



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 1 / 477

# Sentinel-2 Products Specification Document

<b>Written by</b>	<b>Company</b>	<b>Responsibility</b>	<b>Date</b>	<b>Signature</b>
A. Gatti	ACS		12/07/2013	
A. Bertolini				
<b>Verified by</b>				
Claudio Nasuti	ACS	System Engineer	12/07/2013	
<b>Approved by</b>				
Francesco Carriero	ACS	Project Manager	12/07/2013	

Approval evidence is kept within the documentation management system.

Documentation Information			
Submitted to ESA for		Filename:	
<input type="checkbox"/> Information	<input checked="" type="checkbox"/> Review	<input type="checkbox"/> Approval	S2-PDGS-TAS-DI-PSD-V10.doc

**THALES**

**ThalesAlenia**  
Space  
A Thales / Finmeccanica Company

**acs**  
ADVANCED COMPUTER SYSTEMS



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 2 / 477

### CHANGE RECORDS

ISSUE	DATE	§ CHANGE RECORDS	AUTHOR
01	13/01/2012	PDR Issue	ACS Team
02	15/03/2012	Delivery for PDR close-out	ACS Team
		Section 3.20.1: updated file naming convention relative to PDI HKTM as per <b>PDR-RID-26/FM-13</b> disposition.	
		The following sections have been updated as per <b>PDR-RID-70/EC-01</b> disposition: Section 1.6.5: clarified SAFE approach. Sections from 3.6 to 3.13: updated PDI's structure. Sections from 4.6 to 4.9: updated User Product structure.	
		The following sections have been updated as per <b>PDR-RID-73/EC-02</b> taking into account comments and discrepancies detected in the <i>rid73 Attachment.pdf</i> document. Section 1.4 Section 1.6.3 Section 1.6.4 Section 1.6.5 Section 2.6 Section 3.8.3.1 Section 3.8.4	
		As per <b>PDR-RID-75/EC-03</b> point 1: Specified in the Table 3-14, SENSING_TIME field as type date_time:AN_UTC_DATE_TIME. Corrected the corresponding Level-0 Granule schema annexed to this document in the [PSD]_S2-PDGS-TAS-DI-PSD_[02].Schema.zip file. As per <b>PDR-RID-75/EC-03</b> point 2: Corrected section 4.6.7.3. As per <b>PDR-RID-75/EC-03</b> point 3: Added in the Table 3-16 and in the corresponding schema GRANULE_DIMENSIONS field.	
		As per <b>PDR-RID-84/EC-04</b> disposition: Clarified in the section 2.4 the metadata management.	
		Section 1.4: clarified schema management as required by <b>PDR-RID-166/JM-04</b> .	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 3 / 477

		Sections 3.x.3 (x from 1 to 8) and section 1.4 have been updated as per <b>PDR-RID-217/EC-08</b> request.	
		Sections 1.6.2.1 and 1.6.3: updated according to <b>PDR-RID-239/GV-04</b> disposition.	
		Sections 1.6.2.1, 1.6.3 and 1.6.4: updated as per <b>PDR-RID-240/GV-05</b> disposition.	
		Section 1.7.15: updated as per <b>PDR-RID-316/EC-24</b> disposition.	
		Section 4.6.7.1: as required by <b>PDR-RID-464/OC-22</b> this section has been updated providing a preliminary analysis of the product metadata elements to be handled by DAG.	
		Section 4.9.2.1: updated according to ESA response to <b>PDR-RID-465/BK-01</b> .	
		Section 2.1: clarified Level-2A product generation as required by <b>PDR-RID-467/BK-02</b> .	
		Section 1.3: updated clarifying the list of the applicable and reference documents mentioned in this document.	
		Added Section 3.2 to clarify the PDI naming convention.	
		Sections 3.x.3 (x from 1 to 8): for each Granule and Datastrip PDI the content of SAFE Manifest is fully described; an example of Manifest for each PDI is provided in the annexed [PSD]_S2-PDGS-TAS-DI-PSD_[02]_SAFE.zip file.	
		Added Sections 3.22 and 4.10 to describe TCI PDI definition and TCI End User Product..	
		Chapter 5: updated Internal Product Format Definition.	
03	06/04/2012	Delivery to include some ESA comments on the previous issue of the document.	ACS Team
		The following sections, figures and tables have been updated according to comments issued by ESA on the previous issue of the PSD delivered for PDR close-out:  Section 1.3  Section 1.6.5	

		Section 3.8.3.1 Section 3.20.1 Section 4.6.7.1 Section 4.6.8 Table 3-6 Table 3-7 Figure 14	
		Added section 1.5.1 to give a Sentinel-2 product overview to better understand the purpose of the document.	
		Added sections 3.4 and 3.4.2 to underlind the common structure at Granule and Datastrip level.	
		Updated section 3.1 to clarify <i>tar</i> organization and structure.	
		Updated section 3.6 regarding to the PDI Granule Level-0 organization and structure.	
04	09/07/2012	Delivery for CDR-4	
		Section 3.20.1: updated naming convention removing File instance ID mandatory prefix "ssss" (Site centre of the file originator) as required by the Panel Disposition of <b>PDR-RID-026/FM-13</b> and <b>S2PP/FM-13/1/PSD</b> (related to <b>S2PP/FM-09/1/P2FICD</b> and <b>PDR-RID-37/FM-09</b> ).	
		Chapter 2: focusing on DIMAP implementation is provided.	
		Chapter 3: updated to complete and better document the PDI format specifications.	
		Chapter 4: updated to complete and better document the User Product format specifications.	
		The sections 4.3 and 4.6.7.1 (Table 4-12) clarify the processing performed by the DAG-C to compute the QIs at product level.	
		Sections 4.7.9, 4.8.8 and 4.9.9: added the description of <i>manifest</i> files for L1A, L1B and L1C user products.	
		Added Annex C to provide the OLQC_Report.xml report performed by OLQC processor consolidation.	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 5 / 477

		<p>Added <i>manifest.safe</i> files and corresponding XSD schemas relative to Level-1A, Level-1B and Level-1C (cfr. [PSD]_S2-PDGS-TAS-DI-PSD_[05]_SAFE.zip annexed to this document).</p>	
05	20/09/2012	<p>This issue of the document includes the following main improvements:</p> <p>Chapters 1 and 2: updated to help the reader in the understanding of the document;</p> <p>Section 3.7: included latest feedback from Satellite Ancillary Data;</p> <p>Section 3.20: updated HKT M PDI defining it as a SAFE Product Data Item;</p> <p>Chapter 4: all metadata for user product level have been provided;</p> <p>All: consolidation of the file naming, including RID S2PP/FM-13/1/PSD (HKT M file naming now [EOFFS], ref added in applicable documents list);</p> <p>All: CDR-4 Batch 1 RID including ESA red marks taken into account throughout the doc;</p> <p>New version of the XSD schema set according to the document description.</p> <p>Algorithm to generate Product Level QIs as per PDR RID OC-22 agreement (see Table 4-12)</p>	
06	28/11/2012	<p>Section 1.3: updated applicable and reference documentation according to the new baseline documentation.</p>	
		<p>Section 3.2: Clarified the purpose of the PDI_ID definition as a logical and physical naming convention.</p>	
		<p>Section 3.7.3.1:</p> <ol style="list-style-type: none"><li>1. Minor changes on the Table 3-33: <i>Level-0 Datastrip – Image_Data_Info Description</i> to align the metadata description vs XSD schemas.</li><li>2. Updated Table 3-34: <i>Level-0 Datastrip – Satellite_Ancillary_Data_Info Description</i> according to the new issue of the applicable [PDD] and [GPP-IODD] and to align the</li></ol>	

		<p>metadata description vs XSD schemas.</p> <ol style="list-style-type: none"> <li>3. Minor changes on the Table 3-32: <i>Level-0 Datastrip – Quality_Indicator_Info Description</i> to add details on metadata description.</li> <li>4. Updated Table 3-36 <i>Level-0 Datastrip – Auxiliary_Data_Info Description</i> to add the IERS_BULLETIN_FILENAME reference needed to fill the corresponding product level metadata.</li> </ol>	
		<p>Section 3.9.3.1:</p> <ol style="list-style-type: none"> <li>1. Added POD_Info (Figure 32 and Table 3-44) according to the [PDD] description.</li> <li>2. Updated Table 3-46 <i>Level-1A Datastrip – Auxiliary_Data_Info Description</i> to add the IERS Bulletin reference (IERS_BULLETIN_FILENAME) and the Image_Display_Order metadata (RED_CHANNEL, GREEN_CHANNEL, BLUE_CHANNEL).</li> </ol>	
		<p>Section 3.11.3.1:</p> <ol style="list-style-type: none"> <li>1. Updated Table 3-53 <i>Level-1B Datastrip – Auxiliary_Data_Info Description</i> to add the IERS Bulletin reference (IERS_BULLETIN_FILENAME), the GRI data reference and the Image_Display_Order metadata.</li> </ol>	
		<p>Section 3.12.3.1:</p> <ol style="list-style-type: none"> <li>1. Updated Figure 48and Table 3-56 according to the applicable [PDD].</li> </ol>	
		<p>Section 3.13.3.1:</p> <ol style="list-style-type: none"> <li>1. Updated Figure 54 and Table 3-61: <i>Level-1C Datastrip – Auxiliary_Data_Info Description</i> to include ECMWF_DATA_REF, Image_Display_Order and QUANTIFICATION_VALUE metadata according to [PDD] description.</li> </ol>	
		<p>Sections 3.20 and 3.20.1: updated to describe the HKTM PDI as a SAFE product. The corresponding manifest.safe and SAFE schema have been added in the annexed zip file (S2-PDGS-TAS-DI-PSD_[V06]_SAFE.zip).</p>	

		<p>Section 4.4.</p> <ol style="list-style-type: none"> <li>1. Updated according to the applicable [NGEO-EICD-S2].</li> </ol>	
		<p>Section 4.6.2.1:</p> <ol style="list-style-type: none"> <li>2. Updated ISPs description;</li> </ol>	
		<p>Section 4.6.7.1:</p> <ol style="list-style-type: none"> <li>1. Minor changes on the Table 4-9: <i>Level-0 Product_Metadata_File - General_Info Description</i> to add details on metadata description. Added <i>fileFormat</i> attribute for <i>IMAGE_DATA_ID</i> metadata.</li> <li>2. Minor changes on the Table 4-10: <i>Level-0 Product_Metadata_File - Geometric_Info Description</i> to add details on metadata description.</li> </ol>	
		<p>Section 4.7.7.1:</p> <ol style="list-style-type: none"> <li>1. Updated Figure 65 and added Table 4-17: <i>Level-1A Product_Metadata_File - General_Info Description</i> to include the <i>Product_Image_Characteristics</i> according to [PDD] description.</li> </ol>	
		<p>Section 4.8.7.1:</p> <ol style="list-style-type: none"> <li>1. Updated Figure 73 and added Table 4-22: <i>Level-1B Product_Metadata_File – Auxiliary_Data_Info Description</i> to include the <i>Restoration_Parameters</i> and <i>Equalization_Parameters</i> according to [PDD] description.</li> </ol>	
		<p>Section 4.9.7.1:</p> <ol style="list-style-type: none"> <li>1. Removed Radiometric_Info from <i>Product_Metadata_File</i> because, according to [PDD], this group of metadata is available at Datastrip level for each Datastrip composing the product.</li> <li>2. Added Figure 79 and Table 4-23 to detail the general information provided through the <i>Level-1C_Product_Metadata_File</i>.</li> </ol>	
		Section 5.2.2.2: updated file naming for IPF products.	
		Updated in the whole the document the Processing	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 8 / 477

		Baseline definition and management.	
		Updated Annex D to define the OLQC reports naming convention.	
		<b>SYS-1120</b> GML mask format: updated sections 3.4.1, 3.8.2, 3.10.2, 3.12.2. Added annex to describe the grouping strategy to have several masks in one physical GML file.	
		<b>SYS-1121</b> PVI as optional file: updated section 1.5.	
		<b>SYS-1123</b> SAFE format approach packaging: updated section 4.2.	
		<b>SYS-1124</b> Level-0 Granule Physical Format: updated section 3.6.2 and clarified in all the document that L0 Granules come with one image file per band and per detector.	
		<b>SYS-1125</b> Level-0 User Product Data Organization: updated section 4.6.2.1.	
		<b>SYS-1127</b> General Comment on the physical presentation: updated section 4 to include within the User Product physical format an UserProduct_index.html file.	
		<b>SYS-1129</b> Readability of the Document: checked all cross-references and links to tables, figures and sections.	
		<b>SYS-1130</b> SAD raw Data: updated section 4.6.3, Table 3-8 and Table 3-9.	
07	22/02/2013	CDR Delivery	
		Added [OLQC-TN] reference document.	
		Removed [CCTC-IPF] reference document because not available for the end user.	
		The obsolete section 1.4 Document Roadmap has been replaced with the section "How to Use this Document" to help the reader in navigating in the document.	
		Section 1.5: added AS-4 regarding raw SAD data organization.	
		Section 3: all PDI naming conventions and PDI_ID definitions have been updated according to [EOFFS-PDGS].	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 9 / 477

		Section 3.6.3.2: updated IMG_DATA description.	
		Section 3.21 and 3.21.1: updated to describe the SAD files management as per AS-4.	
		<p>Added at Datastrip level (Table 3-32) the following metadata:</p> <p>DATATAKE_SENSING_STOP DATASTRIP_SENSING_START DATASTRIP_SENSING_STOP</p> <p>Renamed SENSING_TIME metadata as DATATAKE_SENSING_START</p>	
		<p>As per RID/ESA-217, removed the metadata :</p> <ul style="list-style-type: none"><li>- Corrected_Attitudes/Values/VELOCITY_VALUES</li><li>- Corrected_Attitudes/Values/VELOCITY_ERRORS</li></ul> <p>from the document (Table 3-34) and the corresponding XSD schema.</p>	
		Removed DEGRADED_ANC_DATA_PERCENTAGE metadata from Granule level (Table 3-16, Table 3-28, Table 3-40, Table 3-50, Table 3-57). This information is available at Datastrip level through the "degradationPercentage" attribute.	
		Section 4: updated User Product structure to include the HTML folder containing a product presentation file ( <b>(SYS-1127)</b> ).	
		Section 4.6.2.1: updated L0 Data Organization description.	
		Section 4.6.3: updated Ancillary Data description.	
		Removed all reference to DEM Quality Masks because no quality mask is available.	
		Removed section 5. INTERNAL PRODUCT FORMAT DEFINITION because not End User oriented. All information has been moved in the appropriate ICDs.	
		Added table in the Annex B to clarify the meaning and the applicability of each inventory metadata.	
		All: the document has been updated to clarify that there are not redundant metadata in the SAFE formatted User Product.	

		<p>Modifies on XSD schemas:</p> <p>dimap.xsd:</p> <ol style="list-style-type: none"> <li>1. removed VELOCITY_VALUES and VELOCITY_ERRORS metadata from AN_ATTITUDE_DATA_INV complexType;</li> <li>2. removed “bandId” attribute from A_GRANULE_FOOTPRINT complexType</li> </ol> <p>item.xsd:</p> <ol style="list-style-type: none"> <li>1. updated all the regular expression according to the new PDI-ID naming conventions</li> </ol> <p>Inventory_Metadata.xsd:</p> <ol style="list-style-type: none"> <li>1. updated all the regular expression according to the new PDI-ID naming conventions</li> <li>2. added annotations to clarify the applicability for each metadata</li> </ol> <p>Added the following schemes to validate the XML metadata files in case of User Product SAFE formatted:</p> <p>SAFE_user_product_Level-0.xsd      SAFE_user_product_Level-1A.xsd      SAFE_user_product_Level-1B.xsd      SAFE_user_product_Level-1C.xsd</p>	
08	17/05/2013	Delivery for CDR Close-out Batch1	
		<p><b>ESA-681</b> <i>Metadata in case of AT granule aggregation:</i> updated section 4.7.8 to include</p> <ul style="list-style-type: none"> <li>• Details about Along-Track Granules Aggregation;</li> <li>• Aggregated Granule ID definition;</li> <li>• Aggregated Granule Physical Format description;</li> <li>• Aggregated Granule Metadata definition.</li> </ul>	
		<p><b>ESA-688</b> <i>GML mask generation strategy:</i> updated sections 3.8.2, 3.9.2 and 3.10.2 to clarify that the mask files are divided per band. The mask naming convention and the masks grouping strategy described in the Annex E of the document have been updated accordingly.</p>	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 11 / 477

		<p><b>ESA-752:</b> <i>tile conso approach vs PSD:</i> updated section 4.9.8 to include the following information:</p> <ul style="list-style-type: none"><li>• Description of the Tile Consolidation concept;</li><li>• Tile consolidated ID definition;</li><li>• Tile consolidated metadata definition.</li></ul>	
		<p><b>ESA-770:</b> <i>Point and comments on the [PSD]:</i> the whole document has been updated to implement the comments listed in the RID PRO-19.pdf annexed to this issue.</p>	
		<p><b>ESA-836 Download Options:</b> updated section 4.4 and Table 4-9 to align the download options as per [SAD] reference document. The User Product XSD schemas have been updated accordingly.</p>	
		<p><b>ESA-571 Sentinel-SAFE Manifest and Product Organization:</b> updated all "SAFE Manifest synoptic table" sections and the example of the SAFE Manifest provided in the zip annexed to the document.</p>	
		<p><b>ESA-826 Points on [PSD].:</b> The whole document has been updated to implement the comments listed in the RID PRO-2.pdf annexed to this issue.</p>	
		<p>Updated section 3.7.3.1 - Table 3-34 to have the same Satellite_Ancillary_Data_Info for each level of processing.</p>	
		<p><b>ESA-751 GID definition / Versioning :</b> updated section 4.2 removing the version id (_Cvvv).</p>	
		<p>Added [OLQC-GIPP] reference document.</p>	
		<p>Annex B: updated Inventory_Metadata description</p>	
		<p>Annex D: updated OLQC report (XSD and XML)</p>	
		<p>A new directory "AUX_DATA" folder containing ECMWF dataset resampled in UTM projection has been added for L1c PDI (note that this modification will request an update of the ICD-IPF V11).</p>	
09	14/06/2013	<p><b>ESA-751 GID definition / Versioning :</b> updated section 1.7.6 and Annex C to add the Processing Baseline in the Datatake_ID (and Group_ID) definition.</p>	
		<p><b>ESA-795 No PDI definition for compression bypassed:</b> updated Table 3-33 to change the</p>	

		metadataLevel on ACTIVE_DETECTOR from <i>Expertise</i> to <i>Brief</i> ; updated Figure 59 and Table 4-9 to add the ON_BOARD_COMPRESSION_MODE metadata; updated sections 3.6.3.2 and 4.6.1 to include the compression by-passed description.	
		Section 1.3: added [GRIB] reference document.	
		Section 1.7.16: updated to clarify which auxiliary data can be embedded in the User Product.	
		Section 2: updated to include ESA's comments on PSD V08 delivered for CDR Close-Out Batch1.	
		Section 3.9.3.1: updated Table 3-43 and Table 3-46 to move Image_Display_Order node from Auxiliary_Data_Info to Image_Data_Info.	
		Section 3.11.3.1: updated Table 3-51 and Table 3-53 to move Image_Display_Order node from Auxiliary_Data_Info to Image_Data_Info.	
		Section 3.13.3.1: updated Table 3-59 and Table 3-61 to move Image_Display_Order node and QUANTIFICATION_VALUE metadata from Auxiliary_Data_Info to Image_Data_Info.	
		Section 3.12.3.1: updated Table 3-56 to add detaild regarding EPSG codes.	
		Section 3.19: added details on ECMWF PDI.	
		Updated the following sections to align the User Product Quality Inticators to OLQC procedures, checks and checklist names consolidation: sections 4.3, 4.6.5, 4.6.7.1, 4.7.7.1, 4.8.7.1 and 4.9.7.1	
		Updated the following sections to add the Processing_Specific_Parameters field (optional field reserved for production chain only but not propagated to User Product): sections 3.4.1, 3.5.1, 3.6.3.1, 3.7.3.1, 3.8.3.1, 3.9.3.1, 3.10.3.1 and 3.12.3.1.	
		The section 4 has been updated to clarify the content of the GRANULE and DATASTRIP folders inside the User Product.	
		Removed all reference to Cloud Mask for Level-0 Datastrip PDI (see comments in RID ESA-770).	
		Renamed in the Table 3-33 the metadata NUMBER_OF_T00_DEGRADED_PACKETS as NUMBER_OF_TOO_DEGRADED_PACKETS	

		Annex D: updated figure and example in the OLQC Report as per OLQC checks and checklist name consolidation.	
		Annex F: updated mask files description.	
		All: renamed the PDI XSD schema.	
		All: updated to include ESA's comments on PSD V08 delivered for CDR Close-Out Batch1.	
10	12/07/2013	<b>ESA-795</b> <i>No PDI definition for compression bypassed:</i> updated sections 1.7.13 and 3.6.3.2.	
		Sections 3.12.2, 3.19: removed .grib extension for ECMWF data.	
		Sections 3.2, 3.15.1, 3.16.1, 3.17.1, 3.19.1: added "S2_" Mission ID applicable to the constellation and used by satellite independent files.	
		Section 3.2, Annex E : removed <i>General Parameters File</i> being an obsolete GIPP file.	
		Sections 3.14.1, 3.15.1, 3.16.1 : updated to set "MPC_" as unique site centre originator of GIPP/DEM/GRI data.	
		Section 3.21: updated to add DPC annotation to SAD packets.	
		Section 1.7.15: updated PVI format.	
		Section 3.19.1: updated ECMWF centre originator.	
		Section 4.6.2.1: updated DPC annotations.	
		Annex C: clarified that the <i>Inventory_Metadata.xml</i> file is only for internal usage.	
		Annex G: updated example of metadata file for a Granule Aggregation	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 14 / 477

## TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>23</b>
1.1 PURPOSE OF THE DOCUMENT .....	23
1.2 DOCUMENT STRUCTURE .....	23
1.3 APPLICABLE AND REFERENCE DOCUMENTS.....	23
1.4 HOW TO USE THIS DOCUMENT .....	26
1.5 ASSUMPTIONS AND TBCs.....	27
1.6 USER PRODUCT .....	29
1.6.1 <i>User Product General Description</i> .....	29
1.6.2 <i>User Product Format</i> .....	30
1.7 GLOSSARY AND DEFINITION OF TERMS.....	31
1.7.1 <i>Mission</i> .....	31
1.7.2 <i>Orbit</i> .....	31
1.7.3 <i>Multi-Spectral Instrument (MSI)</i> .....	32
1.7.4 <i>MSI Bands</i> .....	32
1.7.5 <i>MSI Detectors</i> .....	33
1.7.6 <i>Datatake</i> .....	34
1.7.7 <i>Datastrip</i> .....	34
1.7.8 <i>Granules</i> .....	36
1.7.9 <i>Granules Along-Track Aggregation</i> .....	37
1.7.10 <i>Tiles and UTM Tiled Grid</i> .....	38
1.7.11 <i>Tile Consolidation</i> .....	39
1.7.12 <i>Quality Indicators</i> .....	40
1.7.13 <i>MSI Scene</i> .....	40
1.7.14 <i>Satellite Ancillary Data</i> .....	41
1.7.15 <i>PreView Image</i> .....	41
1.7.16 <i>Auxiliary Data</i> .....	41
<b>2. S2 PRODUCT DEFINITIONS .....</b>	<b>43</b>
2.1 PRODUCT LEVELS .....	43
2.2 PROCESSING BASELINE .....	44
2.3 PRODUCT DATA ITEM (PDI) DEFINITION.....	45
2.4 METADATA MANAGEMENT .....	45
2.5 TIMELINESS DEFINITION.....	46
<b>3. PDI FORMAT DEFINITION.....</b>	<b>47</b>
3.1 TYPE OF PDI .....	47
3.2 PDI NAMING CONVENTION .....	49
3.3 PDI HIERARCHY .....	55
3.4 GRANULE/TILE PDI COMMON STRUCTURE.....	56
3.4.1 <i>Granule_Metadata_File Structure</i> .....	57
3.4.2 <i>Granule/Tile PDI_ID Definition</i> .....	64
3.4.3 <i>Granule/Tile PDI XSD Schemas</i> .....	67

3.4.4	<i>Granule/Tile PDI SAFE Format Approach</i>	68
3.5	DATASTRIp PDI COMMON STRUCTURE	69
3.5.1	<i>Datastrip_Metadata_File Structure</i>	71
3.5.2	<i>Datastrip PDI_ID Definition</i>	78
3.5.3	<i>Datastrip PDI XSD Schemas</i>	80
3.5.4	<i>Datastrip PDI SAFE Format Approach</i>	81
3.6	LEVEL-0 PDI GRANULE DEFINITION	82
3.6.1	<i>PDI_ID definition</i>	83
3.6.2	<i>Level-0 Granule Physical Format</i>	84
3.6.3	<i>Level-0 PDI Granule Structure</i>	86
3.6.4	<i>SAFE Manifest synoptic table</i>	98
3.7	LEVEL-0 PDI DATASTRIp DEFINITION	110
3.7.1	<i>PDI_ID definition</i>	110
3.7.2	<i>Level-0 Datastrip Physical Format</i>	111
3.7.3	<i>Level-0 PDI Datastrip Structure</i>	113
3.7.4	<i>SAFE Manifest synoptic table</i>	139
3.8	LEVEL-1A PDI GRANULE DEFINITION	148
3.8.1	<i>PDI_ID definition</i>	148
3.8.2	<i>Level-1A Granule Physical Format</i>	149
3.8.3	<i>Level-1A PDI Granule Structure</i>	151
3.8.4	<i>SAFE Manifest synoptic table</i>	162
3.9	LEVEL-1A PDI DATASTRIp DEFINITION	170
3.9.1	<i>PDI_ID definition</i>	170
3.9.2	<i>Level-1A Datastrip Physical Format</i>	171
3.9.3	<i>Level-1A PDI Datastrip Structure</i>	172
3.9.4	<i>SAFE Manifest synoptic table</i>	190
3.10	LEVEL-1B PDI GRANULE DEFINITION	199
3.10.1	<i>PDI_ID definition</i>	199
3.10.2	<i>Level-1B Granule Physical Format</i>	200
3.10.3	<i>Level-1B PDI Granule Structure</i>	203
3.10.4	<i>SAFE Manifest synoptic table</i>	214
3.11	LEVEL-1B PDI DATASTRIp DEFINITION	215
3.11.1	<i>PDI_ID definition</i>	215
3.11.2	<i>Level-1B Datastrip Physical Format</i>	216
3.11.3	<i>Level-1B PDI Datastrip Structure</i>	217
3.11.4	<i>SAFE Manifest synoptic table</i>	231
3.12	LEVEL-1C PDI TILE DEFINITION	240
3.12.1	<i>PDI_ID definition</i>	240
3.12.2	<i>Level-1C Tile Physical Format</i>	241
3.12.3	<i>Level-1C PDI Tile Structure</i>	244
3.12.4	<i>SAFE Manifest synoptic table</i>	255
3.13	LEVEL-1C PDI DATASTRIp DEFINITION	263
3.13.1	<i>PDI_ID definition</i>	263
3.13.2	<i>Level-1C Datastrip Physical Format</i>	264
3.13.3	<i>Level-1C PDI Datastrip Structure</i>	265
3.13.4	<i>SAFE Manifest synoptic table</i>	275
3.14	PDI FOR GIPP FILES DEFINITION	284



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 16 / 477

3.14.1	<i>PDI-ID definition</i> .....	284
3.15	PDI FOR DEM FILE DEFINITION .....	285
3.15.1	<i>PDI-ID definition</i> .....	285
3.16	PDI FOR GRI DEFINITION.....	286
3.16.1	<i>PDI-ID definition</i> .....	286
3.17	PDI FOR IERS BULLETIN FILE DEFINITION .....	287
3.17.1	<i>PDI-ID definition</i> .....	287
3.18	PDI FOR POD FILE DEFINITION.....	288
3.18.1	<i>PDI-ID definition</i> .....	288
3.19	PDI FOR ECMWF DATA DEFINITION .....	288
3.19.1	<i>PDI-ID definition</i> .....	289
3.20	S2 HKTM PDI DEFINITION .....	290
3.20.1	<i>PDI-ID definition</i> .....	290
3.21	SAD PDI DEFINITION.....	292
3.21.1	<i>PDI-ID definition</i> .....	292
3.22	TCI PDI DEFINITION .....	295
3.22.1	<i>PDI-ID definition</i> .....	295
<b>4.</b>	<b>USER PRODUCT PHYSICAL FORMAT DEFINITION.....</b>	<b>296</b>
4.1	S2 USER PRODUCT PHYSICAL FORMAT .....	296
4.1.1	<i>User Product XSD Schemas</i> .....	300
4.2	S2 USER PRODUCT NAMING CONVENTION.....	300
4.3	USER PRODUCT QUALITY INDICATORS .....	303
4.4	DOWNLOAD OPTIONS .....	303
4.5	USER PRODUCT SAFE FORMAT APPROACH.....	304
4.6	LEVEL-0 USER PRODUCT SPECIFICATION .....	307
4.6.1	<i>Introduction</i> .....	307
4.6.2	<i>Image Data</i> .....	309
4.6.3	<i>Ancillary Data</i> .....	311
4.6.4	<i>Auxiliary Data</i> .....	312
4.6.5	<i>Quality Indicators</i> .....	312
4.6.6	<i>Metadata</i> .....	313
4.6.7	<i>User Product Level-0 Structure</i> .....	314
4.6.8	<i>User Product Level-0 SAFE Manifest synoptic table</i> .....	341
4.7	LEVEL-1A USER PRODUCT SPECIFICATION .....	350
4.7.1	<i>Introduction</i> .....	350
4.7.2	<i>Image Data</i> .....	352
4.7.3	<i>Ancillary Data</i> .....	353
4.7.4	<i>Auxiliary Data</i> .....	354
4.7.5	<i>Quality Indicators</i> .....	354
4.7.6	<i>Metadata</i> .....	355
4.7.7	<i>User Product Level-1A Structure</i> .....	356
4.7.8	<i>Level-1A Granules Aggregation</i> .....	369
4.7.9	<i>User Product Level-1A SAFE Manifest synoptic table</i> .....	374
4.8	LEVEL-1B USER PRODUCT SPECIFICATION .....	381
4.8.1	<i>Introduction</i> .....	381

 <b>esa</b> <i>Sentinel 2 PDGS Core Procurement</i>	<b>Sentinel-2 Products Specification Document</b>	REF : S2-PDGS-TAS-DI-PSD ISSUE : 10 DATE : 12/07/2013 PAGE : 17 / 477
--	---	--

4.8.2 <i>Image Data</i> .....	383
4.8.3 <i>Ancillary Data</i> .....	383
4.8.4 <i>Auxiliary Data</i> .....	383
4.8.5 <i>Quality Indicators</i> .....	384
4.8.6 <i>Metadata</i> .....	385
4.8.7 <i>User Product Level-1B Structure</i> .....	386
4.8.8 <i>User Product Level-1B SAFE Manifest synoptic table</i> .....	397
<b>4.9 LEVEL-1C USER PRODUCT SPECIFICATION .....</b>	<b>398</b>
4.9.1 <i>Introduction</i> .....	398
4.9.2 <i>Image Data</i> .....	399
4.9.3 <i>Ancillary Data</i> .....	401
4.9.4 <i>Auxiliary Data</i> .....	401
4.9.5 <i>Quality Indicators</i> .....	403
4.9.6 <i>Metadata</i> .....	404
4.9.7 <i>User Product Level-1C Structure</i> .....	405
4.9.8 <i>Tiles Consolidation</i> .....	414
4.9.9 <i>User Product Level-1C SAFE Manifest synoptic table</i> .....	418
<b>4.10 TRUE COLOUR IMAGE (TCI) PRODUCT SPECIFICATION .....</b>	<b>425</b>
<b>ANNEX A: USER PRODUCT BASED ON DIMAP FORMAT .....</b>	<b>426</b>
<b>ANNEX B: INSPIRE METADATA .....</b>	<b>427</b>
<b>ANNEX C: INVENTORY_METADATA .....</b>	<b>451</b>
<b>ANNEX D: OLQC REPORT XSD .....</b>	<b>455</b>
<b>ANNEX E: GROUND IMAGE PROCESSING PARAMETERS .....</b>	<b>459</b>
<b>ANNEX F: MASK TYPES AND GROUPING STRATEGY FOR L1 PRODUCTS .....</b>	<b>464</b>
<b>ANNEX G: EXAMPLE OF METADATA FILE FOR A GRANULE AGGREGATED .....</b>	<b>470</b>
<b>ANNEX H: JPEG2000 COMPRESSION .....</b>	<b>474</b>
<b>ANNEX I: LOGICAL PRODUCT .....</b>	<b>476</b>

### Table of Figures

<b>FIGURE 1: L1C USER PRODUCT AGGREGATING ALL TILES INTERSECTING A USER DEFINED AREA-OF-INTEREST .....</b>	<b>29</b>
--	-----------



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 18 / 477

FIGURE 2: DATATAKE SEGMENTATION IN DATASTRIPS .....	35
FIGURE 3: EXAMPLE OF GRANULES COVERING AN AREA-OF-INTEREST OF THE USER .....	37
FIGURE 4: GRANULES AGGREGATED ALONG-TRACK .....	38
FIGURE 5: EXAMPLE OF TILING (100x100KM <sup>2</sup> ) WITHIN THE UTM15 ZONE .....	39
FIGURE 6: TILE PAIRS CONSOLIDATION .....	40
FIGURE 7: GRANULE / TILE COMMON STRUCTURE .....	56
FIGURE 8: GRANULE_METADATA_FILE .....	57
FIGURE 9: DATASTRIP COMMON STRUCTURE .....	70
FIGURE 10: DATASTRIP_METADATA_FILE .....	71
FIGURE 11: PDI LEVEL-0 GRANULE STRUCTURE.....	82
FIGURE 12: PDI LEVEL-0 GRANULE PHYSICAL FORMAT .....	85
FIGURE 13 : LEVEL-0_GRANULE_METADATA_FILE - GENERAL_INFO DIAGRAM .....	88
FIGURE 14: LEVEL-0_GRANULE_METADATA_FILE - GEOMETRIC_INFO DIAGRAM .....	91
FIGURE 15: LEVEL-0_GRANULE_METADATA_FILE - QUALITY_INDICATOR_INFO DIAGRAM .....	94
FIGURE 16: PDI LEVEL-0 DATASTRIP STRUCTURE .....	110
FIGURE 17: PDI LEVEL-0 DATASTRIP PHYSICAL FORMAT.....	112
FIGURE 18: LEVEL-0 DATASTRIP - GENERAL_INFO DIAGRAM .....	115
FIGURE 19 : LEVEL-0 DATASTRIP – IMAGE_DATA_INFO DIAGRAM .....	120
FIGURE 20: LEVEL-0 DATASTRIP – SATELLITE_ANCILLARY_DATA_INFO DIAGRAM.....	125
FIGURE 21 : LEVEL-0 DATASTRIP – QUALITY_INDICATOR_INFO DIAGRAM .....	134
FIGURE 22 : LEVEL-0 DATASTRIP – AUXILIARY_DATA_INFO DIAGRAM .....	137
FIGURE 23: PDI LEVEL-1A GRANULE STRUCTURE.....	148
FIGURE 24: PDI LEVEL-1A GRANULE PHYSICAL FORMAT .....	151
FIGURE 25: LEVEL-1A_GRANULE_METADATA_FILE - GENERAL_INFO DIAGRAM .....	154
FIGURE 26: LEVEL-1A_GRANULE_METADATA_FILE - GEOMETRIC_INFO DIAGRAM.....	157
FIGURE 27: LEVEL-1A_GRANULE_METADATA_FILE – QUALITY_INDICATORS_INFO DIAGRAM.....	160
FIGURE 28: PDI LEVEL-1A DATASTRIP STRUCTURE .....	170
FIGURE 29: PDI LEVEL-1A DATASTRIP PHYSICAL FORMAT.....	172
FIGURE 30: LEVEL-1A DATASTRIP - GENERAL_INFO DIAGRAM .....	175
FIGURE 31 : LEVEL-1A DATASTRIP – IMAGE_DATA_INFO DIAGRAM .....	179
FIGURE 32: LEVEL-1A DATASTRIP – SATELLITE_ANCILLARY_DATA_INFO DIAGRAM .....	184
FIGURE 33 : LEVEL-1A DATASTRIP – QUALITY_INDICATOR_INFO DIAGRAM .....	185
FIGURE 34 : LEVEL-1A DATASTRIP – AUXILIARY_DATA_INFO DIAGRAM .....	188
FIGURE 35: PDI LEVEL-1B GRANULE STRUCTURE .....	199
FIGURE 36: PDI LEVEL-1B GRANULE PHYSICAL FORMAT .....	202
FIGURE 37: LEVEL-1B_GRANULE_METADATA_FILE - GENERAL_INFO DIAGRAM .....	206
FIGURE 38: LEVEL-1B_GRANULE_METADATA_FILE - GEOMETRIC_INFO DIAGRAM.....	209
FIGURE 39: LEVEL-1B_GRANULE_METADATA_FILE – QUALITY_INDICATORS_INFO DIAGRAM .....	212
FIGURE 40: PDI LEVEL-1B DATASTRIP STRUCTURE.....	215
FIGURE 41: PDI LEVEL-1B DATASTRIP PHYSICAL FORMAT .....	217
FIGURE 42 : LEVEL-1B DATASTRIP – IMAGE_DATA_INFO DIAGRAM .....	219
FIGURE 43: LEVEL-1B DATASTRIP – QUALITY_INDICATOR_INFO DIAGRAM .....	225
FIGURE 44 : LEVEL-1B DATASTRIP – AUXILIARY_DATA_INFO DIAGRAM.....	229
FIGURE 45: PDI LEVEL-1C TILE STRUCTURE.....	240
FIGURE 46: PDI LEVEL-1C TILE PHYSICAL FORMAT.....	243
FIGURE 47: LEVEL-1C_TILE_METADATA_FILE - GENERAL_INFO DIAGRAM .....	247
FIGURE 48: LEVEL-1C_TILE_METADATA_FILE - GEOMETRIC_INFO DIAGRAM .....	249



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 19 / 477

FIGURE 49: LEVEL-1C_TILE_METADATA_FILE – QUALITY_INDICATORS_INFO DIAGRAM .....	252
FIGURE 50: PDI LEVEL-1C DATASTRIP STRUCTURE.....	263
FIGURE 51: PDI LEVEL-1C DATASTRIP PHYSICAL FORMAT.....	265
FIGURE 52 : LEVEL-1C DATASTRIP – IMAGE_DATA_INFO DIAGRAM .....	267
FIGURE 53: LEVEL-1C DATASTRIP – QUALITY_INDICATOR_INFO DIAGRAM .....	271
FIGURE 54 : LEVEL-1C DATASTRIP – AUXILIARY_DATA_INFO DIAGRAM.....	273
FIGURE 55: S2 HKT M PDI DEFINITION .....	290
FIGURE 56: S2 SAD PDI DEFINITION.....	292
FIGURE 57: TCI PDI DEFINITION .....	295
FIGURE 58: LEVEL-0 USER PRODUCT STRUCTURE.....	307
FIGURE 59 : LEVEL-0 PRODUCT_METADATA_FILE - GENERAL_INFO DIAGRAM .....	317
FIGURE 60: LEVEL-0 PRODUCT_METADATA_FILE – GEOMETRIC_INFO DIAGRAM .....	325
FIGURE 61 : LEVEL-0 PRODUCT_METADATA_FILE – AUXILIARY_DATA_INFO DIAGRAM .....	328
FIGURE 62 : LEVEL-0_PRODUCT_METADATA_FILE – QUALITY_INDICATOR_INFO DIAGRAM.....	332
FIGURE 63: LEVEL-1A USER PRODUCT STRUCTURE.....	351
FIGURE 64 : EXAMPLE OF LEVEL-1A GRANULE (IMAGE DATA) CORRESPONDING TO DETECTOR 1 .....	352
FIGURE 65 : LEVEL-1A PRODUCT_METADATA_FILE - GENERAL_INFO DIAGRAM .....	359
FIGURE 66: LEVEL-1A PRODUCT_METADATA_FILE – GEOMETRIC_INFO DIAGRAM.....	362
FIGURE 67 : LEVEL-1A PRODUCT_METADATA_FILE – AUXILIARY_DATA_INFO DIAGRAM .....	363
FIGURE 68 : LEVEL-1A PRODUCT_METADATA_FILE – QUALITY_INDICATOR_INFO DIAGRAM .....	366
FIGURE 69 : EXAMPLE OF LEVEL-1A GRANULES AGGREGATION .....	369
FIGURE 70: LEVEL-1B USER PRODUCT STRUCTURE .....	382
FIGURE 71 : LEVEL-1B PRODUCT_METADATA_FILE - GENERAL_INFO DIAGRAM .....	389
FIGURE 72: LEVEL-1B PRODUCT_METADATA_FILE – GEOMETRIC_INFO DIAGRAM.....	392
FIGURE 73 : LEVEL-1B PRODUCT_METADATA_FILE – AUXILIARY_DATA_INFO DIAGRAM .....	393
FIGURE 74: LEVEL-1C USER PRODUCT STRUCTURE .....	399
FIGURE 75: LEVEL-1C TILING CONCEPT IN UTM .....	400
FIGURE 76 : LEVEL-1C_PRODUCT_METADATA_FILE - GENERAL_INFO DIAGRAM .....	408
FIGURE 77 : LEVEL-1C PRODUCT_METADATA_FILE – AUXILIARY_DATA_INFO DIAGRAM .....	410
FIGURE 78: TILE PAIRS CONSOLIDATION .....	414
FIGURE 79: HMI OF INSPIRE METADATA EDITOR .....	428
FIGURE 80 : VOLUME FOR IMAGE 290KM X 290KM, ESTIMATED WITH AVERAGE JP2000 COMPRESSION RATIO)	474
FIGURE 81: LOGICAL PRODUCT .....	476

### Table of Tables

TABLE 1-1: TABLE OF ASSUMPTIONS .....	27
TABLE 1-2: TABLE OF TBCs.....	28
TABLE 1-3: DATATAKE_ID DEFINITION.....	34
TABLE 2-1: SENTINEL-2 PRODUCT LEVELS AND MAIN CHARACTERISTICS .....	44
TABLE 2-2: SENTINEL-2 PRODUCT TIMELINESS .....	46
TABLE 3-1: TYPE OF PDI .....	49
TABLE 3-2: PDI FILE NAME DECOMPOSITION.....	49
TABLE 3-3: GRANULE (TILE), DATASTRIP AND TCI PDI FILE TYPE.....	50
TABLE 3-4: GIPP FILE TYPE .....	52

TABLE 3-5: DEM FILE TYPE.....	52
TABLE 3-6: GRI FILE TYPE.....	52
TABLE 3-7: HKTM FILE TYPE.....	52
TABLE 3-8: SAD PACKET TYPE POSSIBLE VALUES .....	52
TABLE 3-9: SAD FILE TYPE.....	53
TABLE 3-10: IERS BULLETIN FILE TYPE.....	53
TABLE 3-11: POD FILE TYPE.....	53
TABLE 3-12: ECMWF FILE TYPE.....	53
TABLE 3-13: GRANULE / TILE METADATA STRUCTURE.....	57
TABLE 3-14: GRANULE / TILE PDI GENERAL_INFO .....	58
TABLE 3-15: GRANULE / TILE PDI GEOMETRIC_INFO .....	58
TABLE 3-16: GRANULE / TILE PDI QUALITY INDICATORS.....	62
TABLE 3-17: GRANULE QUALITY CONTROL CHECKS .....	63
TABLE 3-18:HIGH LEVEL STRUCTURE OF SAFE MANIFEST FILE .....	68
TABLE 3-19: DATASTRIP METADATA STRUCTURE.....	71
TABLE 3-20: DATASTRIP PDI GENERAL_INFO .....	72
TABLE 3-21: DATASTRIP PDI IMAGE_DATA_INFO .....	72
TABLE 3-22: DATASTRIP PDI SATELLITE_ANCILLARY_DATA_INFO .....	72
TABLE 3-23: DATASTRIP PDI QUALITY INDICATORS.....	75
TABLE 3-24: DATASTRIP QUALITY CONTROL CHECKS .....	76
TABLE 3-25: DATASTRIP PDI AUXILIARY_DATA_INFO .....	77
TABLE 3-26: LEVEL-0_GRANULE_METADATA_FILE - GENERAL_INFO DESCRIPTION.....	90
TABLE 3-27: LEVEL-0_GRANULE_METADATA_FILE - GEOMETRIC_INFO DESCRIPTION.....	93
TABLE 3-28: LEVEL-0 GRANULE - QUALITY_INDICATORS_INFO DESCRIPTION.....	95
TABLE 3-29 – CONTENT OF INFORMATION PACKAGE MAP FOR PDI LEVEL-0 GRANULE SAFE MANIFEST	101
TABLE 3-30 - CONTENT OF METADATA SECTION FOR PDI LEVEL-0 GRANULE SAFE MANIFEST .....	108
TABLE 3-31 – CONTENT OF DATA OBJECT SECTION FOR PDI LEVEL-0 GRANULE SAFE MANIFEST .....	109
TABLE 3-32: LEVEL-0 DATASTRIP - GENERAL_INFO DESCRIPTION.....	119
TABLE 3-33: LEVEL-0 DATASTRIP – IMAGE_DATA_INFO DESCRIPTION .....	124
TABLE 3-34: LEVEL-0 DATASTRIP – SATELLITE_ANCILLARY_DATA_INFO DESCRIPTION .....	133
TABLE 3-35: LEVEL-0 DATASTRIP – QUALITY_INDICATOR_INFO DESCRIPTION .....	136
TABLE 3-36: LEVEL-0 DATASTRIP – AUXILIARY_DATA_INFO DESCRIPTION .....	138
TABLE 3-37 - CONTENT OF METADATA SECTION FOR PDI LEVEL-0 DATASTRIP SAFE MANIFEST.....	146
TABLE 3-38: LEVEL-1A_GRANULE_METADATA_FILE - GENERAL_INFO DESCRIPTION.....	156
TABLE 3-39: LEVEL-1A_GRANULE_METADATA_FILE - GEOMETRIC_INFO DESCRIPTION.....	159
TABLE 3-40: LEVEL-1A_GRANULE_METADATA_FILE - QUALITY_INDICATORS_INFO DESCRIPTION.....	161
TABLE 3-41 - CONTENT OF METADATA SECTION FOR PDI LEVEL-1A GRANULE SAFE MANIFEST .....	169
TABLE 3-42: LEVEL-1A DATASTRIP - GENERAL_INFO DESCRIPTION.....	178
TABLE 3-43: LEVEL-1A DATASTRIP – IMAGE_DATA_INFO DESCRIPTION .....	183
TABLE 3-44: LEVEL-1A DATASTRIP – SATELLITE_ANCILLARY_DATA_INFO DESCRIPTION .....	184
TABLE 3-45: LEVEL-1A DATASTRIP - QUALITY_INDICATORS_INFO DESCRIPTION .....	187
TABLE 3-46: LEVEL-1A DATASTRIP – AUXILIARY_DATA_INFO DESCRIPTION.....	189
TABLE 3-47 - CONTENT OF METADATA SECTION FOR PDI LEVEL-1A DATASTRIP SAFE MANIFEST.....	198
TABLE 3-48: LEVEL-1B_GRANULE_METADATA_FILE - GENERAL_INFO DESCRIPTION.....	208
TABLE 3-49: LEVEL-1B_GRANULE_METADATA_FILE - GEOMETRIC_INFO DESCRIPTION .....	211
TABLE 3-50: LEVEL-1B_GRANULE_METADATA_FILE - QUALITY_INDICATORS_INFO DESCRIPTION .....	213
TABLE 3-51: LEVEL-1B DATASTRIP – IMAGE_DATA_INFO DESCRIPTION .....	224



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 21 / 477

TABLE 3-52: LEVEL-1B DATASTRIP – QUALITY_INDICATOR_INFO DESCRIPTION.....	227
TABLE 3-53: LEVEL-1B DATASTRIP – AUXILIARY_DATA_INFO DESCRIPTION.....	230
TABLE 3-54 - CONTENT OF METADATA SECTION FOR PDI LEVEL-1B DATASTRIP SAFE MANIFEST .....	239
TABLE 3-55: LEVEL-1C_TILE_METADATA_FILE - GENERAL_INFO DESCRIPTION .....	248
TABLE 3-56: LEVEL-1C_TILE_METADATA_FILE - GEOMETRIC_INFO DESCRIPTION .....	250
TABLE 3-57: LEVEL-1C_TILE_METADATA_FILE – QUALITY_INDICATORS_INFO DESCRIPTION.....	253
TABLE 3-58 CONTENT OF METADATA SECTION FOR PDI LEVEL-1C TILE SAFE MANIFEST .....	262
TABLE 3-59: LEVEL-1C DATASTRIP – IMAGE_DATA_INFO DESCRIPTION .....	270
TABLE 3-60: LEVEL-1C DATASTRIP – QUALITY_INDICATOR_INFO DESCRIPTION.....	272
TABLE 3-61: LEVEL-1C DATASTRIP – AUXILIARY_DATA_INFO DESCRIPTION.....	274
TABLE 3-62 - CONTENT OF METADATA SECTION FOR PDI LEVEL-1C DATASTRIP SAFE MANIFEST .....	283
TABLE 3-63: PDI-ID DEFINITION FOR GIPP FILES.....	284
TABLE 3-64: PDI-ID DEFINITION FOR DEM.....	286
TABLE 3-65: PDI-ID DEFINITION FOR IERS BULLETIN .....	287
TABLE 3-66: PDI-ID DEFINITION FOR SAD.....	293
TABLE 4-1: SENTINEL-2 PRODUCTS PHYSICAL FORMAT .....	298
TABLE 4-2: MAIN PRODUCT DIRECTORY - NAMING CONVENTION.....	301
TABLE 4-3: PRODUCT_METADATA_FILE - NAMING CONVENTION.....	302
TABLE 4-4: PRODUCT_METADATA_FILE - NAMING CONVENTION.....	303
TABLE 4-5:HIGH LEVEL STRUCTURE OF SAFE MANIFEST FILE .....	305
TABLE 4-6: DFEP ANNOTATIONS FOR ONE INSTRUMENT SOURCE PACKET .....	310
TABLE 4-7: NUMBER OF MISSION SOURCE PACKETS IN A GRANULE .....	311
TABLE 4-8: LEVEL-0 PRODUCT METADATA.....	313
TABLE 4-9: LEVEL-0 PRODUCT_METADATA_FILE - GENERAL_INFO DESCRIPTION .....	324
TABLE 4-10: LEVEL-0 PRODUCT_METADATA_FILE - GEOMETRIC_INFO DESCRIPTION .....	327
TABLE 4-11: LEVEL-0 PRODUCT_METADATA_FILE – AUXILIARY_DATA_INFO DESCRIPTION .....	329
TABLE 4-12: LEVEL-0 PRODUCT_METADATA_FILE – QUALITY_INDICATORS_INFO DESCRIPTION .....	337
TABLE 4-13 - CONTENT OF METADATA SECTION FOR LEVEL-0 USER PRODUCT SAFE MANIFEST .....	349
TABLE 4-14: INPUT FOR LEVEL-1A PROCESSING .....	350
TABLE 4-15: NUMBER OF LINES IN ONE GRANULE .....	352
TABLE 4-16: LEVEL-1A PRODUCT METADATA .....	355
TABLE 4-17: LEVEL-1A PRODUCT_METADATA_FILE - GENERAL_INFO DESCRIPTION .....	361
TABLE 4-18 - CONTENT OF METADATA SECTION FOR LEVEL-1A USER PRODUCT SAFE MANIFEST.....	380
TABLE 4-19: INPUT FOR LEVEL-1B PROCESSING .....	381
TABLE 4-20: LEVEL-1B PRODUCT METADATA .....	385
TABLE 4-21: LEVEL-1B PRODUCT_METADATA_FILE - GENERAL_INFO DESCRIPTION .....	391
TABLE 4-22: LEVEL-1B PRODUCT_METADATA_FILE - AUXILIARY_INFO DESCRIPTION .....	393
TABLE 4-23: INPUT OF LEVEL-1C PROCESSING .....	398
TABLE 4-24: LEVEL-1C PRODUCT METADATA .....	404
TABLE 4-25: LEVEL-1C_PRODUCT_METADATA_FILE - GENERAL_INFO DESCRIPTION .....	409
TABLE 4-26: LEVEL-1C_PRODUCT_METADATA_FILE - AUXILIARY_INFO DESCRIPTION.....	410
TABLE 4-27 - CONTENT OF METADATA SECTION FOR LEVEL-1C USER PRODUCT SAFE MANIFEST .....	424



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 22 / 477

PAGE INTENTIONALLY LEFT BLANK



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 23 / 477

## 1. INTRODUCTION

### 1.1 Purpose of the document

The purpose of the Sentinel-2 Products Specification Document (PSD) is to describe in detail the mission User Products.

The Sentinel-2 mission user products are: Level-0, Level-1A, Level-1B and True Colour Image (TCI).

The specification of the Sentinel-2 User Products includes the description of the Product Data Items (PDI) composing them.

### 1.2 Document Structure

This document is structured as follows:

- Chapter 1: Describes the purpose and the structure of the document, provides the list of applicable and reference documents, includes a roadmap to help the reader navigating through the document, includes the list of the assumptions and a preliminary description of the User Product.
- Chapter 2: Presents a list of definitions of the main terms needed to understand the document.
- Chapter 3: Defines the content and structure of each type of PDI, the elementary units composing the User Product.
- Chapter 4: Defines all Sentinel-2 User Products (Level-0, Level-1A, Level-1B, Level-1C and TCI).

Annexed to this document the two zip files are provided:

1. S2-PDGS-TAS-DI-PSD-V10\_Schema.zip
2. S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip

The first zip file contains the XSD schema describing the PDI and User Products (metadata and structure).

The second zip file includes an example of SAFE Manifest for each PDI and User Product and the corresponding xfdu.xsd schema used to validate them.

### 1.3 Applicable and Reference Documents

Applicable Documents mentioned in this document are listed hereafter.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 24 / 477

Reflabel	Reference	Version	Date	Title
OCD	GMES-GSEG-EOPG-TN-09-0008	2.2	15/12/2011	S2 PDGS Operations Concept Document
PDD	GMES-GSEG-EOPG-TN-09-0029	2.3	30/03/2012	S2 PDGS Products Definition

Reference Documents mentioned in this document are listed hereafter.

Reflabel	Reference	Version	Date	Title
SAFE-SPEC	GAEL-P264-DOC-0001-01-01	1.1	11/06/2012	Sentinel Standard Archive Format for Europe (sentinel safe) Control Book – volume 1 – Core Specifications
HMA-GML	OGC 07-036		27/08/2007	Geography Markup Language (GML) 3.2.1 Encoding Standard
EC-INSPIRE-DIR	DIRECTIVE 2007/2/EC		14.03.2007	DIRECTIVE-2007-2-EC (INSPIRE) - Establishing an Infrastructure for Spatial Information
EC-INSPIRE-CR	REGULATION 2008/12/EC		24.12.2008	REGULATION-EC-1205-2008 (INSPIRE) - Implementing Directive 2007-2-EC as regards Metadata
SAFE	WEB			Standard Archive Format for Europe (SAFE), <a href="http://earth.esa.int">http://earth.esa.int</a> /SAFE/
DIMAP	WEB			DIMAP Format Specifications, <a href="http://www.spotimage.fr/dimap/spec/dimap.htm">http://www.spotimage.fr/dimap/spec/dimap.htm</a>
S2GICD	GS2.ICD.ASD.SY.00006	8.0	09.05.2011	Satellite to Ground Segment Interface Control Document
S2GICD-MSI	GS2.ICDASF.MSI.00008	7.0	09/03/2011	MSI Mission Data ICD
DFEP-ICD	DFEP-ICD-KSAC-ESA-1066	1.8	19/10/2012	Sentinel DFEP External ICD – Volume 2
S2GICD-SAD	GS2.ICD.ASD.SY.00012	7.0	31/07/2012	Sentinel 2 Satellite Ancillary Data Interface Control Document
L2A-PDD	S2PAD-VEGA-PD-0001	4.0	03/07/2012	Sentinel 2 MSI – Level 2A products definition
EOFFS-PDGS	GMES-GSEG-EOPG-TN-10-0099	1.0	28/02/2011	Earth Observation GS File Format Standard – Tailoring for the Sentinel Missions PDGS
EOFFS	PE-TN-ESA-GS-0001	2.0	07/03/2011	Earth Observation Ground Segment File Format Standard



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 25 / 477

Reflabel	Reference	Version	Date	Title
MRD	EOP-SM/1163/MR-dr	2.1	08.03.2010	Mission Requirements Document
DAP-R	GMES-PMAN-EOPG-RD-08-0002	1.2	31.12.2010	Data Access Portfolio Requirement Document (DAP/R)
ECMWF-FCAST	WEB	-	-	ECMWF Deterministic Atmospheric Model Products
GRIB	GRIB Edition 1			A GUIDE TO THE CODE FORM FM 92-IX Ext. <a href="http://www.wmo.int/pages/prog/www/WMOCodes/Guides/GRIB/GRIB1-Contents.html">http://www.wmo.int/pages/prog/www/WMOCodes/Guides/GRIB/GRIB1-Contents.html</a>
ECMWF-PDGS-ICD	GMES-GSEG-EOPG-IC-11-0102	1.0	-	ECMWF to Sentinel-2 PDGS ICD
GPP-DEM	GS2-IF-GSGP-70-CNES	1.1	18/03/2010	System DEM Description (GLOBE, filtered SRTM) content and format
GRI-TN	GMES-GSEG-EOPG-TN-10-0071	0.1 Draft	21/07/2010	Sentinel2 Global reference images generation
CCTS-US	S2-PDGS-TAS-DI-CCTS-US	01	13/01/2012	User Services Technical Specification Document (US-CCTS)
NGEO-EICD-S2	NGEO-13-ICD-DLR-066	1.4	2012-07-16	EXTERNAL ICD FOR SENTINEL-2
SAD	S2-PDGS-TAS-DI-SAD	06	22/05/2013	Sentinel-2 PDGS System Architecture Design Document
SRD	GMES-GSEG-EOPG-RD-09-0028	2.2	15.12.2011	S2 PDGS System Requirements Document
GPP-IODD	GS2-ICD-GS-80-CNES	1.10	09/07/2012	GMES Sentinel2 Ground Prototype Processor – Interface Control Document (XSD Set.zip)
GMLJP2	OGC 05-047r3			GML in JPEG2000 for Geographic Imagery (GMLJP2) Encoding Specification <a href="http://www.opengeospatial.org/standards/gmljp2">http://www.opengeospatial.org/standards/gmljp2</a>
JP2STD	ISO/IEC 15444-1		2004	JPEG 2000 standard part 1 and part 2, <a href="http://www.jpeg.org/jpeg2000">http://www.jpeg.org/jpeg2000</a>
OLQC-TN	S2-PDGS-ACS-TN-0128	1.0	14/02/2013	OLQC Inspections
OLQC-GIPP	GAEL-P268-TCN-001	1.1	2012-12-11	OLQC-GIPP interface

## 1.4 How to Use this Document

Purpose of the following tables is to help the reader in navigating in the document. The first one shows the document sections classified according to the different user types; the second one contains a short executive summary of the main contents of the document.

User Type	Pointers to the document section
End User	Roadmap: a) Chapter 1: to know the purpose of this document and to have a preliminary overview of the User Product format; b) Chapter 2: to learn the main product definitions and concepts; c) Chapter 3: to have a description of all possible elements that can be embedded in the User Product; d) Chapter 4: contains the User Product specifications that drive the User Product definition, its structure and its format; this chapter contains all the permanent links to the first three chapters of the document.
IPF Developers	All needed information is contained in the Chapter 3 of the document.
MPA Developers	All sections related to the quality indicators definition at PDI level and at User Product level. Roadmap: Section 3.4; Section 3.5 Table 4-12 Annex D for OLQC report schema

Executive Summary	Pointer to the document section
All terms and Definitions	They are collected in the sections 1.7 and 2.
Physical Format of a S2 User Product	Section 4.1
Naming Convention of a S2 User Product	Section 4.2
List of download option available for an End User	Section 4.4
Physical structure of a Product Data Item	L0 PDI: sections 3.6.2 and 3.7.2 L1A PDI: sections 3.8.2 and 3.9.2 L1B PDI: sections 3.10.2 and 3.11.2 L1C PDI: sections 3.12.2 and 3.13.2
Naming Convention of a Product Data Item	Section 3.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 27 / 477

### 1.5 Assumptions and TBCs

The following tables summarise the current assumptions and issues “To Be Confirmed” along with their status:

Id	Title	Description	Status
AS-1	GML mask format	<p>ESA is internally defining the GML mask format conform to GML 3.2.1 by means of the standard profile 10-157r1. Proposed schemas will be delivered to TAS Consortium for assessing/discussion.</p> <p>The current version used for geotagging is GML 3.1.1 [HMA-GML]. It will be updated in the future if needed.</p>	Closed
AS-2	PVI as optional file	<p>S2-PDGS-DAG-085: <i>The PDGS/DAG function shall, when requested as a download-option, include a previewimage in the User Products downloaded.</i></p> <p>In disagreement with the [PDD], the PVI is considered an optional file included in the final product only if selected by the user.</p> <p>Clarified by ESA: “Actually the PVI as URL should be always embedded in the product. Only the physical file is optional.”</p>	Closed
AS-3	HKTM PDI, SAFE formatted	The HKTM PDI will be provided as a TAR file containing the SAFE-formatted product according to the same structure and content of the analogous product defined for Sentinel-1.	Open
AS-4	Satellite Ancillary Data – files organization	<p>We assume that:</p> <ul style="list-style-type: none"> <li>- Raw SAD data inside the L0 Datastrip PDI and L0 User Product are provided as a set of files each matching a single packet type. Those files cover the temporal extent of the full Datatake.</li> <li>- Raw SAD data inside the SAD PDI are provided as a set of files each matching a single packet type. Those files cover the temporal extent of the full Orbit.</li> </ul>	Open

Table 1-1: Table of Assumptions

Id	Title	Description	Status
TBC-1	DIMAP v2	DIMAP v1 is not applicable for a user product which has different characteristics than SPOT products i.e. for a user product	Closed



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 28 / 477

		that does not contain only one image file and one metadata file. If the DIMAP format have to be foreseen for a Sentinel-2 User Product (including other product components in addition to a one image file e one metadata file) an evolution of DIMAP v1 (i.e. DIMAP v2) have to be confirmed and accepted.	
TBC-2	SID disabled in SAD-ICD	SID 124-125-126 have been erroneously put as disabled in [S2GICD-SAD]. This inconsistency will be fixed in issue 7.0.	Closed
TBC-3	SAD provided as single file	In the current applicable [PDD] (issue 2.2 but also in the next issue 2.3) it is yet "TBC" if all ancillary data source packets are provided within a single file.	Closed

Table 1-2: Table of TBCs

## 1.6 User Product

The **Sentinel-2 User Product** is defined by a collection of data items (image, ancillary, auxiliary) and metadata describing all products elements.

The data items and the metadata are selected through a user download options (see section 4.4)

The User Product physical structure is defined in the Chapter 4.

### 1.6.1 User Product General Description

The **User Product** is the product delivered to the user corresponding to:

- A user defined geographical Area-Of-Interest;
- A user defined selection of the User Product components specified as download options (see section 4.4) according to different user authorizations.

The User Product is composed by a set of Granules (also called Tiles for L1C User Product) intersecting/touching the Area-Of-Interest of the user.

The following figure illustrates the User Product concept for the L1C User Product that aggregates all Tiles corresponding to the user defined Area-Of-Interest.

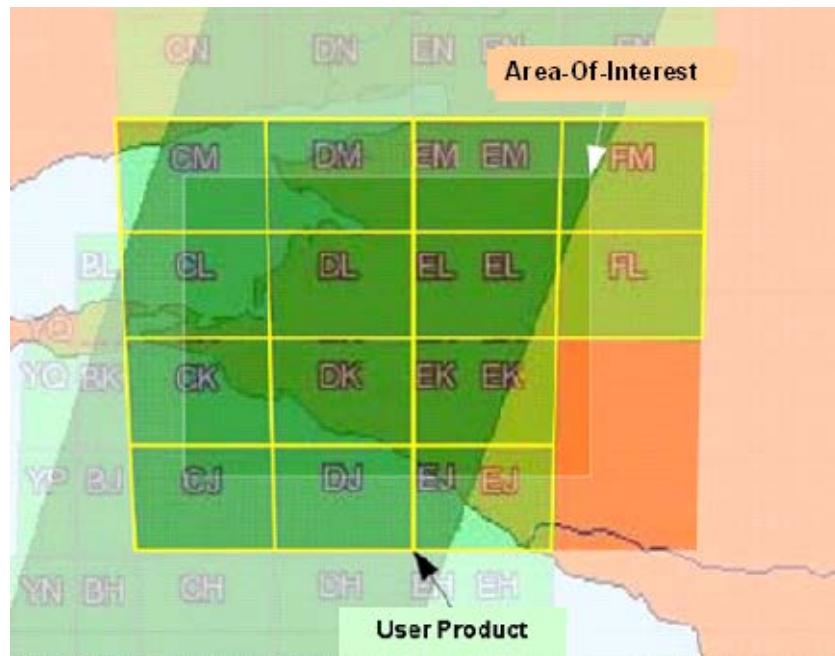


Figure 1: L1C User Product aggregating all Tiles intersecting a user defined Area-Of-Interest



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 30 / 477

The S2 User Products are composed by a set of physical product components referred as **Product Data Items** (PDI) corresponding to the minimum indivisible partition of one Sentinel-2 User Product.

Each PDI is a set or excerpt of the following type of data:

- Image data;
- Ancillary data (satellite orbit position, velocity, time, attitude, etc);
- Auxiliary data;
- Preview Data;
- Quality Indicators Data;
- Metadata.

Each PDI is self-standing as a physical item defined as a tar compressed files in the section 3 of this document but all PDIs used to construct a User Product will never be embedded as TAR but as folder containing the selected components.

The User Product is packaged in **SAFE** (Standard Archive Format for Europe) format as baseline format or in **DIMAP** (Digital Image MAP) format as optional format (see section 1.6.2 for “User Product Format” definition).

Finally, it is important to note that Sentinel-2 User Products is compliant to the **INSPIRE** (Infrastructure for Spatial Information in the European Community) Metadata regulation (cfr. [EC-INSPIRE-CR] and [EC-INSPIRE-DIR]).

INSPIRE is an European Union initiative to establish an infrastructure for spatial information in Europe that helps to make spatial or geographical information more accessible and interoperable for a wide range of purposes. The Sentinel-2 datasets in their inherent quality of describing spatial data are fully entitled to comply with the directive and hence the INSPIRE Metadata directive applies in entirety to the Sentinel-2 products. More details about INSPIRE Metadata regulation are in the Annex B of the document.

### 1.6.2 User Product Format

The User Product is formatted by default as a **SAFE** (Standard Archive Format for Europe) product.

The **SAFE** has been designed to act as a common format for archiving data within ESA Earth Observation archiving facilities and for distributing data to End Users.

SAFE benefits from the experience gathered while developing standards related to data formats.

SAFE intends to resolve the major challenges coming from the packaging and the long-term preservation of Earth Observation data. Special attention has been taken to ensure that SAFE



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 31 / 477

conforms to the ISO 14721:2003 OAIS (Open Archival Information System) reference model and related standards such as the emerging CCSDS/ISO XFDU (XML Formatted Data Units) packaging format.

In order to address the specific needs of Sentinel data, a particular "version" of the SAFE format has been adopted, named "SAFE for Sentinels" (see [SAFE-SPEC]), developed to act as a standard format for Sentinels platform data; it can be defined a "SAFE - like" format, where a few new types specific to Sentinels and different constraints on existing types have been introduced.

In addition to the SAFE format used as baseline to package a S2 User Product, the user will have the possibility to select an other optional output format based on **DIMAP** (Digital Image MAP) format (see [DIMAP]).

In this document the S2 SAFE User Product format is presented and in Annex A the differences with respect to S2 DIMAP User Product format are described.

### 1.7 Glossary and Definition of Terms

All the acronyms used in this document in S2 PDGS Glossary & definitions Document [S2-PDGS-TAS-DI-CMS-GLODEF] are defined. The main acronyms specific for the document are spell out directly in the document first time they are mentioned.

Moreover, this section contains a set of definitions required for the comprehension of the document. All details regarding the definitions here provided are in the [SAD].

#### 1.7.1 Mission

Sentinel-2 **Mission** is based on a twin satellite configuration (Sentinel-2A and 2B) that will offer a unique combination of:

- systematic global coverage of land surfaces : from 56°South to 84°North,
- high revisit: every 5 days at equator under the same viewing conditions with two satellites,
- high spatial resolution: 10m, 20m and 60m, with a wide field of view: 290 km,
- multi-spectral information (13 spectral bands).

#### 1.7.2 Orbit

The term **Orbit** used in this document refers to any specific Sentinel-2 spacecraft orbit.

Each satellite will be deployed in a polar sun-synchronous orbit with a 14.3 orbits per day cycle, the reference altitude will be approximately 786km. The terminology "orbit" refers to one orbital revolution of one given Sentinel-2 spacecraft.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 32 / 477

### 1.7.3 Multi-Spectral Instrument (MSI)

The Multi-Spectral Instrument (MSI) is the main payload of the Sentinel-2 Spacecraft.

The analysis of mission requirements has led to design the Sentinel-2 system based on the concurrent operations of two identical satellites flying on a single orbit plane, each hosting a MSI covering from the visible to the shortwave infrared spectral range and delivering high spatial resolution imagery at global scale and with a high revisiting frequency.

A complete overview of the instrument design and capabilities is provided in Sentinel-2 PDGS Operations Concept Document [OCD].

### 1.7.4 MSI Bands

The MSI spectral bands span from the Visible and the Near Infra-Red to the Short Wave Infra-Red:

- 4 bands at 10m;
- 6 bands at 20m;
- 3 bands at 60m.

All spectral band characteristics and performance are summarised in [OCD].

The MSI spectral bands are identified by a single integer number. The correspondence between band name and band number is given in the following table and this convention is used to identify spectral bands within the User Product.

Physical band	Band index	Pixel resolution (m)	Central wavelength (nm)
B1	0	60	443
B2	1	10	490
B3	2	10	560
B4	3	10	665
B5	4	20	705
B6	5	20	740
B7	6	20	783
B8	7	10	842
B8A	8	20	865
B9	9	60	945
B10	10	60	1375
B11	11	20	1610
B12	12	20	2190

### 1.7.5 MSI Detectors

The MSI includes two focal planes:

- a Visible and Near Infra Red (VNIR) focal plane made of 12 staggered detector modules
- a Short Wave Infra Red (SWIR) focal plane made of 12 staggered detector modules.

From an image processing point of view the detectors are identified 2 digits, from 01 to 12. Detectors' images are numbered from 01 to 12 in the left to right order, i.e. from west to east in the case of a descending orbit.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 34 / 477

### 1.7.6 Datatake

**Datatake** definition refers to a continuous acquisition of an image from one Sentinel-2 satellite in a given MSI imaging mode. The maximum length of an imaging Datatake is 15000 km (continuous observation from Northern Russia to Southern Africa) and this is the longest possible product that a user can ask for.

Datatake\_ID identifies univocally a given Datatake.

Datatake\_ID: GS[SS]\_[YYYYMMDDTHHMMSS]\_[RRRRRR]\_N[xx.yy]

Field Name	Value/Meaning	Note
SS	2A 2B	Identifies the Sentinel2 satellite
YYYYMMDDTHHMMSS	identifies the Datatake Start Time	Fourteen digits, date and time separated by the character T
RRRRRR	000001-999999	Identifies the Absolute Orbit Number
xx.yy	x,y = {0;9}	Processing Baseline (see further for the “Processing Baseline” definition).  Note that a reprocessing production generates a new Datatake and consequently a new Datatake_ID.

Table 1-3: Datatake\_ID Definition

Datatake\_ID Template:

GS2B\_20141104T134012\_123456\_N01.01

### 1.7.7 Datastrip

A **Datastrip** refers to all data corresponding to:

1. a single Datatake;
2. downlinked over a given ground station.



esa  
Sentinel 2 PDGS  
Core Procurement

## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 35 / 477

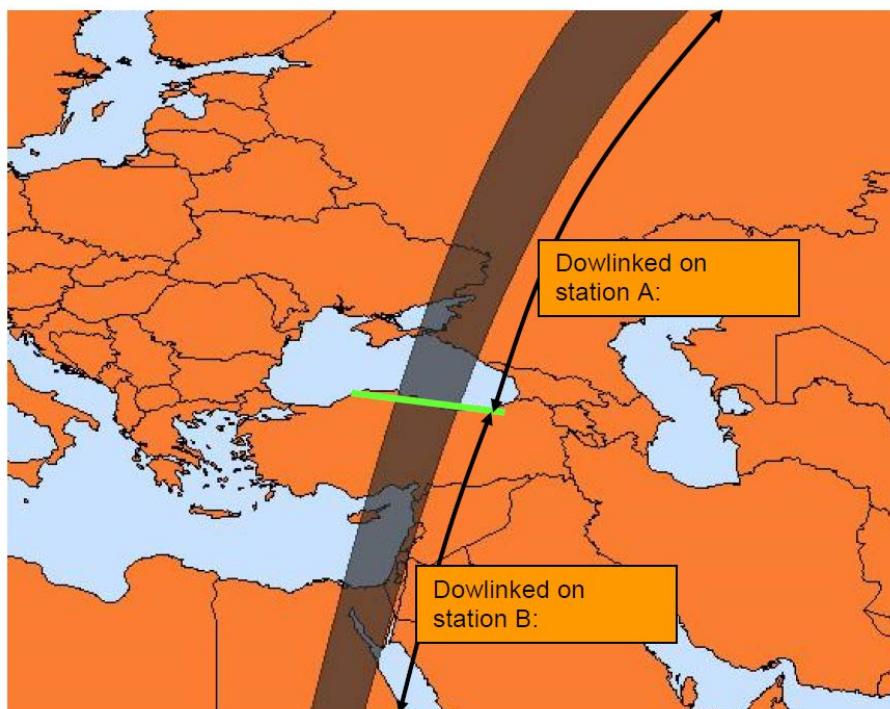


Figure 2: Datatake segmentation in Datastrips



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 36 / 477

The minimum length of a Datastrip is 92 km corresponding to four on-board scenes (see further for the “scene” definition).

The maximum length of a Datastrip is theoretically the maximum length of a Datatake i.e. 15000 km (continuous observation from Northern Russia to Southern Africa).

The Datastrip identifier is a character string that identifies in a unique way a Sentinel-2 acquired Datastrip relatively to a given Datatake.

In the chapter 3, where the Product Data Item (PDI) at Datastrip level is described, the Datastrip identifier is defined through the PDI\_ID definition.

The User Product delivered at the user base corresponds to a sub-set of Datastrips (extraction over an Area-Of-Interest) or a combination of Datastrips of a same Datatake (joining along one Datatake).

### 1.7.8 Granules

MSI products are provided as a compilation along a single orbit of elementary **Granules** of fixed size. In this respect, the product granularity corresponds to the minimum indivisible partition of one Sentinel-2 product.

For Level-0, 1A and 1B products, these Granules are sub-images in MSI sensor reference frame of a given number of lines along-track and detector separated.

Granules are defined further for each product level type.

All Granules intersecting/touching the Region of Interest of the user are provided into the final User Product.

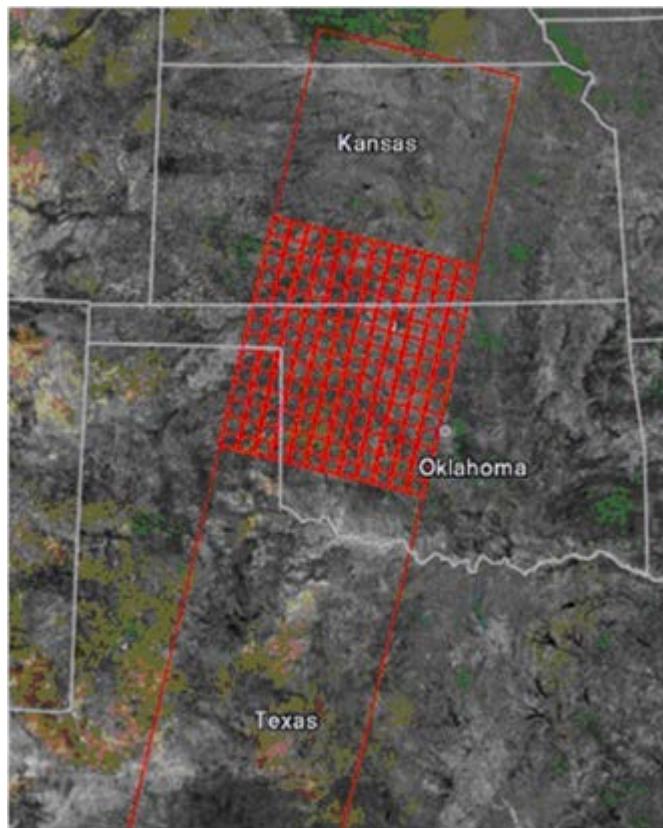


Figure 3: Example of Granules covering an Area-Of-Interest of the User

#### 1.7.9 Granules Along-Track Aggregation

Granules Along-Track aggregation is a download option applicable to L1A and L1B User Products allowing the user to create for each detector one image grouping all single Granules along track. An image viewer may not support well the high number of Granules constituting the L1A/L1B S2 products therefore this option allows to produce at maximum 12 images per band, whatever is the Area-Of-Interest as illustrated in the following figure.



Figure 4: Granules aggregated along-track

#### 1.7.10 Tiles and UTM Tiled Grid

For ortho-rectified products (Level-1C), the Granules are called **Tiles**. A Tile consists of 100kmx100km squared ortho-images in cartographic reference frame UTM/WGS84 (Universal Transverse Mercator / World Geodetic System 1984) projection.

Ortho-rectified product are systematically projected on UTM-UPS/WGS84 projection and tiled. A UTM tiling following the US-MGRS (US-Military Grid Reference System) grid approach is proposed:

- The vertical UTM boundaries and horizontal latitudinal band boundaries define 6° X 8° Grid Zones.
- Each Grid Zone is filled by 100,000-meter grid squares.

The MGRS is derived from the UTM grid system and the UPS (Universal Polar Stereographic) grid system, but uses a different labelling convention. The MGRS is used for the entire earth.

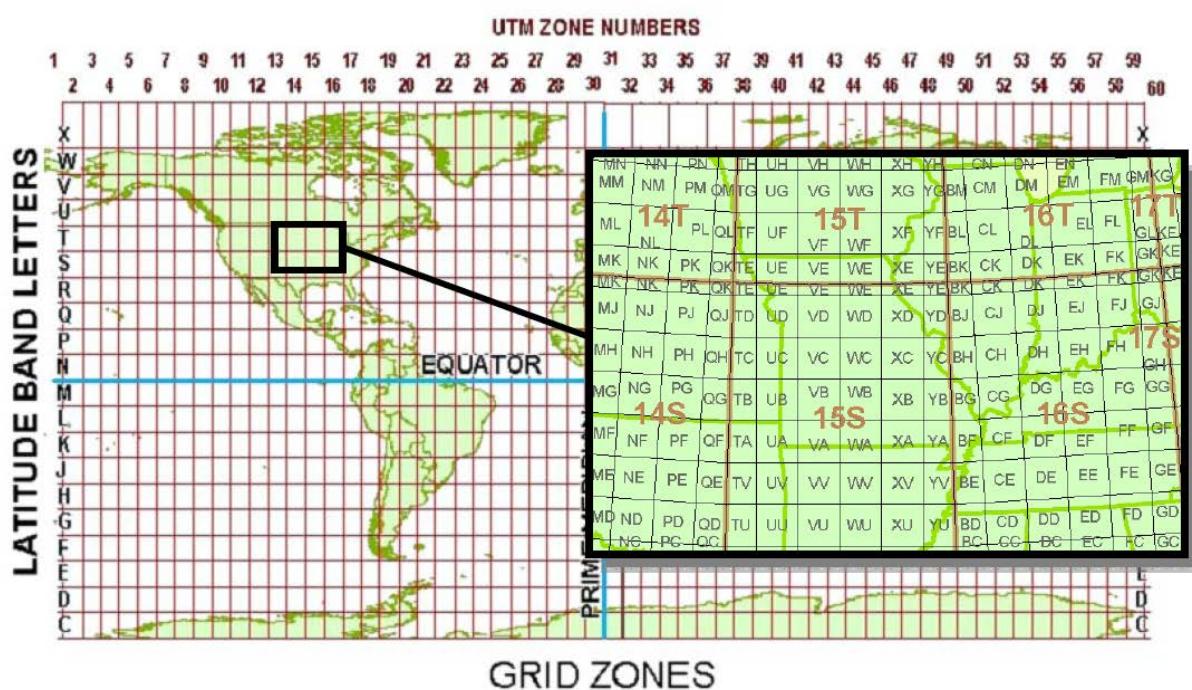


Figure 5: Example of tiling (100x100km<sup>2</sup>) within the UTM15 zone

Hence, the ortho-rectified products (Level-1C) are tiled according to this grid (approximately 100kmx100km). The UTM zone is selected according to each Tile of the product.

#### 1.7.11 Tile Consolidation

Due to the number of CGS in the PDGS system, single Datatakes could be split in several Datastrip. For products in instrument geometry (L0, L1A, L1B), this does not raise any issues but for L1C, the tiles located at the end of a Datastrip and at the beginning of the consecutive one are complementary and uncompleted. Those tiles need to be consolidated to complete them as shown in the following figure:

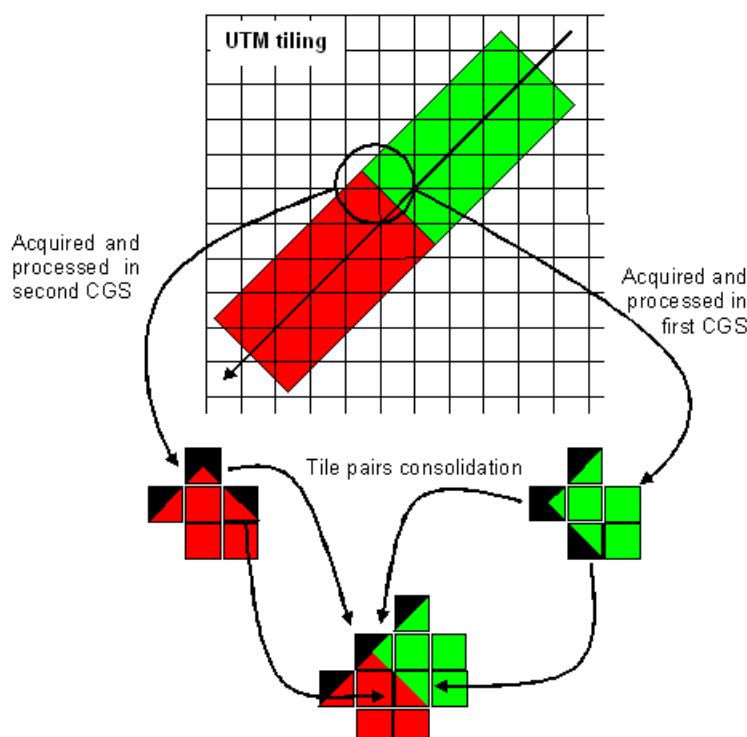


Figure 6: Tile pairs consolidation

### 1.7.12 Quality Indicators

Sentinel-2 products are annotated with Quality Indicators (QIs) in order to provide the user of a dataset the required information to assess its suitability for a certain use/application.

QIs are coming partly as result of the nominal production processing and partly from On Line Quality Control checks performed systematically after the nominal production processing.

### 1.7.13 MSI Scene

MSI image data is packaged on-board in a set of instrument source packets called “on-board scene” or “scene”. This scene corresponds to a simultaneous observation of about 3.6 seconds for all bands and all detectors, which means an approximate coverage on ground of 23km along track, for each band.

Each scene consists then of a deterministic number of CCSDS source packets depending only on the geometric resolution as indicated in the following table:

SSD	Number of packets (strips) per detector and band	Number of detectors	Number of bands	Number of CCSDS packets	Bands
10 m	144	12	4	6912	B2, B8, B3, B4,
20 m	72	12	6	5184	B5, B6, B7, B8a, B11, B12
60 m	24	12	3	864	B1, B9, B10

The MSI instrument can be configured to have data in compressed or by-passed/uncompressed mode in order to fit the downlink bandwidth. Compression by-passed implies that data for only 4 detectors are provided. See section 3.6.3.2.

#### 1.7.14 Satellite Ancillary Data

The Satellite Ancillary Data (SAD) are dumped at the end of each acquisition over a ground station. Sentinel-2 satellites provide Ancillary Data to feed the on-ground image data processing such as orbit position, velocity, time and attitude (generated by the Attitude and Orbit Control System).

The detailed content of the Satellite Ancillary Data source packets is provided in the Satellite Ancillary Data ICD (Interface Control Document) [S2GICD-SAD] and [SAD].

Note that the raw SAD which is a PDI itself (see section 3.21) cover one orbit; the decoded SAD, which is inside the product metadata, covering the Datatake.

#### 1.7.15 PreView Image

The PreView Image (PVI) in JPEG format can be included in the User Product if required by the user. The PVI corresponding to the entire product is based on the PVI extracted from Level-1C Tiles (see section 3.12.2).

#### 1.7.16 Auxiliary Data

Auxiliary Data identifies all auxiliary information to be used by the PDGS for the data-processing activities. The auxiliary data required by S2 data production are:



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 42 / 477

- Ground Image Processing Parameters (**GIPP**): set of **XML** files associated to each processing component to define a set of parameters and their values.

According to a download option, the GIPP files can be embedded in the User Product.

- Digital Elevation Model (**DEM**): at low spatial resolution (GLOBE DEM in DTED-0 format) and at high spatial resolution (SRTM-based in DTED-1 format). For format details see [GPP-DEM].

Due to huge volume of this auxiliary data, the DEM is never embedded in the User Product (no download option).

- Global Reference Image (**GRI**): set of unitary reference images covering one orbit. Each unitary reference image is a mono-spectral **Level-1B product**.

Due to huge volume of this auxiliary data, the GRI data are never embedded in the User Product (no download option).

- European Centre for Medium-Range Weather Forecasts (**ECMWF**): Total Column Ozone (TCO3), Total Column Water Vapour (TCWV) and Mean Sea Level pressure (MSL) not required for data processing but appended to Level-1C User Products.

Those auxiliary data, resampled in L1C geometry and generated in GRIB V1 format (see [GRIB]) are always provided as part of L1C Tiles. The raw ECMWF are never embedded in the User Product (no download option).

- International Earth Rotation & Reference Systems service (**IERS**): bulletins about Earth orientation and Terrestrial reference system (Earth Pole position, UT1-UTC,) published daily. These bulletins are required for the computation of the geometrical model.

According to a download option, the IERS bulletins can be embedded in the User Product.

- Precise Orbit Determination (**POD**): an **XML** file, used in case of GPS data anomaly with the on-board navigation solution.

Auxiliary data never embedded in the User Product (no download option).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 43 / 477

## 2. S2 PRODUCT DEFINITIONS

This section aims to presenting some general definitions regarding the User Products:

- Product Levels
- Processing Baseline
- Metadata Management
- Product Data Item (PDI)
- Timeliness definition

### 2.1 Product Levels

All data acquired by the MSI from the Sentinel-2 constellation will be systematically processed from Level-0 up to Level-1C, as cascading from data reception on-ground in a systematic manner.

Level-0 data processing operations will be performed in real-time during the data-reception operations. They will consist in packaging the MSI and satellite ancillary raw-data supplied by the front-end CGS equipment, and in locally archiving it as Level-0 data files together with appropriate annotations and metadata to enable further processing.

The Level-0 consolidation processing will provide the preliminary quick-look and the ancillary data to be included inside the Level-0 consolidated product.

Note that in this document a “Level-0 Granule” has to be considered as a Level-0 Granule consolidated by Operational Processor.

Level-1 processing includes the three-step processing to generate Level-1A, Level-1B and Level-1C data starting from the consolidated Level-0 data. These three levels correspond respectively to the S2MSI1A, S2MSI1B and S2MSI1C data-products.

The Sentinel-2 Product Levels are compliant with the definitions provided in the applicable documents [MRD] and [DAP-R] definitions.

- The **Level-0 (consolidated)** product corresponds to raw images still on board compressed.
- The **Level-1** products are generated from the Level-0 product:
  - Level-1A : "Raw Image" after decompression,
  - Level-1B : "Radiometrically corrected." product with geometric model refined appended but not applied,
  - Level-1C : Orthorectified product (geometric ortho-correction taking into account a DEM) providing Top Of Atmosphere Reflectances.
- The **Level-2A** prototype product is an orthorectified product providing Bottom-Of Atmosphere reflectances, and basic pixel classification (including classes for different types of cloud) (see [L2A-PDD]). The generation of this prototype product will be triggered “interactively” by the PDGS users based on S2MSI1C products but it will not be systematically generated. This document does not cover the Level-2A product specifications.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 44 / 477

This table outlines the Sentinel-2 User Products with the specification of the product type, level, a brief description and destination users.

Type	Processing Level	Outline Description	Granularity	Intended Users
S2HKTM	N/A	Sentinel-2 spacecraft Housekeeping telemetry in Transfer Frame format	One entire downlink pass (downlink dependent)	FOS
S2MSI0	0	MSI raw-image-data (compressed) in raw ISP format	Per detector and on-board scene 25km across-track 23km along-track	MSI instrument Experts PDGS internal users
S2MSI1A	1A	MSI uncompressed raw image data with spectral bands coarsely coregistered and appended Ancillary data	Per detector and along-track onboard scene size: 25km across-track 23km along-track	Not distributed to external users
S2MSI1B	1B	Radiometrically corrected (calibrated) MSI image data with spectral bands coarsely co-registered and refined geometric model appended but not applied	Along-track band co-registration is performed	Expert End Users
S2MSI1C	1C	Ortho-rectified and UTM geo-coded Top-of- Atmosphere Reflectance with sub-pixel multispectral and multi-date registration	One 100x100km UTM Tile covered within one orbit	General End Users
S2MSI2Ap	2A	Bottom-of-Atmosphere multispectral reflectance in S2MSI1C geometry (orthorectified & UTM)		

Table 2-1: Sentinel-2 product levels and main characteristics

## 2.2 Processing Baseline

The Processing Baseline completely defines the processing environment baseline used at the time of the product generation in terms of:

- Processors version number;
- Static Auxiliary Data (e.g. DEM, GRI) each one with a version number;
- Dynamic Auxiliary Data (e.g. ECMWF data or POD data), each one with its associated version number,
- Processing Configuration files versions.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 45 / 477

Processing Baseline = xx.yy where x,y = {0;9}

An increase of the Processing Baseline code is generated by a change of the elements listed above. A major change is traced by the "xx" digits, a minor change is traced by the "yy" digits.

Note: all the PDIs of a Datatake are always processed with the same Processing Baseline even if acquired in different stations.

For further details regarding the Processing Baseline management see [SAD].

### 2.3 Product Data Item (PDI) Definition

A PDI is a self standing atomic piece of processing-related data:

- **self standing:** it is formed data and metadata, the meta data fully describing the data allowing to handle it as a whole
- **atomic:** a PDI is never split in smaller pieces until download time (where the user may decide to get only a subset of bands for instance).
- **processing-related data:** it can be L0, L1A, L1B Granules or L1C tiles, True Color Images, Preview Images, Datastrip information, or auxiliary data etc...
- **univocally identified:** PDI have a unique Id and therefore can reference each other (for instance, a data strip can reference all its composing Granules).

The PDIs are composed of a set of elements including:

- Image data (MSI data L0/L1A/L1B Granules, L1C Tiles, PVIs, TCIs) ;
- Image metadata (including Satellite ancillary data (satellite orbit position, velocity, time, attitude);
- Image quality indicators and quality checks;
- Orbit metadata;
- Auxiliary data (GIPP, etc.);
- Satellite HKTm Level-0 data.

Note: the PDIs archived in the system are organized and referenced within a logical product hierarchy called **Logical Product**. Further details are in the Annex I.

### 2.4 Metadata Management

The metadata information included in the products (PDI and User Product) provides the requested level of information and referring all the product data items. In the chapter 3 and 4 all the metadata provided for each PDI (Granule and Datastrip) and User Product (L0/L1A/L1B/L1C) are detailed.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 46 / 477

Each PDIs contains many metadata, each one being allocated a metadata level from general product information to detailed product indicators:

- **Brief** metadata provide to the user high level information and an overview of the product.
- **Standard** metadata are an extension of the previous one providing more detailed information on the delivered product. Additional information is then appended.
- **Expertise** metadata can be appended to the previous ones. Those metadata identifies a set of information accessible to expert users mainly for Cal/Val or expertise purposes e.g. for in flight commissioning or for image quality routine follow-up.

The classification Brief/Standard/Expertise is used to provide different level information to the user according to their permissions.

Each PDI metadata (see *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* annexed to this document) is labelled with a specific *metadataLevel* attribute. During the User Product assembling, this attribute is used to select, according to a download option (see section 4.4), the set of metadata that must be included in the product.

For these filtered fields, the *metadataLevel* attribute is not written in the User Product's metadata.

The schema relative to PDIs provided with the zip file (*S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip*) annexed to this document contains the *metadataLevel* attribute set for all the metadata describing the product data items.

### 2.5 Timeliness definition

The following table describes the product characteristics in terms of timeliness.

Timeliness	Description
Nominal	Nominal timeliness, corresponding to the product on-line availability between 3 and 24 hours after data sensing.
NRT	Near-Real-Time, corresponding to the product on-line availability between 100 minutes and 3 hours after data sensing.
RT	Real-Time, corresponding to the product on-line availability no later than 100 minutes after data sensing.

Table 2-2: Sentinel-2 Product Timeliness



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 47 / 477

### 3. PDI FORMAT DEFINITION

This chapter describes the structure and content provided for each PDI-Type.

Note that in this section all PDI are defined as a TAR compressed files the PDI used to build the User Product will never be embedded as TAR but as folder containing the selected components.

#### 3.1 Type of PDI

The following type of PDIs has been identified:

- **PDI-type Granule:** *PDI Granule* contains image data and it is defined for each processing level, Level-0 (consolidated), Level-1A, Level-1B and Level-1C.
- **PDI-type Datastrip:** *PDI Datastrip* is defined for each processing level, Level-0 (consolidated), Level-1A, Level-1B and Level-1C.

PDI Granule and Datastrip will be stored as a **tar**<sup>1</sup> file identified by a unique PDI\_ID (string label defined for each kind of PDI described in the next chapter).

**NOTE:** the PDI used to construct the End User Product will never be embedded as TAR but as folder containing the selected components to be included in the product.

- **PDI-type True Color Image:** TCI&PVI is always associated to a unique Level-1C product. The PDI relative to L1C product at Tile level, includes the Preview Image. For TCI (JPEG2000 with GML geo-referencing) a specific PDI is provided because can be needed to distributed it independently from the Level-1C Tile PDI.
- **PDI-type Auxiliary:** this type of PDI refers to each archived auxiliary data. In this case the PDI (where not otherwise specified) coincides with the aux data itself and the name of the auxiliary data represents the unique PDI\_ID identifying univocally the auxiliary data. If the PDI is composed by a unique file (the auxiliary file), the PDI coincides with the file itself, otherwise the PDI is archived as a *tar* file.
- **PDI-type Ancillary:** similarly to the auxiliary data, this type of PDI (where not otherwise specified) is coincident with the ancillary file itself and it is uniquely identified by its file name (PDI\_ID). If the PDI is composed by a unique file, the PDI coincides with the file itself, otherwise the PDI is archived as a *tar* file.

The following table resumes the type of PDI presented above:

PDI-type	PDI-subtype	Description
----------	-------------	-------------

<sup>1</sup> In order to avoid performance degradation of the Inventory application, the Inventory\_Metadata.xml file is always in a fixed position and then, it must be the first in the tar.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 48 / 477

Granule	Granule Level-0	Level-0 Granule PDI.
	Granule Level-1A	Level-1A Granule PDI.
	Granule Level-1B	Level-1B Granule PDI.
	Tile Level-1C	Level-1C Tile PDI.
Datastrip	Datastrip Level-0	Level-0 Datastrip PDI. Level-0 refers to <b>consolidated</b> Level-0 PDI containing the <b>Quick Look</b> image.
	Datastrip Level-1A	Level-1A Datastrip PDI.
	Datastrip Level-1B	Level-1B Datastrip PDI.
	Datastrip Level-1C	Level-1B Datastrip PDI.
True Color Image	TCI	TCI PDI.
Auxiliary	GRI	The <b>GRI</b> files are stored with your PDI-id and the link to these aux files is set among the metadata at Datastrip level.
	DEM	The <b>DEM</b> is stored with your PDI-id and the link to these aux files is set among the metadata at Datastrip level..
	GIPP	The <b>GIPP</b> files are stored with own PDI-id and the link to these aux files is set among the metadata at Datastrip level.
	ECMWF	Raw <b>ECMWF</b> data containing Meteorological datasets. Resampled ECMWF data are always provided within L1C Tile PDI, in L1C product geometry.
	IERS Bulletin	The International Earth Rotation and Reference System Service ( <b>IERS</b> ) provides data on Earth orientation, on the International Celestial Reference System/Frame, on the International Terrestrial Reference System/Frame, and on geophysical fluids.
	POD	Precise Orbit Determination ( <b>POD</b> ): an XML file, used in case of contingency with the on-board navigation solution.
Ancillary	HKTM	PDI relative to housekeeping telemetry data.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 49 / 477

	SAD	<p>The SAD PDI is formatted as a tar file including a set of binary SAD files, each one corresponding to one SAD file type and covering one orbit ANX to ANX or shorter (current dump orbit). The tar includes also an Inventory_Metadata.xml file.</p> <p>The SAD PDI-id is set among the metadata at Datastrip level (ANC_DATA_REF metadata).</p>
--	-----	---

Table 3-1: Type of PDI

### 3.2 PDI Naming Convention

PDI\_ID is a logical and a physical naming convention defined to identify univocally each type of PDI. In fact, *PDI\_ID* or *PDI\_ID.tar* (where the tar compression is foreseen) represents the PDI physical name defined case by case in the document, but PDI\_ID (without extension) represents also the logical convention used to reference each type of PDI in the archive.

The PDI\_ID naming convention is described hereafter:

MMM\_CCCC\_TTTTTTTTTT\_<Instance\_id> where:

Part	Description	Comment
MMM	<b>Mission ID</b>	"S2A" or "S2B" "S2_" applicable to the constellation, used for satellite independent files.
CCCC	<b>File Class</b>	4 uppercase letters can contain digits. OPER for "Routine Operations" files.  Note that the File Class will be set "OPER" for all products generated during the operation phase. During validation or for internal testing other values can be defined.
TTTTTTTTTT	<b>File Type</b> (File Category + File Semantic)	10 uppercase letters can contain digits and underscores.
<Instance ID>	<b>Instance Id</b>	Uppercase letters, digits and underscores.

Table 3-2: PDI File name decomposition

**File Type** is a 10 characters field either uppercase letters, digits or underscores "\_". The File Type field is subdivided into two sub-fields as follows:



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 50 / 477

TTTTTTTT = FFFFDDDD where:

- FFFF = File Category;
- DDDDDD = Semantic Descriptor.

**File Category** sub-field is defined as the 4 initial characters of the File Type. The File Category is composed by 3 characters and an ending underscore “\_” for separation with the Semantic Descriptor. This sub-field allows the definition of file groups characterised by related information / configuration information / generated data / usage of the data / etc.

**Semantic Descriptor** sub-field is composed by the 6 characters contiguous to the File Category sub-field. The Semantic Descriptor can be composed of uppercase letters, digits or underscores “\_”. This sub-field is unique for a given File Type and must be as descriptive as possible given the 6 character limitation to characterize the information contained by the file.

For the Granule (Tile), Datastrip and TCI PDI the following convention is used:

- File Category is set as **MSI\_** constant string.
- Semantic Descriptor is composed of **YYY\_ZZ** where :

Semantic Descriptor Sub-Field Name	Value/Meaning
YYY	<ul style="list-style-type: none"><li>• L0_ for Level 0 products</li><li>• L1A for Level 1A products</li><li>• L1B for Level 1B products</li><li>• L1C for Level 1C and TCI products</li></ul>
ZZ	<ul style="list-style-type: none"><li>• GR (Granule)</li><li>• DS (Datastrip)</li><li>• TL (Tile)</li><li>• TC (True Color Image)</li></ul>

The following table resumes the unique File Type for a given Granule (Tile), Datastrip and TCI PDI:

Type Of PDI	File Type (File Category + Semantic Descriptor)
Granule Level-0	MSI_L0_GR
Datastrip Level-0	MSI_L0_DS
Granule Level-1A	MSI_L1A_GR
Datastrip Level-1A	MSI_L1A_DS
Granule Level-1B	MSI_L1B_GR
Datastrip Level-1B	MSI_L1B_DS
Tile Level-1C	MSI_L1C_TL
Level-1C Tile Consolidated	MSI_L1C_CO
Datastrip Level-1C	MSI_L1C_DS
True Color Image	MSI_L1C_TC

Table 3-3: Granule (Tile), Datastrip and TCI PDI File Type

The following tables give a list of File Type assigned to each PDI relative to GIPP, DEM, GRI, HKTM and SAD data.

Regarding the GIPP files listed in the table hereafter, note that the file types not highlighted corresponding to the GIPP files listed in the Annex E and detailed in the reference document [GPP-IODD]. The GIPP files highlighted in blue are not real GIPP files but general configuration files managed as the standard GIPP files.

GIP\_OLQCPA GIPP file is detailed in the referenced document [OLQC-GIPP].

<b>GIPP files</b>	<b>FileType (Category+Semantic)</b>
IAS AnaTm image parameters file	GIP_ATMIMA
IAS AnaTm HK parameters file	GIP_ATMSAD
IAS Datation parameters file	GIP_DATATI
LR Extraction parameters file	GIP_LREXTR
InitLoc Inv parameters file	GIP_INVLOC
Pixel line of sight for each bands in the focal plane reference frame	GIP_VIEDIR
Platform model	GIP_SPAMOD
List of blind pixels	GIP_BLINDP
CloudInv parameter file	GIP_CLOINV
InitLoc production parameters file	GIP_PRDLOC
RadioS2 parameters file	GIP_R2PARA
SWIR detectors arrangement parameters	GIP_R2SWIR
Radiometric equalization parameters on board (dark current, on-board inter pixel calibration)	GIP_R2EQOB
Radiometric equalization parameters on ground (on-ground correction)	GIP_R2EQOG
List of defective pixels	GIP_R2DEPI
Deconvolution filter for each deconvoluted band	GIP_R2DEFI
Wavelets filters	GIP_R2WAFI
Wavelets base	GIP_R2DEBA
L2 Norm coefficients (denoising)	GIP_R2L2NC
Denoising thresholds (denoising)	GIP_R2DENT
Threshold file for deconvolution through wavelet packets	GIP_R2DECT
Maximum signal coefficients (denoising)	GIP_R2MACO
Noise model (denoising)	GIP_R2NOMO
Absolute calibration parameters	GIP_R2ABCA
Binning for 60m bands parameters (filters and undersampling)	GIP_R2BINN
Crosstalk correction	GIP_R2CRCO
GeoS2 parameters file (preProc)	GIP_G2PARA
Geometric parameter to refine	GIP_G2PARE
Earth model	GIP_EARMOD
Global geometrical parameters	GIP_GEOPAR
Description of the inter detectors overlapping area	GIP_INTDET
TilingS2 parameters file	GIP_TILPAR
ResampleS2 parameters file (preProc)	GIP_RESPAR
MaskS2 parameters file	GIP_MASPAR



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 52 / 477

GIPP files	FileType (Category+Semantic)
Compression JP2K parameters file	GIP_JP2KPA
ECMWF parameters file	GIP_ECMWFP
On board decompression parameters file	GIP_DECOMP
OLQC configuration parameters file	GIP_OLQCPA
Processing Baseline parameters	GIP_PROBAS

Table 3-4: GIPP File Type

DEM files	FileType (Category+Semantic)
GLOBE DEM Format	DEM_GLOBEF
SRTM DEM Format	DEM_SRTMFO
Geoid File Format	DEM_GEOIDF

Table 3-5: DEM File Type

GRI files	FileType (Category+Semantic)
Global Reference Images	AUX_GRIxxx Where xxx = Relative Orbit (001-143)

Table 3-6: GRI File Type

HKT M files	FileType (Category+Semantic)
House Keeping Telemetry data	PRD_HKT M

Table 3-7: HKT M File Type

The type of a SAD packet depends on its Process Identifiers (PRID) and on its Structure Identifier (SID). The following table resumes the values of SAD packets possibly received.

Unit	Process ID (PRID)	Structure ID (SID)
OBC CSW AOCS	11	105, 106, 108, 109; 110-120; 121-122; (124-126)
STR	A	37
	B	38
	C	39
GPS	A	(215), 218, 223, (224), 225-227, 229-232, (234, 235)
	B	(215), 218, 223, (224), 225-227, 229-232, (234, 235)
OBC CSW MSIC	09	123

Table 3-8: SAD packet type possible values



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 53 / 477

Note that the first line of the following table contains the File Type of an unitary Raw SAD files; the second line indicates the File Type of the SAD PDI, that is the File Type of the tar containing several unitary Raw SAD files.

SAD files	FileType (Category+Semantic)
Raw SAD file containing only SAD packets matching a single packet type.  For SAD files inside SAD PDI (see section 3.21), those files cover the <b>temporal extent of the full orbit</b> .  For SAD files inside an image product (see section 3.7), those files cover the <b>temporal extent of the full Datatake</b> .  The naming of those unitary raw SAD files is in the section 3.21.1	AUX_Sppnnn  Where: nnn = SID, pp = PRID  The possible value for SID and PRID parameters are in the table above.
<b>SAD PDI:</b> a SAD PDI (see section 3.21), consists in a single tar file containing one Raw SAD file per packet type.  The tar naming is in the section 3.21.1	AUX_SADATA

Table 3-9: SAD File Type

IERS Bulletin A	FileType (Category+Semantic)
IERS Bulletin A	AUX_UT1UTC

Table 3-10: IERS Bulletin File Type

POD file	FileType (Category+Semantic)
Restituted precise orbit determination data	MPL PODRES
Predicted precise orbit determination data	MPL PODPRE

Table 3-11: POD File Type

ECMWF file	FileType (Category+Semantic)
ECMWF global forecast dataset	AUX_ECMWFD

Table 3-12: ECMWF File Type

**Instance ID** is used to define several sub-fields within the filename according to the nature of the file. For usage for the Sentinel PDGS, Instance ID is decomposed into a set of mandatory sub-fields in the prefix, complemented by optional ones in the trailing portion of the filename.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 54 / 477

The File Instance ID mandatory sub-fields are always placed on fixed positions within the filename for simple and unambiguous recognition. The mandatory part is subdivided into sub-fields as follows:

<Instance ID mandatory prefix> = ssss\_YYYYMMDDThhmmss

where:

- ssss is the Site Centre of the file originator
- YYYYMMDDThhmmss is the Creation Date

The Site Centre is a 4 characters field defined by either, uppercase letters, digits or underscore “\_”.

The Creation Date is a 15 characters field defined according composed of:

- 8 characters, all digits, for the date: “YYYYMMDD”
- 1 uppercase T: “T”
- 6 characters, all digits, for the time: “hhmmss”

As per the applicable [EOFFS-PDGS], the optional part of the Instance ID allows further characterisation about the scope of every file. The optional suffix is appended to the mandatory prefix and starts with an underscore character immediately followed by a one-character field defining the specific options:

<optional-suffix> = \_lvvvvvvv...

where:

“l” is a one-character option Identifier (e.g. ‘S’, ‘O’, ‘V’, etc);

“vvvvvvv” contains the trailing Option Value.

The following table lists all optional char ID used in this document:

Optional Suffix	Description	Template
Applicability Start: _S	_SYYYYMMDDTHHMMSS Appends the Validity Start Time	_S20130401T123000
Orbit Period: _O	_Offfffff_//////// - ffffff is the first Absolute Orbit Number reported in the file - ////// is the last Absolutr Orbit Number reported in the file  Both first and last orbits shall be zero-padded with 6 overall digits.	_O123456_123457
Applicability Time Period: _V	_VyyyymmddThhmmss_YYYYMMDDTHHMMSS Appends the Validity Period Time fields (Start and Stop)	_V20091210T235134_20091210T235224
Detector ID: _D	_Dxx xx = 01,...12	_D05



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 55 / 477

Absolute Orbit Number: <b>_A</b>	<b>_A</b> ffffff ffffff is the Absolute Orbit Number	<b>_A</b> 123456
Relative Orbit Number: <b>_R</b>	<b>_R</b> zzz zzz is the Relative Orbit Number	<b>_R</b> 123
Tile Number: <b>_T</b>	<b>_T</b> xxxxx xxxxx = fixed string	<b>_T</b> 15SWC
Processing Baseline Number: <b>_N</b>	<b>_N</b> xx.yy x,y={0;9}, identifies the current processing baseline	<b>_N</b> 01.01
Band Index ID: <b>_B</b>	<b>_B</b> xx xx is the band number	<b>_B</b> 8A
Completeness ID: <b>_W</b>	<b>_W</b> x x = F for Full orbit x = P for Partial orbit	<b>_W</b> P
Degradation ID: <b>_L</b>	<b>_L</b> y y = N for Nominal data y = D for Degraded data	<b>_L</b> N

The Instance ID optional part and the complete PDI\_ID are defined case by case through out the document.

### 3.3 PDI Hierarchy

A PDI at Granule level contains among its metadata the PDI\_ID (DATASTRIP\_ID) relative to the PDI at Datastrip level linked to the Granule. This link establishes the hierarchy between Granule vs Datastrip.

Moreover, each PDI at Datastrip level contains among its metadata the Datatake\_ID and this link establishes the hierarchy between Granule/Datastrip vs Datatake.

### 3.4 Granule/Tile PDI Common Structure

Granule/Tile PDI is organized as shown in the following figure:

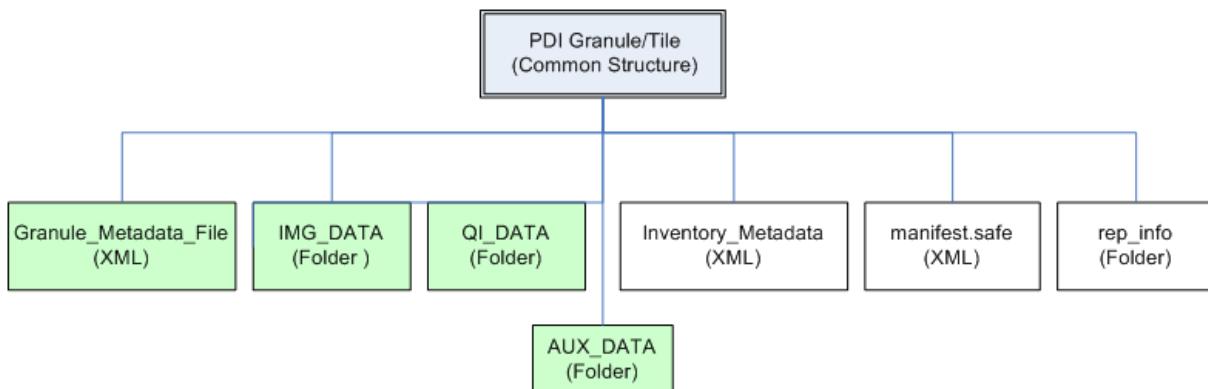


Figure 7: Granule / Tile Common Structure

1. **Granule\_Metadata\_File**: XML metadata file describing all the elements contained in the Granule PDI;
2. **IMG\_DATA**: folder containing the image data foreseen for each kind of Granule / Tile PDI;
3. **QI\_DATA**: folder containing the XML reports including the quality control checks performed by OLQC processor (for each L0/L1A/L1B/L1C PDI) and the GML quality masks (for each L1A/L1B/L1C PDI). The XSD schema of OLQC reports is provided in Annex D, the masks files are listed in the Table 3-4. In addition, in case of L1C Tile, this folder contains the PVI file.
4. **AUX\_DATA**: folder containing ECMWF dataset resampled in UTM projection. Note that this folder is provided only inside a Level-1C Tile PDI.
5. **Inventory\_Metadata.xml**: inventory metadata file.
6. **manifest.safe**: XML SAFE Manifest file (see section 3.4.4).
7. **rep\_info**: folder containing the available XSD schemas used to validate the Granule PDI components (see section 3.4.4)

Note that the *Inventory\_Metadata.xml*, *manifest.safe* and *rep\_info* are available inside a Granule/Tile PDI but they are removed when the PDI is included in the user product.

### 3.4.1 Granule\_Metadata\_File Structure

The Granule\_Metadata\_File is a single metadata file containing different types of information shown in the following figure.

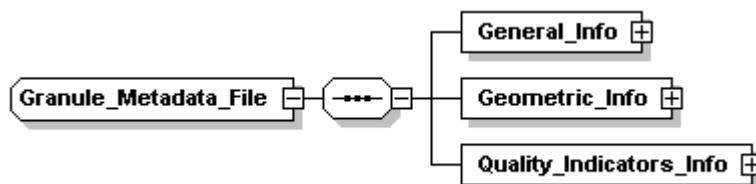


Figure 8: Granule\_Metadata\_File

The structure of the Granule\_Metadata\_File is common to all processing level (L0/L1A/L1B/L1C); the following tables summarize the Granule\_Metadata\_File content. For all details regarding the Granule metadata content, specific for each processing level (L0/L1A/L1B/L1C), refers to the dedicated section.

Info Type	Description	L0/L1A/L1B/L1C
General_Info	General information regarding Granule elements	Y
Geometric_Info	Geometric information providing the geolocation of the Granule	Y
Quality_Indicators_Info	Set of metadata providing information regarding all checks performed at Granule level for each processing level (see Table 3-2)	Y

Table 3-13: Granule / Tile Metadata Structure

Field Name	Description	L0/L1A/L1B	L1C
GRANULE_ID/TILE_ID	Unique Identifier of the Granule PDI (PDI_ID)	Y	Y
DETECTOR_ID	Detector Identifier	Y	N
DATASTRIP_ID	Unique Identifier of the Datastrip PDI (PDI_ID)	Y	Y
DOWNLINK_PRIORITY	Downlink priority flag, can be set to NOMINAL, NRT or RT	Y	Y
SENSING_TIME	Sensing start time of the Datatake (with precision in seconds)	Y	Y
Archiving_Info	Archiving centre and time	Y	Y



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 58 / 477

Processing_Specific_Parameters	Optional field reserved for production chain only (i.e. DPC and/or IPF) and not propagated to User Product	Y	Y
--------------------------------	--	---	---

Table 3-14: Granule / Tile PDI General\_Info

Field Name	Description	L0	L1A/L1B	L1C
Granule_Footprint	Geolocation of the four corners of the Granule envelope (Lat, Lon, H coordinates with horizontal CRS as WGS84 and altitude given over EGM96).	Y	Y	N
Granule_Position	Position of the Granule in the Datatake.	Y	Y	N
Granule_Dimensions	Granule dimensions for each resolution band (10m, 20m and 60m).	N	Y	N
Tile_Geocoding	Coordinates of the Tile (in meters), the pixel dimensions within the Tile (in meters ), the Tile size in number of lines/columns.	N	N	Y
Tile_Angles	Grid of sun and incidence angles.	N	N	Y

Table 3-15: Granule / Tile PDI Geometric\_Info



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 59 / 477

The following table summarizes the QIs provided through the Granule (Tile) metadata file. The green boxes indicate the QIs common to all processing levels.

GRANULE / TILE QUALITY INDICATORS								
Image Content Quality Indicators								
QI Type	Description	Metadata Level	Metadata Field Name	L0	L1A	L1B	L1C	[PDD]
Local cloud coverage indicator	Percentage of cloud coverage	Standard	CLOUDY_PIXEL_PERCENTAGE	Y	Y	Y	Y	§ 5.5.2 § 6.4.2 § 7.4.2 § 8.4.2
List of source packets lost / degraded within the Granule	for each couple (band, detector) with the degradation type, the error type, the date of the first line of the scene which contains the lost / degraded source packet, the counter of the first source packet in error and the number of lost or degraded source packet	Standard	Lost_Source_Packet_List	Y	N	N	N	§ 5.5.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 60 / 477

Local technical quality indicator	Percentage of degraded MSI and ancillary data	Standard	DEGRADED_MSI_DATA_PERCENTAGE	Y	Y	Y	Y	§ 5.5.2 § 6.4.2 § 7.4.2 § 8.4.2
-----------------------------------	---	----------	------------------------------	---	---	---	---	--

PIXEL LEVEL QUALITY INDICATORS									
Image Content Quality Indicators (MASK FILES)									
QI Type	Description	Metatada Level	Metatada Field Name	Main File Type	L0	L1A	L1B	L1C	[PDD]
Coarse cloud mask files	These vector files (derived from cloud detection using the preliminary quicklook images), contain a list of polygons in sensor geometry (Level-1A reference frame) indicating the presence of clouds on the images.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_CLOLOW	N	Y	Y	N	§ 6.4.3 § 7.4.3
Finer cloud mask	A finer cloud mask is computed on final Level-1C images. It is provided in the final reference frame (ground geometry).	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_CLOUDS	N	N	N	Y	§ 8.4.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 61 / 477

Technical quality mask files	These vector files contain a list of polygons in Level-1A reference frame indicating degraded quality areas in the image.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_TECQUA	N	Y	Y	Y	§ 6.4.3 § 7.4.3 § 8.4.3
Land/Water mask files	A land/water mask is computed on final Level-1C images. It is provided in the final reference frame (ground geometry)	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_LANWAT	N	N	N	Y	§ 8.4.3
Detector footprint mask	A mask providing the ground footprint of each detector within a Tile.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_DETFOO	N	N	N	Y	§ 8.4.3

### Radiometric Quality Indicators (MASK FILES)

QI Type	Description	Metatada Level	Metatada Field Name	Main File Type	L0	L1A	L1B	L1C	[PDD]
Radiometric quality masks	A defective pixels' mask, containing the position of defective pixels.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_DEFECT	N	Y	Y	Y	§ 6.4.3 § 7.4.3 § 8.4.3
Radiometric quality masks	A saturated pixels' mask, containing the position of the saturated pixels in the full resolution image.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_SATURA	N	Y	Y	Y	§ 6.4.3 § 7.4.3 § 8.4.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 62 / 477

Radiometric quality masks	A nodata pixels' mask, containing the position of pixels with no data.	Standard	Pixel_Level_QI  Pointer to the Mask files contained in the QI_DATA folder.	MSK_NODATA	N	Y	Y	Y	§ 6.4.3 § 7.4.3 § 8.4.3
---------------------------	--	----------	--	------------	---	---	---	---	-------------------------------

Table 3-16: Granule / Tile PDI Quality Indicators

The mask files are vector files provided as GML format files (see [HMA-GML]).

The naming convention for the gml mask files is defined case by case in the sections 3.8.2, 3.10.2 and 3.12.2.

The grouping strategy to have several masks in one physical GML file is described in the Annex F.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 63 / 477

In the frame of OLQC consolidation, the quality control checks performed by OLQC processor are included inside the XML reports ( § Annex D) stored in the QI\_DATA folder. In the following table, the quality control checks performed on the Granule metadata are provided. For the image data checks and for semantics and syntax inspections, refers to [OLQC-TN] document.

Granule Quality control Checks Information (OLQC OUTPUT)						
Check Name	Checklist Name	Description	L0	L1A	L1B	L1C
Missing_Lines	SENSOR_QUALITY	Number of missing lines	Y	Y	Y	Y
Corrupted_ISP	SENSOR_QUALITY	Corrupted ISP	Y	Y	Y	Y
Sensing_Time	SENSOR_QUALITY	Consistency of Sensing Time	Y	Y	Y	Y
Granule_Dimensions	GEOMETRIC_QUALITY	Consistency of Granule size	N	Y	Y	Y
Product_Footprint	GEOMETRIC_QUALITY	Consistency of Granule footprint wrt the expected geometry	N	Y	Y	Y
Geometric_Header	GEOMETRIC_QUALITY	Consistency of the Incidence and SunAngles	N	Y	Y	Y
Perc_Cloud_Coverage	GENERAL_QUALITY	Check the percentage of cloud coverage	N	Y	Y	Y
List_Fake_Decompression	GENERAL_QUALITY	Check the list of fake decompressed source frames	N	Y	Y	Y
Product_Syntax	FORMAT_CORRECTNESS	Check on Product components syntax & semantics correctness	Y	Y	Y	Y

Table 3-17: Granule Quality Control Checks



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 64 / 477

### 3.4.2 Granule/Tile PDI\_ID Definition

PDI\_ID is a string label identifying univocally the archived PDI. The PDI\_ID (**tar** file name) used for a Level-0/Level-1A/Level-1B Granule PDI and for a Level-1C Tile PDI is compliant to [EOFFS-PDGS] and follows the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTTTT\_<Instance\_ID>.tar

The sub-strings MMM (Mission ID), CCCC (File Class), and TTTTTTTTTT (File Type) are detailed in the section 3.2.

The Granule Instance\_ID is defined hereafter.

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Sensing Time>\_<Detector ID>\_<Processing Baseline>

<Site Centre> and <Creation Date> corresponding to the Instance\_ID mandatory prefix (see section 3.2).

<Site Centre> is the centre where the PDI can be created (processing centre):

- CGS1
- CGS2
- CGS3
- CGS4
- PAC1
- MPCC

The others sub-fields are described in the following table:

Field Name	Value/Meaning	Note
Sensing Time	SYYYYMMDDTHHMMSS	This time refers to the sensing time of the first line of the PDI at Granule level in UTC time.  Fourteen digits, date and time separated by the character T.
Detector ID	D01...12	The MSI detectors are identified by 2 digits, from 01 to 12
Processing Baseline	Nxx.yy  xx.yy where x,y={0;9}, identifies the current processing baseline	The Processing Baseline refers to the processing configuration baseline used at the time of the Granules generation (see section 2.2).  Note: all the PDIs of a Datatake are always processed with the same processing baseline even if acquired in different stations.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 65 / 477

The Tile Instance\_ID is defined hereafter.

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Abs Orbit>\_<Tile>\_<Processing Baseline>

<Site Centre> and <Creation Date> are defined above, the others sub-fields are described in the following table:

Field Name	Value/Meaning	Note
Abs orbit	<b>A</b> zzzzz zzzzz = (000001-999999)	Absolute Orbit Number
Tile	<b>T</b> xxxxx Tile number where xxxx is a fixed string of 5 characters	According to US-MGRS naming convention. See example of section 4.9.2
Processing Baseline	<b>N</b> xx.yy xx.yy where x={0;9}, identifies the current processing baseline	See comment in the table above.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 66 / 477



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 67 / 477

### 3.4.3 Granule/Tile PDI XSD Schemas

This section contains the list of the XSD schemas (annexed to the document) used to describe the structure and the metadata content of each Granule/Tile PDI:

1. `S2_PDI_Level-0_Granule_Structure.xsd`
2. `S2_PDI_Level-1A_Granule_Structure.xsd`
3. `S2_PDI_Level-1B_Granule_Structure.xsd`
4. `S2_PDI_Level-1C_Tile_Structure.xsd`
  
5. `S2_PDI_Level-0_Granule_Metadata.xsd`
6. `S2_PDI_Level-1A_Granule_Metadata.xsd`
7. `S2_PDI_Level-1B_Granule_Metadata.xsd`
8. `S2_PDI_Level-1C_Tile_Metadata.xsd`

The first set of the schemas (points 1 - 4) define the "physical organization" of the Granule/Tile PDI on the disk.

These schemas are "improperly" used to specify elements not envisaged by the XML such as folders, therefore it is actually not expected to be used for the validation of the corresponding XML file.

Oppositely, the second set of the schema (points 5 – 8) are used to validate the XML metadata file provided inside each Granule/Tile PDI.

### 3.4.4 Granule/Tile PDI SAFE Format Approach

Following the presentation in section 1.6.2 and the structure in the Figure 7, all SAFE Granule/Tile PDI include a **manifest.safe** file and a **rep\_info** folder according to [SAFE-SPEC].

The **manifest.safe** is an XML file formatted according to [SAFE-SPEC] providing metadata (concerning the overall context where the PDI is generated and the PDI itself) and a map of the PDI content (consisting in a reference to all data components inside the PDI including measurement data files, ancillary and auxiliary data files, XSD schema, etc).

The **manifest.safe** is composed by three main sections:

Manifest sections	Description
<b>Information Package Map</b>	Contains a high-level textual description of the product and references to all products components.
<b>Metadata Section</b>	Contains the product Metadata, including the product identification and the resource references.
<b>Data Object Section</b>	Contains references to the physical location of each component file contained in the product, with a description of the file format, location, size and checksum.

Table 3-18:High Level Structure of SAFE Manifest File

More in details the **manifest.safe** provided for each PDI contains:

1. metadata information defined by [SAFE-SPEC] including not only the mandatory Metadata Sections (Platform and Processing sections) but, as added value, other relevant non mandatory Metadata Sections (e.g. acquisitionPeriod, measurementOrbitReference, measurementFrameSet),
2. a sub-set of metadata redundant respect to the mandatory XML Granule\_Metadata\_File included in the PDI,
3. the map of the complete content of the PDI, namely all the references to all the files contained in the PDI (including the reference to the XML main metadata file) with the description of each file (e.g. file type, file size, coding, etc...).

Note that the Granule\_Metadata\_File file groups all metadata regarding the PDI and the mission context, while the SAFE Manifest file contains, as added value, the exhaustive map of the PDI itself and a description of each file PDI component (e.g. file type, file size, coding, etc...).

In this respect, the present document provides, for each L0/L1A/L1B/L1C Granule/Tile PDI defined in this Section 3, the following information:

- A set of 3 tables (one for each of the three main sections), containing the list of fields (tags or attribute) to be included in the Safe Manifest file, and for each field:
  - o the field name in the SAFE Manifest file (attributes names are in bold character);
  - o only for the Metadata section, the corresponding field name in the Granule\_Metadata\_File schema; this column highlights the redundant sub-set of

- metadata included both in the XML Granule\_Metadata\_File and in the XML SAFE Manifest file;
  - o a brief textual description of the field;
  - o the data type of the field;
  - o the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory.
- A practical example of SAFE Manifest file containing the tags listed in the table mentioned above. Each tag is set to an indicative value, as realistic as possible; the compliance of the SAFE Manifest file to the SAFE specification has been verified by validating the Manifest file against the SAFE XSD schemas. All SAFE Manifest files and the schemas are provided in the zip file (S2-PDGS-TAS-DI-PSD\_V10\_SAFE.zip) annexed to this document. The XSD schemas are provided as a set of *xfdu.xsd* schemas located in the final leaf of the resources directory.

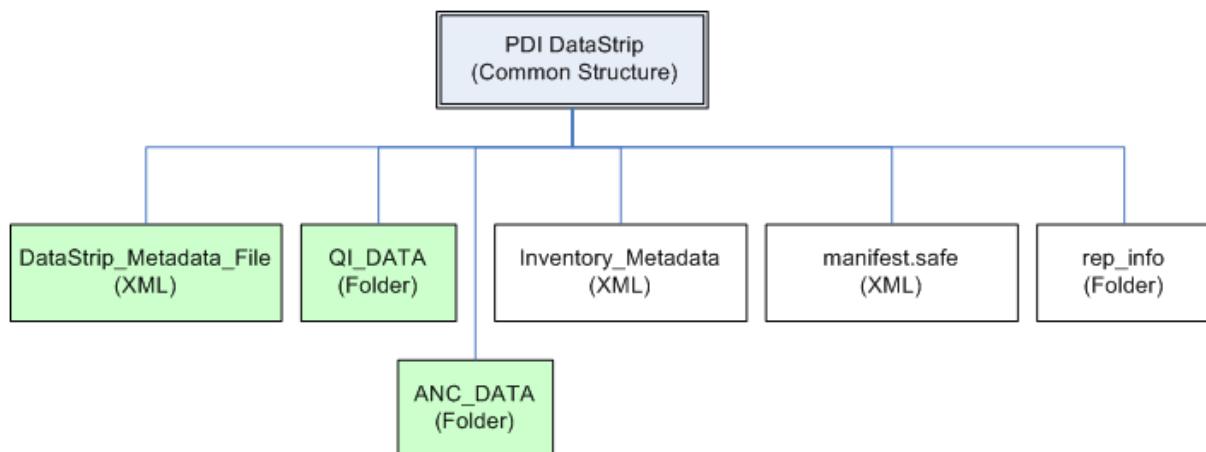
In addition to the mandatory SAFE Manifest file, according to the applicable document [SAFE-SPEC], a SAFE Granule PDI contains the *rep\_info* folder (fixed folder name recommended by [SAFE-SPEC]) including all the available schemas describing the product component files. Those schemas are not mandatory but "may be provided" inside the PDI.

The XSD schemas provided inside the *rep\_info* folder are referenced as internal product components by "metadataComponentSchemas" tag in the manifest file.

On the contrary, according to the SAFE specifications, the XSD schemas used to validate the SAFE manifest files are not included in the *rep\_info* folder but they are external to the PDI.

### 3.5 Datastrip PDI Common Structure

Datastrip PDI is organized as shown in the following figure:



	<b>Sentinel-2 Products Specification Document</b>	REF : S2-PDGS-TAS-DI-PSD ISSUE : 10 DATE : 12/07/2013 PAGE : 70 / 477
--	---	--

Figure 9: Datastrip Common Structure

1. **Datastrip\_Metadata\_File**: XML Metadata file describing all the elements contained in the Datastrip PDI;
2. **QI\_DATA**: folder containing the XML reports including the quality control checks performed by OLQC processor (see XSD schema of the OLQC report in Annex D). In addition, in case of L0 Datastrip this folder contains the preliminary QuickLook file (one file in JPEG2000 format),
3. **ANC\_DATA**: folder containing SAD raw data as received from the DFEP. Note that this folder is provided only inside a Level-0 Datastrip PDI;
4. **Inventory\_Metadata.xml**: inventory metadata file;
5. **manifest.safe**: XML SAFE Manifest file (see section 3.5.4);
6. **rep\_info**: folder containing the available XSD schemas that describe each Datastrip PDI components (see section 3.5.4).

Note that the ANC\_DATA, Inventory\_Metadata.xml, manifest.safe and rep\_info are available inside a Datastrip PDI but they are removed when the PDI is included in the user product.

### 3.5.1 Datastrip\_Metadata\_File Structure

The Datastrip\_Metadata\_File is a single metadata file containing different types of information shown in the following figure.

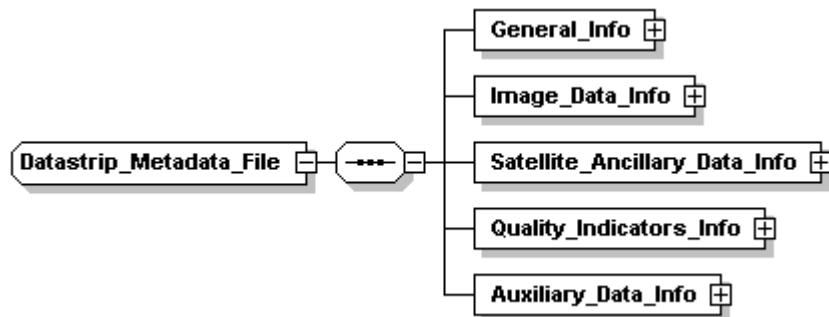


Figure 10: Datastrip\_Metadata\_File

The structure of the Datastrip\_Metadata\_File is common to all processing level (L0/L1A/L1B/L1C); the following tables are summarize the Datastrip\_Metadata\_File content and specify the applicability to the processing level. For all details regarding the Datastrip metadata content, specific for each processing level (L0/L1A/L1B/L1C), refers to the dedicated section in this chapter.

Info Type	Description	L0/L1A/L1B/L1C
General_Info	General information characterizing the Product Data Item	Y
Image_Data_Info	Image data information from MSI telemetry	Y
Satellite_Ancillary_Data_Info	Ancillary data information from Satellite Ancillary Telemetry	Y
Quality_Indicators_Info	Results of all quality checks performed at Datastrip level.	Y
Auxiliary_Data_Info	Auxiliary data information	Y

Table 3-19: Datastrip Metadata Structure

Field Name	Description	L0/L1A/L1B/L1C
Datatake_Info	Identification of the source Datastrip acquisition. General information.	Y
Processing_Info	Datastrip production information	Y
Datastrip_Time_Info	Datastrip Sensing Time information	Y
Downlink_Info	S2 data downlink information	Y
Archiving_Info	S2 data archiving	Y

	information	
Processing_Specific_Parameters	Optional field reserved for production chain only (i.e. DPC and/or IPF) and not propagated to User Product	Y

Table 3-20: Datastrip PDI General\_Info

Field Name	Description	L0	L1A	L1B	L1C
Granules_Information	List of Granules composing the whole Datastrip.	Y	Y	Y	N
Tiles_Information	List of the tiles composing the whole Datastrip.	N	N	N	Y
Sensor_Configuration	MSI Sensor configuration (Information from MSI telemetry)	Y	Y	Y	Y
Geometric_Header_List	Geometric information	Y	Y	Y	N
Radiometric_Info	Radiometric Information	N	Y	Y	Y
List_Fake_Decompr_Source_Frames	List of the decompressed source frames	N	Y	N	N
Geometric_Info	Refined model information	N	N	Y	Y

Table 3-21: Datastrip PDI Image\_Data\_Info

The Satellite Ancillary Data information, available through the Datastrip metadata file, are retrieved from SAD raw data stored in archive with a specific filename defined in the section § 3.21.1.

The SAD data, referenced through the Datastrip metadata file, are provided only inside of a User Level-0 product on temporal extent on the full Datatake, even in the case the product corresponds to an extract.

Field Name	Description	L0/L1A/L1B/L1C
Time_Correlation_Data_List	Time Correlation Data (sampled at 1Hz)	Y
Ephemeris	Description of ephemeris data (filtered and raw)	Y
Attitudes	Description of attitudes data (filtered and raw)	Y
Thermal_Data	Thermal data acquired at 1 Hz	Y
Lost_Source_Packet_List	List of source packets lost/degraded	Y
ANC_DATA_REF	Reference to SAD raw data. These data are archived as a PDI-type Ancillary and referenced by a defined PDI_ID (§ 3.21.1) corresponding to the SAD filename.	Y

Table 3-22: Datastrip PDI Satellite\_Ancillary\_Data\_Info



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 73 / 477



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 74 / 477

The following table summarizes the QIs provided through the Datastrip metadata file.

DATASTRIPE QUALITY INDICATORS						
Geometric Quality Indicators						
QI Type	Description	Metadata Field Name	L0	L1A	L1B	L1C
Absolute location assessment	Absolute location performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Absolute_Location	Y	Y	Y	Y
Planimetric stability assessment	A planimetric stability performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Planimetric_Stability	Y	Y	Y	Y
Ephemeris data quality	Ephemeris data quality retrieved from GPS Dilution of precision (DOP) information.	EPHEMERIS_QUALITY	Y	Y	Y	Y
Ancillary data quality	Ancillary data quality retrieved from GPS Dilution of precision (DOP) information.	ANCILLARY_QUALITY	Y	Y	Y	Y
Geometric refining quality	Available by Datastrip and only if geometric refining applied	Geometric_Refining_Quality	N	N	Y	Y
Multi-spectral registration performance assessment	3 values for 10, 20 and 60m bands (from GIPP data)	Multi_Spectral_Registration	N	N	Y	Y



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 75 / 477

Quicklook Info							
QI Type	Description	Metatada Field Name	L0	L1A	L1B	L1C	[PDD]
Quicklook information	Preliminary quicklook data provided for each Datastrip composing the product	Preliminary_QuickLook	Y	N	N	N	§ 5.5.1
Radiometric Quality Indicators							
QI Type	Description	Metatada Field Name	L0	L1A	L1B	L1C	[PDD]
Radiometric quality indicators for each band (from GIPP data)	Alpha and Beta parameters providing the instrument noise as a function of the radiometric count X for Level-1B : Noise= square root(Alpha_X + Beta_X* X)	Noise_Model	N	Y	Y	Y	§ 6.4.1 § 7.4.1 § 8.4.1
Radiometric quality indicators for each band (from GIPP data)	Absolute calibration accuracy provided as a percentage of accuracy	ABSOLUTE_CALIBRATION_ACCURACY	N	Y	Y	Y	§ 6.4.1 § 7.4.1 § 8.4.1
Radiometric quality indicators for each band (from GIPP data)	Cross-band calibration accuracy provided as a percentage of accuracy	CROSS_BAND_CALIBRATION_ACCURACY	N	Y	Y	Y	§ 6.4.1 § 7.4.1 § 8.4.1
Radiometric quality indicators for each band (from GIPP data)	Multi-temporal calibration accuracy provided as a percentage of accuracy	MULTI_TEMPORAL_CALIBRATION_ACCURACY	N	Y	Y	Y	§ 6.4.1 § 7.4.1 § 8.4.1

Table 3-23: Datastrip PDI Quality Indicators

In the frame of OLQC consolidation, the quality control checks performed by OLQC processor are included inside the XML reports ( § Annex D) stored in the QI\_DATA folder. In the following table, the quality control checks performed on the Datastrip metadata are provided. For the semantics and syntax inspections, refers to [OLQC-TN] document.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 76 / 477

Datastrip Quality control Checks Information (OLQC OUTPUT)						
Check Name	Checklist Name	Description	L0	L1A	L1B	L1C
Degraded_SAD	SENSOR_QUALITY	Check on the consistency of satellite ancillary data	Y	Y	Y	Y
Datation_Model	SENSOR_QUALITY	Check the correctness of the Datation Model	Y	Y	Y	Y
Relative_Orbit_Number	GENERAL_QUALITY	Check the consistency of the relative orbit number	Y	Y	Y	Y
Attitude_Quality_Indicator	GEOMETRIC_QUALITY	Check the admissibility of The Attitude Quality Indicator (QI)	Y	Y	Y	Y
Processor_Version	GENERAL_QUALITY	Check the consistency of the processor version	N	Y	Y	Y
Ephemeris_Planimetric_Stability	GEOMETRIC_QUALITY	Check the consistency of the Ephemeris and Planimetric Stability	N	Y	Y	Y
Absolute_Location_Value	GEOMETRIC_QUALITY	Check the consistency of the Absolute Location	N	Y	Y	Y
Geometric_Refining	GEOMETRIC_QUALITY	Check the correctness of the Geometric Refining process results	N	N	Y	Y
Radiometric_Quality_Indicators	RADIOMETRIC_QUALITY	Check the Radiometric Quality Indicators	N	N	Y	Y
Tile_position	GEOMETRIC_QUALITY	Check on the consistency of the product boundaries (ground coordinates)	N	N	N	Y
Product_Syntax	FORMAT_CORRECTNESS	Check on Product components syntax & semantics correctness	Y	Y	Y	Y
DS_Consistency	FORMAT_CORRECTNESS	Check on Datastrip consistency	Y	Y	Y	Y

Table 3-24: Datastrip Quality Control Checks



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 77 / 477

Field Name	Description	L0	L1A	L1B	L1C
IERS_Bulletin	IERS bulletin. These data are provided for the start acquisition date.	Y	Y	Y	Y
GIPP_List	Reference to the GIPP used: DEM, etc.	Y	Y	Y	Y
PRODUCTION_DEM_TYPE	DEM type used by the production process (GLOBE or SRTM for example)	Y	Y	Y	N
REFERENCE_BAND	Used Reference Band	Y	Y	Y	N

Table 3-25: Datastrip PDI Auxiliary\_Data\_Info



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 78 / 477

### 3.5.2 Datastrip PDI\_ID Definition

The Datastrip PDI\_ID used to identify a Level-0/Level-1A/Level-1B/Level-1C Datastrip PDI follows the same convention described in the section 3.4.2 except for the sub-filed “Detector ID” which is not relevant in case of a Datastrip PDI.

In this case the optional suffix <Sensing Time> refers to start time of the first Granule of the Datastrip.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 79 / 477



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 80 / 477

### 3.5.3 Datastrip PDI XSD Schemas

This section contains the list of the XSD schemas (annexed to the document) used to describe the structure and the metadata content of each Granule/Tile PDI:

1. `S2_PDI_Level-0_Datastrip_Structure.xsd`
2. `S2_PDI_Level-1A_Datastrip_Structure.xsd`
3. `S2_PDI_Level-1B_Datastrip_Structure.xsd`
4. `S2_PDI_Level-1C_Datastrip_Structure.xsd`
  
5. `S2_PDI_Level-0_Datastrip_Metadata.xsd`
6. `S2_PDI_Level-1A_Datastrip_Metadata.xsd`
7. `S2_PDI_Level-1B_Datastrip_Metadata.xsd`
8. `S2_PDI_Level-1C_Datastrip_Metadata.xsd`

The first set of the schemas (points 1 - 4) define the "physical organization" of the Datastrip PDI on the disk.

These schemas are "improperly" used to specify elements not envisaged by the XML such as folders, therefore it is actually not expected to be used for the validation of the corresponding XML file.

Oppositely, the second set of the schema (points 5 – 8) are used to validate the XML metadata file inside each Datastrip PDI.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 81 / 477

### 3.5.4 Datastrip PDI SAFE Format Approach

The SAFE Datastrip PDI definition is the same one described for the Granule/Tile PDI in the section 3.4.4.

### 3.6 Level-0 PDI Granule definition

Level-0 Granule PDI is defined as a **tar** file with the following structure:

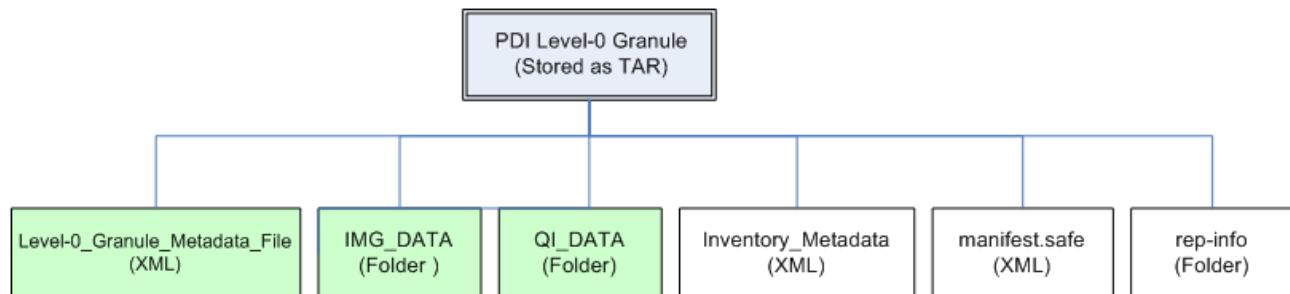


Figure 11: PDI Level-0 Granule Structure

The PDI Level-0 Granule consist of:

1. **Level-0\_Granule\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Granule;
2. **IMG\_DATA**: folder containing the mission data corresponding to one on-board scene for one detector and all spectral bands. The image data are provided as a set of 13 binary files, one for each spectral band, including all corresponding Image Source Packets (ISP) in the observation chronological sequence. The ISPs include their corresponding source packet annotations as a pre-pended header of each source packet;
3. **QI\_DATA**: folder containing XML reports about Geometric quality, Image content quality, Quality control checks information;
4. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C);
5. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.4.4);
6. **rep\_info**: folder containing the available XSD schemas that validate the PDI components (recommended by [SAFE-SPEC], see section 3.4.4).



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 83 / 477

## 3.6.1 PDI\_ID definition

The PDI\_ID (Granule ID) used to identify a Level-0 Granule PDI, follows the description provided in the section 3.4.2. File\_Type is defined in the section 3.2, Table 3-3.

Level-0 Granule file template name (Granule ID):

`S2A_OPER_MS1_L0_GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar`

Note that the PDI\_ID.tar is the physical name of the Granule PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 84 / 477

### 3.6.2 Level-0 Granule Physical Format

The PDI ID defined above represents the “Granule directory” name. Inside the Granule directory, there are the Granule components as in the Figure 11.

Inside that directory, the naming convention used to identify each real files follows the same convention used for define the Granule ID but without the Processing Baseline sub-string.

- **Level-0\_Granule\_Metadata\_File (XML file):**

Granule Metadata File Template name:

*S2A\_OPER\_MTD\_L0\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D01.xml*

The XSD schema which regulates the metadata file is *PDI\_Level-0\_Granule\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **IMG\_DATA (folder):**

Each file contained in the IMG\_DATA folder (13 files, one image file per band) follows the naming convention defined hereafter:

Image File naming convention = <PDI\_ID\*>\_<Band\_Index>.bin where:

Field Name	Value/Meaning	Note
<i>PDI_ID*</i>	PDI_ID without Processing Baseline sub-string	
<i>Band Index</i>	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	Field used to identify the spectral bands within the Granule.

IMG\_DATA/Level-L0 image file template name (binary file):

*S2A\_OPER\_MS1\_L0\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D01\_B03.bin*

- **QI\_DATA (folder):**

QI\_DATA folder contains the XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

File Template Name:

*S2A\_OPER\_MS1\_L0\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D01\_GEOMETRIC\_QUALITY\_report.xml*

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **manifest.safe (XML file):**

XML file with fixed name *manifest.safe*

- **rep\_info (folder):**  
Folder containing the following XSD schemas:
  1. *S2\_PDI\_Level-0\_Granule\_Metadata.xsd*
  2. *Inventory\_Metadata.xsd*
  3. *OLQC\_Report.xsd*

Level-0 Granule Physical Format template:

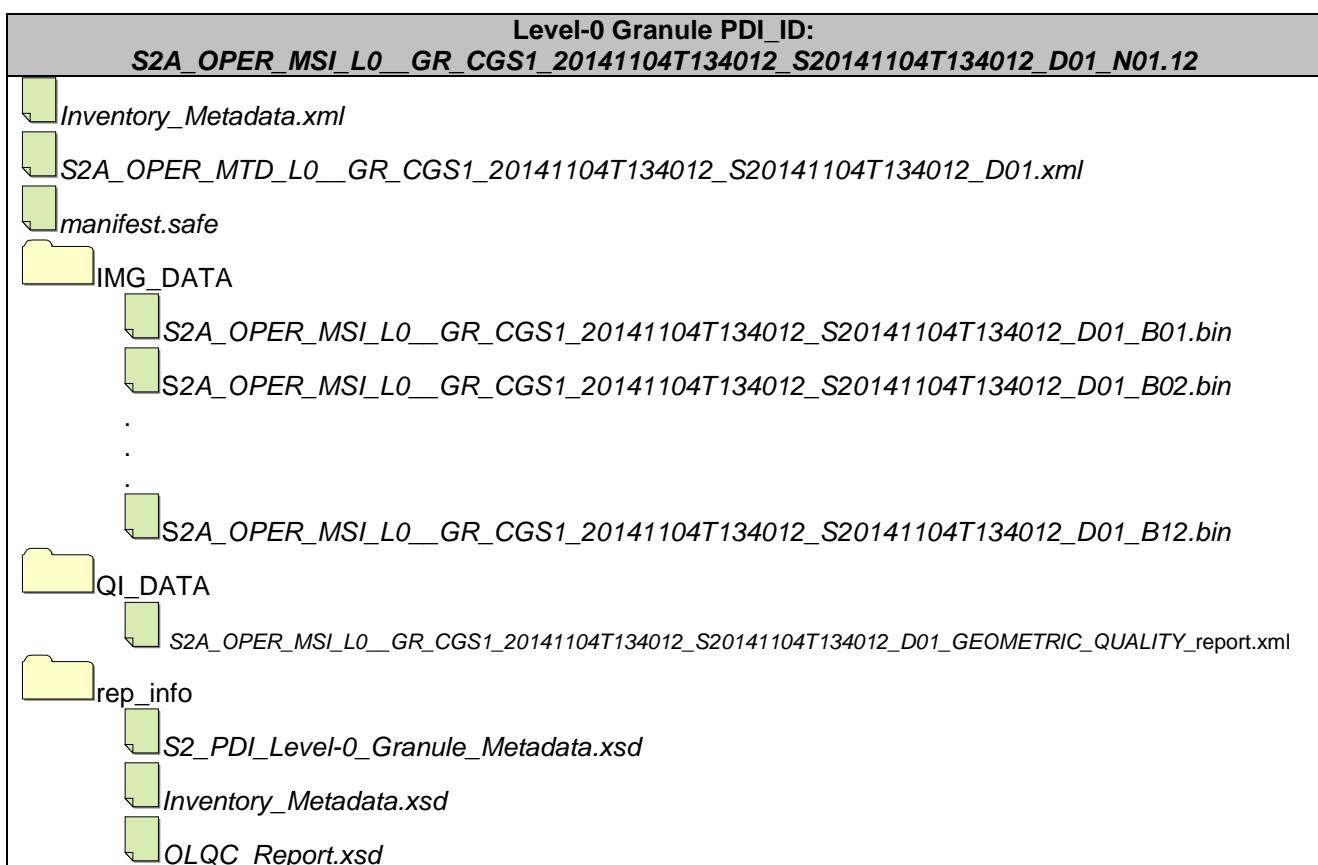
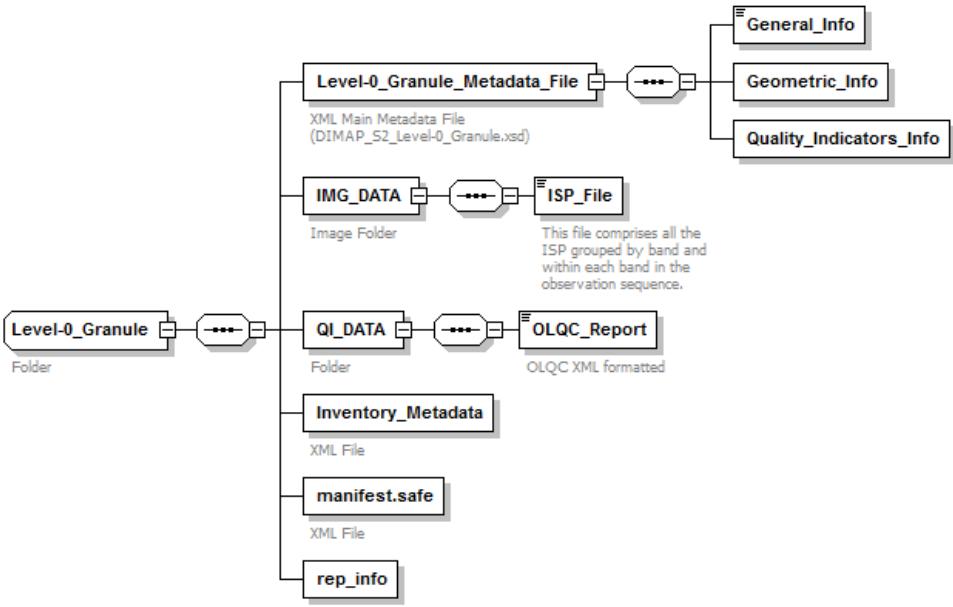


Figure 12: PDI Level-0 Granule Physical Format

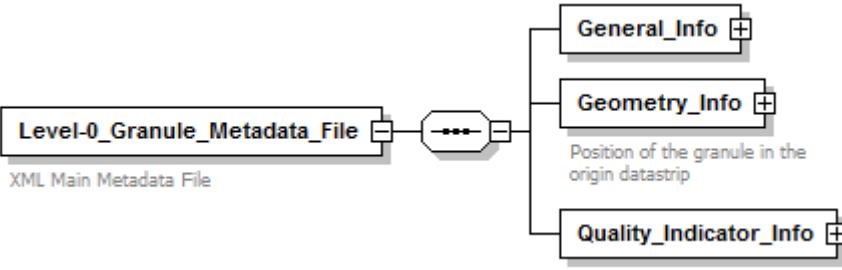
### 3.6.3 Level-0 PDI Granule Structure

The *S2\_PDI\_Level-0\_Granule\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-0 Granule PDI on disk. This schema is provided for information only as it is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 11.

diagram	 <pre> graph TD     LGF[Level-0_Granule_Metadata_File] --- ---&gt; ISP[ISP_File]     LGF --- ---&gt; QID[QI_DATA]     LGF --- ---&gt; IMDF[IMG_DATA]     QID --- ---&gt; OLQC[OLQC_Report]     QID --- ---&gt; InvMD[Inventory_Metadata]     IMDF ---&gt; ManifestSafe[manifest.safe]     IMDF ---&gt; RepInfo[rep_info]     </pre> <p>This diagram illustrates the structure of a Level-0 Granule PDI. It starts with a <b>Level-0_Granule_Metadata_File</b> (XML Main Metadata File (DIMAP_S2_Level-0_Granule.xsd)) which contains three main components: <b>ISP_File</b>, <b>QI_DATA</b>, and <b>IMG_DATA</b>. The <b>QI_DATA</b> component contains <b>OLQC_Report</b> and <b>Inventory_Metadata</b>. The <b>IMG_DATA</b> component contains <b>manifest.safe</b> and <b>rep_info</b>.</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Level-0_Granule_Metadata_File</u></a> <a href="#"><u>IMG_DATA</u></a> <a href="#"><u>QI_DATA</u></a> <a href="#"><u>Inventory_Metadata</u></a> <a href="#"><u>manifest.safe</u></a> <a href="#"><u>rep_info</u></a>
annotation	<p>The Level-0 Granule is defined as a folder containing:</p> <ol style="list-style-type: none"> <li>1. <b>Level-0_Granule_Metadata_File</b>: XML Main Metadata File (DIMAP)</li> <li>2. <b>IMG_DATA</b>: folder containing the 13 image data files, one per band and per detector</li> <li>3. <b>QI_DATA</b>: folder containing XML reports about Quality Indicators</li> <li>4. <b>Inventory_Metadata</b>: XML inventory metadata file</li> <li>5. <b>manifest.safe</b>: XML SAFE Manifest file</li> <li>6. <b>rep_info</b>: folder containing the XSD schema provided inside a SAFE Level-0 Granule</li> </ol> <p>Note that the <b>Inventory_Metadata.xml</b>, <b>manifest.safe</b> and <b>rep_info</b> are removed when the PDI is included in the user product.</p>

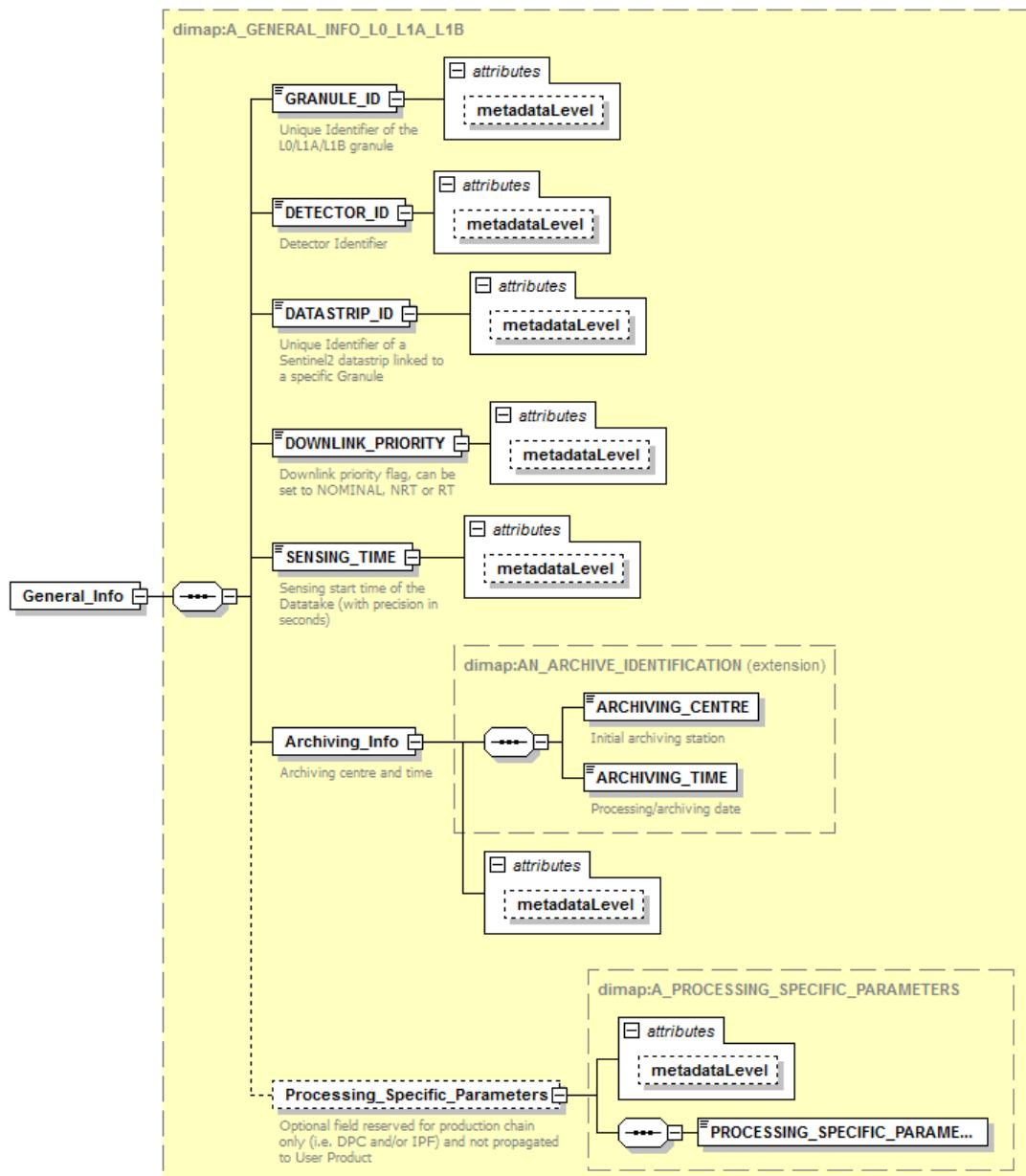
### 3.6.3.1 Level-0\_Granule\_Metadata\_File Schema

Level-0\_Granule\_Metadata\_File is the XML metadata file provided inside each Level-0 Granule. The schema used to validate it is *S2\_PDI\_Level-0\_Granule\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Level0GranuleMetadataFile {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class GeneralInfo     class GeometryInfo     class QualityIndicatorInfo      Level0GranuleMetadataFile "2" -- "*" GeneralInfo :      Level0GranuleMetadataFile "2" -- "*" GeometryInfo :      Level0GranuleMetadataFile "2" -- "*" QualityIndicatorInfo :   </pre> <p>Position of the granule in the origin datastrip</p>
children	<p><a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Quality_Indicators_Info</u></a></p>
annotation	<p>The Level-0_Granule_Metadata_File is an XML file containing three groups of metadata describing the whole product data item.</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: this group of metadata provides general information regarding the Level-0 Granule. The meaning for each metadata is shown in the following diagrams.</li> <li>2. <b>Geometric_Info</b>: these metadata provide information describing the geolocation of the Granule.</li> <li>3. <b>Quality_Indicators_Info</b>: these metadata provide information about cloud coverage assessment and technical quality assessment.</li> </ol>

The following figures and tables give a complete overview of the Level-0\_Granule\_Metadata\_File schema according the description provided in the section 3.4.1.

#### General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 13 : Level-0\_Granule\_Metadata\_File - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 89 / 477

In the following tables, the third column provide the metadata level attribute for each metadata (see section 2.4). In the last column, the check vs applicable [PDD] is traced.

General Info			
Field Name	Description	Metadata Level	Check vs [PDD]
GRANULE_ID	Granule_Identifier metadata indicates the unique identifier of the Level-0 Granule. This parameter coincides with PDI_ID definition described in section 3.6.1 and univocally points a Granule PDI in the archive.	Brief	§ 5.4.2.1
DETECTOR_ID	Detector identifier corresponding to the Granule	Brief	MISSING
DATASTRIP_ID	Unique identifier of the L0 PDI Datastrip linked to L0 PDI Granule. This parameter coincides with the PDI_ID of the PDI Datastrp linked to the Granule. This link establishes the hierarchy Granule vs Datastrip (see section 3.3)	Brief	§ 5.4.1.1 Product Level Metadata, Datastrip Level information
DOWNLINK_PRIORITY	Downlink priority flag. It can be set Nominal/NRT/RT	Standard	§ 5.4.2.2
SENSING_TIME	Imaging Start Time (sensing start time of the Datatake). Corresponding to the first line date on the MSI-Scene (with precision in seconds)  Note: set as Type date_time:AN_UTC_DATE_TIME	Standard	§ 5.4.2.2
Archiving_Info/ARCHIVING_CENTRE	The starting point of the circulation data. The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2</li><li>• CDAM</li><li>• MPCC</li></ul>	Expertise	§ 5.4.1.3 Product Level Metadata, Datastrip Level information
Archiving_Info/ARCHIVING_TIME	Processing/archiving date (UTC data time)	Expertise	§ 5.4.1.3 Product Level Metadata, Datastrip Level information



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

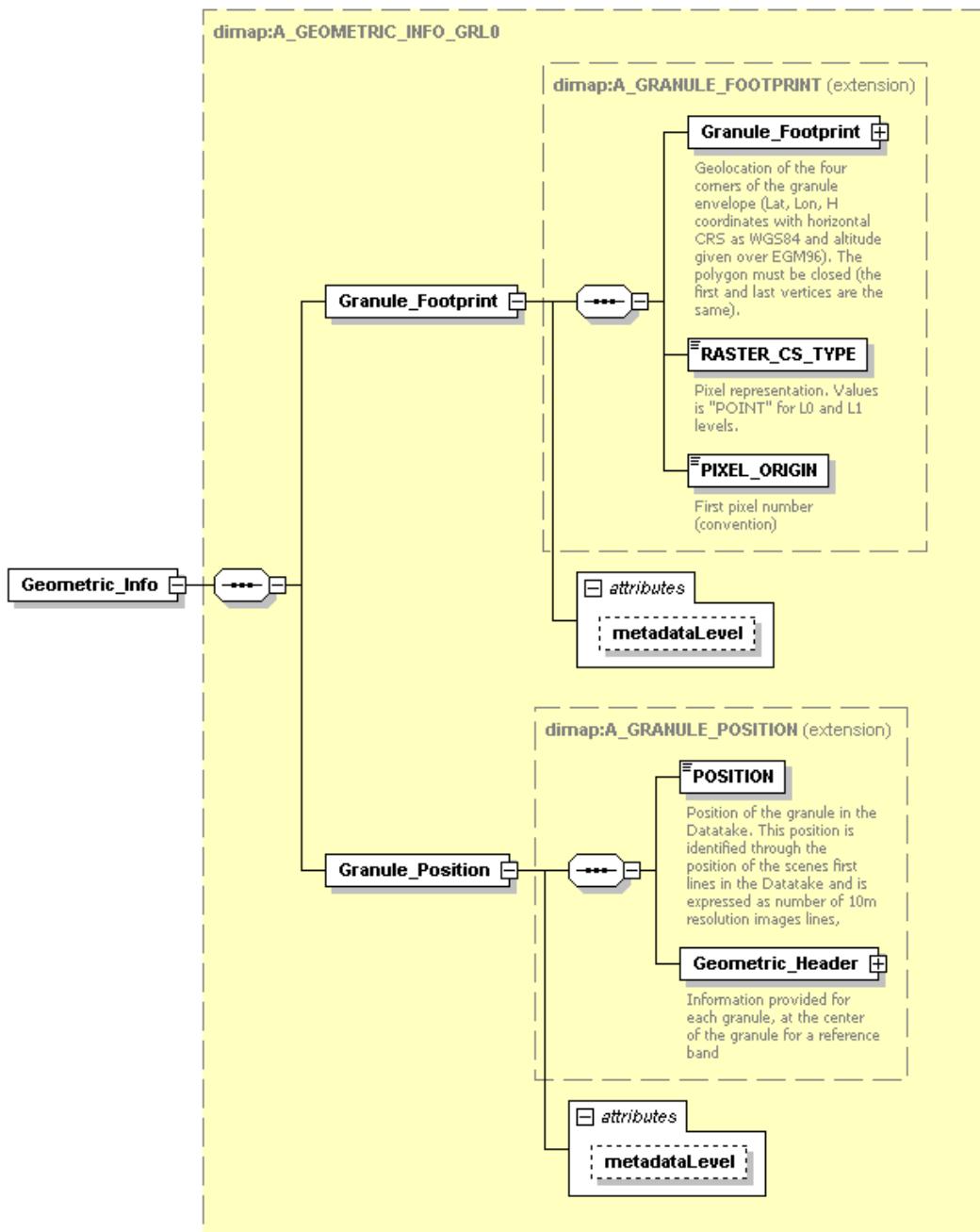
DATE : 12/07/2013

PAGE : 90 / 477

Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING
---	---	-----------	---------

Table 3-26: Level-0\_Granule\_Metadata\_File - General\_Info Description

Geometric\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 14: Level-0\_Granule\_Metadata\_File - Geometric\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 92 / 477

Geometric_Info/Granule_Footprint			
Field Name	Description	Metatada Level	Check vs [PDD]
Granule_Footprint/Unitary_Footprint_List/Unitary_Footprint/Footprint/EXT_POS_LIST	Geolocation of the four corners of the Granule envelope (Lat, Lon, H coordinates with horizontal CRS as WGS84 and altitude given over EGM96).	Brief	§ 5.4.2.1
Granule_Footprint/Unitary_Footprint_List/Unitary_Footprint/Footprint/INT_POS_LIST		Brief	§ 5.4.2.1
RASTER_CS_TYPE	Pixel representation. Values is "POINT" for L0 and L1 levels.	Brief	MISSING
PIXEL_ORIGIN	First pixel number (convention)	Brief	MISSING
Geometric_Info/Granule_Position			
Field Name	Description	Metatada Level	Check vs [PDD]
POSITION	Granule_Position describes the position of the Granule in the origin Datatake. This position is identified through the position of the scenes first lines in the Datatake and is expressed as number of 10m resolution images lines). Moreover information for a reference band at the centre of the Granule (incidence angles and solar angles) are provided.	Standard	§ 5.4.2.2
Geometric_Header/GROUND_CENTER	Information provided for a reference band, at the centre of the Granule, for each Granule. Geolocation of the Granule centre (Lat, Lon, H) Altitude is provided over the geoid.	Standard	§ 5.4.2.1
Geometric_Header/QL_CENTER	The Granule centre in the QL display: 1 (r,c) point.	Standard	NO
Geometric_Header/Incidence_Angles/ZENITH_ANGLE	Information provided for a reference band, at the centre of the Granule, for each Granule. Incidence angles corresponding to the centre of the Granule.	Standard	§ 5.4.2.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 93 / 477

Geometric_Header/Incidence_Angles/AZIMUTH_ANGLE	Information provided for a reference band, at the centre of the Granule, for each Granule. Incidence angles corresponding to the centre of the Granule.	Standard	§ 5.4.2.2
Geometric_Header/Solar_Angles/ZENITH_ANGLE	Information provided for a reference band, at the centre of the Granule, for each Granule. Solar angles corresponding to the centre of the Granule.	Standard	§ 5.4.2.2
Geometric_Header/Solar_Angles/AZIMUTH_ANGLE	Information provided for a reference band, at the centre of the Granule, for each Granule. Solar angles corresponding to the centre of the Granule.	Standard	§ 5.4.2.2

Table 3-27: Level-0\_Granule\_Metadata\_File - Geometric\_Info Description

Quality Indicators Info:

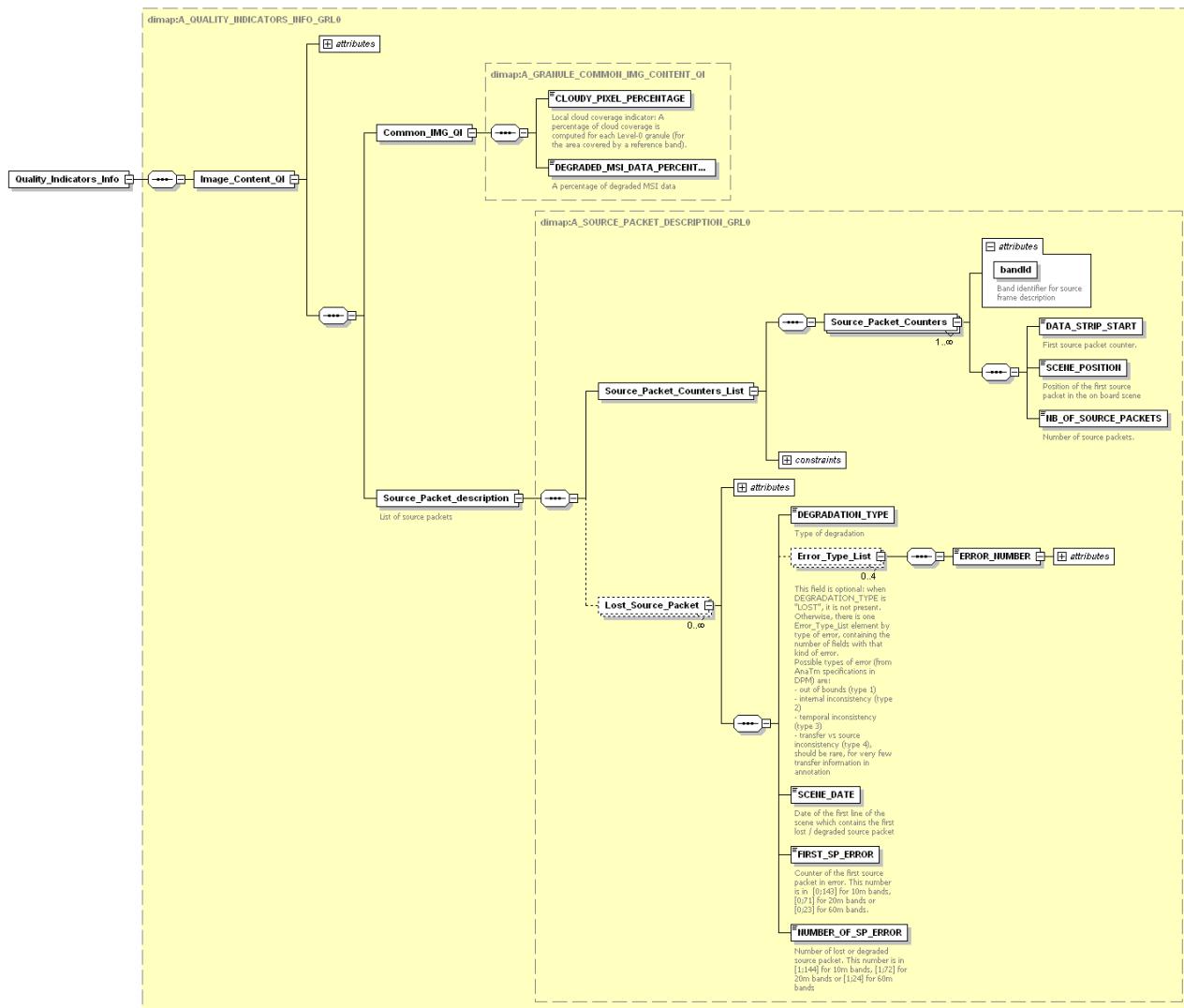


Figure 15: Level-0\_Granule\_Metadata\_File - Quality\_Indicator\_Info Diagram

Generated by XMLSpy

www.altova.com



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 95 / 477

Quality_Indicators_Info/Image_Content_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
CLOUDY_PIXEL_PERCENTAGE	Local cloud coverage indicator: A percentage of cloud coverage is computed for each Level-0 Granule (for the area covered by a <b>reference band</b> ).	Standard	§ 5.5.2
DEGRADED_MSI_DATA_PERCENTAGE	Local technical quality indicator: A percentage of degraded MSI data is provided for each Level-0 Granule.	Standard	§ 5.5.2
Quality_Indicators_Info/Source_Packet_Description			
Field Name	Description	Metatada Level	Check vs [PDD]
Source_Packet_Counters_List/DATA_STRIP_START	First source packet counter	Standard	§ 5.5.2
Source_Packet_Counters_List/SCENE_POSITION	Position of the first source packet in the on board scene	Standard	§ 5.5.2
Source_Packet_Counters_List/NB_OF_SOURCE_PACKETS	Number of source packets	Standard	§ 5.5.2
Lost_Source_Packet/DEGRADATION_TYPE	Type of degradation	Standard	§ 5.5.2
Lost_Source_Packet/Error_Type_List/ERROR_NUMBER	Type of error (from AnaTm specifications)  Attribute: errorType	Standard	§ 5.5.2
Lost_Source_Packet/SCENE_DATE	Date of the first line of the scene which contains the first lost / degraded source packet	Standard	§ 5.5.2
Lost_Source_Packet/FIRST_SP_ERROR	Counter of the first source packet in error. This number is in [0;143] for 10m bands, [0;71] for 20m bands or [0;23] for 60m bands.	Standard	§ 5.5.2
Lost_Source_Packet/NUMBER_OF_SP_ERROR	Number of lost or degraded source packet. This number is in [1;144] for 10m bands, [1;72] for 20m bands or [1;24] for 60m bands	Standard	§ 5.5.2

Table 3-28: Level-0 Granule - Quality\_Indicators\_Info Description



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

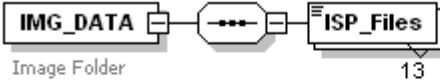
ISSUE : 10

DATE : 12/07/2013

PAGE : 96 / 477

Note that, according to OLQC procedures consolidation, the results of all quality control checks performed by OLQC processor on Level-0 Granule are included in the XML reports stored in the QI\_DATA folder (see § 3.4.1, Table 3-17).

### 3.6.3.2 *IMG\_DATA*

diagram	 <p>Image Folder      13 Set of 13 binary files, one image file per band</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><b><a href="#">ISP_Files</a></b></p>
annotation	<p>IMG_DATA folder contains the mission data corresponding to one on-board scene for one detector and all spectral bands. The image data are provided as a set of 13 binary files, one for each spectral band, including all corresponding Image Source Packets (ISP) in the observation chronological sequence. The ISPs include their corresponding source packet annotations as a pre-pended header of each source packet.</p> <p>Note the following clarification: The ISPs include their corresponding source packet binary annotations as a pre-pended header of each source packet. A source packet header consists in:</p> <ul style="list-style-type: none"> <li>• an annotation computed during the L0 process (called DPC annotation). This annotation is 2 bytes long. It contains the following information: <ul style="list-style-type: none"> <li>- the first bit indicates the global status of the ISP: should it be used (0) or not (1);</li> <li>- the second bit indicates if the packet is complete (0) or not (1);</li> </ul> </li> <li>• - the 13 remaining bits are reserved;</li> <li>• the DFEP annotation as received from the DFEP (cf. DFEP-ICD); it gives in particular the real size of the ISP and shall be used instead of the ISP packet length.</li> </ul> <p>The source packet header must be removed before uncompression during L1 processing.</p>

#### Compression and Compression by-passed modes:

According to the MSI instrument configuration, the ISPs can be compressed or not. Compression by-passed implies that data for only 4 detectors are provided.

In the nominal products the compression is enabled and all detectors are available; in case of calibration products or contingency acquisition the compression is by-passed and only a subset of detectors are active and therefore available in the product.

The instrument configuration implies that the number of the granules is variable and it is driven by the number of the active detectors.

Though the structure of the L0 PDI Granules is the same both for compression and by-passed compression, the L0 ISP semantics and data contents (CCSDS packet data field content including IAD (Image Ancillary Data) is different. They host different kind of data (compressed WICOM applied data and uncompressed raw image data) and the IAD is ordered differently (cf. [S2GICD-



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 98 / 477

MSI]). Within the processing chain, granules in compression bypass are dealt with a specific function in charge of dealing with the different format and perform additional processing tasks usually covered by the WICOM decompressor.

In order to allow properly handle L0 ISP data part, the following metadata are provided at Datastrip level:

- `COMPRESS_MODE` metadata (see section 3.7.3.1, Table 3-33)
  - `Active_Detector_List` metadata set (see section 3.7.3.1, Table 3-33).

To ensure the consistency / completeness of the L0 User Product with on-board compression by-passed a specific ON\_BOARD\_COMPRESSION\_MODE metadata set at product level (see section 4.6.7.1, Table 4-9) indicates the compressed or by-passed compressed data content.

Note: all Datastrips in a product will always have the same compression mode. So when dealing with a User Product there is no need to check for the COMPRESS\_MODE flag at Datastrip level. The ON\_BOARD\_COMPRESSION\_MODE flag is sufficient to understand whether the product is relevant to compressed or uncompressed data.

### 3.6.3.3 QI DATA

diagram	 <pre> graph LR     A[QI_DATA Folder] --&gt; B(( ))     B --&gt; C[OLQC_Report OLQC XML formatted]   </pre> <p>The diagram illustrates a data flow. It starts with a 'QI_DATA' folder icon, followed by a connector symbol, and ends with an 'OLQC_Report' icon. Below the connector is the label 'OLQC XML formatted'. The entire sequence is enclosed in a light gray box.</p>
children	<a href="#"><u>OLQC_Report</u></a>
annotation	<p>QI_DATA folder contains XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The XSD OLQC_Report in the Annex C is provided.</p>

### 3.6.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-0 PDI Granule level.

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 99 / 477

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- the Table 3-29 describing the content and structure of the Information Package Map section; consider that this section provides a logical hierarchical view of the product structure and content, reflecting the product organization, through a series of nested XFDU Content Unit elements; each Content Unit represents either a file or a directory contained in the product (except for the root Content Unit that represents the product itself); if it represents a directory, it nests one or more Content Units. In this way, all files of the product (Data Objects, Metadata Objects associated to Data Objects and XSD Schemas associated to Metadata Objects, with the exception of SAFE Manifest file itself) are pointed by the Information Package Map (each Data and Metadata Object by a Content Unit, each Schema by a repId attribute of the Content Unit); Note that for each product the table reflects exactly the product physical structure as graphically shown in the Figure 11 and Figure 12 (or analogous figures for the others PDI and User Product). The correspondences between elements in the figures 11 and 12 and the *contentUnits* in the table is provided in the “Description” column.
- for the Metadata section, Table 3-30 that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-0\_Granule.xsd”);
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
  - the allowed range of values of the field.
- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-0 PDI Granule Product (with the exception of the Manifest file itself); this includes:
  - the XML Granule Metadata file;
  - the XML Inventory\_Metadata file;
  - one file per spectral band, (up to a total of 13 files) in binary format, containing the ISPs corresponding to one detector and one band. in the observation sequence;
  - a set of Quality Indicator Data Files, including XML reports about Geometric quality, Image content quality, Quality control checks information



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 100 / 477

Name					Description	Data Type	Occ
contentUnit					Root Content Unit representing the whole PDI Granule product.  (e.g. PDI Level-0 Granule box in Figure 11 or Level-0 Granule PDI_ID header in Figure 12)	U	1
	<b>ID</b>				Unique identifier of Content Unit	S	0..1
	<b>unitType</b>				Type of Content Unit	S	0..1
	<b>textInfo</b>				Textual description of the Component to which the Content Unit refers	S	0..1
	<b>repID</b>				Relate one or more XML Schema Components to a Data Object	S	0..1
	<b>dmdID</b>				Relates the Content Unit to the Platform Metadata Object and, if available, to the Acquisition Period Metadata Object (and to any additional Metadata Object).	S	0..1
	<b>pdID</b>				Relates the Content Unit to the Processing Metadata Object	S	0..1
	contentUnit				Content Unit representing either a file or a directory of the PDI Granule Product  (e.g. IMG_DATA box in Figure 11 or IMG_DATA icon in Figure 12)	U	1..*
		<b>ID</b>			Unique identifier of Content Unit	S	0..1
		<b>unitType</b>			Type of Content Unit	S	0..1
		<b>textInfo</b>			Textual description of the Component to which the Content Unit refers	S	0..1
		<b>repID</b>			Relate one or more XML Schema Components to a Data Object	S	0..1
		<b>dmdID</b>			Relates the Content Unit to the Platform Metadata Object and, if available, to the Acquisition Period Metadata Object (and to any additional Metadata Object).	S	0..1
		.....			Further level of nesting (if any) of Content Units		



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 101 / 477

		.....			Further level of nesting (if any) of Content Units		
		contentUnit			Terminal leaf in the product structure hierarchy; this Content Unit represents a Data/Metadata Component file of the PDI Granule Product  (e.g. S2A_OPER_MS1_L0_GR_C GS1_20141104T134012_S20 141104T134012_D01_B01.bi n file in Figure 12)		
			<b>ID</b>		Unique identifier of Content Unit	S	0..1
			<b>unitType</b>		Type of Content Unit	S	0..1
			<b>textInfo</b>		Textual description of the Component to which the Content Unit refers	S	0..1
			<b>repID</b>		Relate one or more XML Schema Components to a Data Object	S	0..1
			<b>dmdID</b>		Relates the Content Unit to the Platform Metadata Object and, if available, to the Acquisition Period Metadata Object (and to any additional Metadata Object).	S	0..1
			<b>dataObjectPointer</b>		Pointer to the Data/Metadata Component represented by the Content Unit	U	1
				<b>dataObjectID</b>	Identifier of Data/Metadata Component in the Data Objects section of the SAFE Manifest	S	1

Table 3-29 – Content of Information Package Map for PDI Level-0 Granule SAFE Manifest



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 102 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data Center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->GRANULE_ID (substring <Mission ID>, see section 3.6.1)	The mission name of the platform		0..1	Sentinel
	number	General_Info->GRANULE_ID (substring <Mission ID>, see section 3.6.1)	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 103 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
						Vicarious_Calibration Raw_Measurement Test_Mode
	instrument->mode-> <b>identifier</b>	N.A.	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1A Datastrip Product
	<b>start</b>	General_Info->Archiving_Info -> ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 104 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info ->ORIGIN_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	processing->resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1A Granule Product
	resource-> processing		Description of the L0 to L1A Processing		0..*	
	resource->processing-> <b>name</b>	N.A.	Name of the L0 to L1A Processing	string	0..1	Processing of Level-0 Granule product
	resource->processing-> <b>start</b>	General_Info->GRANULE_ID (substring <Creation Date>, see section 3.6.1)	Processing start date (UTC)	xs:dateTime	0..1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 105 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing->facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing->facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing->facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing->facility-> <b>site</b>	General_Info-> GRANULE_ID (substring <Site Centre>, see section 3.6.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource-> processing-> facility-> <b>software</b>	N.A.	Description of software component used for Processing		0..*	
	resource-> processing->facility-> <b>software-&gt;name</b>	N.A.	Name of the software component	string	1	
	resource-> processing->facility-> <b>software-&gt;version</b>	N.A.	Version of the software component	string	0..1	
acquisitionPeriod					1	
	startTime	General_Info-> GRANULE_ID (substring <Sensing Time>, see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line	xs:dateTime	1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 106 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			of the PDI at Granule level, see section 3.6.1)			
measurementFrameSet					1	
	cloudVoteNotationSystem-> <b>floor</b>	N.A.	Minimum value of cloud coverage index (Fixed value = 0.0)	double	0..1	0.0
	cloudVoteNotationSystem-> <b>ceil</b>	N.A.	Maximum value of cloud coverage index (Fixed value = 100.0)	double	0..1	100.0
	frame	N.A.	The "frame" concept is used in SAFE to convey the cloud coverage information by subdividing the region of interest of the data into "frames" according to a World Reference System. In the case of Sentinel-2 L1C Products, a similar concept can be used, by associating one single "frame" to the area covered by the granule (with respect to the reference band)		0..13	
	frame->number	N.A.	Number of the frame	integer	0..1	1



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 107 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	frame-center	Geometric_Info->Granule_Position->Geometric_Header->GROUND_CENTER (only lat/lon coordinates, not height)	The Granule centre on ground	gml:PointType	0..1	
	frame->footPrint	Derived from Geometric_Info->Granule_Footprint->Unitary_Footprint_List->Unitary_Footprint	Granule footprint (namely imaged area corresponding to the Granule), corresponding to one detector and all bands	string (gml:linearRingType namely blank separated list of comma-separated long/lat coordinates of footprint closed polygon with last vertex equal to first)	0..1	
	frame->Tile	N.A.			1	One Tile for the frame
	frame->Tile-> <b>row</b>	N.A.	The column index of the Tile. This index is numbered starting from 1.	integer	1	1 (since there is only one Tile)
	frame->Tile-> <b>column</b>	N.A.	The row index of the Tile. This index is numbered starting from 1.	integer	1	1 (since there is only one Tile)
	frame->Tile->cloudVote	Derived from Quality_Indicators_Info->Image_Content_QI->Common_IMG_QI->CLOUDY_PIXEL_PERCENTAGE	Numeric notation qualifying the cloud coverage of the Tile	double	0..1	0 to 100
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..10	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata		0..2	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 108 / 477

SAFE Manifest		From S2_PDI_Level-0_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			files included in the product (e.g. the XML Metadata file Schema)			

Table 3-30 - Content of Metadata Section for PDI Level-0 Granule SAFE Manifest

Name				Description	Data Type	Occ
dataObject				This element references the Data Component included in the product.	U	1..*
	ID			Data Component;ID	S	1
	repId			List of IDs of all XML Schemas associated to Data Component	S	1
	byteStream			Pointer to the Data Component	U	1..*
		contentType		The MIME type for the referenced Data Component	E	1
		size		The size in bytes of the Data Component	UI	1
		fileLocation		Location of file	U	1



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 109 / 477

			<b>locatorType</b>	Type of the file location	URI	1
			<b>textInfo</b>	Textual description of the Data Component	S	0..1
			<b>href</b>	Relative path of the file (in the file system) containing the referenced Data Component	URI	1
		checksum		Checksum value for the Data Component	U	1
			<b>checksumName</b>	Checksum type the Data Component (e.g. MD5)	E	1

Table 3-31 – Content of Data Object Section for PDI Level-0 Granule SAFE Manifest

### 3.7 Level-0 PDI Datastrip definition

Level-0 PDI Datastrip is defined as a **tar** file containing the following structure:

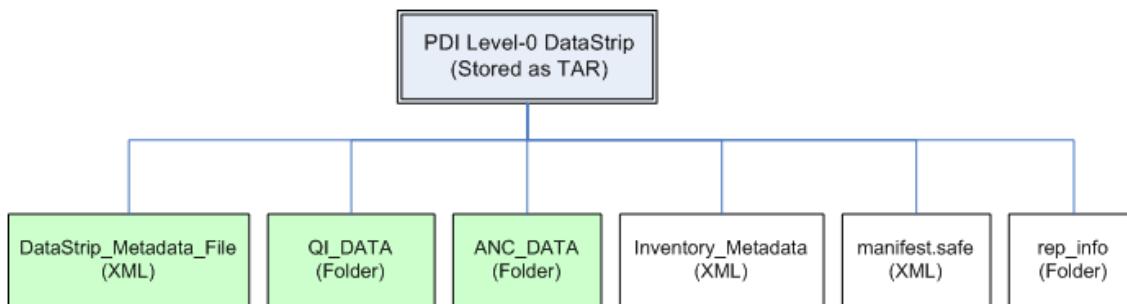


Figure 16: PDI Level-0 Datastrip Structure

The PDI Level-0 Datastrip consist of:

1. **Datastrip\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Datastrip;
2. **QI\_DATA**: folder containing the preliminary QuickLook file and XML reports providing Quality control check results;
3. **ANC\_DATA**: folder containing SAD raw data always provided on temporal extent on the full Datatake. SAD data are provided as a set of unitary Raw Data files each matching a single packet type;
4. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C).
5. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.7.4).
6. **rep\_info**: folder containing the available XSD schema that validate the PDI components (recommended by [SAFE-SPEC], see section 3.4.4)

#### 3.7.1 PDI\_ID definition

Datastrip PDI\_ID (Datastrip ID) is defined in the section 3.5.2. The File\_Type is specified in the section 3.2, Table 3-3.

Level-0 Datastrip template Name (Datastrip ID):

S2A\_OPER\_MSIL0\_DS\_CGS2\_20141104T134012\_S20141104T134012\_N01.12.tar

Note that the PDI\_ID.tar is the physical name of the Datastrip PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 111 / 477

### 3.7.2 Level-0 Datastrip Physical Format

The PDI ID defined above represents the “Datastrip directory” name. Inside the Datastrip directory, there are the Datastrip components as in the Figure 16.

Inside that directory, the naming convention used to identify each real files follows the same convention used for define the Datastrip ID but without the Processing Baseline sub-string.

- **Datastrip\_Metadata\_File (XML file):**

Datastrip\_Metadata\_File template name:

*S2A\_OPER\_MTD\_L0\_DS\_CGS2\_20141104T134012\_S20141104T134012.xml*

The XSD schema which regulates the metadata file is *S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **QI\_DATA (folder):**

QI\_DATA folder contains:

- XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

File Template Name:

*S2A\_OPER\_MS1\_L0\_DS\_CGS1\_20141104T134012\_S20141104T134012\_GEOMETRIC\_QUALITY\_report.xml*

- Preliminary Quick Look file (JPEG2000)

File Template Name:

*S2A\_OPER\_QLK\_L0\_DS\_CGS2\_20141104T134012\_S20141104T134012.jp2*

- **ANC\_DATA (folder):**

ANC\_DATA folder contains:

- Raw Satellite Ancillary Data provided as a set of unitary Raw Data files each matching a single packet type.

File template name (see section 3.21.1):

*S2A\_OPER\_AUX\_S11125\_CGS2\_YYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_YYYYMMDDTHHMMSS\_A01263\_WF\_IN*

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. *S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd*



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 112 / 477

2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-0 Datastrip Physical Format template:

Level-0 Datastrip PDI_ID <b>S2A_OPER_MSI_L0_DS_CGS2_20141104T134012_S20141104T134012_N01.12</b>	
	<i>Inventory_Metadata.xml</i>
	<i>S2A_OPER_MTD_L0_DS_CGS2_20141104T134012_S20141104T134012.xml</i>
	<i>manifest.safe</i>
	<i>QI_DATA</i>
	 <i>S2A_OPER_MSI_L0_DS_CGS1_20141104T134012_S20141104T134012_GEOMETRIC_QUALITY_report.xml</i>
	 <i>S2A_OPER_QLK_L0_DS_CGS2_20141104T134012_S20141104T134012.jp2</i>
	<i>ANC_DATA</i>
	 <i>S2A_OPER_AUX_S11125_CGS2_YYYYMMDDTHHMMSS_VYYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_A01263_WF_IN</i>
	<i>rep_info</i>
	 <i>S2_PDI_Level-0_Datastrip_Metadata.xsd</i>
	 <i>Inventory_Metadata.xsd</i>
	 <i>OLQC_Report.xsd</i>

Figure 17: PDI Level-0 Datastrip Physical Format

### 3.7.3 Level-0 PDI Datastrip Structure

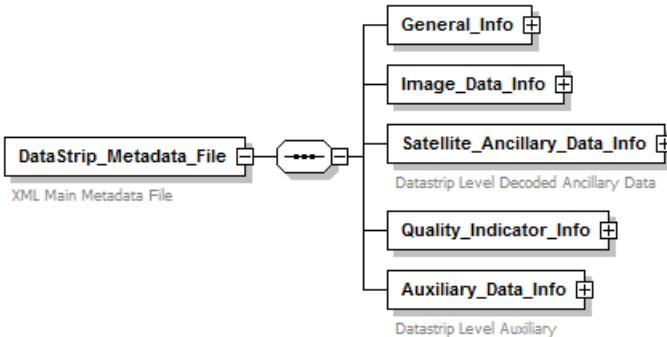
The *S2\_PDI\_Level-0\_Datastrip\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-0 Datastrip PDI on disk. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 16.

diagram	<pre> graph TD     L0[Level-0_DataStrip] --&gt; attributes[attributes]     L0 --&gt; IM[Inventory_Metadata]     L0 --&gt; DMSF[DataStrip_Metadata_File]     L0 --&gt; OI[OI_DATA]     L0 --&gt; ANC[ANC_DATA]     L0 --&gt; manifest[manifest.safe]     L0 --&gt; rep[rep_info]      attributes --&gt; DI[datastripIdentifier]      IM --- XMLIM[XML File]      DMSF --- XMLDMSF[XML Main Metadata File DIMAP_S2_Level-0_DataStrip.xsd]      OI --- JP2[Preliminary_QuickLook One JP2 file]     OI --- OLOC[OLOC_Report XML reports]     OI --- QL[QuickLook_Cloud_Mask One GML file]      ANC --- SAD[SAD_Raw Binary files]      manifest --- XMLMANIFEST[XML File]      rep --- FOLDERREP[Folder]   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">Datastrip_Metadata_File</a> <a href="#">QI</a> <a href="#">DATA</a> <a href="#">Inventory_Metadata</a> <a href="#">manifest.safe</a> <a href="#">rep_info</a>
annotation	<p>The Level-0 Datastrip is defined as a folder containing:</p> <ol style="list-style-type: none"> <li>1. <b>Datastrip_Metadata_File</b>: XML Main Metadata File</li> <li>2. <b>QI_DATA</b>: folder containing XML reports about Quality Indicators, Preliminary QuickLook</li> <li>3. <b>ANC_DATA</b>: folder containing SAD raw data</li> <li>4. <b>Inventory_Metadata</b>: XML inventory metadata file</li> <li>5. <b>manifest.safe</b>: XML SAFE Manifest file</li> <li>6. <b>rep_info</b>: folder containing the XSD schema provided inside a SAFE Level-0 Datastrip</li> </ol>

	<p><u>Note that ANC_DATA, Inventory_Metadata.xml, manifest.safe and rep_info are removed when the PDI is included in the user product.</u></p>
--	--

### 3.7.3.1 Datastrip\_Metadata\_File Schema

Level-0 Datastrip\_Metadata\_File is the XML metadata file provided inside each Level-0 Datastrip. The schema used to validate it is *S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">General_Info</a> <a href="#">Image_Data_Info</a> <a href="#">Satellite_Ancillary_Data_Info</a> <a href="#">Quality_Indicator_Info</a> <a href="#">Auxiliary_Data_Info</a></p>
annotation	<p>The structure of the Datastrip_Metadata_File is common to all processing level (cfr. § 3.5.1)</p> <p>The Datastrip_Metadata_File is an XML file containing all the metadata describing the whole product data item.</p> <ol style="list-style-type: none"> <li>1. <b>General_Info:</b> This group of metadata provide general information characterizing the source Datastrip acquisition.</li> <li>2. <b>Image_Data_Info:</b> Image data information from MSI telemetry.</li> <li>3. <b>Satellite_Ancillary_Data_Info:</b> Ancillary data information from Satellite Ancillary Telemetry.</li> <li>4. <b>Quality_Indicator_Info:</b> Results of all quality checks performed at Datastrip level.</li> <li>5. <b>Auxiliary_Data_Info:</b> Auxiliary data information.</li> </ol>

The following tables and figures give a complete overview of the Level-0 Datastrip\_Metadata\_File schema according the description provided in the section 3.5.1.

[General\\_Info:](#)

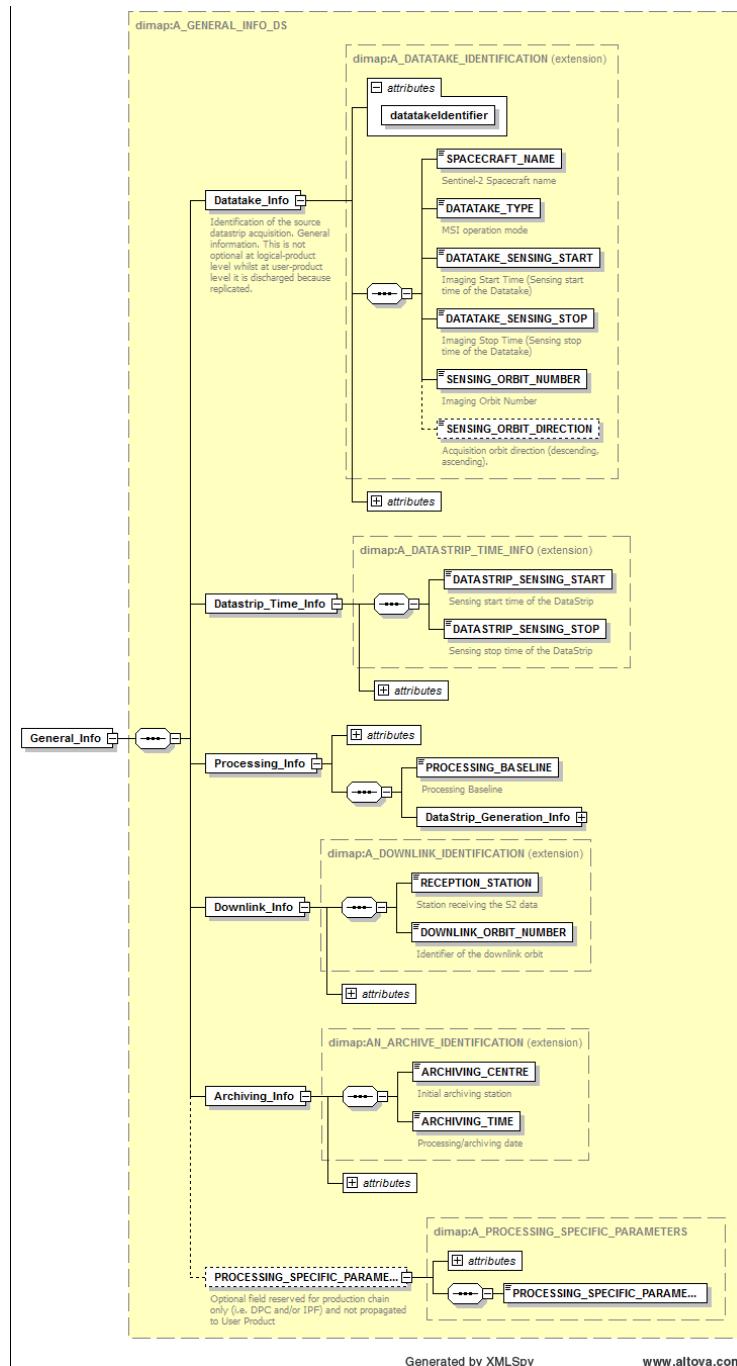


Figure 18: Level-0 Datastrip - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 116 / 477

In the following tables, the third column provide the metadata level attribute for each metadata (see section 2.4) and the last column checks if the specific metadata has been detected or not in the applicable [PDD].

General_Info/Datatake_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
SPACECRAFT_NAME	Sentinel-2 Spacecraft name: Sentinel-2A, Sentinel-2B	Brief	§ 5.4.1.1 Set at product level
DATATAKE_TYPE	MSI operation mode	Brief	§ 5.4.1.1 Set at product level
DATATAKE_SENSING_START	Imaging Start Time (Sensing start time of the Datatake)	Brief	§ 5.4.1.1 Set at product level
DATATAKE_SENSING_STOP	Imaging Stop Time (Sensing stop time of the Datatake)  If this info is not available, the stop time of the Datatake coincides with the stop time of the Datastrip	Brief	MISSING Set at product level
SENSING_ORBIT_NUMBER	Imaging Orbit Number  ESA confirms that SENSING_ORBIT_NUMBER has to be filled by the 'Relative' orbit number which is computed from the Absolute as reported in DPM-IAS02.	Brief	§ 5.4.1.1 Set at product level



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 117 / 477

SENSING_ORBIT_DIRECTION	Imaging Orbit Direction (Default = Ascending)	Brief	§ 5.4.1.1 Set at product level
<b>General_Info/Datastrip_Time_Info</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
DATASTRIP_SENSING_START	Sensing start time of the Datastrip	Brief	MISSING
DATASTRIP_SENSING_STOP	Sensing stop time of the Datastrip	Brief	MISSING
<b>General_Info/Processing_Info</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
PROCESSING_BASELINE	<p>The processing baseline (see section 2.2) refers to the configuration baseline used at the time of the product generation in term of processor software version and major GIPP version.</p> <p>Note: all the PDIs of a Datatake are always processed with the same processing baseline even if acquired in different stations</p>	Expertise	No
Datastrip_Generation_Info/Processing_Step/UTC_DATA_TIME	time-stamp information related to one process. Every process should append the list with a new Step element.	Expertise	§ 5.4.1.3
Datastrip_Generation_Info/Processing_Step/SOFTWARE	The processing steps contains the list of the processors version in use.	Expertise	§ 5.4.1.3
Datastrip_Generation_Info/Processing_Step/SOFTWARE(version attribute)	Software version information related to one process. Every process should append the list with a new Step element.	Expertise	§ 5.4.1.3
Datastrip_Generation_Info/PROCESSING_CENTRE	Production centre: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li></ul>	Expertise	§ 5.4.1.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 118 / 477

- CGS4
- PAC1
- MPCC
- SVLB
- MASP
- MATA

General_Info/Downlink_Info				
Field Name	Description	Metatada Level	Check vs [PDD]	
RECEPTION_STATION	Reception stations: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li></ul>	Standard	§ 5.4.1.2	
DLINK_ORBIT_NUMBER	Identifier of the downlink orbit	Standard	§ 5.4.1.2	
General_Info/Archiving_Info				
Field Name	Description	Metatada Level	Check vs [PDD]	
ARCHIVING_CENTRE	The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2</li><li>• CDAM</li><li>• MPCC</li></ul>	Expertise	§ 5.4.1.3	
ARCHIVING_TIME	Archiving date (UTC data time). Date updated at the end of inventory process	Expertise	§ 5.4.1.3	
Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING	



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 119 / 477

Table 3-32: Level-0 Datastrip - General\_Info Description

Image Data Info:

The exploited Image\_Data\_Info diagram is too complex to be inserted in the document. The following figure shows the high-level diagram, for more details refers to the S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd contained in the S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip annexed to this document. The table hereafter describes all the Image Data Information.

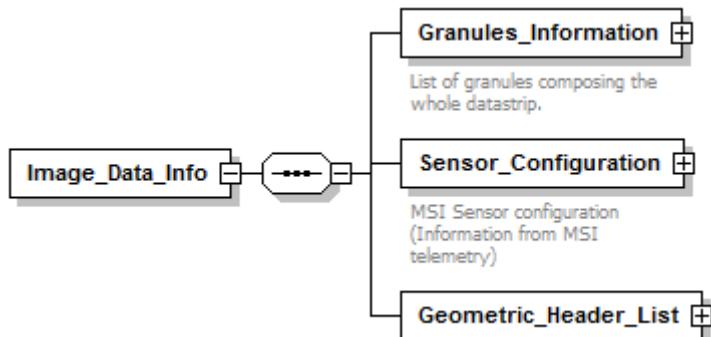


Figure 19 : Level-0 Datastrip – Image\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 121 / 477

Image_Data_Info/Granules_Information			
Field Name	Description	Metatada Level	Check vs [PDD]
/Detector_List/.../POSITION	This branch of the schema provides information regarding all Granules, for each detector, composing the whole Datastrip. Each Granule composing the Datastrip is univocally identified through a unique Granule identifier (PDI_ID at granul level). For each Granule the Position of the Granule is provided. This position is identified through the position of the scenes first lines in the Datastrip and is expressed as number of 10m resolution images lines.	Standard	§ 5.4.2.2
Image_Data_Info/Sensor_Configuration			
Field Name	Description	Metatada Level	Check vs [PDD]
Acquisition_Configuration/COMPRESS_MODE	Flag to indicate if compress mode is by passed	Expertise	§ 5.4.1.3
Acquisition_Configuration/EQUALIZATION_MODE	Flag to indicate if equalization is active	Expertise	§ 5.4.1.3
Acquisition_Configuration/NUC_TABLE_ID	In-flight Non Uniform Correction table ID defined by 10 bits. This ID is uniform for all transmitted bands. It identifies the correction coefficients table used in-flight	Expertise	§ 5.4.1.3
Acquisition_Configuration/Active_Detectors_List/ACTIVE_DETECTOR	<p>On board active Detectors (in case of compression by-passed)</p> <p>Note: Metadata classified <i>Brief</i> (always provided) in order to have always available in the L0 User Product the list of active detectors for each MSI mode. This to ensure the consistency/completeness of the L0 User Product with on-board compression by-passed or not.</p> <p>The list of active detectors is variable and this metadata drives the list of the L0 Granule PDI available in the L0 User Product</p>	Brief	§ 5.4.1.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 122 / 477

Acquisition_Configuration/TDI_Configuration_List/TDI_CONFIGURATION	On board TDI configuration, for B3, B4, B11 and B12 only.	Standard	§ 5.4.1.2
Acquisition_Configuration/Spectral_Band_Info/PHYSICAL_GAINS	Physical Gain for each band	Standard	§ 5.4.1.2
Acquisition_Configuration/Spectral_Band_Info/COMPRESSION_RATE	On-board compression rates for each band	Expertise	§ 5.4.1.3
Acquisition_Configuration/Spectral_Band_Info/INTEGRATION_TIME	On-board integration time for each band	Expertise	§ 5.4.1.3
Source_Packet_Description/Source_Packet_Counters_List/Detector_List/Band_LIST/BAND/DATA_STRIP_START	First source packet counter	Standard	§ 5.4.1.2
Source_Packet_Description/Source_Packet_Counters_List/Detector_List/Band_LIST/BAND/SCENE_POSITION	Position of the first source packet in the on board scene	Standard	§ 5.4.1.2
Source_Packet_Description/Source_Packet_Counters_List/Detector_List/Band_LIST/BAND/NB_OF_SOURCE_PACKETS	Number of source packets.	Standard	§ 5.4.1.2
Source_Packet_Description/Degradation_Summary/Attribute: degradationPercentage	Percentage of lost or degraded (either too degraded or not) ancillary data packets in the Datastrip	-	§ 6.4.2
Source_Packet_Description/Degradation_Summary/NUMBER_OF_LOST_PACKETS	Number of lost packets for the whole Datastrip	Standard	§ 5.4.1.2
Source_Packet_Description/Degradation_Summary/NUMBER_OF_TOO_DEGRADED_PACKETS	Number of too degraded packets (i.e. erroneous packets not trustworthy, meaning they will not be used by further processing) for the whole Datastrip	Standard	§ 5.4.1.2
Source_Packet_Description/Degradation_Summary/NUMBER_OF_DEGRADED_PACKETS	Number of degraded packets (i.e. erroneous packets but trustworthy, meaning they will be used by further processing) for the whole Datastrip	Standard	§ 5.4.1.2
Time_Stamp/LINE_PERIOD	Line period for the acquisition of line of 10 m full-resolution image data	Standard	§ 5.4.1.2
Time_Stamp/Band_Time_Stamp/Detector/REFERENCE_LINE	Datation model for each couple band, detector. Line number corresponding to the time stamp	Standard	§ 5.4.1.2
Time_Stamp/Band_Time_Stamp/Detector/GPS_TIME	Datation model for each couple band, detector. Time stamp.	Standard	§ 5.4.1.2
Time_Stamp/GPS_SYNC	Flag (Boolean) to indicate if MSI is synchronize with GPS time	Standard	§ 5.4.1.2
Time_Stamp/THEORETICAL_LINE_PERIOD	Theoretical line period for the acquisition of line of 10 m full-resolution image data	Standard	NO
Time_Stamp/Quality_Indicators/Global/RMOY	GPS time quality indicator.  Optional. Created when datation models are estimated	Standard	§ 5.4.1.2



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 123 / 477

Time_Stamp/Quality_Indicators/GSP_List/GSP/RMOY	through linear regression.		
Time_Stamp/Quality_Indicators/GSP_List/GSP/RMOY	Optional. Created when datation models are estimated through linear regression.	Standard	NO
<b>Image_Data_Info/Geometric_Header_List</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
Geometric_Header_List/Geometric_Header/GPS_TIME	A GPS date-time value = TAI format	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/LINE_INDEX	Line index (Integer)	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Pointing_Angles/Satellite_Reference/ROLL	double value expressed in degree	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Pointing_Angles/Satellite_Reference/PITCH	double value expressed in degree	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Pointing_Angles/Satellite_Reference/YAW	double value expressed in degree	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Pointing_Angles/Image_Reference/PSI_X	Along lines	Expertise	§ 5.4.1.3 product level
Geometric_Header_List/Geometric_Header/Pointing_Angles/Image_Reference/PSI_Y	Along columns	Expertise	§ 5.4.1.3 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/ORIENTATION	Track orientation. Also called "CAPE". The range of the angle is into [0,360°[	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Incidence_Angles/ZENITH_ANGLE	incidence zenith angle	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Incidence_Angles/ZENITH_ANGLE	incidence azimuth angle	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Solar_Angles/ZENITH_ANGLE	solar azimuth angle	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Solar_Angles/ZENITH_ANGLE	solar azimuth angle	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Pixel_Size/ALONG_TRACK	pixel size along track	Standard	§ 5.4.1.2 product level
Geometric_Header_List/Geometric_Header/Located_Geometric_Header/Pixel_Size/ACROSS_TRACK	pixel size across track	Standard	§ 5.4.1.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

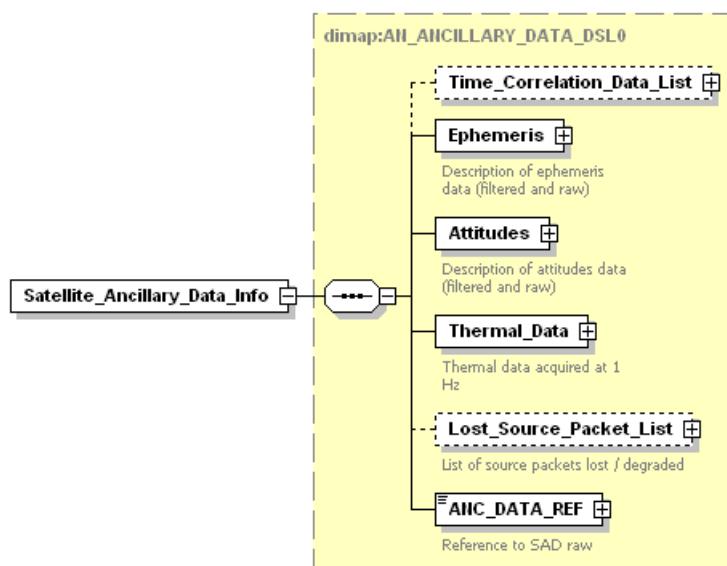
PAGE : 124 / 477

pixel_Size/ACROSS_TRACK		product level
-------------------------	--	---------------

Table 3-33: Level-0 Datastrip – Image\_Data\_Info Description

Satellite\_Ancillary\_Data\_Info:

The expanded Satellite\_Ancillary\_Data\_Info diagram is too complex to be inserted in the document. The following figure shows the high-level diagram, for more details refers to the *S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd* contained in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* annexed to this document.



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 20: Level-0 Datastrip – Satellite\_Ancillary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 126 / 477

Satellite_Ancillary_Data_Info		Description	Metatada Level	Check vs [PDD]
Field Name				
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/NSM		Navigation Solution Method	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/QUALITY_INDEX		Time quality index	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/TDOP		Time dilution of precision.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/IMT		Instrument measurement time representation of the synchronisation time stamp.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/GPS_TIME		GPS time representation of the synchronisation time stamp.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Time_Correlation_Data_List/Time_Correlation_Data/UTC_TIME		UTC time representation of the synchronisation time stamp.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Number_List/Gps_Number/GPS_TIME_START		GPS time value. This field must be filled by the processor according to each GPS time period.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Number_List/Gps_Number/GPS_TIME_END		GPS time value. This field must be filled by the processor according to each GPS time period.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/POSITION_VALUES		Dated positions (X, Y, Z) from GPS in millimeters	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/POSITION_ERRORS		Position errors (dX, dY, dZ) from GPS in millimeters	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/VELOCITY_VALUES		Dated velocities (Vx, Vy, Vz) from GPS in millimeters per seconds	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/VELOCITY_ERRORS		Velocity errors (dVx, dVy, dVz) from GPS in millimeters per seconds	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/GPS_TIME		GP Time value	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/NSM		Navigation Solution Method	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_		Position quality index	Standard	§ 5.4.1.2



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 127 / 477

Satellite_Ancillary_Data_Info			
Field Name	Description	Metadata Level	Check vs [PDD]
Point/QUALITY_INDEX			
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/GDOP	Quality index (Geometrical dilution of precision)	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/PDOP	Quality index (Position dilution of precision)	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/TDOP	Quality index (Time dilution of precision)	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/NOF_SV	The number of Space Vehicless (SVs) the receiver was able to use for the Navigation Solution computation, i.e. SVs for which code and carrier phase measurements and Ephemeris data were available.	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/GPS_Points_List/GPS_Point/TIME_ERROR	GNSS system time error	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/VALID_FLAG	When 1 : ephemeris is valid	Standard	MISSING
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/OPSOL_QUALITY	0: solution is valid / 1: solution propagated / 2: cyclic position update available	Standard	MISSING
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/POSITION_VALUES	Dated positions (X, Y, Z) from AOCS	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/VELOCITY_VALUES	Dated velocities (Vx, Vy, Vz) from AOCS	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/GPS_TIME	GP's Time value	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/AOCS_Ephemeris_List/AOCS_Ephemeris/ORBIT_ANGLE	Orbit angle wrt WGS84	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Ephemeris/POD_Info/POD_FLAG	Flag to indicate if POD (Precise Orbit Determination) data has been used for product generation  Note: POD_Info optional node is not relevant in case of L0 and L1C processing but it is included here to have the same Satellite_Ancillary_Data information for all level of processing.	Standard	MISSING



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 128 / 477

Satellite_Ancillary_Data_Info		Description	Metatada Level	Check vs [PDD]
Field Name		Description		
Satellite_Ancillary_Data_Info/Ephemeris/POD_Info/POD_FILENAME	AME	POD filename	Standard	MISSING
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/QUATERNION_VALUES		Space separated list of 4 quaternion values ordered as Q0 Q1 Q2 Q3	Standard	MISSING
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/QUATERNION_STATUS		status	Standard	MISSING
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/QUATERNION_VALIDITY		When 1 : quaternion is valid	Standard	MISSING
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/GPS_TIME		GP's Time value	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/INUSE_FLAGS		List of 11 boolean flags separated by whitespace: STR1 STR2 STR3 GPSR-A GPSR-B VCU-A VCU-B IMU-1 IMU-2 IMU-3 IMU-4	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/AOCS_MODE		AOCS Mode	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/AOCS_SUBMODE		AOCS submode	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/INNOVATION_STR1		Difference Between GSE filter estimate and second in-use STR measurement	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Corrected_Attitudes/Values/INNOVATION_STR2		Difference Between GSE filter estimate and second in-use STR measurement	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/QUATERNION_VALUES		Space separated list of 4 quaternion values ordered as (Q0 Q1 Q2 Q3) = (qs qv1 qv2 qv3) (inertial attitude J2000).	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/QUATERNION_STATUS		status	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/ANGULAR_RATE		Angular rate (X, Y, Z) in BRF in deg/s	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/GPS_TIME		Time stamp of the center of integration associated with the attitude (with a precision up to 2pow-16 seconds). This field is computed from the centerOfIntegrationTimeStamp value provided in the data block	Expertise	§ 5.4.1.3



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 129 / 477

Satellite_Ancillary_Data_Info	Description	Metatada Level	Check vs [PDD]
Field Name			
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/JULIAN_DATE	Julian date used for precession correction (if enabled); specified in number of days since the epoch date of the built-in star catalog; day 0 corresponds to JD 2451545	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/ATTITUDE_QUALITY_INDICATOR	Attitude Quality	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/RATE_QUALITY	Rate Quality	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Attitude_Data_List/Attitude_Data/VALIDITY_RATE	if set to 1, the rate information is valid (i.e. derived from current measurements)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/OP_MODE	STR operating mode	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/TEC_MODE	Thermo electric cooler mode	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/TARGET_TEMPERATURE	Target temperature for temperature control	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/DETECTOR	Detector temperature	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/OPTICS	Optics temperature	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/HOUSING	Housing temperature	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List/Status_And_Health_Data/SYNC_SOURCE	The source selected for external synchronization	Expertise	§ 5.4.1.3



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 130 / 477

Satellite_Ancillary_Data_Info		Description	Metatada Level	Check vs [PDD]
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/SECNDS_SINCE_TIME_SYNC		The number of seconds since the latest received time synchronization; saturates at 63 seconds	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/TRACKABLE_STARS		Number of trackable stars	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/TRACKED_STARS		Number of stars tracked	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/IDENTIFIED_STARS		Number of identified stars	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/USED_STARS		Number of stars used for attitude determination	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/ATTITUDE_RESULT		Last result of attitude determination	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/STR_List/STR/Status_And_Health_Data_List>Status_And_Health_Data/ID_RESULT		Last result of star identification error	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/IMU/Value/FILTERED_ANGLE		IMU filtered data are angle increments	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/IMU/Value/RAW_ANGLE		IMU raw data are angle increments	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/IMU/Value/GPS_TIME		GPS time value	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/IMU/Value/Temperatures/ORGANISER		Organiser temperature	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/IMU/Value/Temperatures/SIA		Sagnac Interferometer Assembly temperature	Expertise	§ 5.4.1.3



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 131 / 477

Satellite_Ancillary_Data_Info	Description	Metadata Level	Check vs [PDD]
Field Name			
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/OPTICAL_SOURCE	Optical Source temperature	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/BOARD	Board temperature	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/VOLTAGE_OFFSET	Temperature reference voltage offset	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/VOLTAGE	Temperature reference voltage	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/ACQUISITION	0:not acquired, 1:acq failed, 2:acquired	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/VALIDITY	Acquisition validity flag	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/Temperatures/TIME	Time corresponding to the measurements	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/TIME	10PPS time corresponding to the measurements (provided by CSW)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/ACQUISITION	0:not acquired, 1:acq failed, 2:acquired	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/VALIDITY	Acquisition validity flag	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/HEALTH_STATUS_BITS	16 Bits (0/1) sequence as defined in the IMU interface	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Attitudes/Raw_Attitudes/IMU_List/I MU/Value/HEALTH_STATUS_BITS_VALIDITY	1 when all health status validity flag are ok(0)/ 0 otherwise	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/FPA_List/FPA/Value /T	FPA temperature information (thermal control and monitoring, relevant to the detector transmission VNIR or SWIR)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/FPA_List/FPA/Value /GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/FPA_List/FEE/Value /T	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/FPA_List/FEE/Value	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 132 / 477

Satellite_Ancillary_Data_Info	Description	Metatada Level	Check vs [PDD]
Field Name			
/GPS_TIME			
Satellite_Ancillary_Data_Info/Thermal_Data/Mirror_List/Mirror/Value/T	List of temperatures for each mirror	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/Mirror_List/Mirror/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/ThSensor_List/ThSensor/Value/T	List of temperatures for each sensor on telescope	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/ThSensor_List/ThSensor/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/Splitter_List/Value/T	List of temperatures for each splitter	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/SplitterList/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/CSM_Diffuser_List/Value/T	List of temperatures for each diffuser	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/CSM_Diffuser_List/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/IMU_Sensorplate_List/IMU_Sensorplate/Value/T	Imu sensor plate temperatures	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/IMU_Sensorplate_List/IMU_Sensorplate/Value/GPS_TIME	Thermal Data info. (Data are acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Sensorplate_List/STR_Sensorplate/Value/T	List of temperatures for each STR sensorplate	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Sensorplate_List/STR_Sensorplate/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Baseplate_List/STR_Baseplate/Value/T	STR base plate temperatures	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Baseplate_List/STR_Baseplate/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Backplate_List/STR_Backplate/Value/T	STR back plate temperatures.	Expertise	§ 5.4.1.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

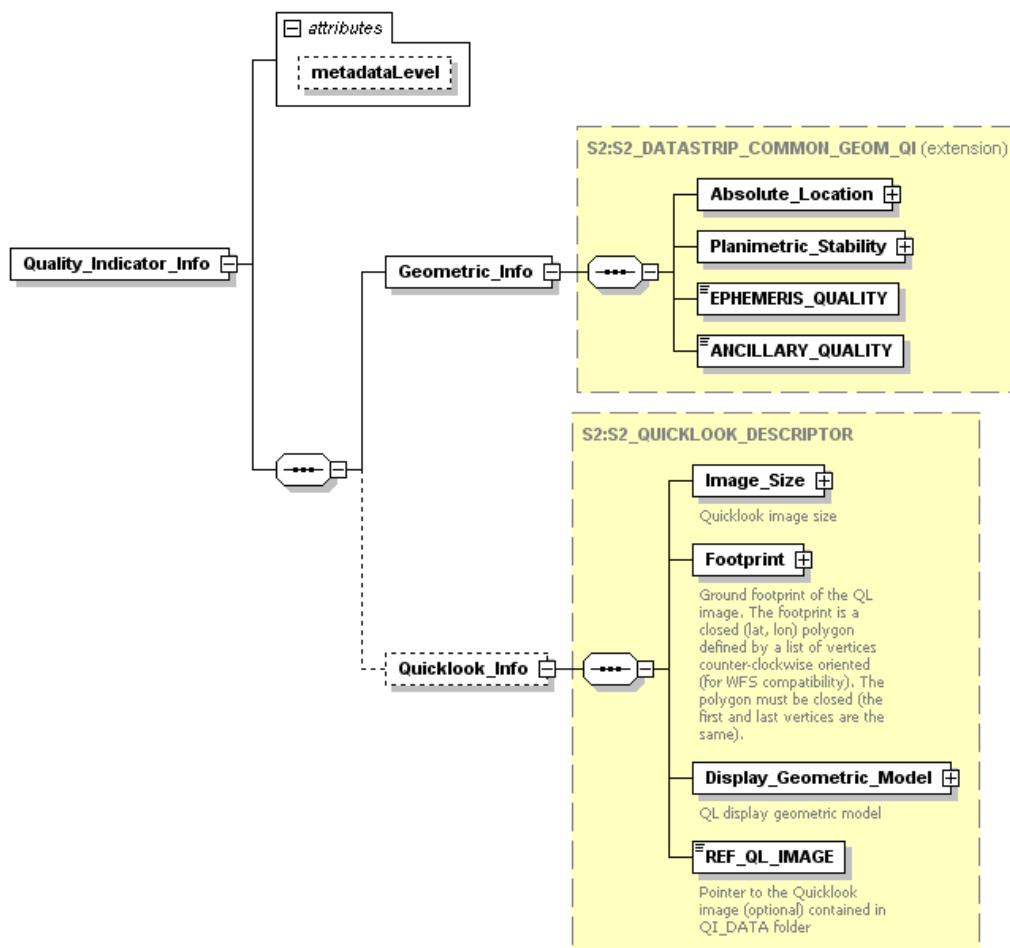
DATE : 12/07/2013

PAGE : 133 / 477

Satellite_Ancillary_Data_Info	Description	Metatada Level	Check vs [PDD]
Satellite_Ancillary_Data_Info/Thermal_Data/STR_Backplate_List /STR_Backplate/Value/GPS_TIME	Thermal Data info (Data acquired at 0.1 Hz)	Expertise	§ 5.4.1.3
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/Lost_Source_Packet/DEGRADATION_TYPE	Type of degradation	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/Lost_Source_Packet/ERROR_BEGINNING_DATE	error begin time	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/Lost_Source_Packet/ERROR_ENDING_DATE	error end time	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/ Degradation_Summary Attribute: degradationPercentage	Percentage of lost or degraded packets for the Datatake	-	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/ NUMBER_OF_LOST_PACKETS	number of lost packets for the whole Datatake	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/Lost_Source_Packet_List/ NUMBER_OF_DEGRADED_PACKETS	number of degraded packets for the whole Datatake	Standard	§ 5.4.1.2
Satellite_Ancillary_Data_Info/ANC_DATA_REF	Reference to SAD raw	Standard	NO

Table 3-34: Level-0 Datastrip – Satellite\_Ancillary\_Data \_Info Description

Quality Indicators Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 21 : Level-0 Datastrip – Quality\_Indicator\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 135 / 477

Quality_Indicator_Info/Geometric_Info			
Field Name	Description	Metatada Level	[PDD]
Absolute_Location	An absolute location performance for the Datastrip is given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 5.5.1
Planimetric_Stability	Planimetric stability assessment: A planimetric stability performance for the Datastrip is given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data	Brief	§ 5.5.1
EPHEMERIS_QUALITY	Ephemeris data quality retrieved from GPS Dilution of precision (DOP) information	Brief	§ 5.5.1
ANCILLARY_QUALITY	Ancillary data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 5.5.1
Quality_Indicator_Info/Quicklook_Info			
Field Name	Description	Metatada Level	[PDD]
Image_Size/NCOLS	Quicklook image size. Number of columns.	Brief	§ 5.5.1
Image_Size/NROWS	Quicklook image size. Number of rows.	Brief	§ 5.5.1
Footprint/EXT_POS_LIST	Ground footprint of the QL image. The footprint is a closed (lat, lon) polygon defined by a list of vertices counter-clockwise oriented (for WFS compatibility). The polygon must be closed (the first and last vertices are the same).  Point list. The coordinates of the points are entered as pairs of latitude and longitude values, or X and Y, or other	Brief	§ 5.5.1
Footprint/INT_POS_LIST	Ground footprint of the QL image. The footprint is a closed (lat, lon) polygon defined by a list of vertices counter-clockwise oriented (for WFS compatibility). The polygon must be closed (the first and last vertices are the same).	Brief	§ 5.5.1



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

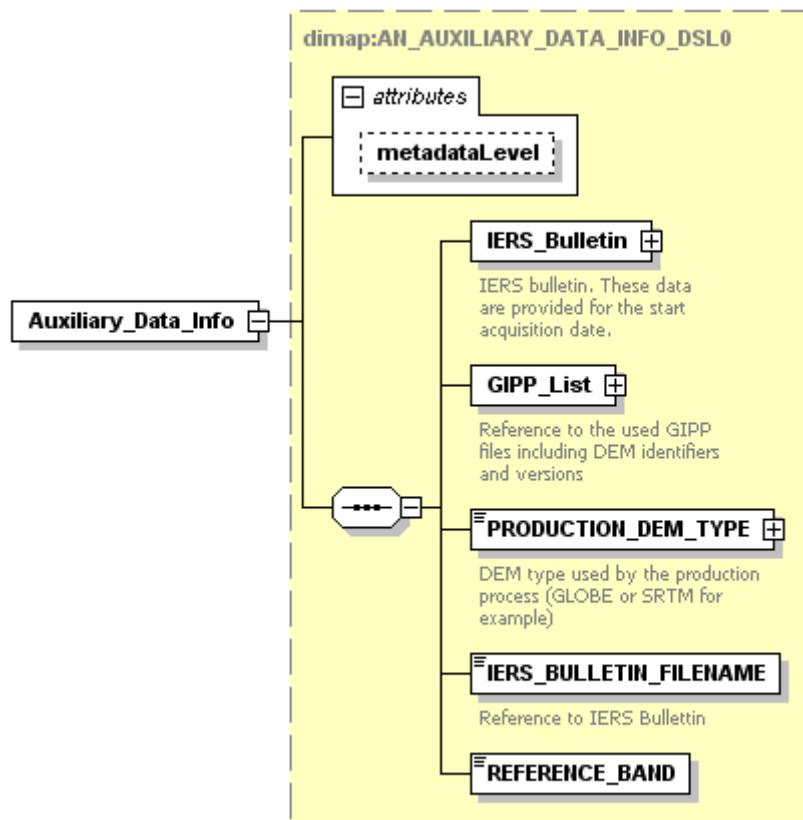
DATE : 12/07/2013

PAGE : 136 / 477

	Point list. The coordinates of the points are entered as pairs of latitude and longitude values, or X and Y, or other		
Display_Geometric_Model/Datation_Model/L0	Line number of the first line	Brief	§ 5.5.1
Display_Geometric_Model/Datation_Model/T0	Date of the first line	Brief	§ 5.5.1
Display_Geometric_Model/Datation_Model/TE	Theoretical line period	Brief	§ 5.5.1
Display_Geometric_Model/Viewing_Directions/NB_OF_PIXELS	Number of pixels	Brief	§ 5.5.1
Display_Geometric_Model/Viewing_Directions/TAN_PSI_X_LIST	List of Tangent Psi X in the image order (there is one data by pixel)	Brief	§ 5.5.1
Display_Geometric_Model/Viewing_Directions/TAN_PSI_Y_LIST	List of Tangent Psi Y in the image order (there is one data by pixel)	Brief	§ 5.5.1
Display_Geometric_Model/Connect_col_List/CONNECT_COL	The 12 detectors are assembled and resampled in a monolithic quicklook image. This block gives, in the quicklook geometry, the connection columns number (last column) for each detectors (the first 11 detectors for compressed mode and 4 for uncompressed mode).	Brief	§ 5.5.1
Display_Geometric_Model/Piloting_To_Msi_Frame/R1	First rotation (angles around an axis)	Brief	§ 5.5.1
Display_Geometric_Model/Piloting_To_Msi_Frame/R2	Second rotation (angles around an axis)	Brief	§ 5.5.1
Display_Geometric_Model/Piloting_To_Msi_Frame/R3	Third rotation (angles around an axis)	Brief	§ 5.5.1
Display_Geometric_Model/Piloting_To_Msi_Frame/SCALE_FACTOR	A scale factor on Z axis (in order to model the focal length deformation)	Brief	§ 5.5.1
Display_Geometric_Model/Piloting_To_Msi_Frame/COMBINATOR_ORDER	The combination order between rotation and scale factor transformations	Brief	§ 5.5.1
REF_QL_IMAGE	Pointer to the Quicklook image	Brief	§ 5.5.1

Table 3-35: Level-0 Datastrip – Quality\_Indicator\_Info Description

Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 22 : Level-0 Datastrip – Auxiliary\_Data\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

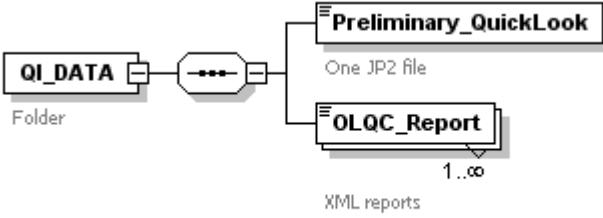
DATE : 12/07/2013

PAGE : 138 / 477

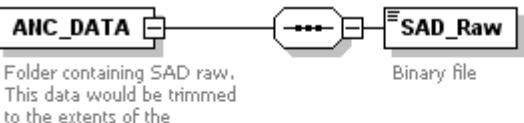
Auxiliary_Data_Info/IERS_Bulletin			
Field Name	Description	Metatada Level	Check vs [PDD]
UT1_UTC	UT1 --UTC in [-0.9;0.9] seconds	Standard	§ 5.4.1.2 Product Level
GPS_TIME_UTC	GPS_time – UTC = in number of seconds	Standard	§ 5.4.1.2 Product Level
GPS_TIME_TAI	GPS_time – TAI	Standard	§ 5.4.1.2 Product Level
POLE_U_ANGLE	U angle pole motion (in arcsec)	Standard	§ 5.4.1.2 Product Level
POLE_V_ANGLE	V angle pole motion (in arcsec)	Standard	§ 5.4.1.2 Product Level
Auxiliary_Data_Info/GIPP_List			
Field Name	Description	Metatada Level	Check vs [PDD]
GIPP_FILENAME	Reference to the used GIPP files.	Standard	§ 5.4.1.2 Product Level
PRODUCTION_DEM_TYPE	DEM type used by the production process (GLOBE or SRTM for example)	Standard	§ 5.4.1.2
IERS_BULLETIN_FILENAME	Filename of the used IERS Bulletin	Standard	MISSING
Auxiliary_Data_Info/REFERENCE_BAND			
Field Name	Description	Metatada Level	Check vs [PDD]
REFERENCE_BAND	Used reference band for datation	Standard	§ 5.4.1.3

Table 3-36: Level-0 Datastrip – Auxiliary\_Data\_Info Description

### 3.7.3.2 QI\_DATA

diagram	 <pre> classDiagram     class QI_DATA {         &lt;&lt;Folder&gt;&gt;     }     class Preliminary_QuickLook {         &lt;&lt;One JP2 file&gt;&gt;     }     class OLQC_Report {         &lt;&lt;1..oo XML reports&gt;&gt;     }      QI_DATA "1" -- "*" Preliminary_QuickLook     QI_DATA "*" -- "1..oo" OLQC_Report   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Preliminary_QuickLook</u></a> <a href="#"><u>OLQC_Report</u></a>
annotation	<p>QI_DATA folder contains:</p> <ul style="list-style-type: none"> <li>- XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The XSD OLQC_Report in Annex D is provided.</li> <li>- preliminary QuickLook file (JP2) including preliminary QuickLook viewing model, preliminary QuickLook image dimensions, preliminary QuickLook image file(s) in sensor geometry.</li> </ul>

### 3.7.3.3 ANC\_DATA

diagram	 <pre> classDiagram     class ANC_DATA {         &lt;&lt;Folder containing SAD raw, This data would be trimmed to the extents of the datatake.&gt;&gt;     }     class SAD_Raw {         &lt;&lt;Binary file&gt;&gt;     }      ANC_DATA --&gt; SAD_Raw   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Preliminary_QuickLook</u></a> <a href="#"><u>OLQC_Report</u></a>
annotation	<p>ANC_DATA folder contains:</p> <ul style="list-style-type: none"> <li>- SAD raw data as received from the DFEP.</li> </ul>

### 3.7.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-0 PDI Datastrip level.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 140 / 477

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- For the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-0\_Datastrip.xsd”);
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
  - the allowed range of values of the field.

In particular, the satellite ancillary data files (e.g. the SAD Raw Data file) and the auxiliary data files used for Level-0 processing (e.g. GIPP files, DEM, IERS Bulletin), are external to the product and are referenced in the Metadata of Manifest file Section (as “resources” in the “processing” section).

- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-0 PDI Datastrip Product (with the exception of the Manifest file itself); this includes:
  - the XML Metadata file;
  - the XML Inventory\_Metadata file;
  - a set of Quality Indicator Data Files, including a OLQC Report file (XML format) and a Preliminary Quick Look file (JPEG2000 format).

A practical example of Manifest file for the Level-0 PDI Datastrip Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 141 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->Datatake_Info->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	General_Info->Datatake_Info->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode
	Instrument->mode->identifier	General_Info->Datatake_Info->	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 142 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		DATATAKE_TYPE				INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-0 Granule Product
	<b>start</b>	General_Info->Archiving_Info->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info->ARCHIVING_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 143 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-0 Datastrip Product
	resource-> processing		Description of the L0 Processing		0..*	
	resource-> processing-> <b>name</b>		Name of the L0 Processing	string	0..1	L0 Processing of Raw Data
	resource-> processing-> <b>start</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->UTC_DATE_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing-> facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing-> facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing-> facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing-> facility-> <b>site</b>	General_Info->Processing_Info->Datastrip_Generation_Info->PROCESSING_CENTER	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC, SVLB, MASP, MATA



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 144 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource-> processing-> facility->software	N.A.	Description of software component used for Processing		0..*	
	resource-> processing-> facility->software-> <b>name</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE	Name of the software component	string	1	
	resource-> processing-> facility->software-> <b>version</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE->version	Version of the software component	string	0..1	
	resource-> processing-> facility->resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc) and of SAD Raw Data file containing the satellite ancillary telemetry; these files are not provided with the product.		0..*	
	resource-> processing-> facility->resource-> <b>name</b>	Satellite_Ancillary_Data_Info-> ANC_DATA_REF (reference to the single SAD Raw Data file)	Absolute path name of the auxiliary or ancillary file	string	1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 145 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		Auxiliary_Data_Info->IERS_Bulletin  Auxiliary_Data_Info->GIPP_List-> GIPP_FILENAME				
	resource-> processing-> facility->resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod ->startTime	Datastrip->L0_Datastrip_PDI_ID (substring <Sensing Time>, see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line of the PDI at Datastrip level, see section 3.6.1)	xs:dateTime	1	
measurementOrbitReference						
	orbitNumber	General_Info->Datatake_Info-> DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber-> <b>type</b>	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the		0..1	start



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 146 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			Datastrip			
	orbitNumber-> <b>groundTrackDirection</b>	General_Info->Datatake_Info-> SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	General_Info->Datatake_Info-> SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..4	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	

Table 3-37 - Content of Metadata Section for PDI Level-0 Datastrip SAFE Manifest



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 147 / 477



### 3.8 Level-1A PDI Granule definition

Level-1A PDI Granule level is defined as a **tar** file with the following structure:

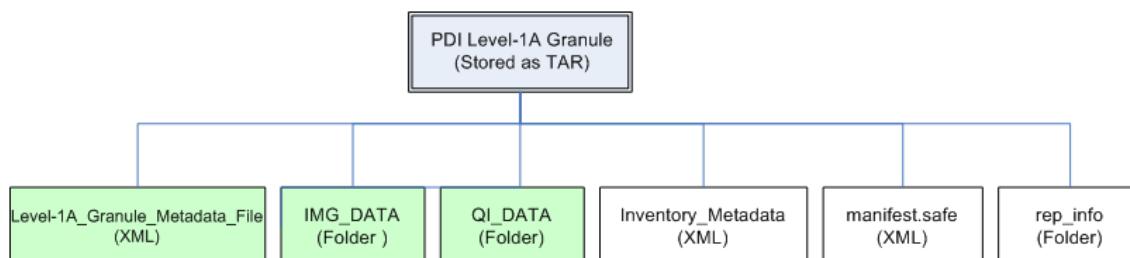


Figure 23: PDI Level-1A Granule Structure

The PDI Level-1A Granule consist of:

1. **Level-1A\_Granule\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Granule,
2. **IMG\_DATA**: folder containing image data compressed using the JPEG2000 algorithm, one file per spectral band.
3. **QI\_DATA**: folder containing XML reports of the Quality control checks and Quality Mask files;
4. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory see Annex C);
5. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.8.4).
6. **rep\_info**: folder containing the available XSD schemas that validate the PDI components (recommended by [SAFE-SPEC], see section 3.4.4)

#### 3.8.1 PDI\_ID definition

The PDI\_ID (Granule ID) used to identify a Level-1A Granule PDI, follows the description provided in the section 3.4.2. File\_Type is defined in the section 3.2, Table 3-3.

Level-1A Granule template Name (Granule ID):

S2A\_OPER\_MSIL1A\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D03\_N01.12.tar

Note that the PDI\_ID.tar is the physical name of the Granule PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 149 / 477

### 3.8.2 Level-1A Granule Physical Format

The PDI ID defined above represents the “Granule directory” name. Inside the Granule directory, there are the Granule components as in the Figure 23.

Inside that directory, the naming convention used to identify each real files follows the same convention used for define the Granule ID but without the Processing Baseline sub-string.

- **Level-1A\_Granule\_Metadata\_File (XML file):**

Granule Metadata File Template name:

*S2A\_OPER\_MTD\_L1A\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D03.xml*

The XSD schema which regulates the metadata file is *S2\_PDI\_Level-1A\_Granule\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **IMG\_DATA (folder):**

The naming convention used to identify the image files contained in the IMG\_DATA folder is defined hereafter:

Image File naming convention = <PDI\_ID\*>\_<Band\_Index>.jp2

where:

Field Name	Value/Meaning	Note
PDI_ID*	PDI_ID without Processing Baseline sub-string	
Band Index	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	Field identifying the spectral bands

IMG\_DATA/Level-1A image file template name:

*S2A\_OPER\_MSIL1A\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D03\_B03.jp2*

- **QI\_DATA (folder):**

QI\_DATA folder contains:

- XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

File Template Name:

*S2A\_OPER\_MSIL1A\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D03\_GEOMETRIC\_QUALITY\_Report.xml*

- Quality\_Masks (one for each type, GML/JPEG2000).



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 150 / 477

The naming used for the mask files follows the same convention defined for the L1A Granule ID (see section 3.4.2) except for the additional <Product Type> field.

Mask files naming convention = MMM\_CCCC\_TTTTTTTT<Instance\_ID>.gml

L1A masks main file types (TTTTTTTTT) are in the Table 3-16 and listed again hereafter

1. MSK\_CLOLOW (Coarse cloud mask files)
2. MSK\_TECQUA (Technical quality mask files)
3. MSK\_DEFECT (Radiometric quality masks)
4. MSK\_SATURA (Radiometric quality masks)
5. MSK\_NODATA (Radiometric quality masks)

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Sensing Time>\_<Detector ID>\_<Band ID>\_<Product\_Type>

Where <Site Centre>, <Creation Date>, <Sensing Time> and <Detector ID> are inherited from the L1A Granule ID, <Product Type> = "MSIL1A" and <Band ID>:

<i>Band ID</i>	Bxx where:  xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12
----------------	---

Template masks filename are:

S2A\_OPER\_MSK\_TECQUA\_CGS1\_20141104T134012\_S20141104T134012\_D03\_B03\_MSIL1A.gml  
S2A\_OPER\_MSK\_SATURA\_CGS1\_20141104T134012\_S20141104T134012\_D03\_B03\_MSIL1A.gml

The grouping strategy to have several masks in one physical GML file is described in the Annex F.

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **manifest.safe (XML file):**

XML file with fixed name *manifest.safe*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. *S2\_PDI\_Level-1A\_Granule\_Metadata.xsd*
2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-1A Granule Physical Format template:

Level-1A Granule PDI_ID: <b>S2A_OPER_MS1_L1A_GR_CGS1_20141104T134012_S20141104T134012_D03_N01.12</b>	
	<i>Inventory_Metadata.xml</i>

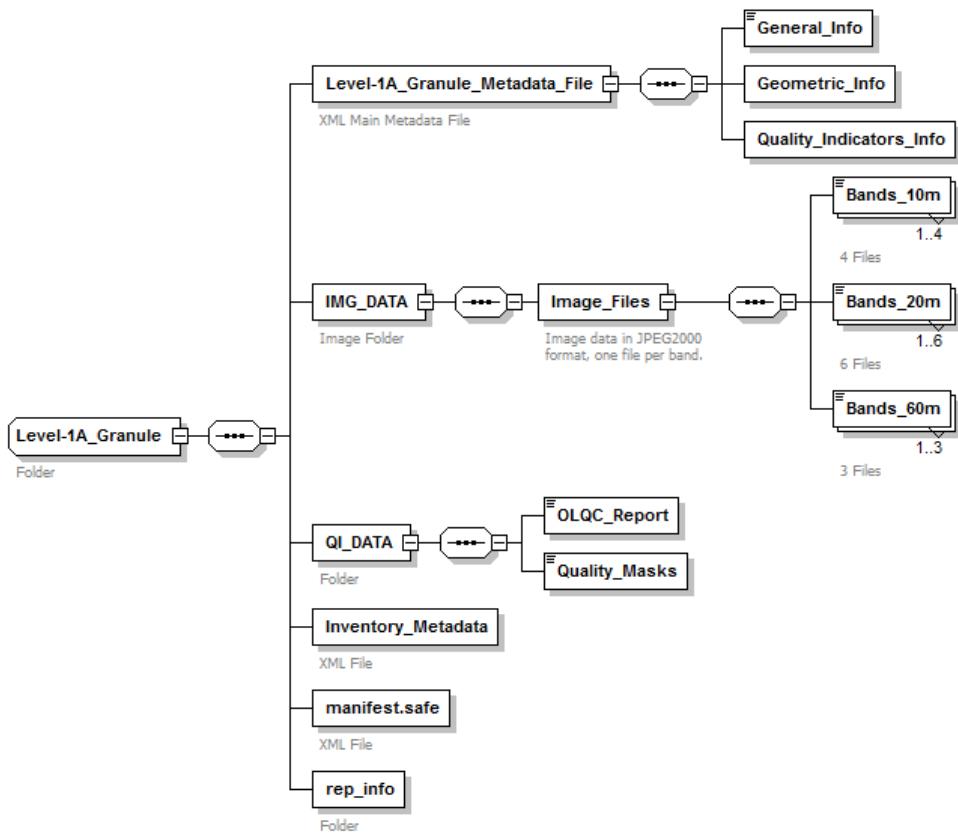


Figure 24: PDI Level-1A Granule Physical Format

### 3.8.3 Level-1A PDI Granule Structure

The *S2\_PDI\_Level-1A\_Granule\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1A Granule PDI on disk. This schema is provided for information only as it is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 23.

diagram



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

children [Level-1A\\_Granule\\_Metadata\\_File](#) [IMG\\_DATA](#) [QI\\_DATA](#) [Inventory\\_Metadata](#) [manifest.safe](#) [rep\\_info](#)

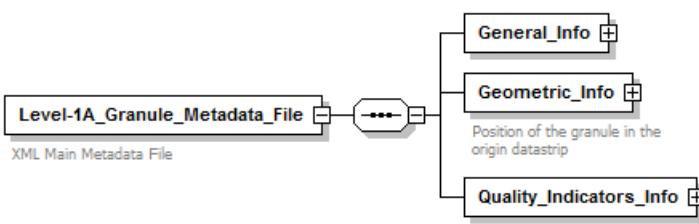
annotation The Level-1A Granule is defined as a folder containing:

1. **Level-1A\_Granule\_Metadata\_File**: XML main metadata file (DIMAP)
2. **IMG\_DATA**: Folder containing Image data in JPEG2000 format, one file per band.
3. **QI\_DATA**: Folder containing XML reports and Quality Masks;
7. **Inventory\_Metadata**: XML inventory metadata file
8. **manifest.safe**: XML SAFE Manifest file
9. **rep\_info**: folder containing the XSD schema provided inside a SAFE Level-1A Granule

Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

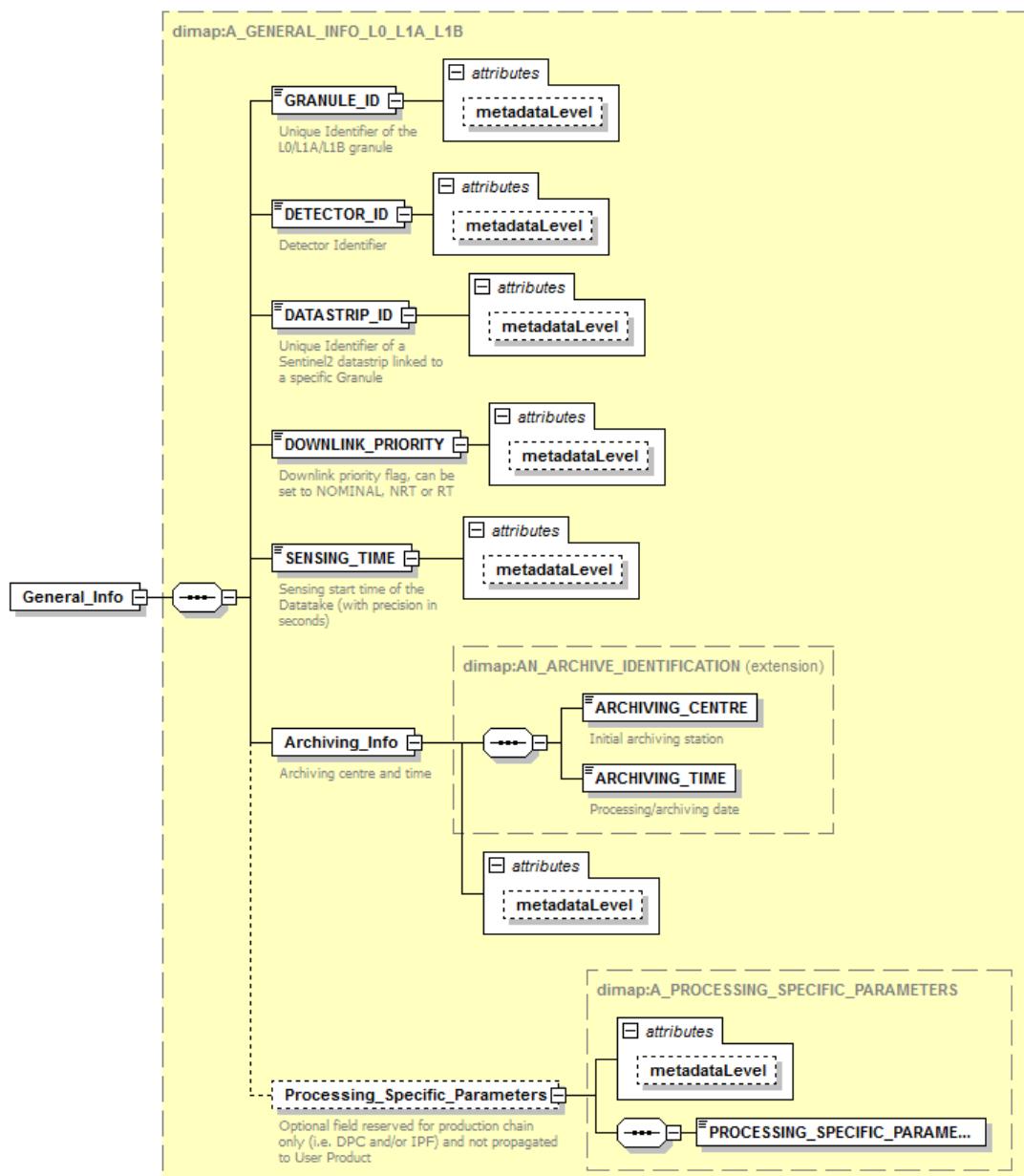
### 3.8.3.1 Level-1A\_Granule\_Metadata\_File Schema

Level-1A\_Granule\_Metadata\_File is the XML metadata file provided inside each Level-1A Granule. The schema used to validate it is *S2\_PDI\_Level-1A\_Granule\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <p>The diagram illustrates the structure of the Level-1A_Granule_Metadata_File. It is represented as a rectangular box labeled "Level-1A_Granule_Metadata_File" with the subtitle "XML Main Metadata File". This box is connected via a line with three dots to another box labeled "General_Info" with a plus sign. Below this, there is a note: "Position of the granule in the origin datastrip". Further down, there is another box labeled "Geometric_Info" with a plus sign. At the bottom, there is a third box labeled "Quality_Indicators_Info" with a plus sign.</p> <p style="text-align: center;">Generated by XMLSpy      www.altova.com</p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a>
annotation	<p>The Level-1A_Granule_Metadata_File is an XML file containing metadata regarding:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: this group of metadata provides general information regarding the Granule.</li> <li>2. <b>Geometric_Info</b>: these metadata provide information describing the geolocation of the Granule.</li> <li>3. <b>Quality_Indicators_Info</b>: this metadata values provide information about image content quality indicators and quality control checks information.</li> </ol>

The following figures and tables give a complete overview of the Level-1A\_Granule\_Metadata\_File schema according the description provided in the section 3.4.1.

#### General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 25: Level-1A\_Granule\_Metadata\_File - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 155 / 477

General Info			
Field Name	Description	Metadata Level	Check vs [PDD]
GRANULE_ID	Granule_Identifier metadata indicates the unique identifier of the Level-1A Granule. This parameter coincides with PDI_ID definition described in section 3.6.1 and univocally points a Granule PDI in the archive.	Brief	§ 6.3.2.1
DETECTOR_ID	Detector identifier corresponding to the Granule	Brief	MISSING
DATASTRIP_ID	Unique identifier of the L1A PDI Datastrip linked to L1A PDI Granule. This parameter coincides with the PDI_ID of the PDI Datastrp linked to the Granule. This link establishes the hierarchy Granule vs Datastrip (see section 3.3)	Brief	§ 6.3.1.1 Product Level Metadata, Datastrip Level information
DOWNLINK_PRIORITY	Downlink priority flag. It can be set Nominal/NRT/RT.	Standard	§ 6.3.2.2
SENSING_TIME	Imaging Start Time (sensing start time of the Datatake). Corresponding to the first line date on the MSI-Scene (with precision in seconds)  Note: set as Type date_time:AN UTC_DATE_TIME	Standard	§ 6.3.2.2
Archiving_Info/ARCHIVING_CENTRE	The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2</li><li>• CDAM</li><li>• MPCC</li></ul>	Expertise	§ 6.3.1.3 Product Level Metadata, Datastrip Level information



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

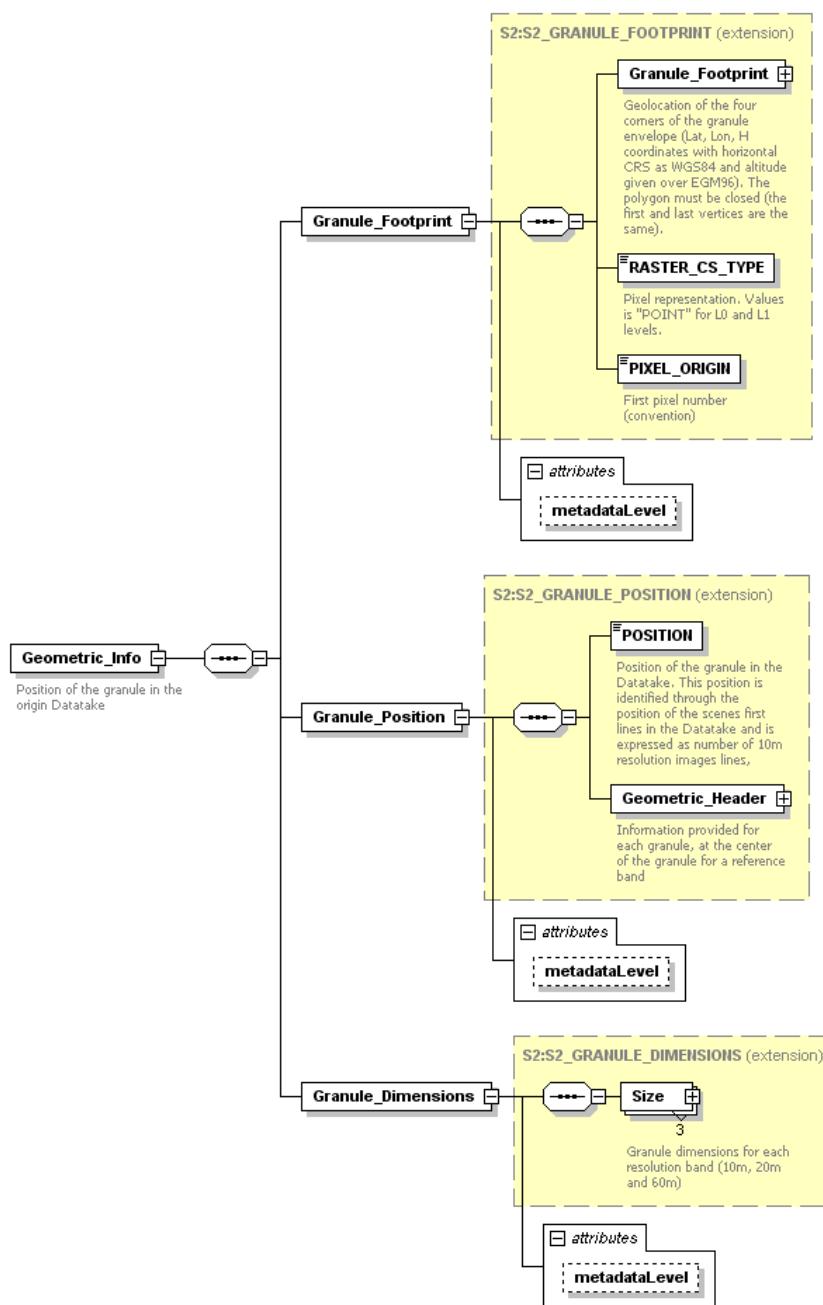
ISSUE : 10

DATE : 12/07/2013

PAGE : 156 / 477

Archiving_Info/ARCHIVING_TIME	Processing/archiving date (UTC data time)	Expertise	§ 6.3.1.3 Product Level Metadata, Datastrip Level information
Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING

Table 3-38: Level-1A\_Granule\_Metadata\_File - General\_Info Description



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 26: Level-1A\_Granule\_Metadata\_File - Geometric\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 158 / 477

<b>Geometric_Info/Granule_Footprint</b>			
<b>Field Name</b>	<b>Description</b>	<b>Metatada Level</b>	<b>Check vs [PDD]</b>
Granule_Footprint	Geolocation of the four corners of the Granule envelope (Lat, Lon, H coordinates with horizontal CRS as WGS84 and altitude given over EGM96).	Brief	§ 6.3.2.1
RASTER_CS_TYPE	Pixel representation. Values is "POINT" for L0 and L1 levels.	Brief	NO
PIXEL_ORIGIN	First pixel number (convention)	Brief	NO
<b>Geometric_Info/Granule_Position</b>			
<b>Field Name</b>	<b>Description</b>	<b>Metatada Level</b>	<b>Check vs [PDD]</b>
Position	Granule_Position describes the position of the Granule in the origin Datatake. This position is identified through the position of the scenes first lines in the Datatake and is expressed as number of 10m resolution images lines). Moreover information for a reference band at the centre of the Granule (incidence angles and solar angles) are provided.	Standard	§ 6.3.2.2
Geometric_Header/GROUND_CENTER	Information provided for a reference band, at the centre of the Granule, for each Granule. Geolocation of the Granule centre (Lat, Lon, H) Altitude is provided over the geoid.	Standard	§ 6.3.2.2
Geometric_Header/QL_CENTER	The Granule centre in the QL display: 1 (r,c) point.	Standard	NO
Geometric_Header/Incidence_Angles	Information provided for a reference band, at the centre of the Granule, for each Granule.	Standard	§ 6.3.2.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

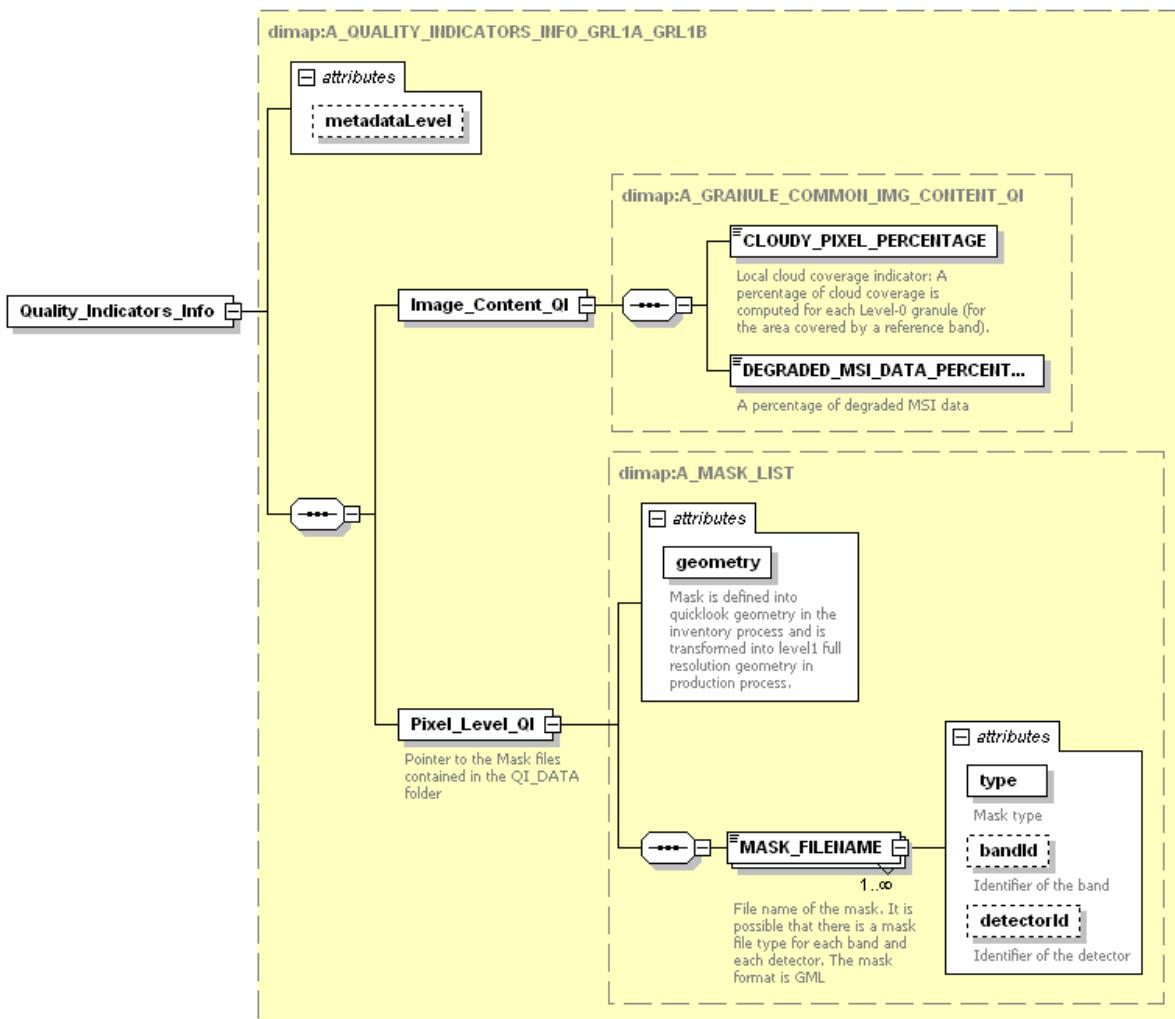
ISSUE : 10

DATE : 12/07/2013

PAGE : 159 / 477

	Incidence angles corresponding to the centre of the Granule.		
Geometric_Header/Solar_Angles	Information provided for a reference band, at the centre of the Granule, for each Granule. Solar angles corresponding to the centre of the Granule.	Standard	§ 6.3.2.2
<b>Geometric_Info/Granule_Dimension</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
Size/NROWS	Granule dimensions provided for each resolution band (10m, 20m and 60m)  Number of Row	Standard	NO
Size/NCOLS	Granule dimensions provided for each resolution band (10m, 20m and 60m)  Number of Columns	Standard	NO

Table 3-39: Level-1A\_Granule\_Metadata\_File - Geometric\_Info Description



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 27: Level-1A\_Granule\_Metadata\_File – Quality\_Indicators\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 161 / 477

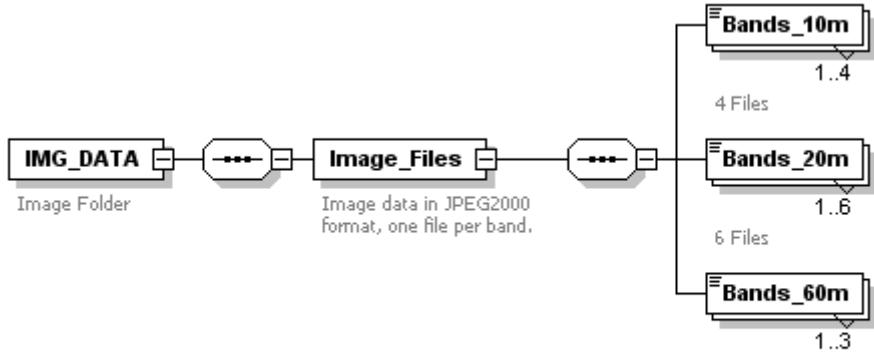
According to the content of the Table 3-4, the following table describes the Quality Indicators provided for a PDI Granule Level-1A.

Quality_Indicators_Info/Image_Content_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
CLOUDY_PIXEL_PERCENTAGE	Local cloud coverage indicator: A percentage of cloud coverage is computed for each Level-1A Granule (for the area covered by a reference band).	Standard	§ 6.4.2
DEGRADED_MSI_DATA_PERCENTAGE	Local technical quality indicator: A percentage of degraded MSI data is provided for each Level-1A Granule.	Standard	§ 6.4.2
Quality_Indicators_Info/Pixel_Level_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
MASK_FILENAME	Pointer to the mask files contained in the QI_DATA folder: <ul style="list-style-type: none"><li>- Coarse cloud mask files</li><li>- Technical quality mask files</li><li>- Radiometric quality masks</li></ul>	Standard	§ 6.3.2.2 § 6.4.3

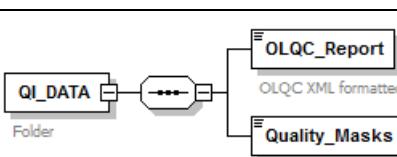
Table 3-40: Level-1A\_Granule\_Metadata\_File – Quality\_Indicators\_Info Description

Note that, according to OLQC procedures consolidation, the results of all quality control checks performed by OLQC processor on Level-1A Granule, are included in the XML reports stored in the QI\_DATA folder (see § 3.4.1, Table 3-17).

### 3.8.3.2 *IMG\_DATA*

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Image_Files</u></a>
annotation	Folder containing image data compressed using the JPEG2000 algorithm, one file per spectral band (13 files).

### 3.8.3.3 *QI\_DATA*

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>OLQC_Report</u></a> <a href="#"><u>Quality_Masks</u></a>
annotation	QI_DATA folder contains the XML reports including the quality control checks performed by OLQC processor and the GML quality masks. The XSD OLQC_Report is provided in Annex D, the masks files are listed in the Table 3-4.

### 3.8.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1A PDI Granule level.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 163 / 477

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-1A\_Granule.xsd”);
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
  - the allowed range of values of the field.
- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-1A PDI Granule Product (with the exception of the Manifest file itself); this includes:
  - the XML Granule Metadata file;
  - the Inventory\_Metadata.xml file;
  - a set of image files in JPEG2000 format (one file per spectral band, up to a total of 13 files);
  - a set of Quality Indicator Data Files, including a OLQC Report file and one or more pixel-level Quality Mask files.

A practical example of Manifest file for the Level-1A PDI Granule Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 164 / 477

SAFE Manifest		From S2_PDI_Level-1A_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->GRANULE_ID (substring <Mission ID>, see section 3.6.1)	The mission name of the platform		0..1	Sentinel
	number	General_Info->GRANULE_ID (substring <Mission ID>, see section 3.6.1)	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 165 / 477

SAFE Manifest		From S2_PDI_Level-1A_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	Instrument->mode-> <b>identifier</b>	N.A.	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1A Datastrip Product
	<b>start</b>	General_Info->Archiving_Info ->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info ->ARCHIVING_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 166 / 477

SAFE Manifest		From S2_PDI_Level-1A_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	processing->resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1A Granule Product
	resource-> processing		Description of the L0 to L1A Processing		0..*	
	resource-> processing-> <b>name</b>	N.A.	Name of the L0 to L1A Processing	string	0..1	Processing of Level-0 Granule product
	resource-> processing-> <b>start</b>	General_Info-> GRANULE_ID (substring <Creation Date> see section 3.6.1)	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing-> facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing-> facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing-> facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing-> facility-> <b>site</b>	General_Info-> GRANULE_ID (substring <Site Centre>, see section 3.6.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 167 / 477

SAFE Manifest		From S2_PDI_Level-1A_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility->software	N.A.	Description of software component used for Processing		0..*	
	resource-> processing-> facility->software-> <b>name</b>	N.A.	Name of the software component	string	1	
	resource-> processing-> facility->software-> <b>version</b>	N.A.	Version of the software component	string	0..1	
acquisitionPeriod					1	
	startTime	General_Info-> GRANULE_ID (substring <Sensing Time> see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line of the PDI at Granule level, see section 3.6.1)	xs:dateTime	1	
measurementFrameSet					1	
	cloudVoteNotationSystem-> <b>floor</b>	N.A.	Minimum value of cloud coverage index (Fixed value = 0.0)	double	0..1	0.0
	cloudVoteNotationSystem-> <b>ceil</b>	N.A.	Maximum value of cloud coverage index (Fixed value = 100.0)	double	0..1	100.0



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 168 / 477

SAFE Manifest		From S2_PDI_Level-1A_Granule_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	frame	N.A.	The “frame” concept is used in SAFE to convey the cloud coverage information by subdividing the region of interest of the data into “frames” according to a World Reference System. In the case of Sentinel-2 L1C Products, a similar concept can be used, by associating one single “frame” to the area covered by the granule (with respect to the reference band)		0..13	
	frame->number	N.A.	Number of the frame	integer	0..1	1
	frame-center	Geometric_Info-> Granule_Position->Geometric_Header-> GROUND_CENTER (only lat/lon coordinates, not height)	The Granule centre on ground	gml:PointType	0..1	
	frame->footPrint	Derived from Geometric_Info->Granule_Footprint-> Unitary_Footprint_List->Unitary_Footprint	Granule footprint (namely imaged area corresponding to the Granule), corresponding to one detector and all bands	string(gml:linearRingType i.e. blank separated list of comma-separated lon/lat coordinates of footprint closed polygon with last vertex equal to first)	0..1	
	frame->Tile	N.A.			1	One Tile for the frame
	frame->Tile->row	N.A.	The column index of the Tile. This index is numbered starting from 1	integer	1	1 (since there is only one Tile)



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 169 / 477

SAFE Manifest		From <b>S2_PDI_Level-1A_Granule_Metadata.xsd</b>	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	frame->Tile-> <b>column</b>	N.A.	The row index of the Tile. This index is numbered starting from 1	integer	1	1 (since there is only one Tile)
	frame->Tile->cloudVote	Derived from Quality_Indicators_Info->Image_Content_QI->CLOUDY_PIXEL_PERCENTAGE	Numeric notation qualifying the cloud coverage of the Tile	double	0..1	0 to 100
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..10	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	

Table 3-41 - Content of Metadata Section for PDI Level-1A Granule SAFE Manifest

### 3.9 Level-1A PDI Datastrip definition

Level-1A PDI Datastrip is defined as a **tar** file containing the following structure:

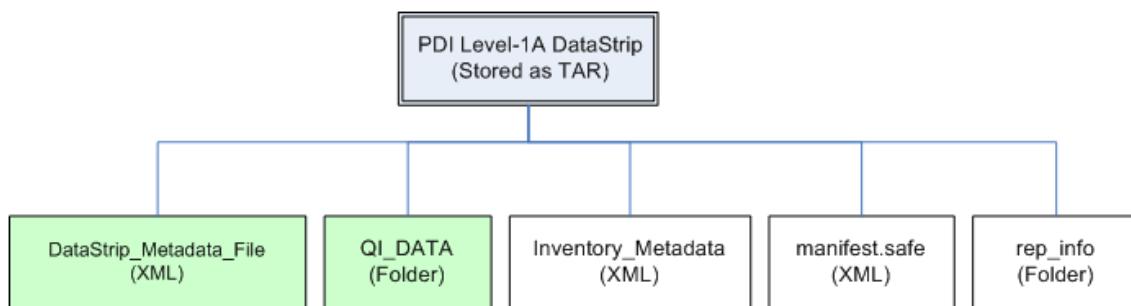


Figure 28: PDI Level-1A Datastrip Structure

The PDI Level-1A Datastrip consist of:

1. **Datastrip\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Datastrip,
2. **QI\_DATA**: folder containing XML reports about Quality control checks information,
3. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C);
4. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.5.4),
5. **rep\_info**: folder containing the available XSD schemas that validate the PDI components (recommended by [SAFE-SPEC], see section 3.5.4).

#### 3.9.1 PDI\_ID definition

Datastrip PDI\_ID (Datastrip ID) is defined in the section 3.5.2. The File\_Type is specified in the section 3.2, Table 3-3.

Level-1A Datastrip Template Name (Datastrip ID):

`S2A_OPER_MS1_L1A_DS_CGS1_20141104T134012_S20141106T134012_N02.10.tar`

Note that the PDI\_ID.tar is the physical name of the Datastrip PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 171 / 477

### 3.9.2 Level-1A Datastrip Physical Format

The PDI ID defined above represents the “Datastrip directory” name. Inside the Datastrip directory, there are the Datastrip components as in the Figure 25.

Inside that directory, the naming convention used to identify each real files, follows the same convention used for define the Datastrip ID but without the Processing Baseline sub-string.

- **Datastrip\_Metadata\_File (XML file):**

Datastrip\_Metadata\_File template name:

*S2A\_OPER\_MTD\_L1A\_DS\_CGS1\_20141104T134012\_S20141106T134012.xml*

The DIMAP schema which regulates the metadata file is *S2\_PDI\_Level-1A\_Datastrip\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **QI\_DATA (folder):**

QI\_DATA folder contains XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

File Template Name:

*S2A\_OPER\_MS1\_L1A\_DS\_CGS1\_20141104T134012\_S20141106T134012\_GEOMETRIC\_QUALITY\_report.xml*

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. *S2\_PDI\_Level-1A\_Datastrip\_Metadata.xsd*
2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-1A Datastrip Physical Format template:

Level-1A Datastrip PDI_ID: <b><i>S2A_OPER_MS1_L1A_DS_CGS1_20141104T134012_S20141106T134012_N02.10</i></b>	
	<i>Inventory_Metadata.xml</i>
	<i>S2A_OPER_MTD_L1A_DS_CGS1_20141104T134012_S20141106T134012.xml</i>
	<i>manifest.safe</i>
	<i>QI_DATA</i>
	<i>S2A_OPER_MS1_L1A_DS_CGS1_20141104T134012_S20141106T134012_GEOMETRIC_QUALITY_report.xml</i>

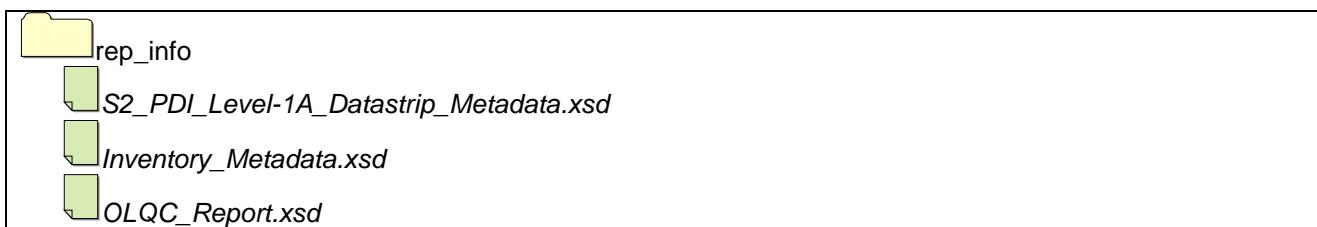
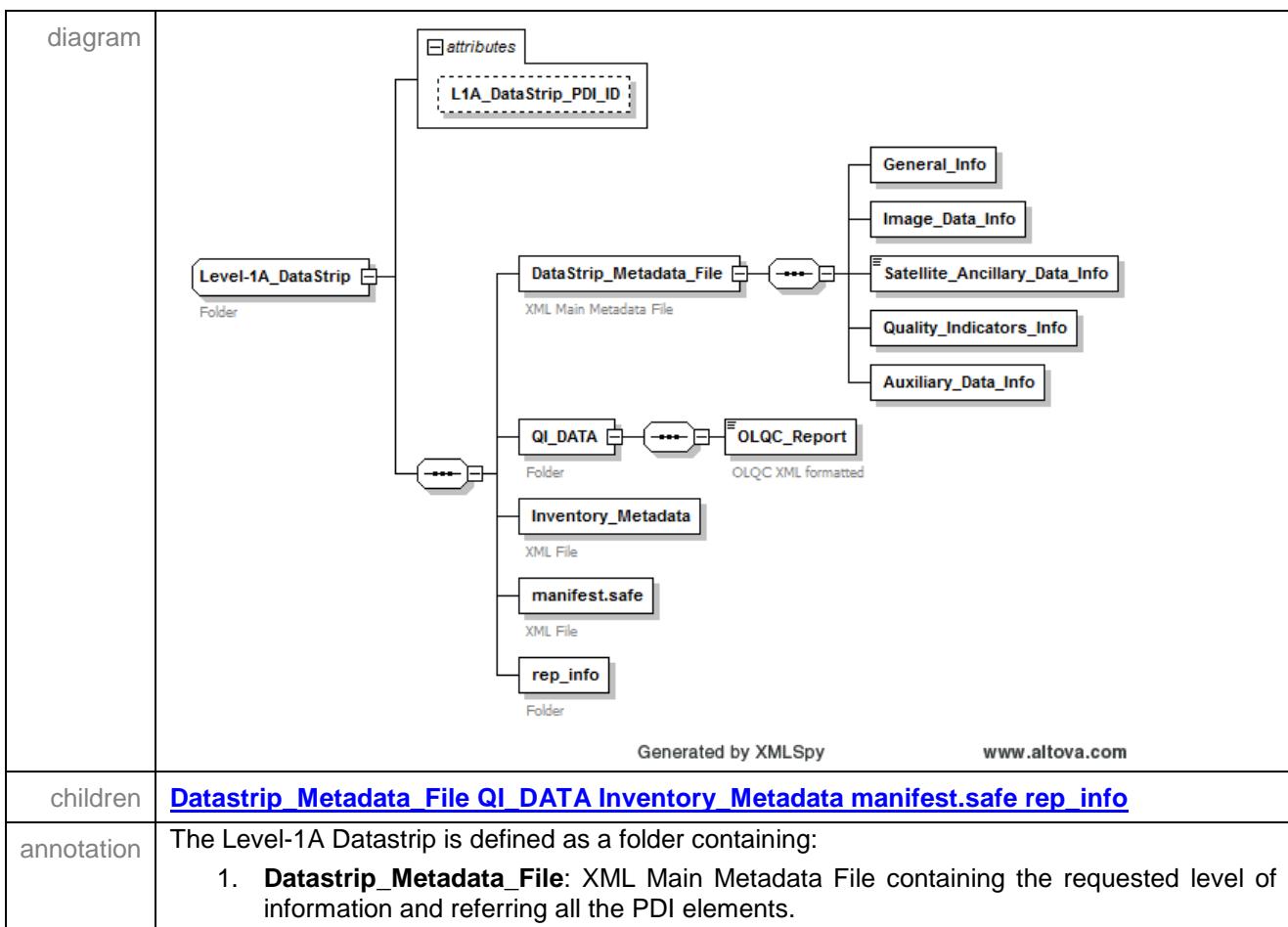


Figure 29: PDI Level-1A Datastrip Physical Format

### 3.9.3 Level-1A PDI Datastrip Structure

The *S2\_PDI\_Level-1A\_Datastrip\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1A Datastrip PDI on. This schema is provided for information only as it is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 28.

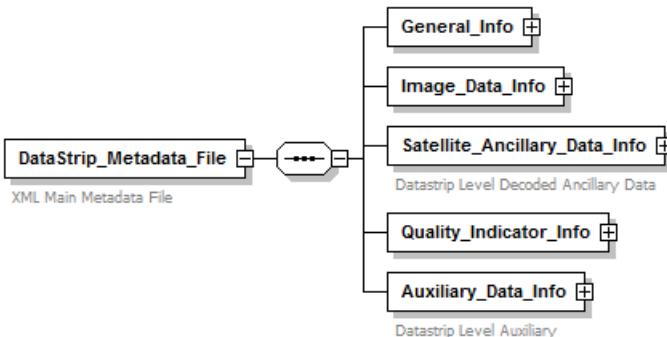


- 2. **QI\_DATA**: folder containing XML reports about Quality Indicators
- 3. **Inventory\_Metadata**: XML inventory metadata file
- 4. **manifest.safe**: XML SAFE Manifest file
- 5. **rep\_info**: folder containing the XSD schema provided inside a SAFE Level-1A Datastrip

Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

### 3.9.3.1 Datastrip\_Metadata\_File Schema

Level-1A Datastrip\_Metadata\_File is the main XML metadata file provided inside each Level-1A Datastrip. The schema used to validate it is *S2\_PDI\_Level-1A\_Datastrip\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">General_Info</a> <a href="#">Image_Data_Info</a> <a href="#">Satellite_Ancillary_Data_Info</a> <a href="#">Quality_Indicator_Info</a> <a href="#">Auxiliary_Data_Info</a>
annotation	<p>The structure of the Datastrip_Metadata_File is common to all processing level (cfr. § 3.5.1)</p> <p>The Datastrip_Metadata_File is an XML file containing all the metadata describing the whole product data item.</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: This group of metadata provide general information characterizing the source Datastrip acquisition.</li> <li>2. <b>Image_Data_Info</b>: Image data information from MSI telemetry.</li> <li>3. <b>Satellite_Ancillary_Data_Info</b>: Ancillary data information from Satellite Ancillary Telemetry.</li> <li>4. <b>Quality_Indicator_Info</b>: Results of all quality checks performed at Datastrip level.</li> <li>5. <b>Auxiliary_Data_Info</b>: Auxiliary data information.</li> </ol>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 174 / 477

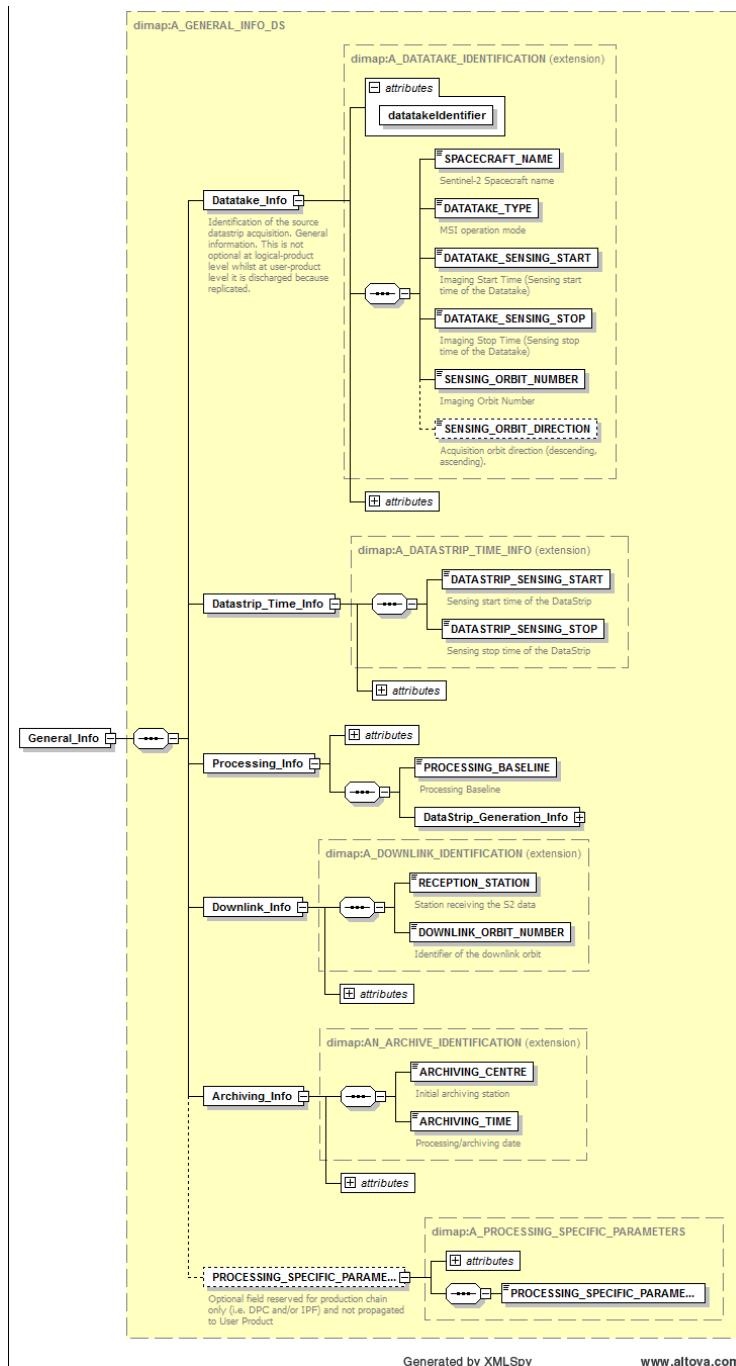
The following tables and figures give a complete overview of the Level-1A Datastrip\_Metadata\_File schema according the description provided in the section 3.5.1.

The General\_Info provided through the Level-1A DataSrip\_Metadata\_File are the same described in the Figure 18 and

Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING
---	--	-----------	---------

**Table 3-32.**

General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 30: Level-1A Datastrip - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 176 / 477

General_Info/Datatake_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
SPACECRAFT_NAME	Sentinel-2 Spacecraft name: Sentinel-2A, Sentinel-2B	Brief	§ 6.3.1.1 Set at product level
DATATAKE_TYPE	MSI operation mode	Brief	§ 6.3.1.1 Set at product level
DATATAKE_SENSING_START	Imaging Start Time (Sensing start time of the Datatake)	Brief	§ 6.3.1.1 Set at product level
DATATAKE_SENSING_STOP	Imaging Stop Time (Sensing stop time of the Datatake)	Brief	MISSING
SENSING_ORBIT_NUMBER	Imaging Orbit Number	Brief	§ 6.3.1.1 Set at product level
SENSING_ORBIT_DIRECTION	Imaging Orbit Direction (Default = Ascending)	Brief	§ 6.3.1.1 Set at product level
General_Info/Datastrip_Time_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
DATASTRIP_SENSING_START	Sensing start time of the Datastrip	Brief	MISSING
DATASTRIP_SENSING_STOP	Sensing stop time of the Datastrip	Brief	MISSING
General_Info/Processing_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
PROCESSING_BASELINE	The processing baseline refers to the configuration baseline used at the time of the generation in term of processor software version and major GIPP version (see section 2.2).	Brief	No



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 177 / 477

	Note: all the PDIs of a Datatake are always processed with the same processing baseline even if acquired in different stations		
Datastrip_Generation_Info/Processing_Step/UTC_DATA_TIME	time-stamp information related to one process. Every process should append the list with a new Step element.	Expertise	§ 6.3.1.3
Datastrip_Generation_Info/Processing_Step/SOFTWARE	The processing steps contains the list of the processors version in use.	Expertise	§ 6.3.1.3
Datastrip_Generation_Info/Processing_Step/SOFTWARE(version attribute)	Software version information related to one process. Every process should append the list with a new Step element.	Expertise	§ 6.3.1.3
Datastrip_Generation_Info/PROCESSING_CENTRE	<p>Production centre:</p> <ul style="list-style-type: none"> <li>• CGS1</li> <li>• CGS2</li> <li>• CGS3</li> <li>• CGS4</li> <li>• PAC1</li> <li>• MPCC</li> <li>• SVLB</li> <li>• MASP</li> <li>• MATA</li> </ul>	Expertise	§ 6.3.1.3
<b>General_Info/Downlink_Info</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
RECEPTION_STATION	<p>Reception stations:</p> <ul style="list-style-type: none"> <li>• CGS1</li> <li>• CGS2</li> <li>• CGS3</li> <li>• CGS4</li> </ul>	Standard	§ 6.3.1.2
DLINK_ORBIT_NUMBER	Identifier of the downlink orbit	Standard	§ 6.3.1.2
<b>General_Info/Archiving_Info</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
ARCHIVING_CENTRE	The allowed values are:	Expertise	§ 6.3.1.3



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

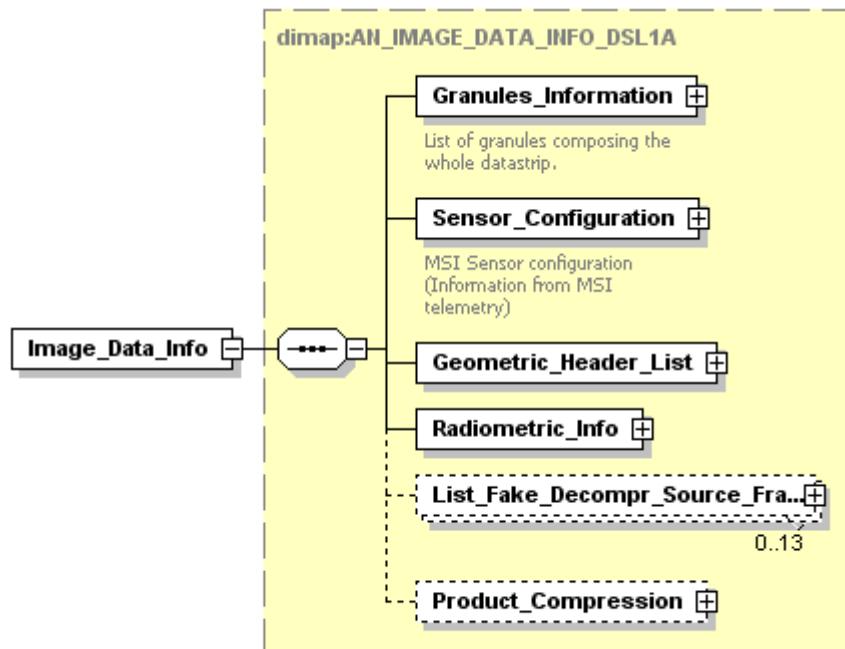
DATE : 12/07/2013

PAGE : 178 / 477

	<ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2</li><li>• CDAMs</li><li>• MPCC</li></ul>		
ARCHIVING_TIME	Processing/archiving date (UTC data time)	Expertise	§ 6.3.1.3
Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING

Table 3-42: Level-1A Datastrip - General\_Info Description

Image Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 31 : Level-1A Datastrip – Image\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 180 / 477

Image_Data_Info/Granules_Information			
Field Name	Description	Metatada Level	Check vs [PDD]
Detector_List/Detector/Granule_List/Granule/POSITION	This branch of the schema provides information regarding all Granules, for each detector, composing the whole Datastrip. Each Granule composing the Datastrip is univocally identified through a unique Granule identifier (PDI_ID at granule level). For each Granule the Position of the Granule is provided. This position is identified through the position of the scenes first lines in the Datastrip and is expressed as number of 10m resolution images lines.	Standard	MISSING
Image_Data_Info/Sensor_Configuration (inherited from Level-0 metadata)			
Field Name	Description	Metatada Level	Check vs [PDD]
Acquisition_Configuration/COMPRESS_MODE	Flag to indicate if compress mode is bypassed	Expertise	§ 6.3.1.3
Acquisition_Configuration/EQUALIZATION_MODE	Flag to indicate if equalization is active	Expertise	§ 6.3.1.3
Acquisition_Configuration/NUC_TABLE_ID	In-flight Non Uniform Correction table ID defined by 10 bits. This ID is uniform for all transmitted bands. It identifies the correction coefficients table used in-flight	Expertise	§ 6.3.1.3
Acquisition_Configuration/Active_Detectors_List	On board active Detectors (in case of compression bypassed)	Expertise	§ 6.3.1.3
Acquisition_Configuration/TDI_Configuration_List	On board TDI configuration, for B3, B4, B11 and B12 only.	Standard	Inherited from L0. § 5.4.1.2
Acquisition_Configuration/Spectral_Band_Info/PHYSICAL_GAIN	Physical Gain for each band	Standard	Inherited from L0, § 5.4.1.2
Acquisition_Configuration/Spectral_Band_Info/COMPRESSION_RATE	On-board compression rates for each band	Expertise	Inherited from L0, § 5.4.1.3
Acquisition_Configuration/Spectral_Band_Info/INTEGRATION_TIME	On-board integration time for each band	Expertise	Inherited from L0, §



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 181 / 477

Source_Packet_Description	Source packet information for each band	Standard	Inherited from L0, § 5.4.1.2
Time_Stamp/LINE_PERIOD	Line period for the acquisition of line of 10 m full-resolution image data	Standard	Inherited from L0, § 5.4.1.2
Time_Stamp/Band_Time_Stamp/Detector	Datation model for each couple band, detector.	Standard	Inherited from L0, § 5.4.1.2
Time_Stamp/GPS_SYNC	Flag (Boolean) to indicate if MSI is synchronize with GPS time	Standard	Inherited from L0, § 5.4.1.2
Time_Stamp/THEORETICAL_LINE_PERIOD	Theoretical line period for the acquisition of line of 10 m full-resolution image data	Standard	Inherited from L0, § 5.4.1.2
Time_Stamp/Quality_Indicators	Optional. Created when datation models are estimated through linear regression.	Standard	Inherited from L0, § 5.4.1.2

### Image\_Data\_Info/Geometric\_Header\_List(inherited from Level-0 metadata)

Field Name	Description	Metatada Level	Check vs [PDD]
Geometric_Header_List	Geometric information.  For all details see Table 3-33, section "Image_Data_Info/Geometric_Header_List"	Standard Expertise	§ 6.3.1.2 § 6.3.1.3

### Image\_Data\_Info/Radiometric\_Info

Field Name	Description	Metatada Level	Check vs [PDD]
SWIR_REARRANGEMENT_PROC	SWIR pixels re-arrangement (only for level 1A production but SWIR rearrangement information shall be preserved in L1B and L1C): A 'true' value indicates that data extraction and SWIR pixels re-arrangement have been processed.	Standard	§ 6.4.1
DEFECTIVE_PIXELS_PROC	Defective pixels processing. A 'true' value indicates that defective pixels have been detected and processed, a 'detection' value indicates that defective pixels have been only detected (only for level 1A production), a 'false'	Standard	MISSING



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 182 / 477

		value indicates that defective pixels have been neither detected nor processed.		
PIXELS_NO_DATA_PROC		Management of NO_DATA pixels. A 'true' value indicates that NO_DATA pixels have been detected and processed, a 'detection' value indicates that NO_DATA pixels have been only detected (only for level 1A production), a 'false' value indicates that NO_DATA pixels have been neither detected nor processed.	Standard	MISSING
SATURATED_PIXELS_PROC		Management of saturated pixels. A 'true' value indicates that saturated pixels has been processed.	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/RESOLUTION	(OPTIONAL branch)	Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION  Spatial resolution	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Wavelength/MIN	Minimum wavelenght	Standard	MISSING	
Spectral_Information_List/Spectral_Informatio/Wavelength/MAX	Maximum wavelenght	Standard	MISSING	
Spectral_Information_List/Spectral_Informatio/Wavelength/CENTRAL	Central wavelenght	Standard	MISSING	
Spectral_Information_List/Spectral_Informatio/Spectral_Response/STEP	Step of spectral response	Standard	MISSING	
Spectral_Information_List/Spectral_Informatio/Spectral_Response/VALUES	List of measures	Standard	MISSING	
Image_Display_Order/RED_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 6.3.1.1	
Image_Display_Order/GREEN_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 6.3.1.1	
Image_Display_Order/BLUE_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 6.3.1.1	
<b>Image_Data_Info/List_Fake_Decompr_Source_Frames</b>				
Field Name	Description	Metatada Level	Check vs [PDD]	
List_Fake_Decompr_Source_Frames	List of the decompressed sources frames	Standard	§ 6.3.1.2	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

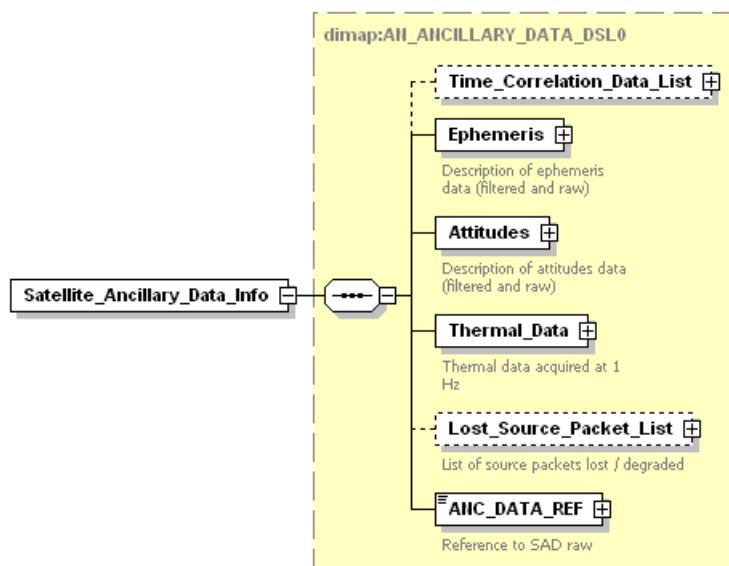
PAGE : 183 / 477

		This field will be better specify as soon as the MRCPBG CFI documentation is available.		
<b>Image_Data_Info/Product_Compression (OPTIONAL BRANCH)</b>				
Field Name	Description	Metatada Level	Check vs [PDD]	
COMPRESSION	<p>Product Compression.</p> <p>The compression may be:</p> <ul style="list-style-type: none"><li>- None.</li><li>- LOSSLESS: Lossless compression, use reversible JPEG2000 compression.</li><li>- LOSSY: Lossy compression, use compression that ensures that JPEG2000 compression has a negligible effect on image quality.</li></ul>	Standard	§ 10.3.2	

Table 3-43: Level-1A Datastrip – Image\_Data\_Info Description

Satellite\_Ancillary\_Data\_Info:

Satellite\_Ancillary\_Data\_Info are the same provided for a L0 Datastrip (cfr. Figure 20 and Table 3-34).



Generated by XMLSpy

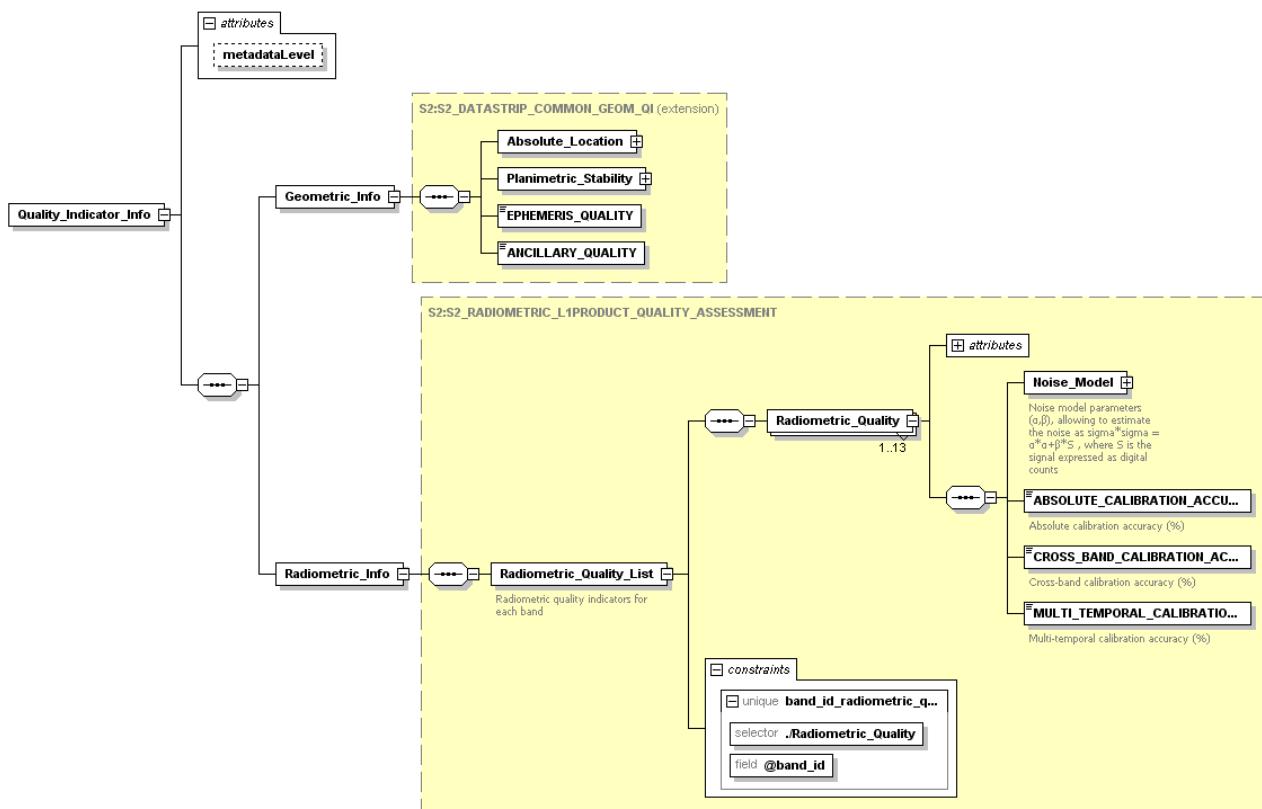
[www.altova.com](http://www.altova.com)

Figure 32: Level-1A Datastrip – Satellite\_Ancillary\_Data\_Info Diagram

<b>Satellite_Ancillary_Data_Info</b>			
<b>Field Name</b>	<b>Description</b>	<b>Metatada Level</b>	<b>Check vs [PDD]</b>
Satellite_Ancillary_Data_Info	Inherited from Level-0 (see Table 3-34)	§ Table 3-34	§ Table 3-34

Table 3-44: Level-1A Datastrip – Satellite\_Ancillary\_Data\_Info Description

Quality Indicators Info:



Generated by XMLSpy

www.altova.com

Figure 33 : Level-1A Datastrip – Quality\_Indicator\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 186 / 477

Quality_Indicator_Info/Geometric_Info			
Field Name	Description	Metatada Level	[PDD]
Absolute_Location	An absolute location performance for the Datastrip is given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 6.4.1
Planimetric_Stability	Planimetric stability assessment: A planimetric stability performance for the Datastrip is given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data	Brief	§ 6.4.1
EPHEMERIS_QUALITY	Ephemeris data quality retrieved from GPS Dilution of precision (DOP) information	Brief	§ 6.4.1
ANCILLARY_QUALITY	Ancillary data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 6.4.1
Quality_Indicator_Info/Radiometric_Info			
Field Name	Description	Metatada Level	[PDD]
Noise_Model	Alpha and Beta parameters providing the instrument noise as a function of the radiometric count X for Level-1B : Noise= square root(Alpha_X + Beta_X* X)	Brief	§ 6.4.1
ABSOLUTE_CALIBRATION_ACCURACY	Absolute calibration accuracy provided as a percentage of accuracy	Brief	§ 6.4.1
CROSS_BAND_CALIBRATION_ACCURACY	Cross-band calibration accuracy provided as a percentage of accuracy	Brief	§ 6.4.1
MULTI_TEMPORAL_CALIBRATION_ACCURACY	Multi-temporal calibration accuracy provided	Brief	§ 6.4.1



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

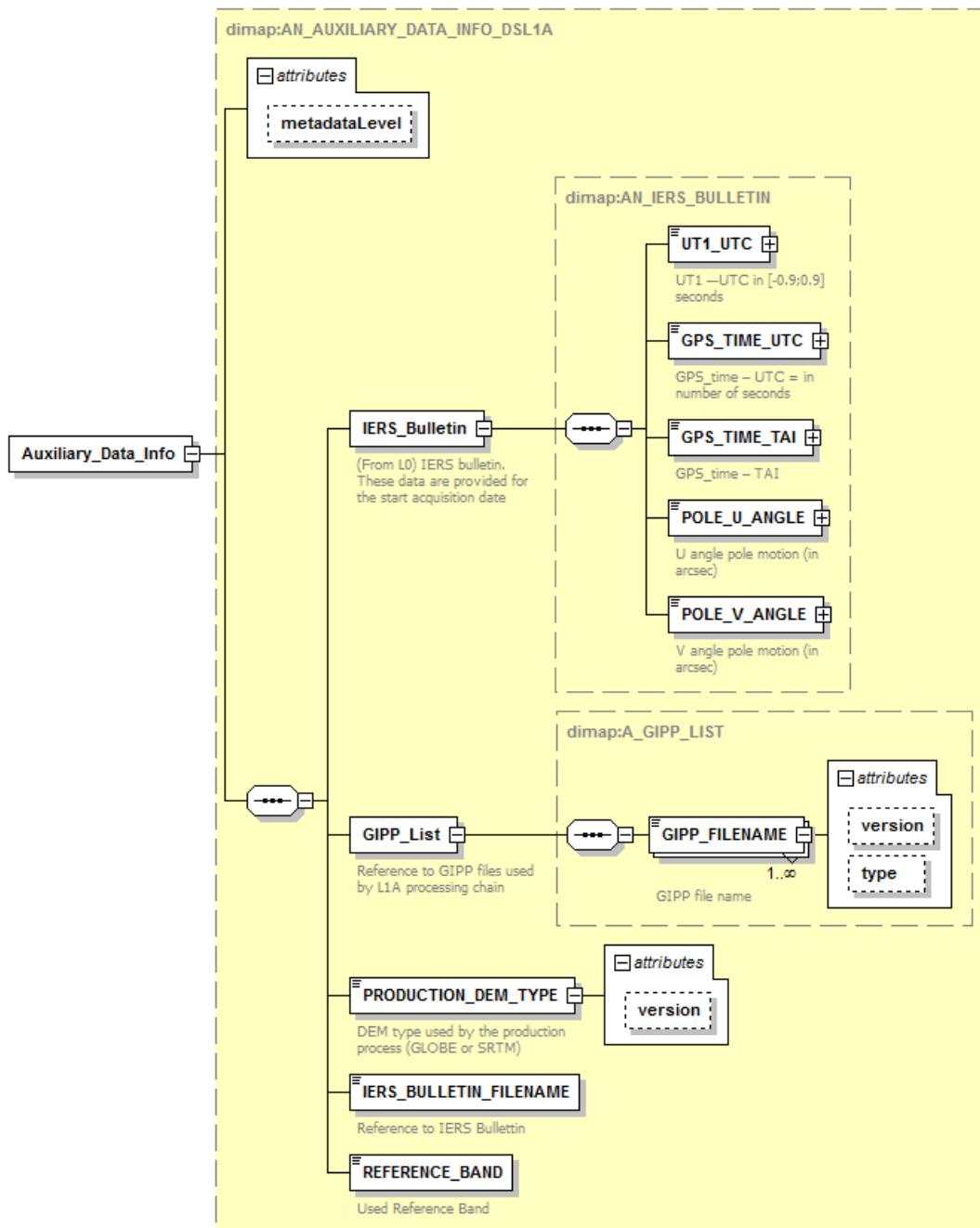
DATE : 12/07/2013

PAGE : 187 / 477

as a percentage of accuracy

Table 3-45: Level-1A Datastrip - Quality\_Indicators\_Info Description

Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 34 : Level-1A Datastrip – Auxiliary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

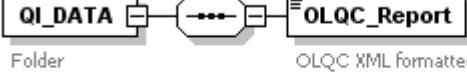
DATE : 12/07/2013

PAGE : 189 / 477

Auxiliary_Data_Info/IERS_Bulletin (aux info from Level-0)			
Field Name	Description	Metadata Level	Check vs [PDD]
UT1_UTC	UT1 --UTC in [-0.9;0.9] seconds	Standard	§ 6.3.1.2
GPS_TIME_UTC	GPS_time – UTC = in number of seconds	Standard	§ 6.3.1.2
GPS_TIME_TAI	GPS_time – TAI	Standard	§ 6.3.1.2
POLE_U_ANGLE	U angle pole motion (in arcsec)	Standard	§ 6.3.1.2
POLE_V_ANGLE	V angle pole motion (in arcsec)	Standard	§ 6.3.1.2
Auxiliary_Data_Info (aux data used by the processing)			
Field Name	Description	Metadata Level	Check vs [PDD]
GIPP_Filename	Reference to the GIPP files used by the L1A processing.	Standard	§ 6.3.1.2
PRODUCTION_DEM_TYPE	DEM type used by the production process (GLOBE or SRTM for example)	Standard	§ 6.3.1.2
IERS_BULLETIN_FILENAME	Filename of the used IERS Bulletin	Standard	MISSING
Auxiliary_Data_Info (others aux info)			
Field Name	Description	Metadata Level	Check vs [PDD]
REFERENCE_BAND	Used reference band for datation	Standard	§ 6.3.1.2

Table 3-46: Level-1A Datastrip – Auxiliary\_Data\_Info Description

### 3.9.3.2 QI\_DATA

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">OLQC_Report</a>
annotation	QI_DATA folder contains XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The XSD OLQC_Report in Annex D is provided.

### 3.9.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1A PDI Datastrip level.

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-1A\_Datastrip.xsd”);
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 191 / 477

- the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
- the allowed range of values of the field.

In particular, the satellite ancillary data files (e.g. the SAD Raw Data file) and the auxiliary data files used for Level-1A processing (e.g. GIPP files, DEM, IERS Bulletin), are external to the product and are referenced in the Metadata of Manifest file Section (as “resources” in the “processing” section).

- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-1A PDI Product (with the exception of the Manifest file itself); this includes:
  - the XML Metadata file;
  - the XML Inventory\_Metadata file;
  - a set of Quality Indicator Data Files, including a OLQC Report file (XML format) and a Preliminary Quick Look file (JPEG2000 format).

A practical example of Manifest file for the Level-1A PDI Datastrip Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip); the Manifest is provided as an example, but its compliancy to the SAFE specification has been verified by validating the Manifest file against the SAFE XSD schema.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 192 / 477

SAFE Manifest		From <i>S2_PDI_Level-0_Datastrip_Metadata.xsd</i>	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->Datatake_Info->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	General_Info->Datatake_Info->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode
	Instrument->mode->identifier	General_Info->Datatake_Info->	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 193 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		DATATAKE_TYPE				INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1A Granule Product
	<b>start</b>	General_Info->Archiving_Info->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info ->	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 194 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		AQRCHIVING_CENTRE				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1A Granule Product
	resource-> processing		Description of the L0 to L1A Processing		0..*	
	resource-> processing-> <b>name</b>		Name of the L0 to L1A Processing	string	0..1	Processing of Level-0 Datastrip product
	resource-> processing-> <b>start</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->UTC_DATE_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing->facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing->facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing->facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 195 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility-> <b>site</b>	General_Info->Processing_Info->Data Strip_Generation_Info->PROCESSING_CENTER	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC, SVLB, MASP, MATA
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource-> processing-> facility->software		Description of software component used for Processing		0..*	
	resource-> processing-> facility->software-> <b>name</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE	Name of the software component	string	1	
	resource-> processing-> facility->software-> <b>version</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE->version	Version of the software component	string	0..1	
	resource-> processing-> facility->resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc. and of SAD Raw Data file containing the satellite ancillary telemetry; these files are not provided with the product.		0..*	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 196 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility->resource-> <b>name</b>	Satellite_Ancillary_Data_Info-> ANC_DATA_REF (reference to the single SAD Raw Data file)  Auxiliary_Data_Info->IERS_Bulletin  Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME	Absolute path name of the auxiliary or ancillary file	string	1	
	resource-> processing-> facility->resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod ->startTime	Datastrip->L1A_Datastrip_PDI_ID (substring <Sensing Time>, see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line of the PDI at Datastrip level, see section 3.6.1)	xs:dateTime	1	
measurementOrbitReference						
	orbitNumber	General_Info->Datatake_Info-> DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 197 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	orbitNumber-> <b>type</b>	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
	orbitNumber-> <b>groundTrackDirection</b>	General_Info->Datatake_Info->SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	General_Info->Datatake_Info->SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..4	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 198 / 477

SAFE Manifest		From <b>S2_PDI_Level-0_Datastrip_Metadata.xsd</b>	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	

Table 3-47 - Content of Metadata Section for PDI Level-1A Datastrip SAFE Manifest

### 3.10 Level-1B PDI Granule definition

Level-1B PDI Granule level is defined as a **tar** file with the following structure:

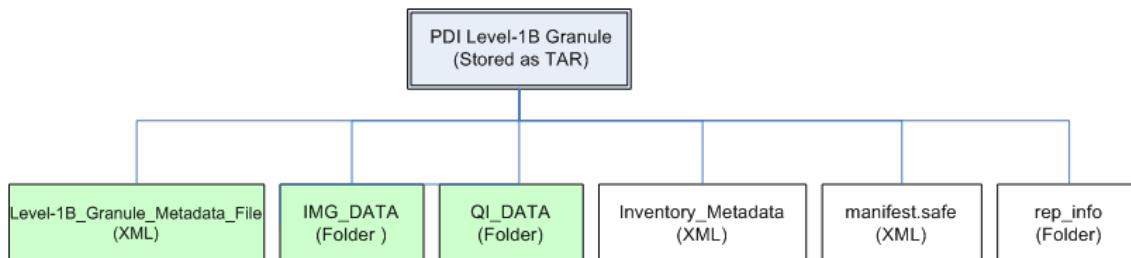


Figure 35: PDI Level-1B Granule Structure

The PDI Level-1B Granule consist of:

1. **Level-1B\_Granule\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Granule,
2. **IMG\_DATA**: folder containing the mission data corresponding to one on-board scene for one detector and all spectral bands,
3. **QI\_DATA**: folder containing XML reports about Geometric quality, Image content quality, Quality control checks information,
4. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C);
5. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.10.4);
6. **rep\_info**: folder containing the available XSD schema that validate the PDI components (recommended by [SAFE-SPEC], see section 3.4.4).

#### 3.10.1 PDI\_ID definition

The PDI\_ID (Granule ID) used to identify a Level-1B Granule PDI, follows the description provided in the section 3.4.2. File\_Type is defined in the section 3.2, Table 3-3.

Level-1B Granule Template Name (Granule ID):

`S2A_OPER_MS1_L1B_GR_CGS1_20141104T134012_S20141104T134012_D11_N05.22.tar`

Note that the PDI\_ID.tar is the physical name of the Granule PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 200 / 477

### 3.10.2 Level-1B Granule Physical Format

The PDI ID defined above represents the “Granule directory” name. Inside the Granule directory, there are the Granule components as in the Figure 35:

Inside that directory, the naming convention used to identify each real files, follows the same convention used for define the Granule ID except for the Processing Baseline sub-string.

- **Level-1B\_Granule\_Metadata\_File (XML file):**

Granule Metadata File Template name

*S2A\_OPER\_MTD\_L1B\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D11\_N05.22.xml*

The XSD schema which regulates the metadata file is the *S2\_PDI\_Level-1B\_Granule\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **IMG\_DATA (folder):**

The naming convention used to identify the image files contained in the IMG\_DATA folder is defined hereafter:

Image File naming convention = <PDI\_ID\*>\_<Band\_Index>.jp2

where:

Field Name	Value/Meaning	Note
PDI_ID*	PDI_ID without Processing Baseline sub-string	
Band Index	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	Field identifying the spectral bands

IMG\_DATA/Level-1B image file template name:

*S2A\_OPER\_MSIL1B\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D11\_B08.jp2*

- **QI\_DATA (folder):**

QI\_DATA folder contains:

- XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

File Template Name:

*S2A\_OPER\_MSIL1B\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D11\_GEOMETRIC\_QUALITY\_report.xml*

- Quality\_Masks (one for each type, GML/JPEG2000).



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 201 / 477

The naming used for the mask files follows the same convention defined for the L1B Granule ID (see section 3.4.2) except for the additional <Product Type> field.

Mask files naming convention = MMM\_CCCC\_TTTTTTTT<Instance\_ID>.gml

L1B masks main file types (TTTTTTTT) are in the Table 3-16 and listed again hereafter

1. MSK\_CLOLOW (Coarse cloud mask files)
2. MSK\_TECQUA (Technical quality mask files)
3. MSK\_DEFECT (Radiometric quality masks)
4. MSK\_SATURA (Radiometric quality masks)
5. MSK\_NODATA (Radiometric quality masks)

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Sensing Time>\_<Detector ID>\_<Band ID>\_<Product\_Type>

Where <Site Centre>, <Creation Date>, <Sensing Time> and <Detector ID> are inherited from the L1B Granule ID, <Product Type> = "MSIL1B" and <Band ID>:

<i>Band ID</i>	Bxx where:  xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12
----------------	---

Template masks filename are:

*S2A\_OPER\_MSK\_TECQUA\_CGS1\_20141104T134012\_S20141104T134012\_D11\_B08\_MSIL1B.gml*  
*S2A\_OPER\_MSK\_SATURA\_CGS1\_20141104T134012\_S20141104T134012\_D11\_B08\_MSIL1B.gml*

The grouping strategy to have several masks in one physical GML file is described in the Annex F.

- **Inventory\_Metadata (XML file):**  
XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*
- **manifest.safe (XML file):**  
XML file with fixed name *manifest.safe*
- **rep\_info (folder):**  
Folder containing the following XSD schemas:
  1. *S2\_PDI\_Level-1B\_Granule\_Metadata.xsd*
  2. *Inventory\_Metadata.xsd*
  3. *OLQC\_Report.xsd*

Level-1B Granule Physical Format template:

Level-1B Granule PDI_ID: <b>S2A_OPER_MS1_L1B_GR_CGS1_20141104T134012_S20141104T134012_D11_N05.22</b>	
	<i>Inventory_Metadata.xml</i>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

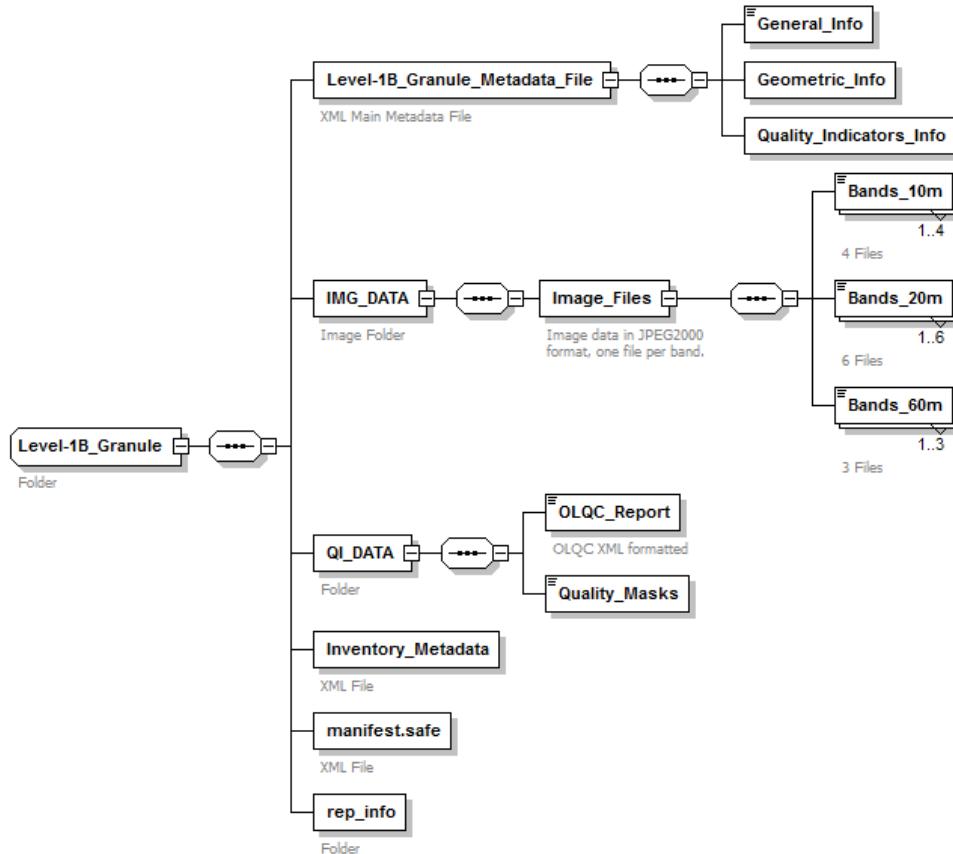
PAGE : 202 / 477



Figure 36: PDI Level-1B Granule Physical Format

### 3.10.3 Level-1B PDI Granule Structure

The *S2\_PDI\_Level-1B\_Granule\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1B Granule PDI on disk. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 35.

diagram	 <pre> graph TD     LGF[Level-1B_Granule] --- LGMF[Level-1B_Granule_Metadata_File]     LGF --- IMGD[IMG_DATA]     LGF --- QID[QI_DATA]     LGF --- IMMD[Inventory_Metadata]     LGF --- MSF[manifest.safe]     LGF --- RI[rep_info]      LGMF --- GI[General_Info]     LGMF --- GI[Geometric_Info]     LGMF --- GI[Quality_Indicators_Info]      IMGD --- IF[Image_Files]     QID --- OLR[OLQC_Report]     QID --- QM[Quality_Masks]      IMMD --- XMLFile1[XML File]     MSF --- XMLFile2[XML File]     RI --- XMLFile3[XML File]   </pre> <p>The diagram illustrates the structure of a Level-1B Granule. It starts with a <b>Level-1B_Granule</b> folder, which contains several sub-folders and files:</p> <ul style="list-style-type: none"> <li><b>Level-1B_Granule_Metadata_File</b>: XML Main Metadata File, containing <b>General_Info</b>, <b>Geometric_Info</b>, and <b>Quality_Indicators_Info</b>.</li> <li><b>IMG_DATA</b>: Image Folder, containing <b>Image_Files</b>. <b>Image_Files</b> contains <b>Bands_10m</b> (1..4 files), <b>Bands_20m</b> (1..6 files), and <b>Bands_60m</b> (1..3 files).</li> <li><b>QI_DATA</b>: Folder, containing <b>OLQC_Report</b> (OLQC XML formatted) and <b>Quality_Masks</b>.</li> <li><b>Inventory_Metadata</b>: XML File.</li> <li><b>manifest.safe</b>: XML File.</li> <li><b>rep_info</b>: Folder.</li> </ul>
	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">Level-1B_Granule_Metadata_File</a> <a href="#">IMG_DATA</a> <a href="#">QI_DATA</a> <a href="#">Inventory_Metadata</a> <a href="#">manifest.safe</a> <a href="#">rep_info</a></p>
annotation	<p>The Level-1B Granule is defined as a folder containing:</p> <ol style="list-style-type: none"> <li>1. <b>Level-1B_Granule_Metadata_File</b>: XML main metadata file describing the Granule.</li> <li>2. <b>IMG_DATA</b>: folder containing Image data in JPEG2000 format, one file per band.</li> <li>3. <b>QI_DATA</b>: folder containing XML reports and Quality Masks;</li> <li>4. <b>Inventory_Metadata</b>: XML inventory metadata file</li> <li>5. <b>manifest.safe</b>: XML SAFE Manifest file</li> <li>6. <b>rep_info</b>: folder containing the XSD schema provided inside a SAFE Level-1B Granule</li> </ol>



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

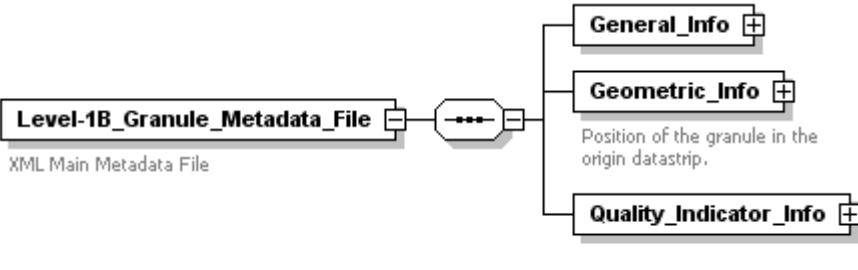
DATE : 12/07/2013

PAGE : 204 / 477

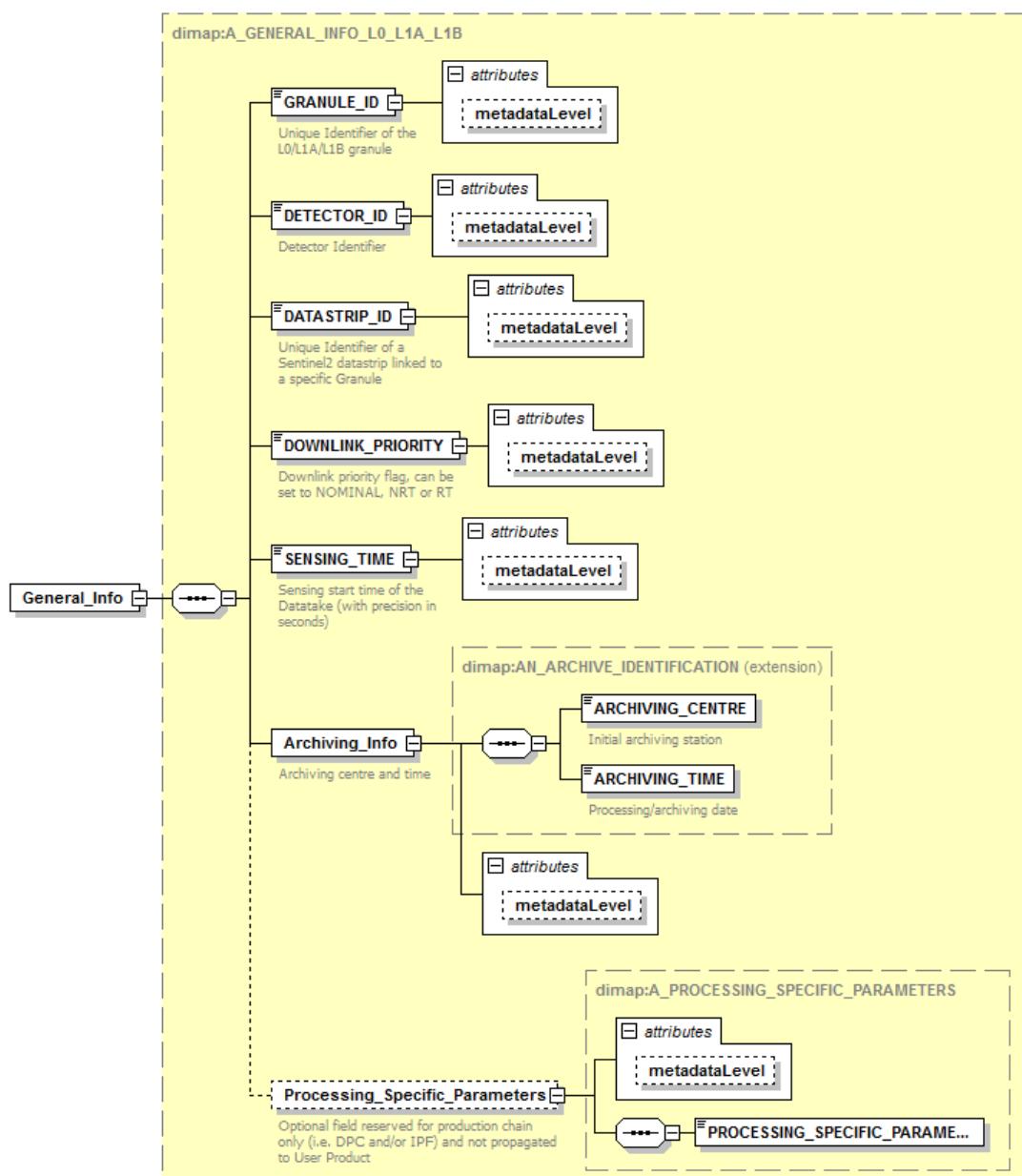
Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

### 3.10.3.1 Level-1B\_Granule\_Metadata\_File Schema

Level-1B\_Granule\_Metadata\_File is the XML metadata file provided inside each Level-1B Granule. The schema used to validate it is *S2\_PDI\_Level-1B\_Granule\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <p>XML Main Metadata File</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a></p>
annotation	<p>The Level-1B_Granule_Metadata_File is an XML file containing metadata regarding:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: this group of metadata provides general information regarding the Granule.</li> <li>2. <b>Geometric_Info</b>: these metadata provide information describing the geolocation of the Granule.</li> <li>3. <b>Quality_Indicators_Info</b>: this metadata values provide information about image content quality indicators and quality control checks information.</li> </ol>

The following figures and tables give a complete overview of the Level-1B\_Granule\_Metadata\_File schema according the description provided in the section 3.4.1.



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 37: Level-1B\_Granule\_Metadata\_File - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 207 / 477

General_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
GRANULE_ID	Granule_Identifier metadata indicates the unique identifier of the Level-1B Granule. This parameter coincides with PDI_ID definition described in section 3.6.1 and univocally points a Granule PDI in the archive.	Brief	§ 7.3.2.1
DETECTOR_ID	Detector identifier corresponding to the Granule	Brief	MISSING
DATASTRIP_ID	Unique identifier of the L1B PDI Datastrip linked to L1A PDI Granule. This parameter coincides with the PDI_ID of the PDI Datastrp linked to the Granule. This link establishes the hierarchy Granule vs Datastrip (see section 3.3)	Brief	§ 7.3.1.1 Product Level Metadata, Datastrip Level information
DLINK_PRIORITY	Downlink priority flag. It can be set Nominal/NRT/RT.	Standard	§ 7.3.2.2
SENSING_TIME	Imaging Start Time (sensing start time of the Datatake). Corresponding to the first line date on the MSI-Scene (with precision in seconds)	Standard	§ 7.3.2.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

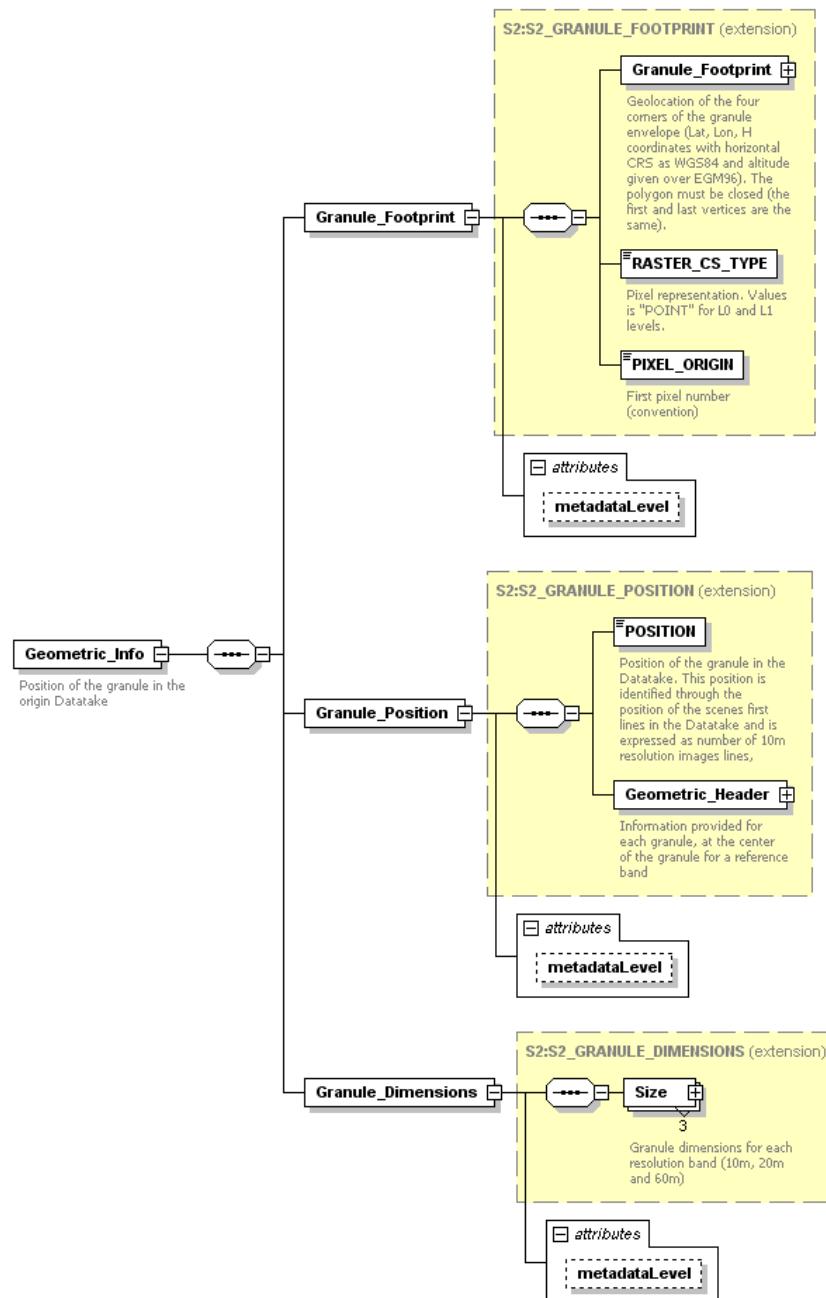
ISSUE : 10

DATE : 12/07/2013

PAGE : 208 / 477

	Note: set as Type date_time:AN_UTC_DATE_TIME		
Archiving_Info/ARCHIVING_CENTRE	The starting point of the circulation data. The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2,</li><li>• CDAM</li><li>• MPCC</li></ul>	Expertise	§ 7.3.1.3 Product Level Metadata, Datastrip Level information
Archiving_Info/ARCHIVING_TIME	Processing/archiving date (UTC data time)	Expertise	§ 7.3.1.3 Product Level Metadata, Datastrip Level information
Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING

Table 3-48: Level-1B\_Granule\_Metadata\_File - General\_Info Description



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 38: Level-1B\_Granule\_Metadata\_File - Geometric\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 210 / 477

Geometric_Info/Granule_Footprint			
Field Name	Description	Metatada Level	Check vs [PDD]
Granule_Footprint	Granule geolocation updated for the Level-1B Granules (same information as Level-1A updated for Level-1B Granules).	Brief	§ 7.3.2.1
RASTER_CS_TYPE	Pixel representation. Values is "POINT" for L0 and L1 levels.	Brief	NO
PIXEL_ORIGIN	First pixel number (convention)	Brief	NO
Geometric_Info/Granule_Position			
Field Name	Description	Metatada Level	Check vs [PDD]
Position	Position of the Granule in the Datatake (from Level-1A Granule Standard metadata),	Standard	§ 7.3.2.2
Geometric_Header/GROUND_CENTER	Updated geometric header for the Level-1B Granules (same information as Level-1A updated for Level-1B Granules).  Information provided for a reference band, at the centre of the Granule, for each Granule. Geolocation of the Granule centre (Lat, Lon, H) Altitude is provided over the geoid.	Standard	§ 7.3.2.2
Geometric_Header/QL_CENTER	Updated geometric header for the Level-1B Granules (same information as Level-1A updated for Level-1B Granules).  The Granule centre in the QL display: 1 (r,c) point.	Standard	NO
Geometric_Header/Incidence_Angles	Updated geometric header for the Level-1B Granules (same information as Level-1A updated for Level-1B Granules).	Standard	§ 7.3.2.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

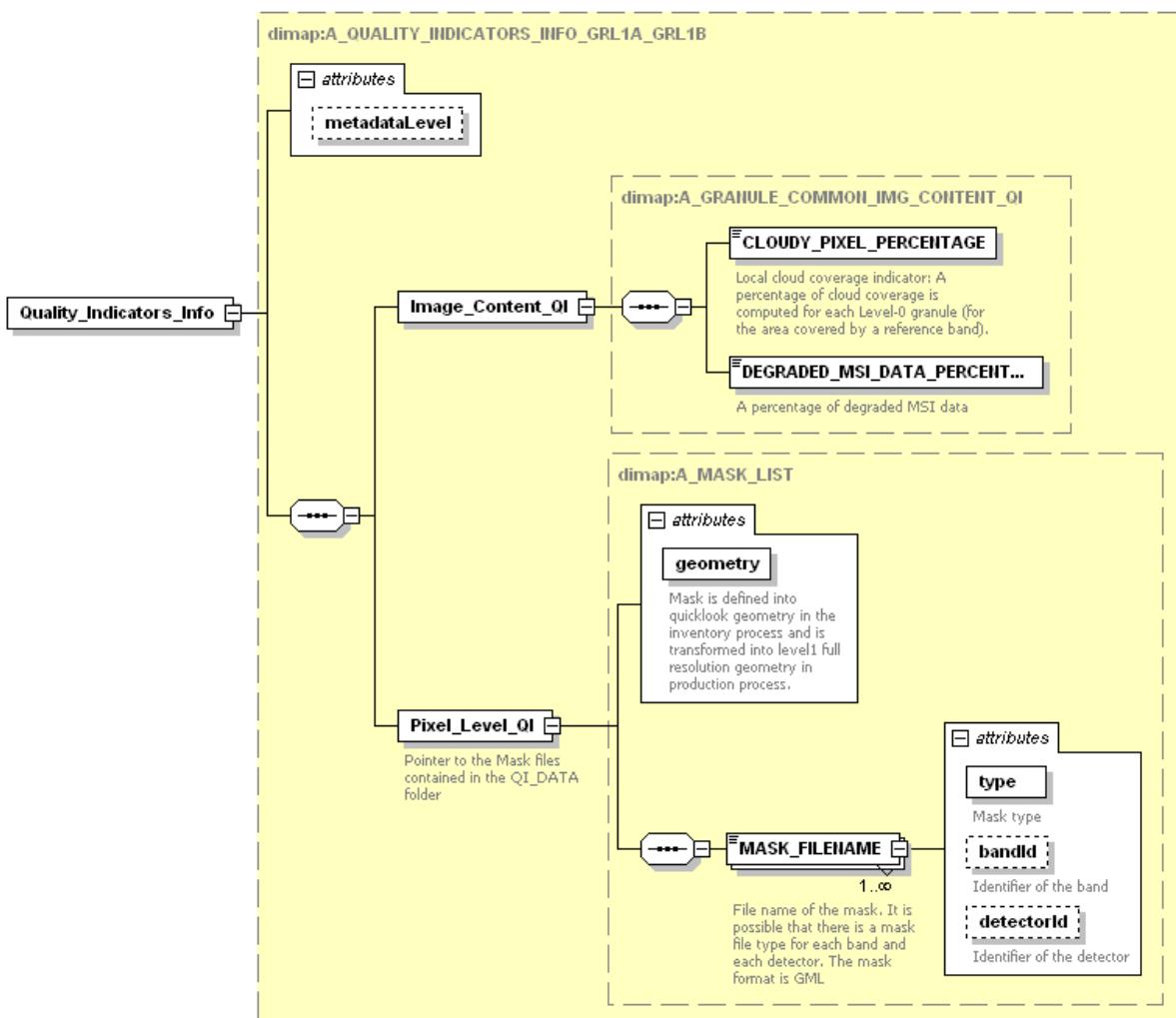
DATE : 12/07/2013

PAGE : 211 / 477

	Information provided for a reference band, at the centre of the Granule, for each Granule. Incidence angles corresponding to the centre of the Granule.		
Geometric_Header/Solar_Angles	Updated geometric header for the Level-1B Granules (same information as Level-1A updated for Level-1B Granules).  Information provided for a reference band, at the centre of the Granule, for each Granule. Solar angles corresponding to the centre of the Granule.	Standard	§ 7.3.2.2
<b>Geometric_Info/Granule_Dimension</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
Size	Granule dimensions provided for each resolution band (10m, 20m and 60m)	Standard	NO

Table 3-49: Level-1B\_Granule\_Metadata\_File - Geometric\_Info Description

The Quality Indicators provided for a PDI Granule L1B are the same provided for L1A.



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 39: Level-1B\_Granule\_Metadata\_File – Quality\_Indicators\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 213 / 477

According to the content of the Table 3-4, the following table describes the Quality Indicators provided for a PDI Granule Level-1B.

Quality_Indicators_Info/Image_Content_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
CLOUDY_PIXEL_PERCENTAGE	Local cloud coverage indicator: A percentage of cloud coverage is computed for each Level-1B Granule (for the area covered by a reference band).	Standard	§ 7.4.2
DEGRADED_MSI_DATA_PERCENTAGE	Local technical quality indicator: A percentage of degraded MSI data is provided for each Level-1B Granule.	Standard	§ 7.4.2
Quality_Indicators_Info/Pixel_Level_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
MASK_FILENAME	Pointer to the mask files contained in the QI_DATA folder: <ul style="list-style-type: none"><li>- Coarse cloud mask files</li><li>- Technical quality mask files</li><li>- Radiometric quality masks</li></ul>	Standard	§ 7.3.2.2

Table 3-50: Level-1B\_Granule\_Metadata\_File – Quality\_Indicators\_Info Description

Note that, according to OLQC procedures consolidation, the results of all quality control checks performed by OLQC processor on Level-1B Granule, are included in the XML reports stored in the QI\_DATA folder (see § 3.4.1, Table 3-17).

### 3.10.3.2 *IMG\_DATA*

diagram	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><b>Image_Files</b></a>
annotation	Folder containing image data compressed using the JPEG2000 algorithm, one file per spectral band (13 files).

### 3.10.3.3 *QI\_DATA*

diagram	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><b>OLQC_Report</b></a> <a href="#"><b>Quality_Masks</b></a>
annotation	QI_DATA folder contains the XML reports including the quality control checks performed by OLQC processor and the GML quality masks. The XSD OLQC_Report is provided in Annex D, the masks files are listed in the Table 3-4.

### 3.10.4 SAFE Manifest synoptic table

The content of the SAFE Manifest for the Level-1B PDI Granule level, is the same as for the Level-1A PDI Granule level (except for a few specific text string in the “processing” section) and can be exhaustively described through Table 3-29, Table 3-41 and Table 3-31.

### 3.11 Level-1B PDI Datastrip definition

Level-1B PDI Datastrip is defined as a **tar** file containing the following structure:

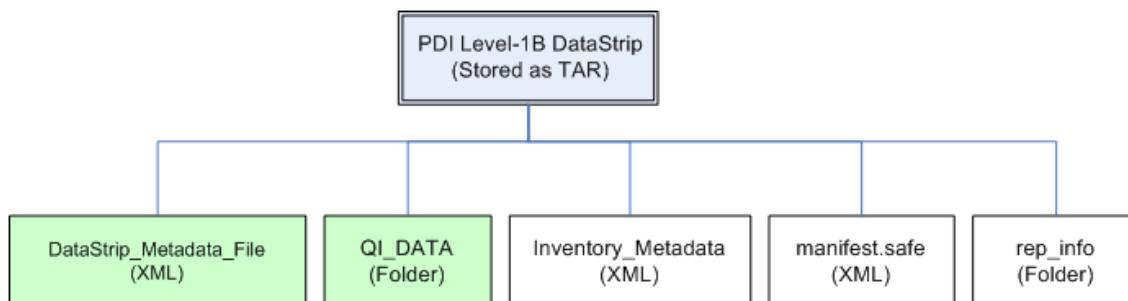


Figure 40: PDI Level-1B Datastrip Structure

The PDI Level-1B Datastrip consist of:

1. **Datastrip\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Datastrip,
2. **QI\_DATA**: folder containing XML reports providing Quality control checks information,
3. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C),
4. **manifest.safe**: XML SAFE Manifest file(mandatory, see section 3.5.4),
5. **rep\_info**: folder containing the available XSD schemas that validate the PDI components (recommended by [SAFE-SPEC], see section 3.5.4).

#### 3.11.1 PDI\_ID definition

Datastrip PDI\_ID (Datastrip ID) is defined in the section 3.5.2. The File\_Type is specified in the section 3.2, Table 3-3.

Level-1B Datastrip Template Name (Datastrip ID):

`S2A_OPER_MS1_L1B_DS_CGS1_20141104T134012_S20141104T134012_N10.10.tar`

Note that the PDI\_ID.tar is the physical name of the Datastrip PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 216 / 477

### 3.11.2 Level-1B Datastrip Physical Format

The PDI ID defined above represents the “Datastrip directory” name. Inside the Datastrip directory, there are the Datastrip components as in the Figure 40:

Inside that directory, the naming convention used to identify each real files follows the same convention used for define the Datastrip ID but without the Processing Baseline sub-string.

- **Datastrip\_Metadata\_File (XML file):**

Datastrip\_Metadata\_File template name:

*S2A\_OPER\_MTD\_L1B\_DS\_CGS1\_20141104T134012\_S20141104T134012.xml*

The XSD schema which regulates the metadata file is *S2\_PDI\_Level-1B\_Datastrip\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **QI\_DATA (folder):**

QI\_DATA folder contains:

– XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex C of the document.

File Template Name:

*S2A\_OPER\_MS1\_L1B\_DS\_CGS1\_20141104T134012\_S20141104T134012\_GEOMETRIC\_QUALITY\_report.xml*

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. *S2\_PDI\_Level-1B\_Datastrip\_Metadata.xsd*
2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-1B Datastrip Physical Format template:

Level-1B Datastrip PDI_ID: <b>S2A_OPER_MS1_L1B_DS_CGS1_20141104T134012_S20141106T134012_N10.10</b>	
	<i>Inventory_Metadata.xml</i>
	<i>S2A_OPER_MTD_L1B_DS_CGS1_20141104T134012_S20141104T134012.xml</i>
	<i>manifest.safe</i>
	<i>QI_DATA</i>

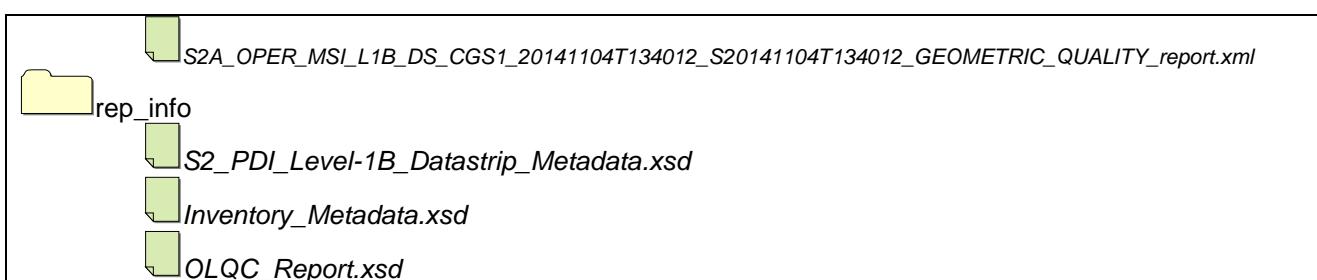
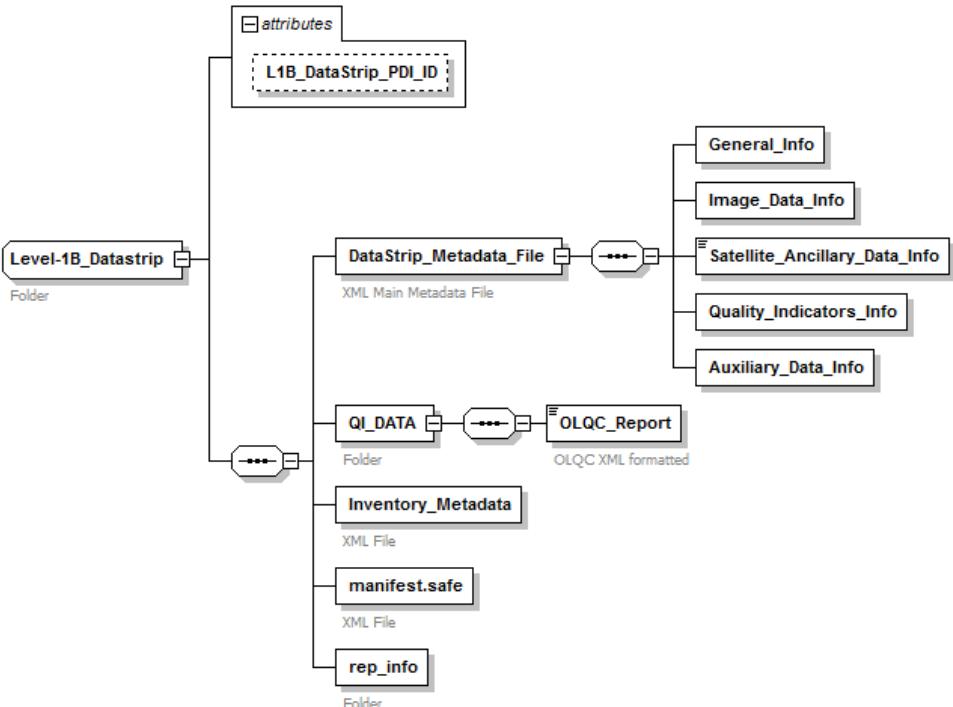


Figure 41: PDI Level-1B Datastrip Physical Format

### 3.11.3 Level-1B PDI Datastrip Structure

The *S2\_PDI\_Level-1B\_Datastrip\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1B Datastrip PDI on. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 40.

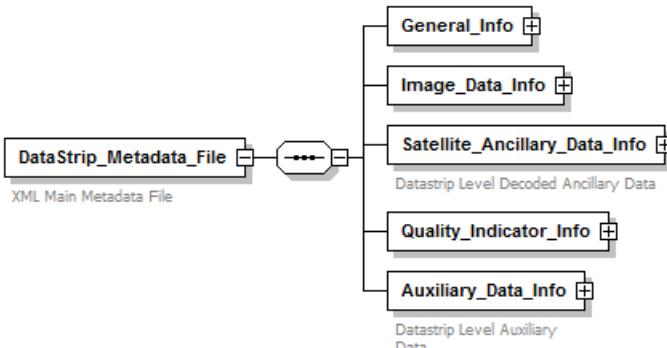
diagram	 <pre> classDiagram     class Level1B_DataStrip {         attributes         L1B_DataStrip_PDI_ID     }     class DataStrip_Metadata_File {         XML_Main_Metadata_File     }     class QI_DATA {         Folder     }     class OLQC_Report {         OLQC_XML_formatted     }     class Inventory_Metadata {         XML_File     }     class manifest.safe {         XML_File     }     class rep_info {         Folder     }      Level1B_DataStrip "1..1" --&gt; "1..1" DataStrip_Metadata_File     DataStrip_Metadata_File "*" --&gt; "1..1" General_Info     DataStrip_Metadata_File "*" --&gt; "1..1" Image_Data_Info     DataStrip_Metadata_File "*" --&gt; "1..1" Satellite_Ancillary_Data_Info     DataStrip_Metadata_File "*" --&gt; "1..1" Quality_Indicators_Info     DataStrip_Metadata_File "*" --&gt; "1..1" Auxiliary_Data_Info     Level1B_DataStrip "*" --&gt; "1..1" QI_DATA     QI_DATA "*" --&gt; "1..1" OLQC_Report     QI_DATA "*" --&gt; "1..1" Inventory_Metadata     QI_DATA "*" --&gt; "1..1" manifest.safe     QI_DATA "*" --&gt; "1..1" rep_info   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">Datastrip_Metadata_File</a> <a href="#">QI_DATA</a> <a href="#">Inventory_Metadata</a> <a href="#">manifest.safe</a> <a href="#">rep_info</a>
annotation	<p>The Level-1B PDI Datastrip is defined as a folder containing:</p> <ol style="list-style-type: none"> <li>1. <b>Datastrip_Metadata_File</b>: XML Main Metadata File containing the requested level of</li> </ol>

- information and referring all the PDI elements (SAFE formatted).
2. **QI\_DATA**: folder containing XML reports with the product quality Indicators.
  3. **Inventory\_Metadata**: XML inventory metadata file.
  4. **manifest.safe**: XML SAFE Manifest file
  5. **rep\_info**: folder containing the XSD schema provided inside a SAFE Level-0 Granule

Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

### 3.11.3.1 Datastrip\_Metadata\_File Schema

Level-1B Datastrip\_Metadata\_File is the XML metadata file provided inside each Level-1B Datastrip. The schema used to validate it is *S2\_PDI\_Level-0\_Datastrip\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

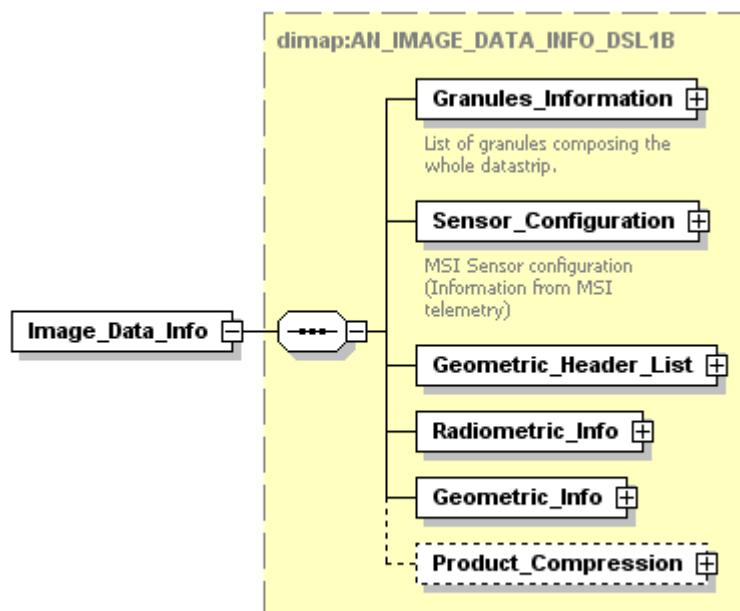
diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">General_Info</a> <a href="#">Image_Data_Info</a> <a href="#">Satellite_Ancillary_Data_Info</a> <a href="#">Quality_Indicator_Info</a> <a href="#">Auxiliary_Data_Info</a></p>
annotation	<p>The structure of the Datastrip_Metadata_File is common to all processing level (cfr. § 3.5.1)</p> <p>The Datastrip_Metadata_File is an XML file containing all the metadata describing the whole product data item.</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: This group of metadata provide general information characterizing the source Datastrip acquisition.</li> <li>2. <b>Image_Data_Info</b>: Image data information from MSI telemetry.</li> <li>3. <b>Satellite_Ancillary_Data_Info</b>: Ancillary data information from Satellite Ancillary Telemetry.</li> <li>4. <b>Quality_Indicator_Info</b>: Results of all quality checks performed at Datastrip level.</li> <li>5. <b>Auxiliary_Data_Info</b>: Auxiliary data information.</li> </ol>

The following tables and figures give a complete overview of the Level-1B Datastrip\_Metadata\_File schema according the description provided in the section 3.5.1.

General\_Info:

The General\_Info provided through the Level-1B DataSrip\_Metadata\_File are the same described in the Figure 18 and Table 3-32.

Image\_Data\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 42 : Level-1B Datastrip – Image\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 220 / 477

Image_Data_Info/Granules_Information			
Field Name	Description	Metatada Level	Check vs [PDD]
/Detector_List/.../POSITION	This branch of the schema provides information regarding all Granules, for each detector, composing the whole Datastrip. Each Granule composing the Datastrip is univocally identified through a unique Granule identifier (PDI_ID at granul level). For each Granule the Position of the Granule is provided. This position is identified through the position of the scenes first lines in the Datastrip and is expressed as number of 10m resolution images lines.	Standard	MISSING
Image_Data_Info/Sensor_Configuration (inherited from Level-0 metadata)			
Field Name	Description	Metatada Level	Check vs [PDD]
Acquisition_Configuration/COMPRESS_MODE	Flag to indicate if compress mode is by passed	Expertise	§ 7.3.1.3
Acquisition_Configuration/EQUALIZATION_MODE	Flag to indicate if equalization is active	Expertise	§ 7.3.1.3
Acquisition_Configuration/NUC_TABLE_ID	In-flight Non Uniform Correction table ID defined by 10 bits. This ID is uniform for all transmitted bands. It identifies the correction coefficients table used in-flight	Expertise	§ 7.3.1.3
Acquisition_Configuration/Active_Detectors_List	On board active Detectors (in case of compression by-passed)	Expertise	§ 7.3.1.3
Acquisition_Configuration/ TDI_Configuration_List	On board TDI configuration, for B3, B4, B11 and B12 only.	Standard	§ 7.3.1.2
Acquisition_Configuration/Spectral_Band_Info/PHYSICAL_GAIN	Physical Gain for each band	Standard	§ 7.3.1.2
Acquisition_Configuration/Spectral_Band_Info/COMPRESSION_RATE	On-board compression rates for each band	Expertise	§ 7.3.1.3
Acquisition_Configuration/Spectral_Band_Info/INTEGRATION_TIME	On-board integration time for each band	Expertise	§ 7.3.1.3
Source_Packet_Description	Source packet information for each band	Standard	§ 7.3.1.2



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 221 / 477

Time_Stamp/LINE_PERIOD	Line period for the acquisition of line of 10 m full-resolution image data	Standard	§ 7.3.1.2
Time_Stamp/Band_Time_Stamp/Detector	Datation model for each couple band, detector.	Standard	§ 7.3.1.2
Time_Stamp/GPS_SYNC	Flag (Boolean) to indicate if MSI is synchronize with GPS time	Standard	§ 7.3.1.2
Time_Stamp/THEORETICAL_LINE_PERIOD	Theoretical line period for the acquisition of line of 10 m full-resolution image data	Standard	§ 7.3.1.2
Time_Stamp/Quality_Indicators	Optional. Created when datation models are estimated through linear regression.	Standard	§ 7.3.1.2
<b>Image_Data_Info/Geometric_Header_List</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
Geometric_Header_List	Geometric information  For all details see Table 3-33, section "Image_Data_Info/Geometric_Header_List"	Standard Expertise	§ 7.3.1.2 § 7.3.1.3
<b>Image_Data_Info/Radiometric_Info</b>			
Field Name	Description	Metatada Level	Check vs [PDD]
SWIR_REARRANGEMENT_PROC	SWIR pixels re-arrangement (only for level 1A production but SWIR rearrangement information shall be preserved in L1B and L1C): A 'true' value indicates that data extraction and SWIR pixels re-arrangement have been processed.	Standard	§ 7.3.1.2
Equalization	On ground equalization of the image using an optimized polynominal correction (only for level 1B production)	Standard	§ 7.3.1.3
CROSSTALK_OPTICAL_PROC	Optical crosstalk correction (only for level 1B production). A 'true' value indicates that optical crosstalk correction has been processed.	Standard	MISSING
CROSSTALK_ELECTRONIC_PROC	Electronic crosstalk correction (only for level 1B	Standard	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 222 / 477

	production). A 'true' value indicates that electronic crosstalk correction has been processed.		
REMOVE_BLIND_PIXELS_PROC	Blind pixel remonving (only for level 1B production). A 'true' value indicates that Blind pixel remonving has been processed.	Standard	MISSING
DEFECTIVE_PIXELS_PROC	Defective pixels processing. A 'true' value indicates that defective pixels have been detected and processed, a 'detection" value indicates that defective pixels have been only detected (only for level 1A production), a 'false" value indicates that defective pixels have been neither detected nor processed.	Standard	MISSING
Restoration	Restoration and levelling of the product to 12 bits (only for level 1B production)	Standard	§ 7.3.1.3
BINNING_PROC	Binning for 60m bands (only for level 1B production). A 'true' value indicates that binning for 60m bands has been processed.	Standard	MISSING
PIXELS_NO_DATA_PROC	Management of NO_DATA pixels. A 'true' value indicates that NO_DATA pixels have been detected and processed, a 'detection" value indicates that NO_DATA pixels have been only detected (only for level 1A production), a 'false" value indicates that NO_DATA pixels have been neither detected nor processed.	Standard	MISSING
SATURATED_PIXELS_PROC	Management of saturated pixels. A 'true' value indicates that saturated pixels has been processed.	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/RESOLUTION	(OPTIONAL BRANCH)  Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION	Standard	MISSING



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 223 / 477

	Spatial resolution		
Spectral_Information_List/Spectral_Informatio/Wavelength/MIN	Minimum wavelenght	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Wavelength/MAX	Maximum wavelenght	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Wavelength/CENTRAL	Central wavelenght	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Spectral_Response/STEP	Step of spectral response	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Spectral_Response/VALUES	List of measures	Standard	MISSING
Image_Display_Order/RED_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 7.3.1.1
Image_Display_Order/GREEN_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 7.3.1.1
Image_Display_Order/BLUE_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 7.3.1.1

## Image\_Data\_Info/Geometric\_Info

Field Name	Description	Metatada Level	Check vs [PDD]
RGM	Flag to identify if the Refined Geometric Model File is computed or obtained from a existing RGMF (reused)	Standard	§ 7.3.1.2
Image_Refining	Refining results. Should exist only if REFINING_TYPE= REFINING or REFINING_REGISTRATION	Standard	§ 7.3.1.2
VNIR_SWIR_Registration	Registration results. Should exist only if REFINING_TYPE= REGISTRATION or REFINING_REGISTRATION	Standard	§ 7.3.1.2
Refined_Corrections_List	Description of the refined corrections. If the refining has been processed by Datastrip then, there are the refined corrections for each Datastrip. These data are created by Geo_S2.	Standard	§ 7.3.1.2

## Image\_Data\_Info/Product\_Compression (OPTIONAL BRANCH)

Field Name	Description	Metatada Level	Check vs [PDD]
COMPRESSION	Product Compression.	Standard	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 224 / 477

The compression may be:

- None.
- LOSSLESS: Lossless compression, use reversible JPEG2000 compression.
- LOSSY: Lossy compression, use compression that ensures that JPEG2000 compression has a negligible effect on image quality.

Table 3-51: Level-1B Datastrip – Image\_Data\_Info Description

Satellite\_Ancillary\_Data\_Info:

The Satellite\_Ancillary\_Data\_Info are the same provided with a L0 Datastrip (cfr. Figure 20 and Table 3-34)

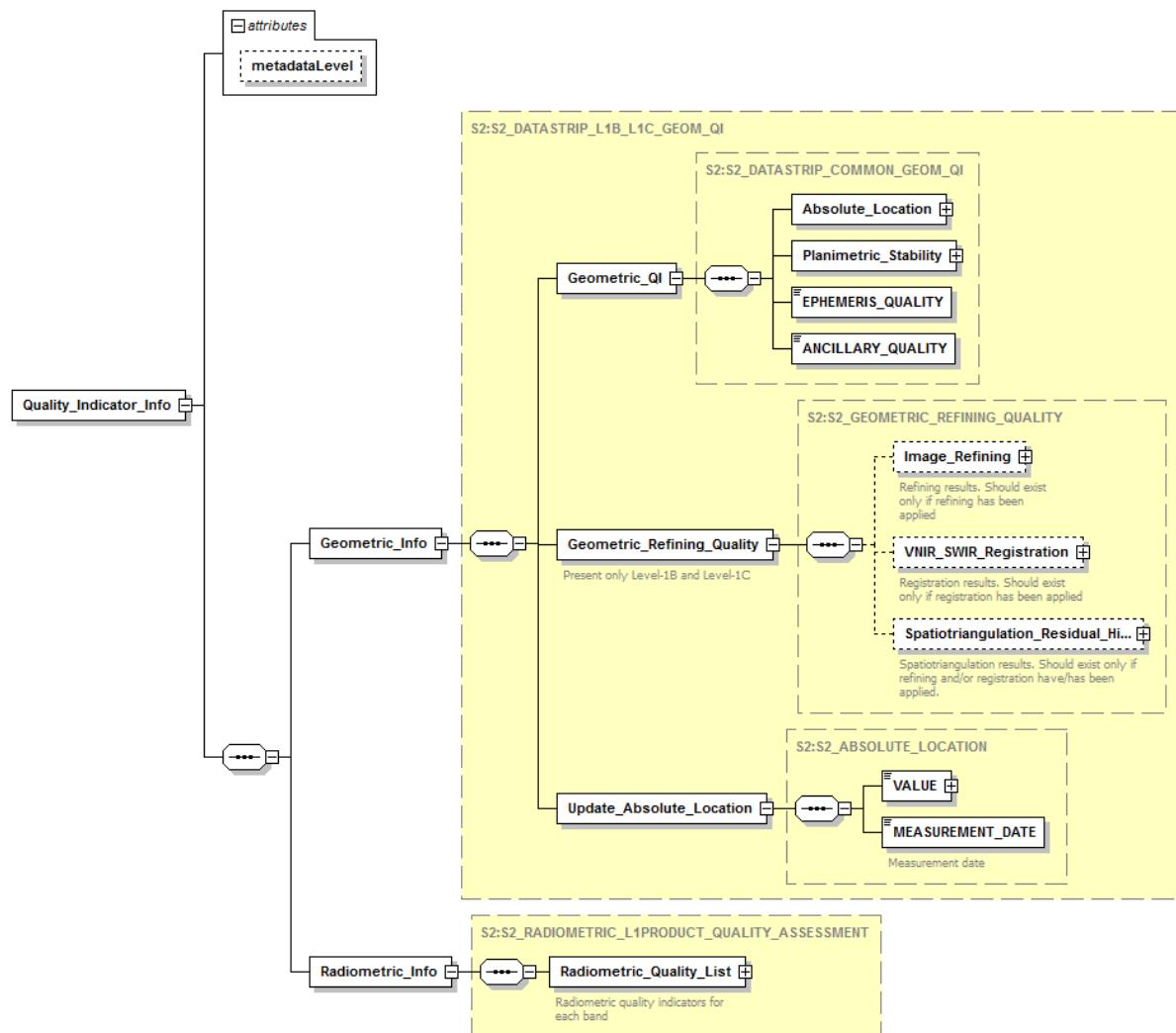


Figure 43: Level-1B Datastrip – Quality\_Indicator\_Info Diagram

Generated by XMLSpy

[www.altova.com](http://www.altova.com)



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 226 / 477

### Quality Indicators Info:

Quality_Indicator_Info/Geometric_Info			
Field Name	Description	Metadata Level	[PDD]
Geometric_QI/Absolute_Location	Absolute location performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 7.4.1
Geometric_QI/Planimetric_Stability	A planimetric stability performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 7.4.1
Geometric_QI/EPHEMERIS_QUALITY	Ephemeris data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 7.4.1
Geometric_QI/ANCILLARY_QUALITY	Ancillary data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 7.4.1
Geometric_Refining_Quality	Available by Datastrip and only if geometric refining is applied. Include Multi_Spectral_Registration performance (3 values for 10, 20 and 60m bands (from GIPP data).	Brief	§ 7.4.1
Update_Absolute_Location	From GIPP data	Brief	§ 7.4.1
Quality_Indicator_Info/Radiometric_Info			
Field Name	Description	Metadata Level	[PDD]



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 227 / 477

Noise_Model	Alpha and Beta parameters providing the instrument noise as a function of the radiometric count X for Level-1B : Noise= square root(Alpha_X + Beta_X* X)	Brief	§ 7.4.1
ABSOLUTE_CALIBRATION_ACCURACY	Absolute calibration accuracy provided as a percentage of accuracy	Brief	§ 7.4.1
CROSS_BAND_CALIBRATION_ACCURACY	Cross-band calibration accuracy provided as a percentage of accuracy	Brief	§ 7.4.1
MULTI_TEMPORAL_CALIBRATION_ACCURACY	Multi-temporal calibration accuracy provided as a percentage of accuracy	Brief	§ 7.4.1

Table 3-52: Level-1B Datastrip – Quality\_Indicator\_Info Description



# Sentinel-2 Products Specification Document

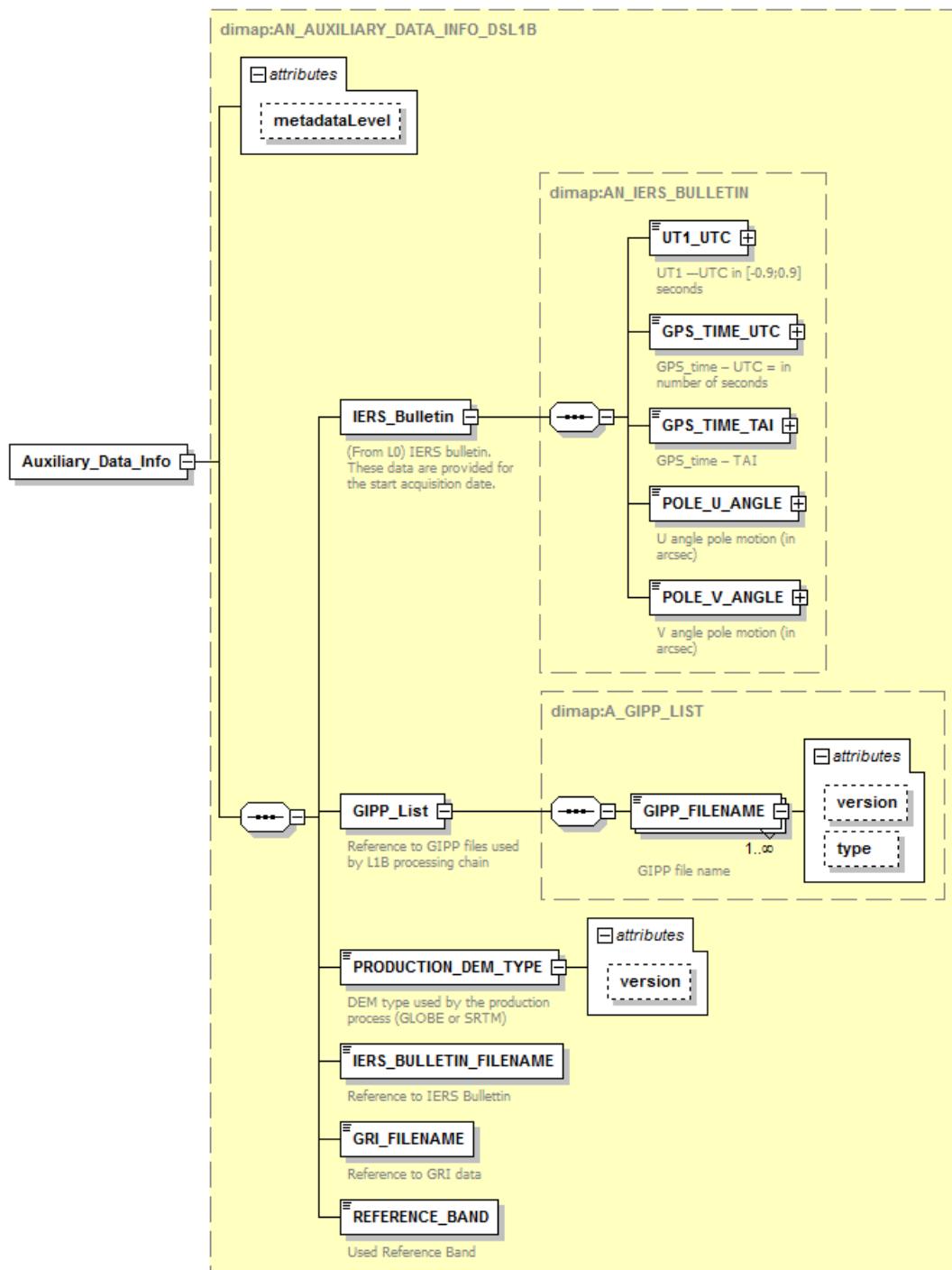
REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 228 / 477

Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 44 : Level-1B Datastrip – Auxiliary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

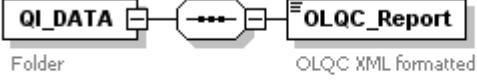
DATE : 12/07/2013

PAGE : 230 / 477

Auxiliary_Data_Info/IERS_Bulletin (aux info from Level-1A)			
Field Name	Description	Metadata Level	Check vs [PDD]
UT1_UTC	UT1 --UTC in [-0.9;0.9] seconds	Standard	§ 7.3.1.2
GPS_TIME_UTC	GPS_time – UTC = in number of seconds	Standard	§ 7.3.1.2
GPS_TIME_TAI	GPS_time – TAI	Standard	§ 7.3.1.2
POLE_U_ANGLE	U angle pole motion (in arcsec)	Standard	§ 7.3.1.2
POLE_V_ANGLE	V angle pole motion (in arcsec)	Standard	§ 7.3.1.2
Auxiliary_Data_Info (aux data used by the processing)			
Field Name	Description	Metadata Level	Check vs [PDD]
GIPP_Filename	Reference to the GIPP files used by the L1B processing.	Standard	§ 7.3.1.2
PRODUCTION_DEM_TYPE	DEM type used by the production process (GLOBE or SRTM)	Standard	§ 7.3.1.2
IERS_BULLETIN_FILENAME	Reference to the used IERS Bulletin	Standard	MISSING
GRI_FILENAME	Reference to the used GRI data	Standard	§ 7.3.1.2
Auxiliary_Data_Info (others aux info)			
Field Name	Description	Metadata Level	Check vs [PDD]
REFERENCE_BAND	Used reference band	Standard	§ 7.3.1.2

Table 3-53: Level-1B Datastrip – Auxiliary\_Data\_Info Description

### 3.11.3.2 QI\_DATA

diagram	 <p>QI_DATA Folder → OLQC_Report OLQC XML formatted</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">OLQC_Report</a>
annotation	<p>QI_DATA folder contains:</p> <ul style="list-style-type: none"> <li>- XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The XSD OLQC_Report in Annex D is provided.</li> </ul>

### 3.11.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1B PDI Datastrip level.

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-1B\_Datastrip.xsd”);
  - a brief textual description of the field;



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 232 / 477

- the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
- the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
- the allowed range of values of the field.

In particular, the satellite ancillary data files (e.g. the SAD Raw Data file) and the auxiliary data files used for Level-1B processing (e.g. GIPP files, DEM, IERS Bulletin), are external to the product and are referenced in the Metadata of Manifest file Section (as “resources” in the “processing” section).

- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-1B PDI Product (with the exception of the Manifest file itself); this includes:
  - the XML Metadata file;
  - the XML Inventory\_Metadata file;
  - a set of Quality Indicator Data Files, including a OLQC Report file (XML format) and a Preliminary Quick Look file (JPEG2000 format).

A practical example of Manifest file for the Level-1B PDI Datastrip Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 233 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->Datatake_Info->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	General_Info->Datatake_Info->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode
	instrument->mode->identifier	General_Info->Datatake_Info->	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 234 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		DATATAKE_TYPE				INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1B Datastrip Product
	<b>start</b>	General_Info->Archiving_Info->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info->ARCHIVING_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 235 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1B Datastrip Product
	resource-> processing		Description of the L1A to L1B Processing		0..*	
	resource-> processing-> <b>name</b>		Name of the L1A to L1B Processing	string	0..1	Processing of Level-1A Datastrip product
	resource-> processing-> <b>start</b>	General_Info->Processing_Info->Datastrip_Generation_Info->Processing_Step->UTC_DATE_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing-> facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing-> facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing-> facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing-> facility-> <b>site</b>	General_Info->Processing_Info->Datastrip_Generation_Info->PROCESSING_CENTER	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC, SVLB, MASP, MATA



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 236 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource-> processing-> facility->software		Description of software component used for Processing		0..*	
	resource-> processing-> facility->software-> <b>name</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE	Name of the software component	string	1	
	resource-> processing-> facility->software-> <b>version</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE->version	Version of the software component	string	0..1	
	resource-> processing-> facility->resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc.) and of SAD Raw Data file containing the satellite ancillary telemetry; these files are not provided with the product.		0..*	
	resource-> processing-> facility->resource-> <b>name</b>	Satellite_Ancillary_Data_Info-> ANC_DATA_REF (reference to the single SAD Raw Data file)	Absolute path name of the auxiliary or ancillary file	string	1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 237 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		Auxiliary_Data_Info->IERS_Bulletin				
		Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME				
	resource-> processing->facility->resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod ->startTime	Datastrip->L1B_Datastrip_PDI_ID (substring <Sensing Time>, see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line of the PDI at Datastrip level, see section 3.6.1)	xs:dateTime	1	
measurementOrbitReference						
	orbitNumber	General_Info->Datatake_Info->DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber-> <b>type</b>	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the		0..1	start



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 238 / 477

SAFE Manifest		From S2_PDI_Level-0_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			Datastrip			
	orbitNumber-> <b>groundTrackDirection</b>	General_Info->Datatake_Info-> SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	> General_Info->Datatake_Info-> SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..4	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 239 / 477

Table 3-54 - Content of Metadata Section for PDI Level-1B Datastrip SAFE Manifest

### 3.12 Level-1C PDI Tile definition

Level-1C PDI Tile level is defined as a **tar** file with the following structure:

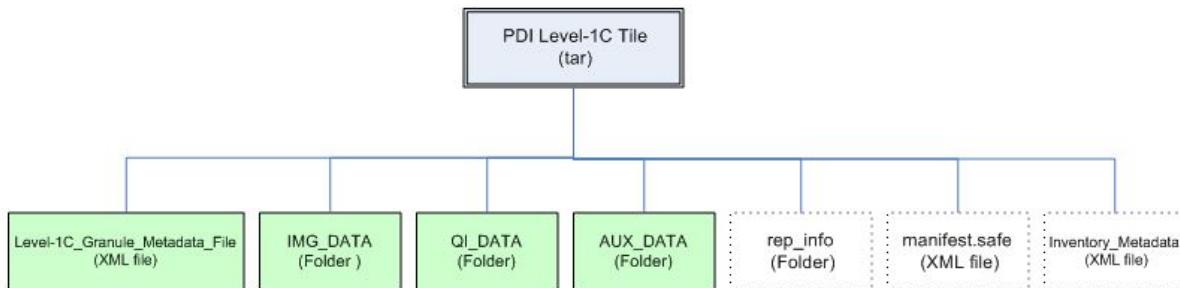


Figure 45: PDI Level-1C Tile Structure

The PDI Level-1C Tile consist of:

1. **Level-1C\_Tile\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Tile,
2. **IMG\_DATA**: folder containing image data files compressed using the JPEG2000 algorithm, one file per band.
3. **QI\_DATA**: folder containing OLQC XML reports of quality checks, mask files and PVI file;
4. **AUX\_DATA**: folder containing ECMWF data resampled in UTM projection;
5. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C);
6. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.12.4);
7. **rep\_info**: folder containing the available XSD schema that validate the PDI components (recommended by [SAFE-SPEC], see section 3.4.4).

#### 3.12.1 PDI\_ID definition

The PDI\_ID (Tile ID) used to identify a Level-1C Tile PDI, follows the description provided in the section 3.4.2. File\_Type is defined in the section 3.2, Table 3-3.

Level-1C Tile template name (Tile ID):

S2A\_OPER\_MSIL1C\_TL\_CGS3\_20141104T134012\_A123456\_T15SWC\_N11.11.tar

Note that the PDI\_ID.tar is the physical name of the Tile PDI after the tar compression.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 241 / 477

### 3.12.2 Level-1C Tile Physical Format

The PDI ID defined above represents the “Tile directory” name. Inside the Tile directory, there are the Tile components as in the Figure 45:

Inside that directory, the naming convention used to identify each real files, follows the same convention used in the section 3.12.1 (and US-MGRS naming convention as in section 4.9.2) to define the Tile ID but without the Processing Baseline sub-string.

- **Level-1C\_Tile\_Metadata\_File (XML file):**

Tile Metadata File Template:

*S2A\_OPER\_MTD\_L1C\_TL\_CGS3\_20141104T134012\_A123456\_T15SWC.xml*

The XSD schema which regulates the metadata file is the *S2\_PDI\_Level-1C\_Tile\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **IMG\_DATA (folder):**

The naming convention used to identify the image files contained in the IMG\_DATA folder is defined hereafter:

Image File naming convention = <PDI\_ID\*>\_<Band\_Index>.jp2

where:

Field Name	Value/Meaning	Note
<i>PDI_ID</i>	PDI_ID without Processing Baseline sub-string	
<i>Band Index</i>	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	Field identifying the spectral bands

IMA\_DATA/Level-1C image file template name:

*S2A\_OPER\_MS1\_L1C\_TL\_CGS3\_20141104T134012\_A123456\_T15SWC\_B03.jp2*

- **QI\_DATA (folder):**

QI\_DATA folder contains:

- XML reports OLQC\_Report.xml generated by On-Line Quality Control processor, including Quality Control Checks results. The OLQC\_Report.xsd schema and the reports naming convention are in the Annex D of the document.
- Quality\_Masks (one for each type, GML/JPEG2000). The naming convention is defined below.
- PVI Preview Image file provided in ground geometry. The preview image is a single file in JPEG2000 format with GML geo-location information; it contains 3 visible-bands (490nm, 560nm, 665nm) in ground geometry at 320m resolution and in display order (RGB).



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 242 / 477

Mask files naming convention = MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>.gml

L1C masks main file types (TTTTTTTTT) are in the Table 3-16 and listed again hereafter

1. MSK\_CLOUDS (Finer cloud mask files)
2. MSK\_TECQUA (Technical quality mask files)
3. MSK\_LANWAT (Land/Water mask files)
4. MSK\_DETFOO (Detector footprint mask files)
5. MSK\_DEFECT (Radiometric quality masks)
6. MSK\_SATURA (Radiometric quality masks)
7. MSK\_NODATA (Radiometric quality masks)

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Abs Orbit>\_<Tile>\_<Band ID><Product\_Type>

Where <Site Centre>, <Creation Date>, <Abs Orbit> and <Tile> are inherited from the L1C Tile ID, <Product Type> = “MSIL1C” and <Band ID>:

Band ID	Bxx where:  xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12 xx = 00 for mask file band independent
---------	---

Template masks filename are:

S2A\_OPER\_MSK\_CLOUDS\_CGS3\_20141104T134012\_A123456\_T15SWC\_B03\_MSIL1C.gml  
S2A\_OPER\_MSK\_LANWAT\_CGS3\_20141104T134012\_A123456\_T15SWC\_B03\_MSIL1C.gml

The grouping strategy to have several masks in one physical GML file is described in the Annex F.

- **AUX\_DATA (folder):**

This folder contains ECMWF data in UTM projection (single file in GRIB V1 format).  
The naming convention is the same defined for ECMWF PDI with file type “AUX\_ECMWF”

Template name:

S2A\_OPER\_AUX\_ECMWF\_PDMC\_YYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_YYYYMMDDTHHMMSS

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **manifest.safe (XML file):**

XML file with fixed name *manifest.safe*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. S2\_PDI\_Level-1C\_Tile\_Metadata.xsd



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 243 / 477

2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-1C Tile Physical Format template:

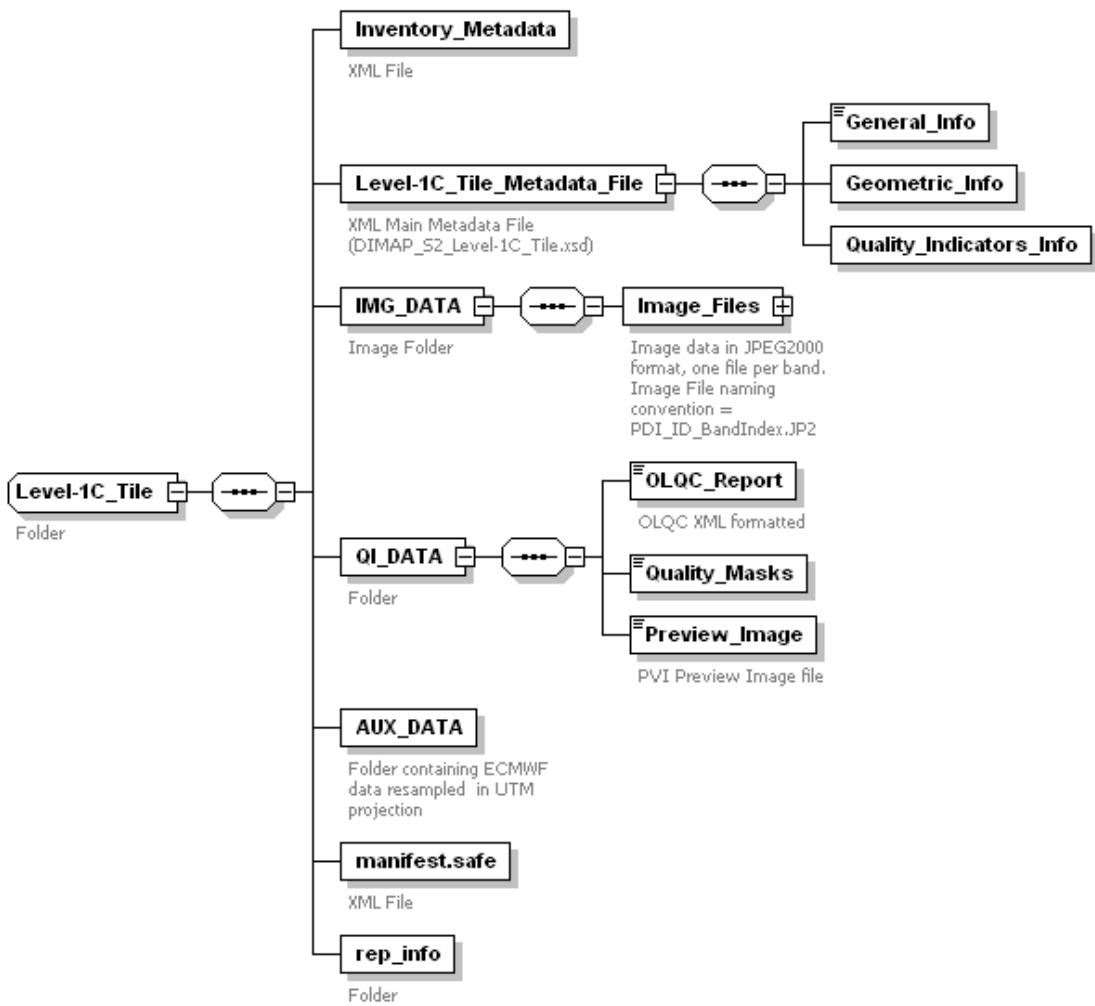
Level-1C Tile PDI_ID: <b>S2A_OPER_MSI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_N11.11</b>	
	<i>Inventory_Metadata.xml</i>
	<i>S2A_OPER_MTD_L1C_TL_CGS3_20141104T134012_A123456_T15SWC.xml</i>
	<i>manifest.safe</i>
	<i>IMG_DATA</i>
	<i>S2A_OPER_MSI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_B01.JPG</i>
	<i>S2A_OPER_MSI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_B02.jp2</i>
.	.
	<i>S2A_OPER_MSI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_B12.jp2</i>
	<i>QI_DATA</i>
	<i>S2A_OPER_MSI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_GEOMETRIC_QUALITY_report.xml</i>
	<i>S2A_OPER_MSK_CLOUDS_CGS3_20141104T134012_A123456_T15SWC_B03_MSIL1C.gml</i>
.	.
	<i>S2A_OPER_MSK_LANWAT_CGS3_20141104T134012_A123456_T15SWC_B03_MSIL1C.gml</i>
	<i>S2A_OPER_PVI_L1C_TL_CGS3_20141104T134012_A123456_T15SWC.xml</i>
	<i>AUX_DATA</i>
	<i>S2A_OPER_AUX_ECMWF_PDMC_YYYYMMDDTHHMMSS_VYYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS</i>
	<i>rep_info</i>
	<i>S2_PDI_Level-1B_Tile_Metadata.xsd</i>
	<i>Inventory_Metadata.xsd</i>
	<i>OLQC_Report.xsd</i>

Figure 46: PDI Level-1C Tile Physical Format

### 3.12.3 Level-1C PDI Tile Structure

The *S2\_PDI\_Level-1C\_Tile\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1C Tile PDI on disk. This schema is provided for information only as it is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 45.

diagram



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

children

[Level-1C\\_Tile\\_Metadata\\_File](#) [IMG\\_DATA](#) [QI\\_DATA](#) [AUX\\_DATA](#) [Inventory\\_Metadata](#) [manifest.safe](#) [rep\\_info](#)

annotation

The Level-1C Tile is defined as a folder containing:

1. **Level-1C\_Tile\_Metadata\_File**: XML main metadata file describing the Granule.
2. **IMG\_DATA**: Folder containing Image data in GML JPEG2000 format, one file per band.
3. **QI\_DATA**: Folder containing XML reports and Quality Masks, Preview Image;



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

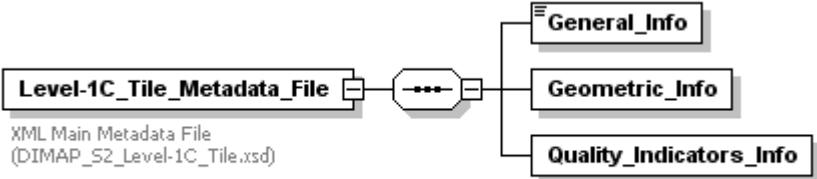
PAGE : 245 / 477

4. **AUX\_DATA**: Folder containing ECMWF data resampled in UTM projection.
5. **Inventory\_Metadata**: XML inventory metadata file
6. **manifest.safe**: XML SAFE Manifest file
7. **rep\_info**: folder containing the XSD schema provided inside a SAFE Level-1C Tile

Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

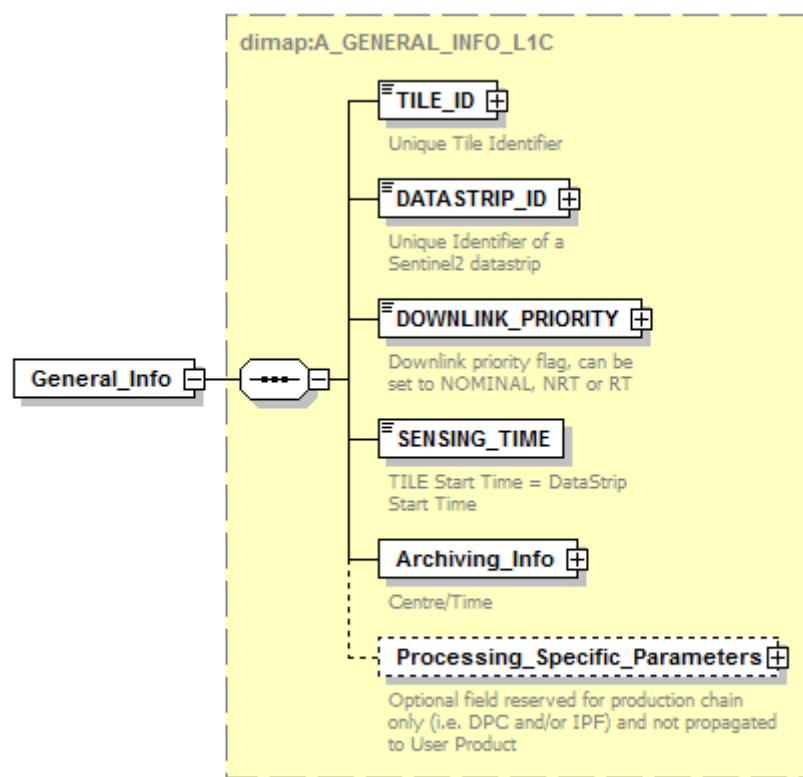
### 3.12.3.1 Level-1C\_Tile\_Metadata\_File Schema

Level-1C\_Tile\_Metadata\_File is the XML metadata file provided inside each Level-1C Tile. The schema used to validate it is the *S2\_PDI\_Level-1B\_Tile\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Level1CTileMetadataFile {         &lt;&lt;XML Main Metadata File (DIMAP_S2_Level-1C_Tile.xsd)&gt;&gt;     }     class GeneralInfo     class GeometricInfo     class QualityIndicatorsInfo      Level1CTileMetadataFile "1" -- "*" GeneralInfo     Level1CTileMetadataFile "1" -- "*" GeometricInfo     Level1CTileMetadataFile "1" -- "*" QualityIndicatorsInfo   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a>
annotation	<p>The Level-1C_Tile_Metadata_File is an XML file containing metadata regarding:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: this group of metadata provides general information regarding the Granule.</li> <li>2. <b>Geometric_Info</b>: these metadata provide information describing the geolocation of the Granule.</li> <li>3. <b>Quality_Indicators_Info</b>: this metadata values provide information about image content quality indicators and quality control checks information.</li> </ol>

The following figures and tables give a complete overview of the Level-1C\_Tile\_Metadata\_File schema according the description provided in the section 3.4.1.

#### General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 47: Level-1C\_Tile\_Metadata\_File - General\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

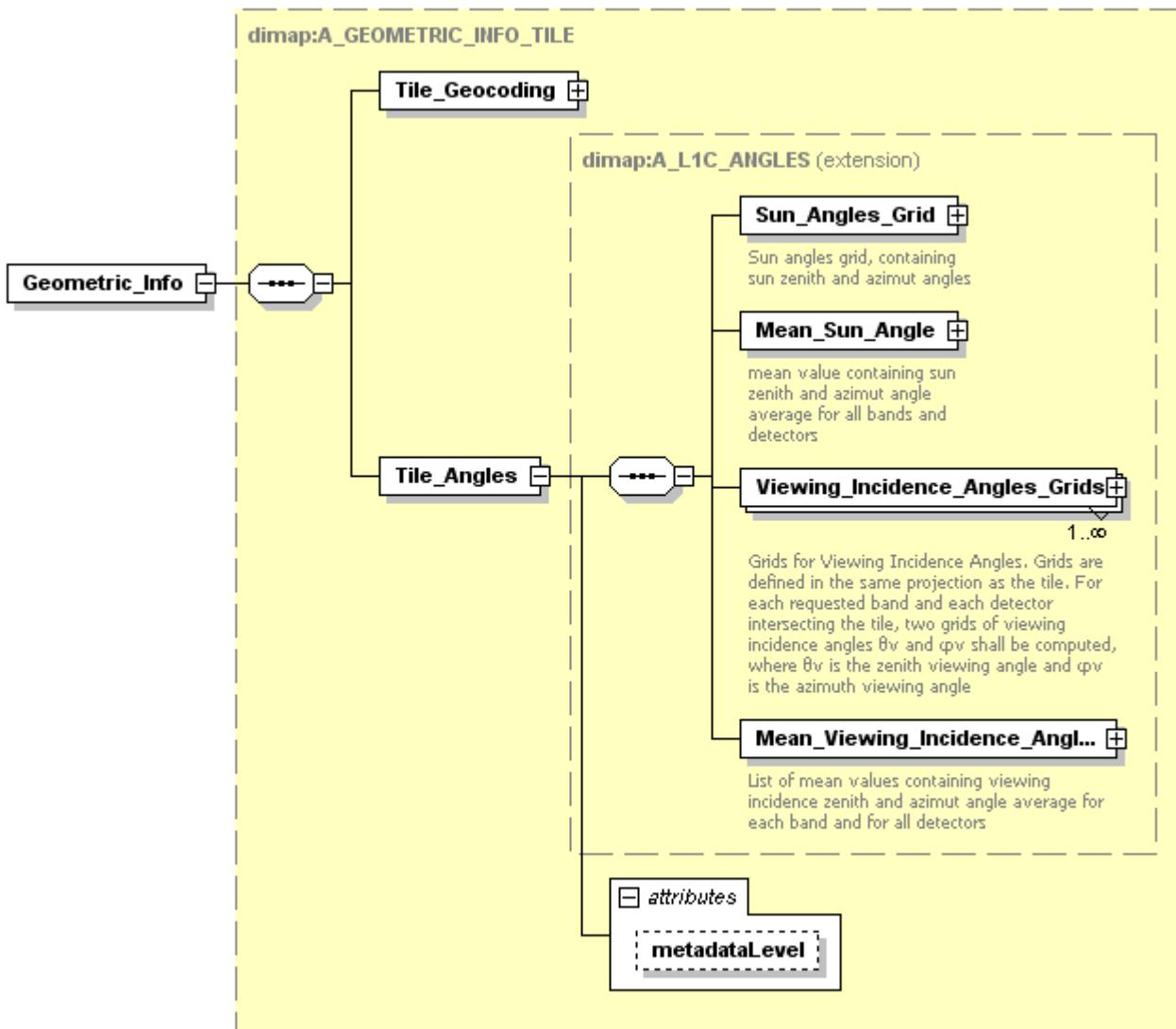
ISSUE : 10

DATE : 12/07/2013

PAGE : 248 / 477

General_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
TILE_ID	TILE identifier (PDI_ID) defined in section 3.12.1 .	Brief	§ 8.3.2.1
DATASTRIP_ID	Unique identifier of the L1C PDI Datastrip linked to the L1C PDI Tile. This parameter coincides with the PDI_ID of the PDI Datastrp linked to the Tile. This link establishes the hierarchy Tile vs Datastrip.	Standard	§ 8.3.2.2
DLINK_PRIORITY	Downlink priority flag. It can be set Nominal/NRT/RT.	Standard	MISSING
SENSING_TIME	TILE Start Time = Datastrip Start Time  Note: set as Type date_time:AN_UTC_DATE_TIME	Standard	MISSING
Archiving_Info/ORIGIN_CENTRE	The starting point of the circulation data. The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li><li>• PAC2</li><li>• CDAM</li><li>• MPCC</li></ul>	Expertise	MISSING
Archiving_Info/ARCHIVING_TIME	Processing/archiving date (UTC data time)	Expertise	MISSING
Processing_Specific_Parameters/ PROCESSING_SPECIFIC_PARAMETERS	Optional field reserved for production chain only (i.e. DPC and/or IPF) and NOT propagated to User Product	Expertise	MISSING

Table 3-55: Level-1C\_Tile\_Metadata\_File - General\_Info Description



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 48: Level-1C\_Tile\_Metadata\_File - Geometric\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 250 / 477

Geometric_Info/Tile_Geocoding			
Field Name	Description	Metatada Level	Check vs [PDD]
HORIZONTAL_CS_NAME	Name of horizontal coordinate reference system.  Example for Tile 33VWG: WGS84 / UTM zone 33N	Brief	NO
HORIZONTAL_CS_CODE	EPSG Code of horizontal coordinate reference system. The EPSG code contains the info of reference system (WGS84) and projection (UTM zone).  Example for Tile 33VWG: EPSG:32633	Brief	NO
Size	Tile dimensions for each resolution band	Brief	§ 8.3.2.1
Geoposition	XDIM and YDIM for each resolution band	Brief	§ 8.3.2.1
Geometric_Info/Tile_Angles			
Field Name	Description	Metatada Level	Check vs [PDD]
Sun_Angles_Grid	Grid of sun angles (zenith and azimuth) and the correction which takes into account earth-sun distance variation and for each band sun equivalent irradiance	Standard	§ 8.3.2.2
Mean_Sun_Angle	Mean value containing sun zenith and azimuth angle average for all bands and detectors	Standard	§ 8.3.2.2
Mean_Incidence_Angle	List of mean values containing viewing incidence zenith and azimuth angle average for each band and for all detectors	Standard	§ 8.3.2.2
Viewing_Incidence_Angles_Grids	Grid of incidence angles (zenith and azimuth) (per bands and detectors)	Standard	§ 8.3.2.2

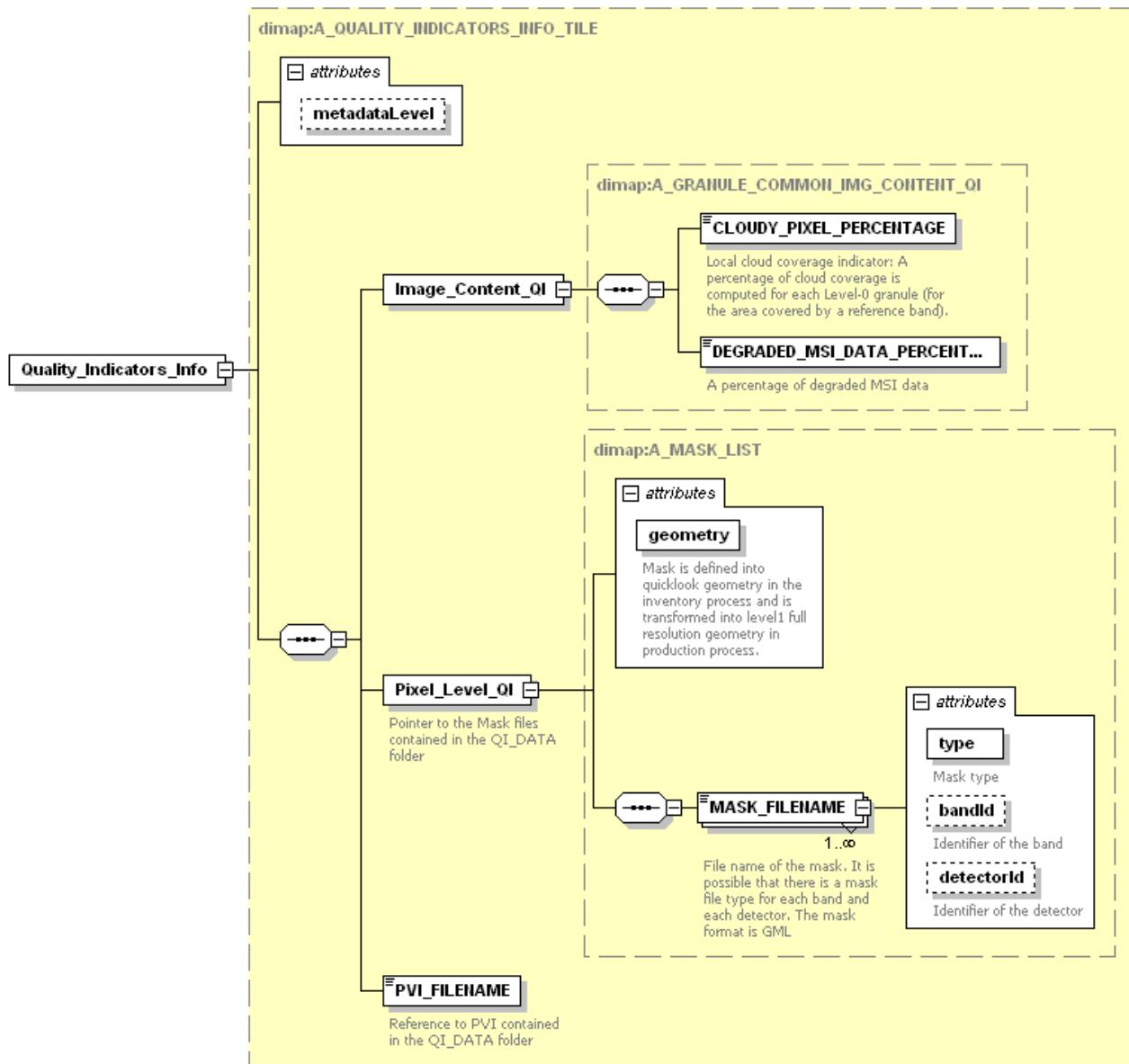
Table 3-56: Level-1C\_Tile\_Metadata\_File - Geometric\_Info Description



# **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 251 / 477





Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 49: Level-1C\_Tile\_Metadata\_File – Quality\_Indicators\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 253 / 477

According to the content of the Table 3-14, the following table describes the Quality Indicators provided for a PDI Tile Level-1C.

Quality_Indicators_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
CLOUDY_PIXEL_PERCENTAGE	Percentage of cloud coverage provided for each Tile.	Standard	§ 8.4.2
DEGRADED_MSI_DATA_PERCENTAGE	Percentage of degraded MSI data provided for each Tile.	Standard	§ 8.4.2
Quality_Indicators_Info/Pixel_Level_QI			
Field Name	Description	Metatada Level	Check vs [PDD]
MASK_FILENAME	Pointer to the mask files contained in the QI_DATA folder: <ul style="list-style-type: none"><li>- Finer cloud mask files</li><li>- Technical quality mask files</li><li>- Land/Water mask files</li><li>- Detector footprint mask</li><li>- Radiometric quality masks</li></ul>	Standard	§ 8.3.2.2 § 8.4.3
PVI_FILENAME	Reference to PVI contained in the QI_DATA folder		MISSING

Table 3-57: Level-1C\_Tile\_Metadata\_File – Quality\_Indicators\_Info Description

Note that, according to OLQC procedures consolidation, the results of all quality control checks performed by OLQC processor on Level-1C Tile, are included in the XML reports stored in the QI\_DATA folder (see § 3.4.1, Table 3-17).

### 3.12.3.2 *IMG\_DATA*

diagram	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Image_Files</u></a>
annotation	Folder containing image data (GML-JPEG2000), one file per spectral band (13 files).

### 3.12.3.3 *QI\_DATA*

diagram	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>OLQC_Report</u></a> <a href="#"><u>Quality_Masks</u></a>
annotation	<p>QI_DATA folder contains:</p> <ul style="list-style-type: none"> <li>• XML reports including the quality control checks performed by OLQC processor. The XSD OLQC_Report is provided in Annex D</li> <li>• GML quality masks., the masks files are listed in the Table 3-4</li> <li>• JPEG2000 Preview_Image is always provided with a Level-1C Tile.</li> </ul>

### 3.12.3.4 AUX\_DATA

diagram	<b>AUX_DATA</b> Folder containing ECMWF data resampled in UTM projection  Generated by XMLSpy <a href="http://www.altova.com">www.altova.com</a>
children	-
annotation	<p>The raw ECMWF global forecast dataset are resampled and provided as part of the Level-1C Tile PDI. These data are distributed in grid information tiles with the same dimensions as the Level-1C Tiles. Grid points are provided in latitude/longitude using WGS84 reference system.</p> <p>They are interpolated from original ECMWF data to match L1C Tiles both temporally (linear) and geometrically (bilinear with a Ground Sample Distance of 12.5km).</p> <p>Each Tile contains one single ECMWF data file in GRIB V1 format (see [GIRB])</p>

### 3.12.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1C PDI Granule level.

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 256 / 477

- the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From DIMAP\_Level-1C\_Tile.xsd”);
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
  - the allowed range of values of the field.
- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-1C PDI Granule Product (with the exception of the Manifest file itself); this includes:
    - the XML Granule Metadata file;
    - the XML Inventory\_Metadata file;
    - a set of image files in JPEG2000 format (one file per spectral band, up to a total of 13 files);
    - a set of Quality Indicator Data Files, including a OLQC Report file and one or more pixel-level Quality Mask files.

A practical example of Manifest file for the Level-1C PDI Granule Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 257 / 477

SAFE Manifest		From S2_PDI_Level-0_Tile_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdclIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->TILE_ID (substring <Mission ID>, see section 3.12.1)	The mission name of the platform		0..1	Sentinel
	number	General_Info->TILE_ID (substring <Mission ID>, see section 3.12.1)	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument-> <b>abbreviation</b>	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 258 / 477

SAFE Manifest		From S2_PDI_Level-0_Tile_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	Instrument->mode-> <b>identifier</b>	N.A.	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1C Tile Product
	<b>start</b>	General_Info->Archiving_Info ->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info ->ARCHIVING_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 259 / 477

SAFE Manifest		From S2_PDI_Level-0_Tile_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1C Tile Product
	resource-> processing		Description of the L1B to L1C Processing		0..*	
	resource-> processing-> <b>name</b>		Name of the L1B to L1C Processing	string	0..1	Processing of Level-1B Granule product
	resource-> processing-> <b>start</b>	General_Info->TILE_ID (substring <Creation Date>, see section 3.12.1)	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing-> facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing-> facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing-> facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing-> facility-> <b>site</b>	General_Info->TILE_ID (substring <Site Centre>, see section 3.12.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 260 / 477

SAFE Manifest		From S2_PDI_Level-0_Tile_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility-> software	N.A.	Description of software component used for Processing		0..*	
	resource-> processing-> facility-> software-> <b>name</b>	N.A.	Name of the software component	string	1	
	resource-> processing-> facility-> software-> <b>version</b>	N.A.	Version of the software component	string	0..1	
acquisitionPeriod					1	
	startTime	General_Info->TILE_ID (substring <Sensing Time>, see section 3.12.1)	Reference time of acquisition of the Granule	xs:dateTime	1	
measurementOrbitReference						
	orbitNumber	General_Info-> TILE_ID (substring <Abs Orbit>, see section 3.12.1)	Absolute orbit number			
	orbitNumber->type		Absolute orbit number type (possible values "start" or "stop"). Set to fixed value "start" since the absolute orbit number refers to the first line of the Tile			
measurementFrameSet						
	cloudVoteNotationSystem				0..1	
	cloudVoteNotationSystem->floor	N.A.	Minimum value of cloud coverage index (Fixed value = 0.0)	double	0..1	0.0



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 261 / 477

SAFE Manifest		From S2_PDI_Level-0_Tile_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	cloudVoteNotationSystem->ceil	N.A.	Maximum value of cloud coverage index (Fixed value = 100.0)	double	0..1	100.0
	frame	N.A.	The "frame" concept is used in SAFE to convey the cloud coverage information by sub-dividing the region of interest of the data into "frames" according to a World Reference System. In the case of Sentinel-2 L1C Products, a similar concept can be used, by associating one single "frame" to the area covered by the Granule		0..1	
	frame->number	N.A.	Number of the band	integer	0..1	1
	frame->Tile	N.A.			1	One Tile for the single frame
	frame->Tile->row	N.A.	The column index of the frame Tile. This index is numbered starting from 1.	integer	1	1 (there is only one Tile for the single frame)
	frame->Tile->column	N.A.	The row index of the frame Tile. This index is numbered starting from 1.	integer	1	1 (there is only one Tile for the single frame)
	frame->Tile->cloudVote	Quality_Indicators_Info-> Image_Content_QI -> CLOUDY_PIXEL_PERCENTAGE	Numeric notation qualifying the cloud coverage of the frame Tile	double	0..1	0 to 100
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML		2..11	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 262 / 477

SAFE Manifest		From <i>S2_PDI_Level-0_Tile_Metadata.xsd</i>	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			Metadata file, the XML Inventory Metadata file)			
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	

Table 3-58 Content of Metadata Section for PDI Level-1C Tile SAFE Manifest

### 3.13 Level-1C PDI Datastrip definition

Level-1C PDI Datastrip is defined as a **tar** file containing the following structure:

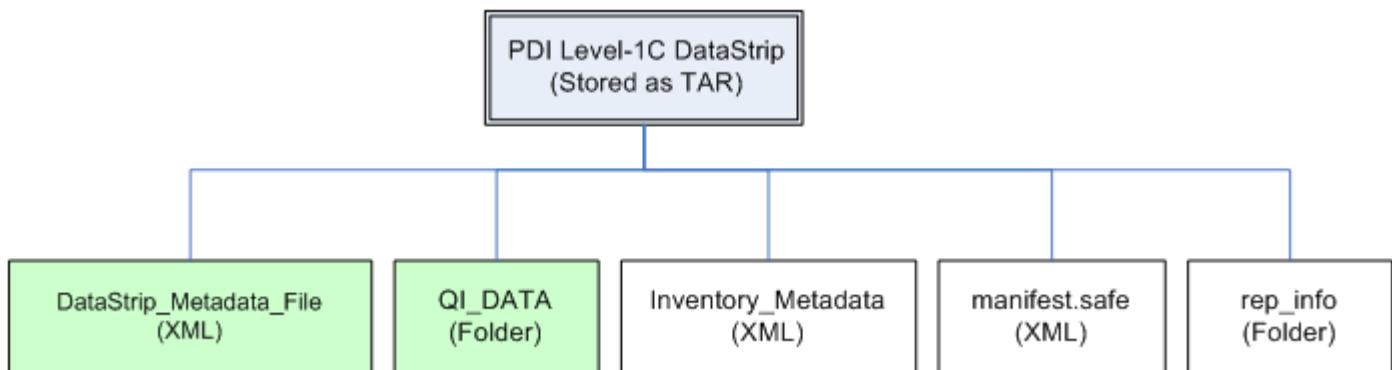


Figure 50: PDI Level-1C Datastrip Structure

The PDI Level-1C Datastrip consist of:

1. **Datastrip\_Metadata\_File**: XML metadata file containing the requested level of information and referring all the product elements describing the Datastrip,
2. **QI\_DATA**: folder containing XML reports about Quality control checks information,
3. **Inventory\_Metadata.xml**: file containing the metadata needed to inventory the PDI (mandatory, see Annex C);
4. **manifest.safe**: XML SAFE Manifest file (mandatory, see section 3.5.4),
5. **rep\_info**: folder containing the available XSD schemas that validate the PDI components (recommended by [SAFE-SPEC], see section 3.5.4).

#### 3.13.1 PDI\_ID definition

Datastrip PDI\_ID (Datastrip ID) is defined in the section 3.5.2. The File\_Type is specified in the section 3.2, Table 3-3.

Level-1C Datastrip Template Name (Datastrip ID):

S2A\_OPER\_MS1\_L1C\_DS\_CGS3\_20141104T134012\_S20141104T134012\_N01.01.tar

Note that the PDI\_ID.tar is the physical name of the Datastrip PDI after the tar compression.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 264 / 477

## 3.13.2 Level-1C Datastrip Physical Format

The PDI ID defined above represents the “Datastrip directory” name. Inside the Datastrip directory, there are the Datastrip components as in the Figure 50:

Inside that directory, the naming convention used to identify each real files follows the same convention used for define the Datastrip ID but without the Processing Baseline sub-string.

- **Datastrip\_Metadata\_File (DIMAP XML file):**

Datastrip\_Metadata\_File template name:

*S2A\_OPER\_MTD\_L1C\_DS\_CGS3\_20141104T134012\_S20141104T134012.xml*

The XSD schema which regulates the metadata file is *S2\_PDI\_Level-1C\_Datastrip\_Metadata.xsd* included in the *S2-PDGS-TAS-DI-PSD-V10\_Schemas.zip* file annexed to the document.

- **QI\_DATA (folder):**

QI\_DATA folder contains XML reports *OLQC\_Report.xml* generated by On-Line Quality Control processor, including Quality Control Checks results. The *OLQC\_Report.xsd* schema and the reports naming convention are in the Annex D of the document.

- **Inventory\_Metadata (XML file):**

XML Inventory metadata file with fixed name *Inventory\_Metadata.xml*

- **manifest.safe (XML file):**

XML file with fixed name *manifest.safe*

- **rep\_info (folder):**

Folder containing the following XSD schemas:

1. *S2\_PDI\_Level-1C\_Datastrip\_Metadata.xsd*
2. *Inventory\_Metadata.xsd*
3. *OLQC\_Report.xsd*

Level-1C Datastrip Physical Format template:

Level-1C Datastrip PDI_ID: <b><i>S2A_OPER_MSI_L1C_DS_CGS3_20141104T134012_S20141104T134012_N01.01</i></b>	
	<i>Inventory_Metadata.xml</i>
	<i>S2A_OPER_MTD_L1C_DS_CGS3_20141104T134012_S20141104T134012.xml</i>
	<i>manifest.safe</i>
	<b>QI_DATA</b>
	<i>S2A_OPER_MSI_L1C_DS_CGS3_20141104T134012_S20141104T134012_GEOMETRIC_QUALITY_report.xml</i>

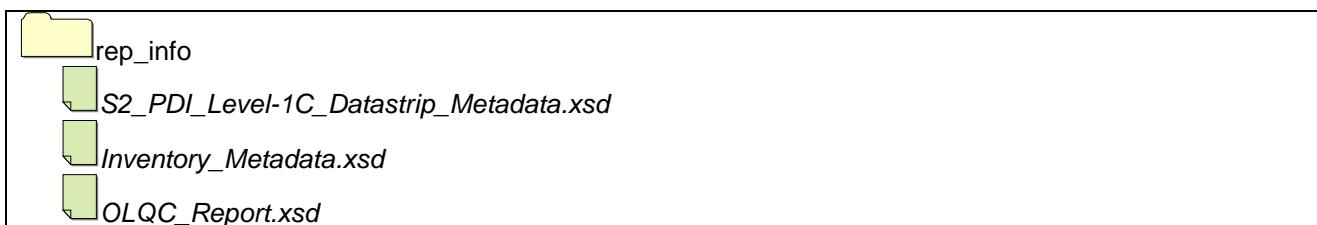
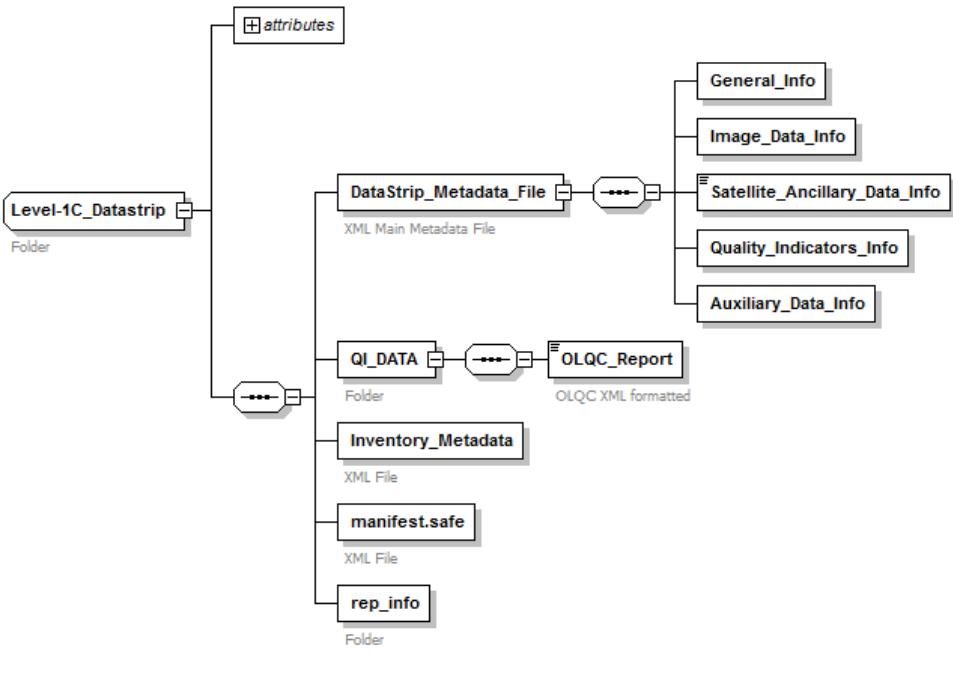


Figure 51: PDI Level-1C Datastrip Physical Format

### 3.13.3 Level-1C PDI Datastrip Structure

The *S2\_PDI\_Level-1C\_Datastrip\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the organization of a Level-1C Datastrip PDI on disk. This schema is provided for information only as it is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the structure shown in the Figure 50.

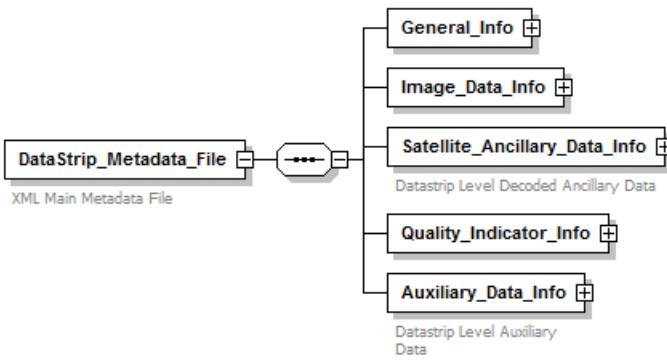
diagram	 <pre> classDiagram     class Level1CDatastrip {         &lt;&lt;Folder&gt;&gt;         &lt;&lt;attributes&gt;&gt;     }     class DataStrip_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;         &lt;&lt;DataStrip_Metadata_File&gt;&gt;     }     class QI_DATA {         &lt;&lt;Folder&gt;&gt;         &lt;&lt;OLQC_Report&gt;&gt;     }     class Inventory_Metadata {         &lt;&lt;XML File&gt;&gt;     }     class manifest.safe {         &lt;&lt;XML File&gt;&gt;     }     class rep_info {         &lt;&lt;Folder&gt;&gt;     }      Level1CDatastrip "1" -- "*" DataStrip_Metadata_File     DataStrip_Metadata_File "1" -- "*" QI_DATA     DataStrip_Metadata_File "1" -- "*" Inventory_Metadata     DataStrip_Metadata_File "1" -- "*" manifest.safe     DataStrip_Metadata_File "1" -- "*" rep_info     QI_DATA "1" -- "*" OLQC_Report     OLQC_Report "1" -- "*" General_Info     OLQC_Report "1" -- "*" Image_Data_Info     OLQC_Report "1" -- "*" Satellite_Ancillary_Data_Info     OLQC_Report "1" -- "*" Quality_Indicators_Info     OLQC_Report "1" -- "*" Auxiliary_Data_Info </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>Datastrip_Metadata_File</u></a> <a href="#"><u>QI_DATA</u></a> <a href="#"><u>Inventory_Metadata</u></a> <a href="#"><u>manifest.safe</u></a> <a href="#"><u>rep_info</u></a>
annotation	<p>The Level-1C Datastrip is defined as a folder containing:</p> <ol style="list-style-type: none"> <li>1. <b>Datastrip_Metadata_File</b>: XML Main Metadata File containing the requested level of information and referring all the PDI elements (SAFE formatted).</li> <li>2. <b>QI_DATA</b>: folder containing the XML reports about Quality Indicators</li> <li>3. <b>Inventory_Metadata</b>: XML inventory metadata file</li> </ol>

- |  |  |
|--|--|
|  | <ul style="list-style-type: none"> <li>4. <b>manifest.safe</b>: XML SAFE Manifest file</li> <li>5. <b>rep_info</b>: folder containing the XSD schema provided inside a SAFE Level-0 Datastrip</li> </ul> |
|--|--|

Note that the Inventory\_Metadata.xml, manifest.safe and rep\_info are removed when the PDI is included in the user product.

### 3.13.3.1 Datastrip\_Metadata\_File Schema

Level-1C Datastrip\_Metadata\_File is the XML metadata file provided inside each Level-1C Datastrip. The schema used to validate it is the *S2\_PDI\_Level-1C\_Datastrip\_Metadata.xsd* annexed to this document. A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

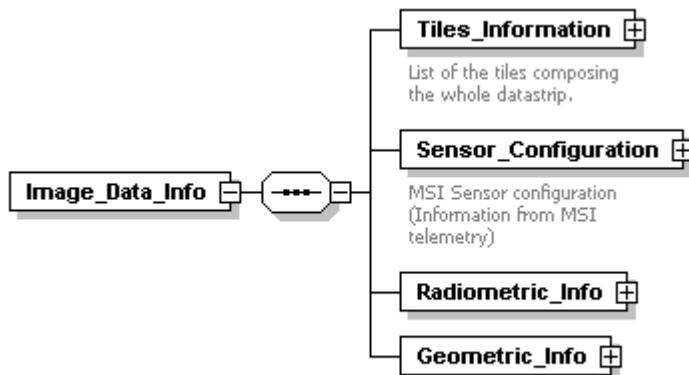
diagram	 <p style="text-align: center;">Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">General_Info</a> <a href="#">Image_Data_Info</a> <a href="#">Satellite_Ancillary_Data_Info</a> <a href="#">Quality_Indicator_Info</a> <a href="#">Auxiliary_Data_Info</a>
annotation	<p>The structure of the Datastrip_Metadata_File is common to all processing level (cfr. § 3.5.1)</p> <p>The Datastrip_Metadata_File is an XML file containing all the metadata describing the whole product data item.</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: This group of metadata provide general information characterizing the source Datastrip acquisition.</li> <li>2. <b>Image_Data_Info</b>: Image data information from MSI telemetry.</li> <li>3. <b>Satellite_Ancillary_Data_Info</b>: Ancillary data information from Satellite Ancillary Telemetry.</li> <li>4. <b>Quality_Indicator_Info</b>: Results of all quality checks performed at Datastrip level.</li> <li>5. <b>Auxiliary_Data_Info</b>: Auxiliary data information.</li> </ol>

The following tables and figures give a complete overview of the Level-1C Datastrip\_Metadata\_File schema according the description provided in the section 3.5.1.

General\_Info:

The General\_Info provided through the Level-1C DataStrip\_Metadata\_File are the same described in the Figure 18 and Table 3-32.

Image\_Data\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 52 : Level-1C Datastrip – Image\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 268 / 477

Image_Data_Info/Tiles_Information			
Field Name	Description	Metatada Level	Check vs [PDD]
Tile_List	List of the tiles composing the whole Datastrip. Each Tile is univocally identified through a unique Tile identifier (PDI_ID, § 3.12.1).	Standard	§ 8.3.2.2
Image_Data_Info/Sensor_Configuration (inherited from L1B)			
Field Name	Description	Metatada Level	Check vs [PDD]
See Table 3-51	MSI Sensor configuration (Information from MSI telemetry)	Expertise	§ 8.3.1.3
Image_Data_Info/Radiometric_Info			
Field Name	Description	Metatada Level	Check vs [PDD]
SWIR_REARRANGEMENT_PROC	SWIR pixels re-arrangement (only for level 1A production but SWIR rearrangement information shall be preserved in L1B and L1C): A 'true' value indicates that data extraction and SWIR pixels re-arrangement have been processed.	Standard	MISSING
SATURATED_PIXELS_PROC	Management of saturated pixels. A 'true' value indicates that saturated pixels has been processed.	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/RESOLUTION	(OPTIONAL FIELDS)  Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION  Spatial resolution	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Wavelength/MIN	Minimum wavelenght	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Wavelength/MAX	Maximum wavelenght	Standard	MISSING



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 269 / 477

Spectral_Information_List/Spectral_Informatio/Wavelength/CENTRAL	Central wavelenght	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Spectral_Response/STEP	Step of spectral response	Standard	MISSING
Spectral_Information_List/Spectral_Informatio/Spectral_Response/VALUES	List of measures	Standard	MISSING
Image_Display_Order/RED_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 8.3.1.1
Image_Display_Order/GREEN_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 8.3.1.1
Image_Display_Order/BLUE_CHANNEL	Relation between product image channels and on board spectral bands (Band index).	Brief	§ 8.3.1.1
QUANTIFICATION_VALUE	Reflectance quantification value (in order to convert digit count into reflectance)	Brief	§ 8.3.1.1

## Image\_Data\_Info/Geometric\_Info

Field Name	Description	Metatada Level	Check vs [PDD]
RGM	Flag to identify if the Refined Geometric Model file is computed or obtained from a existing RGM file (reused)	Standard	MISSING
Image_Refining	Refining results. Should exist only if REFINING_TYPE= REFINING or REFINING_REGISTRATION	Standard	MISSING
VNIR_SWIR_Registration	Registration results. Should exist only if REFINING_TYPE= REGISTRATION or REFINING_REGISTRATION	Standard	MISSING
Refined_Corrections_List	Description of the refined corrections. If the refining has been processed by Datastrip then, there are the refined corrections for each Datastrip. These data are created by Geo_S2	Standard	MISSING

## Image\_Data\_Info/Product\_Compression (OPTIONAL)

Field Name	Description	Metatada Level	Check vs [PDD]
COMPRESSION	Product Compression.  The compression may be:	Standard	§ 10.3.2



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 270 / 477

- |  |   |  |  |
|--|---|--|--|
|  | <ul style="list-style-type: none"><li>- None.</li><li>- LOSSLESS: Lossless compression, use reversible JPEG2000 compression.</li><li>- LOSSY: Lossy compression, use compression that ensures that JPEG2000 compression has a negligible effect on image quality.</li></ul> |  |  |
|--|---|--|--|

- Table 3-59: Level-1C Datastrip – Image\_Data\_Info Description

### Satellite\_Ancillary\_Data\_Info:

The Satellite\_Ancillary\_Data\_Info are the same provided for a L0 Datastrip (cfr. Figure 20 and Table 3-34).

### Quality\_Indicators\_Info:

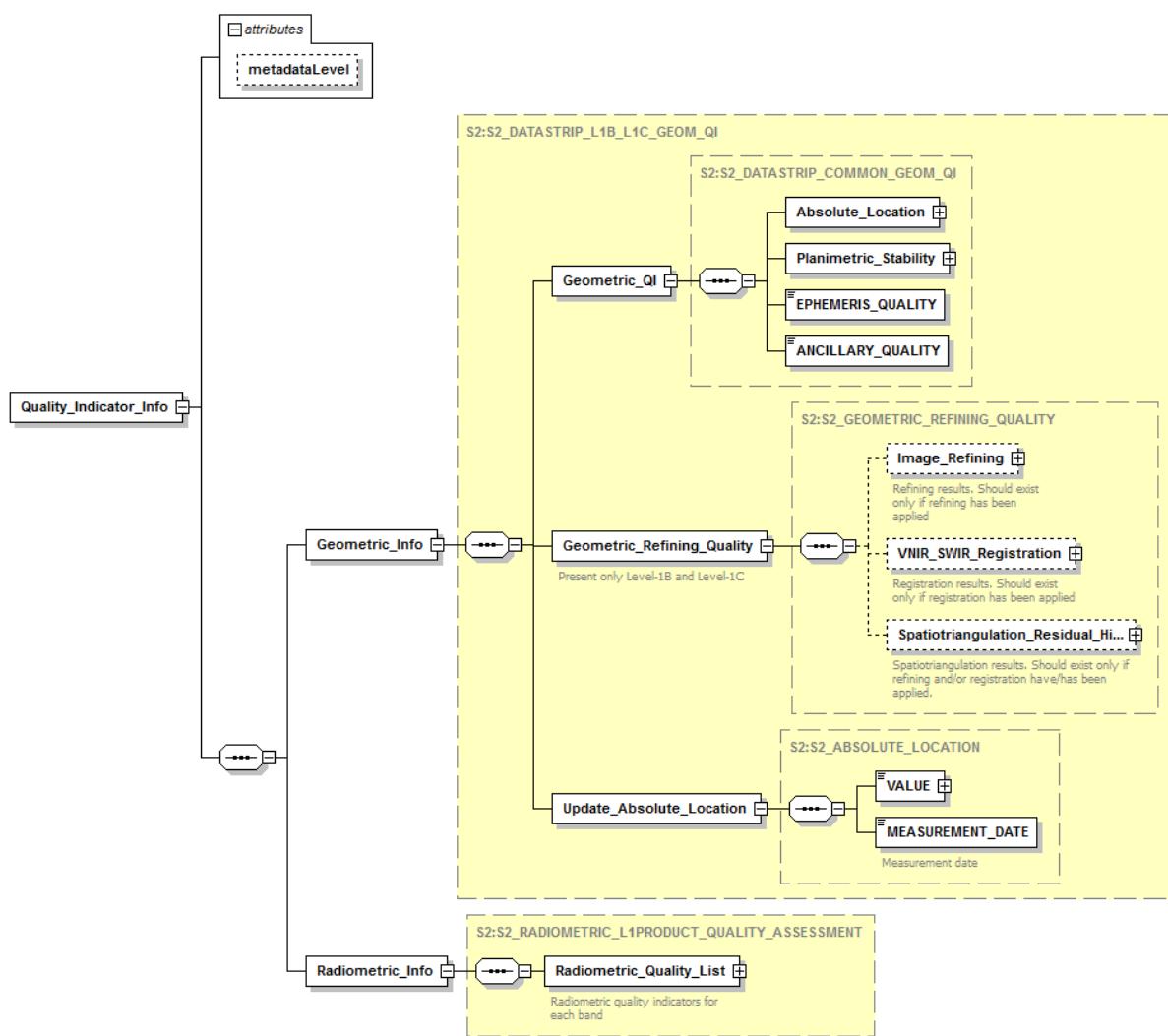


Figure 53: Level-1C Datastrip – Quality\_Indicator\_Info Diagram

Generated by XMLSpy

[www.altova.com](http://www.altova.com)



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

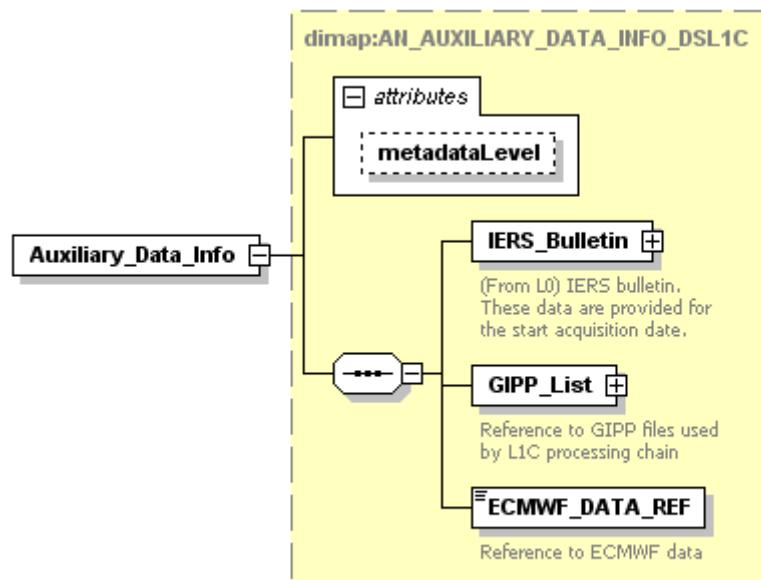
DATE : 12/07/2013

PAGE : 272 / 477

Quality_Indicator_Info/Geometric_Info			
Field Name	Description	Metadata Level	[PDD]
Geometric_QI/Absolute_Location	Absolute location performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 8.4.1
Geometric_QI/Planimetric_Stability	A planimetric stability performance for the Datastrip given from a GIPP table, depending on the health status of the GPS and AOCS sensors (gyros and startrackers) provided in the Satellite Ancillary Data.	Brief	§ 8.4.1
Geometric_QI/EPHEMERIS_QUALITY	Ephemeris data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 8.4.1
Geometric_QI/ANCILLARY_QUALITY	Ancillary data quality retrieved from GPS Dilution of precision (DOP) information.	Brief	§ 8.4.1
Geometric_Refining_Quality	Available by Datastrip and only if geometric refining is applied. Include Multi_Spectral_Registration performance (3 values for 10, 20 and 60m bands (from GIPP data).	Brief	§ 8.4.1
Update_Absolute_Location	From GIPP data	Brief	§ 8.4.1
Quality_Indicator_Info/Radiometric_Info			
Field Name	Description	Metadata Level	[PDD]
Noise_Model	Alpha and Beta parameters providing the instrument noise as a function of the radiometric count X for Level-1B : Noise= square root(Alpha_X + Beta_X* X)	Brief	§ 8.4.1
ABSOLUTE_CALIBRATION_ACCURACY	Absolute calibration accuracy provided as a percentage of accuracy	Brief	§ 8.4.1
CROSS_BAND_CALIBRATION_ACCURACY	Cross-band calibration accuracy provided as a percentage of accuracy	Brief	§ 8.4.1
MULTI_TEMPORAL_CALIBRATION_ACCURACY	Multi-temporal calibration accuracy provided as a percentage of accuracy	Brief	§ 8.4.1

Table 3-60: Level-1C Datastrip – Quality\_Indicator\_Info Description

Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 54 : Level-1C Datastrip – Auxiliary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

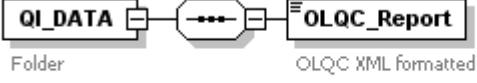
DATE : 12/07/2013

PAGE : 274 / 477

Auxiliary_Data_Info/IERS_Bulletin (from Level-1B)			
Field Name	Description	Metatada Level	Check vs [PDD]
UT1_UTC	UT1 --UTC in [-0.9;0.9] seconds	Standard	§ 8.3.1.2
GPS_TIME_UTC	GPS_time – UTC = in number of seconds	Standard	§ 8.3.1.2
GPS_TIME_TAI	GPS_time – TAI	Standard	§ 8.3.1.2
POLE_U_ANGLE	U angle pole motion (in arcsec)	Standard	§ 8.3.1.2
POLE_V_ANGLE	V angle pole motion (in arcsec)	Standard	§ 8.3.1.2
Auxiliary_Data_Info(aux data used by the processing)			
Field Name	Description	Metatada Level	Check vs [PDD]
GIPP_Filename	Reference to the GIPP files used by the L1C processing.	Standard	§ 8.3.1.2
PRODUCTION DEM_TYPE	Inherited from L1B production	Standard	§ 8.3.1.2
IERS_BULLETIN_FILENAME	Inherited from L1B production	Standard	§ 8.3.1.2
GRI_FILENAME	Inherited from L1B production	Standard	§ 8.3.1.2
ECMWF_DATA_REF	Reference to raw ECMWF data (PDI)	Standard	§ 8.5

Table 3-61: Level-1C Datastrip – Auxiliary\_Data\_Info Description

### 3.13.3.2 QI\_DATA

diagram	 <p>QI_DATA Folder → OLQC_Report OLQC XML formatted</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#">OLQC_Report</a>
annotation	<p>QI_DATA folder contains:</p> <ul style="list-style-type: none"> <li>- XML reports generated by On-Line Quality Control processor, including Quality Control Checks results. The XSD OLQC_Report is Annex D is provided.</li> </ul>

### 3.13.4 SAFE Manifest synoptic table

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1C PDI Datastrip level.

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed (see section 3.4.4) by three main sections (Metadata, Information Package Map and Data Objects).

Part of the information contained in the Metadata section is extracted from the XML metadata file and is therefore duplicated in the SAFE Manifest and in the XML metadata file.

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the XML Metadata File and of its XSD Schema (column “From S2\_Level-1C\_Datastrip.xsd”);
  - a brief textual description of the field;



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 276 / 477

- the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
- the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
- the allowed range of values of the field.

In particular, the satellite ancillary data files (e.g. the SAD Raw Data file) and the auxiliary data files used for Level-1C processing (e.g. GIPP files, DEM, IERS Bulletin), are external to the product and are referenced in the Metadata of Manifest file Section (as “resources” in the “processing” section).

- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-1C PDI Product (with the exception of the Manifest file itself); this includes:
  - the XML Metadata file;
  - the XML Inventory\_Metadata file;
  - a set of Quality Indicator Data Files, including a OLQC Report file (XML format) and a Preliminary Quick Look file (JPEG2000 format).

A practical example of Manifest file for the Level-1C PDI Datastrip Product, containing realistic, though indicative, values, is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 277 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdcIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	General_Info->Datatake_Info->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	General_Info->Datatake_Info->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Calibration Raw_Measurement Test_Mode
	instrument->mode->identifier	General_Info->Datatake_Info->	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 278 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		DATATAKE_TYPE				INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>	N.A.	Name of the Archiving process	string	0..1	Archiving of PDI Level-1C Datastrip Product
	<b>start</b>	DIMAP_Level-1C_Datastrip_ID->General_Info->Archiving_Info->ARCHIVING_TIME	Archiving start date (UTC)	xs:dateTime	0..1	
	facility		Description of Origin Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	General_Info->Archiving_Info->ARCHIVING_CENTRE	The starting point of the circulation data	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, PAC2, CDAM, MPCC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 279 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource		Description of product being archived		0..*	
	resource-> <b>name</b>	N.A.	Name of the product being archived	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	PDI Level-1C Datastrip Product
	resource-> processing		Description of the L1B to L1C Processing		0..*	
	resource-> processing-> <b>name</b>		Name of the L1B to L1C Processing	string	0..1	Processing of Level-1B Datastrip product
	resource-> processing-> <b>start</b>	General_Info->Processing_Info->Data Strip_Generation_Info->PROCESSING_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	resource-> processing-> facility	N.A.	Description of Processing Centre		0..*	
	resource-> processing-> facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	resource-> processing-> facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	resource-> processing-> facility-> <b>site</b>	General_Info->Processing_Info->Data Strip_Generation_Info->PROCESSING_CENTER	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC, SVLB, MASP, MATA



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 280 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> processing-> facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	resource-> processing-> facility->software	N.A.	Description of software component used for Processing		0..*	
	resource-> processing-> facility->software-> <b>name</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE	Name of the software component	string	1	
	resource-> processing-> facility->software-> <b>version</b>	General_Info->Processing_Info->Data Strip_Generation_Info->Processing_Step->SOFTWARE->version	Version of the software component	string	0..1	
	resource-> processing-> facility->resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc.) and of SAD Raw Data file containing the satellite ancillary telemetry; these files are not provided with the product.		0..*	
	resource-> processing-> facility->resource-> <b>name</b>	Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)	Absolute path name of the auxiliary or ancillary file	string	1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 281 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
		Auxiliary_Data_Info->IERS_BulletinN  Auxiliary_Data_Info->GIPP_List-> GIPP_FILENAME				
	resource-> processing-> facility->resource->role	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod ->startTime	Datastrip->L1C_Datastrip_PDI_ID (substring <Sensing Time>, see section 3.6.1)	Reference time of acquisition of the Granule (corresponding to sensing time of the first line of the PDI at Datastrip level, see section 3.6.1)	xs:dateTime	1	
measurementOrbitReference						
	orbitNumber	General_Info->Datatake_Info-> DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber->type	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the		0..1	start



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 282 / 477

SAFE Manifest		From S2_PDI_Level-1C_Datastrip_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			first line of the Datastrip			
	orbitNumber-> <b>groundTrackDirection</b>	General_Info->Datatake_Info-> SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	General_Info->Datatake_Info-> SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		N.A	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the XML Inventory Metadata file)		2..4	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..2	



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 283 / 477

Table 3-62 - Content of Metadata Section for PDI Level-1C Datastrip SAFE Manifest



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 284 / 477

### 3.14 PDI for GIPP files definition

GIPP files corresponding to a set of XML files used by the processors to achieve radiometric and geometric parameters. A GIPP file is associated to a validity period since the parameters can be tuned during the PDGS lifetime. All GIPPs XML files used for each processing level (L0/L1A/L1B/L1C) in the Annex E are listed.

The GIPP files are stored as PDIs that coincide with the file itself. For each type of GIPP file (see section 3.2)

#### 3.14.1 PDI-ID definition

The applicable file naming convention used to identify a GIPP PDI is compliant to [GPP-IODD] and [EOFFS-PDGS]:

PDI\_ID = MMM\_CCCC\_TTTTTTTTTT\_<instance\_id>

The sub-strings MMM (Mission ID), CCCC (File Class), and TTTTTTTTTT (File Type) are detailed in the section 3.2 Table 3-4. The Instance ID for a PDI relative to a GIPP file is defined hereafter.

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Start Validity Time >\_<Stop Validity Time >\_<Bxx>

<Site Centre> and <Creation Date> corresponding to the Instance\_ID mandatory prefix (see section 3.2).

<Site Centre>:

- MPC\_

The sub-fields composing the Instance\_ID are described in the following table:

Field Name	Value/Meaning	Note
Start Validity Time	VyyyymmddThhmmss	"V" is the option Id for validity period
Stop Validity Time	YYYYMMDDThhmmss	
Bxx	Band index xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12  xx = "00" for GIPP files band independent	

Table 3-63: PDI-ID definition for GIPP files

File Template Name:

S2A\_OPER\_GIP\_VIEDIR\_MPC\_\_20091210T235100\_V20091210T235134\_20091210T235224\_B08.xml



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 285 / 477

### 3.15 PDI for DEM file definition

The Image Quality Processor delivers the **System DEM (Digital Elevation Model)** that is composed of two layers (**Global Coarse DEM** and **SRTM DEM**) and a **Basis Geoid Model**.

**GLOBE DEM** gives an average altitude information (in meters) in all points of a global grid. The altitude is provided in the WGS84 reference frame, with respect to the ellipsoid.

The GLOBE DEM is divided in elementary areas of  $1^{\circ} \times 1^{\circ}$ , also called cells. Each cell, provided as a binary file, is limited by meridians (integers of latitude), and parallel (integers of latitude).

The goal of this file is to define an altitude information with an average value for all the point on a global grid with a kilometric resolution. Global size of the Globe DEM is roughly 800 MBytes.

**SRTM DEM** does not cover the entire globe. It covers 80% of land cover from the latitude  $60^{\circ}$  North to  $56^{\circ}$  South. The horizontal reference frame is WGS84. The altitude information is given in the geoid altimetric reference EGM96. Quality information are added to SRTM data through dedicated quality masks. The goal of this file (pseudostatic, supplied at beginning of mission and updatable 3 times during mission lifetime) is to provide a more accurate altimetry information (in meters). Global size of the SRTM DEM, respecting the DTED1 format, is roughly 50 GBytes.

Consistent with the GLOBE DEM, the **Geoid** is given in the WGS84 reference frame. The geoid is used to measure altitude and depth. The frequency is pseudostatic, supplied at beginning of mission via the CNES Euclidium CFI, single binary file of 131 MBytes.

The DEM is never included in the User Product but simply referenced through the metadata file.

The DEM format is defined in the [GPP-DEM] document.

#### 3.15.1 PDI-ID definition

The PDI\_ID (file naming convention) used to reference the DEM within the User Product is compliant to [EOFFS-PDGS] and follows the description provided in the section 3.1:

PDI\_ID = MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>.AAA

The sub-strings MMM (Mission ID), CCCC (File Class), and TTTTTTTT (File Type) are detailed in the section 3.2. The Instance ID for a DEM PDI it is defined hereafter.

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Start Validity Time>

<Site Centre> and <Creation Date> corresponding to the Instance\_ID mandatory prefix.

<Site Centre>:

- MPC\_

The sub-fields composing the Instance\_ID are described in the following table:



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 286 / 477

Field Name	Value/Meaning	Note
Start Validity Time	_SYYYYMMDDTHHMMSS	Taking into account that:  1. GLOBE DEM is classified "pseudostatic" i.e. files supplied at beginning of mission and updatable with (TBD by CNES) frequency; 2. SRTM DEM is classified "pseudostatic" i.e. files supplied at beginning of mission and updatable 3 times during mission lifetime as per CNES clarification; 3. Geoid Model is classified "pseudostatic" i.e. files supplied at beginning of mission via the CNES Euclidium CFI and potentially updatable with TBD by CNES frequency via redelivery of the Euclidium CFI  We can consider the option envisaged for file types whose Stop Validity is not relevant or it is always set to EOM and every new file replaces the previous one (see [EOFFS-PDGS] section 2.1.4.1).

Table 3-64: PDI-ID definition for DEM

File Template Name:

S2\_\_OPER\_DEM\_GLOBEF\_MPC\_\_ 20091210T235100 \_S20091210T235100.tar

## 3.16 PDI for GRI definition

The Global Reference Images (**GRI**) data are never included in the User Product but simply referenced through the metadata file.

The GRI format is defined in the [GRI-TNGRI-TN].

### 3.16.1 PDI-ID definition

The PDI\_ID (file naming convention) used to reference the GRI data within the User Product is compliant to [EOFFS-PDGS] and follows the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTTTT\_<Instance\_ID>

The sub-strings MMM (Mission ID), CCCC (File Class), and TTTTTTTTTT (File Type) are detailed in the section 3.2. The Instance ID for a GRI PDI is defined hereafter.

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Start\_Applicability\_Date>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 287 / 477

<Site Centre> and <Creation Date> corresponding to the Instance\_ID mandatory prefix (see section 3.1), the others sub-field composing the Instance\_ID are table described in the following table:

<Site Centre>:

- MPC\_

<Start\_Applicability\_Date> is the relevant information regarding the GRI start applicability date.

File Template Name:

S2\_OPER\_AUX\_GRI123\_MPC\_YYYYMMDDTHHMMSS\_SYYYYMMDDTHHMMSS.tar

### 3.17 PDI for IERS Bulletin file definition

IERS Bulletin A contains Earth orientation parameters such as x/y pole, UTI-UTC and their errors at daily intervals and predictions for 1 year into the future. These values are needed for geometric transforms within the processing. When a IERS Bulletin A is published at day D0, its applicability date is retroactive to day D0-7. It remains valid until their next update. More precisely, their validity period is defined by the applicability date. The end of validity date is defined by the beginning of validity date of the posterior (i.e. next) bulletin.

The IERS Bulletin A is provided as an ASCII file on a weekly basis.

#### 3.17.1 PDI-ID definition

The PDI\_ID (file naming convention) used for a IERS Bulletin file, compliant to [EOFFS-PDGS] follows the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Start Validity Time>\_<Stop Validity Time>

<Site Centre> and <Creation Date> corresponding to the Instance\_ID mandatory prefix (see section 3.2).

<Site Centre>:

- PDMC

The sub-fields composing the Instance\_ID are described in the following table:

Field Name	Value/Meaning	Note
Start Validity Time	YYYYMMDDThhmmss	V prefix to indicate the validity period
Stop Validity Time	YYYYMMDDThhmmss	

Table 3-65: PDI-ID definition for IERS Bulletin



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 288 / 477

File Template Name:

S2\_OPER\_AUX\_UT1UTC\_PDMC\_YYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_YYYYMMDDTHHMMSS.txt

### 3.18 PDI for POD file definition

The Precise orbit determination data (POD) file is used in case of contingency with the on-board navigation solution.

The POD contains accurate Position and Velocity for a Sentinel2 spacecraft during one orbit.

- Spacecraft Position X, Y, Z (sampled at 1Hz)
- Spacecraft Velocity Vx, Vy, Vz (sampled at 1Hz).

This file, provided as an XML file, one file per Orbit, is valid for all the Datastrips acquired during the temporal coverage of the embedded data. The volume of a POD file on 1 descending orbit (approx. 50mn, 3000 samples) can be estimated to 1 MBytes.

#### 3.18.1 PDI-ID definition

The PDI\_ID (file naming convention) used for a POD file , compliant to [EOFFS-PDGS] follows the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Absolute Orbit>\_<Start Validity Time>\_<Stop Validity Time>

File Template Name:

S2A\_OPER\_MPL\_PODPRE\_MPC\_YYYYMMDDTHHMMSS\_A111111\_VYYYYMMDDTHHMMSS\_YYYYMMDDTHHM  
MSS.eof

### 3.19 PDI for ECMWF data definition

This PDI contains raw ECMWF dataset in GRIB V1 format.

These data, resampled in UTM projection are always provided as part of Level-1C Tile PDI.

Note: the raw ECMWF data are not included in the User Product (no download option).

For furter details regarding ECMWF data and GRIB V1 format see the reference documents [ECMWF-PDGS-ICD] and [GRIB].



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 289 / 477

### 3.19.1 PDI-ID definition

The PDI\_ID (file naming convention) used for ECMWF data, compliant to [EOFFS-PDGS] follows the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Start Validity Time>\_<Stop Validity Time>

File Template Name:

S2\_OPER\_AUX\_ECMWF\_D\_PDMC\_YYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_YYYYMMDDTHHMMSS

### 3.20 S2 HKT M PDI definition

House Keeping Telemetry (HKT M) PDI are routed to FOS after their generation at CGS. Spacecraft housekeeping telemetry is part of the ancillary data and is regularly downlinked to ground stations (every orbit). Raw VCDUs are provided with DFEP annotation as a separated file.

The HKT M PDI is formatted according to [SAFE-SPEC].

The PDI is defined as a **tar** file containing the following structure (representing the SAFE product structure):

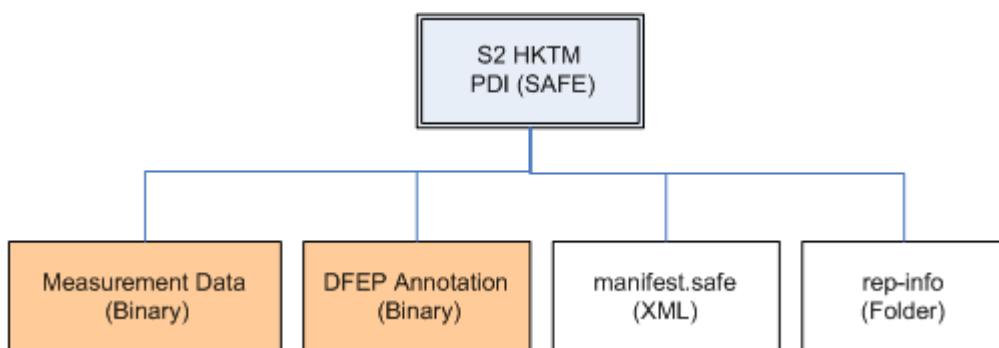


Figure 55: S2 HKT M PDI definition

As described in the figure, this Product Data Item consists of:

1. **Measurement Data file (Binary File):** binary encoded file containing the stream of HKT M Transfer Frames TFs. The content of the housekeeping telemetry is detailed in [S2GICD]
2. **DFEP Annotation file (Binary File):** binary file composed by one record for each HKT M TF, containing the TF annotations computed by the DFEP (cfr. [DFEP-ICD]).
3. **manifest.safe (XML File):** manifest file that includes metadata information describing the overall context where the HKT M data are generated (mission, product history, timing, orbit, etc.) and providing information regarding the content and structure of the product, through references to the other components present in the product. An example of the *manifest.safe* relative to an HKT M product is in the annexed S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip file .
4. **rep\_info (Folder):** folder containing the Measurement Data and DFEP Annotation schemas.

#### 3.20.1 PDI-ID definition

The applicable file naming convention used for PDI relative to HKT M data is compliant to [EOFFS]:

PDI\_ID = MMM\_CCCC\_TTTTTTTT\_<instance\_id\*>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 291 / 477

The sub-strings MMM (Mission ID), CCCC (File Class) are detailed in the section 3.2. The Instance ID for a PDI relative to a HKTM data is defined hereafter.

For HKTM PDIs, TTTTTTTTTT= 'PRD\_HKTM\_\_' (see Table 3-7)

<Instance\_Id\*> = <Valid UTC Start Time>\_<Valid UTC Stop Time>\_VVVV

Where:

<Valid UTC Start Time>: 8+6 digits, separated by “T”

<Valid UTC End Time>: 8+6 digits, separated by “T”

VVVV: four digit indicating the file version. Fixed to '0001' for HKTM PDIs

To identify the two binary files included in the tar structure the following naming convention is used:

Measurement Data (binary file) naming convention:

HKTM\_PDI\_ID\_measurement

DFEP Annotation (binary file) naming convention:

HKTM\_PDI\_ID\_annotation

Files Template Names:

HKTM PDI\_ID (physical name of the *tar* file):

S2A\_OPER\_PRD\_HKTM\_\_\_\_YYYYMMDDTHHMMSS\_\_\_\_YYYYMMDDTHHMMSS\_0001.tar

HKTM product name (physical name of the folder contained in the *tar* file):

S2A\_OPER\_PRD\_HKTM\_\_\_\_YYYYMMDDTHHMMSS\_\_\_\_YYYYMMDDTHHMMSS\_0001.SAFE

Measurement Data file:

S2A\_OPER\_PRD\_HKTM\_\_\_\_YYYYMMDDTHHMMSS\_\_\_\_YYYYMMDDTHHMMSS\_0001\_measurement.dat

DFEP Annotation file:

S2A\_OPER\_PRD\_HKTM\_\_\_\_YYYYMMDDTHHMMSS\_\_\_\_YYYYMMDDTHHMMSS\_0001\_annotation.dat

*manifest.safe*: fixed filename,

Measurement and Annotation schemas (located in the final leaf of the “resources” directory in the annexed zip file):

s2-level-0.xsd

s2-level-0-annot.xsd

### 3.21 SAD PDI definition

RAW Satellite Ancillary Data (SAD) data are systematically downlinked to ground stations at the end of each downlink as source packets provided with their DFEP annotation.

Each SAD packets include their corresponding source packet binary annotations as a pre-pended header. A source packet header consists (according to this order) in:

- DPC annotation computed during the L0 processing DPC annotation (cf. section 4.6.2.1);
- DFEP annotation as received from the DFEP (cf. [DFEP-ICD]).

SAD data (used mainly by the POD) are stored as a PDI.

A SAD PDI consists in a single **tar** file containing a set of unitary Raw SAD files each matching a single packet type defined in the Table 3-9. Those files cover the temporal extent of the full orbit.

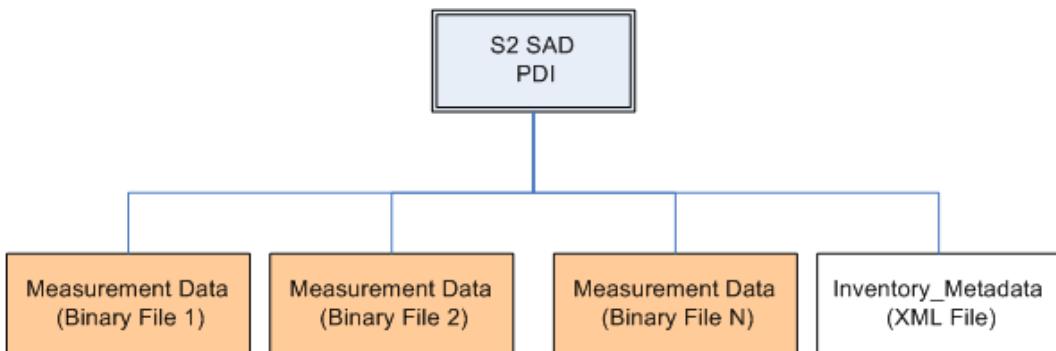


Figure 56: S2 SAD PDI definition

As described in the figure, the SAD PDI consists of:

1. **Measurement Data files (Binary Files):** binary encoded files defined for each SAD type containing only a single source packets type. The content of the SAD telemetry is detailed in [S2GICD-SAD];
2. **Inventory\_Metadata.xml:** file providing metadata to inventory the PDI (see Annex C).

#### 3.21.1 PDI-ID definition

SAD PDI is identified by a unique PDI\_ID (filename) following the description provided in the section 3.2:

PDI\_ID = MMM\_CCCC\_TTTTTTTTTT\_<instance\_id>.tar

The sub-strings MMM (Mission ID), CCCC (File Class), and TTTTTTTTTT (File Type) are detailed in the section 3.2 and Table 3-9. The tar contains a set of unitary Raw SAD files, one for each SAD



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 293 / 477

type (39 different types expected in nominal cases, up to 53 different types with normally disabled SAD enabled) defined in the Table 3-9.

The Instance ID is defined hereafter.

`<Instance_Id> = <Site Centre>_<Creation Date>_<Sensing Start Time>_<Sensing Stop Time >_<Absolute Orbit Number>_<Completeness>_<Integrity>.tar`

`<Site Centre>` and `<Creation Date>` corresponding to the `Instance_ID` mandatory prefix (see section 3.2).

`<Site Centre>:`

- CGS1
- CGS2
- CGS3
- CGS4

The sub-fields composing the `Instance_ID` are described in the following table:

Field Name	Value/Meaning	Note
Sensing Start Time	VYYYYMMDDThhmmss	"V" = option Id for validity period
Sensing Stop Time	YYYYMMDDThhmmss	
Orbit Number	Axxxxxx xxxxxx = (000001-999999)	"A" = option Id for Absolute orbit number
Completeness	<b>Wx</b> where: x = <b>F</b> for Full orbit x = <b>P</b> for Partial orbit	"W" = option Id for Completeness Id
Degradation	<b>Ly</b> where: y = <b>N</b> for Nominal data (no degradation) y = <b>D</b> for Degraded data (some missing packets, due to synchro loss or corrupted telemetry)	"L" = option Id for Degradation Id

Table 3-66: PDI-ID definition for SAD

SAD PDI\_ID template:

S2A\_OPER\_AUX\_SADATA\_CGS2\_VYYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_A123456\_WF\_LN.tar

Measurement Data file (binary file) template:

S2A\_OPER\_AUX\_S11125\_CGS2\_VYYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_VYYYYMMDDTHHMMSS\_A123456\_WF\_LN



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 294 / 477

### 3.22 TCI PDI definition

The set of PDIs related to the True Colour Images (TCIs) are stored separately in their own PDIs. True Colour Image PDI is defined as a **tar** containing the following structure:

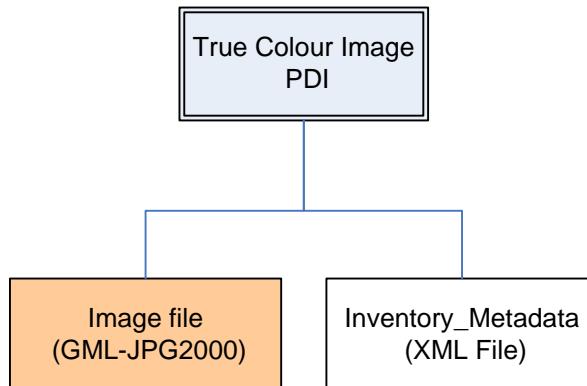


Figure 57: TCI PDI definition

As shown in the figure, the TCI PDI consists of:

- Image file: (GML-JPEG2000). The GML-JPEG2000 implementation is detailed in the reference document [GMLJP2]. It is a single file in JP2000 which gathers the 3 RGB bands.
- Inventory\_Metadata file: Inventory metadata file.

It is identified by a unique PDI-ID defined in the following section.

#### 3.22.1 PDI-ID definition

The PDI\_ID (file naming convention) used for a TCI PDI, compliant to [EOFFS-PDGS] follows the description provided in the section 3.12.1 relative to a Level-1C Tile PDI. The File Type sub-string is defined in the section 3.2.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 296 / 477

## 4. USER PRODUCT PHYSICAL FORMAT DEFINITION

This section contains the definition of the Sentinel-2 User Products structure and format for each processing level.

### 4.1 S2 User Product Physical Format

The following table summarizes for each S2 User Products the expected content and format.  
Note that the User Product structure is common to all processing level (L0/L1A/L1B/L1C) except for the Ancillary Data File provided only inside a Level-0 User Product.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 297 / 477

Product Main Components	Physical Format	Mandatory	L0	L1A	L1B	L1C	Description
<b>Product_Metadata_File</b>	XML file	Y	Y	Y	Y	Y	This is the mandatory XML metadata file that describes the physical organization and the content of the User Product.
<b>manifest.safe</b>	XML file	N	Y	Y	Y	Y	The <i>manifest.safe</i> file will be included in the final product only if the user requires the product SAFE formatted.  Note that the final user product contains only one main <i>manifest.safe</i> file. The <i>manifest.safe</i> files relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the user product, all lower level PDI are removed.
<b>GRANULE</b>	Folder	Y	Y	Y	Y	Y	This is a folder of folders. In fact it contains the list of the Granule composing the product. For each Granule is provided a folder with the same structure defined in the chapter 3 and named as the Granule PDI_ID (Granule ID).  This product main component is the core of the user product containing the imaging data files.
<b>DATASTRIP</b>	Folder	Y	Y	Y	Y	Y	Folder containing the list of folders corresponding each one to the Datastrips composing the product named as the Datastrip PDI_ID (Datastrip ID)..
<b>AUX_DATA</b>	Folder	Y	Y	Y	Y	Y	This folder could contain, if selected by the user, all the auxiliary files used for the processing.
<b>ANC_DATA</b>	Folder	N	Y	N	N	N	Folder containing the Ancillary data source packet provided inside a single file.
<b>Preview_Image</b>	JPEG2000 file	N	Y	Y	Y	Y	Preview Image file (PVI) is included in the final product if required by the user (download option). This preview is extracted from Level-1C image (JPEG2000 low resolution extraction, 3 visible-bands in



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 298 / 477

Product Main Components	Physical Format	Mandatory	L0	L1A	L1B	L1C	Description
							ground geometry at 320m resolution, RGB).
rep_info	Folder	N	Y	Y	Y	Y	Folder containing the XSD schemas describing the User Product components. This folder is optional. It will be included in the final product if the user selects the SAFE format as output format (see section 4.5).
INSPIRE	XML file	Y	Y	Y	Y	Y	Metadata file based on INSPIRE Metadata regulation ([EC-INSPIRE-CR] and [EC-INSPIRE-DIR]).
HTML	Folder	Y	Y	Y	Y	Y	Folder containing two files: 1. UserProduct_index.html 2. UserProduct_index.xsl The first file is a product presentation file allowing the End User to display easily the main content of the product. The second one represents the stylesheet used to generate the first one allowing the End User to display a selected sub-set of the product metadata.

Table 4-1: Sentinel-2 Products Physical Format



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 299 / 477

Note that the user product metadata provides different views of information and its content is organised at three levels:

- **Product level:** general information provided at product level. These metadata are grouped in the Product\_Metadata\_File described in the following sections for each processing level.
- **Granule/Tile level:** information referring to the Granules/tiles (or portion of Granule, i.e. the pixel-level information) composing the user product. These metadata, (located in the user product inside the GRANULE/Granule\_Metadata\_File), are embedded as they are from the Granule PDIs to the final product.
- **Datastrip level information:** information referring to the Datastrip composing the user product. These metadata (located in the user product inside the DATASTRIP/Datastrip\_Metadata\_File), are embedded as they are from the Granule PDIs to the final product.

For details regarding metadata management see section 2.4.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 300 / 477

### 4.1.1 User Product XSD Schemas

This section contains the list of the XSD schemas (annexed to the document) used to describe the structure and the metadata content of each S2 User Product:

1. *S2\_User\_Product\_Level-0\_Structure.xsd*
2. *S2\_User\_Product\_Level-1A\_Structure.xsd*
3. *S2\_User\_Product\_Level-1B\_Structure.xsd*
4. *S2\_User\_Product\_Level-1C\_Structure.xsd*
  
5. *S2\_User\_Product\_Level-0\_Metadata.xsd*
6. *S2\_User\_Product\_Level-1A\_Metadata.xsd*
7. *S2\_User\_Product\_Level-1B\_Metadata.xsd*
8. *S2\_User\_Product\_Level-1C\_Metadata.xsd*

The first set of the schemas (points 1 - 4) define the "physical organization" of a User Product on the disk.

These schemas are "improperly" used to specify elements not envisaged by the XML such as folders, therefore it is actually not expected to be used for the validation of the corresponding XML file.

Oppositely, the second set of the schemas (points 5 – 12) are used to validate the XML metadata file inside each S2 User Product (SAFE and DIMAP formatted).

### 4.2 S2 User Product Naming Convention

The naming of the **main product directory** is compliant to [EOFFS-PDGS] and follows the naming convention defined hereafter:

MMM\_CCCC\_TTTTTTTT\_<Instance\_ID>.<FORMAT> where:

Part	Description	Comment
MMM	<b>Mission ID</b>	S2A S2B
CCCC	<b>File Class</b>	4 uppercase letters: OPER for Routine Operations (all phases)  Note that the File Class will be set "OPER" for all products generated during the operation phase. During validation or for internal testing other values can be defined



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 301 / 477

TTTTTTTTTT	<b>File Type</b> (File Category + File Semantic)	10 uppercase letters can contain digits and underscores: PRD_MSIL0P PRD_MSIL1A PRD_MSIL1B PRD_MSIL1C PRD_MSITCI
<Instance_ID>	<b>Instance Id</b>	Contains uppercase letters, digits and underscores.
<FORMAT>	<b>SAFE</b> <b>DIMAP</b>	According to the User Product output format selected by the final user.

Table 4-2: Main Product Directory - Naming Convention

<instance ID> = ssss\_yyyymmddThhmmss\_R000\_VYYYYMMTDDHHMMSS\_YYYYMMTDDHHMMSS

where:

ssss\_yyyymmddThhmmss is the <Instance ID> mandatory prefix for Site Centre of the file originator and Creation Date.

Sub-String	Description	Comment
OOO	<b>Orbit Number</b>	Relative orbit number
YYYYMMDDHHMMSS	<b>Start Time</b>	Sensing start time
YYYYMMDDHHMMSS	<b>Stop Time</b>	Sensing stop time

The fixed characters “\_R” and “\_V” are defined in the section 3.2.

Examples of S2 product main directory are:

S2A\_OPER\_PRD\_MSIL0P\_PDMC\_20130424T120700\_R054\_V20091210T235100\_20091210T235134.SAFE  
S2A\_OPER\_PRD\_MSIL1A\_PDMC\_20130424T120700\_R055\_V20091210T235052\_20091210T235143.SAFE  
S2B\_OPER\_PRD\_MSIL1B\_PDMC\_20130424T120700\_R056\_V20091210T235052\_20091210T235143.DIMAP

Inside the product directory we have the product main components listed in the Table 4-1.

- **Product\_Metadata\_File (mandatory, XML Main Metadata file):**

The product metadata file name follows the same convention defined for the main product directory where the File Type field is defined in the following table:

Product component	FileType	Note
Product_Metadata_File	MTD_SAFL0P MTD_SAFL1A MTD_SAFL1B MTD_SAFL1C	Valid if the user product is SAFE formatted

	MTD_DMPL0P MTD_DMPL1A MTD_DMPL1B MTD_DMPL1C	Valid if the user product is DIMAP formatted
--	--	--

Table 4-3: Product\_Metadata\_File - Naming Convention

File Template name:

S2A\_OPER\_MTD\_DMPL1A\_PDMC\_20130424T120700\_R054\_V20091210235100\_20091210235134.xml

- **manifest.safe (optional, XML file):**

XML file with fixed name *manifest.safe*.

- **GRANULE (folder):**

GRANULE folder contains the list of folders each one corresponding to the Granules composing the user product. The name (PDI\_ID) and the content (structure of *tar*) of each folder is defined in the chapter 3 for Level-0/Level-1A/Level-1B/Level-1C Granule/Tile.

- **DATASTRIP (folder):**

DATASTRIP folder contains the list of folders each one corresponding to the Datastrips composing the user product. The name (PDI\_ID) and the content (structure of *tar*) of each folder is defined in the chapter 3 for Level-0/Level-1A/Level-1B/Level-1C Datastrip.

- **AUX\_DATA (folder):**

AUX\_DATA folder contains the auxiliary data files used for the processing. The naming convention used to identify each auxiliary file is defined in the chapter 3 for each PDI-Type Auxiliary:

- GIPP
- DEM
- GRI
- IERS
- POD

- **ANC\_DATA (folder):**

ANC\_DATA folder contains the Ancillary Data named as defined in the section 3.21.1 SAD data are provided as a set of unitary Raw Data files each matching a single packet type. Those files cover the temporal extent of the full Datatake.

- **Preview\_Image (optional, JP2 file):**

The product preview image file name follows the same convention defined for the main product directory where the File Type field is defined in the following table:

Product component	FileType	Note
Preview_Image	PVI_MSIL0P PVI_MSIL1A PVI_MSIL1B PVI_MSIL1C PVI_MSITCI	Overview of the product (sub-sampled) mainly for image data browsing and selection purposes



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 303 / 477

Table 4-4: Product\_Metadata\_File - Naming Convention

File Template name:

S2A\_TEST\_PVI\_MSIL1A\_PDMC\_20130424T120700\_R054\_V20091210235100\_20091210235134.jp2

- **rep\_info (folder):**

Folder with fixed name recommended by [SAFE-SPEC].

- **INSPIRE.xml (mandatory, XML file):**

XML file with fixed name.

- **HTML (folder):**

This folder contains two files:

1. UserProduct\_index.html
2. UserProduct\_index.xsl

The first file is a product presentation file allowing the End User to display easily the main content of the product.

The second one represents the stylesheet used to generate the first one allowing the End User to display a selected sub-set of the product metadata.

### 4.3 User Product Quality Indicators

The Quality Indicators (QI) provided inside the User Product are:

1. QI at GRANULE level for each Granule composing the product;
2. QI at DATASTRIP level for each Datastrip composing the product;
3. QI at User Product level including:
  - 3a) QI consolidated from information available at Granules level:
    - o cloud coverage % = AVG(Granule level cloud coverage indicator)
    - o technical quality % = AVG(Granule level technical quality indicator)
  - 3b) reference to all OLQC reports (see Annex D) containing the FAILED checks performed on the Granules and Datastrips composing the product. Note that only the reports with *global>Status FAILED* are embedded in the User Product;
  - 3c) QI representing a synthesis of the OLQC inspections performed at Granule and Datastrip level.

More details regarding the needed processing to compute the QIs at product level, are in the Table 4-12.

### 4.4 Download Options

The download options proposed to the user at the time of the User Product selection are shown in the following table:



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 304 / 477

Download Options									
S2 User Product	Full Swath	Full Datatake	PVI	Auxiliary Data	Metadata Level	Spectral Bands	Consolidated Tiles	Aggregation Along-Track	Output Format
Level-0	YES	YES	YES	YES	YES	YES	NO	NO	YES
Level-1A	YES	YES	YES	YES	YES	YES	NO	YES	YES
Level-1B	YES	YES	YES	YES	YES	YES	NO	YES	YES
Level-1C	NO	YES	YES	YES	YES	YES	YES	NO	YES

- **Full Swath:** option to extend automatically the user selected area to the full MSI swath.
- **Full Datatake:** option to extend automatically the user selected area to the full Datatake.
- **Pre View Image (PVI):** option to include in the final product the PreView image corresponding to the selected User Product.
- **Auxiliary Data:** option to include in the User Product the auxiliary data used for processing. By default, a S2 product contains the list of used auxiliary data referenced at metadata level.
- **Metadata Level:** option to select the level of metadata (Brief/Standard/Expertise) to include in the final product.
- **Spectral Bands:** this option allows to lower the volume of data to download, selecting a given subset of spectral bands.
- **Consolidate Tiles:** using this option, the user may request to receive only complete L1C Tiles that have been consolidated (see Section 4.9.8)
- **Aggregation Along-Track:** this option allows to merge for each detector one image grouping all single Granules along track therefore producing at maximum 12 images per band. (see Section 4.7.8)
- **Output Format:** option to package the final product in SAFE or DIMAP format.

## 4.5 User Product SAFE Format Approach

The User Product is formatted by default as a **SAFE** (Standard Archive Format for Europe) product.

Following the presentation in section 1.6.2 and the User Product structure in the Table 4-1, a SAFE User Product includes a **manifest.safe** file and a **rep\_info** folder according to [SAFE-SPEC].

The **manifest.safe** is an XML file formatted according to [SAFE-SPEC] providing metadata (concerning the overall context where the User Product is generated and the User Product itself) and a map of the User Product content (consisting in a reference to all data components inside the product including measurement data files, ancillary and auxiliary data files, XSD schema, etc).

The **manifest.safe** is composed by three main sections:



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 305 / 477

Manifest sections	Description
<b>Information Package Map</b>	Contains a high-level textual description of the product and references to all products components.
<b>Metadata Section</b>	Contains the product Metadata, including the product identification and the resource references.
<b>Data Object Section</b>	Contains references to the physical location of each component file contained in the product, with a description of the file format, location, size and checksum.

Table 4-5:High Level Structure of SAFE Manifest File

More in details the *manifest.safe* contains:

1. metadata information defined by [SAFE-SPEC] including not only the mandatory Metadata Sections (Platform and Processing sections) but, as added value, other relevant non mandatory Metadata Sections (e.g. acquisitionPeriod, measurementOrbitReference, measurementFrameSet),
2. a sub-set of metadata redundant respect to the mandatory XML Product\_Metadata\_File included in the User Product,
3. the map of the complete content of the User Product, namely all the references to all product component files (including the reference to the XML main metadata file) with the description of each file (e.g. file type, file size, coding, etc...).

Note that the Product\_Metadata\_File file groups all metadata regarding the product and the mission context, while the SAFE Manifest file contains, as added value, the exhaustive map of the User Product itself and a description of each file User Product components (e.g. file type, file size, coding, etc...).

In this respect, the present document provides, for each L0/L1A/L1B/L1C User Product defined in this Section 4, the following information:

- A set of 3 tables (one for each of the three main sections), containing the list of fields (tags or attribute) to be included in the Safe Manifest file, and for each field:
  - the field name in the SAFE Manifest file (attributes names are in bold character);
  - only for the Metadata section, the corresponding field name in the Product\_Metadata\_File schema; this column highlights the redundant sub-set of metadata included both in the XML Product\_Metadata\_File and in the XML SAFE Manifest file;
  - a brief textual description of the field;
  - the data type of the field;
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory.
- A practical example of SAFE Manifest file containing the tags listed in the table mentioned above. Each tag is set to an indicative value, as realistic as possible; the compliance of the SAFE Manifest file to the SAFE specification has been verified by validating the Manifest file against the SAFE XSD schemas. All SAFE Manifest files and the schemas are provided in the zip file (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip) annexed to this document. The XSD



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 306 / 477

schemas are provided as a set of *xfdu.xsd* schemas located in the final leaf of the resources directory.

In addition to the mandatory SAFE Manifest file, according to the applicable document [SAFE-SPEC], a SAFE User Product contains the *rep\_info* folder (fixed folder name recommended by [SAFE-SPEC]) including all the available schemas describing the product component files. Those schemas are not mandatory but "may be provided" inside the product.

The XSD schemas provided inside the *rep\_info* folder are referenced as internal product components by "metadataComponentSchemas" tag in the manifest file.

On the contrary, according to the SAFE specifications, the XSD schemas used to validate the SAFE manifest files are not included in the *rep\_info* folder but they are external to the User Product.

Note that the User Product contains only one main SAFE Manifest file and one *rep\_info* schemas repository. The Manifest files and *rep\_info* repositories relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the User Product. All lower level manifest files and *rep\_info* folders are removed before to build the User Product. SAFE does not authorise multiple SAFE manifest and SAFE schema repository in a product.

## 4.6 Level-0 User Product specification

### 4.6.1 Introduction

Level-0 product is generated from the Sentinel-2 instrument and ancillary telemetries. It contains raw data after restoration of the chronological data sequence at full space/time resolution with all auxiliary and ancillary information to be used in subsequent processing. In fact the Level-0 product contains all the information required to generate the Level-1 (and upper) product levels. The Level-0 consolidation processing stores the Quick Look image in the L0 Datastrip PDI. Reprocessing is from archived consolidated L0 which include QL image to get Level 1 products.

One Level-0 product refers always to one Datatake; it can cover the full Datatake or an its extract. It may refer to one or several Datastrips from the same Datatake. The ancillary data are always provided on temporal extent on the full Datatake, even in the case of an extract.

The following figure gives an overview of the Level-0 User Product physical format. The yellow boxes correspond to folders and the white ones to files:

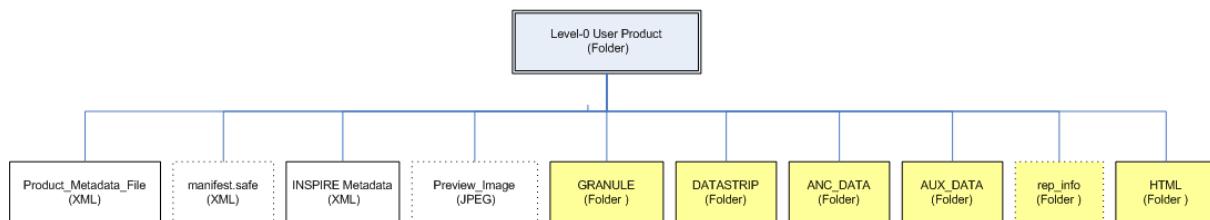


Figure 58: Level-0 User Product Structure

The Level-0 User Product consists of:

1. **Product\_Metadata\_File**: mandatory XML main metadata file.
2. **manifest.safe**: SAFE metadata file (optional). It is included in the product only if the user requests the SAFE as output format (download option).
3. **GRANULE**: folder containing all Granules composing the product (Image Data). The Image Data files inside each Granule are provided as a set of 13 binary files, one image file per band corresponding to a given detector.
4. **DATASTRIPE**: folder containing the Datastrip composing the product linked to the selected Granules.
5. **AUX\_DATA**: folder containing, if requested by the user (download option), the GIPP files and IERS Bulletins used for the Level-0 User Product production. All Level-0 auxiliary data are referenced in the product metadata file.
6. **ANC\_DATA**: folder containing the Satellite Ancillary Data (SAD) needed for the processing (GPS data, attitude data, etc ....). The SAD are always provided as a set of unitary Raw Data files each matching a single packet type. Those files cover the



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 308 / 477

temporal extent of the full Datatake even in the case the product corresponds to an extract.

7. **rep\_info**: folder containing the XSD schema provided inside the product. This folder is optional. It is included in the final product if the user selects the SAFE format as output format (download option).
8. **Preview\_Image**: file consisting of an image limited to 3 visible-bands in ground geometry at 320m resolution. This file, provided if required by the user (download option), gives an overview of the product (sub-sampled) mainly for image data browsing and selection purposes.
9. **INSPIRE**: XML INSPIRE metadata file (see Annex B).
10. **HTML**: folder containing an HTML product presentation file (UserProduct\_index.html) and the corresponding stylesheet (UserProduct\_index.xsl).

Note: The number of the Granules available within a L0 product is variable and driven by the active detectors list specified at Datastrip level (ACTIVE\_DETECTOR metadata).

The list of the active detectors depends on the MSI acquisition mode (compression by-passed or not).

Compression mode is reported in the MSI packet by the MODOP field (cf. [S2GICD-MSI]).

In the nominal products the compression is enabled and all detectors are available; in case of calibration products the compression is by-passed and only a subset of detectors are active and therefore available.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 309 / 477

### 4.6.2 Image Data

#### 4.6.2.1 Data Organization

The image data, inside the Level-0 User Product, are organized per Granules. Each Granule contains the mission data corresponding to one on-board scene for one detector and all spectral bands. Therefore, as described in the section 3.6, the image data inside each Level-0 Granule, are provided as a set of 13 binary files, one for each spectral band, including all corresponding annotated Image Source Packets (ISP) in the observation chronological sequence (see [S2GICD-MSI]).

For instance, a Datatake of 220 scenes (approx. 5000km) contains  $220 \times 12 = 2640$  Granules corresponding to  $2640 \times 13 = 34320$  binary files.

The L0 ISPs contain data part and annotations (note that the annotation must be removed before uncompression during L1 processing).

The data part correspond to MSI compressed data or not inline with the indication in COMPRESS\_MODE metadata. ISPs include their corresponding source packet annotations as a pre-pended header of each source packet. The annotations provided with the ISP (see following table) are the result of the following operations performed on each ISP:

- Reed-Solomon (RS) corrections on all Transfer Frames (TFs) containing the ISP;
- Checks if there are missing TFs by checking anomalies in the sequence of the Virtual Channel Frame Count in the Primary Header;
- CRC Error check on the ISP;
- DPC checks.

Note: even if L0 unconsolidated (L0u) are no user products, ISP furnished in L0u are also annotated.

An annotation is made in two parts:

- first the DPC part;
- then the DFEP part.

The DPC part is 2 bytes long and contains:

- a "packet to be ignored" flag indicating if packet has to be ignored (value set to 1) or to be taken into account (value set to 0), on 1 bit: this indicator regroups all possible packets to be ignored;
- a "packet completeness" flag on 1 bit, set to:
  - 0 if packet complete;
  - 1 if packet is incomplete but long enough to be processed (therefore "packet to be ignored" flag is set to 0);



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 310 / 477

- 1 if packet is incomplete and too short (not to be taken into account for further processing, therefore "packet to be ignored" flag is set to 1);
- a "packet validity" flag on 1 bit, set to:
  - 0 for valid packet (good CRC);
  - 1 if CRC is invalid but packet is declared trustworthy (main information of the header are all correct, "packet to be ignored" flag is set to 0);
  - 1 if CRC is invalid and packet is not trustworthy (not to be taken into account for further processing, therefore "packet to be ignored" flag is set to 1);
- the 13 bits remaining are reserved.

The DFEP part is fully described in the [DFEP-ICD] and is 18 bytes long:

Field ID	Description
mjd_time_stamp	Downlink/ground reception time. The time stamp is the downlink time of the first transfer frame containing parts of the packet
isp_lenght	Size in bytes of the ISP after reconstruction from transfer frames (it may be less than the initial size of the ISP in case of missing transfer frames)
num_VCDUs	Number of Transfer Frames containing the current ISP
num_missing_VCDUs	Number of missing Transfer Frames containing the current ISP
crc_error_flag	CRC Error flag, indicating the detection of CRC error in the ISP
VCID	First bit is set to 1 if VCID field contains VCID, 0 otherwise. 1 bit of spare. 6 bits containing the VCID
Channel	Channel information: C1/C2 01 (binary): C1 10 (binary): C2
Spare	

Table 4-6: DFEP Annotations for one Instrument Source Packet

The original downlinked data stream at ISP level is preserved but corrupted ISPs are flagged; i.e. corrupted ISPs are not discarded, but simply marked as such (field "packet to be ignored" of the DPC annotation set to 1).

DFEP also considers an ISP corrupted (and the corresponding DFEP annotation field crc\_error set to TRUE) in one of the following cases:

- if one or more TFs containing the ISP are missing or found incorrigible during Reed-Solomon decoding (num\_missing\_VCDUs field in Table 1 > 0). In this case, the ISP is extracted, but the successive CRC error check on the packet detects an error, and the field CRCFlag is set to TRUE;
- if the CRC error check detects an error in the extracted ISP e.g. due to packet corruption after generation on-board by the source packet terminal.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 311 / 477

### 4.6.2.2 Volume

Each .Granule has a constant volume of approximately **16 MB** and contains image data with the same time stamp but spatially deregistered due to the interband deregistration of 14 km at maximum.

Level-0 data is kept on-board compressed. The following table describes the contents of a Granule in term of number of mission source packets in a Granule.

SSD	Number of bands	Number of packet per band in one Granule
10 m	4	144
20 m	6	72
60 m	3	24

Table 4-7: Number of mission source packets in a Granule

Each Level-0 Granule is identified in a unique way, using a unique identifier PDI\_ID defined in the section 3.6.1.

### 4.6.3 Ancillary Data

Raw Satellite Ancillary Data are provided inside the Level-0 User Product (within the ANC\_DATA folder) divided by PRID and SID (see Table 3-9). All SAD raw data (DPC and DFEP annotated source packets, cf. §4.6.2.1 for annotation details) are splitted in binary files covering the full Datatake, even in the case the product corresponds to an extract of the entire Datatake.

The decoded SAD, useful for further processing are provided at Datastrip level through the Datastrip metadata file. In particular, these data allow computing the associated geometric model and include:

- Time Correlation Data (sampled at 1Hz),
- Imaging orbit number,
- Ephemeris data,
- Attitudes data (sampled at 10Hz):
- Thermal data



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 312 / 477

### 4.6.4 Auxiliary Data

All Auxiliary Data used for the Level-0 processing are referenced in the product metadata file:

- IERS bulletin file,
- Ground Image Processing Parameters (GIPPs) files (see Annex E),
- Reference to used DEM.

The final user, according to a specific download option, will be able to include in its Level-0 User Product, the IERS bulletin and/or the used GIPP files. DEM is never provided within the product but only referenced at metadata level.

### 4.6.5 Quality Indicators

The Quality Indicators (QI) are made available by the consolidation processing for the Level-0 product.

The *Product Level Quality Indicators* are provided at product level through the product metadata file.

The *Granule Level Quality Indicators* are provided at Granule level through the metadata file.

The *Datastrip Level Quality Indicators* are provided at Datastrip level through the metadata file.

The User Product QI are defined in the Table 4-12.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 313 / 477

### 4.6.6 Metadata

The following table shows the groups of metadata provided inside a Level-0 User Product:

Level-0 User Product Metadata	
<b>Product Level Metadata</b>	All product level metadata, specific for the User level, are consolidated/computed because not present at Granule and Datastrip level.
<b>Granule Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Granule level are copied from the input Granules to the User Product.
<b>DATASTRIP Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Datastrip level are copied from the input Datastrips to the User Product;

Table 4-8: Level-0 Product Metadata

As mentioned in the section 2.4, the User Product metadata (all) are not provided with a *metadataLevel* attribute (Brief/Standard/Expertise) unlike what happens for all Granule and Datastrip metadata.

During the User Product assembling, this attribute is used to select by filtering, according to a download option, the set of metadata that must be included in the final product.

For these filtered fields, the *metadataLevel* attribute is not written in the User Product's metadata.

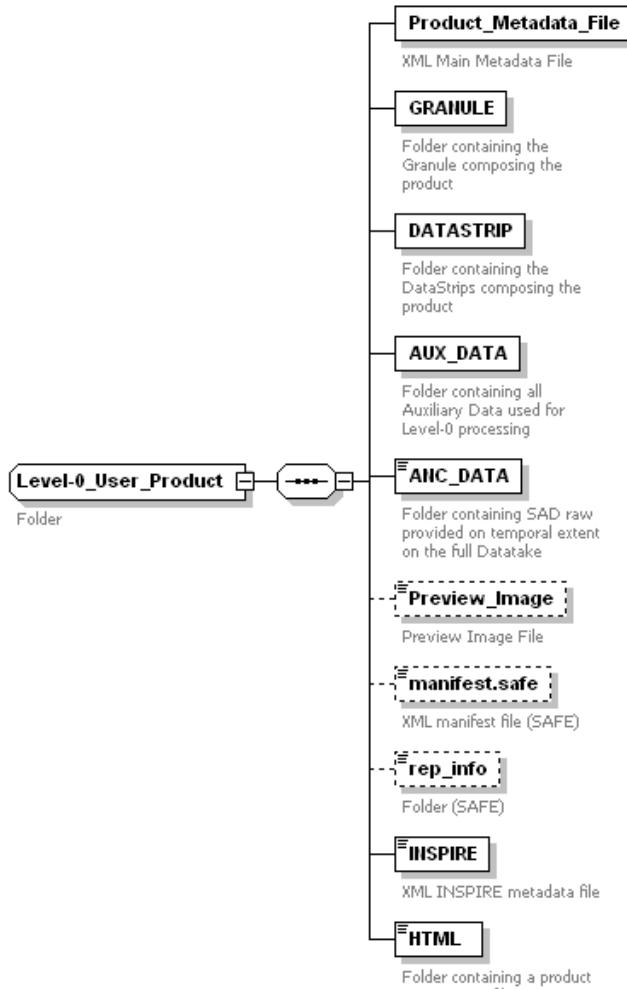
Note that an User Product for an expert user (Expertise download option) will contain all level of metadata (Brief/Standard/Expertise). An User Product for a user with "Standard" or "Brief" permission will contain only Brief/Standard or Brief metadata.

In addition to the metadata in the table above, the User Product contains the *manifest.safe* metadata (when the User Product is SAFE format) and the INSPIRE metadata.

The Level-0 Product Metadata are detailed in the section 4.6.7 where the schema of the product is provided.

#### 4.6.7 User Product Level-0 Structure

S2\_User\_Product\_Level-0\_Structure.xsd schema annexed to the document and shown in the following diagram represents the structure of a S2 Level-0 User Product. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the Figure 58.

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">Product_Metadata_File</a> <a href="#">GRANULE</a> <a href="#">DATASTIP</a> <a href="#">AUX_DATA</a> <a href="#">ANC_DATA</a> <a href="#">Preview_Image</a>  <a href="#">manifest.safe</a> <a href="#">rep_info</a> <a href="#">INSPIRE</a> <a href="#">HTML</a></p>
annotation	<p>The diagram above shows the Level-0 User Product structure containing:</p> <ol style="list-style-type: none"> <li>1. <b>Product_Metadata_File</b>: XML Main Metadata file (DIMAP)</li> <li>2. <b>GRANULE</b>: folder containing the list of the Granules belonging to the product.</li> <li>3. <b>DATASTIP</b>: folder containing the list of the Datastrip belonging the Datatake from</li> </ol>



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 315 / 477

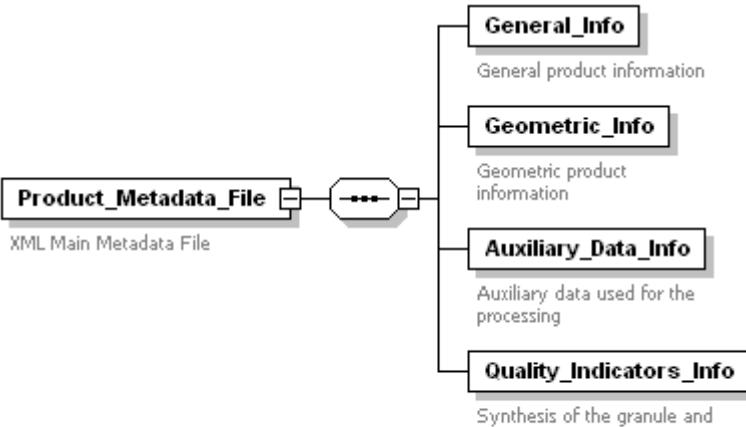
which the product has been selected.

4. **AUX\_DATA**: folder containing all Auxiliary Data used for Level-0 processing (optional, the aux data are included in the product if selected according to a specific download option).
5. **ANC\_DATA**: folder containing ancillary data needed for processing (GPS data, attitude data, etc ....). The ancillary data are always provided on temporal extent on the full Datatake even in the case of an extract.
6. **Preview\_Image**: JPEG2000 for image data browsing and selection purposes.
7. **manifest.safe**: XML SAFE Manifest file
8. **rep\_info**: optional folder containing the XSD DIMAP schema
9. **INSPIRE.xml**: XML INSPIRE metadata file
10. **HTML**: folder containing an HTML product presentation file and the corresponding stylesheet.

#### 4.6.7.1 *Product\_Metadata\_File Schema*

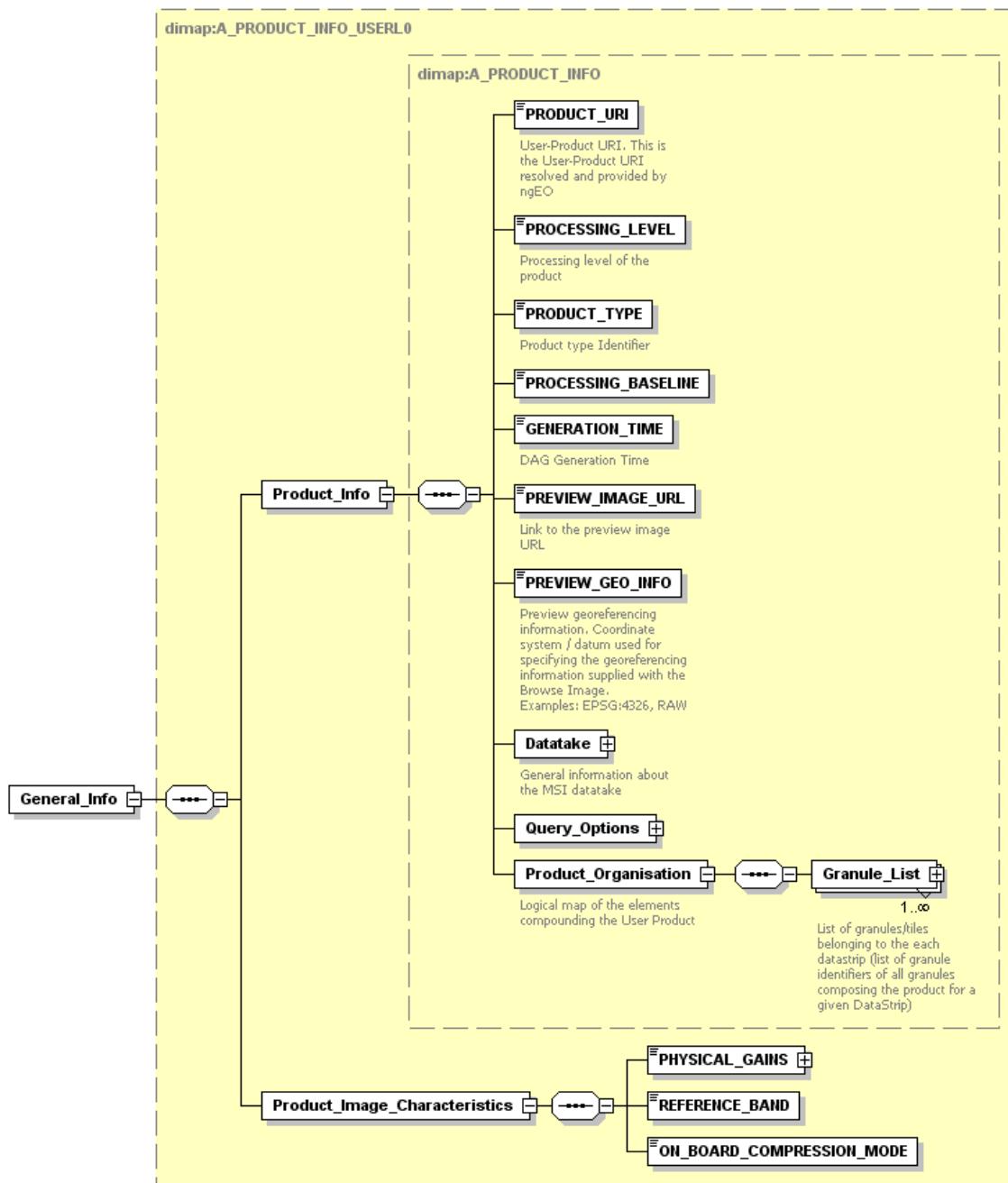
Product\_Metadata\_File is the XML metadata file provided inside the S2 Level-0 User Product. The XSD schema annexed to this document and used to validate it is *S2\_User\_Product\_Level-0\_Metadata.xsd*.

A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Product_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class General_Info {         &lt;&lt;General product information&gt;&gt;     }     class Geometric_Info {         &lt;&lt;Geometric product information&gt;&gt;     }     class Auxiliary_Data_Info {         &lt;&lt;Auxiliary data used for the processing&gt;&gt;     }     class Quality_Indicators_Info {         &lt;&lt;Synthesis of the granule and DataStrip level QIs&gt;&gt;     }      Product_Metadata_File "3" -- "1" General_Info     Product_Metadata_File "3" -- "1" Geometric_Info     Product_Metadata_File "3" -- "1" Auxiliary_Data_Info     Product_Metadata_File "3" -- "1" Quality_Indicators_Info   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Auxiliary_Data_Info</u></a> <a href="#"><u>Quality_Indicators_Info</u></a>
annotation	<p>Product_Metadata_File is an XML file containing:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: this group of metadata provides general product information.</li> <li>2. <b>Geometric_Info</b>: these metadata provide information describing the geolocation over WGS84 of the contour of the product.</li> <li>3. <b>Auxiliary_Data_Info</b>: All the auxiliary data used for the processing are here referenced.</li> <li>4. <b>Quality_Indicators_Info</b>: Synthesis of the Granule and Datastrip level QIs.</li> </ol>

The following figures and tables give a complete description of the User Product metadata.

General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 59 : Level-0 Product\_Metadata\_File - General\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 318 / 477

Legend for the Table 4-9:

- **Field Name:** provides the name used to identify the metadata;
- **Description:** contains a short description of the relative metadata;
- **From Datastrip PDI:** indicates that the metadata at product level is filled using the corresponding information available at Datastrip level (from the Datastrip\_Metadata\_File of the PDI Datastrips composing the product);
- **From Granule PDI:** indicates that the metadata at product level is filled using the corresponding information available at Granule level;
- **From Additional Processing:** indicates that the metadata, specific to the product level, does not originate neither from the Granules nor from the Datastrips composing the product but it is computed during the final product assembling because not present at PDI level.
- **[PDD]:** indicates if the field has been detected or not in the applicable [PDD].

Note: The first section of the table (General\_Info (common section) is common to all processing level. The last section (Product image characteristics section) is specific for a Level-0 User Product.

General_Info (common section)						
Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
PRODUCT_URI	This is the User Product URI resolved and provided by the catalogue ngEO			X	User Product URI resolved and provided by ngEO	MISSING
PROCESSING_LEVEL	Processing level of the product (Level-0)			X	Extracted from PDI filetype	5.4.1.1
PRODUCT_TYPE	Product type Identifier: S2MSI0 S2MSI1A			X	Extracted from PDI_ID	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 319 / 477

### General\_Info (common section)

Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
	S2MSI1B S2MSI1C S2MSI2Ap					
PROCESSING_BASELINE	Processing Baseline	X			crf. Table 3-32	MISSING
GENERATION_TIME	Product generation time			X	End time of product generation	MISSING
PREVIEW_IMAGE_URL	Link to the preview image URL			X	Provided by ngEO	5.4.1.1
PREVIEW_GEO_INFO	Preview georeferencing information.  Note: L1C User Product: browse image footprint covering the complete L1C User Product extent. L0/L1A/L1B : N/A			X	Provided by ngEO	5.4.1.1
Datatake/SPACECRAFT_NAME	Sentinel-2 Spacecraft name: Sentinel-2A Sentinel-2B	X			see Table 3-32	5.4.1.1
Datatake/DATATAKE_TYPE	MSI operation mode	X			see Table 3-32	5.4.1.1
Datatake/DATATAKE_SENSING_START	Imaging Start Time (Sensing start time of the Datatake)	X			see Table 3-32	5.4.1.1
Datatake/DATATAKE_SENSING_STOP	Imaging Stop Time (Sensing stop time of the Datatake)	X		X	This metadata available at	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 320 / 477

### General\_Info (common section)

Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
					product level is consolidated using the last Datatake_Inf o/DATATAK E_SENSING _STOP available at Datastrip level . see Table 3-32	
Datatake/SENSING_ORBIT_NUMBER	Imaging Orbit Number	X			see Table 3-32	5.4.1.1
Datatake/SENSING_ORBIT_DIRECTION	Imaging Orbit Direction (Default = Ascending)	X			see Table 3-32	5.4.1.1
Query_Options/FULL_SWATH_DATATAKE	Flag to extend the user selected area to the full MSI swath (L0/L1A/L1B) or the full Datatake (L0/L1A/L1B/L1C).			X	Option managed at ngEO server level	
Query_Options/Band_List/BAND_NAME	Option to select the product on a given sub-set of spectral band.		X	X	From product URI provided by ngEO	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 321 / 477

### General\_Info (common section)

Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
					containing Download Option flag (for instance: ngEO_DO={ band:[490,560,665],...})	
Query_Options/Metadata_Level_List/METADATA_LEVEL	<p>List of metadata levels (Brief/Standard/Expertise). The End User, according to this download option, will be able to select the set of metadata at Granule and Datastrip level to be included in the final product.</p> <p>NOTE:</p> <ol style="list-style-type: none"> <li>option <u>Brief</u> means that metadata <i>Brief</i> will be included in the User Product;</li> <li>option <u>Standard</u> means that metadata <i>Brief&amp;Standard</i> will be included in the User Product;</li> <li>option <u>Expertise</u> means that metadata <i>Brief&amp;Standard&amp;Expertise</i> will be included in the User Product.</li> </ol>	X	X	X	From product URI provided by ngEO containing Download Option flag (for instance: ngEO_DO={...,metadataLevel:STANDARD,...})	MISSING
Query_Options/Aux_Llist	<p>The final user, according to this download option, will be able to select the auxiliary data to be embedded in the final product:</p> <ul style="list-style-type: none"> <li>• GIPP files (Link to GIPP files to embed in the product)</li> </ul>	X			The product URI provided by ngEO indicates if the aux data	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 322 / 477

General_Info (common section)						
Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
	<ul style="list-style-type: none"><li>IERS (Link to IERS Bulletin files to embed in the product)</li></ul> <p>Note: Raw ECMWF never downloaded (no embedding option); DEM never downloaded (no embedding option); GRI never downloaded (no embedding option);</p>				have to be embedded in the user product (ngEO_DO={...auxData:YES,...})  If YES, the list of aux files to be embedded in the User Product is copied from PDI Datastrip.	
Query_Options/PREVIEW_IMAGE	Selection of preview image of the User Product  The PVI as URL is always embedded in the product. Only the physical file is optional.			X	From product URI provided by ngEO containing Download Option flag (for instance: ngEO_DO={...,pvi:YES,...})	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 323 / 477

### General\_Info (common section)

Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
				.	}	
Query_Options/PRODUCT_FORMAT	The final user, according to this download option, will be able to select the user product format between SAFE or DIMAP format.			X	From product URI provided by ngEO containing Download Option flag (for instance: ngEO_DO={...outputFormat:SENTINELS_SAFE})	MISSING
Query_Options/AGGREGATION_FLAG	Flag to select Along-Track Aggregated Granules (L1A/L1B) and Consolidated Tiles (L1C).			X	For Level-0, aggregation is always FALSE	MISSING
Product_Organisation/Granule_List/@DatastripIdentifier	<p>Product_Organization represents the logical map of the elements (Granules vs Datastrip hierarchy) composing the User Product.</p> <p>DatastripIdentifier is the attribute identifying the Datastrip linked to the list of the Granules composing the User Product.</p> <p>In case of User Product including aggregation of Granules (L1A/L1B) or Tiles consolidated (L1C) this</p>	X				5.4.1.1



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

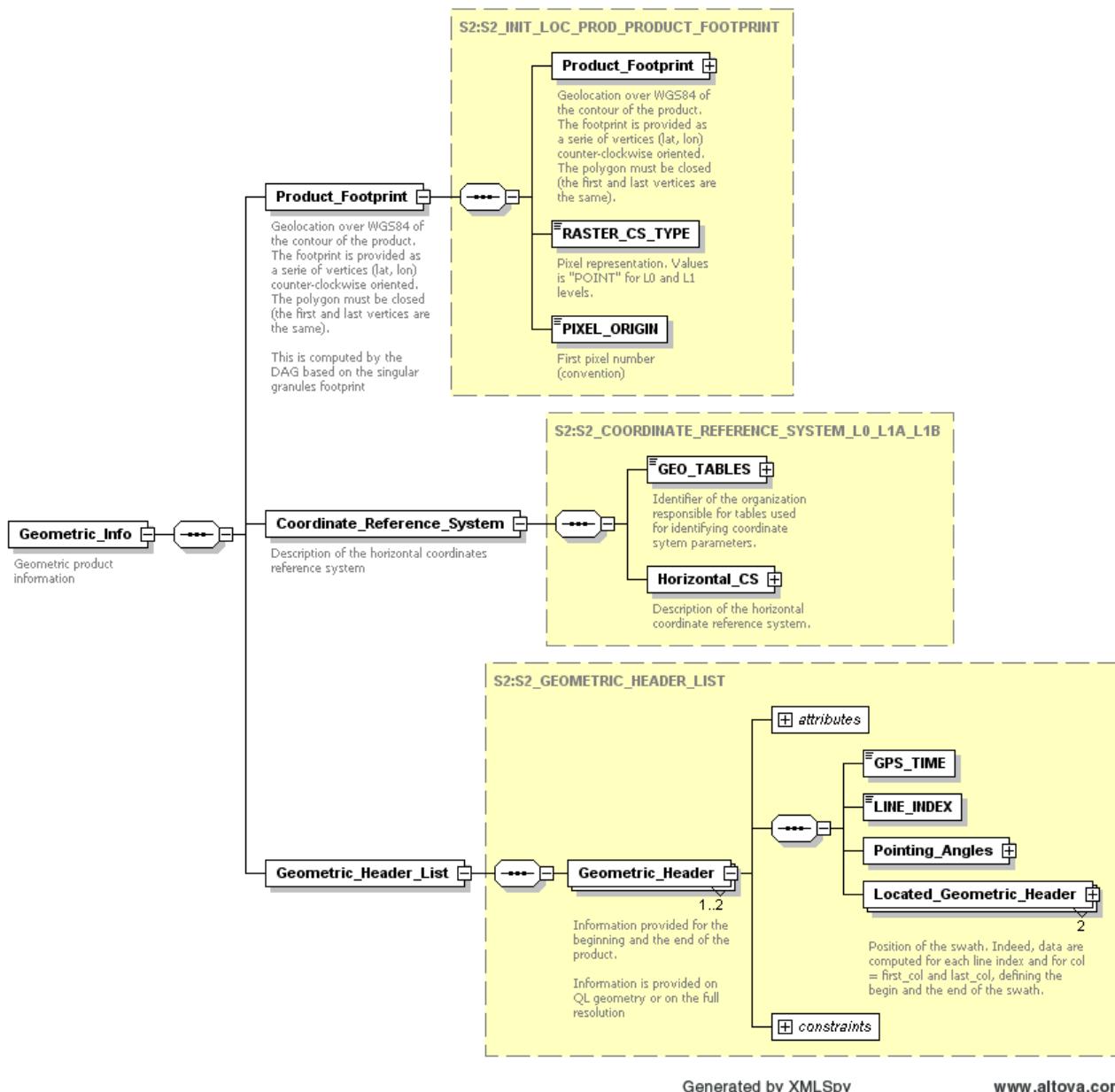
PAGE : 324 / 477

## General\_Info (common section)

Field Name	Description	From Datastrip PDI	From Granule PDI	From Additional Processing	Note	Check vs [PDD]
	attribute contains two (or more) Datastrip identifiers.					
Product_Organisation/Granule_List/Granules/IMAGE_ID	Pointers to Granule/Tile image data files (links to the physical image data)  attribute: fileFormat (JPEG2000, BINARY)		X			5.4.1.1
<b>Product image characteristics section (specific for a L0 User Product)</b>						
Product_Image_Characteristics/PHYSICAL_GAINS	Physical gains for each band	X			§ Table 3-33	§ 5.4.1.2
Product_Image_Characteristics/REFERENCE_BAND	Reference band	X			§ Table 3-36	§ 5.4.1.3
Product_Image_Characteristics/ON_BOARD_COMPRESSION_MODE	Flag to indicate the on board compression mode (by-passed or not).  Note: if this flag is set TRUE, the corresponding metadata COMPRESSION_MODE at L0 Datastrip PDI level is set TRUE.  In case of compression by-passed, the list of active detectors is provided at Datastrip level (ACTIVE_DETECTOR metadata).	X			§ Table 3-33	

Table 4-9: Level-0 Product\_Metadata\_File - General\_Info Description

Geometric\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 60: Level-0 Product\_Metadata\_File – Geometric\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 326 / 477

Geometric_Info/Product_Footprint					
Field Name	Description	From Level-0 Datastrip PDI	From Additional Processing	Note	Check vs [PDD]
Product_Footprint/Global_Footprint/EXT_POS_LIST (*) Product_Footprint/Global_Footprint/INT_POS_LIST	Geolocation over WGS84 of the contour of the product. The footprint is provided as a series of vertices (lat, lon) counter-clockwise oriented.  Global precise footprint of the cut segment (Point list of LAT, LON or X,Y).		X	This is based on the singular Granules footprint	§ 5.4.1.1
Unitary_Footprint_List/Unitary_Footprint/Footprint	(OPTIONAL) Unitary footprint for each detector, each band of the product.		X	This is not required for the Level-0 product.	MISSING
Product_Footprint/RASTER_CS_TYPE	Pixel representation. Values is "POINT" for L0 and L1 levels.		X	Available at Granulelevel	MISSING
Product_Footprint/PIXEL_ORIGIN	First pixel number (convention)		X	Available at Granule level	MISSING
Geometric_Info/Coordinate_Reference_System					
Field Name	Description	From Level-0 Datastrip PDI	From Additional Processing	Note	Check vs [PDD]
GEO_TABLES	Identifier of the organization responsible for tables used for identifying coordinate system parameters (EPSG).		X	Metadata filled as per description	MISSING
HORIZONTAL_CS_TYPE	Description of the horizontal coordinates reference system type (PROJECTED   GEOGRAPHIC)		X	Metadata filled as per description	§ 5.4.1.1
HORIZONTAL_CS_NAME	Description of the horizontal coordinates reference system		X	Metadata filled as per description	§ 5.4.1.1
HORIZONTAL_CS_CODE	Code of horizontal coordinate reference		X	Metadata filled	§ 5.4.1.1



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

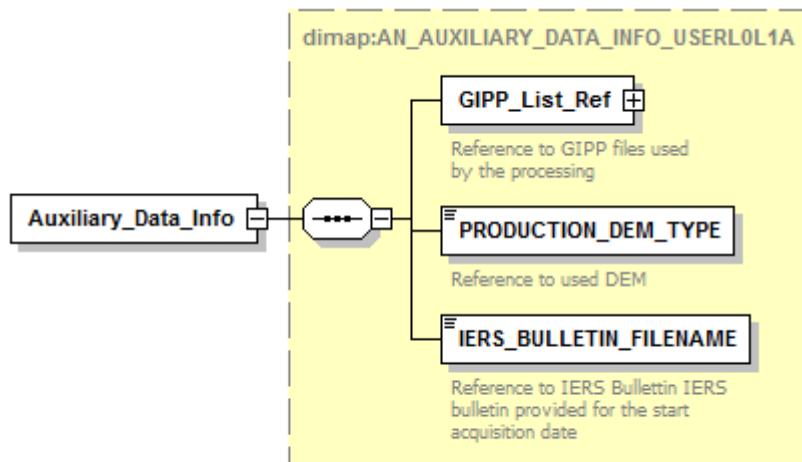
DATE : 12/07/2013

PAGE : 327 / 477

	system. It follows the 'EPSG:xxxx' pattern where xxxx is the unique identification code in the EPSG tables.			as per description	
<b>Geometric_Info/Product_Footprint/Geometric_Header_List (provided for the beginning and the end of the product)</b>					
Field Name	Description	From Level-0 Datastrip PDI	From Additional Processing	Note	Check vs [PDD]
Geometric_Header/GPS_TIME	A GPS date-time value = TAI format	X		Geometric Header Information are provided for the beginning and the end of the product.  § Table 3-33	§ 5.4.1.2
Geometric_Header/LINE_INDEX	Integer	X		§ Table 3-33	§ 5.4.1.2
Geometric_Header/Pointing_Angles/Satellite_Reference (ROLL, PITCH, YAW)	Pointing angles in satellite reference frame	X		§ Table 3-33	§ 5.4.1.2
Geometric_Header/Pointing_Angles/Image_Reference (PSI_X, PSI_Y)	Pointing angles in focal plane referential	X		§ Table 3-33	§ 5.4.1.3
Geometric_Header/Located_Geometric_Header/ORIENTATION	Track orientation. Also called "CAPE". The range of the angle is into [0,360°[	X		§ Table 3-33	§ 5.4.1.2
Geometric_Header/Located_Geometric_Header/Incidence_Angles (ZENITH_ANGLE, AZIMUTH_ANGLE)	Incidence angles	X		§ Table 3-33	§ 5.4.1.2
Geometric_Header/Located_Geometric_Header/Solar_Angles (ZENITH_ANGLE, AZIMUTH_ANGLE)	Solar angles	X		§ Table 3-33	MISSING
Geometric_Header/Located_Geometric_Header/Pixel_Size (ALONG_TRACK, ACROSS_TRACK)	Full resolution pixel sizes along and across track in meters	X		§ Table 3-33	§ 5.4.1.2

Table 4-10: Level-0 Product\_Metadata\_File - Geometric\_Info Description

Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 61 : Level-0 Product\_Metadata\_File – Auxiliary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 329 / 477

Auxiliary_Data_Info					
Field Name	Description	From Level-0 Datastrip PDI	From Additional Processing	Note	[PDD]
GIPP_List_Ref/GIPP_FILENAME	Reference to the GIPP files used by the processing chain.  These files could be in the product (AUX_DATA folder) according to a specific download option.	X		§ Table 3-36	§ 5.6 § 5.4.1.2
PRODUCTION DEM TYPE	DEM type used by the production process (GLOBE or SRTM)	X		§ Table 3-36	§ 5.6 § 5.4.1.2
IERS_BULLETIN_FILENAME	IERS bulletin filename.  This files could be in the product (AUX_DATA folder) according to a specific download option.		X	§ Table 3-36	MISSING

Table 4-11: Level-0 Product\_Metadata\_File – Auxiliary\_Data\_Info Description



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

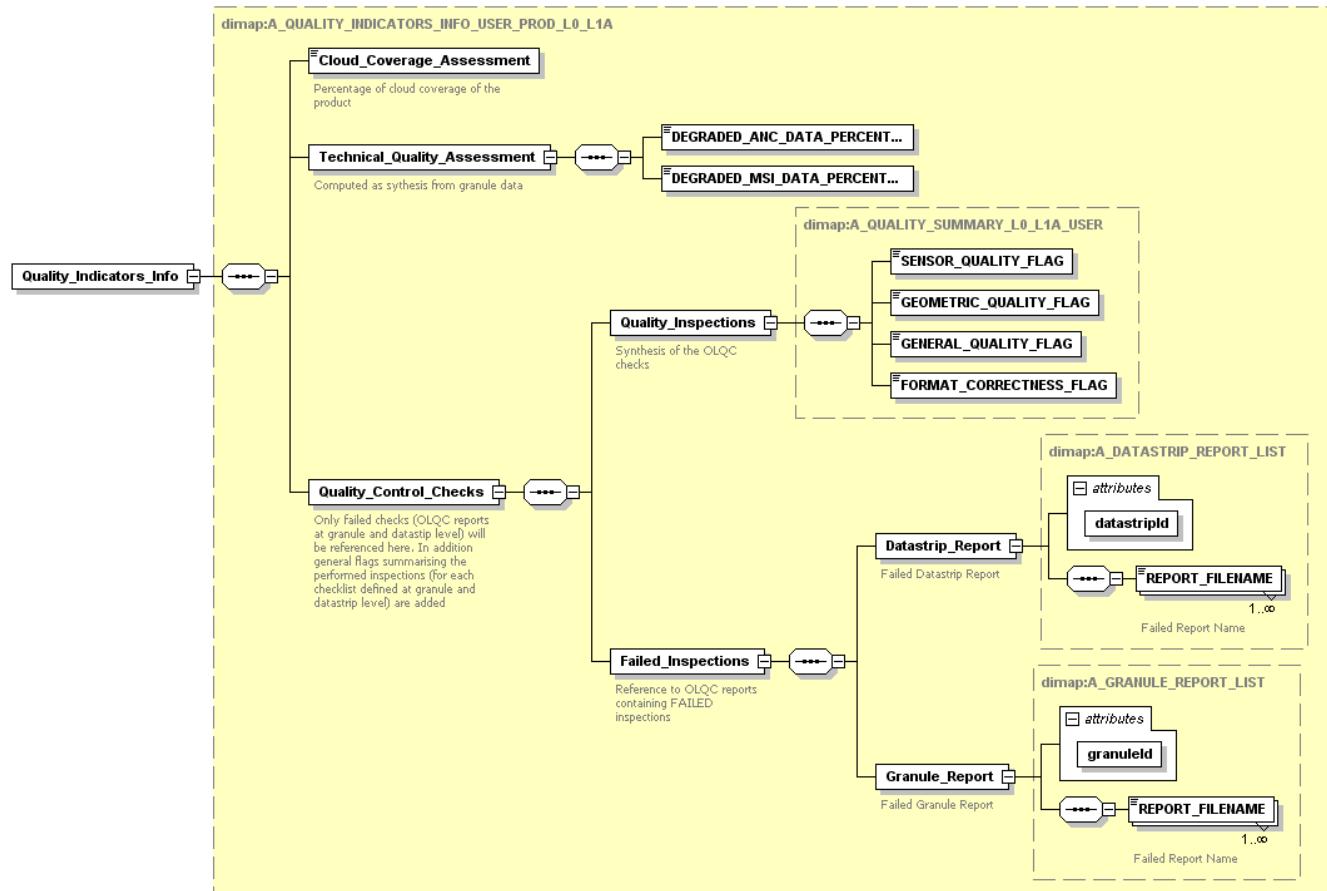
ISSUE : 10

DATE : 12/07/2013

PAGE : 330 / 477

Quality Indicators Info:







## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 332 / 477

Figure 62 : Level-0\_Product\_Metadata\_File – Quality\_Indicator\_Info Diagram

Quality_Indicators_Info							
Field Name	Description	From Level-0 Datastrip PDI	From Level-0 Granule PDI	Additional Processing	Note	[PDD]	
CLOUD_COVERAGE_ASSESSMENT	Percentage of cloud coverage of the product for each area covered by a reference band		X	X	Based on CLOUDY_PIXEL_PERCENTAGE computed for each Granules composing the product:  AVG(CLOUDY_PIXEL_PERCENTAGE)%	§ 5.5.1	
Quality_Indicators_Info/Technical_Quality_Assessment							
Field Name	Description	From Level-0 Datastrip PDI	From Level-0 Granule PDI	From Additional Processing	Note	[PDD]	
DEGRADED_ANC_DATA_PERCENTAGE	Percentage of degraded ancillary data over the product.	X		X	Based on "degradationPercentage" values computed for each Datastrip:  AVG(degradationPercentage)%	§ 5.5.1	
DEGRADED_MSI_DATA_PERCENTAGE	Percentage of degraded MSI data over the product.		X	X	Based on DEGRADED_MSI_DATA_PERCENTAGE computed for each Granule:  AVG(DEGRADED_MSI_DATA_PERCENTAGE)%	§ 5.5.1	
Quality_Indicators_Info/Technical_Quality_Assessment_Inspections							



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 333 / 477

Field Name	Description	From Level-0 Datastrip PDI	From Level-0 Granule PDI	From Additional Processing	Note	[PDD]
SENSOR_QUALITY_FLAG	<p>Synthesis of the OLQC checks performed at: Granule level:</p> <ul style="list-style-type: none"><li>▪ Missing_Lines</li><li>▪ Corrupted_ISP</li><li>▪ Sensing_Time</li></ul> <p>Datastrip level:</p> <ul style="list-style-type: none"><li>▪ Degraded_SAD</li><li>▪ Datation_Model</li></ul> <p>See Table 3-17, Table 3-24 and Annex D.</p> <p>Those checks are grouped in the OLQC reports with SENSOR_QUALITY checklist name and provided in the Granules/QI_DATA and Datastrips/QI_DATA folders.</p> <p>Note: The OLQC report shall be in <i>globalStatus</i> FAILED when one check belongs to checklist is with status FAILED.</p>	X	X	X	<p>Based on the OLQC reports contained in the Granules/QI_DATA and Datastrips/QI_DATA with SENSOR_QUALITY checklist name.</p> <p>SENSOR_QUALITY_FLAG is FAILED if at least one report at Datastrip level and/or more than T% (configurable) of reports at Granules level are with <i>globalStatus</i> FAILED.</p>	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 334 / 477

GEOMETRIC_QUALITY_FLAG	<p>Synthesis of the OLQC checks performed at: Datastrip level:</p> <ul style="list-style-type: none"><li>▪ Attitude_Quality_Indicator</li></ul> <p>See Table 3-17, Table 3-24 and Annex D.</p> <p>Those checks are grouped in the OLQC reports with GEOMETRIC_QUALITY checklist name and provided in the Datastrip/QI_DATA folders.</p> <p>Note: The OLQC report shall be in <i>globalStatus</i> FAILED when one check belongs to checklist is with status FAILED.</p>	X		X	<p>Based on the OLQC reports contained in the Datastrips/QI_DATA with GEOMETRIC_QUALITY checklist name.</p> <p>GEOMETRIC_QUALITY_FLAG is FAILED if at least one report at Datastrip level is with <i>globalStatus</i> FAILED.</p>	MISSING
------------------------	--	---	--	---	---	---------



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 335 / 477

GENERAL_QUALITY_FLAG	<p>Synthesis of the OLQC checks performed at: Datastrip level:</p> <ul style="list-style-type: none"><li>▪ Relative_Orbit_Number</li></ul> <p>See Table 3-17, Table 3-24 and Annex D.</p> <p>Those checks are grouped in the OLQC reports with GENERAL_QUALITY checklist name and provided in the Datastrip/QI_DATA folders.</p> <p>Note: The OLQC report shall be in <i>globalStatus</i> FAILED when one check belongs to checklist is with status FAILED.</p>	X		X	<p>Based on the OLQC reports contained in the Datastrips/QI_DATA with GENERAL_QUALITY checklist name.</p> <p>GENERAL_QUALITY_FLAG is FAILED if at least one report at Datastrip level is with <i>globalStatus</i> FAILED.</p>	MISSING
----------------------	---	---	--	---	---	---------



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 336 / 477

FORMAT_CORRECTNESS_FLAG	Synthesis of the OLQC checks performed at: Granule level: <ul style="list-style-type: none"><li>▪ Product_Syntax</li></ul> Datastrip level: <ul style="list-style-type: none"><li>▪ Product_Syntax</li><li>▪ DS_Consistency</li></ul> See Table 3-17, Table 3-24 and Annex D.  Those checks are grouped in the OLQC reports with FORMAT_CORRECTNESS checklist name and provided in the Granules/QI_DATA and Datastrip/QI_DATA folders.  Note: The OLQC report shall be in <i>globalStatus</i> FAILED when one check belongs to checklist is with status FAILED.	X	X	X	Based on the OLQC reports contained in the Granules/QI_DATA and Datastrips/QI_DATA with FORMAT_CORRECTNESS checklist name.  FORMAT_CORRECTNESS_FLAG is FAILED if at least one report at Datastrip level and/or more than T% (configurable) of reports at Granules level are with <i>globalStatus</i> FAILED.	MISSING

### Quality\_Indicators\_Info/ Quality\_Control\_Checks/Failed\_Inspections

Field Name	Description	From Level-0 Datastrip PDI		From Additional Processing	Note	[PDD]
------------	-------------	----------------------------	--	----------------------------	------	-------



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 337 / 477

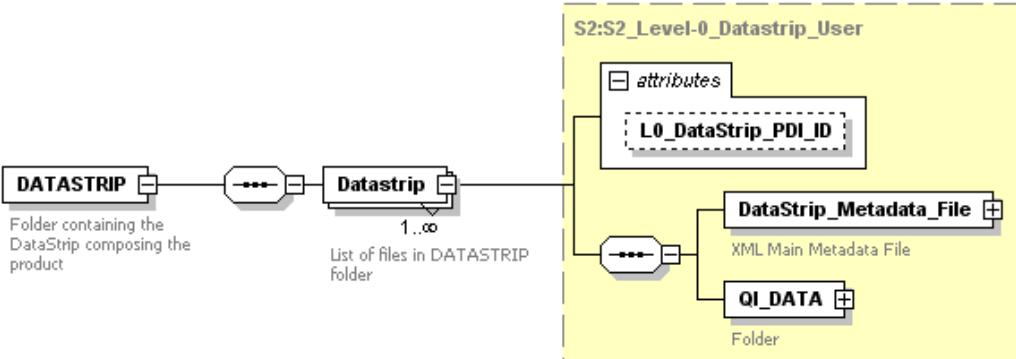
Datastrip_Report/REPORT_FILENAME	Reference (through the filename) to failed Datastrip reports (i.e. refer to OLQC reports with <i>globalStatus</i> FAILED).	X		X	Only the OLQC reports with <i>globalStatus</i> FAILED are included in the User Product within the QI_DATA folders at DATASTRIP level (see section 4.3).  REPORT_FILENAME list corresponds exactly with the list of the FAILED Datastrip reports.	MISSING
Granule_Report/REPORT_FILENAME	Reference (through the filename) to failed Granule reports(i.e. refer to OLQC reports with <i>globalStatus</i> FAILED).		X	X	Only the OLQC reports with <i>globalStatus</i> FAILED are included in the User Product within the QI_DATA folders at GRANULE level (see section 4.3).  REPORT_FILENAME list corresponds exactly with the list of the FAILED Granule reports.	MISSING

Table 4-12: Level-0 Product\_Metadata\_File – Quality\_Indicators\_Info Description

#### 4.6.7.2 GRANULE

diagram	<pre> classDiagram     class GRANULE     class Granule     class S2S2_Level-0_Granule_User {         class Level-0_Granule_Metadata_File         class IMG_DATA         class QI_DATA     }     GRANULE "1..oo" --&gt; Granule     Granule --&gt; S2S2_Level-0_Granule_User   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>GRANULE folder is a “folder of folders” each one corresponding to the Granules composing the product and identified by proper PDI_ID (Granule_ID).</p> <p>The structure of each Granule included in the product is the same of the Level-0 PDI Granule described in the section 3.6.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Granules metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.6.6),</li> <li>2. the XML Level-0_Granule_Metadata_File is validated using the <i>S2_PDI_Level-0_Granule_Metadata.xsd</i> schema annexed to the document,</li> <li>3. the <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Granule PDI is included in the User Product (see section 3.6.3).</li> </ol>

#### 4.6.7.3 DATASTRIP

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>DATASTRIP folder is a “folder of folders” each one corresponding to the Datastrip composing the product and identified by proper PDI_ID (Datastrip_ID).</p> <p>The structure of each Datastrip included in the product is the same of the Level-0 PDI Datastrip described in the section 3.7.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Datastrips metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.6.6),</li> <li>2. the XML Datastrip_Metadata_File is validated using the <i>S2_PDI_Level-0_Datastrip_Metadata.xsd</i> schema annexed to the document,</li> <li>3. <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i>, <i>ANC_DATA</i> and <i>rep_info</i> are removed when the Datastrip PDI is included in the User Product (see section 3.7.3).</li> </ol>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 340 / 477

### 4.6.7.4 AUX\_DATA

diagram	<b>AUX_DATA</b> Folder containing (if requested by the user, download option) all Auxiliary Data used for the processing
annotation	All Auxiliary Data used for Level-0 processing are referenced through the Product_Metadata_File. GIPP files and IERS Bulletin file can be provided if requested by the user (download option). DEM is not provided itself inside the product but only as a reference to the data used.

### 4.6.7.5 ANC\_DATA

diagram	<b>ANC_DATA</b> Folder containing SAD raw. This data would be trimmed to the extents of the datatake.
annotation	This folder contains different SAD files, one for each SAD packet type. The ancillary data are always provided on temporal extent on the full Datatake, even in the case of an extract.

### 4.6.7.6 Preview\_Image

diagram	<b>Preview_Image</b> Preview Image File
annotation	Preview Image file (PVI). PVI is included in the final product if required by the user (download option). This preview is extracted from Level-1C image (JPEG2000 low resolution extraction, 3 visible-bands in ground geometry at 320m resolution, RGB).The final geometric representation of the preview is defined by the user according to its region of interest (either geographic or cartographic representation).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 341 / 477

### 4.6.8 User Product Level-0 SAFE Manifest synoptic table

The User Product contains only one main *manifest.safe* file. The *manifest.safe* files relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the user product, all lower level PDI are removed.

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-0 User product.

Since the user product metadata refers to the contained Granules and Datastrips, the structure of the Manifest is based on the Level-0 Manifests provided for Granules and Datastrip (see sections 3.6.4 and 3.7.4).

The SAFE Manifest file is compliant to the SAFE specification (see [SAFE-SPEC]) and is composed by three main sections (Metadata, Information Package Map and Data Objects).

With reference to the three mentioned sections the chapter provides, as a guideline to the generation process of the SAFE Manifest file, the following elements:

- Table 3-29 describing the content and structure of the Information Package Map section; same consideration apply as in section 3.6.4;
- for the Metadata Section, a table that lists the fields (tags) composing the section, providing, for each field:
  - the field name in the SAFE Manifest file (column “SAFE Manifest”, divided into column “Metadata name”, containing the name of the Metadata section of the manifest to which the field belongs, and “Name of tag or attribute” containing the actual tag name or attribute name (for sake of clarity, attributes are written in bold characters))
  - the name of the corresponding tag (if available, else N.A.) of the DIMAP\_user\_product\_Level-0.xsd;
  - a brief textual description of the field;
  - the data type of the field (e.g. string, string enum, integer, double, xs:dateTime etc.);
  - the occurrence of the field (min/max occurrence e.g. 0..1); a minimum occurrence of 1 means that the field is mandatory;
  - the allowed range of values of the field.
- Table 3-31 describing the content and structure of the Data Objects section; consider that this section contains a reference to each file (Data files and Metadata files) composing the Level-0 User Product (with the exception of the Manifest file itself); this includes:
  - the XML Main Metadata file;
  - the INSPIRE Metadata.XML file;
  - the Auxiliary Data files (IERS Bulletin, GIPPs) required by the processing and included in the product, in the AUX\_DATA folder;



esa  
Sentinel 2 PDGS  
Core Procurement

## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 342 / 477

- the Ancillary Data files needed by processing and included in the product, in the ANC\_DATA folder;
- the Preview Image, used for image data browsing and selection purposes;
- all files included in the "GRANULE" folder, representing the Granules composing the User Product;
- all files included in the "DATASTRIP" folder, representing the Datastrips linked to the Granules composing the User Product.

A practical example of Manifest file for the Level-0 User Product is provided as annexed to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 343 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	DIMAP_Level-0_User_Product_ID->General_Info->Datatake->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	DIMAP_Level-0_User_Product_ID->General_Info->Datatake->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	N.A.	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 344 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
						Calibration Vicarious_Calibration Raw_Measurement Test_Mode
	instrument->mode-> <b>identifier</b>	DIMAP_Level-0_User_Product_ID->Product_Metadata_File->General_Info->Datatake->DATATAKE_TYPE	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>		Name of the L0 Processing	string	0..1	L0 Processing of Raw Data
	<b>start</b>	DIMAP_Level-0_User_Product_ID->General_Info->GENERATION_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	facility	N.A.	Description of Processing Centre		0..*	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 345 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	Level-0_User_Product->GRANULE->General_Info->GRANULE_ID (substring <Site Centre>, see section 3.6.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	facility-> <b>software</b>	N.A.	Description of software component used for Processing		0..*	
	facility-> <b>software-&gt;name</b>	N.A	Name of the software component	string	1	
	facility-> <b>software-&gt;version</b>	N.A	Version of the software component	string	0..1	
	facility-> <b>resource</b>		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc.) and of SAD Raw Data file containing the satellite ancillary		0..*	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 346 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			telemetry; these files are provided with the product.			
	facility->resource-> <b>name</b>	Level-0_User_Product->DATASTRIP->Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)  Level-0_User_Product->DATASTRIP->Auxiliary_Data_Info->IERS_Bulletin  Level-0_User_Product->DATASTRIP->Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME  Level-0_User_Product->DATASTRIP->Auxiliary_Data_Info- DEM_FILENAME	Name of the auxiliary or ancillary files needed for the Processing	string	1	
	facility->resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod -> startTime	DIMAP_Level-0_User_Product_ID->General_Info->Datatake->DATATAKE_SENSING_START	Reference time of acquisition of the product	xs:dateTime	1	
measurementFrameSet					1	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 347 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	footPrint	Derived from DIMAP_Level-0_User_Product_ID->Geometric_Info->Product_Footprint	Product footprint (namely imaged landscape corresponding to the whole product)	string (gml:linearRingType namely blank separated list of comma-separated long/lat coordinates of footprint closed polygon with last vertex equal to first) <sup>2</sup>	0..1	
measurementOrbitReference						
	orbitNumber	DIMAP_Level-0_User_Product_ID->General_Info->Datatake->DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber->type	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the first		0..1	start

<sup>2</sup> Note that the mentioned "gml" namespace represents the standard for geolocation in SAFE format and is not related to DIMAP type A\_GML\_POLYGON\_3D; in order to convert lat/long coordinates between the DIMAP type A\_GML\_POLYGON\_3D and the types gml:pointType and gml:linearRing in the tags <center> or <footprint>, the DIMAP lat/long coordinates should be simply moved into the corresponding tag of SAFE Manifest, properly formatted and the EPSG code in which these coordinates are expressed should be moved into the attribute srsName.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 348 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			Granule of the User Product			
	orbitNumber-> <b>groundTrackDirection</b>	DIMAP_Level-0_User_Product_ID->General_Info-> Datatake->SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	DIMAP_Level-0_User_Product_ID-> General_Info->Datatake->SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		Level-0_User_Product->DATASTRIP-> Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)  Level-0_User_Product->DATASTRIP-> Auxiliary_Data_Info->IERS_Bulletin  Level-0_User_Product->DATASTRIP-> Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the INSPIRE Metadata file, the Ancillary Data files, the Auxiliary Data files)		1..*	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 349 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-0.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..1	

Table 4-13 - Content of Metadata section for Level-0 User Product SAFE Manifest



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 350 / 477

### 4.7 Level-1A User Product specification

#### 4.7.1 Introduction

Level-1A product is obtained by decompressing image data and developing a geometric model to locate any pixel in the image.

The following table introduces the input data of Level-1A processing:

Input of Level-1A processing	Description
Metadata	Metadata from Level-0 product
Image Data	Level-0 data (Granules)
Auxiliary Data	GIPP: Parameters from Level-0 complemented by radiometric and geometric processing parameters. DEM: only the reference to the data used is provided.
Quality Indicator Data	Quality indicators from Level-0

Table 4-14: Input for Level-1A processing

This level corresponds to the systematic processing steps that must be applied before any further processing. It includes:

- decompression of the image data,
- geometric model computation : geolocation information, coarse interband / interdetector registration,
- SWIR pixels re-arrangement.

As requiring only a fast processing, this 'Raw Level' product can be used to allow a quick display of the detectors (sub-swaths) in full resolution. The sub swath can be displayed using standard commercial image processing software.

Note that one Level-1A product:

- refers always to one Datatake;
- refer to one or several Datastrip from the same Datatake;
- may cover the full Datatake or an extract of the Datatake.

In the case of an extract, image data is provided only to cover the selected extract but the ancillary data are always provided through a metadata file on the temporal extent of the full Datatake.

The following figure gives an overview of the Level-1A User Product physical format. The yellow boxes correspond to folders and the white ones to files:

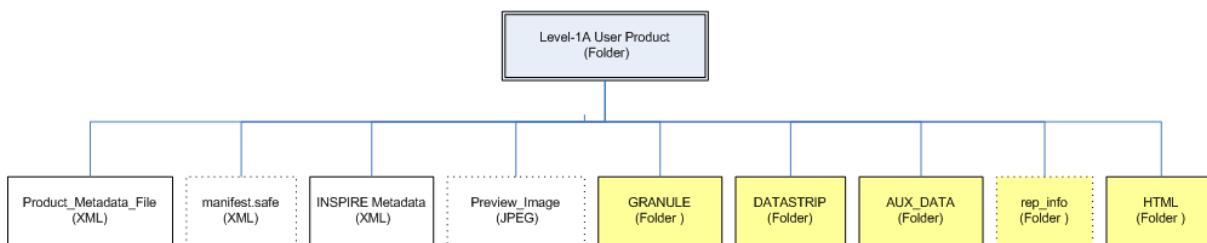


Figure 63: Level-1A User Product Structure

The Level-1A User Product consists of:

1. **Product\_Metadata\_File**: mandatory XML main metadata file.
2. **manifest.safe**: SAFE metadata file (optional). It is included in the product only if the user requests the SAFE as output format (download option).
3. **GRANULE**: folder containing all Granules composing the product (Image Data). The Image Data extent (raster files) correspond to a set of Granules and can covers up to 12 detectors \* 13 bands of the orbit in full resolution. A sub-set of the 13 bands can be provided (download option).
4. **DATASTRIP**: folder containing the Datastrip composing the product linked to the selected Granules.
5. **AUX\_DATA**: folder containing, if requested by the user (download option), the GIPP files and IERS Bulletins used for the Level-1A User Product production. All Level-1A auxiliary data are referenced in the product metadata file.
6. **rep\_info**: folder containing the XSD schema provided inside the product. This folder is optional. It is included in the final product if the user selects the SAFE format as output format (download option).
7. **Preview\_Image**: file consisting of an image limited to 3 visible-bands in ground geometry at 320m resolution. This file, provided if requested by the user (download option), gives an overview of the product (sub-sampled) mainly for image data browsing and selection purposes.
8. **INSPIRE**: XML INSPIRE metadata file (see Annex B).
9. **HTML**: folder containing an HTML product presentation file (UserProduct\_index.html) and the corresponding stylesheet (UserProduct\_index.xsl).

#### 4.7.2 Image Data

The Level-1A image data correspond to a collection of elementary Granules. Each Granule corresponds to one detector of one on board scene and therefore consists of N consecutive lines of one detector of a band, where N depends on the band Spatial Sampling Distance (SSD).

SSD	Number of bands	N : Number of full resolution lines per detector and per band in one Granule
10 m	4	2304
20 m	6	1152
60 m	3	384

Table 4-15: Number of lines in one Granule

The image data extent correspond to a set of .“Granules.” and can covers up to 12 detectors \* 13 bands of the orbit in full resolution. A sub-set of the 13 bands can be provided.

Each Level-1A Granule is identified in a unique way, using a unique identifier PDI\_ID defined in the section 3.8.1.

##### 4.7.2.1 Image Data Encoding and Files

Each image pixel value is encoded on 12 useful bits (as on-board).

The image data are provided as separated files for each spectral band (i.e. in total of 13 GML/JPEG2000 files per Granule).

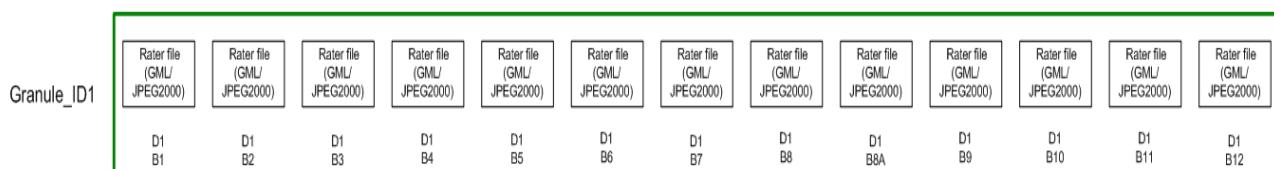


Figure 64 : Example of Level-1A Granule (image data) corresponding to Detector 1

In order to facilitate the product handling at the user base, it will be possible to provide the raster files according to two delivery options:

- Either one file per spectral band and per Granule. For instance, the user can request on a selection of six Granules, the six raster files corresponding to the spectral band B3 (six separated GML/JPEG2000).
- Either a file per spectral band corresponding to the concatenation of *Granules along-track* also called *aggregation of Granules*. For instance, the user can request on an aggregation of six Granules, the raster file corresponding to the spectral band B3 (one single GML/JPEG2000) (§ 4.7.8).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 353 / 477

### 4.7.3 Ancillary Data

The satellite ancillary data (SAD product data item described in the section 3.21) are not embedded in the user Level-1A product but they are referenced (by PDI\_ID) through the metadata file defined at Datastrip level (ANC\_DATA\_REF metadata).

The Level-1A product may cover the full Datatake or an extract of the Datatake, in any case, the SAD are always provided on the temporal extent of the full Datatake.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 354 / 477

### 4.7.4 Auxiliary Data

All Auxiliary Data used for Level-1A processing are referenced in the product metadata file:

- IERS bulletin file,
- Ground Image Processing Parameters (GIPPs) files (see Annex E),
- Reference to the used DEM.

For each auxiliary data a specific PDI is provided (see section 3.1) i.e. all Level-1A auxiliary data will be stored in archive and referenced by a unique identifier (PDI\_ID equal to the PDI filename).

The final user, according to a specific download option, will be able to include in its Level-1A user product, the IERS bulletin auxiliary file and/or the used GIPP files. DEM is never provided within the product but only as a reference to the data used.

### 4.7.5 Quality Indicators

The *Product Level Quality Indicators* are provided at product level and referenced through the product metadata file

The *Granule Level Quality Indicators* are provided at Granule level and referenced through the Granule metadata file.

The *Pixel Level Quality Indicators* are provided at Granule level through dedicated quality mask files pointed through the Granule level metadata file.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 355 / 477

### 4.7.6 Metadata

The following table shows the groups of metadata provided inside a Level-1A User Product:

Level-1A User Product Metadata	
<b>Product Level Metadata</b>	All product level metadata, specific for the User level, are consolidated/computed because not present at Granule and Datastrip level.
<b>Granule Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Granule level are copied from the input Granules to the User Product.
<b>DATASTRIP Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Datastrip level are copied from the input Datastrips to the User Product;

Table 4-16: Level-1A Product Metadata

As mentioned in the section 2.4, the User Product metadata (all) are not provided with a *metadataLevel* attribute (Brief/Standard/Expertise) unlike what happens for all Granule and Datastrip metadata.

During the User Product assembling, this attribute is used to select by filtering, according to a download option, the set of metadata that must be included in the final product.

For these filtered fields, the *metadataLevel* attribute is not written in the User Product's metadata.

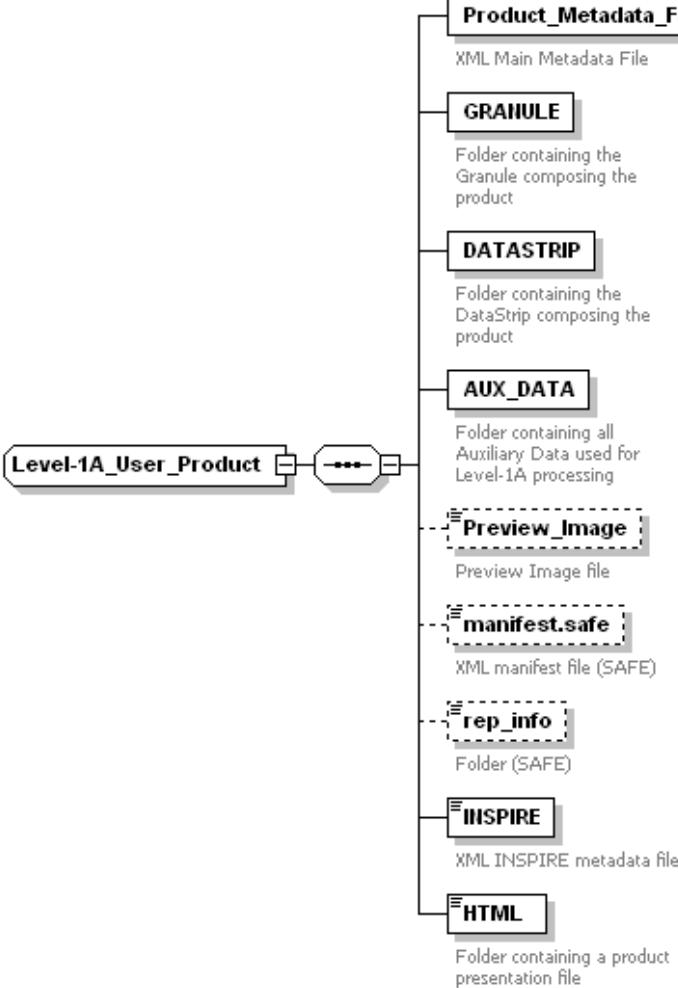
Note that an User Product for an expert user (Expertise download option) will contain all level of metadata (Brief/Standard/Expertise). An User Product for a user with "Standard" or "Brief" permission will contain only Brief/Standard or Brief metadata.

In addition to the metadata in the table above, the User Product contains the *manifest.safe* metadata (when the User Product is SAFE format) and the INSPIRE metadata.

The Level-1A Product Metadata are detailed in the section 4.7.7.1.

#### 4.7.7 User Product Level-1A Structure

*S2\_User\_Product\_Level-1A\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the structure of a S2 Level-1A User Product. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the structure shown in the Figure 63.

diagram	 <pre> graph LR     L1A[Level-1A_User_Product] --- PMF[Product_Metadata_File]     L1A --- GR[GRANULE]     L1A --- DS[DATASTRIP]     L1A --- AUX[AUX_DATA]     L1A --- PI[Preview_Image]     L1A --- MS[manifest.safe]     L1A --- RI[rep_info]     L1A --- INS[INSPIRE]     L1A --- HTL[HTML]     </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">Product_Metadata_File</a> <a href="#">GRANULE</a> <a href="#">DATASTRIP</a> <a href="#">AUX_DATA</a> <a href="#">Preview_Image</a> <a href="#">manifest.safe</a> <a href="#">rep_info</a> <a href="#">INSPIRE</a> <a href="#">HTML</a></p>
Description	<p>Level-1A User Product contains:</p> <ol style="list-style-type: none"> <li>1. <b>Product_Metadata_File</b>: XML Main Metadata file (DIMAP).</li> <li>2. <b>GRANULE</b>: folder containing the list of the Granules belonging to the user product (the Granule structure is described in the section 3.8.3).</li> </ol>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

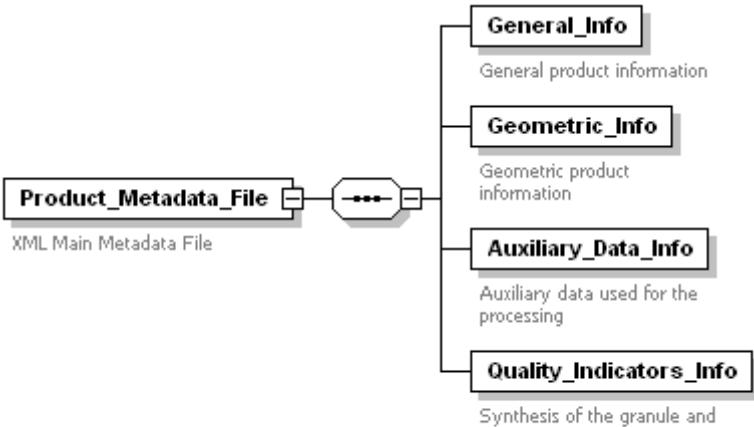
PAGE : 357 / 477

- |  |  |
|--|--|
|  | <ol style="list-style-type: none"><li>3. <b>DATASTRIP:</b> folder containing the list of the Datastrip belonging the Datatake from which Level-1A User Product has been selected (the Datastrip structure is described in the section 3.9.3). .</li><li>4. <b>AUX_DATA:</b> folder containing all Auxiliary Data used for Level-1A processing (optional, the aux data are included in the product if selected according to a specific download option).</li><li>5. <b>Preview_Image:</b> JPEG2000 for image data browsing and selection purposes.</li><li>6. <b>manifest.safe:</b> XML SAFE Manifest file</li><li>7. <b>rep_info:</b> optional folder containing the XSD DIMAP schema</li><li>8. <b>INSPIRE.xml:</b> XML INSPIRE metadata file</li><li>9. <b>HTML:</b> folder containing an HTML product presentation file and the corresponding stylesheet.</li></ol> |
|--|--|

#### 4.7.7.1 *Product\_Metadata\_File Schema*

Product\_Metadata\_File is the XML metadata file provided inside the S2 Level-1A User Product. The XSD schema annexed to this document and used to validate it is *S2\_User\_Product\_Level-1A\_Metadata.xsd*.

A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Product_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class General_Info {         &lt;&lt;General product information&gt;&gt;     }     class Geometric_Info {         &lt;&lt;Geometric product information&gt;&gt;     }     class Auxiliary_Data_Info {         &lt;&lt;Auxiliary data used for the processing&gt;&gt;     }     class Quality_Indicators_Info {         &lt;&lt;Synthesis of the granule and DataStrip level QIs&gt;&gt;     }      Product_Metadata_File "2" -- "3" General_Info     Product_Metadata_File "2" -- "3" Geometric_Info     Product_Metadata_File "2" -- "3" Auxiliary_Data_Info     Product_Metadata_File "2" -- "3" Quality_Indicators_Info   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Auxiliary_Data_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a>
Description	<p>The Product_Metadata_File describes the product data items. It is presented to the user as a structured container of information. Product_Metadata_File is an XML file containing:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: provides general product information.</li> <li>2. <b>Geometric_Info</b>: describing the geolocation over WGS84 of the contour of the product.</li> <li>3. <b>Auxiliary_Data_Info</b>: Links to the AUX_DATA items.</li> <li>4. <b>Quality_Indicators_Info</b>: Synthesis of the Granule and Datastrip level QIs.</li> </ol>

The following figures and tables give a complete description of the User Product metadata.

#### General\_Info:

In addition to the general information, common to all processing level (see Table 4-9) , the specific (general) metadata provided with a Level-1A User Product, are described hereafter.

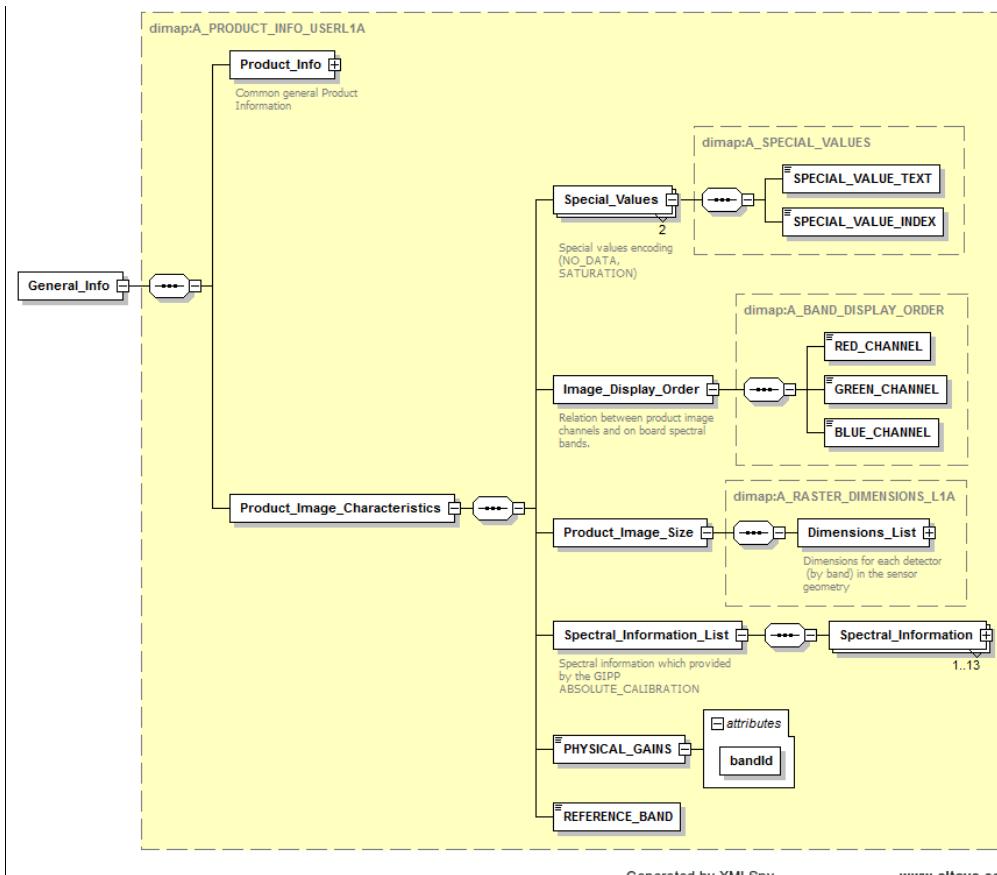


Figure 65 : Level-1A Product\_Metadata\_File - General\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 360 / 477

General_Info			
Field Name	Description	Note	Check vs [PDD]
Product_Info	This group of metadata is described in the Table 4-9.	Table 4-9	Table 4-9
Product_Image_Characteristics/Special_Values/SPECIAL_VALUE_TE XT Product_Image_Characteristics/Special_Values/SPECIAL_VALUE_IND EX	Special values encoding (e.g. NODATA, SATURATION)	Based on Radiometric_Info (PIXELS_NO_DATA_PROC and SATURATED_PIXELS_PROC) available at Datastrip level (see ).	§ 6.3.1.1
Product_Image_Characteristics/Image_Display_Order/RED_CHANNEL Product_Image_Characteristics/Image_Display_Order/GREEN_CHAN NEL Product_Image_Characteristics/Image_Display_Order/BLUE_CHANNE L	Spectral bands (Relation between product image channels and on board spectral bands)	Information available at Datastrip level (see Table 3-46).	§ 6.3.1.1
Product_Image_Characteristics/Product_Image_SizeDimension_List/Di mensions/ Detector_Dimensions/NROWS Product_Image_Characteristics/Product_Image_SizeDimension_List/Di mensions/ Detector_Dimensions/NCOLS	Product Image size (by band x detector)	Based on Granule dimensions	§ 6.3.1.1
Product_Image_Characteristics/Spectral_Information_List/Spectral_ Information/RESOLUTION Product_Image_Characteristics/Spectral_Information_List/Spectral_ Information/Wavelenght/MIN Product_Image_Characteristics/Spectral_Information_List/Spectral_ Information/ Wavelenght/MAX Product_Image_Characteristics/Spectral_Information_List/Spectral_ Information/ Wavelenght/CENTRAL Product_Image_Characteristics/Spectral_Information_List/Spectral_ Information/Spectral_Response/STEP Product_Image_Characteristics/Spectral_Information_List/Spectral_	Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION	Information available at Datastrip level (see Table 3-43).	MISSING



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 361 / 477

General_Info			
Field Name	Description	Note	Check vs [PDD]
Information/Spectral_Response/VALUES			
Product_Image_Characteristics/PHYSICAL_GAINS	Physical Gain for each band		
Product_Image_Characteristics/REFERENCE_BAND	Reference Band used in the processing		

Table 4-17: Level-1A Product\_Metadata\_File - General\_Info Description

Geometric\_Info:

All geometric product information are described in the Table 4-10.

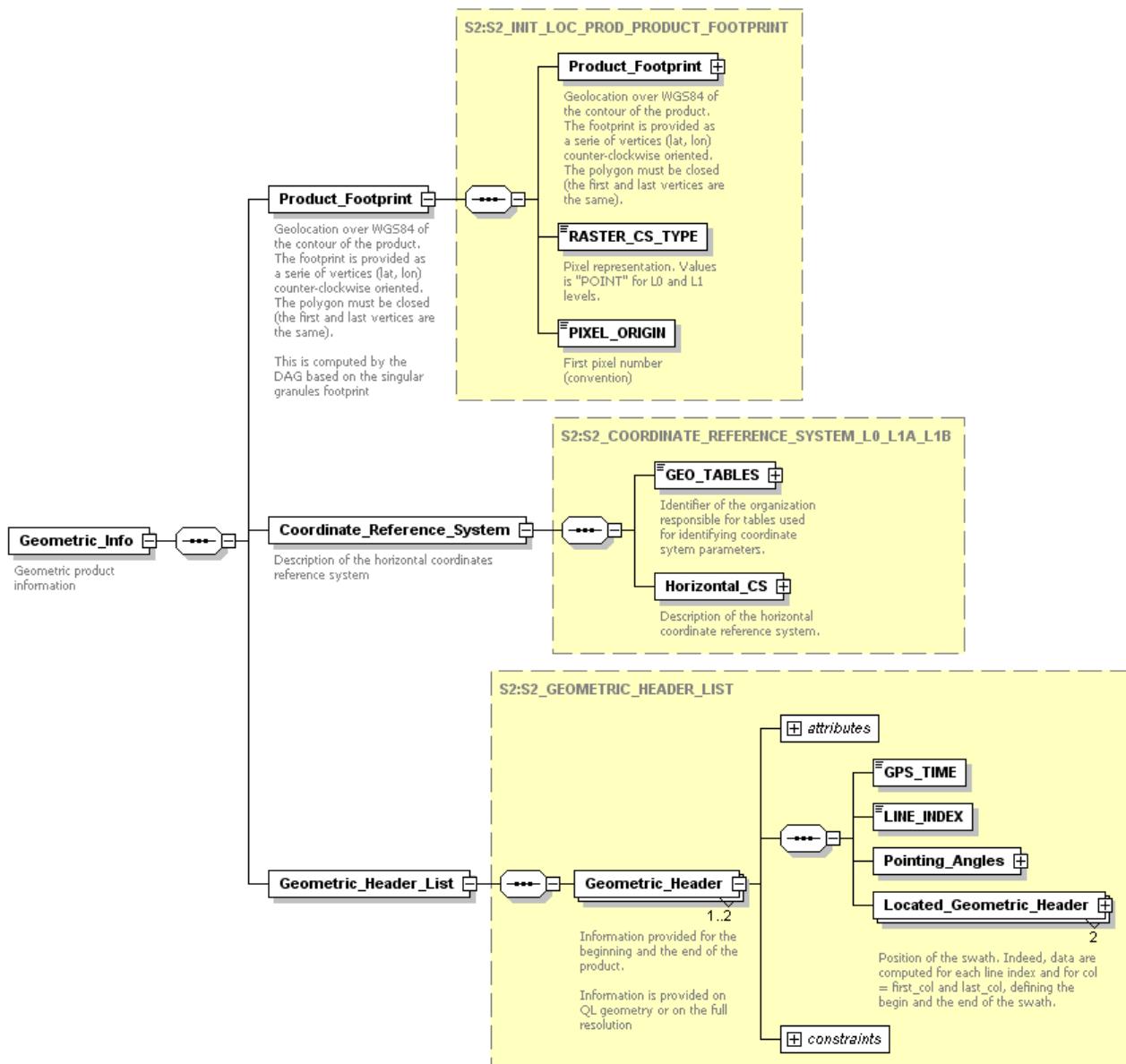


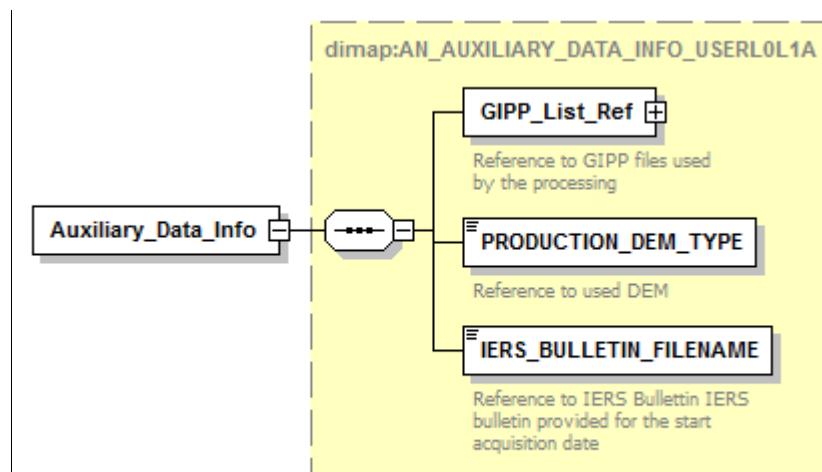
Figure 66: Level-1A Product\_Metadata\_File – Geometric\_Info Diagram

Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Auxiliary Data Info:

All auxiliary data information are described in the Table 4-11.



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 67 : Level-1A Product\_Metadata\_File – Auxiliary\_Data\_Info Diagram



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

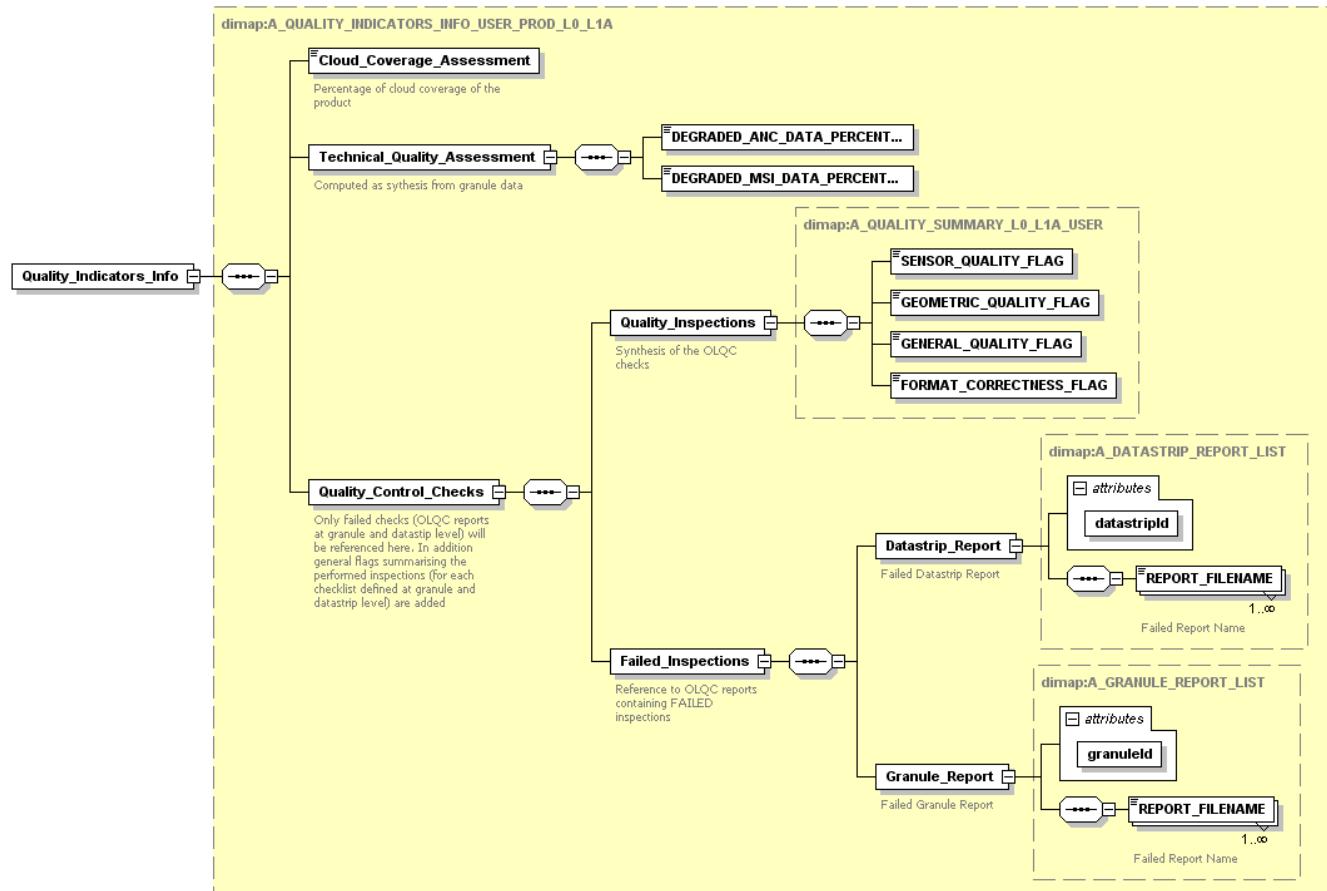
DATE : 12/07/2013

PAGE : 364 / 477

### Quality\_Indicators\_Info:

All Quality\_Indicators\_Info are the same described in the Table 4-12.

All OLQC checks performed on L1A Granules/Datastrips and related to a specific checklist name (see Annex D), are in the Table 3-17 and Table 3-24.



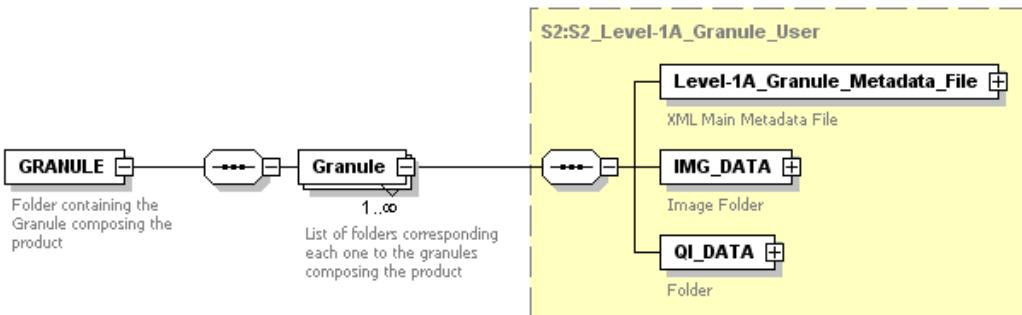


## Sentinel-2 Products Specification Document

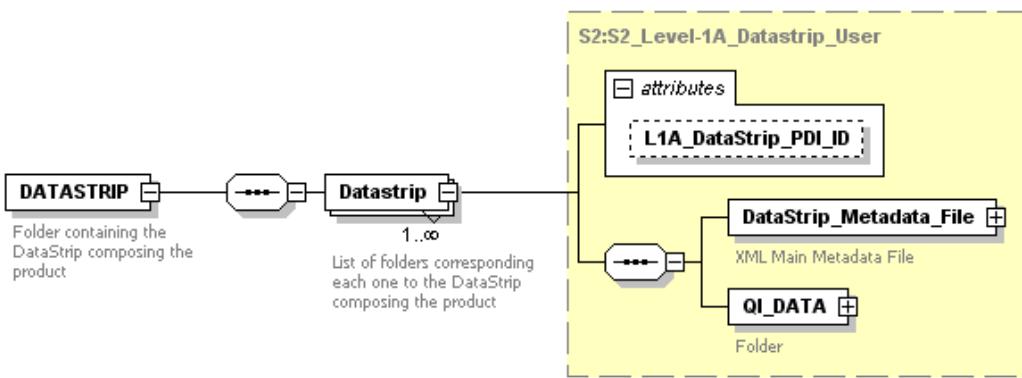
REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 366 / 477

Figure 68 : Level-1A Product\_Metadata\_File – Quality\_Indicator\_Info Diagram

#### 4.7.7.2 GRANULE

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>GRANULE folder is a “folder of folders” each one corresponding to the Granules composing the product and identified by proper PDI_ID (Granule_ID).</p> <p>The structure of each Granule included in the product is the same of the Level-1A PDI Granule described in the section 3.8.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Granule metadata copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.7.6),</li> <li>2. the XML Level-1A_Granule_Metadata_File is validated using the <i>S2_PDI_Level-1A_Granule_Metadata.xsd</i> schema annexed to the document,</li> <li>3. the <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Granule PDI is included in the User Product (see section 3.8.3).</li> </ol>

#### 4.7.7.3 DATASTRIP

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>DATASTRIP folder is a “folder of folders” each one corresponding to the Datastrip composing the product and identified by proper PDI_ID (Datastrip_ID).</p>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 368 / 477

	<p>The structure of each Datastrip included in the product is the same of the Level-1A PDI Datastrip described in the section 3.9.3 taking into account that:</p> <ol style="list-style-type: none"><li>1. the Datastrips metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.7.6),</li><li>2. the XML Datastrip_Metadata_File is validated using the <i>S2_PDI_Level-1A_Datastrip_Metadata.xsd</i> schema annexed to the document,</li><li>3. <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Datastrip PDI is included in the User Product (see section 3.9.3).</li></ol>
--	---

### 4.7.7.4 AUX\_DATA

diagram	<p><b>AUX_DATA</b></p> <p>Folder containing (if requested by the user, download option) all Auxiliary Data used for the processing</p>
annotation	All Auxiliary Data used for Level-1A processing are referenced through the Product_Metadata_File. GIPP files and IERS Bulletin file can be provided if requested by the user (download option). DEM is not provided itself inside the product but only as a reference to the data used.

### 4.7.7.5 Preview\_Image

diagram	<p><b>Preview_Image</b></p> <p>Preview Image File</p>
annotation	Preview Image file (PVI) PVI is included in the final product if required by the user (download option). This preview is extracted from Level-1C image (JPEG2000 low resolution extraction, 3 visible-bands in ground geometry at 320m resolution, RGB). The final geometric representation of the preview is defined by the user according to its region of interest (either geographic or cartographic representation).

#### 4.7.8 Level-1A Granules Aggregation

As image viewer may not support well the high number of Granules constituting the L1A/L1B S2 User Products.

To handle more easily the Level-1A (and Level-1B) products, it is possible, when requested as a download-option, merge the Granule data and metadata of a Level-1A product (and Level-1B) along the satellite track direction.

This option (known as *concatenation of Granules along-track* or *aggregation of Granules*) allows to create one image per detector grouping all single Granules along track therefore producing at maximum 12 JPEG2000 images per band that can be displayed **with a JPEG2000 viewer**.

For all details regarding to the Tile consolidation algorithm refers to the reference document [CCTS-US].

The following figure shows an example of L1A Granules (on the right) and L1A/L1B granules aggregated along-track (on the left) included in an Area-Of-Interest selected by the user.

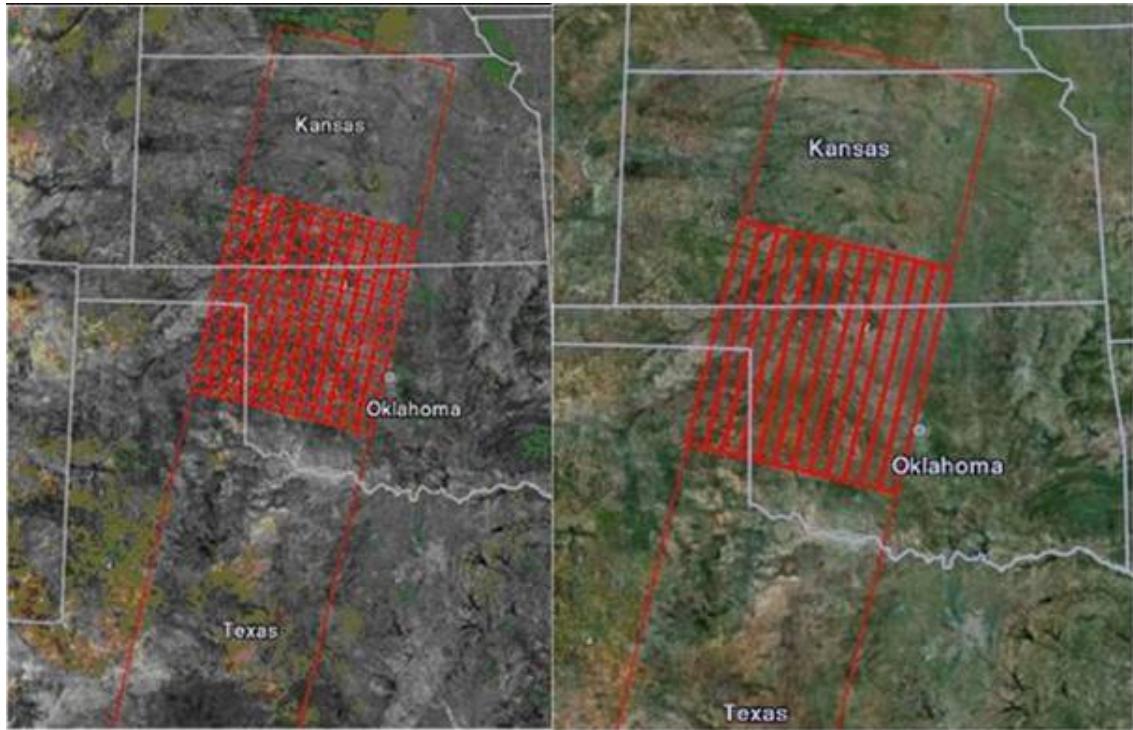


Figure 69 : Example of Level-1A Granules Aggregation



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 370 / 477

The Along-Track Aggregation Granules is a download option that can be selected by the user (see Section 4.4).

In this case the GRANULE folder of the User Product does not contain one folder for each elementary Granule composing the product but one folder for each Granule Aggregated and, as mentioned above, the User Product contains at maximum 12 folders each one corresponding to one detector.

Inside each folder, there are 13 image data files in JPEG2000 format (one for each spectral band) stored in the IMG\_DATA sub-folder and ONE metadata file which envelops all the elementary Granules composing the aggregation.

### 4.7.8.1 Aggregated Granules ID

The Granule ID in case of L1A and L1B Granule aggregated follows the same naming convention defined in the sections 3.8.1 and 3.10.1 with file type **MSI\_L1A\_GA** and **MSI\_L1B\_GA**.

File name template:

- S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_N01.01
- S2A\_OPER\_MSIL1B\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D05\_N01.01

### 4.7.8.2 Level-1A Aggregated Granules Physical Format

Based on Level-1A Granule PDI Physical format, the Granule aggregated is composed by:

- **Metadata\_File (one XML file):**

Template name:

S2A\_OPER\_MTD\_L1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07.xml

Validated using the *S2\_PDI\_Level-1A\_Granule\_Metadata.xsd* schema annexed to the document.

- **IMG\_DATA (fixed folder name):**

Template names for the image files contained in the IMG\_DATA folder of the Granule aggregated corresponding to the Detector 7:

S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_B01.jp2  
S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_B02.jp2  
S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_B03.jp2

...

S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_B12.jp2

- **QI\_DATA (fixed folder name):**



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 371 / 477

QI\_DATA folder contains:

- FAILED OLQC\_Report.xml reports;

Template filename:

S2A\_OPER\_MSIL1A\_GA\_CGS1\_20130419T100000\_S20091211T165928\_D07\_SENSOR\_GEOMETRY.xml

- Quality\_Masks (one for each type, GML/JPEG2000).

Template masks filename:

S2A\_OPER\_MSK\_CLOWL\_CGS1\_0000000T000000\_S20091211T165928\_D07\_B00\_MSIL1A.gml

S2A\_OPER\_MSK\_DEFECT\_CGS1\_0000000T000000\_S20091211T165928\_D07\_B00\_MSIL1A.gml

S2A\_OPER\_MSK\_NODATA\_CGS1\_0000000T000000\_S20091211T165928\_D07\_B00\_MSIL1A.gml

S2A\_OPER\_MSK\_SATURA\_CGS1\_0000000T000000\_S20091211T165928\_D07\_B00\_MSIL1A.gml

S2A\_OPER\_MSK\_TECQUA\_CGS1\_0000000T000000\_S20091211T165928\_D07\_B00\_MSIL1A.gml

Note that the quality masks are aggregated as well. This means that the quality masks are generated performing an APPEND of all mask files relative to each Granule concatenated.

### 4.7.8.3 Metadata of Aggregated Granules

The metadata file envelops all the Granule metadata PDI composing the aggregation. The schema used to validate it is the same of the ones defined for L1A/L1B Granule PDI and annexed to the document.

The following table describes the meaning of each Granule metadata in case of Granule aggregated.

General Info		
Field Name	L1A Granule	L1A Granule Aggregated
GRANULE_ID	Granule PDI Identifier.	Granule Aggregated Identifier as defined in the section 4.7.8.1.
DETECTOR_ID	Detector identifier.	Detector Identifier.
DATASTRIP_ID	Datastrip Identifier.	As the two incomplete Tiles are on two Datastrip, this metadata contains two different Datastrip Identifiers.
DOWNLINK_PRIORITY	Downlink priority flag.	Downlink priority flag.
SENSING_TIME	Imaging Start Time (sensing start time of the Datatake). (UTC data time).	Imaging Start Time (sensing start time of the Datatake). (UTC data time).
Archiving_Info/ARCHIVING_CENT	Archiving Centre.	Archiving Centre.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 372 / 477

RE		
Archiving_Info/ARCHIVING_TIME	Archiving date (UTC data time).	Archiving date (UTC data time).
<b>Geometric_Info</b>		
Field Name	Description	
Granule_Footprint/Granule_Footprint	Geolocation of the four corners of the elementary Granule (Lat, Lon, H coordinates with horizontal CRS as WGS84 and altitude given over EGM96).	Geolocation of the four corners of the Granule aggregated (Lat, Lon, H coordinates with horizontal CRS as WGS84 and altitude given over EGM96).
Granule_Footprint/RASTER_CS_TYPE	Pixel representation. Fixed values is "POINT".	Pixel representation. Fixed values is "POINT".
Granule_Footprint/PIXEL_ORIGIN	First pixel number (convention). Fixed value is "1".	First pixel number (convention). Fixed value is "1".
Granule_Position/POSITION	Position of the Granule in the Datatake. This position is identified through the position of the first line of the first scene in the Datatake and it is expressed as number of 10m resolution images lines.	Position of the Granule in the Datatake. This position is identified through the position of the first line of the first scene in the Datatake and it is expressed as number of 10m resolution images lines.
Granule_Position/Geometric_Header/GROUND_CENTER	Geolocation of the Granule centre (Lat, Lon, H).	Geolocation of the centre (Lat, Lon, H) of the Granule aggregated.
Granule_Position/Geometric_Header/QL_CENTER	The Granule centre in the QL display: 1 (r,c) point.	The Granule aggregated centre in the QL display: 1 (r,c) point.
Granule_Position/Geometric_Header/Incidence_Angles	Incidence angles corresponding to the centre of the Granule.	Incidence angles corresponding to the centre of the Granule aggregated.
Granule_Position/Geometric_Header/Solar_Angles	Solar angles corresponding to the centre of the Granule.	Solar angles corresponding to the centre of the Granule aggregated.
Granule_Dimension/Size/NROWS	Granule dimensions provided for each resolution band (10m, 20m and 60m)  Number of Row	Granule aggregated dimensions provided for each resolution band (10m, 20m and 60m)  Total Number of Row
Granule_Dimension/Size/NCOLS	Granule dimensions provided for each resolution band (10m, 20m and 60m)  Number of Columns	Granule aggregated dimensions provided for each resolution band (10m, 20m and 60m)  Number of Columns  It is the same of an



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 373 / 477

		elementary Granule.
Quality_Indicators_Info		
Field Name	Description	
Image_Content_QI/CLOUDY_PIX_EL_PERCENTAGE	Percentage of cloud coverage for each L1A Granule.	Average of the percentage of cloud coverage computed for each L1A Granule composing the Granule aggregated.
Image_Content_QI/DEGRADED_MSI_DATA_PERCENTAGE	Percentage of degraded MSI data for each L1A Granule.	Average of the percentage of degraded MSI data computed for each L1A Granule composing the Granule aggregated.
Pixel_Level_QI/MASK_FILENAME	Pointer to the mask files contained in the QI_DATA folder of the Granule.	Pointer to the mask files contained in the QI_DATA folder of the Granule aggregated.

An example of the Granules aggregated metadata file in the Annex G is provided

Note that the Aggregation option is addressed at product level setting TRUE the AGGREGATION\_FLAG metadata.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 374 / 477

### 4.7.9 User Product Level-1A SAFE Manifest synoptic table

The final user product contains only one main *manifest.safe* file. The *manifest.safe* files relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the user product, all lower level PDI are removed.

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1A User Product, including a synoptic table with the list of the metadata information to be included in the SAFE Manifest.

Since the user product metadata refers to the contained Granules and Datastrips, the structure of the Manifest is based on the Level-1A Manifests provided for Granules and Datastrip (see sections 3.8.4 and 3.9.4).

Same considerations as in section 4.6.8 applies for what concerns compliancy to SAFE specification [SAFE-SPEC] and content of the synoptic tables, with the exception that the Data Objects Section does not contain, differently from the Level-0 User Product, an ANC\_DATA folder.

A practical example of Manifest file for the Level-1A User Product is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 375 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurren ce	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdclIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	DIMAP_Level-1A_User_Product_ID->General_Info->Product_Info->Datatake->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	DIMAP_Level-1A_User_Product_ID->General_Info->Product_Info->Datatake->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument-> <b>abbreviation</b>	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	DIMAP_Level-1A_User_Product_ID->General_Info->Product_Info->Datatake->DATATAKE_TYPE	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Cali



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 376 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurren ce	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
						bration Raw_Measure ment Test_Mode
	instrument->mode-> <b>identifier</b>	DIMAP_Level-1A_User_Product_ID->General_Info-> Product_Info->Datatake->DATATAKE_TYPE	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW Ins-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>		Name of the L0 to L1A Processing	string	0..1	Generation of L1A User Product
	<b>start</b>	DIMAP_Level-1A_User_Product_ID-> General_Info->Product_Info->GENERATION_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	facility	N.A.	Description of Processing Centre		0..*	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 377 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility->name	N.A.	Extended name of Origin Centre	string	1	
	facility->organization	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility->site	Level-1A_User_Product->GRANULE-> General_Info->GRANULE_ID (substring <Site Centre>, see section 3.6.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	facility->country	N.A.	Country where Origin Centre is located	string	0..1	
	facility->software	N.A.	Description of software component used for Processing		0..*	
	facility->software-> name	N.A	Name of the software component	string	1	
	facility->software-> version	N.A	Version of the software component	string	0..1	
	resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc.) and of SAD Raw Data file containing the satellite ancillary telemetry; these files are provided with the product.		0..*	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 378 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	resource-> <b>name</b>	Level-1A_User_Product->DATASTRIPE-> Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)  Level-1A_User_Product->DATASTRIPE-> Auxiliary_Data_Info->IERS_Bulletin  Level-1A_User_Product->DATASTRIPE-> Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME	Name of the auxiliary or ancillary files needed for the Processing	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod -> startTime	DIMAP_Level-1A_User_Product_ID->General_Info-> Product_Info->Datatake->DATATAKE_SENSING_START	Reference time of acquisition of the product	xs:dateTime	1	
measurementFrameSet					1	
	footPrint	Derived from DIMAP_Level-1A_User_Product_ID-> Geometric_Info->Product_Footprint	Product footprint (namely imaged landscape corresponding to the whole product)	string (gml:linearRingType namely blank separated list of comma-separated long/lat coordinates of footprint closed)	0..1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 379 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurren ce	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
				polygon with last vertex equal to first)		
measurementOrbitReference						
	orbitNumber	DIMAP_Level-1A_User_Product_ID-> General_Info->Product_Info->Datatake-> DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber-> <b>type</b>	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the first Granule of the User Product		0..1	start
	orbitNumber-> <b>groundTrackDirection</b>	DIMAP_Level-1A_User_Product_ID->General_Info-> Product_Info->Datatake->SENSING_ORBIT_ DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	DIMAP_Level-1A_User_Product_ID-> General_Info->Product_Info->Datatake-> SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 380 / 477

SAFE Manifest		Corresponding metadata in the S2_User_Product_Level- 1A_Metadata.xsd	Description	Data Type	Occurren- ce	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	relativeOrbitNumber-> <b>type</b>	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		Level-1A_User_Product->DATASTRIP-> Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the INSPIRE Metadata file, the Auxiliary Data files) or external to the product (the Ancillary Data files)		1..*	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..1	

Table 4-18 - Content of Metadata section for Level-1A User Product SAFE Manifest

## 4.8 Level-1B User Product specification

### 4.8.1 Introduction

The Level-1B product is a *Radio-corrected and geo-refined* product obtained by performing radiometric corrections on the Level-1A data and refining its geometric model.

The Radiometric corrections are applied to obtain a Level-1B User Product but the geo-refinement model is only appended to the metadata and never applied to the product.

The following table introduces the input data of Level-1B processing:

Input of Level-1B processing	Description
Metadata	Metadata from Level-1A product
Image Data	Uncompressed image data (from Level-1A, in the data flow)
Auxiliary Data	GIPP : Parameters from Level-1A complemented by radiometric and geometric processing parameters. GRI (Global Reference Images): only the reference to the data used is provided. DEM: only the reference to the data used is provided.
Quality Indicator Data	Quality Indicator files from Level-1B

Table 4-19: Input for Level-1B processing

The Level-1B corrections include:

- Radiometric corrections:
  - dark signal
  - pixel response non uniformity
  - crosstalk correction
  - defective pixels
  - High spatial resolution bands restoration: deconvolution and denoising based on a wavelet processing (if necessary according to certain noise criteria).
  - Binning for 60m bands (spatial filtering)
- Physical geometric model refinement using GCPs provided by the GRI; this model is not applied to the image but appended to the metadata
- Pixel classification: singular pixels detections (defective pixels, saturations, nodata).

No resampling is performed up to Level-1B.

The geometric model refinement of the Level-1B is optional. A dedicated flag in the metadata notifies whether the geometric model provided is the raw model or the refined model.

Note that one Level-1B product:

- refers always to one Datatake;
- refer to one or several Datastrip from the same Datatake;
- may cover the full Datatake or an extract of the Datatake.

In the case of an extract, the image data are provided to cover the selected extract only. In any case (full or extract of Datatake), the ancillary data, referenced through the product metadata file, are always provided on the temporal extent of the full Datatake.

The following figure gives an overview of the Level-1B User Product physical format. The yellow boxes correspond to folders and the white ones to files:

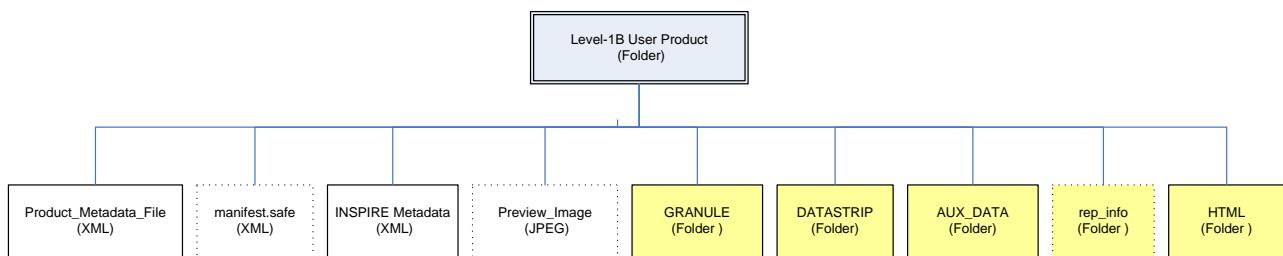


Figure 70: Level-1B User Product Structure

The Level-1B User Product consists of:

1. **Product\_Metadata\_File**: mandatory XML main metadata file.
2. **manifest.safe**: SAFE metadata file (optional). It is included in the product only if the user requests the SAFE as output format (download option).
3. **GRANULE**: folder containing all Granules composing the product (Image Data). The Image Data extent (raster files) correspond to a set of Granules and can covers up to 12 detectors \* 13 bands of the orbit in full resolution. A sub-set of the 13 bands can be provided (download option).
4. **DATASTRIP**: folder containing the Datastrip composing the product linked to the selected Granules.
5. **AUX\_DATA**: folder containing, if requested by the user (download option), the GIPP files and IERS Bulletins used for the Level-1B User Product production. All Level-1B auxiliary data are referenced in the product metadata file.
6. **Preview\_Image**: file consisting of an image limited to 3 visible-bands in ground geometry at 320m resolution. This file, provided if requested by the user (download option), gives an overview of the product (sub-sampled) mainly for image data browsing and selection purposes.
7. **rep\_info**: folder containing the XSD schema provided inside the product. This folder is optional. It is included in the final product if the user selects the SAFE format as output format (download option).
8. **INSPIRE**: XML INSPIRE metadata file (see Annex B).
9. **HTML**: folder containing an HTML product presentation file (UserProduct\_index.html) and the corresponding stylesheet (UserProduct\_index.xsl).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 383 / 477

### 4.8.2 Image Data

The Level-1B image data correspond to a collection of Granules. The image data extent correspond to a set of Granules and can cover *up to 12 detectors \* 13 bands of the orbit in full resolution*. A sub-set of the 13 bands can be provided (same approach as Level-1A).

Each Level-1B Granule is identified in a unique way, using a unique identifier PDI\_ID defined in the section 3.10.1.

#### 4.8.2.1 Image Data Encoding and Files

Each image pixel value is encoded on 12 useful bits (as on-board).

The image data are provided as separated files for each spectral band (i.e. in total of 13 GML/JPEG2000 files per Granule).

As per a Level-1A product, the Level-1B product will be available to the final user according to two delivery options:

- Either one file per spectral band and per Granule;
- Either a file per spectral band corresponding to the concatenation of *Granules along-track* also called *aggregation of Granules* (§ 4.7.8).

### 4.8.3 Ancillary Data

The satellite ancillary data (SAD product data item described in the section 3.21) are not embedded in the Level-1B User Product but they are referenced (by SAD PDI\_ID) through the Datastrip metadata file (ANC\_DATA\_REF metadata).

The Level-1B product may cover the full Datatake or an extract of the Datatake, in any case, the SAD are always provided on the temporal extent of the full Datatake.

### 4.8.4 Auxiliary Data

All Auxiliary Data used for Level-1B processing are referenced in the product metadata file:

- IERS bulletin file,
- Ground Image Processing Parameters (GIPPs) files (see Annex E),
- Reference to the used DEM;
- Reference to the used GRI.

The final user, according to a specific download option, will be able to include in its Level-1B User Product, the IERS bulletin and/or the used GIPP files. DEM and GRI are never provided within the product but only referenced at metadata level.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 384 / 477

### 4.8.5 Quality Indicators

Level-1B quality indicators are derived from Level-1A ones and are complemented by quality indicators relevant to the processing applied.

The *Product Level Quality Indicators* are provided at product level and referenced through the metadata file .

The *Granule Level Quality Indicators* are provided at Granule level and referenced through the metadata file.

The *Pixel Level Quality Indicators* are provided at Granule level through dedicated quality mask files pointed through the Granule level metadata file.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 385 / 477

### 4.8.6 Metadata

The following table shows the groups of metadata provided inside a Level-1B User Product:

Level-1B User Product Metadata	
<b>Product Level Metadata</b>	All product level metadata, specific for the User level, are consolidated/computed because not present at Granule and Datastrip level.
<b>Granule Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Granule level are copied from the input Granules to the User Product.
<b>DATASTRIP Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Datastrip level are copied from the input Datastrips to the User Product;

Table 4-20: Level-1B Product Metadata

As mentioned in the section 2.4, the User Product metadata (all) are not provided with a *metadataLevel* attribute (Brief/Standard/Expertise) unlike what happens for all Granule and Datastrip metadata.

During the User Product assembling, this attribute is used to select by filtering, according to a download option, the set of metadata that must be included in the final product.

For these filtered fields, the *metadataLevel* attribute is not written in the User Product's metadata.

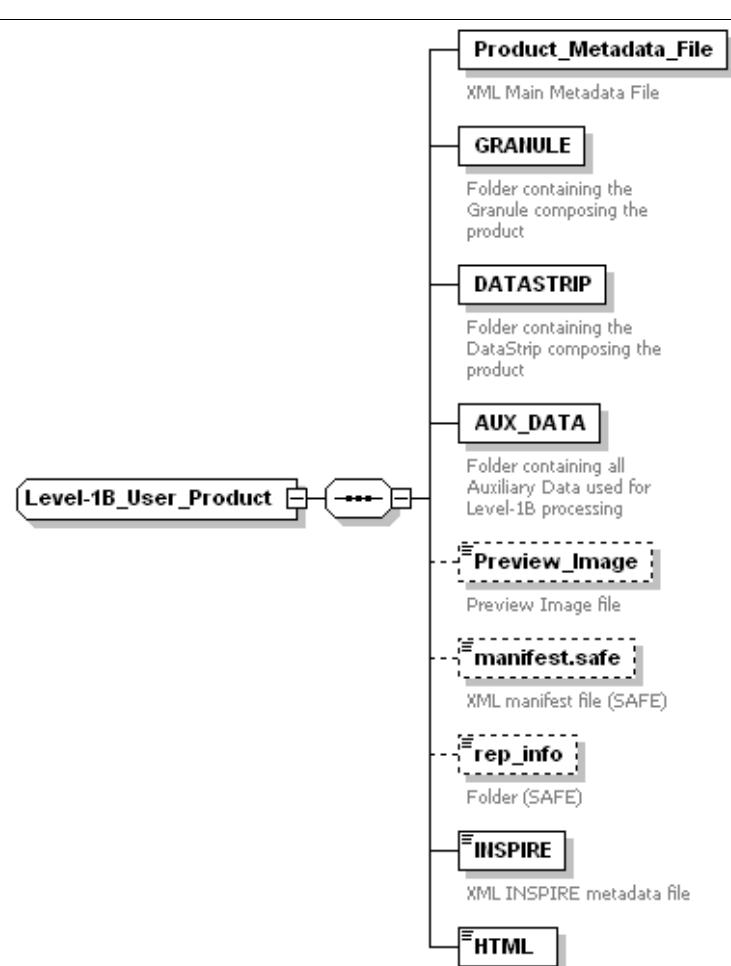
Note that an User Product for an expert user (Expertise download option) will contain all level of metadata (Brief/Standard/Expertise). An User Product for a user with "Standard" or "Brief" permission will contain only Brief/Standard or Brief metadata.

In addition to the metadata in the table above, the User Product contains the *manifest.safe* metadata (when the User Product is SAFE format) and the INSPIRE metadata.

The Level-1B Product Metadata are detailed in the section 4.8.7.

#### 4.8.7 User Product Level-1B Structure

The *S2\_User\_Product\_Level-1B\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the structure of a S2 Level-1B User Product. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the structure shown in the Figure 70.

<p>diagram</p>  <pre> graph TD     L1B[Level-1B_User_Product] --- PMF[Product_Metadata_File]     L1B --- GR[GRANULE]     L1B --- DS[DATASTrip]     L1B --- AD[AUX_DATA]     L1B --- PI[Preview_Image]     L1B --- MS[manifest.safe]     L1B --- RI[rep_info]     L1B --- INS[INSPIRE]     L1B --- HTL[HTML]   </pre>	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
<p>children</p> <p><a href="#">Product_Metadata_File</a> <a href="#">GRANULE</a> <a href="#">DATASTrip</a> <a href="#">AUX_DATA</a> <a href="#">Preview_Image</a> <a href="#">manifest.safe</a> <a href="#">rep_info</a> <a href="#">INSPIRE</a> <a href="#">HTML</a></p>	<p>Description</p> <p>Level-1B User Product contains:</p> <ol style="list-style-type: none"> <li>1. <b>Product_Metadata_File</b>: XML Main Metadata file (DIMAP)</li> </ol>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

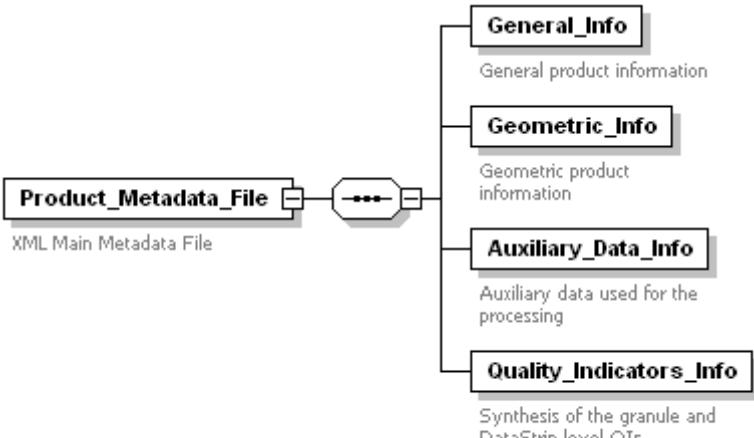
PAGE : 387 / 477

- |  |   |
|--|---|
|  | <ol style="list-style-type: none"><li>2. <b>GRANULE</b>: folder containing the list of the Granules belonging to the user product (the Granule structure is described in the section 3.10.3).</li><li>3. <b>DATASTRIPE</b>: folder containing the list of the Datastrip belonging the Datatake from which Level-1B User Product has been selected (the Datastrip structure is described in the section 3.11.3).</li><li>4. <b>AUX_DATA</b>: folder containing all Auxiliary Data used for Level-1B processing (optional, the aux data will be included in the product if selected according to a specific download option).</li><li>5. <b>Preview_Image</b>: JPEG2000 for image data browsing and selection purposes.</li><li>6. <b>manifest.safe</b>: XML SAFE Manifest file</li><li>7. <b>rep_info</b>: optional folder containing the XSD DIMAP schema</li><li>8. <b>INSPIRE.xml</b>: XML INSPIRE metadata file</li><li>9. <b>HTML</b>: folder containing an HTML product presentation file and the corresponding stylesheet</li></ol> |
|--|---|

#### 4.8.7.1 *Product\_Metadata\_File Schema*

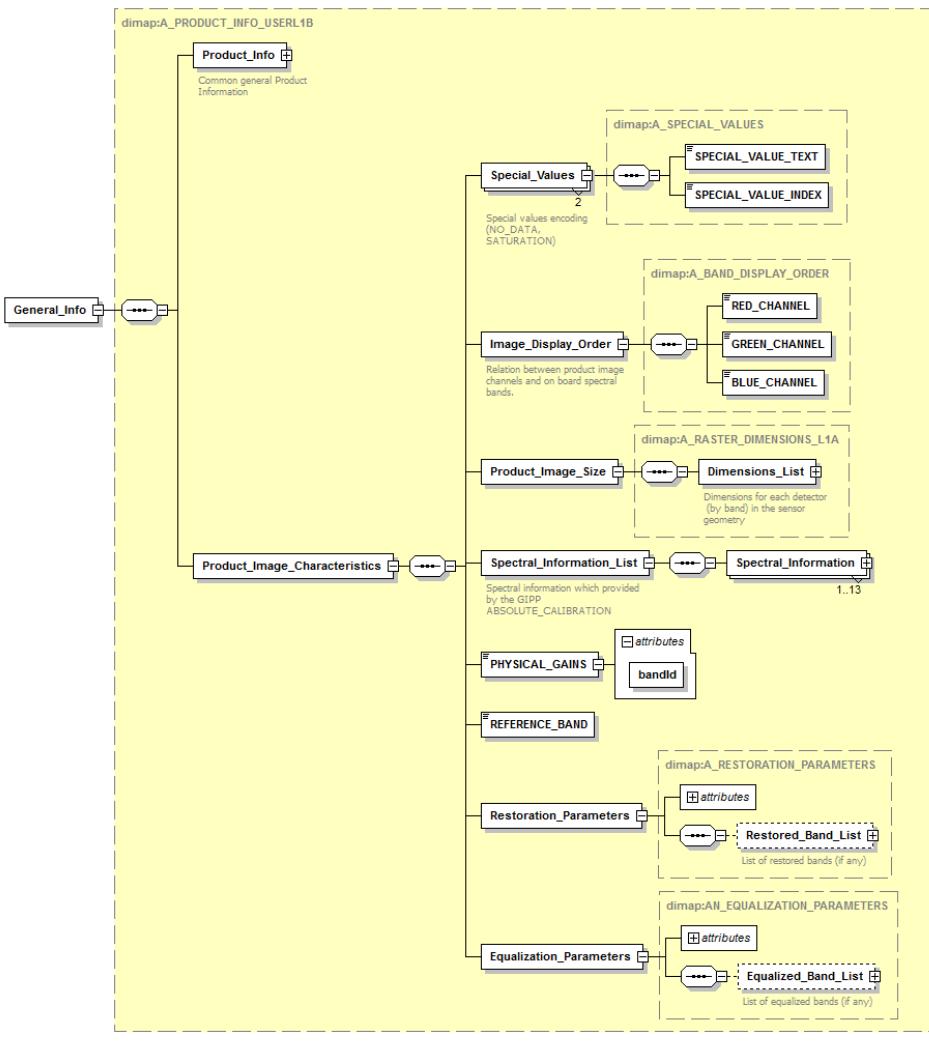
Product\_Metadata\_File is the XML metadata file provided inside the S2 Level-1B User Product. The XSD schema annexed to this document and used to validate it is *S2\_User\_Product\_Level-1B\_Metadata.xsd*.

A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Product_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class General_Info {         &lt;&lt;General product information&gt;&gt;     }     class Geometric_Info {         &lt;&lt;Geometric product information&gt;&gt;     }     class Auxiliary_Data_Info {         &lt;&lt;Auxiliary data used for the processing&gt;&gt;     }     class Quality_Indicators_Info {         &lt;&lt;Synthesis of the granule and DataStrip level QIs&gt;&gt;     }      Product_Metadata_File "2" -- "*" General_Info :      Product_Metadata_File "2" -- "*" Geometric_Info :      Product_Metadata_File "2" -- "*" Auxiliary_Data_Info :      Product_Metadata_File "2" -- "*" Quality_Indicators_Info :   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Auxiliary_Data_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a>
Description	<p>The Product_Metadata_File describes the product data items. It is presented to the user as a structured container of information. Product_Metadata_File is an XML file containing:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: provides general product information.</li> <li>2. <b>Geometric_Info</b>: describing the geolocation over WGS84 of the contour of the product.</li> <li>3. <b>Auxiliary_Data_Info</b>: Links to the AUX_DATA items.</li> <li>4. <b>Quality_Indicators_Info</b>: Synthesis of the Granule and Datastrip level QIs.</li> </ol>

The following figures and tables give a complete description of the User Product metadata.

#### General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 71 : Level-1B Product\_Metadata\_File - General\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 390 / 477

General Info		
Field Name	Description	Note
Product_Info	This group of metadata is described in the Table 4-9.	Table 4-9
Product_Image_Characteristics/Special_Values/SPECIAL_VALUE_TEXT Product_Image_Characteristics/Special_Values/SPECIAL_VALUE_INDEX	Special values encoding (e.g. NODATA, SATURATION)	Based on Radiometric_Info (PIXELS_NO_DATA_PROC and SATURATED_PIXELS_PROC) available at Datastrip level.
Product_Image_Characteristics/Image_Display_Order/RED_CHANNEL Product_Image_Characteristics/Image_Display_Order/GREEN_CHANNEL Product_Image_Characteristics/Image_Display_Order/BLUE_CHANNEL	Spectral bands (Relation between product image channels and on board spectral bands)	Information available at Datastrip level (see Table 3-46).
Product_Image_Characteristics/Product_Image_SizeDimension_List/Dimensions/ Detector_Dimensions/NROWS Product_Image_Characteristics/Product_Image_SizeDimension_List/Dimensions/ Detector_Dimensions/NCOLS	Product Image size (by band x detector)	Based on Granule dimensions
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/RESOLUTION Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/MIN Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/MAX Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/CENTRAL Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Spectral_Response/STEP Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Spectral_Response/VALUES	Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION	Information available at Datastrip level
Product_Image_Characteristics/PHYSICAL_GAINS	Physical Gain for each band	
Product_Image_Characteristics/REFERENCE_BAND	Reference Band used in the processing	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 391 / 477

### General\_Info

Field Name	Description	Note
Restoration_Parameters/Restored_Band_List/Restored_Band/RESTORATION_SCENARIO Restoration_Parameters/Restored_Band_List/Restored_Band/Levelling_Values/XMIN Restoration_Parameters/Restored_Band_List/Restored_Band/Levelling_Values/XMAX	Restoration parameters (list of restored bands, type of restoration and levelling values).	Available at Datastrip level, see Table 3-51
Equalization_Parameters/Equalized_Band_List/Equalized_Band/OFFSET_PROC Equalization_Parameters/Equalized_Band_List/Equalized_Band/DARK_SIGNAL_NON_UNIFORMITY_PROC	Equalization parameters	Available at Datastrip level, see Table 3-51

Table 4-21: Level-1B Product\_Metadata\_File - General\_Info Description

Geometric\_Info:

all geometric product information are described in the Table 4-10.

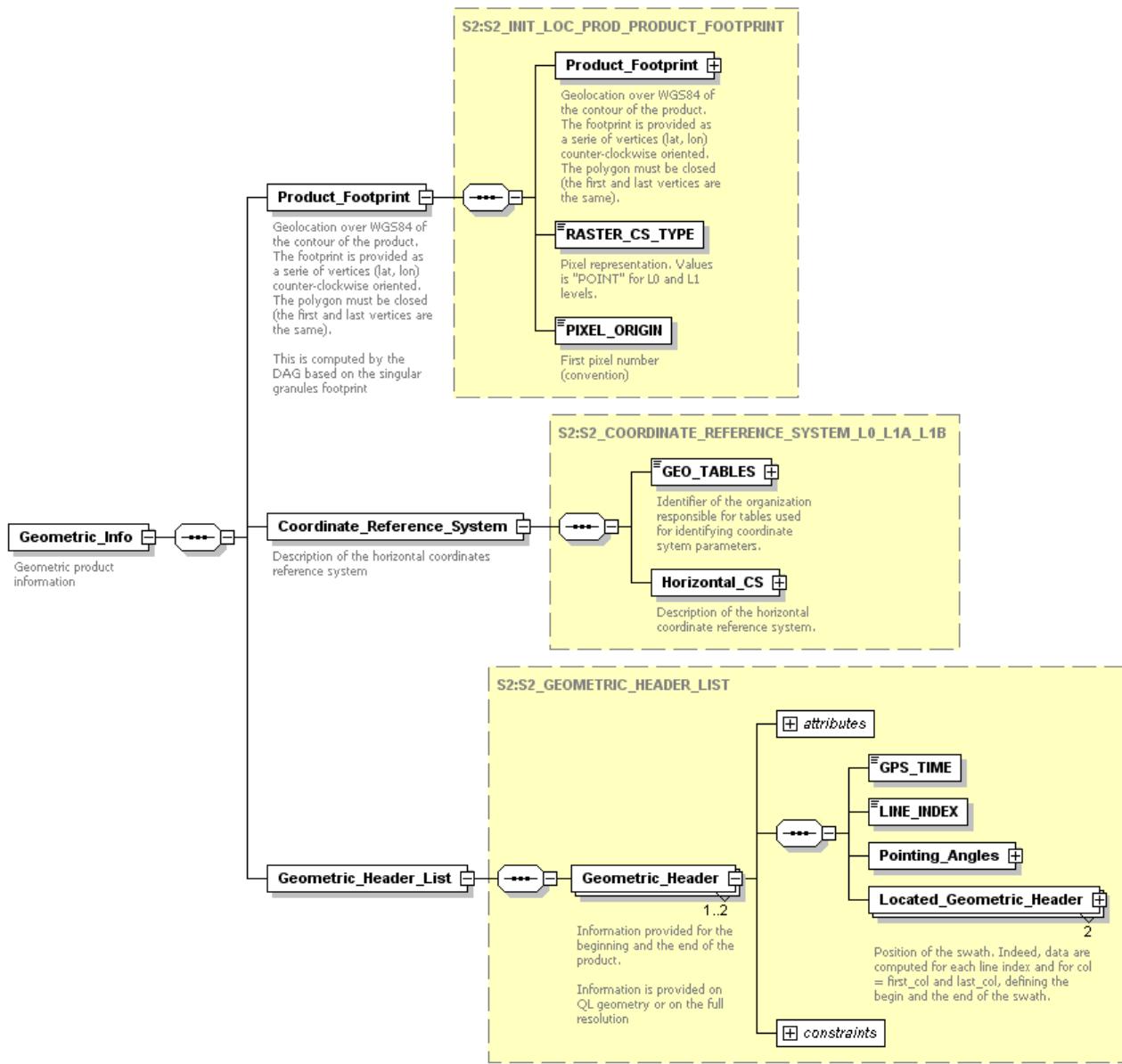
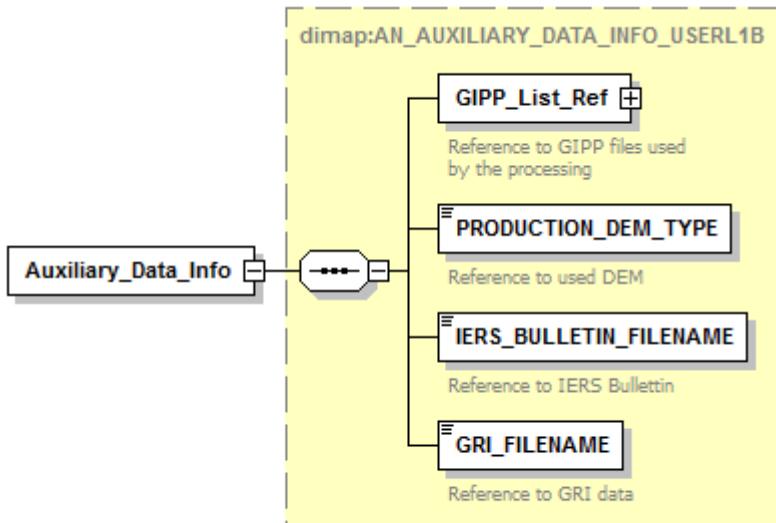


Figure 72: Level-1B Product\_Metadata\_File – Geometric\_Info Diagram

Generated by XMLSpy

[www.altova.com](http://www.altova.com)

### Auxiliary Data Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 73 : Level-1B Product\_Metadata\_File – Auxiliary\_Data\_Info Diagram

<b>Auxiliary_Data_Info</b>			
<b>Field Name</b>	<b>Description</b>	<b>Note</b>	<b>Check vs [PDD]</b>
GIPP_FILENAME	Reference to the used GIPP files.	Available at Datastrip level, see Table 3-53	§ 7.3.1.2
PRODUCTION_DEM_TYPE	Reference to the used DEM	Available at Datastrip level, see Table 3-53	§ 7.3.1.2
IERS_BULLETIN_FILENAME	Reference to the used IERS Bulletin	Available at Datastrip level, see Table 3-53	MISSING
GRI_FILENAME	Reference to the used GRI data	Available at Datastrip level, see Table 3-53	§ 7.3.1.2

Table 4-22: Level-1B Product\_Metadata\_File - Auxiliary\_Info Description

### Quality Indicators Info:

The Quality\_Indicators\_Info are described in the Table 4-12.

In addition the Level-1B User Product contains the RADIOMETRIC\_QUALITY\_FLAG based on the OLQC reports contained in the Datastrips/QI\_DATA with RADIOMETRIC\_QUALITY checklist name.

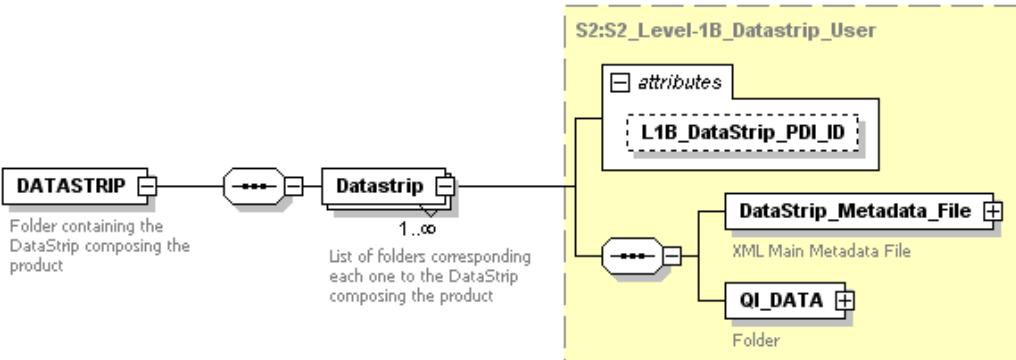
RADIOMETRIC\_QUALITY\_FLAG is FAILED if at least one report at Datastrip level is with globalStatus FAILED.

All OLQC checks performed on L1B Granules/Datastrips and related to a specific checklist name (see Annex D), are in the Table 3-17 and Table 3-24.

#### 4.8.7.2 GRANULE

diagram	<pre> classDiagram     class GRANULE {         &lt;&lt;Folder containing the Granule composing the product&gt;&gt;     }     class Granule {         &lt;&lt;List of folders corresponding each one to the granules composing the product&gt;&gt;     }     class S2S2_Level-1B_Granule_User {         &lt;&lt;User Product&gt;&gt;     }     class Level-1B_Granule_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class IMG_DATA {         &lt;&lt;Image Folder&gt;&gt;     }     class QI_DATA {         &lt;&lt;Folder&gt;&gt;     }      GRANULE "1..&gt;" Granule     Granule "1..&gt;" S2S2_Level-1B_Granule_User     S2S2_Level-1B_Granule_User "1..&gt;" Level-1B_Granule_Metadata_File     S2S2_Level-1B_Granule_User "1..&gt;" IMG_DATA     S2S2_Level-1B_Granule_User "1..&gt;" QI_DATA   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>GRANULE folder is a “folder of folders” each one corresponding to the Granules composing the product and identified by proper PDI_ID (Granule_ID).</p> <p>The structure of each Granule included in the product is the same of the Level-1B PDI Granule described in the section 3.10.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Granule metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.8.6),</li> <li>2. the XML Level-1B_Granule_Metadata_File is validated using the <i>S2_PDI_Level-1B_Granule_Metadata.xsd</i> schema annexed to the document,</li> <li>3. the <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Granule PDI is included in the User Product (see section 3.10.3).</li> </ol>

#### 4.8.7.3 DATASTRIP

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>DATASTRIP folder is a “folder of folders” each one corresponding to the Datastrip composing the product and identified by proper PDI_ID (Datastrip_ID).</p> <p>The structure of each Datastrip included in the product is the same of the Level-1B PDI Datastrip described in the section 3.11.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Datastrips metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.8.6),</li> <li>2. the XML Datastrip_Metadata_File is validated using the <i>S2_PDI_Level-1B_Datastrip_Metadata.xsd</i> schema annexed to the document,</li> <li>3. <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Datastrip PDI is included in the User Product (see section 3.11.3).</li> </ol>

#### 4.8.7.4 AUX\_DATA

diagram	 <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>All Auxiliary Data used for Level-1B processing are referenced through the Product_Metadata_File. GIPP files and IERS Bulletin file can be provided if requested by the user (download option). DEM and GRI are not provided itself inside the product but only as a reference to the data used.</p>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 396 / 477

### 4.8.7.5 Preview\_Image

diagram	<b>Preview_Image</b> Preview Image File
annotation	Preview Image file (PVI). PVI is included in the final product if required by the user (download option). This preview is extracted from Level-1C image (JPEG2000 low resolution extraction, 3 visible-bands in ground geometry at 320m resolution, RGB).The final geometric representation of the preview is defined by the user according to its region of interest (either geographic or cartographic representation).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 397 / 477

### 4.8.8 User Product Level-1B SAFE Manifest synoptic table

The final user product contains only one main *manifest.safe* file. The *manifest.safe* files relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the user product, all lower level PDI are removed.

The content of the SAFE Manifest for the Level-1B User Product level is the same as for the Level-1A User Product level and can be exhaustively described through Table 3-29, Table 4-13 and Table 4-13 , except for the following minor differences in Table 4-13:

- a few specific text string in the “processing” section (containing “L1B” instead of “L1A”)
- the Level-1B User Product Manifest includes a reference to the GRI Auxiliary file, contained in the AUX\_DATA folder (differently from Level-1A User Product); see tag “metadataComponents” in Table 4-13.

Since the user product metadata refers to the contained Granules and Datastrips, the structure of the Manifest is based on the Level-1B Manifests provided for Granules and Datastrip (see sections 3.10.4 and 3.11.4).

A practical example of Manifest file for the Level-1B User Product is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 398 / 477

### 4.9 Level-1C User Product Specification

#### 4.9.1 Introduction

Level-1C is an orthoimage product, i.e. a map projection of the acquired image using a system DEM to correct ground geometric distortions. Pixel radiometric measurements are provided in Top-Of-Atmosphere (TOA) reflectances with all parameters to transform them into radiances. Level-1C products are resampled with a constant GSD (Ground Sampling Distance) of 10m, 20m, 60m according to the native resolution of the different spectral bands.

Input of Level-1C processing	Description
Metadata	Metadata from Level-1B
Image Data	Radiometrically and geometrically corrected image data
Ancillary Data	Ancillary data from the Level-1B (satellite and ground ancillary data, including the refined geometric model)
Auxiliary Data	GIPP: Parameters from Level-1B complemented by radiometric and geometric processing parameters
Quality Indicator Data	Quality Indicator files from Level-1B

Table 4-23: Input of Level-1C Processing

Note that one Level-1C product:

- refers always to one Datatake;
- refer to one or several Datastrip from the same Datatake;
- may cover the full Datatake or an extract of the Datatake.

In the case of an extract, the image data are provided to cover the selected extract only. In any case (full or extract of Datatake), the ancillary data, referenced through the product metadata file, are always provided on the temporal extent of the full Datatake.

By default, Level-1C is geometrically refined. Some Level-1C may not be geometrically refined (e.g. for Cal/Val purposes). These products are identified with a dedicated flag in the metadata.

The following figure gives an overview of the Level-1C User Product physical format. The yellow boxes correspond to folders and the white ones to files:

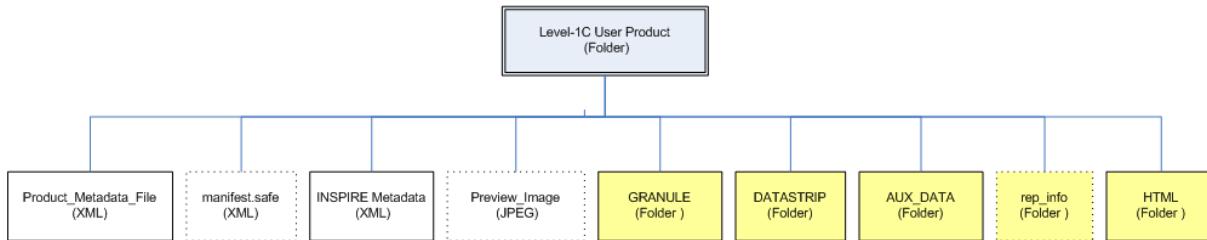


Figure 74: Level-1C User Product Structure

The Level-1C User product consists of:

1. **Product\_Metadata\_File**: mandatory XML main metadata file.
2. **manifest.safe**: SAFE metadata file (optional). It is included in the product only if the user requests the SAFE as output format (download option).
3. **GRANULE**: this folder (the name is chosen for homogeneity with respect to the other User Product but should be TILE) contains the tiles composing the product (Image Data). The Image Data corresponds to a set of Tiles containing one image file per band. A sub-set of the 13 bands can be provided (download option).
4. **DATASTRIP**: folder containing the Datastrip composing the product linked to the selected tiles.
5. **AUX\_DATA**: folder containing, if requested by the user (download option), the GIPP files and IERS Bulletins used for the Level-1C User Product production. All Level-1C auxiliary data are referenced in the product metadata file. In addition, the Level-1C User Product embeds always at GRANULE (TILE) level an elementary set of meteorological datasets resampled ECMWF in tile geometry.
6. **Preview\_Image**: file consisting of an image limited to 3 visible-bands in ground geometry at 320m resolution. This file, provided if requested by the user (download option), gives an overview of the product (sub-sampled) mainly for image data browsing and selection purposes,
7. **rep\_info**: folder containing the XSD schema provided inside the product. This folder is optional. It will be included in the final product if the user select the SAFE format as output format (see section 1.6.4).
8. **INSPIRE**: XML INSPIRE metadata file (see Annex B).
9. **HTML**: folder containing an HTML product presentation file (UserProduct\_index.html) and the corresponding stylesheet (UserProduct\_index.xsl).

#### 4.9.2 Image Data

The final projection of the product is **UTM** (over **WGS84**). The appropriate UTM zone will be selected according to each Tile of the product.

The image data is tiled in several elementary units. Each Tile is defined (with an appropriate GIPP file passed to the Level-1C processing chain), by:

- Its projection code (UTM code),
- Its anchorage point (ground coordinates of the upper-left pixel of the Tile),
- Pixel size in line and column,
- Tile size in number of lines and columns (rectangle)

This definition insures for all resolutions :

- upper-left corner is at the same location
- the number of pixels in the Tile is an integer

However, depending on the information inside the GIPP defining the Tiles, coverage of a Tile could be slightly different depending on the resolutions. Consequently, the lower-right corner could be at different locations depending on the resolutions.

The tiling definition shall ensure an overlap between tiles at the UTM zone borders.

A UTM tiling following the US-MGRS (US Military Grid Reference System) approach is proposed (100x100km<sup>2</sup>).

The tiling concept is illustrated on Figure 78 showing the standard **6° longitude x 8° latitude UTM zones divided into 100km x 100km tiles**.

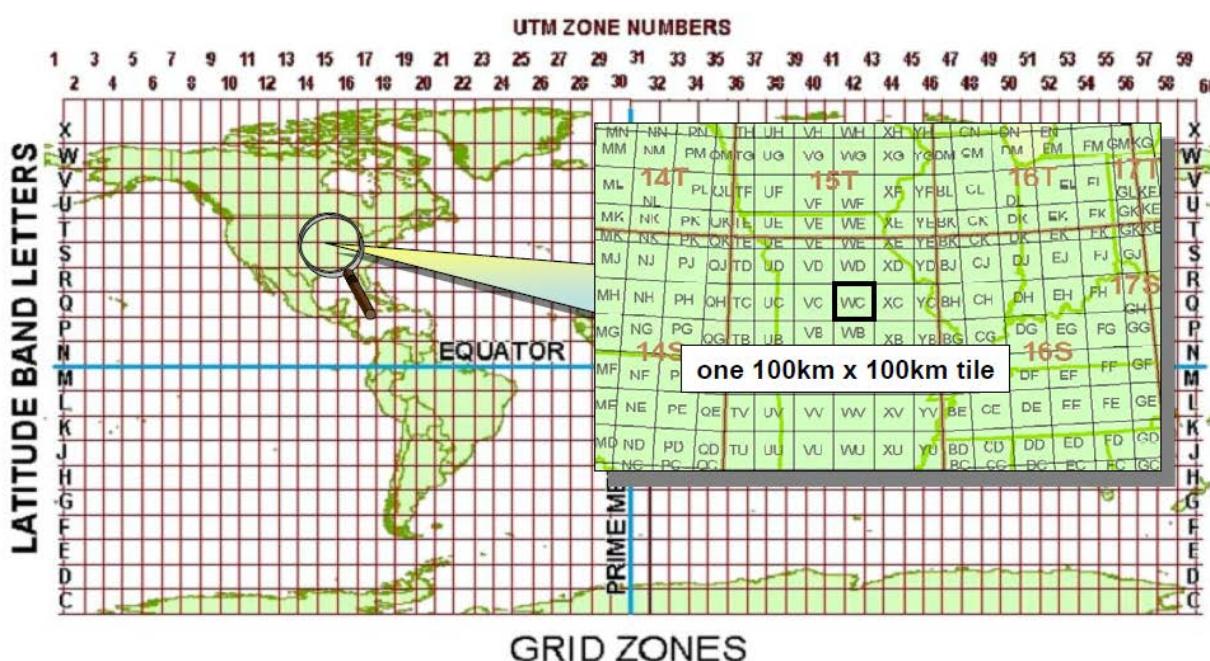


Figure 75: Level-1C Tiling Concept in UTM

Each Tile is then identified by 5 characters:

- The first two characters represent the 6° wide UTM zone.
  - Leading zeroes are included so that Zone 9 is ““09””.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 401 / 477

- The third character is a letter designating a band of latitude.
  - Beginning at 80°S and proceeding northward, the 20 bands are lettered C through X, omitting I and O.
  - The bands are all 8° high except band X, which is 12° high.
- The fourth and fifth characters are a pair of letters designating one of the 100,000-meter side grid squares inside the grid zone.

For example, in the previous figure, the black-squared Tile is identified 15SWC.

### 4.9.2.1 Image Data Encoding and Files

The image data are provided as separated raster files for each spectral band (i.e. in total of 13 GML/JPEG2000 files per Tile).

Each image file is compressed using the JPEG2000 algorithm. The parameters of the JPEG2000 compression are specified in the Annex H. The upper-left pixel corner coordinates of all bands shall have the same coordinates and shall be a multiple of 60m. For each file, the JPEG2000 header contains GML-JP2 information for ortho-image georeferencing. Each Tile is therefore geo-referenced.

### 4.9.3 Ancillary Data

All satellite ancillary data are referenced at product level in the metadata file.

### 4.9.4 Auxiliary Data

All Auxiliary Data used for Level-1C processing are referenced in the product metadata file.

The Level-1C auxiliary data (GIPPs and IERS bulletin) are provided with the product if requested by the user (download option).

In addition, the Level-1C User Product embeds always a GRANULE (TILE) level an elementary set of meteorological datasets extracted and resampled from ECMWF forecast output (cf. [ECMWF-FCAST]) and relevant to down-stream processing (e.g. atmospheric corrections).

The ECMWF auxiliary data embedded in the Level-1C at Tile level includes the following parameters:

- Total column ozone (TCO3) [Kg/m<sup>2</sup>];
- Total column water vapour (TCWV) [Kg/m<sup>2</sup>];
- Mean sea level pressure (MSL) [hPa].

Resulting from a temporal and spatial interpolation of the raw ECMWF global forecast dataset, this data will be provided as part of the Level-1C auxiliary data resampled and distributed in grid



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 402 / 477

information tiles with the same dimensions as the Level-1C Tiles. Grid points are provided in latitude/longitude using WGS84 reference system.

They are interpolated from original ECMWF data to match L1C Tiles both temporally (linear) and geometrically (bilinear with a Ground Sample Distance of 12.5km) and provided in GRIB V1 format.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 403 / 477

### 4.9.5 Quality Indicators

Level-1C quality indicators are derived from Level-1B ones and are complemented by quality indicators relevant to the processing applied.

The *Product Level Quality Indicators* are provided at product level and referenced through the metadata file.

The *Tile Level Quality Indicators* are provided at Tile level in the standard structure of the metadata file.

The *Pixel Level Quality Indicators* are provided at Tile level through dedicated quality masks that provide quality information at pixel level. The Tile level metadata file (Standard structure) contains a pointer to the mask file.

There is one vector file for each type of mask and each Tile (or aggregation of tiles). Each vector mask file consists of a set of polygons defined in ground geometry: (X, Y) in the projected reference frame.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 404 / 477

### 4.9.6 Metadata

The following table shows the groups of metadata provided inside a Level-1C User Product:

Level-1C User Product Metadata	
<b>Product Level Metadata</b>	All product level metadata, specific for the User level, are consolidated/computed because not present at Granule and Datastrip level.
<b>Granule Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Granule level are copied from the input Granules to the User Product.
<b>DATASTRIP Level Metadata (Brief/Standard/Expertise)</b>	All Brief/Standard/Expertise metadata (download option, see section 4.4) defined at Datastrip level are copied from the input Datastrips to the User Product;

Table 4-24: Level-1C Product Metadata

As mentioned in the section 2.4, the User Product metadata (all) are not provided with a *metadataLevel* attribute (Brief/Standard/Expertise) unlike what happens for all Granule and Datastrip metadata.

During the User Product assembling, this attribute is used to select by filtering, according to a download option, the set of metadata that must be included in the final product.

For these filtered fields, the *metadataLevel* attribute is not written in the User Product's metadata.

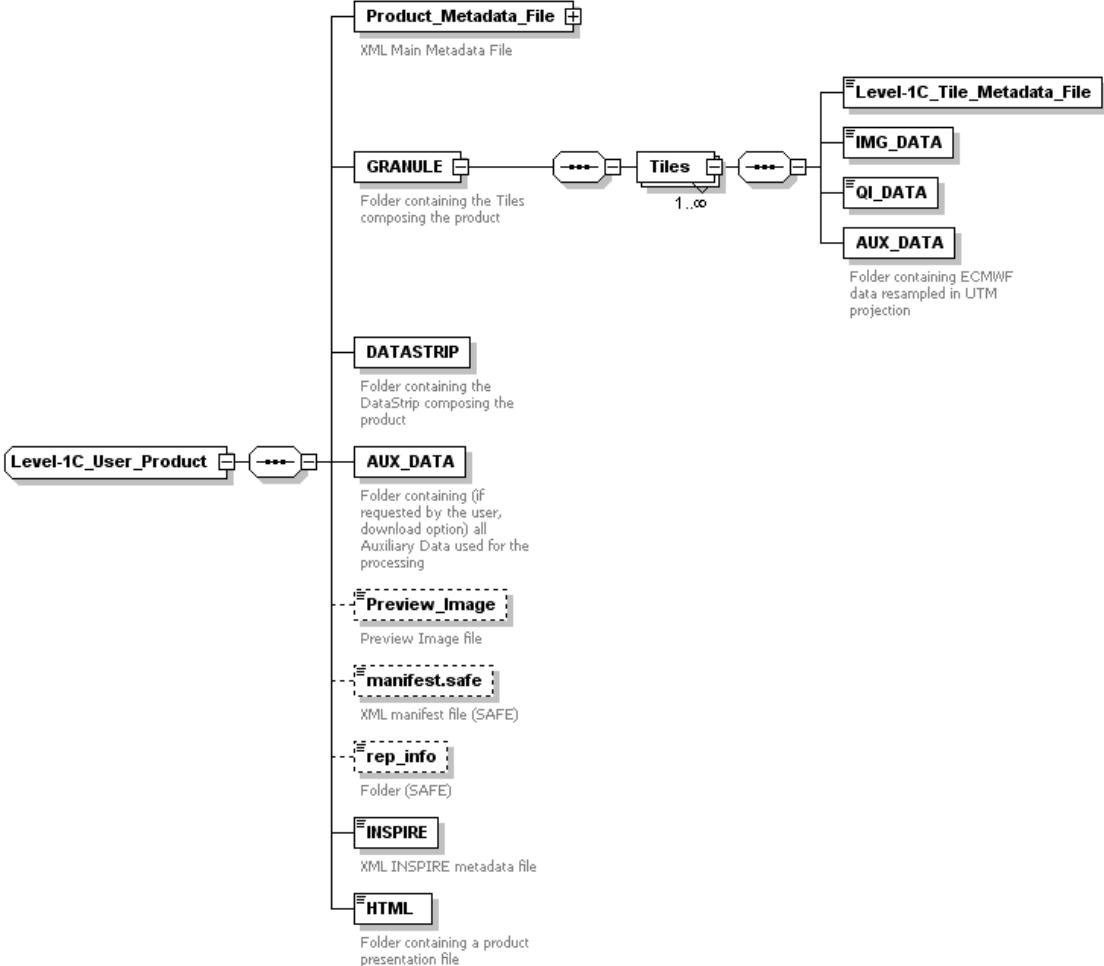
Note that an User Product for an expert user (Expertise download option) will contain all level of metadata (Brief/Standard/Expertise). An User Product for a user with "Standard" or "Brief" permission will contain only Brief/Standard or Brief metadata.

In addition to the metadata in the table above, the User Product contains the *manifest.safe* metadata (when the User Product is SAFE format) and the INSPIRE metadata.

The Level-1C Product Metadata are detailed in the section 4.9.7.

#### 4.9.7 User Product Level-1C Structure

The *S2\_User\_Product\_Level-1C\_Structure.xsd* schema annexed to the document and shown in the following diagram, represents the structure of a S2 Level-1C User Product. This schema is provided for information only as It is actually not expected to be used for the validation of a XML file. The diagram reflects exactly the structure shown in the Figure 74.

diagram	 <pre> graph TD     L1[Level-1C_User_Product] --- PMF[Product_Metadata_File]     L1 --- GR[GRANULE]     L1 --- DS[DATASTRIP]     L1 --- AUX[AUX_DATA]     L1 --- PI[Preview_Image]     L1 --- MS[manifest.safe]     L1 --- RI[rep_info]     L1 --- INS[INSPIRE]     L1 --- HTML[HTML]      GR --- T[Tiles]     T -.-&gt; L1C_LTMF[Level-1C_Tile_Metadata_File]     T -.-&gt; IMG[IMG_DATA]     T -.-&gt; QI[QI_DATA]     T -.-&gt; AUX2[AUX_DATA]   </pre>
	<p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<p><a href="#">Product_Metadata_File</a> <a href="#">GRANULE</a> <a href="#">DATASTRIP</a> <a href="#">AUX_DATA</a> <a href="#">Preview_Image</a> <a href="#">manifest.safe</a>  <a href="#">rep_info</a> <a href="#">INSPIRE</a> <a href="#">HTML</a></p>
Description	Level-1C User Product contains:



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 406 / 477

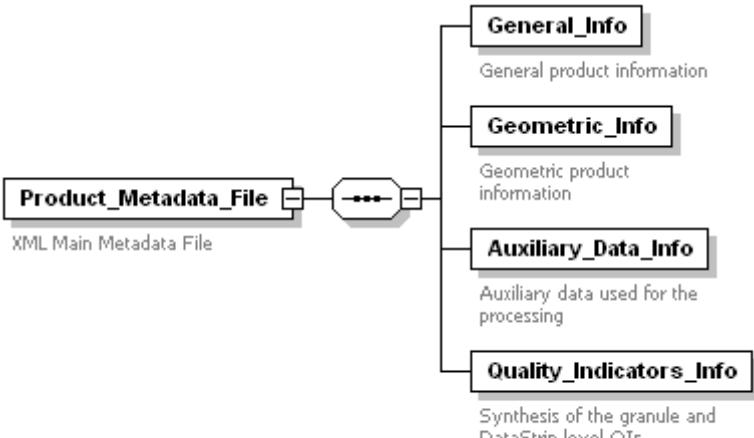
1. **Product\_Metadata\_File:** XML Main Metadata file (DIMAP)
2. **GRANULE:** folder containing the list of the tiles belonging to the user product.
3. **DATASTRIP:** folder containing the list of the Datastrip belonging the Datatake from which Level-1C User Product has been selected.
4. **AUX\_DATA:** folder containing all Auxiliary Data used for Level-1C processing (GIPPs and IERS Bulletin are optional, they will be included in the product if selected according to a specific download option. Raw ECMWF are never included in the product (no download option), on the contrary, resampled ECMWF in tile geometry are mandatory, always embed in the product at GRANULE level).
5. **Preview\_Image:** JPEG2000 for image data browsing and selection purposes.
6. **manifest.safe:** XML SAFE Manifest file
7. **rep\_info:** optional folder containing the XSD DIMAP schema
8. **INSPIRE.xml:** XML INSPIRE metadata file
9. **HTML:** folder containing an HTML product presentation file and the corresponding stylesheet.

Note that the folder containing the tiles is named “GRANULE” to maintain the same naming used for L0/L1A/L1B products.

#### 4.9.7.1 *Product\_Metadata\_File Schema*

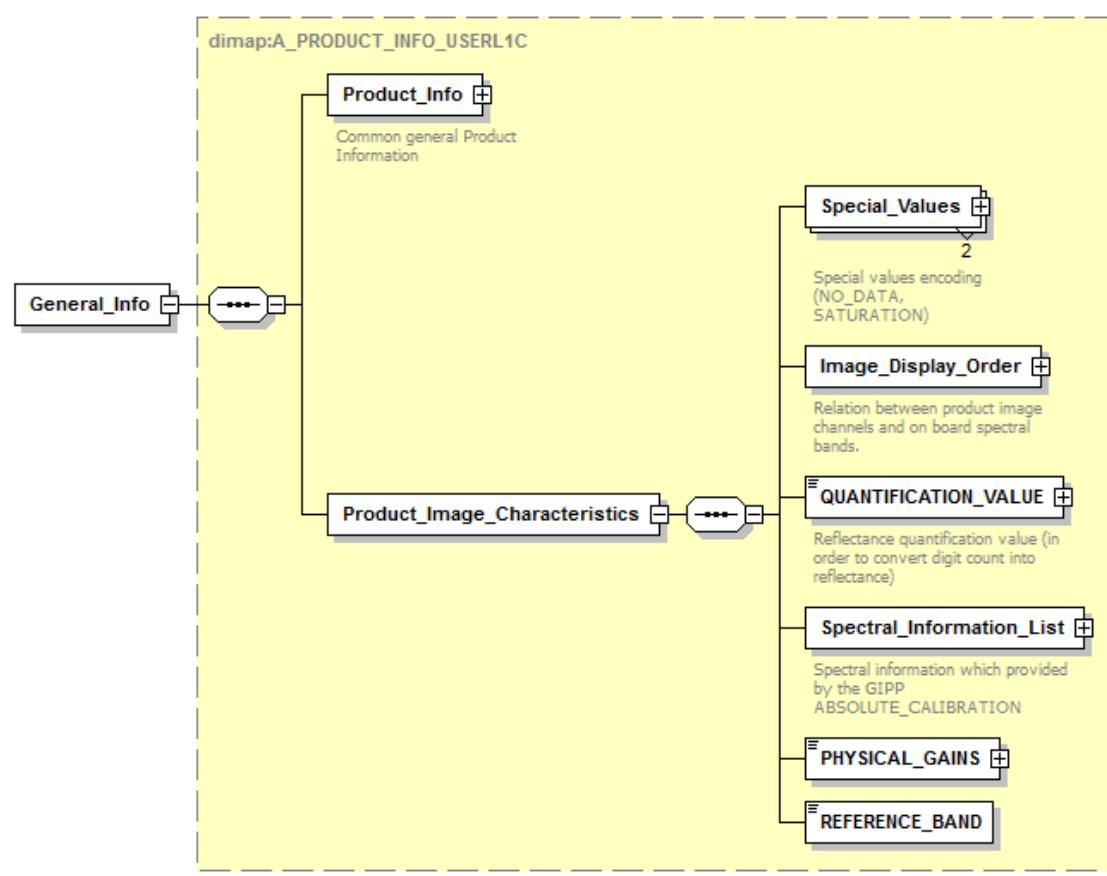
Product\_Metadata\_File is the XML metadata file provided inside the S2 Level-1C User Product. The XSD schema annexed to this document and used to validate it is *S2\_User\_Product\_Level-1C\_Metadata.xsd*.

A detailed description of the schema is given here but for specific details regarding each metadata (e.g. type, default value, fixed value, enumerations, occurrences, etc...) refers to the XSD file.

diagram	 <pre> classDiagram     class Product_Metadata_File {         &lt;&lt;XML Main Metadata File&gt;&gt;     }     class General_Info {         &lt;&lt;General product information&gt;&gt;     }     class Geometric_Info {         &lt;&lt;Geometric product information&gt;&gt;     }     class Auxiliary_Data_Info {         &lt;&lt;Auxiliary data used for the processing&gt;&gt;     }     class Quality_Indicators_Info {         &lt;&lt;Synthesis of the granule and DataStrip level QIs&gt;&gt;     }      Product_Metadata_File "2" -- "3" General_Info     Product_Metadata_File "2" -- "3" Geometric_Info     Product_Metadata_File "2" -- "3" Auxiliary_Data_Info     Product_Metadata_File "2" -- "3" Quality_Indicators_Info   </pre> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
children	<a href="#"><u>General_Info</u></a> <a href="#"><u>Geometric_Info</u></a> <a href="#"><u>Auxiliary_Data_Info</u></a> <a href="#"><u>Quality_Indicator_Info</u></a>
Description	<p>The Product_Metadata_File describes the product data items. It is presented to the user as a structured container of information. Product_Metadata_File is an XML file containing:</p> <ol style="list-style-type: none"> <li>1. <b>General_Info</b>: provides general product information.</li> <li>2. <b>Geometric_Info</b>: describing the geolocation over WGS84 of the contour of the product.</li> <li>3. <b>Auxiliary_Data_Info</b>: Links to the AUX_DATA items.</li> <li>4. <b>Quality_Indicators_Info</b>: Synthesis of the Granule and Datastrip level QIs.</li> </ol>

The following figures and tables give a complete description of the User Product metadata.

#### General\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 76 : Level-1C\_Product\_Metadata\_File - General\_Info Diagram



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 409 / 477

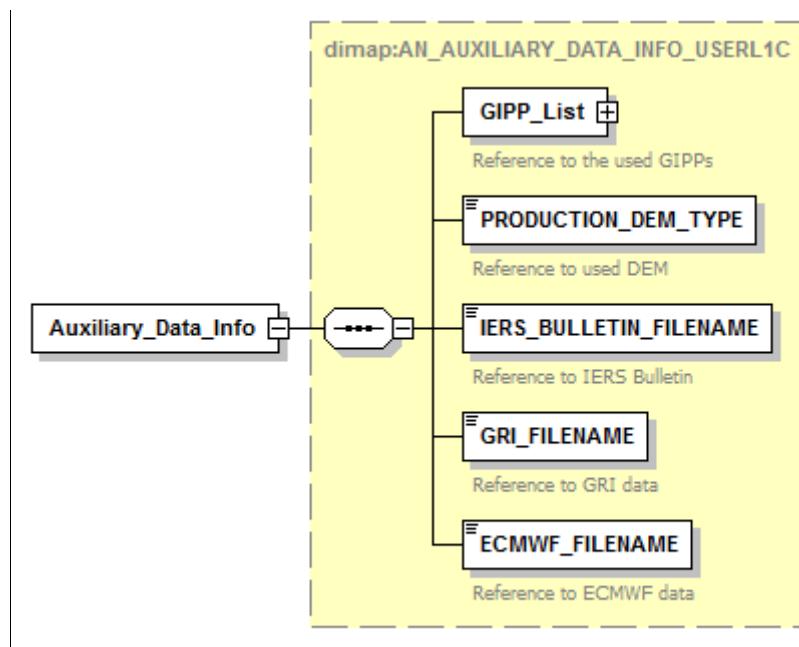
General_Info			
Field Name	Description	Note	Check vs [PDD]
Product_Info	This group of metadata is described in the Table 4-9.	See Table 4-9	§ 8.3.1.1 § 8.3.1.3
Product_Image_Characteristics/SPECIAL_VALUE_TEXT	See Table 4-17	See Table 4-17	§ 8.3.1.1
Product_Image_Characteristics/SPECIAL_VALUE_INDEX			
Product_Image_Characteristics/Image_Display_Order/RED_CHANNEL	Spectral bands (Relation between product image channels and on board spectral bands)	Information available at Datastrip level (see Table 3-61).	§ 8.3.1.1
Product_Image_Characteristics/Image_Display_Order/GREEN_CHANNEL			
Product_Image_Characteristics/Image_Display_Order/BLUE_CHANNEL			
Product_Image_Characteristics/QUANTIFICATION_VALUE	Reflectance quantification value (in order to convert digit count into reflectance) and unit.	Information available at Datastrip level (see Table 3-61).	§ 8.3.1.1
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/RESOLUTION			
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/MIN			
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/MAX			
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Wavelenght/CENTRAL	Spectral filter information provided by the GIPP ABSOLUTE_CALIBRATION	Information available at Datastrip level (see Table 3-56)	
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/Spectral_Response/STEP			
Product_Image_Characteristics/Spectral_Information_List/Spectral_Information/PHYSICAL_GAIN	Physical Gain for each band	Information available at Datastrip level	
Product_Image_Characteristics/REFERENCE_BAND	Used Reference Band	Information available at Datastrip level	

Table 4-25: Level-1C\_Product\_Metadata\_File - General\_Info Description

Geometric\_Info:

All geometric product information are described in the Table 4-10 except for *Geometric\_Header\_List* node not relevant for a Level-1c User Product.

Auxiliary\_Data\_Info:



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

Figure 77 : Level-1C Product\_Metadata\_File – Auxiliary\_Data\_Info Diagram

<b>Auxiliary_Data_Info</b>		
<b>Field Name</b>	<b>Description</b>	<b>Note</b>
GIPP_FILENAME	Reference to the used GIPP files.	Available at Datastrip level
PRODUCTION_DEM_TYPE	Reference to the used DEM	Available at Datastrip level
IERS_BULLETIN_FILENAME	Reference to the used IERS Bulletin	Available at Datastrip level
GRI_FILENAME	Reference to the used GRI data	Available at Datastrip level
ECMWF_FILENAME	Reference to the used ECMWF data	Available at Datastrip level

Table 4-26: Level-1C Product\_Metadata\_File - Auxiliary\_Info Description

Quality\_Indicator\_Info:

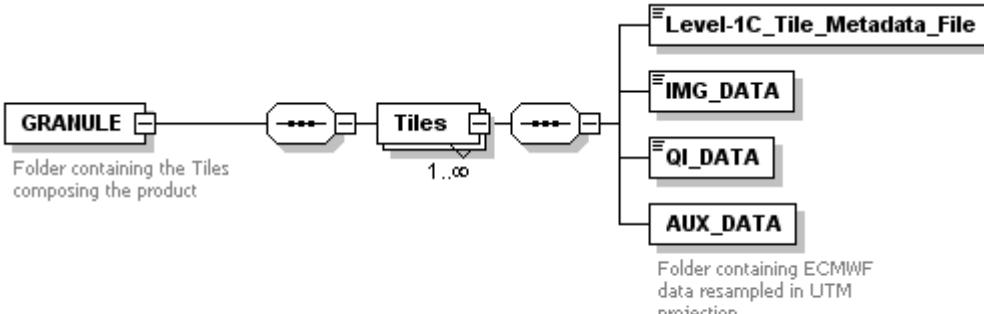
The Quality\_Indicators\_Info are described in the Table 4-12.

In addition the Level-1C User Product contains the RADIOMETRIC\_QUALITY\_FLAG based on the OLQC reports contained in the Datastrips/QI\_DATA with RADIOMETRIC\_QUALITY checklist name.

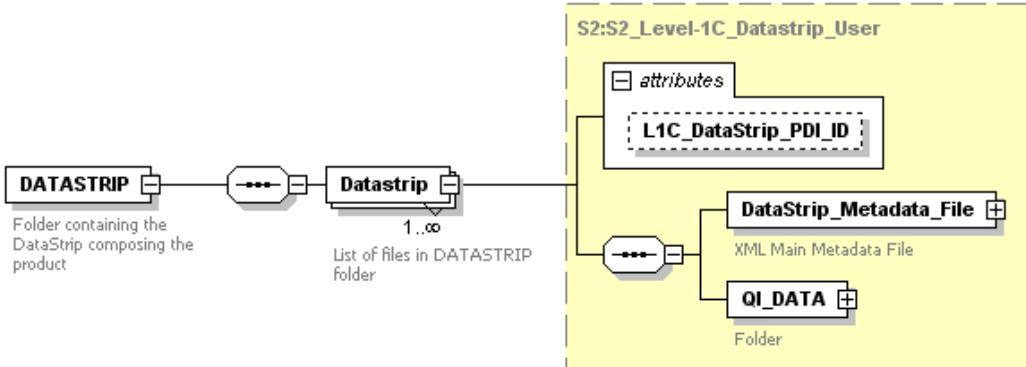
RADIOMETRIC\_QUALITY\_FLAG is FAILED if at least one report at Datastrip level is with *globalStuatus* FAILED.

All OLQC checks performed on L1C Tiles/Datastrips and related to a specific checklist name (see Annex D), are in the Table 3-17 and Table 3-24.

#### 4.9.7.2 GRANULE

diagram	 <p>Folder containing the Tiles composing the product</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>Note: "GRANULE" name has been chosen for homogeneity with respect to the others User Product but should be TILE.</p> <p>GRANULE folder is a "folder of folders" each one corresponding to the Tiles composing the product and identified by proper PDI_ID (Tile ID).</p> <p>The structure of each Tile included in the product is the same of the Level-1C Tile PDI described in the section 3.12.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Tile metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.9.6),</li> <li>2. the XML Level-1C_Tile_Metadata_File is validated using the <i>S2_PDI_Level-1C_Tile_Metadata.xsd</i> schema annexed to the document,</li> <li>3. the <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Tile PDI is included in the User Product (see section 3.12.3).</li> </ol>

#### 4.9.7.3 DATASTRIP

diagram	 <p>The diagram illustrates the structure of a Datastrip. A 'DATASTRIP' folder contains one or more 'Datastrip' objects. Each 'Datastrip' object has an 'L1C_DataStrip_PDI_ID' attribute, a 'DataStrip_Metadata_File' (an XML Main Metadata File), and a 'QI_DATA' folder.</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>DATASTRIP folder is a “folder of folders” each one corresponding to the Datastrip composing the product and identified by proper PDI_ID (Datastrip_ID).</p> <p>The structure of each Datastrip included in the product is the same of the Level-1A PDI Datastrip described in the section 3.13.3 taking into account that:</p> <ol style="list-style-type: none"> <li>1. the Datastrips metadata are copied in the User Product as they are except for the <i>metadataLevel</i> attribute (Brief/Standard/Expertise) always set as empty string (see section 4.9.6),</li> <li>2. the XML Datastrip_Metadata_File is validated using the <i>S2_PDI_Level-1C_Datastrip_Metadata.xsd</i> schema annexed to the document,</li> <li>3. <i>Inventory_Metadata.xml</i>, <i>manifest.safe</i> and <i>rep_info</i> are removed when the Datastrip PDI is included in the User Product (see section 3.13.3).</li> </ol>

#### 4.9.7.4 AUX\_DATA

diagram	 <p>AUX_DATA</p> <p>Folder containing (if requested by the user, download option) all Auxiliary Data used for the processing</p> <p>Generated by XMLSpy      <a href="http://www.altova.com">www.altova.com</a></p>
annotation	<p>All Auxiliary Data used for Level-1C processing are referenced through the Product_Metadata_File. GIPP files and IERS Bulletin are included in the product if requested by the user (download option).</p> <p>In addition, ECMWF auxiliary data (resampled in UTM projection) are mandatory and always embedded in the Level-1C User Product at tile level (within the ANX_DATA folder defined at GRANULE level).</p>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 413 / 477

### 4.9.7.5 Preview\_Image

diagram	 <b>Preview_Image</b> Preview Image File
annotation	Preview Image file (PVI). PVI is included in the final product if required by the user (download option). This preview is extracted from Level-1C image (JPEG2000 low resolution extraction, 3 visible-bands in ground geometry at 320m resolution, RGB).The final geometric representation of the preview is defined by the user according to its region of interest (either geographic or cartographic representation).

#### 4.9.8 Tiles Consolidation

Two adjacent Tiles of the same Datatake but at the edge of two consecutive Datastrips have to be “consolidated” to create a complete one.

During the UTM Tile consolidation processing, the image part of 2 incompletely and complementary Tiles are merged together.

For all details regarding to the Tile consolidation algorithm refers to the reference document [CCTS-US].

Consolidation shall be performed on metadata too, based on the metadata of the 2 source tiles.

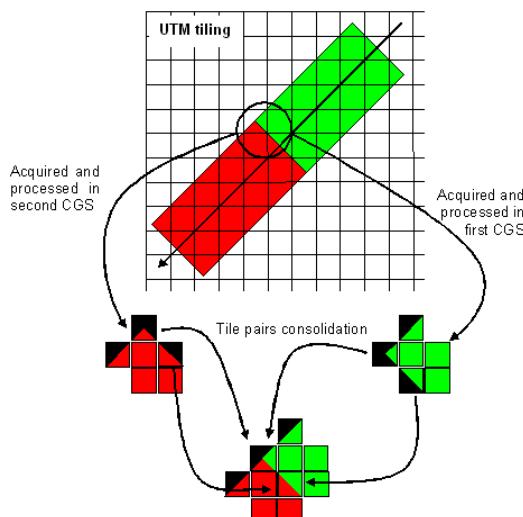


Figure 78: Tile pairs consolidation

##### 4.9.8.1 Tiles Consolidated ID

The Tile ID of a Tile consolidated resulting from a merging of the two incompletely Tiles is the same described in the section 3.4.2 with file type **MSI\_L1C\_CO**:

PDI\_ID = MMM\_CCCC\_TTTTTTTTTT\_<Instance\_ID>

Where:

<Instance\_Id> = <Site Centre>\_<Creation Date>\_<Absolute Orbit>\_<Tile>\_<Processing Baseline>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 415 / 477

As the incomplete Tiles can be dumped on two different acquisition stations, the site centre of the file originator is the fixed string **PAC1** where the merging processing is performed.

Template name:

S2A\_OPER\_MSIL1C\_CO\_PAC1\_20141104T134012\_A012345\_T15SWC\_N01.01.tar

The physical organization (file system) of Tile 1, Tile 2 and Tile 3 is the same as described in the section 3.12.

Note that the merging of incompletely completed Tiles is a download option that can be selected by the user (see Section 4.4). If this option is selected, then the User Product contains only completed tiles (which includes merged tiles, that is the user does not receive incomplete tiles).

### 4.9.8.2 Metadata of a Consolidated Tile

All the metadata describing a consolidated Tile are the same of the ones described in the Section 3.12.3.1.

General_Info		
Field Name	Tile	Tile Consolidated
TILE_ID	TILE identifier (PDI_ID) defined in section 3.12.1	Tile ID defined above
DATASTRIP_ID	Identifier of the Datastrip containing the Tile	As the two incomplete Tiles are on two Datastrip, this metadata contains two different Datastrip Identifiers
DLINK_PRIORITY	Downlink priority flag. It can be set Nominal/NRT/RT	Downlink priority flag. It can be set Nominal/NRT/RT
SENSING_TIME	TILE Start Time = Datastrip Start Time Note: set as Type date_time:AN_UTC_DATE_TIME	As the two incomplete Tiles are on two Datastrip, this metadata contains two different Datastrip Start Time
Archiving_Info/ORIGIN_CENTRE	The starting point of the circulation data. The allowed values are: <ul style="list-style-type: none"><li>• CGS1</li><li>• CGS2</li><li>• CGS3</li><li>• CGS4</li><li>• PAC1</li></ul>	PAC1



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 416 / 477

	<ul style="list-style-type: none"> <li>• PAC2</li> <li>• CDAM</li> <li>• MPCC</li> </ul>	
Archiving_Info/ARCHIVING_TIME	Processing/archiving date (UTC data time)	Processing/archiving date (UTC data time)
<b>Geometric_Info</b>		
Field Name	Tile	Tile Consolidated
Tile_Geocoding/HORIZONTAL_CS_NAME	Name of horizontal coordinate reference system	Name of horizontal coordinate reference system
Tile_Geocoding/HORIZONTAL_CS_CODE	Code of horizontal coordinate reference system	Code of horizontal coordinate reference system
Tile_Geocoding/Size	Tile dimensions for each resolution band	Tile dimensions for each resolution band
Tile_Geocoding/Geoposition	XDIM and YDIM for each resolution band	XDIM and YDIM for each resolution band
Tile_Angles/Sun_Angles_Grid	Grid of sun angles (zenith and azimuth) and the correction which takes into account earth-sun distance variation and for each band sun equivalent irradiance	Grid of sun angles (zenith and azimuth) and the correction which takes into account earth-sun distance variation and for each band sun equivalent irradiance
Tile_Angles/Mean_Sun_Angle	Mean value containing sun zenith and azimuth angle average for all bands and detectors	Mean value containing sun zenith and azimuth angle average for all bands and detectors
Tile_Angles/Mean_Incidence_Angle	List of mean values containing viewing incidence zenith and azimuth angle average for each band and for all detectors	List of mean values containing viewing incidence zenith and azimuth angle average for each band and for all detectors
Tile_Angles/Viewing_Incidence_Angles_Grids	Grid of incidence angles (zenith and azimuth) (per bands and detectors)	Grid of incidence angles (zenith and azimuth) (per bands and detectors)
<b>Quality_Indicators_Info</b>		
Field Name	Tile	Tile Consolidated
CLOUDY_PIXEL_PERCENTAGE	Percentage of the cloud coverage	Average of cloud coverage percentages computed for each



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 417 / 477

		incompleted Tile
DEGRADED_MSI_DATA_PERCENTAGE	Percentage of degraded MSI data	Average of the percentages of degraded MSI data computed for each incompleted Tile
Pixel_Level_QI/MASK_FILENAME	Pointer to the mask files contained in the QI_DATA folder: <ul style="list-style-type: none"><li>- Finer cloud mask files</li><li>- Technical quality mask files</li><li>- Land/Water mask files</li><li>- Detector footprint mask</li><li>- Radiometric quality masks</li></ul>	Pointer to the consolidated mask files contained in the QI_DATA folder of the consolidated Tile
Pixel_Level_QI/PVI_FILENAME	Reference to PVI contained in the QI_DATA folder	Reference to PVI contained in QI_DATA folder of the consolidated Tile



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 418 / 477

### 4.9.9 User Product Level-1C SAFE Manifest synoptic table

The final user product contains only one main *manifest.safe* file. The *manifest.safe* files relative to each Granules/Datastrips composing the product are available at PDI level but they are not included in the user product, all lower level PDI are removed.

This chapter provides a detailed description of the content of the SAFE Manifest for the Level-1C User Product, including a synoptic table with the list of the metadata information to be included in the SAFE Manifest.

The structure of the Manifest is based on the Level-1C Manifests provided for Tiles and Datastrip (see sections 3.12.4 and 3.13.4).

Same considerations as in section 4.6.8 applies for what concerns compliancy to SAFE specification [SAFE-SPEC] and content of synoptic tables (except for the Data Objects Section that does not contain an ANC\_DATA folder).

A practical example of Manifest file for the Level-1C User Product is provided as annexed zip file to this document (S2-PDGS-TAS-DI-PSD-V10\_SAFE.zip).



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 419 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
platform						
	nssdclIdentifier	N.A.	Unique identifier of the platform, defined by the World Data center for Satellite Information (WDC-SI)		1	WDC is discontinued; this tag is set to a default value 0000-0000
	familyName	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake->SPACECRAFT_NAME	The mission name of the platform	string enum	0..1	Sentinel
	number	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake->SPACECRAFT_NAME	Sequence identifier of the platform among the mission	string enum	0..1	2A, 2B, 2C
	instrument->familyName	N.A.	The instrument name used for acquiring the product data	string enum	0..1	Multi-Spectral Instrument
	instrument->abbreviation	N.A.	Abbreviation of the instrument name	string enum	0..1	MSI
	instrument->mode	DIMAP_Level-1C_User_Product->General_Info->Product_info->Datatake->DATATAKE_TYPE	The mode of the instrument	string enum	0..1	Nominal_Observation Dark_Signal_Calibration Extended_Observation Absolute_Radiometry_Calibration Vicarious_Cali



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 420 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
						bration Raw_Measurement Test_Mode
	instrument->mode-> <b>identifier</b>	DIMAP_Level-1C_User_Product->General_Info->Product_info->Datatake->DATATAKE_TYPE	The identifier of the instrument mode	string enum	1	INS-NOBS INS-EOBS INS-DASC INS-ABSR INS-VIC INS-RAW INS-TST
processing			Textual description of the history of processings that lead to the current product and of all the relevant resources involved in the processing (facilities, software, applicable documents etc)		1	
	<b>name</b>		Name of the L1B to L1C Processing	string	0..1	Generation of L1C User Product
	<b>start</b>	DIMAP_Level-1C_User_Product->General_Info->Product_info->GENERATION_TIME	Processing start date (UTC)	xs:dateTime	0..1	
	<b>stop</b>	N.A.	Processing stop date (UTC)	xs:dateTime	0..1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 421 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	facility	N.A.	Description of Processing Centre		0..*	
	facility-> <b>name</b>	N.A.	Extended name of Origin Centre	string	1	
	facility-> <b>organization</b>	N.A.	Organization to which the Origin center belongs	string	0..1	
	facility-> <b>site</b>	Level-1C_User_Product->GRANULE->General_Info->GRANULE_ID (substring <Site Centre>, see section 3.12.1)	Acronym of the Processing center	string enum	0..1	CGS1, CGS2, CGS3, CGS4, PAC1, MPCC
	facility-> <b>country</b>	N.A.	Country where Origin Centre is located	string	0..1	
	facility-> <b>software</b>	N.A.	Description of software component used for Processing		0..*	
	facility-> <b>software-&gt;name</b>	N.A	Name of the software component	string	1	
	facility-> <b>software-&gt;version</b>	N.A	Version of the software component	string	0..1	
	resource		List of auxiliary data files used by the processors to support radiometric and geometric correction (GIPP, DEM, GRI, IERS Bulletin etc.) and of SAD Raw Data file containing the satellite ancillary telemetry; these files are		0..*	



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 422 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
			provided with the product.			
	resource-> <b>name</b>	Level-1C_User_Product->DATASTRIPE->Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)  Level-1C_User_Product->DATASTRIPE->Auxiliary_Data_Info->IERS_Bulletin  Level-1C_User_Product->DATASTRIPE->Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME	Name of the auxiliary or ancillary files needed for the Processing	string	1	
	resource-> <b>role</b>	N.A.	Role of the resource	string	1	Auxiliary data, Ancillary data
acquisitionPeriod					1	
	acquisitionPeriod -> startTime	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake->DATATAKE_SENSING_START	Reference time of acquisition of the product	xs:dateTime	1	
measurementFrameSet					1	
	footPrint	Derived from DIMAP_Level-1C_User_Product->Geometric_Info->Product_Footprint->Product_Footprint	Product footprint (namely imaged landscape corresponding to the whole product)	string (gml:linearRingType namely blank separated list of comma-separated	0..1	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 423 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
				long/lat coordinates of footprint closed polygon with last vertex equal to first)		
measurementOrbitReference						
	orbitNumber	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake->DatatakeIdentifier (substring <AbsoluteOrbitNumber>)	Absolute orbit number		0..1	> 0
	orbitNumber->type	N.A.	Absolute orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the first Granule of the User Product		0..1	start
	orbitNumber-> <b>groundTrackDirection</b>	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake->SENSING_ORBIT_DIRECTION	Direction of the ground track of the Sentinel-2 platform at the time corresponding to orbitNumber->type (start or stop)		0..1	ascending, descending
	relativeOrbitNumber	DIMAP_Level-1C_User_Product->General_Info->Product_Info->Datatake ->SENSING_ORBIT_NUMBER	Relative orbit number (within the cycle)		0..1	1 to 143



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 424 / 477

SAFE Manifest		Corresponding metadata in the DIMAP_user_product_Level-1C.xsd	Description	Data Type	Occurrence	Allowed range of values
Metadata name	Name of tag or attribute (in bold)	Tag name				
	relativeOrbitNumber->type	N.A.	Relative orbit number type (possible values "start" or "stop"). Set to "start" since the absolute orbit number refers to the first line of the Datastrip		0..1	start
metadataComponents		Level-1C_User_Product->DATASTRIP Satellite_Ancillary_Data_Info->ANC_DATA_REF (reference to the single SAD Raw Data file)  Level-1C_User_Product->DATASTRIP-> Auxiliary_Data_Info->IERS_Bulletin  Level-1C_User_Product->DATASTRIP-> Auxiliary_Data_Info->GIPP_List->GIPP_FILENAME	A reference to all Metadata files included in the product (e.g. the XML Metadata file, the INSPIRE Metadata file, the Auxiliary Data files) or external to the product (the Ancillary Data files)		1..*	
metadataComponentSchemas		N.A	A reference to the Schemas used to validate the Metadata files included in the product (e.g. the XML Metadata file Schema)		0..1	

Table 4-27 - Content of Metadata section for Level-1C User Product SAFE Manifest



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 425 / 477

### 4.10 True Colour Image (TCI) product specification

Sentinel-2 PDGS will provide anonymous internet on-line access to Sentinel-2 imagery as True Colour Images (TCI) via a separate On-Line Image Browser (OLIB) application. This service will foster the distribution of eye-catching digital images rather than scientific products with the objective of sharing Sentinel-2 imagery with the general public.

OLIB application according to the user-triggered OLIB interaction, will allow the download of the TCI images from the PDGS archives for visualisation and/or delivery at the end user base.

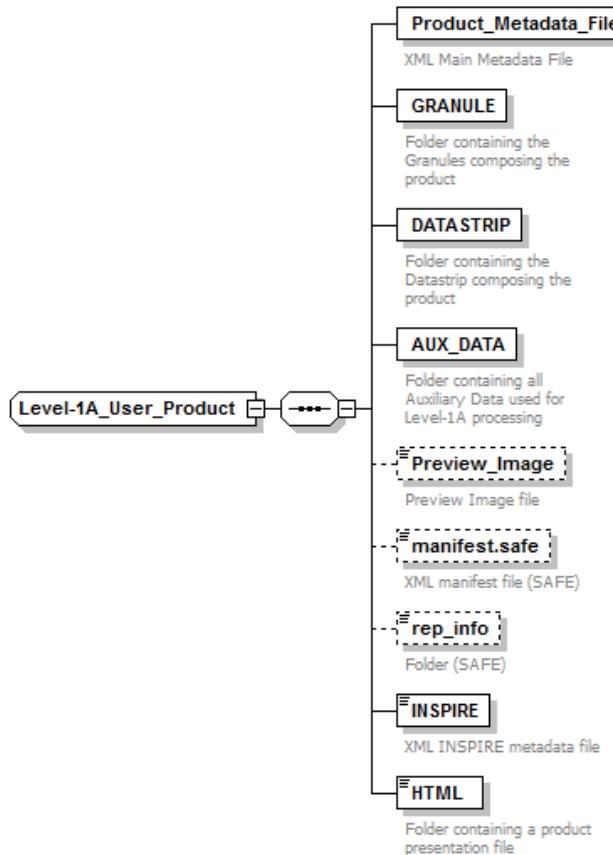
The TCI End User product will be assembled as a single file, constituted by the JPEG2000 GML georeferenced extracted from the input TCI PDIs (tar), and named with the same PDI\_ID defined in the section 3.22.1.

## ANNEX A: USER PRODUCT BASED ON DIMAP FORMAT

A User Product based on DIMAP format has the same structure of the SAFE format one except for the product components specific of a SAFE product that are:

- *manifest.safe*
- *rep\_info*

For instance, the following diagram related to a L1A User Product, represents the structure of the product SAFE formatted when the *manifest.safe* and *rep\_info* are provided, differently it represents the structure of a product DIMAP formatted when *manifest.safe* and *rep\_info* are missing.



Generated by XMLSpy

[www.altova.com](http://www.altova.com)



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 427 / 477

### ANNEX B: INSPIRE METADATA

**Infrastructure for Spatial Information in the European Community (INSPIRE)** is “an European Union initiative to establish an infrastructure for spatial information in Europe that helps to make spatial or geographical information more accessible and interoperable for a wide range of purposes supporting sustainable development”.

In Europe a major recent development has been the entering in force of the INSPIRE Directive in March 2007 (see [EC-INSPIRE-DIR]) establishing an Infrastructure for Spatial Information in Europe to support Community environmental policies, and policies or activities which may have an impact on the environment.

The Directive addresses [34 spatial data themes](#) needed for environmental applications

To ensure that the spatial data infrastructures of the Member States (27 Member States of the European Union) are compatible and usable in a Community and trans-boundary context, the Directive requires that common Implementing Rules (IR) are adopted in a number of specific areas (Metadata, Data Specifications, Network Services, Data and Service Sharing and Monitoring and Reporting).

Since, for the proper functioning of that infrastructure, it is necessary for a user to be able to find spatial data sets and services and to establish whether they may be used and for what purpose, Member States should provide descriptions in the form of metadata for those spatial data sets and services. Since such metadata should be compatible and usable in a Community and trans-boundary context, it is necessary to lay down rules concerning the metadata used to describe the spatial data sets and services corresponding to each theme.

In this context, the INSPIRE Metadata regulation [EC-INSPIRE-CR] dated 03/12/2008 defines a set of metadata necessary to allow identification of the information resource for which metadata is created, its classification and identification of its geographic location and temporal reference, quality and validity, conformity with implementing rules on the interoperability of spatial data sets and services, constraints related to access and use, and organization responsible for the resource. Metadata elements related to the metadata record itself are also necessary to monitor that the metadata created are kept up to date, and for identifying the organization responsible for the creation and maintenance of the metadata. This is the minimum set of metadata elements necessary to comply with Directive 2007/2/EC.

Moreover, instructions are necessary for the validation of metadata regarding to the conditions and expected multiplicity, the value domain of each metadata element is necessary to ensure interoperability of metadata in a multilingual context and that value domain should be able to take the form of free text, dates, codes derived from international standards, such as language codes, keywords derived from controlled lists or thesauri, or character strings.

INSPIRE Implementing Rules shall take account of relevant, existing international standards and user requirements. In the context of metadata for spatial data and spatial data services, the standards EN ISO 19115, EN ISO 19119 have been identified as important standards. XML representation of those metadata is ISO/TS 19139 encoded.

(cfr. <http://inspire.jrc.ec.europa.eu/index.cfm/pageid/101>)



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 428 / 477

For all details regarding INSPIRE DIRECTIVE Establishing an Infrastructure for Spatial Information and for INSPIRE REGULATION regarding Metadata generation, refers to the applicable documents [EC-INSPIRE-DIR] and [EC-INSPIRE-CR] (cfr. <http://inspire.jrc.ec.europa.eu/index.cfm> ).

As part of the GMES program, S2 PDGS support and use INSPIRE Metadata regulation (cfr. [EC-INSPIRE-CR] and [EC-INSPIRE-DIR]).

The Sentinel-2 datasets in their inherent quality of describing spatial data are fully entitled to comply with the directive and hence the INSPIRE Metadata directive applies in entirety to the Sentinel-2 product set.

In this context, the proposed approach is to generate an XML INSPIRE file 19115/19139 encoded, including the set of metadata characterizing the User Product, to be included in the product itself. A tailoring of the metadata filling the XML INSPIRE file has been done selecting the “Metadata elements” listed in the PART B of the applicable document [EC-INSPIRE-CR] and they are set out in the following tables. For each group of metadata, status (Dynamic (D), Static (S) or not applicable (-)), the multiplicity, the value domain and an example of the possible value are reported.

An example of XML INSPIRE metadata file has been generated and validated using the **Metadata Editor** tool provided in the INSPIRE Geoportal (<http://inspire-geoportal.ec.europa.eu/editor/>).

The screenshot shows the 'INSPIRE Geoportal' interface with the 'Metadata Editor' tool. The top navigation bar includes links for 'New', 'Open', 'Validate', 'Save', 'Save as template', 'Help', and 'About'. The main content area is titled 'Metadata on metadata'. It contains several expandable sections: 'Point of contact (\*)' which is expanded to show 'Organisation name (\*)' and 'E-mail (\*)'; 'Metadata date' which is expanded to show the date '2012-03-05'; and 'Metadata language (\*)' which is expanded to show 'english'. At the bottom of the form, there is a note: '(\*) This field is mandatory'.

Figure 79: HMI of INSPIRE Metadata editor



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 429 / 477

### IDENTIFICATION

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Resource title	This a characteristic, and often unique, name by which the resource is known.	D	1	free text	Product_Filename
Resource abstract	This is a brief narrative summary of the content of the resource.	D	1	free text	Product corresponding to a user-defined geographical selection
Resource type	This is the type of resource being described by the metadata.	S	1	From Part D.1 of [EC-INSPIRE-CR].	series
Resource locator	The resource locator defines the link(s) to the resource and/or the link to additional information about the resource.	D	01..*	character string (URL)	<a href="http://www.fao.org/geonetwork/srv/en/main.home">http://www.fao.org/geonetwork/srv/en/main.home</a>
Unique resource identifier	A value uniquely identifying the resource.	D	1..*	mandatory character string code,	" <a href="http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode">http://www.isotc211.org/2005/resources/codeList.xml#CI_RoleCode</a> " "publisher"



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 430 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
				generally assigned by the data owner, and a character string namespace uniquely identifying the context of the identifier code (for example, the data owner).	
Resource language	The language(s) used within the resource.	S	10..*	The value domain limited to the languages defined in ISO 639-2.	eng



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 431 / 477

### CLASSIFICATION OF SPATIAL DATA AND SERVICES

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Topic category	The topic category is a high-level classification scheme to assist in the grouping and topic-based search of available spatial data resources.	S	1 .. *	<p>The value domain of this metadata element is defined in Part D.2 of [EC-INSPIRE-CR].</p> <p>2.10. Imagery / Base Maps / Earth Cover (imageryBaseMapsEarthCover) Base maps.</p> <p>This category applies to the following Directive 2007/2/EC spatial data themes: Annex II(3) Orthoimagery, Annex II(2) Land cover.</p>	imageryBaseMapsEarthCover

### KEYWORD

If a resource is a spatial data set, at least one keyword shall be provided from the general environmental multilingual thesaurus (GEMET) describing the relevant spatial data theme as defined in Annex I, II or III to Directive 2007/2/EC.

For each keyword, the following metadata elements shall be provided:



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 432 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Keyword value	The keyword value is a commonly used word, formalised word or phrase used to describe the subject. While the topic category is too coarse for detailed queries, keywords help narrowing a full text search and they allow for structured keyword search.	S	1..*	free text	Processing
Originating controlled vocabulary	If the keyword value originates from a controlled vocabulary (thesaurus, ontology), for example GEMET, the citation of the originating controlled vocabulary shall be provided.	S	1..*	This citation shall include at least the title and a reference date (date of publication, date of last revision or of creation) of the originating controlled vocabulary.	Eionet GEMET Thesaurus Date of last revision 2011-09-12

### GEOGRAPHIC LOCATION

The requirement for geographic location referred to in Article 11(2)(e) of Directive 2007/2/EC shall be expressed with the metadata element geographic bounding box.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 433 / 477

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Geographic bounding box	This is the extent of the resource in the geographic space, given as a bounding box.	D	1..*	The bounding box shall be expressed with westbound and eastbound longitudes, and southbound and northbound latitudes in decimal degrees, with a precision of at least two decimals.	118.4 86.73 14.55 32.71

### TEMPORAL REFERENCE

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Temporal extent	The temporal extent defines the time period covered by the content of the resource. This time period may be expressed by: <ul style="list-style-type: none"><li>• an individual date,</li><li>• an interval of dates expressed through the starting date and end date of the</li></ul>	-S	01..*	The date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in	2014-01-01



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 434 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Date of publication	<p>interval, • a mix of individual dates and intervals of dates.</p> <p>This is the date of publication of the resource when available, or the date of entry into force. There may be more than one date of publication.</p>	S-	01..*	<p>accordance with ISO 8601.</p> <p>The date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.</p>	2030-01-01
Date of last revision	This is the date of last revision of the resource, if the resource has been revised. There shall not be more than one date of last revision.	-	01..*	<p>The date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.</p>	NA



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 435 / 477

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Date of creation	This is the date of creation of the resource. There shall not be more than one date of creation.	D	01..1	The date shall refer to a temporal reference system and shall be expressed in a form compatible with that system. The default reference system shall be the Gregorian calendar, with dates expressed in accordance with ISO 8601.	2014-01-01

### QUALITY AND VALIDITY

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Lineage	This is a statement on process history and/or overall quality of the spatial data set. Where appropriate it may include a statement whether the data set has been validated or quality assured, whether it is the official version (if multiple versions exist), and	D	1	free text	missing



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 436 / 477

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Spatial resolution	<p>whether it has legal validity.</p> <p>Spatial resolution refers to the level of detail of the data set. It shall be expressed as a set of zero to many resolution distances (typically for gridded data and imagery-derived products) or equivalent scales (typically for maps or map-derived products).</p>	D	01..*	A resolution distance shall be expressed as a numerical value associated with a unit of length.	20

### CONFORMITY

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Specification	This is a citation of the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification to which a particular resource conforms. A resource may conform to more than one implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification.	S	1..*	This citation shall include at least the title and a reference date (date of publication, date of last revision or of creation) of the implementing rules adopted under Article 7(1)	Article 5a(1) to (4) and Article 7 of Decision 1999/468/EC



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 437 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Degree	This is the degree of conformity of the resource to the implementing rules adopted under Article 7(1) of Directive 2007/2/EC or other specification.	S	1..*	of [EC-INSPIRE-DIR] or of the specification.  From Part D.5 of [EC-INSPIRE-CR]. Degree of Conformity: <b>Conformant (conformant):</b> The resource is fully conformant with the cited specification. <b>Not Conformant (notConformant) :</b> The resource does not conform to the cited specification. <b>Not evaluated (notEvaluated):</b> Conformance has not been evaluated.	conformant

### CONSTRAINT RELATED TO ACCESS AND USE





## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 438 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Conditions applying to access and use	This metadata element defines the conditions for access and use of spatial data sets and services, and where applicable, corresponding fees as required by Article 5(2)(b) and Article 11(2)(f) of Directive 2007/2/EC.	S	1..*	free text  The element must have values. If no conditions apply to the access and use of the resource, "no conditions apply" shall be used. If conditions are unknown, "conditions unknown" shall be used. This element shall also provide information on any fees necessary to access and use the resource, if applicable, or refer to a uniform resource locator (URL) where information on fees is available.	no conditions apply
Limitations on public access	When Member States limit public access to spatial data sets and spatial data services under Article 13 of Directive 2007/2/EC, this metadata element shall provide information on the limitations and the reasons for them.	-	1..*	free text	NA



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 439 / 477

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
	If there are no limitations on public access, this metadata element shall indicate that fact.				

### ORGANISATIONS RESPONSIBLE FOR THE ESTABLISHMENT, MANAGEMENT, MAINTENANCE AND DISTRIBUTION OF SPATIAL DATA SETS AND SERVICES

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Responsible party	This is the description of the organisation responsible for the establishment, management, maintenance and distribution of the resource.	S	1..*	This description shall include: - the name of the organisation as free text, - a contact e-mail address as a character string.	respons_party respons_party@org.ext
Responsible party role	This is the role of the responsible organisation.	S	1..*	From Part D.6 of [EC-INSPIRE-CR].  6. RESPONSIBLE PARTY	user



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 440 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
				<p>ROLE</p> <p>6.1. Resource Provider (resourceProvider) Party that supplies the resource.</p> <p>6.2. Custodian (custodian) Party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the resource.</p> <p>6.3. Owner (owner) Party that owns the resource.</p> <p>6.4. User (user) Party who uses the resource.</p> <p>6.5. Distributor (distributor)</p>	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 441 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
				<p>Party who distributes the resource.</p> <p>6.6. Originator (originator) Party who created the resource</p> <p>6.7. Point of Contact (pointOfContact) Party who can be contacted for acquiring knowledge about or acquisition of the resource.</p> <p>6.8. Principal Investigator (principalInvestigator) Key party responsible for gathering information and conducting research.</p> <p>6.9. Processor (processor) Party who has processed the data in a manner such that the resource has been</p>	



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 442 / 477

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
				modified.  6.10. Publisher (publisher) Party who published the resource.  6.11. Author (author) Party who authored the resource.	

### METADATA ON METADATA

Element name	INSPIRE Definition	(S)static (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Metadata point of contact	This is the description of the organisation responsible for the creation and maintenance of the metadata.	S	1..*	This description shall include:  - the name of the organisation as free text,	org_name org_name@org.ext



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 443 / 477

Element name	INSPIRE Definition	(S)tatic (D)ynamic (-) N/A	Multiplicity	Value Domain	Value
Metadata date	The date which specifies when the metadata record was created or updated.	D	1	- a contact e-mail address as a character string.  This date shall be expressed in conformity with ISO 8601.	2012-03-05
Metadata language	This is the language in which the metadata elements are expressed.	S	1	The value domain of this metadata element is limited to the official languages of the Community expressed in conformity with ISO 639-2.	eng

Setting the values listed above (in the column "Value") in the **Metadata Editor** tool provided in the INSPIRE Geoportal (<http://inspire-geoportal.ec.europa.eu/editor/>), the following XML INSPIRE ISO 19115/19139 encoded is provided.



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 444 / 477

```
<?xml version="1.0" encoding="UTF-8"?><gmd:MD_Metadata xsi:schemaLocation="http://www.isotc211.org/2005/gmd
http://schemas.opengis.net/iso/19139/20060504/gmd/gmd.xsd" xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gco="http://www.isotc211.org/2005/gco" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gml="http://www.opengis.net/gml" xmlns:xlink="http://www.w3.org/1999/xlink">
<gmd:fileIdentifier>
<gco:CharacterString>publisher</gco:CharacterString>
</gmd:fileIdentifier>
<gmd:language>
<gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/">
codeListValue="eng">eng</gmd:LanguageCode>
</gmd:language>
<gmd:characterSet>
<gmd:MD_CharacterSetCode codeSpace="ISOTC211/19115" codeListValue="MD_CharacterSetCode_utf8">
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#MD_CharacterSetCode">MD_CharacterS
etCode_utf8</gmd:MD_CharacterSetCode>
</gmd:characterSet>
<gmd:hierarchyLevel>
<gmd:MD_ScopeCode>
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCod
elists.xml#MD_ScopeCode" codeListValue="dataset">dataset</gmd:MD_ScopeCode>
</gmd:hierarchyLevel>
<gmd:contact>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>org_name</gco:CharacterString>
</gmd:organisationName>
<gmd:contactInfo>
<gmd:CI_Contact>
<gmd:address>
<gmd:CI_Address>
<gmd:electronicMailAddress>
<gco:CharacterString>org_name@org.ext</gco:CharacterString>
</gmd:electronicMailAddress>
</gmd:CI_Address>
</gmd:address>
<gmd:CI_Contact>
</gmd:contactInfo>
<gmd:role>
<gmd:CI_RoleCode>
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCod
elists.xml#CI_RoleCode" codeListValue="pointOfContact">pointOfContact</gmd:CI_RoleCode>
</gmd:role>
<gmd:CI_ResponsibleParty>
</gmd:contact>
<gmd:dateStamp>
<gco>Date>2012-03-05</gco>Date>
</gmd:dateStamp>
<gmd:metadataStandardName>
<gco:CharacterString>ISO19115</gco:CharacterString>
</gmd:metadataStandardName>
<gmd:metadataStandardVersion>
<gco:CharacterString>2003/Cor.1:2006</gco:CharacterString>
</gmd:metadataStandardVersion>
<gmd:identificationInfo>
<gmd:MD_DataIdentification>
<gmd:citation>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 445 / 477

```
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Product_Filename</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>2014-01-01</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCod
elists.xml#CI_DateTypeCode" codeListValue="creation">creation</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
<gmd:identifier>
<gmd:RS_Identifier>
<gmd:code>
<gco:CharacterString>publisher</gco:CharacterString>
</gmd:code>
<gmd:codeSpace>
<gco:CharacterString>http://www.isotc211.org/2005/gmd</gco:CharacterString>
</gmd:codeSpace>
</gmd:RS_Identifier>
</gmd:identifier>
<gmd:identifier>
<gmd:RS_Identifier>
<gmd:code>
<gco:CharacterString>publisher</gco:CharacterString>
</gmd:code>
<gmd:codeSpace>
<gco:CharacterString>http://www.isotc211.org/2005/gmd</gco:CharacterString>
</gmd:codeSpace>
</gmd:RS_Identifier>
</gmd:identifier>
</gmd:CI_Citation>
</gmd:citation>
<gmd:abstract>
<gco:CharacterString>Product corresponding to a user-defined geographical selection</gco:CharacterString>
</gmd:abstract>
<gmd:pointOfContact>
<gmd:CI_ResponsibleParty>
<gmd:organisationName>
<gco:CharacterString>respons_party</gco:CharacterString>
</gmd:organisationName>
<gmd:contactInfo>
<gmd:CI_Contact>
<gmd:address>
<gmd:CI_Address>
<gmd:electronicMailAddress>
<gco:CharacterString>respons_party@org.ext</gco:CharacterString>
</gmd:electronicMailAddress>
</gmd:CI_Address>
</gmd:address>
</gmd:CI_Contact>
</gmd:contactInfo>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 446 / 477

```
<gmd:role>
<gmd:CI_RoleCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCod
elists.xml#CI_RoleCode" codeListValue="user">user</gmd:CI_RoleCode>
</gmd:role>
</gmd:CI_ResponsponsibleParty>
</gmd:pointOfContact>
<gmd:descriptiveKeywords>
<gmd:MD_Keywords>
<gmd:keyword>
<gco:CharacterString>Orthoimagery</gco:CharacterString>
</gmd:keyword>
<gmd:keyword>
<gco:CharacterString>Land cover</gco:CharacterString>
</gmd:keyword>
<gmd:keyword>
<gco:CharacterString>Geographical names</gco:CharacterString>
</gmd:keyword>
<gmd:thesaurusName>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>GEMET - INSPIRE themes, version 1.0</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>2011-09-12</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCod
elists.xml#CI_DateTypeCode" codeListValue="revision">revision</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
</gmd:CI_Citation>
<gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:descriptiveKeywords>
<gmd:MD_Keywords>
<gmd:keyword>
<gco:CharacterString>data set series</gco:CharacterString>
</gmd:keyword>
<gmd:thesaurusName>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>INSPIRE - Glossary, version 3</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>2010-01-12</gco:Date>
</gmd:date>
<gmd:dateType>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 447 / 477

```
<gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodeLists.xml#CI_DateTypeCode" codeListValue="publication">publication</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
</gmd:CI_Citation>
</gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:descriptiveKeywords>
<gmd:MD_Keywords>
<gmd:keyword>
<gco:CharacterString>processing</gco:CharacterString>
</gmd:keyword>
<gmd:thesaurusName>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Eionet GEMET Thesaurus</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>2011-09-12</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodeLists.xml#CI_DateTypeCode" codeListValue="revision">revision</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
</gmd:CI_Citation>
</gmd:thesaurusName>
</gmd:MD_Keywords>
</gmd:descriptiveKeywords>
<gmd:resourceConstraints>
<gmd:MD_Constraints>
<gmd:useLimitation>
<gco:CharacterString>no conditions apply</gco:CharacterString>
</gmd:useLimitation>
</gmd:MD_Constraints>
</gmd:resourceConstraints>
<gmd:spatialResolution>
<gmd:MD_Resolution>
<gmd:equivalentScale>
<gmd:MD_RepresentativeFraction>
<gmd:denominator>
<gco:Integer>20</gco:Integer>
</gmd:denominator>
</gmd:MD_RepresentativeFraction>
</gmd:equivalentScale>
</gmd:MD_Resolution>
</gmd:spatialResolution>
<gmd:language>
<gmd:LanguageCode codeList="http://www.loc.gov/standards/iso639-2/">eng</gmd:LanguageCode>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 448 / 477

```
</gmd:language>
<gmd:topicCategory>
<gmd:MD_TopicCategoryCode>imageryBaseMapsEarthCover</gmd:MD_TopicCategoryCode>
</gmd:topicCategory>
<gmd:extent>
<gmd:EX_Extent>
<gmd:geographicElement>
<gmd:EX_GeographicBoundingBox>
<gmd:westBoundLongitude>
<gco:Decimal>-63.15</gco:Decimal>
</gmd:westBoundLongitude>
<gmd:eastBoundLongitude>
<gco:Decimal>-63.01</gco:Decimal>
</gmd:eastBoundLongitude>
<gmd:southBoundLatitude>
<gco:Decimal>18.05</gco:Decimal>
</gmd:southBoundLatitude>
<gmd:northBoundLatitude>
<gco:Decimal>18.12</gco:Decimal>
</gmd:northBoundLatitude>
</gmd:EX_GeographicBoundingBox>
</gmd:geographicElement>
<gmd:temporalElement>
<gmd:EX_TemporalExtent>
<gmd:extent>
<gml:TimePeriod gml:id="IDcd3b1c4f-b5f7-439a-afc4-3317a4cd89be" xsi:type="gml:TimePeriodType">
<gml:beginPosition>2014-01-01</gml:beginPosition>
<gml:endPosition>2030-01-01</gml:endPosition>
</gml:TimePeriod>
</gmd:extent>
</gmd:EX_TemporalExtent>
</gmd:temporalElement>
</gmd:EX_Extent>
</gmd:extent>
</gmd:MD_DataIdentification>
</gmd:identificationInfo>
<gmd:distributionInfo>
<gmd:MD_Distribution>
<gmd:distributionFormat>
<gmd:MD_Format>
<gmd:name>
<gco:CharacterString>unknown</gco:CharacterString>
</gmd:name>
<gmd:version>
<gco:CharacterString>unknown</gco:CharacterString>
</gmd:version>
</gmd:MD_Format>
</gmd:distributionFormat>
<gmd:transferOptions>
<gmd:MD_DigitalTransferOptions>
<gmd:onLine>
<gmd:CI_OnlineResource>
<gmd:linkage>
<gmd:URL>http://www.isotc211.org/2005/gmx</gmd:URL>
</gmd:linkage>
</gmd:CI_OnlineResource>
</gmd:onLine>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 449 / 477

```
</gmd:MD_DigitalTransferOptions>
</gmd:transferOptions>
</gmd:MD_Distribution>
</gmd:distributionInfo>
<gmd:dataQualityInfo>
<gmd:DQ_DataQuality>
<gmd:scope>
<gmd:DQ_Scope>
<gmd:level>
<gmd:MD_ScopeCode codeListValue="dataset"
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodeLists.xml#MD_ScopeCode">dataset</gmd:MD_ScopeCode>
</gmd:level>
</gmd:DQ_Scope>
</gmd:scope>
<gmd:report>
<gmd:DQ_DomainConsistency xsi:type="gmd:DQ_DomainConsistency_Type">
<gmd:result>
<gmd:DQ_ConformanceResult xsi:type="gmd:DQ_ConformanceResult_Type">
<gmd:specification>
<gmd:CI_Citation>
<gmd:title>
<gco:CharacterString>Article 5a(1) to (4) and Article 7 of Decision 1999/468/EC</gco:CharacterString>
</gmd:title>
<gmd:date>
<gmd:CI_Date>
<gmd:date>
<gco:Date>1999-01-01</gco:Date>
</gmd:date>
<gmd:dateType>
<gmd:CI_DateTypeCode
codeList="http://standards.iso.org/ittf/PubliclyAvailableStandards/ISO_19139_Schemas/resources/Codelist/ML_gmxCodeLists.xml#CI_DateTypeCode" codeListValue="creation">creation</gmd:CI_DateTypeCode>
</gmd:dateType>
</gmd:CI_Date>
</gmd:date>
</gmd:CI_Citation>
</gmd:specification>
<gmd:explanation>
<gco:CharacterString>See the referenced specification</gco:CharacterString>
</gmd:explanation>
<gmd:pass>
<gco:Boolean>true</gco:Boolean>
</gmd:pass>
</gmd:DQ_ConformanceResult>
</gmd:result>
</gmd:DQ_DomainConsistency>
<gmd:report>
<gmd:lineage>
<gmd:LI_Lineage>
<gmd:statement>
<gco:CharacterString>missing</gco:CharacterString>
</gmd:statement>
</gmd:LI_Lineage>
</gmd:lineage>
</gmd:DQ_DataQuality>
</gmd:dataQualityInfo>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 450 / 477

</gmd:MD\_Metadata>



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 451 / 477

### ANNEX C: INVENTORY\_METADATA

*Inventory\_Metadata.xsd* is provided in the annexed S2-PDGS-TAS-DI-PSD-V10\_Schema.zip file.

It is common schema shared among all the PDIs including it.

The *Inventory\_Metadata.xml* file is only for internal usage and could be subject to some evolutions.

An example of the *Inventory\_Metadata.xml* file is shown here after.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- A.C.S. Generator $Id: S2PDGS_Converter_Supplementer.sh,v 1.11 2013/02/12 15:14:24 enrkar Exp $ -->
<Inventory_Metadata xsi:schemaLocation="http://pdgs.s2.esa.int/PSD/Inventory_Metadata.xsd Inventory_Metadata.xsd"
xmlns="http://pdgs.s2.esa.int/PSD/Inventory_Metadata.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <File_ID>S2A_OPER_MSI_L0_DS_CGS1_20130213T114644_S20091211T094741_N01.01</File_ID>
  <Group_ID>GS2B_20001104T000000_123456_N01.01</Group_ID>
  <File_Name>S2A_OPER_MSI_L0_DS_CGS1_20130213T114644_S20091211T094741_N01.01</File_Name>
  <File_Version>01.01</File_Version>
  <System>S2PDGS-DPC</System>
  <Source>L0_Processor</Source>
  <Source_Sw_Version>0.0</Source_Sw_Version>
  <Generation_Time>UTC=2013-02-13T11:46:44</Generation_Time>
  <Validity_Start>UTC=2009-12-11T09:47:41</Validity_Start>
  <Validity_Stop>UTC=2009-12-11T09:47:41</Validity_Stop>
  <Start_Orbit_Number>123456</Start_Orbit_Number>
  <Stop_Orbit_Number>123457</Stop_Orbit_Number>
  <Geographic_Localization>
    <GEO_TYPE>Polygon</GEO_TYPE>
    <List_Of_Geo_Pnt count="3">
      <Geo_Pnt>
        <LATITUDE>-90</LATITUDE>
        <LONGITUDE>-180</LONGITUDE>
      </Geo_Pnt>
      <Geo_Pnt>
        <LATITUDE>90</LATITUDE>
        <LONGITUDE>-180</LONGITUDE>
      </Geo_Pnt>
      <Geo_Pnt>
        <LATITUDE>-90</LATITUDE>
        <LONGITUDE>179</LONGITUDE>
      </Geo_Pnt>
    </List_Of_Geo_Pnt>
  </Geographic_Localization>
  <Quality_Info>80</Quality_Info>
  <Data_Size>0</Data_Size>
  <File_Type>MSI_L0_GR</File_Type>
  <File_Class>RT</File_Class>
  <Sensor_Code>MSI</Sensor_Code>
  <Sensor_Mode>NOM</Sensor_Mode>
  <Acquisition_Station>CGS1</Acquisition_Station>
  <Processing_Station>CGS1</Processing_Station>
  <Satellite_Code>S2A</Satellite_Code>
</Inventory_Metadata>
```



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 452 / 477

The following table describes each metadata composing the Inventory\_Metadata.xml file.

Note: in the schema a field is considered NOT mandatory if it is not applicable to all PDI.

Field Name	Description	Value/Template	Mandatory For
File_ID	PDI_ID (Applicable to Granule, Tile, Datastrip and SAD PDI)	See PDI_ID definitions	Granule Tile Datastrip SAD
Parent_ID	Datastrip PDI_ID (Applicable to Granule and Tile PDI linked to a Datastrip PDI)	See PDI_ID definitions	Granule Tile
Group_ID	Label identifying all the PDIs that can be included in a User Product (Applicable to Granule, Tile and Datastrip PDI)	Group_ID definition coincides with Datatake_ID definition. See DATATAKE_ID definition	Granule Tile Datastrip
File_Name	Equal to File_ID metadata (Applicable to Granule, Tile, Datastrip and SAD PDI)	See PDI_ID definitions	Granule Tile Datastrip SAD
File_Version	Processing Baseline (Applicable to Granule, Tile and Datastrip PDI)	"10.11"	Granule Tile Datastrip
System	System where the PDI is generated (Applicable to Granule, Tile, Datastrip and SAD PDI)	S2PDGS-DPC or 2PDGS-MCC	Granule Tile Datastrip SAD
Source	PDI generator processor name, e.g. L0_Processor (Applicable to Granule, Tile, Datastrip and SAD PDI)	"L0_Processor"	Granule Tile Datastrip SAD
Source_Sw_Version	Version of the core component ie version of DPC (Applicable to Granule, Tile, Datastrip and SAD PDI)	"01.00.01"	Granule Tile Datastrip SAD
Generation_Time	PDI Generation Time (Applicable to Granule, Tile, Datastrip and SAD PDI)	"UTC=2013-01-01T,5:11:10"	Granule Tile Datastrip SAD



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 453 / 477

Field Name	Description	Value/Template	Mandatory For
Validity_Start	Sensing Start Time or Validity Start Time (Applicable to Granule, Tile, Datastrip and SAD PDI)  NOTE: in case of TILE PDI the Sensing Start Time coincides with the Datastrip Sensing Start Time	"UTC=2013-01-01T,5:11:10"	Granule Tile Datastrip SAD
Validity_Stop	Sensing Start Time or Validity Stop Time (Applicable to Granule, Tile, Datastrip and SAD PDI)  NOTE: in case of TILE PDI the Sensing Stop Time coincides with the Datastrip Sensing Stop Time	"UTC=2013-01-01T,5:11:10"	Granule Tile Datastrip SAD
Start_Orbit_Number	Start Absolute Orbit number (Applicable to Granule, Tile, Datastrip and SAD PDI)	123456	Granule Tile Datastrip SAD
Stop_Orbit_Number	Stop Absolute Orbit number will be the same of Start Absolute Orbit number (Applicable to Granule, Tile, Datastrip and SAD PDI)	123456	Granule Tile Datastrip SAD
Geographic_Localization	Granule/Tile/Datastrip footprint (Applicable to Granule, Tile and Datastrip PDI)	List of polygon vertex in term of (lat,lon) points, in counter-clockwise order	Granule Tile Datastrip
Quality_Info	Percentage for PDI Quality Indicator (Applicable to Granule, Tile, Datastrip and SAD PDI)	80,00%	Granule Tile Datastrip SAD
Data_Size	PDI Size defined in Mb (Applicable to Granule, Tile, Datastrip and SAD PDI)	2Mb	Granule Tile Datastrip SAD



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

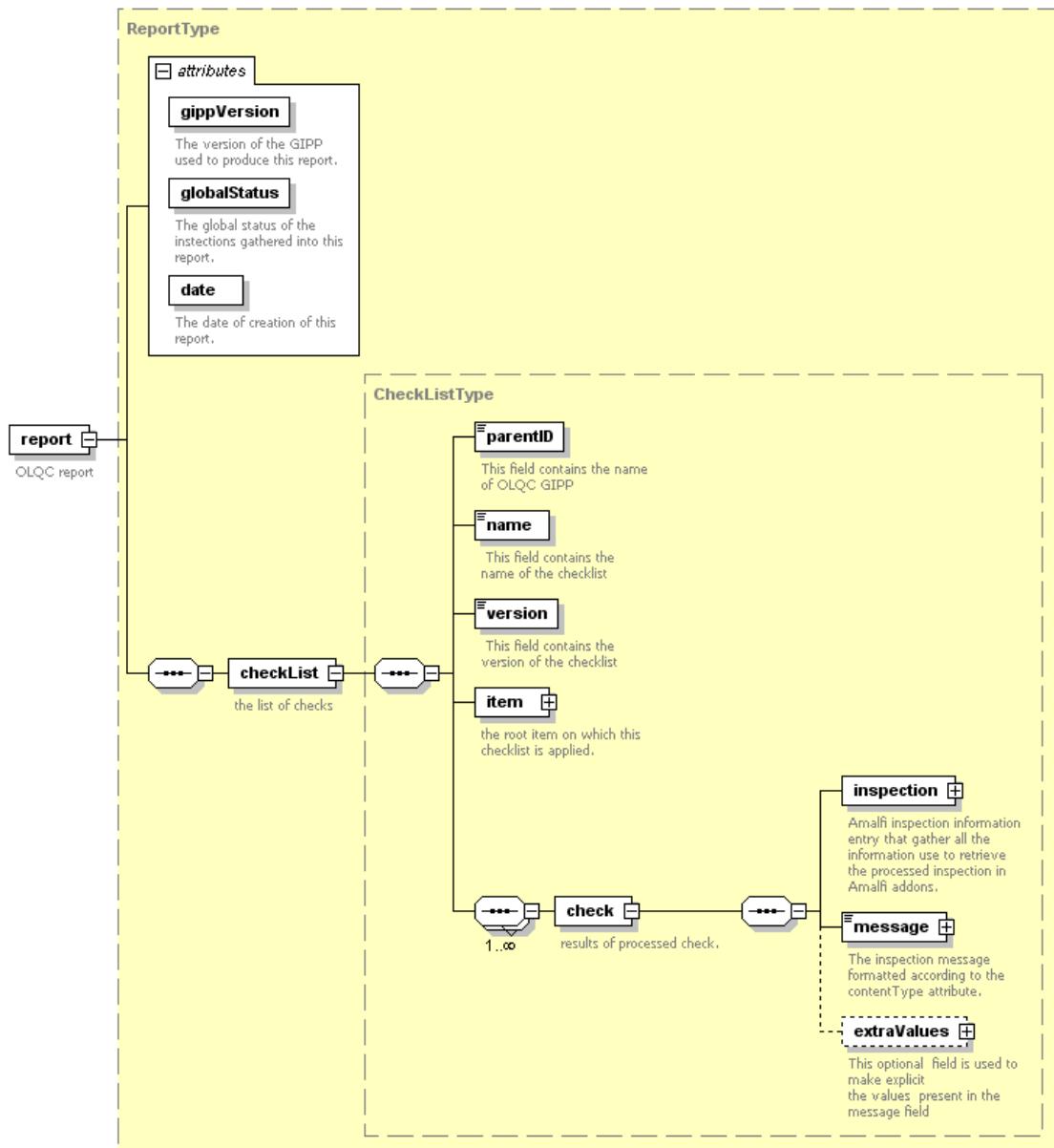
ISSUE : 10

DATE : 12/07/2013

PAGE : 454 / 477

Field Name	Description	Value/Template	Mandatory For
File_Type	PDI File Type PDI File Type (Applicable to Granule, Tile, Datastrip and SAD PDI)	MSI_GR_L1A	Granule Tile Datastrip SAD
Detector	Detector ID (Applicable for Granule PDI)	11	Granule
File_Class	Timeliness (Applicable to Granule, Tile and Datastrip PDI)	NRT	Granule Tile Datastrip
Sensor_Code	MSI fixed string (Applicable to Granule, Tile, Datastrip and SAD PDI)	MSI	Granule Tile Datastrip SAD
Sensor_Mode	MSI Image mode (Applicable to Granule, Tile and Datastrip PDI)	NOM	Granule Tile Datastrip
Acquisition_Station	Acquisition Station Code (Applicable to Granule, Tile, Datastrip and SAD PDI)	CGS1	Granule Tile Datastrip SAD
Processing_Station	Equal to System	PAC1	Granule Tile Datastrip
Satellite_Code	S2A or S2B.NIL if applicable to both satellites	S2A	Granule Tile Datastrip SAD
Ascending_Flag	True if acquisition has been done during the ascending phase of the orbit. (Applicable to Granule, Tile and Datastrip PDI)	true	Granule Tile Datastrip
CloudPercentage	Cloud coverage percentage. (Applicable to Granule, Tile and Datastrip PDI)	50	Granule Tile Datastrip

## ANNEX D: OLQC REPORT XSD



Generated by XMLSpy

[www.altova.com](http://www.altova.com)

The naming convention used for the OLQC reports is:

PDI\_ID\_<checklistname>\_report.xml



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 456 / 477

PDI\_ID is defined case by case in the chapter 3 for each Granule/Tile and Datastrip PDI and <checklistname> are defined in the following table. For further details see [OLQC-TN].

Checklist Name	Granule	Datastrip	L0	L1A	L1B	L1C
SENSOR_QUALITY	Y	Y	Y	Y	Y	Y
GEOMETRIC_QUALITY	Y	Y	Y	Y	Y	Y
GENERAL_QUALITY	Y	Y	Y	Y	Y	Y
RADIOMETRIC_QUALITY	N	Y	N	N	Y	Y
FORMAT_CORRECTNESS	Y	Y	Y	Y	Y	Y

Each report contains all checks related to the specific checklist name as defined in the Table 3-17 and Table 3-24.

The following example of OLQC XML report corresponds to:

inspected PDI = Level-0 Granule

S2A\_OPER\_MS1\_L0\_GR\_CGS1\_20141104T134012\_S20141104T134012\_D01\_N01.12

Checklistname = SENSOR\_QUALITY

Checks = Corrupted\_ISP, Missing\_Lines, Sensing\_Time

GlobalStatus = PASSED (as all check status are PASSED)

```
<?xml version="1.0" encoding="UTF-8"?>
<!-Sample XML file generated by XMLSpy v2006 rel. 3 sp2 (http://www.altova.com)-->
<Earth_Explorer_File xmlns="http://gs2.esa.int/DATA_STRUCTURE/olqcReport"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://gs2.esa.int/DATA_STRUCTURE/olqcReport
  \\bld16\\auriemma\Desktop\olqcreport\OLQC_Report.xsd">
  <Earth_Explorer_Header>
    <Fixed_Header>
      <File_Name>String</File_Name>
      <File_Description>String</File_Description>
      <Notes>String</Notes>
      <Mission>S2</Mission>
      <File_Class>String</File_Class>
      <File_Type>REP_OLQCPA</File_Type>
      <Validity_Period>
        <Validity_Start>UTC=0000-00-00T00:00:00</Validity_Start>
        <Validity_Stop>UTC=0000-00-00T00:00:00</Validity_Stop>
      </Validity_Period>
      <File_Version>2</File_Version>
      <Source>
        <System>String</System>
        <Creator>String</Creator>
        <Creator_Version>String</Creator_Version>
        <Creation_Date>UTC=0000-00-00T00:00:00</Creation_Date>
      </Source>
    </Fixed_Header>
    <Variable_Header/>
  </Earth_Explorer_Header>
  <Data_Block type="xml">
    <report date="2001-12-17T09:30:47.0Z" gippVersion="01.00.01" globalStatus="PASSED">
      <checkList>
        <parentID>String</parentID>
        <name>SENSOR_QUALITY </name>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 457 / 477

```
<version>00.01</version>
<item
url="D:/S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar"
className="SENTINEL 2 Level 0 granule "
name="S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12"
class="ftp://pdgs.s2.esa.int/PSD"/>
<check>
    <inspection
item="S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar" id="DimapPlan"
creation="2001-12-17T09:30:47.0Z" processingStatus="Done" status="PASSED" execution="2001-12-17T09:30:47.0Z"
duration="2.844" name="All Applicable Inspections Plan (Automatic)" priority="2"
itemURL="D:/S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar"/>
        <message contentType="Text">"plain/text">All inspection(s) passed
successfully</message>

    </check>
    <check>
        <inspection
item="S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar" id="Corrupted_ISP"
creation="2001-12-17T09:30:47.0Z" processingStatus="Done" status="PASSED" execution="2001-12-17T09:30:47.0Z"
duration="2.844" name="Corrupted_ISP I" priority="5"
itemURL="D:/S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar"/>
        <message contentType="Text">Check LOST ISP Percentage is less than
1,2%</message>
        </check>
        <check>
            <inspection
item="S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar" id="Sensing_Time"
" creation="2001-12-17T09:30:47.0Z" processingStatus="Done" status="PASSED" execution="2001-12-17T09:30:47.0Z"
duration="2.844" name="Sensing_Time" priority="5"
itemURL="D:/S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar"/>
            <message contentType="Text">Check Sensing Time is correct</message>
            </check>
            <check>
                <inspection
item="S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar" id="Missing_Lines"
creation="2001-12-17T09:30:47.0Z" processingStatus="Done" status="PASSED" execution="2001-12-17T09:30:47.0Z"
duration="2.844" name="Missing_Lines" priority="5"
itemURL="D:/S2A_OPER_MSI_L0__GR_CGS1_20141104T134012_S20141104T134012_D01_N01.12.tar"/>
            <message contentType="Text"> Missing Lines threshold exceeded. threshold(5) LostLineNumber(254)
DegradedLineNumber(365)</message>
                <extraValues>
                    <value name="threshold">5</value>
                    <value name="LostLineNumber">254</value>
                    <value name="DegradedLineNumber">365</value>
                </extraValues>
            </check>
        </checkList>
    </report>
    </Data_Block>
</Earth_Explorer_File>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 458 / 477



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 459 / 477

### ANNEX E: GROUND IMAGE PROCESSING PARAMETERS

The following table gives the list of GIPP files available for each kind of product level. The column "Remarks" indicates if the GIPP file is Satellite dependent and spectral band dependent. There are 34 GIPP file types and a total of 154 GIPP files:

- 23 GIPP Satellite dependent
- 1 GIPP Satellite independent
- 10x13 GIPP Spectral Band dependent

For details see [GPP-IODD].

GIPP Description	Interface name	Volume	Remarks	L0	L1A	L1B	L1C
Pixel line of sight for each bands in the focal plane reference frame	[SATELLITE_ID]_[BAND_ID]_VIE_WING_DIRECTIONS_FILE	1 MB for 10m band 500 KB for 20m bands 170 KB for 60m bands	Indexed by Satellite and by spectral bands	x	x	x	x
Platform model	[SATELLITE_ID]_SPACECRAFT_MODEL_FILE	50 KB	Indexed by Satellite	x	x	x	x
Earth model	EARTH_MODEL_FILE	4 KB		x	x	x	x
Global geometrical parameters	[SATELLITE_ID]_GEOMETRICAL_PARAMETERS_FILE	8 KB	Indexed by Satellite	x	x	x	x
Description of the inter detectors overlapping area	[SATELLITE_ID]_INTER_DETECTOR_FILE	40 KB	Indexed by Satellite	x	x	x	x
Deconvolution filter for each deconvoluted band	[SATELLITE_ID]_[BAND_ID]_DECONVOLUTION_FILTER_FILE	100 KB for each band	Indexed by Satellite and by Spectral bands			x	x
Threshold file for deconvolution through wavelet packets	[SATELLITE_ID]_[BAND_ID]_DECONVOLUTION_THRESHOLD_FILE	30 KB for each band	Indexed by Satellite and by Spectral bands			x	x



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 460 / 477

GIPP Description	Interface name	Volume	Remarks	L0	L1A	L1B	L1C
Wavelets filters	[SATELLITE_ID]_[BAND_ID]_WAVELET_FILTERS_FILE	10 KB for each band	Indexed by Satellite and by Spectral bands			x	x
Wavelets base	[SATELLITE_ID]_[BAND_ID]_WAVELET_BASE_FILE	10 KB for each band	Indexed by Satellite and by Spectral bands			x	x
L2 Norm coefficients (denoising)	[SATELLITE_ID]_[BAND_ID]_L2_NORM_COEFFICIENTS_FILE	30 KB for each band	Indexed by Satellite and by Spectral bands			x	x
Maximum signal coefficients (denoising)	[SATELLITE_ID]_[BAND_ID]_MAXIMUM_COEFFICIENTS_FILE	30 KB for each band	Indexed by Satellite and by Spectral bands			x	x
Denoising thresholds (denoising)	[SATELLITE_ID]_[BAND_ID]_DENOISING_THRESHOLDS_FILE	30 KB for each band	Indexed by Satellite and by Spectral bands			x	x
Noise model (denoising)	[SATELLITE_ID]_NOISE_MODEL_FILE	4 KB	Indexed by Satellite			x	x
SWIR detectors arrangement parameters	[SATELLITE_ID]_SWIR_REARRANGEMENT_PARAMETERS_FILE	20 KB	Indexed by Satellite	x	x	x	
Radiometric equalization parameters on board (dark current, on-board inter pixel)	[SATELLITE_ID]_[BAND_ID]_EQUALIZATION_ONBOARD_PARAMETERS_FILE	3 MB for 10m bands 1.5 MB for 20m bands 500 KB for 60m bands	Indexed by Satellite and by Spectral bands			x	x



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 461 / 477

GIPP Description	Interface name	Volume	Remarks	L0	L1A	L1B	L1C
calibration)							
Radiometric equalization parameters on ground (on-ground correction)	[SATELLITE_ID]_[BAND_ID]_EQUALIZATION_ONGROUND_PARAMETERS_FILE gs2_radios2_equalization_onground_2t	3 MB for 10m bands 1.5 MB for 20m bands 500 KB for 60m bands	Indexed by Satellite and by Spectral bands			x	x
List of defective pixels	[SATELLITE_ID]_DEFECTIVE_PIXELS_FILE	5 KB	Indexed by Satellite	x	x	x	x
List of blind pixels	[SATELLITE_ID]_BLIND_PIXELS_FILE	5 KB	Indexed by Satellite	x	x	x	x
Binning for 60m bands parameters (filters and undersampling)	[SATELLITE_ID]_BINNING_PARAMETERS_FILE	5 KB	Indexed by Satellite			x	x
Absolute calibration parameters	[SATELLITE_ID]_ABSOLUTE_CALIBRATION_PARAMETERS_FILE	30 KB	Indexed by Satellite	x	x	x	x
Crosstalk correction	[SATELLITE_ID]_CROSSTALK_CORRECTIONS_FILE	1 MB	Indexed by Satellite			x	x
IAS AnaTm HK parameters file	[SATELLITE_ID]_ANA_TM_SAD_PARAMETERS_FILE	40 KB	Indexed by Satellite	x	x	x	x
IAS AnaTm image parameters file	[SATELLITE_ID]_ANA_TM_IMAG_E_PARAMETERS_FILE	40 KB	Indexed by Satellite	x	x	x	x
IAS Datation parameters file	[SATELLITE_ID]_DATATION_PARAMETERS_FILE	40 KB	Indexed by Satellite	x	x	x	x
LR Extraction parameters file	[SATELLITE_ID]_LR_EXTRACTION_PARAMETERS_FILE	40 KB	Indexed by Satellite	x	x	x	x
InitLoc Inv parameters	[SATELLITE_ID]_INIT_LOC_INV	40 KB	Indexed by	x	x	x	x



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 462 / 477

GIPP Description	Interface name	Volume	Remarks	L0	L1A	L1B	L1C
file	_PARAMETERS_FILE		Satellite				
CloudInv parameter file	[SATELLITE_ID]_CLOUD_INV_PARAMETERS_FILE	20 KB	Indexed by Satellite	x	x	x	x
InitLoc production parameters file	[SATELLITE_ID]_INIT_LOC_PROD_PARAMETERS_FILE	20 KB	Indexed by Satellite		x	x	x
RadioS2 parameters file	[SATELLITE_ID]_RADIO_S2_PARAMETERS_FILE	40 KB	Indexed by Satellite		x	x	x
GeoS2 parameters file (preProc)	[SATELLITE_ID]_GEO_S2_PARAMETERS_FILE	25 KB	Indexed by Satellite			x	x
Geometric parameter to refine	[SATELLITE_ID]_PARAMETERS_TO_BE_REFINED_FILE	5 KB	Indexed by Satellite			x	x
TilingS2 parameters file	[SATELLITE_ID]_TILING_S2_PARAMETERS_FILE	10 KB	Indexed by Satellite				x
ResampleS2 parameters file (preProc)	[SATELLITE_ID]_RESAMPLE_S2_PARAMETERS_FILE	10 KB	Indexed by Satellite				x
MaskS2 parameters file	[SATELLITE_ID]_MASK_S2_PARAMETERS_FILE	10 KB	Indexed by Satellite				x



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 463 / 477



**esa**  
*Sentinel 2 PDGS  
Core Procurement*

## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 464 / 477

### **ANNEX F: MASK TYPES AND GROUPING STRATEGY FOR L1 PRODUCTS**

The following table shows the main and sub mask types. There are 8 main types of masks and for each main type, one GML file is defined.



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 465 / 477

Mask Type	Main Type	Sub Type	Comments	Processing Level
Technical quality masks	MSK_TECQUA	ANC_LOST	Ancillary lost data	L1A: one file per band and detector; L1B: one file per band and detector; L1C: one file per band and Tile;
		ANC_DEG	Ancillary degraded data	
		MSI_LOST	MSI lost data	
		MSI_DEG	MSI degraded data	
Radiometric quality masks	MSK_DEFECT	QT_DEFECTIVE_PIXELS	Defective pixels (matching defective columns)	L1A: one file per band and detector; L1B: one file per band and detector; L1C: one file per band and Tile;
Radiometric quality masks	MSK_SATURA	QT_SATURATED_PIXELS_L1A	Saturated pixels before on-ground radiometric processing	QT_SATURATED_PIXELS_L1A for L1A products : one file for each detector, each band;  QT_SATURATED_PIXELS_L1A and/or QT_SATURATED_PIXELS_L1B for L1B products: one for each detector, each band;  QT_SATURATED_PIXELS_L1A and/or QT_SATURATED_PIXELS_L1B for L1C products: one for each tile, each band.
		QT_SATURATED_PIXELS_L1B	Saturated pixels after on-ground radiometric processing	
Radiometric quality masks	MSK_NODATA	QT_NODATA_PIXELS	No-data pixels	L1A: one file per band and detector; L1B: one file per band and detector; L1C: one file per band and Tile;
		QT_PARTIALLY_CORRECTED_PIXELS	Pixels partially corrected during cross-talk processing.	
Detector footprint masks	MSK_DETFOO	DETECTOR_FOOTPRINT	For each band and detector intersecting the Tile, a feature describes the intersected ground footprint	L1C: one file per band and Tile;
Coarse cloud masks	MSK_CLOLOW	CLOUD_INV	One file per band and detector	L1A: one file per band and detector; L1B: one file per band and detector;



## Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 466 / 477

Finer cloud masks	MSK_CLOUDS	OPAQUE CIRRUS	Opaque clouds Cirrus clouds	L1C: one file per Tile;
Land/Water masks	MSK_LANWAT	LAND WATER	Lands Water	L1C: one file per Tile;



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 467 / 477

The proposed solution is to group the masks per type and per band.

Each mask GML file contains the mask feature relative to the corresponding mask sub types given a specific band.

The following example shows the adopted grouping strategy. It refers to the MSK\_CLOUDS gml file and contains the mask features for the OPAQUE and CIRRUS sub types.

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<eop:Mask gml:id="S2A_OPER_MSK_CLOUDS_CGS3_20141104T134012_A123456_T15SWC_B03_MSIL1C "
  xmlns:gml="http://www.opengis.net/gml/3.2"
  xmlns:eop="http://www.opengis.net/eop/2.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.opengis.net/eop/2.0 ..//eop.xsd">
<gml:name>Clouds mask from Tile S2A_OPER_MS1_L1C_TL_CGS3_20141104T134012_A123456_T15SWC_N11.11</gml:name>
<gml:boundedBy>
  <gml:Envelope srsName="urn:ogc:def:crs:EPSG:6.3:32614">
    <gml:lowerCorner>399960.000000 4300060.000000</gml:lowerCorner>
    <gml:upperCorner>509760.000000 4190260.000000</gml:upperCorner>
  </gml:Envelope>
</gml:boundedBy>
<eop:maskMembers>
  <eop:MaskFeature gml:id="opaque-0-B01-01-0000">
    <eop:maskType codeSpace="urn:gs2:S2PDGS:maskType">OPAQUE</eop:maskType>
    <eop:extentOf>
      <gml:Polygon gml:id="opaque-0-B01-01-0000_Polygon" srsName="urn:ogc:def:crs:EPSG:6.3:32614">
        <gml:exterior>
          <gml:LinearRing>
            <gml:posList>403950.000000 4230070.000000 404010.000000 ... 4230190.000000 403950.000000
4230070.000000</gml:posList>
          </gml:LinearRing>
        </gml:exterior>
        <gml:interior>
          <gml:LinearRing>
            <gml:posList>449130.000000 4299730.000000 449190.000000 ... 4299610.000000 449130.000000
4299730.000000</gml:posList>
          </gml:LinearRing>
        </gml:interior>
        <gml:interior>
          <gml:LinearRing>
            <gml:posList>460530.000000 4299490.000000 460590.000000 ... 4299430.000000 460530.000000
4299490.000000</gml:posList>
          </gml:LinearRing>
        </gml:interior>
        .
        .
        <gml:interior>
          <gml:LinearRing>
            <gml:posList>508470.000000 4205230.000000 508590.000000 ... 4205170.000000 508470.000000
4205230.000000</gml:posList>
          </gml:LinearRing>
        </gml:interior>
        <gml:Polygon>
        </eop:extentOf>
      </eop:MaskFeature>
      <eop:MaskFeature gml:id="opaque-0-B01-01-0001">
        <eop:maskType codeSpace="urn:gs2:S2PDGS:maskType">OPAQUE</eop:maskType>
        <eop:extentOf>
          <gml:Polygon gml:id="opaque-0-B01-01-0001_Polygon" srsName="urn:ogc:def:crs:EPSG:6.3:32615">
            <gml:exterior>
              <gml:LinearRing>
                <gml:posList>382411.797918543 4290500 382411.797918543 4290500</gml:posList>
            </gml:LinearRing>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD  
ISSUE : 10  
DATE : 12/07/2013  
PAGE : 468 / 477

```
</gml:exterior>
</gml:Polygon>
</eop:extentOf>
</eop:MaskFeature>
<eop:MaskFeature gml:id="cirrus-0-B01-01-0000">
  <eop:maskType codeSpace="urn:gs2:S2PDGS:maskType">CIRRUS</eop:maskType>
  <eop:extentOf>
    <gml:Polygon gml:id="cirrus-0-B01-01-0000_Polygon" srsName="urn:ogc:def:crs:EPSG:6.3:32615">
      <gml:exterior>
        <gml:LinearRing>
          <gml:posList>382411.797918543 4290500 382411.797918543 4290500</gml:posList>
        </gml:LinearRing>
      </gml:exterior>
    </gml:Polygon>
  </eop:extentOf>
</eop:MaskFeature>
</eop:maskMembers>
</eop:Mask>
```

*Remark: this example is not fully realistic, technical masks will not include "holes".*



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 469 / 477



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 470 / 477

## ANNEX G: EXAMPLE OF METADATA FILE FOR A GRANULE AGGREGATED

```
<?xml version = "1.0" encoding="UTF-8"?>
  <n1:Level-1A_Granule_ID xsi:schemaLocation="http://pdgs.s2.esa.int/PSD/S2_PDI_Level-1A_Granule_Metadata.xsd S2_PDI_Level-1A_Granule_Metadata.xsd" xmlns:n1="http://pdgs.s2.esa.int/PSD/S2_PDI_Level-1A_Granule_Metadata.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
    <n1:General_Info>
      <GRANULE_ID>
        metadataLevel="Brief">S2A_OPER_MSI_L1A_GR_CGS1_20130621T120000_S20091211T165928_D07_N01.01</GRANULE_ID>
        <DETECTOR_ID metadataLevel="Brief">07</DETECTOR_ID>
        <DATASTRIP_ID>
          metadataLevel="Brief">S2A_OPER_MSI_L1A_DS_CGS1_20130621T120000_S20091211T165928_N01.01</DATASTRIP_ID>
          <DOWNLINK_PRIORITY metadataLevel="Standard">NRT</DOWNLINK_PRIORITY>
          <SENSING_TIME metadataLevel="Standard">2009-12-11T16:58:51.592742566Z</SENSING_TIME>
          <Archiving_Info metadataLevel="Expertise">
            <ARCHIVING_CENTRE>CGS1</ARCHIVING_CENTRE>
            <ARCHIVING_TIME>2013-02-19T10:15:44Z</ARCHIVING_TIME>
          </Archiving_Info>
        </n1:General_Info>
        <n1:Geometric_Info>
          <Granule_Footprint metadataLevel="Brief">
            <Granule_Footprint>
              <Footprint>
                <EXT_POS_LIST>37.781619442 -98.546300697 561.964 35.002917703 -
                  99.387519694 512.921 34.949015084 -99.117608113 444.079 37.726697926 -98.266969317 513.995 37.781619442 -98.546300697
                  561.964</EXT_POS_LIST>
                </Footprint>
              </Granule_Footprint>
              <RASTER_CS_TYPE>POINT</RASTER_CS_TYPE>
              <PIXEL_ORIGIN>1</PIXEL_ORIGIN>
            </Granule_Footprint>
            <Granule_Position metadataLevel="Standard">
              <POSITION>1</POSITION>
              <Geometric_Header>
                <GROUND_CENTER>36.448998142 -98.809781425 414.78</GROUND_CENTER>
                <QL_CENTER>4 5</QL_CENTER>
                <Incidence_Angles>
                  <ZENITH_ANGLE unit="deg">2.37884</ZENITH_ANGLE>
                  <AZIMUTH_ANGLE unit="deg">214.812</AZIMUTH_ANGLE>
                </Incidence_Angles>
                <Solar_Angles>
                  <ZENITH_ANGLE unit="deg">62.9801</ZENITH_ANGLE>
                  <AZIMUTH_ANGLE unit="deg">156.804</AZIMUTH_ANGLE>
                </Solar_Angles>
              </Geometric_Header>
            </Granule_Position>
            <Granule_Dimensions metadataLevel="Standard">
              <Size resolution="10">
                <NROWS>446026</NROWS>
                <NCOLS>2592</NCOLS>
              </Size>
              <Size resolution="20">
                <NROWS>223020</NROWS>
                <NCOLS>1296</NCOLS>
              </Size>
              <Size resolution="60">
                <NROWS>74354</NROWS>
                <NCOLS>1296</NCOLS>
              </Size>
            </Granule_Dimensions>
          </n1:Geometric_Info>
        <n1:Quality_Indicators_Info metadataLevel="Standard">
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 471 / 477

```
<Image_Content_QI>
    <CLOUDY_PIXEL_PERCENTAGE>0.0304557</CLOUDY_PIXEL_PERCENTAGE>
    <DEGRADED_MSI_DATA_PERCENTAGE>0</DEGRADED_MSI_DATA_PERCENTAGE>
</Image_Content_QI>
<Pixel_Level_QI geometry="FULL_RESOLUTION">
    <MASK_FILENAME bandId="0" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B00_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="0" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B00_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="0" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B00_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="0" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B00_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="0" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B00_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="1" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B01_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="1" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B01_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="1" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B01_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="1" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B01_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="1" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B01_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="2" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B02_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="2" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B02_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="2" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B02_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="2" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B02_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="2" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B02_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="3" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B03_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="3" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B03_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="3" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B03_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="3" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B03_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="3" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B03_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="4" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B04_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="4" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B04_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="4" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B04_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="4" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B04_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="4" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B04_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="5" type="MSK_CLOLOW"
detectorId="07">S2A_OPER_MSK_CLOLOW_CGS1_00000000T000000_S20091211T165928_D07_B05_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="5" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B05_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="5" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B05_MSIL1A.gml</MASK_FILENAME>
    <MASK_FILENAME bandId="5" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B05_MSIL1A.gml</MASK_FILENAME>
```



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 472 / 477



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 473 / 477

```
<MASK_FILENAME bandId="12" type="MSK_DEFECT"
detectorId="07">S2A_OPER_MSK_DEFECT_CGS1_00000000T000000_S20091211T165928_D07_B12_MSIL1A.gml</MASK_FILENAME>
<MASK_FILENAME bandId="12" type="MSK_NODATA"
detectorId="07">S2A_OPER_MSK_NODATA_CGS1_00000000T000000_S20091211T165928_D07_B12_MSIL1A.gml</MASK_FILENAME>
<MASK_FILENAME bandId="12" type="MSK_SATURA"
detectorId="07">S2A_OPER_MSK_SATURA_CGS1_00000000T000000_S20091211T165928_D07_B12_MSIL1A.gml</MASK_FILENAME>
<MASK_FILENAME bandId="12" type="MSK_TECQUA"
detectorId="07">S2A_OPER_MSK_TECQUA_CGS1_00000000T000000_S20091211T165928_D07_B12_MSIL1A.gml</MASK_FILENAME>
</Pixel_Level_QI>
</n1:Quality_Indicators_Info>
</n1:Level-1A_Granule_ID>
```

## ANNEX H: JPEG2000 COMPRESSION

The imagery files in the Level-1 User Product are compressed using JPEG2000 compression algorithms. JPEG2000 format is defined in [JP2STD].

JPEG2000 allows *lossless* or *lossy* compression and allows to optimize the products online delivery using the JPIP (JPEG2000 Interactive Protocol) streaming:

- LOSSLESS: Lossless compression, use reversible JPEG2000 compression.
- LOSSY: Lossy compression, use compression that ensures that JPEG2000 compression has a negligible effect on image quality.

Bands	Nb of Pixels (approx.)	Estimated size in GB with LOSSY Compression (eg. around 4,2 bits/pixels to be adjusted)	Estimated size in GB with LOSSLESS Compression (around 6bits/pixels in average)
4 Bands 10m	3364000000	1,645	2,350
6 Bands 20m	1261500000	0,617	0,881
3 Bands 60m	70083333	0,034	0,049
<b>TOTAL</b>		<b>2,296</b>	<b>3,280</b>

Figure 80 : Volume for image 290km x 290km, estimated with average JP2000 compression ratio)

The information is coded on 12 bits within the JPEG2000 format.

The JPEG2000 files are internally tiled (default tile size: 1024x1024).

The following configurable parameters are used to encode image in JPEG2000. Default values are :

- Tile sizes : 1024x1024,
- Flush period : 1024 lines,
- Codeblock size : 64 (default value),
- Wavelet decomposition level : 5 (default value),
- Order : recommended order is RPCL (Resolution, Position, Colour component, Layer quality),
- Markers : ORGGen\_plt option is used to allow optimized decompression,
- SPrecision and Qstep are 2 parameters depending on image coding (8 or 12 bits),
- SPrecision = coding dynamic (8 or 12) and Qstep = 1 / 2^(coding dynamic),
- Rate = 3.5 bits by colour plane.

Other parameters values are detailed in [JP2STD].



# Sentinel-2 Products Specification Document

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 475 / 477

## ANNEX I: LOGICAL PRODUCT

The **Logical Product** is an intermediate state of the user product, organised and stored in the PDGS archives. Starting from a collection of PDIs (Granule/Tile level and Datastrip level) issued from the processing workflow, the **Logical Product** is an assembly of these PDIs under the form of a hierarchical directory tree of PDI files. On the other hand, all PDIs are organised and referenced within a logical product hierarchy.

More in detail, a Logical Product is composed by a list of PDIs at Datastrip level and by all PDIs at Granule level linked to the Datastrips (see section 3.3). They are relate together by cross referencing as shown in Figure 7.

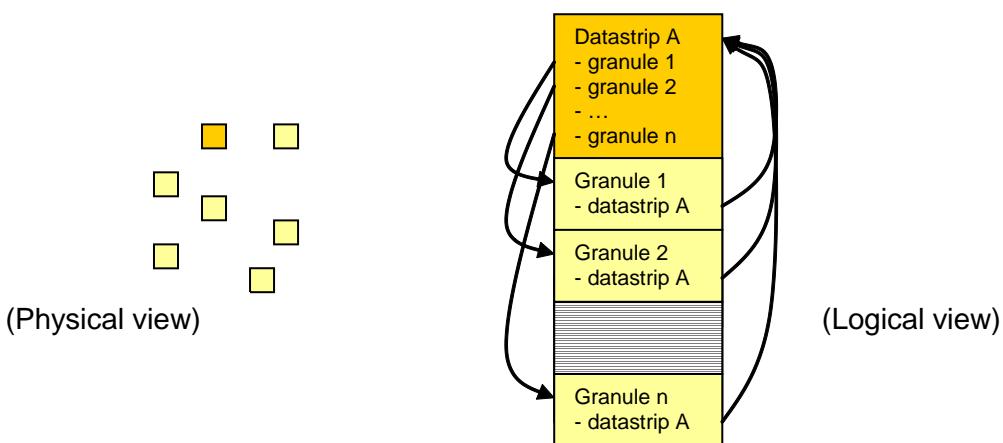


Figure 81: Logical Product

Only logical products are circulated in the system to ensure data coherency (a Granule PDI, HKTM PDI or SAD PDI can not be used without the information contained in its Datastrip PDI).

For instance, a Logical Product relative to a L0 (consolidated) product covering 5000 km is composed by 2600 Granules i.e. 2600x13 imaging files, 2600 metadata files and in addition a global metadata file relative to the Datastrip linked to each Granule.

**User Product** corresponds to a reassembly of **Logical Product** elements into the final structure, complemented by additional processing (product-level metadata creation, along track aggregation, final packaging, etc).

The **User Products** are constructed “on-the-fly” during the delivery process based on the product data held in the PDGS archives.



## **Sentinel-2 Products Specification Document**

REF : S2-PDGS-TAS-DI-PSD

ISSUE : 10

DATE : 12/07/2013

PAGE : 477 / 477

# **END OF DOCUMENT**