Space Telescope Science Institute

JAMES WEBB SPACE TELESCOPE MISSION

SCIENCE AND OPERATIONS CENTER

DATA MANAGEMENT SUBSYSTEM

REQUIREMENTS DOCUMENT

Revision: B

April 23, 2014

CM Foreword

This document is a STScI JWST Configuration Management-controlled document. Changes to this document require prior approval of the STScI JWST CCB. Proposed changes should be submitted to the JWST Office of Configuration Management.

Signature Page

Prepared by:

Electronic Signature   *2/28/2014*

Daryl Swade
DMS System Engineer
STScI/OED

Reviewed by:

Electronic Signature   *3/7/2014*

Gretchen Greene
Chief Engineer: Data Management
STScI/OED

Electronic Signature   *3/14/2014*

Joe Pollizzi
S&OC Systems Development Manager
STScI/JWST Mission Office

Electronic Signature   *3/20/2014*

Kay Spain
JWST QA Manager
STScI/PMO

Approved by:

Electronic Signature   *4/23/2014*

David Hunter
Project Manager
STScI/JWST Mission Office

STScI JWST Document Change Record		
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JWST-STScI-CR-002314	Baseline document	CCB (out-of-board) 5/10/11
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JWST-STScI-CR-003615	Rev. B RTCs: 73542, 73989, 74001, 74420, 74870, 75403, 76006, 76007, 76009, 76684, 76877, 76879, 76880, 76958, 77282, 77303, 77355	CCB (out-of-board) 4/28/2013

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List of Technical TBD/TBR Items

The requirements identified in this table have outstanding technical issues.

Item No.	Location	Req ID	Problem	Actionee	Need Date
1	4.5.3.1	DMS-60	The DMS shall distribute data to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD).	JWST Project	Start of DMS Build 7.1 development (January 2017)
2	4.5.3.2	DMS-285	The archive shall distribute software to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD).	JWST Project	Start of DMS Build 7.1 development (January 2017)
3	4.5.3.3	DMS-284	The archive shall replicate the archive catalog to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD).	JWST Project	Start of DMS Build 7.1 development (January 2017)
4	7.1.9.54	DMS-230	The DMS shall be capable of distributing to other archive facilities at least TBD TBytes of Archived Science Data per year.	JWST Project	Start of DMS Build 7.1 development (January 2017)

x

1   Introduction

1.1   Purpose

The purpose of this document is to specify the requirements for the James Webb Space Telescope (JWST) Data Management Subsystem (DMS). The intended audience for this document includes the JWST Project, engineering staff at the JWST Science and Operations Center (S&OC), S&OC DMS operations staff, and scientific and management staff with an interest in understanding DMS capabilities.

1.2   Scope

The scope of this specification is the JWST Data Management Subsystem, one of the subsystems being developed under the Space Telescope Science Institute (STScI) contract to develop and operate the JWST S&OC. The requirements identified here are considered level 4 and are configured and maintained by STScI.

1.3   Document Organization

Section 1 specifies the purpose, scope, and content of this document, identifies applicable and reference documents, and explains conventions used in defining the requirements.

Section 2 provides a general description of the DMS. This includes a functional overview, identification of the components within the DMS, the context in which DMS resides within the S&OC including interfaces with other S&OC elements and users, a description of the high-level DMS system architecture, DMS data flows, and the definitions of DMS data items.

Section 3 specifies the high level requirements that span multiple DMS components.

Section 4 specifies the DMS interface requirements with other S&OC subsystems.

Section 5 specifies the requirements for the DMS science data processing component.

Section 6 specifies the DMS science software component requirements.

Section 7 specifies requirements for the JWST Data Archive.

Section 8 specifies the requirements for the DMS reprocessing system.

Section 9 specifies the requirements for DMS operational tools.

Section 10 traces DMS requirements to the level 3 S&OC requirements from which the DMS requirements are derived.

1.4   Applicable Documents

The following list of documents form a part of this specification to the extent that these are the documents from which the requirements are derived. Parenthesized identifiers refer to the official JWST Configuration Items (CI) for the given documents (where applicable). For STScI contractual deliverables where no JWST Configuration Items (CI) has yet been defined, a reference to the Data Requirements Document (DRD) of the S&OC contract is substituted. For

STScI documents that are not contract deliverables, the internal STScI Configuration Item (CI) ("JWST-STScI-") is referenced.

- JWST Ground Segment Requirements Document (JWST-RQMT-001056) [GSRD]
- JWST Mission Operations Concept Document (JWST-RQMT-002018) [MOCD]
- JWST Mission Requirements Document (JWST-RQMT-000634) [MRD]
- JWST S&OC Subsystems Interface Requirements and Control Document (JWST-STScI-000905) [SSI]
- JWST Science and Operations Center (S&OC) Element Requirements Document (JWST-RQMT-002032) [SOC]
- JWST Science and Operations Center Element Verification and Validation Plan (JWST-STScI-000058)
- JWST Science Requirements Document (JWST-RQMT-002558)

1.5   Reference Documents

The following documents provide additional context or background information for the material in this document.

1.5.1   JWST Documents

For technical reports and other STScI documents that are not specific contractual deliverables, the internal STScI configuration item ("JWST-STScI-") is referenced, followed by the Next Generation Integrated Network (NGIN) library number for documents available on NGIN.

- JWST User Handbooks, JWST S&OC OP-07
- JWST Project Flight Observatory to Ground Segment Interface Requirements and Control Document, JWST-IRCD-000696
- JWST Project Reference Database Subsystem to Users Interface Requirements and Control Document, JWST-IRCD-003750
- JWST Project Reference Database Subsystem to Internal Users Interface Requirements and Control Document, JWST-STScI-000949
- Operational Implementation and Calibration of Field-of-View Coordinate Systems for the James Webb space Telescope, JWST-STScI-001256
- JWST Data Management System Archive and Distribution Data Volumes, JWST-STScI-002160

1.5.2   Standards Documents

The following specification, standards, and handbooks form a part of this specification to the extent specified in this document.

- Definition of the Flexible Image Transport System (FITS), Astronomy and Astrophysics, 524, A42 (2010)
- System International (SI) <http://physics.nist.gov/cuu/Units/units.html>
- International Electrotechnical Commission (IEC) <http://physics.nist.gov/cuu/Units/binary.html>

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- Goddard Procedures and Guidelines (GPG) 2810.1
- NASA Procedural Requirements (NPR) 2810.1

1.6   Precedence

In the unlikely event of a conflict between specifications, the following precedence order shall apply:

1. JWST Mission Requirements Document (JWST-RQMT-000634)
2. JWST Ground Segment Requirements Document (JWST-RQMT-001056)
3. JWST Science and Operations Center (S&OC) Element Requirements Document (JWST-RQMT-002032)
4. JWST S&OC Subsystems Interface Requirements and Control Document (JWST-STScI-000905)
5. JWST S&OC DMS Requirements Document (JWST-RQMT-002941, this document)

1.7   Requirement Conventions

While requirements are limited to one sentence by convention, some requirements and groups of requirements may need additional explanation. All clarifying text is prefixed by the term "Note:" to distinguish it from the requirement statements. Notes are provided to clarify the interpretation of the requirement.

The term "To Be Determined (**TBD**)" applied to a requirement means that specification for the requirement is currently unknown.

The term "To Be Reviewed (**TBR**)" means that the requirement is subject to review for appropriateness.

2   DMS System Description

2.1   DMS Overview

2.1.1   Functional Overview

The Data Management Subsystem is responsible for processing the science telemetry into a standard astronomical format, calibrating the science data, storing and cataloging JWST data in a data archive, and reprocessing the data as necessary.

In processing the science telemetry, pixel data are sorted into FITS files by exposure and detector. The FITS header keywords are populated with ancillary data such as calibrated engineering parameters; proposal, planning, and scheduling information; science instrument aperture information; and spacecraft ephemeris data. Time conversions are applied to convert the UTC time from the spacecraft into solar system Barycentric and heliocentric times. World Coordinate System parameters are determined based on the reference apertures. The fully populated header keywords and their values are used as input for the metadata in the archive catalog.

Calibration pipelines use calibration reference data and engineering parameters to remove the science instrument signatures, ambient background, and cosmic rays from the detector pixels. A calibration reference data system manages the reference data to insure proper calibrations. Calibrated data products are output from the calibration pipelines. Data analysis software is provided for further analysis of the calibrated data products. Calibration algorithms and data analysis routines will be operable external to the STScI and distributed to the astronomy community.

Data products generated within the DMS are ingested into the JWST Data Archive. A JWST archive catalog is maintained to allow archive users to search metadata and retrieve data files. Data will be distributed to users based on the JWST data release policy. Archive user tools to interface with the archive catalog and retrieve data are provided and maintained.

A reprocessing system will keep the JWST data current with the best available software and calibration reference data. JWST science data products generated by DMS are initially dynamic due to updates to calibration reference data and algorithms, increased knowledge of the science instruments learned in the early stages of the mission, and DMS software error corrections.

2.1.2   Operations Overview

Science Data from the JWST instruments are stored onboard the Observatory in 1 Gbit files that are downlinked twice a day via DSN contacts. These Recorded Science Data files are transferred through the Flight Operations System (FOS) to the Data Management System for processing. The Recorded Science Data files are archived on receipt in DMS.

Recorded Engineering Data are downlinked in the same DSN contact as the science data. Each Recorded Engineering Data file is 140 Mbits, approximately one-half hour in duration. The FOS processes the Recorded Engineering Data into Observation Status files and Calibrated

Engineering Data Products, which are transferred to the DMS. The Recorded Engineering Telemetry Data files are transferred to the DMS for archiving.

DMS will reformat and calibrate the data to generate a set of Science Data products, which will be sent to the archive. Once the DMS has successfully archived the Science Data, a notification is sent to inform the Observer that the Science Data are ready for retrieval. A notification is also provided to PPS for use in grants management.

Archival researchers may query the Science Data Archive using a Science Archive Catalog provided by DMS. This query capability is used to generate an Archive Retrieval Request to retrieve the corresponding Science Data Products. Raw Archived Science Data may also be retrieved upon request. Collections of Archived Science Data are periodically sent to International Data Centers so that these archive partner sites can efficiently serve JWST users around the world.

2.2   DMS Architecture

The DMS position within the JWST System Tree is shown in
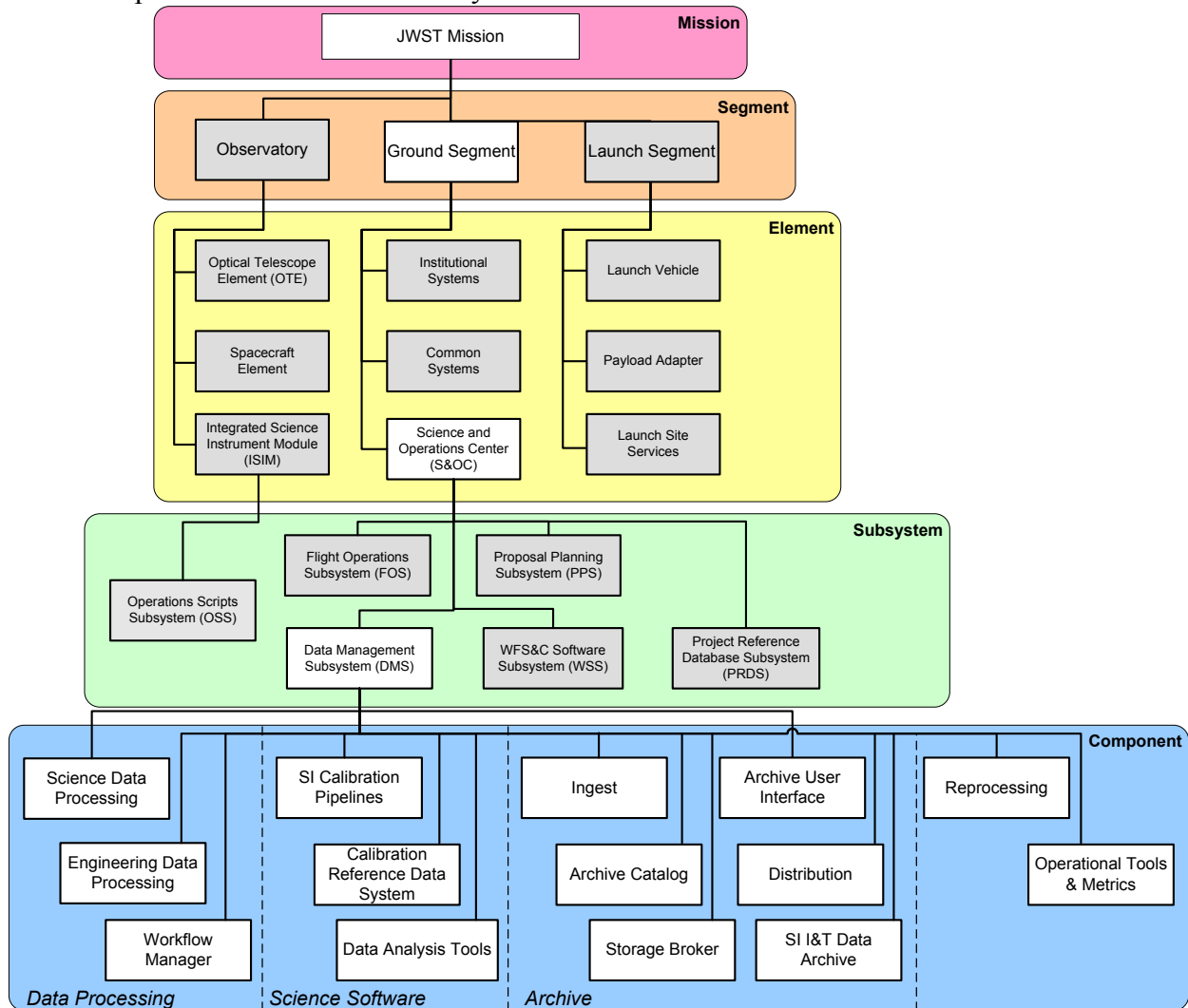
Figure 2-1. The DMS resides in the JWST Science and Operations Center (S&OC). The S&OC resides within the JWST Ground Segment.

The DMS is one of the JWST S&OC elements. Other S&OC elements include:

Proposal Planning Subsystem (PPS) – provides the proposal generation, processing and planning functions required to manage the science program and generate the Observation Plan.

Flight Operations Subsystem (FOS) – responsible for conducting the flight operations for the JWST mission, monitoring the health of the Observatory and planning spacecraft operations.

WFS&C Software Subsystem (WSS) – monitors the Observatory optical performance by detecting Observatory wavefront errors and calculating appropriate corrections. The WSS is critical to OTE commissioning and long-term telescope maintenance.

2-3

Project Reference Database Subsystem (PRDS) – provides the configuration management, data distribution, change management, and change impact assessment functions required to provide a reliable source of configured data for JWST operations.
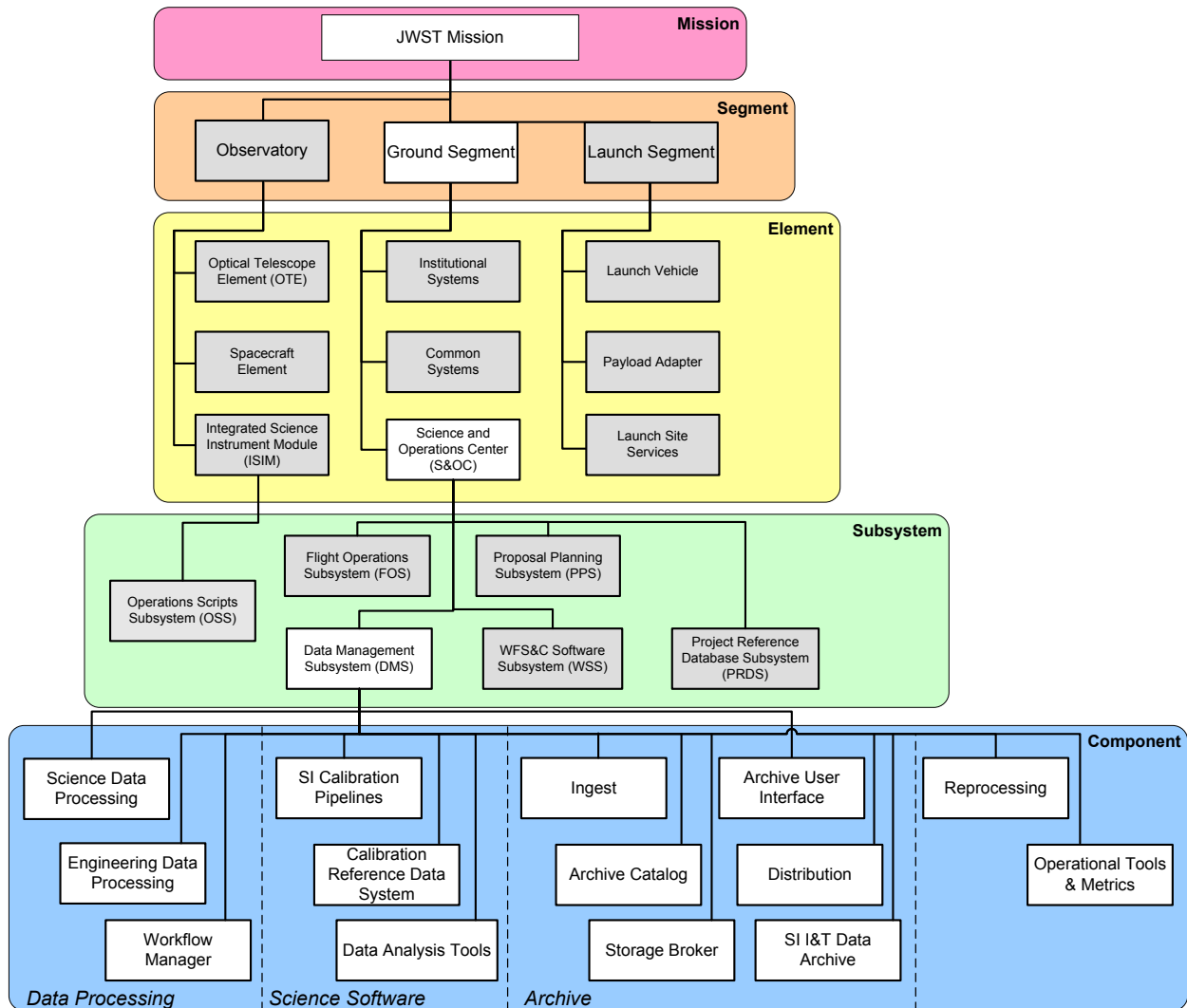
Figure 2-1 – JWST System Tree with Flow to DMS

DMS interfaces are shown in the context diagram of Figure 2-2. Within the S&OC, DMS has interfaces with the four S&OC element listed above: PPS, FOS, WSS, and PRDS. DMS interfaces with JSWT users through the Archive User Interface and data distribution. DMS also supplies JWST data to designated International Data Centers.
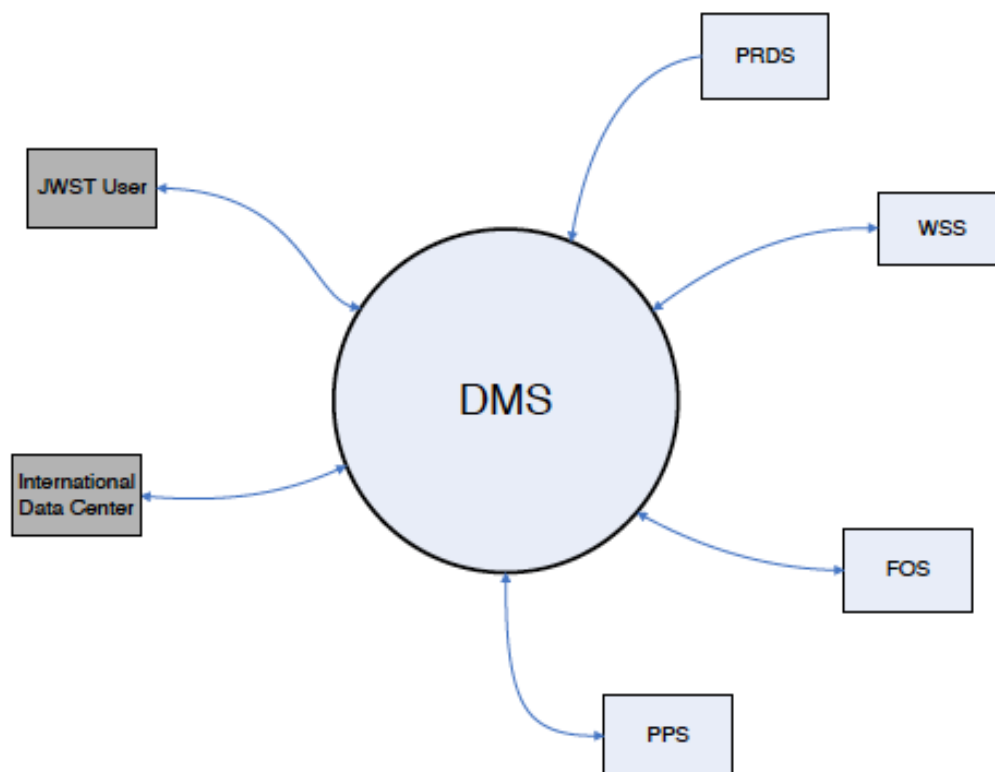
Figure 2-2 – DMS Context Diagram

Within DMS, fourteen software components have been identified. Most of these components can be associated with one of three main DMS architectural partitions: Data Processing, Science Software, and the Archive. In addition, a Reprocessing component interacts with most other DMS components. DMS Operations will require software tools to function effectively and efficiently, as well as software to perform data accounting and gather performance metrics. Table 2-1 lists the DMS architectural partitions and the DMS components. Requirements for each component can be found in the listed section number of this document.

Table 2-1 – DMS Components

Section number	Architectural partition	DMS Component	Acronym
5	Data processing	Science data processing	SDP
		Engineering data processing	EDP
		Workflow Manager	WFM
6	Science Software	SI calibration pipelines	CAL
		Calibration Reference Data System	CRDS
		Data analysis tools	DAT
7	Archive	Ingest	ING
		Archive Catalog	AC

Section number	Architectural partition	DMS Component	Acronym
		Storage Broker	SB
		Distribution	DIST
		Archive user interface	AUI
		SI I&T Data archive	SID
8	Reprocessing	Reprocessing	RP
9	Operations	Operational tools, data accounting, and metrics	OPT

The following sections provide a brief overview of the DMS component functionality.

2.2.1   Data processing

Science data processing – Receives the science telemetry files from the FOS, sorts pixels by detector and exposure, generates FITS format files, and populates FITS header keyword values. FITS header keywords are populated with ancillary data such as calibrated engineering parameters; proposal, planning, and scheduling information; science instrument aperture information; and spacecraft ephemeris data. Time conversions are applied to convert the UTC time from the spacecraft into solar system Barycentric and heliocentric times. World Coordinate System parameters are determined based on the reference apertures.

Engineering data processing – Recorded engineering data files are cataloged and stored in the archive. Relevant calibrated engineering parameters from the calibrated engineering data supplied by FOS are captured in the DMS engineering database. These calibrated engineering parameters will be used in populating header keyword values and calibration software.

Workflow manager –Monitors and controls the flow of data through the data processing stages within pipelines.

2.2.2   Science software

Calibration pipelines – On a science instrument basis, instrumental signatures are removed from the pixel values, and corrections are applied to the pixel values for ambient background and cosmic rays. Associated data products are generated. Calibrated data products are output from the calibration pipelines.

Calibration Reference Data System – Manages the use of reference data in performing science instrument calibrations.

Data analysis software – Provides data users with post-pipeline functionality for data reduction and analysis.

2.2.3   Archive

Ingest – Data products received from the data processing and calibration pipelines are stored in the JWST Data Archive. Fully populated header keywords and their values are used as input for the metadata in the archive catalog.

Archive catalog – Provides a searchable database with metadata that describes the content of science data sets and tracks the location of data files in the archive. Archive users interact with the archive catalog to search metadata and retrieve data files.

Storage broker – Services the files on the primary and safestore data stores.

Archive User Interface – Provides archive users with tools to interface with the archive catalog in order to search and retrieve data from the archive.

Distribution – Transfers requested data files from the archive data store to the archive user based on the JWST data release policy.

SI I&T Data Archive – Serves as a repository for pre-launch integration and test data.

2.2.4   Reprocessing

Reprocessing System – A reprocessing system will automatically refresh data in the archive with the latest calibration and software updates. JWST science data products generated by DMS are initially dynamic due to updates to calibration reference data and algorithms, increased knowledge of the science instruments learned in the early stages of the mission, and DMS software error corrections.

2.2.5   Operational tools

Operational tools – Provide DMS operators with tools necessary to operate the system software and generate information for metrics on system performance.
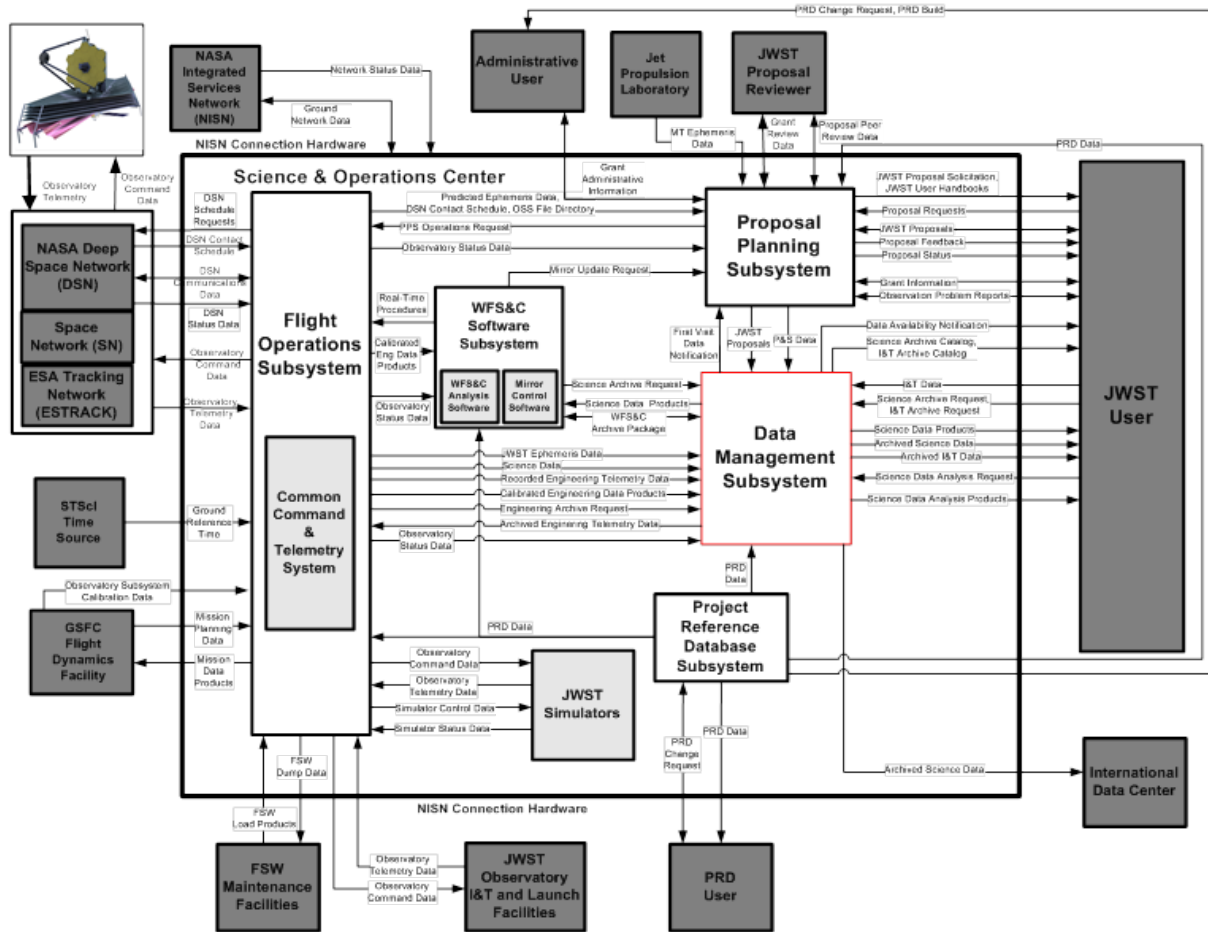
Figure 2-3 – S&OC Data Flow

2.3 Data flow

2.3.1 Software interface data flows

As shown in Figure 2-3, DMS has interfaces with data flows between each of the other S&OC elements. Science and engineering data are received from the FOS, as described above. Proposal, planning, and scheduling information are received from the Proposal Planning Subsystem (PPS). DMS uses data from the Project Reference Database in generating the FITS data products. Science data products are exchanged with the Wavefront Sensing and Control Software Subsystem (WSS).

The significant data files exchanged between DMS and the other S&OC elements are listed in Table 2-2.

Table 2-2 – Significant Data Exchange

DMS Interface	To DMS	From DMS
Flight Operations Subsystem (FOS)	Recorded Science Files Recorded Engineering Files Observatory Status Files Calibrated Engineering Data Products Predictive and Definitive Ephemerides	Recorded Engineering Files
Project Reference Database Subsystem (PRDS)	Science Instrument Aperture Files Datamode table Detector table Leap seconds table S&OC PRD version name	
Proposal Planning Subsystem (PPS)	Proposal Information Planning Information NIRSpec MSA Pre-image	Notification for first exposure in a proposal in archive NIRSpec MSA Pre-image
Wavefront Sensing and Control Software Subsystem (WSS)	WFS&C Archive Packages	WFS image data WFS&C Archive Packages

2.3.2   User interfaces

The JWST data user interfaces with the archive through the Archive User Interface (AUI). The AUI enables archive users to search the Archive Catalog for JWST data sets. Data sets that result from Archive Catalog queries can be marked for retrieval. The AUI allows the archive user to set retrieval options such as which files in the data set to retrieve, inclusion of calibration reference files, and the data distribution mode.

2.4   DMS Internal Data Flows

The data flow between components within the DMS is shown in Figure 2-4.

The primary science data flow is from FOS, through the science data processing pipelines, through the instrument specific calibration pipeline, and into the archive. Supporting data flows into the primary flow at various points along the path. Engineering data, observatory status files, calibrated engineering parameters, and ephemeris data, are received from FOS. Proposal, planning, and scheduling information is received from PPS. Aperture information is delivered from the PRD. Calibration reference data feed into the calibration pipelines. All basic data files are saved to the archive in their original form.
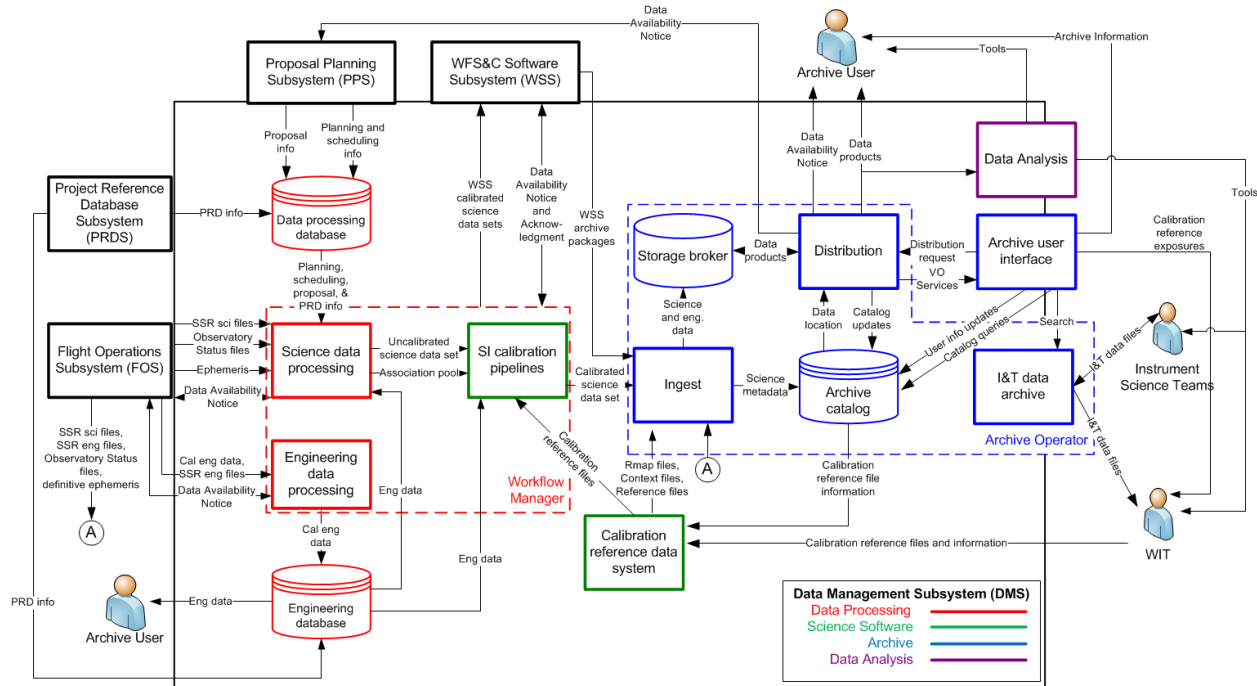
Figure 2-4 – DMS Component Data Flow

The Calibration Reference Data System supplies the reference files and other data necessary for calibration. The Webb Instrument Team (WIT) generates data for the Calibration Reference Data System. At least initially, the Instrument Science Teams will generate calibration reference data from data in the Science Instrument I&T Data Archive, which was delivered to the I&T Data Archive. Calibration reference files are stored in an on-line repository with reference information stored in a database. Calibration Reference Data are also stored in the archive.

Science data sets marked as Wavefront Sensing and Control are forwarded directly to the WSS after calibration. These data sets are also sent to the archive. WSS will send WSS Archive Packages to the archive.

Data files are cataloged and stored in the archive. The ingest process generates metadata about the data set and sends the data to the Storage Broker. Within the Storage Broker files are written to the primary data store and, optionally, to a safestore, backup media that can be moved offsite. The location of each data file within the archive is tracked.

The Archive User interacts with the archive through an Archive User Interface. The Archive User will query the archive catalog to find and mark data files for retrieval. Marked data files will be transferred to the Archive User by the data distribution system.

2.5   Data level definition

Spacecraft science telemetry files are received by the Science Data Processing component of DMS. The MOCD provides the definitions for the levels of data processing in DMS. Figure 2-5 presents an overview of the current data processing levels.

2-10
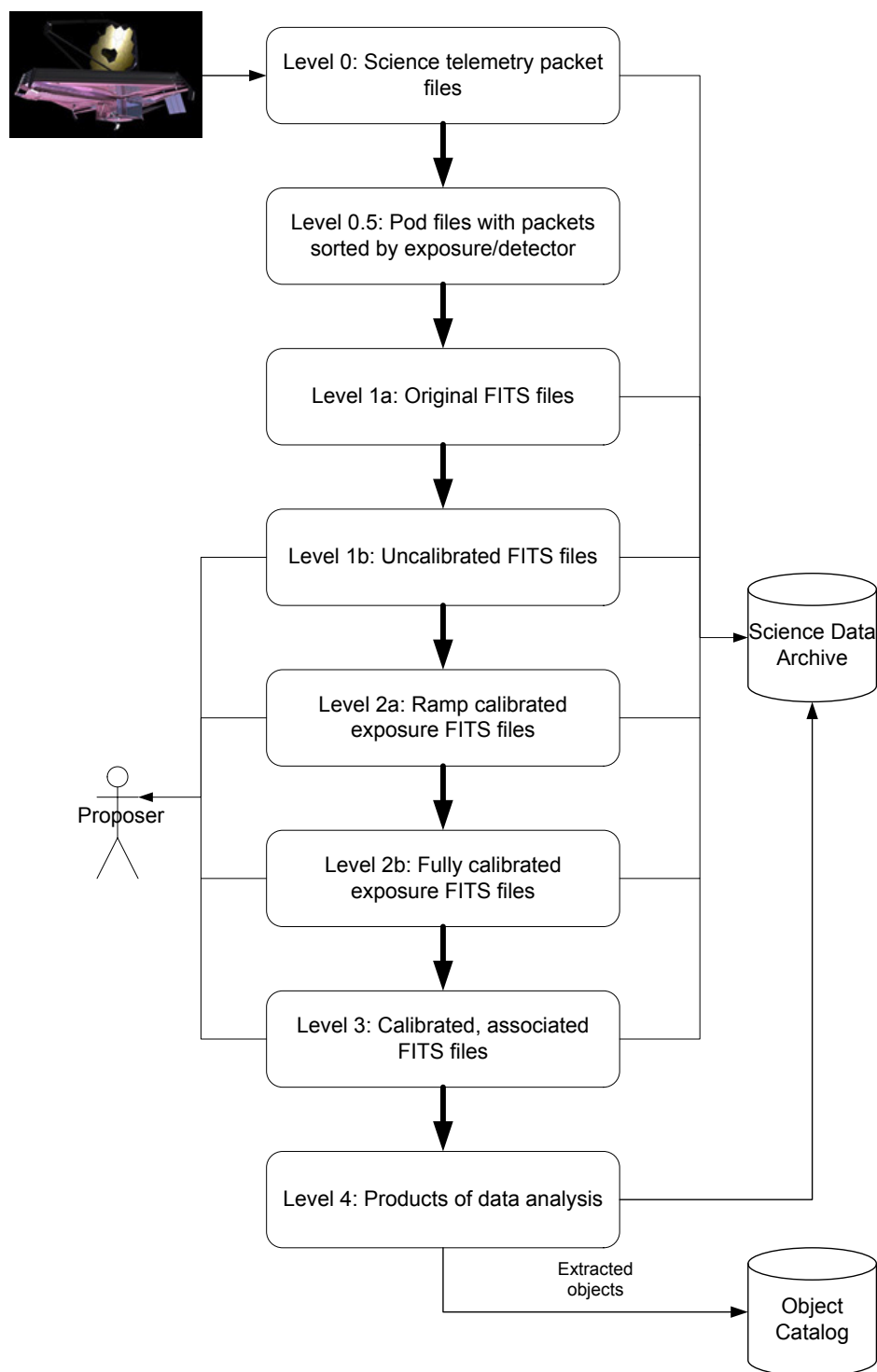
Figure 2-5 – Data Product Levels

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To verify that this is the current version.

Level 0 data are science telemetry files received by DMS in the same binary format as stored on the JWST SSR. The files contain CCSDS telemetry packets with CCSDS packet header information, image header packets, image footer packets, and pixel values in the image data packet (FS-GS ICD).

SDP will uncompress data from the level 0 telemetry files, if necessary, extract the pixel data, and sort the pixel data into FITS files by science instrument detector and exposure. The header will contain FITS required keywords and keywords with values extracted from the telemetry packet headers and image header packets. These level 1a original pixel FITS files will be archived and serve as the starting point for any future reprocessing effort.

SDP will further process the exposure data files to add information in the form of additional keyword/value pairs. Additional header data includes proposal, planning, and scheduling information, spacecraft position, time conversions, and mode appropriate calibration reference files and switches. At the completion of science data processing, the level 1b data file will be ready for calibration.

Calibrated exposure data are at level 2. Level-2a data are at an intermediate calibration. At level-2a, the exposure data cube has been collapsed by fitting a slope to the ramp for each pixel to generate a count rate image. Fully calibrated exposure data are at level-2b

The intent of level 3 processing is to provide observers with the basic reduced data products they need to begin detailed analysis of their data. Exposures from dithered observations are combined. Mosaic observations are also combined. Spectral extractions for individual observations, including those required for MOS spectroscopy, are part of Level 3 processing.

Level 4 products are designed to allow research on the entire JWST archive, and would include, for example, large catalogues of objects derived from the observations of many individual observations.

3   DMS System Requirements

3.1   Operations

3.1.1   Operational Requirements

3.1.1.1   Normal Operations Staffing

The DMS shall operate with no more than 8 hours per day, 5 days per week staffing commencing one year after launch and in the absence of anomalies. [DMS-1]

3.1.1.2   Commissioning Support

DMS shall provide the JWST Mission Operations Team with access to post-processing functions to support commissioning and mission rehearsals. [DMS-50]

3.1.2   Performance Requirements

3.1.2.1   Science Telemetry Volume - Peak Load

SDP shall be capable of receiving at least 458 Gbits of level-0 science data within a 12-hour period. [DMS-114]

Note: The requirement of 458 GBits per day applies to the uncompressed data volume.

3.1.2.2   SDP to Ingest Time

SDP shall transfer level-0 science data to Ingest within 11 hours of receipt, 95% of the time over a period of one year. [DMS-109]

3.1.2.3   Ingest Time

Ingest shall store level-0 science data in the Science Data Archive within 12 hours of receipt, 95% of the time over a period of one year. [DMS-496]

3.1.2.4   Level-2b Data Product Time

DMS shall make level-2b Science Data Products for newly executed JWST Visits available for retrieval by users of the Science Data Archive within 5 days of receipt of the corresponding level-0 data 95% of the time during normal operations. [DMS-68]

3.1.2.5   Level-0 to Level-1a Data Processing Rate

DMS shall be capable of processing 10 GBytes of uncompressed level-0 science data from level-0 to level-1a at a rate of 10 GBytes per hour averaged over a week. [DMS-69]

3.1.2.6   Level-1a Data Storage Rate

DMS shall be capable of storing the level-1a data generated from 10 GBytes of level-0 science data at a rate of 10 GBytes per hour averaged over a week. [DMS-497]

3.1.2.7　Level-1a to Level-1b Data Processing Rate

DMS shall be capable of processing 10 GBytes of uncompressed level-0 science data from level-1a to level-1b at a rate of 10 GBytes per hour averaged over a week. [DMS-261]

Note: 10 GBytes/hour provides over 400% processing margin (458 Gbits/day => 2.39 GBytes/hour). Factor of 4 margin in the processing rate allows time to recover from weekend outages.

3.1.2.8　Level-1b Data Storage Rate

DMS shall be capable of storing the level-1b data generated from 10 GBytes of level-0 science data at a rate of 10 GBytes per hour averaged over a week. [DMS-498]

3.1.2.9　Level-1b to Level-2a Data Processing Rate

DMS shall be capable of processing 10 GBytes of uncompressed level-0 science data from level-1b to level-2a at a rate of 60 GBytes per hour averaged over a week. [DMS-263]

Note: A data processing rate of 60 GB/hr will process the equivalent of 1 year of Level-0 data (20.9 TB) in about 2 weeks.

3.1.2.10　Level-2a to Level-2b Data Processing Rate

DMS shall be capable of processing 10 GBytes of level-0 science data from level-2a to level-2b at a rate of 60 GBytes per hour averaged over a week. [DMS-494]

3.1.2.11　Level-2b to Level-3 Data Processing Rate

DMS shall be capable of processing 10 GBytes of level-0 science data from level-2b to level-3 at a rate of 60 GBytes per hour averaged over a week. [DMS-495]

3.1.2.12　Engineering Database Processing Rate

The DMS engineering database shall be capable of processing and storing calibrated engineering data at a rate of 16 GBytes per day throughout the mission lifetime. [DMS-262]

Note: A daily volume of 6.3 gigabits of raw engineering data is anticipated. It is estimated that there is a 30 to 1 expansion from raw engineering telemetry data to the decommutated engineering telemetry data (reference FOS-2465). DMS expects to receive about two-thirds of the full engineering data stream, hence the 16 GBytes per day estimate. This may be considered an upper limit because the 30:1 expansion is for FOF ASCII format, and DMS may have a more efficient means of formatting the data.

3.1.2.13　WFS&C Data Processing Rate

For designated WFS&C visits containing up to 10 Gbits of uncompressed, level 0 data, the DMS shall generate level 3 data products and make them available to WSS within 90 minutes of receipt of all Science Data and Calibrated Engineering Data needed to process the visit from FOS. [DMS-269]

Note: This requirement assumes that any visits so designated require no manual processing.

3.2   Analysis

3.2.1   Pointing Requirements

3.2.1.1   SI FOV Pointing Knowledge

DMS shall determine the a posteriori pointing knowledge for the Science Instrument Fields of View (FOVs) to within 1 arcsec (1-sigma, radial) of their true positions in the celestial coordinate frame. [DMS-67]

Note: For imaging and spectrographic data, this applies over the entire SI FOV. Data to be used for calculating the pointing knowledge is specified in the Flight Observatory to Ground Segment Interface Requirements and Control Document, JWST-IRCD-000696. Table 3-51 in JWST Project Flight Observatory to Ground IRCD lists engineering data for the FGS and ACS that is necessary, but not sufficient, to figure out how the V2-V3 coordinate system maps onto the celestial coordinate frame during an exposure. To meet DMS-67 for science instrument fields of view, DMS will also need the location of each science instrument aperture in the V2-V3 frame. These V2-V3 aperture locations will be measured during observatory calibration. DMS will also need to know the correction for velocity aberration due to observatory motion during the exposure, which depends on the spacecraft ephemeris.

3.2.1.2   FGS to ACS Roll Alignment Accuracy

The DMS shall determine the orientation of the FGS-Guider FOV relative to the Attitude Control System (ACS) frame to within 50 arcsec. [DMS-266]

Notes: The system requirement is 60 arcsec. The remaining 10 arcsec of the error budget is allocated to the Observatory. The requirement will be achieved via a calibration of the ISIM focal plane relative to the ACS frame.

The DMS must determine orientations to the required accuracy as part of meeting the pointing budgets for the 1-arcsec fine guidance pointing uncertainty requirement (MR-173) and the 1-arcsec a posteriori pointing knowledge requirement (GS-363).

3.2.1.3   SI to FGS Pointing Alignment Accuracy

The DMS shall determine V2/V3 offsets between each science instrument FOV and the FGS-Guider FOV to within 0.32 arcsec, 3-sigma per axis. [DMS-267]

Note: Derived from OBS-565.

3.2.1.4   SI to FGS Roll Alignment Accuracy

The DMS shall determine the orientations of each science instrument FOV relative to the FGS-Guider FOV to within 10 arcsec. [DMS-265]

Note: Derived from OBS-572.

3.2.1.5 Field Distortion Uncertainty

The DMS shall calibrate the field mapping of the SI coordinates relative to standard astrometric fields so that after calibration, the field distortion uncertainty within any SI and the guider does not exceed 0.005 arcsec, 1 sigma per axis. [DMS-268]

3.3 Standards

3.3.1 Design Standards

3.3.1.1 International System of Units

All new DMS software shall use the International System of Units per IEEE/ASTM SI 10-2002: American National Standard for the Use of the International System of Units (SI): The Modern Metric System, with the following exceptions:

(1) This requirement is waived for astronomer user interfaces.

(2) Per IEC 60027-2: International Electrotechnical Commission (IEC) International Standard, the following SI prefixes are defined as follows:

Kilobit: 1,000 bits. Megabit: 1,000,000 bits. Gigabit: 1,000,000,000 bits. [DMS-59]

Note: The requirement is waived for astronomer user interfaces, and is interpreted to include astronomer data products and tools such as Pysynphot.

3.3.1.2 Binary Units

Binary units defined in the DMS shall follow the International Electrotechnical Commission (IEC) system. [DMS-58]

3.3.1.3 Keyword Dictionary

DMS shall maintain a keyword dictionary that includes the following information for each FITS header keyword in science data files: keyword name, default value, possible values, units, data type, keyword source, archive catalog field, short comment for header, long description, and header position. [DMS-56]

3.3.1.4 IVOA Standards

DMS shall adhere to the following core set of IVOA standard Data Access Layer (DAL) protocols for archive distribution: Simple Cone Search, Simple Image Access, Simple Spectral Access, and Table Access Protocol. [DMS-55]

3.3.1.5 Data Set Processing History

There shall be a traceable history for all processed data that includes at least the following:

a) A list of the original data sets

b) Each processing step applied to the data

c) Identification of the software version used for processing the data

d) The software configuration (options invoked or disabled, software switch settings, control

3-4

parameters, etc.)

e) A list of any ancillary data used in processing [DMS-54]

3.3.2   Data Product Requirements

3.3.2.1   Science Data Product Generation

The DMS shall generate Science Data Products from Science Data. [DMS-234]

3.3.2.2   Science Data Product Format

The DMS shall generate Science Data Products as specified in the JWST User Handbooks, JWST S&OC OP-07. [DMS-264]

Note: JWST Data Handbooks will define science data product format for each instrument and act as an IRCD between DMS and the observers.

3.3.2.3   FITS Standard

DMS data products shall conform to at least FITS version 3.0 standards for all Level-1 and higher science data products. [DMS-57]

Note: FITS products include Level-1, Level-2, Level-3, and Level-4 science data products. Ancillary product formats are not necessarily FITS but will follow accepted standards.

3.4   System

3.4.1   DMS Sizing

3.4.1.1   Data Processing Working Disk Space

The DMS data processing system shall have a working disk space of at least 1400 GBytes. [DMS-53]

Note: 1400 GBytes represents sufficient disk space to buffer one week of science data products. Current data volume estimates are based on the results presented in "JWST Data Management System Archive and Distribution Data Volumes," Whitman, Levay, & Kinzel (JWST-STScI-002160), which finds 58GB/day each for L0, L1a, and L1b, and 11GB/day for L2a and L2b combined. L3 data volumes are assumed to be the same as L2.

3.4.2   Test System

3.4.2.1   Test System Mimics Operations

DMS software shall be capable of being tested under realistic operational loads without affecting ongoing operations. [DMS-52]

3.4.3   Security Requirements

3.4.3.1   Data Security

The DMS shall protect its JWST-related data and functions accessing that data by conforming to the NASA Procedural Requirements (NPR) 2810.1 and Goddard Procedures and Guidelines (GPG) 2810.1. [DMS-49]

3.4.3.2   Unauthorized Access

The DMS shall protect JWST data against unauthorized access. [DMS-48]

3.4.3.3   DMS Intrusion Security

DMS shall be monitored and protected against unauthorized and excessive access for its public services and interfaces. [DMS-644]

Note: ITSD runs Intrusion Detection Systems (IDS) that monitor for security attacks and load type attacks.

3.4.3.4   Save the Bits

The DMS shall protect all received JWST recorded science and engineering data against loss or corruption. [DMS-47]

4   DMS Interface Requirements

4.1   FOS

4.1.1   Science data transfer

4.1.1.1   Science Data Receipt

SDP shall receive Science Data from the FOS. [DMS-46]

4.1.1.2   Science Data DAN

SDP shall receive electronic notification via a Data Availability Notification from FOS when Recorded Science data files are available for transfer. [DMS-43]

4.1.1.3   Science Data Archive Ack

When requested by the DAN, SDP shall notify FOS via a Data Availability Notification acknowledgement when the Level 0 science telemetry file is successfully archived. [DMS-270]

4.1.2   Recorded Engineering data transfer

4.1.2.1   Recorded Engineering Data Receipt

EDP shall receive uncompressed Recorded Engineering Telemetry Data files from the FOS. [DMS-41]

Note: Recorded Engineering Telemetry Data Files include both SSR Engineering Data Files and SSR Critical Data Files.

4.1.2.2   Recorded Engineering DAN

EDP shall receive electronic notification via a Data Availability Notification from FOS when Recorded Engineering data files are available for transfer. [DMS-40]

4.1.2.3   Recorded Engineering Data Receipt Ack

When requested by the DAN, EDP shall notify FOS via a Data Availability Notification acknowledgement when Recorded Engineering Data Products are received in DMS.   [DMS-37]

4.1.3   Calibrated Engineering Data Product transfer

4.1.3.1   Calibrated Engineering Data Receipt

DMS shall receive Calibrated Engineering Data Products from the FOS as needed to support the processing of Science Data. [DMS-39]

4.1.3.2   Calibrated Engineering File DAN

EDP shall receive electronic notification via a Data Availability Notification from FOS when a calibrated engineering data file is available for transfer. [DMS-670]

4.1.3.3   Calibrated Engineering Data Receipt Ack

When requested by the DAN, EDP shall notify FOS via a Data Availability Notification acknowledgement when DMS has successfully received a calibrated engineering data file. [DMS-671]

4.1.3.4   Calibrated Engineering Data Volume

DMS shall be capable of receiving at least 16 GB of Calibrated Engineering Data Products per day from the FOS. [DMS-36]

Note: This is the routine transfer of calibrated engineering data needed by DMS for the processing and interpretation of the science data.

4.1.4   Observatory Status Data transfer

4.1.4.1   Observatory Status File Receipt

SDP shall receive Observatory Status files from the FOS. [DMS-35]

Note: The Observatory Status file contains visit and exposure event messages needed in DMS to determine visit completeness.

4.1.4.2   Observatory Status File DAN

SDP shall receive electronic notification via a Data Availability Notification from FOS when the Observatory Status file is available for transfer. [DMS-34]

4.1.4.3   Observatory Status File Archive Ack

When requested by the DAN, SDP shall notify FOS via a Data Availability Notification acknowledgement when the Observatory Status file is successfully archived. [DMS-135]

4.1.5   Definitive Ephemeris Data transfer

4.1.5.1   Ephemeris Data Receipt

SDP shall receive JWST Ephemeris Data from the FOS. [DMS-33]

Note: The Ephemeris file contains both predictive and definitive data. DMS will use the predictive ephemeris for initial processing and the definitive ephemeris during reprocessing.

4.1.5.2   Data Transfer Notification

SDP shall receive electronic notification via a Data Availability Notification from FOS when Ephemeris data is available for transfer. [DMS-32]

4.1.6   Archived Engineering Data retrieval

4.1.6.1   Requests for Recorded Engineering Data

The FOS-DMS interface shall support FOS sending requests to DMS for the retrieval of archived Recorded Engineering Data files. [DMS-30]

4.1.6.2   Retrieval of Recorded Engineering Data

DMS shall provide Archived Engineering Telemetry Data files to the FOS upon request. [DMS-31]

4.1.6.3   Archived Recorded Engineering Data Transfer Notification

DMS shall notify FOS when archival Recorded Engineering Data files are available for transfer. [DMS-29]

4.1.7   SSR File Accounting Reports Transfer

4.1.7.1   SSR File Accounting Reports Receipt

SDP shall receive SSR File Accounting Reports from the FOS. [DMS-687]

4.1.7.2   SSR File Accounting Reports DAN

SDP shall receive electronic notification via a Data Availability Notification from FOS when SSR File Accounting Report files are available for transfer. [DMS-688]

4.1.7.3   SSR File Accounting Reports Ack

When requested by the DAN, SDP shall notify FOS via a Data Availability Notification acknowledgement when the SSR File Accounting Report file is successfully received. [DMS-689]

4.2   PRDS

4.2.1   PRDS Data

4.2.1.1   PRD Data Format

DMS shall receive PRD Data from the PRDS in the format defined in the JWST Project Reference Database Subsystem to Users Interface Requirements and Control Document, JWST-IRCD-003750, and the JWST Project Reference Database Subsystem to Internal Users Interface Requirements and Control Document, JWST-STScI-000949. [DMS-28]

4.2.1.2   PRD as DMS Data Source

DMS shall use the Project Reference Database as the exclusive source of all PRD-managed data used by the DMS in operations. [DMS-27]

4.2.2   Science Instrument Apertures

4.2.2.1   Science Instrument Aperture Information

DMS shall receive from PRDS pixel scales, orientation, and science instrument locations in the FOV (V2, V3 plane) for the purposes of calculating WCS parameters. [DMS-26]

4.2.2.2 SI Aperture Time Dependence

Pixel scales, orientation, and science instrument locations in the FOV (V2, V3 plane) shall be provided as a function of time for reprocessing efforts. [DMS-25]

4.2.2.3 SI Aperture Information Archive

DMS shall maintain a time dependent archive of aperture files. [DMS-24]

4.3 PPS

4.3.1 Proposal Information

4.3.1.1 Proposal Receipt

The PPS-DMS interface shall allow DMS to retrieve JWST Phase II Proposal Data from the PPS database. [DMS-23]

4.3.1.2 Proposal Data Access

The PPS-DMS interface shall allow DMS access to JWST Phase II Proposal Data in the PPS Database. [DMS-22]

4.3.1.3 Types of Phase II Proposal Data

The types of Phase II Proposal Data made available to the DMS shall include the observation specification, template information, visit link data, and proprietary period. [DMS-21]

4.3.1.4 Pre-image DAN

SDP shall receive electronic notification via a Data Availability Notification from PPS in accordance with the JWST S&OC Subsystems Interface and Control Document (JWST-STScI-000905) when a pre-image file is available for transfer. [DMS-752]

4.3.1.5 Pre-image ACK

SDP shall notify PPS via a Data Availability Notification acknowledgement in accordance with the JWST S&OC Subsystems Interface and Control Document (JWST-STScI-000905) when the pre-image file is successfully archived. [DMS-753]

4.3.2 Planning and Scheduling Information

4.3.2.1 Planning and Scheduling Data Receipt

The PPS-DMS interface shall allow DMS to retrieve JWST planning and scheduling data from the PPS database.   [DMS-20]

4.3.2.2 Planning and Scheduling Data Access

The PPS-DMS interface shall allow DMS access to planning and scheduling data in the PPS Database. [DMS-2]

4.3.2.3   Visit Status Information

The types of Scheduling Data made available to the DMS shall include the visit status. [DMS-3]

4.3.3   Notifications to PPS

4.3.3.1   Notifications to PPS

The DMS shall provide First Visit Data Notifications to the PPS. [DMS-4]

4.3.3.2   Notification of First Science Data

DMS shall notify PPS via a First Visit Data Notification when the first science data of a proposal has been archived. [DMS-5]

4.4   WSS

4.4.1   WFS Data Processing

4.4.1.1   Science Data Products to WSS

DMS shall provide Science Data Products to the WSS. [DMS-14]

4.4.1.2   WFS Image Data Calibration

DMS shall calibrate WFS image data. [DMS-6]

4.4.1.3   WFS Image Data Transfer

DMS shall send calibrated WFS image data to the WSS. [DMS-8]

4.4.1.4   DMS to WSS Data Transfer

The WSS-DMS interface shall support transferring files listed in a Data Availability Notification from the DMS to shared storage. [DMS-19]

4.4.1.5   DMS to WSS Science Data DAN

DMS shall notify WSS via a Data Availability Notification when calibrated WFS science files are available for transfer. [DMS-10]

4.4.1.6   DMS to WSS DANs

DMS shall send Data Availability Notifications to the WSS. [DMS-9]

4.4.2   WFS&C Archive Package

4.4.2.1   WFS&C Archive Package Exchange

DMS shall exchange WFS&C Archive Packages with the WSS. [DMS-15]

4.4.2.2   WSS Archive Packages to DMS

SDP shall receive WSS Archive Packages from WSS for storage in the Archive. [DMS-16]

4.4.2.3   Science Data Retrieval Requests

The WSS-DMS interface shall support sending science archive retrieval requests from WSS to the DMS for science data. [DMS-13]

4.4.2.4   Archive Package Retrieval Requests

The WSS-DMS interface shall support sending science archive retrieval requests from WSS to the DMS for WSS Archive Packages. [DMS-17]

4.4.2.5   DMS to WSS Retrieval Notification

DMS shall notify WSS via a Data Availability Notification when requested archive data is available for transfer. [DMS-18]

4.5   External Interface Requirements

4.5.1   Observers

4.5.1.1   Data Availability Notices to Observers

The DMS shall send Data Availability Notices to JWST observers as documented in the JWST User Handbooks, JWST S&OC OP-07. [DMS-65]

4.5.1.2   PI Notification of Visit Data

The DMS shall notify the Principal Investigator (PI) of a JWST Proposal when data from newly executed JWST Visits are available for retrieval as Science Data Products. [DMS-64]

4.5.1.3   User Subscription Service

The archive shall support a user subscription service. [DMS-282]

Note: Notify subscribed users when data status for a program changes: new calibration reference files are available, data have been reprocessed, or data have become public.

4.5.1.4   Customization of User Notifications

The archive shall provide a capability to customize notifications based on user preference. [DMS-283]

4.5.2   Archive Users

4.5.2.1   Access to Archive Catalog

The DMS shall provide public, remote, and electronic access to the Science Archive Catalog. [DMS-63]

4.5.2.2   Access to Science Data

The DMS shall provide remote, electronic access to requested level-1, level-2, and level-3 data stored in the science data archive. [DMS-62]

4.5.2.3   Science Data Analysis Reports

The AUI shall provide human-readable reports that are generated through analysis of level-1 and level-2 science data products to JWST users upon request. [DMS-61]

Note: Examples of such reports are thumbnails, preview data, and observation summaries.

4.5.3   Other Archive Facilities

4.5.3.1   Data Distribution to Archive Facilities

The DMS shall distribute data to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD). [DMS-60]

4.5.3.2   Software Distribution to Archive Facilities

The archive shall distribute software to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD). [DMS-285]

4.5.3.3   Catalog Replication to Archive Facilities

The archive shall replicate the archive catalog to other archive facilities as provided by the terms of agreements negotiated between NASA and its international partners (TBD). [DMS-284]

5   DMS Data Processing Component Requirements

5.1   Science Data Processing (SDP)

5.1.1   General SDP

5.1.1.1   Perform Level-1 Processing

SDP shall perform Level 1 processing on Science Data received from the FOS. [DMS-70]

Note: Level 1 data processing consists of the removal of packet formats, data decompression, transformation of science data into FITS format, and the creation of FITS headers. It does not include calibration.

5.1.1.2   Guide Star FITS Data

SDP shall generate FITS data files from guide star data downlinked with the science telemetry. [DMS-279]

Note: Guide star data includes the acquisition, track, and fine guiding images.

5.1.1.3   Start of SDP Processing

SDP shall begin processing each science exposure upon completion of the transfer of input science telemetry data from the FOS. [DMS-71]

Note: The intent of this requirement is that all data should have an initial immediate processing to verify file integrity.

5.1.1.4   Generation of Metadata

SDP shall produce the metadata required for the archive catalog. [DMS-72]

5.1.1.5   Priority Processing Requests

SDP shall retrieve priority processing requests from PPS. [DMS-73]

5.1.1.6   Processing in Priority Order

SDP shall process science data in priority order. [DMS-74]

5.1.1.7   Processing Order Override

The DMS operator shall have the capability to override the default order in which level-0 files are processed. [DMS-75]

5.1.2   Exposure level timeline

5.1.2.1   Capture Timeline of On-board Events

SDP shall capture the exposure level timeline of events that occurred on-board the observatory. [DMS-76]

5.1.2.2   Capture Visit and Exposure Times

The exposure level timeline of events shall include the start and end times of all executed visits and exposures. [DMS-137]

5.1.2.3   Ignore Duplicate Events

SDP shall ignore duplicate observatory status event entries. [DMS-138]

5.1.2.4   Revised Exposure Timelines

In the case of revised observation status event messages, SDP shall update the exposure level timeline with the revised event information. [DMS-271]

5.1.3   Telemetry receipt

5.1.3.1   Recorded Science Data Receipt

SDP shall receive Recorded Observatory Telemetry Data in the format defined in the JWST Flight Observatory to Ground Segment Interface Requirements and Control Document, JWST-IRCD-000696, and the DSN section of the JWST S&OC Element to Institutional and External Systems Interface Requirements Document, JWST-IRD-002970. [DMS-132]

5.1.3.2   Identification of Science Exposures

SDP shall identify each science exposure using the Observation ID and exposure number from the Science Image Header. [DMS-77]

5.1.3.3   Science Image Header Information

SDP shall use information from the Science Image Header to associate Level 0 image data with a specific exposure. [DMS-115]

5.1.3.4   Recovery of Missing Image Header Information

SDP shall have the capability to read the packet information from multiple image headers and footers within the telemetry to recover from missing information necessary to process the exposure. [DMS-91]

5.1.3.5   Duplicate Science Data

SDP shall filter out any duplicate science data received from the Flight Segment. [DMS-92]

5.1.3.6   Ordered List of Science Telemetry Files

SDP shall generate a SSR-ordered list of science telemetry files that includes header information from each image in the file. [DMS-139]

5.1.3.7   Record Input Files for Each Exposure

SDP shall record the list of input Level 0 files used to construct each Level 1 science data output file. [DMS-79]

5.1.3.8   Store Image Header Information

SDP shall store the image information from every science data image header.
 [DMS-78]

5.1.3.9   Verify Science Data Packet Checksum

SDP shall confirm the integrity of the data by verifying the checksum in each science data packet. [DMS-118]

5.1.3.10 Science Data Packet Checksum Failure

If the science data checksums do not agree, SDP shall flag the file as a problem that requires operator intervention. [DMS-645]

5.1.3.11 Determine Complete Exposure

SDP shall determine when all of the components of an exposure have been received. [DMS-80]

5.1.3.12 Hold Incomplete Exposures

SDP shall hold incomplete exposures until all data arrive or the data are determined to be unrecoverable. [DMS-81]

5.1.4   Data Partitioning

5.1.4.1   Partition Science Telemetry Files

SDP shall partition the science telemetry files into Level-1, original, science data files based on detector (SCA) and exposure. [DMS-116]

Note: Original science data files will contain all integrations that comprise a single exposure.

5.1.4.2   Uncompress Science Telemetry Files

SDP shall uncompress data from the Level-0 science data files as needed. [DMS-120]

5.1.4.3   Preserve Pixel Values in Level-1a Data

Each pixel's data value from the flight segment shall be preserved in the Level-1a original science data set. [DMS-82]

5.1.4.4   Level-1 Data Traceability

It shall be possible to map the level-1 data file for every exposure to a construct in APT that was used to make the observation request. [DMS-646]

5.1.4.5   Flag Missing or Corrupted Pixels

SDP shall flag all missing or corrupted pixels in the Level-1 exposure data. [DMS-121]

5.1.4.6   Fill Missing Pixel Values

SDP shall fill any original missing pixel values with a value of x'0000' (16-bit integer) and populate a data quality array with a value to indicate data fill. [DMS-122]

5.1.4.7   Produce Spatially Contiguous Data Arrays

SDP shall reorder pixel data to produce spatially contiguous arrays. [DMS-83]

5.1.4.8   FITS Image Parity

The parity of the image data shall be such that if the image is rotated to north pointing up, east points to the left. [DMS-275]

5.1.4.9   First Pixel Position - imaging

For NIRCam, MIRI, TFI, and FGS imaging modes, the image data array orientation shall be based on a Science Instrument Aperture System (SIAS, JWST-STScI-001256), such that the +x-axis approximately aligns with the -V2 spacecraft coordinate axis and the +y-axis approximately aligns with the +V3 spacecraft coordinate axis.   [DMS-84]

Note: The telescope V1/V2/V3 coordinate system is right-handed with +V1 pointing toward the sky. See Figure 5-1.

5.1.4.10 First Pixel Position - NIRSpec MOS

For NIRSpec spectroscopic modes, the data array shall be orientated such that the +x-axis is along the dispersion direction with increasing wavelength. The y-axis is perpendicular to the dispersion direction with the +y-axis at a right angle counter-clockwise from the +x-axis. [DMS-662]

Note: The +x-axis points approximately in the +V2/+V3 direction with +V1 pointing toward the sky. See Figure 5-1.

5.1.4.11 FIRST Pixel Position - NIRSpec imaging

For NIRSpec imaging mode, the orientation of the axes in V2/V3 shall be the same as the orientation of the axes in spectroscopic mode. [DMS-663]

Note: The +x-axis points approximately in the +V2/+V3 direction with +V1 pointing toward the sky. See Figure 5-1.
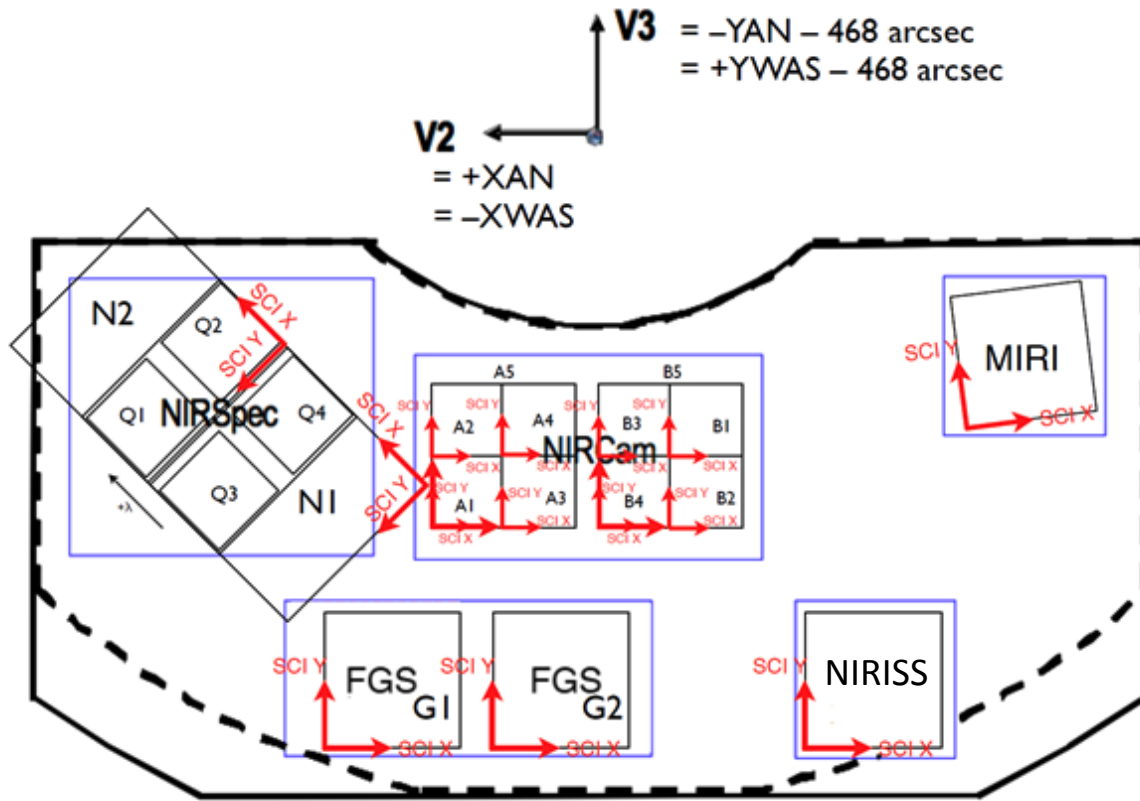
Figure 5-1 – Science Instrument Aperture System of Coordinates

5.1.4.12 Reference Pixel Inclusion

Reference pixels and outputs shall be included in the Level 1 image data array. [DMS-85]

5.1.4.13 No Special Reference Pixel Processing

SDP shall not perform any special processing on reference pixels and outputs. [DMS-90]

5.1.4.14 Definition of First Image Axis

For imaging data, the most rapidly changing index in the data array (NAXIS1) shall correspond to the +x axis in SIAS coordinate. [DMS-86]

Note: For imaging science instruments SIAS +x is close to the -V2 direction. See Figure 5-1.

5.1.4.15 Definition of First Spectral Axis

For spectroscopic data, wavelength (NAXIS1) shall increase along the +x axis. [DMS-276]

Note: For NIRSpec, SIAS +x is along the dispersion direction. See Figure 5-1.

5.1.4.16 Definition of Second image Axis

The second most rapidly changing index in the data array (NAXIS2) shall correspond to the +y axis in SIAS coordinates. [DMS-87]

Note: For imaging science instruments SIAS +y is close to the +V3 direction. For NIRSpec, SIAS +y is along the cross-dispersion direction. See Figure 5-1.

5.1.4.17 Definition of Third Image Axis

The third most rapidly changing index in the data array (NAXIS3) shall correspond to the group readout index including the reset read. [DMS-88]

5.1.4.18 Definition of Fourth Image Axis

The fourth most rapidly changing index in the data array (NAXIS4) shall correspond to the integration index. [DMS-89]

5.1.4.19 Preserve Pixel Values in Level-1b Data

Each pixel's data value from the flight segment shall be preserved in the Level-1b uncalibrated science data set. [DMS-93]

5.1.5   FITS header keyword population

5.1.5.1   Populate Level-1 FITS Keyword Values

SDP shall populate the Level-1 FITS file header keywords. [DMS-94]

5.1.5.2   Extract Observation ID

SDP shall extract the 26 character observation id from the telemetry packet header for each exposure and populate a FITS primary header keyword with the value as read. [DMS-119]

5.1.6   PPS information

5.1.6.1   Include PPS Information in Header Keyword Values

SDP shall populate the FITS data headers with proposal, planning, and scheduling information received from PPS. [DMS-133]

5.1.6.2   TEMPLATE keyword

SDP shall populate a TEMPLATE keyword in the level-1 FITS file primary header with a character string value representing the template that was used in proposal submission for the exposure. [DMS-647]

5.1.6.3   Compare Actual and Planned Keyword Values

SDP shall compare actual exposure values from the science telemetry with planned values and report inconsistencies. [DMS-123]

5.1.7   S/c position information

5.1.7.1   S/c Position and Velocity from Definitive Ephemeris

In order to determine the spacecraft position and velocity at the time of the exposure, SDP shall use the definitive spacecraft ephemeris if it is available; otherwise, SDP shall use the predictive ephemeris. [DMS-125]

5.1.7.2   Predictive or Definitive Ephemeris Used

SDP shall populate a header keyword indicating whether the predictive or definitive ephemeris was used in data processing. [DMS-643]

5.1.7.3   Determine Position and Velocity at Exposure Midpoint

SDP shall populate header keywords with JWST spacecraft position and velocity vector values at the midpoint time of the exposure. [DMS-126]

Note: Needed for differential velocity aberration correction.

5.1.7.4   S/c Roll Angle Value

SDP shall populate a header keyword value with the s/c roll angle defined as the angle of the V3-axis due east from north about the V1-axis. [DMS-127]

5.1.7.5   Populate WCS Keyword Values

SDP shall populate header keywords with the values of WCS parameters that relate pixel positions on the focal plane to sky coordinates as established in the FITS standard. [DMS-128]

5.1.7.6   Differential Velocity Aberration Correction Information

WCS parameters shall include differential velocity aberration correction information. [DMS-140]

5.1.8   Time information

5.1.8.1   Exposure UTC End Time

SDP shall populate header keywords with the UTC time at the end time of the exposure as indicated in the science telemetry image header packet in both standard date/time and MJD format. [DMS-129]

5.1.8.2   Exposure UTC Start Time

SDP shall calculate the UTC start time of each exposure and populate a header keyword with the value. [DMS-130]

5.1.8.3   Exposure UTC Midpoint Time

SDP shall calculate the UTC midpoint time of each exposure and populate a header keyword with the value. [DMS-95]

5.1.8.4 Exposure Barycentric Dynamic End Time

SDP shall populate header keywords with the values of the Barycentric Dynamic Time (TDB) calculated for the end time of the exposure as indicated in the science telemetry image header packet. [DMS-96]

5.1.8.5 Exposure Barycentric Dynamic Start Time

SDP shall populate header keywords with the values of the Barycentric Dynamic Time (TDB) calculated for the start time of the exposure. [DMS-97]

5.1.8.6 Exposure Barycentric Dynamic Midpoint Time

SDP shall populate header keywords with the values of the Barycentric Dynamic Time (TDB) calculated at the midpoint of the exposure. [DMS-98]

5.1.8.7 Exposure Heliocentric End Time

SDP shall populate header keywords with the values of the Heliocentric Time calculated for the end time of the exposure as indicated in the science telemetry image header packet. [DMS-273]

5.1.8.8 Exposure Heliocentric Start Time

SDP shall populate header keywords with the values of the Heliocentric Time calculated for the start time of the exposure. [DMS-274]

5.1.8.9 Exposure Heliocentric Midpoint Time

SDP shall populate header keywords with the values of the Heliocentric Time calculated at the midpoint of the exposure. [DMS-272]

5.1.9 Incorporate engineering data

5.1.9.1 Correlate Science and Engineering Data Times

SDP shall use timestamps and unique identifiers to correlate the science data with the calibrated engineering data for science data processing. [DMS-99]

5.1.9.2 Combine Science and Engineering Data in Data Set

SDP shall combine science, engineering, and observation metadata in a science data set that will be retrieved from the archive as a unit. [DMS-100]

5.1.9.3 Engineering Data Source

The DMS engineering database shall be used as the source of data from the engineering telemetry in pipeline processing of science data. [DMS-252]

5.1.9.4 Engineering Parameters in Header Keyword Values

Level-1b science data shall include header keywords for engineering parameters provided as ancillary information. [DMS-253]

5.1.9.5   Engineering Information in Header Keyword Values Only

Ancillary engineering information for an exposure shall be provided only in the header keyword values. [DMS-254]

5.1.9.6   Ensure All Engineering Data Present

SDP shall ensure that all necessary ancillary engineering information is present in the DMS engineering database before processing of each science exposure. [DMS-251]

5.1.10   Jitter Information

5.1.10.1 Jitter Data Product

DMS shall provide jitter information in a data product.   [DMS-648]

5.1.11   Archive interface

5.1.11.1 Science Data Goes into Science Data Archive

SDP shall store Science Data in the Science Data Archive. [DMS-101]

5.1.11.2 Store all Level-0 Data in the Archive

SDP shall archive the level-0 science telemetry files as received from FOS. [DMS-103]

Note: A level-0 science telemetry file archive will provide a repository of the most basic science data file input into DMS.

5.1.11.3 Store all Level-1a Data in the Archive

SDP shall archive the level-1a original FITS information to serve as a starting point for any potential reprocessing effort. [DMS-104]

5.1.11.4 Store all Level-1b Data in the Archive

SDP shall archive the level-1b uncalibrated FITS information to serve as a starting point for re-calibration either by the DMS calibration pipeline or by an archive user. [DMS-105]

5.1.11.5 Store all Definitive S/c Ephemeris Data in the Archive

SDP shall maintain an archive of all definitive spacecraft ephemeris data. [DMS-106]

5.1.11.6 Store all Observation Status Data in the Archive

SDP shall archive all Observatory Status Data files received from FOS. [DMS-107]

5.1.11.7 Store WSS Archive Packages in the Archive

SDP shall archive all WSS Archive Packages received from WSS. [DMS-108]

5.1.11.8 Receive Ingest Confirmation

SDP shall retain all files until ingest confirms that the files are successfully archived. [DMS-278]

5.1.11.9 Validate Checksum from Ingest

SDP shall validate the checksum received from Ingest for each file. [DMS-683]

5.1.12 Calibration Interface

5.1.12.1 Provide Level-1b Data to Calibration

SDP shall provide the level-1b uncalibrated science data set to the SI Calibration Pipelines. [DMS-649]

5.1.12.2 CRDS Reference File Synchronization

SDP shall use the CRDS context file to determine which local reference files are needed for a CRDS configuration. [DMS-684]

5.1.12.3 Current Operational CRDS Configuration

SDP shall provide a web service that allows CRDS to inquire what CRDS configuration is being used by the operations pipeline. [DMS-685]

5.1.12.4 CRDS Operational History

SDP shall provide a web service to obtain the history of all previously used CRDS configurations including the date range for each configuration. [DMS-686]

5.1.13 Data Completeness

5.1.13.1 Level-0 SDP Archive Performance

SDP shall archive at least 99.875% of the level-0 science data as received from the FOS. [DMS-110]

Note: This is the allocation to SDP from SOC-507 which says DMS will archive 99.75% of the data it receives via FOS.

5.1.13.2 Level-0 Ingest Performance

Ingest shall archive at least 99.875% of the level-0 science data as received from SDP. [DMS-493]

5.1.13.3 Errors Requiring Operator Intervention

SDP shall identify a set of errors that require operator intervention. [DMS-111]

5.1.13.4 Record SDP Fault Information

SDP shall record fault information for any data that cannot complete processing through the entire DMS pipeline. [DMS-112]

5.1.14 Performance

5.1.14.1 WFS&C Visit Data Processing Performance

For designated WFS&C visits containing up to 10 Gbits of uncompressed, level-0 data, the SDP shall generate level-1b science data products within 30 minutes of receipt of all Science Data and Calibrated Engineering Data needed to process the visit from FOS. [DMS-462]

Note: This requirement assumes that any visits so designated require no manual processing.

5.1.15 NIRSpec MSA Metadata

5.1.15.1 NIRSpec MSA Metadata File

DMS shall provide NIRSpec MSA metadata information as a level-1b data product. [DMS-763]

5.2   Engineering Data Processing (EDP)

5.2.1   Recorded Engineering Data

5.2.1.1   Recorded Engineering Data Processing Rate

EDP shall be capable of receiving and processing at least 6.3 Gbits of uncompressed Recorded Engineering Telemetry Data within a 12 hour period. [DMS-242]

Note: This requirement applies concurrently with SOC-72 to make clear that the science and engineering data receipt volume requirements apply simultaneously.

5.2.1.2   Recorded Engineering Data Peak Processing Rate

EDP shall be capable of receiving at least 13 Gbits of uncompressed Recorded Engineering Telemetry Data within a 12-hour period. [DMS-243]

5.2.1.3   Recorded Engineering Data Store

EDP shall store Recorded Engineering Telemetry Data files in the Engineering Data Archive. [DMS-209]
Note: Recorded Engineering Telemetry Data Files include both SSR Engineering Data Files and SSR Critical Data Files.

5.2.1.4   Recorded Engineering File Time Range

EDP shall determine the time range of the data contained in each recorded engineering data file by capturing the earliest and latest packet times in the file. [DMS-244]

5.2.1.5   Recorded Engineering File Catalog

EDP shall provide the archive catalog with the file name and time range of coverage for each recorded engineering data file. [DMS-245]

5.2.1.6   Recorded Engineering File Archive Time

EDP shall store Recorded Engineering Telemetry Data files in the Engineering Data Archive within 23 hours of receipt, 95% of the time over a period of one year. [DMS-213]

5.2.2   Calibrated Engineering Data Products

5.2.2.1   DMS Engineering Database

DMS shall provide an engineering database for calibrated engineering data parameters. [DMS-247]

5.2.2.2   Changes to Eng. Data Subscription

DMS shall support changes to the subscription list of calibrated engineering parameters. [DMS-249]

5.2.2.3   Only Public Parameters in Eng. DB

Only parameters available to the public shall be included in the DMS calibrated engineering parameter subscription list. [DMS-250]

5.2.2.4   Track Changes to Eng DB Parameters

All changes to the DMS engineering database parameter values shall be tracked. [DMS-246]

5.3   Workflow Manager

5.3.1   Stages

5.3.1.1   Stage Integration

The Workflow Manager shall be capable of integrating a parameter-driven, non-interactive computer program as a stage in a workflow. [DMS-500]

5.3.1.2   Multiple Instances of Stages

The Workflow Manager shall provide the capability to run multiple instances of chosen stages simultaneously to improve system throughput. [DMS-501]

Note: Provides parallel processing capability.

5.3.1.3   Stage Instances on Different Machines

The Workflow Manager shall provide the capability to spread stage instances over multiple nodes. [DMS-502]

Note: Provides distributed processing capability.

5.3.1.4   Multiple Workflows on the Same Account

The Workflow Manager shall be capable of running multiple, non-interfering workflows under the same account on the same set of computer hardware. [DMS-503]

Note: Workflows can be designed to interact without interfering.

5.3.1.5   Different Accounts on the Same Hardware

The Workflow Manager shall have the capability of running as separate workflow instances under different user accounts on the same set of computer hardware that do not interfere with each other. [DMS-504]

5.3.1.6   External Trigger Events

The Workflow Manager shall provide the capability for workflows to respond to external trigger events, including but not limited to arrival of files in a directory or reaching a particular date or wall-clock time. [DMS-505]

5.3.1.7   Multi-threaded Stages

The Workflow Manager shall support stages that are multi-threaded computer programs. [DMS-506]

5.3.1.8   Connect to Internet

The Workflow Manager shall permit stages to have access to the Internet. [DMS-507]

5.3.2   Monitor and Control

5.3.2.1   GUI for Monitoring and Control

The Workflow Manager shall have a graphical user interface for monitoring and controlling workflow processing. [DMS-508]

5.3.2.2   Workflow Monitoring

The Workflow Manager shall provide the capability for an authorized operator to monitor the workflow of any other operator. [DMS-509]

5.3.2.3   Workflow Control

The Workflow Manager shall provide the capability for an authorized operator to assume workflow control from another operator. [DMS-510]

5.3.2.4   Application/Workflow Segregation

Applications should be able to run without the workflow manager. [DMS-511]

Note: The Workflow Manager shall not require applications to have embedded workflow control knowledge.

5.3.2.5   Workflow Priority

The Workflow Manager shall be capable of assigning levels of processing priority to each workflow. [DMS-512]

5.3.2.6   Workflow Shutdown

The Workflow Manager shall provide the capability to shut down processing within a workflow after completing the current unit of work, and leave it in a restartable state. [DMS-513]

5.3.2.7   Workflow Restart

The Workflow Manager shall provide the capability to restart processing within a workflow from the point of a prior, clean shut down. [DMS-514]

5.3.2.8   Stage Status Monitoring

The Workflow Manager shall provide indication of the current status of each stage in a workflow. [DMS-515]

5.3.2.9   Dataset Status Monitoring

The Workflow Manager shall provide indication of the current status of each dataset in a workflow. [DMS-516]

5.3.2.10 Suspend/Resume Stage

The Workflow Manager shall provide the capability to suspend/resume a stage after completing the current unit of work, while other stages continue processing in a workflow. [DMS-517]

5.3.2.11 Suspend/Resume Process

The Workflow Manager shall provide the capability to suspend/resume the processing of a dataset after completing the current stage, while other datasets continue processing in a workflow. [DMS-518]

5.3.2.12 Restart Failed Dataset

The Workflow Manager shall provide the capability for an operator to command a failed dataset to restart following the last completed stage in a workflow. [DMS-523]

5.3.2.13 Halt Stage or Workflow

The Workflow Manager shall deliver a "halt" signal, such that a particular stage or entire workflow can be terminated immediately, without waiting for the current dataset to complete processing. [DMS-524]

5.3.2.14 Remote Monitoring and Control

The Workflow Manager shall provide the capability for an authorized user to monitor and control workflows from a remote computer through a common web browser. [DMS-525]

5.3.2.15 Display State of Processing

The Workflow Manager shall provide the capability to display the state of processing for all datasets within a workflow. [DMS-526]

5.3.2.16 Sort Display of Processing State

The Workflow Manager shall provide the capability to control the sort order of the display of the state of processing for all datasets within a workflow. [DMS-527]

5.3.2.17 View Datasets Active in Stage

The Workflow Manager shall provide the capability to view which datasets are actively being processed by a stage. [DMS-528]

5.3.2.18 View Failed Datasets Only

The Workflow Manager shall provide the capability to view the status of only the datasets that have failed processing. [DMS-529]

5.3.2.19 Operate Workflow without Admin Privileges

It shall be possible to operate the Workflow Manager without root/sys admin privileges. [DMS-530]

5.3.2.20 Automated Workflow Start

The Workflow Manager shall be startable in a scripted mode. [DMS-531]

5.3.2.21 Suspend Workflow for Insufficient Disk Space

The Workflow Manager shall have the capability to suspend processing when sufficient disk space is not available to begin processing of another dataset. [DMS-532]

5.3.2.22 Save Processing Configuration

It shall be possible to save the definition of a processing configuration and use this definition to restart the Workflow Manager. [DMS-533]

Note: The configuration definition would contain the names of workflows, number of instances of each stage, etc.

5.3.2.23 Text Formatted Configuration Definition

The Workflow Manager shall accept text-format configuration/set-up definitions. [DMS-534]

5.3.3   Log Messages

5.3.3.1   Capture Stage Specific Log Messages

The Workflow Manager shall capture stage-specific log messages from each dataset in a workflow and make them available to an operator. [DMS-519]

5.3.3.2   Search Stage Specific Log Messages

The Workflow Manager shall provide the capability for searching the stage-specific log messages from each dataset in a workflow. [DMS-520]

5.3.3.3   Capture Dataset Specific Log Messages

The Workflow Manager shall capture dataset-specific log messages across the stages in a workflow, and make them available to an operator. [DMS-521]

Note: E.g., dataset XYZ messages from all of the stages it has passed through.

The log becomes part of the data products.

5.3.3.4   Search Dataset Specific Log Messages

The Workflow Manager shall provide the capability for searching the dataset-specific log messages in a workflow. [DMS-522]

6   DMS Science Software Component Requirements

6.1   Calibration keywords

6.1.1   Calibration Reference Data Keywords

6.1.1.1   Associate Science Data with Calibration Reference Data

SDP shall associate Science Data with applicable Calibration Reference Data for use in calibrating Science Data. [DMS-134]

6.1.1.2   User Designated Calibration Reference Data

The DMS shall provide a capability for the JWST data user to generate Science Data Products using selected applicable Calibration Reference Data. [DMS-187]

6.2   Calibration Pipeline

6.2.1   Calibration Pipeline Processing

6.2.1.1   Generate Science Data Products

The DMS shall generate Calibrated Science Data Products from Science Data for all supported modes of the JWST science instruments, as defined in section 3.1.3 of the S&OC Requirements Document (JWST-RQMT-002032, JWST-STScI-000046) under Science Instrument Capabilities.

6.2.1.1.1   Generate NIRCam Imaging Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Imaging observations. [DMS-720]

6.2.1.1.2   Generate NIRCam Grism Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Grism observations. [DMS-719]

6.2.1.1.3   Generate NIRCam Coronagraphy Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Coronagraphy observations. [DMS-718]

6.2.1.1.4   Generate NIRCam Target Acquisition Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Target Acquisition exposures. [DMS-717]

6.2.1.1.5   Generate NIRCam Single-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Single-Field WFS&C observations. [DMS-716]

6.2.1.1.6 Generate NIRCam Multi-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRCam Multi-Field WFS&C observations. [DMS-715]

6.2.1.1.7 Generate NIRSpec Target Acquisition Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Target Acquisition exposures. [DMS-714]

6.2.1.1.8 Generate NIRSpec Imaging Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Imaging exposures. [DMS-713]

6.2.1.1.9 Generate NIRSpec MOS (R=100) Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Multi-Object Spectroscopy (R=100) observations. [DMS-712]

6.2.1.1.10 Generate NIRSpec MOS (R=1000) Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Multi-Object Spectroscopy (R=1000) observations. [DMS-711]

6.2.1.1.11 Generate NIRSpec MOS (R=2700) Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Multi-Object Spectroscopy (R=2700) observations. [DMS-710]

6.2.1.1.12 Generate NIRSpec IFU Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec IFU Spectroscopy observations. [DMS-709]

6.2.1.1.13 Generate NIRSpec Fixed-Slit Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Fixed-Slit Spectroscopy observations. [DMS-708]

6.2.1.1.14 Generate NIRSpec Multi-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRSpec Multi-Field WFS&C observations. [DMS-707]

6.2.1.1.15 Generate MIRI Target Acquisition Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Target Acquisition exposures. [DMS-706]

6.2.1.1.16 Generate MIRI Imaging Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Imaging observations. [DMS-705]

6.2.1.1.17 Generate MIRI Lyot Coronagraphy Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Lyot (24-Micron) Coronagraphy observations. [DMS-704]

6.2.1.1.18 Generate MIRI Four-Quadrant Phase Mask Coronagraphy Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Four-Quadrant Phase Mask Coronagraphy observations. [DMS-703]

6.2.1.1.19 Generate MIRI IFU (R>1000) Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI IFU (R>1000) Spectroscopy observations. [DMS-702]

6.2.1.1.20 Generate MIRI Low-Resolution, Long Slit (R=100) Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Low-Resolution, Long Slit (R=100) Spectroscopy observations. [DMS-701]

6.2.1.1.21 Generate MIRI Low-Resolution, Slitless Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Low-Resolution, Slitless Spectroscopy observations. [DMS-700]

6.2.1.1.22 Generate MIRI Multi-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from MIRI Multi-Field WFS&C observations. [DMS-699]

6.2.1.1.23 Generate NIRISS Target Acquisition Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Target Acquisition exposures. [DMS-698]

6.2.1.1.24 Generate NIRISS Imaging Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Broad-Band Imaging observations. [DMS-697]

6.2.1.1.25 Generate NIRISS Wide-Field Slitless Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Wide-Field Slitless Spectroscopy observations. [DMS-696]

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6.2.1.1.26 Generate NIRISS Single-Object Slitless Spectroscopy Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Single-Object Slitless Spectroscopy observations. [DMS-695]

6.2.1.1.27 Generate NIRISS Aperture-Masking Interferometry Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Aperture-Masking Interferometry observations. [DMS-694]

6.2.1.1.28 Generate NIRISS Multi-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from NIRISS Multi-Field WFS&C observations. [DMS-693]

6.2.1.1.29 Generate FGS Guiding Science Data Products

The DMS shall generate Calibrated Science Data Products from FGS Guiding images. [DMS-692]

6.2.1.1.30 Generate FGS Calibration Science Data Products

The DMS shall generate Calibrated Science Data Products from FGS Imaging observations. [DMS-690]

6.2.1.1.31 Generate FGS Multi-Field WFS&C Science Data Products

The DMS shall generate Calibrated Science Data Products from FGS Multi-Field WFS&C observations. [DMS-691]

6.2.1.2   Calibration Algorithms for Science Instruments

The DMS shall develop Calibration Algorithms for use in calibrating Science Data generated by the NIRCam, NIRSpec, MIRI, and FGS-TFI instruments. [DMS-188]

6.2.1.3   Calibration Algorithms for Guider

The DMS shall develop Calibration Algorithms for use in calibrating Science Data generated by the FGS-Guider instrument. [DMS-189]

Note: Calibration Algorithms will need to be applied to image data taken during guiding, as well as to images taken specifically for calibration. The same algorithms used to generate calibrated data for onboard use should be used to process guiding data.

6.2.1.4   Create Level-2 Data Products

The Calibration Software shall create Level 2 Science Data Products as specified in the User Handbooks, OP-07. [DMS-460]

6.2.1.5   Create Level-3 Data Products

The Calibration Software shall create Level 3 Science Data Products as specified in the User Handbooks, OP-07. [DMS-461]

6.2.1.6 Observatory Subsystems Calibration

The DMS shall provide functions needed for calibration of the following Observatory subsystems: (a) OTE geometric distortion model (b) FGS bad pixel map [DMS-186]

6.2.1.7 User-configurable Calibration Steps

The DMS shall permit user-configurable control of which steps are executed to calibrate Science Data for a given observation. [DMS-194]

6.2.1.8 Keywords for Derived Calibration Parameters

Calibration software shall add keywords to the science data header for parameters derived from calibration processing. [DMS-255]

6.2.1.9 Calibration Access to DMS Engineering Database

Calibration software shall access the DMS engineering database in order to derive the engineering information needed for science instrument calibration. [DMS-256]

6.2.1.10 Receive Engineering Data in Calibration

The Calibration software shall retrieve relevant engineering data from the Engineering Database. [DMS-458]

6.2.1.11 Calibration Data from Workflow Manager

The Calibration software shall receive Input Data from SDP. [DMS-453]

6.2.1.12 Association Information from Workflow Manager

The Calibration software shall receive Association information from SDP. [DMS-454]

6.2.1.13 Calibrated Science Data Products

Calibration software shall generate Calibrated Science Data Products using the most current Calibration Reference Data applicable to the Science Data. [DMS-596]

6.2.1.14 Request Calibration Reference Data from CRDS

The Calibration software shall request the most current calibration reference data applicable to the science data from the Calibration Reference Data System. [DMS-455]

6.2.1.15 Receive Calibration Reference Data from CRDS

The Calibration software shall receive Calibration Reference Data from the Calibration Reference Data System. [DMS-456]

6.2.1.16 Remote Execution of Calibration Software

It shall be possible to run the Calibration Software outside the JWST Operational Environment. [DMS-459]

Note: This functionality will be implemented by distributing the calibration software to the community.

6.2.1.17 Level 3 Data Processing Rate

For designated WFS&C visits containing up to 10 Gbits of uncompressed level 0 data, calibration shall generate level 3 data products within 60 minutes of receipt of all level 1b data needed to process the visit. [DMS-463]

Note: This requirement assumes that any visits so designated require no manual processing.

6.2.1.18 Calibration History

The Calibration software shall have the capability of including information about the calibration history in the Calibrated Science Data Products. [DMS-484]

6.2.1.19 Archive Level-2a Data

The SI Calibration Pipelines shall provide the level-2a calibrated science data set to Ingest. [DMS-650]

6.2.1.20 Archive Level-2b Data

The SI Calibration Pipelines shall provide the level-2b calibrated science data set to Ingest. [DMS-651]

6.2.1.21 Archive Level-3 Data

The SI Calibration Pipelines shall provide the level-3 calibrated science data set to Ingest. [DMS-652]

6.2.1.22 Image Combination of WSS Dither Exposures

The SI Calibration Pipelines shall combine associated WFS dithered imaging mode individual exposures into a single level 3 science data product using a WSS specified, specific algorithm. [DMS-664]

6.2.2   Calibration steps

6.2.2.1   Error Calculation

The Calibration software shall have the capability of calculating random statistical uncertainties propagated through each calibration step. [DMS-464]

6.2.2.2   Data Quality Flags

The Calibration software shall have the capability of setting Data Quality flags to record degraded calibration quality for each pixel. [DMS-465]

6.2.2.3   Saturation Detection

The Calibration software shall have the capability of detecting and flagging saturated pixels. [DMS-466]

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6.2.2.4 Bias Drift Correction

The Calibration software shall have the capability of correcting for short-term bias drifts. [DMS-467]

6.2.2.5 Nonlinearity Correction

The Calibration software shall have the capability of correcting for nonlinearity. [DMS-468]

6.2.2.6 Detector Background Correction

The Calibration software shall have the capability of removing the detector background signal. [DMS-469]

6.2.2.7 Ramp Jump Detection

The Calibration software shall have the capability of flagging jumps in the ramps. [DMS-470]

6.2.2.8 Ramp Fitting

The Calibration software shall have the capability of measuring the mean count rate and its uncertainty for each pixel from fitting the slopes of the ramp data. [DMS-471]

6.2.2.9 Pixel Sensitivity Correction

The Calibration software shall have the capability of correcting for sensitivity differences between pixels. [DMS-472]

6.2.2.10 Illumination Correction

The Calibration software shall have the capability of correcting for illumination differences across the field. [DMS-473]

6.2.2.11 Latent Signal Correction

The Calibration software shall have the capability of making a correction for the latent signal from earlier exposures or integrations. [DMS-474]

6.2.2.12 Telescope Emission Correction

The Calibration software shall have the capability to correct for emission from the telescope. [DMS-475]

6.2.2.13 Geometric Distortion Correction

The Calibration software shall have the capability of correcting for geometric distortion. [DMS-476]

6.2.2.14 Photometric Calibration

The Calibration software shall have the capability of determining and recording information characterizing the transformation between the measured count rate and absolute flux. [DMS-477]

6.2.2.15 Image Combination - Same Guide Stars

The Calibration software shall have the capability of combining overlapping exposures taken at different positions using the same Guide Stars. [DMS-478]

6.2.2.16 Image Combination - Different Guide Stars

The Calibration software shall have the capability of combining overlapping exposures taken at different positions using different Guide Stars. [DMS-479]

6.2.2.17 Spectra Combination

The Calibration software shall have the capability of combining spectra extracted from different exposures. [DMS-480]

6.2.2.18 Background Subtraction

The Calibration software shall have the capability of subtracting the background from a spectrum. [DMS-481]

6.2.2.19 Spectroscopic Extraction

The Calibration software shall have the capability of extracting a 1-d spectrum from 2-d spectroscopic data. [DMS-482]

6.2.2.20 Aperture Throughput Correction

The Calibration software shall have the capability of correcting spectra for aperture throughput. [DMS-483]

6.2.3   Variations of Calibration Capabilities

6.2.3.1   Fixed Target Calibration

The Calibration software shall have the capability of calibrating Fixed Target Data. [DMS-485]

6.2.3.2   Moving Target Calibration

The Calibration software shall have the capability of calibrating Moving Target Data. [DMS-486]

6.2.3.3   MIRI FAST Data Calibration

The Calibration software shall have the capability of calibrating MIRI data taken in FAST Mode. [DMS-487]

6.2.3.4   MIRI SLOW Data Calibration

The Calibration software shall have the capability of calibrating MIRI data taken in SLOW Mode. [DMS-488]

6.2.3.5 Full Frame Data Calibration

The Calibration software shall have the capability of calibrating Full Frame Data. [DMS-489]

6.2.3.6 Subarray Data Calibration

The Calibration software shall have the capability of calibrating Subarray Data. [DMS-490]

6.2.3.7 Internal Data Calibration

The Calibration software shall have the capability of calibrating data taken of internal calibration sources. [DMS-491]

6.2.3.8 Wavefront Sensing Data Calibration

The Calibration software shall have the capability of calibrating data taken in support of Wavefront Sensing Operations. [DMS-492]

Note: Calibration for wavefront sensing data may be different than calibration for data from other observations.

6.3 Association Processing

6.3.1 Association Properties

6.3.1.1 Association Definition

The DMS shall define Associations that consist of exposures that may be combined during calibration. [DMS-549]

6.3.1.2 Associate Exposures from Different Programs

The DMS shall have the capability of associating exposures from different JWST programs. [DMS-550]

Note: For example, an exposure from a previous program may be used in the Latent Signal Correction calibration step.

6.3.1.3 Dither Associations

The DMS shall associate exposures taken as part of a Dither sequence. [DMS-551]

6.3.1.4 Mosaic Associations

The DMS shall associate exposures taken as part of a Mosaic sequence. [DMS-552]

6.3.1.5 Contemporaneous Calibration Associations

The DMS shall associate contemporaneous calibration exposures with the relevant science exposures. [DMS-553]

Note: Includes wavecals and spectroscopic flat fields. May include latent signal correction exposures.

6.3.1.6   Target Acquisition Associations

The DMS shall associate Target Acquisition exposures with their subsequent Science exposures. [DMS-554]

6.3.1.7   Associate Pre-image Data Files

The DMS shall associate pre-image files with the corresponding science data on an exposure basis. [DMS-754]

6.3.2   Association Pool

6.3.2.1   Association Pool Definition

The DMS shall generate an Association Pool that consists of all exposures that may be combined to form associated products. [DMS-555]

6.3.2.2   Association Failed Exposure Status

The Association Pool shall contain information about the execution status of failed exposures. [DMS-556]

6.3.2.3   Association Degraded Exposure Status

The Association Pool shall contain information about the execution status of degraded exposures. [DMS-557]

6.3.2.4   Association Pool Versions

The DMS shall have the capability of generating new versions of Association Pools. [DMS-558]

Note: For example, if the rules for how exposures are to be combined during Calibration change.

6.3.2.5   Association Pool Unique Name

Each Association Pool shall have a unique name that includes the version number of the Association Pool. [DMS-559]

6.3.2.6   Complete Association Pool

A complete Association Pool shall be constructed at the completion of each observation, or set of linked observations. [DMS-560]

6.3.2.7   Partial Association Pool Creation

A partial Association Pool shall be constructed at the completion of each visit if the observation is not complete. [DMS-561]

6.3.2.8   Partial Association Pool Name

The name of the partial Association Pool shall indicate that it is a partial Association Pool. [DMS-562]

6.3.2.9 Exposure Processing to Level-2a

DMS shall process exposures to Level 2a as soon as data for a complete exposure are received. [DMS-563]

6.3.2.10 Level-2b Processing Initiation

DMS shall initiate Level 2b processing as soon as all exposures necessary for processing the association are available. [DMS-564]

6.3.2.11 Level-3 Processing Initiation

DMS shall initiate Level 3 processing as soon as all exposures necessary for processing the association are available. [DMS-565]

6.3.3 Association Generator

6.3.3.1 Association Generation from Pool

The DMS shall generate Associations from information in the Association Pools. [DMS-566]

6.3.3.2 Association Unique Name

Each Association shall have a unique name. [DMS-567]

6.3.3.3 Association Pool in Association Name

The Association Pool used to generate the Association shall be part of the Association name. [DMS-568]

6.3.3.4 Association Table

Each Association shall be documented in an Association Table. [DMS-569]

6.3.3.5 Association Version

The name of each Association shall include a version number. [DMS-570]

6.3.3.6 Association Name in Data Product

Each data product generated from an Association shall indicate the name of the association. [DMS-571]

6.3.3.7 Partial Association Product Generation

A DMS software tool shall provide an operator with the capability to generate association data products from a partial association pool. [DMS-572]

6.3.3.8 Association History

The Association generator shall write messages to a history repository. [DMS-573]

6.3.3.9 Degraded Data Quality Reported in Association History

Association history messages shall report information on all instances of degraded data quality. [DMS-574]

6.3.4 Associations in the Archive

6.3.4.1 Association Pool in Archive

Association Pools shall be stored in the JWST Data Archive. [DMS-575]

6.3.4.2 Association Table in Archive

Association Tables shall be stored in the JWST Data Archive. [DMS-576]

6.3.4.3 Association Data Products in Archive

Data Products from an Association shall be stored in the JWST Data Archive. [DMS-577]

6.3.4.4 Multiple Versions of Association Tables in Archive

The JWST Data Archive shall support multiple versions of Association Tables. [DMS-578]

6.3.4.5 Multiple Versions of Association Data Products in Archive

The JWST Data Archive shall support multiple versions of Associated Data Products. [DMS-579]

6.3.4.6 Association Data Product Proprietary Rights

DMS shall apply a method to assign Proprietary Rights to Association Data Products. [DMS-580]

6.4 Calibration Reference Data System

6.4.1 Generation of Calibration Reference Data

6.4.1.1 Calibration Reference Data Generation

The DMS shall generate Calibration Reference Data for use in calibrating Science Data from any of the supported modes of the JWST science instruments, as defined in section 3.1.3 of the S&OC Requirements Document (JWST-RQMT-002032, JWST-STScI-000046) under Science Instrument Capabilities.

6.4.1.1.1 Generate NIRCam Imaging Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Imaging observations. [DMS-721]

6.4.1.1.2 Generate NIRCam Grism Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Grism observations. [DMS-722]

6.4.1.1.3   Generate NIRCam Coronagraphy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Coronagraphy observations. [DMS-723]

6.4.1.1.4   Generate NIRCam Target Acquisition Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Target Acquisition exposures. [DMS-724]

6.4.1.1.5   Generate NIRCam Single-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Single-Field WFS&C observations. [DMS-725]

6.4.1.1.6   Generate NIRCam Multi-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRCam Multi-Field WFS&C observations. [DMS-726]

6.4.1.1.7   Generate NIRSpec Target Acquisition Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Target Acquisition exposures. [DMS-727]

6.4.1.1.8   Generate NIRSpec Imaging Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Imaging exposures. [DMS-728]

6.4.1.1.9   Generate NIRSpec MOS (R=100) Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Multi-Object Spectroscopy (R=100) observations. [DMS-729]

6.4.1.1.10 Generate NIRSpec MOS (R=1000) Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Multi-Object Spectroscopy (R=1000) observations. [DMS-730]

6.4.1.1.11 Generate NIRSpec MOS (R=2700) Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Multi-Object Spectroscopy (R=2700) observations. [DMS-731]

6.4.1.1.12 Generate NIRSpec IFU Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec IFU Spectroscopy observations. [DMS-732]

6.4.1.1.13 Generate NIRSpec Fixed-Slit Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Fixed-Slit Spectroscopy observations. [DMS-733]

6.4.1.1.14 Generate NIRSpec Multi-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRSpec Multi-Field WFS&C observations. [DMS-734]

6.4.1.1.15 Generate MIRI Target Acquisition Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Target Acquisition exposures. [DMS-735]

6.4.1.1.16 Generate MIRI Imaging Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Imaging observations. [DMS-736]

6.4.1.1.17 Generate MIRI Lyot Coronagraphy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Lyot (24-Micron) Coronagraphy observations. [DMS-737]

6.4.1.1.18 Generate MIRI Four-Quadrant Phase Mask Coronagraphy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Four-Quadrant Phase Mask Coronagraphy observations. [DMS-738]

6.4.1.1.19 Generate MIRI IFU (R>1000) Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI IFU (R>1000) Spectroscopy observations. [DMS-739]

6.4.1.1.20 Generate MIRI Low-Resolution, Long Slit (R=100) Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Low-Resolution, Long Slit (R=100) Spectroscopy observations. [DMS-740]

6.4.1.1.21 Generate MIRI Low-Resolution, Slitless Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Low-Resolution, Slitless Spectroscopy observations. [DMS-741]

6.4.1.1.22 Generate MIRI Multi-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from MIRI Multi-Field WFS&C observations. [DMS-742]

6.4.1.1.23 Generate NIRISS Target Acquisition Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Target Acquisition exposures. [DMS-743]

6.4.1.1.24 Generate NIRISS Imaging Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Broad-Band Imaging observations. [DMS-744]

6.4.1.1.25 Generate NIRISS Wide-Field Slitless Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Wide-Field Slitless Spectroscopy observations. [DMS-745]

6.4.1.1.26 Generate NIRISS Single-Object Slitless Spectroscopy Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Single-Object Slitless Spectroscopy observations. [DMS-746]

6.4.1.1.27 Generate NIRISS Aperture-Masking Interferometry Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Aperture-Masking Interferometry observations. [DMS-747]

6.4.1.1.28 Generate NIRISS Multi-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from NIRISS Multi-Field WFS&C observations. [DMS-748]

6.4.1.1.29 Generate FGS Guiding Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from FGS Guiding images. [DMS-749]

6.4.1.1.30 Generate FGS Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from FGS Imaging observations. [DMS-750]

6.4.1.1.31 Generate FGS Multi-Field WFS&C Calibration Reference Data

The DMS shall generate Calibration Reference Data for use in calibrating science data from FSG Multi-Field WFS&C observations. [DMS-751]

6.4.1.2   Calibration Reference File Format

The format of each calibration reference file shall be specified in the JWST Calibration Reference File Specification Document. [DMS-653]

6.4.1.3   CRDS Input File Format Validation

CRDS shall validate the format of required input files. [DMS-680]

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Note: Validation for current input files includes: FITS format reference files are FITS conformant; reference files have proper structure and data type for array table columns; and all necessary metadata are present for reference files, rules files, and context files.

6.4.1.4   CRDS Reference File Unique Names

All CRDS reference files shall have unique names. [DMS-681]

6.4.1.5   CRDS Context and Rule File Unique Names

All CRDS rules and context files shall have unique names. [DMS-682]

6.4.2   Calibration Reference Data Archive

6.4.2.1   Calibration Reference Data in the Archive

The DMS shall store Calibration Reference Data in the Science Data Archive. [DMS-191]

6.4.2.2   CRDS file support in the Archive

The archive shall be able to archive the following kinds of files:

a) Calibration Reference Files

b) Rules Files that define how data should be mapped to Calibration Reference Files

c) Context Files that define which Rules Files should be used for a given instance of calibration pipeline execution. [DMS-665]

6.4.2.3   Archive Calibration Reference Data before Use

The CRDS shall ensure that all reference files and information regarding the rules for mapping data to reference files are archived before the reference files or rules are used. [DMS-535]

6.4.2.4   Archive retrieval service for CRDS

The Archive shall provide a programmatic interface for retrieval of any file in the CRDS catalog through a web-service API based on the name of the requested file. [DMS-667]

6.4.2.5   CRDS Web Service

The CRDS catalog shall be capable of being queried read-only through a web-based programmatic service. [DMS-669]

6.4.3   Calibration Reference Data Management

6.4.3.1   Identifying Appropriate Reference Data

The CRDS shall identify the most appropriate reference data to use for the calibration pipelines. [DMS-536]

6.4.3.2   Support for Multiple Versions of Pipelines

The CRDS shall support multiple versions of the calibration pipeline simultaneously. [DMS-537]

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6.4.3.3 Separation of Commits and Use

The CRDS shall commit new reference files without requiring their use in operations. [DMS-538]

6.4.3.4 CRDS Universal Interface

The CRDS shall have a common software interface for both local and remote users. [DMS-539]

6.4.3.5 CRDS User Access

The CRDS shall support querying the CRDS by external users through a web interface for the most appropriate reference files for the specific version of a calibration pipeline and a particular data set. [DMS-540]

6.4.3.6 Supplying Provenance for All Times of Use

The CRDS shall have the capability to recreate the list of appropriate calibration reference files for a point in the past given the date of the query, version of software, and a specific data set. [DMS-541]

6.4.3.7 Saving Metadata for Reference Files

The CRDS shall record meta data about the reference files and all information regarding how data sets are matched to reference files including (but not limited to): How the reference file was generated (or links to documents regarding that); Who created the reference file; Who committed the reference file; Information about the significance of the change. [DMS-542]

6.4.3.8 Reference File Undo Capability

It shall be possible to mark committed reference files as bad so they will no longer be selected by CRDS. [DMS-543]

6.4.3.9 Separation of Mapping Rules from Reference Data

Rules describing how reference files are matched to data and software versions shall be separate from the reference files. [DMS-544]

6.4.3.10 Showing Effects of Mapping Rule Changes

A tool shall be provided that will list where differences exist for recommended reference files between two rules and list of data sets. [DMS-545]

6.4.3.11 Rule Undo Capability

CRDS shall have the capability to undo the use of a specific rule mapping data to a reference file. [DMS-642]

6.4.3.12 Bad Rule Capability

CRDS shall have the capability to mark a specific rule as bad so as to prevent its use by the CRDS. [DMS-641]

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6.4.3.13 Metadata Requirements for Reference Data

Reference files shall include in their headers information in the form of header comments that describe the procedure for making the reference file or point to a reference that describes that procedure. [DMS-546]

6.4.3.14 Displaying Active Reference Files

CRDS shall provide a tool to show the set of active reference files being used for all supported versions of the software, or a specific version of the software. [DMS-547]

6.4.3.15 Displaying Reference Files by Mode

CRDS shall provide a tool to show active files associated with specific instrument observing modes. [DMS-548]

6.5   Data Analysis Support

This section contains requirements for supporting analysis of JWST science data by observers and archive users.

6.5.1   Data Analysis Standards

6.5.1.1   Data Formats

The DMS tools shall utilize FITS data format. [DMS-627]

6.5.1.2   Data Access Protocols

The DMS tools shall utilize VO data access protocols. [DMS-654]

6.5.2   Pipeline Calibration Support

6.5.2.1   Calibration Pipeline Steps

The DMS shall provide a capability for users to run individual Calibration Pipeline steps on JWST data. [DMS-629]

6.5.3   Data Analysis Functions

6.5.3.1   Display and Analyze Science Data

The DMS shall provide a capability to display and analyze Archived Science Data and Science Data Products. [DMS-233]

6.5.3.2   Distribute Data Analysis Software

The DMS shall distribute Data Analysis Software to users on request. [DMS-640]

6.5.3.3   Perform Data Analysis Functions Remotely

The DMS shall provide a capability for JWST users to perform data analysis functions on Science Data Products electronically from remote locations. [DMS-241]

6.5.3.4   Dataset Visualization

The DMS shall provide a capability for visualizing JWST data.   [DMS-625]

Note: This includes:

- 1-d (plotting vectors, e.g. spectra)
- 2-d (image display)
- 3-d (volumetric imaging of IFU data cubes, or ramp data)

6.5.3.5   Dataset Arithmetic

The DMS shall provide a capability for arithmetic operations on collections of JWST datasets. [DMS-626]

Note: This includes:

- Simple arithmetic operations on single datasets
- Binary operations on pairs of datasets
- Application of functions to datasets
- Combination of sets of datasets

6.5.3.6   Model Evaluation

The DMS shall provide the capability of comparing JWST Calibrated Science Data with models that can be cast into arrays with the same dimensionality as the Calibrated Science Data. [DMS-628]

6.5.3.7   Dataset Combination Tools

The DMS shall provide the capability to combine JWST datasets including tools to determine dataset registration and optimal combination of 1-d spectra, 2-d images and 3-d spectral data cubes. [DMS-630]

Note: Requires feature location and matching

- Object identification, fitting (e.g. DAOPHOT/SEXTRACTOR)
- Catalog matching

6.5.3.8   Coronagraphic Science Support

The DMS shall provide tools to support JWST coronagraphic science.   [DMS-631]

Notes:

This includes provision of tools to determine PSF scaling using a variety of techniques.

- Combine data taken at different roll angles
- Model subtraction
- May be useful for data other than coronagraphic data
- Support for multi-wavelength PSF subtraction using TFI

6.5.3.9   IFU Tools

The DMS shall provide tools to enable analysis of JWST IFU data.   [DMS-632]

Note: This includes:

- Combining spectral cubes taken at different positions
- Custom extraction of source spectra
- Combine several spectral channels into a 2-d image
- Arithmetic on spectral planes (line/continuum)
- Velocity analysis

6.5.3.10 Spectral Data Analysis Tools

The DMS shall provide facilities for analyzing JWST spectral data.   [DMS-633]

Notes:

Includes more complex data analysis of spectral data than can be done in an automatic pipeline.

- Custom source spectrum extraction
- Use acquisition image
- Fit multiple lines, continuum, spectral models

6.5.3.11 JWST Instrument Modeling

The DMS shall provide tools for modeling JWST instrumental effects.   [DMS-634]

Notes:

Includes tools for correcting the effects

- Correction not always appropriate for the calibration pipeline (e.g. TFI Field-Dependence of Wavelength, throughput)
- Includes simulation of the effects of the JWST PSF

6.5.3.12 FITSVerify Web Service

The DMS shall provide a web service to PPS that will validate the FITS format and keyword content of a pre-image file. [DMS-755]

7   DMS Archive Component Requirements

7.1   Archive

7.1.1   General Archive Requirements

7.1.1.1   Archive Catalog Accessibility

The Ground Segment shall maintain an on-line archive catalog that is accessible to current and prospective users of JWST data. [DMS-196]

7.1.1.2   Archive all Level-2 Data Inputs

The archive shall contain the historical and current calibration parameters, coefficients, and algorithms needed to transform science telemetry into calibrated measurements expressed in standard units. [DMS-197]

7.1.1.3   Level-0 Archive Data Volume - 5.5 years

The archive shall be capable of storing in the Science Data Archive at least 115 TBytes of level-0, uncompressed science data over a 5.5-year mission. [DMS-198]

7.1.1.4   Level-2 Archive Data Volume - 5.5 years

The archive shall be capable of storing in the Science Data Archive at least 11.2 TBytes of level-2, uncompressed science data over a 5.5-year mission. [DMS-635]

7.1.1.5   Level-0 Archive Data Volume - 10 Years

The design of the Science Data Archive shall be scalable to a total capacity of at least 209 TBytes of level-0, uncompressed science data over a 10-year mission. [DMS-195]

Note: The objective is to support the goal of a 10-year mission. The requirement means that while the as-built system only has a required capacity of 115 TBytes; it should be possible to double that capacity without significant redesign.

7.1.1.6   Level-2 Archive Data Volume - 10 years

The design of the Science Data Archive shall be scalable to a total capacity of at least 20.4 TBytes of level-2, uncompressed science data over a 10-year mission. [DMS-636]

7.1.2   Ingest

7.1.2.1   Ingest Data Receipt

Ingest shall receive Science Data from SDP. [DMS-289]

7.1.2.2   Archive Level-0 Science Data

Ingest shall archive the level-0 science telemetry files from SDP as received from FOS. [DMS-290]

7.1.2.3   Archive Level-1a Science Data

Ingest shall archive the level-1a original FITS files from SDP. [DMS-291]

Note: Serves as a starting point for any potential reprocessing effort.

7.1.2.4   Archive Level-1b Science Data

Ingest shall archive the level-1b uncalibrated FITS files from SDP. [DMS-292]

Note: Serves as a starting point for re-calibration either by the DMS calibration pipeline or by an archive user.

7.1.2.5   Archive Level-2a Science Data

Ingest shall archive the level-2a calibrated FITS files from SDP. [DMS-294]

7.1.2.6   Archive Level-2b Science Data

Ingest shall archive the level-2b calibrated FITS files from SDP. [DMS-639]

7.1.2.7   Archive Level-3 Science Data Products

Ingest shall archive the level-3 calibrated FITS data product files from SDP. [DMS-295]

7.1.2.8   Archive Level-4 Science Data Products

Ingest shall be capable of archiving selected level-4 data products for safe keeping. [DMS-293]

Note: While there are currently no requirements for the generation of Level-4 products the system should be capable of archiving these products.

7.1.2.9   Archive Guide Star Acquisition Images

Guide star acquisition images shall be stored in the science archive. [DMS-102]

Note: Guide star acquisition images include data from all five functions under FSG Operate mode: identification full frame images, acquisition 128x128 and 32x32 subarray images, track 32x32 subarray images, fine guiding 8x8 subarray images, and calibration full frame images.

7.1.2.10 Archive Request Completion Status

Ingest shall report to SDP the archive request completion status. [DMS-301]

7.1.2.11 Level-4 Archive Completion Status

Ingest shall report to the level-4 data provider the archive request completion status. [DMS-302]

7.1.2.12 First Science Data Archived Notification

Ingest shall notify PPS when the first science data of a proposal has been archived. [DMS-303]

7.1.2.13 Archive DMS Software

Ingest shall be capable of archiving of DMS software with each release. [DMS-304]

7.1.2.14 Archive Data Set

Ingest shall archive all files in a data set as a unit. [DMS-306]

Note: Data set - group of files at the same processing level that need to be processed concurrently.

7.1.2.15 Uniquely Identify Data in Archive

Ingest shall place metadata in the housekeeping catalog tables to uniquely identify each dataset in the archive. [DMS-307]

7.1.2.16 Archive Data Set Processing Log

Ingest shall maintain a log of processing records for each data set. [DMS-308]

7.1.2.17 Bundle Data Set

Ingest shall have the capability to bundle the contents of a data set prior to writing data to the primary data store and safestore. [DMS-305]

Note: e.g., tar

7.1.2.18 Validate Presence of Required Files

Ingest shall validate the presence of all required files in a data set. [DMS-310]

7.1.2.19 Override List of Required Files

Ingest shall provide the capability to override the list of required files in order to archive a data set. [DMS-311]

7.1.2.20 Validate FITS Standard

Ingest shall validate that each FITS file in a dataset adheres to the FITS standard. [DMS-312]

7.1.2.21 Ingest Checksum to SDP

Ingest shall compute and pass to data processing pipelines a checksum on files received from data processing pipelines. [DMS-313]

7.1.2.22 Ingest Checksum to Storage Broker

Ingest shall compute and save a checksum on files passed to the storage broker. [DMS-314]

7.1.2.23 Validate Storage Broker Checksum

Ingest shall validate the checksum received from the storage broker for each file. [DMS-309]

7.1.3 Safestore

7.1.3.1 Long-term, Off-site Storage

The archive shall have the capability to maintain a verified copy of selected archived data on long-term offsite archive storage. [DMS-200]

7.1.3.2 Verify Data on Safestore

The storage broker shall have the capability to create a verified copy of selected archived data on long-term offsite archive storage. [DMS-199]

7.1.3.3 Select Files for Safestore

The storage broker shall be configurable to allow specification of which files are saved to long term archive storage. [DMS-332]

7.1.3.4 Level-0 Data to Safestore

The storage broker shall create a verified copy of all level-0 data files on long-term archive storage. [DMS-333]

7.1.3.5 Level-1a Data to Safestore

The storage broker shall create a verified copy of all level-1a data files on long-term archive storage. [DMS-334]

7.1.3.6 Recorded Engineering Data to Safestore

The storage broker shall create a verified copy of all recorded engineering data files on long-term archive storage. [DMS-335]

7.1.3.7 Restore Data from Safestore

The archive shall have the capability to restore the contents of the Science Data Archive from the long-term archive storage media. [DMS-201]

7.1.3.8 Restore Catalog from Safestore

The archive shall have the capability to restore the contents of the Science Archive Catalog from the long-term archive storage media. [DMS-637]

7.1.3.9 Maintain Recorded Engineering Data on Safestore

The archive shall maintain a verified copy of the contents of the Recorded Engineering Data Archive on long-term archive storage media at a safe site. [DMS-202]

7.1.3.10 Maintain Catalog of Recorded Engineering Data on Safestore

The archive shall maintain a verified copy of the contents of the Recorded Engineering Archive Catalog on long-term archive storage media at a safe site. [DMS-446]

7.1.3.11 Restore Recorded Engineering Data from Safestore

The archive shall have the capability to restore the contents of the Engineering Data Archive from the long-term archive storage media. [DMS-203]

7.1.3.12 Restore Engineering Data Catalog from Safestore

The archive shall be able to restore the contents of the Engineering Archive Catalog from the long-term archive storage media. [DMS-638]

7.1.4 Archive Catalog

7.1.4.1 On-line Science Archive Catalog

The DMS shall maintain an on-line Science Archive Catalog identifying and describing all of the data that exists in the Science Data Archive. [DMS-205]

7.1.4.2 Public Archive Catalog

The content of the Archive Catalog shall be publically accessible. [DMS-316]

7.1.4.3 Searchable Archive Catalog

The on-line science catalog shall be publically searchable. [DMS-317]

7.1.4.4 Metadata Extracted from Science Data Headers

The JWST science catalog shall contain metadata extracted from designated science data set keyword values. [DMS-315]

7.1.4.5 Metadata from External Sources

The JWST science catalog shall provide the capability to contain metadata derived from external sources. [DMS-318]

7.1.4.6 Automatically Enforce Archive Catalog Internal Consistency

The Archive Catalog shall be designed such that internal consistency is automatically enforced. [DMS-280]

7.1.4.7 Unique Identifier for Each File in Archive

The Archive Catalog shall contain a unique identifier for each file in the archive. [DMS-321]

7.1.4.8 Proprietary State of Data Files

The Archive Catalog shall track the proprietary state of science data files. [DMS-322]

7.1.4.9 Unique Identifier for Each Data Set in Archive

The Archive Catalog shall contain metadata to uniquely identify each data set in the archive. [DMS-320]

7.1.5   Science Data Archive

7.1.5.1   Expiration of Proprietary Period

Electronic availability of JWST science data sets to archival researchers shall commence as soon as the PI proprietary data period expires. [DMS-208]

7.1.5.2   Archive Pre-image Data Files

The archive shall ingest and store pre-images as received from PPS.   [DMS-672]

Note: The image file must be supplied by proposer in FITS format, even if the data already exist in the archive.

7.1.6   Engineering Data Archive

7.1.6.1   Archive Recorded Engineering Data - Life of Mission

The archive shall ingest and store Recorded Engineering Data for the life of the mission. [DMS-655]

7.1.6.2   Archive Recorded Engineering Data

The archive shall ingest and store Recorded Engineering Data. [DMS-656]

7.1.6.3   Archive Observatory Status Data - Life of Mission

The archive shall ingest and store Observatory Status Data for the life of the mission. [DMS-210]

7.1.6.4   Archive Observatory Status Data

The archive shall ingest and store Observatory Status Data. [DMS-297]

7.1.6.5   Archive Definitive Ephemeris Data - Life of Mission

The archive shall ingest and store Definitive Ephemeris Data for the life of the mission. [DMS-211]

7.1.6.6   Archive Definitive Ephemeris Data

The archive shall ingest and store Definitive Ephemeris Data. [DMS-298]

7.1.6.7   Archive WFS&C Archive Packages - Life of Mission

The archive shall ingest and store WFS&C Archive Packages for the life of the mission. [DMS-212]

7.1.6.8   Archive WFS&C MCS Archive Package

The archive shall ingest and store the WFS&C MCS archive package. [DMS-300]

7.1.6.9   Restrict Access to WFS&C MCS Archive package

Ingest shall set a restricted status on the WFS&C MCS archive package. [DMS-657]

7.1.6.10 Archive WFS&C WAS Archive Package

The archive shall ingest and store the WFS&C WAS archive package. [DMS-299]

7.1.6.11 No Access Restrictions on WFS&C WAS Archive Package

Ingest shall set no proprietary restrictions on the WFS&C WAS archive package. [DMS-658]

7.1.6.12 Archive WFS&C OPD Files

The archive shall ingest and store the WFS&C OPD files. [DMS-659]

Note: When the optional WFS&C OPD files exist, they will be transferred from WSS to DMS along with a WAS archive package.

7.1.6.13 No Access Restrictions on WFS&C OPD Files

Ingest shall set no proprietary restrictions on the WFS&C OPD files. [DMS-760]

7.1.6.14 Archive WFS&C WEx Archive Package

The archive shall ingest and store the WFS&C WEx archive package. [DMS-761]

7.1.6.15 No Access Restrictions on WEx Archive Package

Ingest shall set no proprietary restrictions on the WFS&C WEx archive package. [DMS762]

7.1.6.16 Recorded Engineering Data Archive Performance

EDP shall provide Archive Ingest with at least 99.75% of all Recorded Engineering Telemetry Data files received from FOS to catalog and store in the Engineering Data Archive. [DMS-214]

7.1.6.17 On-line Engineering Archive Catalog

Archive ingest shall maintain an on-line Engineering Archive Catalog identifying and describing all of the data files that exists in the Engineering Data Archive. [DMS-215]

7.1.6.18 Recorded Engineering Archive Data Volume - 5.5 Years

Archive ingest shall be capable of storing in the Engineering Data Archive at least 1.6 TBytes of Recorded Engineering Telemetry Data over a 5-year mission. [DMS-218]

7.1.6.19 Recorded Engineering Archive Data Volume - 10 Years

The design of the Engineering Data Archive shall be scalable to a capacity of at least 3.2 TBytes of Recorded Engineering Telemetry Data over a 10-year mission. [DMS-204]

Note: This is to support the goal of a 10-year mission. The requirement means that while the as-built system only has a required capacity of 1.6 TBytes, it should be possible to double that capacity without significant redesign.

7.1.6.20 Public DMS Engineering Database

The DMS engineering database shall be accessible to the public. [DMS-258]

7.1.6.21 Engineering Database Parameters

The engineering database shall contain parameters necessary for science data processing and calibration. [DMS-319]

Note: These engineering parameters include ancillary information for the science data user, and the engineering parameters are needed for science data calibration.

7.1.6.22 Engineering Database - Parameter Queries

DMS engineering database users shall have the capability to query the DMS engineering database for any engineering parameter contained in the database. [DMS-259]

7.1.6.23 Engineering Database - Time Queries

The DMS engineering database shall have the capability to be queried for engineering parameters over a given time frame.   [DMS-257]

7.1.6.24 Engineering Database Web Service

The web service for the DMS engineering database shall provide the same results for an identical query issued by user input and operational software. [DMS-277]

7.1.7   Storage Broker

7.1.7.1   File Uniqueness

The storage broker shall uniquely identify each file in the archive. [DMS-323]

7.1.7.2   Latest Version of Data

The storage broker shall have the capability to provide the latest version of all data. [DMS-324]

7.1.7.3   On-line Access to Processing Data

The storage broker shall provide on-line access to the latest version of the processed data. [DMS-325]

7.1.7.4   On-line Access to Contributed Data

The storage broker shall provide on-line access to the latest version of contributed data. [DMS-326]

7.1.7.5   Lossless Compression of Data

The storage broker shall have the capability to compress data sets losslessly prior to writing data to the primary data store and safestore. [DMS-327]

7.1.7.6   Storage Broker Checksum

The storage broker shall compute a checksum on files as received from Ingest. [DMS-328]

7.1.7.7   Storage Broker Checksum to Ingest

The storage broker shall return the value of the checksum to Ingest. [DMS-329]

7.1.7.8   Location of Data Files on Primary Data Store

The storage broker shall register the location of the data files on the primary data store in the archive catalog. [DMS-330]

7.1.7.9   Location of Data Files on Safestore

The storage broker shall register the location of the data files on the safestore in the archive catalog. [DMS-331]

7.1.7.10 Continue Ingest with Off-line Safestore

In the event that data cannot be delivered to the long term off-site storage system, the storage broker shall continue to ingest data to the primary data store. [DMS-336]

7.1.7.11 Continue Distribution with Off-line Safestore

In the event that data cannot be delivered to the long term off-site storage system, the storage broker shall continue to distribute data from the primary archive. [DMS-337]

7.1.7.12 Store Pre-image Files On-line

The storage broker shall store the pre-image file in the on-line cache component of the JWST data archive.   [DMS-756]

7.1.8   Archive User Interface

7.1.8.1   Search Science Catalog

The AUI shall provide a capability to search the Science Archive Catalog. [DMS-206]

7.1.8.2   Export Science Catalog Search Results

The AUI shall provide the capability to export search results in common tabular formats. [DMS-339]

Note: Current formats include xml, csv, html, VO table.

7.1.8.3   Duplicate Target Checker

The AUI shall provide a capability to identify duplicate targets across archived and planned observations (either individually or for an entire observing program). [DMS-338]

7.1.8.4   Request Science Data Products

The AUI shall provide a capability for users to request Science Data Products for all data described in the Science Archive Catalog. [DMS-222]

7.1.8.5   Display Data Previews

The AUI shall have the capability to display data previews. [DMS-340]

7.1.8.6   Display Data Footprints

The AUI shall have the capability to display footprints of existing data in a field. [DMS-341]

7.1.8.7   Group Data for Retrieval

The AUI shall provide the capability to retrieve files in groups identified by the use of predefined retrieval categories. [DMS-342]

Note: Example retrieval categories for HST: uncalibrated, calibrated, image only, best reference files, used reference files, etc. Other JWST categories may include mosaic components, dither components, etc.

7.1.8.8   Search Engineering Archive Catalog

The Archive User Interface shall provide a capability to search the Engineering Archive Catalog. [DMS-216]

7.1.8.9   Retrieve Recorded Engineering Data

The AUI shall provide the capability to retrieve Recorded Engineering data files. [DMS-343]

7.1.8.10 Query Engineering Database for Parameters

The AUI shall provide the capability to query the DMS engineering database for any engineering parameter contained in the database. [DMS-344]

7.1.8.11 Query Engineering Database over Time

The AUI shall provide the capability to query the DMS engineering database for engineering parameters over any time frame. [DMS-345]

7.1.8.12 Export Engineering Database Search Results

The AUI shall provide the capability to export search results from the DMS engineering database in time series formats. [DMS-346]

7.1.8.13 Map Calibrated Engineering Data to Science Data

AUI shall provide the capability to identify and retrieve calibrated engineering data that corresponds to specific science data. [DMS-347]

7.1.8.14 Filter and Sort Engineering Database Search Results

The AUI shall provide the capability to filter and sort search results. [DMS-348]

7.1.8.15 Distribution Mechanisms

The AUI shall provide the user with the available choices of distribution mechanisms. [DMS-349]

7.1.8.16 Unfulfilled Request

The AUI shall inform the user if a request cannot be fulfilled. [DMS-351]

7.1.8.17 AUI User Subscription Service Support

The AUI shall be capable of supporting a user subscription service on a specific program, observation, or data set basis. [DMS-352]

Note: Archive users can participate in a subscription service that will notify them when data become non-proprietary or are reprocessed.

7.1.8.18 Package Retrieved Files for Transfer

The AUI shall provide options for packaging of files for transfer to user using common compressed archive formats. [DMS-449]

Note: For example: zip, gzip (lossless), tar, possibly FITS compression

7.1.8.19 Authenticate Registered User

The AUI shall authenticate a registered archive username and password. [DMS-353]

7.1.8.20 Support Guest User Account

The AUI shall provide access to a non-registered user using an archive username of 'anonymous' when provided with a valid email address as the password. [DMS-354]

7.1.8.21 No Proprietary Data for Guest Users

The AUI shall reject a request for proprietary data from a guest user. [DMS-356]

7.1.8.22 Provide Access to Level-4 Data Products

The archive user interface shall provide user access to level-4 data products and their associated documentation. [DMS-357]

7.1.8.23 Host Level-4 Data Products

The archive shall host level-4 data products and their associated documentation for retrieval through the archive user interface. [DMS-358]

Note: Level 4 products are designed to allow research on the entire JWST archive, and would include, for example, large catalogues of objects derived from the observations of many individual observations. As such as the development of Level 4 products would only be contemplated after a substantial portion of the mission had been completed.

7.1.8.24 Follow MAST Guidelines

User contributed level-4 data products (High-Level Science Products) will be delivered to the archive following the MAST guidelines and policies. [DMS-359]

Note: See http://archive.stsci.edu/hlsp/hlsp_guidelines.html

7.1.8.25 Inform Users of more Recent Version

The Archive User Interface (AUI) shall inform users when there is a more recently produced version of data available than the version that was requested. [DMS-677]

7.1.8.26 Inform Users of Batch Mode Option

Upon failure of a direct access distribution request, the Archive User Interface (AUI) shall inform users that data may be obtained via a batch-mode distribution request. [DMS-679]

7.1.8.27 Retrieve Pre-image Data Files with Science Data

The Archive User Interface shall provide an option to retrieve the associated pre-images with an archive retrieval request for science data. [DMS-757]

7.1.8.28 Notification on Direct Access Request Receipt

The AUI shall notify the user when a direct access request has been received and validated. [DMS-764]

7.1.9   Data Distribution

7.1.9.1   Direct distribution to PIs

The Archive shall make new science data sets available to the Principal Investigator (PI) of the observing program through Direct Distribution. [DMS-223]

7.1.9.2   Distribute Science Data Products

Distribution shall provide archived science data products upon request. [DMS-224]

7.1.9.3   Distribute Uncalibrated and/or Calibrated Data

Distribution shall be capable of providing uncalibrated and/or calibrated data upon request. [DMS-207]

7.1.9.4   Distribute Calibration Reference Data

Distribution shall provide calibration reference data upon request. [DMS-226]

7.1.9.5   Distribute Recorded Engineering Data

Distribution shall provide Recorded Engineering Telemetry Data upon request. [DMS-217]

7.1.9.6   Distribute Recorded Engineering Data for Life of Mission

Distribution shall be capable of retrieving any Archived Engineering Telemetry Data that was stored in the Engineering Data Archive for the life of the mission. [DMS-219]

7.1.9.7   Recorded Engineering Data Distribution Performance

Distribution shall retrieve up to one day of archived Recorded Engineering Telemetry Data within 60 minutes for 95% of requests. [DMS-220]

7.1.9.8   Direct Distribution

Distribution shall have the capability to distribute data directly to archive users via electronic mechanisms. [DMS-228]

7.1.9.9   Batch Mode Distribution

The Archive shall support batch mode distribution of data to archive users via electronic and shippable media mechanisms. [DMS-675]

7.1.9.10 Shippable Media Distribution

Distribution shall have the capability to distribute data to archive users via shippable media. [DMS-447]

Note: Examples of shippable media include DVD and external USB drive.

7.1.9.11 Batch Distribution Mechanism Operator Override

An archive operator shall have the capability to override the user selected batch distribution mechanism. [DMS-448]

7.1.9.12 Unique Identifier for Archive Request

Each archive request shall have a unique identifier. [DMS-361]

7.1.9.13 Distribution Request History

The distribution software shall maintain a permanent history of the processing status for every request. [DMS-362]

7.1.9.14 Regulate Single User Resources

Distribution shall regulate the system resources consumed by a single user. [DMS-363]

7.1.9.15 Batch Distribution Priority

Batch distribution shall have the capability to set the processing priority on an archive request. [DMS-452]

7.1.9.16 Batch Mode Distribution Priority Adjustment

The Archive shall have the capability to adjust the priorities of batch mode data distribution requests. [DMS-676]

7.1.9.17 Pause Batch Archive Request

An authorized operator shall have the capability to manually pause the processing of a batch archive request. [DMS-364]

7.1.9.18 Resume Batch Archive Request

Distribution shall have the capability to resume a paused batch archive request from the point it was paused. [DMS-365]

7.1.9.19 Terminate Batch Archive Request

An authorized operator shall have the capability to manually terminate the processing of a batch archive request. [DMS-366]

Note: A terminated batch archive request cannot be resumed.

7.1.9.20 Restart Batch Archive Request

Distribution shall have the capability to restart a terminated batch archive request. [DMS-367]

7.1.9.21 Flush Terminated Batch Archive Request

Distribution shall have the capability to flush a terminated batch archive request from the system. [DMS-368]

7.1.9.22 Partial Archive Request Failure

Failure to retrieve some files due to an incorrect user specification in an archive request shall not result in failure of the entire request. [DMS-369]

Note: Examples: proprietary data without access rights & non-proprietary data in the same request, nonexistent file requested, catalog errors.

7.1.9.23 Batch Archive Request Transmission Error

When a batch archive request fails due to a transmission error, distribution shall save the state of the request and, on recovery, only transmit files not previously transmitted. [DMS-370]

7.1.9.24 Requests State Saved on Halt

If the batch distribution system is halted, it shall have saved the state of all batch requests and, on recovery, resume processing the requests. [DMS-371]

7.1.9.25 Report Distribution Fault Conditions

Distribution shall make fault conditions available to the Archive Operator Interface. [DMS-372]

7.1.9.26 Successful Request Submission Notification

Distribution shall notify the archive user on successful submission of a request from the AUI to the distribution system. [DMS-374]

7.1.9.27 Request Status

Distribution shall provide a mechanism for the archive user to check on the current status of the archive request. [DMS-373]

7.1.9.28 Request Success Notification

Distribution shall notify the archive user on successful completion of a request. [DMS-375]

7.1.9.29 Unsuccessful Request Notification

Distribution shall notify the archive user that a problem occurred on the unsuccessful completion of a request. [DMS-376]

7.1.9.30 Distribution Request Authentication

Distribution shall authenticate the archive username and password for a request from a registered user. [DMS-377]

7.1.9.31 Distribution to Unregistered Users

Distribution shall be capable of distributing data to unregistered users. [DMS-378]

7.1.9.32 Retrieve Latest Version

By default, distribution shall retrieve the latest version of a file. [DMS-380]

7.1.9.33 Override Default Retrieval Version

Distribution shall have the capability to override the default retrieval version of any file. [DMS-381]

7.1.9.34 Deliver File in same Form

Distribution shall be capable of delivering a requested file to a user that is identical in content to the file that was ingested. [DMS-660]

7.1.9.35 Distribution Manifest

A manifest shall accompany all distributions on shippable media. [DMS-383]

7.1.9.36 File Compression for Data Transfer

Distribution shall support file compression options for transfer to user. [DMS-385]

Note: Examples: gzip (lossless), FITS compression (lossless and lossy)

7.1.9.37 Packaging of Files for Transfer

Distribution shall support packaging of files for transfer to user using common archive formats. [DMS-386]

Note: For example: zip, tar, none

7.1.9.38 Distribution Options in Notification

Distribution shall report requested compression and packaging information in the notification to the user. [DMS-387]

7.1.9.39 Direct Access to Public Data

Distribution shall provide direct access to public data. [DMS-388]

7.1.9.40 Control Direct Access to Data

Distribution shall be able to control access to selected data. [DMS-389]

7.1.9.41 Labels for Each Piece of Media

Distribution shall label each piece of shippable media connected to a request. [DMS-393]

Note: Label specification should include: User Name, tracking_id, date the media is written.

7.1.9.42 Distribution Performance to External Users

The DMS shall be capable of distributing to external users of the Science Data Archive at least 30 TBytes of archived science data products per year over a 5.5 year mission. [DMS-229]

7.1.9.43 Distribution Performance to Internal Users

The DMS shall be capable of distributing to internal STScI users of the Science Data Archive at least 113 TBytes of archived science data products per year over a 5.5 year mission. [DMS-360]

7.1.9.44 Notification Message on Batch Request Receipt

Distribution shall notify the user when the batch request has been received and validated. [DMS-399]

7.1.9.45 Notification Message on Failed Batch Request Validation

Distribution shall notify the user when the batch request is received and fails validation. [DMS-400]

7.1.9.46 Notification on Delivery Completion

Distribution shall notify users when the delivery of their data is complete. [DMS-401]

7.1.9.47 Distribution to Other Archive Facility Performance

The DMS shall be capable of distributing to other archive facilities at least TBD TBytes of Archived Science Data per year over a 5.5 year mission. [DMS-230]

7.1.9.48 Push Data to Public Mirror Site

The Archive shall have the capability to push the latest version of non-proprietary science data onto public mirror sites. [DMS-287]

7.1.9.49 Push Data to Protected Mirror Site

The Archive shall have the capability to push the latest version of selected data from the science archive onto a protected mirror site. [DMS-288]

Note: mirror site may be internal to the S&OC (an internal cache)

7.1.9.50 Data Products from Mirror Site

The Archive shall have the capability to transfer selected data products from an archive mirror site. [DMS-286]

7.1.9.51 Archive Catalog to Mirror Site

The Archive shall have the capability to push the latest version of the archive catalog onto mirror sites. [DMS-499]

7.1.9.52 Pre-image File Access

Distribution shall provide direct access to pre-image files through a web service. [DMS-758]

7.1.10 Proprietary Rights

7.1.10.1 Proprietary Data Period

Distribution shall limit access to level 1, 2, 3, and 4 archived science data during a proprietary data period to the Principal Investigator (PI) of a Science Proposal and his/her designees. [DMS-231]

7.1.10.2 Default Proprietary Period

Ingest shall set the default proprietary period on a program basis as defined by JWST Science Policy. [DMS-402]

7.1.10.3 Modify Proprietary Period

An operator capability shall exist to modify proprietary dates at the program or observation level. [DMS-403]

7.1.10.4 Log Proprietary Period Modifications

All modifications to the proprietary date of data shall be logged in a database table. [DMS-404]

7.1.10.5 Notification of Public Data

The archive user subscription service shall include a notification as to when data become public. [DMS-405]

7.1.10.6 Recorded Engineering Data Access

Recorded engineering files shall only be available for superuser access. [DMS-355]

7.1.10.7 Non-proprietary Data Access

Distribution shall provide public access to non-proprietary archived science data. [DMS-232]

7.1.10.8 Levels of Data Access

The archive shall enforce three levels of archive data access: restricted, proprietary, and public. [DMS-407]

7.1.10.9 Modify Data Restriction

An operator capability shall exist to modify the restriction of data at the program or observation level. [DMS-408]

Note: Certain data taken in conjunction with one proposal can overlap data taken in another earlier proposal. When this happens, the data from the later proposal will be "restricted" so that even its owners cannot retrieve it for a certain period of time. This data is also referred to as "embargoed."

7.1.10.10   Log Data Restriction Modifications

All modifications to the access control of data shall be logged in a database table. [DMS-409]

7.1.10.11   Data Access Enforced by Distribution

Distribution shall enforce the data access control on a program or observation. [DMS-410]

7.1.10.12   Proprietary Data Retrieval

Distribution shall enforce the rule that a user must be registered with the archive in order to retrieve proprietary data. [DMS-411]

7.1.10.13   Notification of Attempt to Retrieve Proprietary Data

Distribution shall notify archive users of their attempt to retrieve proprietary data on the email response sent when the retrieval request is submitted. [DMS-412]

7.1.10.14   Notification of Unsuccessful Request Submission

Distribution shall notify archive users of their unsuccessful attempt to retrieve restricted data in the email response sent when the retrieval request is submitted.   [DMS-413]

7.1.10.15   Notification of Restricted Data Request

Distribution shall warn archive users of the restricted nature of the data retrieved in the email notification of successful retrieval of restricted data. [DMS-678]

7.1.10.16   Indication of Proprietary Status

The AUI shall indicate the proprietary status of data. [DMS-414]

7.1.10.17   Indication of Restricted Status

The AUI shall indicate the restricted status of data. [DMS-415]

7.1.10.18   Levels of Registered Archive Users

There shall be three levels of registered archive users, each providing different levels of user access: superuser, analyst, and general. [DMS-416]

7.1.10.19   Superuser

A superuser shall have the capability to retrieve any data in the archive. [DMS-417]

7.1.10.20   Analyst

An analyst shall have the capability to retrieve any data in the archive that is not restricted. [DMS-418]

7.1.10.21   General Archive User

A general user shall have the capability to retrieve public data and any proprietary data for which he/she has been granted access. [DMS-419]

7.1.10.22   Public Data for Any User

Any user shall have the capability to retrieve data in the archive that is public. [DMS-420]

7.1.10.23   Only Public Data for Unregistered User

An unregistered user shall have the capability to retrieve only public data from the archive. [DMS-421]

7.1.10.24   Pre-image Proprietary Rights

The Archive shall enforce proprietary rights on the pre-image data files. [DMS-759]

Note: PPS will authenticate the proposal system user and pass that information to the archive. The archive will use the passed credentials to verify that the proposal system user is authorized to retrieve the pre-image data files.

7.1.11 Archive Operator Interface (AOI)

7.1.11.1 AOI Access

The AOI shall be accessible remotely and electronically via the STScI intranet. [DMS-422]

7.1.11.2 AOI Access Authentication

The AOI shall control access to the Archive System via a username/password authentication scheme. [DMS-423]

7.1.11.3 AOI Remote Monitor and Control

The AOI shall enable operators to monitor and control the Archive System remotely through the use of Archive System Monitor/ Control Pages. [DMS-424]

7.1.11.4 Display AOI Page Name

The AOI shall display the name of an Archive System Monitor/ Control Page near the top of the page. [DMS-425]

7.1.11.5 Display AOI Pages on Demand

The AOI shall display Archive System Monitor/ Control Pages on demand. [DMS-426]

7.1.11.6 Display AOI Pages Resizable

The AOI shall enable Archive System Monitor/ Control Pages to be resizable. [DMS-427]

7.1.11.7 Display AOI Pages Updates in Real-time

The AOI shall update Archive System Monitor/ Control Pages in real-time. [DMS-428]

7.1.11.8 Select Components

The AOI shall provide for operator selection of which Archive System components to monitor/ control. [DMS-429]

7.1.11.9 AOI Overall Monitoring

The AOI shall enable overall operator monitoring of the Archive System via selected monitoring of the servers and processes comprising the system and selected monitoring of the data ingest and data distribution requests made to the Archive System. [DMS-430]

7.1.11.10   AOI Server Monitor Pages

The AOI shall provide Archive System Server Monitor Pages displaying server status information including the following: server up or down, task server working on, number of requests received in last T hours (where T is an operator tunable software parameter), number of requests in trouble, number of requests pending, state of requests (queued, active, paused, terminated). [DMS-431]

7.1.11.11   AOI Request Monitor Pages

The AOI shall provide Archive System Request Monitor Pages displaying active request status information including the following: request identifier, request data source, request data destination, state of request (on hold, data being retrieved from disk, data being written to media). [DMS-432]

7.1.11.12   AOI Summary Status Information

The AOI shall continuously display a summary of Archive System status information on every Archive System Monitor/Control Page. [DMS-433]

7.1.11.13   Order AOI Status by Any Displayed Field

The AOI shall enable displayed status information to be ordered by any displayed field. [DMS-434]

7.1.11.14   AOI Errors and Alarms

The AOI shall actively present Archive System errors and alarms to operators in real-time and without regard to the Archive System Monitor/Control Page currently being displayed. [DMS-435]

7.1.11.15   Examine Log Files through AOI

The AOI shall provide the capability for operator examination of Archive System Log Files. [DMS-436]

7.1.11.16   AOI Operator Control

The AOI shall enable overall operator control of the Archive System via selected control of the servers and processes comprising the system and selected control of the data ingest and data distribution requests made to the system. [DMS-437]

7.1.11.17   AOI Server Control Pages

The AOI shall provide Archive System Server Control Pages enabling operators to manage Archive System workload via selectively terminating/restarting/pausing/resuming Archive System servers and processes. [DMS-438]

7.1.11.18   AOI Request Control Pages

The AOI shall provide Archive System Request Control Pages enabling operators to manage Archive System workload via selectively terminating/restarting/pausing/resuming requests made to the Archive System. [DMS-439]

7.1.11.19   AOI Disable Request Acceptance

The AOI shall enable operators to disable the acceptance of new Archive System Requests until current Archive System Requests have completed. [DMS-440]

7.1.11.20   AOI Disable Request Acceptance for Time

The AOI shall enable operators to disable the acceptance of new Archive System Requests for an indefinite period of time. [DMS-441]

7.1.11.21   AOI Prioritize Requests

The AOI shall enable operators to prioritize requests made to the Archive System. [DMS-442]

7.1.11.22   AOI Select Multiple Requests

The AOI shall enable selected multiple requests made to the archive system to be operated on as a group. [DMS-443]

7.1.11.23   AOI Modify Restricted and Proprietary Dates

The AOI shall enable operators to modify restricted and proprietary dates assigned to data within the Archive System. [DMS-444]

7.1.11.24   AOI Override System Defaults

The AOI shall enable operators to override selected defaults within the Archive System. [DMS-445]

7.2   SID Archive Requirements

7.2.1   SID Archive Ingest Requirements

7.2.1.1   Store JWST I&T Data

JWST I&T Data shall be stored in the SID Archive. [DMS-185]

7.2.1.2   Notification to Archive

The SID Archive shall receive notification from JWST users when I&T data are available for archiving. [DMS-184]

7.2.1.3   I&T Data Archive Access

The SID Archive shall provide mechanisms to control which JWST users have access to the SID Archive for ingesting I&T Data. [DMS-183]

7.2.1.4   I&T Archive Data Delivery

The SID Archive shall support multiple methods of I&T Data delivery for archiving including the following:

mirrored disk volumes local to the STScI

network transfers

removable media shipped to the STScI [DMS-182]

7.2.1.5   Receipt of I&T Data

The SID Archive shall receive I&T Data from JWST users. [DMS-181]

7.2.1.6   File and Package Based Archive Requests

The SID Archive shall support both File Based and Package Based archive requests. [DMS-180]

7.2.1.7   File Names Unique

A File Based archive request shall be comprised of a set of uniquely named files contained in a specified directory. [DMS-179]

7.2.1.8   Archive File Individually

Each file in a File Based archive request shall be archived individually. [DMS-178]

7.2.1.9   Verify FITS Standard

Each FITS file contained within a File Based archive request shall be examined prior to its ingest to determine its adherence to the FITS File Standard. [DMS-177]

7.2.1.10 Package Based Archive Request

A Packaged Based archive request shall be comprised of a set of files contained in a directory hierarchy with its top-level directory specified; this constitutes a Package. [DMS-174]

7.2.1.11 Unique Name for TAR File

Each Package shall be bundled into a uniquely named tar file prior to its ingest into the SID Archive. [DMS-173]

7.2.1.12 Disposition of Archive Request

The SID Archive shall notify requesting JWST users of the success or failure disposition of their data archive requests. [DMS-171]

7.2.1.13 I&T Archive Data Volume

The SID Archive shall be capable of storing up to 58.5 TBytes of I&T Data. [DMS-166]

7.2.1.14 I&T Archive Protection

The SID Archive shall protect its data and functions accessing the data in accordance with NASA Procedural Requirements (NPR) 2810.1 and Goddard Procedures and Guidelines (GPG) 2810.1. [DMS-165]

7.2.2 SID Archive Cataloging Requirements

7.2.2.1 I&T Archive Catalog

The SID Archive shall maintain an on-line I&T Archive Catalog identifying and describing all of the data that exist in the SID Archive. [DMS-164]

7.2.2.2 I&T Archive Access

The SID Archive Catalog shall be accessible via electronic means. [DMS-163]

7.2.2.3 I&T Archive Catalog Search

The SID Archive Catalog shall be searchable upon request. [DMS-162]

7.2.2.4 I&T Archive Catalog Information

The SID Archive shall receive information used for cataloging I&T Data from JWST users. [DMS-161]

7.2.2.5 Metadata from Readme.xml File

Information used for cataloging each file in a File Based archive request shall consist of metadata contained in a Readme.xml file provided with the request. [DMS-160]

7.2.2.6 Metadata from FITS Headers

Information used for cataloging each FITS file in a File Based archive request shall include metadata extracted from Header Keywords within the FITS file. [DMS-260]

7.2.2.7 Catalog Files Individually

Each file in a File Based archive request shall be cataloged individually. [DMS-159]

7.2.2.8   Metadata in Readme.xml

The metadata contained in the Readme.xml file for population of the Archive Catalog for File Based archive requests shall include the following:

Area - Facility where test was conducted

Phase - Ambient, Cryo, ect.

Start date and time - Date and time of start of test

End date and time - Date and time of end of test

Test Title - As specified in executed test plan

Test Number - As specified in executed test plan

Responsible Organization - Organization which conducted test

Responsible Engineer - Point of Contact for executed test

Test Description - short textual description of purpose/content of executed test

Submission Type Indicator - 'File' [DMS-158]

7.2.2.9   Metadata in FITS Headers

The metadata extracted from FITS Header Keywords for population of the Archive Catalog for FITS files contained within File Based archive requests shall include the following:

DATE - date of FITS file creation

ROOTNAME - rootname of observation set

INSTRUME - identifier of instrument used to acquire data

OBS_ID - observation ID from science data packet image header

DATAMODE - Reference number used to specify ground data processing requirements for this data

TARGNAME - name of target

EXPTIME - observation exposure time [DMS-157]

7.2.2.10 Package Catalog Information

Information used for cataloging Packaged Based archive requests shall consist of metadata contained in a Readme.xml file provided with the request. [DMS-156]

7.2.2.11 Package Readme.xml Information

The metadata contained in the Readme.xml file for population of the Archive Catalog for Packaged Based archive requests shall include the following:

Area - Facility where test was conducted

Phase - Ambient, Cryo, ect.

Start date and time - Date and time of start of test

End date and time - Date and time of end of test

Test Title - As specified in executed test plan

Test Number - As specified in executed test plan

Responsible Organization - Organization which conducted test

Responsible Engineer - Point of Contact for executed test

Test Description - short textual description of purpose/content of executed test

Submission Type Indicator - 'Package' [DMS-155]

7.2.3 SID Archive Retrieval/Distribution Requirements

7.2.3.1 Retrieve I&T Data

The SID Archive shall retrieve archived I&T Data upon request for any data described in the SID Archive Catalog. [DMS-150]

7.2.3.2 I&T Data Electronic Distribution

The SID Archive retrieval/distribution mechanisms shall be accessible via electronic means. [DMS-149]

7.2.3.3 I&T Archive Access Authentication

The SID Archive retrieval/distribution mechanisms shall control access to the SID Archive contents via a username/password user authentication scheme and a group level access restriction scheme. [DMS-148]

7.2.3.4 I&T Archive Distribution Modes

The SID Archive retrieval/distribution mechanisms shall provide multiple methods of I&T Data delivery to requesting users including the following:

user accessible staging disks

ftp network transfer

dvd

cd-r

hard drive

flash media [DMS-147]

7.2.3.5 Distribution of Files and Packages

The SID Archive shall provide both File Based and Package Based archive retrievals/distributions. [DMS-146]

7.2.3.6 Unique File Name

A File Based archive retrieval/distribution shall be comprised of a set of uniquely named files. [DMS-145]

7.2.3.7 Unique TAR Name for Packages

A Packaged Based archive retrieval/distribution shall be comprised of a uniquely named tar file containing a directory hierarchy containing a set of files. [DMS-144]

7.2.3.8 Notification of Request Disposition

The SID Archive shall notify requesting users of the success or failure disposition of their retrieval/distribution requests. [DMS-143]

7.2.3.9 Notification of Data Availability

The SID Archive shall inform requesting users when their requested data has been retrieved and is available for distribution. [DMS-142]

8   DMS Reprocessing Component Requirements

8.1   Reprocessing

8.1.1   General Reprocessing Requirements

8.1.1.1   Generate Science Data Products from Archive

The DMS shall be capable of generating Science Data Products for any data stored in the Science Data Archive for the life of the mission. [DMS-235]

8.1.1.2   Most Current Calibrations

Calibrated data (i.e., data processed to remove instrument signatures) shall be supplied upon request, using the most current calibrations applicable to the data set. [DMS-236]

8.1.2   Science Data Reprocessing

8.1.2.1   Reprocessing Reentry Point

The reprocessing system shall determine the proper reentry point for an observation to be reprocessed. [DMS-237]

8.1.2.2   Reprocess From Level-1a Data

Reprocessing shall be capable of starting with level-1a data. [DMS-238]

8.1.2.3   Reprocess From Level-2a Data

Recalibration shall be capable of starting with level-2a data. [DMS-239]

8.1.2.4   Reprocess From Level-1b Data

Reprocessing shall be capable of starting with level-1b data. [DMS-588]

8.1.2.5   Access Any Definitive Ephemeris

DMS shall maintain the capability to access definitive ephemeris data at any time in the mission for which definitive data exist. [DMS-240]

8.1.3   Reprocessing Logic

8.1.3.1   Monitor CRDS

The Reprocessing System shall monitor calibration reference files changes in the CRDS. [DMS-581]

8.1.3.2   Monitor Software Versions

The Reprocessing System shall monitor changes in data processing software. [DMS-582]

8.1.3.3   Observation Ready for Reprocessing

The Reprocessing System shall determine when an observation is ready for reprocessing. [DMS-583]

8.1.4   Reprocessing Rules

8.1.4.1   Only Reprocess Complete Observations

The Reprocessing System shall only select completed observations for automatic reprocessing. [DMS-584]

Note: A complete observation has no more exposures expected.

8.1.4.2   Use Current Best Reference Files and Software

The Reprocessing System shall use the current best reference files and software for a given observation at the time of reprocessing. [DMS-585]

Note: The most current applicable calibration data that has been approved and released should be used.

8.1.4.3   Replace Data Products in Primary Archive

Reprocessed observation data products shall supersede their previous version in the primary archive. [DMS-586]

8.1.4.4   Re-catalog on Reprocessing Ingest

Reprocessed observation data products shall repopulate the Archive Catalog with information from the reprocessed data headers upon archive ingest. [DMS-674]

8.1.4.5   Manual Input of Reprocessing Observations

The Reprocessing System shall accept manual input of a list of observations to be reprocessed regardless of their reprocessing system state. [DMS-587]

8.1.5   Reprocessing Priority

8.1.5.1   Reprocessing Priorities

The DMS shall process data in the following priority order:

- Data designated to be processed immediately

- Processing on initial receipt of data from the telescope

- Reprocessing of an observation less than one year from execution requested by an archive user

- Reprocessing of an observation more than one year from execution requested by an archive user

- Reprocessing of data less than one year from execution

- Reprocessing of data more than one year from execution [DMS-590]

8.1.6   Reprocessing and the AUI

8.1.6.1   AUI Show Current Best Reference Files

The Archive User Interface shall show the current reference files for an observation. [DMS-591]

8.1.6.2   AUI Show Current Software Version

The Archive User Interface shall show the current version number for each calibration step of an observation. [DMS-592]

8.1.6.3   Estimated Time for Reprocessing

The AUI shall show the estimated time until data with the most current calibration will be available, if primary archive does not have the latest calibration. [DMS-661]

8.1.6.4   Notification of Reprocessed Data

The archive user subscription service shall include a notification as to when data become reprocessed. [DMS-597]

8.1.7   Reprocessing and Header Keywords

8.1.7.1   Header Keywords for Calibration Reference Files

All calibration reference files used in data processing shall be captured in header keywords. [DMS-593]

8.1.7.2   Header Keywords for Software Versions

Header keywords shall reflect the software version of each calibration step used to process the data file. [DMS-594]

8.1.8   Reprocessing Performance

8.1.8.1   Best Calibration Frequency

Calibrated data products requested through the Archive User Interface shall have the current calibration at least 95% of the time. [DMS-595]

Note: Only 5% of retrieval requests should require reprocessing before delivery in order to have the current best calibration. Ideally, archive users want immediate access to data with the best calibrations.

9   DMS Operational Tool Requirements

9.1   Operational Tools

9.1.1   Documentation

9.1.1.1   Searchable Shift Report

Operational tools shall support the creation, storage and online display of a searchable archive of operator shift reports. [DMS-599]

9.1.1.2   Searchable Data Processing Errors

Operational tools shall support the creation, storage, and management of a searchable database of data set processing errors and their disposition. [DMS-600]

9.1.1.3   Operating Procedures Support

Operational tools shall support creation, management, and online publishing of DMS standard operating procedures. [DMS-601]

9.1.2   Data Repair

9.1.2.1   Edit Science Telemetry File

Operational tools shall be capable of editing level-0 science headers and trailers to repair critical formatting information for level-1a data set creation. [DMS-602]

9.1.2.2   Process Data with Missing Pixels

Operational tools shall enable the processing of an exposure with missing data. [DMS-603]

Note: In the event that data transmission or recorder management problems result in partial exposures, they are expected to wait indefinitely in the pipeline for the remaining data that will never arrive. An operational tool would flag the exposure as incomplete, allow for manual editing of the header or adding fill data, and cue the pipeline to continue processing.

9.1.2.3   Calibrated Engineering Data Gap Reports

Operational tools shall generate a report of gaps in the calibrated engineering database including a list of exposures affected by the missing data. [DMS-604]

9.1.3   Troubleshooting

9.1.3.1   Report on Association Dependencies

Operational tools shall generate a human readable report of association product dependencies. [DMS-605]

9.1.3.2   S/c Events Report

Operational tools shall generate a report of merged observation status file contents for events in a given time period. [DMS-606]

9.1.3.3   Data Processing Message Report

Operational tools shall generate a time-tagged report containing all processing log events, filterable by data set name, process name, and error type. [DMS-607]

9.1.4   Archive Quality

9.1.4.1   Archive Completeness

Operational tools shall generate a report that determines if all expected

Level-0 telemetry data sets

Science exposure data sets

Science association products

Ancillary data sets

in any given time period have been received and archived. [DMS-608]

9.1.4.2   Report on Data Set Availability Time

Operational tools shall generate a report on the timeliness of availability of data sets in the archive. [DMS-609]

9.1.4.3   Header Comparison Tool

Operational tools shall be capable of comparing contents of a FITS data set header with the contents of the following and reporting on discrepancies.

PPS database

Archive catalog

Calibrated engineering database [DMS-610]

9.1.4.4   Physically Delete Data Set from Archive

Operational tools shall be capable of removing a data set completely from the archive and archive catalog. [DMS-611]

9.1.4.5   Logically Delete Data Set from Archive

Operational tools shall be capable of flagging a data set in the archive so as to make it irretrievable. [DMS-612]

9.1.4.6   Purge Versions of Data Set from Archive

Operational tools shall be capable of purging older or inferior versions of current data sets from the primary archive along with their associated catalog entries. [DMS-613]

9.1.5   Processing Exception Handling

9.1.5.1   Cleanup Failed Data Set Processing

Operational tools shall support DMS operators in restarting failed pipeline processing at any stage by performing the appropriate cleanup of all intermediate files or database records. [DMS-614]

9.1.5.2   Cleanup Anomalous Data Set

Operational tools shall be capable of removing all pipeline processing data and database tracking information following receipt of an anomalous data set. [DMS-615]

9.1.5.3   Bypass Calibration Step

Operational tools shall provide a mechanism for bypassing calibration steps completely for a given exposure, observation, or association such that the exposure, observation, or association archives and catalogs correctly. [DMS-616]

9.1.5.4   Force Association Processing

Operational tools shall support forcing an association to complete processing and successfully archive in spite of missing member data set(s). [DMS-617]

9.1.5.5   Override Association Definitions

Operational tools shall provide the manual capability to override association definitions. [DMS-618]

9.2   Contingencies

9.2.1   Archive

9.2.1.1   Archive Data to Problem Class

Operational tools shall be capable of archiving exposures that cannot be processed or cataloged to a problem data archive class. [DMS-619]

9.2.2   Data Flags

9.2.2.1   Flag Unexecuted Exposures or Visits

Operational tools shall have the capability of flagging lost exposures or entire visits as "never executed". [DMS-620]

Note: Used for manual cleanup in the case of lost or corrupted data.

9.2.2.2   Flag Gap in Calibrated Engineering Data

Operational tools shall be capable of manually flagging a gap in the calibrated engineering database that is needed for science processing. [DMS-621]

9.2.2.3   Flag CRDS Delivery as Bad

Operational tools shall have the capability to designate a CRDS delivery as bad. [DMS-622]

9.2.3   Data Transmission

9.2.3.1   Request Retransmission

Operational tools shall provide the capability for a DMS operator to specify a retransmission request for the following from the FOS.

- level-0 science and engineering telemetry files
- observation status files
- calibrated engineering data files
- ancillary files [DMS-623]

9.2.3.2   Receipt of Data via Media

Operational tools shall provide the capability to receive high priority data via alternate media in the event of network outages. [DMS-624]

10   DMS-S&OC Requirement Trace

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
3.1.1.1 Normal Operations Staffing [DMS-1]	3.4.1.1.1 Normal Operations Staffing [SOC-2497]	Demonstration
3.1.1.2 Commissioning Support [DMS-50]	3.1.1.1.4 Facility Support for Mission Operations Team [SOC-1928]	Demonstration
3.1.2.1 Science Telemetry Volume - Peak Load [DMS-114]	3.4.2.3.2 Science Data Receipt Volume - Peak Load [SOC-74]	Test
3.1.2.2 SDP to Ingest Time [DMS-109]	3.4.2.3.3 Science Data Archive Performance [SOC-503]	Analysis
3.1.2.3 Ingest Time [DMS-496]	3.4.2.3.3 Science Data Archive Performance [SOC-503]	Analysis
3.1.2.4 Level-2b Data Product Time [DMS-68]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Test
3.1.2.5 Level-0 to Level-1a Data Processing Rate [DMS-69]	3.4.2.3.1 Science Data Volume [SOC-72]	Demonstration
3.1.2.6 Level-1a Data Storage Rate [DMS-497]	3.4.2.3.3 Science Data Archive Performance [SOC-503]	Demonstration
3.1.2.7 Level-1a to Level-1b Data Processing Rate [DMS-261]	3.4.2.3.1 Science Data Volume [SOC-72]	Demonstration
3.1.2.8 Level-1b Data Storage Rate [DMS-498]	3.4.2.3.3 Science Data Archive Performance [SOC-503]	Demonstration
3.1.2.9 Level-1b to Level-2a Data Processing Rate [DMS-263]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Demonstration
3.1.2.10 Level-2a to Level-2b Data Processing Rate [DMS-494]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Demonstration
3.1.2.11 Level-2b to Level-3 Data Processing Rate [DMS-495]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Demonstration
3.1.2.12 Engineering Database Processing Rate [DMS-262]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Analysis

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
3.1.2.13 WFS&C Data Processing Rate [DMS-269]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561] 3.1.5.1 WFS&C Data Processing Time [SOC-3415]	Test
3.2.1.1 SI FOV Pointing Knowledge [DMS-67]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Analysis
3.2.1.2 FGS to ACS Roll Alignment Accuracy [DMS-266]	3.4.3.2.1 FGS to ACS Roll Alignment Accuracy [SOC-3364]	Analysis
3.2.1.3 SI to FGS Pointing Alignment Accuracy [DMS-267]	3.4.3.2.2 SI to FGS Pointing Alignment Accuracy [SOC-3399]	Analysis
3.2.1.4 SI to FGS Roll Alignment Accuracy [DMS-265]	3.4.3.2.3 SI to FGS Roll Alignment Accuracy [SOC-3402]	Analysis
3.2.1.5 Field Distortion Uncertainty [DMS-268]	3.4.3.2.5 Field Distortion Uncertainty [SOC-2686]	Analysis
3.3.1.1 International System of Units [DMS-59]	3.1.2.2.1 Units [SOC-1562]	Inspection
3.3.1.2 Binary Units [DMS-58]	3.1.2.2.1 Units [SOC-1562]	Inspection
3.3.1.3 Keyword Dictionary [DMS-56]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Inspection
3.3.1.4 IVOA Standards [DMS-55]	3.4.1.2.1.2 Science Archive Catalog Access [SOC-492]	Inspection
3.3.1.5 Data Set Processing History [DMS-54]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Inspection
3.3.2.1 Science Data Product Generation [DMS-234]	3.4.5.1.3 Science Data Product Generation [SOC-529]	Demonstration
3.3.2.2 Science Data Product Format [DMS-264]	3.4.1.2.1.6 Science Data Product Format [SOC-3405]	Inspection
3.3.2.3 FITS Standard [DMS-57]	3.4.1.2.1.6 Science Data Product Format [SOC-3405]	Inspection
3.4.1.1 Data Processing Working Disk Space [DMS-53]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Analysis

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
3.4.2.1 Test System Mimics Operations [DMS-52]	3.4.1.6.1 Software Testing During Operations [SOC-1779]	Demonstration
3.4.3.1 Data Security [DMS-49]	3.4.1.4.1 Data Security [SOC-1754]	Inspection
3.4.3.2 Unauthorized Access [DMS-48]	3.4.1.4.1 Data Security [SOC-1754]	Demonstration
3.4.3.3 DMS Intrusion Security [DMS-644]	3.4.1.4.1 Data Security [SOC-1754]	Demonstration
3.4.3.4 Save the Bits [DMS-47]	3.4.1.4.1 Data Security [SOC-1754]	Demonstration
4.1.1.1 Science Data Receipt [DMS-46]	3.4.1.3.2.1 Science Data Receipt [SOC-2103]	Demonstration
4.1.1.2 Science Data DAN [DMS-43]	3.4.1.3.2.1 Science Data Receipt [SOC-2103]	Test
4.1.1.3 Science Data Archive Ack [DMS-270]	3.4.1.3.2.1 Science Data Receipt [SOC-2103]	Test
4.1.2.1 Recorded Engineering Data Receipt [DMS-41]	3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Demonstration
4.1.2.2 Recorded Engineering DAN [DMS-40]	3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Test
4.1.2.3 Recorded Engineering Data Receipt Ack [DMS-37]	3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Test
4.1.3.1 Calibrated Engineering Data Receipt [DMS-39]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
4.1.3.2 Calibrated Engineering File DAN [DMS-670]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
4.1.3.3 Calibrated Engineering Data Receipt Ack [DMS-671]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
4.1.3.4 Calibrated Engineering Data Volume [DMS-36]	3.3.4.2.2.1 Calibrated Engineering Data Product Distribution Performance [SOC-741]	Test
4.1.4.1 Observatory Status File Receipt [DMS-35]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
4.1.4.2 Observatory Status File DAN [DMS-34]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Test
4.1.4.3 Observatory Status File Archive Ack [DMS-135]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Test
4.1.5.1 Ephemeris Data Receipt [DMS-33]	3.4.1.3.2.5 JWST Ephemeris Data Receipt [SOC-2109]	Demonstration
4.1.5.2 Data Transfer Notification [DMS-32]	3.4.1.3.2.5 JWST Ephemeris Data Receipt [SOC-2109]	Test
4.1.6.1 Requests for Recorded Engineering Data [DMS-30]	3.4.1.3.2.6 Archived Engineering Telemetry Data Transfer [SOC-2708]	Demonstration
4.1.6.2 Retrieval of Recorded Engineering Data [DMS-31]	3.4.1.3.2.6 Archived Engineering Telemetry Data Transfer [SOC-2708]	Demonstration
4.1.6.3 Archived Recorded Engineering Data Transfer Notification [DMS-29]	3.4.1.3.2.6 Archived Engineering Telemetry Data Transfer [SOC-2708]	Test
4.1.7.1 SSR File Accounting Reports Receipt [DMS-687]	3.4.1.3.2.1 Science Data Receipt [SOC-2103] 3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Demonstration
4.1.7.2 SSR File Accounting Reports DAN [DMS-688]	3.4.1.3.2.1 Science Data Receipt [SOC-2103] 3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Test
4.1.7.3 SSR File Accounting Reports Ack [DMS-689]	3.4.1.3.2.1 Science Data Receipt [SOC-2103] 3.4.1.3.2.2 Recorded Engineering Telemetry Data Receipt [SOC-2105]	Test
4.2.1.1 PRD Data Format [DMS-28]	3.4.1.3.4.1 PRD Data Receipt [SOC-2116]	Demonstration
4.2.1.2 PRD as DMS Data Source [DMS-27]	3.4.1.5.1 Operations Data Source [SOC-1775]	Inspection
4.2.2.1 Science Instrument Aperture Information [DMS-26]	3.4.1.5.1 Operations Data Source [SOC-1775]	Demonstration

Check with the JWST SOCCER Database at: https://soccer.stsci.edu
To verify that this is the current version.

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
4.2.2.2 SI Aperture Time Dependence [DMS-25]	3.4.1.5.1 Operations Data Source [SOC-1775]	Inspection
4.2.2.3 SI Aperture Information Archive [DMS-24]	3.4.1.5.1 Operations Data Source [SOC-1775]	Inspection
4.3.1.1 Proposal Receipt [DMS-23]	3.4.1.3.1.1 JWST Proposal Receipt [SOC-2096]	Demonstration
4.3.1.2 Proposal Data Access [DMS-22]	3.4.1.3.1.1 JWST Proposal Receipt [SOC-2096]	Demonstration
4.3.1.3 Types of Phase II Proposal Data [DMS-21]	3.4.1.3.1.1 JWST Proposal Receipt [SOC-2096]	Inspection
4.3.1.4 Pre-image DAN [DMS-752]	3.2.1.3.2.1 JWST Proposal Transfer [SOC-1979]	Test
4.3.1.5 Pre-image ACK [DMS-753]	3.2.1.3.2.1 JWST Proposal Transfer [SOC-1979]	Test
4.3.2.1 Planning and Scheduling Data Receipt [DMS-20]	3.4.1.3.1.3 P&S Data Receipt [SOC-2098]	Demonstration
4.3.2.2 Planning and Scheduling Data Access [DMS-2]	3.4.1.3.1.3 P&S Data Receipt [SOC-2098]	Demonstration
4.3.2.3 Visit Status Information [DMS-3]	3.4.1.3.1.3 P&S Data Receipt [SOC-2098]	Inspection
4.3.3.1 Notifications to PPS [DMS-4]	3.4.1.3.1.4 First Visit Data Notification [SOC-2444]	Test
4.3.3.2 Notification of First Science Data [DMS-5]	3.4.1.3.1.4 First Visit Data Notification [SOC-2444]	Test
4.4.1.1 Science Data Products to WSS [DMS-14]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Demonstration
4.4.1.2 WFS Image Data Calibration [DMS-6]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Demonstration
4.4.1.3 WFS Image Data Transfer [DMS-8]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
4.4.1.4 DMS to WSS Data Transfer [DMS-19]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
4.4.1.5 DMS to WSS Science Data DAN [DMS-10]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
4.4.1.6 DMS to WSS DANs [DMS-9]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
4.4.2.1 WFS&C Archive Package Exchange [DMS-15]	3.4.1.3.3.2 WFS&C Archive Package Exchange [SOC-2091]	Demonstration
4.4.2.2 WSS Archive Packages to DMS [DMS-16]	3.4.1.3.3.2 WFS&C Archive Package Exchange [SOC-2091]	Test
4.4.2.3 Science Data Retrieval Requests [DMS-13]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
4.4.2.4 Archive Package Retrieval Requests [DMS-17]	3.4.1.3.3.2 WFS&C Archive Package Exchange [SOC-2091]	Test
4.4.2.5 DMS to WSS Retrieval Notification [DMS-18]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
4.5.1.1 Data Availability Notices to Observers [DMS-65]	3.4.1.2.1.1 Data Availability Notification [SOC-2083]	Test
4.5.1.2 PI Notification of Visit Data [DMS-64]	3.4.5.1.6 Data Distribution to PI [SOC-564]	Test
4.5.1.3 User Subscription Service [DMS-282]	3.4.5.1.6 Data Distribution to PI [SOC-564]	Test
4.5.1.4 Customization of User Notifications [DMS-283]	3.4.5.1.6 Data Distribution to PI [SOC-564]	Test
4.5.2.1 Access to Archive Catalog [DMS-63]	3.4.1.2.1.2 Science Archive Catalog Access [SOC-492]	Test
4.5.2.2 Access to Science Data [DMS-62]	3.4.1.2.1.5 Science Data Product Access [SOC-546]	Test
4.5.2.3 Science Data Analysis Reports [DMS-61]	3.4.1.2.1.8 Science Data Analysis Product Generation [SOC-2120]	Test
4.5.3.1 Data Distribution to Archive Facilities [DMS-60]	3.4.1.2.3 DMS Interface with International Data Centers [SOC-34]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
4.5.3.2 Software Distribution to Archive Facilities [DMS-285]	3.4.1.2.3 DMS Interface with International Data Centers [SOC-34]	Demonstration
4.5.3.3 Catalog Replication to Archive Facilities [DMS-284]	3.4.1.2.3 DMS Interface with International Data Centers [SOC-34]	Demonstration
5.1.1.1 Perform Level-1 Processing [DMS-70]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.1.2 Guide Star FITS Data [DMS-279]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.1.3 Start of SDP Processing [DMS-71]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.1.4 Generation of Metadata [DMS-72]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Demonstration
5.1.1.5 Priority Processing Requests [DMS-73]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561]	Test
5.1.1.6 Processing in Priority Order [DMS-74]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561]	Test
5.1.1.7 Processing Order Override [DMS-75]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561]	Test
5.1.2.1 Capture Timeline of On-board Events [DMS-76]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Demonstration
5.1.2.2 Capture Visit and Exposure Times [DMS-137]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Inspection
5.1.2.3 Ignore Duplicate Events [DMS-138]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Test
5.1.2.4 Revised Exposure Timelines [DMS-271]	3.4.1.3.2.4 Observatory Status Data Receipt [SOC-2475]	Test
5.1.3.1 Recorded Science Data Receipt [DMS-132]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Demonstration
5.1.3.2 Identification of Science Exposures [DMS-77]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.3.3 Science Image Header Information [DMS-115]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Inspection
5.1.3.4 Recovery of Missing Image Header Information [DMS-91]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.5 Duplicate Science Data [DMS-92]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.6 Ordered List of Science Telemetry Files [DMS-139]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.7 Record Input Files for Each Exposure [DMS-79]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Demonstration
5.1.3.8 Store Image Header Information [DMS-78]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Demonstration
5.1.3.9 Verify Science Data Packet Checksum [DMS-118]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.10 Science Data Packet Checksum Failure [DMS-645]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.11 Determine Complete Exposure [DMS-80]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.3.12 Hold Incomplete Exposures [DMS-81]	3.4.1.2.2.1 Observatory Telemetry Data Format [SOC-1788]	Test
5.1.4.1 Partition Science Telemetry Files [DMS-116]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.4.2 Uncompress Science Telemetry Files [DMS-120]	3.4.2.4.1 Science Data Decompression [SOC-474]	Test
5.1.4.3 Preserve Pixel Values in Level-1a Data [DMS-82]	3.4.2.1.4 Science Data Quality Assessment [SOC-476]	Test
5.1.4.4 Level-1 Data Traceability [DMS-646]	3.4.5.1.3 Science Data Product Generation [SOC-529]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.4.5 Flag Missing or Corrupted Pixels [DMS-121]	3.4.2.1.4 Science Data Quality Assessment [SOC-476]	Test
5.1.4.6 Fill Missing Pixel Values [DMS-122]	3.4.2.1.4 Science Data Quality Assessment [SOC-476]	Test
5.1.4.7 Produce Spatially Contiguous Data Arrays [DMS-83]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.8 FITS Image Parity [DMS-275]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.9 First Pixel Position - imaging [DMS-84]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.10 First Pixel Position - NIRSpec MOS [DMS-662]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.11 FIRST Pixel Position - NIRSpec imaging [DMS-663]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.12 Reference Pixel Inclusion [DMS-85]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.13 No Special Reference Pixel Processing [DMS-90]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.1.4.14 Definition of First Image Axis [DMS-86]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.15 Definition of First Spectral Axis [DMS-276]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.16 Definition of Second image Axis [DMS-87]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.17 Definition of Third Image Axis [DMS-88]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.1.4.18 Definition of Fourth Image Axis [DMS-89]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.4.19 Preserve Pixel Values in Level-1b Data [DMS-93]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.5.1 Populate Level-1 FITS Keyword Values [DMS-94]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.5.2 Extract Observation ID [DMS-119]	3.4.1.3.3.1 Science Data Product Transfer [SOC-2086]	Test
5.1.6.1 Include PPS Information in Header Keyword Values [DMS-133]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Demonstration
5.1.6.2 TEMPLATE keyword [DMS-647]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.6.3 Compare Actual and Planned Keyword Values [DMS-123]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.7.1 S/c Position and Velocity from Definitive Ephemeris [DMS-125]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Test
5.1.7.2 Predictive or Definitive Ephemeris Used [DMS-643]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Test
5.1.7.3 Determine Position and Velocity at Exposure Midpoint [DMS-126]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Test
5.1.7.4 S/c Roll Angle Value [DMS-127]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Test
5.1.7.5 Populate WCS Keyword Values [DMS-128]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Test
5.1.7.6 Differential Velocity Aberration Correction Information [DMS-140]	3.4.3.2.4 SI FOV Pointing Knowledge [SOC-1640]	Inspection
5.1.8.1 Exposure UTC End Time [DMS-129]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.2 Exposure UTC Start Time [DMS-130]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.3 Exposure UTC Midpoint Time [DMS-95]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.8.4 Exposure Barycentric Dynamic End Time [DMS-96]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.5 Exposure Barycentric Dynamic Start Time [DMS-97]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.6 Exposure Barycentric Dynamic Midpoint Time [DMS-98]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.7 Exposure Heliocentric End Time [DMS-273]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.8 Exposure Heliocentric Start Time [DMS-274]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.8.9 Exposure Heliocentric Midpoint Time [DMS-272]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.9.1 Correlate Science and Engineering Data Times [DMS-99]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.9.2 Combine Science and Engineering Data in Data Set [DMS-100]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.9.3 Engineering Data Source [DMS-252]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
5.1.9.4 Engineering Parameters in Header Keyword Values [DMS-253]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Inspection
5.1.9.5 Engineering Information in Header Keyword Values Only [DMS-254]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Inspection
5.1.9.6 Ensure All Engineering Data Present [DMS-251]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
5.1.10.1 Jitter Data Product [DMS-648]	3.4.1.2.1.6 Science Data Product Format [SOC-3405]	Test
5.1.11.1 Science Data Goes into Science Data Archive [DMS-101]	3.4.2.1.3 Archive Science Data [SOC-472]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.11.2 Store all Level-0 Data in the Archive [DMS-103]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
5.1.11.3 Store all Level-1a Data in the Archive [DMS-104]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
5.1.11.4 Store all Level-1b Data in the Archive [DMS-105]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
5.1.11.5 Store all Definitive S/c Ephemeris Data in the Archive [DMS-106]	3.4.4.1.6 Long-Term Storage of Definitive Ephemeris Data [SOC-482]	Demonstration
5.1.11.6 Store all Observation Status Data in the Archive [DMS-107]	3.4.4.1.5 Long-Term Storage of Observatory Status Data [SOC-1862]	Demonstration
5.1.11.7 Store WSS Archive Packages in the Archive [DMS-108]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Demonstration
5.1.11.8 Receive Ingest Confirmation [DMS-278]	3.4.2.3.4 Science Data Archive Reliability [SOC-507]	Test
5.1.11.9 Validate Checksum from Ingest [DMS-683]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
5.1.12.1 Provide Level-1b Data to Calibration [DMS-649]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
5.1.12.2 CRDS Reference File Synchronization [DMS-684]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
5.1.12.3 Current Operational CRDS Configuration [DMS-685]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
5.1.12.4 CRDS Operational History [DMS-686]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
5.1.13.1 Level-0 SDP Archive Performance [DMS-110]	3.4.2.3.4 Science Data Archive Reliability [SOC-507]	Analysis
5.1.13.2 Level-0 Ingest Performance [DMS-493]	3.4.2.3.4 Science Data Archive Reliability [SOC-507]	Analysis

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.1.13.3 Errors Requiring Operator Intervention [DMS-111]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.13.4 Record SDP Fault Information [DMS-112]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.1.14.1 WFS&C Visit Data Processing Performance [DMS-462]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561]	Test
5.1.15.1 NIRSpec MSA Metadata File [DMS-763]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
5.2.1.1 Recorded Engineering Data Processing Rate [DMS-242]	3.4.4.3.1 Engineering Data Processing Volume [SOC-3386]	Test
5.2.1.2 Recorded Engineering Data Peak Processing Rate [DMS-243]	3.4.4.3.2 Engineering Data Receipt Volume - Peak Load [SOC-3388]	Test
5.2.1.3 Recorded Engineering Data Store [DMS-209]	3.4.4.1.1 Storage of Recorded Engineering Data [SOC-720]	Demonstration
5.2.1.4 Recorded Engineering File Time Range [DMS-244]	3.4.4.1.1 Storage of Recorded Engineering Data [SOC-720]	Test
5.2.1.5 Recorded Engineering File Catalog [DMS-245]	3.4.4.1.1 Storage of Recorded Engineering Data [SOC-720]	Test
5.2.1.6 Recorded Engineering File Archive Time [DMS-213]	3.4.4.3.3 Engineering Archive Performance [SOC-1740]	Analysis
5.2.2.1 DMS Engineering Database [DMS-247]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
5.2.2.2 Changes to Eng. Data Subscription [DMS-249]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
5.2.2.3 Only Public Parameters in Eng. DB [DMS-250]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Inspection
5.2.2 Calibrated Engineering Data Products [DMS-246]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.3.1.1 Stage Integration [DMS-500]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.1.2 Multiple Instances of Stages [DMS-501]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.1.3 Stage Instances on Different Machines [DMS-502]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.1.4 Multiple Workflows on the Same Account [DMS-503]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.3.1.5 Different Accounts on the Same Hardware [DMS-504]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.3.1.6 External Trigger Events [DMS-505]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.1.7 Multi-threaded Stages [DMS-506]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.1.8 Connect to Internet [DMS-507]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.1 GUI for Monitoring and Control [DMS-508]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.2 Workflow Monitoring [DMS-509]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.3 Workflow Control [DMS-510]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.4 Application/Workflow Segregation [DMS-511]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Analysis
5.3.2.5 Workflow Priority [DMS-512]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.6 Workflow Shutdown [DMS-513]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.7 Workflow Restart [DMS-514]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.8 Stage Status Monitoring [DMS-515]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.9 Dataset Status Monitoring [DMS-516]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.10 Suspend/Resume Stage [DMS-517]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.3.2.11 Suspend/Resume Process [DMS-518]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.12 Restart Failed Dataset [DMS-523]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.13 Halt Stage or Workflow [DMS-524]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.14 Remote Monitoring and Control [DMS-525]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.15 Display State of Processing [DMS-526]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.16 Sort Display of Processing State [DMS-527]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.17 View Datasets Active in Stage [DMS-528]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.18 View Failed Datasets Only [DMS-529]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.19 Operate Workflow without Admin Privileges [DMS-530]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.3.2.20 Automated Workflow Start [DMS-531]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.21 Suspend Workflow for Insufficient Disk Space [DMS-532]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.22 Save Processing Configuration [DMS-533]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.2.23 Text Formatted Configuration Definition [DMS-534]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
5.3.3.1 Capture Stage Specific Log Messages [DMS-519]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.3.3.2 Search Stage Specific Log Messages [DMS-520]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
5.3.3.3 Capture Dataset Specific Log Messages [DMS-521]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
5.3.3.4 Search Dataset Specific Log Messages [DMS-522]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Demonstration
6.1.1.1 Associate Science Data with Calibration Reference Data [DMS-134]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.1.1.2 User Designated Calibration Reference Data [DMS-187]	3.4.3.1.4 Selection of Calibration Reference Data [SOC-523]	Test
6.2.1.1.1 Generate NIRCam Imaging Science Data Products [DMS-720]	3.1.3.1.1 NIRCam Imaging [SOC-2147]	Inspection
6.2.1.1.2 Generate NIRCam Grism Science Data Products [DMS-719]	3.1.3.1.3 NIRCam Grism Spectroscopy [SOC-3436]	Inspection
6.2.1.1.3 Generate NIRCam Coronagraphy Science Data Products [DMS-718]	3.1.3.1.2 NIRCam Coronagraphy [SOC-2149]	Inspection
6.2.1.1.4 Generate NIRCam Target Acquisition Science Data Products [DMS-717]	3.1.3.1.4 NIRCam Target Acquisition [SOC-2193]	Inspection
6.2.1.1.5 Generate NIRCam Single-Field WFS&C Science Data Products [DMS-716]	3.1.3.1.5 NIRCam Single-Field WFS&C Operations [SOC-2151]	Inspection
6.2.1.1.6 Generate NIRCam Multi-Field WFS&C Science Data Products [DMS-715]	3.1.3.1.6 NIRCam Multi-Field WFS&C Operations [SOC-3332]	Inspection
6.2.1.1.7 Generate NIRSpec Target Acquisition Science Data Products [DMS-714]	3.1.3.2.1 NIRSpec Target Acquisition [SOC-2195]	Inspection
6.2.1.1.8 Generate NIRSpec Imaging Science Data Products [DMS-713]	3.1.3.2.1 NIRSpec Target Acquisition [SOC-2195]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.1.1.9 Generate NIRSpec MOS (R=100) Science Data Products [DMS-712]	3.1.3.2.2 NIRSpec MOS (R=100) Spectroscopy [SOC-2153]	Inspection
6.2.1.1.10 Generate NIRSpec MOS (R=1000) Science Data Products [DMS-711]	3.1.3.2.3 NIRSpec MOS (R=1000) Spectroscopy [SOC-2155]	Inspection
6.2.1.1.11 Generate NIRSpec MOS (R=2700) Science Data Products [DMS-710]	3.1.3.2.4 NIRSpec MOS (R=2700) Spectroscopy [SOC-3291]	Inspection
6.2.1.1.12 Generate NIRSpec IFU Spectroscopy Science Data Products [DMS-709]	3.1.3.2.5 NIRSpec IFU Spectroscopy [SOC-2157]	Inspection
6.2.1.1.13 Generate NIRSpec Fixed-Slit Spectroscopy Science Data Products [DMS-708]	3.1.3.2.6 NIRSpec Fixed-Slit Spectroscopy [SOC-2159]	Inspection
6.2.1.1.14 Generate NIRSpec Multi-Field WFS&C Science Data Products [DMS-707]	3.1.3.2.7 NIRSpec Multi-Field WFS&C Operations [SOC-3334]	Inspection
6.2.1.1.15 Generate MIRI Target Acquisition Science Data Products [DMS-706]	3.1.3.3.1 MIRI Target Acquisition [SOC-2197]	Inspection
6.2.1.1.16 Generate MIRI Imaging Science Data Products [DMS-705]	3.1.3.3.2 MIRI Imaging [SOC-2161]	Inspection
6.2.1.1.17 Generate MIRI Lyot Coronagraphy Science Data Products [DMS-704]	3.1.3.3.3 MIRI 24-Micron Coronagraphy [SOC-2163]	Inspection
6.2.1.1.18 Generate MIRI Four-Quadrant Phase Mask Coronagraphy Science Data Products [DMS-703]	3.1.3.3.4 MIRI Four-Quadrant Phase Mask Coronagraphy [SOC-3293]	Inspection
6.2.1.1.19 Generate MIRI IFU (R>1000) Spectroscopy Science Data Products [DMS-702]	3.1.3.3.5 MIRI IFU (R>1000) Spectroscopy [SOC-2165]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.1.1.20 Generate MIRI Low-Resolution, Long Slit (R=100)Spectroscopy Science Data Products [DMS-701]	3.1.3.3.6 MIRI Low-Resolution (R=100) Spectroscopy [SOC-2167]	Inspection
6.2.1.1.21 Generate MIRI Low-Resolution, Slitless Spectroscopy Science Data Products [DMS-700]	3.1.3.3.6 MIRI Low-Resolution (R=100) Spectroscopy [SOC-2167]	Inspection
6.2.1.1.22 Generate MIRI Multi-Field WFS&C Science Data Products [DMS-699]	3.1.3.3.7 MIRI Multi-Field WFS&C Operations [SOC-3411]	Inspection
6.2.1.1.23 Generate NIRISS Target Acquisition Science Data Products [DMS-698]	3.1.3.4.1 NIRISS Target Acquisition [SOC-3421]	Inspection
6.2.1.1.24 Generate NIRISS Imaging Science Data Products [DMS-697]	3.1.3.4.2 NIRISS Imaging [SOC-3417]	Inspection
6.2.1.1.25 Generate NIRISS Wide-Field Slitless Spectroscopy Science Data Products [DMS-696]	3.1.3.4.3 NIRISS Wide-Field Slitless Spectroscopy [SOC-3418]	Inspection
6.2.1.1.26 Generate NIRISS Single-Object Slitless Spectroscopy Science Data Products [DMS-695]	3.1.3.4.4 NIRISS Single-Object Slitless Spectroscopy [SOC-3419]	Inspection
6.2.1.1.27 Generate NIRISS Aperture-Masking Interferometry Science Data Products [DMS-694]	3.1.3.4.5 NIRISS Aperture-Masking Interferometry [SOC-3420]	Inspection
6.2.1.1.28 Generate NIRISS Multi-Field WFS&C Science Data Products [DMS-693]	3.1.3.4.6 NIRISS Multi-Field WFS&C Operations [SOC-3422]	Inspection
6.2.1.1.29 Generate FGS Guiding Science Data Products [DMS-692]	3.1.3.5.1 FGS Guiding [SOC-2774]	Inspection
6.2.1.1.30 Generate FGS Calibration Science Data Products [DMS-690]	3.1.3.5.2 FGS Calibration [SOC-2776]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.1.1.31 Generate FGS Multi-Field WFS&C Science Data Products [DMS-691]	3.1.3.5.3 FGS Multi-Field WFS&C Operations [SOC-3336]	Inspection
6.2.1.2 Calibration Algorithms for Science Instruments [DMS-188]	3.4.3.1.2 Science Data Calibration [SOC-513]	Demonstration
6.2.1.3 Calibration Algorithms for Guider [DMS-189]	3.4.3.1.2 Science Data Calibration [SOC-513]	Demonstration
6.2.1.4 Create Level-2 Data Products [DMS-460]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.2.1.5 Create Level-3 Data Products [DMS-461]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.2.1.6 Observatory Subsystems Calibration [DMS-186]	3.4.5.1.7 Observatory Subsystem Calibration [SOC-3356]	Demonstration
6.2.1.7 User-configurable Calibration Steps [DMS-194]	3.4.3.1.5 Configurable Calibration Steps [SOC-2521]	Test
6.2.1.8 Keywords for Derived Calibration Parameters [DMS-255]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
6.2.1.9 Calibration Access to DMS Engineering Database [DMS-256]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
6.2.1.10 Receive Engineering Data in Calibration [DMS-458]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.1.11 Calibration Data from Workflow Manager [DMS-453]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.1.12 Association Information from Workflow Manager [DMS-454]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.1.13 Calibrated Science Data Products [DMS-596]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.1.14 Request Calibration Reference Data from CRDS [DMS-455]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.2.1.15 Receive Calibration Reference Data from CRDS [DMS-456]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.2.1.16 Remote Execution of Calibration Software [DMS-459]	3.4.3.1.5 Configurable Calibration Steps [SOC-2521]	Test
6.2.1.17 Level 3 Data Processing Rate [DMS-463]	3.4.5.3.2 Science Data Product Availability for Designated Visits [SOC-561]	Test
6.2.1.18 Calibration History [DMS-484]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.1.19 Archive Level-2a Data [DMS-650]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
6.2.1.20 Archive Level-2b Data [DMS-651]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
6.2.1.21 Archive Level-3 Data [DMS-652]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
6.2.1.22 Image Combination of WSS Dither Exposures [DMS-664]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.1 Error Calculation [DMS-464]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.2 Data Quality Flags [DMS-465]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.3 Saturation Detection [DMS-466]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.4 Bias Drift Correction [DMS-467]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.5 Nonlinearity Correction [DMS-468]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.6 Detector Background Correction [DMS-469]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.7 Ramp Jump Detection [DMS-470]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.8 Ramp Fitting [DMS-471]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.2.9 Pixel Sensitivity Correction [DMS-472]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.10 Illumination Correction [DMS-473]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.11 Latent Signal Correction [DMS-474]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.12 Telescope Emission Correction [DMS-475]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.13 Geometric Distortion Correction [DMS-476]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.14 Photometric Calibration [DMS-477]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.15 Image Combination – Same Guide Stars [DMS-478]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.16 Image Combination – Different Guide Stars [DMS-479]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.17 Spectra Combination [DMS-480]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.18 Background Subtraction [DMS-481]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.19 Spectroscopic Extraction [DMS-482]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.2.20 Aperture Throughput Correction [DMS-483]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.1 Fixed Target Calibration [DMS-485]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.2 Moving Target Calibration [DMS-486]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.3 MIRI FAST Data Calibration [DMS-487]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.4 MIRI SLOW Data Calibration [DMS-488]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.5 Full Frame Data Calibration [DMS-489]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.2.3.6 Subarray Data Calibration [DMS-490]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.7 Internal Data Calibration [DMS-491]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.2.3.8 Wavefront Sensing Data Calibration [DMS-492]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.1 Association Definition [DMS-549]	3.4.3.1.2 Science Data Calibration [SOC-513]	Analysis
6.3.1.2 Associate Exposures from Different Programs [DMS-550]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.3 Dither Associations [DMS-551]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.4 Mosaic Associations [DMS-552]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.5 Contemporaneous Calibration Associations [DMS-553]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.6 Target Acquisition Associations [DMS-554]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.1.7 Associate Pre-image Data Files [DMS-754]	3.4.2.1.5 MSA Pre-Image Archiving [SOC-3434]	Test
6.3.2.1 Association Pool Definition [DMS-555]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.2.2 Association Failed Exposure Status [DMS-556]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.2.3 Association Degraded Exposure Status [DMS-557]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.2.4 Association Pool Versions [DMS-558]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.2.5 Association Pool Unique Name [DMS-559]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.2.6 Complete Association Pool [DMS-560]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.3.2.7 Partial Association Pool Creation [DMS-561]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.2.8 Partial Association Pool Name [DMS-562]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.2.9 Exposure Processing to Level-2a [DMS-563]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.2.10 Level-2b Processing Initiation [DMS-564]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.2.11 Level-3 Processing Initiation [DMS-565]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.3.1 Association Generation from Pool [DMS-566]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.3.2 Association Unique Name [DMS-567]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.3.3 Association Pool in Association Name [DMS-568]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.3.4 Association Table [DMS-569]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.3.5 Association Version [DMS-570]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.3.6 Association Name in Data Product [DMS-571]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.3.7 Partial Association Product Generation [DMS-572]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.3.8 Association History [DMS-573]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.3.9 Degraded Data Quality Reported in Association History [DMS-574]	3.4.3.1.2 Science Data Calibration [SOC-513]	Inspection
6.3.4.1 Association Pool in Archive [DMS-575]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.3.4.2 Association Table in Archive [DMS-576]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.4.3 Association Data Products in Archive [DMS-577]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.4.4 Multiple Versions of Association Tables in Archive [DMS-578]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.4.5 Multiple Versions of Association Data Products in Archive [DMS-579]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
6.3.4.6 Association Data Product Proprietary Rights [DMS-580]	3.4.3.1.2 Science Data Calibration [SOC-513]	Demonstration
6.4.1.1.1 Generate NIRCam Imaging Calibration Reference Data [DMS-721]	3.1.3.1.1 NIRCam Imaging [SOC-2147]	Test
6.4.1.1.2 Generate NIRCam Grism Calibration Reference Data [DMS-722]	3.1.3.1.3 NIRCam Grism Spectroscopy [SOC-3436]	Test
6.4.1.1.3 Generate NIRCam Coronagraphy Calibration Reference Data [DMS-723]	3.1.3.1.2 NIRCam Coronagraphy [SOC-2149]	Test
6.4.1.1.4 Generate NIRCam Target Acquisition Calibration Reference Data [DMS-724]	3.1.3.1.4 NIRCam Target Acquisition [SOC-2193]	Test
6.4.1.1.5 Generate NIRCam Single-Field WFS&C Calibration Reference Data [DMS-725]	3.1.3.1.5 NIRCam Single-Field WFS&C Operations [SOC-2151]	Test
6.4.1.1.6 Generate NIRCam Multi-Field WFS&C Calibration Reference Data [DMS-726]	3.1.3.1.6 NIRCam Multi-Field WFS&C Operations [SOC-3332]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.4.1.1.7 Generate NIRSpec Target Acquisition Calibration Reference Data [DMS-727]	3.1.3.2.1 NIRSpec Target Acquisition [SOC-2195]	Test
6.4.1.1.8 Generate NIRSpec Imaging Calibration Reference Data [DMS-728]	3.1.3.2.1 NIRSpec Target Acquisition [SOC-2195]	Test
6.4.1.1.9 Generate NIRSpec MOS (R=100) Calibration Reference Data [DMS-729]	3.1.3.2.2 NIRSpec MOS (R=100) Spectroscopy [SOC-2153]	Test
6.4.1.1.10 Generate NIRSpec MOS (R=1000) Calibration Reference Data [DMS-730]	3.1.3.2.3 NIRSpec MOS (R=1000) Spectroscopy [SOC-2155]	Test
6.4.1.1.11 Generate NIRSpec MOS (R=2700) Calibration Reference Data [DMS-731]	3.1.3.2.4 NIRSpec MOS (R=2700) Spectroscopy [SOC-3291]	Test
6.4.1.1.12 Generate NIRSpec IFU Spectroscopy Calibration Reference Data [DMS-732]	3.1.3.2.5 NIRSpec IFU Spectroscopy [SOC-2157]	Test
6.4.1.1.13 Generate NIRSpec Fixed-Slit Spectroscopy Calibration Reference Data [DMS-733]	3.1.3.2.6 NIRSpec Fixed-Slit Spectroscopy [SOC-2159]	Test
6.4.1.1.14 Generate NIRSpec Multi-Field WFS&C Calibration Reference Data [DMS-734]	3.1.3.2.7 NIRSpec Multi-Field WFS&C Operations [SOC-3334]	Test
6.4.1.1.15 Generate MIRI Target Acquisition Calibration Reference Data [DMS-735]	3.1.3.3.1 MIRI Target Acquisition [SOC-2197]	Test
6.4.1.1.16 Generate MIRI Imaging Calibration Reference Data [DMS-736]	3.1.3.3.2 MIRI Imaging [SOC-2161]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.4.1.1.17 Generate MIRI Lyot Coronagraphy Calibration Reference Data [DMS-737]	3.1.3.3.3 MIRI 24-Micron Coronagraphy [SOC-2163]	Test
6.4.1.1.18 Generate MIRI Four-Quadrant Phase Mask Coronagraphy Calibration Reference Data [DMS-738]	3.1.3.3.4 MIRI Four-Quadrant Phase Mask Coronagraphy [SOC-3293]	Test
6.4.1.1.19 Generate MIRI IFU (R>1000) Spectroscopy Calibration Reference Data [DMS-739]	3.1.3.3.5 MIRI IFU (R>1000) Spectroscopy [SOC-2165]	Test
6.4.1.1.20 Generate MIRI Low-Resolution, Long Slit (R=100)Spectroscopy Calibration Reference Data [DMS-740]	3.1.3.3.6 MIRI Low-Resolution (R=100) Spectroscopy [SOC-2167]	Test
6.4.1.1.21 Generate MIRI Low-Resolution, Slitless Spectroscopy Calibration Reference Data [DMS-741]	3.1.3.3.6 MIRI Low-Resolution (R=100) Spectroscopy [SOC-2167]	Test
6.4.1.1.22 Generate MIRI Multi-Field WFS&C Calibration Reference Data [DMS-742]	3.1.3.3.7 MIRI Multi-Field WFS&C Operations [SOC-3411]	Test
6.4.1.1.23 Generate NIRISS Target Acquisition Calibration Reference Data [DMS-743]	3.1.3.4.1 NIRISS Target Acquisition [SOC-3421]	Test
6.4.1.1.24 Generate NIRISS Imaging Calibration Reference Data [DMS-744]	3.1.3.4.2 NIRISS Imaging [SOC-3417]	Test
6.4.1.1.25 Generate NIRISS Wide-Field Slitless Spectroscopy Calibration Reference Data [DMS-745]	3.1.3.4.3 NIRISS Wide-Field Slitless Spectroscopy [SOC-3418]	Test
6.4.1.1.26 Generate NIRISS Single-Object Slitless Spectroscopy Calibration Reference Data [DMS-746]	3.1.3.4.4 NIRISS Single-Object Slitless Spectroscopy [SOC-3419]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.4.1.1.27 Generate NIRISS Aperture-Masking Interferometry Calibration Reference Data [DMS-747]	3.1.3.4.5 NIRISS Aperture-Masking Interferometry [SOC-3420]	Test
6.4.1.1.28 Generate NIRISS Multi-Field WFS&C Calibration Reference Data [DMS-748]	3.1.3.4.6 NIRISS Multi-Field WFS&C Operations [SOC-3422]	Test
6.4.1.1.29 Generate FGS Guiding Calibration Reference Data [DMS-749]	3.1.3.5.1 FGS Guiding [SOC-2774]	Test
6.4.1.1.30 Generate FGS Calibration Calibration Reference Data [DMS-750]	3.1.3.5.2 FGS Calibration [SOC-2776]	Test
6.4.1.1.31 Generate FGS Multi-Field WFS&C Calibration Reference Data [DMS-751]	3.1.3.5.3 FGS Multi-Field WFS&C Operations [SOC-3336]	Test
6.4.1.2 Calibration Reference File Format [DMS-653]	3.4.3.1.1 Calibration Reference Data Generation [SOC-2471]	Inspection
6.4.1.3 CRDS Input File Format Validation [DMS-680]	3.4.3.1.1 Calibration Reference Data Generation [SOC-2471]	Demonstration
6.4.1.4 CRDS Reference File Unique Names [DMS-681]	3.4.3.1.1 Calibration Reference Data Generation [SOC-2471]	Demonstration
6.4.1.5 CRDS Context and Rule File Unique Names [DMS-682]	3.4.3.1.1 Calibration Reference Data Generation [SOC-2471]	Demonstration
6.4.2.1 Calibration Reference Data in the Archive [DMS-191]	3.4.2.3.1 Science Data Volume [SOC-72]	Test
6.4.2.2 CRDS file support in the Archive [DMS-665]	3.4.2.1.6 Archive Calibration Reference Data [SOC-1866]	Demonstration
6.4.2.3 Archive Calibration Reference Data before Use [DMS-535]	3.4.2.1.6 Archive Calibration Reference Data [SOC-1866]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.4.2.4 Archive retrieval service for CRDS [DMS-667]	3.4.2.1.6 Archive Calibration Reference Data [SOC-1866]	Demonstration
6.4.2.5 CRDS Web Service [DMS-669]	3.4.2.1.6 Archive Calibration Reference Data [SOC-1866]	Demonstration
6.4.3.1 Identifying Appropriate Reference Data [DMS-536]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.2 Support for Multiple Versions of Pipelines [DMS-537]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.3 Separation of Commits and Use [DMS-538]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.4 CRDS Universal Interface [DMS-539]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Demonstration
6.4.3.5 CRDS User Access [DMS-540]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.6 Supplying Provenance for All Times of Use [DMS-541]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.7 Saving Metadata for Reference Files [DMS-542]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Inspection
6.4.3.8 Reference File Undo Capability [DMS-543]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.9 Separation of Mapping Rules from Reference Data [DMS-544]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Analysis
6.4.3.10 Showing Effects of Mapping Rule Changes [DMS-545]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.11 Rule Undo Capability [DMS-642]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.12 Bad Rule Capability [DMS-641]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.13 Metadata Requirements for Reference Data [DMS-546]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.4.3.14 Displaying Active Reference Files [DMS-547]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.4.3.15 Displaying Reference Files by Mode [DMS-548]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
6.5.1.1 Data Formats [DMS-627]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.1.2 Data Access Protocols [DMS-654]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.2.1 Calibration Pipeline Steps [DMS-629]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.1 Display and Analyze Science Data [DMS-233]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.2 Distribute Data Analysis Software [DMS-640]	3.4.6.2.1 Remote Data Analysis [SOC-586]	Demonstration
6.5.3.3 Perform Data Analysis Functions Remotely [DMS-241]	3.4.6.2.1 Remote Data Analysis [SOC-586]	Demonstration
6.5.3.4 Dataset Visualization [DMS-625]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.5 Dataset Arithmetic [DMS-626]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.6 Model Evaluation [DMS-628]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.7 Dataset Combination Tools [DMS-630]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.8 Coronagraphic Science Support [DMS-631]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.9 IFU Tools [DMS-632]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.10 Spectral Data Analysis Tools [DMS-633]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration
6.5.3.11 JWST Instrument Modeling [DMS-634]	3.4.6.1.1 Data Analysis Capability [SOC-584]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
6.5.3.12 FITSVerify Web Service [DMS-755]	3.4.2.1.5 MSA Pre-Image Archiving [SOC-3434]	Test
7.1.1.1 Archive Catalog Accessibility [DMS-196]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Demonstration
7.1.1.2 Archive all Level-2 Data Inputs [DMS-197]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Demonstration
7.1.1.3 Level-0 Archive Data Volume - 5.5 years [DMS-198]	3.4.2.3.5 Science Data Archive Capacity [SOC-509]	Analysis
7.1.1.4 Level-2 Archive Data Volume - 5.5 years [DMS-635]	3.4.2.3.5 Science Data Archive Capacity [SOC-509]	Analysis
7.1.1.5 Level-0 Archive Data Volume - 10 Years [DMS-195]	3.4.2.5.1 Scalability of Archive Design [SOC-1855]	Analysis
7.1.1.6 Level-2 Archive Data Volume - 10 years [DMS-636]	3.4.2.5.1 Scalability of Archive Design [SOC-1855]	Analysis
7.1.2.1 Ingest Data Receipt [DMS-289]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.2 Archive Level-0 Science Data [DMS-290]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.3 Archive Level-1a Science Data [DMS-291]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.4 Archive Level-1b Science Data [DMS-292]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.5 Archive Level-2a Science Data [DMS-294]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.6 Archive Level-2b Science Data [DMS-639]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.7 Archive Level-3 Science Data Products [DMS-295]	3.4.2.1.3 Archive Science Data [SOC-472]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.2.8 Archive Level-4 Science Data Products [DMS-293]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.9 Archive Guide Star Acquisition Images [DMS-102]	3.4.2.1.3 Archive Science Data [SOC-472]	Demonstration
7.1.2.10 Archive Request Completion Status [DMS-301]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.11 Level-4 Archive Completion Status [DMS-302]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.12 First Science Data Archived Notification [DMS-303]	3.4.1.3.1.4 First Visit Data Notification [SOC-2444]	Test
7.1.2.13 Archive DMS Software [DMS-304]	3.4.1.4.1 Data Security [SOC-1754]	Test
7.1.2.14 Archive Data Set [DMS-306]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.15 Uniquely Identify Data in Archive [DMS-307]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.16 Archive Data Set Processing Log [DMS-308]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.17 Bundle Data Set [DMS-305]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.18 Validate Presence of Required Files [DMS-310]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.19 Override List of Required Files [DMS-311]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.20 Validate FITS Standard [DMS-312]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.21 Ingest Checksum to SDP [DMS-313]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.2.22 Ingest Checksum to Storage Broker [DMS-314]	3.4.2.1.3 Archive Science Data [SOC-472]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.2.23 Validate Storage Broker Checksum [DMS-309]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.3.1 Long-term, Off-site Storage [DMS-200]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Demonstration
7.1.3.2 Verify Data on Safestore [DMS-199]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Demonstration
7.1.3.3 Select Files for Safestore [DMS-332]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Test
7.1.3.4 Level-0 Data to Safestore [DMS-333]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Test
7.1.3.5 Level-1a Data to Safestore [DMS-334]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Test
7.1.3.6 Recorded Engineering Data to Safestore [DMS-335]	3.4.2.2.1 Archive Data and Catalog Safestore [SOC-1493]	Test
7.1.3.7 Restore Data from Safestore [DMS-201]	3.4.2.2.2 Archive Data and Catalog Restore [SOC-1495]	Test
7.1.3.8 Restore Catalog from Safestore [DMS-637]	3.4.2.2.2 Archive Data and Catalog Restore [SOC-1495]	Test
7.1.3.9 Maintain Recorded Engineering Data on Safestore [DMS-202]	3.4.4.2.1 Engineering Archive Data and Catalog Safestore [SOC-1497]	Demonstration
7.1.3.10 Maintain Catalog of Recorded Engineering Data on Safestore [DMS-446]	3.4.4.2.1 Engineering Archive Data and Catalog Safestore [SOC-1497]	Demonstration
7.1.3.11 Restore Recorded Engineering Data from Safestore [DMS-203]	3.4.4.2.2 Engineering Archive Data and Catalog Restore [SOC-1499]	Test
7.1.3.12 Restore Engineering Data Catalog from Safestore [DMS-638]	3.4.4.2.2 Engineering Archive Data and Catalog Restore [SOC-1499]	Test
7.1.4.1 On-line Science Archive Catalog [DMS-205]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Demonstration
7.1.4.2 Public Archive Catalog [DMS-316]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Test
7.1.4.3 Searchable Archive Catalog [DMS-317]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Demonstration

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.4.4 Metadata Extracted from Science Data Headers [DMS-315]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Inspection
7.1.4.5 Metadata from External Sources [DMS-318]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Test
7.1.4.6 Automatically Enforce Archive Catalog Internal Consistency [DMS-280]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Demonstration
7.1.4.7 Unique Identifier for Each File in Archive [DMS-321]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Inspection
7.1.4.8 Proprietary State of Data Files [DMS-322]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Test
7.1.4.9 Unique Identifier for Each Data Set in Archive [DMS-320]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Inspection
7.1.5.1 Expiration of Proprietary Period [DMS-208]	3.4.5.2.1 Public Access to Non-Proprietary Science Data [SOC-32]	Test
7.1.5.2 Archive Pre-image Data Files [DMS-672]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.6.1 Archive Recorded Engineering Data - Life of Mission [DMS-655]	3.4.4.1.1 Storage of Recorded Engineering Data [SOC-720]	Analysis
7.1.6.2 Archive Recorded Engineering Data [DMS-656]	3.4.4.1.1 Storage of Recorded Engineering Data [SOC-720]	Test
7.1.6.3 Archive Observatory Status Data - Life of Mission [DMS-210]	3.4.4.1.5 Long-Term Storage of Observatory Status Data [SOC-1862]	Analysis
7.1.6.4 Archive Observatory Status Data [DMS-297]	3.4.4.1.5 Long-Term Storage of Observatory Status Data [SOC-1862]	Test
7.1.6.5 Archive Definitive Ephemeris Data - Life of Mission [DMS-211]	3.4.4.1.6 Long-Term Storage of Definitive Ephemeris Data [SOC-482]	Analysis

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.6.6 Archive Definitive Ephemeris Data [DMS-298]	3.4.4.1.6 Long-Term Storage of Definitive Ephemeris Data [SOC-482]	Test
7.1.6.7 Archive WFS&C Archive Packages - Life of Mission [DMS-212]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Analysis
7.1.6.8 Archive WFS&C MCS Archive Package [DMS-300]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.9 Restrict Access to WFS&C MCS Archive package [DMS-657]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.10 Archive WFS&C WAS Archive Package [DMS-299]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.11 No Access Restrictions on WFS&C WAS Archive Package [DMS-658]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.12 Archive WFS&C OPD Files [DMS-659]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.13 No Access Restrictions on WFS&C OPD Files [DMS-760]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.14 Archive WFS&C WEx Archive Package [DMS-761]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.15 No Access Restrictions on WEx Archive Package [DMS-762]	3.4.4.1.7 Long-Term Storage of WFS&C Archive Packages [SOC-2630]	Test
7.1.6.16 Recorded Engineering Data Archive Performance [DMS-214]	3.4.4.3.4 Engineering Archive Reliability [SOC-505]	Analysis
7.1.6.17 On-line Engineering Archive Catalog [DMS-215]	3.4.4.1.2 Engineering Archive Catalog [SOC-711]	Demonstration
7.1.6.18 Recorded Engineering Archive Data Volume - 5.5 Years [DMS-218]	3.4.4.3.5 Engineering Archive Data Volume [SOC-729]	Analysis

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.6.19 Recorded Engineering Archive Data Volume - 10 Years [DMS-204]	3.4.4.4.1 Scalability of Archive Design [SOC-1859]	Analysis
7.1.6.20 Public DMS Engineering Database [DMS-258]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
7.1.6.21 Engineering Database Parameters [DMS-319]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Test
7.1.6.22 Engineering Database - Parameter Queries [DMS-259]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
7.1.6.23 Engineering Database - Time Queries [DMS-257]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Test
7.1.6.24 Engineering Database Web Service [DMS-277]	3.4.1.3.2.3 Calibrated Engineering Data Product Receipt [SOC-2756]	Demonstration
7.1.7.1 File Uniqueness [DMS-323]	3.4.2.1.3 Archive Science Data [SOC-472]	Inspection
7.1.7.2 Latest Version of Data [DMS-324]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.7.3 On-line Access to Processing Data [DMS-325]	3.4.2.1.3 Archive Science Data [SOC-472]	Demonstration
7.1.7.4 On-line Access to Contributed Data [DMS-326]	3.4.2.1.3 Archive Science Data [SOC-472]	Demonstration
7.1.7.5 Lossless Compression of Data [DMS-327]	3.4.2.1.3 Archive Science Data [SOC-472]	Demonstration
7.1.7.6 Storage Broker Checksum [DMS-328]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.7.7 Storage Broker Checksum to Ingest [DMS-329]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.7.8 Location of Data Files on Primary Data Store [DMS-330]	3.4.2.1.3 Archive Science Data [SOC-472]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.7.9 Location of Data Files on Safestore [DMS-331]	3.4.2.1.3 Archive Science Data [SOC-472]	Inspection
7.1.7.10 Continue Ingest with Off-line Safestore [DMS-336]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.7.11 Continue Distribution with Off-line Safestore [DMS-337]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
7.1.7.12 Store Pre-image Files On-line [DMS-756]	3.4.1.3.1.2 MSA Pre-Image Transfer [SOC-3432]	Inspection
7.1.8.1 Search Science Catalog [DMS-206]	3.4.2.1.8 Science Archive Catalog Search [SOC-494]	Demonstration
7.1.8.2 Export Science Catalog Search Results [DMS-339]	3.4.2.1.8 Science Archive Catalog Search [SOC-494]	Test
7.1.8.3 Duplicate Target Checker [DMS-338]	3.4.2.1.8 Science Archive Catalog Search [SOC-494]	Test
7.1.8.4 Request Science Data Products [DMS-222]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.5 Display Data Previews [DMS-340]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.6 Display Data Footprints [DMS-341]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.7 Group Data for Retrieval [DMS-342]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.8 Search Engineering Archive Catalog [DMS-216]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Demonstration
7.1.8.9 Retrieve Recorded Engineering Data [DMS-343]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Test
7.1.8.10 Query Engineering Database for Parameters [DMS-344]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Demonstration
7.1.8.11 Query Engineering Database over Time [DMS-345]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Demonstration

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.8.12 Export Engineering Database Search Results [DMS-346]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Test
7.1.8.13 Map Calibrated Engineering Data to Science Data [DMS-347]	3.4.4.1.3 Engineering Archive Catalog Search [SOC-715]	Test
7.1.8.14 Filter and Sort Engineering Database Search Results [DMS-348]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.15 Distribution Mechanisms [DMS-349]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.16 Unfulfilled Request [DMS-351]	3.4.5.1.2 Science Data Product Request [SOC-531]	Demonstration
7.1.8.17 AUI User Subscription Service Support [DMS-352]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.18 Package Retrieved Files for Transfer [DMS-449]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.19 Authenticate Registered User [DMS-353]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.20 Support Guest User Account [DMS-354]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.21 No Proprietary Data for Guest Users [DMS-356]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.22 Provide Access to Level-4 Data Products [DMS-357]	3.4.1.2.1.5 Science Data Product Access [SOC-546]	Test
7.1.8.23 Host Level-4 Data Products [DMS-358]	3.4.1.2.1.5 Science Data Product Access [SOC-546]	Test
7.1.8.24 Follow MAST Guidelines [DMS-359]	3.4.1.2.1.5 Science Data Product Access [SOC-546]	Analysis
7.1.8.25 Inform Users of more Recent Version [DMS-677]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.8.26 Inform Users of Batch Mode Option [DMS-679]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.8.27 Retrieve Pre-image Data Files with Science Data [DMS-757]	3.4.2.1.5 MSA Pre-Image Archiving [SOC-3434]	Test
7.1.8.28 Notification on Direct Access Request Receipt [DMS-764]	3.4.5.1.2 Science Data Product Request [SOC-531]	Test
7.1.9.1 Direct Distribution to PIs [DMS-223]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.2 Distribute Science Data Products [DMS-224]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.3 Distribute Uncalibrated and/or Calibrated Data [DMS-207]	3.4.5.1.1 Retrieval of Uncalibrated Data [SOC-1546]	Test
7.1.9.4 Distribute Calibration Reference Data [DMS-226]	3.4.5.1.5 Retrieve Calibration Reference Data [SOC-525]	Test
7.1.9.5 Distribute Recorded Engineering Data [DMS-217]	3.4.4.1.4 Retrieval of Raw Engineering Data [SOC-1902]	Test
7.1.9.6 Distribute Recorded Engineering Data for Life of Mission [DMS-219]	3.4.4.3.6 Engineering Archive Lifetime [SOC-3349]	Analysis
7.1.9.7 Recorded Engineering Data Distribution Performance [DMS-220]	3.4.4.3.7 Archived Engineering Data Retrieval Time [SOC-2460]	Analysis
7.1.9.8 Direct Distribution [DMS-228]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.9 Batch Mode Distribution [DMS-675]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.10 Shippable Media Distribution [DMS-447]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.11 Batch Distribution Mechanism Operator Override [DMS-448]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.9.12 Unique Identifier for Archive Request [DMS-361]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.9.13 Distribution Request History [DMS-362]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.9.14 Regulate Single User Resources [DMS-363]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.15 Batch Distribution Priority [DMS-452]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.16 Batch Mode Distribution Priority Adjustment [DMS-676]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.17 Pause Batch Archive Request [DMS-364]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.18 Resume Batch Archive Request [DMS-365]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.19 Terminate Batch Archive Request [DMS-366]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.20 Restart Batch Archive Request [DMS-367]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.21 Flush Terminated Batch Archive Request [DMS-368]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.22 Partial Archive Request Failure [DMS-369]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.23 Batch Archive Request Transmission Error [DMS-370]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.24 Requests State Saved on Halt [DMS-371]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.25 Report Distribution Fault Conditions [DMS-372]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.9.26 Successful Request Submission Notification [DMS-374]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.27 Request Status [DMS-373]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.9.28 Request Success Notification [DMS-375]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.29 Unsuccessful Request Notification [DMS-376]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.30 Distribution Request Authentication [DMS-377]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.31 Distribution to Unregistered Users [DMS-378]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.32 Retrieve Latest Version [DMS-380]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.33 Override Default Retrieval Version [DMS-381]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.34 Deliver File in same Form [DMS-660]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.35 Distribution Manifest [DMS-383]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.9.36 File Compression for Data Transfer [DMS-385]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.37 Packaging of Files for Transfer [DMS-386]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.38 Distribution Options in Notification [DMS-387]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.9.39 Direct Access to Public Data [DMS-388]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.40 Control Data Access [DMS-389]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.9.41 Labels for Each Piece of Media [DMS-393]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.9.42 Distribution Performance to External Users [DMS-229]	3.4.5.3.4 Science Data Product Volume [SOC-559]	Analysis
7.1.9.43 Distribution Performance to Internal Users [DMS-360]	3.4.5.3.4 Science Data Product Volume [SOC-559]	Analysis
7.1.9.44 Notification Message on Batch Request Receipt [DMS-399]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.45 Notification Message on Failed Batch Request Validation [DMS-400]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.46 Notification on Delivery Completion [DMS-401]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.9.47 Distribution to Other Archive Facility Performance [DMS-230]	3.4.5.3.5 International Data Center Distribution Volume [SOC-1699]	Analysis
7.1.9.48 Push Data to Public Mirror Site [DMS-287]	3.4.5.3.5 International Data Center Distribution Volume [SOC-1699]	Test
7.1.9.49 Push Data to Protected Mirror Site [DMS-288]	3.4.5.3.5 International Data Center Distribution Volume [SOC-1699]	Test
7.1.9.50 Data Products from Mirror Site [DMS-286]	3.4.5.3.5 International Data Center Distribution Volume [SOC-1699]	Test
7.1.9.51 Archive Catalog to Mirror Site [DMS-499]	3.4.5.3.5 International Data Center Distribution Volume [SOC-1699]	Test
7.1.9.52 Pre-image File Access [DMS-758]	3.4.1.3.1.2 MSA Pre-Image Transfer [SOC-3432]	Test
7.1.10.1 Proprietary Data Period [DMS-231]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.2 Default Proprietary Period [DMS-402]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.3 Modify Proprietary Period [DMS-403]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.10.4 Log Proprietary Period Modifications [DMS-404]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.5 Notification of Public Data [DMS-405]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Inspection
7.1.10.6 Recorded Engineering Data Access [DMS-355]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.7 Non-proprietary Data Access [DMS-232]	3.4.5.2.1 Public Access to Non-Proprietary Science Data [SOC-32]	Test
7.1.10.8 Levels of Data Access [DMS-407]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.9 Modify Data Restriction [DMS-408]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.10 Log Data Restriction Modifications [DMS-409]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Inspection
7.1.10.11 Data Access Enforced by Distribution [DMS-410]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.12 Proprietary Data Retrieval [DMS-411]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.13 Notification of Attempt to Retrieve Proprietary Data [DMS-412]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.14 Notification of Unsuccessful Request Submission [DMS-413]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.15 Notification of Restricted Data Request [DMS-678]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.16 Indication of Proprietary Status [DMS-414]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Inspection
7.1.10.17 Indication of Restricted Status [DMS-415]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Inspection

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.10.18 Levels of Registered Archive Users [DMS-416]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.19 Superuser [DMS-417]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.20 Analyst [DMS-418]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.21 General Archive User [DMS-419]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.22 Public Data for Any User [DMS-420]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.23 Only Public Data for Unregistered User [DMS-421]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.10.24 Pre-image Proprietary Rights [DMS-759]	3.4.1.4.2 Proprietary Data Period [SOC-566]	Test
7.1.11.1 AOI Access [DMS-422]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.2 AOI Access Authentication [DMS-423]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.3 AOI Remote Monitor and Control [DMS-424]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.4 Display AOI Page Name [DMS-425]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.11.5 Display AOI Pages on Demand [DMS-426]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.11.6 Display AOI Pages Resizable [DMS-427]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.11.7 Display AOI Pages Updates in Real-time [DMS-428]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.11.8 Select Components [DMS-429]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.9 AOI Overall Monitoring [DMS-430]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.1.11.10 AOI Server Monitor Pages [DMS-431]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.11 AOI Request Monitor Pages [DMS-432]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.12 AOI Summary Status Information [DMS-433]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Inspection
7.1.11.13 Order AOI Status by Any Displayed Field [DMS-434]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.14 AOI Errors and Alarms [DMS-435]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.15 Examine Log Files through AOI [DMS-436]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Demonstration
7.1.11.16 AOI Operator Control [DMS-437]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.17 AOI Server Control Pages [DMS-438]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.18 AOI Request Control Pages [DMS-439]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.19 AOI Disable Request Acceptance [DMS-440]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.20 AOI Disable Request Acceptance for Time [DMS-441]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.21 AOI Prioritize Requests [DMS-442]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.22 AOI Select Multiple Requests [DMS-443]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.23 AOI Modify Restricted and Proprietary Dates [DMS-444]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test
7.1.11.24 AOI Override System Defaults [DMS-445]	3.4.5.1.4 Retrieval of Science Data Products [SOC-1587]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.2.1.1 Store JWST I&T Data [DMS-185]	3.4.7.1.1 I&T Data Storage [SOC-2357]	Demonstration
7.2.1.2 Notification to Archive [DMS-184]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.3 I&T Data Archive Access [DMS-183]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.4 I&T Archive Data Delivery [DMS-182]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.1.5 Receipt of I&T Data [DMS-181]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.6 File and Package Based Archive Requests [DMS-180]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.1.7 File Names Unique [DMS-179]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.8 Archive File Individually [DMS-178]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.1.9 Verify FITS Standard [DMS-177]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.1.10 Package Based Archive Request [DMS-174]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.11 Unique Name for TAR File [DMS-173]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.1.12 Disposition of Archive Request [DMS-171]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Demonstration
7.2.1.13 I&T Archive Data Volume [DMS-166]	3.4.7.2.1 I&T Archive Capacity [SOC-2379]	Inspection
7.2.1.14 I&T Archive Protection [DMS-165]	3.4.1.4.1 Data Security [SOC-1754]	Inspection
7.2.2.1 I&T Archive Catalog [DMS-164]	3.4.7.1.2 I&T Archive Catalog [SOC-2359]	Demonstration
7.2.2.2 I&T Archive Access [DMS-163]	3.4.1.2.1.4 I&T Archive Catalog Access [SOC-2349]	Demonstration
7.2.2.3 I&T Archive Catalog Search [DMS-162]	3.4.7.1.3 I&T Archive Catalog Search [SOC-2361]	Test
7.2.2.4 I&T Archive Catalog Information [DMS-161]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.2.2.5 Metadata from Readme.xml File [DMS-160]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.6 Metadata from FITS Headers [DMS-260]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.7 Catalog Files Individually [DMS-159]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.8 Metadata in Readme.xml [DMS-158]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.9 Metadata in FITS Headers [DMS-157]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.10 Package Catalog Information [DMS-156]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.2.11 Package Readme.xml Information [DMS-155]	3.4.1.2.1.3 I&T Data Receipt [SOC-2353]	Test
7.2.3.1 Retrieve I&T Data [DMS-150]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
7.2.3.2 I&T Data Electronic Distribution [DMS-149]	3.4.1.2.1.7 Archived I&T Data Access [SOC-2351]	Demonstration
7.2.3.3 I&T Archive Access Authentication [DMS-148]	3.4.1.2.1.7 Archived I&T Data Access [SOC-2351]	Test
7.2.3.4 I&T Archive Distribution Modes [DMS-147]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
7.2.3.5 Distribution of Files and Packages [DMS-146]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
7.2.3.6 Unique File Name [DMS-145]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
7.2.3.7 Unique TAR Name for Packages [DMS-144]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
7.2.3.8 Notification of Request Disposition [DMS-143]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
7.2.3.9 Notification of Data Availability [DMS-142]	3.4.7.1.4 Archived I&T Data Retrieval [SOC-2369]	Test
8.1.1.1 Generate Science Data Products from Archive [DMS-235]	3.4.5.3.3 Science Data Product Generation Lifetime [SOC-540]	Analysis
8.1.1.2 Most Current Calibrations [DMS-236]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.2.1 Reprocessing Reentry Point [DMS-237]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.2.2 Reprocess From Level-1a Data [DMS-238]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.2.3 Reprocess From Level-2a Data [DMS-239]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.2.4 Reprocess From Level-1b Data [DMS-588]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.2.5 Access Any Definitive Ephemeris [DMS-240]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Demonstration
8.1.3.1 Monitor CRDS [DMS-581]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.3.2 Monitor Software Versions [DMS-582]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.3.3 Observation Ready for Reprocessing [DMS-583]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.4.1 Only Reprocess Complete Observations [DMS-584]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.4.2 Use Current Best Reference Files and Software [DMS-585]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.4.3 Replace Data Products in Primary Archive [DMS-586]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.4.4 Re-catalog on Reprocessing Ingest [DMS-674]	3.4.2.1.7 Science Archive Catalog [SOC-490]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
8.1.4.5 Manual Input of Reprocessing Observations [DMS-587]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.5.1 Reprocessing Priorities [DMS-590]	3.4.5.3.1 Science Data Product Availability [SOC-538]	Test
8.1.6.1 AUI Show Current Best Reference Files [DMS-591]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Inspection
8.1.6.2 AUI Show Current Software Version [DMS-592]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Inspection
8.1.6.3 Estimated Time for Reprocessing [DMS-661]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Inspection
8.1.6.4 Notification of Reprocessed Data [DMS-597]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.7.1 Header Keywords for Calibration Reference Files [DMS-593]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.7.2 Header Keywords for Software Versions [DMS-594]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
8.1.8.1 Best Calibration Frequency [DMS-595]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Analysis
9.1.1.1 Searchable Shift Report [DMS-599]	3.4.1.1.1 Normal Operations Staffing [SOC-2497]	Test
9.1.1.2 Searchable Data Processing Errors [DMS-600]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
9.1.1.3 Operating Procedures Support [DMS-601]	3.4.1.1.1 Normal Operations Staffing [SOC-2497]	Test
9.1.2.1 Edit Science Telemetry File [DMS-602]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.1.2.2 Process Data with Missing Pixels [DMS-603]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.1.2.3 Calibrated Engineering Data Gap Reports [DMS-604]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test

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DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
9.1.3.1 Report on Association Dependencies [DMS-605]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
9.1.3.2 S/c Events Report [DMS-606]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.1.3.3 Data Processing Message Report [DMS-607]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
9.1.4.1 Archive Completeness [DMS-608]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
9.1.4.2 Report on Data Set Availability Time [DMS-609]	3.4.2.3.3 Science Data Archive Performance [SOC-503]	Test
9.1.4.3 Header Comparison Tool [DMS-610]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.1.4 Archive Quality [DMS-611]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
9.1.4.5 Logically Delete Data Set from Archive [DMS-612]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
9.1.4.6 Purge Versions of Data Set from Archive [DMS-613]	3.4.2.1.3 Archive Science Data [SOC-472]	Test
9.1.5.1 Cleanup Failed Data Set Processing [DMS-614]	3.4.2.1.1 Science Data Characteristics [SOC-2173]	Test
9.1.5.2 Cleanup Anomalous Data Set [DMS-615]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.1.5.3 Bypass Calibration Step [DMS-616]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
9.1.5.4 Force Association Processing [DMS-617]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
9.1.5.5 Override Association Definitions [DMS-618]	3.4.3.1.2 Science Data Calibration [SOC-513]	Test
9.2.1.1 Archive Data to Problem Class [DMS-619]	3.4.2.1.3 Archive Science Data [SOC-472]	Test

DMS Level 4 Requirement	S&OC Level 3 Requirement	Verification Method
9.2.2.1 Flag Unexecuted Exposures or Visits [DMS-620]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.2.2.2 Flag Gap in Calibrated Engineering Data [DMS-621]	3.4.2.1.2 Level 1 Processing [SOC-1689]	Test
9.2.2.3 Flag CRDS Delivery as Bad [DMS-622]	3.4.3.1.3 Use of Most Current Calibrations [SOC-3416]	Test
9.2.3.1 Request Retransmission [DMS-623]	3.4.1.3.2.1 Science Data Receipt [SOC-2103]	Test
9.2.3.2 Receipt of Data via Media [DMS-624]	3.4.1.3.2.1 Science Data Receipt [SOC-2103]	Test

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Appendix A.   DMS Glossary

This glossary defines specialized terms used in DMS.

Term	Definition
Activity	A discrete task to be performed on JWST as part of carrying out a visit and which is executable through a call to an On-Board Script. An Activity is the lowest level of detail on program content that the PPS needs to deal with. Types of activities include exposures, slews, and GS acquisitions.
Archive Research Program	A type of program that requests access to the JWST data archive. An archival research program does not request additional JWST observing time.
Bad Star Information	Information about Guide Stars associated with failed GS Acquisitions.
Batch Distribution	A distribution of data from the Archive in which the transfer of data is de-coupled or asynchronous from the request.
Calibration Proposal	A type of observing proposal developed for purposes of maintaining calibration information for the science instruments and OTE.
Common Archive Observation Model (CAOM)	The Common Archive Observation Model is a unified model of metadata for all astronomical data archives. The CAOM enables cross-mission searches, simplifies archive access with a common set of software, and enhances scientific value of the data archive.
Dark Calibration	A type of calibration performed by taking one or more exposures with the detector shielded from external light.
Data Availability Notification (DAN)	A message indicating that new data is available for retrieval from an S&OC data archive.
Data Cube	A series of groups arranged in time order and stored as a 3-D array in a FITS file.
Definitive Execution Time	The time when a visit actually executed, based on confirmed visit execution data.
Direct Distribution	A distribution of data from the Archive in which the transfer of data is synchronous with the request.
Dither Pattern	A set of exposures within a visit that is repeated at slightly different pointing, with the pointing systematically varied to trace a spatial pattern on the sky.
Deep Space Network (DSN) Contact	A communication contact with JWST via the DSN.
Duplication Report	A report describing the results of automated duplication checking on a JWST proposal.
Engineering Observation	A type of observation developed for purposes of maintaining the observatory. Types of engineering observations include momentum dumps, SK maneuvers, and WFS&C observations. (The term observation is used to refer to all content placed on the JWST observing timeline, even when no science data are taken.)
Engineering Telemetry	Downlinked information other than science data, such as voltages, temperatures, status messages, and position data. Sometimes called 'housekeeping' or 'state of health' data. Engineering telemetry is downlinked either from the SSR or in real-time (adapted from the FGIRCD).
Error	A known problem with an observation that prevents it from successfully executing as specified.

Term	Definition
ESX	VMware ESX is an enterprise-level computer virtualization product offered by VMware, Inc.
Executed Visit	A visit that has completed execution onboard JWST with no errors detected during onboard processing.
Exposure	The end result of resetting a detector on a JWST science instrument and then non-destructively sampling it one or more times while data are being taken.
Failed Visit	A visit that began execution onboard JWST but terminated abnormally due to errors detected during onboard processing. Possible causes of visit failure include guide star acquisition failure, target acquisition failure, and safing events.
File Dump Data	"Any type of data stored as files in any observatory memory with the exception of data stored on the Solid State Recorder" (from the FGIRCD).
FITSWriter	An application that creates FITS files from packetized JWST instrument science telemetry and csv format engineering data.
Guide Star (GS) Acquisition	A type of activity that involves acquiring lock on a Guide Star to stabilize pointing during a visit.
Guide Star (GS) Reference Star	A celestial object to be used by onboard software in pattern matching for purposes of identifying a particular Guide Star.
GSID Archive	An operational deployment archive system based on the SID Archive software. The GSID Archive is deployed in the S&OC I&T SITAR area and hosts JWST Engineering Ground Test data collected during formal testing at remote facilities.
GTO Proposal	A type of observing proposal that uses observing time guaranteed to the Investigator in exchange for work performed on an instrument or observatory development team.
Guide Star	The descriptive data of a star used to control the pointing of JWST.
Guide Star Catalog	A database of information about Guide Stars that is used to identify usable Guide Stars for a particular visit.
ISIM Event Log	"Log of ICDH activities, important events, and faults in ASCII" (from the FGIRCD).
JWST Ephemeris Data	A representation of the future (predicted) or historical (definitive) position of the JWST Observatory as a function of time.
Legacy Proposal	A type of observing proposal that addresses a major JWST science theme and requires a relatively large amount of observing time.
Link Set	The transitive closure of a set of observations related through timing links or orientation links. Planning and scheduling of an observation may depend on other observations in the same link set, but is independent of all observations outside the link set. Observations without links constitute a singleton link set.
Memory Dump	"Information dumped from memory used by the flight software. It may consist of computer program code, or tables or constants or other data used by the flight software" (from the FGIRCD).
Mirror Site	A location external to STScI that holds a copy of archive data, and possibly the archive catalog. The mirror site may hold all or a subset of the archive content.
Mission Planning Data	Planning products generated by FDF for use by the S&OC.
Mission-Critical Observation	A type of engineering observation designated as requiring attended operations with real-time commanding and monitoring.

Term	Definition
Momentum Dump Observation	A type of engineering observation that contains a momentum dump.
Mosaic	A type of observation that involves taking images or spectra of adjacent fields (tiles) on the sky to cover an area larger than would be accessible using a single Guide Star. A mosaic involves multiple visits with different Guide Stars.
Micro-Shutter Array (MSA) Configuration	For the NIRSpec Micro-Shutter Array, a specification of which shutters are to be open vs. closed in order to take spectra of particular targets. The orientation must be known in order to define an MSA Configuration.
Observation	A logical unit within an observing program that is defined by the observer and consists of one or more visits separated by minor slews. An observation is placed on a Long-Range Plan as a single unit, and is independent of other observations except for links.
Observation Data	Data describing an observation.
Observation Plan Data	Data prepared by the S&OC to update the contents of the Observation Plan.
Observation Problem Report	A report of an engineering problem with an observation, eventually including the results of an investigation of the cause and recommended solution.
Observation Status	The status of an observation with respect to S&OC processing.
Observatory Command Data	All data uplinked from the ground to the JWST Observatory.
Observatory Event Activity Log Data	Time-ordered data generated by the S&OC recording the status of execution and/or rejection of Observatory Command Data, based on S/C event logs and ISIM event messages received from the Observatory.
Observatory Telemetry/Data	Generic term encompassing all information sent from the Observatory to the ground via the RF Link, whether recorded or real-time. Includes science data, engineering telemetry, memory dumps, and file dumps (adapted from the FGIRCD).
Observing Cycle	A time interval, nominally one year, used to define a set of programs to be implemented in that interval. The Proposal Solicitation defines the Observing Cycle for which JWST proposals are prepared. A subset of these proposals is selected for implementation during the cycle. In practice, the cycle boundary is fuzzy; a small fraction of programs may begin execution before the nominal cycle start date or extend beyond the cycle end date.
Observing Form	A schema (parameterized container) defining the valid content and structure for a particular type of Observation. An Observing Form restricts an observer to a limited set of predefined options.
Observing Program	A type of program that requests JWST observing time and consists of a set of observations (as opposed to an Archival Research Program).
Observation Plan (OP) Window	A time interval that limits the range of times when a visit may execute. The Observation Plan Executive enforces OP Windows.
Orientation	An aspect of spacecraft attitude that defines the degree of "roll" of the telescope about its boresight (V1) axis. Orientation is defined by choosing a feature on the V2-V3 plane, such as the +V3 axis, and determining its direction on the sky.
Orientation Constraint	A type of Special Requirement that restricts the orientation of an observation.
Orientation Link	A type of Observation Link that restricts the relative orientation of two or more observations.

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Term	Definition
Parallel Visit	A type of visit that is to be executed in parallel with a prime visit using a different SI. A parallel visit does not define an independent spacecraft attitude; it is executed at the spacecraft attitude of the prime visit to which it is attached.
Phase Critical Observation	An observation with a type of timing constraint that is periodic and repeats indefinitely.
Pitch	An aspect of spacecraft attitude that defines the orientation of the sunshield relative to the Sun. Pitch is defined as the Sun angle (angle between the +V1 axis and the Sun) minus 90 degrees. Zero pitch corresponds to a "neutral" attitude with the sunshield normal to the Sun.
Plan Window	A time interval during which an observation is planned for possible execution.
Pointing	An aspect of spacecraft attitude that gives the direction on the sky in which the telescope is pointed, usually given in celestial coordinates. A convenient definition for operations is the combination of the celestial coordinates of the target to be observed and the focal plane coordinates of the aperture where the target should be placed.
Project Reference Database (PRD) Data	Data released from the Project Reference Database, or similar data used for local configuration management at a particular site.
Predicted Ephemeris Data	Data that describes the predicted position and velocity of the JWST Observatory as a function of time.
Prime Visit	A type of visit that establishes the spacecraft attitude of JWST during its execution.
Program	A part of a JWST proposal that provides a specification for a science, calibration, or engineering investigation to be pursued using JWST mission resources. A program may be in various states of implementation.
Program Identifier	A unique identifier for an approved program.
Project Reference Database (PRD)	The central repository, or collection of repositories, for static data placed under JWST Project configuration control and used to develop, test, or operate the JWST Observatory.
Proprietary Period	An attribute of an Observing Proposal that sets the interval of time after visit execution during which the Investigator has exclusive rights to the science data.
Quick Look Data	"Critical Data played back by ground commanded SSR start and stop locations" (from the FGIRCD).
Real-time Engineering Telemetry	"Engineering telemetry downlinked in real-time" (from the FGIRCD).
Real-time Event Log Data	"Event log data from ISIM or spacecraft downlinked in real-time" (from the FGIRCD).
Real-time Telemetry/Data	"This is telemetry that is transmitted on the observatory to ground RF link as soon as possible after it is acquired by the observatory data acquisition systems. It includes real-time engineering telemetry, real-time event log data, memory dump data, and file dump data" (from the FGIRCD).
Recorded Engineering Telemetry	"Telemetry engineering telemetry that is written and stored on the SSR. It includes engineering data generated by the ISIM, the spacecraft, and the Optical Telescope Elements." (from the FGIRCD)
Recorded Event Log Data	"Data event log data stored on the SSR. Consists primarily of science activity logs and is unique to ISIM element" (from the FGIRCD).

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Term	Definition
Recorded Science Data	Data "acquired by the ISIM Command and Data Handling subsystem from science instrument focal planes. It consists of focal plane pixel data and any ancillary data associated with the pixel data and included as part of the focal plane data files." (from the FGIRCD).
Recorded Telemetry/Data	"Data that is written to and stored on the SSR. This data consists primarily of science data generated by the ISIM and the engineering data generated by the observatory. It includes recorded engineering telemetry, recorded event log data, and science data" (from the FGIRCD).
Reference Pixel	"All detectors on JWST will incorporate specially engineered reference pixels. Although they do not respond to light, the reference pixels electrically mimic a regular light-sensitive pixel. Using reference pixels, it should be possible to calibrate out bias drifts and many other artifacts having a timescale longer than twice the row rate during detector readout." (from MOCD)
Safestore	A duplicate repository of archive data that is maintained off-site from STScI.
Science Data Archive	The data archive that contains all received science data and associated engineering telemetry data and is intended to be available throughout and beyond the JWST mission lifetime.
Science Target	With regard to NIRSpec MSA spectroscopy, a target that is observed for science reasons rather than as part of a target acquisition procedure.
SID Archive	An operational deployment archive system for JWST I&T Science Instrument data.
Sky Flat	A type of calibration performed by taking one or more external Exposures and using the sky background as the calibration source.
Slew	A type of activity that changes pointing to observe a new target at the start of a visit.
Spacecraft Attitude	The positioning of the observatory vehicle in space, as specified by the directions of its rotational axes (V1, V2, V3). Spacecraft attitude may be determined by a combination of two orthogonal properties, pointing and orientation.
Storage Broker	A service that provides a uniform interface to heterogeneous data storage resources over a network.
Short-Term Schedule (STS) Baseline	A data structure that configures and links together Short-Term Schedules used for operational JWST scheduling. The STS Baseline includes information on the Nominal Execution Time and Definitive Execution Time (if available) of scheduled visits.
Short-Term Schedule (STS) Baseline Segment	A subset of the STS Baseline spanning a particular time interval.
Short-Term Schedule (STS) Boundary Conditions	A description of the state of the Observatory at the start of an STS. Only state variables that affect scheduling are included.
Short-Term Schedule (STS) Output Products	User reports and ancillary data produced during short-term scheduling.
Short-Term Schedule (STS) Timeline	A data structure within an STS consisting of a series of visits and the times when they are scheduled.
Target	An expected source of data for an exposure. A target may be either a celestial object or an internal calibration source.

Term	Definition
Target Acquisition	A type of activity that invokes an onboard procedure to search for a target and position the target precisely within an aperture.
Target Coordinates	The celestial coordinates of a target.
Target Description	Information provided by an Investigator to characterize a target.
Target Metadata	Information provided by an Investigator to categorize a target for future archive users.
Target Name	A string identifying a target.
Target Set	A group of Targets to be observed simultaneously for NIRSpec MSA Observations.
Target of Opportunity (ToO) Observation	A type of observation that is intended to observe a new astronomical event, such as a supernova. ToO observations are typically submitted in advance but activated only when the event of interest occurs.
Up-the-Ramp Sampling	A detector read-out method in which the pixels are sampled non-destructively at uniform intervals resulting in a set of reads following the accumulating charge in the pixel over time.
V3 Position Angle	The angle on the focal plane (measured counterclockwise) from the direction of the North Ecliptic Pole, as viewed from the projection of the V1 axis onto the sky, to the +V3 axis.
Visit	A series of activities within an observation that is to be executed as a logical unit without interruption.
Visit Execution Data	Data obtained through analysis of Observatory Event Activity Log Data, which indicate the status and execution time (if successful) of visits processed by the Observation Plan Executive.
Visit File	A file uplinked as part of an OP Update Package which specifies the content of a Prime visit, together with any attached Parallel visits, in a format that can be interpreted by the Observation Plan Executive.
Visit Status	The state of a visit with respect to S&OC processing.
Warning	A potential problem with an observation that may prevent it from successfully executing as specified.
Wave-Front Sensing and Control (WFS&C) Observation	A type of engineering observation used to monitor the optical quality of the JWST point-spread function and to adjust the figure of the JWST mirror segments if necessary. The adjustment is done through a placeholder activity which permits actuator update directives to be executed if necessary.
Zodiacal Light	A source of sky background resulting from sunlight scattered from dust particles orbiting the Sun.

Appendix B. DMS Acronym List

Term	Definition
AC	Archive Catalog
ACS	Attitude Control System
AOI	Archive Operator Interface
APID	Application Process Identifier
APT	Astronomer's Proposal Tool
AR	Automated Reprocessing
ASCII	American Standard Code for Information Interchange
ASIC	Application Specific Integrated Circuit
AUI	Archive User Interface
BIC	Bus Interface Card
CAL	Science Instrument Calibration Pipelines
CAOM	Common Archive Observation Model
CCSDS	Consultative Committee on Space Data Systems
CCTS	Common Command and Telemetry System
CDBS	Calibration DataBase System
C&DH	Command and Data Handling
CDS	CCSDS Day Segmented
CDS	Centre de Données astronomiques de Strasbourg
CFDP	CCSDS File Delivery Protocol
COTS	Commercial of the Shelf
CRD	Calibration Reference Data
CRDS	Calibration Reference Data System
CWG	Calibration Working Group
DADS	Data Archive and Distribution System
DAN	Data Availability Notification
DAT	Data Analysis Tools
DIST	Distribution
DMS	Data Management Subsystem
DPQ	Data Processing Queue
DSN	Deep Space Network
EDP	Engineering Data Processing
EDW	Engineering Data Warehouse
ESX	Elastic Sky X

Term	Definition
FCSI	FPAP Controller SpareWire Interface
FDF	GSFC's Flight Dynamics Facility
FGS	Fine Guidance Sensor
FITS	Flexible Image Transport System
FOS	Flight Operations Subsystem
FOT	Flight Operations Team
FOV	Field Of View
FPAP	Focal Plane Array Processor
FPE	Focal Plane Electronics
FPGA	Field Programmable Gate Array
FSW	Flight SoftWare
Gb	Gigabit (10^9 bits)
GFE	Government Furnished Equipment
GSID	Ground Segment I&t Data (Archive)
GSRD	Ground Segment Requirements Document
HGA	High Gain Antenna
HST	Hubble Space Telescope
HLA	Hubble Legacy Archive
I&T	Integration and Test
ICD	Interface Control Document
ICDH	ISIM Command and Data Handling
ID	Identifier
IFSW	ISIM Flight SoftWare
IFU	Integral Field Unit
IGSS	ISIM Ground Support System
IRCD	Interface and Requirements Control Document
IRSU	ISIM Remote Services Unit
ISIM	Integrated Science Instrument Module
ITAR	International Traffic in Arms Regulations
JWST	James Webb Space Telescope
MAST	Multi-mission Archive at Space Telescope
Mb (Mbit)	Megabit (10^6 bits)
MCS	Mirror Control Software
MIR	Mid-Infrared
MIRI	Mid-Infrared Instrument

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Term	Definition
MOS	Multi-Object Spectroscopy
MSA	Micro-Shutter Array
NGIN	Next Generation Integrated Network
NIR	Near Infrared
NIRCam	Near Infrared Camera
NIRISS	Near InfraRed Imager and Slitless Spectrograph
NIRSpec	Near Infrared Spectrograph
NISN	NASA Integrated Services Network
NSA	New Staging Architecture
OPGS	Observation Plan Generation System
OSS	Operations Scripts Subsystem
OTE	Optical Telescope Element
OTFR	On-The-Fly Reprocessing
OWL	Open Workflow Layer
PI	Principal Investigator
PPS	Proposal Planning Subsystem
PRD	Project Reference Database
PRDS	Project Reference Database Subsystem
PyRAF	Python Reduction and Analysis Facility
RP	Reprocessing
RTC	Requirements Technical Coordination
S&OC	Science and Operations Center
S/C	Spacecraft
S/N	Signal to Noise
SCA	Sensor Chip Assembly
SCEP	Sensor Chip Electronics Processor
SDP	Science Data Processing
SI	Science Instrument
SIAF	Science Instrument Aperture File
SIAS	Science Instrument Aperture System
SID	Science instrument Integration and testing Data (Archive)
SIDECAR	System for Image Digitization, Enhancement, Control, and Retrieval
SOA	Service-Oriented Architecture
SOCCER	**S**cience & **O**perations **C**enter **C**ontrolled **E**lectronic **R**epository
SSR	Solid State Recorder

Term	Definition
STScI	Space Telescope Science Institute
STSDAS	Space Telescope Science Data Analysis System
TFI	Tunable Filter Imager
UTC	Universal Time Coordinated
VO	Virtual Observatory
VAO	Virtual Astronomical Observatory
WFM	WorkFlow Manager
WFS&C	Wavefront Sensing and Control
WSS	WFS&C Software Subsystem
XML	Extensible Markup Language