1. (normative)  
     
   Data dictionary

**B.1 General**

This annex provides a detailed description of each of the classes and each class attribute in the models presented in this document in the form of a tabular data dictionary.

**B.2 Overview of Microwave Radiometer sensors (Figure 3)**

|  | **Name/Rolename** | **Definition** | **Obligation/ Condition** | **Max occurrence** | **Data type/Class** | **Domain** | **Example Value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. | CA\_CalibrationValidation | Root entity that defines information about calibration | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | AggregatedClass (MD\_CoverageDescription) | Line 2 |  |
| 2. | calibrationType | Characterization of the calibration coded with the data type CA\_CalibrationType | M | 1 | CA\_CalibrationType |  |  |
| 3. | CA\_MicrowaveRadiometerSensor | Top-level class for all calibration information of microwave radiometer sensors | Use obligation/condition from referencing object | Use maximum occurrence from referencing object | SpecifiedClass  (CA\_CalibrationValidation) | Line 4 to 10 |  |
| 4. | observationType | Observation type of the microwave radiometer sensor | M | 1 | CA\_observationType | Imager or sounder |  |
| 5. | receiverType | Type of the microwave radiometer receiver | M | 1 | CA\_ReceiverType | SSB or DSB |  |
| 6. | *Rolename:*  TACalibration | TA calibration | M | 1 | CA\_TACalibration, | Calibration to the receiver of a microwave radiometer |  |
| 7. | *Rolename:*  antennaPatternCalibration | Antenna pattern calibration | M | 1 | CA\_AntennaPatternCalibration | Antenna pattern correction |  |
| 8. | *Rolename:* geometricPosition | Geometric positioning | M | 1 | CA\_GeometricPosition | Latitude and longitude of the pixel. |  |
| 9. | *Rolename:* auxiliaryData | Auxiliary Data including SCF and satellite attachment information | M | 1 | CA\_AuxiliaryData |  |  |
| 10. | *Rolename:*  TBCalibrationValidation | TB calibration and validation | M | 1 | CA\_TBCalibrationValidation |  |  |

**B.3 Antenna Pattern Calibration (Figure 6)**

|  | **Name/Rolename** | **Definition** | **Obligation/ Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example Value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 11. | CA\_AntennaPatternCalibration | Information related to the antenna pattern calibration of the microwave radiometer system | Use obligation / condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class  (CA\_MicrowaveRadiometerSensors) | Line 12 to 20 |  |
| 12. | TA | Antenna temperature | M | 1 | Real | 0<=TA - > Value <= 350, the unit is Kelvin | 283 |
| 13. | spillover | Spillover | M | 1 | Real | 0<=spillover- > Value <= 1 | 0.001 |
| 14. | satelliteAttitude | Satellite attitude expressed in the combination of the omega, phi and kappa components | M | 1 | SD\_Attitude | ISO/TS19130 |  |
| 15. | satelliteOrbitalHeight | Satellite orbital height | M | 1 | Real | >0, the unit is kilometres | 828.929 |
| 16. | beamwidth | Antenna beamwidth | M | 1 | Angle | >0 | 2.0 |
| 17. | mainBeamEfficiency | Antenna main beam efficiency | M | 1 | Real | 0<meanBeamEfficiency - > Value < 1 | 0.95 |
| 18. | coPolAntennaPattern | Co-polarization antenna pattern | M | 1 | CA\_AntennaPattern | Data for antenna pattern at the co-polarization | Note 1 |
| 19. | crossPolAntennaPattern | Cross-polarization antenna pattern | M | 1 | CA\_AntennaPattern | Data for antenna pattern at the cross-polarization | Note 1 |
| 20. | TBWithinTheScene | TB within the scene (output attribute) | M | 1 | Real | 0< TBWithinTheScene - > Value <= 350, the unit is Kelvin | 284 |

**Note 1: coPolAntennaPattern & crossPolAntennaPattern example data**

**(The following is a very simple one, the actual antenna pattern is an extremely large matrix. If we have M elevation angles, N azimuth angles, the “pattern” is a complex matrix of M\*N (up to many thousands elements), either presented by the real and imagery parts, or by the amplitude an phase, see the attaching file)**

**B.4 Auxiliary Data (Figure 7)**

|  | **Name/Rolename** | **Definition** | **Obligation/ Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example Value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 21. | CA\_AuxiliaryData | Information related to the auxiliary data that are needed in the MR calibration procedure. | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class  (CA\_MicrowaveRadiometerSensor) | Line 21 to 42 |  |
| 22. | CA\_SCF | Sensor Constant File used for calibration |  |  | Aggregated  Class(CA\_AuxiliaryData) | Line 23 to 35 |  |
| 23 | centreFrequency | Centre frequency of the microwave radiometer sensor | M | 1 | Real[1..2] | 0.1<= centreFrequency - > Value <= 3000, the unit is GHz | 116.2486  121.2514 |
| 24 | Bandwidth | Bandwidth of the microwave radiometer receiver | M | 1 | Real[1..2] | >0, the unit is GHz | 0.1920  0.1920 |
| 25. | bandwidthCorrection  Coefficients | Bandwidth correction coefficients including 2 items of the first-order correction | M | 1 | Real [2] | Including 2 items: the 1st item is non-dimensional, the unit of the 2nd is Kelvin. | 0.9999  0.05 |
| 26. | USBLimit | Frequency range of the Upper Side Band | M | 1 | OrderedReal | >0, the unit is GHz | 121.1554  121.3474 |
| 27. | LSBLimit | Frequency range of the Lower Side Band | M | 1 | OrderedReal | >0, the unit is GHz | 116.1526  116.3447 |
| 28. | polarizationMode | Polarization mode of the microwave radiometer TB measurement to be calibrated. | M | 1 | CA\_PolarizationMode | vertical-polarization, horizontal polarization, the third Stokes parameter, the fourth Stokes parameter | h\_pol |
| 29. | mainBeamEfficiency | Antenna main beam efficiency | M | 1 | Real | 0<mainBeamEfficiency - > Value <= 1 | 0.95 |
| 30. | thermistorCalibrationCoefficients | Thermistor calibration coefficients | M | 1 | Real [3] | Including 3 items: the unit of the 1st is Kelvin / Volt2, of the 2nd is Kelvin / Volt, of the 3rd is Kelvin. | [0.001  0.99  0.1] |
| 31. | antennaPattern | Antenna pattern at a given frequency within a range of elevation angles and azimuth angles | M | 1 | CA\_AntennaPattern | Data for antenna pattern at co-polariation and cross-polarization | Note 1 |
| 33. | nonlinearity | Nonlinearity terms at different operation temperatures of the radiometer for correcting the nonlinear contributions of the system. | M | 1 | OrderedReal | Unrestricted | [280 0.5;  290 0.6] |
| 34. | hotTargetTB | TB of the Hot target blackbody | M | 1 | Real | Unrestricted | 285 |
| 35. | coldTargetTB | TB of the Cold target. | M | 1 | Real | Unrestricted | 2.7 |
| 36. | CA\_SatelliteAttachmentInformation | Data type that defines the satellite attachment information | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class(CA\_AuxiliaryData) | Line 37 to 42 | Note 2 |
| 37. | satelliteOrbitalHeight | Satellite orbital height with respect to the reference ellipsoid. | M | 1 | Real {ordered} | >0, the unit is km | 828.929  … … |
| 38. | satelliteAttitude | Satellite attitude expressed in the combination of the omega, phi and kappa components | M | 1 | SD\_Attitude{ordered} | ISO/TS19130 | [-0.03 -0.01 0.05] |
| 39. | timeOfMeasurement | Time of measurement | M | 1 | DateTime{ordered} | ISO19103  Unrestricted | 2019-05-04T18:13:51.0  … … |
| 40. | latitudeOfMeasurement | Latitude of measurement | M | 1 | Real {ordered} | -90 <= latitudeOfMeasurement ->Value<= 90, the unit is degree | 15.5649  … … |
| 41. | longitudeOfMeasurement | Longitude of measurement | M | 1 | Real{ordered} | -180 <= longitudeOfMeasurement ->Value<= 180, the unit is degree | 132.5652  … … |
| 42. | satelliteGNSSPosition | Satellite GNSS position ([X, Y, Z] coordinates, expressed in meters), | M | 1 | DirectPosition{ordered} | ISO 19107 | [-4.7224774e+06 5.0735210e+06 1.9688311e+06]  … … |
| 43. | CA\_AntennaPattern | Data type that defines the antenna pattern in the elevation and azimuth dimensions | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 44–46 | Note 1 |
| 44. | patternElevationAngle | Elevation angle | M | 1 | OrderedReal | -90<= patternElevationAngle - > Value <= 90 | Note 1 |
| 45. | patternAzimuthAngle | Azimuth angle | M | 1 | OrderedReal | -180<= patternAzimuthAngle - > Value <= 180 | Note 1 |
| 46. | pattern | Complex pattern including the amplitude and phase at different elevation angles and azimuth angles, at least them should be given in E- and H- cuts of the ports of the antenna. | M | 1 | OrderedReal/ array | <0, the unit is decibel, or dB | Note 1 |

**Note 2: For the satellite attachment information, we only present one set of measurements here. The information may be an ordered sequence of measurements with similar structure.**

**B.5 Geometric Position (Figure 4)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Name/Rolename** | **Definition** | **Obligation/ Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example Value** |
| 47. | CA\_GeometricPosition | Information related to the geometric correction of the microwave radiometer system | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class  (CA\_MicrowaveRadiometerSensor) | Line 51 to 55 |  |
| 48. | satelliteAttachmentInformation | Satellite attachment information | M | 1 | CA\_satelliteAttachmentInformation |  |  |
| 49. | microwaveRadiometerViewingAngle | Microwave radiometer viewing angle with respect to the platform | M | 1 | Angle | >=0, ISO 19103 | 30 |
| 50. | microwaveRadiometerIncidentAngle | Microwave radiometer incident angle with respect to the earth surface | M | 1 | Angle | >=0, ISO 19103 | 33.9 |
| 51. | microwaveRadiometerPixelSize | Microwave radiometer pixel size (expressed in the elevation resolution multiple the azimuth resolution) | M | 1 | OrderedReal | >0, the unit is kilometre | [15,15] |
| 52. | microwaveRadiometerSamplingInterval | Microwave radiometer sampling interval between the successive samples in a scan. | M | 1 | Real | >0, the unit is millisecond | 12.0 |

**B.6 TA Calibration (Figure 5)**

|  | **Name/Rolename** | **Definition** | **Obligation/Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example Value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 53. | CA\_TACalibration | Information related to the antenna temperature calibration of the microwave radiometer system | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class  (CA\_MicrowaveRadiometerSensor) | Line 57 to 65 |  |
| 54. | hotTargetTBInformation | Hot target TB information | M | 1 | CA\_TargetTBInformation |  |  |
| 55. | coldTargetTBInformation | Cold target TB information | M | 1 | CA\_TargetTBInformation |  |  |
| 56. | receiverTemperature | operation temperature of the microwave radiometer | M | 1 | Real | 240<= receiverTemperature - > Value <= 350, the unit is Kelvin | 288 |
| 57. | hotTargetType | Hot target type | M | 1 | CA\_HotTargetType |  | hotBlackbody |
| 58. | coldTargetType | Cold target type | M | 1 | CA\_coldTargetType |  | coldSky |
| 59. | spectralResponseFunction | Spectral response function | M | 1 | CA\_SpectralResponseFunction |  | Note 3 |
| 60. | nonlinearity | Nonlinearity term at different operation temperatures of the radiometer for correcting the nonlinear contributions of the system. | M | 1 | Real |  | [280 0.5;  290 0.6] |
| 61. | TA | Antenna temperature (output attribute) | M | 1 | Real | 0<=TA - > Value <= 350, the unit is Kelvin | 283 |
| 62. | CA\_TargetTBInformation | Data type that defines the target (either hot or cold) TB information | Use obligation / condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 66–69 |  |
| 63. | targetTB | TB from the measured target, usually from varied-temperature blackbody | M | 1 | Real | 0<= targetTB - > Value <= 350, the unit is Kelvin | 288 |
| 64. | targetTBBias | bias in TB of the targetTB | M | 1 | Real | the unit is Kelvin | 0.2 |
| 65. | targetTBUncertainty | uncertainty in TB of the targetTB | M | 1 | Real | >0, the unit is Kelvin | 1.0 |
| 66. | targetTBVoltage | microwave radiometer output in voltage or count | M | 1 | Real | the unit is Volt or count | 3.5 |
| 67. | CA\_SpectralResponseFunction | Data type that defines the spectral response function of the microwave radiometer sensor | Use obligation / condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 48-49 | Note 3 |
| 68. | Frequency | Frequency |  |  | Vector | >0, the unit is GHz | Note 3 |
| 69. | spectralResponse | response weights or radio at the frequencies within the bandwidth of the receiver |  |  | Vector/array | Usually in normalized weights in dB, --100 <= spectralResponseFunction ->Value<= 1 | Note 3 |

**Note 3: SRF Example Value**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Band | Frequency(GHz) | Spectral response function (Weights) | Band | Frequency(GHz) | Spectral response function (Weights) |
| LSB | 116.1526 | 0.034773 | USB | 121.1554 | 0.021594 |
| 116.1674 | 0.039172 | 121.1701 | 0.024326 |
| 116.1821 | 0.041576 | 121.1849 | 0.029084 |
| 116.1969 | 0.041576 | 121.1997 | 0.030869 |
| 116.2117 | 0.046835 | 121.2145 | 0.034773 |
| 116.2265 | 0.046835 | 121.2292 | 0.034773 |
| 116.2412 | 0.036907 | 121.2440 | 0.036907 |
| 116.256 | 0.036907 | 121.2588 | 0.036907 |
| 116.2708 | 0.034773 | 121.2736 | 0.046835 |
| 116.2856 | 0.034773 | 121.2883 | 0.046835 |
| 116.3003 | 0.030869 | 121.3031 | 0.041576 |
| 116.3151 | 0.029084 | 121.3179 | 0.041576 |
| 116.3299 | 0.024326 | 121.3327 | 0.039172 |
| 116.3447 | 0.021594 | 121.3474 | 0.034773 |

**B.7 TB Calibration Validation (Figure 8)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Name/Rolename** | **Definition** | **Obligation/ Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example Value** |
| 70. | CA\_TBCalibrationValidation | Calibration / Validation of the TB. | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated Class  (CAMicrowaveRadiometerSensors) | Line 71 to 79 |  |
| 71. | TBWithinTheScene | TB within the scene of the microwave radiometer | M | 1 | Real | 0< TBWithinTheScene - > Value <= 350 the unit is Kelvin | 285 |
| 72 | payloadOperatingStatus | Payload operating status | M | 1 | CA\_PayloadOperatingStatus |  | Normal |
| 73. | TBTrueValueValue | The equivalent TB true value | M | 1 | Real | 0< TBTrueValue > Value <= 350, the unit is Kelvin | 285.5 |
| 74. | consistencyThreshold | Consistency threshold | M | 1 | Real | the unit is Kelvin | 3.0 |
| 75. | TBCalibrationBias | TB calibration bias (output attribute) | M | 1 | Real | the unit is Kelvin | -0.5 |
| 76. | TBCalibrationStandardDeviation | TB calibration standard deviation (output attribute) | M | 1 | Real | >=0, the unit is Kelvin | 1.0 |
| 77. | calibrationParameterAdjustments | Calibration adjustment coefficients (output attribute) | M | 1 | CA\_CalibrationCoefficientAdjustments |  |  |
| 78. | reCalibratedTB | Re-calibrated TB (output attribute) | M | 1 | Real | >0, the unit is Kelvin | 285.5 |
| 79. | calibrationResults | Parameters in the calibration / validation report (output attribute) | M | 1 | CA\_CalibrationResults |  |  |
| 80. | CA\_CalibrationParameterAdjustments | Data type that defines the calibration adjustment coefficients | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 81–84 |  |
| 81. | hotTargetBTBias | Hot target BT bias | M | 1 | Real | the unit is Kelvin | 0.2 |
| 82. | coldTargetBTBias | Cold target BT bias | M | 1 | Real | the unit is Kelvin | 0.2 |
| 83. | nonlinearityCorrection | Nonlinearity coefficient correction | M | 1 | Real | Unrestricted | 0.001 |
| 84. | antennaPatternCorrectionCoefficient | Antenna pattern correction coefficient | M | 1 | OrderedReal | 0<= antennaPatternCorrectionCoefficient ->Value<= 1 | [0.999 0.001 0.3] |
| 85. | CA\_CalibrationResults | Data type that defines the calibration / validation results | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 86–89 |  |
| 86. | calibrationBias | Calibration bias | M | 1 | Real | the unit is Kelvin | -0.5 |
| 87. | calibrationUncertainty | Calibration uncertainty | M | 1 | Real | the unit is Kelvin | 1.0 |
| 88. | calibrationStability | Calibration stability | M | 1 | Real | the unit is Kelvin/annual | 0.1 |

**B.8 TB True Value (Figure 9)**

|  | **Name/Rolename** | **Definition** | **Obligation/Condition** | **Max occurrence** | **Data type/ Class** | **Domain** | **Example value** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 89. | CA\_TBTrueValue | TB True Value | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class | Line 91 to 94 |  |
| 90 | TBTrueValueType | TB true value type | M | 1 | CA\_TBTrueValueType |  | vicariousCalibration |
| 91. | TBTrueValueValue | TB true value. If TBTrueValueType=vicariousCalibration, TBTrueValueValue= CA\_VicariousCalibrationTrueValue.vicariousCalibrationTBValue; if TBTrueValueType=crossCalibration, TBTrueValueValue= CA\_CrossCalibrationTrueValue.crossCalibrationTBValue; if TBTrueValueValue= CA\_AbsoluteCalibrationTrueValue.absoluteCalibrationTBValue. | M | 1 | Real | 0< TBTrueValueValue -> Value <= 350, the unit is Kelvin | 285.5 |
| 92. | vicariousCalibrationTrueValue | TB from vicarious calibration | M | 1 | CA\_VicariousCalibrationTrueValue |  | 285.5 |
| 93. | crossCalibrationTrueValue | TB from cross calibration | M | 1 | CA\_CrossCalibrationTrueValue |  | 285.5 |
| 94. | absoluteCalibrationTrueValue | TB from OMB method or other absolute calibration methods. | M | 1 | CA\_AbsoluteCalibrationTrueValue |  | 285.5 |
| 95. | CA\_VicariousCalibrationTrueValue | Vicarious calibration true Value | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated Class (CA\_TBTrueValue) | Line 96 to 101 |  |
| 96. | hotEndTBInformation | Hot-end TB information | M | 1 | CA\_TargetTBInformation |  |  |
| 97. | coldEndTBInformation | Cold-end TB information | M | 1 | CA\_TargetTBInformation |  |  |
| 98. | hotEndType | Hot-end Type | M | 1 | CA\_HotEndType |  | rainForest |
| 99. | coldEndType | Cold-end Type | M | 1 | CA\_ColdEndType |  | ocean |
| 100. | vicariousCalibrationTBValue | Vicarious calibration TB Value | M | 1 | Real | >0, the unit is Kelvin | 285.5 |
| 101 | vicariousCalibrationTBUncertainty | Vicarious calibration TB uncertainty | M | 1 | Real | >=0, the unit is Kelvin | 1.0 |
| 102. | CA\_CrossCalibrationTrueValue | Cross calibration true value | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated Class (CA\_TBTrueValue) | Line 103 to 108 |  |
| 103. | referenceSatelliteName | Reference satellite name | M | 1 | String |  | FY-3C |
| 104. | calibratedSatelliteAttachmentInformation | Calibrated satellite attachment information | M | 1 | CA\_SatelliteAttachmentInformation |  |  |
| 105. | referenceSatelliteAttachmentInformation | Reference satellite attachment information | M | 1 | CA\_SatelliteAttachmentInformation |  |  |
| 106. | referenceSatelliteTB | Reference satellite TB | M | 1 | Real | 0<= referenceSatelliteTB - > Value <= 350, the unit is Kelvin | 285.3 |
| 107. | crossCalibrationTBValue | Cross Calibration TB true value | M | 1 | Real | 0<= referenceSatelliteTB - > Value <= 350, the unit is Kelvin | 285.5 |
| 108. | crossCalibrationTBUncertainty | Cross calibration TB uncertainty | M | 1 | Real | >=0, the unit is Kelvin | 1.0 |
| 109. | CA\_AbsoluteCalibrationTrueValue | Absolute calibration true value | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Aggregated  Class (CA\_TBTrueValue) | Line 110 to 116 | 285.5 |
| 110. | atmosphereProfile | Atmosphere profiles for computing using radiative transfer model | M | 1 | CA\_AtmosphereProfile |  |  |
| 111. | oceanSurface | Ocean surface parameters for computing using radiative transfer model | M | 1 | CA\_OceanSurface |  |  |
| 112. | landSurface | Land surface parameters for computing using radiative transfer model | M | 1 | CA\_LandSurface |  |  |
| 113. | radiativeTransferModel | Microwave Radiative transfer model for simulating the TB co-located to the satellite sensing. | M | 1 | CA\_RadiativeTransferModel |  |  |
| 114. | absoluteCalibrationTBValue | simulated TB using radiative transfer model or other absolute methods. | M | 1 | Real | 0< absoluteCalibrationTBValue - > Value <= 350, the unit is Kelvin |  |
| 115. | absoluteCalibrationTBUncertainty | Absolute calibration TB uncertainty | M | 1 | Real | >=0, the unit is Kelvin |  |
| 116. | geophysicsQualifyFlags: | Geo-location flags for qualifying the calibration | M | 1 | CA\_GeophysicsQualifyFlags | =0 for unqualified geo-location; =1 for qualified geo-location |  |
| 117. | CA\_AtmosphereProfile | Data type that defines the atmosphere profile | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 118–121 |  |
| 118. | atmosphereTemperature | Atmosphere temperature profile | M | 1 | OrderedReal | >0, the unit is Kelvin |  |
| 119. | atmosphereHumidity | Atmosphere humidity profile | M | 1 | OrderedReal | 0<=atmosphereMoisture ->Value<= 1, the unit is kg/kg |  |
| 120. | atmospherePressure | Atmosphere pressure profile | M | 1 | OrderedReal | >0, the unit is hundred Pascal |  |
| 121. | atmosphereLiquid water | Atmosphere liquid water profile | M | 1 | OrderedReal | >=0, the unit is kg/kg |  |
| 122. | cloudCover | Cloud cover percentage | M | 1 | Real | 0<=cloudCover ->Value<= 100, the unit is percentage |  |
| 123. | CA\_OceanSurface | Data type that defines the ocean surface information | Use obligation / condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line123–129 |  |
| 124. | oceanSurfaceTemperature | Ocean surface temperature | M | 1 | Real | >0, the unit is Kelvin | 293 |
| 125. | oceanSurfaceSalinity | Ocean surface salinity | M | 1 | Real | the unit is ‰ | 35 |
| 126. | oceanSurfaceRoughness | Ocean surface roughness | M | 1 | Real | the unit is degree | 10 |
| 127. | oceanSurfaceWindSpeed | Ocean surface wind speed | M | 1 | Real | the unit is m/s | 7 |
| 128. | oceanSurfaceWind Direction | Ocean surface wind direction (with respect to the North) | M | 1 | Real | 0<=oceanSurfaceWindDirection ->Value<= 360, the unit is degree | 135 |
| 129. | seaIceConcentration | Sea ice concentration | M | 1 | Real | 0<=seaIceConcentration ->Value<= 100, the unit is percentage | 0 |
| 130. | CA\_LandSurface | Data type that defines the land surface information | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 132–135 | forest |
| 131. | soilMoisture | Soil moisture | M | 1 | Real | 0<=soilMoisture->Value<= 100, the unit is percentage | 10 |
| 132. | landSurfaceTemperature | Land surface temperature | M | 1 | Real | 0< landSurfaceTemperature ->Value<= 350, the unit is Kelvin | 293 |
| 133. | landCoverType | Land cover type | M | 1 | CA\_LandCoverType |  |  |
|  | **Name/Rolename** | **Definition** | **Obligation/Condition** | **Max occurrence** | **Data type/ Class** | **Domain** |  |
| 134. | CA\_RadiativeTransferModel | Data type that defines the radiative transfer model | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 136–138 |  |
| 135. | atmosphereAbsorption | Atmosphere absorption | M | 1 | Real | 0<=atmosphereAbsorption->Value<= 1 | 0.5 |
| 136. | oceanEmissivity | Ocean emissivity | M | 1 | Real | 0<=oceanEmissivity->Value<= 1  for the vertical and horizontal polarization, for the third and the fourth Stokes parameters, the ranges are within [-0.1, 0.1] | 0.5 |
| 137. | oceanReflectivity | Ocean reflectivity | M | 1 | Real | 0<=oceanReflectivity->Value<= 1 for the vertical and horizontal polarization, for the third and the fourth Stokes parameters, the values are 0. | 0.5 |
| 138. | landSurfaceEmissivity | Land surface emissivity | M | 1 | Real | 0<=landSurfaceEmissivity->Value<= 1 | 0.9 |
| 139. | CA\_GeophysicsQualifyFlags | Data type that defines the geophysics qualify flags. If any of the flag equals 1, the data should be rejected in the calibration process. | Use obligation/ condition from referencing object | Use maximum occurrence from referencing object | Class <<Data type>> | Line 140–143 |  |
| 140. | oceanLandFlag | Flag indicating the presence of land within the scene. The Flag can be determined from the land-ocean mask. | M | 1 | Integer | =0 for ocean; =1 for land or coast | 0 |
| 141. | cloudFlag | Flag indicating the presence of cloud in the path of the observation. | M | 1 | Integer | =0 for no cloud; =1 for presence of cloud | 1 |
| 142. | rainFlag | Flag indicating the presence of rain in the path of the observation. | M | 1 | Integer | =0 for no rain; =1 for presence of rain | 0 |
| 143. | seaIceFlag | Flag indicating the presence of sea ice within the scene. | M | 1 | Integer | =0 for no sea ice; =1 for presence of sea ice | 0 |

**Note 4: Atmosphere Profile (The following is a very simple one, the actual profile may have much more lines, see the attaching file)**

|  |  |  |  |
| --- | --- | --- | --- |
| Atmosphere Pressure (hPa) | Atmosphere Temperature (K) | Atmosphere Humidity (kg/kg) | Atmosphere Liquid Water (kg/kg) |
| 1013 | 293 | 0.03 | 0.01 |
| 955 | 290 | 0.02 | 0.01 |
| 900 | 287 | 0.02 | 0.02 |
| 848 | 284 | 0.01 | 0.01 |
| 799 | 281 | 0.01 | 0.01 |
| …… | | | |

**B.9 Codelists**

**B.9.1** **Calibration Type (Figure 3)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 1. | CA\_CalibrationType | CalibrationType Code | Type of calibration dedicated to certain senor |
| 2. | Optics | 001 | Optics sensor calibration. |
| 3. | lidar  <enumeration value="SAR/INSAR"/>  <enumeration value="MicrowaveRadiometer | 002 | Lidar calibration. |
| 4. | SAR/INSAR | 003 | SAR/INSAR calibration. |
| 5. | microwaveRadiometer | 004 | Microwave radiometer calibration. |

**B.9.2 ColdEndType (Figure 9)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 6. | CA\_ColdEndType | ColdEndType Code | Type of the colder target when applying vicarious calibration |
| 7. | ocean | 001 | Global open ocean emission at the certain sea surface temperature with lower wind speed and clear sky . |
| 8. | other | 002 | Other |

**B.9.3 ColdTargetType (Figure 5)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 9. | CA\_ColdTargetType | ColdTargetType Code | Type of the colder target of the microwave radiometer on-board calibration |
| 10. | coldSky | 001 | The cosmos background radiation at microwave bands. |
| 11 | Coldblackbody | 002 | A manmade broadband passive microwave calibration source with an uniform background radiation in the microwave region of the spectrum, usually working at the liquid nitrogen temperature or temperature lower than that of Hotblackbody with a refrigeration technology. |

**B.9.4 HotEndType (Figure 9)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 12. | CA\_HotEndType | HotEndType Code | Type of the warmer target when applying vicarious calibration |
| 13. | rainForest | 001 | Rain forest, especially referring to Amazon forest. |
| 14. | Desert | 002 | Desert with an bigger area than the footprint of a microwave radiometer |
| 15. | Moon | 003 | Moon maybe served as a reference for the stability of a microwave radiometer. |
| 16. | iceSheet | 004 | Ice sheet at the polar area of the Earth. |
| 17. | other | 005 | Other |

**B.9.5 HotTargetType (Figure 5)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 18. | CA\_HotTargetType | HotTargetType Code | Type of the warmer target of the microwave radiometer on-board calibration, usually working at the ambient temperature |
| 19. | hotBlackbody | 001 | A manmade broadband passive microwave calibration source with an uniform background radiation in the microwave region of the spectrum, working at the ambient temperature or above the temperature of its surroundings. |
| 20. | noiseDiode | 002 | Noise Diode |
| 21. | matchLoad | 003 | a microwave match load at a given range of frequency |

**B.9.6 LandCoverType (Figure 9)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 22. | CA\_LandCoverType | LandCoverType Code | Type of the land cover classification |
| 23. | forest | 001 | Forest |
| 24. | grass | 002 | Grass |
| 25. | desert | 003 | Desert |
| 26. | inlandWater | 004 | Inland water |
| 27. | iceSheet | 005 | Ice sheet |
| 28. | other | 006 | Other |

**B.9.7 Observation Type (Figure 3)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 29. | CA\_ObservationType | ObservationType Code | Type of observation manner of the microwave radiometer, usually relative to the geometry configuration and the target being observed. |
| 30. | imager | 001 | microwave radiometer, usually for imaging the surface of the Earth with conical scanning antenna. |
| 31. | sounder | 002 | microwave radiometer, usually for sounding the atmospheric profiles of the temperature, humidity, and other parameters with cross-tracking scanning antenna. |

**B.9.8 PayloadOperatingStatus (Figure 8)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 32. | CA\_PayloadOperatingStatus | PayloadOperatingStatus Code | Payload operating status of the satellite microwave radiometer |
| 33. | normal | 001 | Normal |
| 34. | satelliteAbnormal | 002 | Satellite Abnormal |
| 35. | payloadAbnormal | 003 | Payload Abnormal |
| 36. | otherAbnormal | 005 | Other Abnormal |

**B.9.9 PolarizationMode (Figure 7)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domainc ode** | **Definition** |
| 37. | CA\_PolarizationMode | PolarizationModeCode | Polarization mode of the microwave radiometer TB measurement to be calibrated. |
| 38. | v-pol | 001 | Vertical polarization |
| 39. | h-pol | 002 | Horizontal polarization |
| 40 | U-pol | 003 | Third element of the Stokes vector. |
| 41 | V-pol | 004 | Forth element of the Stokes vector. |

**B.9.10 ReceiverType (Figure 3)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domainc ode** | **Definition** |
| 42. | CA\_ReceiverType | ReceiverType Code | Receiver type of the microwave radiometer |
| 43. | DSB | 001 | Double Side Band receiver |
| 44. | SSB | 002 | Single Side Band receiver |

**B.9.****11 TBTrueValueType (Figure 9)**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Name** | **Domain code** | **Definition** |
| 45. | CA\_TBTrueValueType | TBTrueValueTypeCode | Type of the true value used in TB calibration /validation |
| 46. | vicariousCalibration | 001 | TBs from Vicarious Calibration, especially referring to those from cold-end sea surface vicarious calibration. |
| 47. | crossCalibration | 002 | TBs from Cross Calibration, especially referring to those from the other satellites. |
| 48. | absoluteCalibration | 003 | Observed TBs Minuses Background TBs from microwave transfer model simulations |