Appendix. 3-1

AMSR Level 1 product format description（MAS-100046A）

MAS-100046A

ADEOS-Ⅱ　AMSR
Level 1 Product Format
Description Document

Japan Aerospace Exploration Agency (JAXA)

Contents

1. Introduction

This document is the level 1 product format description of AMSR (Advanced Microwave Scanning Radiometer) on boarded ADEOS-II (Advanced Earth Observation Satellite II).

1.1. Abstract

AMSR products are shown in Table 1.1-1. This document explains level 1A, level 1B and level 1B Map products.

Table 1.1-1 Types of AMSR products

Product level	Outline of the product
1A	This product includes observed sensor data, the radiometric correction conversion coefficients, and geometrical information of each sampled observation. Observed sensor data is raw counted value, and geometrical information contains geo-location of observed surface on the earth, solar angle, directional vector to ADEOS-II, and so on.
1B	This product includes the brightness temperature converted by the radiometric correction coefficients from observed sensor data of level 1A. It also contains the ancillary data stored in level 1A product.
1B Map	This product is a clipped observation data of the level 1B product for some 3000 km around and map projected, and includes ancillary information. There exist three kinds of projection methods such as Equirectangular, Mercator and Polar stereo.
2	This product includes physical parameters related the hydrology (accumulated water vapor, accumulated cloud liquid water, amount of precipitation, sea surface wind speed, sea surface temperature, sea ice concentration, snow water equivalence, and soil moisture) produced from L1B products, and ancillary information.
2 Map	This product is clipped from level 2 product for some 3000 km around and map projected, and includes ancillary information.
3	There are two kinds of these products such as daily or monthly averaged observation data. It includes ancillary information and map projected onto global grids.

Remarks: The shaded products in the above list are specified in other documents for each.

2. Abstract of the Satellite and Sensor

2.1. Overview of ADEOS-II

The earth observing satellite ADEOS-II was launched from Tanegashima Space Center by H-IIA rocket in Dec 2002. ADEOS-II is a successor to ADEOS, and was designed to understand geophysical mechanisms rooted in environmental problems, such as global warming, and develop and improve sensing technology.

ADEOS-II satellite is shown in Figure 2.1-1. Its main characteristics and sensors are listed in Table 2.1-1 and Table 2.1-2.

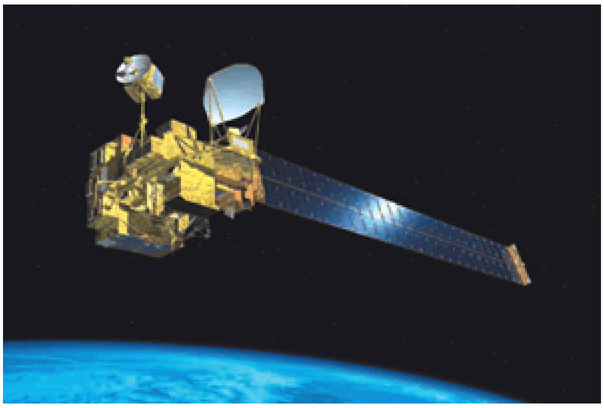


Figure 2.1-1 ADEOS-II Satellite

Table 2.1-1 Main characteristics of ADEOS-II

Launch Date		Dec 14th, 2002
Weight		About 3,700 kg (at launch)
Power		more than 5,000W
Life		3 years (Target)
Orbit	Category	Sun-synchronous sub-recurrent orbit
	Altitude	802.9 km
	Inclination	98.62 degrees
	Period	101 minutes
	Revisit Period	4 days
	Local Sun Time	AM 10: 30 ± 15 minutes

Table 2.1-2 Instruments of ADEOS-II

Instrument		Development organization(Country)
AMSR	Advanced Microwave Scanning Radiometer	JAXA （Japan）
GLI	Global Imager	JAXA （Japan）
ILAS-II	Improved Limb Atmospheric Spectrometer-II	JME （Japan）
Sea Winds	Sea Winds	NASA （US）
POLDER	Polarization and Directionality of the Earth’s Reflectances	CNES （France）

* JAXA: Japan Aerospace Exploration Agency
* JME: Japan Ministry of Environment
* NASA: National Aeronautics and Space Administration
* CNES: Centre National d'Etudes Spatiales

2.2. Overview of AMSR

AMSR (Advanced Microwave Scanning Radiometer) has the largest-diameter microwave scanning radiometer, and it can observe water relevant data with high resolution. Moreover, AMSR observes microwaves instead of optical data, and it can observe from day to night, under any weather condition and less cloud effects. AMSR will demonstrate advantages and viabilities of microwave-based observation of land and sea under clouds.

AMSR measures the radiation from the earth surface or atmosphere. The data obtained by AMSR is converted to brightness temperature by the temperature of CSM (Cold Sky Mirror) and HTS (High Temperature noise Source, the radiometric wave absorber). It will provide geophysical information relevant to water such as the integrated water vapor, integrated cloud liquid water, precipitation, sea surface wind speed, sea surface temperature, sea ice concentration, snow water equivalent, and soil moisture and so on.

Main characteristics of AMSR are shown Table 2.2-1.

Table 2.2-1 Main Characteristics of AMSR

Frequency (GHz)	6.9	10.65	18.7	23.8	36.5	89	50.3	52.8
Resolution	About 50 km		About 25 km		15 km	5 km	10 km	
Band Width (MHz)	350	100	200	400	1000	3000	200	400
Polarization	Horizontal and Vertical						Vertical	
Incident Angle	About 55 degrees							
Swath Width	About 1600 km							
Dynamic Range	2.7-340 K							
Absolute Accuracy	1 K (1-sigma)							
Temperature Resolution	0.3-1 K (1-sigma)							
Quantization bits	12bits	10 bits						

2.3. Observation Principal of AMSR

An object emits the electromagnetic wave of various wavelengths from its surface in microwave region (1-100 GHz). The electromagnetic intensity differs by its physical features, observing frequencies, and so on. Using these characteristics, AMSR observes the faint microwave emitted from the earth surface or the atmosphere.

AMSR main reflector rotates to scan and collect radiation of the microwave from the earth surface or the atmosphere. After the microwave was concentrated with its main reflector, it was distributed to the six receivers. The microwave signals detected by each receiver are amplified and integrated, then converted to the digital count value by an A/D converter. These values are the observation raw data of a level 1 product. Furthermore each receiver observes the microwaves of background radiation from the deep space and radiation from the absorber which temperature is controlled for the specific temperature. These data are applied to correct the observation data.

2.4. Observation Geometry

AMSR is a conical scan sensor and sweeps the surface of the Earth at about ±90° centered at the direction of the satellite flight. The swath width is about 1600 km. The scanning period is 1.5sec and the data-sampling interval is every 2.6msec for 6GHz - 36GHz, 1.3msec for 89GHz and triggered by the antenna rotation. As a result, the AMSR samples 580 data points for a scan of 89GHz and 290 points for other channels. (Fig. 2.4-1)

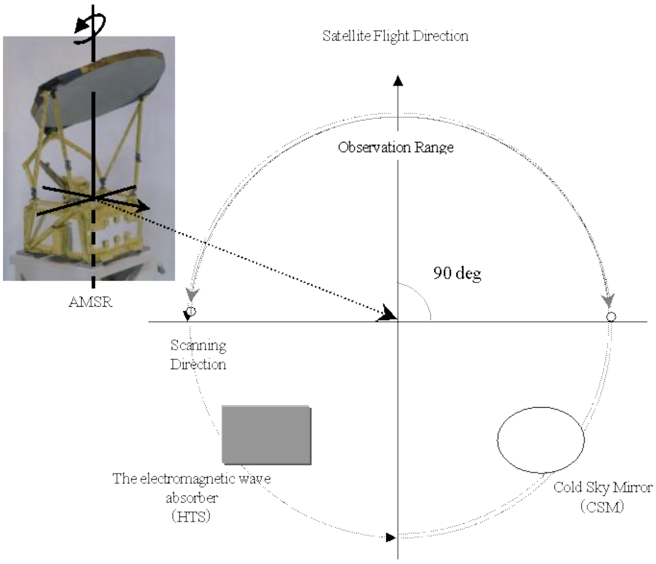


Figure 2.4-1 Observation Geometry of AMSR

3. AMSR Level 1 Product

3.1. Definition of a Scene for AMSR

A scene of AMSR is defined as a half orbit between the South and North Poles for its observed position on the earth (Table 3.1-1). An observed position of AMSR is not nadir but little forward to the satellite flight direction. Therefore, a scan location shifts about 2.5 minutes earlier from the satellite nadir on the orbit (Figure. 3.1-1) but its center is positioned to the satellite nadir. (Table 3.1-2, Figure 3.1-2).

The number of scans of a scene is calculated with the orbital revisit period, the total number of paths, and the scanning interval. In case of AMSR, the number of scans is 2022 scans in a half orbit 50.5 minutes.

2022.1 = 86400[sec/day]*4[day/rec] / 57[orbits/rec] / 1.5[sec/scan] / 2[scene/orbit] + 1[the other pole]

This number will be changed under the influence of the attitude fluctuation.

Table 3.1-1 Definition of a Scene for AMSR

Orbit Direction	Definition
Ascending Scene	The scan including the two-poles point from the southernmost point to the northernmost point of a half orbit
Descending Scene	The scan including the two-poles point from the northernmost point to the southernmost point of a half orbit

Table 3.1-2 Center Position of a Scan

Processing level/Frequency		The number of observation points	Start Position	Center Position
L1A	Except for 89GHz	290	1	146
	89GHz	580	1	291
L1B	Except for 89GHz	196	1 (48th of L1A)	99
	89GHz	392	1 (95th of L1A)	197

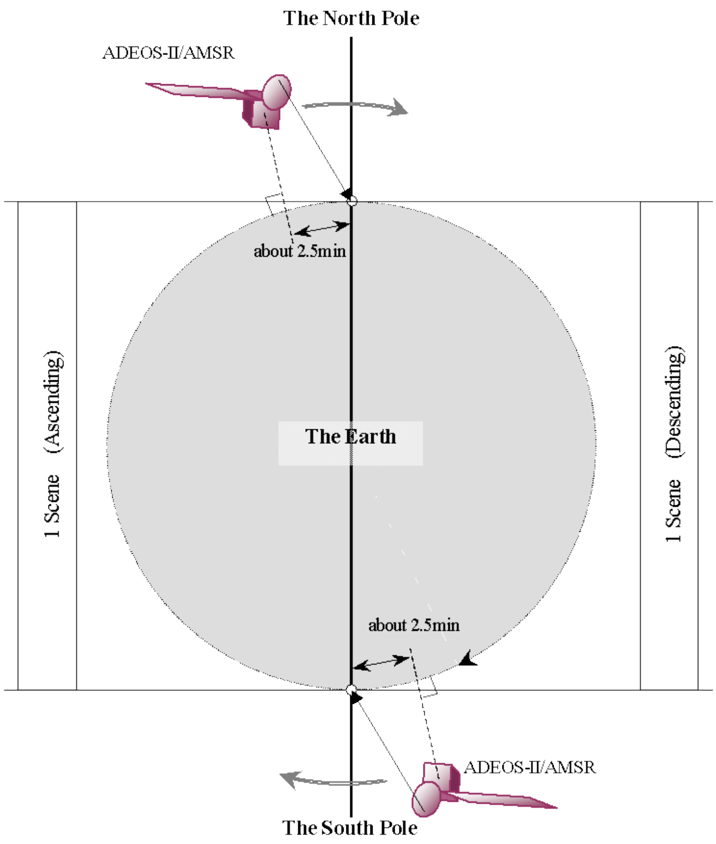


Figure 3.1-1 Geometry of a scene and the flight direction of ADEOS-II

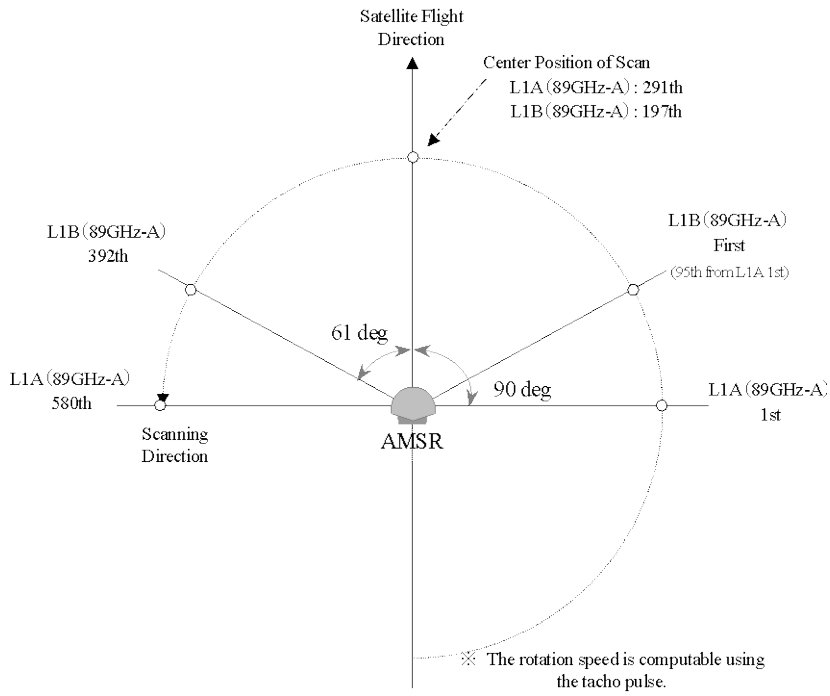


Figure 3.1-2 Geometry of the observation points of a scan

3.2. AMSR Level 1 Product Specification

Level 1 product of AMSR is one file per one scene. And a scene is extended about 10 scans at both ends for reprocessing. As a result, the number of scans of one product is about 2042 scans. At the other hand, the file of L1B Map is produced on demand. Its projection image is the fixed size and extracted by ordered latitude. The specification of the AMSR processing is shown below.

Table 3.2-1 Specification of AMSR level 1 products

<table>
<tr><th>Level</th><th>Production</th><th>Processing</th><th>The number of scans</th><th>Scanning width</th></tr>
<tr><td>1A</td><td>Planned</td><td>Automatic /
Manual Retry</td><td>Half Orbit +
Overlaps (each 10 scans at both ends)</td><td>290: except 89GHz
580: 89GHz</td></tr>
<tr><td rowspan="2">1B</td><td rowspan="2">Planned</td><td>Automatic /
Manual Retry</td><td>Half Orbit +
Overlaps (each 10 scans at both ends)</td><td rowspan="2">196: except 89GHz
392: 89GHz</td></tr>
<tr><td>Near Real Time</td><td>EOC*1 receiving range only</td></tr>
<tr><td>1BMap</td><td>On demand</td><td>Automatic</td><td colspan="2">300 pixel * 300 pixel</td></tr>
</table>

*1. EOC (JAXA Earth Observation Center)

Table 3.2-2 Level of processing in AMSR

Level	Processing Explanation	The state of observation data
1A	・ After sorting packets of observation data, deletes the duplicated packets. ・ The missing packets in the raw data are filled with dummy data. ・ 12 bit and 10 bit observation datasets are converted into 16 bit 2 byte data. ・ Calculates the conversion coefficient from the raw data to the antenna temperature used for next step processing, L1B processing. ・ Calculates longitude/latitude of observation positions, incident angle, the direction of sun and so on. ・ Adds the information of the missing packets and another quality information. ・ Adds the land/ocean flag. ・ Adds the overlapped 10 scans to the start and end of a scene.	Raw data
1B	・ The raw data count values are converted into the brightness temperature through calculating antenna temperature. ・ The observation data range is changed to the antenna angle from –61 degrees to +61 degrees.	Brightness temperature image
1B Map	・ Observed brightness temperature products clipped from L1B. ・ Mapping types are Mercator for under 60 degrees latitude data, Latitude/Longitude Equatorial for under 60 degrees latitude data and Polar Stereo for polar region over 60 degrees latitude.	Mapped brightness temperature image

4. HDF

4.1. Outline of HDF

HDF (Hierarchical Data Format) is developed by NCSA (The National Center for Supercomputing Applications; the University of Illinois) and its objects are machine- and medium- independent and physical representations of data and metadata. HDF can store many varieties of data structure. HDF files are equally accessible by routines written either in FORTRAN or in C provided freely by NCSA.

4.2. HDF File

HDF is a file that consists of the item name and value, and stores them hierarchically. The item name of a data set is using a common name between products, and becomes a key for searching the target data. The HDF library prepares six kinds of data models for storing data sets, and provides the interface. The suitable data model is selected based on the classification and composition of data, and the purpose. Regarding AMSR level 1 product, the HDF library is version 4.2r4, and the following three data models are adopted.

- Global Attribute

  Global Attribute is used for storing attribute information of a character and a numerical value. In AMSR level 1 product, this model is used for the core meta-information and product meta-information. This information is stored as text.

- Vdata

  The Vdata is used for storing customized data records. A Vdata object is a one-dimensional array of records. Each record in a Vdata object contains a set of elements, which adhere to a specifically defined template. In AMSR level 1 product, this model is used for the scanning start time.

- Scientific Data Sets (SDS)

  SDS is used for storing the data of n-dimensional array. Data values in a data set are stored with standard data type (8, 16 or 32 bits signed/unsigned integer, or 32, 64 bits floating point number). Moreover, it can have attribute information corresponding to the data value in a SDS. In AMSR level 1 product, this model is used for all data except for the scanning start time.

§L1A

AMSR Level 1A
Product Format Description

Contents

1. Explanation of the Product

The Level 1A product stores the value of observed microwave radiation from the earth surface, and it's geometric information as HDF. The features of Level1A product are shown below.

- Range of data

  The level 1A product is extracted data in range of a half orbit between the South Pole and North Pole from level 0 data.
- Observation width

  The range of the observation is ±90 degrees centered at the flight direction. (See Figure 1-1.) 290 data points are observed for each frequency below 89GHz and 580 for 89GHz.
- Main items of stored data

  - Scan time
  - Count value of the antenna temperature for the earth surface observation data
    (Without radiometric conversion)
  - Radiometric conversion coefficients
  - Count value of the temperature for HTS and CSM
  - Geometric information (position, observation incidence angle, sun azimuth angle, etc.)
  - Quality information
  - Others (The information of the satellite, sensor, and product etc.)

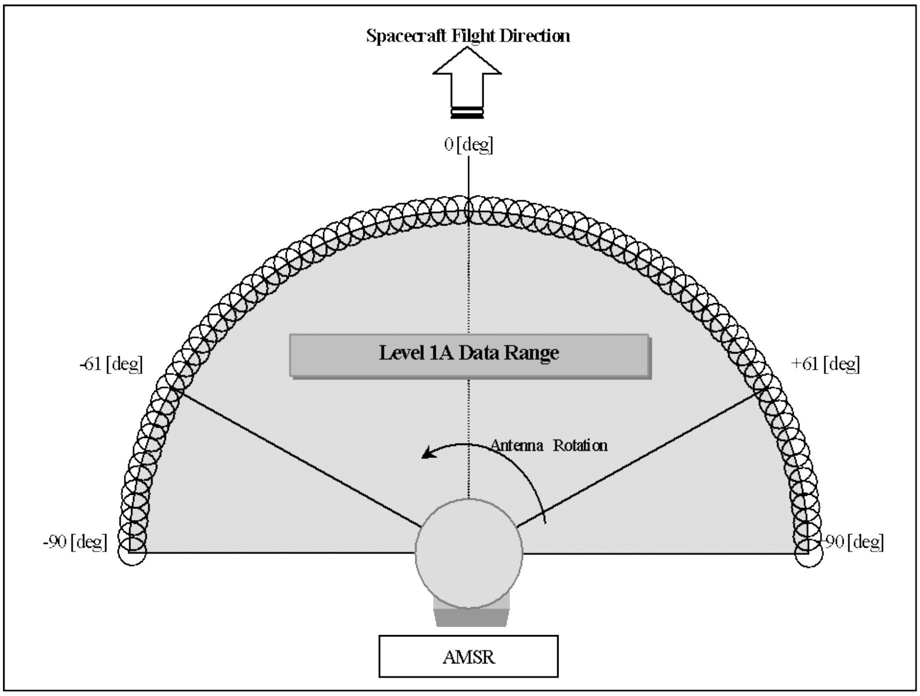


Figure 1-1 The range of one scan for AMSR（Level 1A）

1.1. Product Structure

The logical structure of level 1A product is shown in Table 1-1.

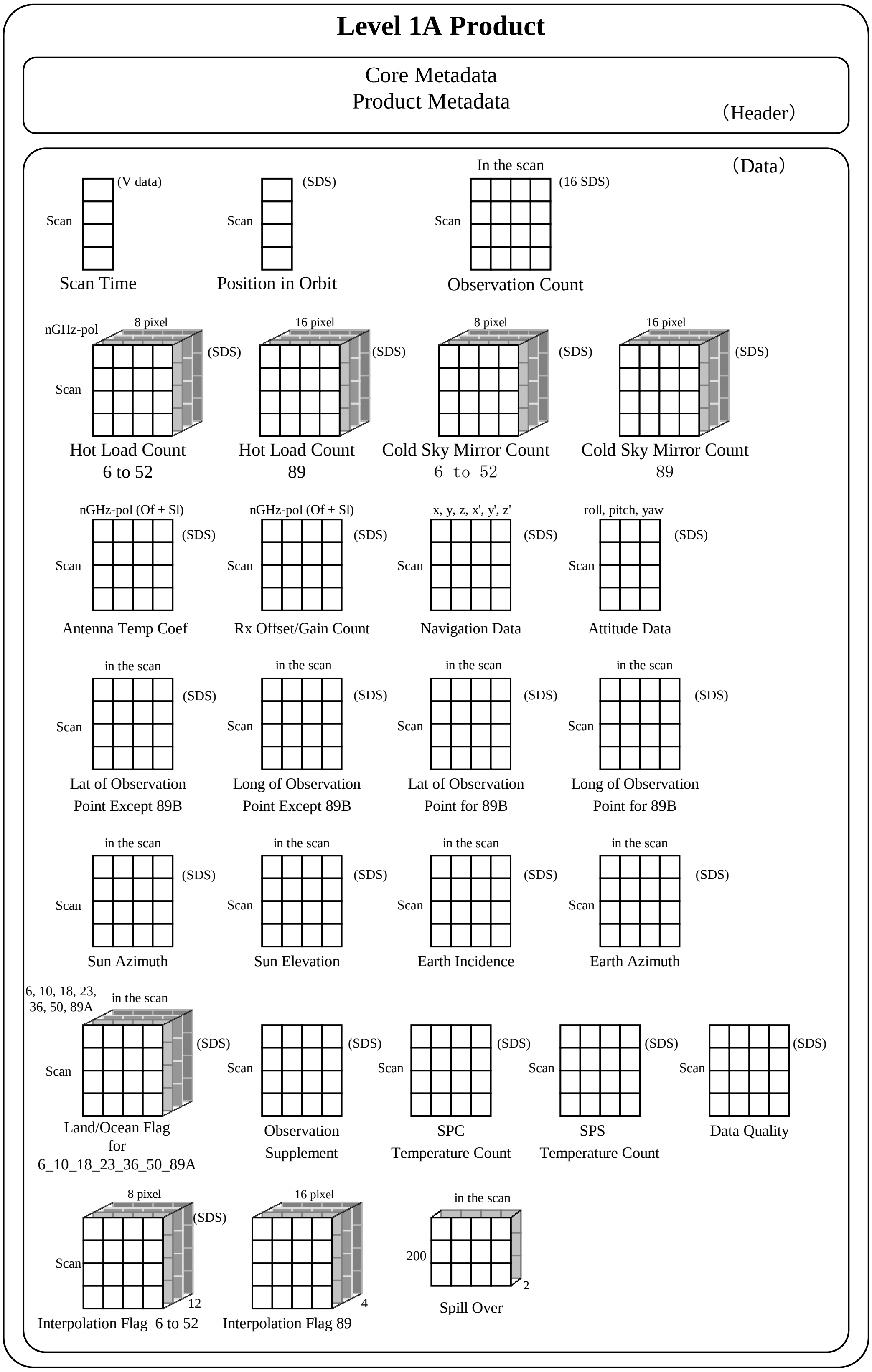
Table 1-1 Logical Structure of AMSR Level 1A product

<table>
<tr><th colspan="2">Structure</th><th>HDF Data Model</th><th>Contents</th></tr>
<tr><td rowspan="2">Header Part</td><td>Core Meta</td><td>Global Attribute</td><td>The general information of the product is stored. It is based on the indispensable item of the attribute of NASA ECS (B. 0).</td></tr>
<tr><td>Product Meta</td><td>Global Attribute</td><td>Main characteristics of AMSR and the conversion table of the engineering values, etc. are stored.</td></tr>
<tr><td colspan="2">Data Part</td><td>Vdata SDS</td><td>The data shown below are stored.
• Scan Time
• Raw values of Observation Data
• Calibration Data
• Supplementary information
(Positions, Orbits, Attitudes, Coefficients, Observation incidence angle, the sun azimuth, etc.)
• Quality information</td></tr>
</table>

1.2. File Structure

The file structure of AMSR level 1A product is shown in Figure 1.2-1. The explanation for the core metadata of the header part is shown in Table 1.2-1, and the product metadata is shown in Table 1.2-2.

Moreover, the explanation for each item of the data part shows the data size and the scale factor in Table 1.2-3, and the data structure in Figure 1.2-2 – 1.2-16.



Data Structure

Figure 1.2-1 The Data Structure

Table 1.2-1 Core Meta Items (1/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
ShortName	The abbreviated name of the product	AMSR-L1A		Fix
VersionID	The version ID of the product	RELEASE3		Example
SizeMBECSDataGranule	Data size of the product (Mbytes)	36.6		Example
LocalGranuleID	Product management number	A2AMS03011815MD_P01A0000000		Example
ProcessingLevelID	ID of processing level	L1A		Fix
ReprocessingActual	Re-processing date (UTC)	blank or 2002-08-10	Date only set for Re-processing (0-Fill for blank)	Example
ProductionDateTime	Product creation date (UTC)	2002-07-29T07:14:29.000Z	0-Fill for blank	Example
RangeBeginningTime	Start time of observation data (UTC)	02:57:17.53Z	0-Fill for blank	Example
RangeBeginningDate	Start date of observation data	2002-07-29	0-Fill for blank	Example
RangeEndingTime	End time of observation data (UTC)	03:47:06.81Z	0-Fill for blank	Example
RangeEndingDate	End date of observation data	2002-07-29	0-Fill for blank	Example
GringPointLatitude	Latitude of data effective range	83.71,73.23,34.10,-25.31,-84.97,-73.60,-23.13,36.52		Example
GringPointLongitude	Longitude of data effective range	152.28,91.82,-10.34,-24.72,-39.30,-105.73,-40.70,-27.99		Example
PGEName	Data processing software name	L1A_Process_Software		Fix
PGEVersion	Data processing software version	3*33*33***33330333		Example
InputPointer	Input file name	A2_AMS_MDR_ASF-_L0_SIG_20030118_1005, A2_AMS_MDR_ASF-_L0_SIG_20030118_1012		Example
ProcessingCenter	Data processing center	JAXA EOC		Fix
ContactOrganizationName	Contact organization name	JAXA,1401,Ohashi,Hatoyama-machi,Hiki-gun,Saitama,350-0393,JAPAN,+81-49-298-1307,orderdesk@eoc.jaxa.jp		Fix
StartOrbitNumber	Start orbit number	1251		Example
StopOrbitNumber	End orbit number	1251		Example
EquatorCrossingLongitude	Longitude at the time of equatorial passage	-28.80		Example
EquatorCrossingDate	Date of equatorial passage	2002-07-29	0-Fill for blank	Example
EquatorCrossingTime	Time of equatorial passage	03:24:14.41Z	0-Fill for blank	Example

Table 1.2-1 Core Meta Items (2/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
OrbitDirection	Orbit direction	DESCENDING		Example
EphemerisGranulePointer	Orbit data file name	EL20030118		Example
EphemerisType	Type of orbit data	GPS		Example
PlatformShortName	Abbreviated name of Platform	ADEOS-2		Fix
SensorShortName	Sensor name	AMSR		Fix
NumberofScans	Number of scans	2042		Example
NumberofMissingScans	Number of missing packets	1		Example
ECSDataModel	Meta data model name	B.0		Fix
DiscontinuityVirtualChannelCounter	Judgement of virtual channel unit counter discontinuity	continuation		Example
QALocationPacketDiscontinuity	Judgment of packet sequence counter discontinuity	discontinuation		Example
NumberofPackets	Number of packets	31904		Example
NumberofInputFiles	Number of input files	2		Example
NumberMissingPackets	Number of missing packets	1		Example
NumberofGoodPackets	Number of good packets	31903		Example
ReceivingCondition	Receiving condition	blank		Fix
EphemerisQA	Ephemeris limit check	OK		Example
AutomaticQAFlag	Limit check by software	PASS		Example
AutomaticQAFlagExplanation	Explanation of limit check by software	1.MissingDataQA:Less than 1010 is available->OK, 2.AntennaRotationQA:Less than 20 is available->OK, 3.HotCalibrationSourceQA:Less than 20 is available->OK, 4.AttitudeDataQA:Less than 20 is available->OK, 5.EphemerisDataQA:Less than 20 is available->OK, 6.QualityofGeometricInformationQA: Less than 0 is available->OK, 7.BrightnessTemperatureQA:Less than 20 is available->OK, All items are OK, 'PASS' is employed		Fix

Table 1.2-1 Core Meta Items (3/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
ScienceQualityFlag	The quality flag when computing the amount of physics	blank		Fix
ScienceQualityFlagExplanation	Explanation of the quality flag when computing the amount of physics	blank		Fix
QAPercentMisssingData	Percentage of missing data	0		Example
QAPercentOutofBoundsData	Percentage of out of bound data	0		Example
QAPercentParityErrorData	Percentage of parity error data	0		Example
ProcessingQADescription	Description of the processing error	PROC_COMP		Example
ProcessingQAAttirbute	The attribute name which is abnormal by QA metadata	NumberofMissingPackets		Example

Table 1.2-2 Product Meta Items (1/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
SatelliteOrbit	The kind of Satellite's orbit	Sun-synchronous_sub-recurrent	Fix
Altitude	The altitude of Satellite	802.9Km	Fix
OrbitSemiMajorAxis	The orbit semi-major axis	7181.317km	Fix
OrbitEccentricity	The orbit eccentricity	0.00007	Fix
OrbitArgumentPerigee	The orbit argument perigee	244.018	Fix
OrbitInclination	The orbit inclination	98.62	Fix
OrbitPeriod	The orbit period	101minutes	Fix
RevisitTime	Orbit recurrent days	4days	Fix
AMSRChannel	The kind of AMSR channels	6.925GHz,10.65GHz,18.7GHz,23.8GHz,36.5GHz,50.3GHz,52.8GHz,89.0GHz-A,89.0GHz-B	Fix
AMSRBandWidth	Band width of AMSR	6G-350MHz,10G-100MHz,18G-200MHz,23G-400MHz,36G-1000MHz,50.3G-200MHz,52G-400MHz, 89GA-3000MHz,89GB-3000MHz	Fix
AMSRbeamWidth	Beam width of AMSR	6G-1.8deg,10G-1.2deg,18G-0.64deg,23G-0.75deg,36G-0.35deg,50.3G-0.25deg,52G-0.25deg,89GA-0.15deg, 89GB-0.15deg	Fix
OffNadir	Off-nadir angle	46.7deg : for 89GB 46.3deg	Fix
SpatialResolution(AzXEl)	Spatial resolution	6G-39.8kmX69.5km,10G-26.6kmX46.3km,18G-14.4kmX25.1km,23G-16.6kmX28.9km,36G-7.7kmX13.5km,50.3G-5.5kmX9.6km,52G-5.5kmX9.6km,89GA-3.3kmX5.8km,89GB-3.3kmX5.7km	Fix
ScanningPeriod	Scanning period	1.5sec	Fix
SwathWidth	Swath width	1600km	Fix
DynamicRange	Dynamic range	2.7K-340K	Fix
DataFormatType	Data format type	NCSA-HDF	Fix
HDFFormatVersion	HDF format version	Ver4.2r4	Fix
EllipsoidName	Earth ellipse model	WGS84	Fix
SemiMajorAxisofEarth	Earth equatorial radius	6378.1km	Fix
FlatteningRatioofEarth	Flattening ratio of earth	0.00335	Fix
SensorAlignment	Sensor alignment	Rx=0.00000,Ry=0.00000,Rz=0.00000	Fix
ThermistorCountRangeWx	The effective range of a thermistor engineering value conversion factor	61,138,301,456,591,698,780,840,883,915,937,954,966,974,1023	Fix

Table 1.2-2 Product Meta Items (2/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
ThermistorConversionTable Wa	Thermistor conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
ThermistorConversionTable Wb	Thermistor conversion table: Wb	0.00000,0.06500,0.06100,0.06500,0.07400,0.09400,0.12200,0.16700,0.23300,0.31300,0.45500,0.58800,0.83300,1.25000,0.00000	Fix
ThermistorConversionTable Wc	Thermistor conversion table: Wc	-35.0000,-38.9610,-38.4660,-39.4190,-46.7780,-55.2340,-75.1220,-110.0000,-165.3490,-235.9380,-365.9090,-491.1760,-725.0000,-1127.5000,90.0000	Fix
ThermistorConversionTable Wd	Thermistor conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1CountRangeWx	Platinum#1 count range: Wx	1168,1296,1536,1792,2032,2272,2512,2752,2992,3232,3472,3712,3952,4095	Fix
Platinum#1ConversionTable Wa	Platinum#1 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1ConversionTable Wb	Platinum#1 conversion table: Wb	0.00000,0.03906,0.04167,0.03906,0.04167,0.04167,0.04167,0.04167,0.04167,0.04167,0.04167,0.04167,0.04167,0.04167	Fix
Platinum#1ConversionTable Wc	Platinum#1 conversion table: Wc	-35.0000,-80.6250,-84.0000,-80.0000,-84.6667,-84.6667,-84.6667,-84.6667,-84.6667,-55.5000,-84.6667,-84.6667,-84.6667,-84.6667	Fix
Platinum#1ConversionTable Wd	Platinum#1 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2CountRangeWx	Platinum#2 count range: Wx	272,528,784,1040,1296,1536,1792,2032,2288,2528,2768,3008,3248,3472,3712,4095	Fix
Platinum#2ConversionTable Wa	Platinum#2 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2ConversionTable Wb	Platinum#2 conversion table: Wb	0.00000,0.07813,0.07813,0.07813,0.07813,0.08333,0.07813,0.08333,0.07813,0.08333,0.08333,0.08333,0.08333,0.08929,0.08333,0.00000	Fix
Platinum#2ConversionTable Wc	Platinum#2 conversion table: Wc	-140.0000,-161.2500,-161.2500,-161.2500,-161.2500,-168.0000,-160.0000,-169.3333,-158.7500,-170.6667,-170.6667,-170.6667,-170.6667,-190.0000,-169.3333,140.0000	Fix
Platinum#2ConversionTable Wd	Platinum#2 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix

Table 1.2-2 Product Meta Items (3/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
Platinum#3CountRangeWx	Platinum#3 count range: Wx	368,704,1040,1360,1696,2032,2352,2688,3008,3344,3664,4000,4095	Fix
Platinum#3ConversionTable Wa	Platinum#3 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#3ConversionTable Wb	Platinum#3 conversion table: Wb	0.00000,0.00893,0.00893,0.00938,0.00893,0.00893,0.00938,0.00893,0.00938,0.00893,0.00938,0.00893,0.00000	Fix
Platinum#3ConversionTable Wc	Platinum#3 conversion table: Wc	12.0000,8.7143,8.7143,8.2500,8.8571,8.8571,7.9500,9.0000,7.8000,9.1429,7.6500,9.2857,45.0000	Fix
Platinum#3ConversionTable Wd	Platinum#3 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
CoefficientAvv	Coefficient: Avv	6G-1.031,10G-1.027,18G-1.022,23G-1.029,36G-1.030,50G-1.024,52G-1.030,89GA-1.029,89GB-1.030	Fix
CoefiicientAhv	Coefficient: Ahv	6G--0.003,10G--0.003,18G--0.003,23G--0.003,36G--0.003,50G-0.000,52G-0.000,89GA--0.004,89GB--0.004	Fix
CoefficientAov	Coefficient: Aov	6G--0.028,10G--0.024,18G--0.019,23G--0.026,36G--0.027,50G--0.024,52G--0.030,89GA--0.025,89GB--0.026	Fix
CoefficientAhh	Coefficient: Ahh	6G-1.031,10G-1.027,18G-1.022,23G-1.032,36G-1.030,50G-0.000,52G-0.000,89GA-1.028,89GB-1.029	Fix
CoefficientAvh	Coefficient: Avh	6G--0.003,10G--0.002,18G--0.003,23G--0.007,36G--0.004,50G-0.000,52G-0.000,89GA--0.004,89GB--0.005	Fix
CoefficientAoh	Coefficient: Aoh	6G--0.027,10G--0.025,18G--0.019,23G--0.024,36G--0.026,50G-0.000,52G-0.000,89GA--0.024,89GB--0.024	Fix
CSMTemperature	Brightness temperature of deep space	6GV-2.800, 6GH-2.800, 10GV-2.800, 10GH-2.800, 18GV-2.800, 18GH-2.800, 23GV-2.800, 23GH-2.800, 36GV-2.800, 36GH-2.800, 50GV-2.800, 52GV-2.800, 89GAV-2.800, 89GAH-2.800, 89GBV-2.800, 89GBH-2.800	Fix
CoRegistrationParametererA1	Co-registration parameter: A1	6G-0.65620, 10G-0.33450, 18G-0.49090, 23G-0.56100, 36G-0.44800, 50G-0.00000	Example
CoRegistrationParametererA2	Co-registration parameter: A2	6G--0.24480, 10G--0.27380, 18G-0.00420, 23G-0.00000, 36G-0.06000, 50G-0.00000	Example

Table 1.2-2 Product Meta Items (4/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
CalibrationCurve Coefficient#1	The radiometric correction coefficient for the 0th order	6GV--0.1919871, 6GH--0.0994771, 10GV--0.0140960, 10GH--0.0011593, 18GV-0.0000000, 18GH-0.0000000, 23GV--0.1514239, 23GH--0.1514239, 36GV--0.0264439, 36GH--0.0555515, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0197245, 89GAH--0.0632250, 89GBV--0.0186104, 89GBH--0.0659556	Example
CalibrationCurve Coefficient#2	The radiometric correction coefficient for the 1st order	6GV-1.0692195, 6GH-1.0358657, 10GV-1.0050821, 10GH-1.0004180, 18GV-1.0000000, 18GH-1.0129884, 23GV-1.0545937, 23GH-1.0545937, 36GV-1.0095340, 36GH-1.0200283, 50GV-1.0000000, 52GV-1.0000000, 89GAV-1.0071118, 89GAH-1.0227955, 89GBV-1.0067097, 89GBH-1.0237784	Example
CalibrationCurve Coefficient#3	The radiometric correction coefficient for the 2nd order	6GV--0.0002331, 6GH--0.0001208, 10GV--0.0000171, 10GH--0.0000014, 18GV-0.0000000, 18GH--0.0000436, 23GV--0.0001835, 23GH--0.0001835, 36GV--0.0000321, 36GH--0.0000673, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0000241, 89GAH--0.0000768, 89GBV--0.0000225, 89GBH--0.0000796	Example
CalibrationCurve Coefficient#4	The radiometric correction coefficient for the 3rd order	6GV-0.0000000, 6GH-0.0000000, 10GV-0.0000000, 10GH-0.0000000, 18GV-0.0000000, 18GH-0.0000000, 23GV-0.0000000, 23GH-0.0000000, 36GV-0.0000000, 36GH-0.0000000, 50GV-0.0000000, 52GV-0.0000000, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Example
CalibrationCurve Coefficient#5	The radiometric correction coefficient for the 4th order	6GV-0.0000000, 6GH-0.0000000, 10GV-0.0000000, 10GH-0.0000000, 18GV-0.0000000, 18GH-0.0000000, 23GV-0.0000000, 23GH-0.0000000, 36GV-0.0000000, 36GH-0.0000000, 50GV-0.0000000, 52GV-0.0000000, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Example
CalibrationMethod	Calibration method name	RxTemperatureReferenced,SpillOver,CSMInterpolation, Absolute89GPositioning,NonlinearityCorrection * RxTemperatureReferenced may be changed into HTUCoefficients or ElectromagneticAnalysis	Example
HTSCorrectionParameter Version	Parameter version of the HTS correction.	ver0002	Example
SpillOverParameterVersion	Parameter version of the CSM spill over correction	ver0001	Example
CSMInterpolationParameter Version	Parameter version of the CSM interpolation correction	ver0001	Example
Absolute89Gpositioning ParameterVersion	Parameter version of the correction for absolute positions of 89 GHz	ver0002	Example

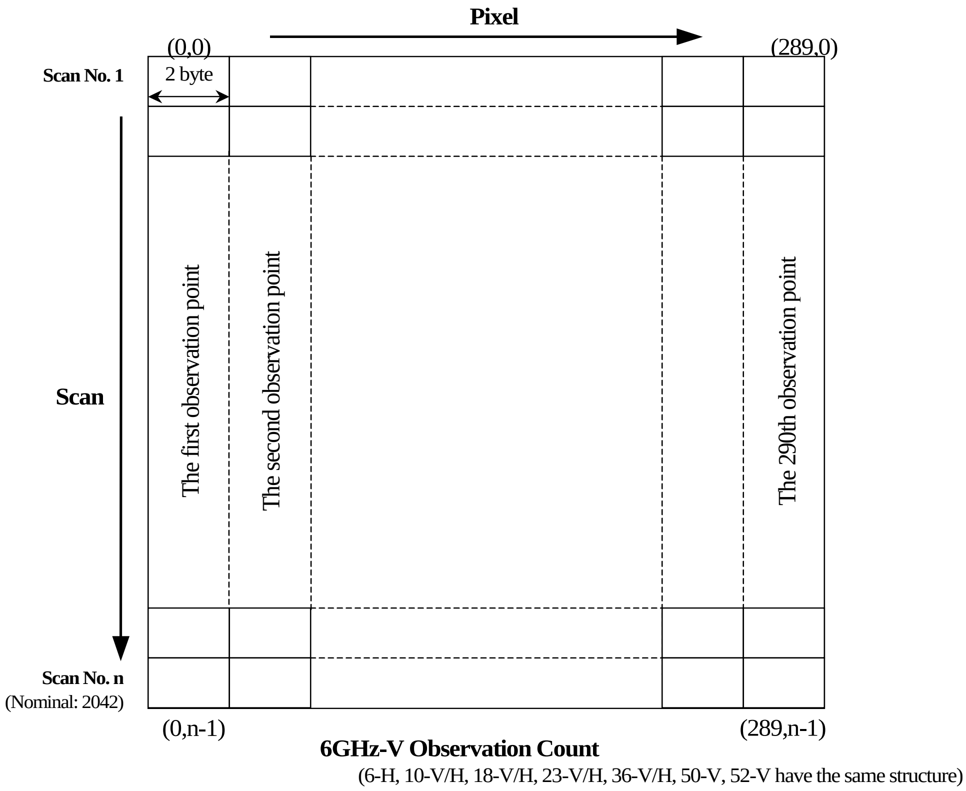
Table 1.2-3 Data Items, Sizes and Scaling Factors (1/2)

No.	Items	Byte	Type	Scale factor	No. of samples per scan	Units	Dimension
1	Scan_Time	8	double	1.0	1	sec	nscan
2	Position_in_Orbit	8	double	1.0	1	-	nscan
3	Navigation_Data	6*4	float	1.0	6	m,m/s	nscan
4	Attitude_Data	3*4	float	1.0	3	deg	nscan
5	6GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
6	6GHz-H_Observation_Count	2	signed int	1.0	290	Count	290*nscan
7	10.65GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
8	10.65GHz-H_Observation_Count	2	signed int	1.0	290	Count	290*nscan
9	18.7GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
10	18.7GHz-H_Observation_Count	2	signed int	1.0	290	Count	290*nscan
11	23.8GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
12	23.8GHz-H_Observation_Count	2	signed int	1.0	290	Count	290*nscan
13	36.5GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
14	36.5GHz-H_Observation_Count	2	signed int	1.0	290	Count	290*nscan
15	50.3GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
16	52.8GHz-V_Observation_Count	2	signed int	1.0	290	Count	290*nscan
17	89.0GHz-V-A_Observation_Count	2	signed int	1.0	580	Count	580*nscan
18	89.0GHz-V-B_Observation_Count	2	signed int	1.0	580	Count	580*nscan
19	89.0GHz-H-A_Observation_Count	2	signed int	1.0	580	Count	580*nscan
20	89.0GHz-H-B_Observation_Count	2	signed int	1.0	580	Count	580*nscan

Table 1.2-3 Data Items, Sizes and Scaling Factors (2/2)

No.	Items	Byte	Type	Scale factor	No. of samples per scan	Units	Dimension
21	Hot_Load_Count_6_to_52	2	signed int	1.0	8	Count	8*nscan*12
22	Hot_Load_Count_89	2	signed int	1	16	Count	16*nscan*4
23	Cold_Sky_Mirror_Count_6_to_52	2	signed int	1	8	Count	8*nscan*12
24	Cold_Sky_Mirror_Count_89	2	signed int	1	16	Count	16*nscan*4
25	Antenna_Temp_Coef(Of+Sl)	4	float	1	32	K+K/Cnt	32*nscan
26	Rx_Offset/Gain_Count	2	unsigned int	1	32	Count	32*nscan
27	Lat_of_Observation_Point_Except_89B	2	signed int	0.01	580	deg	580*nscan
28	Long_of_Observation_Point_Except_89B	2	signed int	0.01	580	deg	580*nscan
29	Lat_of_Observation_Point_for_89B	2	signed int	0.01	580	deg	580*nscan
30	Long_of_Observation_Point_for_89B	2	signed int	0.01	580	deg	580*nscan
31	Sun_Azimuth	2	signed int	0.1	290	deg	290*nscan
32	Sun_Elevation	2	signed int	0.1	290	deg	290*nscan
33	Earth_Incidence #1	1	signed char	0.02	290	deg	290*nscan
34	Earth_Azimuth	2	signed int	0.01	290	deg	290*nscan
35	Land/Ocean_Flag_for_ 6_10_18_23_36_50_89A	1	unsigned char	1	290	%	290*nscan*7
36	Observation_Supplement	2	-	1	27	-	27*nscan
37	SPC_Temperature_Count	2	unsigned int	1	20	Count	20*nscan
38	SPS_Temperature_Count	2	unsigned int	1	32	Count	32*nscan
39	Data_Quality	4	float	1	128	-	128*nscan
40	Interpolation_Flag_6_to_52	1	-	1	16	-	8*nscan*12
41	Interpolation_Flag_89	1	-	1	32	-	16*nscan*4
42	Spill_Over	4	float	1	243	mV	290*200scan*2

#1: The Earth Incidence has also sub-attribute “OFFSET”. This offset is set to 55.0.



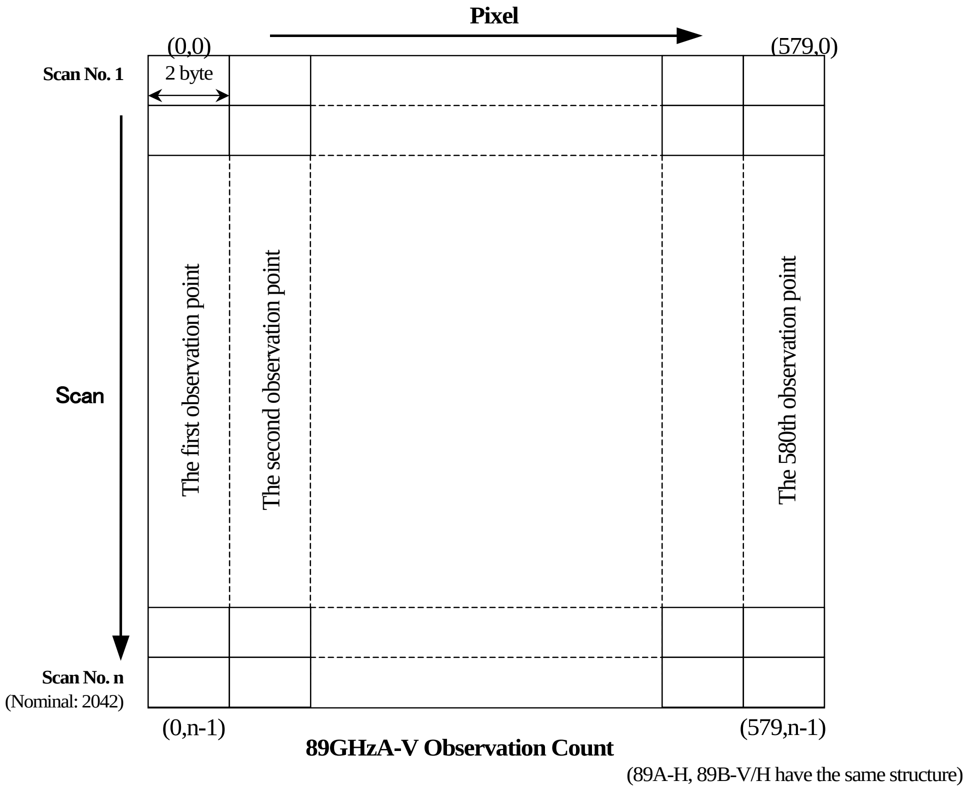
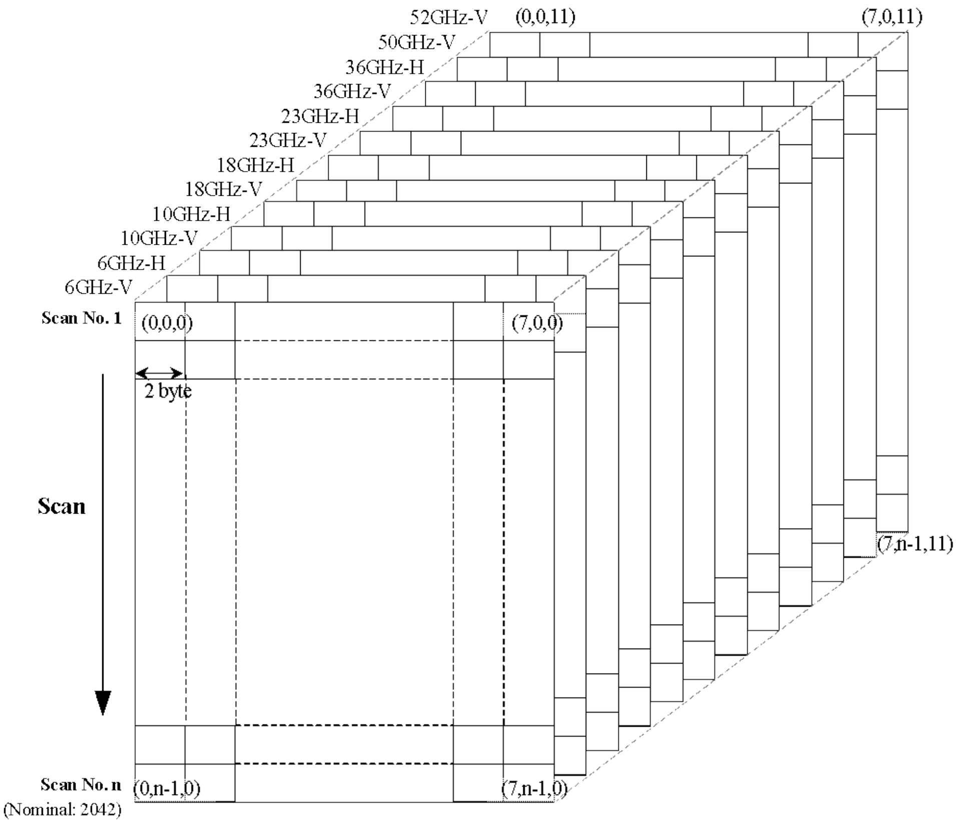
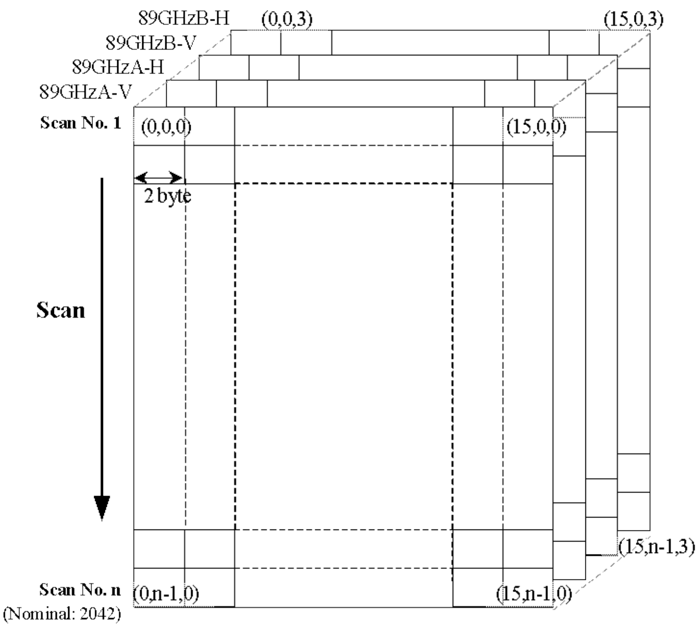


Figure 1.2-2 The Structure of Observation Count



Hot Load Count 6 to 52
Cold Sky Mirror Count 6 to 52
(Hot Load and Cold Sky Mirror Count have the same structure.)



Hot Load Count 89

Figure 1.2-3 The Structure of Hot Load Count, Cold Sky Mirror Count

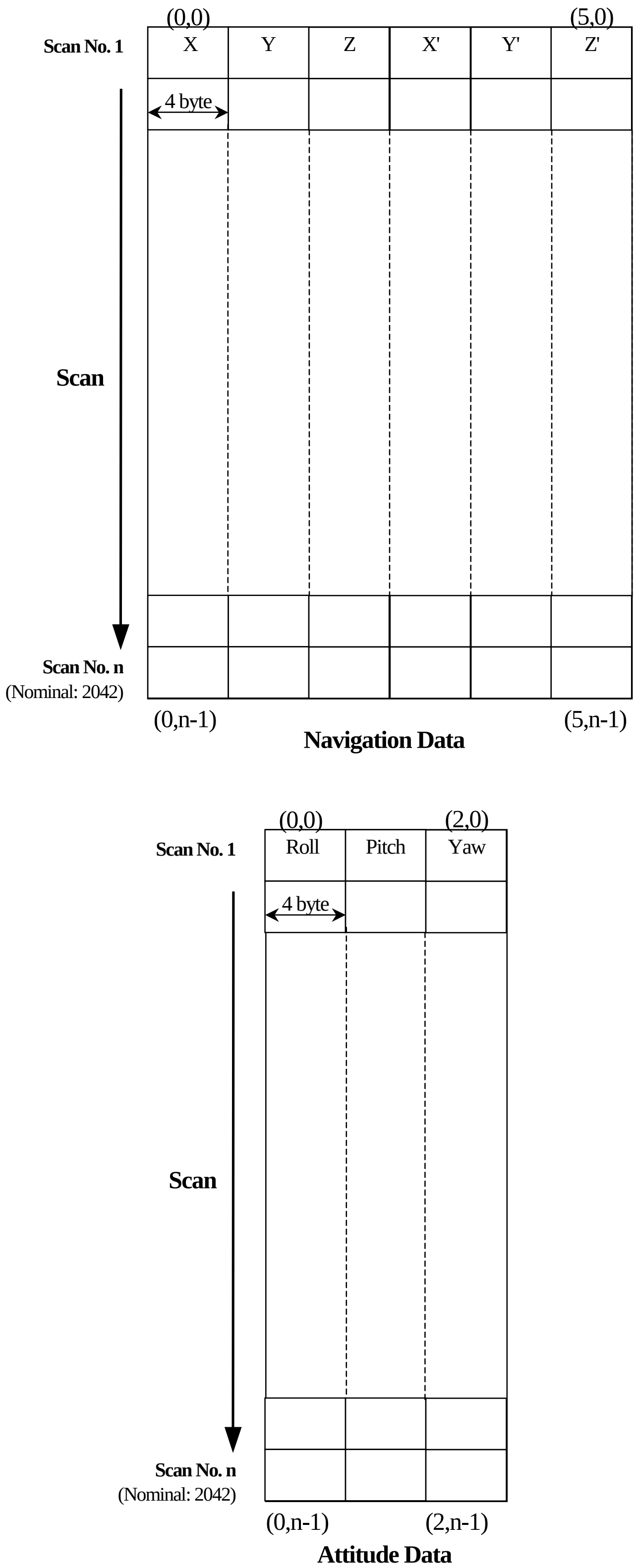


Figure 1.2-4 The Structure of Navigation Data, Attitude Data

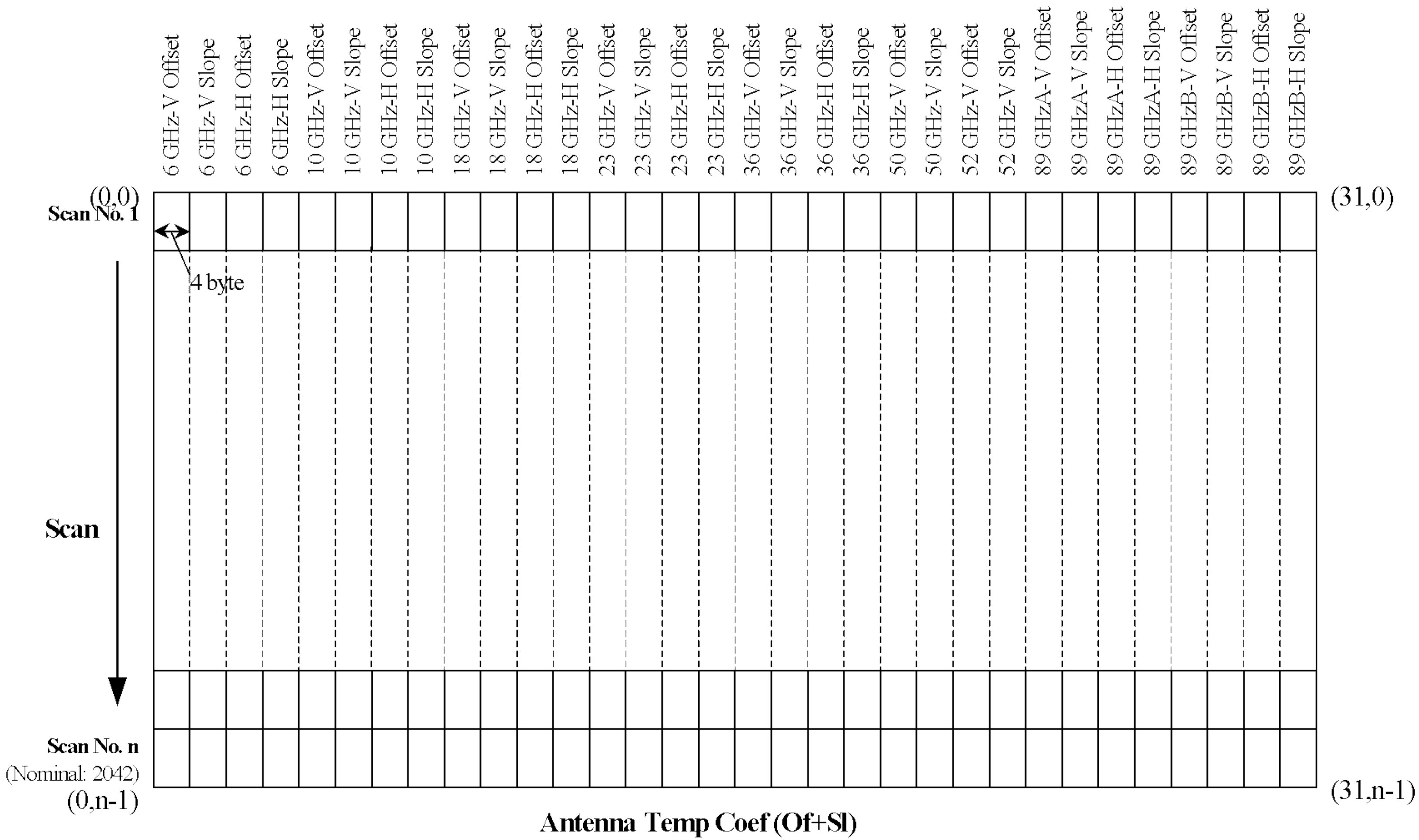


Figure 1.2-5 The Structure of Antenna Temp Coef

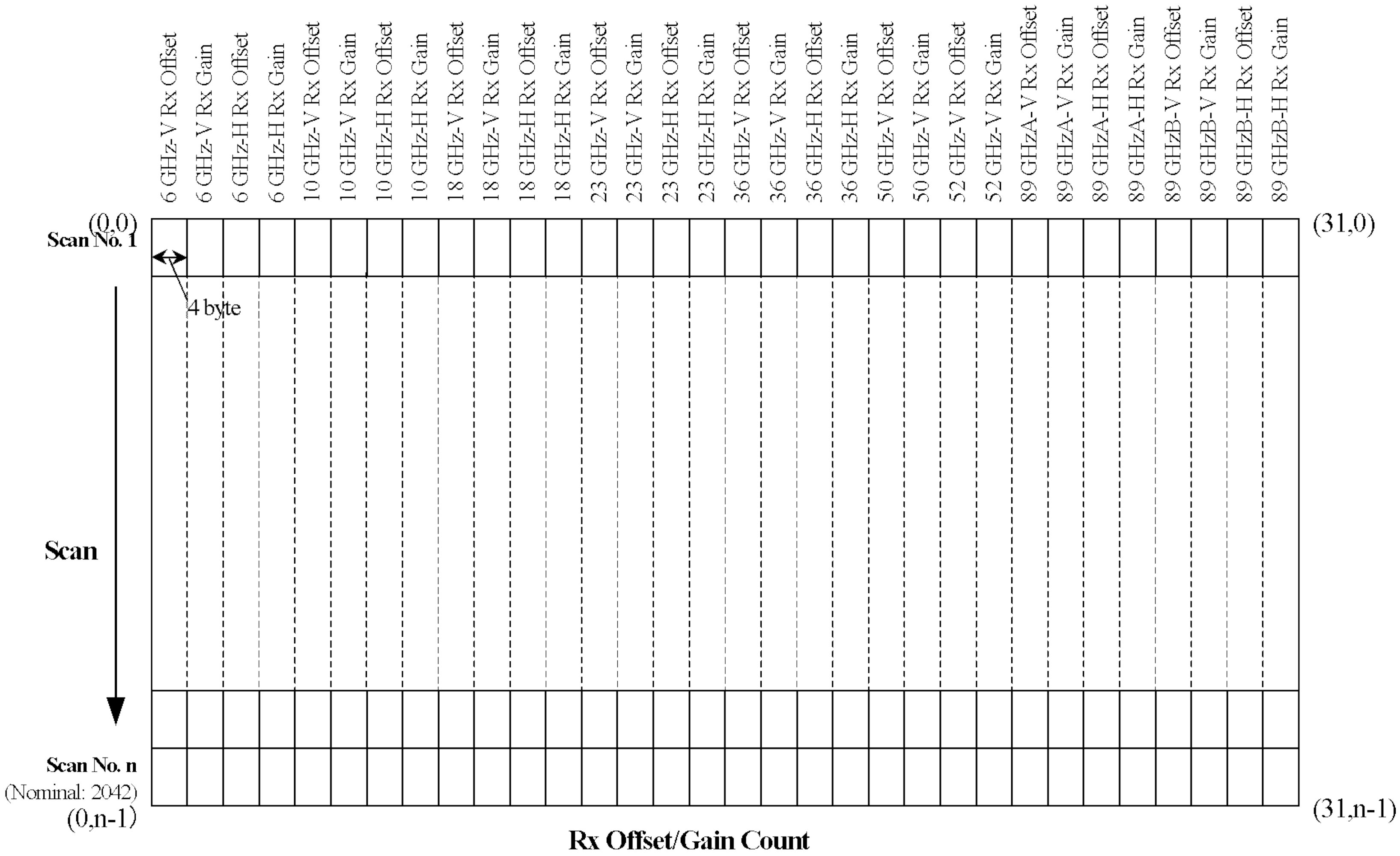
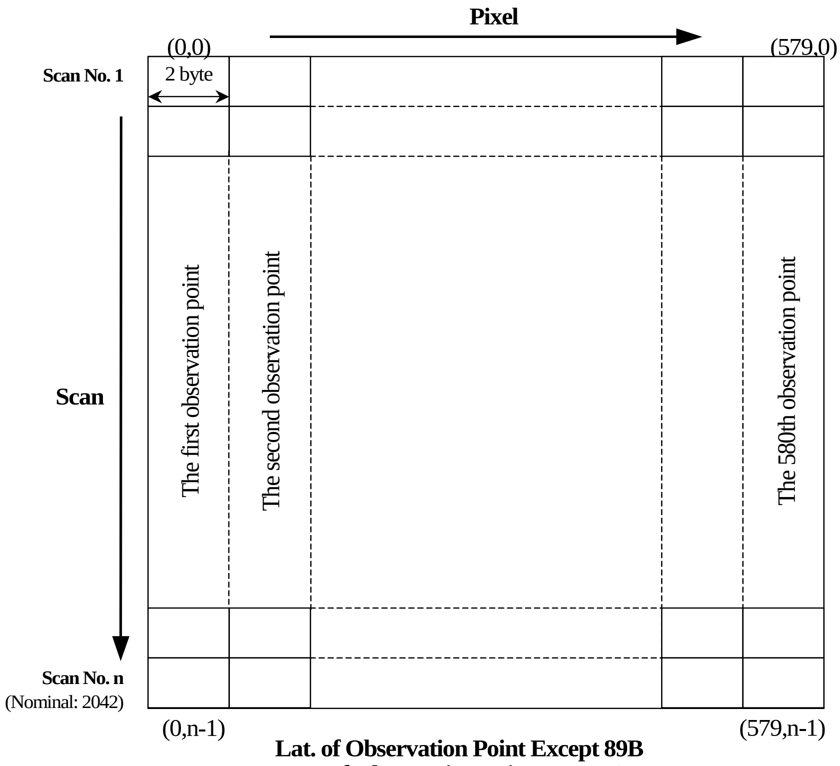
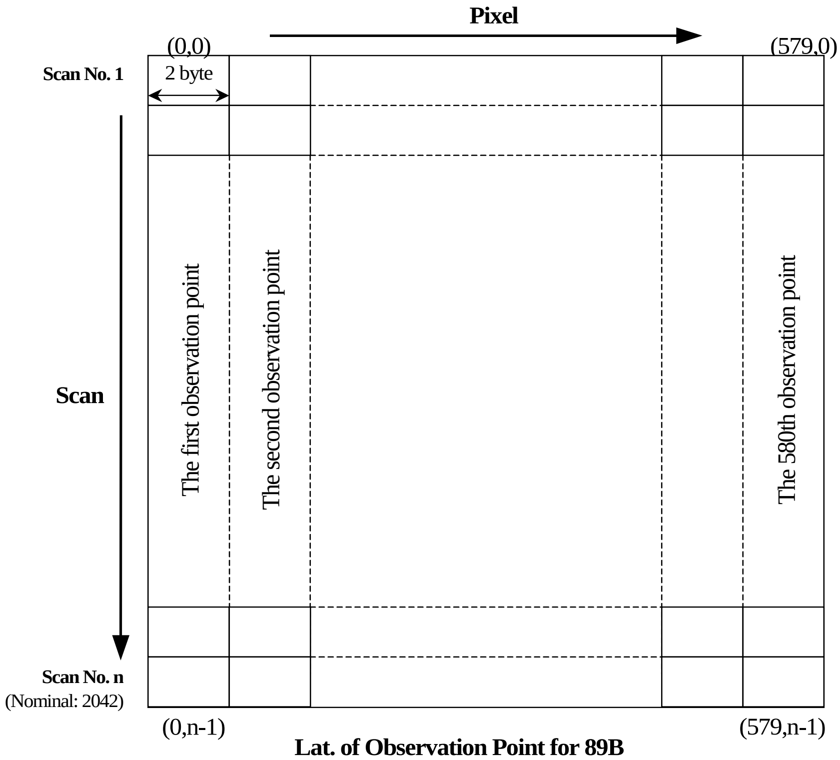


Figure 1.2-6 The Structure of Rx Offset/Gain Count



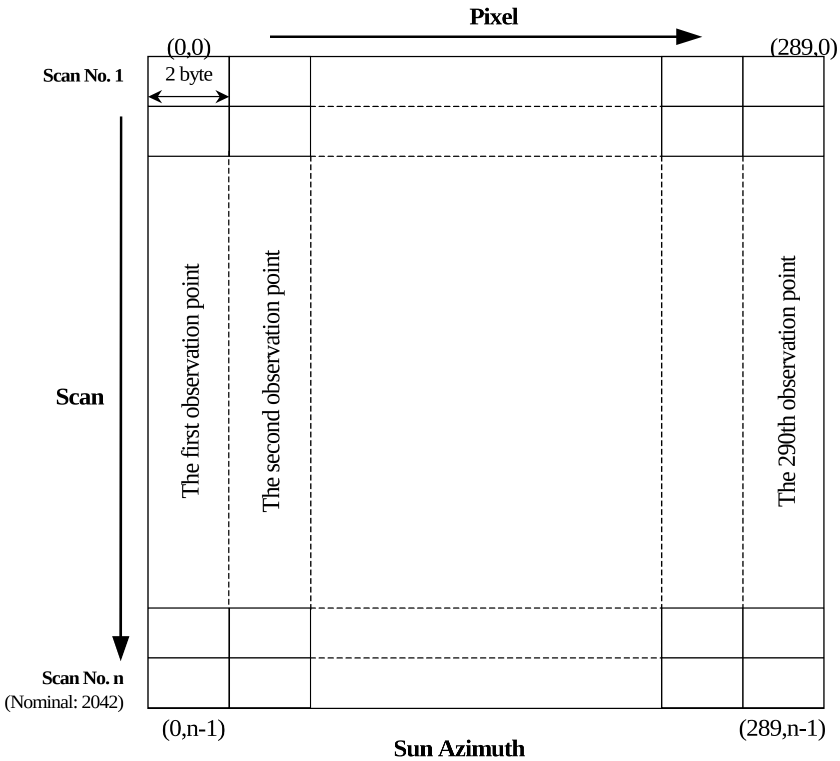
Lat. of Observation Point Except 89B
Long. of Observation Point Except 89B

(Latitude and Longitude have the same structure.)



Lat. of Observation Point for 89B
Long. of Observation Point for 89B

Figure 1.2-7 The Structure of Lat of Observation Point, Long of Observation Point



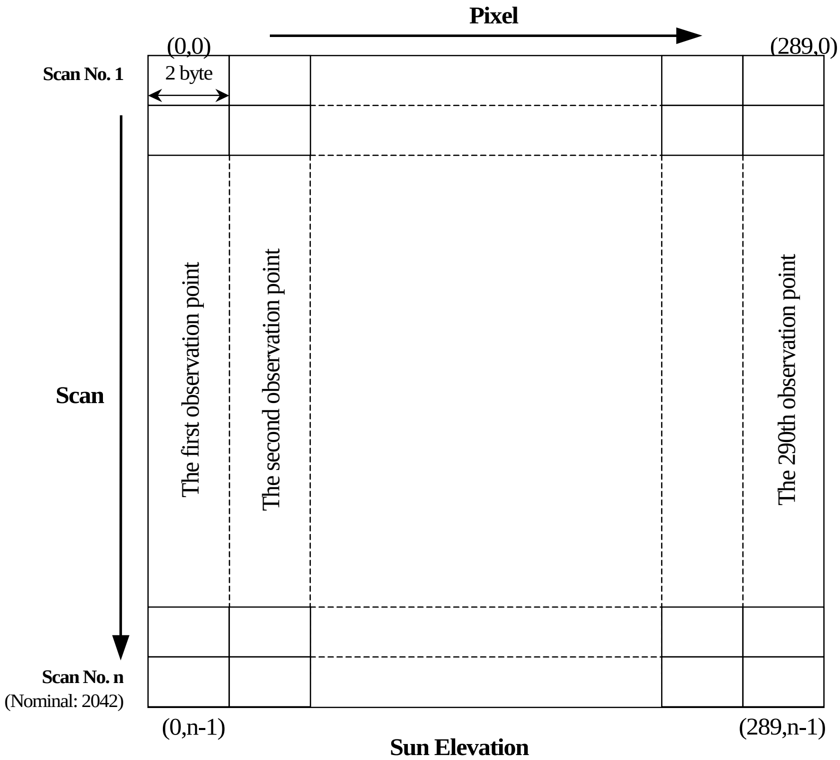
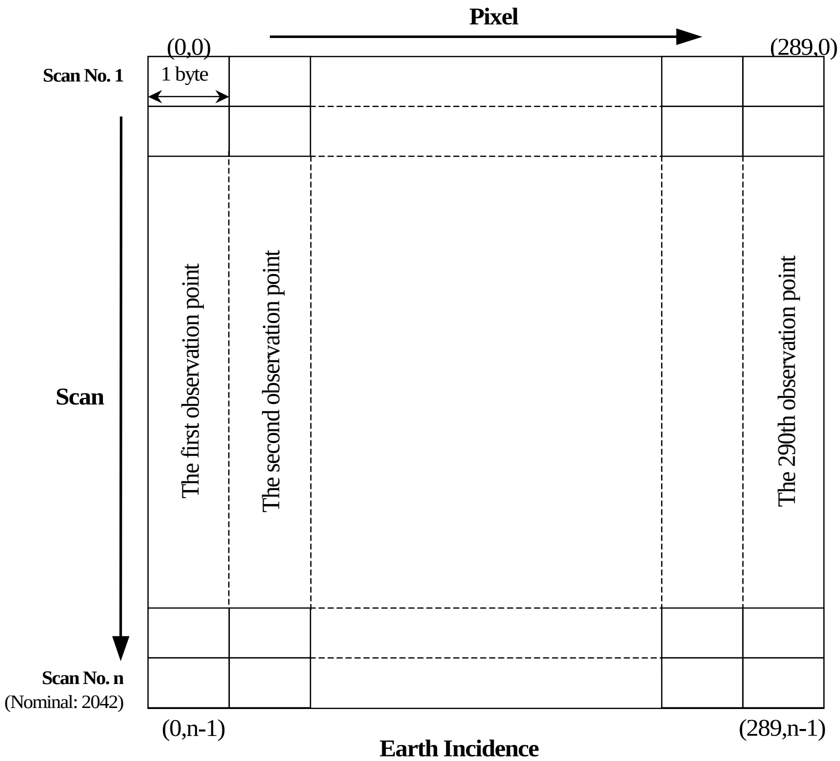


Figure 1.2-8 The Structure of Sun Azimuth, Sun Elevation



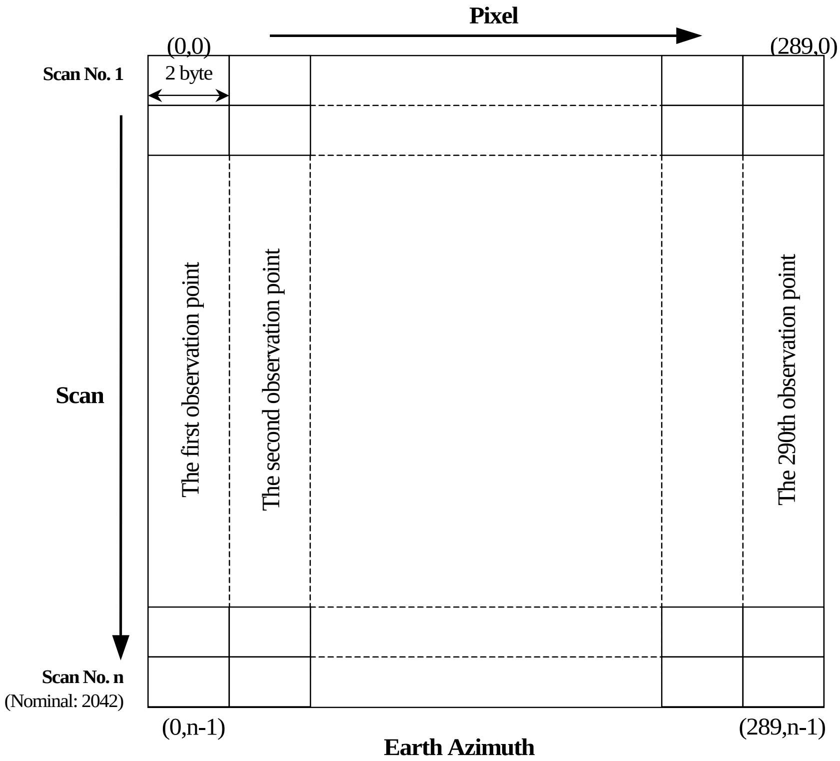


Figure 1.2-9 The Structure of Earth Incidence, Earth Azimuth

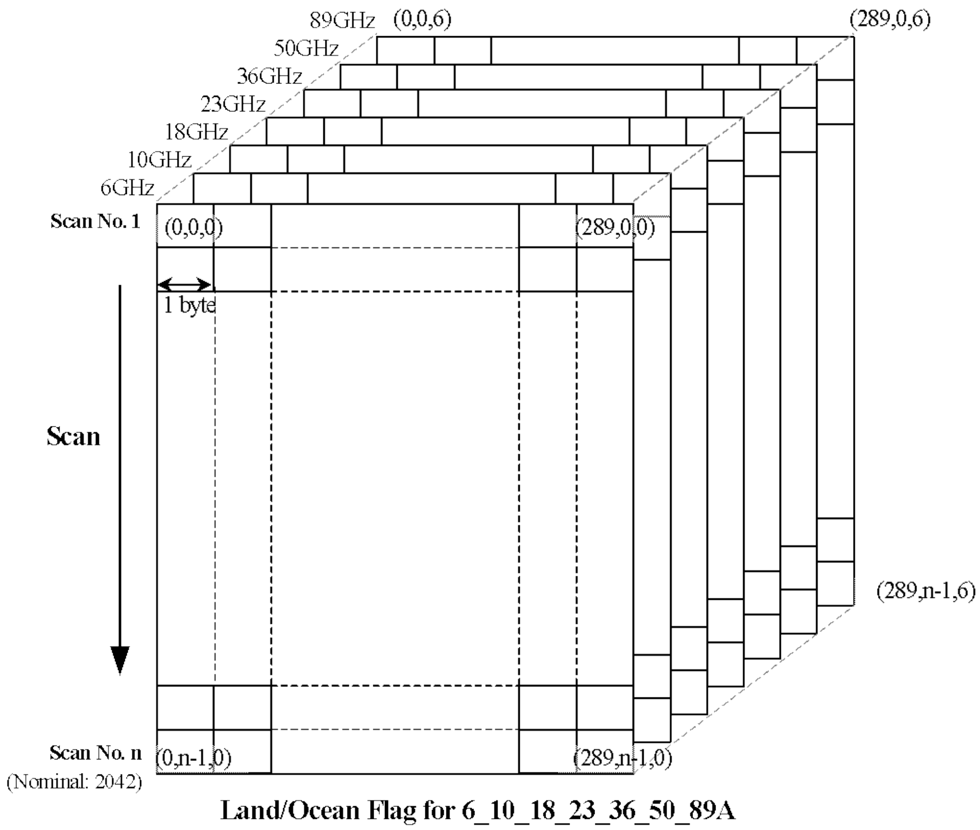


Figure 1.2-10 The Structure of Land/Ocean Flag

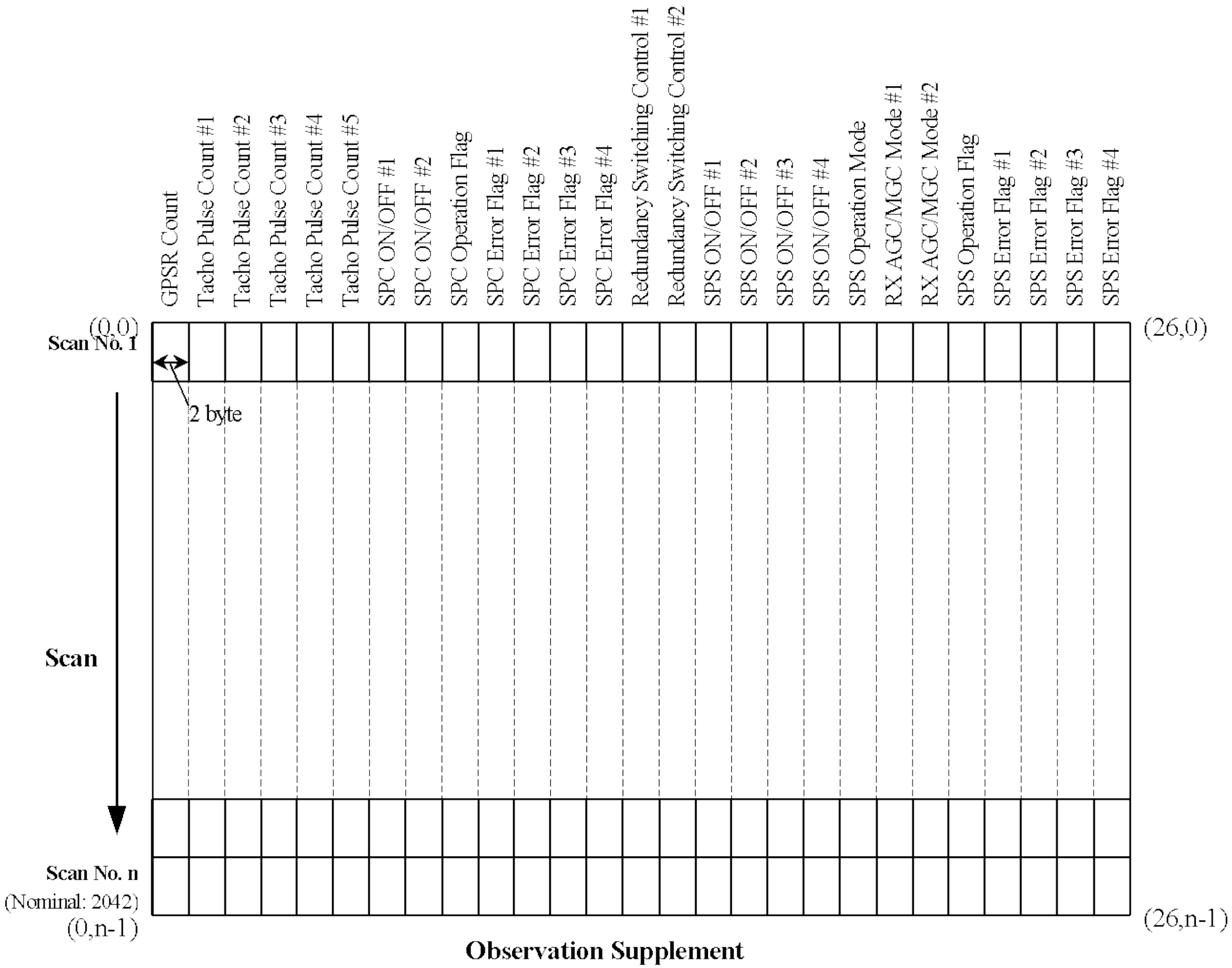


Figure 1.2-11 The Structure of Observation Supplement

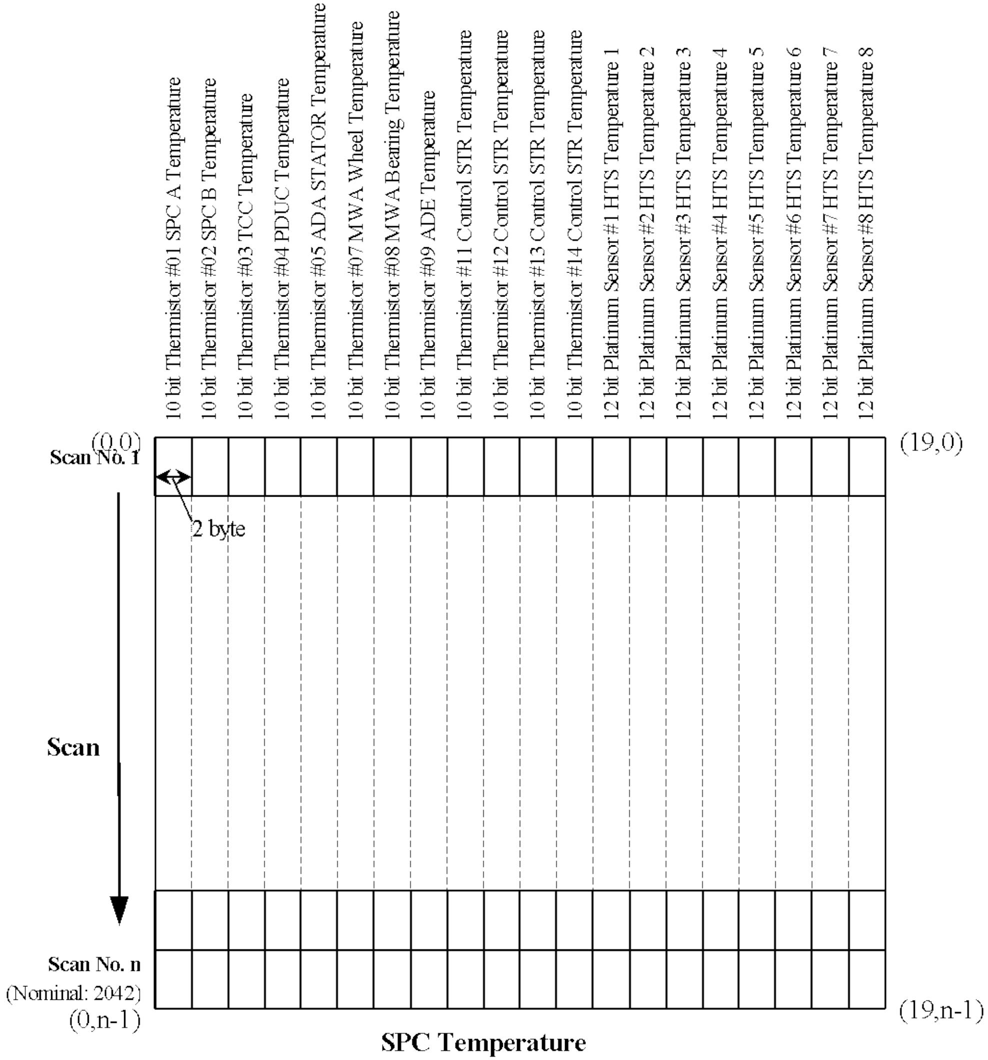


Figure 1.2-12 The Structure of SPC Temperature Count

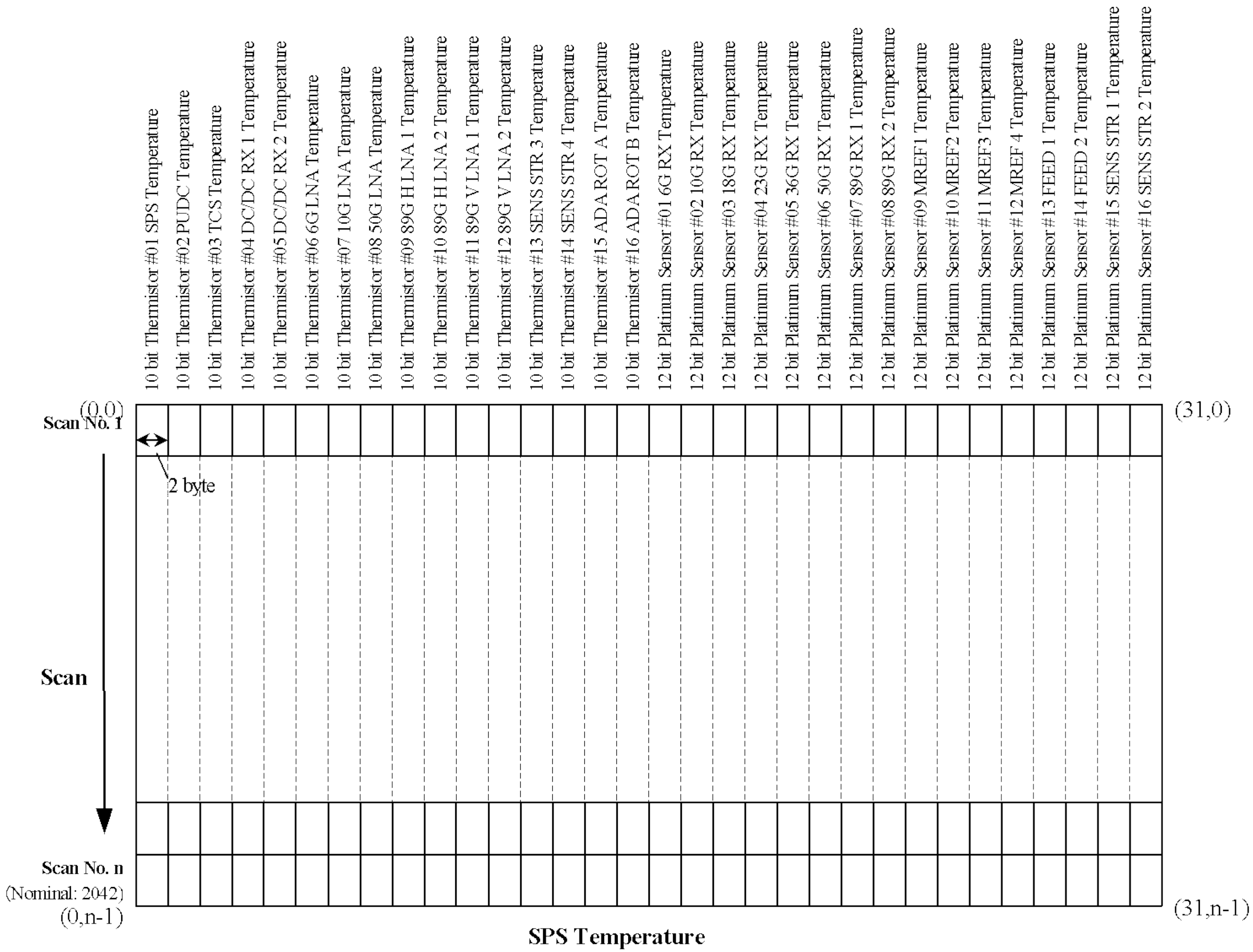


Figure 1.2-13 The Structure of SPS Temperature Count

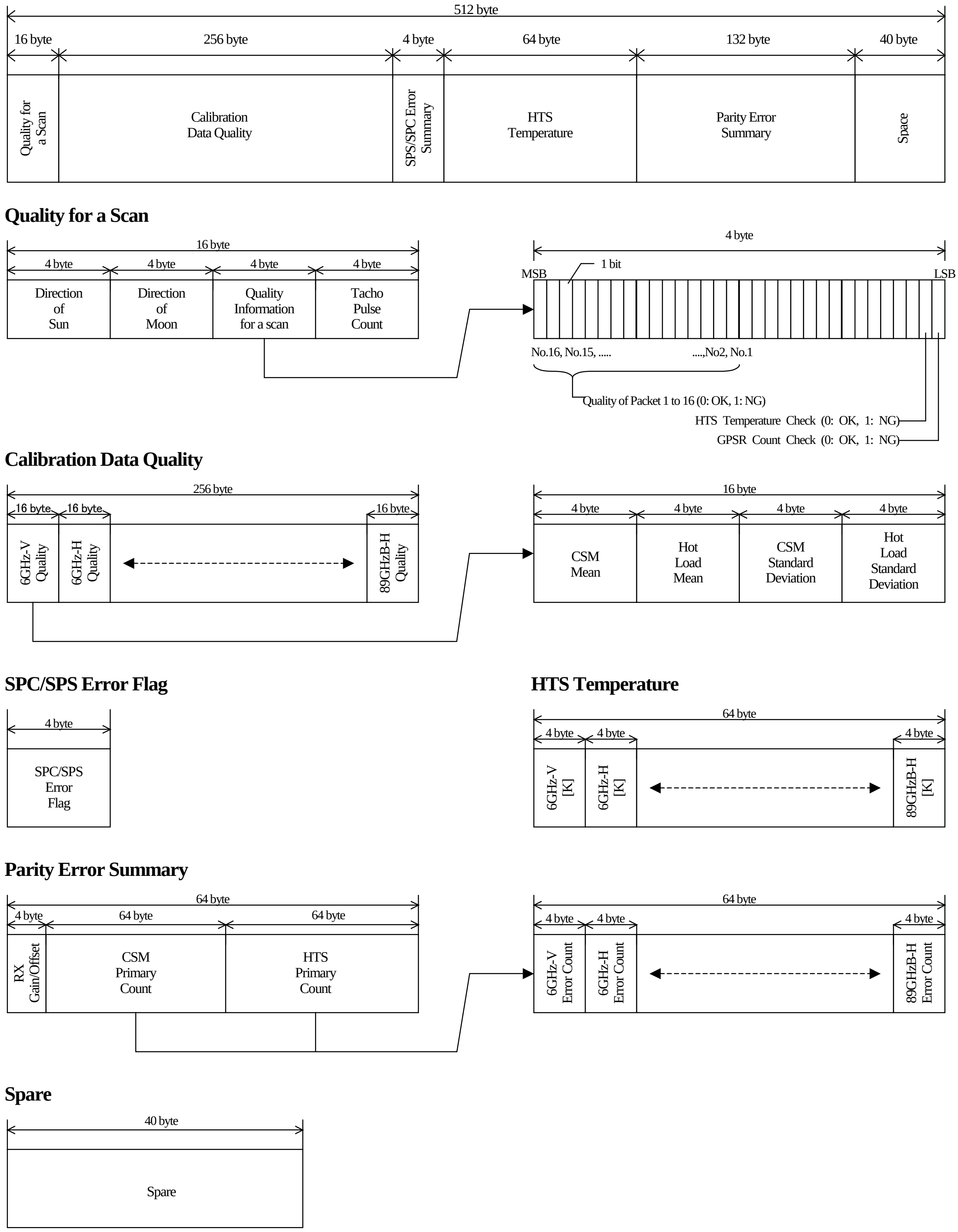
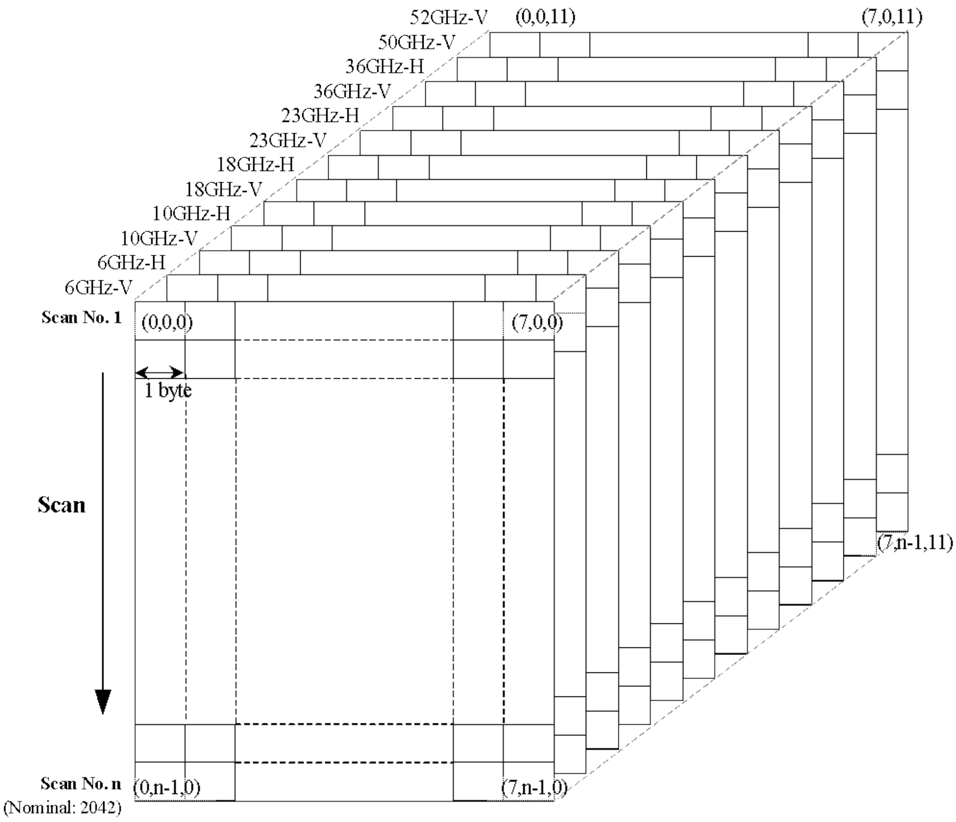
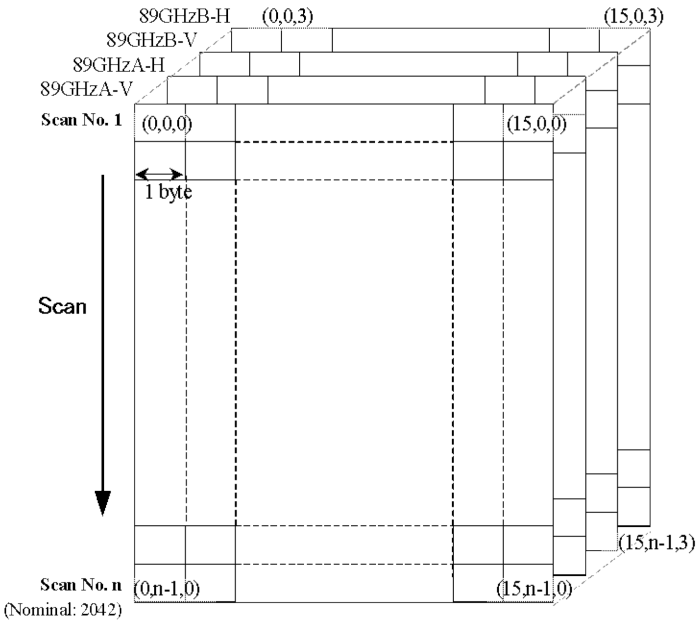


Figure 1.2-14 The Structure of Data Quality



Interpolation_Flag 6 to 52



Interpolation_Flag 89

Figure 1.2-15 The Structure of Interpolation Flag

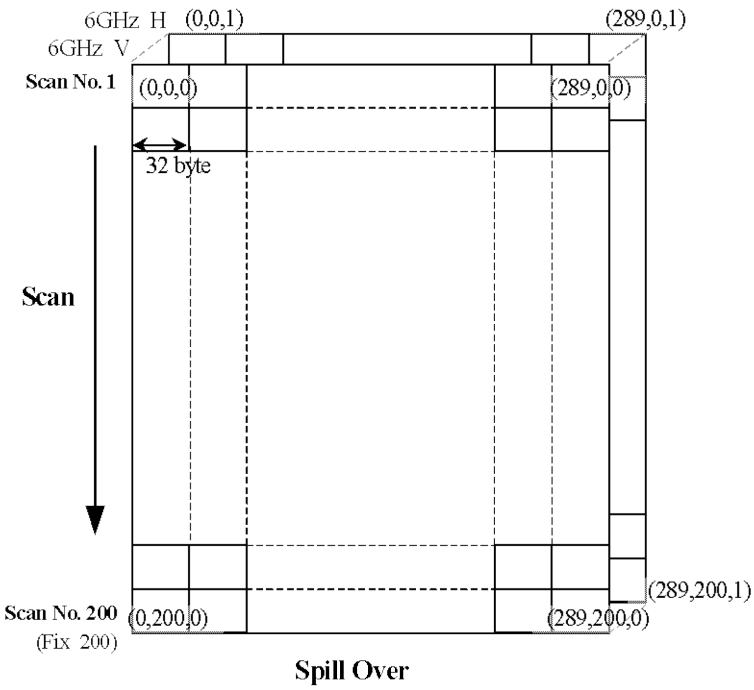


Figure 1.2-16 The Structure of Spill Over

1.3. Data Size of one Level 1A Product

The data size of one AMSR level 1A product file is shown in Table 1.3-1 in case of 2020 scans. However, the actual file size is 8% smaller because HDF is a compressed format.

Table 1.3-1 Estimation of Data Volume

AMSR Product Data Size

Item	No. of Samples	No. of Bytes	Semi Total	Remark
Scan Time	1	8	8	
Position in Orbit	1	8	8	
6GHz-V Observation Count	290	2	580	
6GHz-H Observation Count	290	2	580	
10.65GHz-V Observation Count	290	2	580	
10.65GHz-H Observation Count	290	2	580	
18.7GHz-V Observation Count	290	2	580	
18.7GHz-H Observation Count	290	2	580	
23.8GHz-V Observation Count	290	2	580	
23.8GHz-H Observation Count	290	2	580	
36.5GHz-V Observation Count	290	2	580	
36.5GHz-H Observation Count	290	2	580	
50.3GHz-V Observation Count	290	2	580	
52.8GHz-H Observation Count	290	2	580	
89.9GHz-V-A Observation Count	580	2	1160	
89.9GHz-H-A Observation Count	580	2	1160	
89.9GHz-V-B Observation Count	580	2	1160	
89.9GHz-H-B Observation Count	580	2	1160	
Hot Load Count 6 to 52	8	2	192	(8*2) * 12 freq
Hot Load Count 89	16	2	128	(1*2) * 4 freq
Cold Sky Mirror Count 6 to 52	8	2	192	(8*2) * 12 freq
Cold Sky Mirror Count 89	16	2	128	(16*2) * 4 freq
Antenna Temp Coef (Of + Sl)	32	4	128	
Rx Offset/Gain Count	32	2	64	
Navigation Data	6	4	24	
Attitude Data	3	4	12	
Lat of Observation Point Except 89B	580	2	1160	
Long of Observation Point Except 89B	580	2	1160	
Lat of Observation Point for 89B	580	2	1160	
Long of Observation Point for 89B	580	2	1160	
Sun Azimuth	290	2	580	A scan only
Sun Elevation	290	2	580	A scan only
Earth Incidence	290	1	290	A scan only
Earth Azimuth	290	2	580	A scan only
Land/Ocean Flag	290	1	2030	1*7 for 6.10.23.37.50.89A
Observation Support	27	2	54	
SPC Temperature Count	20	2	40	
SPS Temperature Count	32	2	64	
Data Quality	512	4	2048	
Interpolation Flag 6 to 52	8	1	96	(8*1) * 12 freq
Interpolation Flag 89	16	1	64	(16*1) * 4 freq
Spill Over	290	4	2320	* 2 freq * 200 Scan
Total			25870	
Volume/Granule (MB)			45.8	2020 Scans/Scene
Volume/Day (GB)			1.3	29 Files/Day
Volume/Month (GB)			38.9	30 Days/Month

1.4. The Others

1.4.1. File Name Convention

The file name convention of AMSR level 1 product (1A, 1B 1BMap) is shown below. The Granule ID obeys the Granule ID convention in Earth Observation Center of JAXA

GranuleID + Extensions（.00）

1.4.2. Definition of the Product Data Range

The data range of AMSR level 1 product (only in case of 1A and 1B) is the half orbit defined as a scene (Figure 1.4.2-1) and extended about 10 scans at both ends. The both ends of a half orbit correspond to the maximum and minimum latitude of the observation point at the center of the scan.

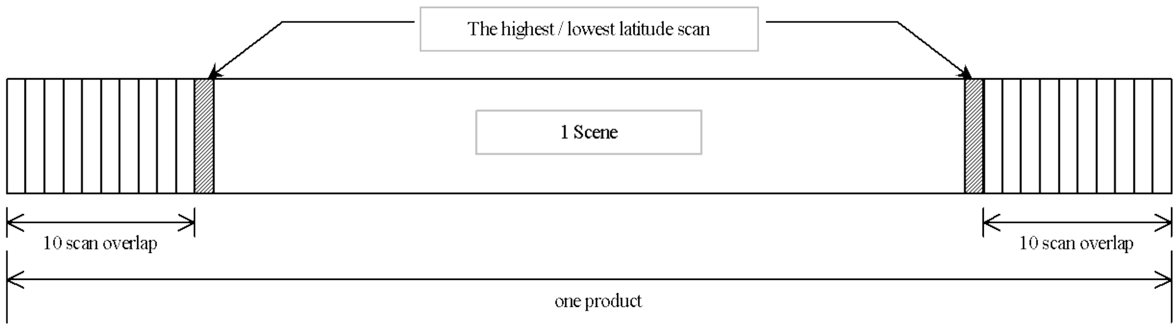


Figure 1.4.2-1 Definition of One Product Range

1.4.3. Coordinate System

AMSR level 1 product (1A, 1B) stores observation positions (latitude, longitude) and orbit information of satellite. An observation position is expressed in Greenwich coordinate system (Earth Fixed Coordinate). The range of the east longitude is from 0 to 180 degrees and the range of the west longitude is from 0 to -180 degrees. Similarly, the range of the north latitude is from 0 to 90 degrees, the range of the south latitude is from 0 to -90 degrees. Earth model of WGS84 is adopted for geometric calculation. On the other hand, the orbit information is stored as the inertia system of J2000.0.

1.4.4. Scaling Factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR level 1 product (1A, 1B). The scale factor is stored with the data unit in the attribute information on Vdata or SDS.

2. Data Explanation

This chapter shows explanation of each data item of AMSR level 1A product including common items for level 1B and level 1BMap.

2.1. Core Metadata

(1) ShortName

The abbreviated name of a product is stored. The fixed abbreviated names of each processing level are shown below.

AMSR-L1A	Level 1A
AMSR-L1B	Level 1B
AMSR-L1M	Level 1B Map

(2) VersionID

"RELEASRx" (x is version_ID) is stored as the product version.

(3) SizeMBESDataGranule

The size (Mbytes) of the product is stored.

(4) LocalGranuleID

The Granule ID based on JAXA EOC ID convention is stored. The Granule ID for level 1A is as follows.

A2AMSYYMMDDPPMX _ KNLL0000000

[Scene ID]

A2	A2 (Fix: ADEOS-II)
AMS	AMS (Fix: AMSR)
YYMMDD	Date of data acquisition start (UT)
PP	Path number at the observation start point (01 – 57)
M	M or R (M: regular process / re-process, R: near real time process)
X	A or D (Orbit direction, A: Ascending, D: Descending)

[Product ID]

K	P or N (P: regular process / re-process, N: near real time process)
N	0 (Fix: Spare)
LL	1A (Fix: for level 1A)
0000000	0 (Fix: Spare)

(5) ProcessingLevelID

The processing level is stored. ID of each processing level is shown below.

L1A	Level 1A
L1B	Level 1B
L1M	Level 1B Map

(6) ReprocessingActual

The re-processing data (UT) is stored in case of using a level 1A product itself. A blank is stored in other cases.

(7) ProductionDateTime

The production time (UT) is stored.

(8) RangeBeginningTime, RangeBeginningDate, RangeEndingTime, RangeEndingDate

The observation start and end time of 89 GHz A-horn's observation are at the start and end scan time of the product are the scan beginning time of the southernmost and northernmost point, which does not contain extended scans. However, in the case of a short size product that does not include a pole region, the scanning time of each end is stored.

(9) GringPointLatitude, GringPointLongitude

Eight representative latitude and longitude of the outline for the observation are stored. They are set as a clockwise from the scanning start position, and these positions are observation points of 89 GHz A-horn. Since the spatial information in a product cannot be expressed as a rectangle on the equidistant cylindrical projection map, it is expressed in polygon like "G" (Figure 2.1-1).

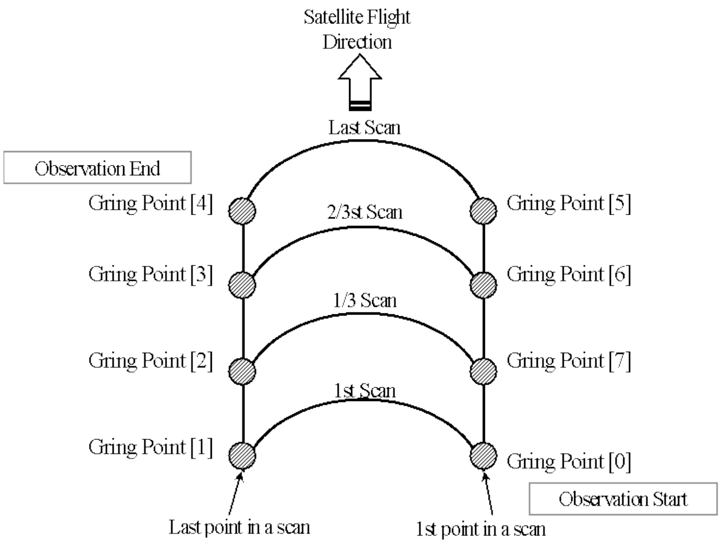


Figure 2.1-1 The combination of the Gring

(10) PGEName

The product generation software name is stored. The name of each processing level is shown below.

L1A_Process_Software	Level 1A
L1B_Process_Software	Level 1B
L1BMap-Process-Software	Level 1B Map

(11) PGEVersion

The version number of the AMSR level 1 processing system is stored. The version number consists of four versions shown below, and total is 18 characters.

System version (10 characters) + Level 1 software version (3 characters)
+ Algorithm version (3 characters) + System parameters version (2 characters)

(12) InputPointer

The level 0 data file name used for processing are stored.

(13) ProcessingCenter, ContactOrganizationName

The contact of JAXA/EOC is stored as the offer organization of the level 1 product.

(14) StartOrbitNumber, StopOrbitNumber

The orbit number of the satellite in the start/end position for the product is stored.

(15) EquatorCrossingLongitude, EquatorCrossingDate, EquatorCrossingTime

The equator crossing longitude, date and time (UT) are stored. However, if the satellite does not pass through an equator (like near real time product or short product by the lack of observation data), it is filed with “*”.

(16) OrbitDirection

The direction (ASCENDING/DESCENDING) of the product is stored.

(17) EphemerisGranulePointer

The orbit data file names used for processing are stored.

(18) EphemerisType

The type of orbit information used for processing is stored. The abbreviation is shown below.

GPS	GPS
The predictive ephemeris	ELMP
The definitive ephemeris	ELMD

(19)　PlatformShortName, SensorShortName

The abbreviated name of the satellite (Platform) and the observation sensor is stored.

(20)　NumberofScans

The number of scans of the observation data in a product is stored. It contains the additional scans of each 10 scans at start/end part as shown in Figure 1.4.2-1.

(21)　NumberofMissingScans

The number of missing scans in the product is stored. Though one scan of AMSR consists of 16 packets, it counts one missing scan even if one packet is lost. (The missing packet position is stored in DataQuality shown in 2.3)

(22)　ECSDataModel

The fixed value “B.0” is stored as the version of metadata model defined in ECS.

(23)　DicontinuityVertualChannelCounter

It represents the status of continuous receiving of inputted level 0 data’s packets, and stored value is shown below.

continuation	Continuation
discontinuation	Discontinuation (Anomaly)

(24)　QALocationPacket-Discontinuity

The packet continuity state of the product is stored. The continuity state of the packet is the value shown in the following.

Continuity	Continuation
Discontinuity	Discontinuation

(25)　NumberofPackets

The total packet number of the product is stored. Since one scans are 16 packets, the relation between NumberPackets and NumberofScan are shown in below.

NumberofPackets = NumberofScan * 16 Packets

(26)　NumberofInputFiles

The number of level 0 data files used for processing is stored. It is corresponding to the number of files stored in InputPointer.

(27) NumberofMissingPackets, NumberofGoodPackets

The number of missing packets and the number of normal packets in the product are stored. The relation between the total packets number and these attributes are as follows.

NumberofPackets = NumberofMissingPackets + NumberofGoodPackets

(28) ReceivingCondition

The blank is stored.

(29) EphemerisQA

The quality inspection result of the orbit and attitude data is stored. The quality inspection result becomes NG, when either number of following limit checks errors exceeds 20% of the data. And it becomes OK in other cases.

Check the orbit data:

$$LowerLimit \leqq R \leqq UpperLimit$$

$$R = \sqrt{X^2 + Y^2 + Z^2}$$

Check the attitude data:

$$LowerLimit \leqq Roll, Pitch, Yaw \leqq UpperLmit$$

(30) AutomaticQAFlag

The automatic inspection result of data processing is stored. The items of the automatic inspections are shown in the attribute "AutomaticQAFlagExplanation". And the following value is stored.

PASS	Good	(When al check items are in the state of 'OK'.)
FAIL	Poor	(When some check items are in the state of 'NG'.)
FAIL	NG	(When all check items are in the state of 'NG'.)

(31) AutomaticQAFlagExplanation

The contents of automatic inspection and its thresholds are stored.

1.MissingDataQA:Less than 1010 is available->OK,
2.AntennaRotationQA:Less than 20 is available->OK,
3.HotCalibrationSourceQA:Less than 20 is available->OK,
4.AttitudeDataQA:Less than 20 is available->OK,
5.EphemerisDataQA:Less than 20 is available->OK,
6.QualityofGeometricInformationQA:Less than 0 is available->OK,
7.BrightnessTemperatureQA:Less than 20 is available->OK,
All items are OK, 'PASS' is employed

(32) ScienceQualityFlag, ScienceQualityFlagExplanation

The blank is stored for level 1.

（33） QAPercentMissingData

The percentage of the missing data in the product is stored.

* Missing observation data is set to '-9999' in SDS.

（34） QAPercentOutofBounds

The percentage of the limit error to all data is stored. It is judged as error when the antenna temperature and brightness temperature exceed the limit value.

* In the level 1A product, since brightness temperature conversion is not executed, it is filled with 0.
* In the level 1B product, abnormal brightness temperature is stored as negative value.

（35） QAPercentPariuyError

The percentage of a parity error to all data is stored. It is judged as error whether the parity error flag exists in the raw observation data (Figure 2.1-2).

* When the observation data has a parity error, -32768 is stored in the level 1B product.

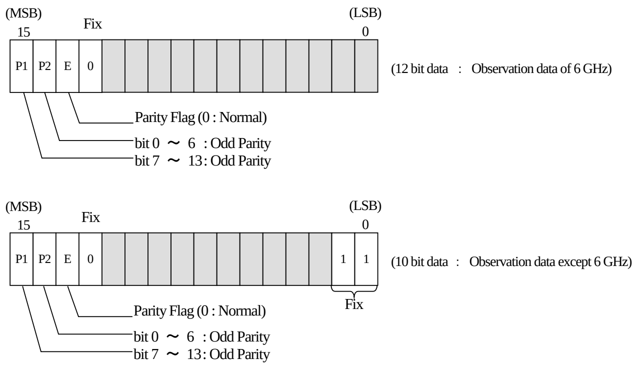


Figure 2.1-2 SPS Temperature Count data

（36） ProcessingQADescription

The error message generated by the data processing software is stored. “PROC_COMP” is stored when processing software is completed normally.

（37） ProcessingQAAttribute

As the quality information of the processed data, the item name corresponding to the following standard of the anomaly judgment is stored.

Items	Anomaly standard
NumberofMissingPackets	In case of the lack of more than one packet
EphemerisQA	In case of NG
QAPercentMissingData	In case of more than 1 %
QAPercentOutofBoundsData	In case of more than 1 %
QAPercentParityErrorData	In case of more than 1 %

2.2. Product Metadata

(1) SatelliteOrbit, Attitude, OrbitSemiMajorAxis, OrbitEccenticity, OrbitArgumentPrigee, OrbitInclination, OrbitPeriod, RevisitTime

The caracteristics of ADEOS-II are stored.

SatelliteOrbit	Sun-synchronous_sub-recurrent
Altitude	802.9 km
OrbitSemiMajorAxis	7181.317 km
OrbitEccentricity	0.00007
OrbitArgumentPerigee	244.018 degrees
OrbitInclination	98.62 degrees
OrbitPeriod	101 minutes
RevisitTime	4 days

(2) AMSRChannel, AMSRBandWidth, AMSRBeamWidth, OffNadir, SpatialResolution(AzXEl), ScanningPeriod, SwathWidth, DynamicRange

The characteristics of AMSR are stored.

AMSRChannel	Observing channels of AMSR are set.	
AMSRBandWidth	Bandwidth for each frequency is set.	
AMSRBeamWidth	Beam width for each frequency is set.	
OffNadir	The off nadir angle of 89 GHz A-horn and 89 GHz B-horn are set.	
SpatialResolution(AzXEl)	6G-39.8kmX69.5km,10G-26.6kmX46.3km,18G-14.4kmX25.1km, 23G-16.6kmX28.9km,36G-7.7kmX13.5km,50.3G-5.5kmX9.6km, 52G-5.5kmX9.6km,89GA-3.3kmX5.8km,89GB-3.3kmX5.7km	
ScanningPeriod	Scanning period is set.	1.5 sec
SwathWidth	Swath width is set.	1600 km
DynamicRange	Dynamic range is set.	2.7 K - 340 K

(3) DataFromatType, HDFFormatVersion

The file format information of the product is stored.

DataFromatType	Format	NCSA-HDF
HDFFormatVersion	Version	Ver4.2r4

(4) <u>EllipsoidName, SemiMajorAxisofEarth, FlatteningRatioofEarth</u>

The earth model used in AMSR data processing software is stored.

EllipsoidName	The earth ellipsoid name	WGS84
SemiMajorAxisofEarth	The semi major axis of the earth	6378.1km
FlatteningRatioofEarth	The flattening ratio of the earth	0.00335

(5) <u>SensorAlignment</u>

Alignment values between ADEOS-II body coordinate system and the AMSR coordinate system are stored.

(6) <u>Thermistor</u>

The engineering conversion coefficients for the thermistor and those applicable ranges are store.

Thermistor Count	Range	Wx	Thermistor conversion table applied range.
Thermistor Conversion	Table	Wa	Thermistor conversion table Wa.
Thermistor Conversion	Table	Wb	Thermistor conversion table Wb.
Thermistor Conversion	Table	Wc	Thermistor conversion table Wc.
Thermistor Conversion	Table	Wd	Thermistor conversion table Wd.

The formula of conversion from count to engineering value is ;

$$EngineeringValue[K] = Wa_{i\cdot}C^2 + Wb_i \cdot C + Wc_i + Wd_i + 273.15$$

$$C \quad : Count$$

$$i \quad : Wx_{i-1} \leqq C \leqq Wx_i$$

(7) <u>Platinum#1</u>

The engineering conversion coefficients for the platinum sensor #1 and those applicable ranges are stored.

Platinum#1 Count	Range	Wx	Platinum #1 Table applied range.
Platinum#1Conversion	Table	Wa	Platinum #1 conversion table Wa.
Platinum#1Conversion	Table	Wb	Platinum #1 conversion table Wb.
Platinum#1Conversion	Table	Wc	Platinum #1 conversion table Wc.
Platinum#1Conversion	Table	Wd	Platinum #1 conversion table Wd.

The conversion formula is the same as that for Thermistor.

(8) Platinum#2

The enginnering conversion coefficients for the platinum sensor #2 and those applicable ranges are stored.

Platinum#2 Count	Range	Wx	Platinum #2 Table applied range.
Platinum#2 Conversion	Table	Wa	Platinum #2 conversion table Wa.
Platinum#2 Conversion	Table	Wb	Platinum #2 conversion table Wb.
Platinum#2 Conversion	Table	Wc	Platinum #2 conversion table Wc.
Platinum#2 Conversion	Table	Wd	Platinum #2 conversion table Wd.

The conversion formula is the same as that for Thermistor.

(9) Platinum#3

The engineering conversion coefficients for the platinum sensor #3 and those applicable ranges are stored.

Platinum#3 Count	Range	Wx	Platinum #3 Table applied range.
Platinum#3 Conversion	Table	Wa	Platinum #3 conversion table Wa
Platinum#3 Conversion	Table	Wb	Platinum #3 conversion table Wb
Platinum#3 Conversion	Table	Wc	Platinum #3 conversion table Wc
Platinum#3 Conversion	Table	Wd	Platinum #3 conversion table Wd

The conversion formula is the same as that for Thermistor.

(10) CoefficientA (CoefficientAvv, CoefficientAhv, CoefficientAov, CoefficientAhh, CoefficientAvh, CoefficientAoh)

The conversion coefficients in each frequency are stored for the brightness temperature, The coefficients are used for changing the antenna temperature (Ta) of observation data into the brightness temperature (Tb). Brightness temperature is computed by the following formula, which is different to polarizations.

$$Tbv = Avv\ Tav + Ahv\ Tah + 2.7\ Aov$$

Tbv: The observation brightness temperature of the vertical polarization.
Tav: The antenna temperature of the vertical polarization.
Tah: The antenna temperature of the horizontal polarization.
Avv: The conversion coefficient of the vertical co-polarization.
Ahv: The conversion coefficient of the vertical cross-polarization.
Aov: The coefficient of the deep space’s brightness temperature of the vertical polarization.

$$Tbh = Ahh\ Tah + Avh\ Tav + 2.7\ Aoh$$

Tbh: The observation brightness temperature of the horizontal polarization.
Tav: The antenna temperature of the vertical polarization.
Tah: The antenna temperature of the horizontal polarization.
Avh: The conversion coefficient of the horizontal cross-polarization.
Ahh: The conversion coefficient of the horizontal co-polarization.
Aoh: The coefficient of the deep space’s brightness temperature of the horizontal polarization.

(11) CSMTemperature

The antenna temperature of deep space is stored for each frequency. The stored value is used as a conversion factor in data processing software.

(12) CoRegistrationParameterA1, CoRegistrationParameterA2

The co-registration parameters A1 and A2 are stored for each frequency. The co-registration parameters are used for calculating the position (latitude and longitude) of the observing point for each frequency except 89 GHz. The latitude and longitude of each frequency (except 89 GHz) are calculated by the method shown below. The observation position Pt [m] of the m-th point in each scan is calculated by observation position of odd-numbered points (origin 1) P [2m-1] of 89 GHz A-horn and observation position of even-numbered points P [2m]. The elements of vectors of Pt [m], ex, ey, and ez, are shown in the following formula.

$$ex = \vec{p}_1$$

$$ez = \frac{\vec{P}_1 \times \vec{P}_2}{\left|\vec{P}_1 \times \vec{P}_2\right|}$$

$$ey = ez \times ex$$

$$\cos\theta = \vec{P}_1 \bullet \vec{P}_2$$

$$\vec{P}_1 : \text{The vector of observation point } P[2m-1]$$

$$\vec{P}_2 : \text{The vector of observation point } P[2m]$$

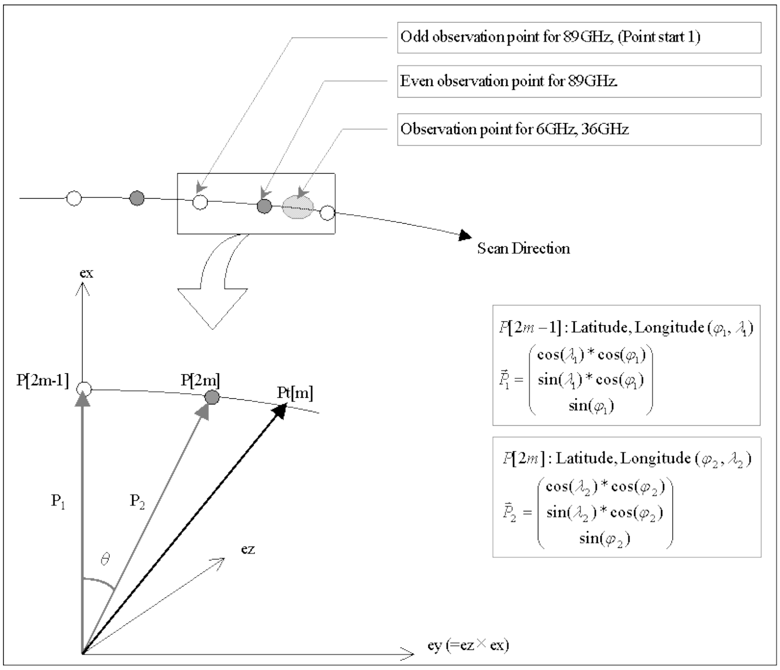


Figure 2.2-1 The definition of ex, ey, ez.

The ex is the vector of the odd-numbered observation point of 89 GHz A-horn from the earth center, and the ey is the rectangular vector to the ex in a plane including the next observation point of 89GHz A-horn. And, the ez is a rectangular vector to ex and ey. Here, A1 is defined as the co-registration parameter of the ex-ey plane, and A2 is defined as the co-registration parameter of the ex-ez plane, then the observation position of frequency except 89 GHz is calculated by the following formula.

$$Pt[m] = \cos(A2 \cdot \theta) \cdot \left(\cos(A1 \cdot \theta) \cdot ex + \sin(A1 \cdot \theta) \cdot ey\right) + \sin(A2 \cdot \theta) \cdot ez$$

(13) CalibrationCurveCoefficient#1, CalibrationCurveCoefficient#2, CalibrationCurveCoefficient#3, CalibrationCurveCoefficient#4, CalibrationCurveCoefficient#5

The coefficients of radiometric correction are stored for nonlinear calibration of the antenna temperature in each frequency. Nonlinear calibration is performed by the following formula.

CalibrationCurveCoefficient#1	C0	The coefficient for 0-th order
CalibrationCurveCoefficient#2	C1	The coefficient for 1st order
CalibrationCurveCoefficient#3	C2	The coefficient for 2nd order
CalibrationCurveCoefficient#4	C3	The coefficient for 3rd order
CalibrationCurveCoefficient#5	C4	The coefficient for 4-th order

$Ta = C0 + C1\ Ta' + C2\ (Ta')^2 + C3\ (Ta')^3 + C4\ (Ta')^4$

Ta : Nonlinear calibrated antenna temperature [K]

Ta' : The antenna temperature calculated with antenna temperature coefficients [K]

*The calculation of antenna temperature with antenna temperature coefficients is shown at Antenna_Temperature_Coef (Of+Sl).

(14) CalibrationMethod

The following every adopted calibration methods are stored. When no methods are adopted, the blank is stored.

Target Data	Calibration Method Name	Explanation
Observation data of high temperature calibrator (HTS)	HTUCoefficients	HTS calibration method is chosen one of three.
	ElectromagneticAnalysis	
	RxTemperatureReferenced	
Observation data of low temperature calibrator (CSM)	SpillOver	This is used for removing the ground radiation effect on CSM at 6 GHz.
	CSMInterpolation	This is used for removing the moon light effect, the interference of radio frequency, and the stray light from the sun on CSM.
Geometric information	Absolute89GPositioning	This is used for geometric correction of 89 GHz.
Antenna temperature	NonlinearityCorrection	This is used for the nonlinear calibration of the antenna temperature.

(15) HTSCorrectionParameterVersion

The version of the parameter file used in order to calibrate the temperature of HTS is stored as 4 characters (XXXX). The kinds of calibration are shown in CalibrationMethod. When this calibration is not performed, it is filled with "*".

(16) SpillOverParameterVersion

The version of the parameter file used in order to calibrate the ground radiation mixed into the 6 GHz CSM data is stored as 4 characters (XXXX). When this calibration is not performed, it is filled with "*".

(17) CSMInterpolationParameterVersion

The version of the parameter file used in order to calibrate the following items for CSM data is stored as 4 characters (XXXX). When this calibration is not performed, it is filled with "*".

(18) Absolute89GpositioningParameterVersion

The version of the parameter file used in order to correct the 89 GHz position information is stored as 4 characters (XXXX). When the position information is not corrected, it is filled with "*".

2.3. Data Items

(1) <u>ScanTime</u>

The observation start time of 89GHz A-Horn in every scan is stored. The time is a total second (TAI) from 0:00 (UT) on January 1st, 1993.

* Since the observation width differs from level 1A to level 1B, the start scan time is also different.

(2) <u>Position in Orbit</u>

The position in a satellite orbit is stored. The position of a satellite consists of an orbit number and a position from the ascending node. This is expressed in the following formula.

Position_in_Orbit = Orbit Number + Satellite Position

*Satellite Position = (Scan_Time – Ascending Node Passage Time) / (101.0 * 60)*

(3) <u>Navigation Data</u>

The Cartesian orbit information on a satellite is stored in the inertial coordinate system. Orbit information is the position and velocity of a satellite corresponding to the observation start time (Scan_Time) of each scan.

(4) <u>Attitude Data</u>

The attitude errors (Roll, Pitch, Yaw) are stored as attitude information corresponding to the observation start time (Scan_Time) of each scan. The coordinate system is a right-hand system that is Roll for the satellite flight direction and Yaq for the earth center direction.

(5) <u>6GHz-V Observation Count</u>

The observed count value of 6GHz vertical polarization is stored.

* The following value is stored for the abnormal observation data. This is applied for all frequency and polarization.

-9999	Value for the lack of data
-32768	Value for the parity error

(6) <u>6GHz-H Observation Count</u>

The observed count value of 6GHz horizontal polarization is stored.

(7) <u>10.65GHz-V Observation Count</u>

The observed count value of 10.65GHz vertical polarization is stored.

(8) <u>10.65GHz-H Observation Count</u>

The observed count value of 10.65GHz horizontal polarization is stored.

(9) 18.7GHz-V Observation Count

The observed count value of 18.7GHz vertical polarization is stored.

(10) 18.7GHz-H Observation Count

The observed count value of 18.7GHz horizontal polarization is stored.

(11) 23.8GHz-V Observation Count

The observed count value of 23.8GHz vertical polarization is stored.

(12) 23.8GHz-H Observation Count

The observed count value of 23.8GHz horizontal polarization is stored.

(13) 36.5GHz-V Observation Count

The observed count value of 36.5GHz vertical polarization is stored.

(14) 36.5GHz-H Observation Count

The observed count value of 36.5GHz horizontal polarization is stored.

(15) 50.3GHz-V Observation Count

The observed count value of 50.3GHz vertical polarization is stored.

(16) 52.8GHz-V Observation Count

The observed count value of 50.3GHz horizontal polarization is stored.

(17) 89.0GHz-V-A Observation Count

The observed count value of 89.0GHz A-horn’s vertical polarization is stored.

(18) 89.0GHz-H-A Observation Count

The observed count value of 89.0GHz A-horn’s horizontal polarization is stored.

(19) 89.0GHz-V-B Observation Count

The observed count value of 89.0GHz B-horn’s vertical polarization is stored.

(20) 89.0GHz-H-B Observation Count

The observed count value of 89.0GHz B-horn’s horizontal polarization is stored.

(21) Hot-Load Count 6 to 52

The observed count value of HTS and polarization is stored for each frequency except 89GHz. The number of observation data for 1 scan is 8 points.

* The following value is stored for the abnormal observation data. This is applied for all frequency and polarization.

0	Value for Lack of data.
-32768	Value for Parity error.

(22) Hot-Load Count 89

The observed count value of HTS and polarization is stored for 89 GHz. The number of observation data for 1 scan is 16 points.

(23) Cold Sky Mirror Count 6 to 52

The observed count value of CSM and polarization is stored for each frequency except 89 GHz. The number of observation data for 1 scan is 8 points.

* The following value is stored as the abnormal value in the low temperature calibration data of all frequency and polarization.

0	Value of Lack of data.
32767	Value of Parity error.

(24) Cold_Sky_Mirror_Count_89

The observed count value of CSM and polarization is stored for 89 GHz. The number of observation data for 1 scan is 16 points.

(25) Antenna Temperature Coef (Of + Sl)

The antenna temperature conversion coefficients and polarization are stored for each frequency. The antenna temperature coefficients contain offset-value and slope-value, and these coefficients are used for converting the observed count value into antenna temperature.

$$Ta_{p,l} = Csl_{p,l} * Obs_{p,l} + Cof_{p,l}$$

Ta : *the antenna temperature [K]*

Obs : *the count value of observation data*

Aof : *the antenna temperature conversion coefficient (offset-value)*

Asl : *the antenna temperature conversion coefficient (slope-value)*

(26) Rx_Offset/Gain_Count

The gain and offset value for a receiver (RX) of each frequency are stored in every scan.

(27) Lat_of_Observation_Point_Except_89B

The latitude of the observation point on the earth surface at 89GHz A-horn is stored.

Data Range	North: 0 to 90 degrees / South: 0 to -90 degrees
Scaling Factor	0.01
Abnormal value	99.99 degrees

* The observation point (latitude, longitude) on the earth surface at 89 GHz A-horn is the standard to calculate the position of frequency except 89 GHz. The calculation method of the position of each frequency is shown in CoRegisttrationParameter.

(28) Long_of_Observation_Point_Except_89B

The longitude of the observation point on the earth surface at 89GHz A-horn is stored.

Data Range	-180 to 180 degrees
Scaling Factor	0.01
Abnormal value	222.22 degrees

(29) Lat_of_Observation_Point_for_89B

The latitude of the observation point on the earth surface at 89GHz B-horn is stored. The data range, scaling factor, and abnormal value are the same as 89 GHz A-horn.

(30) Long_of_Observation_Point_for_89B

The longitude to the observation point on the earth surface at 89GHz B-horn is stored. The data range, scaling factor, and abnormal value are the same as 89 GHz A-horn.

(31) Sun_Azimuth

The sun azimuth angle on odd observation points (origin 1) of 89 GHz A-horn is stored. (See Figure 2.3-1.)

Data Range	-180 degree to 180 degrees	
Scaling Factor	0.1	
Abnormal Value	-32768	The case of observation point error. The case of setting value is less than –180 degrees.
	32767	The case of setting value is more than 180 degrees.

(32) <u>Sun_Elevation</u>

The sun elevation angle on odd observation points (origin 1) of 89 GHz A-horn is stored. (See Figure 2.3-1.)

Data Range	-180 degree to 180 degrees	
Scaling Factor	0.1	
Abnormal Value	-32768	The case of observation point error.
		The case of setting value is below –180 degrees.
	32767	The case of setting value is over 180 degrees.

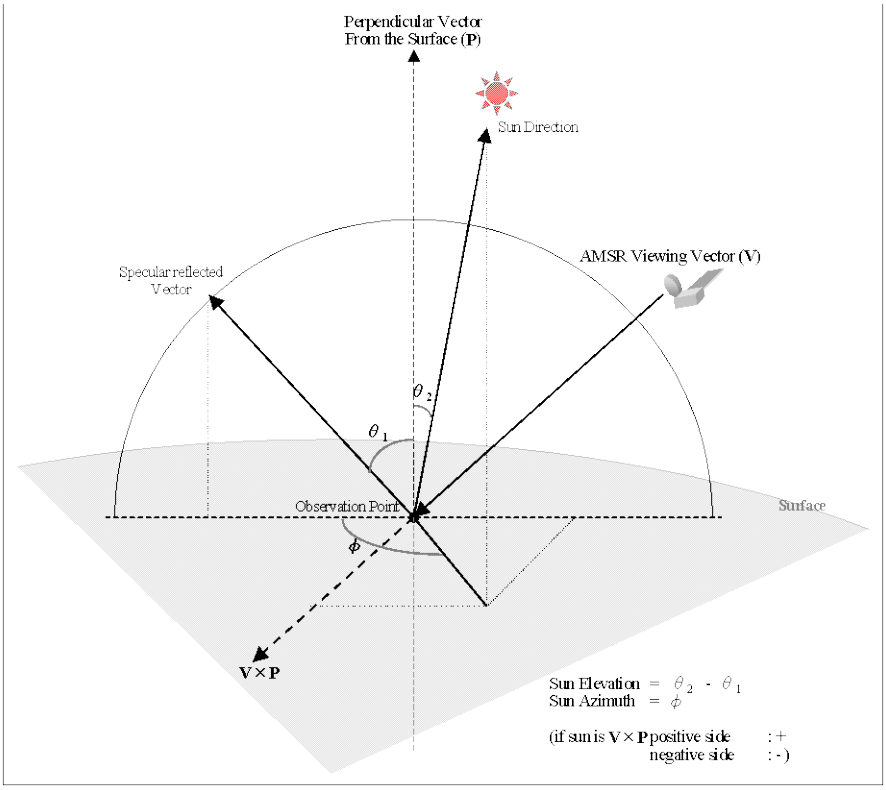


Figure 2.3-1 The definition of Sun Elevation, Azimuth

(33) <u>Earth_Incidence</u>

The earth incident angle on odd observation points (origin 1) of 89 GHz A-horn is stored. (See Figure 2.3-2.) It is the angle between the perpendicular vector of the earth surface and the viewing vector of AMSR defined by Figure 2.3-2.

Data Range	52.4 degrees to 57.54 degrees	
Scaling factor	0.02	
Offset Value	55.0 degrees	
Abnormal Value	-128	In case of observation point error.
		In case of setting value is less than –127.
	127	In case of the sun elevation exceeds 180 degrees.

(34) <u>Earth_Azimuth</u>

The earth azimuth angle on odd observation points (origin 1) of 89 GHz A-horn is stored. (See Figure 2.3-2.) It is the angle between the north oriented vector on the observation point and the inversed projected viewing vector defined by Figure 2.3-2.

Data Range	-180.0 degrees to 180.0 degrees	
Scaling Factor	0.01	
Abnormal Value	99999	In case of observation point error.

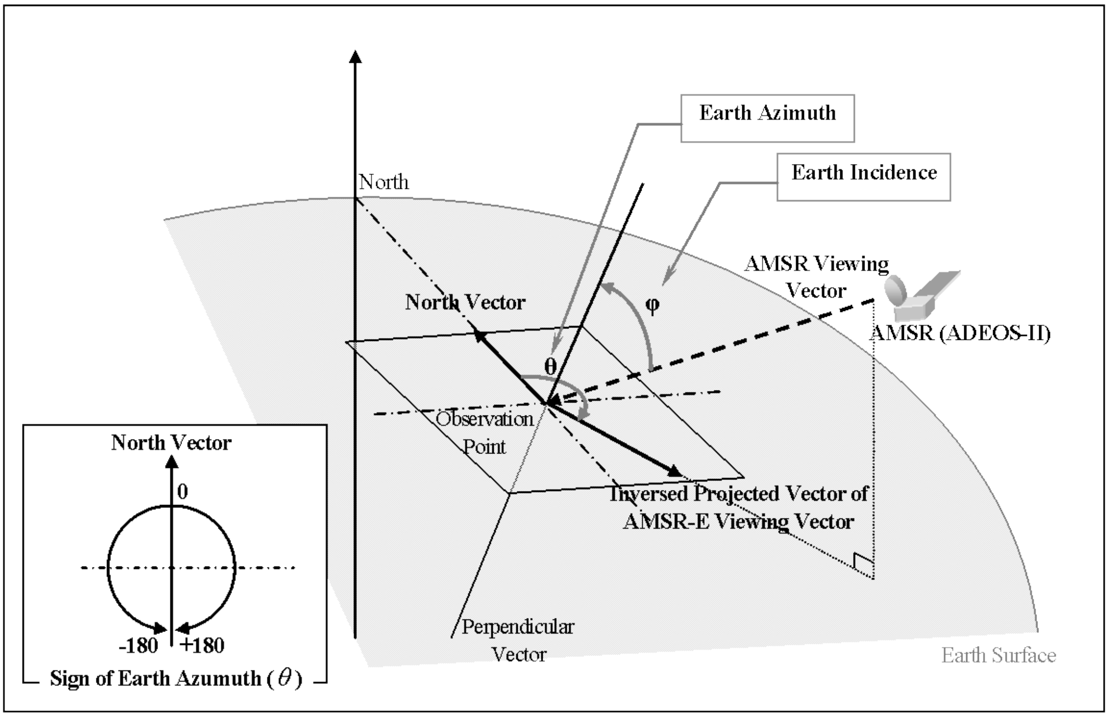


Figure 2.3-2 The definition of Earth Azimuth, Incidence

(35) Land/Ocean Flag_6 10 18 23 36 50 89A

The land coverage percentage of the observation footprint of AMSR is stored for each frequency.

* The 89 GHz land/ocean flag is stored for only odd points of A-horn (origin 1).

* The observation point of each frequency except 89 GHz is equivalent to the position that corrected by co-registration parameters. The calculation method is shown in the item "CoRegistrationParameter".

(36) Observation_Supplement

Observation supplement raw data such as a H/W state is stored for each scan. (See Figure 1.2-11.)

(37) SPC_Temperature_Count

The temperature of SPC (Signal Processor Control unit) in each scan is stored with the value of 10 bits and 12 bits of raw data acquired from the satellite. (See Figure 2.3-3 and Figure 1.2-12.)

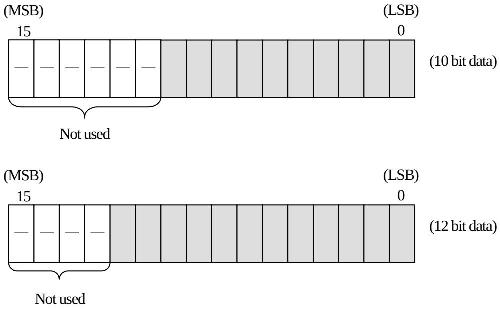


Figure 2.3-3 The Data Structure of SPC Temperature Count

(38) SPS Temperature Count

The temperature of SPS (Signal Processor Sensor unit) in each scan is stored with the value of 10 bits and 12 bits of raw data acquired from the satellite. (See Figure 2.3-4 and Figure 1.2-13.)

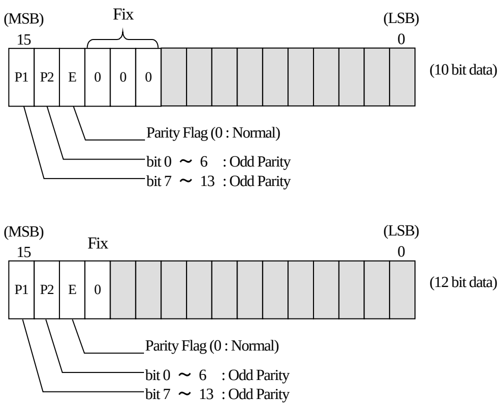


Figure 2.3-4 The Data Structure of SPS Temperature Count

(39) <u>Data Quality</u>

The quality information and supplementary information are stored. These correspond to observation data and calculation result in each scan. The stored information is shown below.

1） The Sun Direction Angle from CSM. (Direction of Sun) [type: float]

The angle [degree] between the viewing vector of CSM and the direction of the sun is stored. (See Figure 2.3-5)

2） The Moon Direction Angle from CSM. (Direction of Moon) [type: float]

The angle [degree] between the viewing vector of CSM and the direction of the moon is stored. (See Figure 2.3-5)

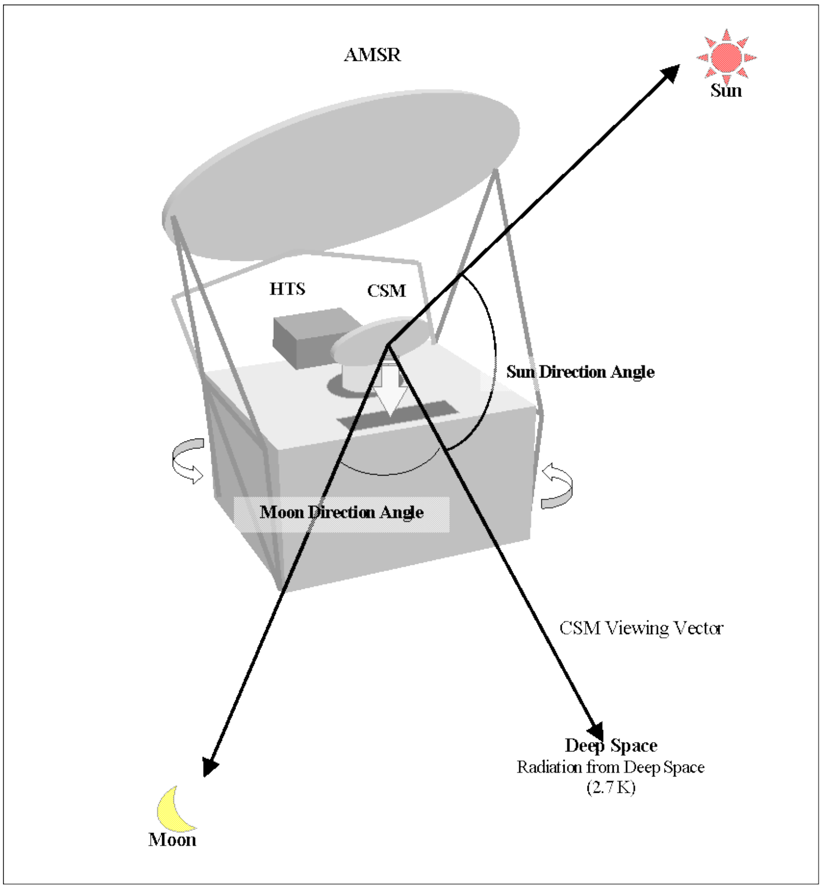


Figure 2.3-5 The Definition of the Moon, the Sun Direction

3） The quality of a scan. (Quality Information of a Scan)

Flag information for each bit of 32-bits is stored. This flag is set to 0 for normal case, and 1 for error case. The setting of each bit is shown sequentially from LSB (Least Significant Bit).

a) The result of GPSR counts check. (1 bit)

When the difference of the GPSR counts in about 1 scan is outside of the range 1.5±1.0 (sec) or -6.5±1.0 (sec) in engineering value, an error value (1) is set.

b) The result of HTS temperature check. (1 bit)

When the difference of the HTS temperature is more than 0.5 K in engineering value, an error value (1) is set.

c) The condition for each packet. (16 bits)

When there are lacks of packets or the code of "DEAD", which shows the hexadecimal code for the lack packet filled by NASA EDOS, an error value (1) is set. The quality for each 16 packets is set from the 3rd bit LSB to MSB (Most Significant Bit).

4） Tacho Pulse Count (Tacho Pulse Count) [type: float]

The angle [degree] of averaged tacho pulse counts is stored.

5） Quality of the calibration data (Calibration Data Quality)

As quality of the calibration source, the statistics of the CSM and HTS are stored in order of, 6G-V, 6G-H, 10G-V, 10G-H, 18G-V, 18G-H, 23G-V, 23G-H, 36G-V, 36G-H, 50G-V, 52G-V, 89GA-V, 89GA-H, 89GB-V, and 89GB-H. Detailed statistical information is shown below.

a) The average value of CSM count. (4 bytes) [type: float]
b) The average value of HTS count. (4 bytes) [type: float]
c) The standard deviation of CSM count. (4 bytes) [type: float]
d) The standard deviation of HTS count. (4 bytes) [type: float]

6） SPC, SPS Error Flag(SPC/SPS Error Flag) [type: bit]

The check result of the error flag for SPC and SPS that affects observation data is stored. The stored value is shown below.

0: Normal case
1: SPC anomaly case
2: SPS anomaly case
3: Both SPC and SPS anomaly case

7） HTS temperature (HTS Temperature) [type: float]

The HTS temperature ([K]) is stored for each frequency. The stored temperature is the value used for calculation of the coefficients for the antenna temperature conversion. The storing order of each frequency is the same as above 5).

8） Parity Error Summary (Parity Error Summary)

The sum of the following parity error is stored for each scan.

a) The sum of parity error for RX Offset/Gain of all frequency. [type: float]

b) The sum of parity error for CSM count for each frequency. [type: float]
(Storing order is the same as above 5).)

c) The sum of parity error for HTS count for each frequency. [type: float]
(Storing order is the same as above 5).)

9） Spare

It is filled with 0.

(40) Interpolation_Flag_6_to_52

The interpolation flag for CSM data is stored for each frequency except 89GHz. (Shown in Figure 2.3-6.) Each flag is corresponded to the correction items shown below.

- Correction for the contamination of the moon reflection
- Correction for the stray light from the sun
- Correction for the radio frequency interference on CSM data

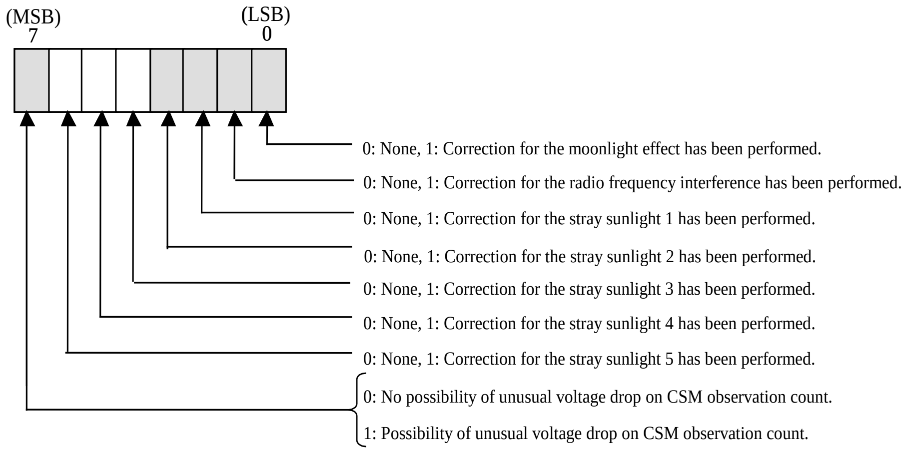


Figure 2.3-6 The Format of The Interpolation Flag

(41) Interpolation_Flag_89

The interpolation flag for CSM data is stored for 89GHz. (Shown in Figure 2.3-6.)

(42) Spill_Over

The observation voltage of 6 GHz before 200 scans is stored from the head scan of the product. (And the unit is mV.) This information is used for calibrating the ground radiation on CSM.

* For Near Real Time processing, they are filled with 0.
* The abnormal values are shown in below.

-999.0	In case of error on a voltage conversion etc.
0.0	In case of the lack of observation data, parity error, RxOffset/Gain error .

§L1B

AMSR Level 1B
Product Format Description

Contents

1. Explanation of the Product

The Level 1B product stores the value of observed microwave radiation from the earth surface and it's geometric information as HDF. The features of the level 1B product are shown below.

- Range of data

  The level 1B product is extracted to the range of a half orbit between the South Pole and North Pole from level 0 data.

- Observation width

  The range of the observation width is ±61 degrees centered at the flight direction. (See Figure 1-1.)

  196 data points are observed for each frequency below 89GHz and 392 for 89GHz.

- Main storing data
  - Scan time
  - Brightness temperature of the earth surface observation data
    (With radiometric conversion and correction)
  - Radiometric conversion coefficients
  - Temperature of the high temperature calibrator and the low temperature calibrator
  - Geometric information (position, observation incidence angle, sun azimuth angle, etc.)
  - Quality information
  - Others (The information of the satellite, sensor, and product etc.)

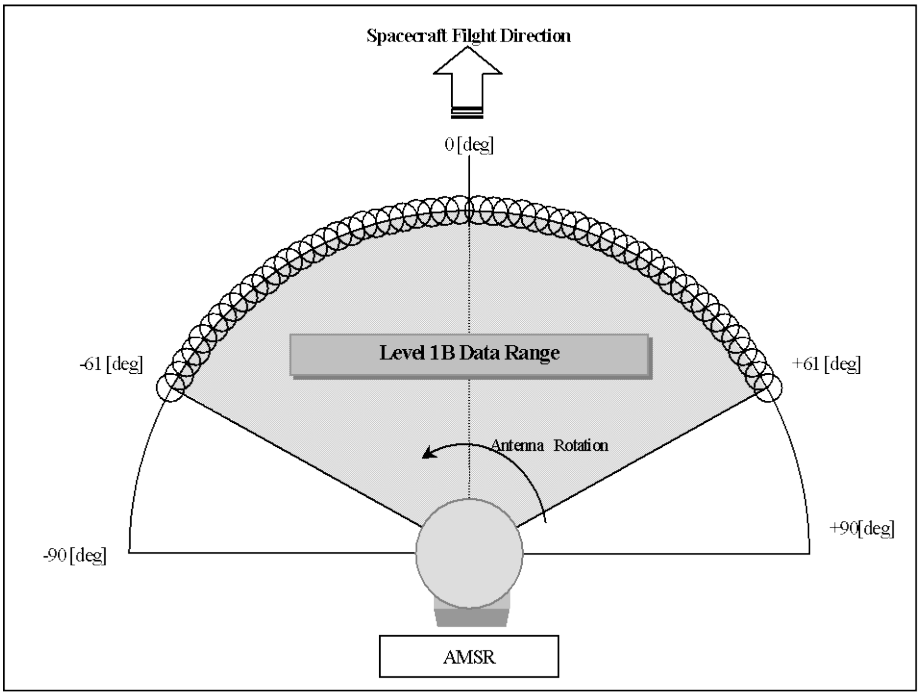


Figure 1-1 Range of one scan for AMSR (Level 1B)

1.1. Product Structure

The logical structure of level 1B product is shown in Table 1.1-1.

Table 1.1-1 Logical Structure of AMSR Level 1B product

<table>
<tr><th colspan="2">Structure</th><th>HDF Data Model</th><th>Contents</th></tr>
<tr><td rowspan="2">Header Part</td><td>Core Meta</td><td>Global Attribute</td><td>The general information of the product is stored. It is based on the indispensable item of the attribute of NASA ECS (B. 0).</td></tr>
<tr><td>Product Meta</td><td>Global Attribute</td><td>Main characteristics of AMSR and the conversion table of the engineering values, etc. are stored.</td></tr>
<tr><td colspan="2">Data Part</td><td>Vdata
SDS</td><td>The data shown below is stored.
• Scan Time
• Brightness Temperature of observation data
• Calibration Data
• Supplementary information
(Positions, Orbits, Attitudes, Coefficients, Observation incidence angle, the sun azimuth, etc.)
• Quality information</td></tr>
</table>

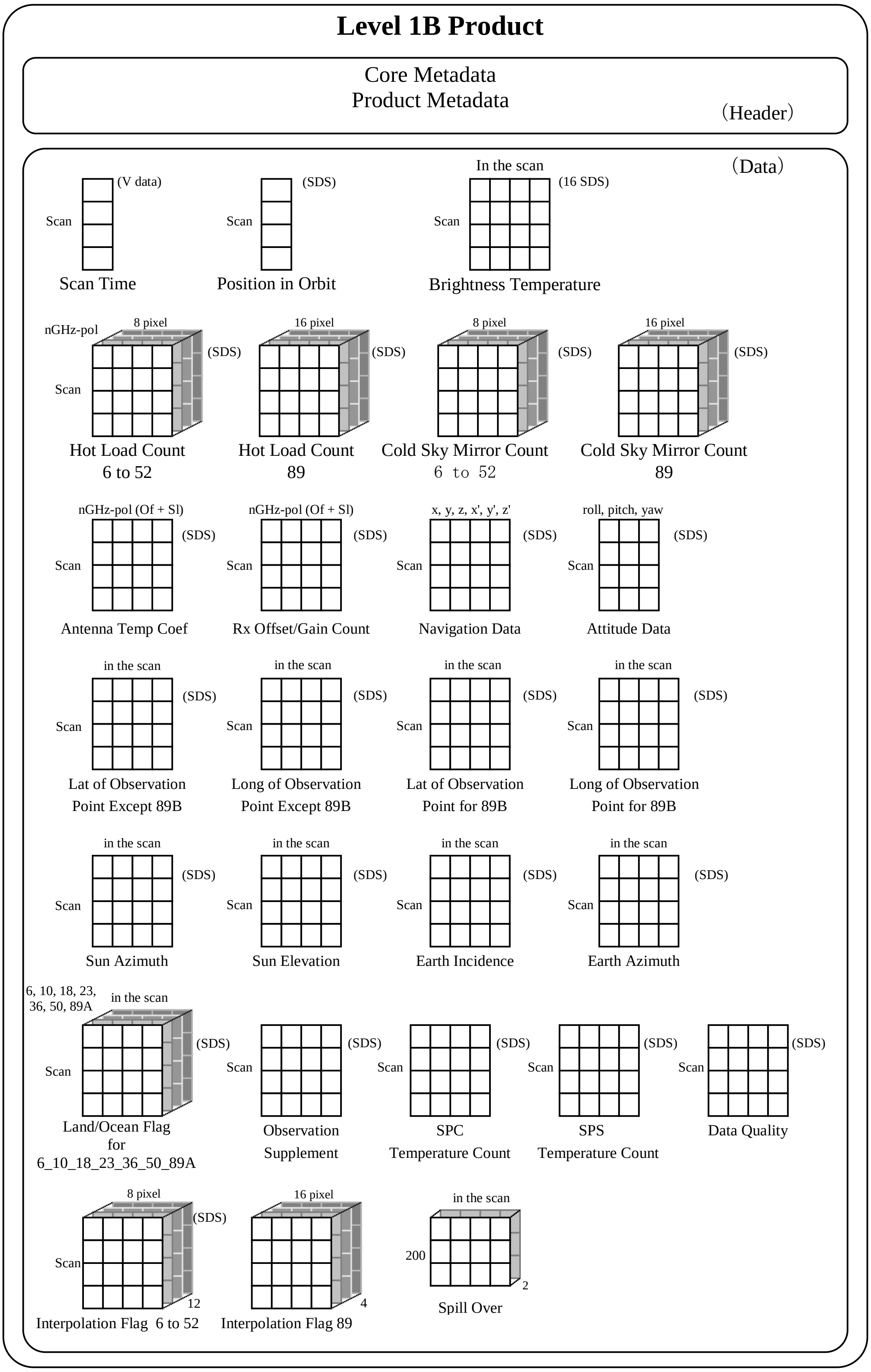
Please refer to the level 1A format description about level 1B product items except the followings, since they are the same as the format of the level 1A product.

- The observation data of earth surface is stored as brightness temperature.
- The range of the observation is ±61 degrees to the satellite flight direction.

1.2. Structure of the Product

The file structure of AMSR level 1B product is shown in Figure 1.2-1. The explanation for the core metadata of the header part is shown in Table 1.2-1, and the product metadata is shown in Table 1.2-2. Moreover, the explanation for each item of the data part shows the data size and the scale factor in Table 1.2-3, and the data structure of brightness temperature different from level 1A in Figure 1.2-2.

[Cautions]
In Table 1.2-1, Table 1.2-2, and Table 1.2-3, un-hatched part shows the peculiar information of the level 1B product. The explanation subsequent to Chapter 2 shows only peculiar information of the level 1B product, and the common items (the hatched) with level 1A product are explained in the level 1A product format description.



Data Structure

Figure 1.2-1 Data Structure

Table 1.2-1 Core Meta Items (1/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
ShortName	The abbreviated name of the product	AMSR-L1B		Fix
VersionID	The version ID of the product	RELEASE3		Example
SizeMBECSDataGranule	Data size of the product (Mbytes)	36.6		Example
LocalGranuleID	Product management number	A2AMS03011815MD_P01B0000000		Example
ProcessingLevelID	ID of processing level	L1B		Fix
ReprocessingActual	Re-processing date (UTC)	blank or 2002-08-10	Date only set for Re-processing (0-Fill for blank)	Example
ProductionDateTime	Product creation date (UTC)	2002-07-29T07:14:29.000Z	0-Fill for blank	Example
RangeBeginningTime	Start time of observation data (UTC)	02:57:17.53Z	0-Fill for blank	Example
RangeBeginningDate	Start date of observation data	2002-07-29	0-Fill for blank	Example
RangeEndingTime	End time of observation data (UTC)	03:47:06.81Z	0-Fill for blank	Example
RangeEndingDate	End date of observation data	2002-07-29	0-Fill for blank	Example
GringPointLatitude	Latitude of data effective range	83.71,73.23,34.10,-25.31,-84.97,-73.60,-23.13,36.52		Example
GringPointLongitude	Longitude of data effective range	152.28,91.82,-10.34,-24.72,-39.30,-105.73,-40.70,-27.99		Example
PGEName	Data processing software name	L1B_Process_Software		Fix
PGEVersion	Data processing software version	3*33*33***33330333		Example
InputPointer	Input file name	A2_AMS_MDR_ASF-_L0_SIG_20030118_1005, A2_AMS_MDR_ASF-_L0_SIG_20030118_1012		Example
ProcessingCenter	Data processing center	JAXA EOC		Fix
ContactOrganizationName	Contact organization name	JAXA,1401,Ohashi,Hatoyama-machi,Hiki-gun,Saitama,350-0393,JAPAN,+81-49-298-1307,orderdesk@eoc.jaxa.jp		Fix
StartOrbitNumber	Start orbit number	1251		Example
StopOrbitNumber	End orbit number	1251		Example
EquatorCrossingLongitude	Longitude at the time of equatorial passage	-28.80		Example
EquatorCrossingDate	Date of equatorial passage	2002-07-29	0-Fill for blank	Example
EquatorCrossingTime	Time of equatorial passage	03:24:14.41Z	0-Fill for blank	Example

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-1 Core Meta Items (2/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
OrbitDirection	Orbit direction	DESCENDING		Example
EphemerisGranulePointer	Orbit data file name	EL20030118		Example
EphemerisType	Type of orbit data	GPS		Example
PlatformShortName	Abbreviated name of Platform	ADEOS-2		Fix
SensorShortName	Sensor name	AMSR		Fix
NumberofScans	Number of scans	2042		Example
NumberofMissingScans	Number of missing packets	1		Example
ECSDataModel	Meta data model name	B.0		Fix
DiscontinuityVirtualChannelCounter	Judgement of virtual channel unit counter discontinuity	continuation		Example
QALocationPacketDiscontinuity	Judgment of packet sequence counter discontinuity	discontinuation		Example
NumberofPackets	Number of packets	31904		Example
NumberofInputFiles	Number of input files	2		Example
NumberMissingPackets	Number of missing packets	1		Example
NumberofGoodPackets	Number of good packets	31903		Example
ReceivingCondition	Receiving condition	blank		Fix
EphemerisQA	Ephemeris limit check	OK		Example
AutomaticQAFlag	Limit check by software	PASS		Example
AutomaticQAFlagExplanation	Explanation of limit check by software	1.MissingDataQA:Less than 1010 is available->OK, 2.AntennaRotationQA:Less than 20 is available->OK, 3.HotCalibrationSourceQA:Less than 20 is available->OK, 4.AttitudeDataQA:Less than 20 is available->OK, 5.EphemerisDataQA:Less than 20 is available->OK, 6.QualityofGeometricInformationQA: Less than 0 is available->OK, 7.BrightnessTemperatureQA:Less than 20 is available->OK, All items are OK, 'PASS' is employed		Fix

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-1 Core Meta Items (3/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/Example
ScienceQualityFlag	The quality flag when computing the amount of physics	blank		Fix
ScienceQualityFlagExplanation	Explanation of the quality flag when computing the amount of physics	blank		Fix
QAPercentMisssingData	Percentage of missing data	0		Example
QAPercentOutofBoundsData	Percentage of out of bound data	0		Example
QAPercentParityErrorData	Percentage of parity error data	0		Example
ProcessingQADescription	Description of the processing error	PROC_COMP		Example
ProcessingQAAttirbute	The attribute name which is abnormal by QA metadata	Blank or NumberofMissingPackets	An attribute name is set up only at the time of unusual generating.	Example

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (1/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
SatelliteOrbit	The kind of Satellite's orbit	Sun-synchronous_sub-recurrent	Fix
Altitude	The altitude of Satellite	802.9Km	Fix
OrbitSemiMajorAxis	The orbit semi-major axis	7181.317km	Fix
OrbitEccentricity	The orbit eccentricity	0.00007	Fix
OrbitArgumentPerigee	The orbit argument perigee	244.018	Fix
OrbitInclination	The orbit inclination	98.62	Fix
OrbitPeriod	The orbit period	101minutes	Fix
RevisitTime	Orbit recurrent days	4days	Fix
AMSRChannel	The kind of AMSR channels	6.925GHz,10.65GHz,18.7GHz,23.8GHz,36.5GHz,50.3GHz,52.8GHz,89.0GHz-A,89.0GHz-B	Fix
AMSRBandWidth	Band width of AMSR	6G-350MHz,10G-100MHz,18G-200MHz,23G-400MHz,36G-1000MHz,50.3G-200MHz,52G-400MHz, 89GA-3000MHz,89GB-3000MHz	Fix
AMSRbeamWidth	Beam width of AMSR	6G-1.8deg,10G-1.2deg,18G-0.64deg,23G-0.75deg,36G-0.35deg,50.3G-0.25deg,52G-0.25deg,89GA-0.15deg, 89GB-0.15deg	Fix
OffNadir	Off-nadir angle	46.7deg : for 89GB 46.3deg	Fix
SpatialResolution(AzXEl)	Spatial resolution	6G-39.8kmX69.5km,10G-26.6kmX46.3km,18G-14.4kmX25.1km,23G-16.6kmX28.9km,36G-7.7kmX13.5km,50.3G-5.5kmX9.6km,52G-5.5kmX9.6km,89GA-3.3kmX5.8km,89GB-3.3kmX5.7km	Fix
ScanningPeriod	Scanning period	1.5sec	Fix
SwathWidth	Swath width	1600km	Fix
DynamicRange	Dynamic range	2.7K-340K	Fix
DataFormatType	Data format type	NCSA-HDF	Fix
HDFFormatVersion	HDF format version	Ver4.2r4	Fix
EllipsoidName	Earth ellipse model	WGS84	Fix
SemiMajorAxisofEarth	Earth equatorial radius	6378.1km	Fix
FlatteningRatioofEarth	Flattening ratio of earth	0.00335	Fix
SensorAlignment	Sensor alignment	Rx=0.00000,Ry=0.00000,Rz=0.00000	Fix
ThermistorCountRangeWx	The effective range of a thermistor engineering value conversion factor	61,138,301,456,591,698,780,840,883,915,937,954,966,974,1023	Fix

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (2/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
ThermistorConversionTable Wa	Thermistor conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
ThermistorConversionTable Wb	Thermistor conversion table: Wb	0.00000,0.06500,0.06100,0.06500,0.07400,0.09400,0.12200,0.16700,0.23 300,0.31300,0.45500,0.58800,0.83300,1.25000,0.00000	Fix
ThermistorConversionTable Wc	Thermistor conversion table: Wc	-35.0000,-38.9610,-38.4660,-39.4190,-46.7780,-55.2340,-75.1220,-110.00 00,-165.3490,-235.9380,-365.9090,-491.1760,-725.0000,-1127.5000,90.00 00	Fix
ThermistorConversionTable Wd	Thermistor conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1CountRangeWx	Platinum#1 count range: Wx	1168,1296,1536,1792,2032,2272,2512,2752,2992,3232,3472,3712,3952,4 095	Fix
Platinum#1ConversionTable Wa	Platinum#1 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1ConversionTable Wb	Platinum#1 conversion table: Wb	0.00000,0.03906,0.04167,0.03906,0.04167,0.04167,0.04167,0.04167,0.04 167,0.04167,0.04167,0.04167,0.04167,0.04167	Fix
Platinum#1ConversionTable Wc	Platinum#1 conversion table: Wc	-35.0000,-80.6250,-84.0000,-80.0000,-84.6667,-84.6667,-84.6667,-84.666 7,-84.6667,-55.5000,-84.6667,-84.6667,-84.6667,-84.6667	Fix
Platinum#1ConversionTable Wd	Platinum#1 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2CountRangeWx	Platinum#2 count range: Wx	272,528,784,1040,1296,1536,1792,2032,2288,2528,2768,3008,3248,3472, 3712,4095	Fix
Platinum#2ConversionTable Wa	Platinum#2 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2ConversionTable Wb	Platinum#2 conversion table: Wb	0.00000,0.07813,0.07813,0.07813,0.07813,0.08333,0.07813,0.08333,0.07 813,0.08333,0.08333,0.08333,0.08333,0.08929,0.08333,0.00000	Fix
Platinum#2ConversionTable Wc	Platinum#2 conversion table: Wc	-140.0000,-161.2500,-161.2500,-161.2500,-161.2500,-168.0000,-160.000 0,-169.3333,-158.7500,-170.6667,-170.6667,-170.6667,-170.6667,-190.00 00,-169.3333,140.0000	Fix
Platinum#2ConversionTable Wd	Platinum#2 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (3/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
Platinum#3CountRangeWx	Platinum#3 count range: Wx	368,704,1040,1360,1696,2032,2352,2688,3008,3344,3664,4000,4095	Fix
Platinum#3ConversionTable Wa	Platinum#3 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#3ConversionTable Wb	Platinum#3 conversion table: Wb	0.00000,0.00893,0.00893,0.00938,0.00893,0.00893,0.00938,0.00893,0.00938,0.00893,0.00938,0.00893,0.00000	Fix
Platinum#3ConversionTable Wc	Platinum#3 conversion table: Wc	12.0000,8.7143,8.7143,8.2500,8.8571,8.8571,7.9500,9.0000,7.8000,9.1429,7.6500,9.2857,45.0000	Fix
Platinum#3ConversionTable Wd	Platinum#3 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
CoefficientAvv	Coefficient: Avv	6G-1.031,10G-1.027,18G-1.022,23G-1.029,36G-1.030,50G-1.024,52G-1.030,89GA-1.029,89GB-1.030	Fix
CoefiicientAhv	Coefficient: Ahv	6G--0.003,10G--0.003,18G--0.003,23G--0.003,36G--0.003,50G-0.000,52G-0.000,89GA--0.004,89GB--0.004	Fix
CoefficientAov	Coefficient: Aov	6G--0.028,10G--0.024,18G--0.019,23G--0.026,36G--0.027,50G--0.024,52G--0.030,89GA--0.025,89GB--0.026	Fix
CoefficientAhh	Coefficient: Ahh	6G-1.031,10G-1.027,18G-1.022,23G-1.032,36G-1.030,50G-0.000,52G-0.000,89GA-1.028,89GB-1.029	Fix
CoefficientAvh	Coefficient: Avh	6G--0.003,10G--0.002,18G--0.003,23G--0.007,36G--0.004,50G-0.000,52G-0.000,89GA--0.004,89GB--0.005	Fix
CoefficientAoh	Coefficient: Aoh	6G--0.027,10G--0.025,18G--0.019,23G--0.024,36G--0.026,50G-0.000,52G-0.000,89GA--0.024,89GB--0.024	Fix
CSMTemperature	Brightness temperature of deep space	6GV-2.800, 6GH-2.800, 10GV-2.800, 10GH-2.800, 18GV-2.800, 18GH-2.800, 23GV-2.800, 23GH-2.800, 36GV-2.800, 36GH-2.800, 50GV-2.800, 52GV-2.800, 89GAV-2.800, 89GAH-2.800, 89GBV-2.800, 89GBH-2.800	Fix
CoRegistrationParametererA1	Co-registration parameter: A1	6G--0.34380, 10G--0.66550, 18G--0.50910, 23G--0.43900, 36G--0.55200, 50G-0.00000	Example
CoRegistrationParametererA2	Co-registration parameter: A2	6G--0.24480, 10G--0.27380, 18G-0.00420, 23G-0.00000, 36G-0.06000, 50G-0.00000	Example

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (4/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
CalibrationCurve Coefficient#1	The radiometric correction coefficient for the 0th order	6GV--0.1919871, 6GH--0.0994771, 10GV--0.0140960, 10GH--0.0011593, 18GV-0.0000000, 18GH-0.0000000, 23GV--0.1514239, 23GH--0.1514239, 36GV--0.0264439, 36GH--0.0555515, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0197245, 89GAH--0.0632250, 89GBV--0.0186104, 89GBH--0.0659556	Example
CalibrationCurve Coefficient#2	The radiometric correction coefficient for the 1st order	6GV-1.0692195, 6GH-1.0358657, 10GV-1.0050821, 10GH-1.0004180, 18GV-1.0000000, 18GH-1.0129884, 23GV-1.0545937, 23GH-1.0545937, 36GV-1.0095340, 36GH-1.0200283, 50GV-1.0000000, 52GV-1.0000000, 89GAV-1.0071118, 89GAH-1.0227955, 89GBV-1.0067097, 89GBH-1.0237784	Example
CalibrationCurve Coefficient#3	The radiometric correction coefficient for the 2nd order	6GV--0.0002331, 6GH--0.0001208, 10GV--0.0000171, 10GH--0.0000014, 18GV-0.0000000, 18GH--0.0000436, 23GV--0.0001835, 23GH--0.0001835, 36GV--0.0000321, 36GH--0.0000673, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0000241, 89GAH--0.0000768, 89GBV--0.0000225, 89GBH--0.0000796	Example
CalibrationCurve Coefficient#4	The radiometric correction coefficient for the 3rd order	6GV-0.0000000, 6GH-0.0000000, 10GV-0.0000000, 10GH-0.0000000, 18GV-0.0000000, 18GH-0.0000000, 23GV-0.0000000, 23GH-0.0000000, 36GV-0.0000000, 36GH-0.0000000, 50GV-0.0000000, 52GV-0.0000000, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Example
CalibrationCurve Coefficient#5	The radiometric correction coefficient for the 4th order	6GV-0.0000000, 6GH-0.0000000, 10GV-0.0000000, 10GH-0.0000000, 18GV-0.0000000, 18GH-0.0000000, 23GV-0.0000000, 23GH-0.0000000, 36GV-0.0000000, 36GH-0.0000000, 50GV-0.0000000, 52GV-0.0000000, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Example
CalibrationMethod	Calibration method name	RxTemperatureReferenced,SpillOver,CSMInterpolation, Absolute89GPositioning,NonlinearityCorrection * RxTemperatureReferenced may be changed into HTUCoefficients or ElectromagneticAnalysis	Example
HTSCorrectionParameter Version	Parameter version of the HTS correction.	ver0002	Example
SpillOverParameterVersion	Parameter version of the CSM spill over correction	ver0001	Example
CSMInterpolationParameter Version	Parameter version of the CSM interpolation correction	ver0001	Example
Absolute89Gpositioning ParameterVersion	Parameter version of the correction for absolute positions of 89 GHz	ver0002	Example

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

Table 1.2-3 Data Items, Sizes and Scaling Factors (1/2)

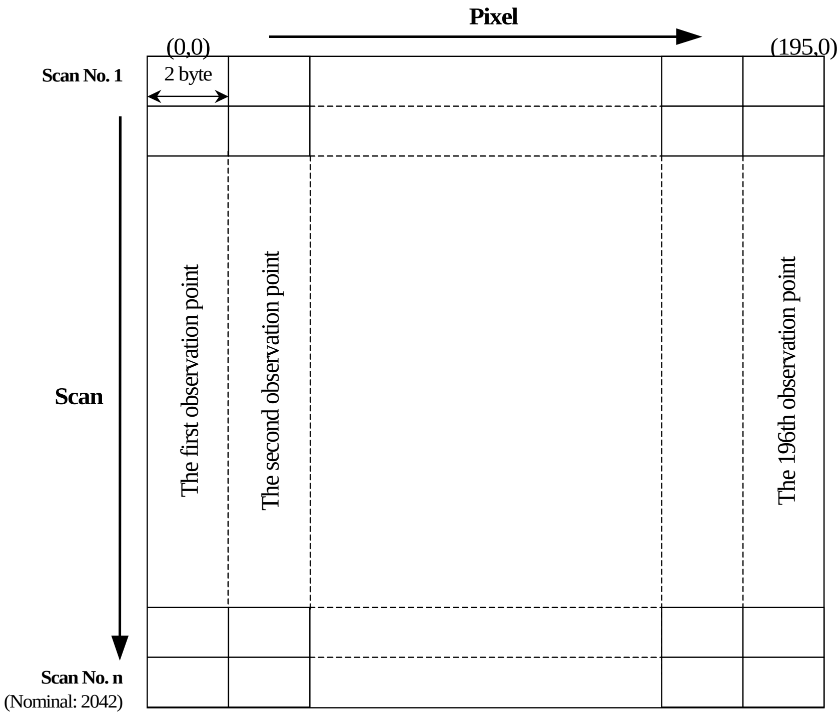
No.	Items	Byte	Type	Scale factor	No. of samples per scan	Units	Dimension
1	Scan_Time	8	Double	1	1	sec	nscan
2	Position_in_Orbit	8	Double	1	1	-	nscan
3	Navigation_Data	6*4	float	1	6	m,m/s	6*nscan
4	Attitude_Data	3*4	float	1	3	deg	3*nscan
5	6GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
6	6GHz-H_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
7	10.65GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
8	10.65GHz-H_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
9	18.7GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
10	18.7GHz-H_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
11	23.8GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
12	23.8GHz-H_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
13	36.5GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
14	36.5GHz-H_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
15	50.3GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
16	52.8GHz-V_Birghtness_Temperature	2	signed int	0.1	196	K	196*nscan
17	89.0GHz-A-V_Birghtness_Temperature	2	signed int	0.1	196	K	392*nscan
18	89.0GHz-A-H_Birghtness_Temperature	2	signed int	0.1	392	K	392*nscan
19	89.0GHz-B-V_Birghtness_Temperature	2	signed int	0.1	392	K	392*nscan
20	89.0GHz-B-H_Birghtness_Temperature	2	signed int	0.1	392	K	392*nscan

* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)

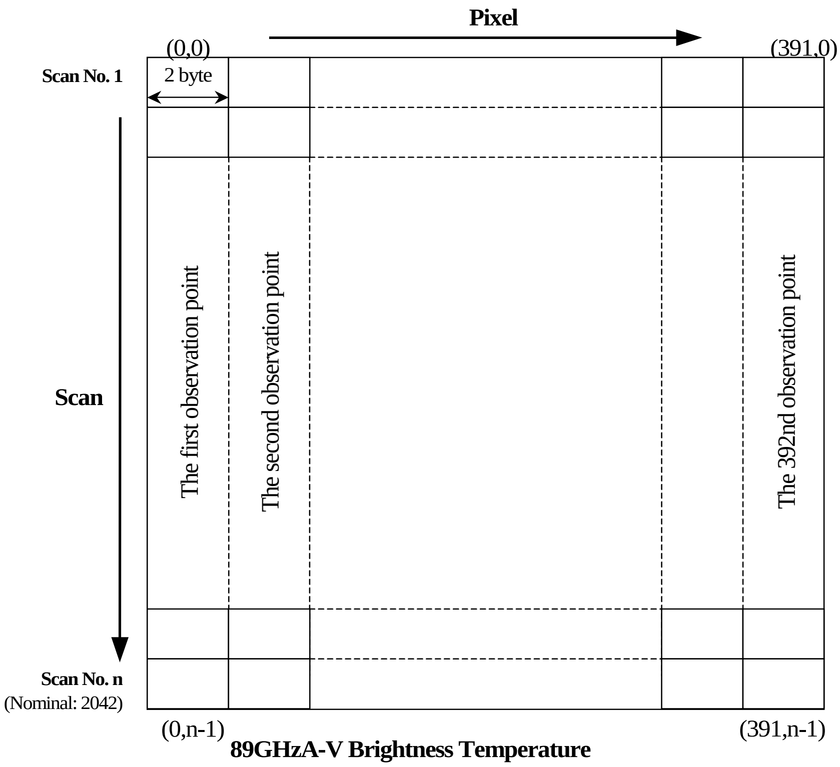
Table 1.2-3 Data Items, Sizes and Scaling Factors (2/2)

No.	Items	Byte	Type	Scale factor	No. of samples per scan	Units	Dimension
21	Hot_Load_Count_6_to_52	2	signed int	1	8	Count	8*nscan*12
22	Hot_Load_Count_89	2	signed int	1	16	Count	16*nscan*4
23	Cold_Sky_Mirror_Count_6_to_52	2	signed int	1	8	Count	8*nscan*12
24	Cold_Sky_Mirror_Count_89	2	signed int	1	16	Count	16*nscan*4
25	Antenna_Temp_Coef(Of+Sl)	4	float	1	32	K+K/Cnt	32*nscan
26	Rx_Offset/Gain_Count	2	unsigned int	1	32	Count	32*nscan
27	Lat_of_Observation_Point_Except_89B	2	signed int	0.01	392	deg	392*nscan
28	Long_of_Observation_Point_Except_89B	2	signed int	0.01	392	deg	392*nscan
29	Lat_of_Observation_Point_for_89B	2	signed int	0.01	392	deg	392*nscan
30	Long_of_Observation_Point_for_89B	2	signed int	0.01	392	deg	392*nscan
31	Sun_Azimuth	2	signed int	0.1	196	deg	196*nscan
32	Sun_Elevation	2	signed int	0.1	196	deg	196*nscan
33	Earth_Incidence #1	1	signed char	0.02	196	deg	196*nscan
34	Earth_Azimuth	2	signed int	0.01	196	deg	196*nscan
35	Land/Ocean_Flag_for_ 6_10_18_23_36_50_89A	1	unsigned int	1	196	%	196*nscan*7
36	Observation_Supplement	2	-	1	27	-	27*nscan
37	SPC_Temperature_Count	2	unsigned int	1	20	Count	20*nscan
38	SPS_Temperature_Count	2	unsigned int	1	32	Count	32*nscan
39	Data_Quality	4	float	1	128	-	128*nscan
40	Interpolation_Flag_6_to_52	1	char	1	8	-	8*nscan*12
41	Interpolation_Flag_89	1	char	1	16	-	16*nscan*4
42	Spill_Over	4	float	1	243	mV	290*200scan*2

#1: The Earth Incidence has also sub-attribute “OFFSET”. This offset is set to 55.0.
* The un-hatched indicates the peculiar information of the level 1B product. (Refer to the level 1A product description for the hatched.)



6GHz-V Brightness Temperature
(6-H, 10-V/H, 18-V/H, 23-V/H, 36-V/H, 50-V, 52-V have the same structure)



89GHzA-V Brightness Temperature
(89A-H, 89B-V/H have the same structure)

Figure 1.2-2 Structure of Brightness Temperature

1.3. Data Size of one Level 1B Product

The data size of one AMSR level 1B product file is shown in Table 1.3-1 in case of 2020 scans. However, the actual file size is 8% smaller because HDF is a compressed format.

Table 1.3-1 Estimation of the Data Volume

AMSR Product Data Size

Item	No. of Samples	No. of Bytes	Semi Total	Remark
Scan Time	1	8	8	
Position in Orbit	1	8	8	
6GHz-V Brightness Temperature	196	2	392	
6GHz-H Brightness Temperature	196	2	392	
10.65GHz-V Brightness Temperature	196	2	392	
10.65GHz-H Brightness Temperature	196	2	392	
18.7GHz-V Brightness Temperature	196	2	392	
18.7GHz-H Brightness Temperature	196	2	392	
23.8GHz-V Brightness Temperature	196	2	392	
23.8GHz-H Brightness Temperature	196	2	392	
36.5GHz-V Brightness Temperature	196	2	392	
36.5GHz-H Brightness Temperature	196	2	392	
50.3GHz-V Brightness Temperature	196	2	392	
52.8GHz-H Brightness Temperature	196	2	392	
89.9GHz-V-A Brightness Temperature	392	2	784	
89.9GHz-H-A Brightness Temperature	392	2	784	
89.9GHz-V-B Brightness Temperature	392	2	784	
89.9GHz-H-B Brightness Temperature	392	2	784	
Hot Load Count 6 to 52	8	2	192	(2*8) * 12 freq
Hot Load Count 89	16	2	128	(2*16) * 4 freq
Cold Sky Mirror Count 6 to 52	8	2	192	(2*8) * 12 freq
Cold Sky Mirror Count 89	16	2	128	(2*16) * 4 freq
Antenna Temp Coef (Of + Sl)	32	4	128	
Rx Offset/Gain Count	32	2	64	
Navigation Data	6	4	24	
Attitude Data	3	4	12	
Lat of Observation Point Except 89B	392	2	784	
Long of Observation Point Except 89B	392	2	784	
Lat of Observation Point for 89B	392	2	784	
Long of Observation Point for 89B	392	2	784	
Sun Azimuth	196	2	392	A scan only
Sun Elevation	196	2	392	A scan only
Earth Incidence	196	1	196	A scan only
Earth Azimuth	196	2	392	A scan only
Land/Ocean Flag	196	1	1372	1*7 for
Observation Support	27	2	54	
SPC Temperature Count	22	2	44	
SPS Temperature Count	32	2	64	
Data Quality	512	4	64	
Interpolation_Flag 6 to 52	8	1	96	(1*8) * 12 freq
Interpolation_Flag 89	16	1	64	(1*16) * 4 freq
Spill Over	290	4	2320	* 2 freq * 200 Scan
Total			17310	
Volume/Granule (MB)			29.3	2020 Scans/Scene
Volume/Day (GB)			0.8	29 Files/Day
Volume/Month (GB)			25.7	30 Days/Month

2. Data Explanation

This chapter shows explanation of each data item of AMSR-E level 1B product excluding common items for level 1A product.

2.1. Core Metadata

(1) ShortName

The abbreviated name of a product is stored. Please refer to the level 1A product description for the details.

(2) LocalGranuleID

The Granule ID based on JAXA EOC ID convention is stored. The Granule ID for level 1B is as follows.

A2AMSYYMMDDPPMX _ KNLL0000000

[Scene ID]

A2	A2 (Fix: ADEOS-II)
AMS	AMS (Fix: AMSR)
YYMMDD	Date of data acquisition start (UT)
PP	Path number at the observation start point (01 – 57)
M	M or R (M: regular process / re-process, R: near real time process)
X	A or D (Orbit direction, A: Ascending, D: Descending)

[Product ID]

K	P or N (P: regular process / re-process, N: near real time process)
N	0 (Fix: Spare)
LL	1B (Fix: for level 1B)
0000000	0 (Fix: Spare)

(3) ProcessingLevelID

The processing level is stored. Please refer to the level 1A product description for the details.

(4) PGEName

The data processing software name is stored. Please refer to the level 1A product description for the details.

2.2. Product Metadata

(1) CoRegistrationParameterA1, CoRegistrationParameterA2

The co-registration parameters A1 and A2 are stored for each frequency. The relation of the number of observation points between level 1B and level 1A is shown the following table. Extraction of the observation width is performed with the same center position in a scan. As a result, the scanning start position is changed from the odd-numbered point in level 1A to the even-numbered point in level 1B, and then the coefficient of A1 changes with processing levels.

Processing Level		Number of observation points	Start Position	Center Position	Note
L1A	Except 89GHz	290	1	146	
	89GHz	580	1	291	
L1B	Except 89GHz	196	1(48*)	99(146*)	*: Position of level 1A
	89GHz	392	1(95*)	197(291*)	*: Position of level 1A

Please refer to the level 1A product description for the calculation method of position using co-registration parameters A1 and A2.

2.3. Data Items

(1) 6GHz-V_Brightness_Temperature

The observed brightness temperature of 6 GHz vertical polarization is stored.

* The following value is stored for the abnormal observation data. This is applied for all frequencies and polarizations.

Scaling Factor	0.1 (All Frequencies)	
Abnormal Values	-9999	Value for Lack of data
	-32768	Value for Parity error
	The other minus value	Value for Limit Check error

(2) 6GHz-H_Brightness_Temperature

The observed brightness temperature of 6 GHz horizontal polarization is stored.

(3) 10.65GHz-V_Brightness_Temperature

The observed brightness temperature of 10.65 GHz vertical polarization is stored.

(4) 10.65GHz-H_Brightness_Temperature

The observed brightness temperature of 10.65 GHz horizontal polarization is stored.

(5) 18.7GHz-V_Brightness_Temperature

The observed brightness temperature of 18.7 GHz vertical polarization is stored.

(6) 18.7GHz-H_Brightness_Temperature

The observed brightness temperature of 18.7 GHz horizontal polarization is stored.

(7) 23.8GHz-V_Brightness_Temperature

The observed brightness temperature of 23.8 GHz vertical polarization is stored.

(8) 23.8GHz-H_Brightness_Temperature

The observed brightness temperature of 23.8 GHz horizontal polarization is stored.

(9) 36.5GHz-V_Brightness_Temperature

The observed brightness temperature of 36.5 GHz vertical polarization is stored.

(10) 36.5GHz-H_Brightness_Temperature

The observed brightness temperature of 36.5 GHz horizontal polarization is stored.

(11) 50.3GHz-V_Brightness_Temperature

The observed brightness temperature of 50.3 GHz vertical polarization is stored.

(12) 52.8GHz-V_Brightness_Temperature

The observed brightness temperature of 52.8 GHz vertical polarization is stored.

(13) 89.0GHz-V-A_Brightness_Temperature

The observed brightness temperature of 89 GHz A-horn’s vertical polarization is stored.

(14) 89.0GHz-H-A_Brightness_Temperature

The observed brightness temperature of 89 GHz A-horn’s horizontal polarization is stored.

(15) 89.0GHz-V-B_Brightness_Temperature

The observed brightness temperature of 89 GHz B-horn’s vertical polarization is stored.

(16) 89.0GHz-H-B_Brightness_Temperature

The observed brightness temperature of 89 GHz B-horn’s horizontal polarization is stored.

§L1M

AMSR Level 1B Map
Product Format Description

Contents

1. Explanation of Product

The Level 1B Map product stores the corrected brightness temperature that projected on the map as HDF. The features of the product are shown below.

- Range of the map projection image

  The map projected image expresses the brightness temperature extracted from the specified center position by the region of about 3000 km x 3000 km, and the center position of the image has relations in Table 1-1. And the observation width in the image is about 1600 km that corresponds the level 1B observation width (See Figure. 1-1).
- The method of map projection

  The map projection methods are shown below. In each projection method, the range of the center latitude that can be specified is limited (Table 1-2). And the image size is the same in all projection methods.
  - Equirectangular projection
  - Mercator projection
  - Polar Stereo projection
- Main storing data
  - The brightness temperature of the earth observation data (with radiometric correction)
  - The geometric information (position, observation incident angle, sun azimuth angle, etc.)
  - The quality information
  - The others (The information of the satellite, sensor, and product etc.)

Table 1-1 Map projected image size and the interval of a pixel

Frequency	Image size(Pixel)	Flight Direction(km/pixel)	Azimuth Direction(km/pixel)
Except 89GHz	300×300	10	10
89GHz	600×600	5	5

* The 89GHz image is completed by each observation data of A-horn and B-horn along the flight direction.

Table 1-2 Relations between the map projection method and the center latitude

Map projection method	Range of the center latitude (degrees)	Number of input level 1B	Note
Equirectangular	-60 < Phi < 60	1	
Mercator			
Polar Stereo	-60 ≥ Phi 60 ≤ Phi	1 or 2	When the center latitude is -65 degrees or less and 60 degrees or more, it needs 2 products.

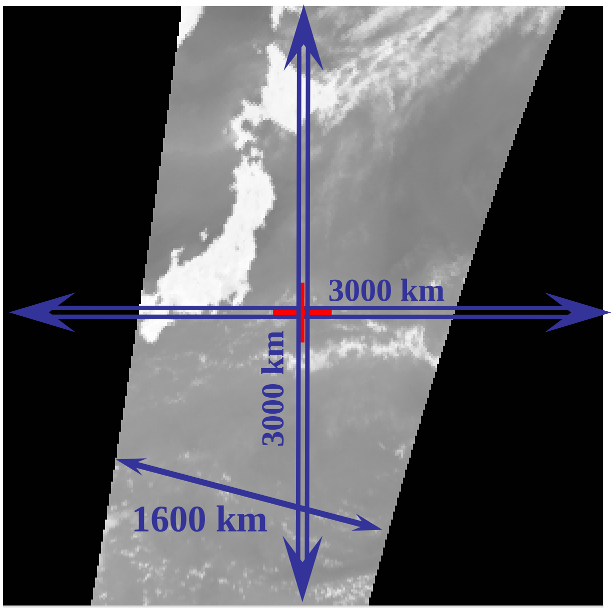


Figure 1-1 the range of the map-projected image
(Example: The map projected image by Mercator projection.)

1.1. Product Structure

The logical structure of level 1B Map product is shown in Table 1.1-1.

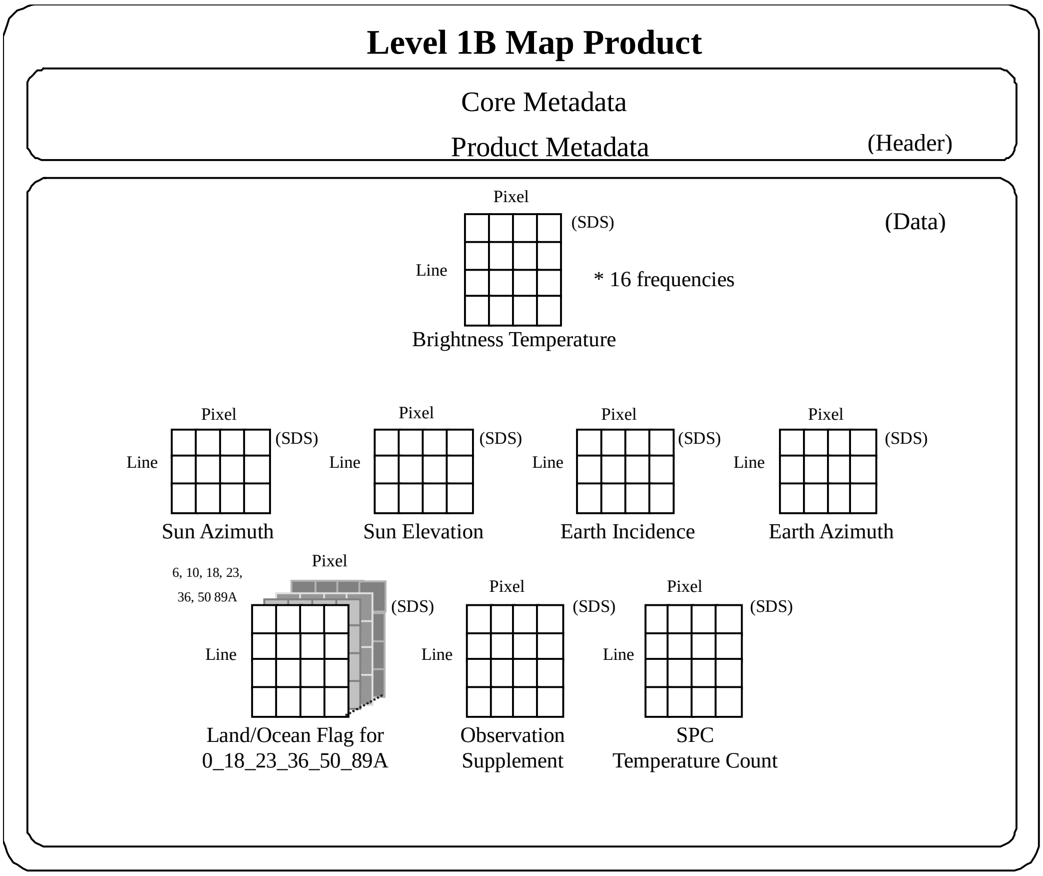
Table 1.1-1 Logical Structure of AMSR Level 1B Map product

Structure		HDF Data Model	Contents
Header Part	Core Meta	Global Attribute	The general information of the product is stored. It is based on the indispensable item of the attribute of NASA ECS (B. 0). (It is same as level 1B product.)
	Product Meta	Global Attribute	Main characteristics of AMSR and the conversion table of the engineering values, etc. are stored. (It is same as level 1B product.)
Data Part		Vdata SDS	The data shown below is stored. • Map-projected brightness temperature (all frequencies) • Geometric information (The position of four corners, the observation incident angle, the sun azimuth angle, and the land/ocean flags) • Quality information

1.2. File Structure

The file structure of AMSR level 1B Map product is shown in Figure 1.2-1. The explanation for the core metadata of header part is shown in Table 1.2-1, and the product metadata is shown in Table 1.2-2. Moreover, the explanation for each item of data part shows the data size and the scale factor in Table 1.2-3, and the data structure in Figure 1.2-2 - 1.2-16.

[Cautions]
In Table 1.2-1, Table 1.2-2, and Table 1.2-3, un-hatched shows the peculiar information of the level 1B Map product. The explanation subsequent to Chapter 2 shows only peculiar information of the level 1B Map product, and the common items (the hatched) with level 1A product are explained in the level 1A product format description.



Data Structure

Figure 1.2-1 The Data Structure

Table 1.2-1 Core Meta Items (1/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/ Example
ShortName	The abbreviated name of the product	AMSREL1M		Fix
VersionID	The version ID of the product	RELEASE3		Example
SizeMBECSDataGranule	Data size of the product (Mbytes)	36.6		Example
LocalGranuleID	Product management number	P1AME020729210MD_O01MMN00NWTN50		Example
ProcessingLevelID	ID of processing level	L1M		Fix
ReprocessingActual	Re-processing date (UTC)	blank or 2002-08-10	Date only set for Re-processing (0-Fill for blank)	Example
ProductionDateTime	Product creation date (UTC)	2002-07-29T07:14:29.000Z	0-Fill for blank	Example
RangeBeginningTime	Start time of observation data (UTC)	02:57:17.53Z	0-Fill for blank	Example
RangeBeginningDate	Start date of observation data	2002-07-29	0-Fill for blank	Example
RangeEndingTime	End time of observation data (UTC)	03:47:06.81Z	0-Fill for blank	Example
RangeEndingDate	End date of observation data	2002-07-29	0-Fill for blank	Example
GringPointLatitude1	Latitude at the upper left of a image	+61.66		Example
GringPointLongitude1	Longitude at the upper left of a image	-36.01		Example
GringPointLatitude2	Latitude at the lower left of a image	+34.09		Example
GringPointLongitude2	Longitude at the lower left of a image	-36.01		Example
GringPointLatitude3	Latitude at the lower right of a image	+34.09		Example
GringPointLongitude3	Longitude at the lower right of a image	+5.84		Example
GringPointLatitude4	Latitude at the upper right of a image	+61.66		Example
GringPointLongitude4	Longitude at the upper right of a image	+5.84		Example

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-1 Core Meta Items (2/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/ Example
PGEName	Data processing software name	L1BMAP-Process-Software		Fix
PGEVersion	Data processing software version	3*33*33***33330333		Example
InputPointer	Input file name	R1540402SGS0221003170100.RBD, R1540402SGS0221005320100.RBD		Example
ProcessingCenter	Data processing center	JAXA EOC		Fix
ContactOrganization Name	Contact organization name	JAXA,1401 Ohhashi Hatoyama-Machi,Hiki-gun, Saitama,350-0393,Japan,+81-49-298-1307, orderdesk@eoc.jaxa.jp		Fix
StartOrbitNumber	Start orbit number	1251		Example
StopOrbitNumber	End orbit number	1251		Example
EquatorCrossing Longitude	Longitude at the time of equatorial passage	-28.80		Example
EquatorCrossingDate	Date of equatorial passage	2002-07-29	0-Fill for blank	Example
EquatorCrossingTime	Time of equatorial passage	03:24:14.41Z	0-Fill for blank	Example
OrbitDirection	Orbit direction	DESCENDING		Example
EphemerisGranule Pointer	Orbital data file name	R1540957SGS0221003170100.RBD		Example
EphemerisType	Type of orbital data	ELMP		Example
PlatformShortName	Abbreviated name of Platform	EOS-PM1		Fix
SensorShortName	Sensor name	AMSR-E		Fix
NumberofScans	Number of scans	1994		Example
NumberofMissingScans	Number of missing packets	1		Example
ECSDataModel	Meta data model name	B.0		Fix
DiscontinuityVirtual ChannelCounter	Judgement of virtual channel unit counter discontinuity	DEAD Encounter		Example
QALocationPacket Discontinuity	Judgment of packet sequence counter discontinuity	discontinuation		Example

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-1 Core Meta Items (3/3)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/ Example
NumberofPackets	Number of packets	31904		Example
NumberofInputFiles	Number of input files	2		Example
NumberMissingPackets	Number of missing packets	1		Example
NumberofGoodPackets	Number of good packets	31903		Example
ReceivingCondition	Receiving condition	blank		Fix
EphemerisQA	Ephemeris limit check	OK		Example
AutomaticQAFlag	Limit check by software	PASS		Example
AutomaticQAFlag Explanation	Explanation of limit check by software	1.ProcessedAnomalyQA:Less than 20 is available->OK, 2.InputAnomalyQA:Less than 20 is available->OK, All items are OK, 'PASS' is employed		Fix
ScienceQualityFlag	The quality flag when computing the amount of physics	blank		Fix
ScienceQualityFlag Explanation	Explanation of the quality flag when computing the amount of physics	blank		Fix
QAPercentMisssingData	Percentage of missing data	0		Example
QAPercentOut ofBoundsData	Percentage of out of bound data	0		Example
QAPercentParityErrorData	Percentage of parity error data	0		Example
ProcessingQADescription	Description of the processing error	PROC_COMP		Example
ProcessingQAAttirbute	The attribute name which is abnormal by QA metadata	brank or NumberofMissingPackets	An attribute name is set up only at the time of unusual generating.	Example

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (1/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
SatelliteOrbit	The kind of Satellite's orbit	Sun-synchronous_sub-recurrent	Fix
Altitude	The altitude of Satellite	707.9km	Fix
OrbitSemiMajorAxis	The orbit semi-major axis	7085.858km	Fix
OrbitEccentricity	The orbital eccentricity	0.00095	Fix
OrbitArgumentPerigee	The orbital argument perigee	106.480deg	Fix
OrbitInclination	The orbital inclination	98.15deg	Fix
OrbitPeriod	The orbital period	98minutes	Fix
RevisitTime	Orbit recurrent days	16days	Fix
AMSRChannel	The kind of AMSR channels	6.925GHz,10.65GHz,18.7GHz,23.8GHz,36.5GHz,89.0GHz-A,89.0GHz-B	Fix
AMSRBandWidth	Band width of AMSR	6G-350MHz,10G-100MHz,18G-200MHz,23G-400MHz,36G-1000MHz, 50.3G-0,52G-0,89GA-3000MHz,89GB-3000MHz	Fix
AMSRbeamWidth	Beam width of AMSR	6G-1.8deg,10G-1.2deg,18G-0.64deg,23G-0.75deg,36G-0.35deg, 50.3G-0,52G-0,89GA-0.15deg,89GB-0.15deg	Fix
OffNadir	Off-nadir angle	47.0deg: 89GB, 47.5deg: others	Fix
SpatialResolution(AzXEl)	Spatial resolution	6G-43.2kmX75.4km,10G-29.4kmX51.4km,18G-15.7kmX27.4km,23G-18.1kmX31.5km, 36G-8.2kmX14.4km,50.3G- ,52G- ,89GA-3.7kmX6.5km,89GB-3.5kmX5.9km	Fix
ScanningPeriod	Scanning period	1.5sec	Fix
SwathWidth	Swath width	1450km	Fix
DynamicRange	Dynamic range	2.7K-340K	Fix
DataFormatType	Data format type	NCSA-HDF	Fix
HDFFormatVersion	HDF format version	Ver4.2r4	Fix
EllipsoidName	Earth ellipse model	WGS84	Fix
SemiMajorAxisofEarth	Earth equatorial radius	6378.1km	Fix
FlatteningRatioofEarth	Flattening ratio of earth	0.00335	Fix
SensorAlignment	Sensor alignment	Rx=0.00000,Ry=0.00000,Rz=0.00000	Fix
ThermistorCountRangeWx	The effective range of a thermistor engineering value conversion factor	60,585,770,872,924,952,961,1023	Fix

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (2/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
ThermistorConversionTable Wa	Thermistor conversion table: Wa	0.000000,0.000015,0.000161,0.000618,0.002331,0.011459,0.010101,0.000000	Fix
ThermistorConversionTable Wb	Thermistor conversion table: Wb	0.000000,0.056460,-0.109878,-0.819170,-3.801865,-20.783040,-18.212120,0.000000	Fix
ThermistorConversionTable Wc	Thermistor conversion table: Wc	-35.000000,-38.250000,9.220000,284.170000,1582.770000,9480.000000,8263.350000,90.000000	Fix
ThermistorConversionTable Wd	Thermistor conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1CountRangeWx	Platinum#1 count range: Wx	1168,1296,1536,1752,4095	Fix
Platinum#1ConversionTableWa	Platinum#1 conversion table: Wa	0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1ConversionTableWb	Platinum#1 conversion table: Wb	0.000000,0.039000,0.042000,0.039000,0.042000	Fix
Platinum#1ConversionTableWc	Platinum#1 conversion table: Wc	-35.000000,-80.625000,-84.000000,-80.000000,-84.667000	Fix
Platinum#1ConversionTableWd	Platinum#1 conversion table: Wd	0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2CountRangeWx	Platinum#2 count range: Wx	272,1536,1792,2032,2288,3248,3712,4095	Fix
Platinum#2ConversionTableWa	Platinum#2 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#2ConversionTableWb	Platinum#2 conversion table: Wb	0.000000,0.078300,0.078000,0.083000,0.078000,0.083000,0.085300,0.000000	Fix
Platinum#2ConversionTableWc	Platinum#2 conversion table: Wc	-140.000000,-161.440000,-160.000000,-169.333000,-158.750000,-170.667000,-177.640000,140.000000	Fix
Platinum#2ConversionTableWd	Platinum#2 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (3/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
Platinum#3CountRangeWx	Platinum#3 count range: Wx	349,1454,2000,2555,3059,3566,4020,4095	Fix
Platinum#3ConversionTableWa	Platinum#3 conversion table: Wa	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
Platinum#3ConversionTableWb	Platinum#3 conversion table: Wb	0.000000,0.009100,0.009100,0.009100,0.009900,0.009900,0.008500,0.000000	Fix
Platinum#3ConversionTableWc	Platinum#3 conversion table: Wc	0.000000,6.845000,6.803800,6.803800,4.719500,4.719500,9.835000,44.000000	Fix
Platinum#3ConversionTableWd	Platinum#3 conversion table: Wd	0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0	Fix
CoefficientAvv	Coefficient: Avv	6G-1.037,10G-1.032,18G-1.025,23G-1.032,36G-1.029,50G-0.000,52G-0.000,89GA-1.025,89GB-1.029	Fix
CoefiicientAhv	Coefficient: Ahv	6G--0.003,10G--0.003,18G--0.003,23G--0.004,36G--0.004,50G-0.000,52G-0.000,89GA--0.003,89GB--0.004	Fix
CoefficientAov	Coefficient: Aov	6G--0.034,10G--0.029,18G--0.022,23G--0.028,36G--0.024,50G-0.000,52G-0.000,89GA--0.022,89GB--0.024	Fix
CoefficientAhh	Coefficient: Ahh	6G-1.037,10G-1.031,18G-1.025,23G-1.034,36G-1.029,50G-0.000,52G-0.000,89GA-1.028,89GB-1.031	Fix
CoefficientAvh	Coefficient: Avh	6G--0.003,10G--0.002,18G--0.003,23G--0.006,36G--0.004,50G-0.000,52G-0.000,89GA--0.006,89GB--0.006	Fix
CoefficientAoh	Coefficient: Aoh	6G--0.034,10G--0.029,18G--0.022,23G--0.028,36G--0.024,50G-0.000,52G-0.000,89GA--0.022,89GB--0.024	Fix
CSMTemperature	Brightness temperature of the deep space	6GV-2.800, 6GH-2.800, 10GV-2.800, 10GH-2.800, 18GV-2.800, 18GH-2.800, 23GV-2.800, 23GH-2.800, 36GV-2.800, 36GH-2.800, 50GV-0.000, 52GV-0.000, 89GAV-2.800, 89GAH-2.800, 89GBV-2.800, 89GBH-2.800	Fix
CoRegistrationParametererA1	Co-registration parameter: A1	6G--0.34380, 10G--0.66550, 18G--0.50910, 23G--0.43900, 36G--0.55200, 50G-0.00000 (These are stored same values as level 1B product.)	Fix
CoRegistrationParametererA2	Co-registration parameter: A2	6G--0.24480, 10G--0.27380, 18G-0.00420, 23G-0.00000, 36G-0.06000, 50G-0.00000 (These are stored same values as level 1B product.)	Fix

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)

Table 1.2-2 Product Meta Items (4/4)

Items (Attribute Name)	Explanation	Concrete Values or Examples	Fix/ Example
Re-samplingMethod	Re-sampling method	NN	Fix
PixelSpacingExcept89G	Pixel resolution except 89 GHz	10km	Fix
PixelSpacingFor89G	Pixel resolution of 89 GHz	5km	Fix
ImageSizeExcept89G(Pixel)	Image size (pixel) except 89 GHz	300	Fix
ImageSizeFor89G(Pixel)	Image size (pixel) of 89 GHz	600	Fix
ImageSizeExcept89G(Line)	Image size (line) except 89 GHz	300	Fix
ImageSizeFor89G(Line)	Image size (line) of 89 GHz	600	Fix

* The un-hatched indicates the peculiar information of the level 1B Map product. (Refer to the level 1A product description for the hatched.)
* The level 1B Map product does not store following product meta data in level 1B product.

- CalibrationCurveCoefficient#1-#4
- CalibrationMethod
- HTSCorrectionParameterVersion
- SpillOverParameterVersion
- CSMInterporationParameterVersion
- Absolute89PositioningParameterVersion

Table 1.2-3 Data Size and Scaling Factor of Attribute Items

No.	Items	Byte	Type	Scale factor	Units	Dimension
1	6GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
2	6GHz-H Brightness Temperature	2	signed int	0.1	K	300×300
3	10.65GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
4	10.65GHz-H Brightness Temperature	2	signed int	0.1	K	300×300
5	18.7GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
6	18.7GHz-H Brightness Temperature	2	signed int	0.1	K	300×300
7	23.8GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
8	23.8GHz-H Brightness Temperature	2	signed int	0.1	K	300×300
9	36.5GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
10	36.5GHz-H Brightness Temperature	2	signed int	0.1	K	300×300
11	50.3GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
12	52.8GHz-V Brightness Temperature	2	signed int	0.1	K	300×300
13	89.0GHz-V Brightness Temperature	2	signed int	0.1	K	600×600
14	89.0GHz-H Brightness Temperature	2	signed int	0.1	K	600×600
15	Sun Azimuth	2	signed int	0.1	deg	300×300
16	Sun Elevation	2	signed int	0.1	deg	300×300
17	Earth Incidence #1	1	signed char	0.02	deg	300×300
18	Earth Azimuth	2	signed int	0.01	deg	300×300
19	Land/Ocean flag for 6,10,18,23,37,50,89A	1	unsigned char	1.0	%	300×300
20	Data Quality Except89G	1	-	-	-	300×300
21	Data Quality For 89G	1	-	-	-	600×600

#1: The Earth Incidence has also sub-attribute “OFFSET”. This offset is set to 55.0.

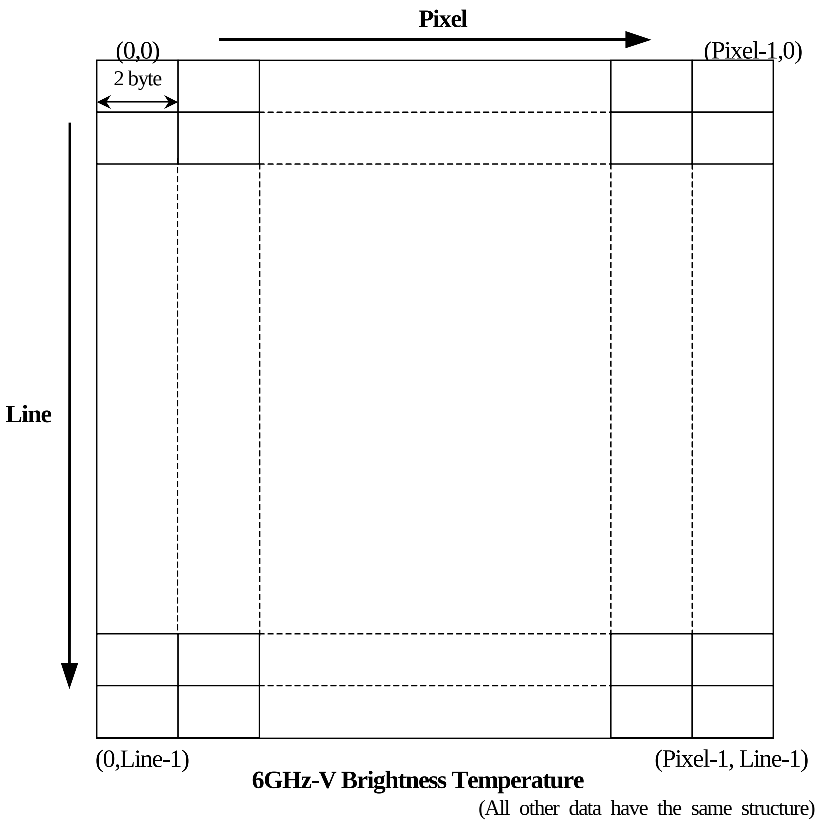
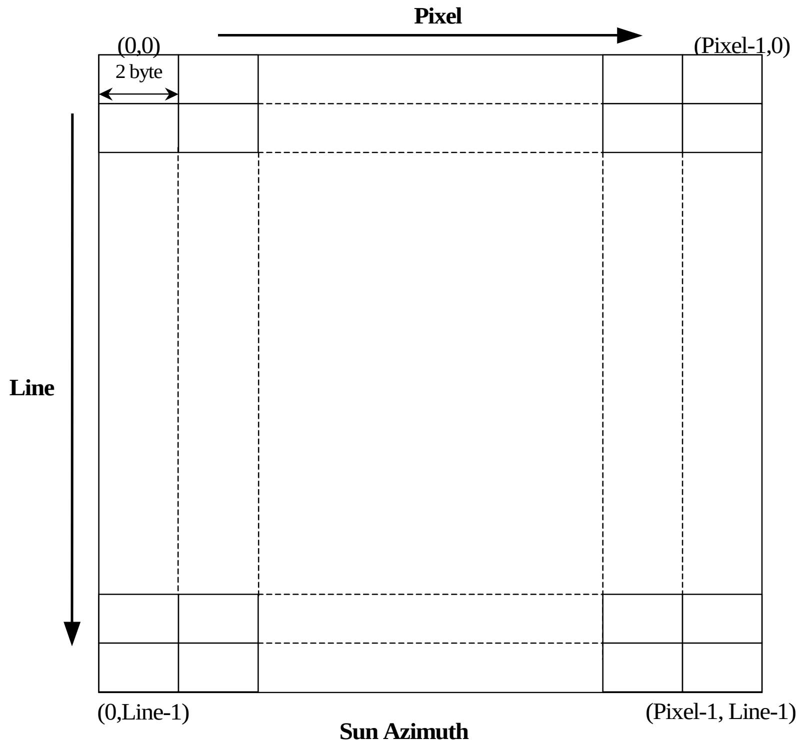
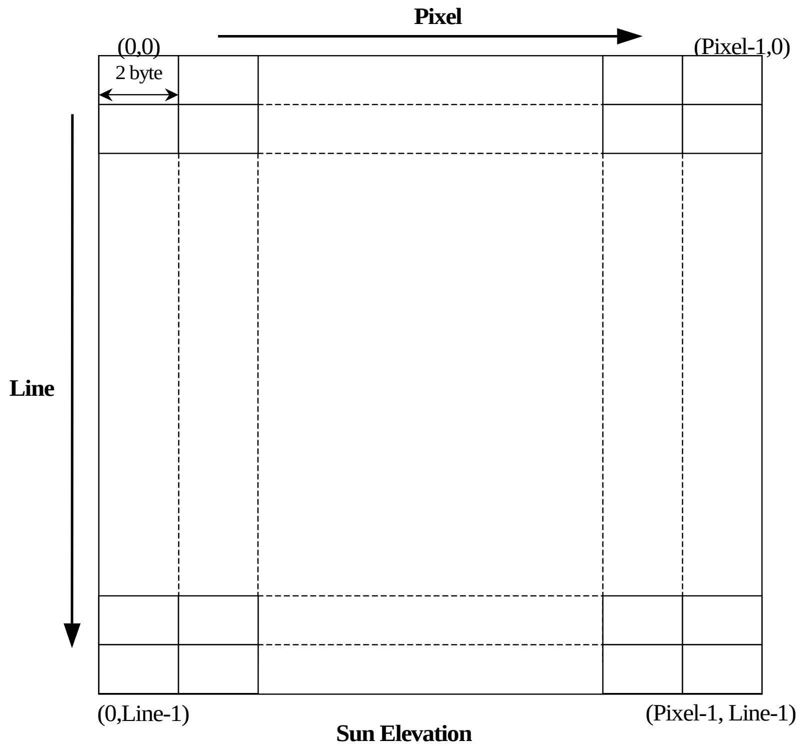


Figure 1.2-2 Structure of the Mapped Brightness Temperature (Image Data)

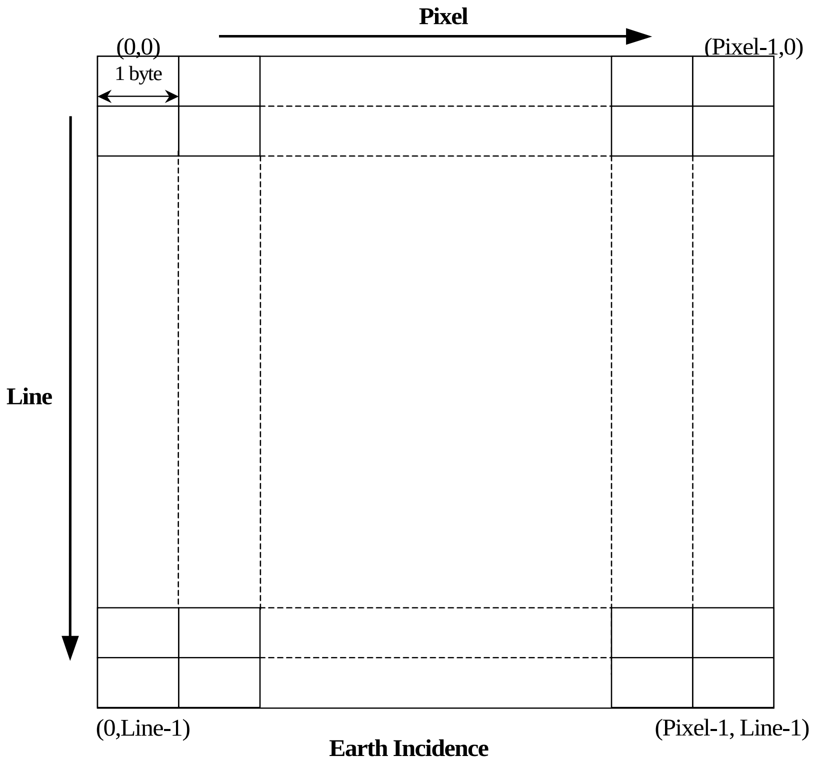


Sun Azimuth



Sun Elevation

Figure 1.2-3 Structure of Sun Azimuth and Sun Elevation



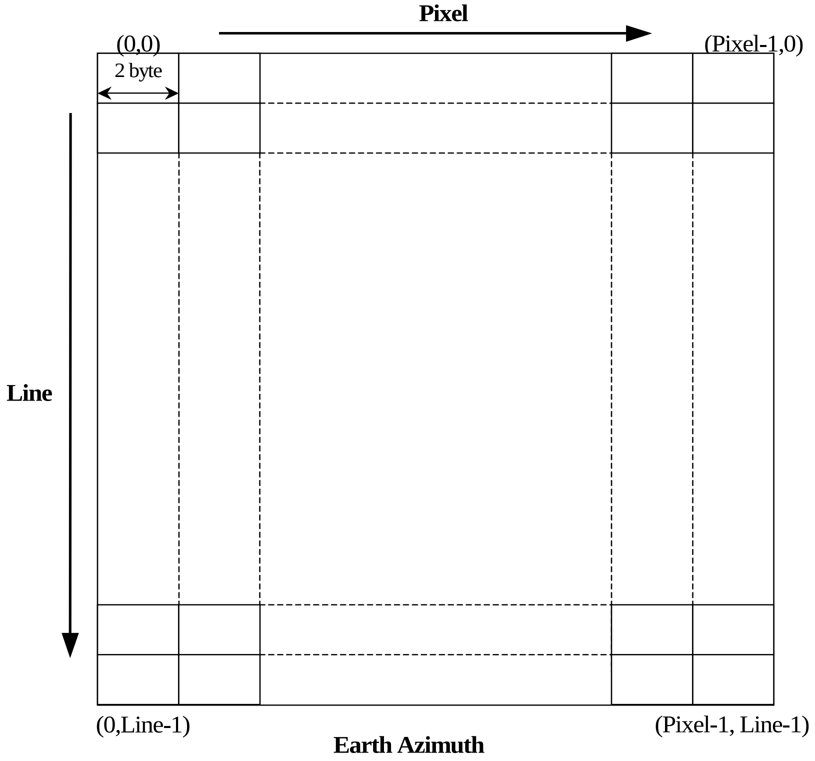


Figure 1.2-4 Structure of Earth Incidence and Earth Azimuth

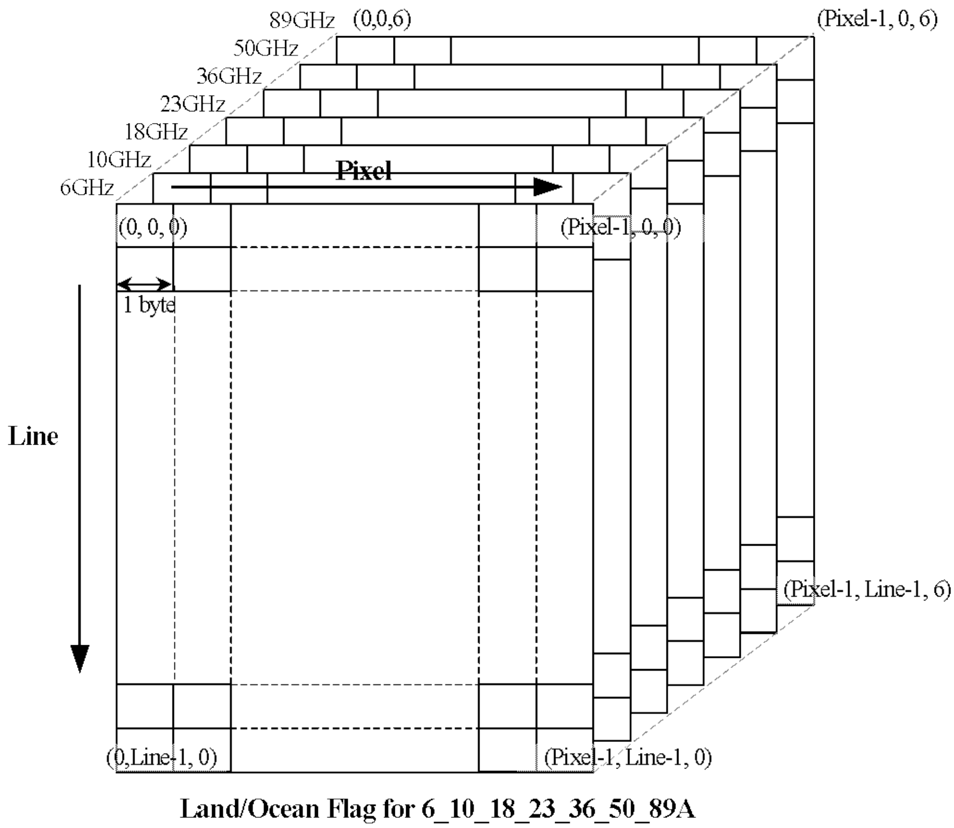


Figure 1.2-5 Structure of Land/Ocean Flag

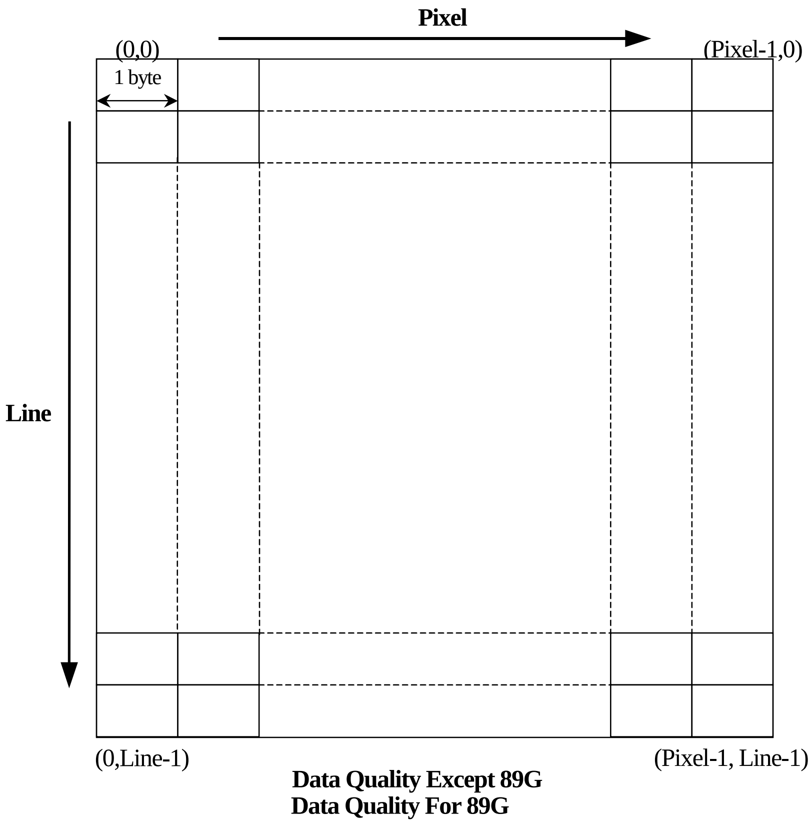


Figure 1.2-6 Structure of Data Quality

1.3. Mapping method

The level 1B Map product is the re-sampled image that used one of the following map projection methods.

- Equirectangular projection
- Mercator projection
- Polar Stereo projection

1.3.1. Equirectangular projection

The latitude and longitude (ϕ, λ) of the observing point are convertible for the equirectangular coordinates (x, y) by the following formula.

$$x = \lambda$$
$$y = \phi$$

1.3.2. Mercator projection

In Mercator method, the latitude and longitude (ϕ, λ) are convertible for the Mercator coordinates (x, y) by the following formula.

$$x = \mathrm{Re}(\lambda - \lambda_0)$$
$$y = \mathrm{Re}\ln\left\{ \tan\left(\frac{\pi}{4} + \frac{1}{2}(\phi - \phi_0)\frac{1 - e\sin(\phi - \phi_0)}{1 + e\sin(\phi - \phi_0)}\right)^{e/2} \right\}$$

In the above formula, Re is the earth equatorial radius (the longer radius), and *e* is the eccentricity of the earth expressed in the following formula using the longer radius Ra, and the shorter radius Rb.

$$e = \sqrt{1 - \frac{R_b^2}{R_a^2}}$$

1.3.3. Polar stereo

In Polar Stereo method, the latitude and longitude (ϕ, λ) are converted into (x, y) by following steps.

(1) Calculate the geocentric latitude

$$\phi' = ta\,n^{-1}\{(1-e^2)\tan\phi\}$$

(2) Calculate the x,y in the Polar Stereo coordinate

Using the following formula, the positions of x,y are calculated

1) In the case of the northern hemisphere,

$$\frac{x}{m0} = -\mathrm{Re}\frac{\sqrt{(1-e^2)}\cos\phi}{\sqrt{(1-e^2)\cos^2\phi} + \sin\phi'} \cdot \sin(-\lambda)$$

$$\frac{y}{m_0} = -\mathrm{Re}\frac{\sqrt{(1-e^2)}\cos\phi}{\sqrt{(1-e^2)\cos^2\phi} + \sin\phi'} \cdot \cos(-\lambda)$$

2) In the case of the southern hemisphere,

$$\frac{x}{m_0} = \mathrm{Re}\frac{\sqrt{(1-e^2)}\cos\phi}{\sqrt{(1-e^2)\cos^2\phi} + \sin\phi'} \cdot \sin(-\lambda)$$

$$\frac{y}{m_0} = \mathrm{Re}\frac{\sqrt{(1-e^2)}\cos\phi}{\sqrt{(1-e^2)\cos^2\phi} + \sin\phi'} \cdot \cos(-\lambda)$$

In the above formula, the Re, e, m_0 are defined as follows,

Re : The earth equatorial radius

e : The eccentricity

m_0 : The scaling factor at the origin (1.0)

1.4. Re-sampling Method

The value of 1 pixel of the map-projected image is re-sampled brightness temperature of the level 1B product. The re-sampling method used by level 1B Map processing is only the nearest neighbor method (the NN method).

1.4.1. The Nearest Neighbor Method

As the value of the observation point P’ (u, v), the nearest neighbor method adopts the nearest observation point P from four points, which enclose the observation point P’ (u, v), and it is expressed with the following formula.

$$P'u,v = Pij$$

$$i = [u+0.5]$$
$$j = [v+0.5]$$

In the above formula, [ ] is the gauss symbol, and that value is expressed with an integer value.

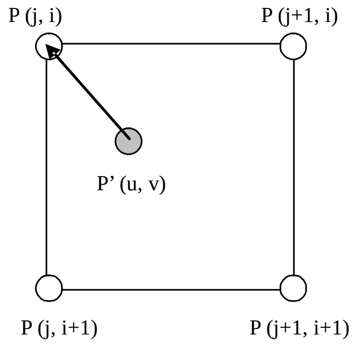


Figure 1.4-1 Explanation of the nearest neighbor method

1.5. Data volume size of a product

The data volume size of AMSR level 1B Map product is shown in Table 1.5-1. Since the map projected image size is fixed, the file size of a level 1B Map product is the fixed value as 5.1 MB.

Table 1.5-1 Estimation of the Data Volume

Item	No. of Pixel	No. of Line	No. of Bytes	Semi Total	Remark
6.9GHz-V Mapped Brightness Temperature	300	300	2	180000	
6.9GHz-H Mapped Brighness Temperature	300	300	2	180000	
10.7GHz-V Mapped Brightness Temperature	300	300	2	180000	
10.7GHz-H Mapped Brighness Temperature	300	300	2	180000	
18.7GHz-V Mapped Brightness Temperature	300	300	2	180000	
18.7GHz-H Mapped Brighness Temperature	300	300	2	180000	
23.8GHz-V Mapped Brightness Temperature	300	300	2	180000	
23.8GHz-H Mapped Brighness Temperature	300	300	2	180000	
36.5GHz-V Mapped Brightness Temperature	300	300	2	180000	
36.5GHz-H Mapped Brighness Temperature	300	300	2	180000	
50.3GHz-V Mapped Brightness Temperature	300	300	2	180000	
52.8GHz-V Mapped Brightness Temperature	300	300	2	180000	
89.0GHz-V Mapped Brightness Temperature	600	600	2	720000	
89.0GHz-H Mapped Brighness Temperature	600	600	2	720000	
Sun Azimuth	300	300	2	180000	
Sun Elevation	300	300	2	180000	
Earth Incidence	300	300	1	90000	
Earth Azimuth	300	300	2	180000	
Land/Ocean Flag	300	300	1	630000	1*7 for 6,10,23,37,50,89A
DataQualityExcept89G	300	300	1	90000	
DataQualityFor89G	600	600	1	360000	A scan only
Total				5310000	
Volume/Granule (MB)				5.1	
Volume/Day (GB)				0.143	29 Files/Day
Volume/Month (GB)				4.302	30 Days/Month

1.6. The others

1.6.1. The data range of the product

Since the observation width of AMSR is about 1600 km, the map-projected region (3000 km x 3000 km) is not filled with brightness temperature. Therefore, the region that cannot acquire the brightness temperature value from the level 1B product stores the dummy value (0). (See Figure 1.6.1-1)

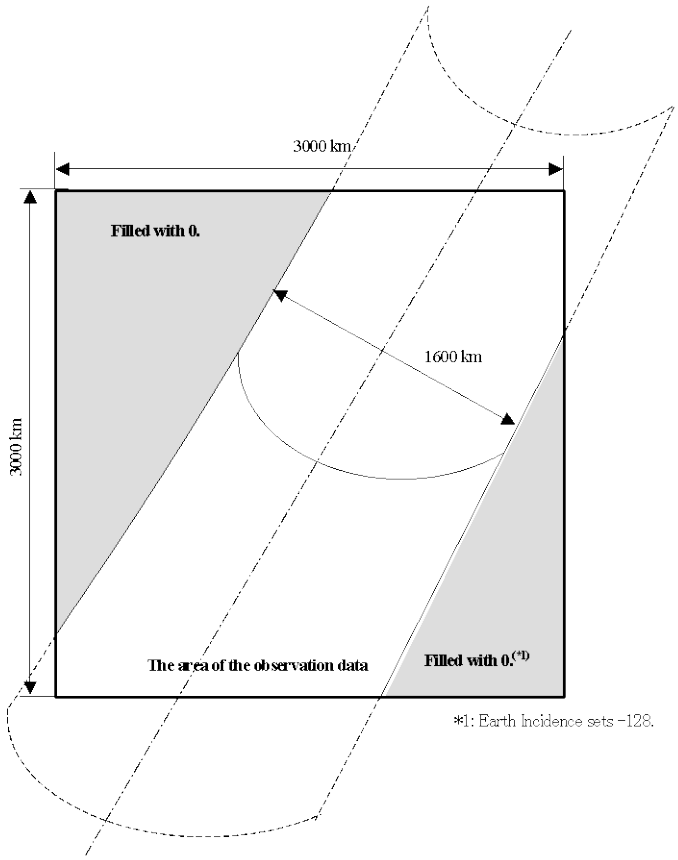


Figure 1.6.1-1 the region of map image data

In case of the Polar Stereo projection, directions of mapped image between Northern Hemisphere and Southern Hemisphere differ as shown in Figure 1.6.1-2 and Figure 1.6.1-3.

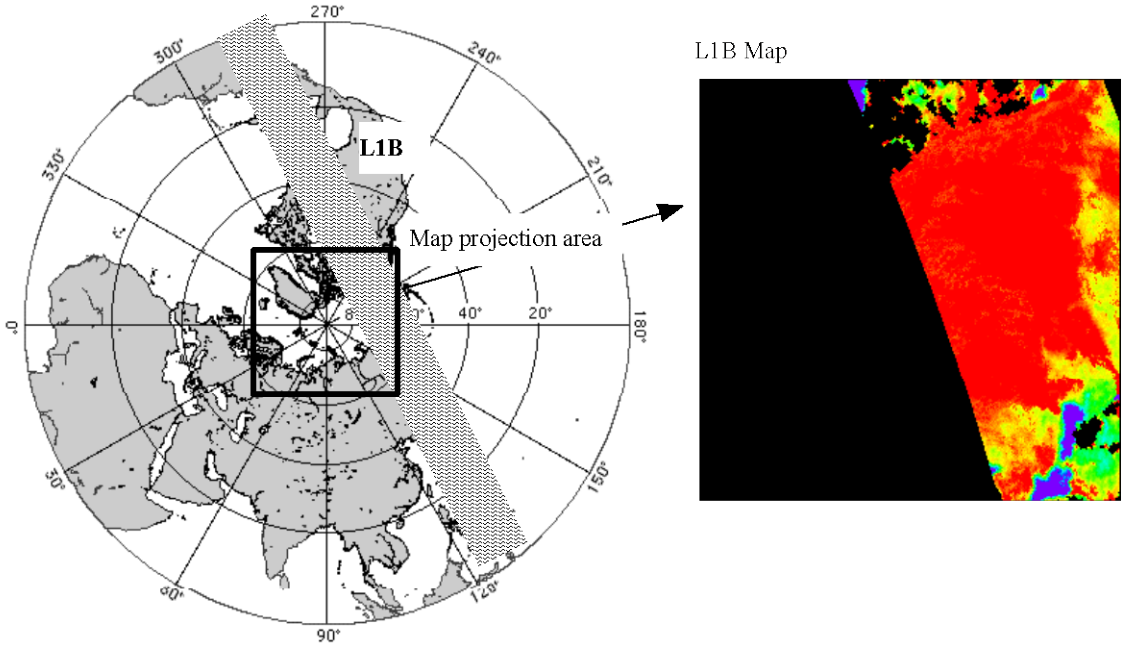


Figure 1.6.1-2　Direction of map projection（the Northern Hemisphere）

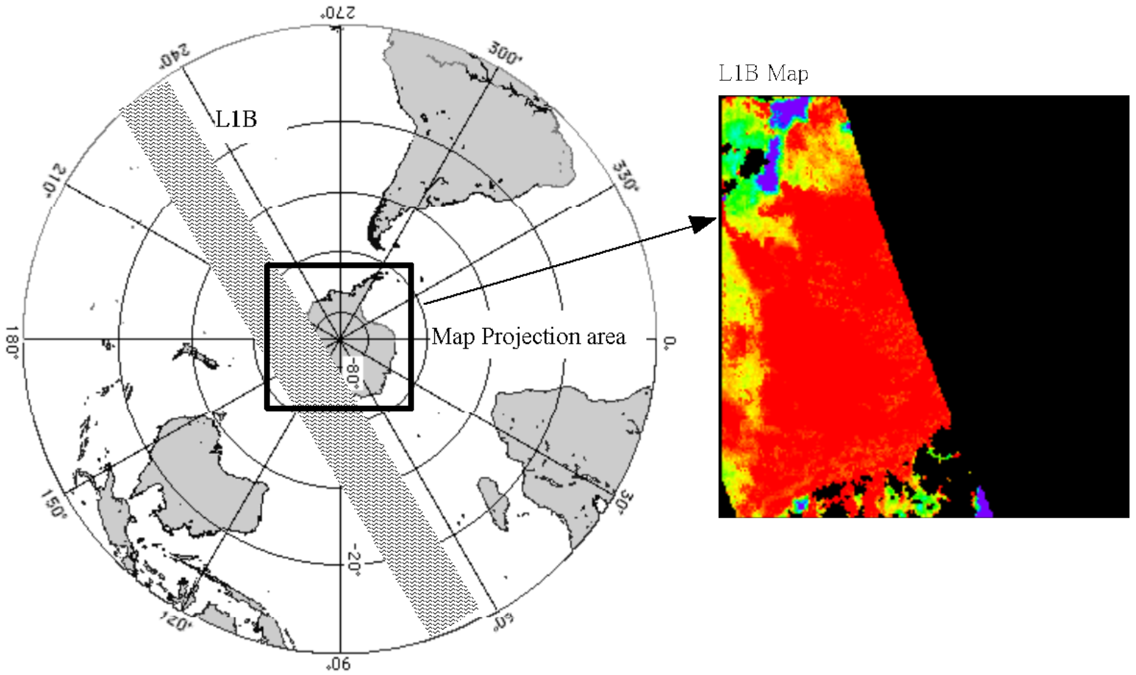


Figure 1.6.1-3　Direction of map projection（the Southern Hemisphere）

1.6.2. Coordinate System

The position information stored in the AMSR level 1B Map product is the latitude and longitude that are used for map projection of the observation brightness temperature.

It is represented by the Greenwich coordinate system (earth fixed coordinate system), and the range of latitude is from -90 to 90 degrees, and the range of longitude is from -180 to 180 degrees. The earth model currently used by geometrical calculation is WGS84.

1.6.3. Scaling Factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR level 1B Map. The scale factor is stored with the data unit in the attribute information on Vdata or SDS.

Moreover, the latitude and the longitude information on a center and four corners are stored in attribute information of the map projected brightness temperature.

2. Data Explanation

This chapter shows explanation of each data item of AMSR level 1B Map product excluding common items for level 1A product of level 1B product.

2.1. Core metadata

(1) ShortName

The abbreviated name of a product is stored. Please refer to the level 1A product description for the details.

(2) LocalGranuleID

ID that according to the granule ID system used at EOC is stored. The granule ID of AMSR level 1B Map product is defined by following.

A2AMSYYMMDDPPMX _ KNLLBCnnREVSnn

[Scene ID]

A2	A2 (Fixed: ADEOS-II)
AMS	AMS (Fixed: AMSR)
YYMMDD	Date of data acquisition start (UT)
PP	Path number at the observation start point (01 – 57)
M	M (M: regular process)
X	A or D (Orbit direction, A: Ascending, D: Descending)

[Product ID]

K	O (Fixed: Order project)
N	0 (Fixed: Spare)
LL	1M (Fixed: for level 1B Map)
B	Mapping method (E: Equirectangular; M: Mercator; P: Polar Stereo)
Cnn	Standard Latitude (C00: Scene Center; D00: Standard Latitude; Snn: Latitude in the south; Nnn: Latitude in the north)
R	N (Fixed: re-sampling method, Nearest Neighbor)
E	W(Fixed: Earth ellipse model, WGS84)
V	T (Fixed: Map direction, True North)
Snn	Center Latitude (S90 – N90)

(3) ProcessingLevelID

The processing level is stored. Please refer to the level 1A product description for the details.

(4) GringPointLatitude1, GringPointLongitude1 – GringPointLatitude4, GringPointLongitude4

The latitude and longitude of the four corners corresponding to the map-projected image of 89 GHz are stored. They are set as a counterclockwise from the upper left, as shown in Figure 2.1-1.

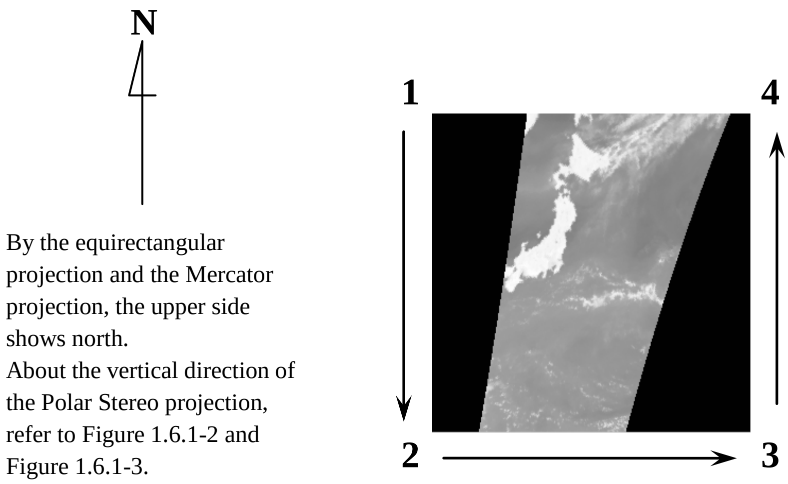


Figure 2.1-1 the order of GringPoint

(5) PGEName

The product generation software name is stored. Please refer to the level 1A product description for the details.

(6) AutomaticQAFlag

The automatic inspection result of data processing is stored. The items of the automatic inspections are shown in the attribute “AutomaticQAFlagExplanation”. And the following value is stored. Automatic inspection in level 1B Map processing is the check results of calculation anomaly about the map projection and the quality information of brightness temperature. The inspection result and the setting value of the product are the correspondence shown below.

PASS	Good	(When all check items are in the state of 'OK'.)
FAIL	Poor	(When some check items are in the state of 'NG'.)
FAIL	NG	(When all check items are in the state of 'NG'.)

(7) AutomaticQAFlagExplanation

The contents of automatic inspection for level 1B Map processing and its thresholds are stored.

```
1.ProcessedAnomalyQA:Less than 20 is available->OK,
2.InputAnomalyQA:Less than 20 is available->OK,
All items are OK, 'PASS' is employed
```

2.2. Product metadata

(1) MapProjectionMethod

One of the following 3 kinds of mapping methods is stored.

EquivalentLongitude/Latitude	Equirectangular projection
Mercator projection	The Mercator
Polar Stereo projection	The Polar Stereo

(2) ResamplingMethod

The nearest neighbor method “NN” is stored for AMSR mapping process.

(3) PixelSpacingExcept89G

The fixed value “10km” is stored except 89GHz as a pixel resolution.

(4) PixelSpacingFor89G

The fixed value “5km” is stored for 89GHz as a pixel resolution.

(5) ImageSizeExcept89G (Pixel)

The fixed value “300” pixels are stored except 89GHz as an image size.

(6) ImageSizeExcept89G (Line)

The fixed value “300” lines are stored except 89GHz as an image size.

(7) ImageSizeFor89G (Pixel)

The fixed value “300” pixels are stored for 89GHz as an image size.

(8) ImageSizeFor89G (Line)

The fixed value “300” lines are stored for 89GHz as an image size.

2.3. Explanation of Each Data

(1) 6GHz-V Brightness Temperature

The observation brightness temperature of 6 GHz vertical polarization after map projection is stored.

* In the attribute information of observation brightness temperature after map projection, the following information is stored. This is applied for all frequencies and polarizations. The latitude and longitude of the center and four corners of each frequency are the corrected value with the co-registration parameter (CoRegistrationParmeterA1/A2). Therefore the registration gap between frequencies arises, since map projection is performed on the basis of 89 GHz.

Scaling Factor	0.1 (This item is the same in all frequencies)
Unit	K
Center Latitude/Longitude	latitude, longitude of the center position [deg]
Upper Left Latitude/Longitude	latitude, longitude of the upper left position [deg]
Lower Left Latitude/Longitude	latitude, longitude of the lower left position [deg]
Upper Right Latitude/Longitude	latitude, longitude of the upper right position [deg]
Lower Right Latitude/Longitude	latitude, longitude of the lower right position [deg]

* The following value is stored for the abnormal observation data. This is applied for all frequencies and polarizations.

0	Outside of the observation range
-9999	Deficit data value
-32768	The parity error value
The others, negative value	The anomaly value over the limit range

(2) 6GHz-H Brightness Temperature

The observation brightness temperature of 6 GHz horizontal polarization after map projection is stored.

(3) 10.65GHz-V Brightness Temperature

The observation brightness temperature of 10.65 GHz vertical polarization after map projection is stored.

(4) 10.65GHz-H Brightness Temperature

The observation brightness temperature of 10.65 GHz horizontal polarization after map projection is stored.

(5) 18.7GHz-V Brightness Temperature

The observation brightness temperature of 18.7 GHz vertical polarization after map projection is stored.

(6) 18.7GHz-H Brightness Temperature

The observation brightness temperature of 18.7 GHz horizontal polarization after map projection is stored.

(7) 23.8GHz-V Brightness Temperature

The observation brightness temperature of 23.8 GHz vertical polarization after map projection is stored.

(8) 23.8GHz-H Brightness Temperature

The observation brightness temperature of 23.8 GHz horizontal polarization after map projection is stored.

(9) 36.5GHz-V Brightness Temperature

The observation brightness temperature of 36.5 GHz vertical polarization after map projection is stored.

(10) 36.5GHz-H Brightness Temperature

The observation brightness temperature of 36.5 GHz horizontal polarization after map projection is stored.

(11) 50.3GHz-V Brightness Temperature

The observation brightness temperature of 50.3 GHz vertical polarization after map projection is stored.

(12) 52.8GHz-V Brightness Temperature

The observation brightness temperature of 52.8 GHz vertical polarization after map projection is stored.

(13) 89.0GHz-V Brightness Temperature

The observation brightness temperature of 89.0 GHz vertical polarization after map projection is stored.

(14) 89.0GHz-H Brightness Temperature

The observation brightness temperature of 89.0 GHz horizontal polarization after map projection is stored.

(15) Sun Azimuth

The sun azimuth angle in each pixel after map projection is stored. (Please refer to the level 1A product description for the details in subsequent items).

(16) Sun Elevation

The sun elevation angle in each pixel after map projection is stored.

(17) Earth Incidence

The earth incidence angle in each pixel after map projection is stored.

(18) Earth Azimuth

The earth azimuth angle in each pixel after map projection is stored.

(19) Land/Ocean Flag

The land coverage percentage of the observation footprint of AMSR is stored for each frequency.

(20) Data Quality Except 89G

The data quality is stored for every pixel in the map projected observation brightness temperature except 89GHz. Each bit of data quality is set 0 for normal and 1 for abnormal (Figure. 2.3-1).

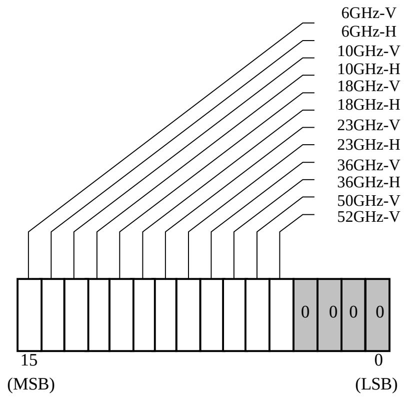


Figure 2.3-1 Details of the quality information

(21) Data Quality For 89G

The data quality is stored for every pixel in the map projected observation brightness temperature of 89GHz. Each bit of the data quality is set 0 for normal and 1 for abnormal (Figure. 2.3-2).

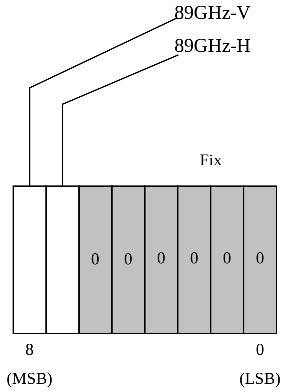


Figure 2.3-2 Details of the quality information