AMSR-E Slow Rotation Data Format Description Document

Effective Page List

Page	Symbol
All	Rev. A

Revision History

Rev	Date	Revised Page	Description
NC	Sep. 2013	all	First Release
A	Mar. 2014	L1S-2,10 L1S-14,16 L1S-41(39),42(40) L1S-45(47)	Typo corrected Typo corrected The expression and the contents of explanation were improved. The expression and the contents of explanation were improved.

Data Configuration History

Date	Scene ID	PGE Version	Contents
2013/09		444*44****44440444	Release of AMSR-E Slow Rotation Data

Contents

1. Introduction

This document is the data format description of AMSR-E (Advanced Microwave Scanning Radiometer for EOS) on boarded Aqua (EOS-PM; Earth Observation Satellite-PM).

1.1. Abstract

AMSR-E products are shown in Table 1.1-1. This document explains AMSR-E Slow Rotation Data products.

The observation method of normal rotation (40rpm) and slow rotation (2rpm) of AMSR-E are indicated in Chapter 3.

Table 1.1-1 Types of AMSR-E 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 Aqua, 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.
1S	This product includes observed sensor data the brightness temperature converted by the radiometric correction coefficients from observed sensor data, geometrical information solar angle, direction vector to Aqua, and so on,
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 by normal rotation of AMSR-E. (40rpm)

2. Abstract of the Satellite and Sensor

2.1. Overview of Aqua (EOS-PM; Earth Observation Satellite-PM)

The earth observing satellite Aqua of NASA was launched from the Vandenberg Firing Range in California by a DELTA II launch vehicle in May 2002. Aqua observes various kinds of physical phenomena related to water and energy circulation from space. Aqua data will promote the research activities for interactions between the atmosphere, oceans and lands, and their effects on climate changes.

There are a lot of derived data from Aqua data such as atmospheric temperature, humidity, clouds and precipitation, earth radiation, snow and sea ice, sea-surface temperature, oceanic primary production, and soil water. These collected datasets are expected to promote the further development of research on global environmental change, as well as improving numerical weather forecasts.

Aqua 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 Aqua Satellite

Table 2.1-1 Main characteristics of Aqua

Launch Date		May 4th, 2002
Weight		About 3,000 kg (at launch)
Power		4,444 W (Average)
Life		6 years (Target)
Orbit	Category	Sun-synchronous sub-recurrent orbit
	Altitude	705 km
	Inclination	98 ± 0.1degrees
	Period	98.9 minutes
	Revisit Period	16 days
	Local Sun Time	PM13: 30 ± 15 minutes

Table 2.1-2 Instruments of Aqua

Instrument		Development organization(Country)	
AMSR-E	Advanced Microwave Scanning Radiometer for EOS	JAXA	（Japan）
AMSU	Advanced Microwave Sounding Unit	NASA	（US）
AIRS	Atmospheric Infrared Sounder	NASA	（US）
CERES	Clouds and the Earth’s Radiant Energy System	NASA	（US）
HSB	Humidity Sounder for Brazil	INPE	（Brazil）
MODIS	Moderate Resolution Imaging Spectroradiometer	NASA	（US）

* JAXA: Japan Aerospace Exploration Agency
* NASA: National Aeronautics and Space Administration
* INPE: Institute National de Pesquisas Espaciais

2.2. Overview of AMSR-E

AMSR-E (Advanced Microwave Scanning Radiometer for EOS) has the largest-diameter microwave scanning radiometer (about 1.6 meters), and it can observe water relevant data with high resolution. Moreover, AMSR-E observes microwaves instead of optical data, and it can observe from day to night, under any weather condition and less cloud effects. AMSR-E will demonstrate advantages and viabilities of microwave-based observation of land and sea under clouds.

AMSR-E measures the radiation from the earth surface or atmosphere. The data obtained by AMSR-E 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-E are shown Table 2.2-1.

Table 2.2-1 Main Characteristics of AMSR-E

<table>
<tr><td>Frequency (GHz)</td><td>6.9</td><td>10.65</td><td>18.7</td><td>23.8</td><td>36.5</td><td>89</td></tr>
<tr><td>Resolution</td><td colspan="2">About 50 km</td><td colspan="2">About 25 km</td><td>15 km</td><td>5 km</td></tr>
<tr><td>Band Width (MHz)</td><td>350</td><td>100</td><td>200</td><td>400</td><td>1000</td><td>3000</td></tr>
<tr><td>Polarization</td><td colspan="6">Horizontal and Vertical</td></tr>
<tr><td>Incident Angle</td><td colspan="6">About 55 degrees</td></tr>
<tr><td>Cross Polarization Characteristics</td><td colspan="6">Under -20 db</td></tr>
<tr><td>Swath Width</td><td colspan="6">About 1450 km</td></tr>
<tr><td>Dynamic Range</td><td colspan="6">2.7-340 K</td></tr>
<tr><td>Absolute Accuracy</td><td colspan="6">1 K (1-sigma)</td></tr>
<tr><td>Temperature Resolution</td><td colspan="6">0.3-1 K (1-sigma)</td></tr>
<tr><td>Quantization bits</td><td>12 bits</td><td colspan="5">10 bits</td></tr>
</table>

3. Abstract of the observation method

3.1. Principal of AMSR-E Observation

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-E observes the faint microwave emitted from the earth surface or the atmosphere.

AMSR-E 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.

3.2. Observation of AMSR-E Normal Rotation Mode

AMSR-E is a conical scan sensor. The antenna observed by 40 times per minute in AMSR-E Normal Rotation Mode (40rpm).

AMSR-E sweeps the surface of the Earth at about ±75° centered at the direction of the satellite flight. The swath width is about 1450 km. The scanning period is 1.5 sec (*1) 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-E samples 486 data points for a scan of 89GHz and 243 points for other channels (See Fig. 2.4-1).

*1: In AMSR-E Normal Rotation Mode, it is defined one rotation as one scan.

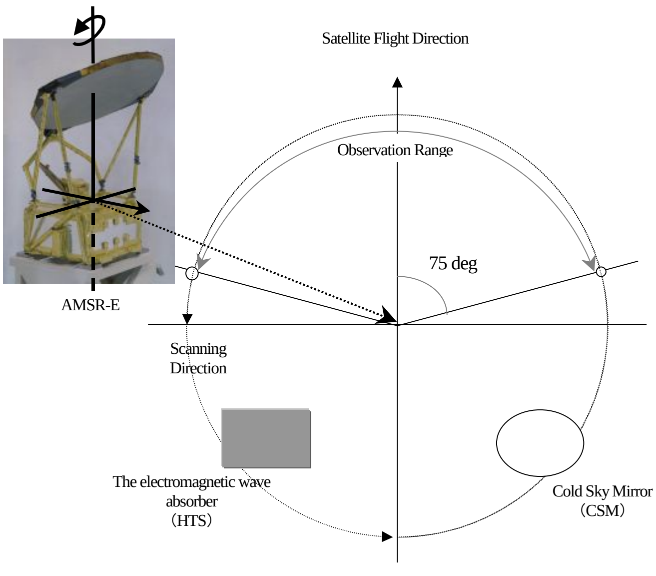


Figure 2.4-1 Observation Geometry of AMSR-E

3.3. Observation of AMSR-E Slow Rotation Mode

AMSR-E has been operated in AMSR-E Slow Rotation Mode since Dec. 4th, 2012.The antenna observed by about 2 times per minute in AMSR-E Slow Rotation Mode (2.076701rpm). As a result, the scanning period is 28.89 sec. In AMSR-E Slow Rotation Mode, AMSR-E sweeps the surface of the Earth at about ±75 degree centered at the direction of the satellite flight.

And the observing interval is 2.0 sec, start point of the observation timing is the about 120 degrees counterclockwise on the direction of the satellite flight. This observation timing is reset after 2 rotations of the antenna.

The data-sampling interval is every 2.6msec for 6GHz – 36GHz, 1.3msec for 89GHz, these interval are same as AMSR-E Normal Rotation Mode. As a result, the AMSR-E samples 486 data points for a scan of 89GHz and 243 points for other channels.

In AMSR-E Slow Rotation Mode, AMSR-E observes by about 29 times per minute as shown in Figure3.3-1. AMSR-E Normal Rotation Mode defines one rotation as one scan, but AMSR-E Slow Rotation Mode defines observing interval of one time as one scan (Figure3.3-2).

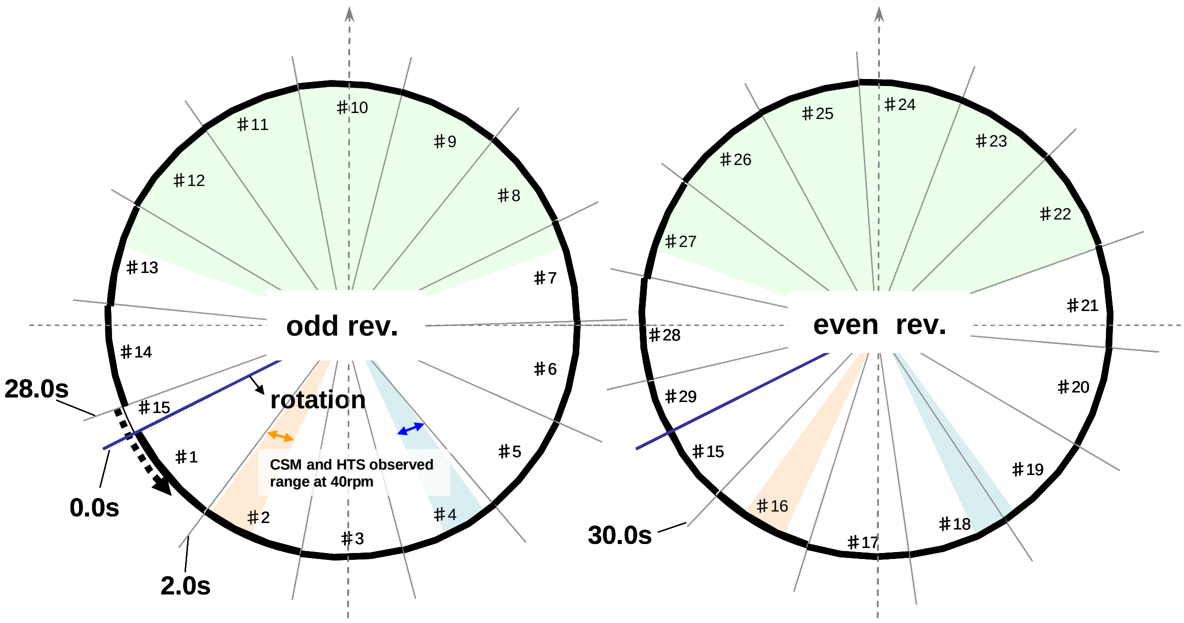


Figure 3.3-1 observation timing of AMSR-E Slow Rotation Mode

The schematic diagram of AMSR-E Slow Rotation Mode is shown below.

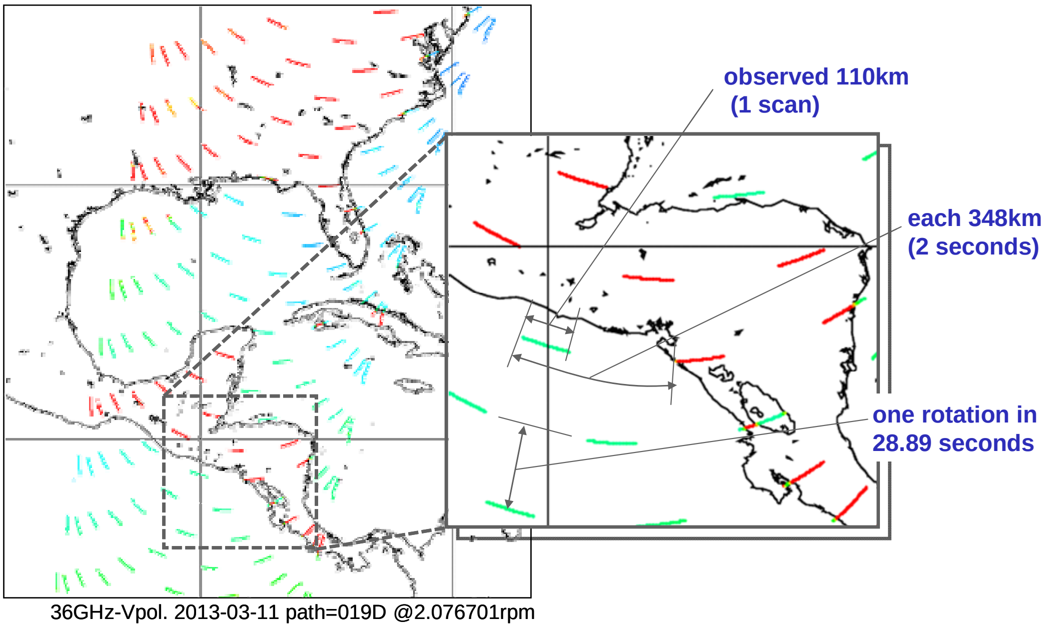


Figure 3.3-2 Schematic diagram of AMSR-E observation

(AMSR-E Slow Rotation Mode)

In AMSR-E Slow Rotation Mode, the interval for every scan is coarse and it becomes the schematic diagram of AMSR-E observation thinned out compared with AMSR-E Normal Rotation Mode.

In AMSR-E Slow Rotation Mode, the CSM/HTS are observed 2 times per minute and the amount of these data decrease from AMSR-E Normal Rotation Mode.

Brightness temperature in AMSR-E Slow Rotation Mode is calculated from ±120sec averaged CSM/HTS values (Figure3.3-3).

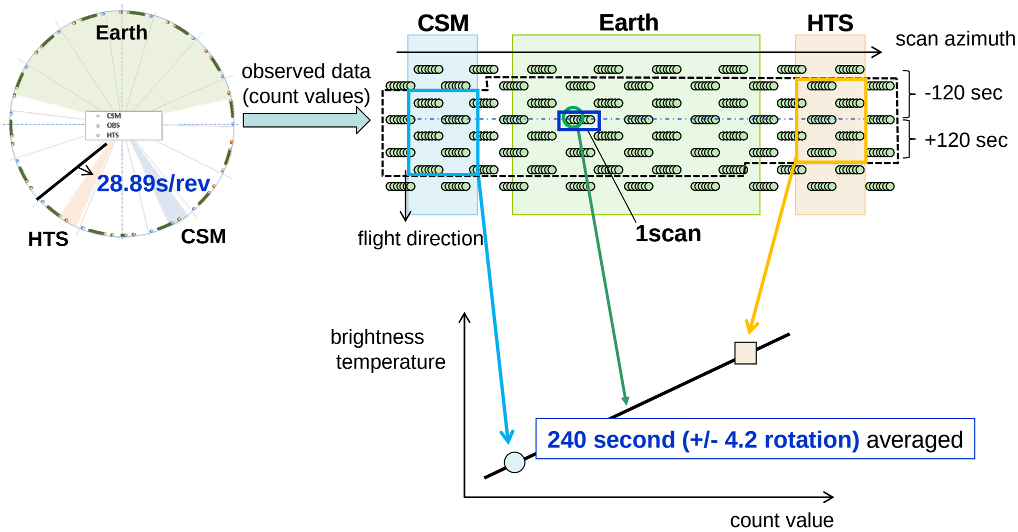


Figure 3.3-3 The range of the calibration data used for calculation of brightness temperature

4. AMSR-E Slow Rotation Data

4.1. Definition of the scene for AMSR-E

A scene of AMSR-E Slow Rotation Data is defined as a half orbit between the South and North Poles for its observed position on the earth (See Table 3.1-1). An observed position of AMSR-E 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).

In AMSR-E Slow Rotation Mode, the observed range of the surface of the Earth is shown in Table 3.1-2 and 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. For AMSR-E, the number of scans is 1485 scans in a half orbit 49.4 minutes.

1484.3= 86400[sec/day]*16[day/rec] / 233[orbits/rec] / 2.0[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-E

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	The range of observations	
			Data of Brightness Temperature	Data except Brightness Temperature
L1S	Except for 89GHz	243	±61 degree	±75 degree
	89GHz	486	±61 degree	±75 degree

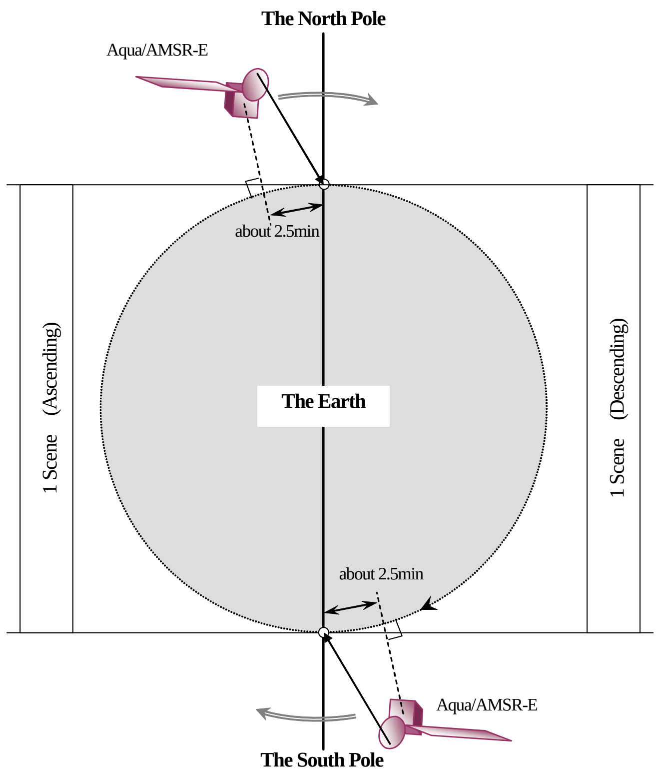


Figure 3.1-1 Geometry of a scene and the flight direction of Aqua

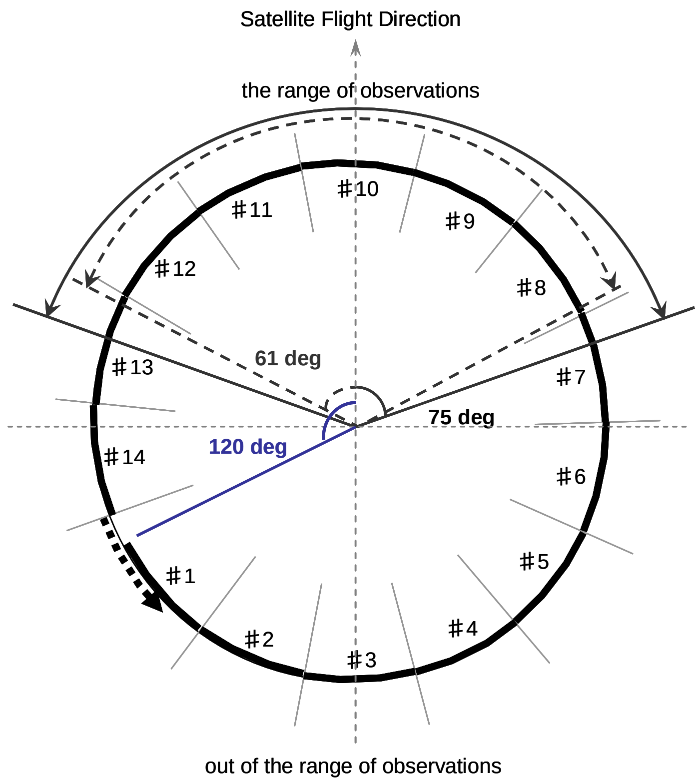


Figure 3.1-2 Geometry of the range observations of AMSR-E Slow Rotation Data

4.2. AMSR-E Slow Rotation Data Specification

AMSR-E Slow Rotation Data is one file per one scene. The number of scans of one product is about 1500 scans. The specification of the AMSR-E Slow Rotation Data is shown below.

Table 4.2-1 Specification of AMSR-E Slow Rotation Data

Level	Production	The number of scans	Scanning width*1
1S	Planned	Half Orbit + Overlaps (each 10 scans at both ends)	243: except 89GHz 486: 89GHz

*1. The data of outside the range of observations is stored as dummy value.

Table 4.2-2 Level of processing in AMSR-E

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 (Rate Buffered 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. ・Add the information of the missing packets and other quality information. ・Add the land/ocean flags. ・Add the overlapped 10 scans to the start and end of the scene.	Raw data
1B	・The raw data value are converted into the brightness temperature through calculating antenna temperature. ・The observation data range is changed to the antenna angle from -61 degree to +61 degrees.	Brightness temperature
1S	・Stored raw data and brightness temperature, the data range of each value are same as level1A and Level1B. ・Add the longitude/latitude of observation positions for each low frequency.	Raw data and Brightness temperature

Remarks:The shaded products in the above list is a product made by AMSR-E Normal Rotation Mode.

5. HDF

5.1. 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.

5.2. 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-E Slow Rotation Data, 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-E Slow Rotation Data, 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-E Slow Rotation Data, 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-E Slow Rotation Data, this model is used for all data except for the scanning start time.

§L1S

AMSR-E Slow Rotation
Data Format Description

Contents

1 Explanation of the AMSR-E Slow Rotation Data

The AMSR-E Slow Rotation Data stores the value of observed microwave radiation from the earth surface and it's geometric information as HDF. The features of the AMSR-E Slow Rotation Data are shown below.

- Range of data

  The AMSR-E Slow Rotation Data is extracted data in range of a half orbit between the South Pole and North Pole from level 0 data (Science and GBAD data).

- Observation width

  The range of the observation is ±75 degrees centered at the flight direction. (See Figure 1-1.) 243 data points are observed for each frequency below 89GHz and 486 points for 89GHz.

  The range of the observation data converted to Brightness Temperature is ±61 degrees centered at the flight direction.

- Main items of stored data
  - Scan time
  - Count value of the antenna temperature for the earth surface observation data
  - Radiometric conversion coefficients
  - Brightness temperature of the earth surface observation data.
  - Geometric information (position, observation incidence angle, sun azimuth angle, etc.)
  - Quality information
  - Others (the information of the satellite, sensor, and data etc.)

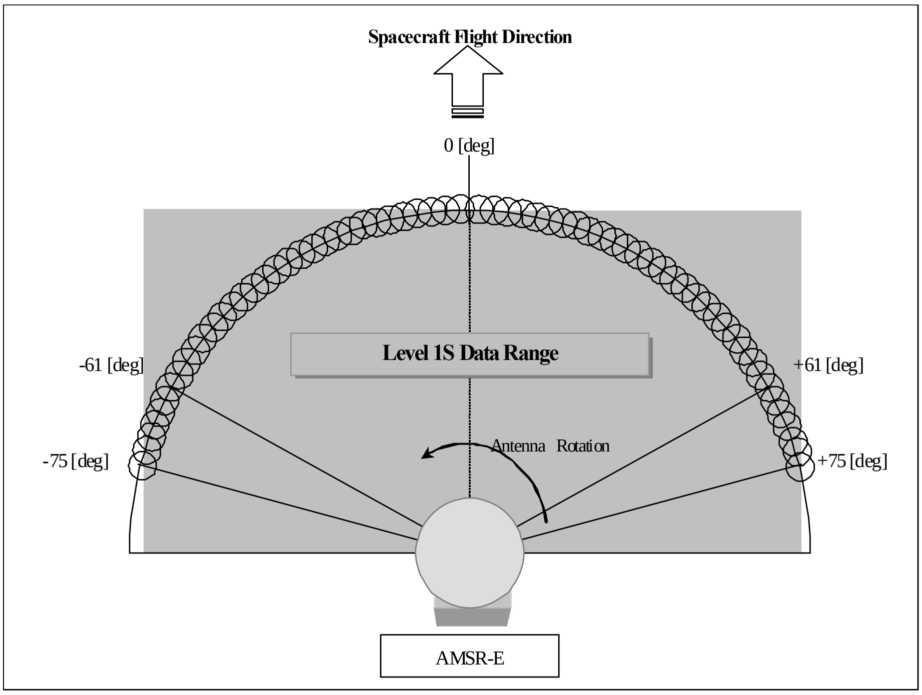


Figure 1-1 The Data Range of the observation for AMSR-E (Level 1S)

1.1 AMSR-E Slow Rotation Data Structure

The logical structure of AMSR-E Slow Rotation Data is shown in Table 1-1.

Table 1-1 Logical Structure of AMSR-E Slow Rotation Data

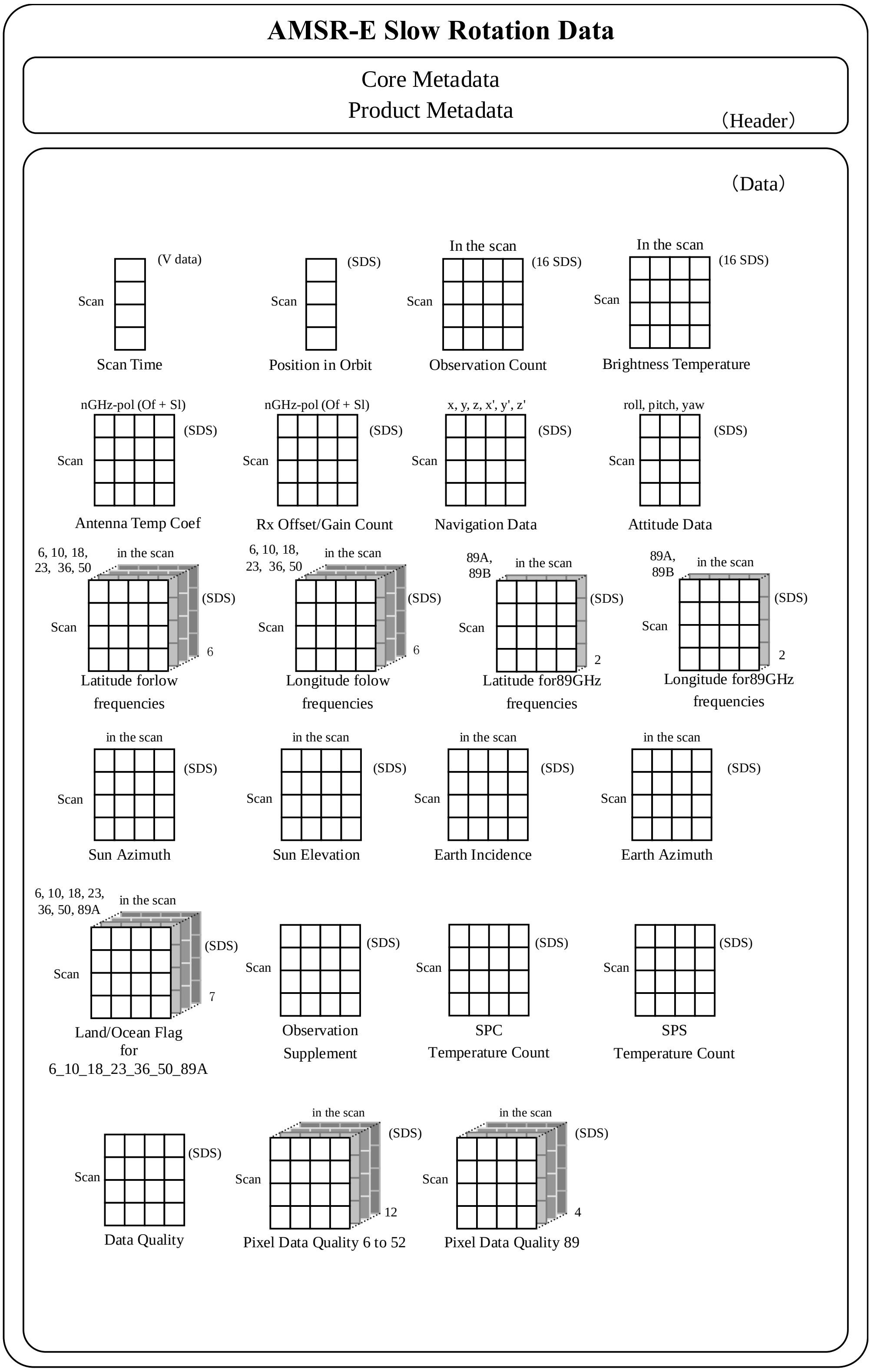
<table>
<tr><th colspan="2">Structure</th><th>HDF Data Model</th><th>Contents</th></tr>
<tr><td rowspan="2">Header Part</td><td>Core Meta</td><td>Global Attribute</td><td>The general information of the AMSR-E Slow Rotation Data is stored. It is based on the indispensable item of the attribute of NASA ECS (B. 0).</td></tr>
<tr><td>Product Meta</td><td>Global Attribute</td><td>Main characteristics of AMSR-E 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
• Raw values of Observation Data
• Brightness Temperature
• 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-E Slow Rotation Data 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 - 1.2-15.

A



Data Structure

Figure 1.2-1 The Data Structure

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

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/ Example
ShortName	The abbreviated name of the AMSR-E Slow Rotation Data	AMSREL1S		Fix
VersionID	The version ID of the AMSR-E Slow Rotation Data	RELEASE4		Example
SizeMBECSDataGranule	Data size of the AMSR-E Slow Rotation Data (Mbytes)	28.5		Example
LocalGranuleID	AMSR-E Slow Rotation Data management number	P1AME130731222MD_T01S0000000		Example
ProcessingLevelID	ID of processing level	L1S		Fix
ReprocessingActual	Re-processing date (UTC)	Blank or 2002-08-10	Date only set for Re-processing (0-Fill for blank)	Example
ProductionDateTime	AMSR-E Slow Rotation Data creation date (UTC)	2013-08-17T14:09:01.000Z	0-Fill for blank	Example
RangeBeginningTime	Start time of observation data (UTC)	04:14:54.06Z	0-Fill for blank	Example
RangeBeginningDate	Start date of observation data	2013-07-31	0-Fill for blank	Example
RangeEndingTime	End time of observation data (UTC)	05:04:54.59Z	0-Fill for blank	Example
RangeEndingDate	End date of observation data	2013-07-31	0-Fill for blank	Example
GringPointLatitude	Latitude of data effective range	Blank		Fix
GringPointLongitude	Longitude of data effective range	Blank		Fix
PGEName	Data processing software name	L1S_Process_Software		Fix
PGEVersion	Data processing software version	4444*44****44440444		Example
InputPointer	Input file name	R1540402SGS21321205500000.RBD, R1540402SGS21321207800000.RBD		Example
ProcessingCenter	Data processing center	Blank		Fix
ContactOrganizationName	Contact organization name	Blank		Fix
StartOrbitNumber	Start orbit number	59793		Example
StopOrbitNumber	End orbit number	59793		Example
EquatorCrossingLongitude	Longitude at the time of equatorial passage	-46.00		Example
EquatorCrossingDate	Date of equatorial passage	2013-07-31	0-Fill for blank	Example
EquatorCrossingTime	Time of equatorial passage	04:39:48.32Z	0-Fill for blank	Example

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

Items (Attribute Name)	Explanation	Concrete Values or Examples	Attention	Fix/ Example
OrbitDirection	Orbit direction	DESCENDING		Example
EphemerisGranulePointer	Orbit data file name	20130731.ELMD		Example
EphemerisType	Type of orbit data	ELMD		Example
PlatformShortName	Abbreviated name of Platform	EOS-PM1		Fix
SensorShortName	Sensor name	AMSR-E		Fix
NumberofScans	Number of scans	1507		Example
NumberofMissingScans	Number of missing packets	1		Example
ECSDataModel	Meta data model name	B.0		Fix
DiscontinuityVirtualChannelCounter	Judgement of virtual channel unit counter discontinuity	DEAD Encounter		Example
QALocationPacketDiscontinuity	Judgment of packet sequence counter discontinuity	discontinuation		Example
NumberofPackets	Number of packets	24112		Example
NumberofInputFiles	Number of input files	1		Example
NumberofMissingPackets	Number of missing packets	16		Example
NumberofGoodPackets	Number of good packets	24096		Example
ReceivingCondition	Receiving condition	Blank		Fix
EphemerisQA	Ephemeris limit check	OK		Example
AutomaticQAFlag	Limit check by software	Blank		Fix
AutomaticQAFlagExplanation	Explanation of limit check by software	Blank		Fix
ScienceQualityFlag	The quality flag when computing the amount of physical values	Blank		Fix
ScienceQualityFlagExplanation	Explanation of the quality flag when computing the amount of physical values	Bank		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

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 orbit eccentricity	0.00095	Fix
OrbitArgumentPerigee	The orbit argument perigee	106.480deg	Fix
OrbitInclination	The orbit inclination	98.15deg	Fix
OrbitPeriod	The orbit 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	28.89 sec	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

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#1ConversionTable Wa	Platinum#1 conversion table: Wa	0.0,0.0,0.0,0.0,0.0	Fix
Platinum#1ConversionTable Wb	Platinum#1 conversion table: Wb	0.000000,0.039000,0.042000,0.039000,0.042000	Fix
Platinum#1ConversionTable Wc	Platinum#1 conversion table: Wc	-35.000000,-80.625000,-84.000000,-80.000000,-84.667000	Fix
Platinum#1ConversionTable Wd	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#2ConversionTable Wa	Platinum#2 conversion table: Wa	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	0.000000,0.078300,0.078000,0.083000,0.078000,0.083000,0.085300,0.000000	Fix
Platinum#2ConversionTable Wc	Platinum#2 conversion table: Wc	-140.000000,-161.440000,-160.000000,-169.333000,-158.750000,-170.667000,-177.640000,140.000000	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	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	349,1454,2000,2555,3059,3566,4020,4095	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	Fix
Platinum#3ConversionTable Wb	Platinum#3 conversion table: Wb	0.000000,0.009100,0.009100,0.009100,0.009900,0.009900,0.008500,0.000000	Fix
Platinum#3ConversionTable Wc	Platinum#3 conversion table: Wc	0.000000,6.845000,6.803800,6.803800,4.719500,4.719500,9.835000,44.000000	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	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 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
CoRegistrationParameterA1	Co-registration parameter: A1	Blank	Fix
CoRegistrationParameterA2	Co-registration parameter: A2	Blank	Fix

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--0.2099101, 6GH--0.2054645, 10GV--0.0580782, 10GH--0.0103279, 18GV--0.0853578, 18GH--0.0435186, 23GV--0.1288643, 23GH--0.1288643, 36GV--0.0475611, 36GH--0.0536047, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0278573, 89GAH--0.0447590, 89GBV--0.0273764, 89GBH--0.0316265	Example
CalibrationCurve Coefficient#2	The radiometric correction coefficient for the 1st order	6GV-1.0756783, 6GH-1.0740756, 10GV-1.0209393, 10GH-1.0037236, 18GV-1.0307711, 18GH-1.0156885, 23GV-1.0464586, 23GH-1.0464586, 36GV-1.0171470, 36GH-1.0193259, 50GV-0.0000000, 52GV-0.0000000, 89GAV-1.0100426, 89GAH-1.0161356, 89GBV-1.0098693, 89GBH-1.0114014	Example
CalibrationCurve Coefficient#3	The radiometric correction coefficient for the 2nd order	6GV--0.0002537, 6GH--0.0002483, 10GV--0.0000704, 10GH--0.0000125, 18GV--0.0001022, 18GH--0.0000522, 23GV--0.0001556, 23GH--0.0001556, 36GV--0.0000575, 36GH--0.0000648, 50GV-0.0000000, 52GV-0.0000000, 89GAV--0.0000334, 89GAH--0.0000537, 89GBV--0.0000329, 89GBH--0.0000379	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, 89GV-0.0000000, 89GH-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, 89GV-0.0000000, 89GH-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	ver0002	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	ver0001	Example

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

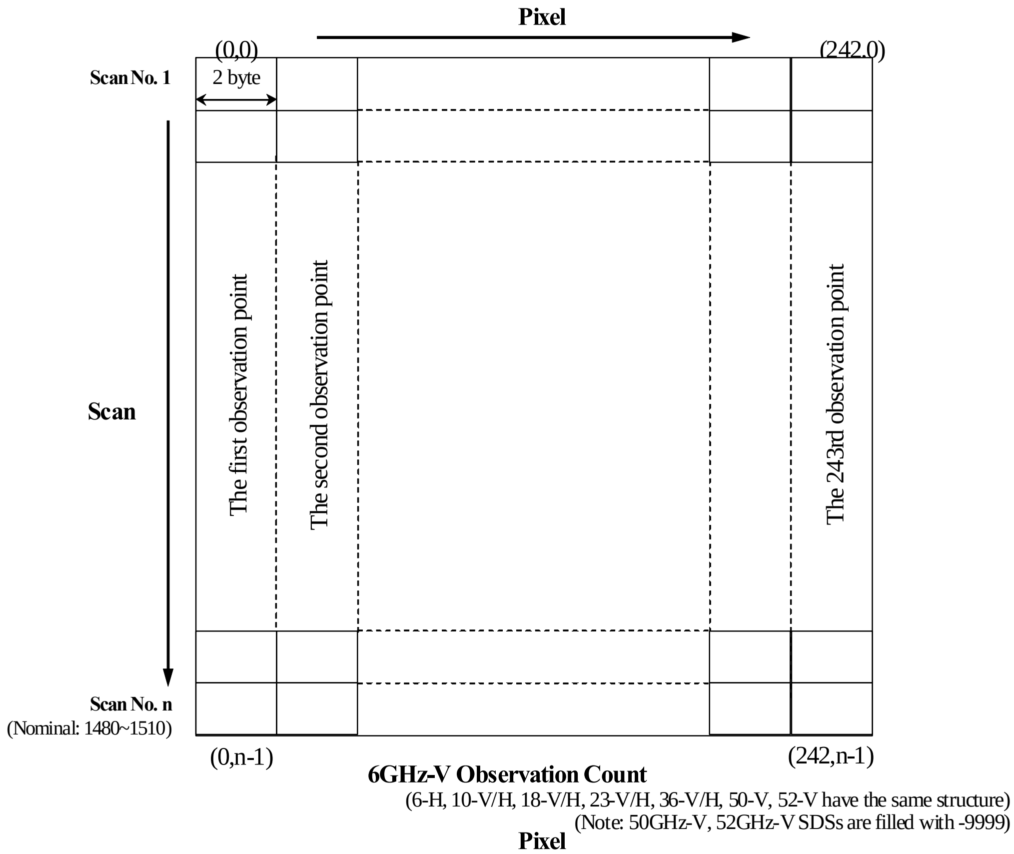
No.	Items	Byte	Type	Scaling factor	No. of samples per scan	Units	Dimension
1	Scan_Time	8	double	1.0	1	sec	nscan
2	Position_in_Orbit	8	double	1.0	1	-	nscan
3	Navigation_Data	6*4	float	1.0	6	m,m/s	nscan
4	Attitude_Data	3*4	float	1.0	3	deg	nscan
5	6GHz-V_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
6	6GHz-H_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
7	10.65GHz-V_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
8	10.65GHz-H_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
9	18.7GHz-V_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
10	18.7GHz-H_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
11	23.8GHz-V_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
12	23.8GHz-H_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
13	36.5GHz-V_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
14	36.5GHz-H_Observation_Count	2	signed short int	1.0	243	Count	243*nscan
15	50.3GHz-V_Observation_Count #1	2	signed short int	1.0	243	Count	243*nscan
16	52.8GHz-V_Observation_Count #1	2	signed short int	1.0	243	Count	243*nscan
17	89.0GHz-V-A_Observation_Count	2	signed short int	1.0	486	Count	486*nscan
18	89.0GHz-V-B_Observation_Count	2	signed short int	1.0	486	Count	486*nscan
19	89.0GHz-H-A_Observation_Count	2	signed short int	1.0	486	Count	486*nscan
20	89.0GHz-H-B_Observation_Count	2	signed short int	1.0	486	Count	486*nscan
21	6GHz-V_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
22	6GHz-H_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
23	10.65GHz-V_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
24	10.65GHz-H_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
25	18.7GHz-V_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
26	18.7GHz-H_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
27	23.8GHz-V_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
28	23.8GHz-H_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan

#1: 50GHz and 52GHz are filled with 0 for AMSR-E.

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
29	36.5GHz-V_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
30	36.5GHz-H_Brightness_Temperature	2	signed short int	0.1	243	K	243*nscan
31	50.3GHz-V_Brightness_Temperature #1	2	signed short int	0.1	243	K	243*nscan
32	52.8GHz-V_Brightness_Temperature #1	2	signed short int	0.1	243	K	243*nscan
33	89.0GHz-A-V_Brightness_Temperature	2	signed short int	0.1	486	K	486*nscan
34	89.0GHz-A-H_Brightness_Temperature	2	signed short int	0.1	486	K	486*nscan
35	89.0GHz-B-V_Brightness_Temperature	2	signed short int	0.1	486	K	486*nscan
36	89.0GHz-B-H_Brightness_Temperature	2	signed short int	0.1	486	K	486*nscan
37	Antenna_Temp_Coef(Of+Sl)	4	float	1	32	K+K/Cnt	32*nscan
38	Rx_Offset/Gain_Count	2	unsigned short int	1	32	Count	32*nscan
39	Latitude for low frequencies	4	float	1	243	deg	243*nscan*6
40	Longitude for low frequencies	4	float	1	243	deg	243*nscan*6
41	Latitude for 89GHz frequencies	4	float	1	486	deg	486*nscan*2
42	Longitude for 89GHz frequencies	4	float	1	486	deg	486*nscan*2
43	Sun_Azimuth	2	signed short int	0.1	243	deg	243*nscan
44	Sun_Elevation	2	signed short int	0.1	243	deg	243*nscan
45	Earth_Incidence #2	1	signed char	0.02	243	deg	243*nscan
46	Earth_Azimuth	2	signed short int	0.01	243	deg	243*nscan
47	Land/Ocean_Flag_for_ 6_10_18_23_36_50_89A	1	unsigned char	1	243	%	243*nscan*7
48	Observation_Supplement	2	-	1	27	-	27*nscan
49	SPC_Temperature_Count	2	unsigned short int	1	20	Count	20*nscan
50	SPS_Temperature_Count	2	unsigned short int	1	32	Count	32*nscan
51	Data_Quality	4	float	1	128	-	128*nscan
52	Pixel_Data_Quality_6_to_52	2	unsigned short int	1	243	-	243*nscan*12
53	Pixel_Data_Quality_89	2	unsigned short int	1	486	-	486*nscan*4

#2: The Earth Incidence has also sub-attribute "OFFSET". This offset is set to 55.0.



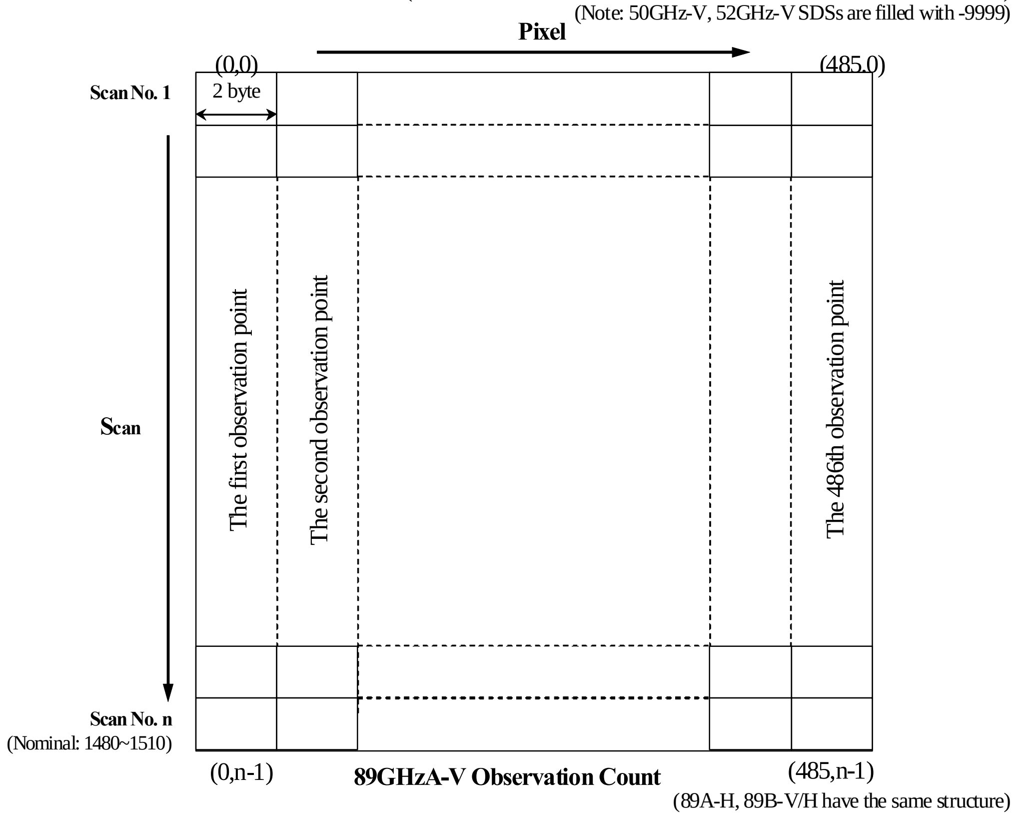
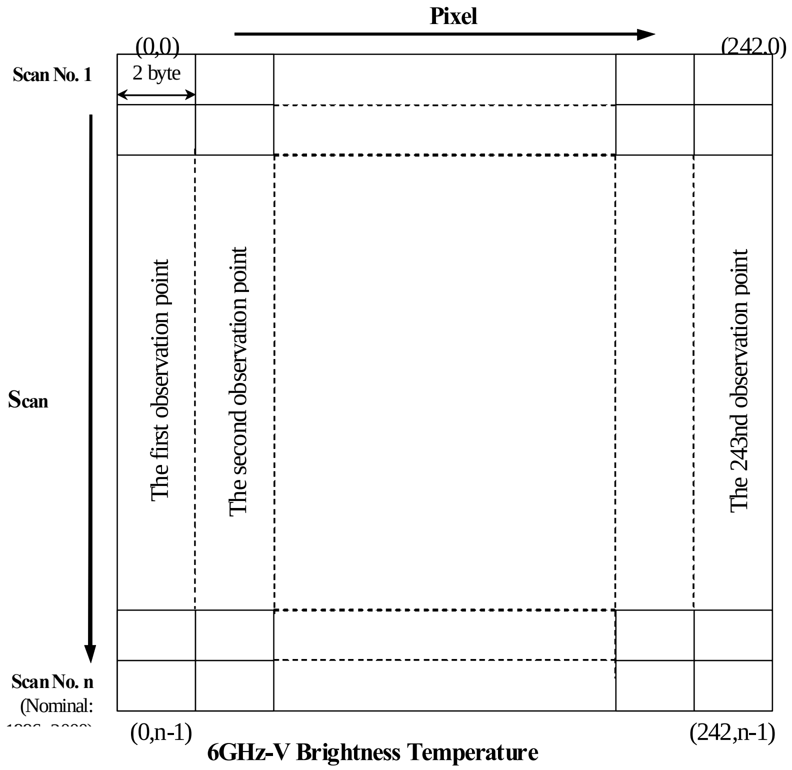


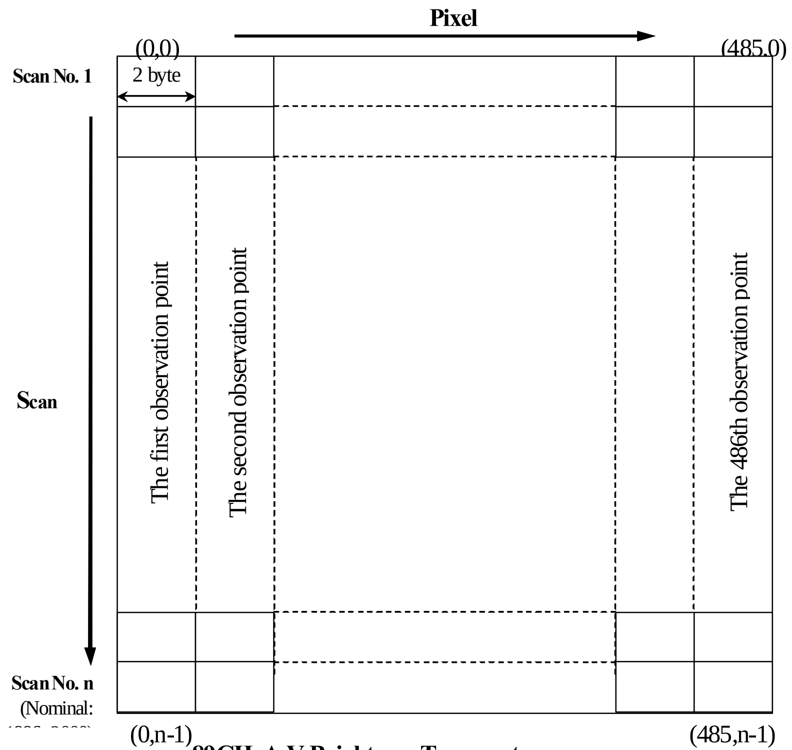
Figure 1.2-2 The Structure of Observation Count



6GHz-V Brightness Temperature

(6-H, 10-V/H, 18-V/H, 23-V/H, 36-V/H, 50-V, 52-V are the same structure)

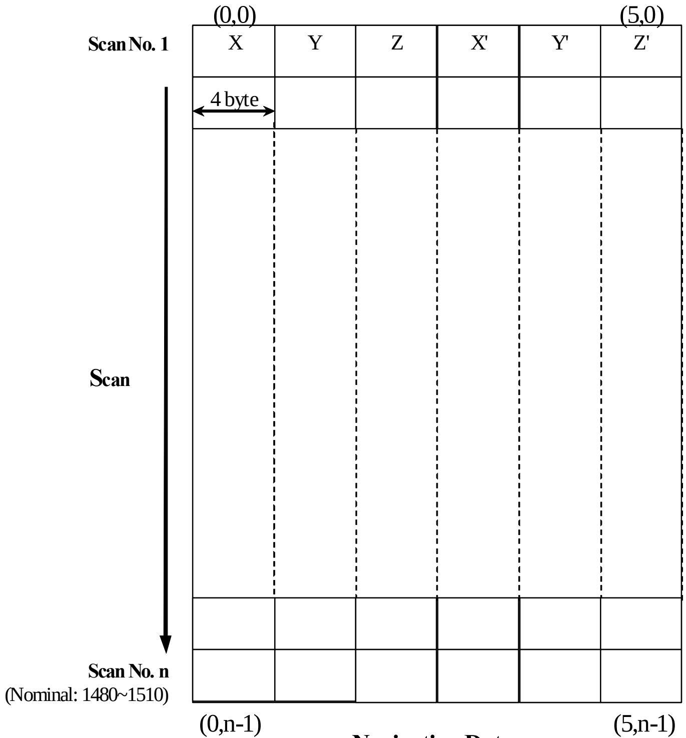
(Note: 50-V, 52-V SDSs are filled with -9999)



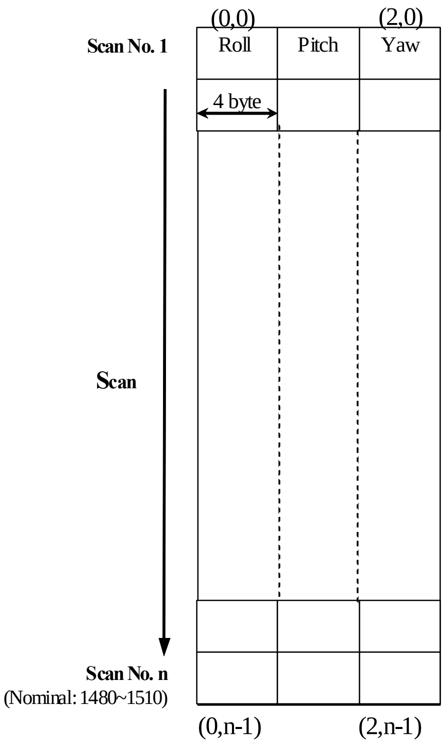
89GHzA-V Brightness Temperature

(89A-H, 89B-V/H are the same structure)

Figure 1.2-3 Structure of Brightness Temperature

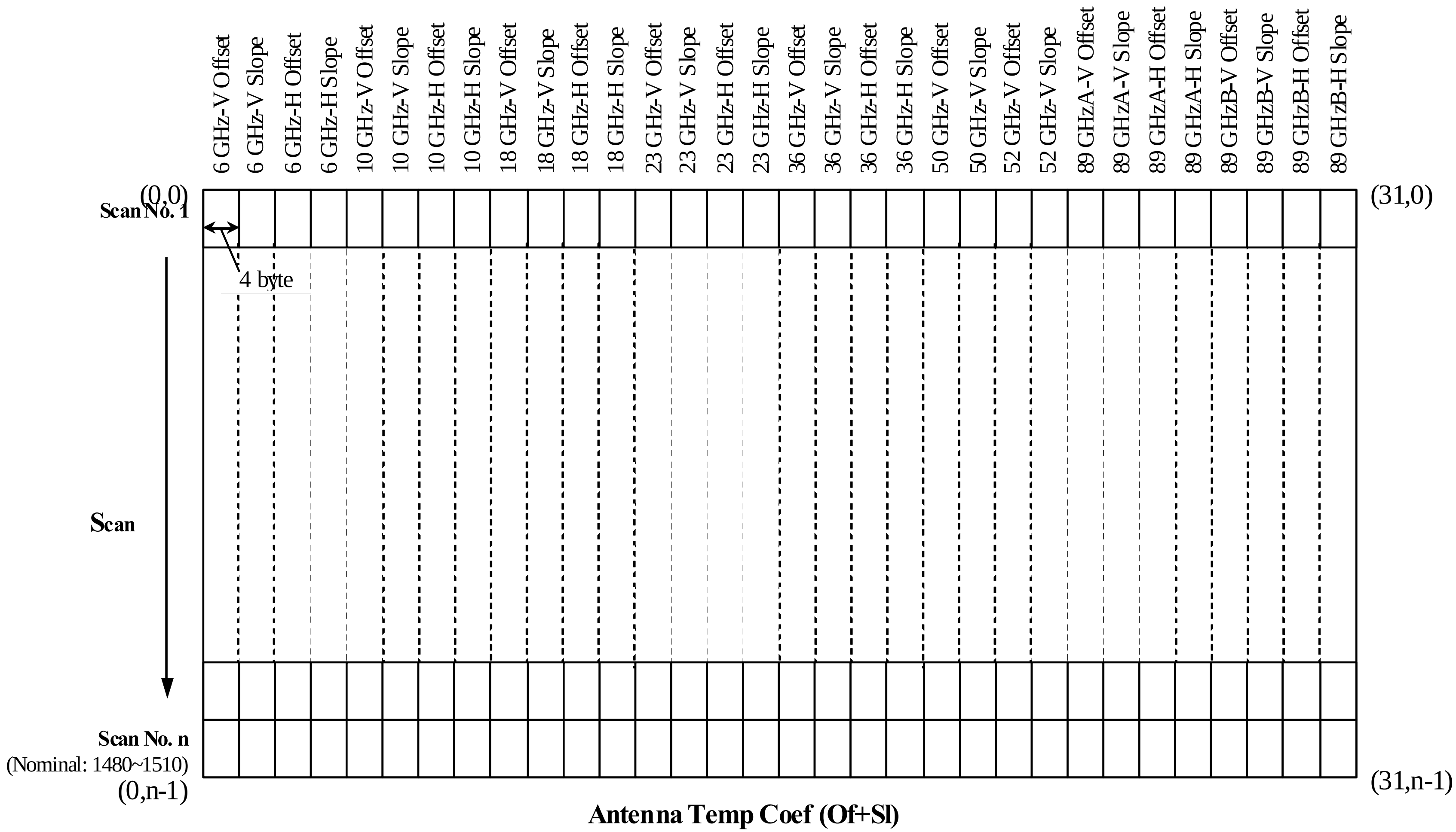


Navigation Data



Attitude Data

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



(Note: 50GHz-V, 52GHz-V, 89GHzA are filled with -9999)

A

Figure 1.2-5 The Structure of Antenna Temp Coef.

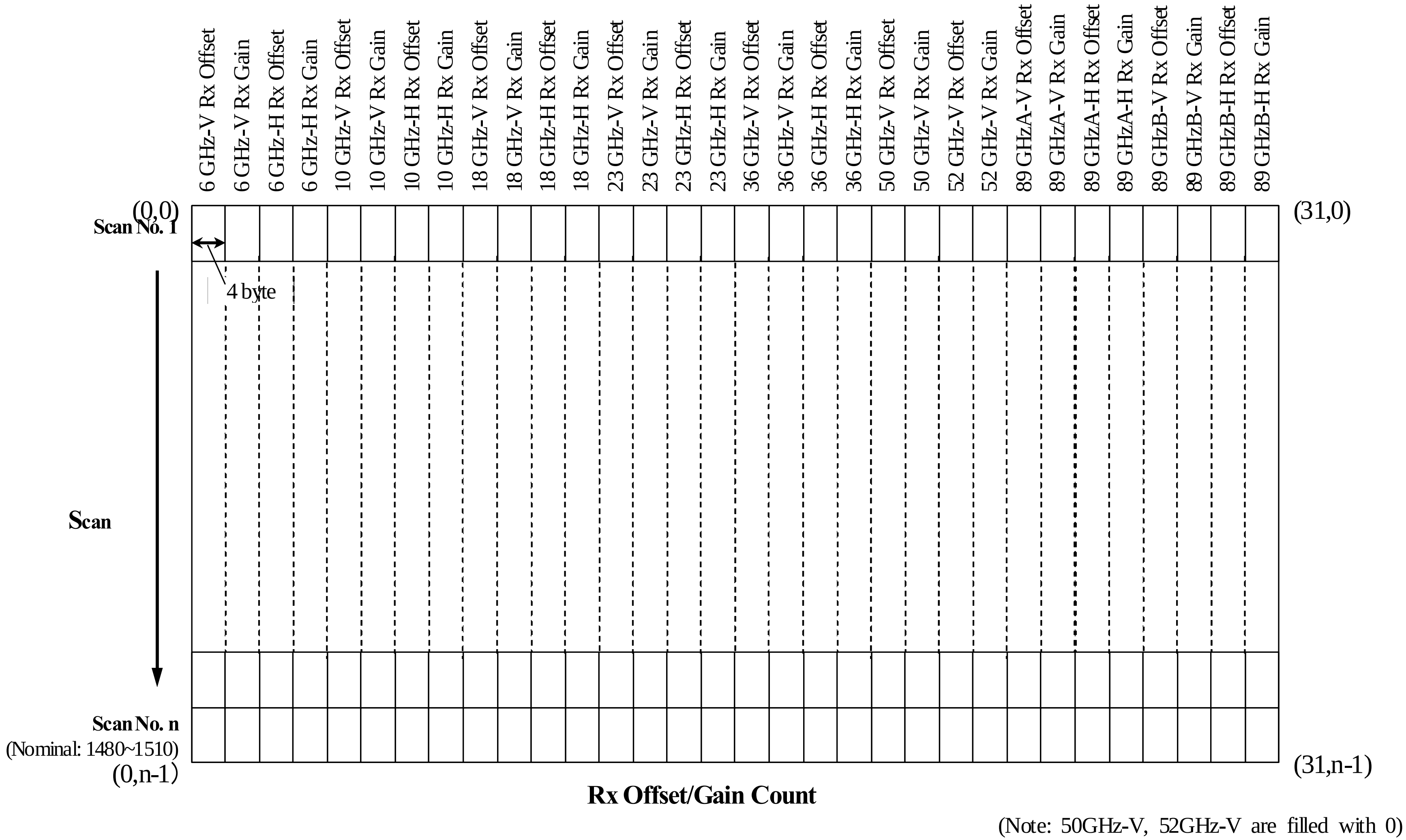
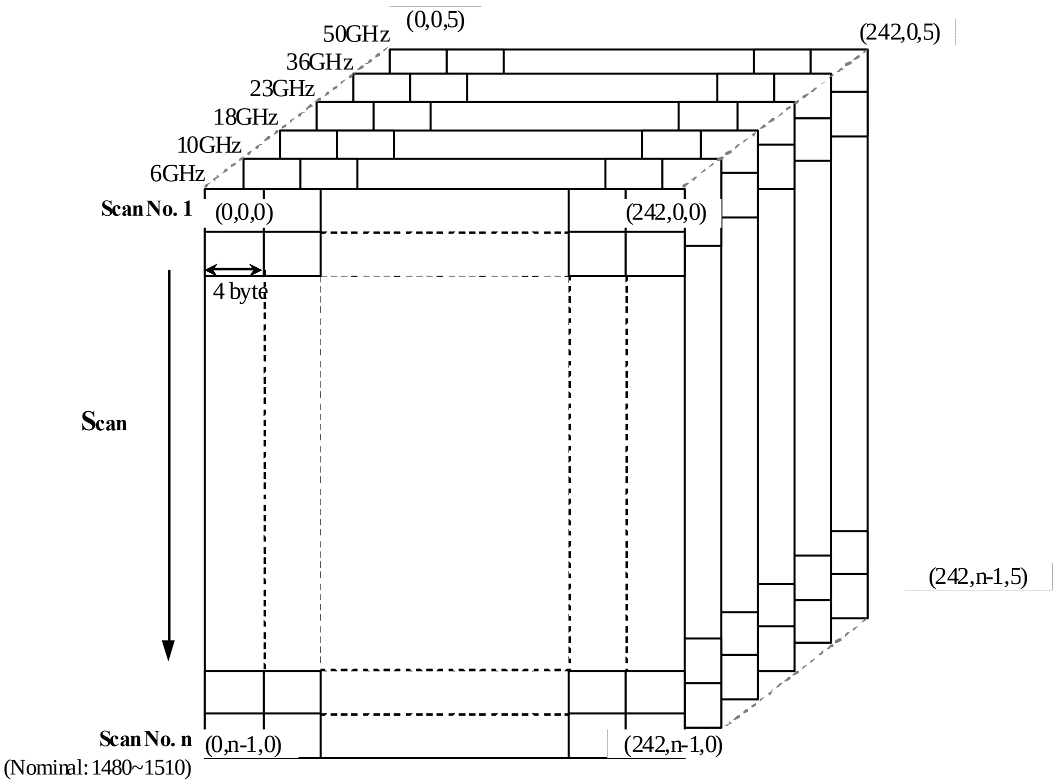


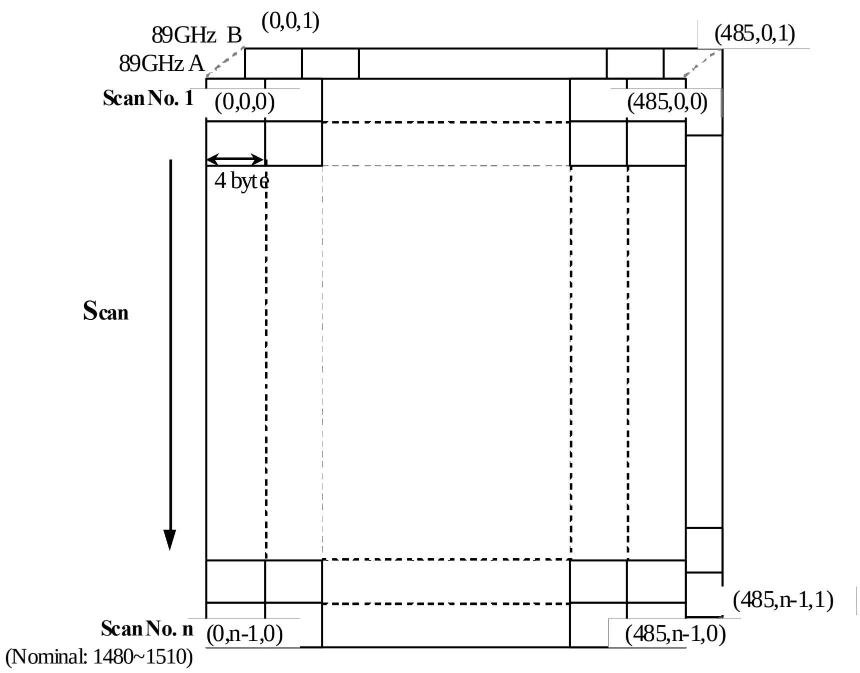
Figure 1.2-6 The Structure of Rx Offset/Gain Count

A



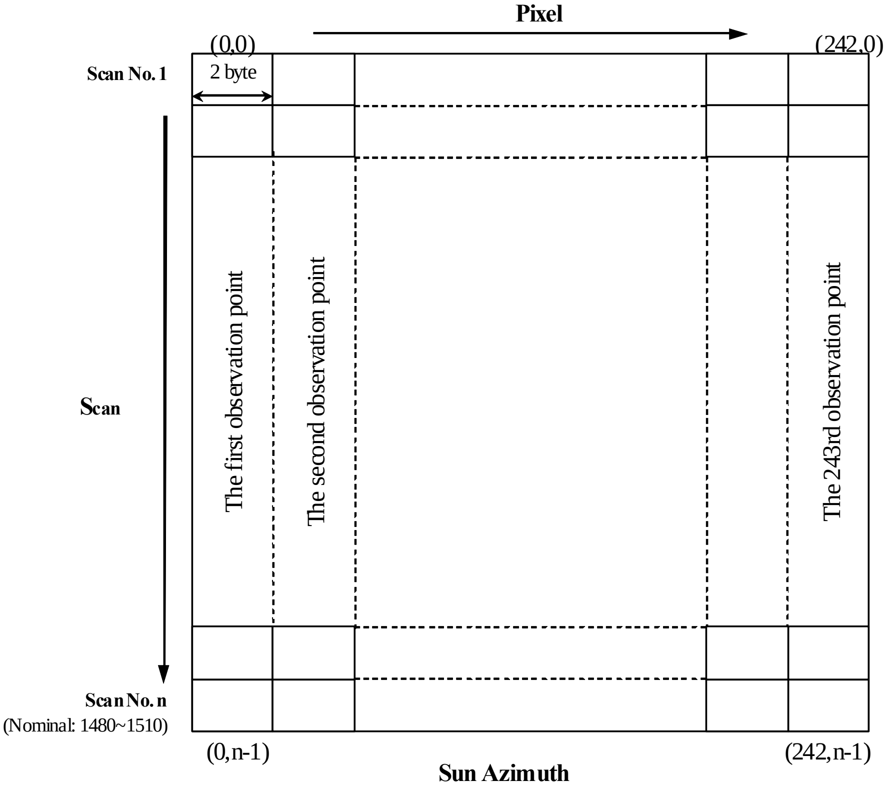
Latitude/Longitude for low frequencies

(Note: 50GHz SDS are filled with 99.99)



Latitude/Longitude for 89GHz frequencies

Figure 1.2-7 The Structure of Latitude of Observation Point, Longitude of Observation Point.



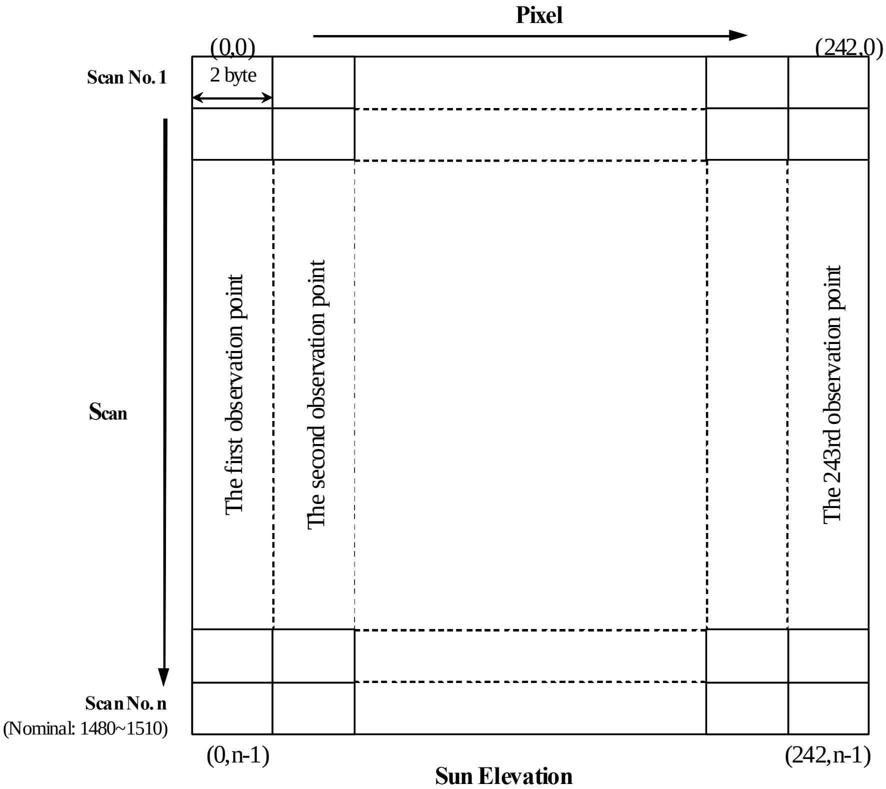
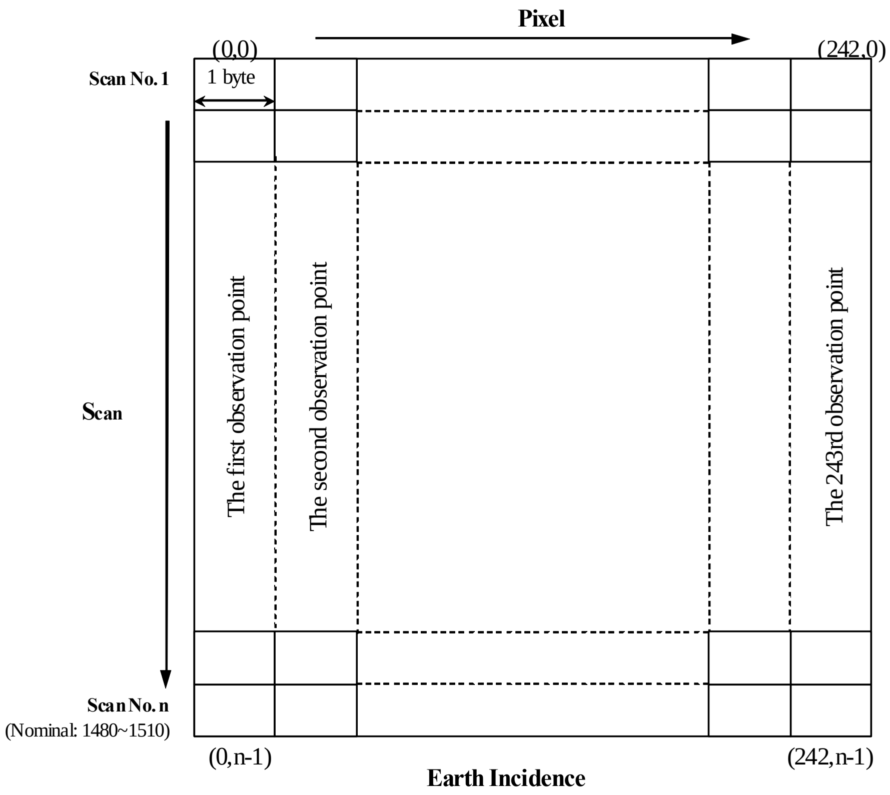


Figure 1.2-8 The Structure of Sun Azimuth, Sun Elevation



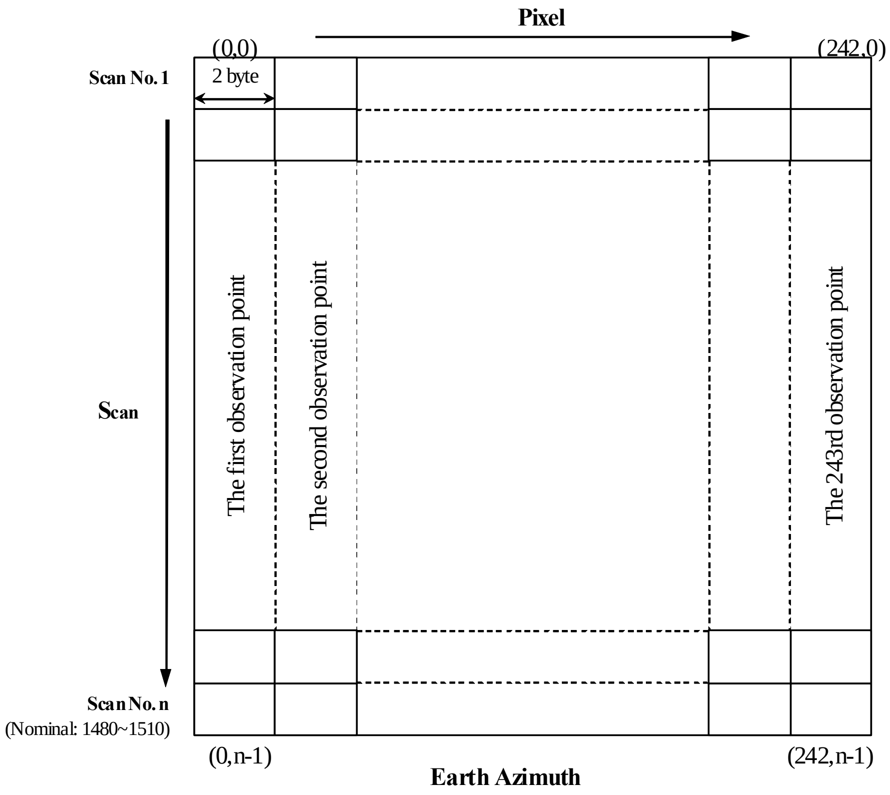


Figure 1.2-9 The Structure of Earth Incidence, Earth Azimuth

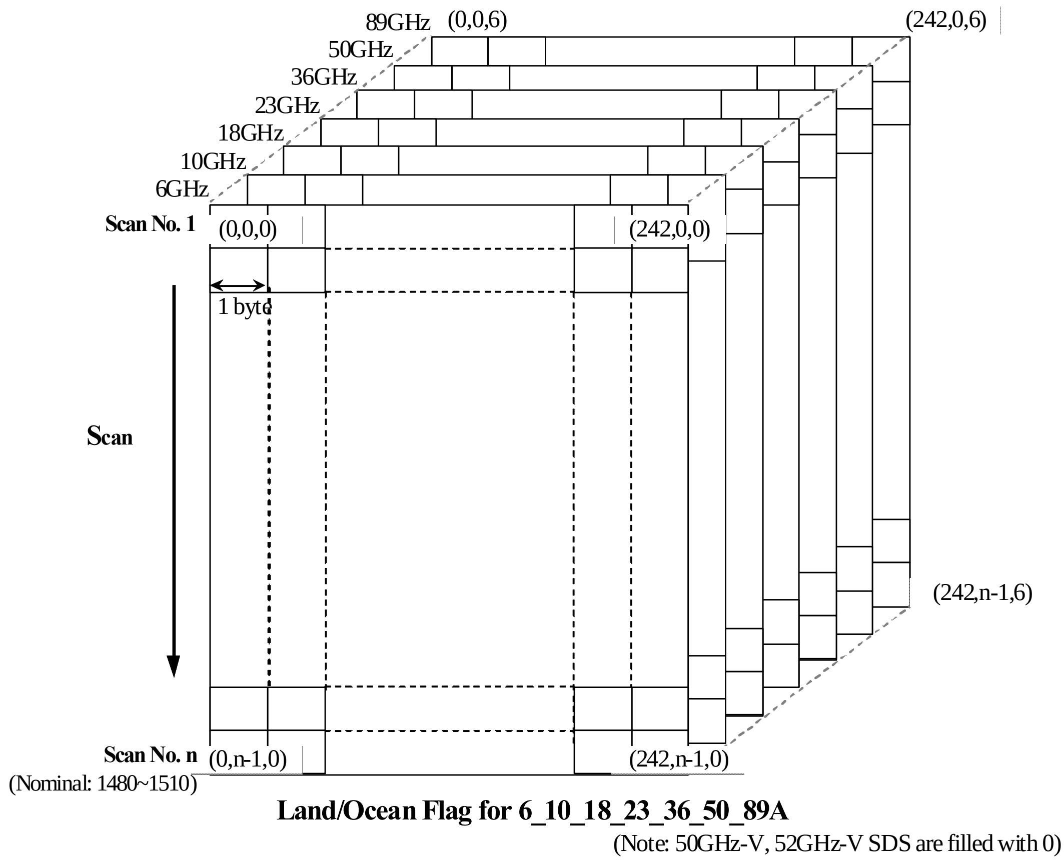


Figure 1.2-10 The Structure of Land/Ocean Flag

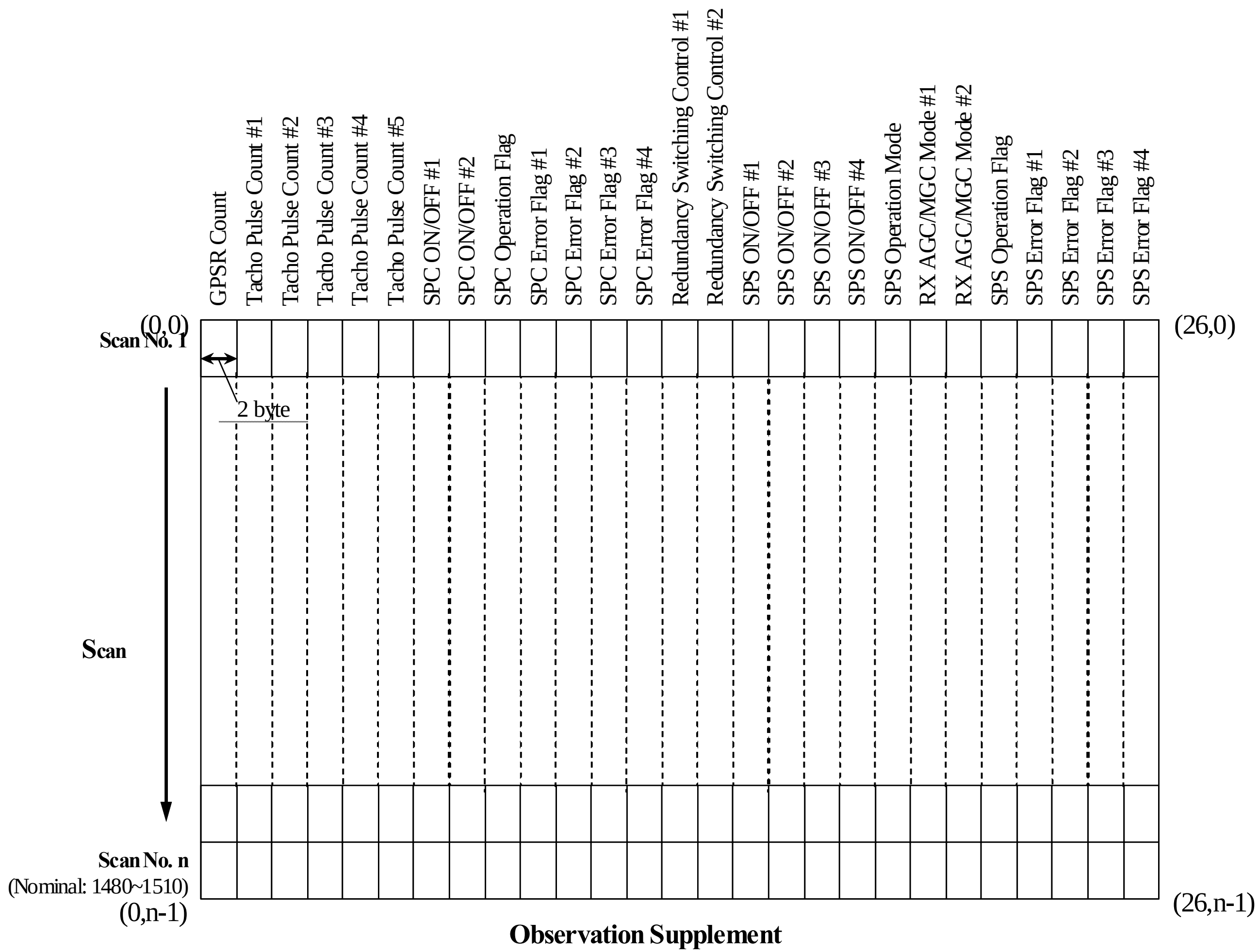


Figure 1.2-11 The Structure of Observation Supplement

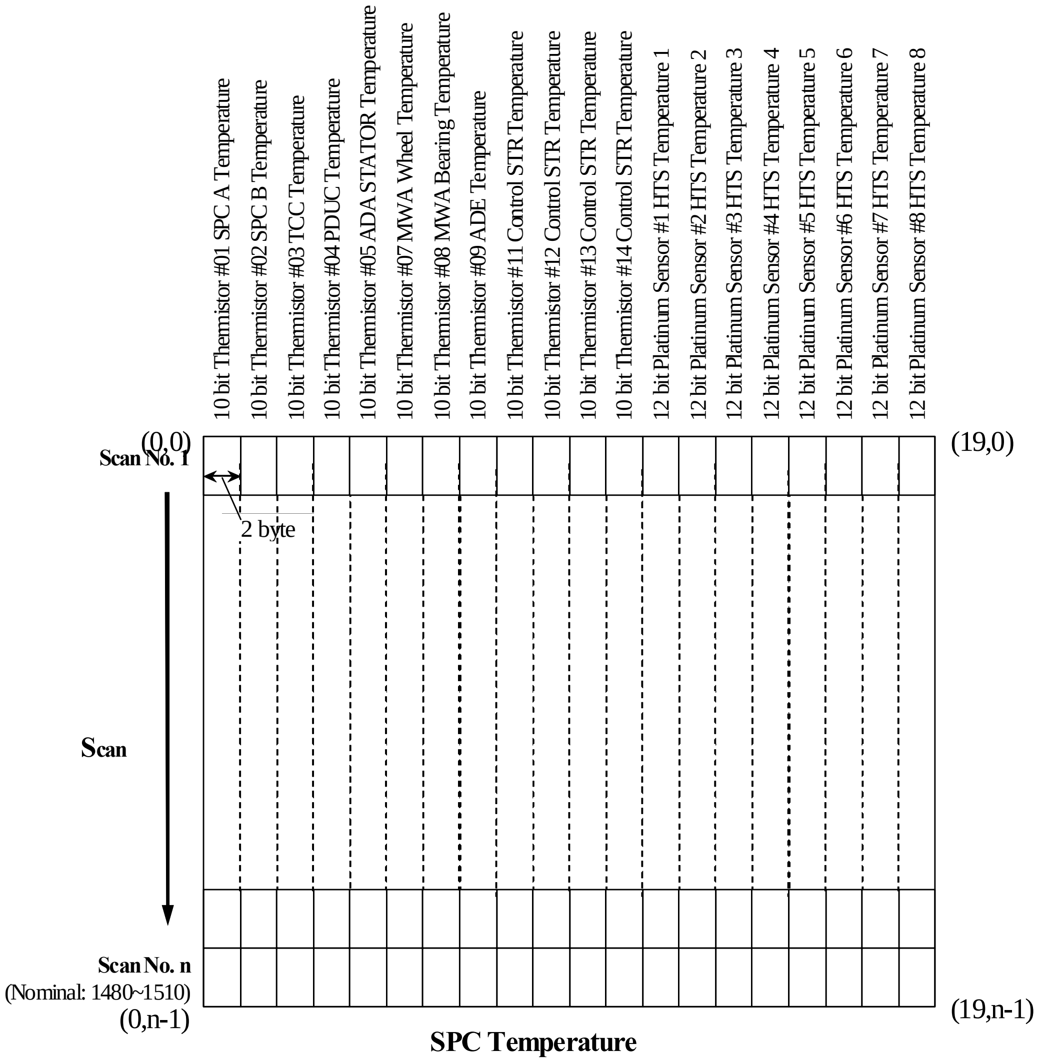


Figure 1.2-12 The Structure of SPC Temperature Count (0-19)

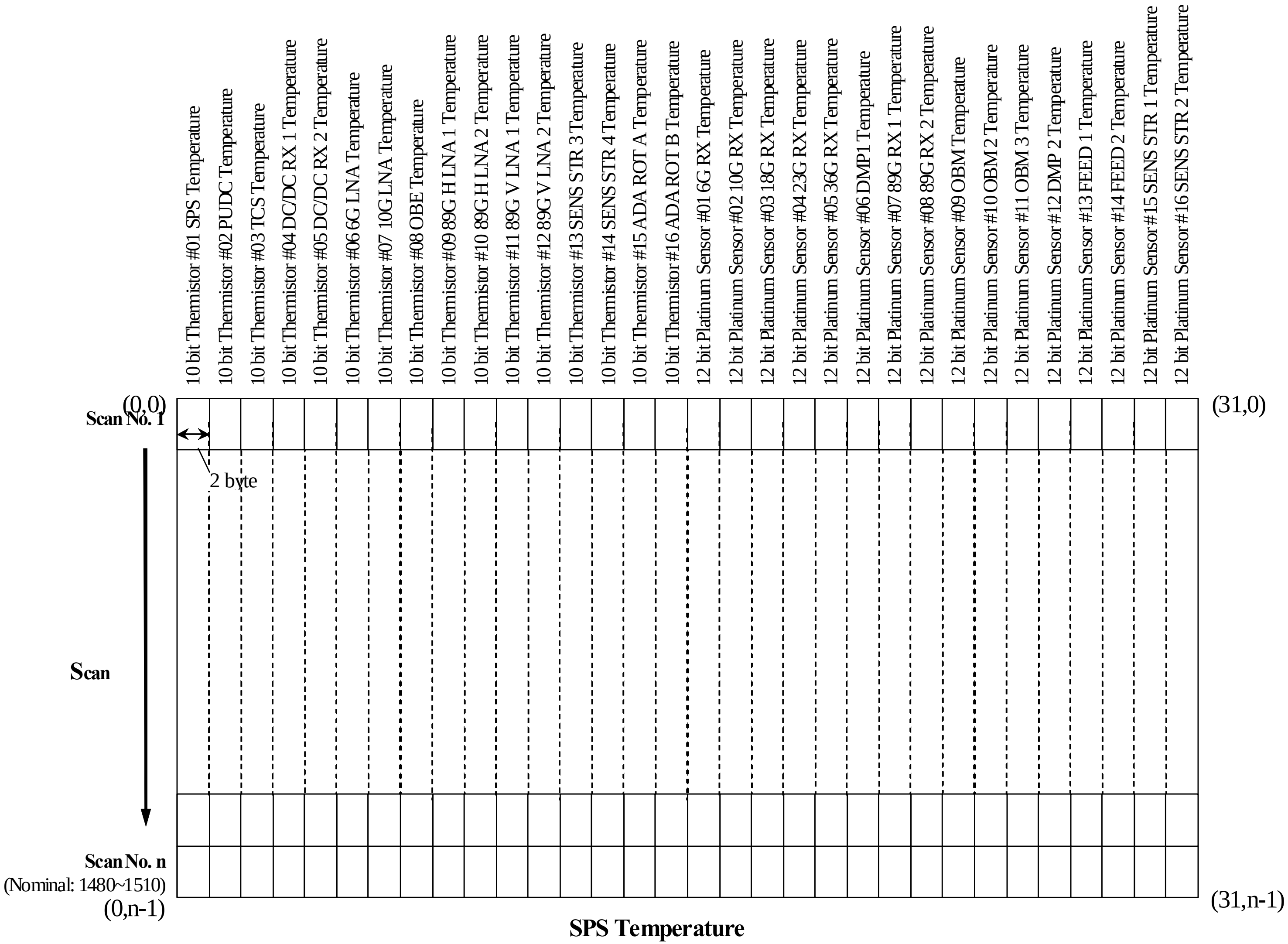


Figure 1.2-13 The Structure of SPS Temperature Count (0-31)

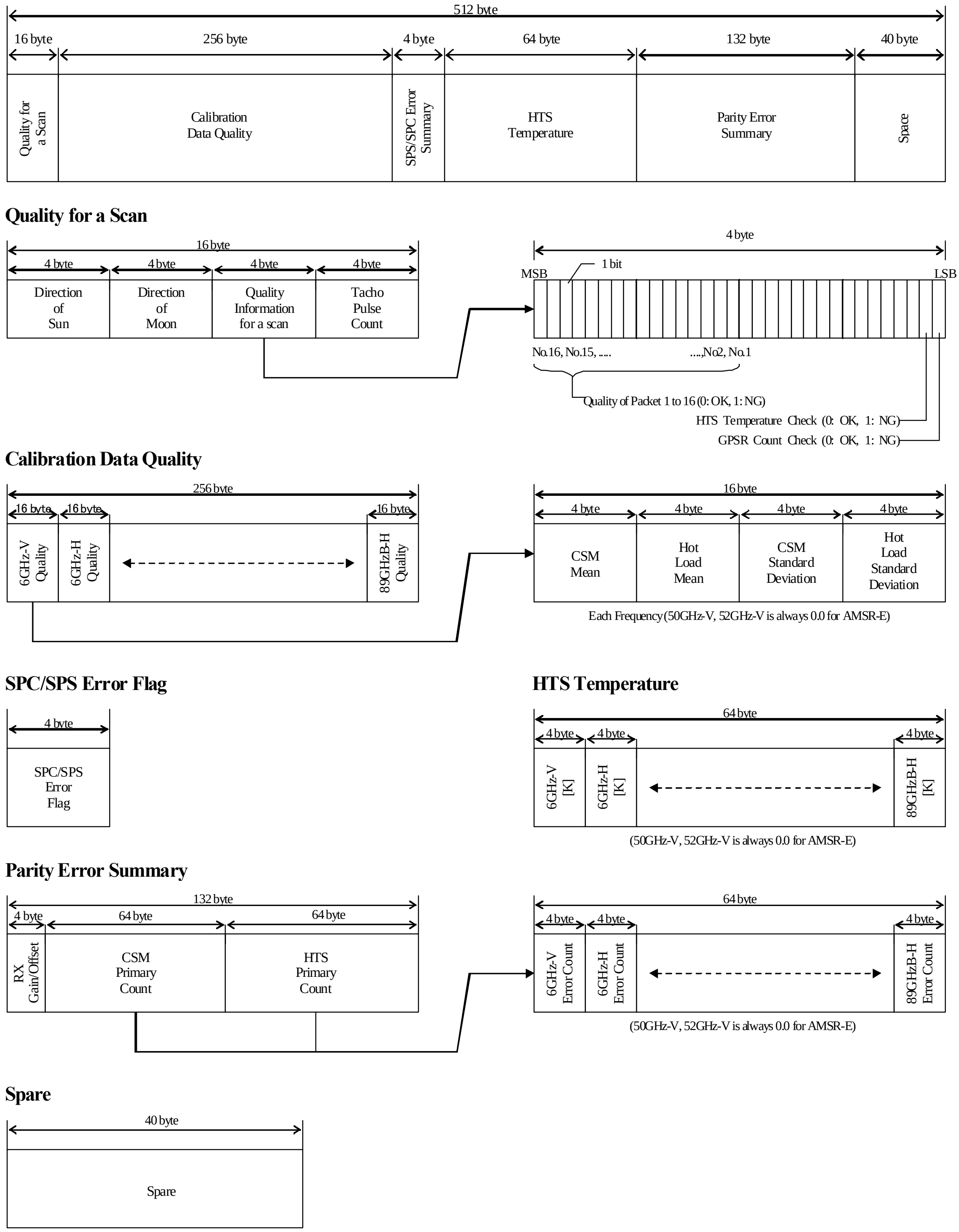
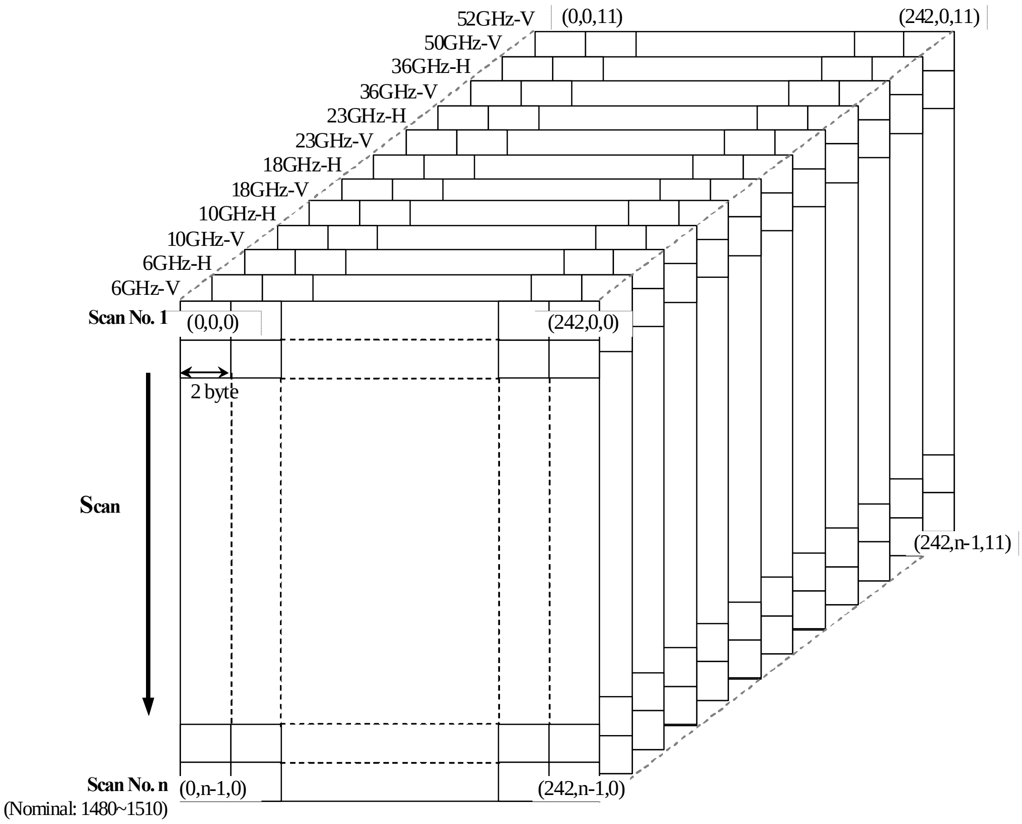
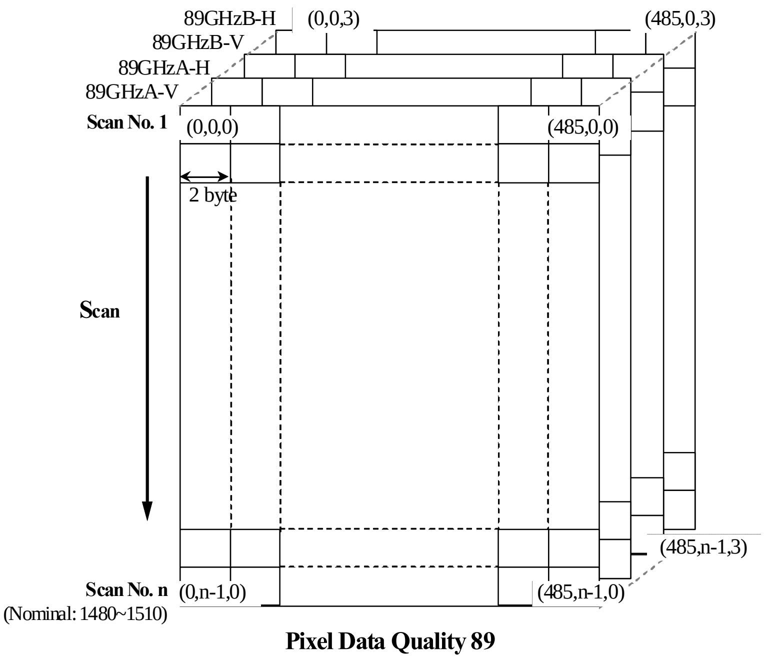


Figure 1.2-14 The Structure of Data Quality



Pixel Data Quality 6 to 52

(Note: 50GHz-V, 52GHz-V SDS are filled with 0)



Pixel Data Quality 89

Figure 1.2-15 The Structure of Pixel Data Quality

1.3 Data Size of one AMSR-E Slow Rotation Data

The data size of one AMSR-E Slow Rotation Data is shown in Table 1.3-1 in case of 1500 sequences. However, the actual file size is 8% smaller because HDF is a compressed format.

Table 1.3-1 Estimation of the Data Volume

AMSR-E Level 1S 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	243	2	486	
6GHz-H Observation Count	243	2	486	
10.65GHz-V Observation Count	243	2	486	
10.65GHz-H Observation Count	243	2	486	
18.7GHz-V Observation Count	243	2	486	
18.7GHz-H Observation Count	243	2	486	
23.8GHz-V Observation Count	243	2	486	
23.8GHz-H Observation Count	243	2	486	
36.5GHz-V Observation Count	243	2	486	
36.5GHz-H Observation Count	243	2	486	
50.3GHz-V Observation Count	243	2	486	
52.8GHz-H Observation Count	243	2	486	
89.9GHz-V-A Observation Count	486	2	972	
89.9GHz-H-A Observation Count	486	2	972	
89.9GHz-V-B Observation Count	486	2	972	
89.9GHz-H-B Observation Count	486	2	972	
6GHz-V Brigtness Temperature	243	2	486	
6GHz-H Brigtness Temperature	243	2	486	
10.65GHz-V Brigtness Temperature	243	2	486	
10.65GHz-H Brigtness Temperature	243	2	486	
18.7GHz-V Brigtness Temperature	243	2	486	
18.7GHz-H Brigtness Temperature	243	2	486	
23.8GHz-V Brigtness Temperature	243	2	486	
23.8GHz-H Brigtness Temperature	243	2	486	
36.5GHz-V Brigtness Temperature	243	2	486	
36.5GHz-H Brigtness Temperature	243	2	486	
50.3GHz-V Brigtness Temperature	243	2	486	
52.8GHz-H Brigtness Temperature	243	2	486	
89.9GHz-V-A Brigtness Temperature	486	2	972	
89.9GHz-H-A Brigtness Temperature	486	2	972	
89.9GHz-V-B Brigtness Temperature	486	2	972	
89.9GHz-H-B Brigtness Temperature	486	2	972	
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	
Latitude for low frequencies	243	4	972	
Longitude for low frequencies	243	4	972	
Latitude for 89GHz frequencies	486	4	1944	
Longitude for 89GHz frequencies	486	4	1944	
Sun Azimuth	243	2	486	A scan only
Sun Elevation	243	2	486	A scan only
Earth Incidence	243	1	243	A scan only
Earth Azimuth	243	2	486	A scan only
Land/Ocean Flag	243	1	1701	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	
Pixel Data Quality 6 to 52	243	2	5832	(243*2) * 12 freq
Pixel Data Quality 89	486	2	3888	(486*2) * 4 freq
Total			40844	
Volume/Granule (MB)			58.4	1500 Scan/Scene
Volume/Day (GB)			1.7	29 Files/Day
Volume/Month (GB)			49.6	30 Days/Month

1.4 The Others

1.4.1 File Name Convention

The file name convention of AMSR-E Slow Rotation Data is shown below.

GranuleID + Extensions (.00)

1.4.2 Definition of the AMSR-E Slow Rotation Data Range

The data range of AMSR-E Slow Rotation Data is the half orbit defined as a scene (See Figure 1.4.2-1) and extended about 10 sequences 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 sequence.

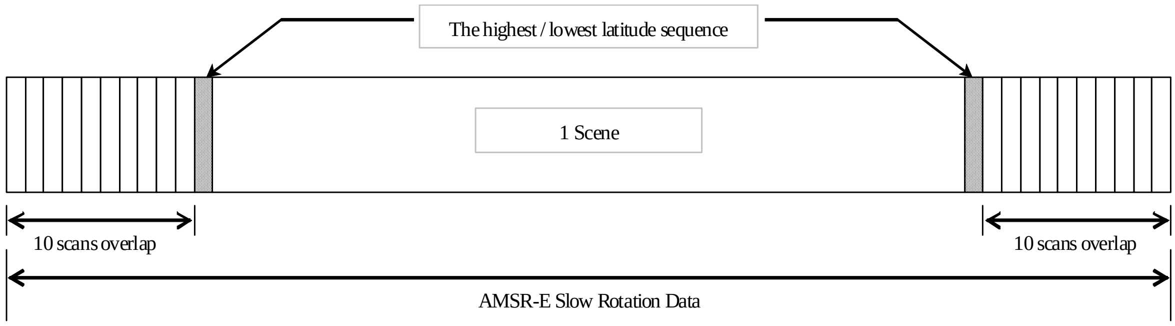


Figure 1.4.2-1 Definition of One AMSR-E Slow Rotation Data Range

1.4.3 Coordinate System

AMSR-E Slow Rotation Data stores observation position (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 coordinate 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-E Slow Rotation Data. The scale factor is stored with the data unit in the attribute information on Vdata or SDS in AMSR-E Slow Rotation Data.

2 Data Explanation

This chapter shows explanation of each data item of AMSR-E Slow Rotation Data.

2.1 Core Metadata

（1） <u>ShortName</u>

The abbreviated name of AMSR-E Slow Rotation Data is stored.

AMSREL1S Level 1S

（2） <u>VersionID</u>

“RELEASEx” (x is version ID) is stored as AMSR-E Slow Rotation Data version.

（3） <u>SizeMBESDataGranule</u>

The size (Mbytes) of AMSR-E Slow Rotation Data is stored.

（4） <u>LocalGranuleID</u>

The Granule ID for AMSR-E Slow Rotation Data is shown below.

P1AMEYYMMDDPPPMX _ KNLL0000000

[Scene ID]

P1	P1 (Fixed: EOS-PM1 Aqua)
AME	AME (Fixed: AMSR-E)
YYMMDD	Date of data acquisition start (UT)
PPP	Path number at the observation start point (001 – 233)
M	M (M: regular process)
X	A or D (Orbit direction, A: Ascending, D: Descending)

[Product ID]

K	T(*TBD)
N	0 (Fixed: Spare)
LL	1S (Fixed: for level 1S)
0000000	0 (Fixed: Spare)

（5） <u>ProcessingLevelID</u>

The processing level is stored. The ID of AMSR-E Slow Rotation Data is shown below.

L1S Level 1S

（6） <u>ReprocessingActual</u>

The re-processing date (UT) is stored.

（7） <u>ProductionDateTime</u>

The production time (UT) is stored.

(8)　RangeBeginningTime, RangeBeginningDate, RangeEndingTime, RangeEndingDate

The observation start and end time of 89 GHz A-horn’s are stored. The start and end time of the AMSR-E Slow Rotation Data 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 AMSR-E Slow Rotation Data that does not include a pole region, the scanning time of each end is stored.

(9)　GringPointLatitude, GringPointLongitude

For AMSR-E Slow Rotation Data, the latitude and longitude of the GringPoints are not calculated since one scan is not consisted of 16 packets. Blanks are stored.

(10)　PGEName

AMSR-E Slow Rotation Data generation software name is stored. The name is shown below.

L1S_Process_Software　　　　Level 1S

(11)　PGEVersion

The version number of AMSR-E Slow Rotation Data processing software 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 science data file names used for processing are stored.

(13)　ProcessingCenter, ContactOrganizationName

Blanks are stored as the offer organization of the AMSR-E Slow Rotation Data.

(14)　StartOrbitNumber, StopOrbitNumber

The orbit number of the satellite in a start/end position for AMSR-E Slow Rotation Data is stored. The orbit number of AMSR-E is sequential from the Aqua launch.

(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 short AMSR-E Slow Rotation Data by the lack of observation data), it is filled with "*".

(16)　OrbitDirection

The direction (ASCENDING/DESCENDING) of AMSR-E Slow Rotation Data 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.

ELMD	The definitive ephemeris (when using DEFEPHEM)

(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 AMSR-E Slow Rotation Data is stored. It contains the additional scans of each 10 sequences at start/end part as shown in Figure 1.4.2-1.

(21) NumberofMissingScans

The number of missing scans in AMSR-E Slow Rotation Data is stored. Though one scan of AMSR-E consists of 16 packets, it counts one missing scan even if one packet is lost. (The missing packet position is stored in Data Quality shown in 2.3)

(22) ECSDataModel

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

(23) DiscontinuityVirtualChannelCounter

It represents the status of continuous receiving of inputted Science data's packets, and stored value is shown below. In case of Science RBD, AMSR-E Slow Rotation Data processing software copies the status flag of ESH (EDOS Service Header in the science RBD file). And in case of PDS, AMSR-E Slow Rotation Data processing software sets the result of checking data.

Continuation	Continuation	(RBD / PDS)
Discontinuation	Discontinuation (Anomaly)	(RBD only)
DEAD Encounter	Encountered DEAD	(RBD/PDS)

RBD: It indicates Rate Buffered Data, and 20 bytes data (it is called ESH: EDOS Service Header) are inserted to every packets. RBD is acquired from NASA to JAXA/EOC online.

PDS: It indicates Production Data Sets, and ESH are removed. PDS stores about 2 hour data and they are delivered from NASA to JAXA/EOC via media on demand.

(24) QALocationPacketDiscontinuity

The packet continuity state of AMSR-E Slow Rotation Data is stored. The continuity state of the packet is the value shown in the following.

(25) NumberofPackets

The total packet number of AMSR-E Slow Rotation Data is stored. Since one sequence is 16 packets, the relation between NumberofPackets and NumberofSequence are shown in below.

NumberofPackets = NumberofSequence * 16 packets

(26) NumberofInputFiles

The number of science 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 AMSR-E Slow Rotation Data are stored. The relation between the total packets number and these attributes are as follows.

NumberofPackets = NumberofMissingPackets + NumberofGoodPackets

(28) ReceivingCondition

Blank is stored.

(29) EphemerisQA

The quality judged by the checking orbit data and attitude data is stored. The quality inspection result becomes NG, when either number of following limit check 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 inspections are not carried out for AMSR-E Slow Rotation Data. Blank is stored.

(31) AutomaticQAFlagExplanation

The automatic inspections are not carried out for AMSR-E Rotation Data. Blank is stored.

(32)　ScienceQualityFlag, ScienceQualityFlagExplanation

Blank are stored for AMSR-E Slow Rotation Data.

(33)　QAPercentMissingData

The percentage of the missing data in AMSR-E Slow Rotation Data is stored.

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

(34)　QAPercentOutofBoundsData

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.

* For AMSR-E Slow Rotation Data, abnormal brightness temperature is stored as negative value.

(35)　QAPercentParityErrorData

The percentage of a parity error data 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 parity error, -32768 is stored in AMSR-E Slow Rotation Data.

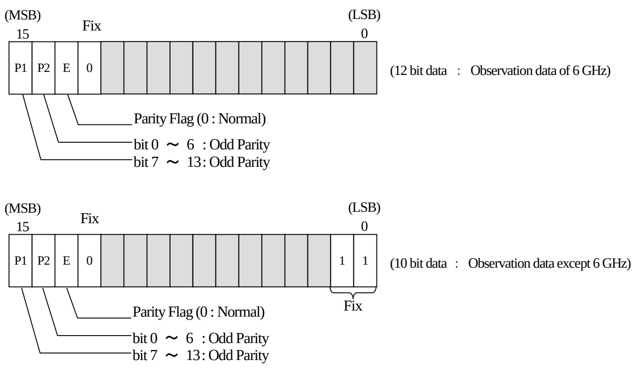


Figure 2.1-2 Bit formats of observation data (raw data)

(36)　ProcessingQADescription

The error message generated by AMSR-E Slow Rotation 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, OrbitArgumentPerigee, OrbitInclination, OrbitPeriod, RevisitTime

The characteristics of Aqua are stored.

SatelliteOrbit	Sun-synchronous_sub-recurrent
Altitude	707.9 km
OrbitSemiMajorAxis	7085.858 km
OrbitEccentricity	0.00095
OrbitArgumentPerigee	106.480 degrees
OrbitInclination	98.15 degrees
OrbitPeriod	98 minutes
RevisitTime	16 days

(2) AMSRChannel, AMSRBandWidth, AMSRBeamWidth, OffNadir, SpatialResolution(AzXEl)

The characteristics of AMSR-E are stored.

AMSRChannel	Observing channels of AMSR-E 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-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	
ScanningPeriod	Scanning period is set.	28.89 sec
SwathWidth	Swath width is set.	1450 km
DynamicRange	Dynamic range is set.	2.7 – 340 K

(3) DataFormatType, HDFFormatVersion

The file format information of AMSR-E Slow Rotation Data is stored.

DataFormatType	NCSA-HDF	AMSR-E Slow Rotation Data Format Type
HDFFormatVersion	Ver4.2r4	Version number of HDF Format

(4) EllipsoidName, SemiMajorAxisofEarth, FlatteningRatioofEarth

The earth model used in AMSR-E 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) SensorAlignment

Alignment values between Aqua body coordinate system and the AMSR-E coordinate system are stored.

(6) Thermistor

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

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

The formula of conversion from count to engineering value is:

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

$$C \quad : Count$$

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

(7) Platinum#1

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 coefficients Wa.
Platinum#1Conversion	Table Wb	Platinum #1 conversion coefficients Wb.
Platinum#1Conversion	Table Wc	Platinum #1 conversion coefficients Wc.
Platinum#1Conversion	Table Wd	Platinum #1 conversion coefficients Wd.

The conversion formula is the same as that for thermistor.

(8) Platinum#2

The engineering 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 coefficients Wa.
Platinum#2 Conversion	Table Wb	Platinum #2 conversion coefficients Wb.
Platinum#2 Conversion	Table Wc	Platinum #2 conversion coefficients Wc.
Platinum#2 Conversion	Table Wd	Platinum #2 conversion coefficients 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 coefficients Wa
Platinum#3 Conversion	Table Wb	Platinum #3 conversion coefficients Wb
Platinum#3 Conversion	Table Wc	Platinum #3 conversion coefficients Wc
Platinum#3 Conversion	Table Wd	Platinum #3 conversion coefficients 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 the deep space is stored for each frequency. The stored value is used as a conversion factor in AMSR-E Slow Rotation Data processing software.

(12) CoRegistrationParameterA1, CoRegistrationParameterA2

The AMSR-E Slow Rotation Data is not used the co-registration parameters A1 and A2. Blank is stored.

(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

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

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, 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

In AMSR-E Slow Rotation Mode, the observed range of the surface of the Earth is as follows.

Data of Brightness temperature	:	±61 degree centered at the direction of the satellite flight
Data except Brightness temperature	:	±75 degree centered at the direction of the satellite flight

(1) Scan_Time

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

(2) Position_in_Orbit

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) / (98.9 * 60)*

(3) Navigation_Data

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) Attitude_Data

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 Yaw for the earth center direction.

(5) 6GHz-V_Observation_Count

The observed count value of 6 GHz 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 Lack of data
-32767	Value for out of the range of observations
-32768	Value for Parity error.

(6) 6GHz-H_Observation_Count

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

(7) 10.65GHz-V_Observation_Count

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

(8) 10.65GHz-H_Observation_Count

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

(9) 18.7GHz-V_Observation_Count

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

(10) 18.7GHz-H_Observation_Count

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

(11) 23.8GHz-V_Observation_Count

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

(12) 23.8GHz-H_Observation_Count

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

(13) 36.5GHz-V_Observation_Count

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

(14) 36.5GHz-H_Observation_Count

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

(15) 50.3GHz-V_Observation_Count

Since 50.3 GHz is not observed by AMSR-E, 0 fills it.

(16) 52.8GHz-V_Observation_Count

Since 52.8 GHz is not observed by AMSR-E, 0 fills it.

(17) 89.0GHz-V-A_Observation_Count

The observed count value of 89 GHz A-horn's vertical polarization is stored.

(18) 89.0GHz-H-A_Observation_Count

The observed count value of 89 GHz A-horn's horizontal polarization is stored.

(19) 89.0GHz-V-B_Observation_Count

The observed count value of 89 GHz B-horn's vertical polarization is stored.

(20) 89.0GHz-H-B_Observation_Count

The observed count value of 89 GHz B-horn's horizontal polarization is stored.

(21) 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
	-32767	Value for out of the range of observations
	-32768	Value for Parity error
	The other minus value	Value for Limit Check error

(22) 6GHz-H_Brightness_Temperature

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

(23) 10.65GHz-V_Brightness_Temperature

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

(24) 10.65GHz-H_Brightness_Temperature

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

(25) 18.7GHz-V_Brightness_Temperature

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

(26) 18.7GHz-H_Brightness_Temperature

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

(27) 23.8GHz-V_Brightness_Temperature

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

(28) 23.8GHz-H_Brightness_Temperature

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

(29) 36.5GHz-V_Brightness_Temperature

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

(30) 36.5GHz-H_Brightness_Temperature

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

(31) 50.3GHz-V_Brightness_Temperature

Since 50.3 GHz is not observed by AMSR-E, 0 fills it.

(32) 52.8GHz-V_Brightness_Temperature

Since 52.8 GHz is not observed by AMSR-E, 0 fills it.

(33) 89.0GHz-V-A_Brightness_Temperature

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

(34) 89.0GHz-H-A_Brightness_Temperature

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

(35) 89.0GHz-V-B_Brightness_Temperature

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

(36) 89.0GHz-H-B_Brightness_Temperature

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

(37) 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)*

(38) Rx_Offset/Gain_Count

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

(39) Latitude for low frequencies A

The latitude of the observation point on the earth surface at 6 to 50 GHz is stored for each frequency.

The statistics of the latitude for low frequencies are stored in order of 6GHz, 10GHz, 18GHz, 23GHz, 36GHz, 50GHz.

Data Range	North: 0 to 90 degrees / South: 0 to -90 degrees
Scaling Factor	1.0
Abnormal value	99.99 degrees
Out of the range of observations	-99.99 degrees

A

* Since 50 GHz is not observed by AMSR-E, it is filled with 99.99.

(40) Longitude for low frequencies

The longitude of the observation point on the earth surface at 6 to 50 GHz is stored for each frequency.

The statistics of the longitude for low frequencies are stored in order of 6GHz, 10GHz, 18GHz, 23GHz, 36GHz, 50GHz.

Data Range	-180 to 180 degrees
Scaling Factor	1.0
Abnormal value	222.22 degrees
Out of the range of observations	-222.22 degrees

* Since 50 GHz is not observed by AMSR-E, it is filled with 222.22.

(41) Latitude for 89GHz frequencies

The latitude of the observation point on the earth surface at 89GHz is stored. The data range, scaling factor, abnormal value, and out of the range of observations are the same as except 89 GHz.

(42) Longitude for 89GHz frequencies

The longitude to the observation point on the earth surface at 89GHz is stored. The data range, scaling factor, abnormal value, and out of the range of observations are the same as except 89 GHz.

(43) 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	In the case of observation point error.
		In the case of setting value is less than –180 degrees.
	32767	In the case of setting value is more than 180 degrees.
	-32767	In the case of outside a range of observations.

(44) Sun_Elevation

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	In the case of observation point error.
		In the case of setting value is below –180 degrees.
	32767	In the case of setting value is over 180 degrees.
	-32767	In the case of outside a range of observations.

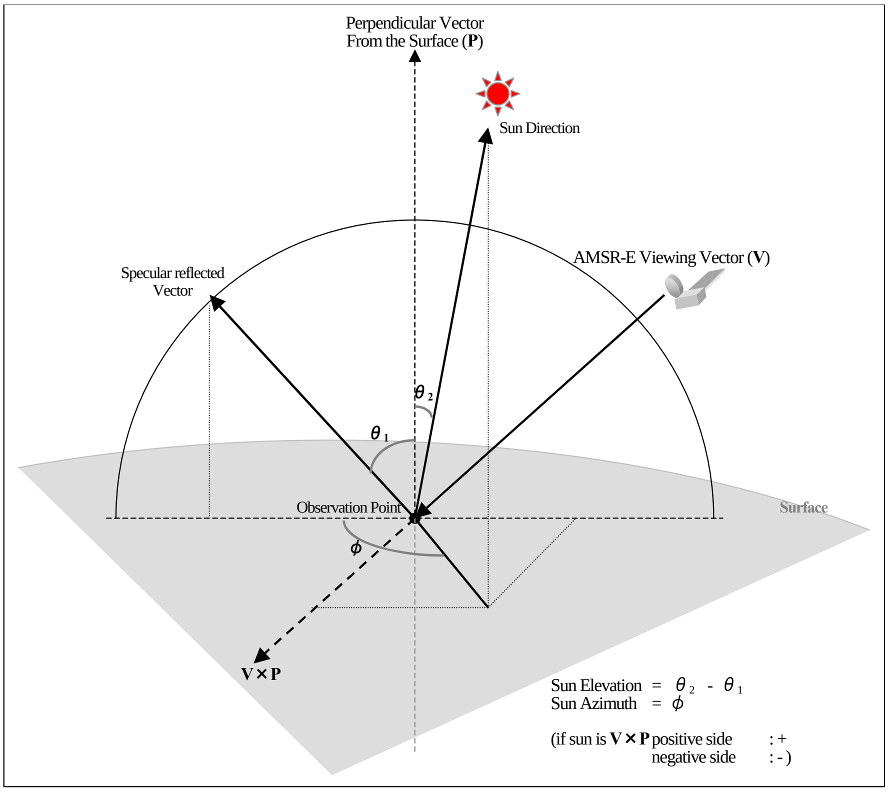


Figure 2.3-1 definition of Sun Elevation, Azimuth

(45) Earth_Incidence

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-E 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 the case of observation point error.	
		In the case of setting value is less than –127.	
	127	In the case of the sun elevation exceeds 180 degrees.	
	-127	In the case of outside a range of observations.	

(46) Earth_Azimuth

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	-32768	In the case of observation point error.
		In the case of setting value is below -180 degrees.
	32767	In the case of setting value is over 180 degrees.
	-32767	In the case of outside a range of observations.

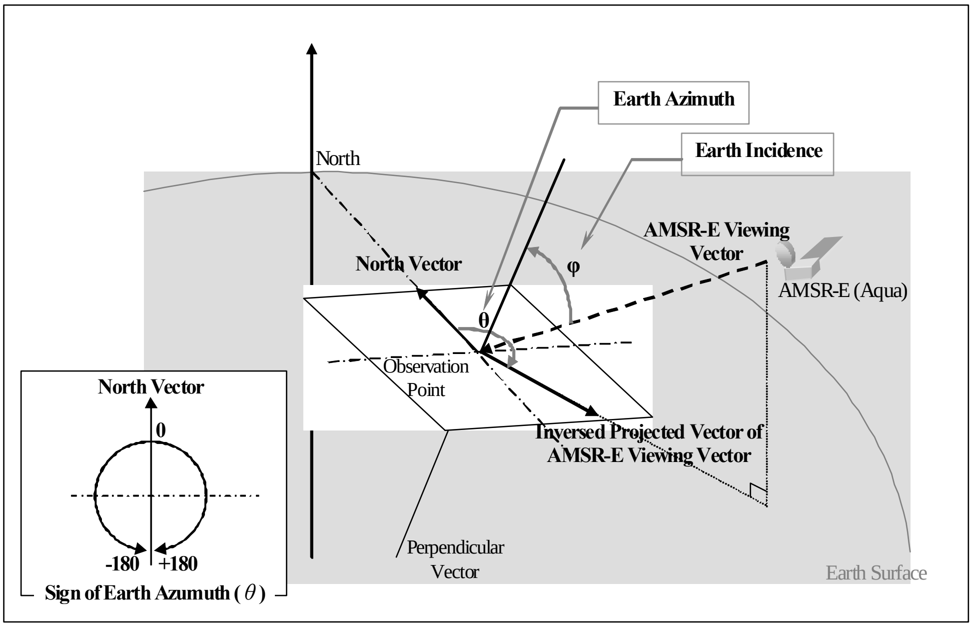


Figure 2.3-2 definition of Earth Azimuth and Incidence

(47) Land/Ocean_Flag_6_10_18_23_36_50_89A

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

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

* Since 50 GHz and 52-GHz are not observed by AMSR-E, they are filled with 0.

*The part outside a range of observations is filled 222.

(48) Observation_Supplement

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

(49) 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.)

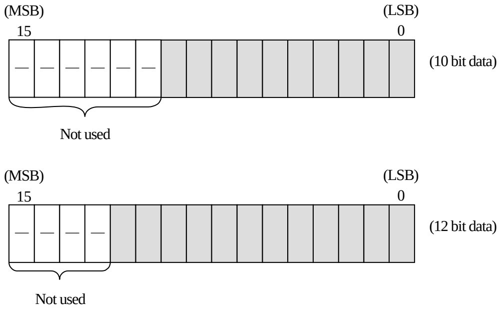


Figure 2.3-3 The Data Structure of SPC Temperature Count

(50) 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.)

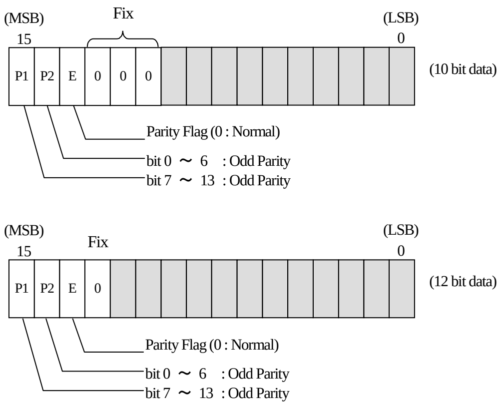


Figure 2.3-4 The Data Structure of SPS Temperature Count

(51) Data_Quality

The quality information and supplementary information are stored. These correspond to observation data and calculation result in each sequence. 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)

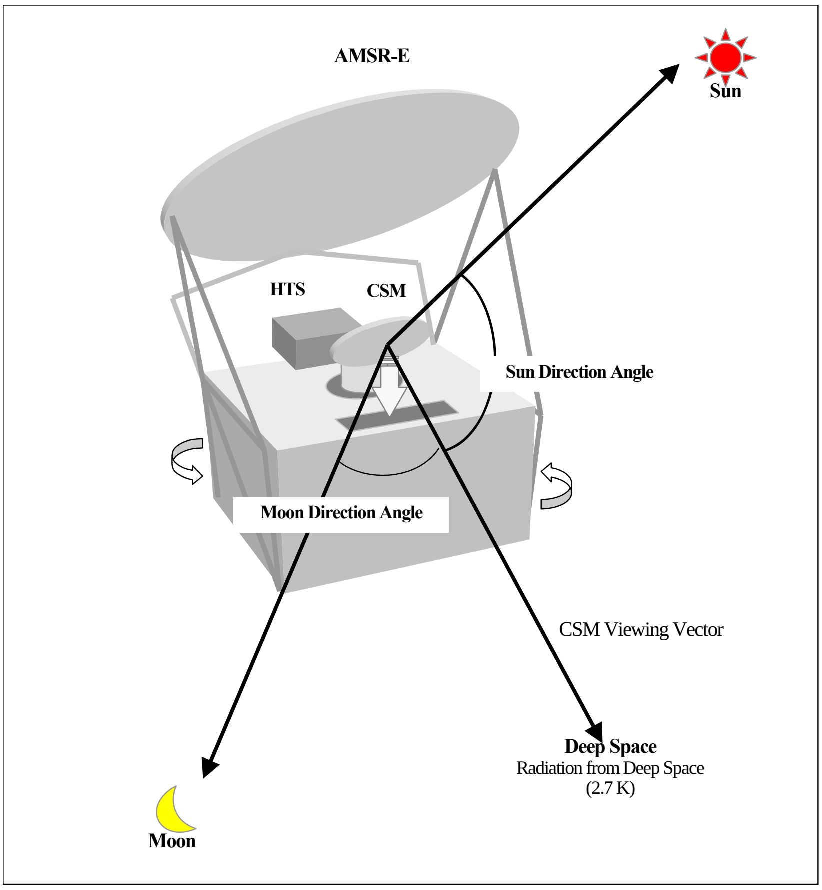


Figure 2.3-5 definition of the Moon Direction Angle and the Sun Direction Angle

3） The quality of a sequence. (Quality Information of a Sequence)

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.

* Since 50 G-V and 52-G-V are not observed by AMSR-E, they are filled with 0.

a) The average value of CSM count. (4 byte s) [type: float]

b) The average value of HTS count. (4 byte s) [type: float]

c) The standard deviation of CSM count is not compute; they are filled with -9999. (4 byte s) [type: float]

d) The standard deviation of HTS count is not compute; they are filled with -9999. (4 byte s) [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 sequence.

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.

(52) Pixel Data Quality 6_to_52

Pixel Data Quality of Brightness Temperature, CSM and HTS are stored for each frequency except 89GHz. (Shown in Figure 2.3-6.) Each flag corresponded to the correction items shown below.

- The value expresses each type. (Information of observational range and Brightness Temperature, CSM and HTS correction)
  - Correction Brightness Temperature data. (The scan bias)
  - Correction CSM data. (Spill over, the contamination of the moon reflection and the stray light)
  - Correction HTS data. (The stray light)

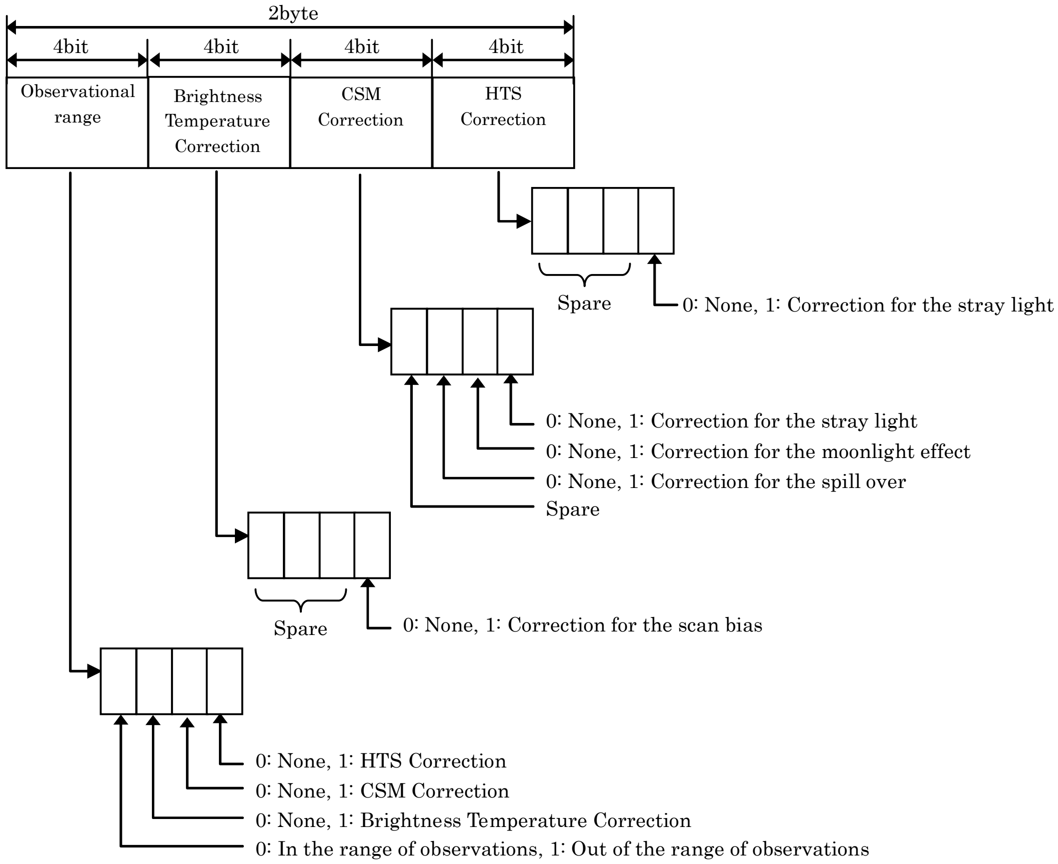


Figure 2.3-6 Format of Pixel Data Quality

(53) Pixel Data Quality 89

Pixel Data Quality of Brightness Temperature, CSM and HTS are stored for 89GHz. (Shown in Figure 2.3-6.)