AMSR-E Level-1R(HDF5) product format description

Japan Aerospace Exploration Agency (JAXA)

Contents

1. Introduction

1.1. Purpose

This format description document describes the format of AMSR-E Level 1R(HDF5) product at Japan Aerospace Exploration Agency (JAXA). This document describes the structure and contents of AMSR-E Level1R(HDF5) product.

1.2. Overview

AMSR-E Level1R(HDF5) product stores the resampling brightness temperature data. The resampling brightness temperature is processed to match the difference of resolution in each frequency.

2. Product description

AMSR-E Level 1R(HDF5) product stores the resampling brightness temperature data and supplementary data as HDF5 format. Show the product format as below.

2.1. Structure of product file

The structure of the AMSR-E Level 1R(HDF5) product is shown in Table 2-1.

Table 2-1 The Structure of AMSR-E Level 1R(HDF5) product

Structure		HDF Data Model	Contents
Header	product metadata	Attribute	Describe unique information of the product data. (Sensor specification, Engineering value coefficients, etc.)
Data		Dataset	The example of the stored data are shown as below. • Scan time • Resampling brightness temperature data • Altitude data • Latitude and Longitude • Supplementary information • Land Sea flag • Quality information

In order to share the product structure with the product of AMSR2, there is a data area of 7.3 GHz band which is an observation frequency which does not exist in AMSR-E. Please be aware that data in the 6.9 GHz band before bias correction is stored in this area

2.2. Structure of data

The file structure of AMSR-E level 1R(HDF5) product is shown in Figure 2-1. The explanation for the product metadata is shown in Table 2-2. Moreover, the explanation for each item of the data parts shows the data size and the scale factor in Table 2-3.

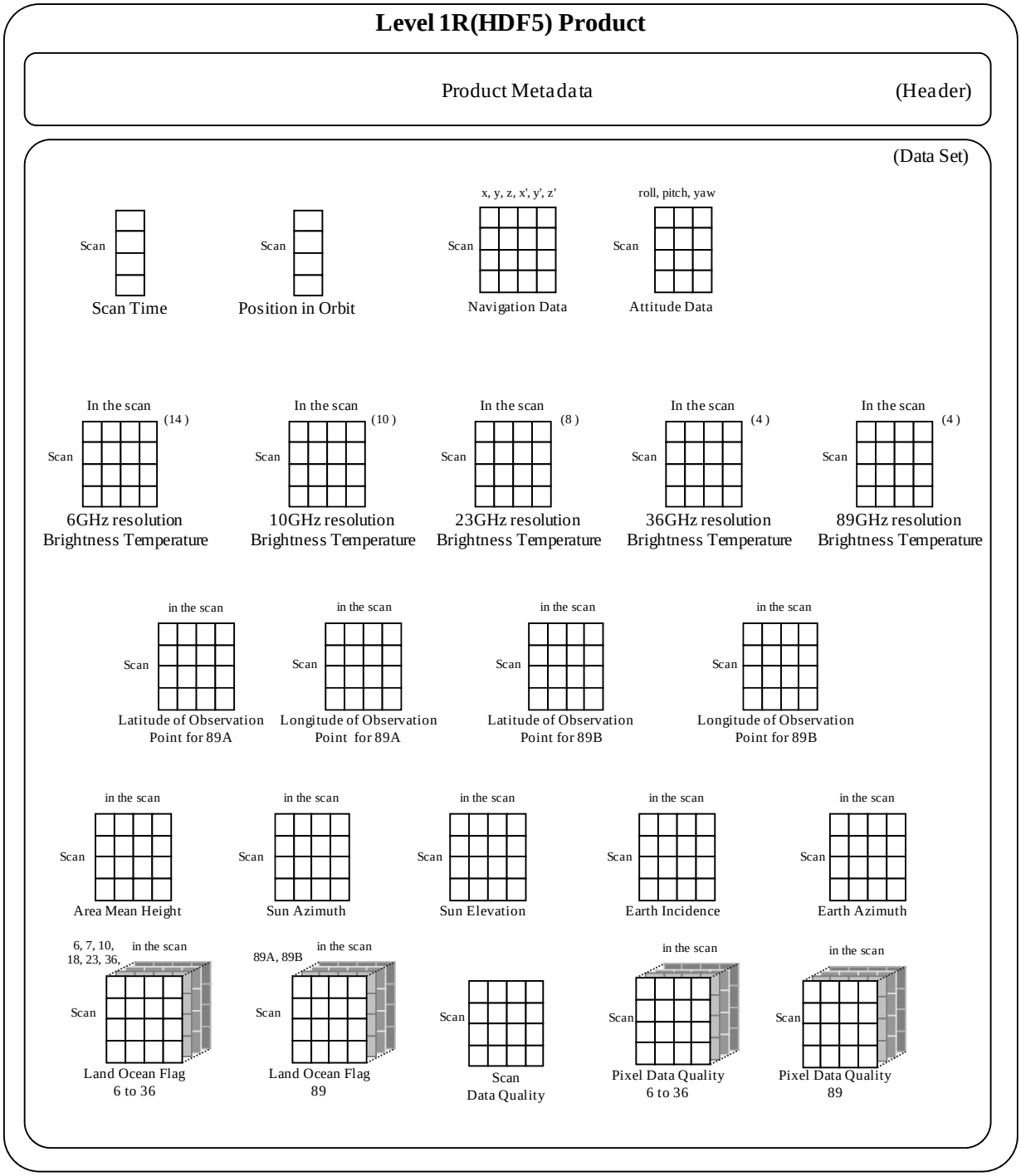


Figure 2-1 Data structure of AMSR-E Level 1R(HDF5) product

Table 2-2 Product meta items (1/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
1.	ProductName	Abbreviated name	12	AMSR-E-L1R	Fixed
2.	GeophysicalName	Geophysical quantity name	36	Brightness Temperature	Fixed
3.	ProductVersion	Product version	1	「X」 0～Z	Variable
4.	AlgorithmVersion	Algorithm version	3	「XXX」 000～999	Variable
5.	ParameterVersion	Parameter version	3	「XXX」 000～999	Variable
6.	ProductSize_MByte	Product size(MB)	8	「XXX」 000～999	Variable
7.	GranuleID	Granule ID	64	「XXXXXXXXXXX」	Variable
8.	Operation	Product kind	22	Standard	Variable
9.	ProductionDateTime	Product creation time and date (UTC)	25	[YYYY-MM-DDThh:mm:ss.uuuZ] YYYY: 0000~9999 (year) MM: 01~12 (month) DD: 01~31 (day) hh: 00~23 (hour) mm: 00~59 (minute) ss: 00~59 (second) uuu: 000~999 (millisecond)	Variable
10.	ObservationStartDateTime	Start time and date of observation data (UTC)	25	[YYYY-MM-DDThh:mm:ss.uuuZ] YYYY: 0000~9999 (year) MM: 01~12 (month) DD: 01~31 (day) hh: 00~23 (hour) mm: 00~59 (minute) ss: 00~59 (second) uuu: 000~999 (millisecond)	Variable

Table 2-2 Product meta items (2/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
11.	ObservationEndDateTime	End time and date of observation data (UTC)	25	[YYYY-MM-DDThh:mm:ss.uuuZ] YYYY: 0000~9999 (year) MM: 01~12 (month) DD: 01~31 (day) hh: 00~23 (hour) mm: 00~59 (minute) ss: 00~59 (second) uuu: 000~999 (millisecond)	Variable
12.	GringPointLatitude	Latitude of data effective range	80	83.71,73.23,34.10,-25.31,-84.97,-73.60,-23.13,36.52	Variable
13.	GringPointLongitude	Longitude of data effective range	80	152.28,91.82,-10.34,-24.72,-39.30,-105.73,-40.70,-27.99	Variable
14.	PGEName	Data processing software name	20	AMSR-E Reprocessing System	Fixed
15.	InputFileName	Input file name	128	PM1AME_200801141003_038A_L1SGBTBR_4400400.h5	Variable
16.	ProcessingCenter	Data processing center	12	JAXA JSS2	Fixed
17.	ContactOrganizationName	Contact organization name	300	JAXA Satellite Applications and Operations Center (SAOC) Address:2-1-1,Sengen,Tsukuba-city,Ibaraki,Japan	Fixed
18.	ContactOrganizationTelephone	Contact telephone number	16	Blank	Fixed
19.	StartOrbitNumber	Start orbit number	6	1251	Variable
20.	StopOrbitNumber	End orbit number	6	1251	Variable
21.	EquatorCrossingLongitude	Longitude at the time of equatorial passage	8	-28.80	Variable
22.	EquatorCrossingDateTime	Time and date of equatorial passage (UTC)	25	[YYYY-MM-DDThh:mm:ss.uuuZ] YYYY: 0000~9999 (year) MM: 01~12 (month) DD: 01~31 (day) hh: 00~23 (hour) mm: 00~59 (minute) ss: 00~59 (second) uuu: 000~999 (millisecond)	Variable
23.	OrbitDirection	Orbit direction	11	Descending Ascending	Variable
24.	PassNumber	Pass number of observation start point	4	「XXX」 0～999	Variable
25.	OrbitDataFileName	Support orbit file name	128	R1540957SGS0221003170100.RBD	Variable

Table 2-2 Product meta items (3/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
26.	EphemerisMissingDataRate	Missing rate of orbit data	5	Good	Variable
27.	AttitudeMissingDataRate	Missing rate of attitude data	5	Good	Variable
28.	OrbitDataType	Orbit data type	8	ELMP	Variable
29.	PlatformShortName	Platform name	8	AQUA	Fixed
30.	SensorShortName	Sensor name	8	AMSR-E	Fixed
31.	NumberOfScans	Number of scan	6	「XXXXX」 0～99999	Variable
32.	NumberOfMissingScans	Number of missing scans	8	1	Variable
33.	AntennaRotationVelocity	Velocity of antenna rotation	4	40.0	Fixed
34.	ECSDataModel	Meta data model name	8	B.0	Fixed
35.	NumberOfPackets	Number of level 0 packets	8	31904	Fixed
36.	NumberOfInputFiles	Number of input level 0 files	2	2	Variable
37.	NumberMissingPackets	Number of missing packets	9	1	Variable
38.	NumberOfGoodPackets	Number of packets	9	31903	Variable
39.	OverlapScans	Number of overlap scans	3	30	Fixed
40.	QALocationOfPacketDiscontinuity	Continuity of packet sequence counter	16	discontinuation	Variable
41.	EphemerisQA	Ephemeris limit check	3	OK	Variable
42.	AutomaticQAFlag	Limit check by software	5	Good	Variable
43.	ScienceQualityFlag	Quality flag of calculating geophysical quantity	8	Blank	Fixed
44.	ScienceQualityFlagExplanation	Explanation of “ScienceQualityFlag”	512	Blank	Fixed
45.	AutomaticQAFlagExplanation	Explanation of limit check by software	512	1.MissingDataQA:Less than 20 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	Variable
46.	QAPercentMissingData	Number of missing data	7	0	Variable
47.	QAPercentOutofBoundsData	Percentage of out of bound data(%)	8	0	Variable
48.	QAPercentParityErrorData	Percentage of parity error data	8	0	Variable

Table 2-2 Product meta items (4/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
49.	ProcessingQADescription	Description of the processing error	12	PROC_COMP	Variable
50.	ProcessingQAAttribute	The attribute name which is abnormal by QA metadata	128	Blank or NumberofMissingPackets	Variable
51.	GlobalMeteorologicalDataType	Used meteorolical data	8	Blank	Variable
52.	AncillaryDataInformation	Information of ancillary data	256	Blank	Variable
53.	SatelliteOrbit	The kind of satellite's orbit	36	Sun-synchronous_sub-recurrent	Fixed
54.	SatelliteAltitude	The altitude of satellite	8	707.9km	Fixed
55.	OrbitSemiMajorAxis	The orbit semi-major axis	11	7085.858km	Fixed
56.	OrbitEccentricity	The orbit eccentricity	8	0.00095	Fixed
57.	OrbitArgumentPerigee	The orbit argument perigee	11	106.480deg	Fixed
58.	OrbitInclination	The orbit inclination	9	98.15deg	Fixed
59.	OrbitPeriod	The orbit period	11	98minutes	Fixed
60.	RevisitTime	Orbit recurrent days	6	16days	Fixed
61.	AMSRChannel	The kind of AMSR-E Channels	80	6.925GHz,10.65GHz,18.7GHz,23.8GHz,36.5GHz,89.0GHz-A,89.0GHz-B	Fixed
62.	AMSRBandWidth	Band width of AMSR-E	128	6G-350MHz,10G-100MHz,18G-200MHz,23G-400MHz, 36G-1000MHz,89GA-3000MHz,89GB-3000MHz	Fixed
63.	AMSRBeamWidth	Beam width of AMSR-E	128	6G-1.8deg,10G-1.2deg,18G-0.64deg,23G-0.75deg, 36G-0.35deg,89GA-0.15deg,89GB-0.15deg	Fixed
64.	OffNadir	Off-nadir angle	34	47.0deg : 89GB, 47.5deg : others	Fixed
65.	SpatialResolution	Spatial resolution (Az x El)	192	6G-43.2kmX75.4km,10G-29.4kmX51.4km,18G-15.7kmX27.4km, 23G-18.1kmX31.5km,36G-8.2kmX14.4km, 89GA-3.7kmX6.5km,89GB-3.5kmX5.9km	Fixed
66.	ScanningPeriod	Scanning period	7	1.5sec	Fixed
67.	SwathWidth	Swath width	7	1450km (The scanning width corresponding to the -61 - +61 scan angle range of performance guarantee. In actual operation, the 1600 km of -75 - +75deg.)	Fixed
68.	DynamicRange	Dynamic range	10	2.7K-340K	Fixed
69.	DataFormatType	Data format type	9	HDF	Fixed
70.	HDFFormatVersion	HDF format version	10	Ver5.1.8.3	Fixed
71.	EllipsoidName	Earth ellipse model	6	WGS84	Fixed
72.	SemiMajorAxisofEarth	Earth equatorial radius	8	6378.1km	Fixed
73.	FlatteningRatioofEarth	Flattening ratio of the earth	7	0.00335	Fixed
74.	SensorAlignment	Sensor alignment	33	Rx=0.00000,Ry=0.00000,Rz=0.00000	Fixed
75.	Thermistor1CountRange	Thermistor#1 count rage	128	Blank	Fixed

Table 2-2 Product meta items (5/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
76.	Thermistor1ConversionTableD	Thermistor#1 conversion table D	128	Blank	Fixed
77.	Thermistor1ConversionTableE	Thermistor#1 conversion table E	128	Blank	Fixed
78.	Thermistor1ConversionTableF	Thermistor#1 conversion table F	128	Blank	Fixed
79.	Thermistor2CountRange	Thermistor#2 count rage	128	Blank	Fixed
80.	Thermistor2ConversionTableW4	Thermistor#2 conversion table W4	128	Blank	Fixed
81.	Thermistor2ConversionTableW3	Thermistor#2 conversion table W3	128	Blank	Fixed
82.	Thermistor2ConversionTableW2	Thermistor#2 conversion table W2	128	Blank	Fixed
83.	Thermistor2ConversionTableW1	Thermistor#2 conversion table W1	128	Blank	Fixed
84.	Thermistor2ConversionTableW0	Thermistor#2 conversion table W1	128	Blank	Fixed
85.	Thermistor3CountRange	Thermistor#3 count rage	128	Blank	Fixed
86.	Thermistor3ConversionTableW4	Thermistor#3 conversion table W4	128	Blank	Fixed
87.	Thermistor3ConversionTableW3	Thermistor#3 conversion table W3	128	Blank	Fixed
88.	Thermistor3ConversionTableW2	Thermistor#3 conversion table W2	128	Blank	Fixed
89.	Thermistor3ConversionTableW1	Thermistor#3 conversion table W1	128	Blank	Fixed
90.	Thermistor3ConversionTableW0	Thermistor#3 conversion table W0	128	Blank	Fixed
91.	Platinum1CountRange	Platinum#1 count rage	128	Blank	Fixed
92.	Platinum1ConversionTableW4	Platinum#1 conversion table W4	128	Blank	Fixed
93.	Platinum1ConversionTableW3	Platinum#1 conversion table W3	128	Blank	Fixed
94.	Platinum1ConversionTableW2	Platinum#1 conversion table W2	128	Blank	Fixed
95.	Platinum1ConversionTableW1	Platinum#1 conversion table W1	128	Blank	Fixed

Table 2-2 Product meta items (6/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
96.	Platinum1ConversionTableW0	Platinum#1 conversion table W0	128	Blank	Fixed
97.	Platinum2CountRange	Platinum#2 count rage	128	Blank	Fixed
98.	Platinum2ConversionTableW4	Platinum#2 conversion table W4	128	Blank	Fixed
99.	Platinum2ConversionTableW3	Platinum#2 conversion table W3	128	Blank	Fixed
100.	Platinum2ConversionTableW2	Platinum#2 conversion table W2	128	Blank	Fixed
101.	Platinum2ConversionTableW1	Platinum#2 conversion table W1	128	Blank	Fixed
102.	Platinum2ConversionTableW0	Platinum#2 conversion table W0	128	Blank	Fixed
103.	Platinum3ConversionTableW4	Platinum#3 count rage	128	Blank	Fixed
104.	Platinum3ConversionTableW3	Platinum#3 conversion table W4	128	Blank	Fixed
105.	Platinum3ConversionTableW2	Platinum#3 conversion table W3	128	Blank	Fixed
106.	Platinum3ConversionTableW1	Platinum#3 conversion table W2	128	Blank	Fixed
107.	Platinum3ConversionTableW0	Platinum#3 conversion table W1	128	Blank	Fixed
108.	CoefficientAvv	Brightness temperature coefficient Avv	192	Blank	Fixed
109.	CoefficientAhv	Brightness temperature coefficient Ahv	192	Blank	Fixed
110.	CoefficientAov	Brightness temperature coefficient Aov	192	Blank	Fixed
111.	CoefficientAhh	Brightness temperature coefficient Ahh	192	Blank	Fixed
112.	CoefficientAvh	Brightness temperature coefficient Avh	192	Blank	Fixed
113.	CoefficientAoh	Brightness temperature coefficient Aoh	192	Blank	Fixed
114.	CSMTemperature	Brightness temperature of deep space	256	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, 89GAV-2.800, 89GAH-2.800, 89GBV-2.800, 89GBH-2.800	Fixed

Table 2-2 Product meta items (7/7)

No.	Meta data name	Explanation	size	Example or Range	Fixed/Variable
115.	CoRegistrationParameterA1	Co-registration parameter A1	128	6G-1.10450, 7G-1.10450, 10G-0.65040, 18G-0.67990, 23G-0.74050, 36G-0.68490	Fixed
116.	CoRegistrationParameterA2	Co-registration parameter A2	128	6G--1.04960, 7G--1.04960, 10G--0.64760, 18G--0.20170, 23G--0.26610, 36G--0.21810	Fixed
117.	CalibrationCurveCoefficient#1	The radiometric correction coefficient for the 0th order	280	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, 89GAV--0.0278573, 89GAH--0.0447590, 89GBV--0.0273764, 89GBH--0.0316265	Fixed
118.	CalibrationCurveCoefficient#2	The radiometric correction coefficient for the 1st order	280	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, 89GAV-1.0100426, 89GAH-1.0161356, 89GBV-1.0098693, 89GBH-1.0114014	Fixed
119.	CalibrationCurveCoefficient#3	The radiometric correction coefficient for the 2nd order	280	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, 89GAV--0.0000334, 89GAH--0.0000537, 89GBV--0.0000329, 89GBH--0.0000379	Fixed
120.	CalibrationCurveCoefficient#4	The radiometric correction coefficient for the 3rd order	280	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, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Fixed
121.	CalibrationCurveCoefficient#5	The radiometric correction coefficient for the 4th order	280	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, 89GAV-0.0000000, 89GAH-0.0000000, 89GBV-0.0000000, 89GBH-0.0000000	Fixed
122.	CalibrationMethod	Calibration method name	128	RxTemperatureReferenced,SpillOver,CSMInterpolation, Absolute89GPositioning,NonlinearityCorrection	Fixed

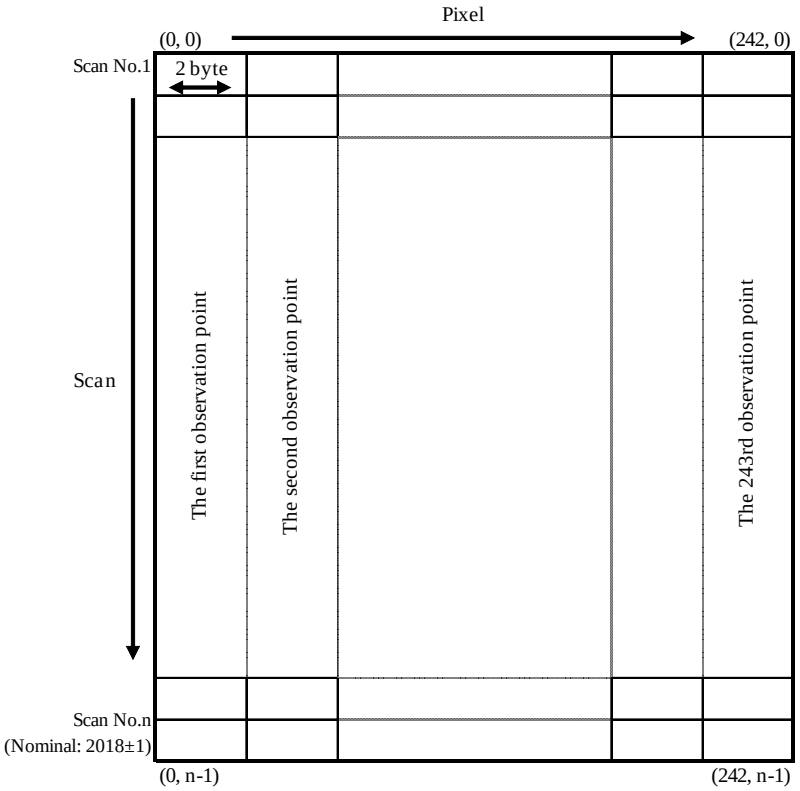
Table 2-3 Data items, size and scaling factor (1/2)

No.	Data	Sample	Bytes/Sample	Type	Bytes/Record	Records	Sum(Bytes)	Scale factor	Units
1.	Scan Time	1	8	double	8	2,040	16,320	1.00	sec
2.	Position in Orbit	1	8	double	8	2,040	16,320	1.00	-
3.	Navigation Data	6	4	float	24	2,040	48,960	1.00	m,m/s
4.	Attitude Data	3	4	float	12	2,040	24,480	1.00	deg
	<6GHz resolution>								
5.	Brightness Temperature (res06,6.9GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
6.	Brightness Temperature (res06,6.9GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
7.	Brightness Temperature (res06,7.3GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
8.	Brightness Temperature (res06,7.3GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
9.	Brightness Temperature (res06,10.7GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
10.	Brightness Temperature (res06,10.7GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
11.	Brightness Temperature (res06,18.7GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
12.	Brightness Temperature (res06,18.7GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
13.	Brightness Temperature (res06,23.8GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
14.	Brightness Temperature (res06,23.8GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
15.	Brightness Temperature (res06,36.5GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
16.	Brightness Temperature (res06,36.5GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
17.	Brightness Temperature (res06,89.0GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
18.	Brightness Temperature (res06,89.0GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
	<10GHz resolution>								
19.	Brightness Temperature (res10,10.7GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
20.	Brightness Temperature (res10,10.7GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
21.	Brightness Temperature (res10,18.7GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
22.	Brightness Temperature (res10,18.7GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
23.	Brightness Temperature (res10,23.8GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
24.	Brightness Temperature (res10,23.8GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
25.	Brightness Temperature (res10,36.5GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
26.	Brightness Temperature (res10,36.5GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
27.	Brightness Temperature (res10,89.0GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
28.	Brightness Temperature (res10,89.0GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
	<23GHz resolution>								
29.	Brightness Temperature (res23,18.7GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
30.	Brightness Temperature (res23,18.7GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K

Table 2-3 Data items, size and scaling factor (2/2)

No.	Data	Sample	Bytes/Sample	Type	Bytes/Record	Records	Sum(Bytes)	Scale factor	Units
31.	Brightness Temperature (res23,23.8GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
32.	Brightness Temperature (res23,23.8GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
33.	Brightness Temperature (res23,36.5GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
34.	Brightness Temperature (res23,36.5GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
35.	Brightness Temperature (res23,89.0GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
36.	Brightness Temperature (res23,89.0GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
	<36GHz resolution>								
37.	Brightness Temperature (res36,36.5GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
38.	Brightness Temperature (res36,36.5GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
39.	Brightness Temperature (res36,89.0GHz,V)	243	2	unsigned int	486	2,040	991,440	0.01	K
40.	Brightness Temperature (res36,89.0GHz,H)	243	2	unsigned int	486	2,040	991,440	0.01	K
	<89GHz resolution>								
41.	Brightness Temperature (original,89GHz-A,V)	486	2	unsigned int	972	2,040	1,982,880	0.01	K
42.	Brightness Temperature (original,89GHz-A,H)	486	2	unsigned int	972	2,040	1,982,880	0.01	K
43.	Brightness Temperature (original,89GHz-B,V)	486	2	unsigned int	972	2,040	1,982,880	0.01	K
44.	Brightness Temperature (original,89GHz-B,H)	486	2	unsigned int	972	2,040	1,982,880	0.01	K
45.	Latitude of Observation Point for 89A	486	4	Float	1,944	2,040	3,965,760	1.00	deg
46.	Longitude of Observation Point for 89A	486	4	Float	1,944	2,040	3,965,760	1.00	deg
47.	Latitude of Observation Point for 89B	486	4	Float	1,944	2,040	3,965,760	1.00	deg
48.	Longitude of Observation Point for 89B	486	4	Float	1,944	2,040	3,965,760	1.00	deg
49.	Area Mean Height	243	2	signed int	486	2,040	991,440	1.00	m
50.	Sun Azimuth	243	2	signed int	486	2,040	991,440	0.01	deg
51.	Sun Elevation	243	2	signed int	486	2,040	991,440	0.01	deg
52.	Earth Incidence	243	2	signed int	486	2,040	991,440	0.01	deg
53.	Earth Azimuth	243	2	signed int	486	2,040	991,440	0.01	deg
54.	Land_Ocean Flag 6 to 36	1458	1	unsigned char	1458	2,040	2,974,320	1.00	%
55.	Land_Ocean Flag 89	972	1	unsigned char	972	2,040	1,982,880	1.00	%
56.	Scan Data Quality	512	1	unsigned char	1	2,040	1,044,480	1.00	-
57.	Pixel Data Quality 6 to 36	486	1	unsigned char	486	2,040	991,440	1.00	-
58.	Pixel Data Quality 89	486	1	unsigned char	486	2,040	991,440	1.00	-
	Total(Bytes)						72,534,240		
	Total(MB)						***69.2***		

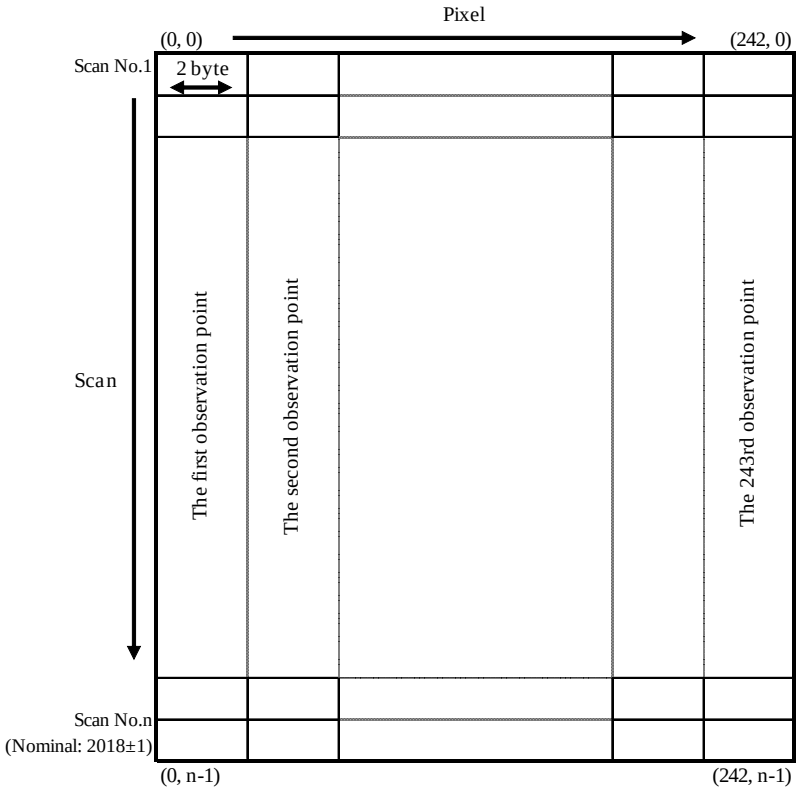
2.3. Architecture of data



<6GHz resolution>
6GHz-V Brightness Temperature
(6-H, 7-V/H, 10-V/H, 23-V/H, 36-V/H, 89-V/H has the same structure)

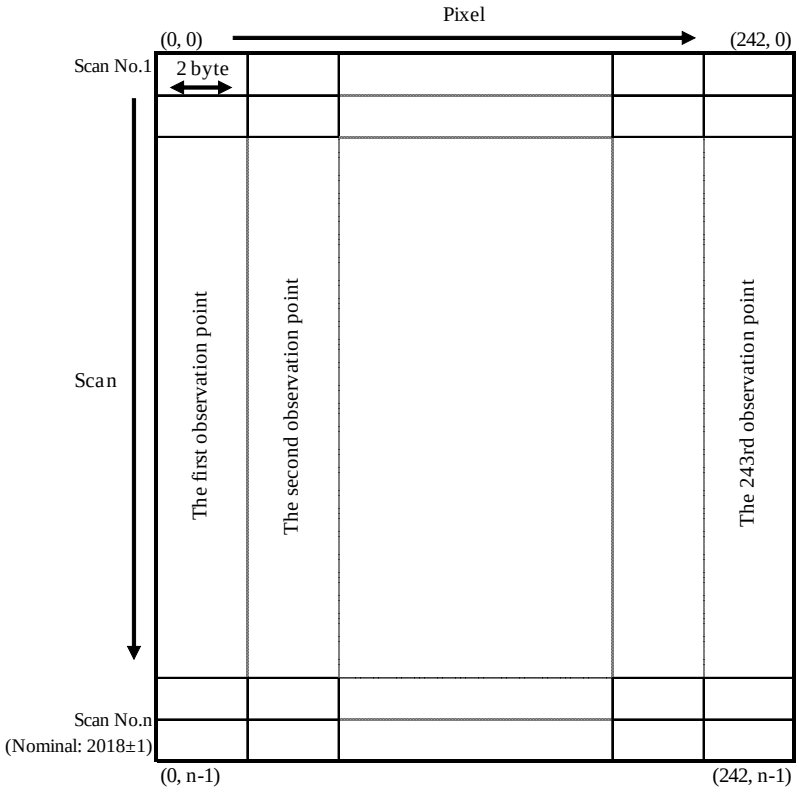
Note : Data in the 6 GHz band before bias correction is stored in 7-V/H.

Figure 2-2 Structure of 6GHz resolution Brightness Temperature



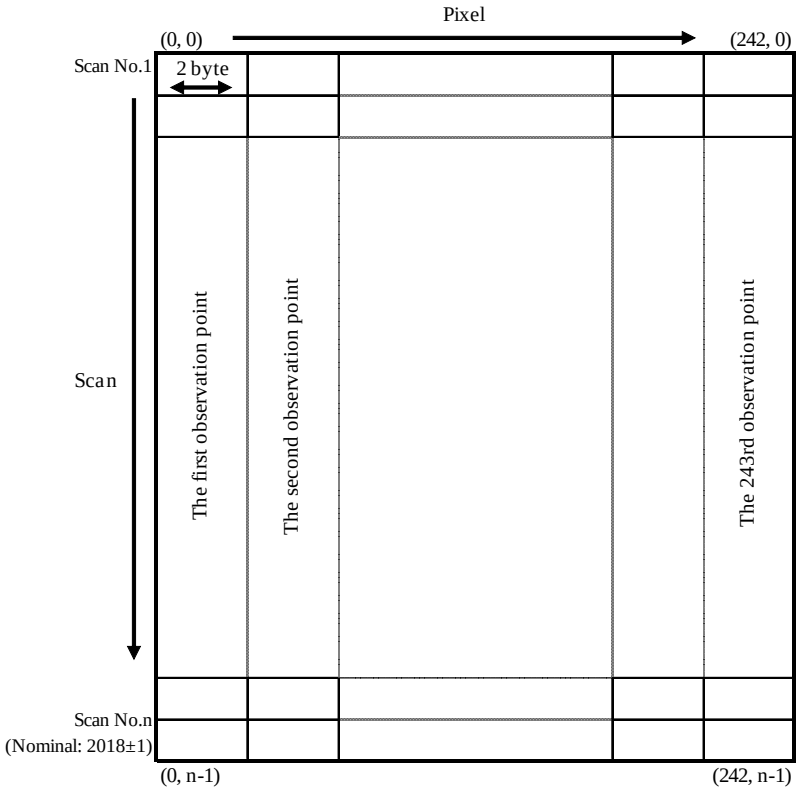
<10GHz resolution>
10GHz-V Brightness Temperature
(10-H, 23-V/H, 36-V/H, 89-V/H has the same structure)

Figure 2-3 Structure of 10GHz resolution Brightness Temperature



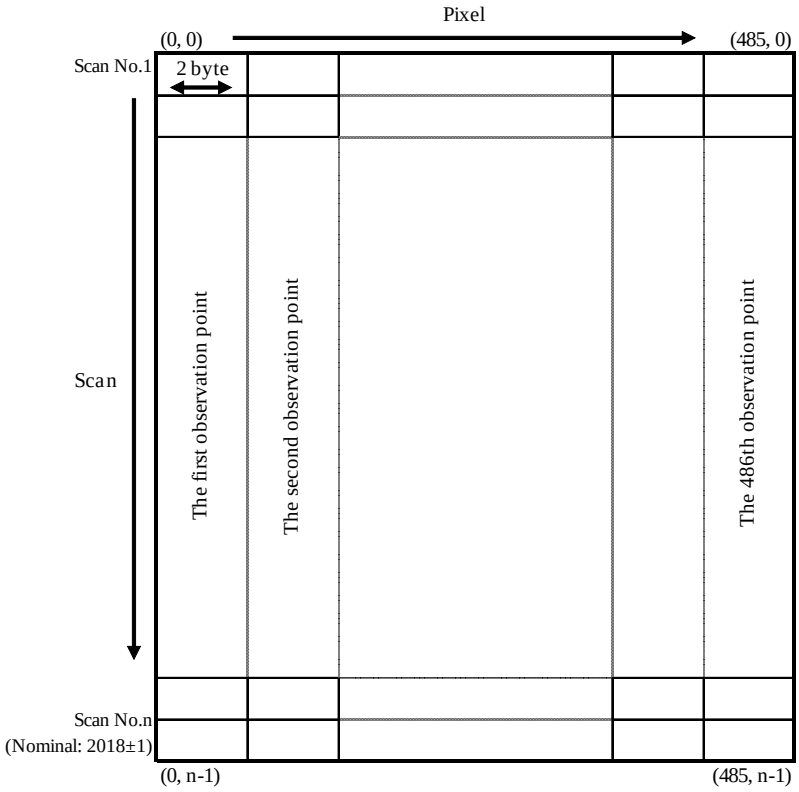
<23GHz resolution>
18GHz-V Brightness Temperature
(18-H, 23-V/H, 36-V/H, 89-V/H has the same structure)

Figure 2-4 Structure of 23GHz resolution Brightness Temperature



<36GHz resolution>
36GHz-V Brightness Temperature
(36-H, 89-V/H has the same structure)

Figure 2-5 Structure of 36GHz resolution Brightness Temperature



<89GHz resolution>
89GHzA-V Brightness Temperature
(89GHz-A-H, 89B-V/H has the same structure)

Figure 2-6 Structure of 89GHz resolution Brightness Temperature

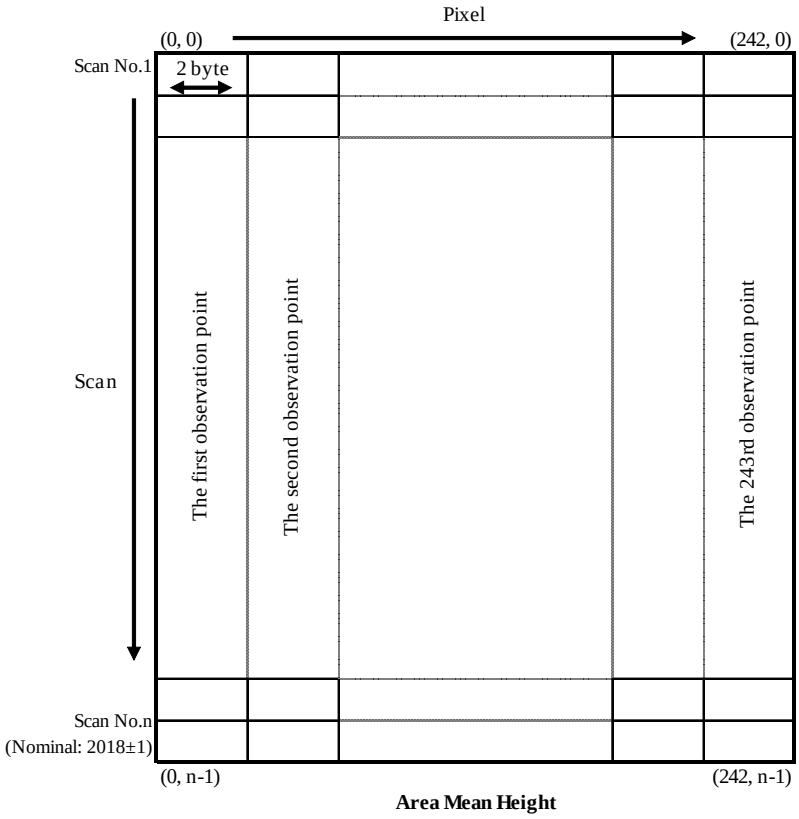


Figure 2-7 Structure of Area Mean Height

2.4. Special instruction

2.4.1. Product file name

AMSR-E Level1R(HDF5) product file name is ruled below.

File name = Granule ID + extension [.h5]

Byte Location	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
AMSR-E	P	M	1	A	M	E		Y	Y	Y	Y	M	M	D	D	H	H	m	m		P	P	P	X		L	L	x	x	K	K	K	r	d	v	a	a	a	p	p	p

Scene ID

Product ID

Scene ID

[Satellite] [Sensor] [Observation start time] [Path number] [Orbit direction]

Satellite:	PM1 (Fixed Value)
Sensor:	AME (Fixed Value)
Observation start time:	YYYYMMDDHHmm (UTC)
Path number:	PPP (001 ~ 233)
Orbit direction:	X (A: Ascending, D: Descending)

Product ID

[Process level] [Process kind] [Product ID] [Resolution] [Developer ID] [Product version] [Algorithm version] [Parameter version]

Process level:	LL (L1: Level1)
Process kind:	xx (SG: Standard operation product)
Product ID:	KKK (<L1A> ADN: Digital Number, <L1B> BTB: Brightness Temperature, <L1R> RTB: Brightness Temperature)
Resolution:	r (<L1> R: Raw (Fixed Value))
Developer ID:	d (<L1> _: underscore (Fixed Value))
Product version:	V (0 ~ 9, a ~ z)
Algorithm version:	aaa (000 ~ 999)
Parameter version:	ppp (000 ~ 999)

2.4.2. Definition of the product data range

The data range of AMSR-E L1R(HDF5) product is the half orbit defined as a scene (Figure 2-8) and extended about 30 scans at both ends. The both ends of a half orbit correspond to maximum and minimum latitude of the observation point at the center of the scan.

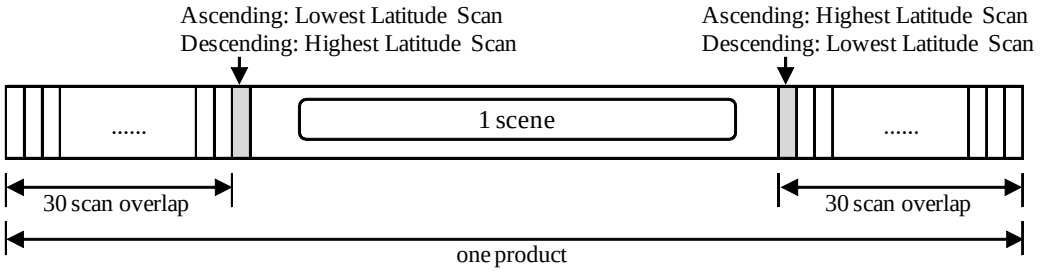


Figure 2-8 Product data range

2.4.3. Coordinate system

AMSR-E Level1R(HDF5) product 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.

2.4.4. Scaling Factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR-E Level1R(HDF5) product. The scaling factor is set for each dataset and stored with the data unit in the attribute information.

3. Data explanation

This chapter shows explanation of each data item of AMSR-E Level 1R(HDF5) product file.

3.1. Product metadata (Attribute)

(1) ProductName

Abbreviated name of the product is stored as below.

AMSR-E-L1R: AMSR-E Level1R(HDF5)

(2) GeophysicalName

The geophysical quantity name is stored as below.

Element	Content	Remarks
GeophysicalName	Brightness Temperature	

(3) ProductionVersion

The product version is stored as below.

Element	Missing	Min	Max	unit	Remarks
ProductionVerion	-	0	Z	-	single-digit or alpha-numeral

(4) AlgorithmVersion

The algorithm version is stored as below.

Element	Missing	Min	Max	unit	Remarks
AlgorithmVersion	-	000	999	-	3-digit numeral

(5) ParameterVersion

The parameter version is stored as below.

Element	Missing	Min	Max	unit	Remarks
ParameterVersion	-	000	999	-	3-digit numeral

(6) ProductSize_MByte

The product size is stored as below.

Element	Missing	Min	Max	unit	Remarks
ProductSize_MByte	-	0.0	9999.9	MByte	

(7) GranuleID

The granule ID is stored. Granule ID is unique ID for the product file.

(8) Operation

The product kind is stored as below.

Standard: Standard operation

(9) ProductionDateTime

The product creation time and date is stored.

(10) ObservationStartDateTime

The start time and date of observation data is stored.

Element	Format	Remarks
ProductionDateTime	「YYYY-MM-DDThh:mm:ss.uuuZ」 YYYY: XXXX(Year) MM: 01 ~ 12(Month) DD: 01 ~ 31(Day) hh: 00 ~ 23(Hour) mm: 00 ~ 59(Minute) ss: 00 ~ 59(Second) uuu: 000 ~ 999(Millisecond)	When the leap second is updated, “ss” may show 60.

(11) ObservationEndDateTime

The end time and date of observation data is stored.

Element	Format	Remarks
ObservationStartDateTime	「YYYY-MM-DDThh:mm:ss.uuuZ」 YYYY: XXXX(Year) MM: 01 ~ 12(Month) DD: 01 ~ 31(Day) hh: 00 ~ 23(Hour) mm: 00 ~ 59(Minute) ss: 00 ~ 59(Second) uuu: 000 ~ 999(Millisecond)	When the leap second is updated, “ss” may show 60.

(12) GringPointLatitude, GringPointLongitude

Tight representative points (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 89GHz 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”. The stored data are delimited by comma [,].

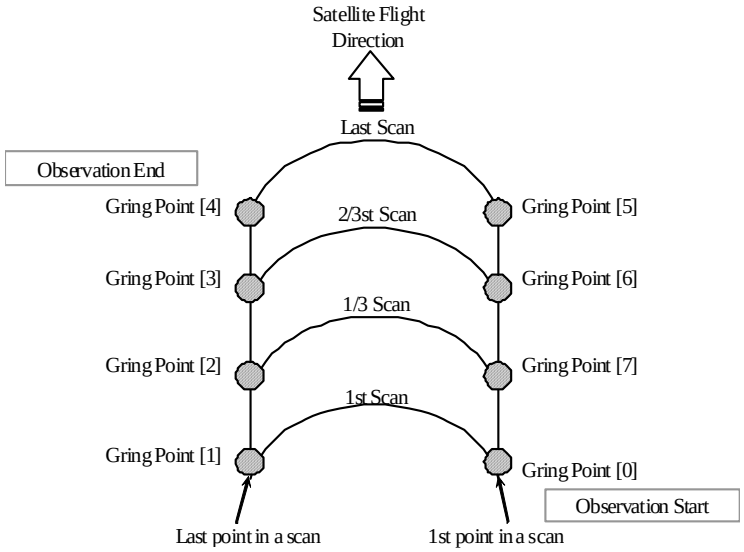


Figure 3-1 The relationship between Gring point and data location

(13) PGEName

The application name is stored.

Element	Content	Remarks
PGEName	[AMSR-E Reprocessing System]	

(14) InputFileName

The input file name are stored. If there are some input files. the stored data are delimited by comma[,].

(15) ProcessingCenter, ContactOrganizationName, ContactOrganizationTelephone

The information of data processing center is stored.

(16) StartOrbitNumber, StopOrbitNumber

The orbit numbers at the observation start and end point in the product file are stored. The orbit number shows total orbit number. this number means integrated value from the Aqua Satellite launch.

Element	Missing	Min	Max	unit	Remarks
StartOrbitNumber	-	0	9999	-	
StopOrbitNumber	-	0	9999	-	

(17) EquatorCrossingLongitude, EquatorCrossingDateTime

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

Element	Missing	Min	Max	unit	Remarks
EquatorCrossingLongitude	-	-180.0	180.0	-	

Element	Format	Remarks
EquatorCrossingDateTime	「YYYY-MM-DDThh:mm:ss.uuuZ」 YYYY: XXXX(Year) MM: 01 ~ 12(Month) DD: 01 ~ 31(Day) hh: 00 ~ 23(Hour) mm: 00 ~ 59(Minute) ss: 00 ~ 59(Second) uuu: 000 ~ 999(Millisecond)	When the leap second is updated, “ss” may show 60.

(18) OrbitDirection

The orbit direction at the observation start position is stored.

Element	Format	Remarks
OrbitDirection	[Ascending] or [Descending]	

(19) PassNumber

The pass number at the observation start point is stored.

Element	Missing	Min	Max	unit	Remarks
PassNumber	-	0	233	-	

(20) OrbitDataFileName

If the L1 process used supplemental orbit data file, the orbit file name would be stored. If there are some input files, it would be stored with comma-delimited.

(21) EphemerisMissingDataRate

The rate of the lack with orbit data is stored.

Element	Format	Remarks
EphemerisMissingDataRate	[Good] or [Fair] or [NG]	

(22) AttitudeMissingDataTate

The rate of the lack with attitude data is stored.

Element	Format	Remarks
AttitudeMissingDataRate	[Good] or [Fair] or [NG]	

(23) OrbitDataType

The orbit data type used in L1 process is stored.

Element	Format	Remarks
OrbitDataType	[ELMP]: Predictive orbit data [ELMD]: Definitive orbit data	

(24) PlatformShortName

The satellite name [AQUA] is stored.

(25) SensorShortName

The sensor name [AMSR-E] is stored.

(26) NumberOfScans

The number of scans of the observation data in the product is stored. It contains the additional scans of each 10 scans at start/end part.

Element	Missing	Min	Max	unit	Remarks
NumberOfScans	-9999	0	99999	-	

(27) NumberOfMissingScans

The number of missing scans in the product is stored. Though one scan of AMSR-E consists of 16 packets, it counts one missing scan even if one packet is lost.

Element	Missing	Min	Max	unit	Remarks
NumberOfMissingScans	-9999	0	99999	-	

(28) AntennaRotationVelocity

The rotating velocity of AMSR-E antenna is stored.

Element	Number	Remarks
AntennaRotationVelocity	40.0	Fixed

(29) ECSDataModel

The metadata model name is stored.

(30) NumberOfPackets

The number of packets is stored.

(31) NumberOfInputFiles

The number of input L0 files is stored.

Element	Missing	Min	Max	unit	Remarks
NumberOfInputFiles	-	0	9	-	

(32) NumberMissingPackets

The number of lack packets in the product file is stored.

(33) NumberOfGoodPackets

The number of packets in the product file is stored.

(34) OverlapScans

The number of one side overlap scans is stored.

Element	Number	Remarks
OverlapScans	30	Fixed

(35) QALocationOfPacketDiscontinuity

The consecutiveness of “Packet Sequence Counter” is stored.

Element	Format	Remarks
QALocationOfPacketDiscontinuity	[Continuation] or [Discontinuatioin]	

(36) EphemerisQA

The quality of satellite orbit and attitude data checked by software 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. The calculating with limit check is shown as below.

Check the satellite orbit data:

$$LowerLimit \leqq R \leqq UpperLimit$$

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

Check the satelite attitude data:

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

(37) 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.

Good: When all check items are in the state of ‘OK’.

Fair: When some check items are in the state of ‘NG’.

NG: When all check items are in the state of ‘NG’.

(38) ScienceQualityFlag

The quality flag is stored when the L2 process calculates geophysical data. In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(39) ScienceQualityFlagExplanation

The explanation of Science QualityFlag is stored. In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(40) AutomaticQAFlagExplanation

The result checked by software automatically is stored.

1.MissingDataQA:Less than 20 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

(41) QAPercentMissingData

The rate of lack scan data is stored.

Element	Missing	Min	Max	unit	Remarks
QAPercentMissingData	-	0	100	%	

(42) QAPercentOutofBoundsData

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

Element	Missing	Min	Max	unit	Remarks
QAPercentOutofBoundsData	-	0	100	%	

(43) QAPercentParityErrorData

The percentage of parity error data is stored. It is judged as error whether the parity error flag exists in the raw observation data.

Element	Missing	Min	Max	unit	Remarks
QAPercentParityErrorData	-	0	100	%	

(44) ProcessingQADescription

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

(45) ProcessingQAAttribute

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

NumberOfMissingPackets:	In case of the lack of more than 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%

(46) GlobalMeteorologicalDataType

The meteorological data type used in L2 process is stored. In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(47) AncillaryDataInformation

The ancillary data used in L2 process is stored. In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(48) SatelliteOrbit, SatelliteAltitude, OrbitSemiMajorAxis, OrbitEccentricity, OrbitArgumentPerigee, OrbitInclination, OrbitPeriod, RevisitTime

The characteristics of Aqua satellite are stored.

Element	Content	Remarks
SatelliteOrbit	[Sun-synchronous_sub-recurrent]	Fixed
SatelliteAltitude	[707.9km]	Fixed
OrbitSemiMajorAxis	[7085.858km]	Fixed
OrbitEccentricity	[0.00095]	Fixed
ORbitArgumentPerigee	[106.480deg]	Fixed
OrbitInclination	[98.15deg]	Fixed
OrbitPeriod	[98minutes]	Fixed
RevisitTime	[16days]	Fixed

(49) AMSRChannel, AMSRBandWidth, AMSRBeamWidth, OffNadir, SpatialResolution, ScanningPeriod, SwathWidth, DynamicRange

The characteristics of AMSR-E sensor are stored.

Element	Content	Format	Remarks
AMSRChannel	Observing channels of AMSR-E	[6.925GHz,10.65GHz,18.7GHz,23.8GHz, 36.5GHz,89.0GHz-A,89.0GHz-B]	Fixed
AMSRBandWidth	Bandwidth for each frequency	[6G-350MHz,10G-100MHz,18G-200MHz ,23G-400MHz,36G-1000MHz,89GA-3000 MHz,89GB-3000MHz]	Fixed
AMSRBeamWidth	Beam width for each frequency	[6G-1.8deg,10G-1.2deg,18G-0.64deg,23G -0.75deg,36G-0.35deg,89GA-0.15deg,89G B-0.15deg]	Fixed
OffNadir	The off nadir angle of 89GHz A-horn and 89GHz B-horn	[47.0deg : 89GB, 47.5deg : others]	Fixed
SpatialResolution	Spatial Resolution for each frequency	[6G-43.2kmX75.4km,10G-29.4kmX51.4k m,18G-15.7kmX27.4km,23G-18.1kmX31. 5km,36G-8.2kmX14.4km,89GA-3.7kmX6. 5km,89GB-3.5kmX5.9km]	Fixed
ScanningPeriod	Scanning period	[1.5sec]	Fixed
SwathWidth	Swath width	[1450km]	Fixed
DynamicRange	Dynamic range	[2.7K-340K]	Fixed

(50) DataFormatType, HDFFormatVersion

The format type of the product file are stored.

Element	Content	Format	Remarks
DataFormatType	Format type	[HDF]	Fixed
HDFFormatVersion	HDF Version	[Ver5.1.8.3]	Fixed

(51) EllipsoidName, SemiMajorAxisofEarth, FlatteningRatioofEarth

The earth model used in AMSR-E data processing software are stored.

Element	Content	Format	Remarks
EllipsoidName	Earth ellipsoid model	[WGS84]	Fixed
SemiMajorAxisofEarth	Semi major axis of earth	[6378.1km]	Fixed
FlatteningRatioofEarth	Flattening ratio of earth	[0.00355]	Fixed

(52) SensorAlignment

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

Element	Content	Format	Remarks
SensorAlignment	Sensor alignment	[Rx=0.00000,Ry=0.00000,Rz =0.00000]	Fixed

(53) Thermistor1CountRange, Thermistor1ConversionTableD, Thermistor1ConversionTableE, Thermistor1ConversionTableF

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(54) Thermistor2CountRange, Thermistor2ConversionTableW4, Thermistor2ConversionTableW3, Thermistor2ConversionTableW2, Thermistor2ConversionTableW1, Thermistor2ConversionTableW0

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(55) Thermistor3CountRange, Thermistor3ConversionTableW4, Thermistor3ConversionTableW3, Thermistor3ConversionTableW2, Thermistor3ConversionTableW1, Thermistor3ConversionTableW0

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(56) Platinum1CountRange, Platinum1ConversonTableW4, Platinum1ConversonTableW3, Platinum1ConversonTableW2, Platinum1ConversonTableW1, Platinum1ConversonTableW0

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(57) Platinum2CountRange, Platinum2ConversonTableW4, Platinum2ConversonTableW3, Platinum2ConversonTableW2, Platinum2ConversonTableW1, Platinum2ConversonTableW0

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(58) Platinum3ConversonTableW4, Platinum3ConversonTableW3, Platinum3ConversonTableW2, Platinum3ConversonTableW1, Platinum3ConversonTableW0

In the AMSR-E level 1R (HDF5) product, blank values are stored in this area.

(59) 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.

It is stored blank for the AMSR-E L1B(HDF5) product file.

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

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.

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

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.

(60) CSMTemperature

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

(61) CoregistrationParameterA1, CoregistrationParameterA2

Then co-registration parameter A1 and A2 are stored for each frequency. The co-registration parameter are used for calculating the position (Latitude ant Longitude) of the observing point for each frequency except 89 GHz. The latitude and longitude of each frequency (except 89GHz) 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 89GHz A-horn and observation position of even-numbered points P[m]. The elements of vector of Pt[m], *ex, ey* and ez are shown in the following formula.

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

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

$$ey = ez \times ex$$

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

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

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

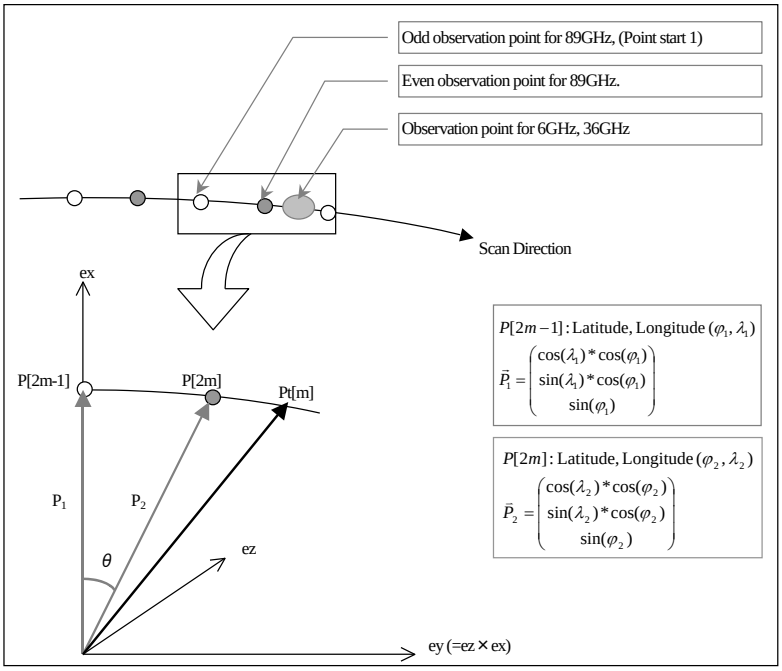


Table 3-1 the definition of the vector *ex*, *ey*, *ex*

The *ex* is the vector of the odd-numbered observation points of 89GHz 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 89GHz is calculated by the following formula.

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

(62) 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. The stored data are delimited by comma.

CalibrationCurveCoefficient#1	C0	The coefficient for 0th 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 4th 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+S1).

(63) CalibrationMethod

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

Target data	Calibration method name	Explanation
HTS Count data	HTUCoefficients	HTS calibration method is chosen one of three.
	ElectromagneticAnalysis	
	RxTemperatureReferenced	
CSM count data	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 89GHz.
Antenna temperature	NonlinearityCorrection	This is used for the nonlinear calibration of the antenna temperature.

3.2. Data Items

(1) ScanTime

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

(2) Position in Orbit

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

Position_in_Orbit = Total orbit number + Satellite position

Satellite Position = (Scan_Time – Ascending node passage time) / (98.9 * 60.0)

(3) Navigation Data

The satellite position with the WGS84 earth fixed coordinate system is stored. Orbit information is the position and velocity of the 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) Brightness Temperature (res06, 6.9GHz, V)

The observed brightness temperature of 6.9GHz vertical polarization is stored.

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

Abnormal values 65534: Parity error value , Missing value

(6) Brightness Temperature (res06, 6.9GHz, H)

The observed brightness temperature of 6.9GHz horizontal polarization is stored.

(7) Brightness Temperature (res06, 7.3GHz, V)

In the AMSR-E level 1R (HDF5) product, the observed brightness temperature of 6.9 GHz vertical polarization before bias correction is stored.

(8) Brightness Temperature (res06, 7.3GHz, H)

In the AMSR-E level 1R (HDF5) product, the observed brightness temperature of 6.9 GHz horizontal polarization before bias correction is stored.

(9) Brightness Temperature (res06, 10.7GHz, V)

The observed brightness temperature of 10.7GHz vertical polarization matched to the resolution of 6.9GHz is stored.

(10) Brightness Temperature (res06, 10.7GHz, H)

The observed brightness temperature of 10.7GHz horizontal polarization matched to resolution of 6.9GHz is stored.

(11) Brightness Temperature (res06, 18.7GHz, V)

The observed brightness temperature of 18.7GHz vertical polarization matched to the resolution of 6.9GHz is stored.

(12) Brightness Temperature (res06, 18.7GHz, H)

The observed brightness temperature of 18.7GHz horizontal polarization matched to resolution of 6.9GHz is stored.

(13) Brightness Temperature (res06, 23.8GHz, V)

The observed brightness temperature of 23.8GHz vertical polarization matched to the resolution of 6.9GHz is stored.

(14) Brightness Temperature (res06, 23.8GHz, H)

The observed brightness temperature of 23.8GHz horizontal polarization matched to resolution of 6.9GHz is stored.

(15) Brightness Temperature (res06, 36.5GHz, V)

The observed brightness temperature of 36.5GHz vertical polarization matched to the resolution of 6.9GHz is stored.

(16) Brightness Temperature (res06, 36.5GHz, H)

The observed brightness temperature of 36.5GHz horizontal polarization matched to resolution of 6.9GHz is stored.

(17) Brightness Temperature (res06, 89.0GHz, V)

The observed brightness temperature of 89.0GHz vertical polarization matched to the resolution of 6.9GHz is stored.

(18) Brightness Temperature (res06, 89.0GHz, H)

The observed brightness temperature of 89.0GHz horizontal polarization matched to resolution of 6.9GHz is stored.

(19) Brightness Temperature (res10, 10.7GHz, V)

The observed brightness temperature of 10.7GHz vertical polarization is stored.

(20) Brightness Temperature (res10, 10.7GHz, H)

The observed brightness temperature of 10.7GHz horizontal polarization is stored.

(21) Brightness Temperature (res10, 18.7GHz, V)

The observed brightness temperature of 18.7GHz vertical polarization matched to the resolution of 10.7GHz is stored.

(22) Brightness Temperature (res10, 18.7GHz, H)

The observed brightness temperature of 18.7GHz horizontal polarization matched to resolution of 10.7GHz is stored.

(23) Brightness Temperature (res10, 23.8GHz, V)

The observed brightness temperature of 23.8GHz vertical polarization matched to the resolution of 10.7GHz is stored.

(24) Brightness Temperature (res10, 23.8GHz, H)

The observed brightness temperature of 23.8GHz horizontal polarization matched to resolution of 10.7GHz is stored.

(25) Brightness Temperature (res10, 36.5GHz, V)

The observed brightness temperature of 36.5GHz vertical polarization matched to the resolution of 10.7GHz is stored.

(26) Brightness Temperature (res10, 36.5GHz, H)

The observed brightness temperature of 36.5GHz horizontal polarization matched to resolution of 10.7GHz is stored.

(27) Brightness Temperature (res10, 89.0GHz, V)

The observed brightness temperature of 89.0GHz vertical polarization matched to the resolution of 10.7GHz is stored.

(28) Brightness Temperature (res10, 89.0GHz, H)

The observed brightness temperature of 89.0GHz horizontal polarization matched to resolution of 10.7GHz is stored.

(29) Brightness Temperature (res23, 18.7GHz, V)

The observed brightness temperature of 18.7GHz vertical polarization matched to the resolution of 23.8GHz is stored.

(30) Brightness Temperature (res23, 18.7GHz, H)

The observed brightness temperature of 18.7GHz horizontal polarization matched to the resolution of 23.8GHz is stored.

(31) Brightness Temperature (res23, 23.8GHz, V)

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

(32) Brightness Temperature (res23, 23.8GHz, H)

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

(33) Brightness Temperature (res23, 36.5GHz, V)

The observed brightness temperature of 36.5GHz vertical polarization matched to the resolution of 23.8GHz is stored.

(34) Brightness Temperature (res23, 36.5GHz, H)

The observed brightness temperature of 36.5GHz horizontal polarization matched to the resolution of 23.8GHz is stored.

(35) Brightness Temperature (res23, 89.0GHz, V)

The observed brightness temperature of 89.0GHz vertical polarization matched to the resolution of 23.8GHz is stored.

(36) Brightness Temperature (res23, 89.0GHz, H)

The observed brightness temperature of 89.0GHz horizontal polarization matched to the resolution of 23.8GHz is stored.

(37) Brightness Temperature (res36, 36.5GHz, V)

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

(38) Brightness Temperature (res36, 36.5GHz, H)

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

(39) Brightness Temperature (res36, 89.0GHz, V)

The observed brightness temperature of 89.0GHz vertical polarization matched to the resolution of 36.5GHz is stored.

(40) Brightness Temperature (res36, 89.0GHz, H)

The observed brightness temperature of 89.0GHz horizontal polarization matched to the resolution of 36.5GHz is stored.

(41) Brightness Temperature (original, 89GHz-A, V)

The observed brightness temperature of 89.0GHz A-horn vertical polarization is stored.

(42) Brightness Temperature (original, 89GHz-A, H)

The observed brightness temperature of 89.0GHz A-horn horizontal polarization is stored.

(43) Brightness Temperature (original, 89GHz-B, V)

The observed brightness temperature of 89.0GHz B-horn vertical polarization is stored.

(44) Brightness Temperature (original, 89GHz-B, H)

The observed brightness temperature of 89.0GHz B-horn horizontal polarization is stored.

(45) Latitude of Observation Point for 89A

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

Data Range:	North: 0 to 90 degree / South: 0 to -90 degree
Scaling factor:	1.0
Abnormal value:	-9999.99

(46) Longitude of Observation point for 89A

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

Data Range:	-180 to 180 degree
Scaling factor:	1.0
Abnormal value:	-9999.99

(47) Latitude of Observation Point for 89B

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

(48) Longitude of Observation point for 89B

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

(49) Area Mean Height

The altitude data at the odd number point of 89.0GHz A-horn is stored. (origin 1)

Element	Missing	Min	Max	unit	Remarks
Area Mean Height	-99999.00	-15000	6000	m	

(50) Sun Azimuth

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

Data Range: -180 to 180 degree

Scaling factor: 0.1

Abnormal value -32768: The case of observation point error

The case of setting value is less than -180 degree.

32767: The case of setting value is more than 180 degree.

(51) Sun Elevation

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

Data Range: -180 to 180 degree

Scaling factor: 0.1

Abnormal value -32768: The case of observation point error

The case of setting value is less than -180 degree.

32767: The case of setting value is more than 180 degree.

(52) Earth Incidence

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

Data Range: 52.4 to 57.54 degree

Scaling factor: 0.01

Offset value: 55.0 degree

Abnormal value:

(53) Earth Azimuth

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

Data Range: -180.0 to 180.0 degree

Scaling factor: 0.01

Abnormal value:

(54) Land Ocean Flag 6 to 36, Land Ocean Flag 89

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

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

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

In the AMSR-E level1R(HDF5) product, there are 7GHz region of observation frequencies not present in AMSR-E. Information on 6GHz is stored in these area.

Element	Missing	Min	Max	unit	Remarks
Land Ocean Flag	255	0	100	%	

(55) Scan Data Quality

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 form CSM. (Direction of sun) [type: float]

The angle between the viewing vector of CSM and the direction of the sun is stored.

2) The moon direction angle from CAM. (Direction of moon) [type: float]

The angle between the viewing vector of CSM and the direction of the moon is stored.

3) The quality of the scan. (Quality information of the 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 form LSB (Least Significant Bit).

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

When the difference of the GPSR counts in about one 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 (1bit)

When the difference of the HTS temperature is more than 0.5K 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 of average tacho pulse count 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 6GHz-V, 6Ghz-H, 10GHz-V, 10GHz-H, 18GHz-V, 18GHz-H, 23GHz-V, 23GHz-H, 36GHz-V, 36GHz-H, 50GHz-V, 52GHz-V, 89GHz A-horn-V, 89GHz A-horn-H, 89GHz B-horn-V and 89GHz B-horn-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: flat]

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 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]

c) The sum of parity error for HTS count for each frequency. [type: float]

9) Spare

It is filled with 0.

(56) Pixel Data Quality 6 to 36

It is stored blank for the AMSR-E L1B(HDF5) product file.

(57) Pixel Data Quality 89

It is stored blank for the AMSR-E L1B(HDF5) product file.