AMSR2 Level 1A product format specification

- Content -

1 Introduction

1.1 Purpose

This format specification describes the format of AMSR2 level 1A product which is produced at Japan Aerospace Exploration Agency (JAXA). This document describes the structure and contents of AMSR2 level 1A product.

1.2 Overview

AMSR2 level 1A product stores the raw count data, geometric information, radiometric information, land/sea flag and supplemental data.

2 Applicable and reference documents

2.1 Applicable documents

- AMSR2 Level 1 algorithm description (SGC-090053)
- EIS granule ID prescription (NEB-060005B)

2.2 Reference documents

- AMSR-E Data Users Handbook(NCX-030021)
- AMSR-E Level 1 product format description (NEB-00011F)
- AMSR-E Level 2 format description (NDX-000272C)
- AMSR-E Level 2 Map format description (NDX-000273D)
- AMSR-E Level 3 format description (NDX-000274B)

3 Product description

AMSR2 Level 1A product stores the count value of observed microwave radiation from the earth surface and the geometric information as HDF5. The features of the product are shown as below.

3.1 Structure of product file

Table 3.1-1 AMSR2 Level 1A product file structure shows the AMSR2 Level 1A product structure.

Table 3.1-1 AMSR2 Level 1A product file structure

Structure		HDF Data	Content
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 is shown as below. ・Scanning time ・Observed count data ・HTS, CSM count data ・Latitude/Longitude ・Supplementary information ・Land Sea flag ・Quality information

3.2 Structure of data

Fig. 3.2-1 AMSR2 level 1A product data structure shows structure of AMSR2 level 1A product data. Table3.2-1Table 3.1-1 AMSR2 Level 1A product file structure shows data set specification of level 1A product data. In this regard, data size and number of records are values in case of standard operation.

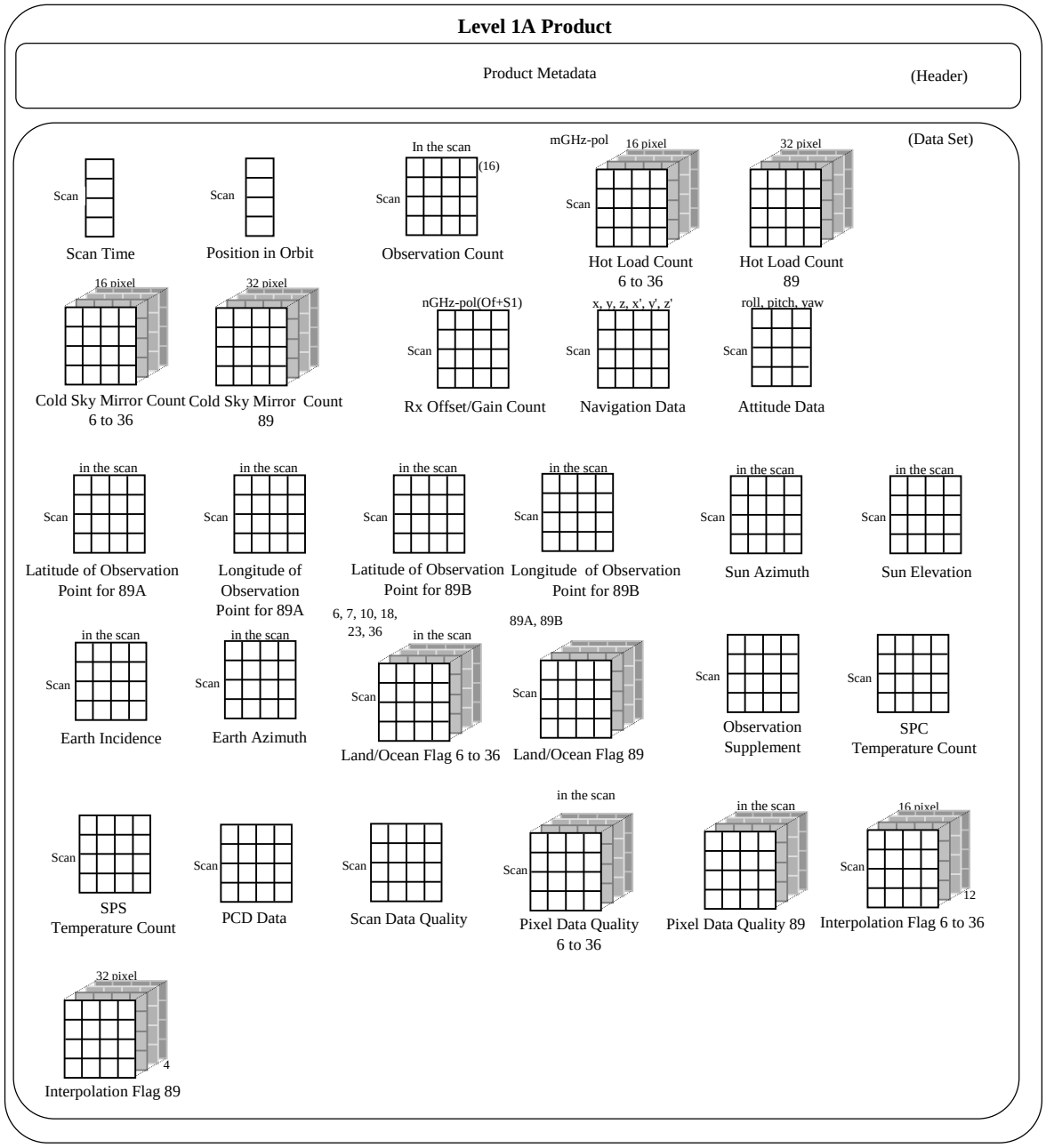


Fig. 3.2-1 AMSR2 level 1A product data structure

*The position of the observation point (latitude and longitude) at the frequency of other than 89GHz is calculated by using the observation position of the 89GHzA horn and the relative registration factors. (See P.4.1-15 - 4.1-16)

Table 3.2-1 Product metadata items(1/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
1	ProductName	12	Abbreviated name	[XXXXXXXXXX] AMSR2-L1A : Level 1A AMSR2-L1B : Level 1B AMSR2-L1R : Level 1R	Variable
2	GeophysicalName	36	Geophysical quantity name	[XXXXXXXXXXXXXXXXX] Observation Count : Observed count value Brightness Temperature: Brightness temperature	Fixed
3	ProductVersion	1	Product version	[X] 0～Z	Variable
4	AlgorithmVersion	3	Algorithm version	[XXX] 000～999	Variable
5	ParameterVersion	3	Parameter version	[XXX] 000～999	Variable
6	ProductSize_MByte	8	Product size(MByte)	[XXXXX．X]（x1024x1024byte） 0．0～99999.9	Variable
7	GranuleID	64	Granule ID	[XXXXXXXXXX]	Variable
8	Operation	22	Product kind	[XXXXXXXXXX] Standard : Standard operation NearRealTime(Global) : Near Real Time operation (Global area) NearRealTime(local) : Near Real Time operation (Local area)	Variable
9	ProductionDateTime	24	Product creation time and date (UTC)	[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)	Variable

Table 3.2-1 Product metadata items(2/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
10	ObservationStartDateTime	25	Start time and date of observation data （UTC）	[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)	Variable
11	ObservationEndDateTime	25	End time and date of observation data （UTC）	[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)	Variable
12	GringPointLatitude	80	Latitude of data effective range	Ex.) 83.71,73.23,34.10,-25.31,-84.97,-73.60,-23.13,36.52 See the section 4.2 for more information	Variable
13	GringPointLongitude	80	Longitude of data effective range	Ex.) 152.28,91.82,-10.34,-24.72,-39.30,-105.73,-40.70,-27.99 See the section 4.2 for more information	Variable
14	PGEName	20	Data processing software name	[XXXXXXXXXXX] XXXXXXXXXXX : Strings	Fixed
15	InputFileName	128	Input file name (Level0 data file name)	Ex.) GW1AM2_201209090530_002D_L0S1576E.bin, GW1AM2_201209090620_002A_L0S1576E.bin	Variable
16	ProcessingCenter	12	Data processing center	[XXXXXXXXXXX] XXXXXXXXXXX : Strings	Fixed
17	ContactOrganizationName	300	Contact organization name	[XXXXXXXXXXX] XXXXXXXXXXX : Strings	Fixed
18	ContactOrganizationTelephone	16	Contact telephone number	[+050-0000-0000] Strings	Fixed

Table 3.2-1 Product metadata items(3/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
19	StartOrbitNumber	6	Start orbit number	[XXXXX] 0～99999	Variable
20	StopOrbitNumber	6	End orbit number	[XXXXX] 0～99999	Variable
21	EquatorCrossingLongitude	8	Longitude at the time of equatorial passage	[XXXX.XX] -180.00～180.00	Variable
22	EquatorCrossingDateTime	25	Time and date of equatorial passage （UTC）	[YYYY-MM-DD T hh: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)	Variable
23	OrbitDirection	11	Orbit direction	[XXXXXXXXX] Ascending Descending	Variable
24	PassNumber	4	Pass number of observation start point	[XXX] 0～999	Variable
25	OrbitDataFileName	128	Support orbit file name	[XXXXX] Strings It may be blank, when the process didn’t use this file.	Variable
26	EphemerisMissingDataRate	5	Missing rate of orbit data	[XXXXX] Good Fair NG	Variable
27	AttitudeMissingDataRate	5	Missing rate of attitude data	[XXXXX] Good Fair NG	Variable
28	OrbitDataType	8	orbit data type	[XXXXXXXX] ONBOARD:On board data ELMD：Defined orbit data ELMP：Forecast orbit data	Variable

Table 3.2-1 Product metadata items(4/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
29	PlatformShortName	8	Platform name	[XXXXXXXX] GCOM-W1	Fixed
30	SensorShortName	8	Sensor names	[XXXXXXXX] AMSR2	Fixed
31	NumberOfScans	6	Number of scan	[XXXXX] 0～99999	Variable
32	NumberOfMissingScans	8	Number of missing scans	[XXXXX] 0～99999	Variable
33	AntennaRotationVelocity	4	Velocity of antenna rotation （30～40rpm）	[XX.X] 30.0～40.0	Variable
34	ECSDataModel	8	Meta data model name	[B.0] String	Fixed
35	NumberOfPackets	8	Number of level 0 packets	Blank	Fixed
36	NumberOfInputFiles	2	Number of input level 0 files	[X] 0～9	Variable
37	NumberMissingPackets	9	Number of missing packets	[XXXXX] 0～99999999	Variable
38	NumberOfGoodPackets	9	Number of packets	[XXXXX] 0～99999999	Variable
39	OverlapScans	3	Number of overlap scans(One side）	20	Fixed
40	QALocationOfPacketDiscontinuity	16	Continuity of Packet Sequence Counter	[XXXXXXXXXXXXXXXX] Continuation Discontinuation	Variable
41	EphemerisQA	3	Ephemeris limit check	[XX] OK NG	Variable
42	AutomaticQAFlag	5	Limit check by software	[XX] Good Fair NG	Variable
43	ScienceQualityFlag	8	Quality flag of calculating geophysical quantity	Blank * Blank in the Level 1 product	Fixed
44	ScienceQualityFlagExplanation	512	Explanation of “ScienceQualityFlag”	Blank * Blank in the Level 1 product	Fixed

Table 3.2-1 Product metadata items(5/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
45	AutomaticQAFlagExplanation	512	Explanation of limit check by software	1.MissingScanQA:Less than 21 is available->OK, 2.MissingDataQA:Less than 321 is available->OK, 3.AntennaRotationQA:Less than 21 is available->OK, 4.HotCalibrationSourceQA:Less than 21 is available->OK, 5.AttitudeDataQA:Less than 21 is available->OK, 6.EphemerisDataQA:Less than 21 is available->OK, 7.QualityofGeometricInformationQA:Less than 1 is available->OK, 8.BrightnessTemperatureQA:Less than 21 is available->OK	Variable
46	QAPercentMissingData	7	Number of missing data	[XXX.XX] 0～100,-9999	Variable
47	QAPercentOutofBoundsData	8	Percentage of out of bound data(%)	[XXX] 0～100	Variable
48	QAPercentParityErrorData	8	Percentage of parity error data	[XXX.XX] 0～100,-32768	Variable
49	ProcessingQADescription	12	Description of the processing error	[XXXXXXXXXXXXXXXX] Strings	Variable
50	ProcessingQAAttribute	128	The attribute name which is abnormal by QA metadata	[XXXXXXXXXXXXXXXX] Strings	Variable
51	GlobalMeteorologicalDataType	8	Used meteorological data	[XXX] Analysis : Process didn't use Analysis meteorological data Forecast : Process didn't use Forecast meteorological data None : Process didn't use meteorological data * Blank in the Level 1 product	Variable
52	AncillaryDataInformation	256	Information of ancillary data (Used data in Level 2 process)	[XXXXXX] Strings * Blank in the Level 1 product	Variable
53	SatelliteOrbit	36	The kind of Satellite's orbit	Sun-synchronous_sub-recurrent	Fixed
54	SatelliteAltitude	8	The altitude of Satellite	699.6km	Fixed
55	OrbitSemiMajorAxis	11	The orbit semi-major axis	7085.858km	Fixed
56	OrbitEccentricity	8	The orbit eccentricity	Frozen	Fixed
57	OrbitArgumentPerigee	11	The orbit argument perigee	-	Fixed
58	OrbitInclination	9	The orbit inclination	98.186deg	Fixed
59	OrbitPeriod	11	The orbit period	98.8min	Fixed

Table 3.2-1 Product metadata items(6/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
60	RevisitTime	6	Orbit recurrent days	16days	Fixed
61	AMSRChannel	80	The kind of AMSR channels	Ex.) 6.925GHz,7.3GHz,10.65GHz,18.7GHz,23.8GHz,36.5GHz,89.0GHz-A,89.0GHz-B	Fixed
62	AMSRBandWidth	128	Band width of AMSR	Ex.) 6G-350MHz, 7G-350MHz, 10G-100MHz, 18G-200MHz, 23G-400MHz,36G-1000MHz, 89GA-3000MHz, 89GB-3000MHz	Fixed
63	AMSRBeamWidth	128	Beam width of AMSR	Ex.) 6G-1.8deg,7G-1.8deg,10G-1.2deg,18G-0.64deg,23G-0.75deg, 36G-0.35deg,89GA-0.15deg,89GB-0.15deg	Fixed
64	OffNadir	34	Off-nadir angle	Ex.) 47.0deg : 89GB, 47.5deg : others	Fixed
65	SpatialResolution	192	Spatial resolution (Az x El)	Ex.) 6G-35kmX61km,7G-35kmX61km,10G-24kmX41km,18G-13kmX22km,23G-15kmX26km,36G-7kmX12km,89GA-3kmX5km,89GB-3kmX5km	Fixed
66	ScanningPeriod	7	Scanning period	Ex.) 1.5sec	Fixed
67	SwathWidth	7	Swath width	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	10	Dynamic range	Ex.) 2.7K-340K	Fixed
69	DataFormatType	9	Data format type	Ex.) HDF	Fixed
70	HDFFormatVersion	10	HDF format version	Ex.) Ver5.1.8.4	Fixed
71	EllipsoidName	6	Earth ellipse model	Ex.) WGS84	Fixed
72	SemiMajorAxisofEarth	8	earth equatorial radius	Ex.) 6378.1km	Fixed
73	FlatteningRatioofEarth	7	Flattening ratio of earth	Ex.) 0.00335	Fixed
74	SensorAlignment	33	Sensor alignment	Roll(Rx),Pitch(Ry),Yaw(Rz)	Fixed
75	Thermistor1CountRange	128	Thermistor#1 count range	See 4.1 (49) (49)	Fixed
76	Thermistor1ConversionTableD	128	Thermistor#1 conversion table D	See 4.1 (49)	Fixed
77	Thermistor1ConversionTableE	128	Thermistor#1 conversion table E	See 4.1 (49)	Fixed
78	Thermistor1ConversionTableF	128	Thermistor#1 conversion table F	See 4.1 (49)	Fixed
79	Thermistor2CountRange	128	Thermistor#2 count range	See 4.1 (50)	Fixed
80	Thermistor2ConversionTableW4	128	Thermistor#2 conversion table W4	See 4.1 (50)	Fixed

Table 3.2-1 Product metadata items(7/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
81	Thermistor2ConversionTableW3	128	Thermistor#2 conversion table W3	See 4.1 (50)	Fixed
82	Thermistor2ConversionTableW2	128	Thermistor#2 conversion table W2	See 4.1 (50)	Fixed
83	Thermistor2ConversionTableW1	128	Thermistor#2 conversion table W1	See 4.1 (50)	Fixed
84	Thermistor2ConversionTableW0	128	Thermistor#2 conversion table W0	See 4.1 (50)	Fixed
85	Thermistor3CountRange	128	Thermistor#3 count range	See 4.1 (51)	Fixed
86	Thermistor3ConversionTableW4	128	Thermistor#3 conversion table W4	See 4.1 (51)	Fixed
87	Thermistor3ConversionTableW3	128	Thermistor#3 conversion table W3	See 4.1 (51)	Fixed
88	Thermistor3ConversionTableW2	128	Thermistor#3 conversion table W2	See 4.1 (51)	Fixed
89	Thermistor3ConversionTableW1	128	Thermistor#3 conversion table W1	See 4.1 (51)	Fixed
90	Thermistor3ConversionTableW0	128	Thermistor#3 conversion table W0	See 4.1 (51)	Fixed
91	Platinum1CountRange	128	Platinum#1 count range	See 4.1 (52)	Fixed
92	Platinum1ConversionTableW4	128	Platinum#1 conversion table W4	See 4.1 (52)	Fixed
93	Platinum1ConversionTableW3	128	Platinum#1 conversion table W3	See 4.1 (52)	Fixed
94	Platinum1ConversionTableW2	128	Platinum#1 conversion table W2	See 4.1 (52)	Fixed
95	Platinum1ConversionTableW1	128	Platinum#1 conversion table W1	See 4.1 (52)	Fixed
96	Platinum1ConversionTableW0	128	Platinum#1 conversion table W0	See 4.1 (52)	Fixed
97	Platinum2CountRange	128	Platinum#2 count range	See 4.1 (53)	Fixed
98	Platinum2ConversionTableW4	128	Platinum#2 conversion table W4	See 4.1 (53)	Fixed
99	Platinum2ConversionTableW3	128	Platinum#2 conversion table W3	See 4.1 (53)	Fixed
100	Platinum2ConversionTableW2	128	Platinum#2 conversion table W2	See 4.1 (53)	Fixed
101	Platinum2ConversionTableW1	128	Platinum#2 conversion table W1	See 4.1 (53)	Fixed
102	Platinum2ConversionTableW0	128	Platinum#2 conversion table W0	See 4.1 (53)	Fixed
103	Platinum3ConversionTableW4	128	Platinum#3 conversion table W4	See 4.1 (54)	Fixed
104	Platinum3ConversionTableW3	128	Platinum#3 conversion table W3	See 4.1 (54)	Fixed
105	Platinum3ConversionTableW2	128	Platinum#3 conversion table W2	See 4.1 (54)	Fixed
106	Platinum3ConversionTableW1	128	Platinum#3 conversion table W1	See 4.1 (54)	Fixed
107	Platinum3ConversionTableW0	128	Platinum#3 conversion table W0	See 4.1 (54)	Fixed
108	CoefficientAvv	192	Brightness temperature coefficient Avv	See 4.1 (55)	Fixed
109	CoefficientAhv	192	Brightness temperature coefficient Ahv	See 4.1 (55)	Fixed
110	CoefficientAov	192	Brightness temperature coefficient Aov	See 4.1 (55)	Fixed
111	CoefficientAhh	192	Brightness temperature coefficient Ahh	See 4.1 (55)	Fixed
112	CoefficientAvh	192	Brightness temperature coefficient Avh	See 4.1 (55)	Fixed
113	CoefficientAoh	192	Brightness temperature coefficient Aoh	See 4.1 (55)	Fixed

Table 3.2-1 Product metadata items(8/9)

No	MetaDataName	DataSize	Explanation	Example or Range	Fixed/ Variable
114	CSMTemperature	256	Brightness temperature of deep space	See 4.1 (56)	Fixed
115	CoRegistrationParameterA1	128	Co-registration parameter A1	See 4.1 (57)	Fixed
116	CoRegistrationParameterA2	128	Co-registration parameter A2	See 4.1 (57)	Fixed
117	CalibrationCurveCoefficient#1	280	The radiometric correction coefficient for the 0th order	See 4.1 (58)	Fixed
118	CalibrationCurveCoefficient#2	280	The radiometric correction coefficient for the 1st order	See 4.1 (58)	Fixed
119	CalibrationCurveCoefficient#3	280	The radiometric correction coefficient for the 2nd order	See 4.1 (58)	Fixed
120	CalibrationCurveCoefficient#4	280	The radiometric correction coefficient for the 3rd order	See 4.1 (58)	Fixed
121	CalibrationCurveCoefficient#5	280	The radiometric correction coefficient for the 4th order	See 4.1 (58)	Fixed
122	CalibrationMethod	128	Calibration method name	See 4.1 (59)	Fixed

Table 3.2-2 Data set list(0/2)

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
1	Product Meta Data	100	100	-	10,000	1	10,000	-	-
2	Scan Time	1	8	double	8	2,018	16,144	1.00	sec
3	Position in Orbit	1	8	double	8	2,018	16,144	1.00	-
4	Navigation Data	6	4	float	24	2,018	48,432	1.00	m,m/s
5	Attitude Data	3	4	float	12	2,018	24,216	1.00	deg
6	Observation Count (6.9GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
7	Observation Count (6.9GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
8	Observation Count (7.3GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
9	Observation Count (7.3GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
10	Observation Count (10.7GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
11	Observation Count (10.7GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
12	Observation Count (18.7GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
13	Observation Count (18.7GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
14	Observation Count (23.8GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
15	Observation Count (23.8GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
16	Observation Count (36.5GHz,V)	243	2	signed int	486	2,018	980,748	1.00	Count
17	Observation Count (36.5GHz,H)	243	2	signed int	486	2,018	980,748	1.00	Count
18	Observation Count (89.0GHz-A,V)	486	2	signed int	972	2,018	1,961,496	1.00	Count
19	Observation Count (89.0GHz-A,H)	486	2	signed int	972	2,018	1,961,496	1.00	Count
20	Observation Count (89.0GHz-B,V)	486	2	signed int	972	2,018	1,961,496	1.00	Count
21	Observation Count (89.0GHz-B,H)	486	2	signed int	972	2,018	1,961,496	1.00	Count
22	Hot Load Count 6 to 36	192	2	signed int	384	2,018	774,912	1.00	Count
23	Hot Load Count 89	128	2	signed int	256	2,018	516,608	1.00	Count
24	Cold Sky Mirror Count 6 to 36	192	2	signed int	384	2,018	774,912	1.00	Count
25	Cold Sky Mirror Count 89	128	2	signed int	256	2,018	516,608	1.00	Count
26	Rx Offset_Gain Count	32	2	unsigned int	64	2,018	129,152	1.00	Count
27	Latitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg
28	Longitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg

Table 3.2-2 Data set list(1/2)

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
29	Latitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg
30	Longitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg
31	Sun Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
32	Sun Elevation	243	2	signed int	486	2,018	980,748	0.01	deg
33	Earth Incidence	243	2	signed int	486	2,018	980,748	0.01	deg
34	Earth Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
35	Land_Ocean Flag 6 to 36	1,458	1	unsigned char	1,458	2,018	2,942,244	1.00	%
36	Land_Ocean Flag 89	972	1	unsigned char	972	2,018	1,961,496	1.00	%
37	Observation Supplement	124	2	binary (*1)	248	2,018	500,464	-	-
38	SPC Temperature Count	34	2	unsigned int	68	2,018	137,224	1.00	Count
39	SPS Temperature Count	46	2	unsigned int	92	2,018	185,656	1.00	Count
40	PCD Data	1	64	binary (*2)	64	2,018	129,152	-	-
41	Scan Data Quality	1	512	binary (*3)	512	2,018	1,033,216	-	-
42	Pixel Data Quality 6 to 36	243	2	binary (*4)	486	2,018	980,748	-	-
43	Pixel Data Quality 89	486	1	Unsigned char	486	2,018	980,748	-	-
44	Interpolation Flag 6 to 36	192	1	binary (*5)	192	2,018	387,456	-	-
45	Interpolation Flag 89	128	1	binary (*6)	128	2,018	258,304	-	-
	Total(Bytes)						51,553,756		
	Total(MB)						***49.17***		

(*1) The actual Product (HDF), it is stored as an “unsigned char” array of 248 elements. The 1 sample means every 2byte data. (Big Endian)

(*2) The actual Product (HDF), it is stored as an “unsigned char” array of 64 elements. The 1 sample means 64byte. (Big Endian)

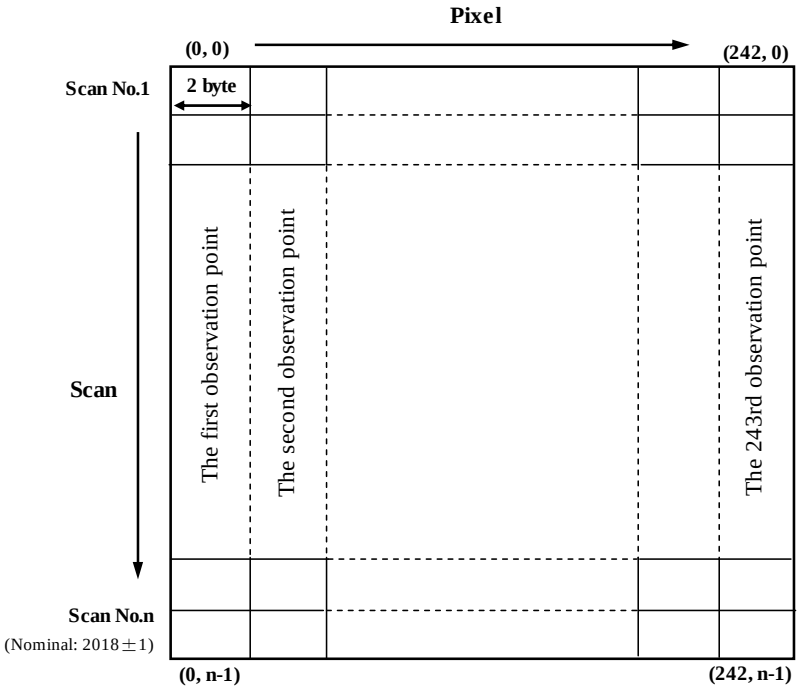
(*3) The actual Product (HDF), it is stored as an “unsigned char” array of 512 elements. The 1 sample means 512byte. (Little Endian)

(*4) The actual Product (HDF), it is stored as an “unsigned char” array of 486 elements. The 1 sample means every 2byte data. (Big Endian)

(*5) The actual Product (HDF), it is stored as an “unsigned char” array of 16*12ch elements.

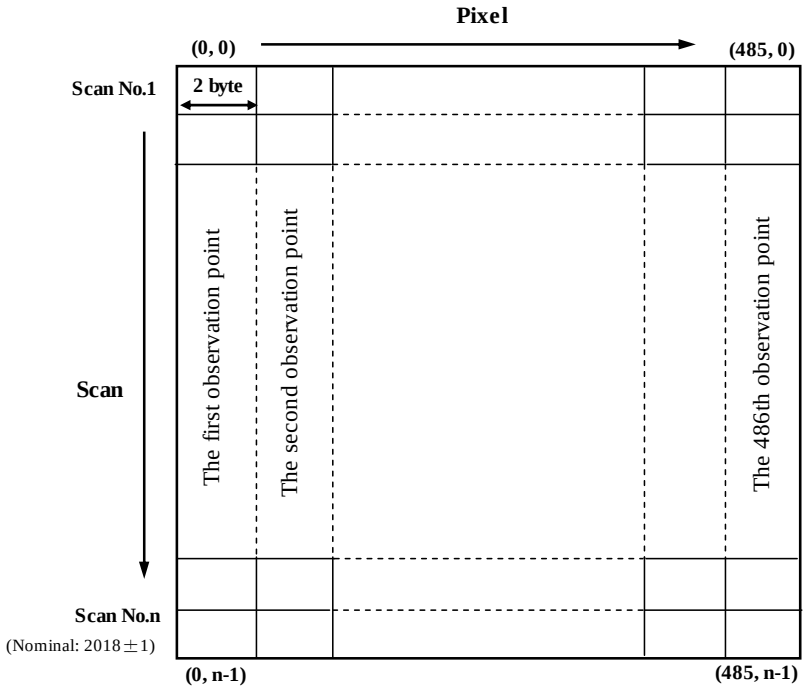
(*6) The actual Product (HDF), it is stored as an “unsigned char” array of 32*4ch elements.

3.3 Architecture of data



Observation Count (6.9GHz,V)

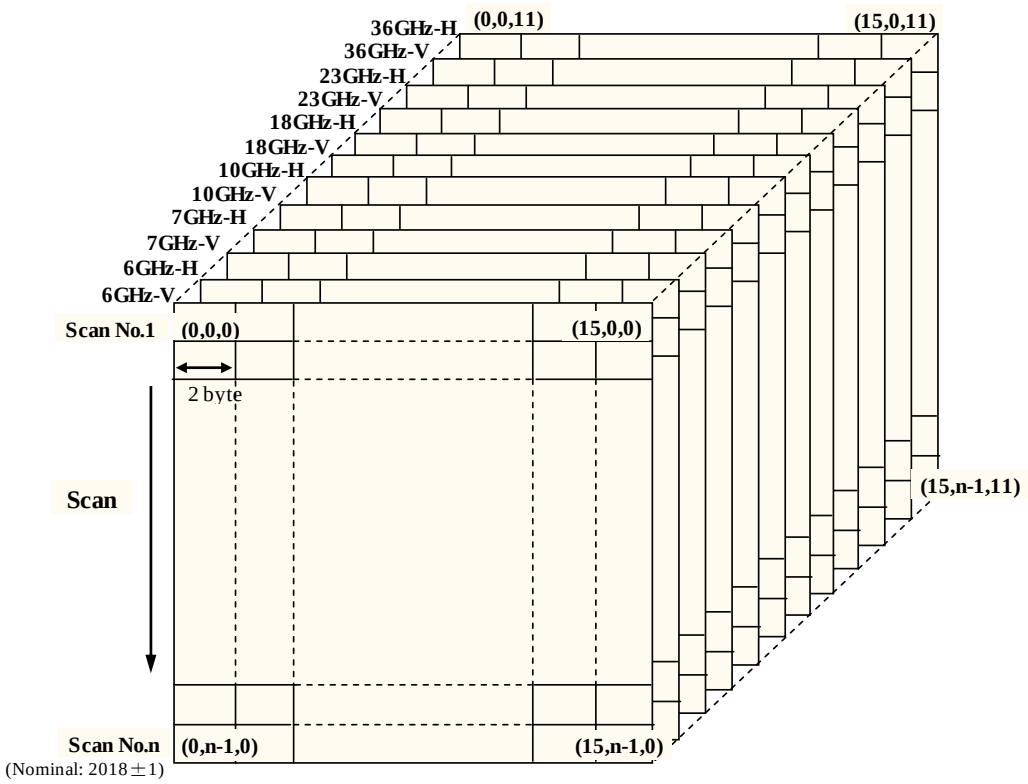
(6-V/H, 7-V/H, 10-V/H, 18-V/H, 23-V/H, 36-V/H have the same structure)



Observation Count (89.0GHz-V)

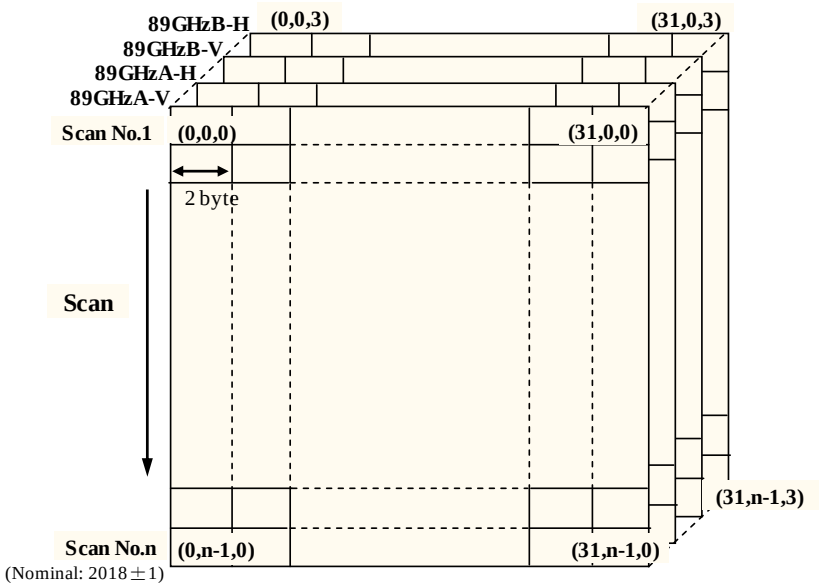
(89A-H, 89B-V/H have the same structure)

Fig. 3.3-1 Structure of Observation Count



Hot Load Count 6 to 36
Cold Sky Mirror Count 6 to 36

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



Hot Load Count 89

Fig. 3.3-2 Structure of Hot Load Count / Cold Sky Mirror Count

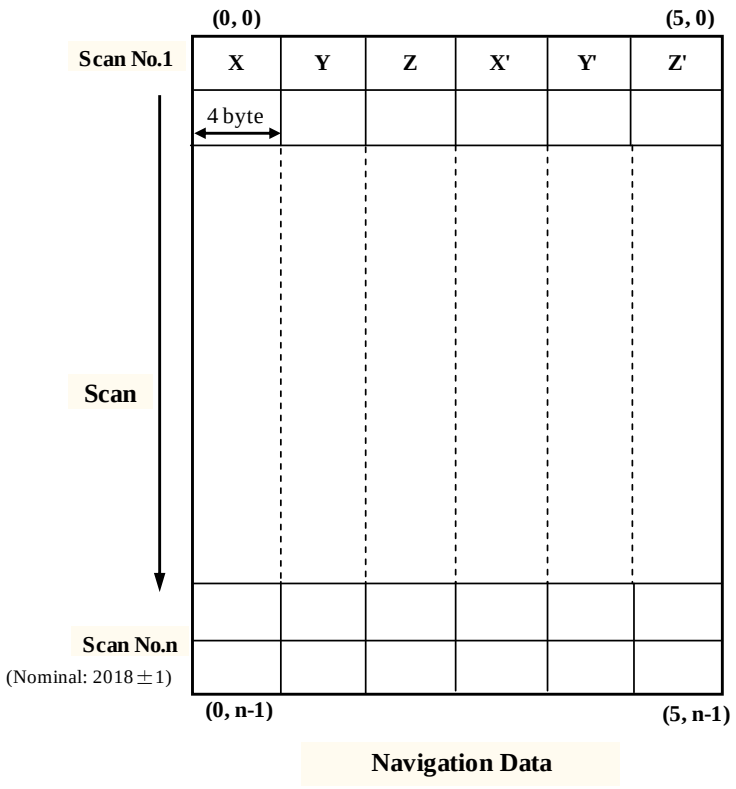
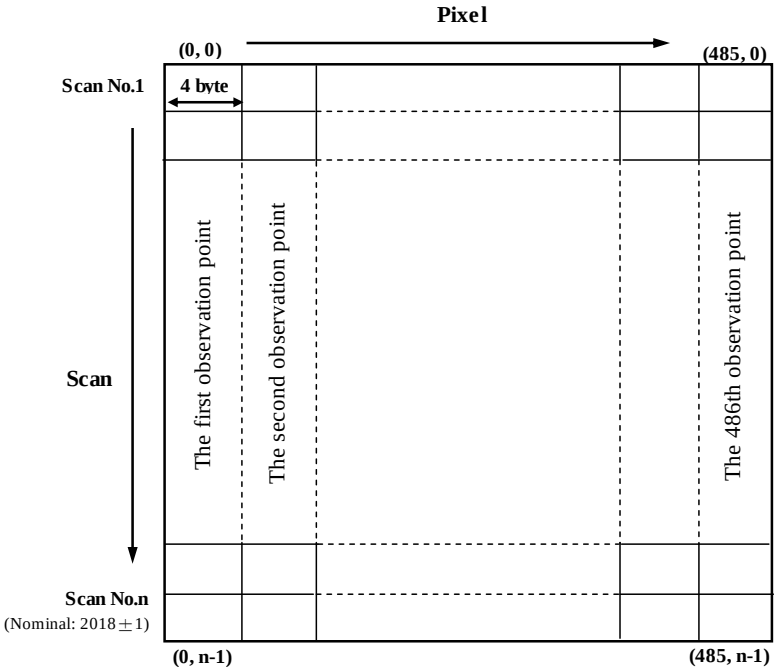


Fig. 3.3-3 Structure of Navigation Data / Attitude Data

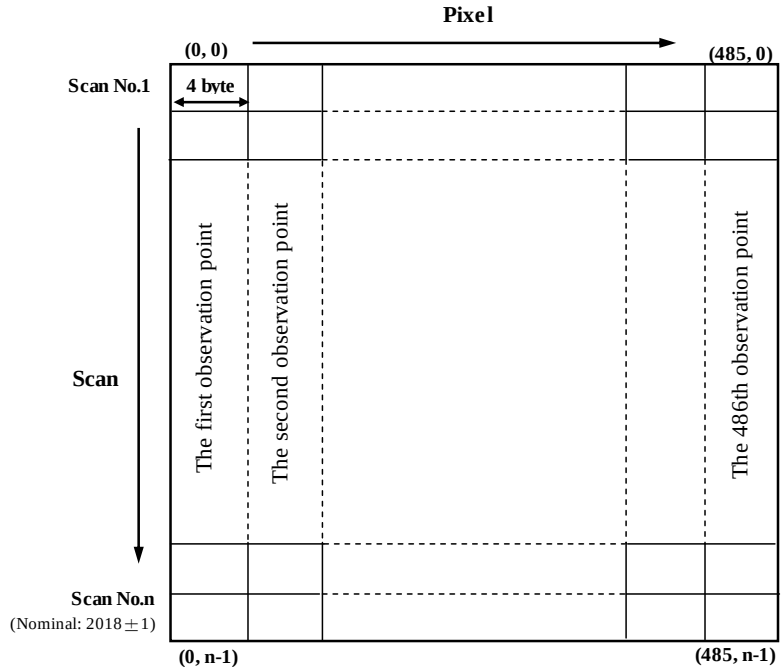
No.	Name	Scan Num (0,0) →				ASD WORD Number (0,n)
1	6 GHz-V Rx Offset					
2	6 GHz-V Rx Gain					
3	6 GHz-H Rx Offset					
4	6 GHz-H Rx Gain					
5	7 GHz-V Rx Offset					
6	7 GHz-V Rx Gain					
7	7 GHz-H Rx Offset					
8	7 GHz-H Rx Gain					
9	10 GHz-V Rx Offset					
10	10 GHz-V Rx Gain					
11	10 GHz-H Rx Offset					
12	10 GHz-H Rx Gain					
13	18 GHz-V Rx Offset					
14	18 GHz-V Rx Gain					
15	18 GHz-H Rx Offset					
16	18 GHz-H Rx Gain					
17	23 GHz-V Rx Offset					
18	23 GHz-V Rx Gain					
19	23 GHz-H Rx Offset					
20	23 GHz-H Rx Gain					
21	36 GHz-V Rx Offset					
22	36 GHz-V Rx Gain					
23	36 GHz-H Rx Offset					
24	36 GHz-H Rx Gain					
25	89 GHzA-V Rx Offset					
26	89 GHzA-V Rx Gain					
27	89 GHzA-H Rx Offset					
28	89 GHzA-H Rx Gain					
29	89 GHzB-V Rx Offset					
30	89 GHzB-V Rx Gain					
31	89 GHzB-H Rx Offset					
32	89 GHzB-H Rx Gain					

Fig. 3.3-4 Structure of Rx Offset/Gain Count



Latitude of Observation Point for 89A
Longitude of Observation Point for 89A

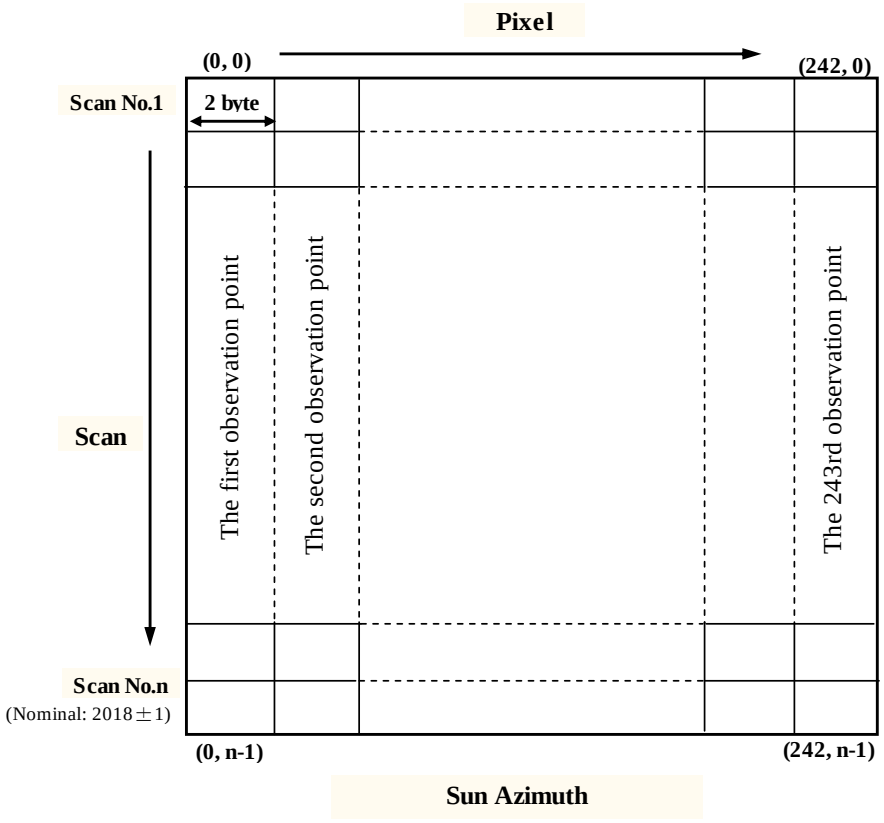
(Latitude and Longitude have the same structure.)



Latitude of Observation Point for 89B
Longitude of Observation Point for 89B

(Latitude and Longitude have the same structure.)

Fig. 3.3-5 Structure of Latitude of Observation Point / Longitude of Observation Point


Pixel
(0, 0)
(242, 0)
Scan No.1
2 byte
The first observation point
The second observation point
The 243rd observation point
Scan
Scan No.n
(Nominal: 2018±1)
(0, n-1)
(242, n-1)
Sun Azimuth

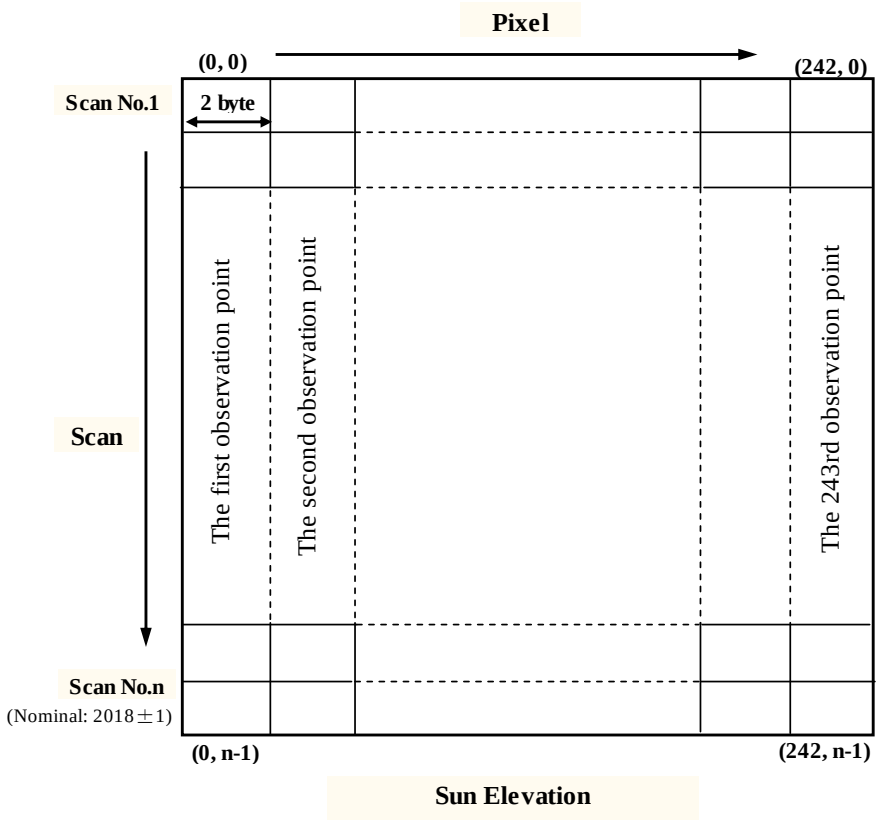
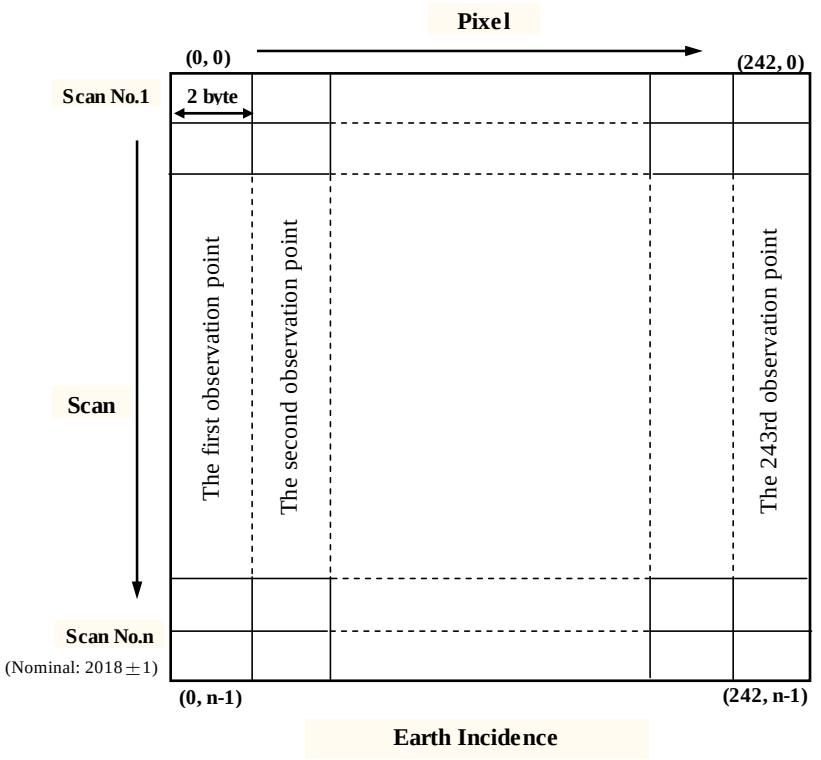

Pixel
(0, 0)
(242, 0)
Scan No.1
2 byte
The first observation point
The second observation point
The 243rd observation point
Scan
Scan No.n
(Nominal: 2018±1)
(0, n-1)
(242, n-1)
Sun Elevation

Fig. 3.3-6 Structure of Sun Azimuth / Sun Elevation



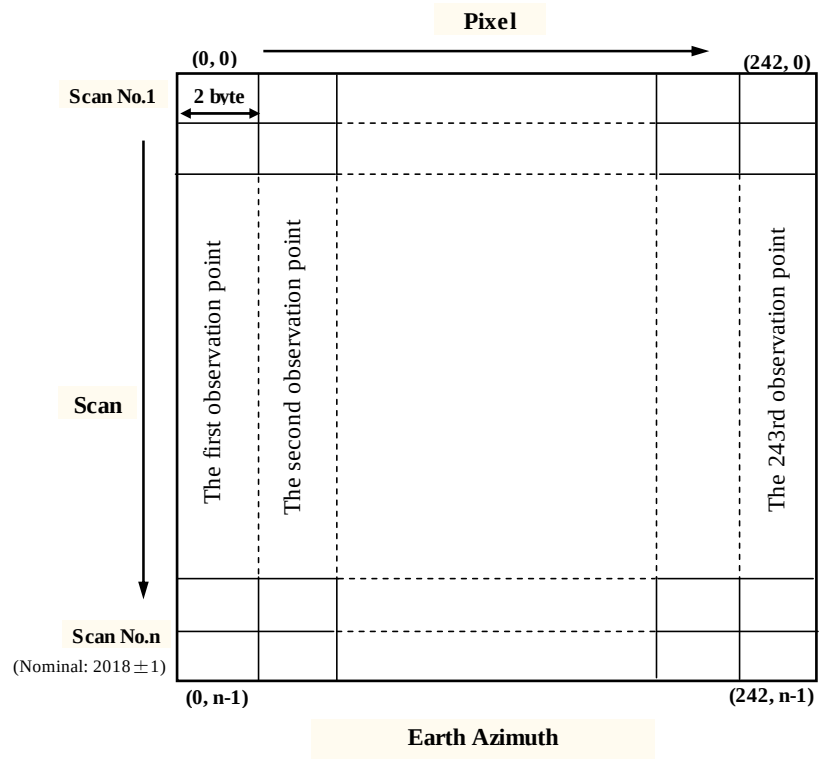
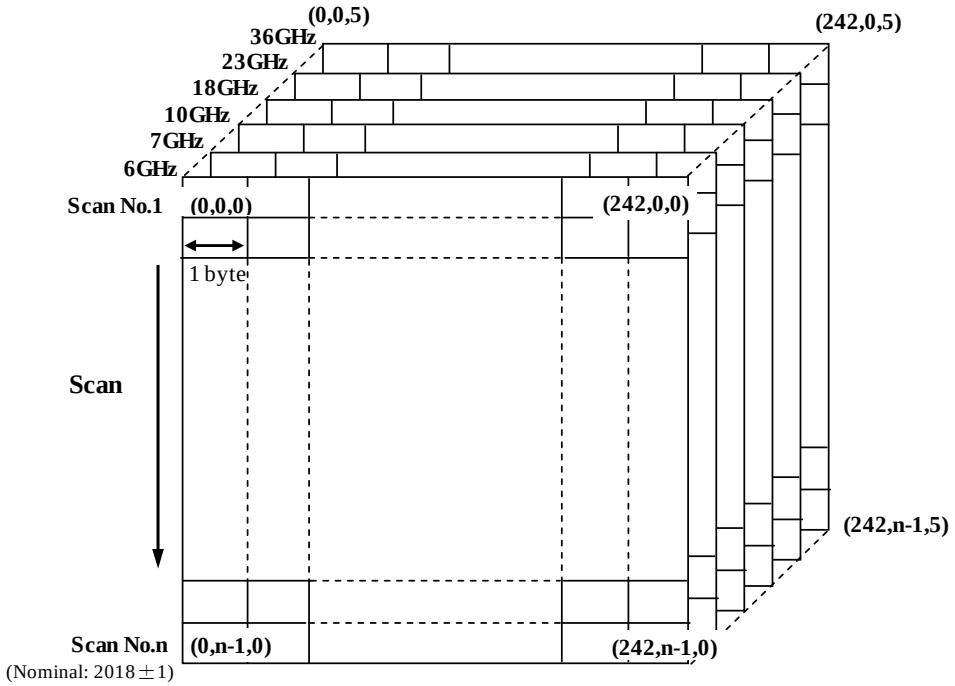
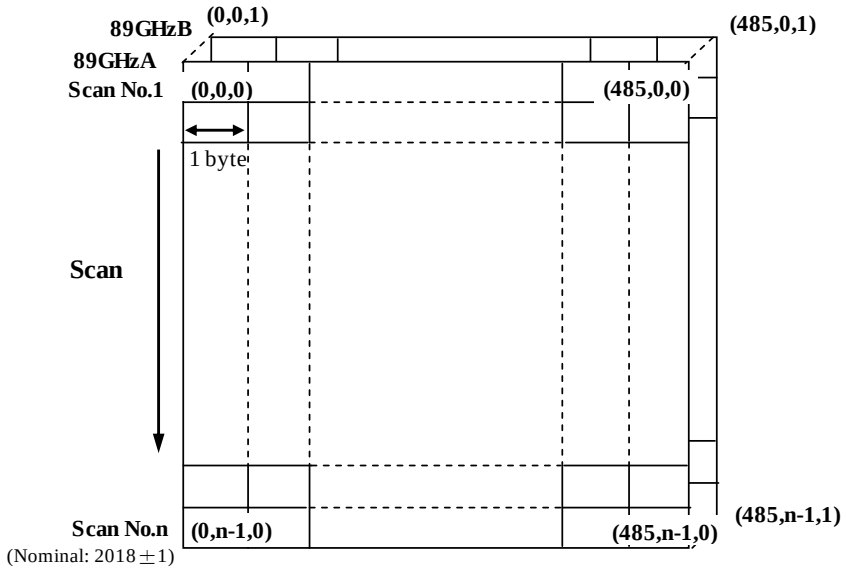


Fig. 3.3-7 Structure of Earth Incidence / Earth Azimuth



Land/Ocean Flag 6 to 36



Land/Ocean Flag 89

Fig. 3.3-8 Structure of Land_Ocean Flag

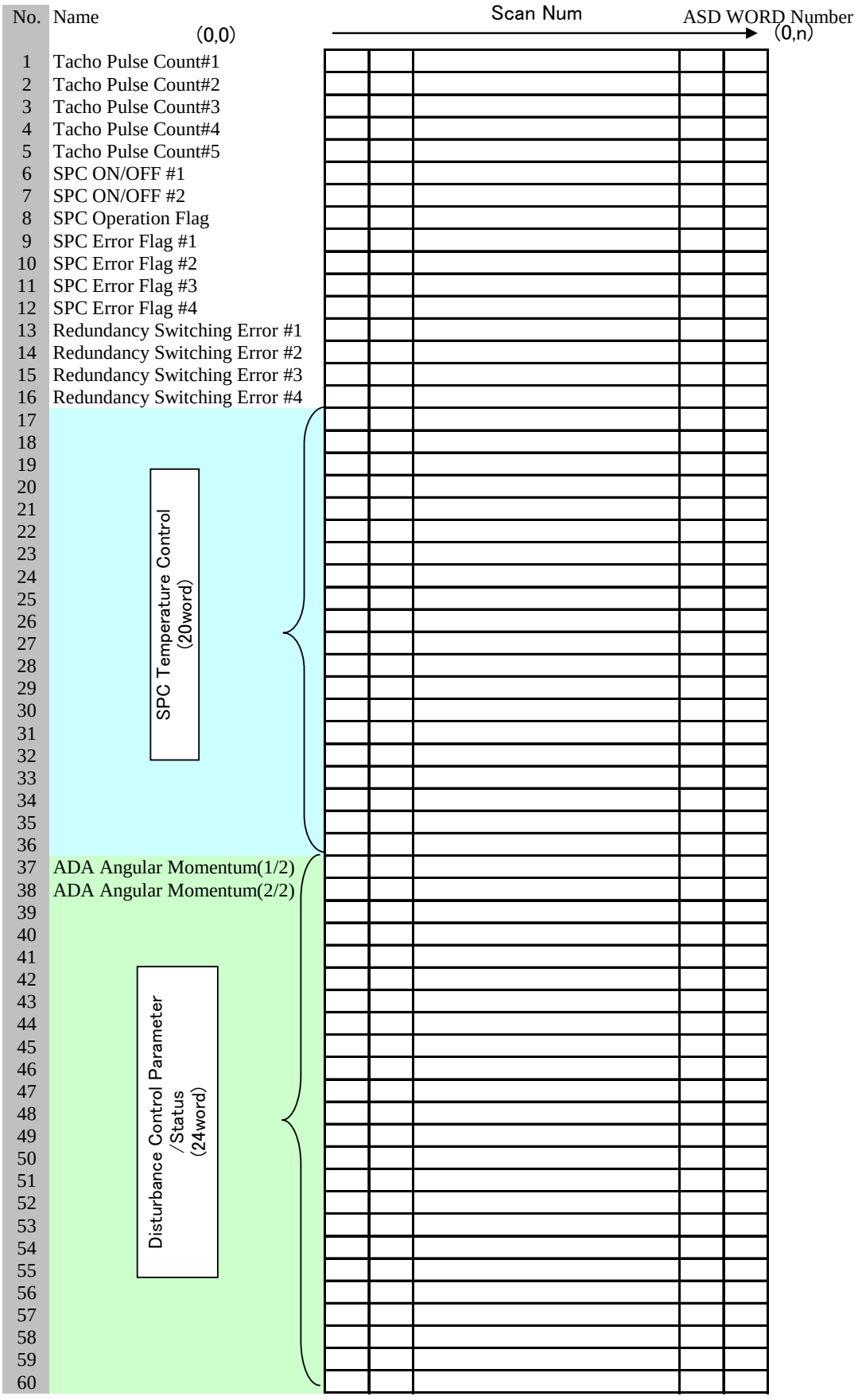


Fig. 3.3-9 Structure of Observation Supplement (1/2)

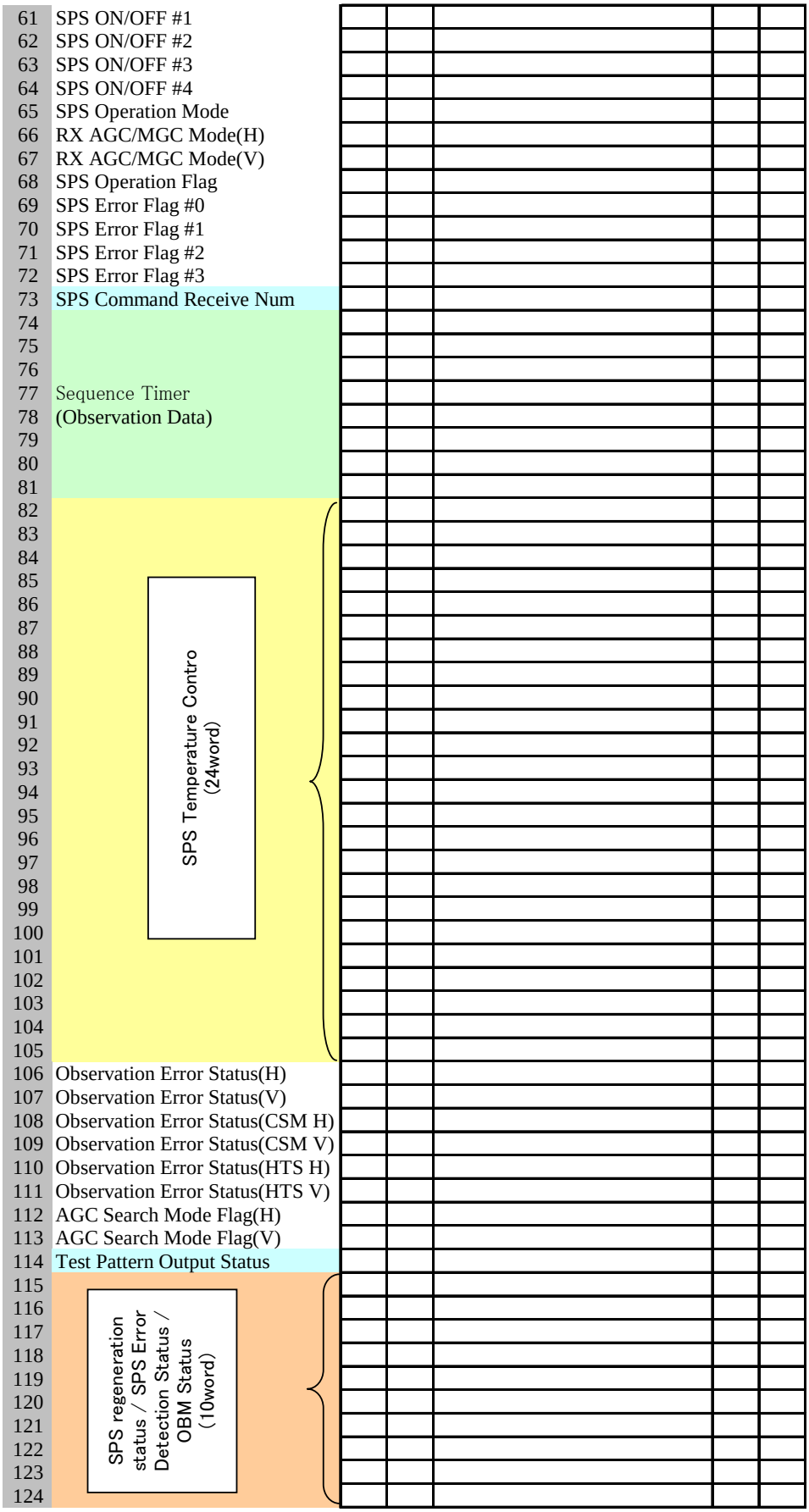


Fig. 3.3-10 Structure of Observation Supplement (2/2)

No.	Name	(0,0) Scan Num → (0,n) ASD WORD Number				
1	HTS Control Temperature 1 (A/B)					
2	HTS Control Temperature 2 (A/B)					
3	HTS Control Temperature 3 (A/B)					
4	HTS Control Temperature 4 (A/B)					
5	HTS Control Temperature 5 (A/B)					
6	CSM Temperature					
7	HTS Temperature 1					
8	HTS Temperature 2					
9	HTS Temperature 3					
10	HTS Temperature 4					
11	HTS Temperature 5					
12	HTS Temperature 6					
13	HTS Temperature 7					
14	HTS Temperature 8					
15	HTS Temperature 9					
16	HTS Temperature 10					
17	SPC A Temperature					
18	SPC B Temperature					
19	TCC Temperature					
20	PDUC 1 Temperature					
21	PDUC 2 Temperature					
22	Control STR Temperature 1					
23	Control STR Temperature 2					
24	Control STR Temperature 3					
25	Control STR Temperature 4					
26	ADA STATOR Temperature (A/B)					
27	ADE Temperature					
28	MWA A Wheel Temperature					
29	MWA A Bearing Temperature					
30	MWA B Wheel Temperature					
31	MWA B Bearing Temperature					
32	0x0000					
33	0x0000					
34	0x0000					

Fig. 3.3-11 Structure of SPC Temperature Count

No.	Name (0,0)	Scan Num → (0,n)				ASD WORD Number
1	TCP Control Temperature 1-A					
2	TCP Control Temperature 1-B					
3	TCP Control Temperature 2-A					
4	TCP Control Temperature 2-B					
5	TCP Control Temperature 3-A					
6	TCP Control Temperature 3-B					
7	TCP Control Temperature 4-A					
8	TCP Control Temperature 4-B					
9	OBM 1 Temperature					
10	OBM 2 Temperature					
11	OBM 3 Temperature					
12	OBM 4 Temperature					
13	FEED Temperature 1					
14	FEED Temperature 2					
15	Main Reflector Temperature					
16	Damper 1 Temperature					
17	Damper 2 Temperature					
18	SPS Temperature					
19	TCS Temperature					
20	PDUS Temperature					
21	Sensor STR Temperature 1					
22	Sensor STR Temperature 2					
23	Sensor STR Temperature 3					
24	Sensor STR Temperature 4					
25	DC/DC RX 1 Temperature					
26	DC/DC RX 2 Temperature					
27	6GHz LNA H Temperature					
28	10GHz LNA H Temperature					
29	89GHzA H LNA Temperature					
30	89GHzB H LNA Temperature					
31	89GHzA V LNA Temperature					
32	89GHzB V LNA Temperature					
33	6GHz RX Temperature					
34	7GHz RX Temperature					
35	10GHz RX Temperature					
36	18GHz RX Temperature					
37	23GHz RX Temperature					
38	36GHz RX Temperature					
39	89GHzA RX Temperature					
40	89GHzB RX Temperature					
41	TCP Temperature					
42	ADA ROTOR A Temperature					
43	ADA ROTOR B Temperature					
44	6.9GHz RX V Temperature					
45	18GHz RX V Temperature					
46	89GHz A RX V Temperature					

Fig. 3.3-123.3-13 Structure of SPS Temperature Count

2 byte

Primary Header	
Secondary Header	
Navigation Time	
Navigation Position X(1/3)	**Navigation Position X(2/3)**
Navigation Position X(3/3)	**Navigation Position Y(1/3)**
Navigation Position Y(2/3)	**Navigation Position Y(3/3)**
Navigation Position Z(1/3)	**Navigation Position Z(2/3)**
Navigation Position Z(3/3)	**Navigation Velocity X(1/3)**
Navigation Velocity X(2/3)	**Navigation Velocity X(3/3)**
Navigation Velocity Y(1/3)	**Navigation Velocity Y(2/3)**
Navigation Velocity Y(3/3)	**Navigation Velocity Z(1/3)**
Navigation Velocity Z(2/3)	**Navigation Velocity Z(3/3)**
Attitude Error Roll(1/3)	**Attitude Error Roll(2/3)**
Attitude Error Roll(3/3)	**Attitude Error Pitch(1/3)**
Attitude Error Pitch(2/3)	**Attitude Error Pitch(3/3)**
Attitude Error Yaw(1/3)	**Attitude Error Yaw(2/3)**
Attitude Error Yaw(3/3)	**Attitude Angular Velocity Roll(1/3)**
Attitude Angular Velocity Roll(2/3)	**Attitude Angular Velocity Roll(3/3)**
Attitude Angular Velocity Pitch(1/3)	**Attitude Angular Velocity Pitch(2/3)**
Attitude Angular Velocity Pitch(3/3)	**Attitude Angular Velocity Yaw(1/3)**
Attitude Angular Velocity Yaw(2/3)	**Attitude Angular Velocity Yaw(3/3)**
Latitude Argument (1/2)	
Latitude Argument (2/2)	
Navigation Status (1/2)	
Navigation Status (2/2)	
Attitude Decision Time	**Attitude Decision Flag**
N/A	

Fig. 3.3-14 Structure of PCD Data

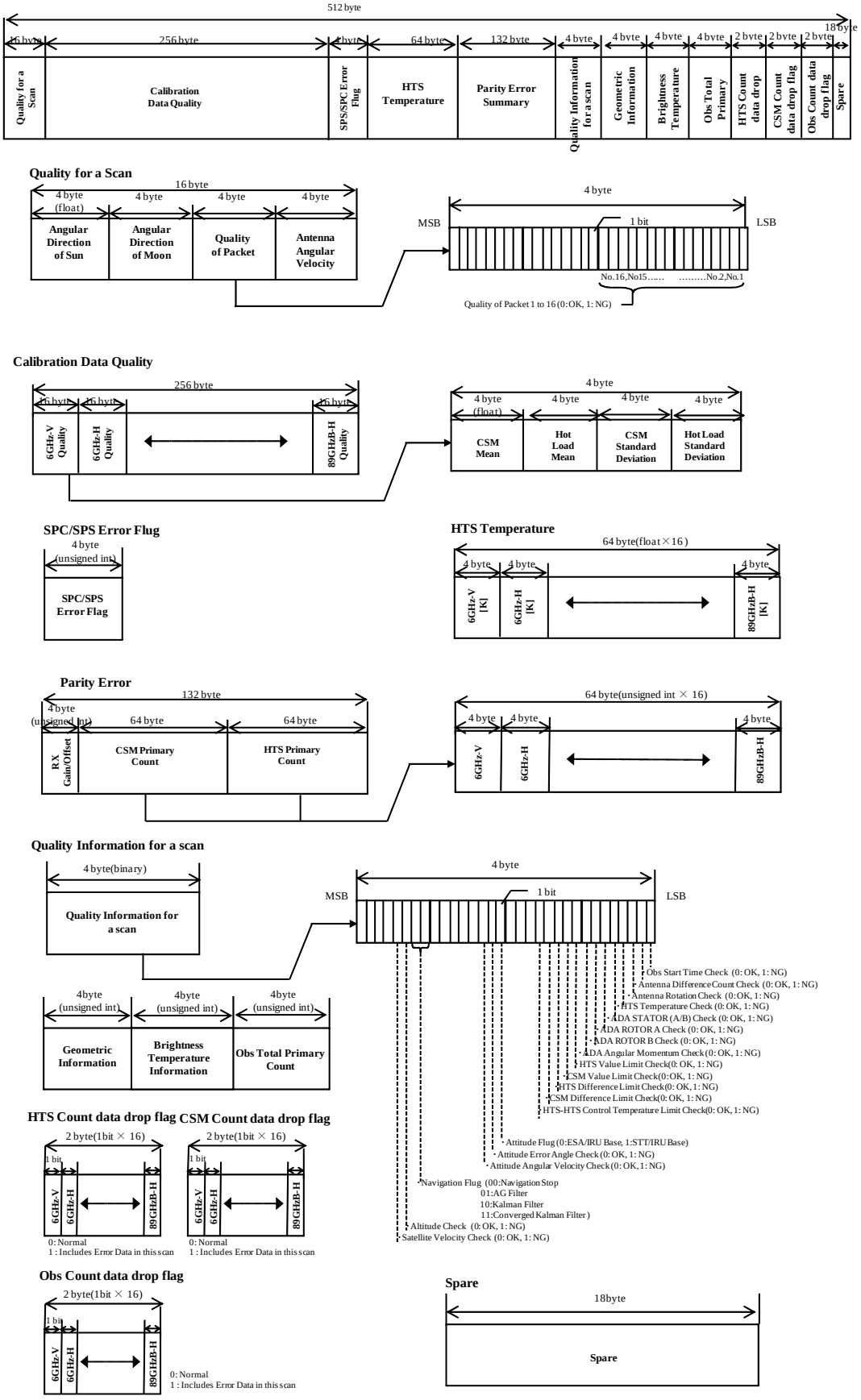
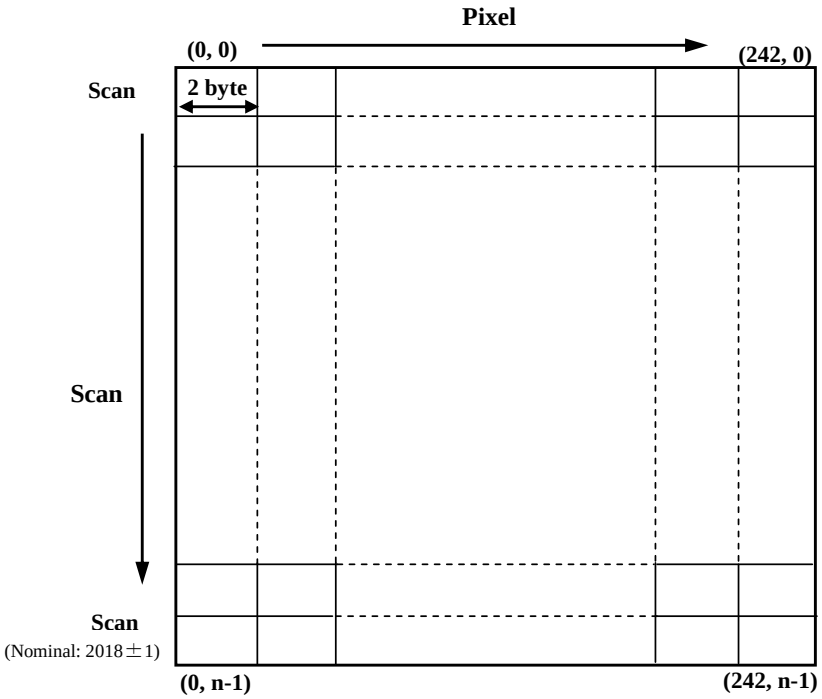
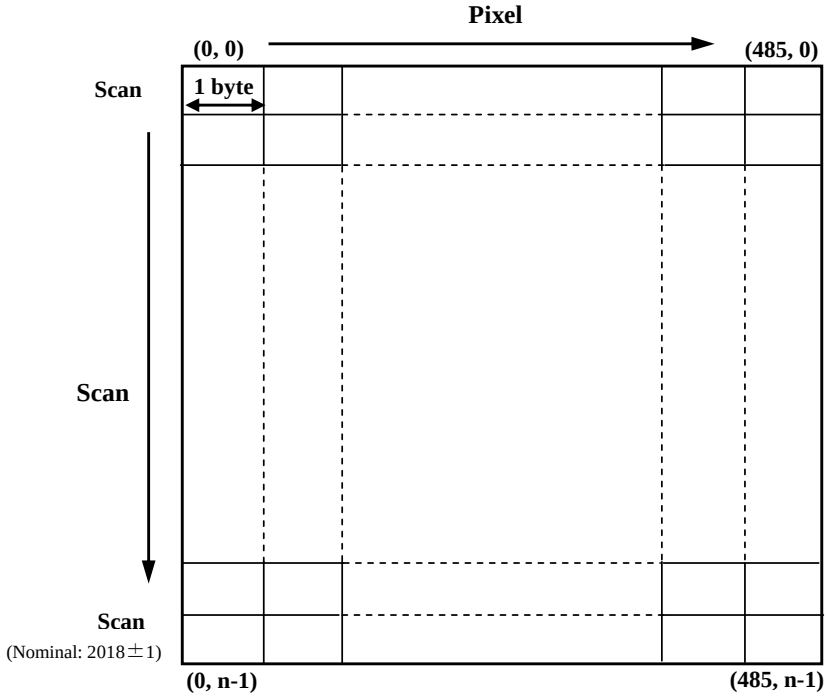


Fig. 3.3-15 Structure of Scan Data Quality

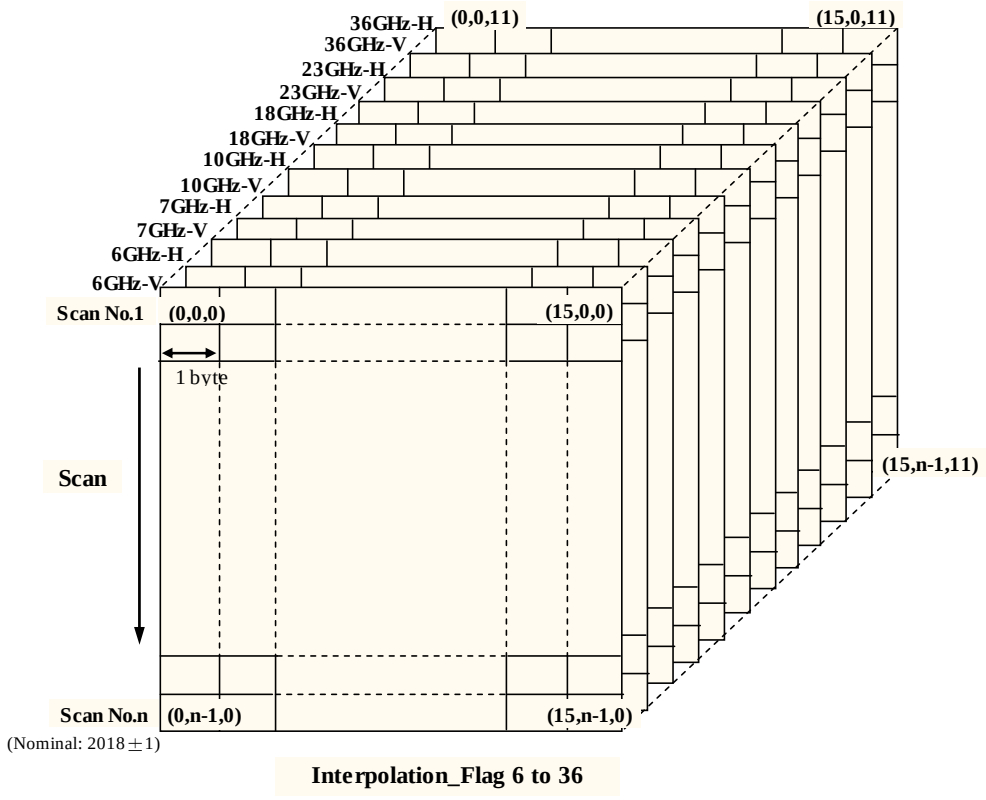


Pixel Data Quality 6 to 36



Pixel Data Quality 89

Fig. 3.3-16 Structure of Pixel Data Quality



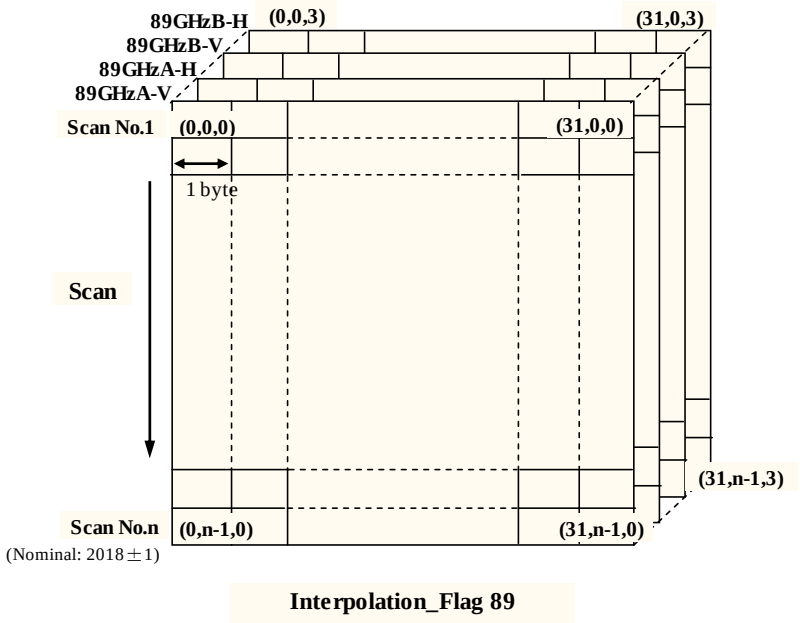


Fig. 3.3-17 Structure of Interpolation_Flag

3.4 Special instruction

3.4.1 Product file name

AMSR2 level 1 product file name (1A, 1B, 1R) is ruled below. Granule ID is stated by reference documents.

File name = Granule ID + extension [.h5]

Scene ID Product ID

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
AMSR2	G	W	1	A	M	2	_	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

<Exp.> G W 1 A M 2 _ 2 0 1 1 1 1 1 3 2 3 4 5 _ 0 1 2 D _ L 1 D L A D N R _ 1 1 0 1 0 0 1

Scene ID

[Satellite] [Sensor] [Observation Start Time] [Pass Number] [Orbit Direction]
- Satellite : GW1（Fixed Value）
- Sensor : AM2（Fixed Value）
- Observation Start Time : YYYYMMDDHHmm（UTC）
- Pass Number : PPP（000～300）*Observation Start point
- 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 : Level 1, L2 : Level 2）
- Process Kind : xx （SG : Standard operation product, SN : Near real time operation product (Global), SL : Near real time operation product (Local),
  RG : Research standard operation product, RN : Research Near real time operation product (Global),
  RL : Research Near real time operation product (Local), DL : For the Direct recieving station (Local area)）
- Product ID : KKK（<L1A> ADN : Digital Number, <L1B> BTB : Brightness Temperature, <L1R> RTB : Brightness Temperature,
  <L2> CLW : Cloud Liquid Water, TPW : Total Precipitable Water, PRC : Precipitation,
  SST : Sea Surface Temperature, SSW : Sea Surface Wind speed, SIC : Sea Ice Concentration,
  SND : Snow Depth, SMC : Soil Moisture Content）
- Resolution : r（<L1> R : Raw（Fixed Value）, <L2> L: Low [243 pixels], H : High[486 pixels]）
- Developer ID : d（<L1> _ : underscore（Fixed Value）, <L2> : A～Z）
- Product version : v（0～9, a～z）
- Algorithm version : aaa（000～999）
- Parameter version : ppp（000～999）

3.4.2 Definition of the Product Data range

Fig. 3.4-1shows the definition of the data range stored in level 1 product file. The data range of AMSR2 level 1 product is the half orbit defined as a scene and extended about 30 scans at both ends. The both ends of a half orbit correspond to the maximum and minimum latitude of the observation point at the center of the scan.

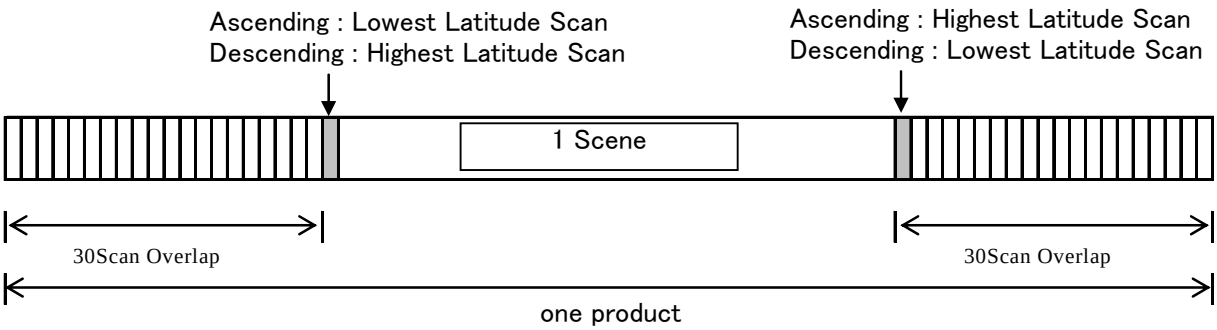


Fig. 3.4-1 Product data range

3.4.3 Coordinate system

AMSR2 level 1 product (1A, 1B, 1R) stores observation position (latitude, longitude) and orbit information of satellite. The observation positions are 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. The orbit information is stored as WGS84 earth fixed coordinate system.

3.4.4 Scaling factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR2 level 1 product. AMSR2 dataset has scaling factor in the HDF5 file. The scaling factor is set for each dataset and stored with the data unit in the attribute information.

4 Description of data

This chapter shows explanation of each data item in the AMSR2 level 1A product file. Some of them are common items with AMSR2 level 1B product and AMSR2 level 1R product.

4.1 Product metadata (Attribute)

The following description explains each product metadata item in the AMSR2 level 1A product file. These product metadata are common items with AMSR2 level 1B product and AMSR2 level 1R product.

(1) ProductName

Abbreviated name of the product is stored as below.

[AMSR2-L1A] : AMSR2 level 1A process
[AMSR2-L1B] : AMSR2 level 1B process
[AMSR2-L1R] : AMSR2 level 1R process

(2) GeophysicalName

The geophysical quantity name is stored as below.

Item	Content	Remarks
GeophysicalName	[XXXXXXXXXXXXXX] Observation Count Brightness Temperature	-

(3) ProductVersion

The product version is stored as below.

Item	Minimum	Maximum	Error value	Unit	Remarks
ProductVersion	0	Z	-	-	single-digit or alpha-numeral

(4) AlgorithmVersion

The algorithm version is stored as below.

Item	Minimum	Maximum	Error value	Unit	Remarks
AlgorithmVersion	000	999	-	-	3-digit numeral

(5) ParameterVersion

The parameter version is stored as below.

Item	Minimum	Maximum	Error value	Unit	Remarks
ParameterVersion	000	999	-	-	3-digit numeral

(6) ProductSize_MByte

The product size is stored as below.

Item	Minimum	Maximum	Error value	Unit	Remarks
ProductSize_MByte	0.0	99999.9	-	MByte	Mbyte=(×1024×1024byte)

(7) GranuleID

The granule ID is stored. Granule ID is unique ID for product file. Please see the section 3.4.1 for more detail.

(8) Operation

The product kind is stored as below.

Standard : Standard operation

NearRealTime(Global) : Near Real Time operation (Global area)

NearRealTime(local) : Near Real Time operation (Local area)

(9) ProductionDateTime

The product creation time and date is stored as below.

Item	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.

(10) ObservationStartDateTime

The start time and date of observation data is stored as below.

Item	Format	Remarks
ObservationStartTime	[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)	-

(11) ObservationEndDateTime

The end time and date of observation data is stored as below.

Item	Format	Remarks
ObservationEndTime	[YYYY-MM-DD T hh: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)	-

(12) GringPointLatitude, GringPointLongitude

Eight 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 89 GHz A-horn. Since the spatial information in a product cannot be expressed as a rectangle on the equidistant cylindrical projection map, it is expressed in polygon like "G". The stored data are delimited by comma [,].

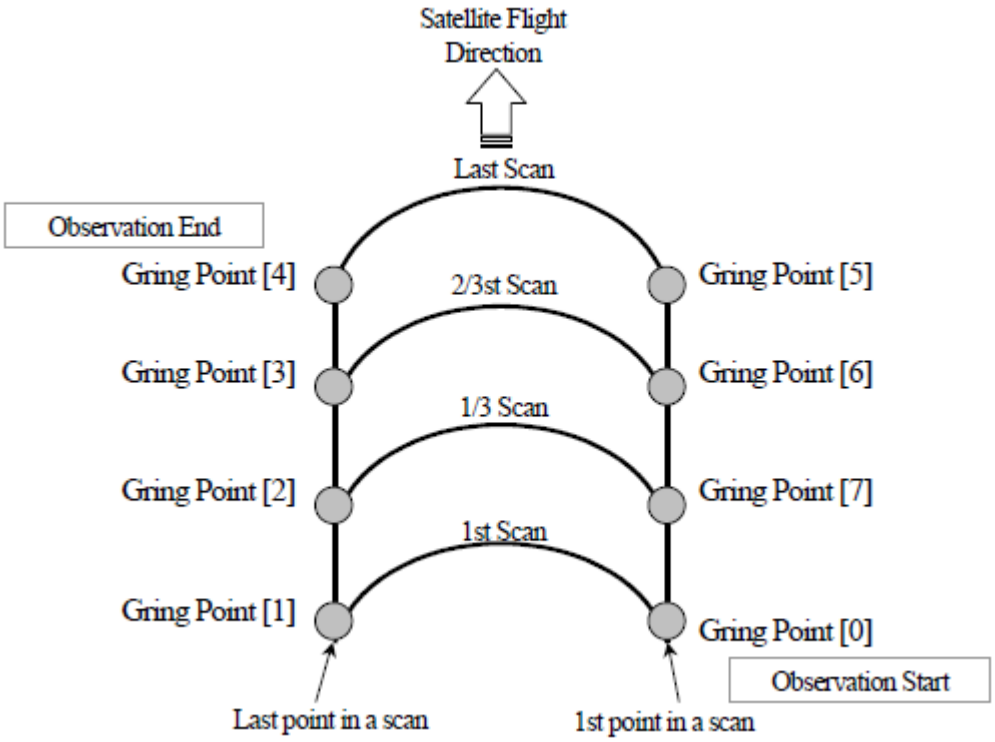


Fig. 4.1-1 The relationship between Gring Pointand data location

(13) PGEName

The apprication name is stored.

Item	Content	Remarks
PGEName	Apprication name	Maximum size of character is 20.

(14) InputFileName

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

Item	Content	Remarks
InputFileName	Input File Name	Maximum size of character is 128.

(15) ProcessingCenter, ContactOrganizationName, ContactOrganizationTelephone

The information of data processing center is stored.

Item	Content	Remarks
ProcessingCenter	Processing Center	Maximum size of character is 12.
ContactOrganizationName	Organization Name	Maximum size of character is 300.
ContactOrganizationTelephone	Organization Telephone number	Maximum size of character is 16.

(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 GCOM-W1 satellite launch.

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
StartOrbitNumber	Start orbit number	0	99999	-9999	-	Under 5 digit number
StopOrbitNumber	End orbit numbe	0	99999	-9999	-	Under 5 digit number

(17) EquatorCrossingLongitude, EquatorCrossingDateTime

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

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
EquatorCrossing Longitude	The equator crossing longitude	-180.00	180.00	-9999.0	-	The longitude at the first crossing equator is stored in case of near real time operation.

Item	Content	Format	Remarks
EquatorCrossing DateTime	The equator crossing time	[YYYY-MM-DD T hh: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)	The time at the first crossing equator is stored in case of near real time operation.

(18) OrbitDirection

The orbit direction at the observation start point is stored.

Item	Content	Format	Remarks
OrbitDirection	Orbit direction	Ascending or Descending	Maximum size of character is 11.

(19) PassNumber

The pass number at the observation start point is stored.

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
PassNumber	Pass number	0	233	-99	なし	Under 3 digit number

(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.

Item	Content	Format	Remarks
OrbitDataFileName	Supplemental orbit data file name	-	Maximum size of character is 128.

(21) EphemerisMissingDataRate, AttitudeMissingDataRate

The rate of lack with orbit data and attitude data are stored.

Item	Content	Format	Remarks
EphemerisMissingDataRate	The rate of lack with orbit data	[Good] [Fair] [NG]	Maximum size of character is 5.
AttitudeMissingDataRate	The rate of lack with attitude data		

(22) OrbitDataType

The orbit data type used in L1 process is stored.

Item	Content	Format	Remarks
OrbitDataType	Orbit data type	[ONBOARD] : On board data [ELMD] : Fixed orbit data [ELMP] : Predicted orbit data [NOMINAL] : Nominal orbit data	Maximum size of character is 8.

(23) PlatformShortName, SensorShortName

The satellite name [GCOM-W1] and sensor name [AMSR2] are stored.

(24) NumberOfScans, NumberOfMissingScans

The number of scans and lack of scans in product file are stored. “NumberOfScans” doesn’t include overlap scans. So you need to calculate sum of scans in product files as below.

Sum of scans in product files

＝OverlapScans×2+ NumberOfScans

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
NumberOfScans	Number of scans	0	99999	-9999	-	Under 5 digit number
NumberOfMissingScans	Number of lack scans					

(25) AntennaRotationVelocity

The observed rotating velocity of the AMSR2 antenna is stored.

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
AntennaRotationVelocity	Rotating velocity of the AMSR2 antenna	30.0	40.0	-999	rpm	-

(26) ECSDataModel

The metadata model name is stored.

Item	Content	Format	Remarks
MetaDataModel	Metadata model name	[B.0]	Maximum size of character is 8.

(27) NumberOfPackets

The number of packets is stored. But it is difficult to estimate correct value, so it is always set blank.

(28) NumberOfInputFiles

The number of input L0 files is stored. It is corresponding to the number of L0 files described to "(14) InputFileName".

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
NumberOfInputFiles	Number of input L0 files	0	9	-	-	1 digit number It is stored blank in case of near real time operation.

(29) NumberMissingPackets, NumberOfGoodPackets

The number of the lack packets and number of packets in the product file are stored.

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
NumberMissingPackets	Number of lack packets	0	99999999	-9999999	-	Under 8 digit number
NumberOfGoodPackets	Number of packets					

(30) OverlapScans

The number of one side overlap scans is stored.

Item	Content	Number	Remarks
OverlapScans	Number of one side overlap scans	20	One side value

(31) QALocationOfPacketDiscontinuity

The consecutiveness of “Packet Sequence Counter” is stored.

Item	Content	Format	Remarks
QALocationOfPacket Discontinuity	The consecutiveness of “Packet Sequence Counter”	“Continuation” “Discontinuation”	Maximum size of character is 16.

(32) 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 satellite attitude data

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

Check the satellite velocity data

$$LowerLimit \leqq V \leqq UpperLimit$$

$$V = \sqrt{V_x^{\,2} + V_y^{\,2} + V_z^{\,2}}$$

Item	Content	Format	Remarks
EphemerisQA	Ephemeris check	[OK] [NG]	Maximum size of character is 2.

(33) 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’.

Item	Content	Format	Remarks
AutomaticQAFlag	The result checked by software.	Good Fair NG	Maximum size of character is 4.

(34) ScienceQualityFlag

The quality flag is stored when the L2 process calculates geophysical data. It is stored blank for the L1 product file.

Item	Content	Format	Remarks
ScienceQualityFlag	The quality flag of geophysical data	Strings	Maximum size of character is 8.

(35) ScienceQualityFlagExplanation

The explanation of ScienceQualityFlag is stored. It is stored blank for the L1 product file.

Item	Content	Format	Remarks
ScienceQualityFlag Explanation	The explanation of ScienceQualityFlag	Strings	Maximum size of character is 512.

(36) AutomaticQAFlagExplanation

The result checked by software automatically is stored.

Item	Content	Format	Remarks
AutomaticQAFlag Explanation	The result checked by software	See example below	Maximum size of character is 512.

＜example of AutomaticQAFlagExplanation＞

1.MissingScanQA:Less than 21 is available->OK,
2.MissingDataQA:Less than 321 is available->OK,
3.AntennaRotationQA:Less than 21 is available->OK,
4.HotCalibrationSourceQA:Less than 21 is available->OK,
5.AttitudeDataQA:Less than 21 is available->OK,
6.EphemerisDataQA:Less than 21 is available->OK,
7.QualityofGeometricInformationQA:Less than 1 is available->OK,
8.BrightnessTemperatureQA:Less than 21 is available->OK

(37) QAPercentMissingData

The rate of lack scan data is stored.

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
QAPercentMissingData	The lack of data	0	100	-99	%	Under 3 digit number

(38) 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.

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

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
QAPercentOutofBoundsData	The percentage of the limit error	0	100	negative value	-	Under 3 digit number

(39) 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.

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

Table 4.1-1 Format of the raw observation data

MSB

b0	Parity error (P2)	b2 … b8 Parity error [0:Normal/1:Ubnormal]
b1	Parity error (P1)	b9 … b15 Parity error [0:Normal/1:Ubnormal]
b2	0	-
b3	0	-
b4	Data 2^11	Range: -2048...+2047
b5	Data 2^10	
b6	Data 2^9	
b7	Data 2^8	
b8	Data 2^7	
b9	Data 2^6	
b10	Data 2^5	
b11	Data 2^4	
b12	Data 2^3	
b13	Data 2^2	
b14	Data 2^1	
b15	Data 2^0	

LSB

Item	Content	Minimum	Maximum	Error value	Unit	Remarks
QAPercentParityErrorData	The percentage of the parity error	0	100	-32768	-	Under 6 digit number

(40) ProcessingQADescription

The error message generated by data-processing software is stored. "PROC_COMP" is stored when processing software is completed normally.

Item	Content	Format	Remarks
ProcessingQADescription	The error information in the process error	[PROC_COMP] [*********]	Maximum size of character is 12.

(41) ProcessingQAAttribute

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

Item	Error criteria
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%

Item	Content	Format	Remarks
ProcessingQAAttribute	The attribute name of QA metadata in which occurred	[NumberofMissingPackets] [EphemerisQA] [QAPercentMissingData] [QAPercentOutofBoundsData] [QAPercentParityErrorData]	Maximum size of character is 128.

(42) GlobalMeteorologicalDataType

The meteorological data type used in L2process is stored. It is stored blank for the L1 product file.

Item	Content	Format	Remarks
Global Meteorological Type	The meteorological data type used in L2process	[XXX] Analysis : Analized meteorological data Forecast : Predicted meteorological data None : None use	Maximum size of character is 8 .* It is stored blank in the L1 product.

(43) AncillaryDataInformation

The ancillary data used in L2process is stored. It is stored blank for the L1 product file.

Item	Content	Format	Remarks
Ancillary Data Information	The ancillary data used in L2process	[XXXXXXXX]	Maximum size of character is 512 .* It is stored blank in the L1 product.

(44) SatelliteOrbit, SatelliteAltitude, OrbitSemiMajorAxis, OrbitEccenticity, OrbitArgumentPrigee, OrbitInclination, OrbitPeriod, RevisitTime

The characteristics of GCOM-W1 are stored.

Item	Content	Format	Remarks
SatelliteOrbit	Satellite Orbit	Sun-synchronous_sub-recurrent	Fixed value
SatelliteAltitude	Satellite Altitude	[699.6km]	Fixed value
OrbitSemiMajorAxis	Orbit SemiMajor Axis	[7085.858km]	Fixed value
OrbitEccenticity	Orbit Eccenticity	[Frozen]	Fixed value
OrbitArgumentPrigee	Orbit Argument Prigee	[106.480deg]	Fixed value
OrbitInclination	Orbit Inclination	[98.186deg]	Fixed value
OrbitPeriod	Orbit Period	[98.8min]	Fixed value
RevisitTime	Revisit Time	[16days]	Fixed value

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

The characteristics of AMSR2 are stored.

Item	Content	Format	Remarks
AMSRChannel	Observing channels of AMSR2	[6.925GHz, 7.3GHz, 10.65GHz, 18.7GHz, 23.8GHz, 36.5GHz, 89.0GHz-A, 89.0GHz-B]	Fixed value
AMSRBandWidth	Bandwidth for each frequency	[6G-350MHz, 7G-350MHz,10G-100MHz ,18G-200MHz,23G-400MHz,36G-1000MHz, ,89GA-3000MHz,89GB-3000MHz]	Fixed value
AMSRBeamWidth	Beam width for each frequency	[6G-1.8deg, 7G-1.8deg, 10G-1.2deg, 18G-0.64deg, 23G-0.75deg, 36G-0.35deg, 89GA-0.15deg, 89GB-0.15deg]	Fixed value
OffNadir	The off nadir angle of 89 GHz A-horn and 89 GHz B-horn [The other frequencies are same value as 89 GHz A-horn.]	[47.0deg : 89GB, 47.5deg : others]	Fixed value
SpatialResolution (AzXEl)	SpatialResolution for each frequency	[6G-35kmX61km, 7G-35kmX61km, 10G-34kmX41km, 18G-14kmX22km, 23G-15kmX26km, 36G-7kmX12km, 89GA-3kmX5km, 89GB-3kmX5km]	Fixed value
ScanningPeriod	Scanning period	[1.5sec]	Fixed value
SwathWidth	Swath width	[1450km]	Fixed value
DynamicRange	Dynamic range	[2.7K-340K]	Fixed value

(46) DataFromatType, HDFFormatVersion

The format type of the product file is stored.

Item	Content	Format	Remarks
DataFromatType	Forrmat type	[HDF]	Fixed value
HDFFormatVersion	HDF version	[Ver5.1.8.4]	Fixed value

(47) EllipsoidName, SemiMajorAxisofEarth, FlatteningRatioofEarth

The earth model used in AMSR2 data processing software is stored.

Item	Content	Format	Remarks
EllipsoidName	Earth ellipsoid model	[WGS84]	Fixed value
SemiMajorAxisofEarth	Semi major axis of earth	[6378.1km]	Fixed value
FlatteningRatioofEarth	Flattening ratio of earth	[0.00335]	Fixed value

(48) SensorAlignment

Alignment values between GCOM-W1 body coordinate system and the AMSR2 coordinate system are stored.

Item	Content	Format	Remarks
SensorAlignment	Sensor alignment	Roll(Rx),Pitch(Ry),Yaw(Rz)	Fixed value

(49) Thermistor1

The engineering conversion coefficients for the thermistor#1 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Thermistor1CountRange Thermistor #1 conversion table applied range
- Thermistor1ConversionTableD Thermistor #1 conversion coefficients D
- Thermistor1ConversionTableE Thermistor #1 conversion coefficients E
- Thermistor1ConversionTableF Thermistor #1 conversion coefficients F

(50) Thermistor2

The engineering conversion coefficients for the thermistor#2 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Thermistor2CountRange Thermistor #2 conversion table applied range
- Thermistor2ConversionTableW4 Thermistor #2 conversion coefficients W4
- Thermistor2ConversionTableW3 Thermistor #2 conversion coefficients W3
- Thermistor2ConversionTableW2 Thermistor #2 conversion coefficients W2
- Thermistor2ConversionTableW1 Thermistor #2 conversion coefficients W1
- Thermistor2ConversionTableW0 Thermistor #2 conversion coefficients W0

(51) Thermistor3

The engineering conversion coefficients for the thermistor#3 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Thermistor3CountRange Thermistor #3 conversion table applied range
- Thermistor3ConversionTableW4 Thermistor #3 conversion coefficients W4
- Thermistor3ConversionTableW3 Thermistor #3 conversion coefficients W3
- Thermistor3ConversionTableW2 Thermistor #3 conversion coefficients W2
- Thermistor3ConversionTableW1 Thermistor #3 conversion coefficients W1
- Thermistor3ConversionTableW0 Thermistor #3 conversion coefficients W0

(52) Platinum1

The engineering conversion coefficients for the platinum sensor #1 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Platinum1CountRange Platinum senseor #1 conversion table applied range
- Platinum1ConversionTableW4 Platinum senseor #1 conversion coefficients W4
- Platinum1ConversionTableW3 Platinum senseor #1 conversion coefficients W3
- Platinum1ConversionTableW2 Platinum senseor #1 conversion coefficients W2
- Platinum1ConversionTableW1 Platinum senseor #1 conversion coefficients W1
- Platinum1ConversionTableW0 Platinum senseor #1 conversion coefficients W0

(53) Platinum2

The engineering conversion coefficients for the platinum sensor #2 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Platinum2CountRange Platinum senseor #2 conversion table applied range
- Platinum2ConversionTableW4 Platinum senseor #2 conversion coefficients W4
- Platinum2ConversionTableW3 Platinum senseor #2 conversion coefficients W3
- Platinum2ConversionTableW2 Platinum senseor #2 conversion coefficients W2
- Platinum2ConversionTableW1 Platinum senseor #2 conversion coefficients W1
- Platinum2ConversionTableW0 Platinum senseor #2 conversion coefficients W0

(54) Platinum3

The engineering conversion coefficients for the platinum sensor #3 and their applicable ranges are stored. The stored data are delimited by comma [,].

- Platinum3CountRange Platinum senseor #3 conversion table applied range
- Platinum3ConversionTableW4 Platinum senseor #3 conversion coefficients W4
- Platinum3ConversionTableW3 Platinum senseor #3 conversion coefficients W3
- Platinum3ConversionTableW2 Platinum senseor #3 conversion coefficients W2
- Platinum3ConversionTableW1 Platinum senseor #3 conversion coefficients W1
- Platinum3ConversionTableW0 Platinum senseor #3 conversion coefficients W0

(55) 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.

$$T_{Bv} = A_{vv}T_{Av} + A_{hv}T_{Ah} + A_{ov}$$
$$T_{Bh} = A_{vh}T_{Av} + A_{hh}T_{Ah} + A_{oh}$$

T_{Bv}: The observation brightness temperature of the vertical polarization.

T_{Av}: The antenna temperature of the vertical polarization.

T_{Ah}: The antenna temperature of the horizontal polarization.

A_{vv}: The conversion coefficient of the vertical co-polarization.

A_{hv}: The conversion coefficient of the vertical cross-polarization.

A_{ov}: The coefficient of the deep space's brightness temperature of the vertical pola rization.

T_{Bh}: The observation brightness temperature of the horizontal polarization.

T_{Bv}: The antenna temperature of the vertical polarization.

T_{Ah}: The antenna temperature of the horizontal polarization.

A_{vh}: The conversion coefficient of the horizontal cross-polarization.

A_{hh}: The conversion coefficient of the horizontal co-polarization.

A_{oh}:The coefficient of the deep space's brightness temperature of the horizontal po larization.

Item	Format	Example	Remarks
CoefficientAvv	The stored data are delimited by comma [,].	6G-1.03042,7G-1.04354,10G-1.02779, 18G-1.02290, 23G-1.02466,36G-1.02508, 89GA-1.02332,89GB-1.02296	Fixed value
CoefficientAhv	The stored data are delimited by comma [,].	6G--0.00310,7G--0.00948,10G--0.00279, 18G--0.00259,23G--0.00273,36G--0.00248, 89GA--0.00259,89GB--0.00223	Fixed value
CoefficientAov	The stored data are delimited by comma [,].	6G--0.07375,7G--0.09198,10G--0.06749, 18G--0.05485,23G--0.05919,36G--0.06102, 89GA--0.05597,89GB--0.05597	Fixed value
CoefficientAhh	The stored data are delimited by comma [,].	6G-1.03029,7G-1.04181,10G-1.02754, 18G-1.02285,23G-1.02504,36G-1.02506, 89GA-1.02320,89GB-1.02313	Fixed value
CoefficientAvh	The stored data are delimited by comma [,].	6G--0.00298,7G--0.00775,10G--0.00254, 18G--0.00253,23G--0.00312,36G--0.00246, 89GA--0.00247,89GB--0.00240	Fixed value
CoefficientAoh	The stored data are delimited by comma [,].	6G--0.07375,7G--0.09198,10G--0.06749, 18G--0.05485, 23G--0.05919,36G--0.06102, 89GA--0.05597,89GB--0.05597	Fixed value

(56) CSMTemperature

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

Item	Format	Example	Remarks
CSMTemperature	The stored data are delimited by comma [,].	6GV-2.700, 6GH-2.700, 7GV-2.700, 7GH-2.700, 10GV-2.700, 10GH-2.700, 18GV-2.800, 18GH-2.800,23GV-2.800, 23GH-2.800, 36GV-2.800, 36GH-2.800, 89GAV-3.300, 89GAH-3.300, 89GBV-3.300, 89GBH-3.300	Fixed value

(57) CoRegistrationParameterA1, CoRegistrationParameterA2

The co-registration parameters A1 and A2 are stored for each frequency. The co-registration parameters are used for calculating the position (latitude and longitude) of the observing point for each frequency except 89 GHz. The latitude and longitude of each frequency (except 89 GHz) are calculated by the method shown below. The observation position Pt [m] of the m-th point (m=1, 2, 3, …, 243) in each scan is calculated by observation position of odd-numbered points (origin 1) P [2m-1] of 89 GHz A-horn and observation position of even-numbered points P [2m]. The elements of vectors of Pt [m], *ex*, *ey*, and *ez*, are shown in the following formula.

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

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

$$ey = ez \times ex$$

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

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

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

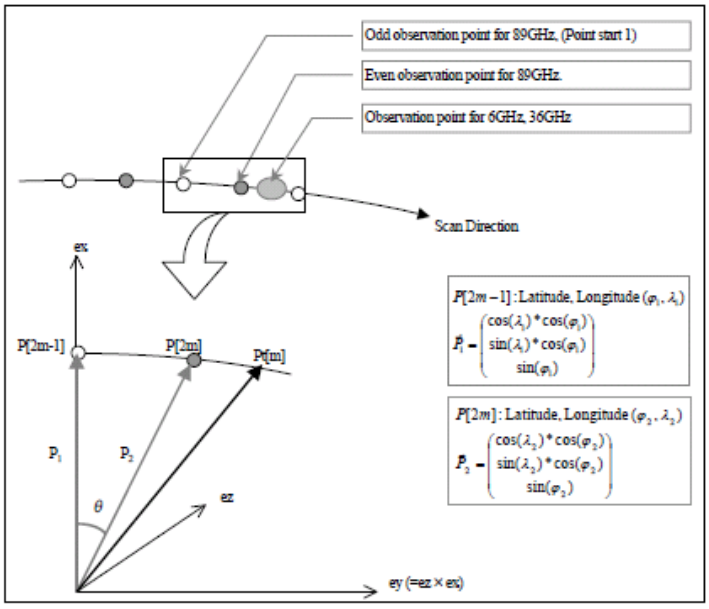


Fig. 4.1-2 The definition of the vector ex, ey, ez.

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

ex-ez plane, then the observation position of frequency except 89 GHz is calculated by the following formula.

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

Item	Format	Example	Remarks
CoRegistrationParameterA1	The stored data are delimited by comma [,].	6G-1.16934,7G-0.86160, 10G-1.04596,18G-1.08919, 23G-1.08342,36G-0.80741	Fixed value
CoRegistrationParameterA2	The stored data are delimited by comma [,].	6G--0.03576,7G--0.04742, 10G--0.20515,18G-0.01587, 23G--0.06023,36G-0.05469	Fixed value

In L1R, performs resampling process for aligning the latitude and longitude mainly 89GHzA horn. The latitude and longitude at the frequency of other than 89GHz is consistent with the latitude and longitude of the observation position P of 89GHzA horn [2m-1].(Relative registration coefficient is set to 0.)

(58) 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 The coefficient for 0th order C_0
- CalibrationCurveCoefficient#2 The coefficient for 1st order C_1
- CalibrationCurveCoefficient#3 The coefficient for 2nd order C_2
- CalibrationCurveCoefficient#4 The coefficient for 3rd order C_3
- CalibrationCurveCoefficient#5 The coefficient for 4th order C_4

$$T_A = C_4 T_A'^4 + C_3 T_A'^3 + C_2 T_A'^2 + C_1 T_A' + C_0$$

T_A=Nonlinear calibrated the antenna temperature [K]

T'_A=The antenna temperature calculated with antenna temperature coefficients [K]

Item	Format	Example	Remarks
CalibrationCurveCoefficient#1	The stored data are delimited by comma [,].	6GV-0.000000,6GH-0.000000, 7GV-0.000000,7GH-0.000000, 10GV-0.000000,10GH-0.000000, 18GV-0.000000,18GH-0.000000, 23GV-0.000000,23GH-0.000000, 36GV-0.000000,36GH-0.000000, 89GAV-0.000000,89GAH-0.000000, 89GBV-0.000000,89GBH-0.000000,	Fixed value
CalibrationCurveCoefficient#2	The stored data are delimited by comma [,].	6GV-1.000000,6GH-1.000000, 7GV-1.000000,7GH-1.000000, 10GV-1.000000,10GH-1.000000, 18GV-1.000000,18GH-1.000000, 23GV-1.000000,23GH-1.000000, 36GV-1.000000,36GH-1.000000, 89GAV-1.000000,89GAH-1.000000, 89GBV-1.000000,89GBH-1.000000,	Fixed value
CalibrationCurveCoefficient#3	The stored data are delimited by comma [,].	6GV-0.000000,6GH-0.000000, 7GV-0.000000,7GH-0.000000, 10GV-0.000000,10GH-0.000000, 18GV-0.000000,18GH-0.000000, 23GV-0.000000,23GH-0.000000, 36GV-0.000000,36GH-0.000000, 89GAV-0.000000,89GAH-0.000000, 89GBV-0.000000,89GBH-0.000000,	Fixed value
CalibrationCurveCoefficient#4	The stored data are delimited by comma [,].	6GV-0.000000,6GH-0.000000, 7GV-0.000000,7GH-0.000000, 10GV-0.000000,10GH-0.000000, 18GV-0.000000,18GH-0.000000, 23GV-0.000000,23GH-0.000000, 36GV-0.000000,36GH-0.000000, 89GAV-0.000000,89GAH-0.000000, 89GBV-0.000000,89GBH-0.000000,	Fixed value
CalibrationCurveCoefficient#5	The stored data are delimited by comma [,].	6GV-0.000000,6GH-0.000000, 7GV-0.000000,7GH-0.000000, 10GV-0.000000,10GH-0.000000, 18GV-0.000000,18GH-0.000000, 23GV-0.000000,23GH-0.000000, 36GV-0.000000,36GH-0.000000, 89GAV-0.000000,89GAH-0.000000, 89GBV-0.000000,89GBH-0.000000,	Fixed value

(59) 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 89 GHz.
Antenna temperature	NonlinearityCorrection	This is used for the nonlinear calibration of the antenna temperature.

Item	Format	Example	Remarks
CalibrationMethod	Calibration method name	Strings	Fixed value

4.2 Dataset

(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 (UTC) on January 1st, 1993.

(2) Position in Orbit

The satellite position on the 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.

Postion_in_Orbit = Total orbit number + Satellite position

Satellite position = (Scan_Time – Ascending node passage time) / (98.9 * 60)

Item	Minimum	Maximum	Error value	Unit	Remarks
Position in Orbit	0.0	99999.9999	-9999.0	-	-

(3) Navigation Data

The satellite position with the WGS84 earth fixed coordinate system is stored. 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) Observation Count (6.9GHz,V)

The observed count value of 6.9 GHz vertical polarization is stored. The following value is stored for the abnormal observation data. This is applied for all frequency and polarization.

Item	Minimum	Maximum	Error value	Unit	Remarks
Observation Count	-2048	2048	-32767 [Missing data] -32768 [Parity error]	Count	-

(6) Observation Count (6.9GHz,H)

The observed count value of 6.9 GHz horizontal polarization is stored.

(7) Observation Count (7.3GHz,V)

The observed count value of 7.3 GHz vertical polarization is stored.

(8) Observation Count (7.3GHz,H)

The observed count value of 7.3 GHz horizontal polarization is stored.

(9) Observation Count (10.7GHz,V)
The observed count value of 10.7 GHz vertical polarization is stored.

(10) Observation Count (10.7GHz,H)
The observed count value of 10.7 GHz horizontal polarization is stored.

(11) Observation Count (18.7GHz,V)
The observed count value of 18.7 GHz vertical polarization is stored.

(12) Observation Count (18.7GHz,H)
The observed count value of 18.7GHz horizontal polarization is stored.

(13) Observation Count (23.8GHz,V)
The observed count value of 23.8 GHz vertical polarization is stored.

(14) Observation Count (23.8GHz,H)
The observed count value of 23.8 GHz horizontal polarization is stored.

(15) Observation Count (36.5GHz,V)
The observed count value of 36.5 GHz vertical polarization is stored.

(16) Observation Count (36.5GHz,H)
The observed count value of 36.5 GHz horizontal polarization is stored.

(17) Observation Count (89.0GHz-A,V)
The observed count value of 89 GHz A-horn's vertical polarization is stored.

(18) Observation Count (89.0GHz-A,H)
The observed count value of 89 GHz A-horn's horizontal polarization is stored.

(19) Observation Count (89.0GHz-B,V)
The observed count value of 89 GHz B-horn's vertical polarization is stored.

(20) Observation Count (89.0GHz-B,H)
The observed count value of 89 GHz B-horn's horizontal polarization is stored.

(21) Hot Load Count 6 to 36
The observed count value of HTS and polarization is stored for each frequency except 89 GHz. The number of observation data for 1 scan is 16 points. The following value is applied for all frequency and polarization.

Item	Minimum	Maximum	Error value	Unit	Remarks
Hot Load Count 6 to 36	-2048	2048	-32767 [Missing data]	Count	-
			-32768 [Parity error]		

(22) Hot Load Count 89

The observed count value of HTS and polarization is stored for 89 GHz. The number of observation data for 1 scan is 32 points.

Item	Minimum	Maximum	Error value	Unit	Remarks
Hot Load Count 89	-2048	2048	-32767 [Missing data] -32768 [Parity error]	Count	-

(23) Cold Sky Mirror Count 6 to 36

The observed count value of CSM and polarization is stored for each frequency except 89 GHz. The number of observation data for 1 scan is 16 points. The following value is applied for all frequency and polarization.

Item	Minimum	Maximum	Error value	Unit	Remarks
Cold Sky Mirror Count 6 to 36	-2048	2048	-32767 [Missing data] -32768 [Parity error]	Count	-

(24) Cold Sky Mirror Count 89

The observed count value of CSM and polarization is stored for 89 GHz. The number of observation data for 1 scan is 32 points.

Item	Minimum	Maximum	Error value	Unit	Remarks
Cold Sky Mirror Count 89	-2048	2048	-32767 [Missing data] -32768 [Parity error]	Count	-

(25) Rx Offset Gain Count

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

Item	Minimum	Maximum	Error value	Unit	Remarks
Rx Offset Gain Count	0	255	65535	Count	-

(26) Latitude of Observation Point for 89A

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

In the case of level 1A, 1B, the data which do not process altitude correction are stored. (It's original data)

In the case of level 1R, the data which process altitude correction are stored.

$$-90° < latitude \leq 90°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Latitude of Observation Point for 89A	-90.00	90.00	-9999.99	deg	Negative value shows south latitude. Positive value shows north latitude.

(27) Longitude of Observation Point for 89A

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

In the case of level 1A, 1B, the data which do not process altitude correction are stored. (It's original data)

In the case of level 1R, the data which process altitude correction are stored.

$$-180° < longitude \leq 180°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Longitude of Observation Point for 89A	-180.00	180.00	-9999.99	deg	Negative value shows west longitude. Positive value shows east longitude.

(28) Latitude of Observation Point for 89B

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

In the case of level 1A, 1B, the data which do not process altitude correction are stored. (It's original data)

In the case of level 1R, the data which process altitude correction are stored.

(29) Longitude of Observation Point for 89B

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

In the case of level 1A, 1B, the data which do not process altitude correction are stored. (It's original data)

In the case of level 1R, the data which process altitude correction are stored.

(30) Sun Azimuth

The sun azimuth angle on odd observation points (origin 1) of 89 GHz A-horn is stored. (Fig. 4.2-1)

$$-180° < Angle \leq 180°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Sun Azimuth	-180	180	-32767 ・The case of observation point error. ・The case of setting value is less than –180 degrees or more than 180 degrees.	deg	Scale factor 0.01

(31) Sun Elevation

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

$$-180° < Angle \leq 180°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Sun Elevation	-180	180	-32767 ・The case of observation point error. ・The case of setting value is less than –180 degrees or more than 180 degrees.	deg	Scale factor 0.01

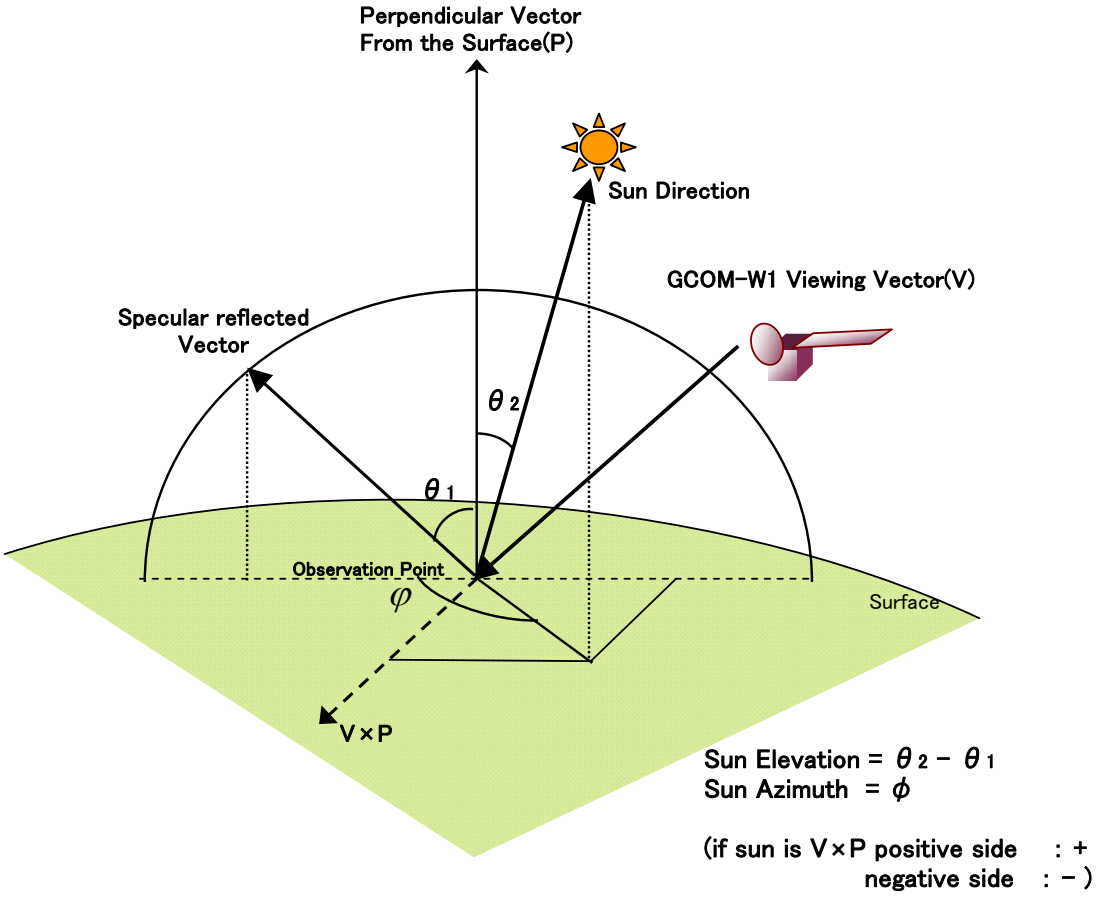


Fig. 4.2-1 The definition of sun elevation, azimuth

(32) Earth Incidence

The earth incident angle on odd observation points (origin 1) of 89 GHz A-horn is stored. It is the angle between the perpendicular vector of the earth surface and the viewing vector of AMSR2. (Fig. 4.2-2)

$$-180° < Angle \leq 180°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Earth Incidence	-180	180	-32767 ・The case of observation point error.	deg	Scale factor 0.01

(33) Earth Azimuth

The earth azimuth angle on odd observation points (origin 1) of 89 GHz A-horn is stored. It is the angle between the north oriented vector on the observation point and the inversed projected viewing vector. (Fig. 4.2-2)

$$-180° < Angle \leq 180°$$

Item	Minimum	Maximum	Error value	Unit	Remarks
Earth Azimuth	-180.00	180.00	-32767 ・The case of observation point error.	deg	Scale factor 0.01

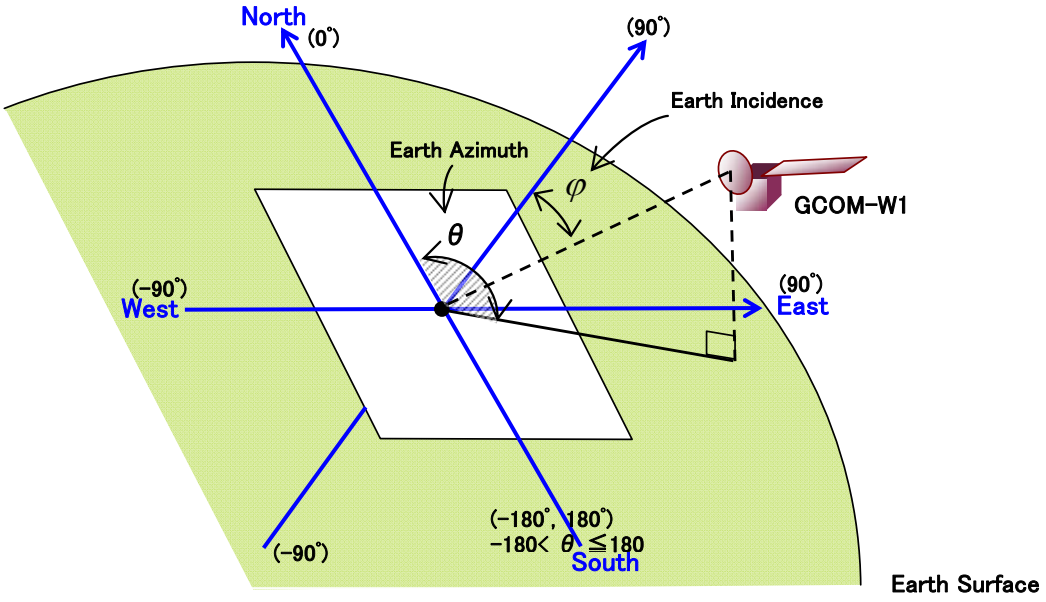


Fig. 4.2-2 The definition of earth azimuth, incidence

(34) Land_Ocean Flag 6 to 36 ,Land_Ocean Flag 89

The land coverage percentage of the observation footprint of AMSR2 is stored for each frequency. In the case of level 1A, 1B, the original latitude and longitude data are used to calculate the Land_Ocean Flag.
In the case of level 1R, the latitude and longitude data that are processed altitude correction are used to calculate the Land_Ocean Flag.

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

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

Item	Minimum	Maximum	Error value	Unit	Remarks
Land_Ocean Flag	0 (Land)	100 (Water)	255	%	-

(35) Observation Supplement

Observation supplement raw data such as a H/W state is stored for each scan. If the scan is missing data, all 1 are stored in it.

(36) SPC Temperature Count

The temperature of SPC (Signal Processor Control unit) in each scan is stored with the value of 12 bits of raw data acquired from the satellite. If it is a missing scan, all 1 are stored in it.

(37) SPS Temperature Count

The temperature of SPS (Signal Processor Sensor unit) in each scan is stored with the value of 12 bits of raw data acquired from the satellite. If it is a missing scan, all 1 are stored in it.

(38) PCD Data

The PCD (Payload Correction Data) data id stored. If it is a missing scan, 1 is stored in all bits at this dataset.

(39) Scan Data Quality

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

1) Angular direction of sun from CSM (4byte/float)

The angle [degree] between the viewing vector of CSM and the direction of the sun is stored. (Fig. 4.2-3)

2) Angular direction of moon from CSM(4byte/float)

The angle [degree] between the viewing vector of CSM and the direction of the moon is stored. （Fig. 4.2-3）

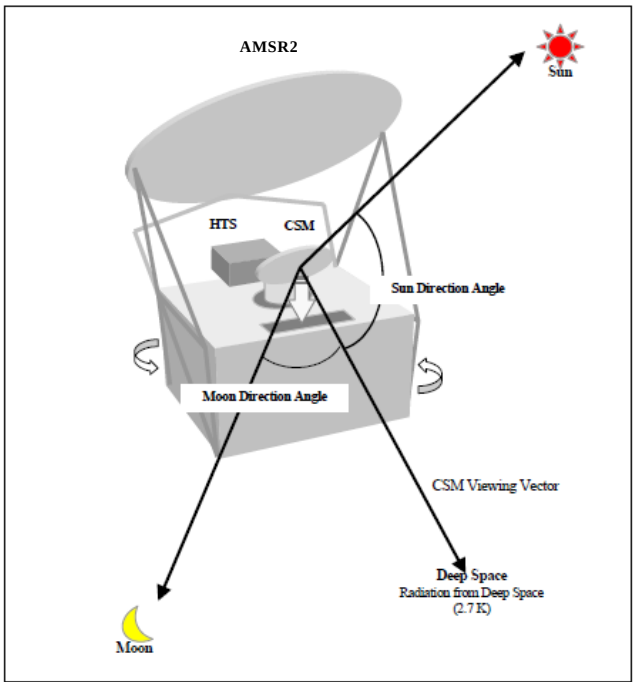


Fig. 4.2-3 The definition of the moon direction angle and the sun direction angle.

3) Quality of packets

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).

4) Antenna Rotation Velocity（4byte/float）

The antenna rotative velocity calculated by tacho pulse count is stored for each scan. [rpm]

5) Calibration Data Quality（4byte/float）

The statistics information of calibration count (CSM, HTS) is stored for each scan. They 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,

89GA-V, 89GA-H, 89GB-V and 89GB-H. Detailed statistical information is shown below.

(a) Average of CSM Count（4byte/float）
(b) Average of HTS Count（4byte/float）
(c) Standard deviation of CSM Count（4byte/float）
(d) Standard deviation of HTS Count（4byte/float）

6) SPC and SPS Error Flag

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
1: SPC is error
2: SPS is error
3: SPC and SPS are error

7) HTS Temperature（4byte/float）

It shows the HTS temperature value [K] for each frequency. The stored HTS temperature is data used when calculates brightness temperature. (All frequencies are stored in the order corresponding to “5) Calibration Data Quality”.)

8) The sum of parity error

It shows the sum of parity error number as below items in the scan.

(a)The sum of RX Offset/Gain count with parity error

(b)The sum of CSM count with parity error (All frequencies and polarization are stored in the order corresponding to “5) Calibration Data Quality”.)

(c)The sum of HTS count with parity error (All frequencies and polarization are stored in the order corresponding to “5) Calibration Data Quality”.)

9) Quality Information for a scan

It shows the quality inforamtin of a scan with bit by bit. These bits are set by level 1A or 1B process. The more details are shown as below.

・Obs Start Time Check　(0: OK, 1: NG)
・Antenna Difference Count Check(0: OK, 1: NG)
・Antenna Rotation Check　(0: OK, 1: NG)
・HTS Temperature Check (0: OK, 1: NG)
・ADA STATOR (A/B) Check (0: OK, 1: NG)
・ADA ROTOR A Check (0: OK, 1: NG)
・ADA ROTOR B Check (0: OK, 1: NG)
・ADA Angular Momentum Check (0: OK, 1: NG)
・HTS Value Limit Check(0: OK, 1: NG)
・CSM Value Limit Check(0: OK, 1: NG)
・HTS Difference Limit Check(0: OK, 1: NG)
・CSM Difference Limit Check(0: OK, 1: NG)
・HTS-HTS Control Temperature Limit Check(0: OK, 1: NG)
・Attitude Flug (0:ESA/IRU Base, 1:STT/IRU Base)
・Attitude Error Angle Check (0: OK, 1: NG)
・Attitude Angular Velocity Check (0: OK, 1: NG)
・Navigation Flug　(00:Navigation Stop
　　01:AG Filter
　　10:Kalman Filter
　　11:Converged Kalman Filter)
・Altitude Check　(0: OK, 1: NG)
・Satellite Velocity Check　(0: OK, 1: NG)

10) Geometric Information

It is shows the number not to be able to calculate latitude or longitude information.
Maximum = 1944(486×4(Type)）4Type : Lat89A,Lat89B,Lon89A,Lon89B

11) Brightness Temperature Information

It is shows the number of brightness temperatures that exceed the limit.
Maximum
= 4860（243×2(Polarization)×6(Frequencies)+486×2(Polarization)×2(Frequencies)）

12) Obs Total Primary Count

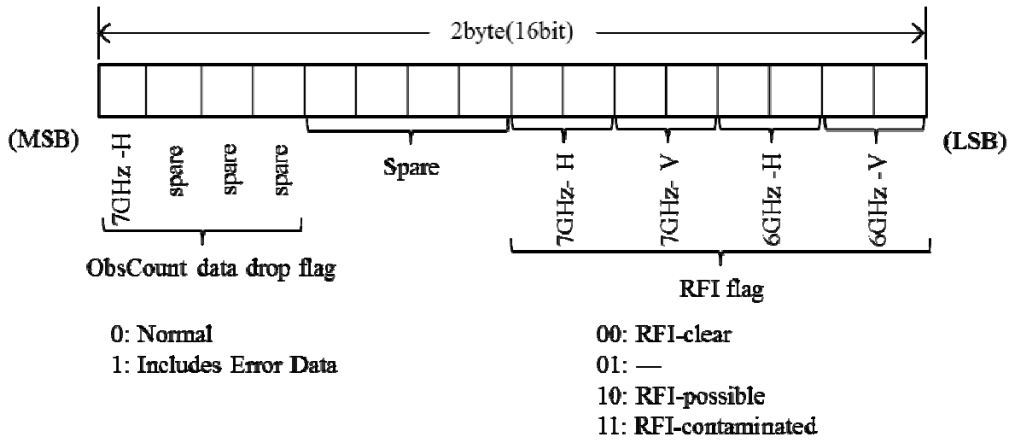
It is shows the number of observation count value with parity error
Maximum
= 4860（243×2(Polarization)×6(Frequencies)+486×2(Polarization)×2(Frequencies)）

13) Spare

0 is stored in it.

(40) Pixel Data Quality 6 to 36

The flag that shows the data include RFI is stored for each frequency and polarization (currently only applied for 6GHz and 7GHz). This flag is stored by Level 1B process. The Level 1A product file stores 0 in this flag.And,Obs Count data drop flag (only 7GHz-H) is also stored.



(41) Pixel Data Quality 89

The flag that shows the data include RFI is stored for each frequency and polarization for 89GHz. It shows bit by bit each frequency and polarization. This flag is stored by Level 1B process. The Level 1A product file stores 0 in this flag.

(42) Interpolation Flag 6 to 36

The interpolation flag for calibration data is stored for each frequency except 89GHz. Fig. 4.2-4 shows the interpolation flag format. Each flag is corresponded to the correction items shown as below.

- Correction for the moonlight effect.
- Correction for the interference in the radio frequency from stationary stellites and others.

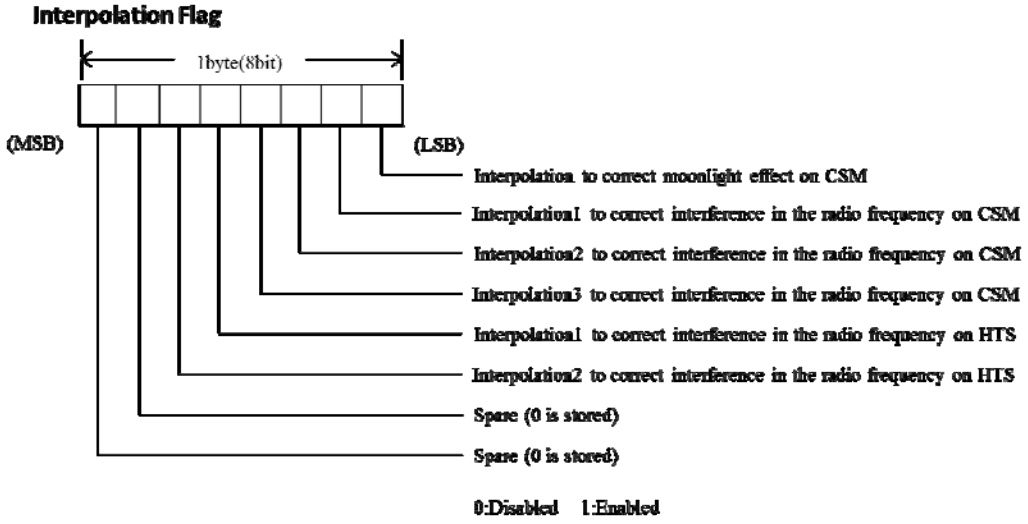


Fig. 4.2-4 The format of the interpolation flag

(43) Interpolation Flag 89

The interpolation flag for calibration data is stored for 89GHz.（Shown in Fig. 4.2-4）

AMSR2 Level 1B product format specification

- Content -

1 Introduction

1.1 Purpose

This format specification describes the format of AMSR2 level 1B product produced at Japan Aerospace Exploration Agency (JAXA). This document describes the structure and contents of AMSR2 level 1B product.

1.2 Overview

AMSR2 level 1B product stores the brightness temperature data. The other dataset are the same as the format of the AMSR2 level 1A product.

2 Applicable and reference documents

2.1 Applicable documents

- AMSR2 Level 1 algorithm description (SGC-090053)
- EIS granule ID prescription (NEB-060005B)

2.2 Reference documents

- AMSR-E Data Users Handbook(NCX-030021)
- AMSR-E Level 1 product format description (NEB-00011F)
- AMSR-E Level 2 format description (NDX-000272C)
- AMSR-E Level 2 Map format description (NDX-000273D)
- AMSR-E Level 3 format description (NDX-000274B)

3 Product description

AMSR2 Level 1B product stores the brightness temperature data and supplementary data as HDF5 format. Show the product format as below.

3.1 Structure of product file

Table 3.1-1 AMSR2 Level 1B product file structure shows the AMSR2 Level 1B product structure.

Table 3.1-1 AMSR2 Level 1B product file structure

Structure		HDF Data	Content
Header	Product Metadata	Attribute	Describe unique information of the product data. (Sensor specification, Engineering value coefficients…etc) See the AMSR2 Level 1A product format specification. The specification shows more details of attribute contents.
Data		Dataset	The example of the stored data is shown as below. ・Scanning time ・Brightness temperature data ・HTS, CSM count data ・Latitude/Longitude ・Supplementary information ・Land Sea flag ・Quality information

3.2 Structure of data

Fig. 3.2-1 AMSR2 level 1B product data structure shows structure of AMSR2 level 1B product data. “The level 1B Product Metadata” is the same as “the level 1A Product Metadata”, so refer to AMSR2 level 1A product format specification. Table 3.2-1 Data set list shows data set specification of level 1B Product data. In this regard, data size and number of records are values for the case of standard operation.

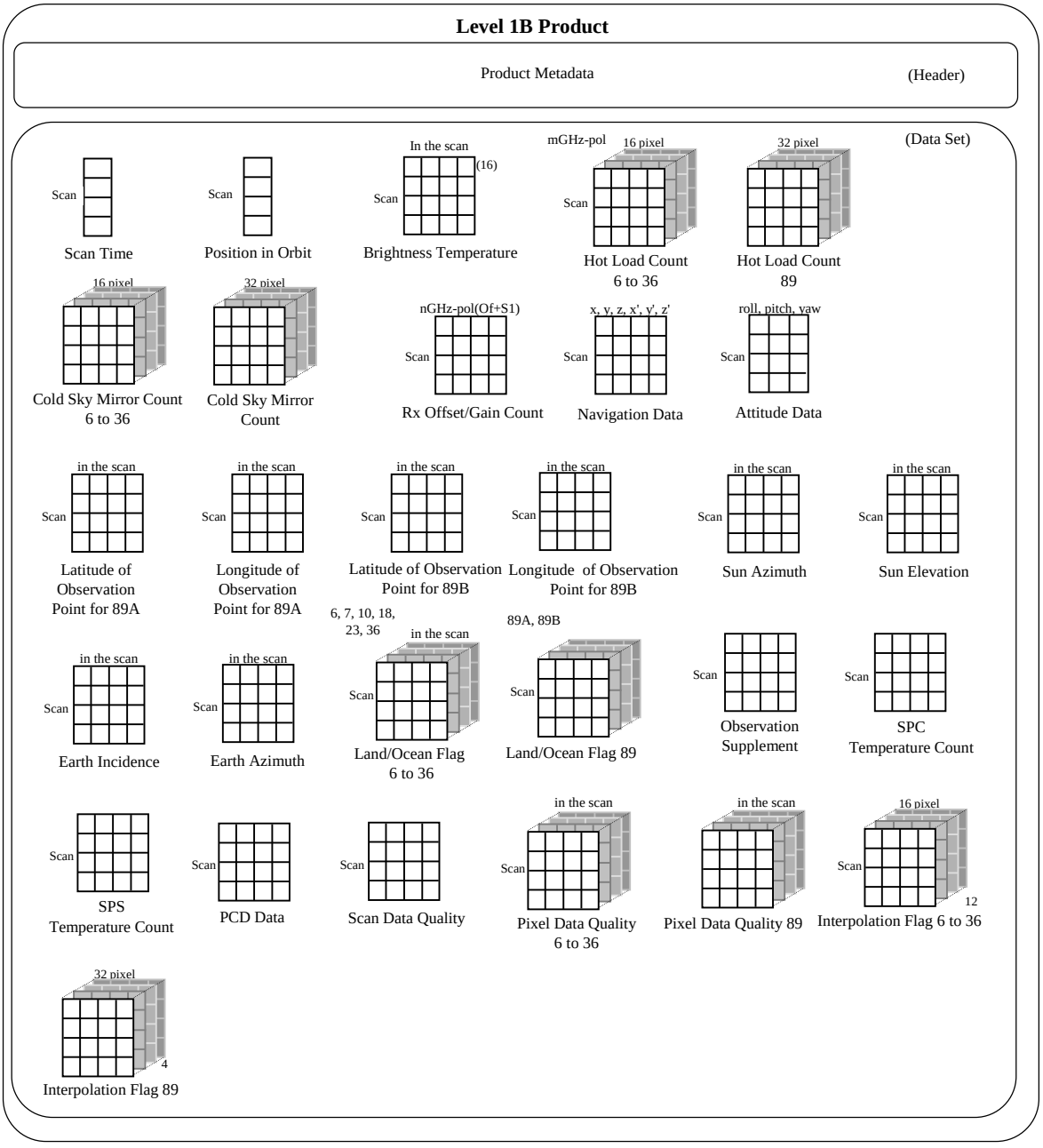


Fig. 3.2-1 AMSR2 level 1B product data structure

*The position of the observation point (latitude and longitude) at the frequency of other than 89GHz is calculated by using the observation position of the 89GHz-A horn and the relative registration factors.(Refer to 3.2 Structure of data of AMSR2 Level 1A product format specification)

Table 3.2-1 Data set list（1/2）

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
1	Product Meta Data	100	100	-	10,000	1	10,000	-	-
2	Scan Time	1	8	double	8	2,018	16,144	1.00	sec
3	Position in Orbit	1	8	double	8	2,018	16,144	1.00	-
4	Navigation Data	6	4	float	24	2,018	48,432	1.00	m,m/s
5	Attitude Data	3	4	float	12	2,018	24,216	1.00	deg
6	Brightness Temperature (6.9GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
7	Brightness Temperature (6.9GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
8	Brightness Temperature (7.3GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
9	Brightness Temperature (7.3GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
10	Brightness Temperature (10.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
11	Brightness Temperature (10.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
12	Brightness Temperature (18.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
13	Brightness Temperature (18.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
14	Brightness Temperature (23.8GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
15	Brightness Temperature (23.8GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
16	Brightness Temperature (36.5GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
17	Brightness Temperature (36.5GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
18	Brightness Temperature (89.0GHz-A,V)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
19	Brightness Temperature (89.0GHz-A,H)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
20	Brightness Temperature (89.0GHz-B,V)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
21	Brightness Temperature (89.0GHz-B,H)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
22	Hot Load Count 6 to 36	192	2	signed int	384	2,018	774,912	1.00	Count
23	Hot Load Count 89	128	2	signed int	256	2,018	516,608	1.00	Count
24	Cold Sky Mirror Count 6 to 36	192	2	signed int	384	2,018	774,912	1.00	Count
25	Cold Sky Mirror Count 89	128	2	signed int	256	2,018	516,608	1.00	Count
26	Rx Offset_Gain Count	32	2	unsigned int	64	2,018	129,152	1.00	Count
27	Latitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg

Table 3.2-1 Data set list（2/2）

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
28	Longitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg
29	Latitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg
30	Longitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg
31	Sun Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
32	Sun Elevation	243	2	signed int	486	2,018	980,748	0.01	deg
33	Earth Incidence	243	2	signed int	486	2,018	980,748	0.01	deg
34	Earth Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
35	Land_Ocean Flag 6 to 36	1,458	1	unsigned char	1,458	2,018	2,942,244	1.00	%
36	Land_Ocean Flag 89	972	1	unsigned char	972	2,018	1,961,496	1.00	%
37	Observation Supplement	124	2	binary (*1)	248	2,018	500,464	-	-
38	SPC Temperature Count	34	2	unsigned int	68	2,018	137,224	1.00	Count
39	SPS Temperature Count	46	2	unsigned int	92	2,018	185,656	1.00	Count
40	PCD Data	1	64	binary (*2)	64	2,018	129,152	-	-
41	Scan Data Quality	1	512	binary (*3)	512	2,018	1,033,216	-	-
42	Pixel Data Quality 6 to 36	243	2	binary (*4)	486	2,018	980,748	-	-
43	Pixel Data Quality 89	486	1	unsigned char	486	2,018	980,748	-	-
44	Interpolation Flag 6 to 36	192	1	binary (*5)	192	2,018	387,456	-	-
45	Interpolation Flag 89	128	1	binary (*6)	128	2,018	258,304	-	-
	Total(Bytes)						51,553,756		
	Total(MB)						***49.17***		

(*1) The actual Product (HDF), it is stored as an “unsigned char” array of 248 elements. The 1 sample means every 2byte data. (Big Endian)

(*2) The actual Product (HDF), it is stored as an “unsigned char” array of 64 elements. The 1 sample means 64byte. (Big Endian)

(*3) The actual Product (HDF), it is stored as an “unsigned char” array of 512 elements. The 1 sample means 512byte. (Little Endian)

(*4) The actual Product (HDF), it is stored as an “unsigned char” array of 486 elements. The 1 sample means every 2byte data.

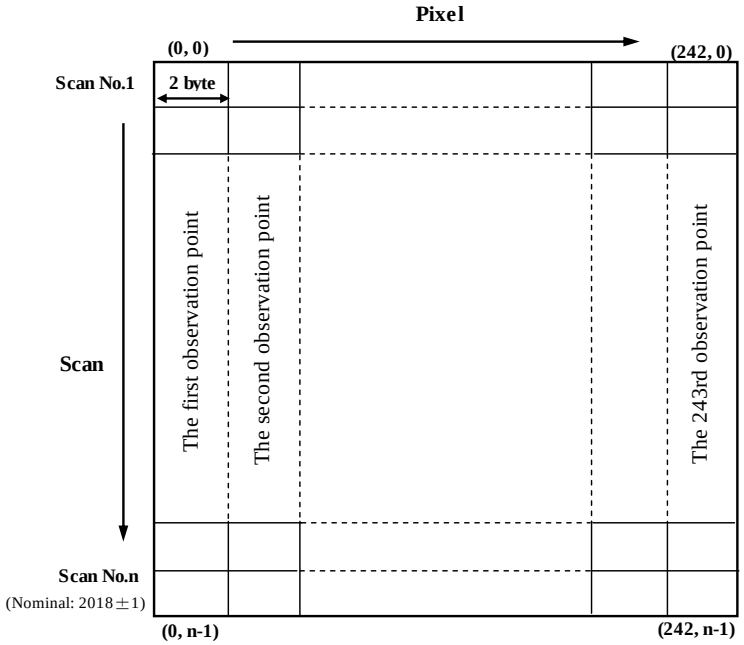
Table 3.2-1 Data set list（3/2）

(Big Endian)

(*5) The actual Product (HDF), it is stored as an “unsigned char” array of 16*12ch elements.

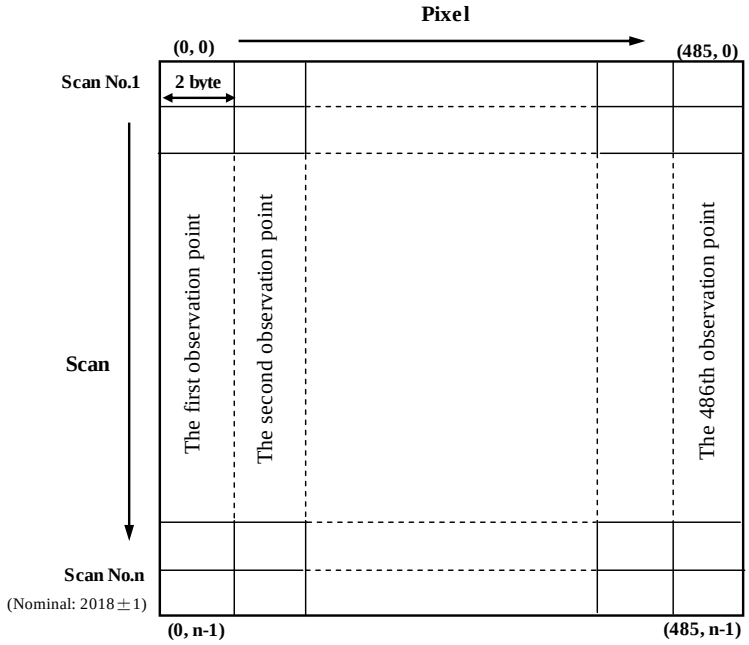
(*6) The actual Product (HDF), it is stored as an “unsigned char” array of 32*4ch elements.

3.3 Architecture of data



Brightness Temperature(6.9GHz,V)

(6-H, 7-V/H, 10-V/H, 18-V/H, 23-V/H, 36-V/H, have the same structure)



Brightness Temperature(89.0GHz-

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

Fig. 3.3-1 Structure of Brightness Temperature

3.4 Special instruction

3.4.1 Product file name

AMSR2 level 1 product file name (1A, 1B, 1R) is ruled below. Granule ID is stated by reference documents.

File name = Granule ID + extension [.h5]

Scene ID Product ID

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
AMSR2	G	W	1	A	M	2	_	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

<Exp.> G W 1 A M 2 _ 2 0 1 1 1 1 1 3 2 3 4 5 _ 0 1 2 D _ L 1 D L A D N R _ 1 1 0 1 0 0 1

Scene ID

[Satellite] [Sensor] [Observation Start Time] [Pass Number] [Orbit Direction]
- Satellite : GW1（Fixed Value）
- Sensor : AM2（Fixed Value）
- Observation Start Time : YYYYMMDDHHmm（UTC）
- Pass Number : PPP（000～300）*Observation Start point
- 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 : Level 1, L2 : Level 2）
- Process Kind : xx （SG : Standard operation product, SN : Near real time operation product (Global), SL : Near real time operation product (Local),
  RG : Research standard operation product, RN : Research Near real time operation product (Global),
  RL : Research Near real time operation product (Local), DL : For the Direct recieving station (Local area)）
- Product ID : KKK（<L1A> ADN : Digital Number, <L1B> BTB : Brightness Temperature, <L1R> RTB : Brightness Temperature,
  ＜L2＞ CLW : Cloud Liquid Water, TPW : Total Precipitable Water, PRC : Precipitation,
  SST : Sea Surface Temperature, SSW : Sea Surface Wind speed, SIC : Sea Ice Concentration,
  SND : Snow Depth, SMC : Soil Moisture Content）
- Resolution : r（<L1> R : Raw（Fixed Value）, ＜L2＞ L: Low [243 pixels], H : High[486 pixels]）
- Developer ID : d（<L1> _ : underscore（Fixed Value）, ＜L2＞ : A～Z）
- Product version : v（0～9, a～z）
- Algorithm version : aaa（000～999）
- Parameter version : ppp（000～999）

3.4.2 Definition of the Product Data range

Fig. 3.4-1 shows the definition of the data range stored in level 1 product file. The data range of AMSR2 level 1 product is the half orbit defined as a scene and extended about 30 scans at both ends. The both ends of a half orbit correspond to the maximum and minimum latitude of the observation point at the center of the scan.

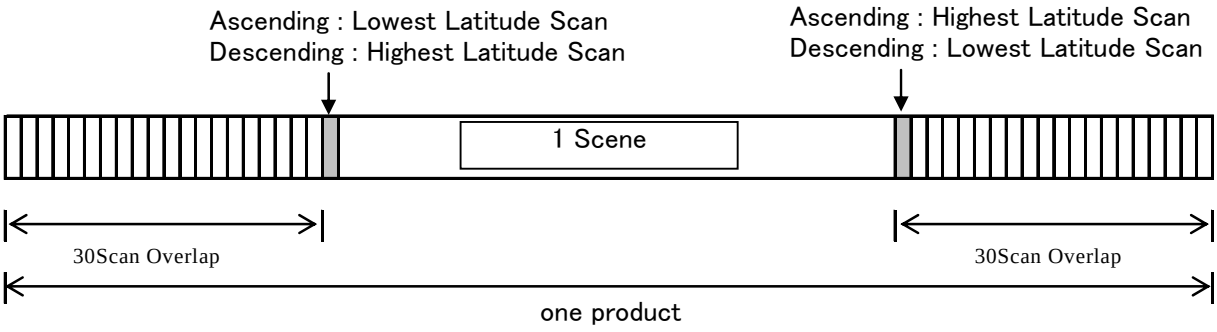


Fig. 3.4-1 Product data range

3.4.3 Coordinate system

AMSR2 level 1 product (1A, 1B, 1R) stores observation position (latitude, longitude) and orbit information of satellite. The observation positions are 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. The orbit information is stored as WGS84 earth fixed coordinate system.

3.4.4 Scaling factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR2 level 1 product. AMSR2 dataset has scaling factor in the HDF5 file. The scaling factor is set for each dataset and stored with the data unit in the attribute information.

4 Description of data

4.1 Product metadata (Attribute)

4.2 See the AMSR2 Level 1A product format specification. The specification shows more details of attribute contents.Dataset

(1) Brightness Temperature (6.9GHz,V)

The observed 6.9 GHz V brightness temperature is stored. The error value of brightness temperature is shown as below. This is applied for all frequency and polarization.

Item	Minimum	Maximum	Error value	Unit	Remarks
Brightness Temperature	10	500	65535 (Missing value)	K	-
			65534 (Parity error value)		

(2) Brightness Temperature (6.9GHz,H)

The observed 6.9 GHz H brightness temperature is stored.

(3) Brightness Temperature (7.3GHz,V)

The observed 7.3 GHz V brightness temperature is stored.

(4) Brightness Temperature (7.3GHz,H)

The observed 7.3 GHz H brightness temperature is stored.

(5) Brightness Temperature (10.7GHz,V)

The observed 10.7 GHz V brightness temperature is stored.

(6) Brightness Temperature (10.7GHz,H)

The observed 10.7 GHz H brightness temperature is stored.

(7) Brightness Temperature (18.7GHz,V)

The observed 18.7 GHz V brightness temperature is stored.

(8) Brightness Temperature (18.7GHz,H)

The observed 18.7 GHz H brightness temperature is stored.

(9) Brightness Temperature (23.8GHz,V)

The observed 23.8 GHz V brightness temperature is stored.

(10) Brightness Temperature (23.8GHz,H)

The observed 23.8 GHz H brightness temperature is stored.

(11) Brightness Temperature (36.5GHz,V)

The observed 36.5 GHz V brightness temperature is stored.

(12) Brightness Temperature (36.5GHz,H)
The observed 36.5 GHz H brightness temperature is stored.

(13) Brightness Temperature (89.0GHz-A,V)
The observed 89.0A GHz V brightness temperature is stored.

(14) Brightness Temperature (89.0GHz-A,H)
The observed 89.0A GHz H brightness temperature is stored.

(15) Brightness Temperature (89.0GHz-B,V)
The observed 89.0B GHz V brightness temperature is stored.

(16) Brightness Temperature (89.0GHz-B,H)
The observed 89.0B GHz H brightness temperature is stored.

Please refer to AMSR2 level 1A product format specification as the other datase t.

AMSR2 Level 1R product format specification

- Content -

1 Introduction

1.1 Purpose

This format specification describes the format of AMSR2 level 1R product produced at Japan Aerospace Exploration Agency (JAXA). This document describes the structure and contents of AMSR2 level 1R product.

1.2 Overview

AMSR2 level 1R product stores the resampling brightness temperature data. The resampling brightness temperature is processed to match the difference of resolution in each frequency.

2 Applicable and reference documents

2.1 Applicable documents

- AMSR2 Level 1 algorithm description (SGC-090053)
- EIS granule ID prescription (NEB-060005B)

2.2 Reference documents

- AMSR-E Data Users Handbook(NCX-030021)
- AMSR-E Level 1 product format description (NEB-00011F)
- AMSR-E Level 2 format description (NDX-000272C)
- AMSR-E Level 2 Map format description (NDX-000273D)
- AMSR-E Level 3 format description (NDX-000274B)

3 Product description

AMSR2 Level 1R product stores the resampling brightness temperature data and supplementary data as HDF5 format. Show the product format as below.

3.1 Structure of product file

Table 3.1-1 AMSR2 Level 1R product file structure shows the AMSR2 Level 1R product structure.

Table 3.1-1 AMSR2 Level 1R product file structure

Structure		HDF Data	Content
Header	Product Metadata	Attribute	Describe unique information of the product data. (Sensor specification, Engineering value coefficients…etc) See the AMSR2 Level 1A product format specification. That specification shows more details of attribute contents.
Data		Dataset	The example of the stored data is shown as below. ・Scanning time ・Resampling brightness temperature data ・Altitude data ・Latitude/Longitude ・Supplementary information ・Land Sea flag ・Quality information

3.2 Structure of data

Fig. 3.2-1 AMSR2 level 1R product data structure shows structure of AMSR2 level 1B product data. “The level 1B Product Metadata” is the same as “the level 1A Product Metadata”, so refer to AMSR2 level 1A product format specification. Table 3.2-1 Data set list shows data set specification of level 1B Product data. In this regard, data size and number of records are values for the case of standard operation.

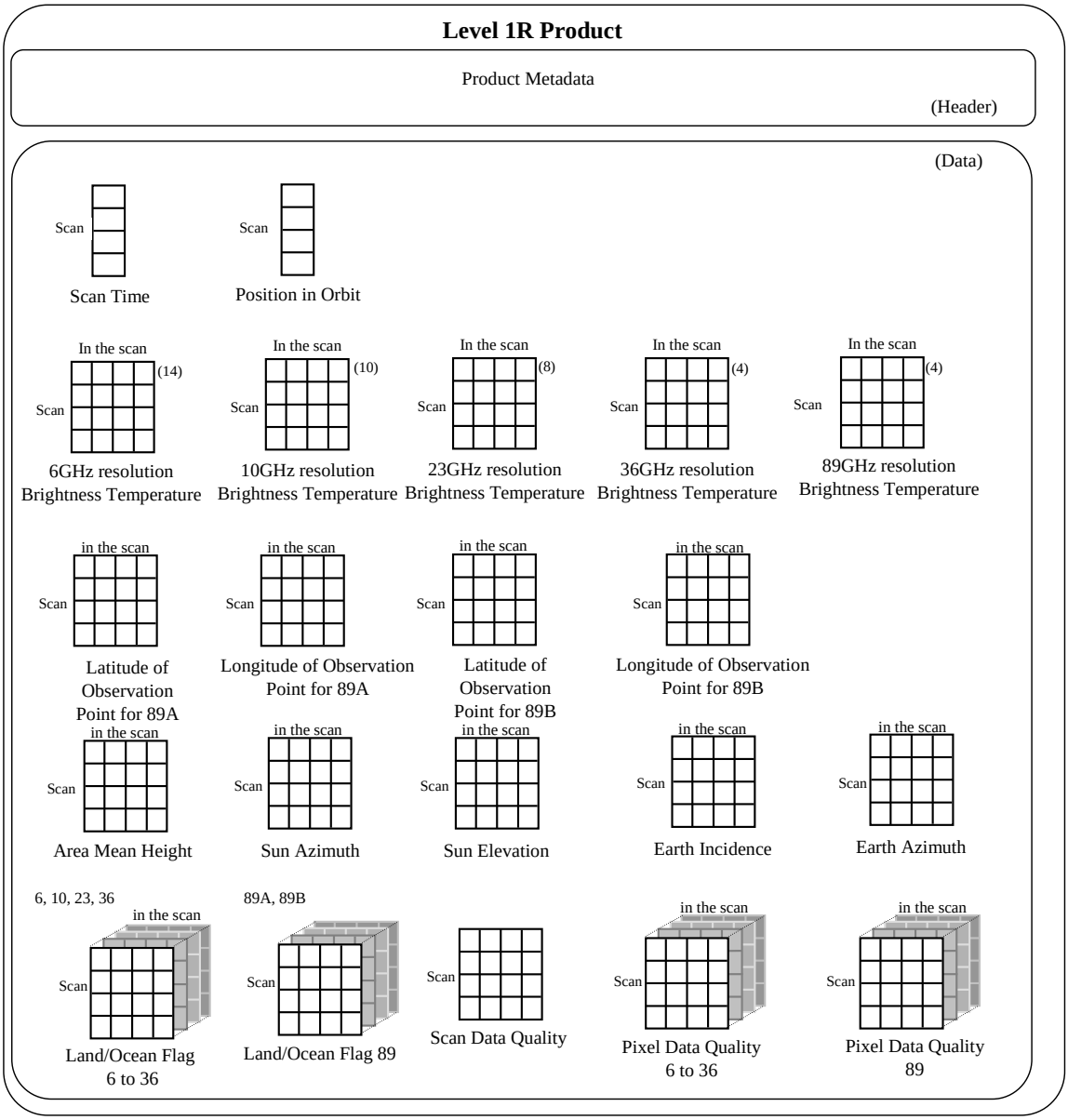


Fig. 3.2-1 AMSR2 level 1R product data structure

*The value of the observed position of 89GHz-A horn is used as the position of the observation point (latitude and longitude) at the frequency of other than 89GHz.(Refer to 4.1(57)CoRegistrationParameterA1, CoRegistrationParameterA2 of AMSR2 Level 1A product format specification)

Table 3.2-1 Data set list(1/3)

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
1	Product Meta Data	100	100	-	10,000	1	10,000	-	-
2	Scan Time	1	8	double	8	2,018	16,144	1.00	sec
3	Position in Orbit	1	8	double	8	2,018	16,144	1.00	-
4	Navigation Data	6	4	float	24	2,018	48,432	1.00	m,m/s
5	Attitude Data	3	4	float	12	2,018	24,216	1.00	deg
	<6GHz resolution>								
6	Brightness Temperature (res06,6.9GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
7	Brightness Temperature (res06,6.9GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
8	Brightness Temperature (res06,7.3GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
9	Brightness Temperature (res06,7.3GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
10	Brightness Temperature (res06,10.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
11	Brightness Temperature (res06,10.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
12	Brightness Temperature (res06,18.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
13	Brightness Temperature (res06,18.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
14	Brightness Temperature (res06,23.8GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
15	Brightness Temperature (res06,23.8GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
16	Brightness Temperature (res06,36.5GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
17	Brightness Temperature (res06,36.5GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
18	Brightness Temperature (res06,89.0GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
19	Brightness Temperature (res06,89.0GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
	<10GHz resolution>								
20	Brightness Temperature (res10,10.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
21	Brightness Temperature (res10,10.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
22	Brightness Temperature (res10,18.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
23	Brightness Temperature (res10,18.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
24	Brightness Temperature (res10,23.8GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K

Table 3.2-1 Data set list(2/3)

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
25	Brightness Temperature (res10,23.8GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
26	Brightness Temperature (res10,36.5GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
27	Brightness Temperature (res10,36.5GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
28	Brightness Temperature (res10,89.0GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
29	Brightness Temperature (res10,89.0GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
	<23GHz resolution>								
30	Brightness Temperature (res23,18.7GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
31	Brightness Temperature (res23,18.7GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
32	Brightness Temperature (res23,23.8GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
33	Brightness Temperature (res23,23.8GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
34	Brightness Temperature (res23,36.5GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
35	Brightness Temperature (res23,36.5GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
36	Brightness Temperature (res23,89.0GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
37	Brightness Temperature (res23,89.0GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
	<36GHz resolution>								
38	Brightness Temperature (res36,36.5GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
39	Brightness Temperature (res36,36.5GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
40	Brightness Temperature (res36,89.0GHz,V)	243	2	unsigned int	486	2,018	980,748	0.01	K
41	Brightness Temperature (res36,89.0GHz,H)	243	2	unsigned int	486	2,018	980,748	0.01	K
	<89GHz resolution>								
42	Brightness Temperature (original,89GHz-A,V)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
43	Brightness Temperature (original,89GHz-A,H)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
44	Brightness Temperature (original,89GHz-B,V)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
45	Brightness Temperature (original,89GHz-B,H)	486	2	unsigned int	972	2,018	1,961,496	0.01	K
46	Latitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg
47	Longitude of Observation Point for 89A	486	4	float	1,944	2,018	3,922,992	1.00	deg
48	Latitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg

Table 3.2-1 Data set list(3/3)

No.	Data	Samples	Bytes/ Sample	Type	Bytes/ Record	Records	Sum(bytes)	Scale factor	Units
49	Longitude of Observation Point for 89B	486	4	float	1,944	2,018	3,922,992	1.00	deg
50	Area Mean Height	243	2	signed int	486	2,018	980,748	1.00	m
51	Sun Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
52	Sun Elevation	243	2	signed int	486	2,018	980,748	0.01	deg
53	Earth Incidence	243	2	signed int	486	2,018	980,748	0.01	deg
54	Earth Azimuth	243	2	signed int	486	2,018	980,748	0.01	deg
55	Land_Ocean Flag 6 to 36	972	1	unsigned char	972	2,018	1,961,496	1.00	%
56	Land_Ocean Flag 89	972	1	unsigned char	972	2,018	1,961,496	1.00	%
57	Scan Data Quality	1	512	binary (*1)	512	2,018	1,033,216	1.00	-
58	Pixel Data Quality 6 to 36	243	2	binary (*2)	486	2,018	980,748	1.00	-
59	Pixel Data Quality 89	486	1	unsigned char	486	2,018	980,748	1.00	-
	Total(Bytes)						70,781,260		
	Total(MB)						***67.50***		

(*1) The actual Product (HDF), it is stored as an “unsigned char” array of 512 elements. The 1 sample means 512byte. (Little Endian)

(*2) The actual Product (HDF), it is stored as an “unsigned char” array of 486 elements. The 1 sample means every 2byte data. (Big Endian)

3.3 Architecture of data

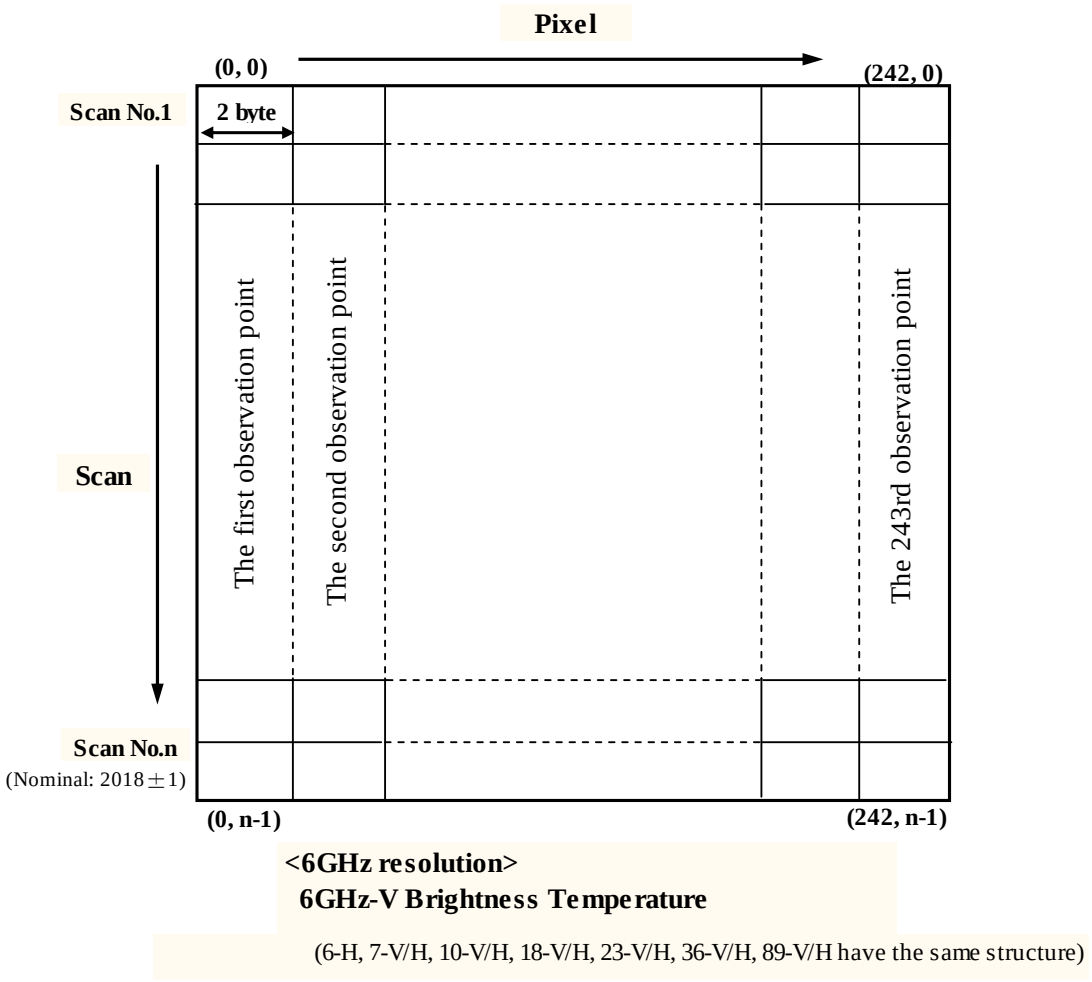


Fig. 3.3-1 6GHz resolution Brightness Temperature

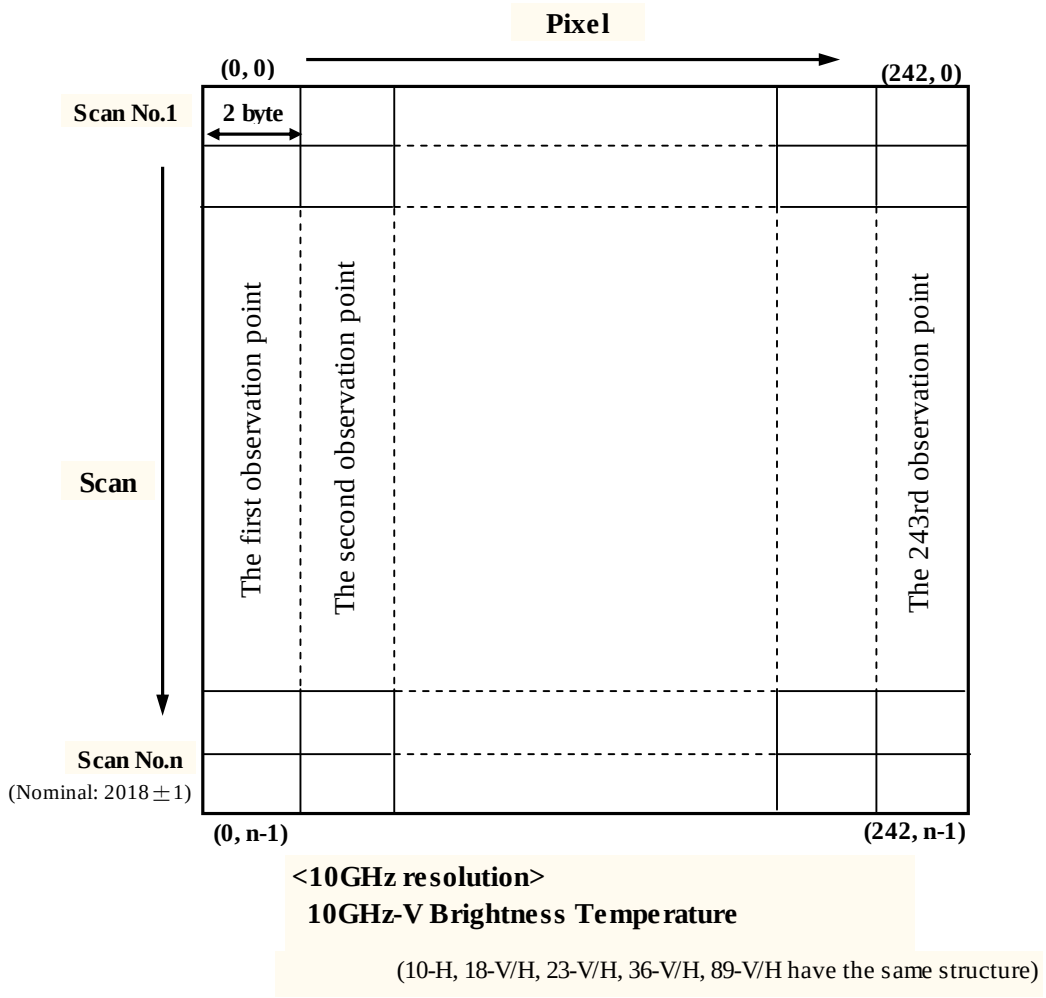


Fig. 3.3-2 10GHz resolution Brightness Temperature

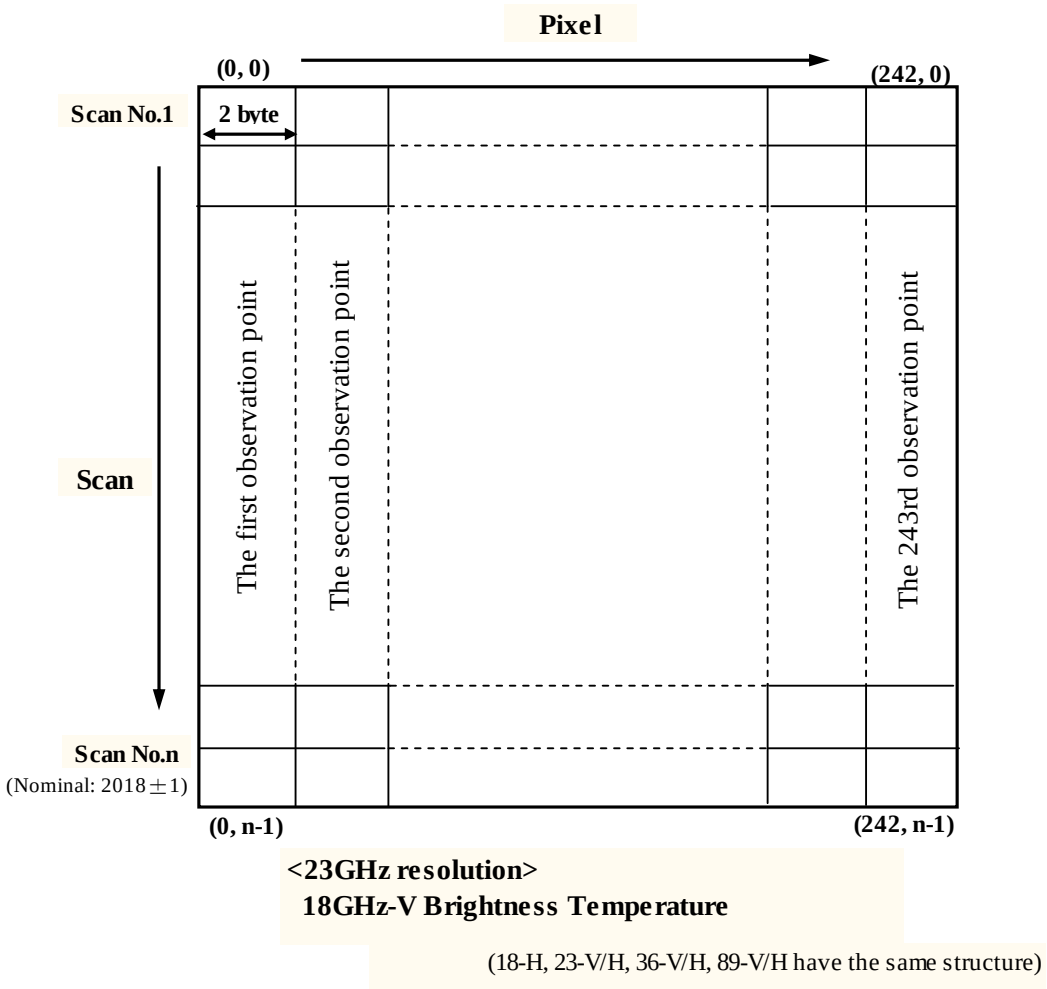


Fig. 3.3-3 23GHz resolution Brightness Temperature

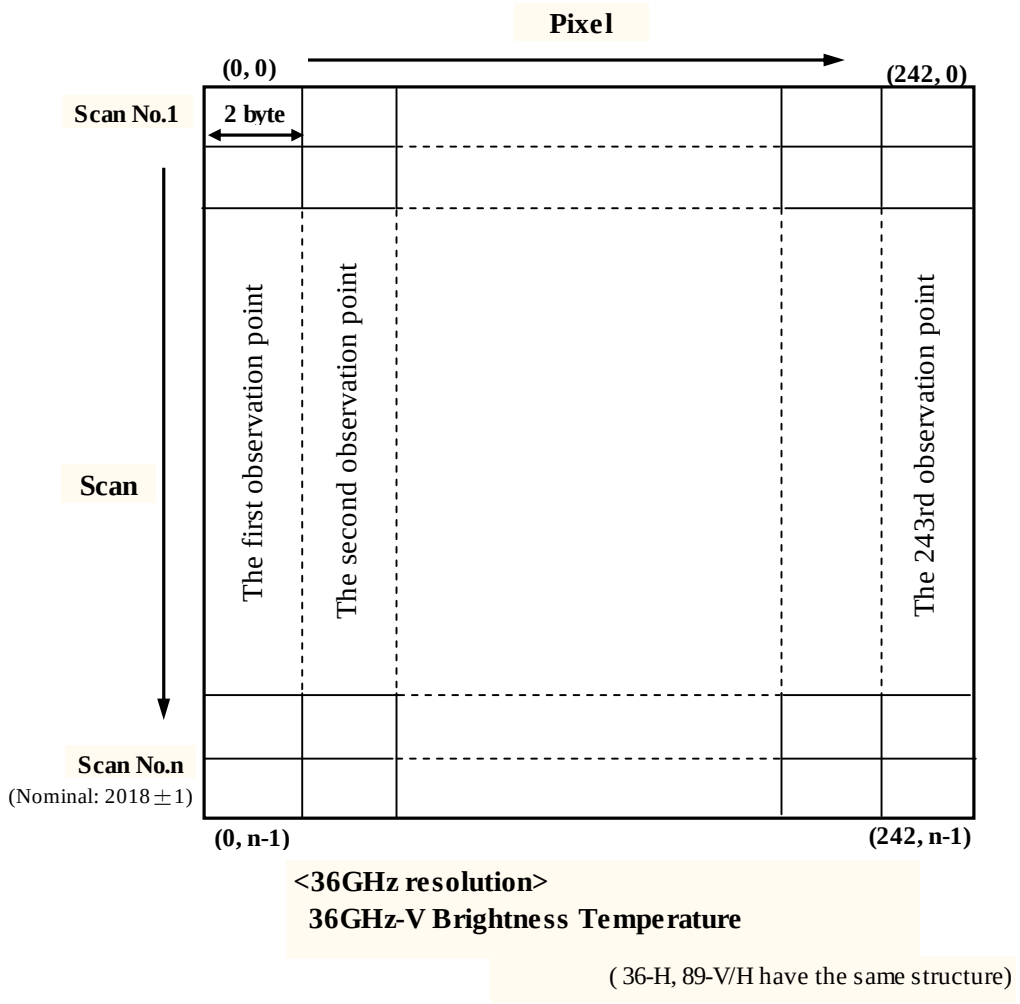


Fig. 3.3-4 36GHz resolution Brightness Temperature

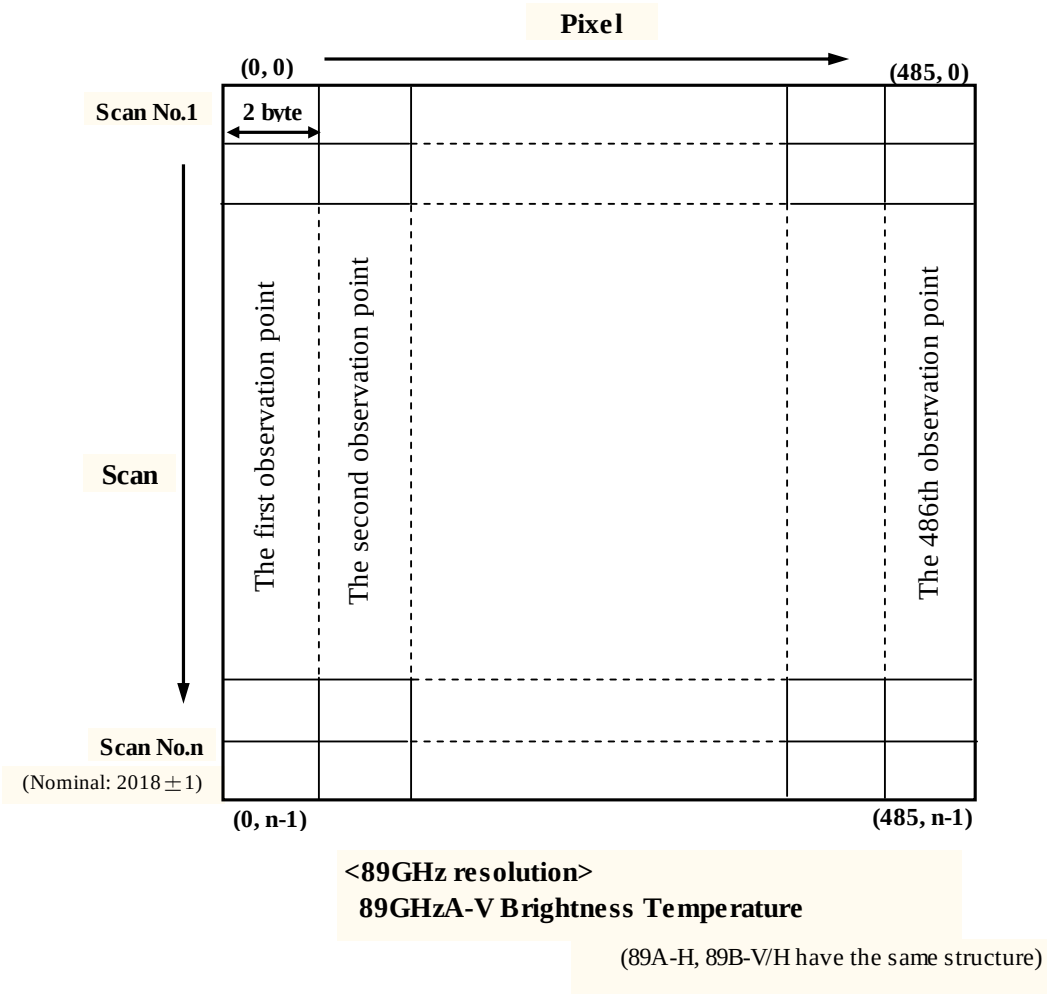


Fig. 3.3-5 89GHz resolution Brightness Temperature

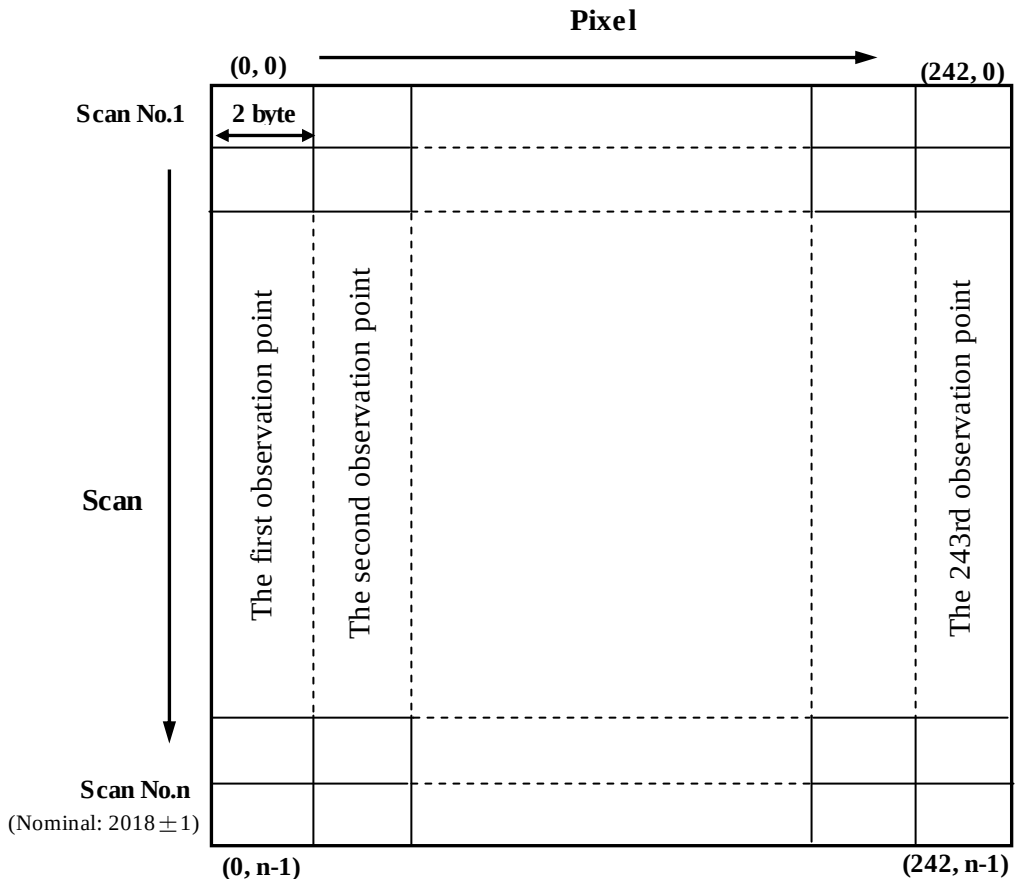


Fig. 3.3-6 Area Mean Height

3.4 Special instruction

3.4.1 Product file name

AMSR2 level 1 product file name (1A, 1B, 1R) is ruled below. Granule ID is stated by reference documents.

File name = Granule ID + extension [.h5]

Scene ID Product ID

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
AMSR2	G	W	1	A	M	2	_	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

<Exp.> G W 1 A M 2 _ 2 0 1 1 1 1 1 3 2 3 4 5 _ 0 1 2 D _ L 1 D L A D N R _ 1 1 0 1 0 0 1

Scene ID

[Satellite] [Sensor] [Observation Start Time] [Pass Number] [Orbit Direction]
- Satellite : GW1（Fixed Value）
- Sensor : AM2（Fixed Value）
- Observation Start Time : YYYYMMDDHHmm（UTC）
- Pass Number : PPP（000～300）*Observation Start point
- 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 : Level 1, L2 : Level 2）
- Process Kind : xx （SG : Standard operation product, SN : Near real time operation product (Global), SL : Near real time operation product (Local),
  RG : Research standard operation product, RN : Research Near real time operation product (Global),
  RL : Research Near real time operation product (Local), DL : For the Direct recieving station (Local area)）
- Product ID : KKK（<L1A> ADN : Digital Number, <L1B> BTB : Brightness Temperature, <L1R> RTB : Brightness Temperature,
  ＜L2＞ CLW : Cloud Liquid Water, TPW : Total Precipitable Water, PRC : Precipitation,
  SST : Sea Surface Temperature, SSW : Sea Surface Wind speed, SIC : Sea Ice Concentration,
  SND : Snow Depth, SMC : Soil Moisture Content）
- Resolution : r（<L1> R : Raw（Fixed Value）, ＜L2＞ L: Low [243 pixels], H : High[486 pixels]）
- Developer ID : d（<L1> _ : underscore（Fixed Value）, ＜L2＞ : A～Z）
- Product version : v（0～9, a～z）
- Algorithm version : aaa（000～999）
- Parameter version : ppp（000～999）

3.4.2 Definition of the Product Data range

Fig. 3.4-1 shows the definition of the data range stored in level 1 product file. The data range of AMSR2 level 1 product is the half orbit defined as a scene and extended about 30 scans at both ends. The both ends of a half orbit correspond to the maximum and minimum latitude of the observation point at the center of the scan.

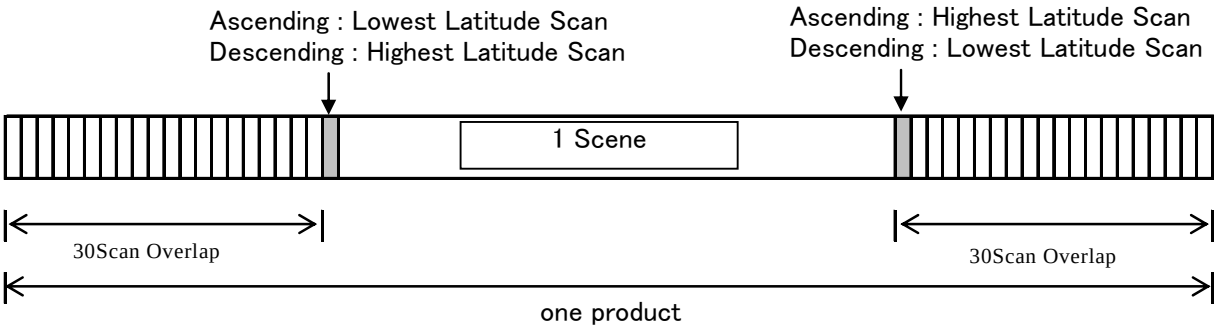


Fig. 3.4-1 Product data range

3.4.3 Coordinate system

AMSR2 level 1 product (1A, 1B, 1R) stores observation position (latitude, longitude) and orbit information of satellite. The observation positions are 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. The orbit information is stored as WGS84 earth fixed coordinate system.

3.4.4 Scaling factor

In order to make data volume small, scaling factors are applied for some floating number in AMSR2 level 1 product. AMSR2 dataset has scaling factor in the HDF5 file. The scaling factor is set for each dataset and stored with the data unit in the attribute information.

4 Description of data

4.1 Product metadata (Attribute)

4.2 See the AMSR2 Level 1A product format specification. The specification shows more details of attribute contents.Dataset

(1) Brightness Temperature (res06,6.9GHz,V)

The observed 6.9 GHz V brightness temperature matched to the resolution of 6.9 GHz is stored. The error value of brightness temperature is shown as below. This is applied for all frequency and polarization.

Item	Minimum	Maximum	Error value	Unit	Remarks
Brightness Temperature	10	500	65535 (Missing value)	K	-
			65534 (Parity error value)		

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

The observed 6.9 GHz H brightness temperature matched to the resolution of 6.9 GHz is stored.

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

The observed 7.3 GHz V brightness temperature matched to the resolution of 6.9 GHz is stored.

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

The observed 7.3 GHz H brightness temperature matched to the resolution of 6.9 GHz is stored.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(12) Brightness Temperature (res06,36.5GHz,H)
The observed 36.5 GHz H brightness temperature matched to the resolution of 6.9 GHz is stored.

(13) Brightness Temperature (res06,89.0GHz,V)
The observed 89.0 GHz V brightness temperature matched to the resolution of 6.9 GHz is stored.

(14) Brightness Temperature (res06,89.0GHz,H)
The observed 89.0 GHz H brightness temperature matched to the resolution of 6.9 GHz is stored.

(15) Brightness Temperature (res10,10.7GHz,V)
The observed 10.7 GHz V brightness temperature matched to the resolution of 10.7 GHz is stored.

(16) Brightness Temperature (res10,10.7GHz,H)
The observed 10.7 GHz H brightness temperature matched to the resolution of 10.7 GHz is stored.

(17) Brightness Temperature (res10,18.7GHz,V)
The observed 18.7 GHz V brightness temperature matched to the resolution of 10.7 GHz is stored.

(18) Brightness Temperature (res10,18.7GHz,H)
The observed 18.7 GHz H brightness temperature matched to the resolution of 10.7 GHz is stored.

(19) Brightness Temperature (res10,23.8GHz,V)
The observed 23.8 GHz V brightness temperature matched to the resolution of 10.7 GHz is stored.

(20) Brightness Temperature (res10,23.8GHz,H)
The observed 23.8 GHz H brightness temperature matched to the resolution of 10.7 GHz is stored.

(21) Brightness Temperature (res10,36.5GHz,V)
The observed 36.5 GHz V brightness temperature matched to the resolution of 10.7 GHz is stored.

(22) Brightness Temperature (res10,36.5GHz,H)
The observed 36.5 GHz H brightness temperature matched to the resolution of 10.7 GHz is stored.

(23) Brightness Temperature (res10,89.0GHz,V)
The observed 89.0 GHz V brightness temperature matched to the resolution of 10.7 GHz is stored.

(24) Brightness Temperature (res10,89.0GHz,H)
The observed 89.0 GHz H brightness temperature matched to the resolution of 10.7 GHz is stored.

(25) Brightness Temperature (res23,18.7GHz,V)
The observed 18.7 GHz V brightness temperature matched to the resolution of 23.8 GHz is stored.

(26) Brightness Temperature (res23,18.7GHz,H)
The observed 18.7 GHz H brightness temperature matched to the resolution of 23.8 GHz is stored.

(27) Brightness Temperature (res23,23.8GHz,V)
The observed 23.8 GHz V brightness temperature matched to the resolution of 23.8 GHz is stored.

(28) Brightness Temperature (res23,23.8GHz,H)
The observed 23.8 GHz H brightness temperature matched to the resolution of 23.8 GHz is stored.

(29) Brightness Temperature (res23,36.5GHz,V)
The observed 36.5 GHz V brightness temperature matched to the resolution of 23.8 GHz is stored.

(30) Brightness Temperature (res23,36.5GHz,H)
The observed 36.5 GHz H brightness temperature matched to the resolution of 23.8 GHz is stored.

(31) Brightness Temperature (res23,89.0GHz,V)
The observed 89.0 GHz V brightness temperature matched to the resolution of 23.8 GHz is stored.

(32) Brightness Temperature (res23,89.0GHz,H)
The observed 89.0 GHz H brightness temperature matched to the resolution of 23.8 GHz is stored.

(33) Brightness Temperature (res36,36.5GHz,V)
The observed 36.5 GHz V brightness temperature matched to the resolution of 36.5 GHz is stored.

(34) Brightness Temperature (res36,36.5GHz,H)
The observed 36.5 GHz H brightness temperature matched to the resolution of 36.5 GHz is stored.

(35) Brightness Temperature (res36,89.0GHz,V)
The observed 36.5 GHz V brightness temperature matched to the resolution of 89.0 GHz is stored.

(36) Brightness Temperature (res36,89.0GHz,H)
The observed 36.5 GHz H brightness temperature matched to the resolution of 89.0 GHz is stored.

(37) Brightness Temperature (original,89GHz-A,V)
The observed 89.0A GHz V brightness temperature is stored.

(38) Brightness Temperature (original,89GHz-A,H)
The observed 89.0A GHz H brightness temperature is stored.

(39) Brightness Temperature (original,89GHz-B,V)
The observed 89.0B GHz V brightness temperature is stored.

(40) Brightness Temperature (original,89GHz-B,H)
The observed 89.0B GHz V brightness temperature is stored.

(41) Area Mean Height
The altitude data at the odd number point of 89.0A horn is stored. (1 origin)

Item	Minimum	Maximum	Error value	Unit	Remarks
Area Mean Height	-15000	6000	-99999.00	m	

(42) Land_Ocean Flag 6 to 36 ,Land_Ocean Flag 89

The land and water (sea and river) condition at the each observed point is stored on percentage. The percentage shows ratio of land and sea at the footprint of observed point.
In the case of level 1R, the latitude and longitude data that are processed altitude correction are used to calculate the Land_Ocean Flag.

* The land sea flag of 89.0 GHz is stored at the odd number point of 89.0 A horn. (1 origin)
* The land sea flag of 6 to 36GHz is stored the flag at the observed point corrected by "CoRagistrationParameter" on the each frequency.
* AMSR2 level 1R product stored the land sea flags that are frequencies of 6, 10, 23, 36GHz. Because AMSR2 level 1R product is resampled in 4 kind frequencies of 6, 10, 23, 36GHz.

Item	Minimum	Maximum	Error value	Unit	Remarks
Land_Ocean Flag	0 (Land)	100 (Sea)	255	%	-

Please refer to AMSR2 level 1A product format specification as the other datase t.