Orchestrating a brighter world NEC

ASNARO-2 Product Guide

2020 April
NEC Corporation

Version	Date	Note
1.0	2018 July 10	First Version
A	2019 Jan. 28	1.3 ASNARO-2 Satellite was added.
		Table 3-2 Scene Size Range resolution was corrected to the ground range resolution.
		Table 3-13 Pixel Spacing, Resolution, Number of Looks Resolution and number of looks were added in the list.
		3.5.2.1 Level 1.5 Product A) Image Data Size "Value of each product size" is corrected to "Estimated value of each product size".
		Table 5-5 Data Set Summary Record Field No. 25: "Ellipsoid attitude" was corrected to "Ellipsoid height".
		Field No. 97: "Resolution in ground range" was corrected to "Resolution in azimuth".
		Field No. 135: "Nominal" was deleted.
		Table 5-6 Map Projection Data Records Filed No.77, 78: Name of facility related data record was corrected from "5" to "3".
		Table 5-13 Facility Related Data Record Filed No.8: Name of facility related data record was corrected from "5" to "3".
		Filed No.24: The following errors were corrected. F=f-Fo (degrees) -> Φ = φ-Φ0 [deg] L=l-Lo (degrees) -> Λ = λ-Λ0 [deg] Where (f, l) -> where (φ, λ)
		Table 5-14 SAR Image File Descriptor Record Filed No.65: "Maximum data range of pixel" was corrected to "Maximum data value of pixel".
		Table 6-2 List of GeoTIFF Tag and Key Tag name was corrected as follows. - HostCompute -> HostComputer - GeogGeodeticDatumGeoKe -> GeogGeodeticDatumGeoKey
		Table 7-3 GEOPSB, PRJPSB (NITF 2.1) Format "Left fill" was corrected to "Right fill" in the field of "ZOR".
		Table 8-1 Metadata Order of the item of Value range (min) and Value range (max) were replaced due to the opposite position.

		Value in the Occurrences of eop:auxiliaryDataSetFileName was corrected from "1" to "Unbounded".
		Description in the content of sar:maximumIncidenceAngle was corrected from "minimum" to "maximum".
		Notice "L1.1: Empty tag" was added in the Remarks in eop:referenceSystemIdentifier (eop:browse) and eop:referenceSystemIdentifier (eop:product).
		Table 9-1 Attached Data (Orbit), Table 9-2 Attached Data (Attitude) Notes relating to the time storing of records was added in the Remarks
		Description with respect to copyright and distribution was added in the header.
		Errors were corrected. (Error of simple writing and reference destination)
B	2019 April 10	Figure 3-1 Ground Range Resolution of each Off-nadir angle (SP/SP2 & SM) and Figure 3-2 Ground Range Resolution per Off-nadir angle (SS) were added.
		10. Guarantee range was added.
C	2019 June 25	Disclosure restriction was changed.
		1.3.1 Annotation was added.
		1.3.3 - Clear notification about Leve 1.5 Product was added. - Annotation was added.
		3.2 Resolution was deleted from scene size table
		3.5.1.1 Section A) Resolution was added.
		3.5.2.1 Section A) Resolution was added.
D	2019 Oct. 01	Table 1-2 -Swath of Stripmap "12km × 12km to 60km" was corrected to "12km × 12km to 52km". -Swath of ScanSAR "50km × 50km to 200km" was corrected to "50km × 50km to 183.2km". -Annotation was added. Table 3-2 -Azimuth Scene Size(long product) of Stripmap "Maximum 60km" was corrected to "Maximum 52km". -Swath of ScanSAR "Maximum 200km" was corrected to "Maximum 183.2km". -Annotation was added. Table 3-3 -Annotation was added.
E	2020 Apr. 01	5. Description of The files corresponding to each table was added.

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1. Introduction

1.1. Introduction

This document specifies the ASNARO-2 Level 1 products generated at ASNARO-2 ground system. ASNARO-2 ground system performs Level 1 processing to the data acquired by SAR sensor mounted on ASNARO-2.

1.2. Scope

This document defines the specification of Level 1 products.
Detailed format and specification of Level 1 products are also described in this document.

1.3. ASNARO-2 Satellite

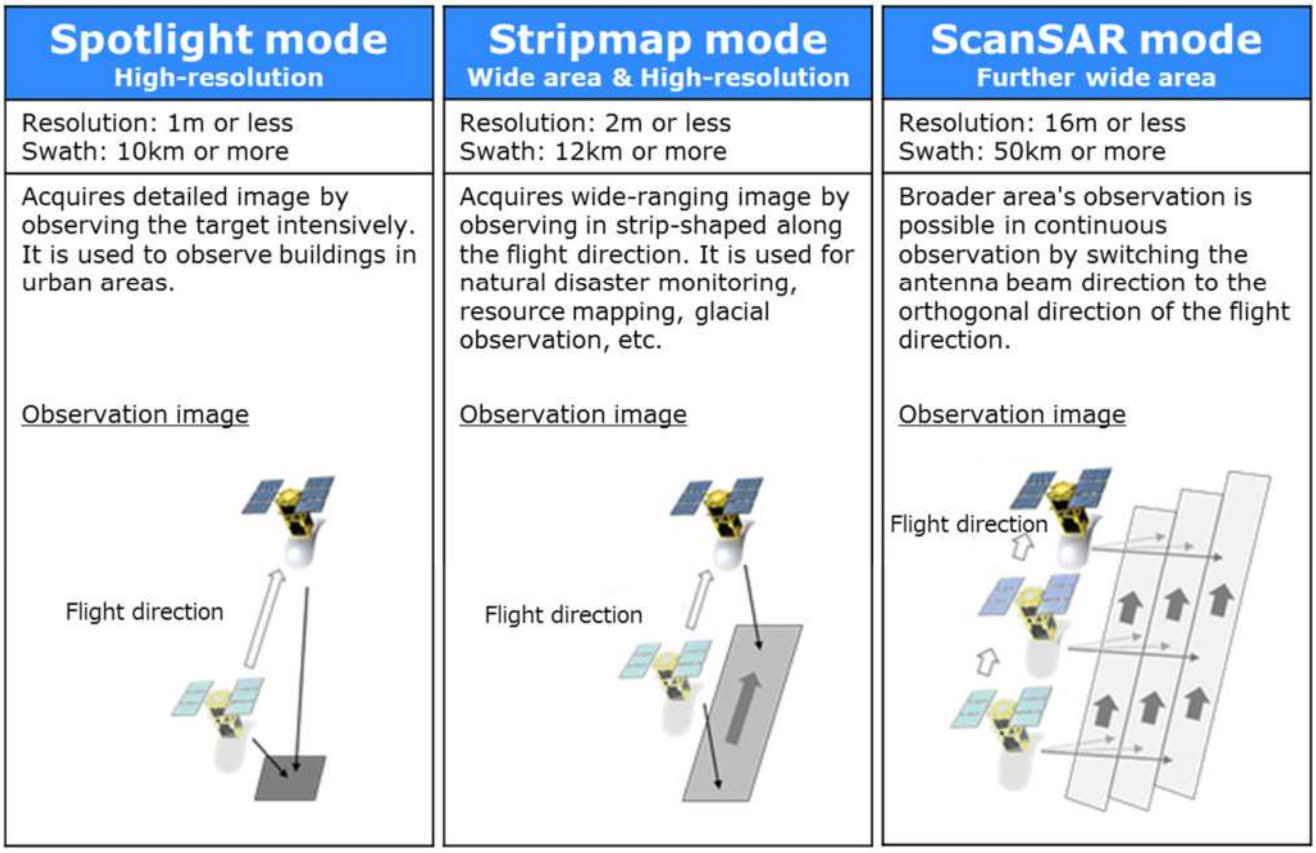
1.3.1. Mission Overview

ANSARO-2 operates in the following three acquisition modes.

Spotlight mode:
This mode can acquire detailed data with high-resolution because antenna direction is kept to the target by rotating satellite attitude. It's optimal for grasping the changes of buildings and development situation in urban areas.

Stripmap mode:
This mode observes in strip-shaped along the satellite's flight direction by fixing the antenna direction. It is used to observe wide-ranging area, such as the monitoring of large-scale natural disaster (volcanic activity, landslides, etc.).

ScanSAR mode:
This mode observes wide swath by switching sequentially the antenna beam direction to the orthogonal direction (range direction) of the satellite's flight direction. It is used to grasp the situation of broader area than stripmap mode.



Observation Mode of ASNARO-2

* Resolution and scene size are the value in the case of Level 1.5 product/ off-nadir angle around 35 deg/ nominal pixel spacing. For details, see Section 3-143.5.2.1.

1.3.2. ASNARO-2 Specification

ASNARO-2 specification is listed in Table 1-1.

Table 1-1 ASNARO-2 Specifications

Mission	X-band SAR
Mass	570kg
Orbit	Sun-synchronous sub-recurrent orbit
Altitude	Approximately 505km above the equator
Inclination angle	Approximately 97.4°
Local Time of Descending Node (LTDN)	6:00 (Dawn-Dusk)
Revisit cycle	14 days

1.3.3. Image Product Performance (Level 1.5 product)

Image product performance of ASNARO-2 is listed in Table 1-2.

Table 1-2 ASNARO-2 Image Product Performance (Level 1.5 product)

<table>
<tr><th colspan="2">Items</th><th colspan="4">Performance</th></tr>
<tr><td colspan="2">Observation mode</td><td>Spotlight 1</td><td>Spotlight 2</td><td>Stripmap</td><td>ScanSAR</td></tr>
<tr><td colspan="2">NESZ *1</td><td>Under
-14.0dB</td><td>Under
-15.5dB</td><td>Under
-17.0dB</td><td>Under
-25.0dB</td></tr>
<tr><td rowspan="2">Spatial resolution *1</td><td>Rg</td><td colspan="2">Under 1.0m</td><td>Under 2.0m</td><td>Under 16.0m</td></tr>
<tr><td>Az</td><td colspan="2">Under 1.0m</td><td>Under 2.0m</td><td>Under 16.0m</td></tr>
<tr><td colspan="2">S/A *1</td><td colspan="4">Over 20dB</td></tr>
<tr><td colspan="2" rowspan="2">Swath *1</td><td colspan="4">Rg×Az</td></tr>
<tr><td colspan="2">10km × 10km</td><td>12km ×
12km to 52km *2</td><td>50km ×
50km to 183.2km *2</td></tr>
<tr><td colspan="2">Off-nadir angle</td><td colspan="4">15° to 45°</td></tr>
<tr><td colspan="2">Frequency</td><td colspan="4">Approximately 9.65GHz</td></tr>
<tr><td colspan="2">Polarization</td><td colspan="4">VV or HH</td></tr>
</table>

*1 The value at the center of the image; off-nadir angle is around 35 deg. and flight height above the equator is 505 km. For details, see Section 3.5.2.1.
*2 The overlap between scenes is about 2 km in Stripmap and about 5.6 km in ScanSAR.

2. Documents

2.1. Reference Documents

A) GeoTIFF

"TIFF Revision 6.0", Adobe Developers Association.
"GeoTIFF Format Specification GeoTIFF Revision 1.0", Niles Ritter, Mike Ruth.

B) NITF 2.1

MIL-STD-2500C "DEPARTMENT OF DEFENSE INTERFACE STANDARD NATIONAL IMAGERY TRANSMISSION FORMAT VERSION 2.1", Department Of Defense, United States of America.

C) Metadata format of OGC standard

OGC 06-080r4 "OpenGIS Geography Markup Language (GML) Application Schema for Earth Observation Products", Open Geospatial Consortium.

OGC 06-131r6 "OGC® Catalogue Services Standard 2.0 Extension Package for ebRIM Application Profile: Earth Observation Products", Open Geospatial Consortium.

OGC 10-157r1 "Earth Observation Metadata profile of Observations & Measurements", Open Geospatial Consortium.

D) EPSG code

"EPSG Geodetic Parameter Dataset Version 8.2" (EPSG_v8_2.mdb), International Association of Oil & Gas Products.
"Geomatics Guidance Note Number 7, part 2 Coordinate Conversions and Transformations including Formulas", International Association of Oil & Gas Products.

3. Level 1 Product Specification

Level 1 product is classified into Level 1.1 product and Level 1.5 product.

3.1. Definition of Processing Level

Processing level of ASNARO-2 product is shown in Table 3-1.

Table 3-1 Definition of Processing Levels

Level	Definition
1.1	Range compression and single look azimuth compression are performed, and data is output on the slant range coordinate. [In case of Spotlight mode 1, Spotlight mode 2, and Stripmap mode] Level 1.1 data is SLC (Single Look Complex) data. It consists of 32 bit real part and 32 bit imaginary part per one pixel. [In case of ScanSAR mode] Level 1.1 data is SLI (Single Look Intensity) data. It consists of 32 bit real number data per one pixel.
1.5	Multi-look processing, ground range conversion and map projection are performed. Level 1.5 data consists of 16 bit quantized unsigned integer data per one pixel.

3.2. Definition of Scene

Scene size is defined by observation width and observation length and is varied by observation mode and off-nadir angle.
Scene size of each observation mode is shown in Table 3-2. Ground Range Scene Size of each Off-nadir angle is shown in Table 3-3.

Table 3-2 Scene Size

Observation Mode	Spotlight 1	Spotlight 2	Stripmap	ScanSAR
Ground Range Scene Size *1	10km	10km	12km	50km
Azimuth Scene Size (standard product)	10km	10km	12km	50km
Azimuth Scene Size (long product) *2	–	–	Maximum 52km	Maximum 183.2km

*1 In the case of off-nadir angle of 35 degrees.
For observation width for each off-nadir angle, refer to Table 3-3.
*2 The overlap between scenes is about 2 km in Stripmap and about 5.6 km in ScanSAR.

Table 3-3 Ground Range Scene Size of each Off-nadir angle (1/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Scene Size [km]
Spotlight 1 Spotlight 2	15.0	less				10.0
	15.0	greater or equal	~	16.0	less or equal	10.0
	16.0	greater	~	17.0	less or equal	10.0
	17.0	greater	~	18.0	less or equal	10.0
	18.0	greater	~	19.0	less or equal	10.0
	19.0	greater	~	20.0	less or equal	10.0
	20.0	greater	~	21.0	less or equal	10.0
	21.0	greater	~	22.0	less or equal	10.0
	22.0	greater	~	23.0	less or equal	10.0
	23.0	greater	~	24.0	less or equal	10.0
	24.0	greater	~	25.0	less or equal	10.0
	25.0	greater	~	26.0	less or equal	10.0
	26.0	greater	~	27.0	less or equal	10.0
	27.0	greater	~	28.0	less or equal	10.0
	28.0	greater	~	29.0	less or equal	10.0
	29.0	greater	~	30.0	less or equal	10.0
	30.0	greater	~	31.0	less or equal	10.0
	31.0	greater	~	32.0	less or equal	10.0
	32.0	greater	~	33.0	less or equal	10.0
	33.0	greater	~	34.0	less or equal	10.0
	34.0	greater	~	35.0	less or equal	10.0
	35.0	greater	~	36.0	less or equal	10.0
	36.0	greater	~	37.0	less or equal	10.0
	37.0	greater	~	38.0	less or equal	10.0
	38.0	greater	~	39.0	less or equal	10.0
	39.0	greater	~	40.0	less or equal	10.0
	40.0	greater	~	41.0	less or equal	10.0
	41.0	greater	~	42.0	less or equal	10.0
	42.0	greater	~	43.0	less or equal	10.0
	43.0	greater	~	44.0	less or equal	10.0
	44.0	greater	~	45.0	less or equal	10.0
	45.0	greater				10.0

Table 3-3 Ground Range Scene Size of each Off-nadir angle (2/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Scene Size [km]
Stripmap	15.0	less				10.0
	15.0	greater or equal	~	16.0	less or equal	10.0
	16.0	greater	~	17.0	less or equal	10.0
	17.0	greater	~	18.0	less or equal	10.0
	18.0	greater	~	19.0	less or equal	10.0
	19.0	greater	~	20.0	less or equal	10.0
	20.0	greater	~	21.0	less or equal	10.0
	21.0	greater	~	22.0	less or equal	10.0
	22.0	greater	~	23.0	less or equal	10.0
	23.0	greater	~	24.0	less or equal	12.0
	24.0	greater	~	25.0	less or equal	12.0
	25.0	greater	~	26.0	less or equal	12.0
	26.0	greater	~	27.0	less or equal	12.0
	27.0	greater	~	28.0	less or equal	12.0
	28.0	greater	~	29.0	less or equal	12.0
	29.0	greater	~	30.0	less or equal	12.0
	30.0	greater	~	31.0	less or equal	12.0
	31.0	greater	~	32.0	less or equal	12.0
	32.0	greater	~	33.0	less or equal	12.0
	33.0	greater	~	34.0	less or equal	12.0
	34.0	greater	~	35.0	less or equal	12.0
	35.0	greater	~	36.0	less or equal	12.0
	36.0	greater	~	37.0	less or equal	12.0
	37.0	greater	~	38.0	less or equal	12.0
	38.0	greater	~	39.0	less or equal	12.0
	39.0	greater	~	40.0	less or equal	12.0
	40.0	greater	~	41.0	less or equal	12.0
	41.0	greater	~	42.0	less or equal	12.0
	42.0	greater	~	43.0	less or equal	12.0
	43.0	greater	~	44.0	less or equal	12.0
	44.0	greater	~	45.0	less or equal	12.0
	45.0	greater				12.0

Table 3-3 Ground Range Scene Size of each Off-nadir angle (3/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Scene Size [km]
ScanSAR *1	15.0	less				35.0
	15.0	greater or equal	~	16.0	less or equal	35.0
	16.0	greater	~	17.0	less or equal	35.0
	17.0	greater	~	18.0	less or equal	35.0
	18.0	greater	~	19.0	less or equal	35.0
	19.0	greater	~	20.0	less or equal	35.0
	20.0	greater	~	21.0	less or equal	35.0
	21.0	greater	~	22.0	less or equal	35.0
	22.0	greater	~	23.0	less or equal	35.0
	23.0	greater	~	24.0	less or equal	35.0
	24.0	greater	~	25.0	less or equal	35.0
	25.0	greater	~	26.0	less or equal	40.0
	26.0	greater	~	27.0	less or equal	40.0
	27.0	greater	~	28.0	less or equal	40.0
	28.0	greater	~	29.0	less or equal	40.0
	29.0	greater	~	30.0	less or equal	40.0
	30.0	greater	~	31.0	less or equal	40.0
	31.0	greater	~	32.0	less or equal	40.0
	32.0	greater	~	33.0	less or equal	40.0
	33.0	greater	~	34.0	less or equal	40.0
	34.0	greater	~	35.0	less or equal	50.0
	35.0	greater	~	36.0	less or equal	50.0
	36.0	greater	~	37.0	less or equal	50.0
	37.0	greater	~	38.0	less or equal	50.0
	38.0	greater	~	39.0	less or equal	50.0
	39.0	greater	~	40.0	less or equal	50.0
	40.0	greater	~	41.0	less or equal	50.0
	41.0	greater	~	42.0	less or equal	50.0
	42.0	greater	~	43.0	less or equal	50.0
	43.0	greater	~	44.0	less or equal	40.0
	44.0	greater	~	45.0	less or equal	40.0
	45.0	greater				40.0

*1 In ScanSAR, the image quality may deteriorate in case of 42.0 degree greater or equal.

3.3. Format

The relation between corresponding formats of Level 1 product and processing level is shown in Table 3-4.

Table 3-4 Format of Level 1 Product

Format	Description	Processing Level	
		1.1	1.5
CEOS	This format is created by Committee on Earth Observation Satellite and it is based on the CCT format. Image information and metadata are divided into multiple files and stored in CEOS. CEOS has two types of format: CEOS-BSQ (Band Sequential) and CEOS-BIL (Band Interleaved by Line). Format of this product is CEOS-BSQ.	O	O
GeoTIFF	This format is based on TIFF 6.0. Image information and geo-referenced information are stored in one file.	O	O
NITF 2.1	This format is based on National Imagery Transmission Format version 2.1. Image information and metadata are stored in one file.	O	O

O: corresponded

3.4. Level 1 Product Dataset

Product dataset consists of some components such as product, metadata, browse image, and so on.
The structure of Level 1 product dataset is shown in Table 3-5.

Table 3-5 Structure of Level 1 Product Dataset

No.	Data Type		Description	Format
1.	Level 1 product		It is the data which data processing depending on the processing level is performed to the earth observation data obtained through sensor.	CEOS GeoTIFF NITF 2.1
2.	Metadata		Metadata stores the information which explains products.	XML [OGC 06-080r4]
3.	Browse data		It is the image data for displaying products easily.	JPEG
4.	Attached data	Orbit data	It is used when product is generated.	Binary
5.		Attitude data	It is used when product is generated.	Binary

Level 1 product structure of each processing level are shown in Table 3-6.
The detailed structure of each processing level is described in the following section.

Table 3-6 Structure of Level 1 Product per Processing

No.	Processing Level (Level 1.n)	Components of Level 1 Product dataset				
		Level 1 Product	Metadata	Attached data		
				Browse	Orbit	Attitude
1.	Level 1.1	O	O	O	O	O
2.	Level 1.5	O	O	O	O	O

3.5. Structure of Level 1 Product Dataset

3.5.1. Level 1.1 Product Dataset

Level 1 product dataset generated in Level 1.1 processing is shown in Table 3-7.

Table 3-7 Structure of Level 1.1 Product Dataset

No.	Data	Description	File Format	No. of files
1.	Level 1.1 Product	It is the file storing image data which Level 1.1 processing was performed. It is generated for each product ID.	CEOS GeoTIFF NITF 2.1	4/1 (*1)
2.	Browse image	It is the reduced image of Level 1.1 product	JPEG	1
3.	Level 1.1 metadata	It stores the attached information of Level 1.1 product. It is generated for each product ID.	XML [OGC-06-080r4]	1
4.	Orbit data	It is used when product is generated.	Binary	1
5.	Attitude data	It is used when product is generated.	Binary	1

*1: In the case of CEOS, there are four files, otherwise there is one file.

3.5.1.1. Level 1.1 Product

The specification of Level 1.1 product is shown in Table 3-8.

Table 3-8 Specification of Level 1.1 Product

No.	Product Specification	Observation Mode			
		Spotlight 1	Spotlight 2	Stripmap	ScanSAR
1.	File name	Refer to the naming rules of Level 1 product in section 4.			
2.	Fiel format	Choose one of the following formats CEOS GeoTIFF NITF 2.1			
3.	Type of one pixel	Image data of complex number Real part (32 bits real number) + imaginary part (32 bits real number) (IEEE754: binary 32)			Amplitude data 32 bit real number
4.	Pixel Spacing (Rg x Az)	0.5m × 0.64m	0.5m ×0.35m	1.0m × 1.4m	1.0m × 8.0m
5.	Size (No. of pixels x No. of lines)	15000×40000	15000×80000	12000×16000	45000×7500
6.	Image data size	Approximately 1.9GB	Approximately 3.5GB	Approximately 1.0GB	Approximately 1.4GB
7.	Scope on the surface	Approximately 10km x 10km	Approximately 10km x 10km	Approximately 12km x 12km	Approximately 50km x 50km

*: Since product size differs depending on the observation condition, these sizes described above are the sample as nominal condition.

A) Resolution

The resolution of Level 1.1 product is shown in Table 3-9.

Table 3-9 Resolution of Level 1.1 product

Observation Mode	Spotlight 1	Spotlight 2	Stripmap	ScanSAR
Ground Range Resolution of Level 1.1	1.0m	1.0m	2.0m	16.0m
Azimuth Resolution of Level 1.1	1.0m	1.0m	2.0m	16.0m

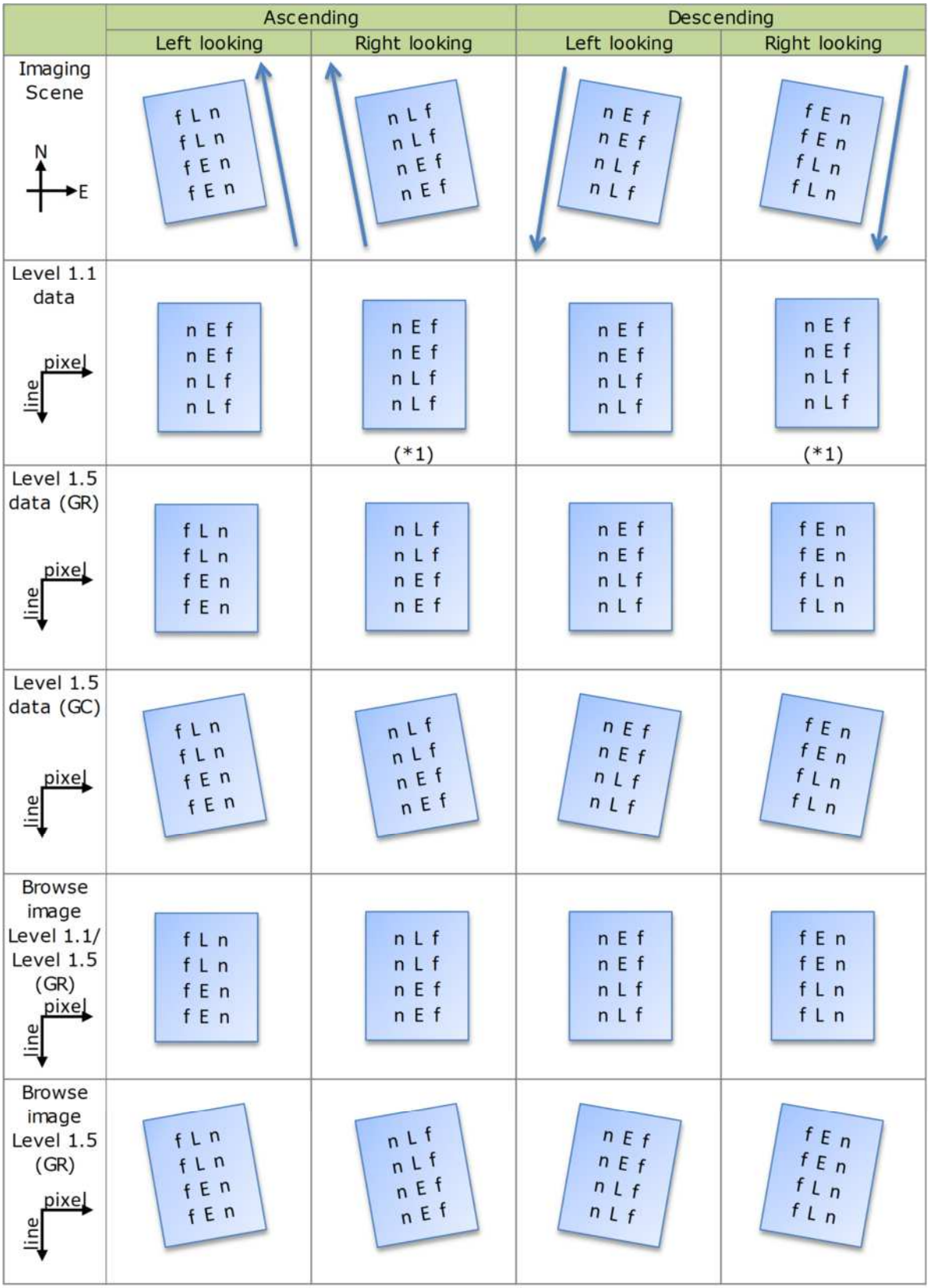
* In the case of off-nadir angle of 35 degrees/ pixel spacing SP: 0.5m, SM: 1.0, SS: 10.0m.

3.5.1.2. Browse Image

Browse image is the rescaled image data of Level 1.1 product.
Its format is shown in Table 3-10.
Relation between the image direction of Level 1.1 data and Level 1.5 and the browse image direction of Level 1.1 and Level 1.5 is shown in Figure 3-1.

Table 3-10 Format of Level 1.1 Browse Image

No.	Item	Specification
1	File name	Refer to the naming rules of Level 1 product in section 4.
2	Format	JPEG (not JPEG2000)
3	Data format	Amplitude data
4	Data type	Integer of one byte
5	Size	Pixel direction: 1024 or less Line direction: 1024 or less Rescale the longer side of either pixel direction or line direction to 1024 pixels or less. Browse image of long product also defines as the same size. Aspect ratio is not changed.



* Arrows indicates satellite orbit and heading direction.
* Meaning of each symbol are as follows.
  n: nearest-range, f: farthest-range, E: early azimuth, L: late azimuth

(*1) If displaying as an image, it turns over.

Figure 3-1 Direction of Browse Image

3.5.1.3. Level 1.1 Metadata

Level 1.1 metadata stores the information which explains products.
For detail, refer to section 8.

3.5.1.4. Orbit Data

Orbit data stores the orbit used when product is generated.
For detail, refer to section 9.

3.5.1.5. Attitude Data

Attitude data stores the attitude used when product is generated.
For detail, refer to section 9.

3.5.2. Level 1.5 Product Dataset

Level 1.5 product dataset generated in Level 1.5 processing is shown in Table 3-11

Table 3-11 Structure of Level 1.5 Product Dataset

No.	Data	Description	File Format	No. of files
1.	Level 1.5 Product	It is the file storing image data which Level 1 .5 processing was performed. It is generated for each product ID.	CEOS GeoTIFF NITF 2.1	4/1 (*1)
2.	Browse image	It is the reduced image of Level 1.5 product	JPEG	1
3.	Level 1.5 metadata	It is the file which stores the attached information of Level 1.5 product. It is generated for each product ID.	XML [OGC-06-080r4]	1
4.	Orbit data	It is the orbit data used when product is generated.	Binary	1
5.	Attitude data	It is the attitude data used when product is generated.	Binary	1

*1: In the case of CEOS, there are four files, otherwise there is one file.

3.5.2.1. Level 1.5 Product

The specification of Level 1.5 product is shown in Table 3-12.

Table 3-12 Specification of Level 1.5 Product

No.	Product Specification	Observation Mode			
		Spotlight 1	Spotlight 2	Stripmap	ScanSAR
1.	File name	Refer to the naming rules of Level 1 product in section 4.			
2.	Fiel format	Choose one of the following formats CEOS GeoTIFF NITF 2.1			
3.	Type of one pixel	Amplitude data 16 bits unsigned integer			
4.	Pixel Spacing (Rg x Az)	Pixel spacing is selectable based on the observation mode. Correspondence between observation mode and pixel spacing is shown in Table 3-14.			
5.	Size (No. of pixels x No. of lines)	Refer to 3.5.2.1 B).			
6.	Image data size	Refer to 3.5.2.1 B).			
7.	Scope on the surface	Approximately 10km x 10km	Approximately 10km x 10km	Approximately 12km x 12km	Approximately 50km x 50km
8.	Geodetic type	Choose one of the following types. WGS84 GRS80/ITRF97			
9.	Map projection	Choose one of the following projections. Universal Transverse Mercator (UTM) Polar Stereo (PS) Mercator (MER)			
10.	Resampling	Choose one of the following resampling. NN (Nearest Neighbor) CC (Cubic Convolution) BL (Bi-linear) CS (Cubic Spline)			
11.	Framing	Choose one of the following framing Geo-reference Geo-coded			

A) Resolution

The resolution of Level 1.5 product is shown in Table 3-13.
The pixel spacing, resolution, number of Looks is shown in Table 3-14.
The ground range resolution of each off-nadir angle is shown in Table 3-15.
Figure 3-2 and Figure 3-3 shows graph of the ground range resolution of each off-nadir angle.

Table 3-13 Resolution of Level 1.5 product

Observation Mode	Spotlight 1	Spotlight 2	Stripmap	ScanSAR
Ground Range Resolution of Level 1.5	1.0m	1.0m	2.0m	16.0m
Azimuth Resolution of Level 1.5	1.0m	1.0m	2.0m	16.0m

* In the case of off-nadir angle of 35 degrees/ pixel spacing SP: 0.5m, SM: 1.0, SS: 10.0m.

Table 3-14 Pixel Spacing, Resolution, Number of Looks (L1.5)

Observation Mode	Pixel Spacing (meter)	Resolution (Az x Rg)	No. of Looks (Az x Rg)
SP1	0.5	1m x 1m	1 x 1
	1.0	2m x 2m	2 x 2
	2.0	4m x 4m	4 x 4
SP2	0.5	1m x 1m	2 x 1
	1.0	2m x 2m	4 x 2
	2.0	4m x 4m	8 x 4
SM	1.0	2m x 2m	1 x 1
	2.0	4m x 4m	2 x 2
	4.0	8m x 8m	4 x 4
SS	10.0	16m x 16m	1 x 1
	20.0	32m x 32m	2 x 2

* In the case of off-nadir angle of 35 degrees.

Table 3-15 Ground Range Resolution of each Off-nadir angle (1/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Resolution [m]
Spotlight 1 Spotlight 2	15.0	less				-
	15.0	greater or equal	~	16.0	less or equal	2.2
	16.0	greater	~	17.0	less or equal	2.1
	17.0	greater	~	18.0	less or equal	1.9
	18.0	greater	~	19.0	less or equal	1.8
	19.0	greater	~	20.0	less or equal	1.7
	20.0	greater	~	21.0	less or equal	1.7
	21.0	greater	~	22.0	less or equal	1.6
	22.0	greater	~	23.0	less or equal	1.5
	23.0	greater	~	24.0	less or equal	1.5
	24.0	greater	~	25.0	less or equal	1.4
	25.0	greater	~	26.0	less or equal	1.3
	26.0	greater	~	27.0	less or equal	1.3
	27.0	greater	~	28.0	less or equal	1.2
	28.0	greater	~	29.0	less or equal	1.2
	29.0	greater	~	30.0	less or equal	1.2
	30.0	greater	~	31.0	less or equal	1.1
	31.0	greater	~	32.0	less or equal	1.1
	32.0	greater	~	33.0	less or equal	1.1
	33.0	greater	~	34.0	less or equal	1.0
	34.0	greater	~	35.0	less or equal	1.0
	35.0	greater	~	36.0	less or equal	1.0
	36.0	greater	~	37.0	less or equal	1.0
	37.0	greater	~	38.0	less or equal	0.9
	38.0	greater	~	39.0	less or equal	0.9
	39.0	greater	~	40.0	less or equal	0.9
	40.0	greater	~	41.0	less or equal	0.9
	41.0	greater	~	42.0	less or equal	0.9
	42.0	greater	~	43.0	less or equal	0.8
	43.0	greater	~	44.0	less or equal	0.8
	44.0	greater	~	45.0	less or equal	0.8
	45.0	greater				-

* In the case of pixel spacing SP1,SP2: 0.5m.

Table 3-15 Ground Range Resolution of each Off-nadir angle (2/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Resolution [m]
Stripmap	15.0	less				-
	15.0	greater or equal	~	16.0	less or equal	4.4
	16.0	greater	~	17.0	less or equal	4.1
	17.0	greater	~	18.0	less or equal	3.9
	18.0	greater	~	19.0	less or equal	3.7
	19.0	greater	~	20.0	less or equal	3.5
	20.0	greater	~	21.0	less or equal	3.3
	21.0	greater	~	22.0	less or equal	3.2
	22.0	greater	~	23.0	less or equal	3.0
	23.0	greater	~	24.0	less or equal	2.9
	24.0	greater	~	25.0	less or equal	2.8
	25.0	greater	~	26.0	less or equal	2.7
	26.0	greater	~	27.0	less or equal	2.6
	27.0	greater	~	28.0	less or equal	2.5
	28.0	greater	~	29.0	less or equal	2.4
	29.0	greater	~	30.0	less or equal	2.3
	30.0	greater	~	31.0	less or equal	2.3
	31.0	greater	~	32.0	less or equal	2.2
	32.0	greater	~	33.0	less or equal	2.1
	33.0	greater	~	34.0	less or equal	2.1
	34.0	greater	~	35.0	less or equal	2.0
	35.0	greater	~	36.0	less or equal	2.0
	36.0	greater	~	37.0	less or equal	1.9
	37.0	greater	~	38.0	less or equal	1.9
	38.0	greater	~	39.0	less or equal	1.8
	39.0	greater	~	40.0	less or equal	1.8
	40.0	greater	~	41.0	less or equal	1.8
	41.0	greater	~	42.0	less or equal	1.7
	42.0	greater	~	43.0	less or equal	1.7
	43.0	greater	~	44.0	less or equal	1.7
	44.0	greater	~	45.0	less or equal	1.6
	45.0	greater				-

* In the case of SM: 1.0m.

Table 3-15 Ground Range Resolution of each Off-nadir angle (3/3)

Observation Mode	Off-nadir angle [degree]					Ground Range Resolution [m]
ScanSAR	15.0	less				-
	15.0	greater or equal	~	16.0	less or equal	34.4
	16.0	greater	~	17.0	less or equal	32.3
	17.0	greater	~	18.0	less or equal	30.4
	18.0	greater	~	19.0	less or equal	28.8
	19.0	greater	~	20.0	less or equal	27.3
	20.0	greater	~	21.0	less or equal	26.0
	21.0	greater	~	22.0	less or equal	24.8
	22.0	greater	~	23.0	less or equal	23.8
	23.0	greater	~	24.0	less or equal	22.8
	24.0	greater	~	25.0	less or equal	21.9
	25.0	greater	~	26.0	less or equal	21.1
	26.0	greater	~	27.0	less or equal	20.3
	27.0	greater	~	28.0	less or equal	19.6
	28.0	greater	~	29.0	less or equal	19.0
	29.0	greater	~	30.0	less or equal	18.4
	30.0	greater	~	31.0	less or equal	17.8
	31.0	greater	~	32.0	less or equal	17.3
	32.0	greater	~	33.0	less or equal	16.8
	33.0	greater	~	34.0	less or equal	16.3
	34.0	greater	~	35.0	less or equal	15.9
	35.0	greater	~	36.0	less or equal	15.5
	36.0	greater	~	37.0	less or equal	15.1
	37.0	greater	~	38.0	less or equal	14.8
	38.0	greater	~	39.0	less or equal	14.5
	39.0	greater	~	40.0	less or equal	14.1
	40.0	greater	~	41.0	less or equal	13.8
	41.0	greater	~	42.0	less or equal	13.6
	42.0	greater	~	43.0	less or equal	13.3
	43.0	greater	~	44.0	less or equal	13.1
	44.0	greater	~	45.0	less or equal	12.8
	45.0	greater				-

* In the case of SS: 10.0m.

Figure 3-2 Ground Range Resolution of each Off-nadir angle (SP/SP2 & SM)

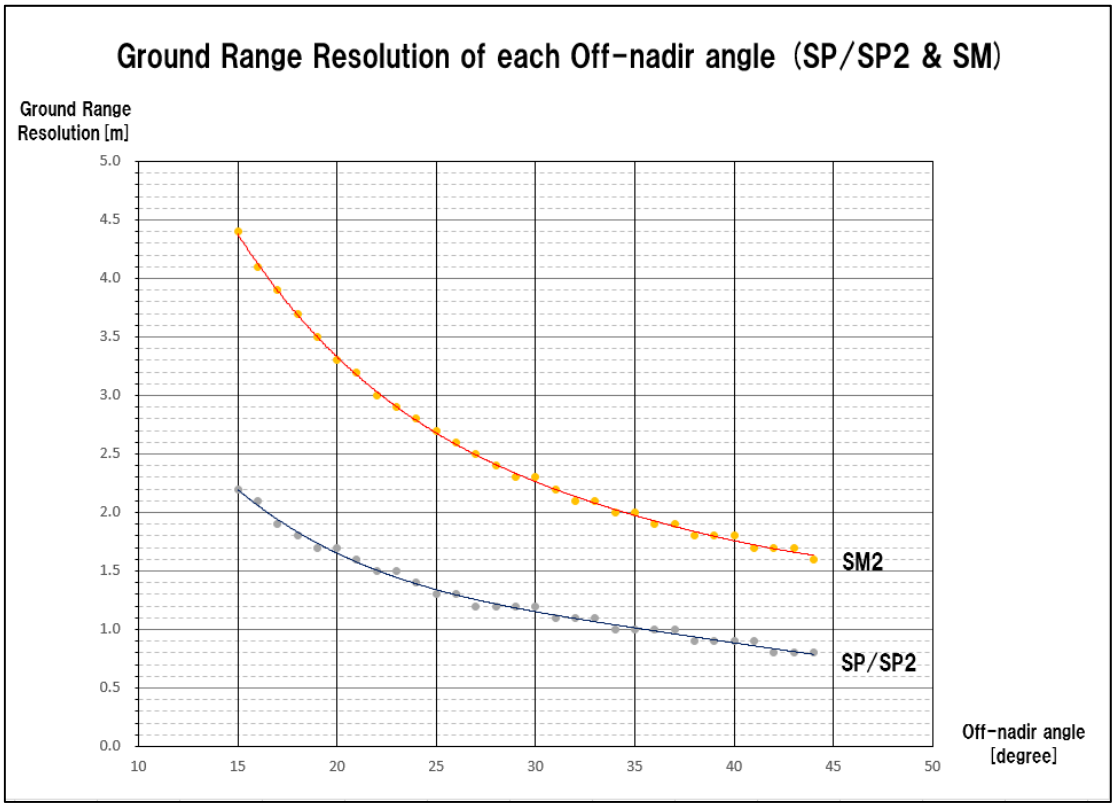
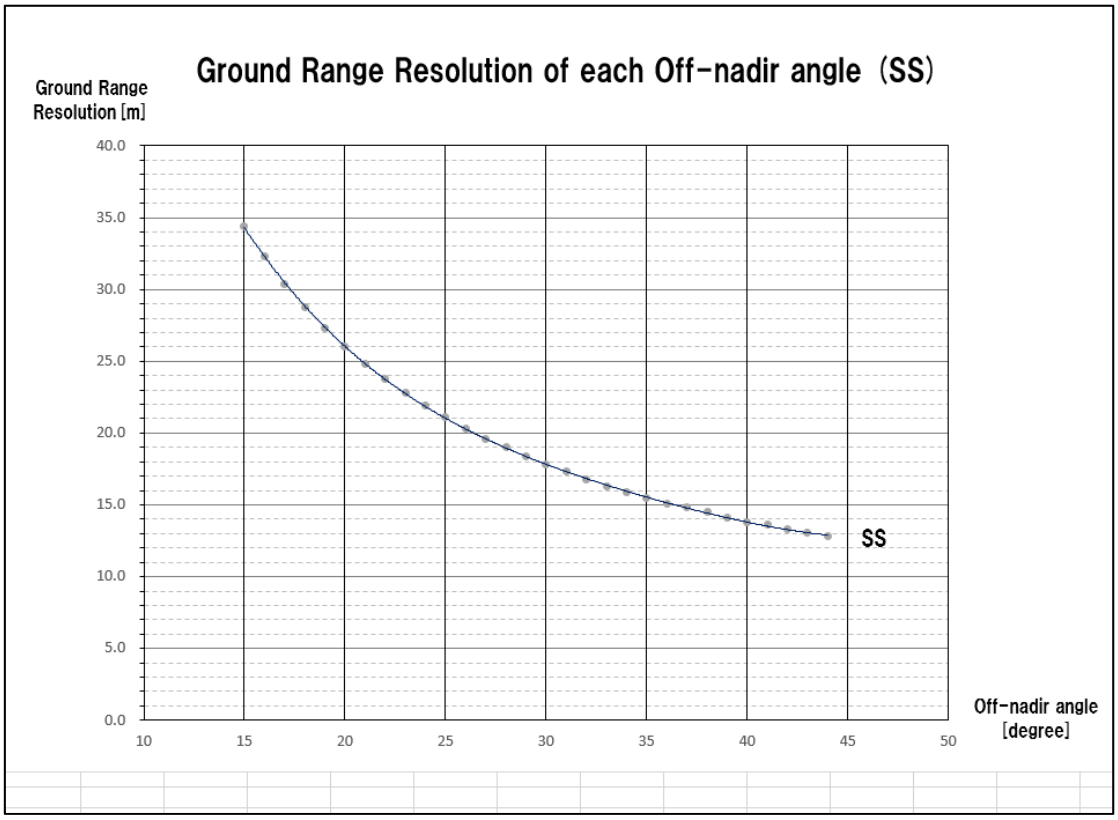


Figure 3-3 Ground Range Resolution per Off-nadir angle (SS)



B) Image Data Size

Estimated value of each product size of Geo-reference and Geo-coded is shown in Table 3-16 and Table 3-17.
Distortion caused by map projection is not considered.
These values in the tables are only for the image size, not including any other information.
In actuality, the size of header information of image format is added to them.
Its size differs depending on formats and the maximum size is approximately 10MB.

Table 3-16 Level 1.5 Estimated Value of Product Size (Geo-reference)

No.	Observation Mode	Pixel Spacing [meter]	Number of pixels	Number of lines	Image data size [MB]
1.	Spotlight mode 1	0.5	20000	20000	763.0
2.		1.0	10000	10000	191.0
3.		2.0	5000	5000	47.7
4.	Spotlight mode 2	0.5	20000	20000	763.0
5.		1.0	10000	10000	191.0
6.		2.0	5000	5000	47.7
7.	Stripmap mode	1.0	12000	12000	275.0
8.		2.0	6000	6000	68.7
9.		4.0	3000	3000	17.2
10.	ScanSAR mode	10.0	5000	5000	47.7
11.		20.0	2500	2500	12.0

*Size of dummy data is included.
Distortion caused by map projection is not included.

Table 3-17 Level 1.5 Estimated Value of Product Size (Geo-coded)

No.	Observation Mode	Pixel Spacing [meter]	Number of pixels	Number of lines	Image data size [MB]
1.	Spotlight mode 1	0.5	28300	28300	1530.0
2.		1.0	14200	14200	382.0
3.		2.0	7100	7100	95.4
4.	Spotlight mode 2	0.5	28300	28300	1530.0
5.		1.0	14200	14200	382.0
6.		2.0	7100	7100	95.4
7.	Stripmap mode	1.0	17000	17000	550.0
8.		2.0	8490	8490	138.0
9.		4.0	4250	4250	34.4
10.	ScanSAR mode	10.0	7080	7080	95.4
11.		20.0	3540	3540	23.9

*Size of dummy data is included.
Distortion caused by map projection is not included.

3.5.2.2. Browse Image

Browse image is the reduced image of Level 1.5 product.
For details, refer to section 3.5.1.2.

3.5.2.3. Level 1.5 Metadata

Level 1.5 metadata stores the information which explains products.
For detail, refer to section 8.

3.5.2.4. Orbit Data

Orbit data stores the orbit used when product is generated.
For detail, refer to section 9.

3.5.2.5. Attitude Data

Attitude data stores the attitude used when product is generated.
For detail, refer to section 9.

4. File Naming Rules of Level 1 Product

Structure of file name in each data composed of Level 1 product dataset is described below.
Details of them are shown in Table 4-1.

[GG…G]-AAABBBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU[file extension]

Table 4-1 Naming Rules of Level 1 Product (1/2)

No.	Field	Name	Value, Specification
1.	G…G	Data type	Variable length character string Fixed character string for each data type. For details, refer to Table 4-2.
2.	-	Delimiter	"-" : Hyphen
3.	AAABBBBBBCCCCC-YYMMDD	Scene ID	
4.	AAA	Satellite ID	"AS2"
5.	BBBBBB	Orbit accumulation number	Five digits
6.	CCCCC	Frame number	Five digits
7.	-	Delimiter	"-" : Hyphen
8.	YYMMDD	Observation date	Six digits
9.	NNL	Scene option ID	
10.	NN	Scene shift	"SN" S :sign (-:M, +: P) N :Scene shift value (1 to 5) "__" : No scene shift value Two-underscore Sample) -5: M5 +4: P4
11.	L	Long product identifier	"L" : Long product "_" : Nominal product Underscore
12.	-	Delimiter	"-" : Hyphen
13.	DDDEFFFGHI	Product ID	
14.	DDD	Observation mode	SP_ : Spotlight mode 1 SP2 : Spotlight mode 2 SM_ : Stripmap mode SS_ : ScanSAR mode
15.	E	Observation direction	L : Left looking R : Right looking
16.	FFF	Processing level	1.1 : Level 1.1 1.5 : Level 1.5
17.	G	Processing option	G : Geo-coded R : Geo-Reference "_" : Not specified Underscore

Table 4-1 Naming Rules of Level 1 Product (2/2)

No.	Field		Name	Value, Specification
18.		H	Map projection	U : UTM P : PS M : MER "_" : Not specified Underscore
19.		I	Orbit direction	A : Ascending D : Descending
20.	U		Product calibration mode Option ID	"_" : Nominal product (calibrated) Underscore A : Uncalibrated absolute calibration T : Uncalibrated geometric calibration P : Uncalibrated antenna pattern Users can order nominal product only.
21.	[Extension]		Extension	Variable length character string Fixed character string for each data type. For details, refer to Table 4-3.

Table 4-2 Naming Rules of Level 1 Product (Data Type)

No.	Data Type	Value of G…G Field (Data Type)		
1.	Level 1 product	CEOS	Volume directory	"VOL"
			SAR Leader	"LED"
			SAR Image	"IMG-XX"
			SAR Trailer	"TRL"
		GeoTIFF	"IMG-XX"	
		NITF	"IMG-XX"	
2.	Metadata	"MET"		
3.	Browse image	"BRO"		
4.	Attached data	Orbit data	"ORB"	
		Attitude data	"POS"	

* XX: Polarization information
HH: Horizontally polarized wave transmission / Horizontally polarized wave receiving
VV: Vertically polarized wave transmission / Vertically polarized wave receiving

Table 4-3 Naming Rules of Level 1 Product (Extension)

No.	Data Type	Value of Extension Field
1.	Level 1 product	Fixed character string for each file format CEOS : Omit GeoTIFF : ".tif" NITF : ".ntf"
2.	Metadata	".xml"
3.	Browse image	".jpg"
4.	Attached data	".bin"

5. Level 1 Product (CEOS) Format

Level 1 CEOS product format is shown in Table 5-1 to Table 5-17.

The files corresponding to each table are as follows.

Table 5-1 to Table 5-3 : Volume directory (VOL)
Table 5-4 to Table 5-13 : SAR Leader (LED)
Table 5-14 to Table 5-16 : SAR Image (IMG-XX)
Table 5-17 : SAR Trailer (TRL)

Table 5-1 Volume Descriptor Record (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 - 4	B4	Record sequence number = $1)_{10}$	00000001h
2	5 - 5	B1	1st record subtype code = $192)_{10}$	C0h
3	6 - 6	B1	Record type code = $192)_{10}$	C0h
4	7 - 7	B1	2nd record subtype code = $18)_{10}$	12h
5	8 - 8	B1	3rd record subtype code = $18)_{10}$	12h
6	9 - 12	B4	Length of this record = $360)_{10}$	00000168h
7	13 - 14	A2	ASCII/EBCDIC flag = 'Ab': ASCII	Ab
8	15 - 16	A2	Blanks	bb
9	17 - 28	A12	Format control document ID = 'CEOS-SARbbbb'	CEOS-SAR
10	29 - 30	A2	Format control document revision level = 'NN' NN: 'bA' to 'bZ'	bA
11	31 - 32	A2	Superstructure record format revision level = 'NN' NN: 'bA' to 'bZ'	bA
12	33 - 44	A12	Software release and revision level = 'NNN.NNNbbbbb' 001.000, 001.001, … 001.100, … 002.000	001.000bbbbb
13	45 - 60	A16	Physical volume ID = 'NNGSbbbbbbbbbbbb'	NNGSbbbbbbbbbbb
14	61 - 76	A16	Logical volume ID = 'MMNSSSYYYYMMDDbb' MM : Mission ID (ASNARO2= 'AS') N : Mission Number (= '2') SSS : Sensor ID (SAR = 'SAR') YYYY: Product generation year MM : Product generation month DD : Product generation day	AS2SAR20170101bb
15	77 - 92	A16	Volume set ID = 'MMMMMMMMbSSSbbbb' MMMMMMMM: Mission name (ASNARO2 = 'ASNARO2b') SSS: Sensor name (SAR = 'SAR')	ASNARO2bbSARbbbb
16	93 - 94	I2	Total number of physical volumes in the logical volume = 'b1'	b1
17	95 - 96	I2	Physical volume sequence number of the first tape = 'b1'	b1
18	97 - 98	I2	Physical volume sequence number of the last tape = 'b1'	b1
19	99 - 100	I2	Physical volume sequence number of the current tape = 'b1'	b1

Table 5-1 Volume Descriptor Record (2/2)

Field No.	Byte No.	Type	Description	Remarks
20	101 - 104	I4	The number of files in the logical volume following volume directory file. = 'bbb3': Leader, Image, Trailer	bbb3
21	105 - 108	I4	The number of Logical volume within volume set. = 'bbb1'	bbb1
22	109 - 112	I4	The number of logical volume within physical volume = 'bbb1'	bbb1
23	113 - 120	A8	Logical volume creation date = 'YYYYMMDD' (Without zero suppression) YYYY: Year MM : Month DD : Day	20170101
24	121 - 128	A8	Logical volume creation time = 'HHMMSSXX' (Without zero suppression) HH: Hour MM: Minute SS: Second XX: 10 mili-second	12010100
25	129 - 140	A12	Logical volume generation country (JAPAN) = 'JAPANbbbbbbb'	JAPANbbbbbbb
26	141 - 148	A8	Logical volume generation agency = 'NECbbbbb'	NECbbbbb
27	149 - 160	A12	Logical volume generation facility = 'NNGSbbbbbbbb'	NNGSbbbbbbbb
28	161 - 164	I4	Number of file pointer records in volume directory = 'bbb3'	bbb3
29	165 - 168	I4	Number of text records in volume directory = 'bbb1'	bbb1
30	169 - 260	A92	Volume descriptor Spare = Blanks	Blanks (b*92)
31	261 - 360	A100	Local use segment = Blanks	Blanks (b*100)

Table 5-2 File Pointer Record (1/3)

Filed No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number Leader file = $2)_{10}$ Image file = $3)_{10}$ Trailer file = $4)_{10}$	
2	5 – 5	B1	1st record sub-type code = $219)_{10}$	DBh
3	6 – 6	B1	Record type code = $192)_{10}$	C0h
4	7 – 7	B1	2nd sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd sub-type code = $18)_{10}$	12h
6	9 – 12	B4	Record length = $360)_{10}$	00000168h
7	13 – 14	A2	ASCII/EBCDIC code = 'Ab': ASCII	Ab
8	15 – 16	A2	Blanks	bb
9	17 – 20	I4	Referenced file number Leader file = 'bbb1' Image file = 'bbb2' Trailer file = 'bbb3'	bbb1
10	21 – 36	A16	Referenced file name ID = 'MMNbSSSTFFFFbbbb' MM : Mission ID (ASNARO2 = 'AS') N : Mission number (= '2') SSS: Sensor ID (SAR= 'SAR') T : Processing level code Level 1.1 = 'B' Level 1.5 = 'C' FFFF: File type (*) Leader file = 'SARL' Image file = 'IMOP' Trailer file = 'SART'	AS2bSARCSARLbbbb
11	37 – 64	A28	Referenced file class Leader file = 'SARLEADERbFILEbbbbbbbbbbbbbb' Image file = 'IMAGERYbOPTIONSbFILEbbbbbbbb' Trailer file = 'SARTRAILERbFILEbbbbbbbbbbbb'	SARLEADERbFILEbbbbbbbbbbbbb

Table 5-2 File Pointer Record (2/3)

Filed No.	Byte No.	Type	Description	Remarks
12	65 – 68	A4	Referenced file class code Leader file = 'SARL' Image file = 'IMOP' Trailer file = 'SART'	SARL
13	69 – 96	A28	Referenced file data type = 'MIXEDbBINARYbANDbASCIIbbbbbb'	MIXEDbBINARYbANDbASCIIbbbbbb
14	97 – 100	A4	Referenced file data type code = 'MBAA' (Mixed Binary And ASCII)	MBAA
15	101 – 108	I8	Number of records in referenced file Leader file = 'bbbbbbb9': Level 1.1 'bbbbbb10': Level 1.5 Image file = N + 1 (N is the number of signal data records): Level 1.1 = N + 1 (N is the number of processed data records): Level 1.5 Trailer file = 1	bbbbbbb9
16	109 – 116	I8	Length of the first record in referenced file = 'bbbbb720'	bbbbb720
17	117 – 124	I8	Maximum record length in referenced file	bbbbnnnn
18	125 – 136	A12	Referenced file record length type Leader file = 'VARIABLEbLEN' Image file = 'VARIABLEbLEN' Trailer file = 'VARIABLEbLEN '	VARIABLEbLEN
19	137 – 140	A4	Referenced file record length type code Leader file = 'VARE' Image file = 'VARE' Trailer file = 'VARE'	VARE
20	141 – 142	I2	The number of the physical volume set containing the first record of the file = 'b1'	b1
21	143 – 144	I2	The number of the physical volume set containing the last record of the file= 'b1'	b1
22	145 – 152	I8	Record number of the first record appearing on this physical volume = 'bbbbbbb1'	bbbbbbb1

Table 5-2 File Pointer Record (3/3)

Filed No.	Byte No.	Type	Description	Remarks
23	153 – 160	I8	Record number of the last record appearing on this physical volume Leader file = 'bbbbbbb9': Level 1.1 'bbbbbb10': Level 1.5 Image file = N + 1 (N is the number of signal data records): Level 1.1 = N + 1 (N is the number of processed data records): Level 1.5 Trailer file = 1	bbbbbbb9
24	161 – 260	A100	Spare = Blanks	Blanks (b*100)
25	261 – 360	A100	Local use segment = Blanks	Blanks (b*100)

Table 5-3 Text Record (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $5)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $192)_{10}$	C0h
4	7 – 7	B1	2nd sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd sub-type code = $18)_{10}$	12h
6	9 – 12	B4	Record length = $360)_{10}$	00000168h
7	13 – 14	A2	ASCII/EBCDIC code = 'Ab': ASCII	Ab
8	15 – 16	A2	Blanks	bb
9	17 – 56	A40	Product ID = 'PRODUCT:DDDEFFFGHIbbbbbbbbbbbbbbbbbbbbbb' DDD: Observation mode SP_: Spotlight mode 1 SP2: Spotlight mode 2 SM_: Stripmap mode SS_: ScanSAR mode E: Observation direction L: Left looking R: Right looking FFF: Processing level 1.1: Level 1.1 1.5: Level 1.5 G: Processing option G: Geo-Coded R: Geo-Reference _: Not specified (underscore) H: Map projection U: UTM P: PS M: MER _: Not specified (underscore) I: Orbit direction A: Ascending D: Descending	PRODUCT: SP2R1.5GUAbbbbbbbbbbbbbbbbbbbbbb

Table 5-3 Text Record (2/2)

Field No.	Byte No.	Type	Description	Remarks
10	57 – 116	A60	Location and date/time of product creation = 'PROCESS:JAPAN-NECbb-ASNARO2-FDCbbbYYYYMMDDbHHMMSSb…b' (without zero suppression) YYYYMMDD: Date of creation (YYYY: Year, MM: Month, DD: Day) HHMMSS: Time of creation (UTC)	PROCESS: JAPAN-NECbb-ASNARO2-FDCbbbYYYYMMDDbHHMMSSb…b
11	117 – 156	A40	Physical tape ID = 'TAPEbID:bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb'	TAPEbID:bbbbbbbbbbbbbbbbbbbbbbbbbbbbbb
12	157 – 196	A40	Scene ID = 'ORBITb:AAABBBBBBCCCCC-YYMMDDbbbbbbbbbbbb' AAA: Satellite (= 'AS2') BBBBBB: Orbit accumulation number CCCCC: Frame number -: Separator (hyphen) YYMMDD: Observation date (YY: the last two-digits of year, MM: month, DD: day)	ORBITb:AS201234501234-170101bbbbbbbbbbbb
13	197 – 236	A40	Scene location ID = 'FRAMEbCENTRE:bbbbbbbbbbbbbbbbbbbbbbbbbbbb': Level 1.1 = 'FRAMEbCENTRE:bN±nnn.nnbbE±nnn.nnbbbbbbbb': Level 1.5 N±nnn.nn: Latitude of scene center [deg] E±nnn.nn: Longitude of scene center [deg]	In the case of Level 1.1, FRAMEbCENTRE:bbbbbbbbbbbbbbbbbbbbbb
14	237 – 360	A124	Blanks	Blanks (b*124)

Table 5-4 SAR Leader File Descriptor Record (1/3)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $1)_{10}$	00000001h
2	5 – 5	B1	1st record sub-type code = $11)_{10}$	0Bh
3	6 – 6	B1	Record type code = $192)_{10}$	C0h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $18)_{10}$	12h
6	9 – 12	B4	Record length = $720)_{10}$	000002D0h
7	13 – 14	A2	ASCII/EBCDIC code = 'Ab': ASCII	Ab
8	15 – 16	A2	Blanks	bb
9	17 – 28	A12	Format control document ID = 'CEOS-SARbbbb'	CEOS-SARbbbb
10	29 – 30	A2	Format control document revision level = 'NN' NN: 'bA' to 'bZ'	bA
11	31 – 32	A2	Record format revision level = 'NN' NN: 'bA' to 'bZ'	bA
12	33 – 44	A12	Software release and revision number = 'NNN.NNNbbbbb' 001.000, 001.001, … 001.100, … 002.000	001.000bbbbb
13	45 – 48	I4	The number of files = 'bbb1'	bbb1
14	49 – 64	A16	File ID = 'MMNbSSSTFFFFbbbb' MM : Mission ID (ASNARO2= 'AS') N : Mission number (= '2') SSS: Sensor ID (SAR= 'SAR') T : Preocessing level code Level 1.1 = 'B' Level 1.5 = 'C' FFFF: File type Leader file = 'SARL' Image file = 'IMOP' Trailer file = 'SART'	AS2bSARCSARLbbbb
15	65 – 68	A4	Record sequence and location type flag = 'FSEQ'	FSEQ
16	69 – 76	I8	Location of sequence number = 'bbbbbbb1'	bbbbbbb1 (Location of record number)
17	77 – 80	I4	Field length of sequence number = 'bbb4'	bbb4 (Field length of record number)
18	81 – 84	A4	Record code and location type flag = 'FTYP'	FTYP

Table 5-4 SAR Leader File Descriptor Record (2/3)

Field No.	Byte No.	Type	Description	Remarks
19	85 – 92	I8	Location of record code = 'bbbbbbb5'	bbbbbbb5 (Location of record code)
20	93 – 96	I4	Field length of record code = 'bbb4'	bbb4 (Field length of record code)
21	97 – 100	A4	Record length and location type flag = 'FLGT'	FLGT
22	101 – 108	I8	Location of record length = 'bbbbbbb9'	bbbbbbb9 (Location of record length)
23	109 – 112	I4	Field length of record length = 'bbb4'	bbb4 (Field length of record length)
24	113 – 180	A68	Blanks	Blanks (b*68)
25	181 – 186	I6	Number of data set summary records = 'bbbbb1'	bbbbb1
26	187 – 192	I6	Data set summary record length = 'bb4096'	bb4096
27	193 – 198	I6	Number of map projection data records = 'bbbbb0': Level 1.1 = 'bbbbb1': Level 1.5	bbbbb1
28	199 – 204	I6	Map projection data record length = 'bbbbb0': Level 1.1 = 'bb1620': Level 1.5	bb1620
29	205 – 210	I6	Number of platform position data records = 'bbbbb1'	bbbbb1
30	211 – 216	I6	Platform position data record length = 'b16384'	b16384
31	217 – 222	I6	Number of attitude data records = 'bbbbb1'	bbbbb1
32	223 – 228	I6	Attitude data record length = 'b16384'	b16384
33	229 – 234	I6	Number of radiometric data records = 'bbbbb1'	bbbbb1
34	235 – 240	I6	Radiometric data record length = 'bb9860'	bb9860
35	241 – 246	I6	Number of radiometric compensation records = 'bbbbb0'	bbbbb0
36	247 – 252	I6	Radiometric compensation record length = 'bbbbb0'	bbbbb0
37	253 258	I6	Number of data quality summary records = 'bbbbb1'	bbbbb1
38	259 – 264	I6	Data quality summary record length = 'bb1620'	bb1620
39	265 – 270	I6	Number of data histogram records = 'bbbbb0'	bbbbb0
40	271 – 276	I6	Data histogram record length = 'bbbbb0'	bbbbb0
41	277 – 282	I6	Number of range spectra records = 'bbbbb0'	bbbbb0
42	283 – 288	I6	Range spectra record length = 'bbbbb0'	bbbbb0
43	289 – 294	I6	Number of DEM descriptor records = 'bbbbb0'	bbbbb0

Table 5-4 SAR Leader File Descriptor Record (3/3)

Field No.	Byte No.	Type	Description	Remarks
44	295 – 300	I6	DEM descriptor record length = 'bbbbb0'	bbbbb0
45	301 – 306	I6	Number of radar parameter data update records = 'bbbbb0'	bbbbb0
46	307 – 312	I6	Radar parameter data update record length = 'bbbbb0'	bbbbb0
47	313 – 318	I6	Number of annotation data records = 'bbbbb0'	bbbbb0
48	319 – 324	I6	Annotation data record length = 'bbbbb0'	bbbbb0
49	325 – 330	I6	Number of detailed processing parameters records = 'bbbbb0'	bbbbb0
50	331 – 336	I6	Detailed processing parameters record length = 'bbbbb0'	bbbbb0
51	337 – 342	I6	Number of calibration data records = 'bbbbb0'	bbbbb0
52	343 – 348	I6	Calibration data record length = 'bbbbb0'	bbbbb0
53	349 – 354	I6	Number of GCP records = 'bbbbb0'	bbbbb0
54	355 – 360	I6	GCP record length = 'bbbbb0'	bbbbb0
55	361 – 420	10A6	Spare	Blanks (b*60)
56	421 426	I6	Number of facility related data 1 records = 'bbbbb1'	bbbbb1
57	427 434	I8	Facility related data 1 record length = 'b2006000'	b2006000
58	435 440	I6	Number of facility related data 2 records = 'bbbbb1'	bbbbb1
59	441 448	I8	Facility related data 2 record length = 'bbb50000'	bbb50000
60	449 – 454	I6	Number of facility related data 3 records = 'bbbbb1'	bbbbb1
61	455 – 462	I8	Facility related data 3 record length = 'bbbb5000'	bbbb5000
62	463 – 720	A258	Blanks	Blanks (b*258)

Table 5-5 Data set Summary Record (1/10)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $2)_{10}$	00000002h
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $10)_{10}$	0Ah
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $20)_{10}$	14h
6	9 – 12	B4	Data set summary records length = $4096)_{10}$	00001000h
7	13 – 16	I4	Data set summary records sequence number = 'bbb1'	bbb1
8	17 – 20	A4	SAR channel ID = Blanks (fixed value)	bbbb
9	21 – 52	A32	Scene ID = 'AAABBBBBBCCCCC-YYMMDDbbbbbbbbbb' AAA: Satellite ID (= 'AS2') BBBBBB: Orbit accumulation number CCCCC: Frame number -: Separator (hyphen) YYMMDD: Observation date (YY: the last two-digits of year, MM: month, DD: day)	AS200000100010-150101bbbbbbbbbb
10	53 – 68	A16	Number of scene reference = Blanks (fixed value)	bbbbbbbbbbbbbbbb
11	69 – 100	A32	Scene center time = 'YYYYMMDDHHMMSSttbbbbbbbbbbbbbbbb' (Without zero suppression, YYYY: year, MM: month, DD: day) HHMMSSttt: Time (UTC)	20151011200000000bbbbbbbbbbbbbbb
12	101 – 116	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbbb
13	117 – 132	F16.7	Geodetic latitude (defined as positive to the north of the equator and negative to the south) of processed scene center [deg] = Blanks: Level 1.1 = Positive value to the north of the equator: Level 1.5 = Negative value to the south of the equator: Level 1.5	In the case of Level 1.1, bbbbbbbbbbbbbbbb
14	133 – 148	F16.7	Geodetic longitude (defined as positive to the east of the prime meridian and negative to the west) of processed scene center [deg] = Blanks: Level 1.1 = Positive value to the east of the prime meridian: Level 1.5 = Negative value to the west of the prime meridian: Level 1.5	In the case of Level 1.1, bbbbbbbbbbbbbbbb

Table 5-5 Data set Summary Record (2/10)

Field No.	Byte No.	Type	Description	Remarks
15	149 – 164	F16.7	Processed scene center true heading [deg] = Blanks: Level 1.1 = Value: Level 1.5	In the case of Level 1.1, bbbbbbbbbbbbbbb
16	165 – 180	A16	Ellipsoid designator = 'GRS80bbbbbbbbbbb' (fixed value)	GRS80bbbbbbbbbbbb
17	181 – 196	F16.7	Ellipsoid semi-major axis [km] = 6378.1370000	(Ellipsoid semi-major axis)
18	197 – 212	F16.7	Ellipsoid semi-minor axis [km] = 6356.7523141	(Ellipsoid semi-minor axis)
19	213 – 228	F16.7	Earth mass [10^{24} kg] = 5.9740000	(Earth mass)
20	229 – 244	F16.7	Gravitational constant [10^{-14} $m^3/(kg/s^2)$] = 3.9860050	(Gravitational constant)
21	245 – 260	F16.7	Elllipsoid J2 parameter = 0.1082629×10^{-2}	(Elllipsoid J2 parameter)
22	261 – 276	F16.7	Elllipsoid J3 parameter = -0.0000254×10^{-1}	(Elllipsoid J3 parameter)
23	277 – 292	F16.7	Elllipsoid J4 parameter = -0.0000162×10^{-1}	(Elllipsoid J4 parameter)
24	293 – 308	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
25	309 – 324	F16.7	Eliipsoid height used for processing [m] = Value	
26	325 – 332	I8	Scene center line No. (Including zero fill) = Value	N/2 is set. (N: the number of lines)
27	333 – 340	I8	Scene center pixel No. (Including zero fill) = Value	M/2 is set. (M: number of pixels)
28	341 – 356	F16.7	Processing scene length [km] = Value	bbbbbbbbbbbbbbb
29	357 – 372	F16.7	Processed scene width [km] = Value: Level 1.1 (Slant range) / 1.5 (Ground range)	bbbbbbbbbbbbbbb
30	373 – 388	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
31	389 – 392	I4	The number of SAR channels = 'bbb8'	bbb8
32	393 – 396	A4	Spare = Blanks (fixed value)	bbbb
33	397 – 412	A16	Sensor platform mission identifer (ID) = 'ASNARO2bbbbbbbbb'	ASNARO2bbbbbbbbb
34	413 – 444	A32	Sensor ID and operation mode = 'AAAAAAAA-BB-CCC-bbbbbbbbbbbbbbbb' AAAAAAAA: Satellite ID (= 'ASNARO2b') BB : SAR band (= 'Xb') CCC : Operation mode 'SP_': Spotlight mode 1 'SP2': Spotlight mode 2 'SM_': Stripmap mode 'SS_': ScanSAR mode	ASNARO2b-Xb-SP2-bbbbbbbbbbbbbbbb
35	445 – 452	I8	Orbit number of flight line indicator	bbbbbbb1

Table 5-5 Data set Summary Record (3/10)

Field No.	Byte No.	Type	Description	Remarks
36	453 – 460	F8.3	Sensor platform geodetic latitude at the nadir corresponding to scene center [deg] = Blanks: Level 1.1 = Value: Level 1.5	Level 1.1: bbbbbbbb
37	461 – 468	F8.3	Sensor platform geodetic longitude at the nadir corresponding to scene center [deg] = Blanks: Level 1.1 = Value: Level 1.5	Level 1.1: bbbbbbbb
38	469 – 476	F8.3	Sensor platform heading at the nadir corresponding to scene center [deg] = Blanks: Level 1.1 = Value: Level 1.5	Level 1.1: bbbbbbbb
39	477 – 484	F8.3	Sensor clock angle as measured relative to sensor platform flight direction [deg] Left = 'b-90.000' Right = 'bb90.000'	b-90.000
40	485 – 492	F8.3	Incidence angle at the scene center [deg] = Vallue	(Incidence angle)
41	493 – 500	A8	Spare = Blanks (fixed value)	bbbbbbbb
42	501 – 516	F16.7	Radar wavelength [m] = Nominal value	(Radar wavelength)
43	517 – 518	A2	Motion compensation indicator = '00' (fixed value) 00: No compensation 01: on board compensation 10: in processor compensation 11: both on board and in processor	00
44	519 – 534	A16	Range pulse code = 'LINEARbFMbCHIRPb'	LINEARbFMbCHIRPb
45	535 – 550	E16.7	Range pulse amplitude coefficient #1 [Hz] = Nominal value (= 0.0) Center frequency ξ1 for pulse width τ of linearFMmodulationchirp (Constant term)	(Range pulse amplitude coefficient #1)
46	551 – 566	E16.7	Range pulse amplitude coefficient #2 [Hz] = Nominal value FMrate ξ 2 for pulse width τ of linearFMmodulationchirp (Linear coefficient terms)	(Range pulse amplitude coefficient #2)
47	567 – 582	E16.7	Range pulse amplitude coefficient #3 [Hz/s^2] = Nominal value (= 0.0) FMrate ξ 3 for pulse width τ of linearFMmodulationchirp (Quadratic coefficient terms)	(Range pulse amplitude coefficient #3)
48	583 – 598	E16.7	Range pulse amplitude coefficient #4 [Hz/s^3] = Nominal value (= 0.0) FMrate ξ 4 for pulse width τ of linearFMmodulationchirp (Cubic coefficient terms)	(Range pulse amplitude coefficient #4)
49	599 – 614	E16.7	Range pulse amplitude coefficient #5 [Hz/s^4] = Nominal value (= 0.0) FMrate ξ 5 for pulse width τ of linearFMmodulationchirp (Quartic coefficient terms)	(Range pulse amplitude coefficient #5)

Table 5-5 Data set Summary Record (4/10)

Field No.	Byte No.	Type	Description	Remarks
50	615 – 630	E16.7	Range pulse phase coefficient #1 (Constant term) = Blanks (fixed value)	bbbbbbbbbbbbbbb
51	631 – 646	E16.7	Range pulse phase coefficient #2 (Linear coefficient terms) = Blanks (fixed value)	bbbbbbbbbbbbbbb
52	647 – 662	E16.7	Range pulse phase coefficient #3 (Quadratic coefficient terms) = Blanks (fixed value)	bbbbbbbbbbbbbbb
53	663 – 678	E16.7	Range pulse phase coefficient #4 (Cubic coefficient terms) = Blanks (fixed value)	bbbbbbbbbbbbbbb
54	679 – 694	E16.7	Range pulse phase coefficient #5 (Quartic term coefficient) = Blanks (fixed value)	bbbbbbbbbbbbbbb
55	695 – 702	I8	Down linked data chirp extraction index = bbbbbbb1 (fixed value)) linear-up chirp = 'bbbbbbb0' linear-down chirp = 'bbbbbbb1' linear-up and -down chirp = 'bbbbbbb2'	bbbbbbb1
56	703 – 710	A8	Data compression No compression = 'bbbbbbb0' 1/2 compression = 'bbbbbbb1' 1/4 compression = 'bbbbbbb2'	bbbbbbb1
57	711 – 726	F16.7	Sampling rate [MHz]	(Set sampling rate of the 1st frame)
58	727 – 742	F16.7	Range gate (early edge (in time) at the start of the image) [μsec]	(Set range gate of the 1st frame)
59	743 – 758	F16.7	Range pulse width [μsec]	(Set range pulse width of the 1st frame)
60	759 – 762	A4	Base band conversion flag = 'YESb' (fixed value)	YESb
61	763 – 766	A4	Range compressed flag = 'YESb': range compressed (fixed value)	YESb
62	767 – 782	F16.7	Receiver gain for like polarization (early edge (in time) at the start of the image) [dB] = Nominal value	(Receiver gain for like polarization)
63	783 – 798	F16.7	Receiver gain for cross polarization (early edge (in time) at the start of the image) [dB] = Blanks	(Receiver gain for cross polarization)
64	799 – 806	I8	Quantization in bits per channel = 'bbbbbbb8'	bbbbbbb8
65	807 – 818	A12	Quantized descriptor = 'UNIFORMbI,Qb'	UNIFORMbI,Qb
66	819 – 834	F16.7	DC Bias for I-component = Nominal value	(DC Bias for I-component
67	835 – 850	F16.7	DC Bias for Q-component = Nominal value	(DC Bias for Q-component)
68	851 – 866	F16.7	Gain imbalance for I and Q = Nominal value	(Gain imbalance for I and Q)
69	867 – 882	F16.7	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
70	883 – 898	F16.7	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
71	899 – 914	F16.7	Electronic boresight [deg]	Electronic boresight and mechanical boresight are the same definition. (The same value)

Table 5-5 Data set Summary Record (5/10)

Field No.	Byte No.	Type	Description	Remarks
72	915 – 930	F16.7	Mechanical boresight [deg]	Electronic boresight and mechanical boresight are the same definition. (The same value)
73	931 – 934	A4	Echo tracker-on/off = 'OFFb' (fixed value)	OFFb
74	935 – 950	F16.7	PRF[mHz] = PRF of the first line of scene	
75	951 – 966	F16.7	Two-way antenna beam width [deg] (Elevation, Effective value) = Nominal value	(Two-way antenna beam width elecation)
76	967 – 982	F16.7	Two-way antenna beam width [deg] (Azimuth, Effective value) = Nominal value	(Two-way antenna beam width azimuth)
77	983 – 998	I16	Satellite encoded binary time code = Blanks	
78	999 – 1030	A32	Satellite clock time = Blanks	
79	1031 – 1046	I16	Satellite clock increment [nsec] = Blanks	
80	1047 – 1062	A16	Processing facility ID = 'NNGSbbbbbbbbbb'	NNGSbbbbbbbbbb
81	1063 – 1070	A8	Processing system ID = 'NNGSbbbb'	NNGSbbbb
82	1071 – 1078	A8	Processing version ID Note: This is the same as the first eight characters of software release and version ID for volume descriptor.	NNN.NNNb
83	1079 – 1094	A16	Processing code of processing facility = Blanks (fixed value)	bbbbbbbbbbbbbbbb
84	1095 – 1110	A16	Product level code = '1.1bbbbbbbbbbbbb': Level 1.1 = '1.5bbbbbbbbbbbbb': Level 1.5	
85	1111 – 1142	A32	Product type specifier = 'BASICbIMAGEbbbbbbbbbbbbbbbbbbbbbb': Level 1.1 = 'STANDARDbGEOCODEDbIMAGEbbbbbbbbb': Level 1.5	
86	1143 – 1174	A32	Processing algorithm ID = Blanks (fixed value)	bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb
87	1175 – 1190	F16.7	Number of looks in azimuth = 1.0: Level 1.1 = Value: Level 1.5	
88	1191 – 1206	F16.7	Number of looks in range = 1.0: Level 1.1 = Value: Level 1.5	
89	1207 – 1222	F16.7	Bandwidth per look in azimuth [Hz] = Same value as 1239-1254 bytes	

Table 5-5 Data set Summary Record (6/10)

Field No.	Byte No.	Type	Description	Remarks
90	1223 – 1238	F16.7	Bandwidth per look in range [kHz] = 3dB down width of the power spectrum of the reference function	
91	1239 – 1254	F16.7	Bandwidth in azimuth [Hz] (3dB down width of power spectrum of the reference function) = 3dB down width of power spectrum of the reference function: Except ScanSAR mode = Blanks: ScanSAR mode	
92	1255 – 1270	F16.7	Bandwidth in range [kHz] = Value: Level 1.1/1.5	bbbbbbbbbbbbbbb
93	1271 – 1302	A32	Window function in azimuth = Type of window function (*1) (If window function is not specified, 'RECTANGLEbbbbbbbbbbbbbbbbbbbbbb')	(*1) Rectangular window: 'RECTANGLEbbbbbbbbbbbbbbbbbbbbb' Cosine-squared window: 'COSINE-SQUAREDbbbbbbbbbbbbbbbbb' Hanning window: 'HANNINGbbbbbbbbbbbbbbbbbbbbbb' Hamming window: 'HAMMINGbbbbbbbbbbbbbbbbbbbbbb' Blackman window: 'BLACKMANbbbbbbbbbbbbbbbbbbbbb' Kaiser window: 'KAISERbbbbbbbbbbbbbbbbbbbbbb' Taylor window : 'TAYLORbbbbbbbbbbbbbbbbbbbbbb'
94	1303 – 1334	A32	Window funcution in range = Type of window function (*1): Level 1.1/1.5 (If window function is not specified, 'RECTANGLEbbbbbbbbbbbbbbbbbbbbbb')	
95	1335 – 1350	A16	Data input source (eg.HDDT-ID) = 'ONLINEbbbbbbbbbb': Online transfer (fixed value)	ONLINEbbbbbbbbbb
96	1351 – 1366	F16.7	Resolution in ground range [m] = Nominal value	
97	1367 – 1382	F16.7	Resolution in azimuth [m] = Nominal value	
98	1383 – 1398	F16.7	Radiometric parameter (Bias) = Blanks (fixed value)	bbbbbbbbbbbbbbb
99	1399 – 1414	F16.7	Radiometric parameter（Gain）= Blanks (fixed value)	bbbbbbbbbbbbbbb
100	1415 – 1430	F16.7	Along track Doppler frequency (center) constant term at the scene center time [Hz] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb

Table 5-5 Data set Summary Record (7/10)

Field No.	Byte No.	Type	Description	Remarks
101	1431 – 1446	F16.7	Along track Dopper frequency (center) linear coefficient terms at the scene center time [Hz/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
102	1447 – 1462	F16.7	Along track Dopper frequency (center) quadratic coefficient terms at the scene center time [Hz/pixel/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
103	1463 – 1478	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
104	1479 – 1494	F16.7	Cross track Doppler frequency (center) constant term at the scene center time [Hz] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
105	1495 – 1510	F16.7	Cross track Doppler frequency (center) linear coefficient term at the scene center time [Hz/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
106	1511 – 1526	F16.7	Cross track Doppler frequency (center) quadratic coefficient term at the scene center time [Hz/pixel/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
107	1527 – 1534	A8	Time direction indicator along pixel direction = Blanks (fixed value)	bbbbbbbb
108	1535 – 1542	A8	Time direction indicator along line direction Ascending = 'ASCENDbb' Descending = 'DESCENDb'	ASCENDbb
109	1543 – 1558	F16.7	Along track Doppler frequency rate constant terms at the scene center time [Hz/sec] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb

Table 5-5 Data set Summary Record (8/10)

Field No.	Byte No.	Type	Description	Remarks
110	1559 – 1574	F16.7	Along track Doppler frequency rate linear coefficient terms at the scene center time [Hz/sec/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
111	1575 – 1590	F16.7	Along track Doppler frequency rate quadratic coefficient terms at the scene center time [Hz/sec/pixel/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
112	1591 – 1606	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
113	1607 – 1622	F16.7	Cross track Doppler frequency rate constant terms at the scene center time [Hz/sec] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
114	1623 – 1638	F16.7	Cross track Doppler frequency rate linear coefficient terms at the scene center time [Hz/sec/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
115	1639 – 1654	F16.7	Cross track Doppler frequency rate quadratic coefficient terms at the scene center time[Hz/sec/pixel/pixel] = Blanks : Level 1.5 = Value: Level 1.1 (ScanSAR mode: 0.0 (fixed value))	In the case of Level 1.5, bbbbbbbbbbbbbbb
116	1655 – 1670	A16	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbb
117	1671 – 1678	A8	Line content indicator = 'RANGEbbb': Level 1.1 = 'OTHERbbb': Level 1.5	In the case of Level 1.1, RANGEbbb
118	1679 – 1682	A4	Clutter lock applied flag = 'YESb'、'NObb'	
119	1683 – 1686	A4	Auto-focusing applied flag = 'YESb'、'NObb'	

Table 5-5 Data set Summary Record (9/10)

Field No.	Byte No.	Type	Description	Remarks
120	1687 – 1702	F16.7	Line spacing [m] = Calculated azimuth spacing: Level 1.1 = Value: Level 1.5	In the case of Level 1.5, the pixel spacing is not defined as the value on a reference ellipsoid but as the value on a map coordinates.
121	1703 – 1718	F16.7	Pixel spacing [m] = Calculated range spacing: Level 1.1 = Value: Level 1.5	For Level 1.5, the pixel spacing is not defined as the value on a reference ellipsoid but as the value on a map coordinates.
122	1719 – 1734	A16	Processor range compression designator = 'EXTRACTEDbCHIRPb'	
123	1735 – 1750	F16.7	Doppler center frequency approximately coefficient constant term (a) = Value: Level 1.1/1.5	fd = a + b・R fd: Doppler center frequency [Hz] R: Slant range [km]
124	1751 – 1766	F16.7	Doppler center frequency approximately linear coefficient term（b） = Value: Level 1.1/1.5	
			SENSOR SPECIFIC LOCAL USE SEGMENT	
125	1767 – 1770	I4	Calibration mode data location flag No calibration data = 'bbb0'	bbb0
126	1771 – 1778	I8	Start line number of calibration at the side of start = 'bbbbbbb0'	bbbbbbb0
127	1779 – 1786	I8	End line number of calibration at the side of start = 'bbbbbbb0'	bbbbbbb0
128	1787 – 1794	I8	Start line number of calibration at the side of end = 'bbbbbbb0'	bbbbbbb0
129	1795 – 1802	I8	End line number of calibration at the side of end = 'bbbbbbb0'	bbbbbbb0
130	1803 – 1806	I4	PRF switching indicator A fixed PRF 1 scene = 'bbb0' Variable PRFs = switched number (if the PRF is switched one time: 'bbb1') ScanSAR mode = 'bbb0' (fixed value)	bbb0
131	1807 – 1814	I8	Line number of PRF switching (The first PRF switching is stored) A fixed PRF = 'bbbbbbb1' ScanSAR mode = 'bbbbbbb0'	bbbbbbb1

Table 5-5 Data set Summary Record (10/10)

Field No.	Byte No.	Type	Description	Remarks
132	1815 – 1830	F16.7	The direction of a beam center in a scene center [deg] = Value	
133	1831 – 1834	I4	Yaw steering mode flag Yaw steering mode = 'bbb0' (fixed value)	bbb0
134	1835 – 1838	I4	Parameter table number of automatically setting = 'bbbb'	bbbb
135	1839 – 1854	F16.7	Off nadir angle [deg]	bbbbbb24.2000000
136	1855 – 1858	I4	Antenna beam number = 'bbb0'	bbb0
137	1859 – 1886	A28	Spare = Blanks (fixed value)	bbbbbbbbbbbbbbbbbbbbbbbbbbbb
			PROCESSING SPECIFIC LOCAL USE SEGMENT	
138	1887 – 1906	E20.13	Incidence angle constant term (a0) = Value	$\theta = a0 + a1*R + a2*R^2 + a3*R^3 + a4*R^4 + a5*R^5$ θ: Incidence angle [rad] R: Slant range [km]
139	1907 – 1926	E20.13	Incidence angle linear coefficient term (a1) = Value	
140	1927 – 1946	E20.13	Incidence angle quadratic coefficient term (a2) = Value	
141	1947 – 1966	E20.13	Incidence angle cubic coefficient term (a3) = Value	
142	1967 – 1986	E20.13	Incidence angle forth coefficient term (a4) = Value	
143	1987 – 2006	E20.13	Incidence angle fifth coefficient term (a5) = Value	
			IMAGE ANNOTATION SEGMENT	
144	2007 – 2014	I8	Number of annotation points (up to 64) = 'bbbbbbb0'	bbbbbbb0
145	2015 – 2022	A8	Spare = Blanks (fixed value)	bbbbbbbb
146	2023 – 2030	I8	Line number of the 1st annotation start = Blanks	bbbbbbbb
147	2031 – 2038	I8	Pixel number of the 1st annotation start = Blanks	bbbbbbbb
148	2039 – 2054	A16	The 1st annotation text = Blanks	bbbbbbbbbbbbbbbb
149	2055 – 2062	I8	Line number of the 2nd annotation start = Blanks	bbbbbbbb
150	2063 – 2070	I8	Pixel number of the 2nd annotation start = Blanks	bbbbbbbb
151	2071 – 2086	A16	The 2nd annotation text = Blanks	bbbbbbbbbbbbbbbb
	・		Line number of Nth annotation start = Blanks	Repeat up to 64th
	・		Pixcel number of Nth annotation start = Blanks	Repeat up to 64th
	・		Nth annotation text = Blanks	Repeat up to 64th
152	4039 – 4046	I8	Line number of the 64th annotation start = Blanks	bbbbbbbb
153	4047 – 4054	I8	Pixel number of the 64th annotation start = Blanks	bbbbbbbb
154	4055 – 4070	A16	The 64th annotation text = Blanks	bbbbbbbbbbbbbbbb
155	4071 – 4096	A26	System reserve = Blanks	bbbbbbbbbbbbbbbbbbbbbbbbbb

Table 5-6 Map Projection Data Record (1/5)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $3)_{10}$	00000003h Only level 1.5 has this record.
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $20)_{10}$	14h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code= $20)_{10}$	14h
6	9 – 12	B4	Map projection data record length = $620)_{10}$	00000654h
7	13 – 28	A16	Blanks	bbbbbbbbbbbbbbbb
			MAP PROJECTION GENERAL INFORMATION	
8	29 – 60	A32	Map projection Geo-coded = 'GEOCODEDbbbbbbbbbbbbbbbbbbbbbbbb' Geo-reference = 'GEOREFERENCEbbbbbbbbbbbbbbbbbbbb'	
9	61 – 76	I16	Number of pixel per line	
10	77 – 92	I16	Number of lines	
11	93 – 108	F16.7	Inter-line distance in output scene [m]	The inter-line/pixel distances is not defined as the value on a reference ellipsoid but as the value on a map coordinates.
12	109 – 124	F16.7	Inter-pixel distance in output scene [m]	
13	125 – 140	F16.7	The angle between projection axis from true north at the processed scene center [deg]	
14	141 – 156	F16.7	Actual platform orbital Inclination = 0.0000000	
15	157 – 172	F16.7	Actual ascending node = 0.0000000	
16	173 – 188	F16.7	Distance of platform at input scene center from the geocentric [m]	
17	189 – 204	F16.7	Geodetic altitude of the platform relative to the ellipsoid [m]	
18	205 – 220	F16.7	Actual ground speed at the nadir at input scene center time [m/second]	
19	221 – 236	F16.7	Platform headings [deg]	
			GEODETIC PARAMETER	
20	237 – 268	A32	Name of reference geodetic parameter = 'WGS84bbbbbbbbbbbbbbbbbbbbbbbbbb': WGS84 = 'GRS80_ITRF97bbbbbbbbbbbbbbbbbbbb': GRS80/ITRF97	
21	269 – 284	F16.7	Semi-major axis of referenced ellipsoid [m]	
22	285 – 300	F16.7	Semi-minor axis of referenced ellipsoid [m]	

Table 5-6 Map Projection Data Record (2/5)

Field No.	Byte No.	Type	Description	Remarks
23	301 – 316	F16.7	Datum shift param (dx) [m]	
24	317 – 332	F16.7	Datum shift param (dy) [m]	
25	333 – 348	F16.7	Datum shift param (dz) [m]	
26	349 – 364	F16.7	Datum shift (1st rotation angle) [arcsec]	
27	365 – 380	F16.7	Datum shift (2nd rotation angle) [arcsec]	
28	381 – 396	F16.7	Datum shift (3rd rotation angle) [arcsec]	
29	397 – 412	F16.7	Scale factor of referenced ellipsoid	
			MAP PROJECTION DESIGNATOR	
30	413 – 444	A32	Alphanumeric description of map projection = 'UTM-PROJECTIONbbbbbbbbbbbbbbbbbb': UTM-projection = 'PS-PROJECTIONbbbbbbbbbbbbbbbbbb': PS-projection = 'MER-PROJECTIONbbbbbbbbbbbbbbbbbb': Mercator-projection	
			UTM-PROJECTION(1st default)	
31	445 – 476	A32	Type of UTM = 'UNIVERSALbTRANSVERSEbMERCATORbbb'	Blanks except UTM
32	477 – 480	A4	UTM zone number	
33	481 – 496	F16.5	Map origin (false easting) [m] = 500000.00000	
34	497 – 512	F16.5	Map origin (false northing) [m] = 0.00000: Northern Hemisphere = 10000000.00000: Southern Hemisphere	
35	513 – 528	F16.7	Center of projection longitude [deg]	
36	529 – 544	F16.7	Center of projection latitude [deg]	
37	545 – 560	A16	Blanks	
38	561 – 576	A16	Blanks	
39	577 – 592	F16.7	Scale factor = 0.9996000	
			PS-PROJECTION (2nd default)	
40	593 – 624	A32	Type of PS = 'POLARbSTEREOGRAPHICbbbbbbbbbbbbbb'	Blanks except PS
41	625 – 640	F16.7	Center of projection longitude [deg]	
42	641 – 656	F16.7	Center of projection latitude [deg]	
43	657 – 672	F16.7	Scale factor = 1.0000000	

Table 5-6 Map Projection Data Record (3/5)

Field No.	Byte No.	Type	Description	Remarks
			NATIONAL SYSTEMS PROJECTION (any other)	
44	673 – 704	A32	Projection descriptor = 'MERCATORbbbbbbbbbbbbbbbbbbbbbbbb': MER-PROJECTION	Blanks except MER
45	705 – 720	F16.5	Map origin (false easting) [m] = 0.0	
46	721 – 736	F16.5	Map origin (false northing) [m] = 0.0	
47	737 – 752	F16.7	Center of projection longitude [deg](set up center map origin lat/lon)	
48	753 – 768	F16.7	Center of projection latitude [deg](set up center map origin lat/lon)	
49	769 – 784	F16.7	Standard parallel [deg] (Standard parallelφ1) = 0.0	
50	785 – 800	F16.7	Standard parallel [deg] (Standard parallelφ2) = 0.0	
51	801 – 816	F16.7	Standard parallel [deg] = Blanks	
52	817 – 832	F16.7	Standard parallel [deg] = Blanks	
53	833 – 848	F16.7	Central meridian [deg] = Blanks	
54	849 – 864	F16.7	Central meridian [deg] = Blanks	
55	865 – 880	F16.7	Central meridian [deg] = Blanks	
56	881 – 944	A64	Blanks	
			COORDINATES OF FOUR CORNER POINTS	
57	945 – 960	F16.7	Top left corner northing [km]	Set northing at the center of pixel at the top left corner
58	961 – 976	F16.7	Top left corner easting [km]	Set easting at the center of pixel at the top left corner
59	977 – 992	F16.7	Top right corner northing [km]	Set northing at the center of pixel at the top right corner
60	993 – 1008	F16.7	Top right corner easting [km]	Set easting at the center of pixel at the top right corner
61	1009 – 1024	F16.7	Bottom right corner northing [km]	Set northing at the center of pixel at the bottom right corner
62	1025 – 1040	F16.7	Bottom right corner easting [km]	Set easting at the center of pixel at the bottom right corner
63	1041 – 1056	F16.7	Bottom left corner northing [km]	Set northing at the center of pixel at the bottom left corner

Table 5-6 Map Projection Data Record (4/5)

Field No.	Byte No.	Type	Description	Remarks
64	1057 – 1072	F16.7	Bottom left corner easting [km]	Set easting at the center of pixel at the bottom left corner
65	1073 – 1088	F16.7	Top left corner latitude [deg]	Set latitude at the center of pixel at the top left corner
66	1089 – 1104	F16.7	Top left corner longitude [deg]	Set longitude at the center of pixel at the top left corner
67	1105 – 1120	F16.7	Top right corner latitude [deg]	Set latitude at the center of pixel at the top right corner
68	1121 – 1136	F16.7	Top right corner longitude [deg]	Set longitude at the center of pixel at the top right corner
69	1137 – 1152	F16.7	Bottom right corner latitude [deg]	Set latitude at the center of pixel at the bottom right corner
70	1153 – 1168	F16.7	Bottom right corner longitude [deg]	Set longitude at the center of pixel at the bottom right corner
71	1169 – 1184	F16.7	Bottom left corner latitude [deg]	Set latitude at the center of pixel at the bottom left corner
72	1185 – 1200	F16.7	Bottom left corner longitude [deg]	Set longitude at the center of pixel at the bottom left corner
73	1201 – 1216	A16	Top left corner terrain height relative to ellipsoid [m] = Blanks	
74	1217 – 1232	A16	Top right corner terrain height relative to ellipsoid [m] = Blanks	
75	1233 – 1248	A16	Bottom right corner terrain height relative to ellipsoid [m] = Blanks	
76	1249 – 1264	A16	Bottom left corner terrain height relative to ellipsoid [m] = Blanks	
77	1265 – 1424	8E20.10	Eight coefficients to convert from a line(L) and pixel(P) position to the map projection frame of reference (E, N), say (E, N) where: E = A11 + A12*L + A13*P + A14*L*P N = A21 + A22*L + A23*P + A24*L*P The order of storing: A11, A12, A13, …, A24 The coefficients of 1025-2024 bytes in facility related data record 3 should be used.	For the expressions, the position defined as (P, L) = (1, 1) corresponds to the central point of the pixel at the upper left corner and (E, N) show a longitude [deg] and a latitude [deg].

Table 5-6 Map Projection Data Record (5/5)

Field No.	Byte No.	Type	Description	Remarks
78	1425 – 1584	8E20.10	Eight coefficients to convert from the map projection (E, N) to line(L) and pixel(P) position in the image, say (L, P) where: L = B11 + B12*E + B13*N + B14*E*N P = B21 + B22*E + B23*N + B24*E*N The order of storing: B11, B12, B13, …, B24 The coefficients of 2065-3064 bytes in facility related data record 3 should be used.	For the expressions, the position defined as (P, L) = (1, 1) corresponds to the central point of the pixel at the upper left corner and (E, N) show a longitude [deg] and a latitude [deg].
79	1585 - 1600	F16.7	Height of projected face (ellipsoid height) [m]	
80	1601 – 1620	A20	Blanks	

Table 5-7 Platform Position Data Record (1/3)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number Level 1.1 = $3)_{10}$ Level 1.5 = $4)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $30)_{10}$	1Eh
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $20)_{10}$	14h
6	9 – 12	B4	Platform position data record length = $16384)_{10}$	00004000h
7	13 – 44	A32	Orbital elements designator On-board orbit = '1bbbbbbbbbbbbbbbbbbbbbbbbbbbbb' Orbit information (decision) = '2bbbbbbbbbbbbbbbbbbbbbbbbbbbbb'	2bbbbbbbbbbbbbbbbbbbbbbbbbbbbb
8	45 – 60	F16.7	1st orbital element Position vector in the earth fixed coordinate system of the scene center (x) [m] = Value	
9	61 – 76	F16.7	2nd orbital element Position vector in the earth fixed coordinate system of the scene center (y) [m] = Value	
10	77 – 92	F16.7	3rd orbital element Position vector in the earth fixed coordinate system of the scene center (z) [m] = Value	
11	93 – 108	F16.7	4th orbital element Velocity vector in the earth fixed coordinate system of the scene center (x') [m/sec] = Value	
12	109 – 124	F16.7	5th orbital element Velocity vector in the earth fixed coordinate system of the scene center (y') [m/sec] = Value	

Table 5-7 Platform Position Data Record (2/3)

Field No.	Byte No.	Type	Description	Remarks
13	125 – 140	F16.7	6th orbital element Velocity vector in the earth fixed coordinate system of the scene center (z') [m/sec] = Value	
14	141 – 144	I4	Number of data points On-board orbit = 'bbb6' to 'b121' Orbit information (decision) = 'bbb4' to 'bbb7'	bbb5
15	145 – 148	I4	YYYY : Year of the 1st point	2015
16	149 – 152	I4	bbMM : Month of the 1st point	bb02
17	153 – 156	I4	bbDD : Day of the 1st point	bb02
18	157 – 160	I4	Day in the year of the 1st point (Ex: 2nd February = 33th)	bb33
19	161 – 182	E22.15	Seconds of day in UTC at the 1st point in UTC (Ex: 0:51:30.23 = 3090.23)	b0.309023000000000E+04
20	183 – 204	E22.15	Time interval between data points [sec] On-board orbit = 1.0 Orbit information (decision) = 60.0	b0.600000000000000E+02
21	205 – 268	A64	Reference coordinate system (ECI, ECR) = 'ECRbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb bbb'	ECRbbbbbbbbbbbbbbbbbbbbbbbbbbbbb bbbbbbbbbbbbbbbbbbbbbbbbbbbbbbbb
22	269 – 290	E22.15	Greenwich mean hour angle [degree] = Blanks (fixed value)	bbbbbbbbbbbbbbbbbbbbbb
23	291 – 306	F16.7	Along track position error [m] = Nominal value	(Along track position error)
24	307 – 322	F16.7	Across track position error [m] = Nominal value	(Across track position error)
25	323 – 338	F16.7	Radial position error [m] = Nominal value	(Radial position error)
26	339 – 354	F16.7	Along track velocity error [m/sec] = Nominal value	(Along track velocity error)
27	355 – 370	F16.7	Across track velocity error [m/sec] = Nominal value	(Across track velocity error)
28	371 – 386	F16.7	Radial velocity error [m/sec] = Nominal value	(Radial velocity error)
			FIRST POSITIONAL DATA POINT	
29	387 – 408	E22.15	1st data point position vector (x) [m]	(1st data point position vector)
30	409 – 430	E22.15	1st data point position vector (y) [m]	(1st data point position vector)
31	431 – 452	E22.15	1st data point position vector (z) [m]	(1st data point position vector)
32	453 – 474	E22.15	1st data point velocity vector (x') [m/sec]	(1st data point velocity vector)

Table 5-7 Platform Position Data Record (3/3)

Field No.	Byte No.	Type	Description	Remarks
33	475 – 496	E22.15	1st data point velocity vector (y') [m/sec]	(1st data point velocity vector)
34	497 – 518	E22.15	1st data point velocity vector (z') [m/sec]	(1st data point velocity vector)
	519 – 16358	120*6* E22.15	Repeat from the 2nd data point to the nth data point (maximum 121) with the same format of 387-518 bytes. The number of n is described in Field No. 14. After repeating, remaining spaces are filled with blanks.	
35	16359 – 16376	A18	Blanks	bbbbbbbbbbbbbbbbbb
36	16377 – 16377	I1	Occurrence flag of a leap second No leap second = '0' Occurrence of a leap second = '1'	If the leap second is included in stored orbit data range, 1 is stored.
37	16378 – 16384	A7	Blanks	Blanks (b*7)

Table 5-8 Attitude Data Record (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number Level 1.1 = $4)_{10}$ Level 1.5 = $5)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $40)_{10}$	28h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $20)_{10}$	14h
6	9 – 12	B4	Attitude data records length = $16384)_{10}$	00004000h
7	13 – 16	I4	Number of data points = 'bbb6' to 'b121'	bb22
8	17 – 20	I4	Day in the year	bbb1
9	21 – 28	I8	Milli-second of the day in UTC time = 'bbbbbbb0' to '86399999'	bbb28800
10	29 – 32	I4	Pitch data quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0
11	33 – 36	I4	Roll data quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0
12	37 – 40	I4	Yaw data quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0
13	41 – 54	E14.6	Pitch [deg]	(Pitch)
14	55 – 68	E14.6	Roll [deg]	(Roll)
15	69 – 82	E14.6	Yaw [deg]	(Yaw)
16	83 – 86	I4	Pitch rate quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0

Table 5-8 Attitude Data Record (2/2)

Field No.	Byte No.	Type	Description	Remarks
17	87 – 90	I4	Roll rate quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0
18	91 – 94	I4	Yaw rate quality flag Good (within limit check) = 'bbb0' NG (out of limit check) = 'bbb1'	bbb0
19	95 – 108	E14.6	Pitch rate [deg/sec]	(Pitch rate)
20	109 – 122	E14.6	Roll rate[deg/sec]	(Roll rate)
21	123 – 136	E14.6	Yaw rate[deg/sec]	(Yaw rate)
	137 – 14536	120*120	Repeat from the 2nd data point to the nth data point (maximum 121) with the same format of 17-136 bytes. The number of n is described in Field No. 7. After repeating, remaining spaces are filled with blanks.	
22	14537 – 16384	A1848	Blanks	Blanks (b1848)

Table 5-9 Radiometric Data Record (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number Level 1.1 = $5)_{10}$ Level 1.5 = $6)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	
3	6 – 6	B1	Record type code = $50)_{10}$	
4	7 – 7	B1	2nd sub-type code = $18)_{10}$	
5	8 – 8	B1	3rd sub-type code = $20)_{10}$	
6	9 – 12	B4	Radiometric data record length = $9860)_{10}$	
7	13 – 16	I4	Radiometric data records sequence number = 'bbb1'	
8	17 – 20	I4	Number of radiometric fields = 'bbb1'	
			RADIOMETRIC DATA SET	
9	21 – 36	F16.7	Calibration factor (CF) Level 1.1 (Except ScanSAR): $\sigma^0 = 10*\log_{10}\langle I^2+Q^2\rangle + CF$ Level 1.1 (ScanSAR): $\sigma^0 = 10*\log_{10}\langle V^2\rangle + CF$ Level 1.5: $\sigma^0 = 10*\log_{10}\langle DN^2\rangle + CF$ This means that the sigma-naught of a pixel can be obtained by the ensemble averaging (<>), i.e., the spatial averaging of pixel values around the target. Here, I, Q: Pixel values of Level 1.1 (except ScanSAR) V: Pixel values of Level 1.1 (ScanSAR) DN: Pixel values of Level 1.5	
10	37 – 52	F16.7	Transmission distortion matrix (DT) Real part of DT(1, 1) = 1.0 (fixed value)	
11	53 – 68	F16.7	Imaginary part of DT (1, 1) = 0.0 (fixed value)	
12	69 – 84	F16.7	Real part of DT (1, 2) = 0.0 (fixed value)	
13	85 – 100	F16.7	Imaginary part of DT (1, 2) = 0.0 (fixed value)	
14	101 – 116	F16.7	Real part of DT (2, 1) = 0.0 (fixed value)	
15	117 – 132	F16.7	Imaginary part of DT (2, 1) = 0.0 (fixed value)	
16	133 – 148	F16.7	Real part of DT (2, 2) = 1.0 (fixed value)	

Table 5-9 Radiometric Data Record (2/2)

Field No.	Byte No.	Type	Description	Remarks
17	149 – 164	F16.7	Imaginary part of DT (2, 2) = 0.0 (fixed value)	
18	165 – 180	F16.7	Reception distortion matrix (DR) Real part of DT (1, 1) = 1.0 (fixed value)	
19	181 – 196	F16.7	Imaginary part of DT (1, 1) = 0.0 (fixed value)	
20	197 – 212	F16.7	Real part of DT (1, 2) = 0.0 (fixed value)	
21	213 – 228	F16.7	Imaginary part of DT (1, 2) = 0.0 (fixed value)	
22	229 – 244	F16.7	Real part of DT (2, 1) = 0.0 (fixed value)	
23	245 – 260	F16.7	Imaginary part of DT (2, 1) = 0.0 (fixed value)	
24	261 – 276	F16.7	Real part of DT (2, 2) = 1.0 (fixed value)	
25	277 – 292	F16.7	Imaginary part of DT (2, 2) = 0.0 (fixed value)	
26	293 – 9860	A9568	Reserve (Blanks)	

Table 5-10 Data Quality Summary Record (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number Level 1.1 = $6)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	
3	6 – 6	B1	Record type code = $60)_{10}$	
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	
5	8 – 8	B1	3rd record sub-type code = $20)_{10}$	
6	9 – 12	B4	Data quality summary record length = $1620)_{10}$	
7	13 – 16	I4	Data quality summary record number = 'bbb1'	
8	17 – 20	A4	SAR channel ID = Blanks	bbbb
9	21 – 26	A6	Date of the last calibration update = 'YYMMDD' YY: the last two-digits of year MM: Month DD: Day	
10	27 – 30	A4	Number of channels = 1 (fixed value)	bbb1
			ABSOLUTE RADIOMETRIC DATA QUALITY	
11	31 – 46	F16.7	ISLR (nominal value) [dB]	
12	47 – 62	F16.7	PSLR (nominal value) [dB]	
13	63 – 78	F16.7	Azimuth ambiguity rate (AAR) (Nominal value) [dB]	
14	79 – 94	F16.7	Range ambiguity rate (RAR) (Nominal value) [dB]	
15	95 – 110	F16.7	Estimate of SNR [dB]	
16	111 – 126	F16.7	BER (Actual value) = Blanks	bbbbbbbbbbbbbbbb
17	127 – 142	F16.7	Slant range resolution (Nominal value) [m]	
18	143 – 158	F16.7	Azimuth resolution (Nominal value) [m]	
19	159 – 174	F16.7	Radiometric resolution (Nominal value) [dB] = Blanks	bbbbbbbbbbbbbbbb
20	175 – 190	F16.7	Instantaneous dynamic range [dB] = Blanks	bbbbbbbbbbbbbbbb
21	191 – 206	F16.7	Nominal absolute radiometric calibration magnitude uncertainty of SAR channel indicated in bytes 17-20 [dB] = Blanks	bbbbbbbbbbbbbbbb
22	207 – 222	F16.7	Nominal absolute radiometric calibration phase uncertainty of SAR channel indicated in bytes 17-20 [degree] = Blanks	bbbbbbbbbbbbbbbb

Table 5-10 Data Quality Summary Record (2/2)

Field No.	Byte No.	Type	Description	Remarks
			RELATIVE RADIOMETRIC QUALITY	
23	223 – 238	F16.7	Nominal relative radiometric calibration magnitude uncertainty of SAR channel indicated in bytes 17-20 [dB] = Blanks	bbbbbbbbbbbbbbbb
24	239 – 254	F16.7	Nominal relative radiometric calibration phase uncertainty of SAR channel indicated in bytes 17-20 [deg] = Blanks	bbbbbbbbbbbbbbbb
25	255 494	A240	Blanks	
26	495 734	A240	Blanks	
			ABSOLUTE GEOMETRIC DATA QUALITY	
27	735 – 750	F16.7	Absolute location error along track (Nominal value) [m]	
28	751 – 766	F16.7	Absolute location error cross track (Nominal value) [m]	
29	767 – 782	F16.7	Geometric distortion scale in line direction (Nominal value) = Blanks	bbbbbbbbbbbbbbbb
30	783 – 798	F16.7	Geometric distortion scale in pixel direction (Nominal value) = Blanks	bbbbbbbbbbbbbbbb
31	799 – 814	F16.7	Geometric distortion skew = Blanks	bbbbbbbbbbbbbbbb
32	815 – 830	F16.7	Scene orientation error = Blanks	bbbbbbbbbbbbbbbb
			RELATIVE GEOMETRIC DATA QUALITY	
33	831 1620	A790	Blanks	

Table 5-11 Facility Related Data Record 1 (1/1)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record sequence number, Level 1.1 = $7)_{10}$ Level 1.5 = $8)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $200)_{10}$	C8h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $18)_{10}$ CEOS = $20)_{10,}$ CCRS = $36)_{10,}$ ESA = $50)_{10,}$ NASA = $60)_{10,}$ JPL = $61)_{10}$ JAXA = $70)_{10,}$ DFVLR = $80)_{10}$, RAE = $90)_{10}$, TELESPAZIO = $10)_{10}$ UNSPECIFIED = $18)_{10}$, etc.	12h
6	9 – 12	B4	Record length = $2006000)_{10}$	1E9BF0h
7	13 – 16	I4	Facility related data record number= 'bbb1'	bbb1
8	17 – 66	A50	Blanks	Blanks (b*50)
9	67 – 2006000	A2005934	Set the contents of earth rotation parameter file	(Contents of earth rotation parameter file)

Table 5-12 Facility Related Data Record 2 (1/2)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record sequence number Level 1.1 = $8)_{10}$ Level 1.5 = $9)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $200)_{10}$	C8h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $18)_{10}$ CEOS = $20)_{10}$, CCRS = $36)_{10}$, ESA = $50)_{10}$, NASA = $60)_{10}$, JPL = $61)_{10}$ JAXA = $70)_{10}$, DFVLR = $80)_{10}$, RAE = $90)_{10}$, TELESPAZIO = $10)_{10}$ UNSPECIFIED = $18)_{10}$, etc.	12h
6	9 – 12	B4	Record length = $50000)_{10}$	0000c350h
7	13 – 16	I4	Facility related data record number = 'bbb2'	bbb2
			On-board orbit data	
8	17 – 20	I4	Number of data points = 'bbb6' to 'b121'	bb22
9	21 – 24	I4	YYYY: Year of the 1st point	2015
10	25 – 28	I4	Day in the year of the 1st point (Ex: 2nd February = 33th)	bb33
11	29 – 50	E22.15	Seconds of day of the 1st point in UTC (Ex: 0:51:30.23 = 3090.23)	b0.309023000000000E+04
12	51 – 72	E22.15	1st data point position vector (x) [m]	(1st data point position vector)
13	73 – 94	E22.15	1st data point position vector (y) [m]	(1st data point position vector)
14	95 – 116	E22.15	1st data point position vector (z) [m]	(1st data point position vector)
15	117 – 138	E22.15	1st data point velocity vector (x') [m/sec]	(1st data point velocity vector)
16	139 – 160	E22.15	1st data point velocity vector (y') [m/sec]	(1st data point velocity vector)
17	161 – 182	E22.15	1st data point velocity vector (z') [m/sec]	(1st data point velocity vector)
18	183 - 186	I4	1st data point on-board orbit status Available = bbb0 Not available = bbb1	
19	187 - 220	A34	1st data point (spare)	

Table 5-12 Facility Related Data Record 2 (2/2)

Field No.	Byte No.	Type	Description	Remarks
20	221 – 24220	200*120	Repeat from the 2nd data point to the nth data point (maximum 121) with the same format of 21-220 bytes. The number of n is described in Field No. 8. After repeating, remaining spaces are filled with blanks.	
21	24221 – 25020	A800	Blanks	b*800
			On-board attitude data	
22	25021 – 25024	I4	Number of data points = 'bbb6' to 'b121'	bb22
23	25025 – 25028	I4	YYYY: Year of 1st point	2015
24	25029 – 25032	I4	Day in the year of the 1st point (Ex: 2nd February = 33th)	bb33
25	25033 – 25054	E22.15	Seconds of day of the 1st point in UTC (Ex: 0:51:30.23 = 3090.23)	b0.309023000000000E+04
26	25055 – 25076	E22.15	1st data point satellite attitude quaternion 1 (q1)	(1st data point quaternion)
27	25077 – 25098	E22.15	1st data point satellite attitude quaternion 2 (q2)	(1st data point quaternion)
28	25099 – 25120	E22.15	1st data point satellite attitude quaternion 3 (q3)	(1st data point quaternion)
29	25121 – 25142	E22.15	1st data point satellite attitude quaternion 4 (q4)	(1st data point quaternion)
30	25143 – 25164	E22.15	1st data point satellite rate (ωx) [rad/sec]	(1st data point satellite rate)
31	25165 – 25186	E22.15	1st data point satellite rate (ωy) [rad/sec]	(1st data point satellite rate)
32	25187 - 25208	E22.15	1st data point satellite rate (ωz) [rad/sec]	(1st data point satellite rate)
33	25209 - 25212	I4	1st data point on-board attitude status Available = bbb0 Not available = bbb1	
34	25213 - 25224	A12	1st data point (spare)	
35	25225 – 49224	200*120	Repeat from the 2nd data point to the nth data point (maximum 121) with the same format of 25025-25224 bytes. The number of n is described in Field No. 22. After repeating, remaining spaces are filled with blanks.	
36	49225 – 50000	A776	Blanks	Blanks (b*776)

Table 5-13 Facility Related Data Record 3 (1/3)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record sequence number Level 1.1 = $9)_{10}$ Level 1.5 = $10)_{10}$	
2	5 – 5	B1	1st record sub-type code = $18)_{10}$	12h
3	6 – 6	B1	Record type code = $200)_{10}$	C8h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $18)_{10}$ CEOS = $20)_{10}$, CCRS = $36)_{10}$, ESA = $50)_{10}$, NASA = $60)_{10}$, JPL = $61)_{10}$ JAXA = $70)_{10}$, DFVLR = $80)_{10}$, RAE = $90)_{10}$, TELESPAZIO = $10)_{10}$ UNSPECIFIED = $18)_{10}$, etc.	12h
6	9 – 12	B4	Record length = $5000)_{10}$	00001388h
7	13 – 16	I4	Facility related data record number = 'bbb3'	bbb3
8	17 – 416	20E20.10	Twenty coefficients to convert from the map projection (φ, λ) to Line(L) and pixel (P) position in the image, say (P, L) where: Level 1.5: $P = a_0 + a_1*\varphi + a_2*\lambda + a_3*\varphi*\lambda + a_4*\varphi^2 + a_5*\lambda^2 + a_6*\varphi^2*\lambda + a_7*\varphi*\lambda^2 + a_8*\varphi^3 + a_9*\lambda^3$ $L = b_0 + b_1*\varphi + b_2*\lambda + b_3*\varphi*\lambda + b_4*\varphi^2 + b_5*\lambda^2 + b_6*\varphi^2*\lambda + b_7*\varphi*\lambda^2 + b_8*\varphi^3 + b_9*\lambda^3$ Coefficients a_0 to a_9 and b_0 to b_9 (The order of storing a_0, a_1, a_2, …, a_9 and b_0, b_1, b_2, …, b_9) Level 1.1: Blanks The coefficients of 2065-3064 bytes in facility related data record 3 should be used.	For the expressions, the position defined as (P, L) = (1, 1) corresponds to the central point of the pixel at the upper left corner and (φ, λ) show a longitude [deg] and a latitude [deg].
9	417 – 420	I4	Calibration mode data location flag No calibration data = 'bbb0'	bbb0
10	421 – 428	I8	Start line number of calibration at the upper image No calibration data = 'bbbbbbb0'	bbbbbbb0
11	429 – 436	I8	End line number of calibration at the upper image No calibration data = 'bbbbbbb0'	bbbbbbb0

Table 5-13 Facility Related Data Record 3 (2/3)

Field No.	Byte No.	Type	Description	Remarks
12	437 – 444	I8	Start line number of calibration at the bottom image No calibration data = 'bbbbbbb0'	bbbbbbb0
13	445 – 452	I8	Stop line number of calibration at the bottom image No calibration data = 'bbbbbbb0'	bbbbbbb0
14	453 – 456	I4	PRF switching flag No change in a scene = 'bbb0' (fixed value)	bbb0
15	457 – 464	I8	Start line number of PRF switching No change = 'bbbbbbb1' (fixed value)	bbbbbbb1
16	465 – 472	I8	Blanks	bbbbbbbb
17	473 – 480	I8	Number of loss lines (Level 1.0)	
18	481 – 488	I8	Number of loss lines (range for processing in Level 1.1/1.5)	
19	489 – 800	A312	Blanks	b*312
20	801 – 1024	A224	System reserve	b*224
21	1025 – 2024	50E20.10	Coefficients of the 8th polynomial expression to convert from pixel (P) and line (L) to latitude (φ) and longitude (λ), say (φ, λ) where: $\varphi = a_0 *L^4*P^4 + a_1 *L^3*P^4 + a_2 *L^2*P^4 + a_3 *L*P^4 + a_4 *P^4$ $+ a_5 *L^4*P^3 + a_6 *L^3*P^3 + a_7 *L^2*P^3 + a_8 *L*P^3 + a_9 *P^3$ $+ a_{10}*L^4*P^2 + a_{11}*L^3*P^2 + a_{12}*L^2*P^2 + a_{13}*L*P^2 + a_{14}*P^2$ $+ a_{15}*L^4*P + a_{16}*L^3*P + a_{17}*L^2*P + a_{18}*L*P + a_{19}*P$ $+ a_{20}*L^4 + a_{21}*L^3 + a_{22}*L^2 + a_{23}*L + a_{24}$ $\lambda = b_0 *L^4*P^4 + b_1 *L^3*P^4 + b_2 *L^2*P^4 + b_3 *L*P^4 + b_4 *P^4$ $+ b_5 *L^4*P^3 + b_6 *L^3*P^3 + b_7 *L^2*P^3 + b_8 *L*P^3 + b_9 *P^3$ $+ b_{10}*L^4*P^2 + b_{11}*L^3*P^2 + b_{12}*L^2*P^2 + b_{13}*L*P^2 + b_{14}*P^2$ $+ b_{15}*L^4*P + b_{16}*L^3*P + b_{17}*L^2*P + b_{18}*L*P + b_{19}*P$ $+ b_{20}*L^4 + b_{21}*L^3 + b_{22}*L^2 + b_{23}*L + b_{24}$ (The order of storing: a_0, a_1, a_2, …, a_{24} and b_0, b_1, b_2, …, b_{24})	(P, L) referred in the upper left pixel(p) and line (l) are substituted by the following expressions as P = p - Po, L = l - Lo, where (p, l) is an arbitrary coordinate address on the image. For the expressions above, the position defined as (p, l)=(0, 0) corresponds to the central point of the pixel at the upper left corner and (φ, λ) is measured in "degrees". If coefficient isn't calculated (e.g. Scene including the pole), it becomes blanks.
22	2025 – 2044	E20.10	Origin Pixel (P_0) = Pixel position in the image center	Even if the above coefficient isn't calculated, value is stored.
23	2045 – 2064	E20.10	Origin Line (L_0) = Line position in the image center	

Table 5-13 Facility Related Data Record 3 (3/3)

Field No.	Byte No.	Type	Description	Remarks
24	2065 – 3064	50E20.10	Coefficients of the 8th polynomial expression to convert from latitude (Φ) and longitude (Λ) to pixel (p) and line (l), say (p, l) where: $p = c_0 *\Lambda^4*\Phi^4 + c_1 *\Lambda^3*\Phi^4 + c_2 *\Lambda^2*\Phi^4 + c_3 *\Lambda*\Phi^4 + c_4 *\Phi^4$ $+ c_5 *\Lambda^4*\Phi^3 + c_6 *\Lambda^3*\Phi^3 + c_7 *\Lambda^2*\Phi^3 + c_8 *\Lambda*\Phi^3 + c_9 *\Phi^3$ $+ c_{10}*\Lambda^4*\Phi^2 + c_{11}*\Lambda^3*\Phi^2 + c_{12}*\Lambda^2*\Phi^2 + c_{13}*\Lambda*\Phi^2 + c_{14}*\Phi^2$ $+ c_{15}*\Lambda^4*\Phi + c_{16}*\Lambda^3*\Phi + c_{17}*\Lambda^2*\Phi + c_{18}*\Lambda*\Phi + c_{19}*\Phi$ $+ c_{20}*\Lambda^4 + c_{21}*\Lambda^3 + c_{22}*\Lambda^2 + c_{23}*\Lambda + c_{24}$ $l = d_0 *\Lambda^4*\Phi^4 + d_1 *\Lambda^3*\Phi^4 + d_2 *\Lambda^2*\Phi^4 + d_3 *\Lambda*\Phi^4 + d_4 *\Phi^4$ $+ d_5 *\Lambda^4*\Phi^3 + d_6 *\Lambda^3*\Phi^3 + d_7 *\Lambda^2*\Phi^3 + d_8 *\Lambda*\Phi^3 + d_9 *\Phi^3$ $+ d_{10}*\Lambda^4*\Phi^2 + d_{11}*\Lambda^3*\Phi^2 + d_{12}*\Lambda^2*\Phi^2 + d_{13}*\Lambda*\Phi^2 + d_{14}*\Phi^2$ $+ d_{15}*\Lambda^4*\Phi + d_{16}*\Lambda^3*\Phi + d_{17}*\Lambda^2*\Phi + d_{18}*\Lambda*\Phi + d_{19}*\Phi$ $+ d_{20}*\Lambda^4 + d_{21}*\Lambda^3 + d_{22}*\Lambda^2 + d_{23}*\Lambda + d_{24}$ (The order of storing: c_0, c_1, c_2, …, c_{24} and d_0, d_1, d_2, …, d_{24})	(Φ, Λ) referred in the upper left latitude(φ), longitude(λ) are substituted by the following expressions as Φ = φ-Φ0 [deg], Λ = λ-Λ0 [deg], where (φ, λ) is an arbitrary position on the image. For the expressions, the position defined as (p, l)=(0, 0) corresponds to the central point of the pixel at the upper left corner. If coefficient isn't calculated (e.g. Scene including the pole), it becomes blanks.
25	3065 – 3084	E20.10	Origin Latitude (Φ_0) = Scene center latitude [deg]	Even if the above coefficient isn't calculated, value is stored.
26	3085 – 3104	E20.10	Origin Longitude (Λ_0) = Scene center longitude [deg]	
27	3105 – 5000	A1896	Blanks	b*1896

Table 5-14 SAR Image File Descriptor Record (1/4)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $1)_{10}$	00000001h
2	5 – 5	B1	1st record sub-type code = $50)_{10}$	32h
3	6 – 6	B1	Record type code = $192)_{10}$	C0h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = $18)_{10}$	12h
6	9 – 12	B4	Record length = $720)_{10}$	000002D0h
7	13 – 14	A2	ASCII/EBCDIC flag = 'Ab': ASCII	Ab
8	15 – 16	A2	Blanks	bb
9	17 – 28	A12	Format control document ID = 'CEOS-SARbbbb'	CEOS-SARbbbb
10	29 – 30	A2	Format control document revision level = 'NN' NN: 'bA' to 'bZ'	bA
11	31 – 32	A2	Record foramt revision level = 'NN' NN: 'bA' to 'bZ'	bA
12	33 – 44	A12	Software release & revision number = 'NNN.NNNbbbbb' 001.000, 001.001, … 001.100, … 002.000	001.000bbbbb
13	45 – 48	I4	File number = 'bbb1'	bbb1
14	49 – 64	A16	File ID = 'MMNbSSSTFFFFbbbb' MM: Mission ID (ASNARO2= 'AS') NN: Mission number (= '2') SSS: Sensor ID (SAR= 'SAR') T: Processing level code Level 1.1 = 'B' Level 1.5 = 'C' FFFF: File Type Leader file = 'SARL' Image file = 'IMOP' Trailer file = 'SART'	AS2bSARCIMOPbbbb
15	65 – 68	A4	Record sequence and location type flag = 'FSEQ'	FSEQ
16	69 – 76	I8	Location of sequence number = 'bbbbbbb1'	bbbbbbb1 (Location of record number)
17	77 – 80	I4	Field length of sequence number = 'bbb4'	bbb4 (Field length of record number)
18	81 – 84	A4	Record code and location type flag = 'FTYP'	FTYP

Table 5-14 SAR Image File Descriptor Record (2/4)

Field No.	Byte No.	Type	Description	Remarks
19	85 – 92	I8	Location of record code = 'bbbbbbb5'	bbbbbbb5 (Location of record code)
20	93 – 96	I4	Field length of record code = 'bbb4'	bbb4 (Field length of record code)
21	97 – 100	A4	Record length and location type flag = 'FLGT'	FLGT
22	101 – 108	I8	Location of record length = 'bbbbbbb9'	bbbbbbb9 (Location of record length)
23	109 – 112	I4	Field length of record length = 'bbb4'	bbb4 (Field length of record length)
24	113 – 113	A1	Reserved = Blanks	b
25	114 – 114	A1	Reserved = Blanks	b
26	115 – 115	A1	Reserved = Blanks	b
27	116 – 116	A1	Reserved = Blanks	b
28	117 – 180	A64	Reserved = Blanks	Blanks (b*64)
29	181 – 186	I6	Number of SAR data records Number of signal data records	The order of record sequence is the order of observation time.
30	187 – 192	I6	SAR data record length	
31	193 – 216	A24	Reserved = Blanks	bbbbbbbbbbbbbbbbbbbbbbbb
			SAMPLE GROUP DATA	
32	217 – 220	I4	Bit length per sample Level 1.1 = 'bb32' Level 1.5 = 'bb16'	
33	221 – 224	I4	Number of samples per data group Level 1.1 (Except ScanSAR) = 'bbb2' Level 1.1 (ScanSAR)/1.5 = 'bbb1'	
34	225 – 228	I4	Number of bytes per data group Level 1.1 (Except ScanSAR) = 'bbb8' Level 1.1 (ScanSAR) = 'bbb4' Level 1.5 = 'bbb2'	
35	229 – 232	A4	Justification and order of samples within data group = Blanks (fixed value)	bbbb
			SAR RELATED DATA IN THE RECORD	
36	233 – 236	I4	Number of SAR channels = 'bbb1' (fixed value)	bbb1
37	237 – 244	I8	Number of lines per data set (one channel) (Excluding border lines)	

Table 5-14 SAR Image File Descriptor Record (3/4)

Field No.	Byte No.	Type	Description	Remarks
38	245 – 248	I4	Number of left border pixels per line = 'bbb0'	bbb0
39	249 – 256	I8	Number of data groups (or pixels) per line	In the csae of Level 1.1 products, each data record corresponds to 1 image range line. Each range line begins at the nearest-range pixel and ends at the farthest-range pixel.
40	257 – 260	I4	Number of right border pixels per line = 'bbb0'	bbb0
41	261 – 264	I4	Number of top border lines = 'bbb0'	bbb0
42	265 – 268	I4	Number of bottom border lines = 'bbb0'	bbb0
43	269 – 272	A4	Interleaving ID = 'BSQb' (fixed value)	BSQb
			RECORD DATA IN THE FILE	
44	273 – 274	I2	Number of physical records per line = 'b1' (fixed value)	b1
45	275 – 276	I2	Number of physical records per multi-channel line in this file = 'b1' (fixed value)	b1
46	277 – 280	I4	Number of bytes of PREFIX DATA per record Level 1.1 = 'b544' Level 1.5 = 'b192'	In the case of Level 1.1, b544
47	281 – 288	I8	Number of bytes of SAR data per record	In the case of Level 1.1 products, each data record corresponds to 1 image range line. Each range line begins at the nearest-range pixel and ends at the farthest-range pixel.
48	289 – 292	I4	Number of bytes of SUFFIX DATA per record = 'bbb0' (fixed value)	bbb0
49	293 – 296	A4	PREFIX/SUFFIX repeat flag = 'bbbb' (fixed value))	bbbb
			PREFIX/SUFFIX DATA LOCATORS	
50	297 – 304	A8	Sample data line number locator = 'bb13b4PB' 'P': Prefix, 'S': Suffix 'A': ASCII, 'B': Binary, 'N': Numeric	bb13b4PB (Data line number location) 4 bytes from 13th byte in signal data record
51	305 – 312	A8	SAR channel number locator = 'bb49b2PB'	bb49b2PB (SAR channel ID location)

Table 5-14 SAR Image File Descriptor Record (4/4)

Field No.	Byte No.	Type	Description	Remarks
52	313 – 320	A8	Time of SAR data line locator = 'bb45b4PB'	bb45b4PB (Description position of sensor acquiring milli-seconds)
53	321 – 328	A8	Left-fill count locator = 'bb21b4PB'	bb21b4PB (Description position of number of left-fill)
54	329 – 336	A8	Right-fill count locator = 'bb29b4PB'	bb29b4PB (Description position of number of right-fill)
55	337 – 340	A4	Pad pixels present indicator = 'bbbb'	bbbb
56	341 – 368	A28	Blanks	bbbbbbbbbbbbbbbbbbbbbbbbbbbb
57	369 – 376	A8	SAR data line quality code locator = 'bb97b4PB'	bb97b4PB (Invalid line flag location)
58	377 – 384	A8	Calibration information field locator = 'bbbbbbbb'	bbbbbbbb
59	385 – 392	A8	Gain values field locator = 'bbbbbbbb'	bbbbbbbb
60	393 – 400	A8	Bias values filed locator = 'bbbbbbbb'	bbbbbbbb
61	401 – 428	A28	SAR data format type indicator Level 1.1 (Except ScanSAR) = 'COMPLEX*8bbbbbbbbbbbbbbbbbbb' Level 1.1 (ScanSAR) = 'REAL*4bbbbbbbbbbbbbbbbbbbb' Level 1.5 = 'UNSIGNEDbINTEGER*2bbbbbbbbb'	UNSIGNEDbINTEGER*2bbbbbbbbb''IU2b' : 2-bytes unsigned integer 'REAL*4bbbbbbbbbbbbbbbbbbbb''R*4b' : real value of floating point type 'COMPLEX*8bbbbbbbbbbbbbbbbbbb''C*8b' :The front half of 8 bytes field (4 bytes) is real part, and the latter half field (4 bytes) is imaginary part. Each of them is expressed in the real value of floating point type.
62	429 – 432	A4	SAR data format type code Level 1.1 (Except ScanSAR) = 'C*8b' Level 1.1 (ScanSAR) = 'R*4b' Level 1.5 = 'IU2b'	
63	433 – 436	I4	Number of left fill bits within pixel = 'bbb0'	bbb0
64	437 – 440	I4	Number of right fill bits within pixel = 'bbb0'	bbb0
65	441 – 448	I8	Maximum data value of pixel (starting from 0) Level 1.1 = Blanks ('bbbbbbbb') Level 1.5 = 'bbb65535'	
66	449 – 720	A272	Blanks	Blanks (b*272)

Table 5-15 Signal Data Record (1/4)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record sequence number = 2, 3, …)$_{10}$	Only Level 1.1 had this record.
2	5 – 5	B1	1st record sub-type code = 50)$_{10}$	32h
3	6 – 6	B1	Record type code = 10)$_{10}$	0Ah
4	7 – 7	B1	2nd record sub-type code = 18)$_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = 20)$_{10}$	14h
6	9 – 12	B4	Record length	
			PREFIX DATA-GENERAL INFORMATION	
7	13 – 16	B4	SAR image data line number = 1, 2, 3 …)$_{10}$	
8	17 – 20	B4	SAR image data record index = 1)$_{10}$ (fixed value) (Indicates the record sequence number in the image line)	
9	21 – 24	B4	Actual count of left-fill pixels	If dummy data exists at the head of a line, the number of its data is stored. If dummy data doesn't exist, zero is stored.
10	25 – 28	B4	Actual count of data pixels	Store the number of actual data pixels excepting dummy data in a line. Each range line begins at the nearest-range pixel and ends at the farthest-range pixel.
11	29 – 32	B4	Actual count of right-fill pixels	If dummy data exists at the last of a line, the number of its data is stored. If dummy data doesn't exist, zero is stored.
			PREFIX DATA-SENSOR PARAMETERS	
12	33 – 36	B4	Sensor parameters update flag = 1)$_{10}$ (update)	Update from No.13 to No.37 for each line.
13	37 – 40	B4	Sensor acquisition year	
14	41 – 44	B4	Sensor acquisition day in the year	
15	45 – 48	B4	Sensor acquisition milli-seconds of day (UTC)	

Table 5-15 Signal Data Record (2/4)

Field No.	Byte No.	Type	Description	Remarks
16	49 – 50	B2	SAR channel ID Single polarization = $1)_{10}$	0001h
17	51 – 52	B2	SAR channel code = $3)_{10}$ L = $0)_{10}$ S = $1)_{10}$ C = $2)_{10}$ X = $3)_{10}$ KU = $4)_{10}$ KA = $5)_{10}$	0003h
18	53 – 54	B2	Transmitted polarization Horizontal polarization (H) = $0)_{10}$ Vertical polarization (V) = $1)_{10}$	0000h
19	55 – 56	B2	Received polarization H = $0)_{10}$ V = $1)_{10}$	0000h
20	57 – 60	B4	PRF [mHz] = Copy the value of field No. 74 of dataset summary	
21	61 – 64	B4	Scan ID = $0)_{10}$ (fixed value)	
22	65 – 66	B2	Onboard range compressed flag = $0)_{10}$ NO = $0)_{10}$ YES = $1)_{10}$	0000h
23	67 – 68	B2	Chirp type designator LINEAR FM CHIRP = $0)_{10}$ PHASE MODULATORS = $1)_{10}$	
24	69 – 72	B4	Chirp length (pulse width) [nsec]	(Chirp length)
25	73 – 76	B4	Chirp constant coefficient [Hz] = Nominal value	(Chirp constant coefficient)
26	77 – 80	B4	Chirp linear coefficient [Hz/μsec] = Nominal value	(Chirp linear coefficient)
27	81 – 84	B4	Chirp quadratic coefficient [Hz/μsec^2] = Nominal value	(Chirp quadratic coefficient)
28	85 – 92	B8	Sensor acquisition micro-seconds of day (UTC))	
29	93 – 96	B4	Receiver gain [dB] = Nominal value	(Receiver gain)

Table 5-15 Signal Data Record (3/4)

Field No.	Byte No.	Type	Description	Remarks
30	97 – 100	B4	Invalid line flag NO (Effective line) = $0)_{10}$ YES: Invalid line = $1)_{10}$, Loss line = $2)_{10}$	
31	101 – 104	B4	Electronic elevation angle at nadir of antenna [deg] = $0)_{10}$	
32	105 – 108	B4	Mechanical elevation angle at nadir of antenna [deg] = $0)_{10}$	
33	109 – 112	B4	Electronic antenna squint angle [deg] = $0)_{10}$	
34	113 – 116	B4	Mechanical antenna squint angle [deg] = $0)_{10}$	
35	117 – 120	B4	Slant range to the 1st data sample[mm]	
36	121 – 124	B4	Data record window position (SAMPLE DELAY [nsec])	
37	125 – 128	B4	Spare = Blanks (0: NULL)	Blanks (0: NULL)
			PREFIX DATA-PLATFORM REFERENCE INFORMATION	
38	129 – 132	B4	Platform position parameters update flag = $0)_{10}$ (fixed value) Repeat = $0)_{10}$ Update = $1)_{10}$	
39	133 – 136	B4	Platform latitude [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
40	137 – 140	B4	Platform longitude [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
41	141 – 144	B4	Platform altitude [m] = $0)_{10}$	Blanks (0: NULL)
42	145 – 148	B4	Platform ground speed [cm/sec] = $0)_{10}$	Blanks (0: NULL)
43	149 – 160	3B4	Platform velocity X', Y', Z' [cm/sec] = $0)_{10}$	Blanks (0: NULL)
44	161 – 172	3B4	Platform acceleration X", Y", Z" [cm/sec^2] = $0)_{10}$	Blanks (0: NULL)
45	173 – 176	B4	Platform track angle [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
46	177 – 180	B4	Platform true track angle [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
47	181 – 184	B4	Platform pitch angle [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
48	185 – 188	B4	Platform roll angle [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
49	189 – 192	B4	Platform yaw angle [1/1,000,000 deg] = $0)_{10}$	Blanks (0: NULL)
			PREFIX DATA-SENSOR/FACILITY SPECIFIC AUXILIARY DATA	
50	193 – 196	B4	Latitude of the 1st pixel [1/1,000,000 deg] = Value	
51	197 – 200	B4	Latitude of the center-pixel [1/1,000,000 deg] = Value	The latitude at M/2th pixel is set. (M: number of pixels)

Table 5-15 Signal Data Record (4/4)

Field No.	Byte No.	Type	Description	Remarks
52	201 – 204	B4	Latitude of the last pixel [1/1,000,000 deg] = Value	
53	205 – 208	B4	Longitude of the 1st pixel [1/1,000,000 deg] = Value	
54	209 – 212	B4	Longitude of the center-pixel [1/1,000,000 deg] = Value	The longitude at M/2th pixel is set. (M: number of pixels)
55	213 – 216	B4	Longitude of the last pixel [1/1,000,000 deg] = Value	
			SCANSAR BURST DATA PARAMETERS	
56	217 – 220	B4	Blanks = $0)_{10}$	Blanks (0) fixed
57	221 – 224	B4	Blanks = $0)_{10}$	Blanks (0) fixed
58	225 – 284	B60	Blanks = $0)_{10}$	
59	285 – 288	B4	ASNARO2 frame number = $0)_{10}$	
60	289 – 544	B256	auxiliary data	
			SAR RAW SIGNAL DATA	
61	545 – i	jBk	SAR data i: number of bytes of data + 544 j: number of pixels on this record k: pixel size (*1) Level 1.1 (Except ScanSAR): 8 bytes Level 1.1 (ScanSAR): 4 bytes	Repeat as many times as the number of pixels. (*1) For Level 1.1 (Except ScanSAR), type is 8 bytes float complex (4 bytes float (real part) + 4 bytes float (imaginary part)). For Level 1.1 (ScanSAR), type is 4 bytes float (IEEE floating point type).

Table 5-16 Processed Data Record (1/3)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record sequence number = 2, 3, …)$_{10}$	Only Level 1.5 has this record.
2	5 – 5	B1	1st record sub-type code = 50)$_{10}$	32h
3	6 – 6	B1	Record type code = 11)$_{10}$	0Bh
4	7 – 7	B1	2nd record sub-type code = 18)$_{10}$	12h
5	8 – 8	B1	3rd record sub-type code = 20)$_{10}$	14h
6	9 – 12	B4	Record length	
			PREFIX DATA-GENERAL INFORMATION	
7	13 – 16	B4	SAR image data line number = 1, 2, 3 …)$_{10}$	
8	17 – 20	B4	SAR image data record index = 1)$_{10}$ (fixed value) (Indicates the record sequence number in the same line)	00000001h
9	21 – 24	B4	Actual count of left-fill pixels = 0)$_{10}$ (fixed value)	00000000h
10	25 – 28	B4	Actual count of data pixels	
11	29 – 32	B4	Actual count of right-fill pixels = 0)$_{10}$	00000000h
			PREFIX DATA-SENSOR PARAMETERS	
12	33 – 36	B4	Sensor parameters update flag = 0)$_{10}$	00000000h
13	37 – 40	B4	Sensor acquisition year Year of scene start line	
14	41 – 44	B4	Sensor acquisition day in the year Scene start line of day	
15	45 – 48	B4	Sensor acquisition milliseconds of day = 0)$_{10}$	
16	49 – 50	B2	SAR channel ID Single polarization = 1)$_{10}$	0001h
17	51 – 52	B2	SAR channel code = 3)$_{10}$ L = 0)$_{10}$ S = 1)$_{10}$ C = 2)$_{10}$ X = 3)$_{10}$ KU = 4)$_{10}$ KA = 5)$_{10}$	0003h

Table 5-16 Processed Data Record (2/3)

Field No.	Byte No.	Type	Description	Remarks
18	53 – 54	B2	Transmitted pulse polarization Horizontal polarization (H) = $0)_{10}$ Vertical polarization (V) = $1)_{10}$	
19	55 – 56	B2	Received pulse polarization H = $0)_{10}$ V = $1)_{10}$	
20	57 – 60	B4	PRF [mHz] Except ScanSAR mode = The same through the one scene ScanSAR = $0)_{10}$ (fixed value)	
21	61 – 64	B4	Scan number = $0)_{10}$ (fixed value)	
22	65 – 68	B4	Slant range to the 1st pixel [m] = $0)_{10}$	
23	69 – 72	B4	Slant range to the mid-pixel [m] = $0)_{10}$	
24	73 – 76	B4	Slant range to the last-pixel [m] = $0)_{10}$	
25	77 – 80	B4	Doppler centroid value at the 1st pixel [1/1,000Hz] = $0)_{10}$	
26	81 – 84	B4	Doppler centroid value at the mid-pixel[1/1,000Hz] = $0)_{10}$	
27	85 – 88	B4	Doppler centroid value at the last pixel [1/1,000Hz] = $0)_{10}$	
28	89 – 92	B4	Azimuth FM rate of the 1st pixel [Hz/msec] = $0)_{10}$	
29	93 – 96	B4	Azimuth FM rate of the mid-pixel [Hz/msec] = $0)_{10}$	
30	97 – 100	B4	Azimuth FM rate of the last pixel [Hz/msec] = $0)_{10}$	
31	101 – 104	B4	Look angle of nadir [1/1,000,000 deg] = $0)_{10}$	00000000h
32	105 – 108	B4	Azimuth squint angle [1/1,000,000 deg] = $0)_{10}$	00000000h
33	109 – 128	B20	Blanks = $0)_{10}$	
			PREFIX DATA-GEOGRAPHIC REFERENCE INFO.	
34	129 – 132	B4	Geographic reference Parameter update flag = $0)_{10}$	00000000h
35	133 – 136	B4	Latitude of the 1st pixel [1/1,000,000 deg]	
36	137 – 140	B4	Latitude of the mid-pixel [1/1,000,000 deg]	The latitude at M/2th pixel is set. (M: number of pixels)
37	141 – 144	B4	Latitude of the last pixel [1/1,000,000 deg]	
38	145 – 148	B4	Longitude of the 1st pixel [1/1,000,000 deg]	

Table 5-16 Processed Data Record (3/3)

Field No.	Byte No.	Type	Description	Remarks
39	149 – 152	B4	Longitude of the mid-pixel [1/1,000,000 deg]	The longitude at M/2th pixel is set. (M: number of pixels)
40	153 – 156	B4	Longitude of the last pixel [1/1,000,000 deg]	
41	157 – 160	B4	Northing of the 1st pixel [m]	
42	161 – 164	B4	Blanks = $0)_{10}$	00000000h
43	165 – 168	B4	Northing of the last pixel [m]	
44	169 – 172	B4	Easting of the 1st pixel [m]	
45	173 – 176	B4	Blanks = $0)_{10}$	00000000h
46	177 – 180	B4	Easting of the last pixel [m]	
47	181 – 184	B4	Line heading (orientation of the perpendicular to the data line center relative to the true north) [1/1,000,000 deg]	
48	185 – 192	B8	Blanks = $0)_{10}$	00000000h
			SAR PROCESSED DATA	
	193 – i	jBk	SAR processed data i: number of bytes of data + 192 j: number of pixels on this record k: size of pixel in bytes [2 bytes]	
			SUFFIX DATA	
		0*B	Processing Facility specific details	

Table 5-17 SAR Trailer File Descriptor Record (1/3)

Field No.	Byte No.	Type	Description	Remarks
1	1 – 4	B4	Record number = $1)_{10}$	00000001h
2	5 – 5	B1	1st record sub-type code = $63)_{10}$	3Fh
3	6 – 6	B1	Record type code = $192)_{10}$	C0h
4	7 – 7	B1	2nd record sub-type code = $18)_{10}$	12h
5	8 – 8	B1	3rd record sub-type code =$18)_{10}$	12h
6	9 – 12	B4	Record length = $720)_{10}$	000002D0h
7	13 – 14	A2	ASCII/EBCDIC code = 'Ab': ASCII	Ab
8	15 – 16	A2	Blanks	bb
9	17 – 28	A12	Format control document ID = 'CEOS-SARbbbb'	CEOS-SARbbbb
10	29 – 30	A2	Format control document revision number = 'NN' NN: 'bA' to 'bZ'	bA
11	31 – 32	A2	Record format revision level = 'NN' NN: 'bA' to 'bZ'	bA
12	33 – 44	A12	Software release & revision number = 'NNN.NNNbbbbb' 001.000, 001.001, … 001.100, … 002.000	001.000bbbbb
13	45 – 48	I4	Number of files = 'bbb1'	bbb1
14	49 – 64	A16	File ID = 'MMNbSSSTFFFFbbbb' MM: Mission ID (ASNARO2= 'AS') N: Mission number (= '2') SSS: Sensor ID (SAR= 'SAR') T: Processing level code Level 1.1 = 'B' Level 1.5 = 'C' FFFF: File type Leader file = 'SARL' Image file = 'IMOP' Trailer file = 'SART'	AS2bSARCSARTbbbb
15	65 – 68	A4	Record sequence and location type flag = 'FSEQ'	FSEQ
16	69 – 76	I8	Location of sequence number = 'bbbbbbb1'	bbbbbbb1 (Location of record number)
17	77 – 80	I4	Field length of sequence number = 'bbb4'	bbb4 (Field length of record number)
18	81 – 84	A4	Record code and location type flag = 'FTYP'	FTYP

Table 5-17 SAR Trailer File Descriptor Record (2/3)

Field No.	Byte No.	Type	Description	Remarks
19	85 – 92	I8	Location of record code = 'bbbbbbb5'	bbbbbbb5 (Location of record code)
20	93 – 96	I4	Field length of record code = 'bbb4'	bbb4 (Field length of record code)
21	97 – 100	A4	Record length and location type flag = 'FLGT'	FLGT
22	101 – 108	I8	Location of record length = 'bbbbbbb9'	bbbbbbb9 (Location of record length)
23	109 – 112	I4	Field length of record length = 'bbb4'	bbb4 (Field length of record length)
24	113 – 180	A68	Blanks	Blanks (b*68)
25	181 – 186	I6	Number of data set summary records = 'bbbbb0'	bbbbb0
26	187 – 192	I6	Data set summary record length = 'bbbbb0'	bbbbb0
27	193 – 198	I6	Number of map projection data records = 'bbbbb0'	bbbbb0
28	199 – 204	I6	Map projection data record length = 'bbbbb0'	bbbbb0
29	205 – 210	I6	Number of platform position data records = 'bbbbb0'	bbbbb0
30	211 – 216	I6	Platform position data record length = 'bbbbb0'	bbbbb0
31	217 – 222	I6	Number of attitude data records = 'bbbbb0'	bbbbb0
32	223 – 228	I6	Attitude data record length = 'bbbbb0'	bbbbb0
33	229 – 234	I6	Number of radiometric data records = 'bbbbb0'	bbbbb0
34	235 – 240	I6	Radiometric data record length = 'bbbbb0'	bbbbb0
35	241 – 246	I6	Number of radiometric compensation records = 'bbbbb0'	bbbbb0
36	247 – 252	I6	Radiometric compensation record length = 'bbbbb0'	bbbbb0
37	253 258	I6	Number of data quality summary records = 'bbbbb0'	bbbbb0
38	259 – 264	I6	Data quality summary record length = 'bbbbb0'	bbbbb0
39	265 – 270	I6	Number of data histogram records = 'bbbbb0'	bbbbb0
40	271 – 276	I6	Data histogram record length = 'bbbbb0'	bbbbb0
41	277 – 282	I6	Number of range spectra records = 'bbbbb0'	bbbbb0
42	283 – 288	I6	Range spectra record length = 'bbbbb0'	bbbbb0
43	289 – 294	I6	Number of DEM descriptor records = 'bbbbb0'	bbbbb0
44	295 – 300	I6	DEM descriptor record length = 'bbbbb0'	bbbbb0
45	301 – 306	I6	Number of radar parameter data update records = 'bbbbb0'	bbbbb0
46	307 – 312	I6	Radar parameter data update record length = 'bbbbb0'	bbbbb0
47	313 – 318	I6	Number of annotation data records = 'bbbbb0'	bbbbb0

Table 5-17 SAR Trailer File Descriptor Record (3/3)

Field No.	Byte No.	Type	Description	Remarks
48	319 – 324	I6	Annotation data record length = 'bbbbb0'	bbbbb0
49	325 – 330	I6	Number of detailed processing parameters records 'bbbbb0'	bbbbb0
50	331 – 336	I6	Detailed processing parameters record length = 'bbbbb0'	bbbbb0
51	337 – 342	I6	Number of calibration data records = 'bbbbb0'	bbbbb0
52	343 – 348	I6	Calibration data record length = 'bbbbb0'	bbbbb0
53	349 – 354	I6	Number of GCP records = 'bbbbb0'	bbbbb0
54	355 – 360	I6	GCP record length = 'bbbbb0'	bbbbb0
55	361 – 420	10A6	Spare = Blanks	Blanks
56	421 – 426	I6	Number of facility related data 1 records = 'bbbbb0'	bbbbb0
57	427 – 434	I8	Facility related data 1 record length = 'bbbbbbb0'	bbbbbbb0
58	435 – 440	I6	Number of facility related data 2 records = 'bbbbb0'	bbbbb0
59	441 – 448	I8	Facility related data 2 record length = 'bbbbbbb0'	bbbbbbb0
60	449 – 454	I6	Number of facility related data 3 records = 'bbbbb0'	bbbbb0
61	455 – 462	I8	Facility related data 3 record length = 'bbbbbbb0'	bbbbbbb0
62	463 – 720	A258	Blanks	Blanks (b*258)

6. Level 1 Product (GeoTIFF) Format

Constraint conditions of level 1 product (GeoTIFF) format is shown in Table 6-1.
List of GeoTIFF tag and key is shown in Table 6-2.

Table 6-1 Constraint Conditions

No.	Conditions
1	Level 1.1 product consists of real part and imaginary part per one pixel. These are gray scale images. In Level 1.1 product (Except Scan SAR), SamplesPerPixel which is one of the TIFF field is defined as 2.
2	Level 1 product is based on TIFF Revision 6.0.
3	In Level 1.1 product, settings of GeoTIFF tag and GeoKey are not based on the rules and regulations.
4	Product which size is 4GB or more is created as BigTIFF including GeoTIFF tag.

Table 6-2 List of GeoTIFF Tag and Key (1/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
TIFF Field	Artist	315	ASCII	-	Variable character string "NEC"	-
	BitsPerSample	258	SHORT	SamplesPerPixel	L1.1 (Except ScanSAR): 32, 32 L1.1 (ScanSAR): 32 L1.5: 16	Each component type is as follows. L1.1 (Except ScanSAR): FLOAT, FLOAT (32-bit single precision (4-byte) IEEE format.) L1.1 (ScanSAR): FLOAT (32-bit single precision (4-byte) IEEE format.) L1.5 : SHORT (16-bit unsigned integer)
	Compression	259	SHORT	1	No compression: 1	-
	Copyright	33432	ASCII	-	Variable character string "Copyright(c) 2018 NEC All Right Reserved."	-
	DateTime	306	ASCII	20	Date and time of image creation (UTC) is represented the following format and the length of the string including terminating NUL is 20 bytes. "YYYY:MM:DD HH:MM:SS"	-
	ExtraSamples	338	SHORT	Subtract the value (assumed from PhotometricInterpretation) from SamplesPerPixel	L1.1: 0 L1.5: This field doesn't exist	In the case of L1.1, the count of ExtraSamples is one. Pixel data consists of real part and imaginary part. We defined imaginary part as ExtraSamples.
	HostComputer	316	ASCII	-	Variable character string Processing center code "FCDC"	-

Table 6-2 List of GeoTIFF Tag and Key (2/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
TIFF Field	ImageDescription	270	ASCII	-	Variable character string File name IMG-XX-AAABBBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU.tif XX: polarization (in order of transmission and reception) AAABBBBBBCCCCC-YYMMDD: Scene ID NNL: scene option ID DDEFFFGHI: product ID U: "_" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	ImageLength	257	LONG	1	Variable The number of lines	-
	ImageWidth	256	LONG	1	Variable The number of pixels	-
	Make	271	ASCII	-	Variable character string "NEC"	-
	Model	272	ASCII	-	Variable character string "ASNARO-2"	-
	Orientation	274	SHORT	1	1	It differs from the scan direction. It's also different from the time sequence of sensor scanning.
	PhotometricInterpretation	262	SHORT	1	1	-
	PlanarConfiguration	284	SHORT	1	L1.1 (Except ScanSAR): 1 L1.1 (ScanSAR): 1 L1.5: 1	Data sequence of L1.1 is as follows. "IQIQIQ… …"
	ResolutionUnit	296	SHORT	1	3	-
	RowsPerStrip	278	SHORT	1	1	-

Table 6-2 List of GeoTIFF Tag and Key (3/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
TIFF Field	SampleFormat	339	SHORT	SamplesPerPixel	Fixed value which is different by each processing level. L1.1 (Except ScanSAR): 3, 3 L1.1 (Scan SAR): 3 L1.5: 1	-
	SamplesPerPixel	277	SHORT	1	Fixed value which is different by each processing level. L1.1 (Except ScanSAR): 2 L1.1 (ScanSAR): 1 L1.5: 1	-
	SmaxSampleValue	341	The field type that best matches the sample data	SamplesPerPixel	Fixed value which is different by each processing level. L1.1: 3.4028235E+38 L1.5: 65535	-
	SminSampleValue	340	The field type that best matches the sample data	SamplesPerPixel	Fixed value which is different by each processing level. L1.1: -3.4028235E+38 L1.5: 0	-
	Software	305	ASCII	-	Variable character string “GroundNEXTAR_IMG-SAR”	-
	StripByteCounts	279	SHORT or LONG	In the case of PlanarConfiguration =1, it is the number of strips per image.	Variable	-

Table 6-2 List of GeoTIFF Tag and Key (4/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
TIFF Field	StripOffsets	273	SHORT or LONG	In the case of PlanarConfiguration =1, it is the number of strips per image.	Variable	-
	XResolution	282	RATIONAL	1	Variable	-
	YResolution	283	RATIONAL	1	Variable	-
GeoTIFF	GeoKeyDirectory Tag	34735	SHORT	4 or more	Entry for GeoKey is defined according to the specification of GeoTIFF.	-
	GeoDoubleParamsTag	34736	DOUBLE	-	This tag is used to store all of the DOUBLE valued GeoKeys, referenced by the GeoKeyDirectoryTag.	-
	GeoAsciiParamsTag	34737	ASCII	-	Character string value of GeoKey is stored according to the specification.	-
	ModelTiepointTag	33922	DOUBLE	Multiply the tie point by six.	L1.1: four corners (four points) of image (latitude/longitude) L1.5 Geo-reference : This field doesn’t exist Geo-coded: Top left corner of the image (map projection)	
	ModelPixelScaleTag	33550	DOUBLE	3	L1.1: This field doesn’t exist L1.5 Geo-reference: This field doesn’t exist Geo-coded: pixel spacing (m)	

Table 6-2 List of GeoTIFF Tag and Key (5/8)

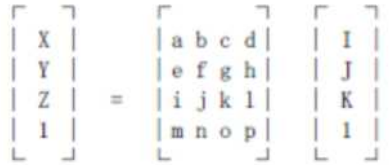
Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
GeoTIFF	ModelTransformationTag	34264	DOUBLE	16	L1.1: This field doesn't exist L1.5 Geo-Reference: conversion matrix to map projection Geo-coded: This field doesn't exist	Transformation matrix between the raster space and the model space. Stored value is (a,b,c,d … …, m,n,o,p). Where, Model cords = matrix * raster cords  In Baseline GeoTIFF, since model space is two dimension, the values are as follows. c=g=i=j=k=l=m=n=o=0, p=1
GeoKey	GTModelTypeGeoKey	1024	SHORT	1	L1.1: 2 L1.5: 1	-
	GTRasterTypeGeoKey	1025	SHORT	1	1	-
	GTCitationGeoKey	1026	ASCII	1	L1.1: This field doesn't exist L1.5 Geo-reference: "GEOREFERENCE" Geo-coded: "GEOCODED"	-
	GeographicTypeGeoKey	2048	SHORT	1	L1.1: 4326 L1.5: WGS84: 4326 GRS80/ITRF97: 4338	-

Table 6-2 List of GeoTIFF Tag and Key (6/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
GeoKey	GeogCitationGeoKey	2049	ASCII	-	L1.1: This field doesn't exist L1.5: "Datum=X Ellipsoid=Y Projection=Z" X: Geodetic coordinate (WGS84 or ITRF97) Y: Ellipsoid (WGS84 or GRS80) Z: Projection (UTM or PS or MER) *X, Y, Z are separated by blanks.	-
	GeogGeodeticDatumGeoKey	2050	SHORT	1	L1.1: This field doesn't exist L1.5 WGS84: 6326 ITRF97: 6655	-
	GeogPrimeMeridianGeoKey	2051	SHORT	1	L1.1: This field doesn't exist L1.5: 8901	-
	GeogLinearUnitsGeoKey	2052	SHORT	1	L1.1: This field doesn't exist L1.5: 9001	-
	GeogAngularUnitsGeoKey	2054	SHORT	1	L1.1: This field doesn't exist L1.5: 9102	-
	GeogEllipsoidGeoKey	2056	SHORT	1	L1.1: This field doesn't exist L1.5 WGS84: 7030 GRS80: 7019	-
	ProjectedCSTypeGeoKey	3072	SHORT	1	L1.1: This field doesn't exist L1.5 UTM and WGS84: 32600 + zone number (Northern hemisphere) 32700 + zone number (Southern hemisphere) Other than above: 32767	-

Table 6-2 List of GeoTIFF Tag and Key (7/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
GeoKey	PCSCitationGeoKey	3073	ASCII	-	L1.1: This field doesn't exist L1.5 UTM: "UTM Zone ZZ X with Y" PS: "Polar Stereographic with Y" MER: "Mercator with Y" ZZ: UTM zone number (two digits) X: Hemisphere (N: North, S: South) Y: Ellipsoid, Geodetic coordinate (WGS84 or GRS80/ITRF97)	-
	ProjectionGeoKey	3074	SHORT	1	L1.1: This field doesn't exist L1.5 UTM: 16000 + zone number (North hemisphere) 16100 + zone number (South hemisphere) Other than above: 32767	-
	ProjCoordTransGeoKey	3075	SHORT	1	L1.1: This field doesn't exist L1.5 UTM: This field doesn't exist PS: 15 MER: 7	-
	ProjLinearUnitsGeoKey	3076	SHORT	1	L1.1: This field doesn't exist L1.5: 9001	-
	ProjNatOriginLongGeoKey	3080	DOUBLE	1	L1.1: This field doesn't exist L1.5: Center of projection longitude	-
	ProjNatOriginLatGeoKey	3081	DOUBLE	1	L1.1: This field doesn't exist L1.5: Center of projection latitude	-
	ProjFalseEastingGeoKey	3082	DOUBLE	1	L1.1: This field doesn't exist L1.5 UTM: 500000.0 PS: This field doesn't exist MER: 0.0	-

Table 6-2 List of GeoTIFF Tag and Key (8/8)

Class	Identifier	Format Information			ASNARO2	Remarks
	Tag name, Field name/Key name	Tag/Key ID (Dec)	Type	Count (- : variable)	Value	
GeoKey	ProjFalseNorthingGeoKey	3083	DOUBLE	1	L1.1: This field doesn't exist L1.5 UTM: 0.0 (North hemisphere) 10000000.0 (South hemisphere) PS: This field doesn't exist MER: 0.0	-
	ProjScaleAtNatOriginGeoKey	3092	DOUBLE	1	L1.1: This field doesn't exist L1.5 UTM: 0.9996 PS: 1.0 MER: This field doesn't exist	-

7. Level 1 Product (NITF2.1) Format

Constraint conditions of level 1 product (NITF2.1) format is shown in Table 7-1.
NITF2.1 format is shown in Table 7-2.

Table 7-1 Constraint Conditions

No.	Condition
1	This format is not applied to the product which file size is 10GB or more.

Table 7-2 NITF2.1 Format (1/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	FHDR	File Profile Name	4	BCS-A NITF	R	"NITF"	-
	FVER	File Version	5	BCS-A 02.10	R	"02.10"	-
	CLEVEL	Complexity Level	2	BCS-N positive integer 01 to 99	R	“7”	-
	STYPE	Standard Type	4	BCS-A BF01	R	"BF01"	-
	OSTAID	Originating Station ID	10	BCS-A	R	Processing center code Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	FDT	File Data and Time	14	BCS-N integer CCYYMMDDhhmmss CC: Century (00-99) YY: Year (00-99) MM: Month (01-12) DD: Day (01-31) hh: Hour (00-23) mm: Minute (00-59) ss: Second (00-59)	R	Date and time of file creation (UTC) CCYYMMDDhhmmss CC: Century (00-99) YY: Year (00-99) MM: Month (01-12) DD: Day (01-31) hh: Hour (00-23) mm: Minute (00-59) ss: Second (00-59)	In the case of leap second, the next second of it is set to FDT.
	FTITLE	File Title	80	ECS-A (Default is ECS spaces(0x20))	<R>	File name IMG-XX-AAABBBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU.tif XX: “Polarization (in order of transmission and reception) AAABBBBBBCCCCC-YYMMDD: Scene ID NNL: Scene option ID DDEFFFGHI: Product ID U: "_" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-

Table 7-2 NITF2.1 Format (2/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	FSCLAS	File Security Classification	1	ECS-A T, S, C, R, or U	R	"U"	-
	FSCLSY	File Security Classification System	2	ECS-A (Default is ECS spaces(0x20))	<R>	2 spaces	-
	FSCODE	File Codewords	11	BCS-A (Default is BCS spaces(0x20))	<R>	11 spaces	-
	FSCTLH	File Control and Handling	2	ECS-A (Default is ECS spaces(0x20))	<R>	2 spaces	-
	FSREL	File Releasing Instructions	20	ECS-A (Default is ECS spaces(0x20))	<R>	20 spaces	-
	FSDCTP	File Declassification Type	2	ECS-A DD, DE, GD, GE, O or X (Default is ECS spaces(0x20))	<R>	2 spaces	-
	FSDCDT	File Declassification Date	8	ECS-A CCYYMMDD (Default is ECS spaces(0x20))	<R>	8 spaces	-
	FSDCXM	File Declassification Exemption	4	ECS-A X1 to X8, X251 to X259 (Default is ECS spaces(0x20))	<R>	4 spaces	-
	FSDG	File Downgrade	1	ECS-A S, C or R (Default is ECS space(0x20))	<R>	1 spaces	-

Table 7-2 NITF2.1 Format (3/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	FSDGDT	File Downgrade Date	8	ECS-A CCYYMMDD (Default is ECS spaces (0x20))	<R>	8 spaces	-
	FSCLTX	File Classification Text	43	ECS-A (Default is ECS spaces(0x20))	<R>	43 spaces	-
	FSCATP	File Classification Authority Type	1	ECS-A (Default is ECS spaces(0x20))	<R>	1 spaces	-
	FSCAUT	File Classification Authority	40	ECS-A (Default is ECS spaces(0x20))	<R>	40 spaces	-
	FSCRSN	File Classification Reason	1	ECS-A A to G (Default is ECS spaces(0x20))	<R>	1 spaces	-
	FSSRDT	File Security Source Date	8	ECS-A CCYYMMDD (Default is ECS spaces(0x20))	<R>	8 spaces	-
	FSCTLN	File Security Control Number	15	ECS-A (Default is ECS spaces(0x20))	<R>	15 spaces	-
	FSCOP	File Copy Number	5	BCS-N positive integer 00000 to 99999 (Default is BCS zeros(0x30))	R	“00000”	-
	FSCPYS	File Number of Copies	5	BCS-N positive integer 00000 to 99999 (Default is BCS zeros(0x30))	R	“00000”	-

Table 7-2 NITF2.1 Format (4/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	ENCRYP	Encryption	1	BCS-N positive integer (Default is BCS zero(0x30)) 0 = Not Encrypted	R	“0”	-
	FBKGC	File Background Color	3	Unsigned binary integer (0x00 to 0xFF, 0x00 to 0xFF, 0x00 to 0xFF)	R	“000”	-
	ONAME	Originator's Name	24	ECS-A (Default is ECS spaces(0x20))	<R>	"NEC" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	OPHONE	Originator's Phone Number	18	ECS-A (Default is ECS spaces(0x20))	<R>	18 spaces Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	FL	File Length	12	BCS-N positive integer 000000000388 to 999999999998, 999999999999	R	File length (byte)	-
	HL	NITF File Header Length	6	BCS-N positive integer 000388 to 999999	R	NITF file header length (byte)	-
	NUMI	Number of Image Segments	3	BCS-N positive integer (Default is BCS zeros(0x30)) 000 to 999	R	“001”	-
	LISHn	Length of nth Image Subheader	6	BCS-N positive integer 000439 to 999998, 999999	C	Image Sub header length (byte)	n=1. In ASNARO-2, The number of ImageSubheader is 1.

Table 7-2 NITF2.1 Format (5/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	LIn	Length of nth Image Segment	10	BCS-N positive integer 0000000001 to 9999999998, 9999999999	C	Image size (byte)	n=1. In ASNARO-2, The number of ImageSegment is 1.
	NUMS	Number of Graphic Segments	3	BCS-N positive integer 000 to 999	R	“000”	-
	NUMX	Reserved for Future Use	3	BCS-N positive integer 000	R	“000”	-
	NUMT	Number of Text Segments	3	BCS-N positive integer (Default is BCS zeros(0x30)) 000 to 999	R	“000”	-
	NUMDES	Number of Data Extension Segments	3	BCS-N positive integer (Default is BCS zeros(0x30)) 000 to 999	R	“000”	-
	NUMRES	Number of Reserved Extension Segments	3	BCS-N positive integer(Default is BCS zeros(0x30))000 to 999	R	“000”	-
	UDHDL	User Defined Header Data Length	5	BCS-N positive integer (Default is BCS zeros(0x30)) 00000, 00003 to 99999	R	“00000”	-

Table 7-2 NITF2.1 Format (6/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF file header	XHDL	Extended Header Data Length	5	BCS-N positive integer (Default is BCS zeros(0x30)) 00000, 00003 to 99999	R	Extended header data length (byte) L1.1: "00000 L1.5: Total size of GEOPSB and PRJPSB + 3 UTM: "00626" PS: "00611" MER: "00626"	-
	XHDLOFL	Extended Header Data Overflow	3	BCS-N positive integer (Default is BCS zeros(0x30)) 000 to 999	C	Extended Header Data Overflow L1.1: This field doesn't exist L1.5: "000"	-
	XHD	Extended Header Data	XHD L-3	TRE	C	Extended Header Data L1.1: This field doesn't exist L1.5: GEOPSB and PRJPSB (Refer to Table 7-3)	-
NITF image subheader	IM	File Part Type	2	BCS-A IM	R	"IM"	-
	IID1	Image Identifier 1	10	BCS-A User-defined	R	"IMG_000001"	—
	IDATIM	Image Date and Time	14	BCS-N CCYYMMDDhhmmss CC: Century (00-99) YY: Year (00-99) MM: Month (01-12) DD: Day (01-31) hh: Hour (00-23) mm: Minute (00-59) ss: Second (00-59)	R	Image Date and Time (UTC) CCYYMMDDhhmmss CC: Century (00-99) YY: Year (00-99) MM: Month (01-12) DD: Day (01-31) hh: Hour (00-23) mm: Minute (00-59) ss: Second (00-59)	In the case of leap second, the next second of it is set to IDATIM.

Table 7-2 NITF2.1 Format (7/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	TGTID	Target Identifier	17	BCS-A BBBBBBBBBBOOOOOCC (Default is BCS spaces(0x20) for all or any sub-part of this field)	<R>	17 spaces	-
	IID2	Image Identifier 2	80	ECS-A (Default is ECS spaces(0x20))	<R>	80 spaces	-
	ISCLAS	Image Security Classification	1	ECS-A T, S, C, R, or U	R	"U"	-
	ISCLSY	Image Security Classification System	2	ECS-A (Default is ECS spaces(0x20))	<R>	2 spaces	-
	ISCODE	Image Codewords	11	BCS-A (Default is ECS spaces(0x20))	<R>	11 spaces	-
	ISCTLH	Image Control and Handling	2	ECS-A (Default is ECS spaces(0x20))	<R>	2 spaces	-
	ISREL	Image Releasing Instructions	20	ECS-A (Default is ECS spaces(0x20))	<R>	20 spaces	-
	ISDCTP	Image Declassification Type	2	ECS-A DD, DE, GD, GE, O or X (Default is ECS spaces(0x20))	<R>	2 spaces	-
	ISDCDT	Image Declassification Date	8	ECS-ACCYYMMDD(Default is ECS spaces(0x20))	<R>	8 spaces	-

Table 7-2 NITF2.1 Format (8/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	ISDCXM	Image Declassification Exemption	4	ECS-A X1 to X8, X251 to X259 (Default is ECS spaces(0x20))	<R>	4 spaces	-
	ISDG	Image Downgrade	1	ECS-A S, C or R (Default is ECS spaces(0x20))	<R>	1 spaces	-
	ISDGDT	Image Downgrade Date	8	ECS-A CCYYMMDD (Default is ECS spaces(0x20))	<R>	8 spaces	-
	ISCLTX	Image Classification Text	43	ECS-A User-defined free text (Default is ECS spaces(0x20))	<R>	43 spaces	-
	ISCATP	Image Classification Authority Type	1	ECS-A O, D, M (Default is ECS spaces(0x20))	<R>	1 spaces	-
	ISCAUT	Image Classification Authority	40	ECS-A User-defined free text (Default is ECS spaces(0x20))	<R>	40 spaces	-
	ISCRSN	Image Classification Reason	1	ECS-A A to G (Default is ECS spaces(0x20))	<R>	1 spaces	-
	ISSRDT	Image Security Source Date	8	ECS-A CCYYMMDD (Default is ECS spaces(0x20))	<R>	8 spaces	-

Table 7-2 NITF2.1 Format (9/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	ISCTLN	Image Security Control Number	15	ECS-A (Default is ECS spaces(0x20))	<R>	15 spaces	-
	ENCRYP	Encryption	1	BCS-N positive integer (Default is BCS zero(0x30)) 0 = not encrypted	R	“0”	-
	ISORCE	Image Source	42	ECS-A (Default is ECS spaces(0x20))	<R>	42 spaces	-
	NROWS	Number of Significant Rows in Image	8	BCS-N positive integer 00000001 to 99999999	R	Number of lines in image Right-fill. If the number is lower than 8 digits, zero is filled in the higher order.	-
	NCOLS	Number of Significant Columns in Image	8	BCS-N positive integer 00000001 to 99999999	R	Number of pixels in image Right-fill. If the number is lower than 8 digits, zero is filled in the higher order.	-
	PVTYPE	Pixel Value Type	3	BCS-A INT, B, SI, R or C	R	L1.1 (Except ScanSAR): “C” L1.1 (ScanSAR): “R” L1.5: “INT”	-
	IREP	Image Representation	8	BCS-A MONO, RGB, RGB/LUT, MULTI, NODISPLY, NVECTOR, POLAR, VPH, YCbCr601	R	L1.1: “NODISPLAY” L1.5: “MONO”	-

Table 7-2 NITF2.1 Format (10/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	ICAT	Image Category	8	BCS-A VIS, SL, TI, FL, RD, EO, OP, HR, HS, CP, BP, SAR, SARIQ, IR, MAP, MS, FP, MRI, XRAY, CAT, VD, PAT, LEG, DTEM, MATR, LOCG, BARO,CURRENT, DEPTH,WIND (Default is VIS)	R	"SAR" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	ABPP	Actual Bits-Per-Pixel Per Band	2	BCS-N 01 to 96	R	L1.1 (Except ScanSAR): “64” L1.1 (ScanSAR): “32” L1.5: “16”	-
	PJUST	Pixel Justification	1	BCS-A L or R (Default is R)	R	"R"	-
	ICORDS	Image Coordinate Representation	1	BCS-A U, G, N, S, D or (Default is BCS spaces(0x20))	<R>	"D"	-
	IGEOLO	Image Geographic Location	60	BCS-A ±dd.ddd±ddd.ddd(four times) or ddmmssXdddmmssY (four times) or zzBJKeeeeennnnn (four times) or zzeeeeeennnnnnn (four times)	C	Latitude and longitude of four corners of image is stored continuously in order of top left corner, top right corner, bottom right corner and left bottom corner. Each of them is stored in the following format. ±dd.ddd±ddd.ddd (four times) ±dd.ddd: Latitude (+: north latitude) ±ddd.ddd: Longitude (+: east longitude) Left-fill. If the values do not fill the allotted size, the remaining bytes are filled with space.	-

Table 7-2 NITF2.1 Format (11/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	NICOM	Number of Image Comments	1	BCS-N positive integer 0 to 9	R	“0”	-
	IC	Image Compression	2	BCS-A NC, NM, C1, C3, C4, C5, C6, C7, C8, I1, M1, M3, M4, M5, M6, M7, M8	R	"NC"	-
	NBANDS	Number of Bands	1	BCS-N positive integer 0 to 9 BCS zero (0x30)	R	“1”	-
	IREPBANDn	nth Band Representation	2	BCS-A LU, R, G, B, M, Y, Cb, Cr (Default is BCS spaces(0x20))	<R>	L1.1: 2 spaces L1.5: “M”	n=1
	ISUBCATn	nth Band Subcategory	6	BCS-A I, Q, M, P, SPEED, DIRECT, User-defined wave length, CGX, CGY, GGX, GGY (Default is BCS spaces(0x20))	<R>	6 spaces	n=1
	IFCn	nth Band Image Filter Condition	1	BCS-A N	R	"N"	n=1
	IMFLTn	nth Band Standard Image Filter Code	3	BCS-A Fill with BCS spaces(0x20)	<R>	3 spaces	n=1

Table 7-2 NITF2.1 Format (12/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	NLUTSn	Number of LUTS for the nth Image Band	1	BCS-N positive integer 0 to 4 (Default is BCS zero (0x30) if no LUTs are included.)	R	“0”	n=1
	ISYNC	Image Sync code	1	BCS-N positive integer 0 = No Sync Code	R	“0”	-
	IMODE	Image Mode	1	BCS-A B, P, R, S	R	"B"	NBANDS=1
	NBPR	Number of Blocks Per Row	4	BCS-N positive integer 0001 to 9999	R	Number of blocks in the horizontal direction Right-fill. If the number is lower than four digits, zero is filled in the higher order.	-
	NBPC	Number of Blocks Per Column	4	BCS-N positive integer 0001 to 9999	R	Number of blocks in the vertical direction Right-fill. If the number is lower than four digits, zero is filled in the higher order.	-
	NPPBH	Number of Pixels Per Block Horizontal	4	BCS-N positive integer 0000 or 0001 to 8192	R	“0512”	-
	NPPBV	Number of Pixels Per Block Vertical	4	BCS-N positive integer 0000 or 0001 to 8192	R	“0512”	-
	NBPP	Number of Bits Per Pixel Per Band	2	BCS-N positive integer 01 to 96	R	L1.1 (Except ScanSAR): “64” L1.1 (ScanSAR): “32” L1.5: “16”	-
	IDLVL	Image Display Level	3	BCS-N positive integer 001 to 999	R	“001”	-
	IALVL	Attachment Level	3	BCS-N positive integer 000 to 998	R	“000”	-

Table 7-2 NITF2.1 Format (13/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	ILOC	Image Location	10	BCS-N RRRRRCCCCC For positive row and column values RRRRR and CCCCC are both in the range 00000 to 99999. For negative row and column values RRRRR and CCCCC are both in the range -0001 to -9999	R	“0000000000”	-
	IMAG	Image Magnification	4	BCS-A decimal value, /x, where x = any nonnegative integer ≤ 999 (Default is 1.0 followed by BCS space (0x20))	R	"1.0" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	UDIDL	User Defined Image Data Length	5	BCS-N 00000 or 00003 to 99999	R	“00000”	-
	IXSHDL	Image Extended Subheader Data Length	5	BCS-N positive integer 00000 or 00003 to 99999	R	Extended header data length (byte) L1.1: “00000” L1.5: “00123” (CSCRNA size + 3)	-
	IXSOFL	Image Extended Subheader Overflow	3	BCS-N positive integer 000 to 999	C	L1.1: This field doesn’t exist L1.5: “000”	-

Table 7-2 NITF2.1 Format (14/14)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
NITF image subheader	IXSHD	Image Extended Subheader Data	IXSHDL −3	TRE(s)	C	Extended header data L1.1: This field doesn’t exist L1.5: “CSCRNA” (Refer to Table 7-5)	-

Table 7-3 GEOPSB, PRJPSB (NITF 2.1) Format (1/4)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
GEOPSB (Geographic position information)	CETAG	Unique Extension Identifier	6	"GEOPSB"	R	"GEOPSB"	-
	CEL	Length of Data to Follow	5	"00443"	R	"00443"	-
	TYP	Coordinate System Type	3	BCS-A GEO: Geographical coordinate(latitude, longitude) MAP: Coordinate (easting, northing) on the map (grid) DIG: Geographical coordinate or coordinate on the map. (grid or registered position)	R	"GEO"	-
	UNI	Coordinate Units	3	BCS-A SEC: Second of the decimal system DEG: Degree of the decimal system M: Meter	R	NITF2.1: "DEG"	-
	DAG	Geodetic Datum Name	80	BCS-A (DIGEST part3-6,Table 6-2 Geodetic Datum Codes)	R	WGS84 : "World Geodetic System 1984" GRS80 : "Geodetic Reference System 1980 / International Terrestrial Reference Frame 1997" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-

Table 7-3 GEOPSB, PRJPSB (NITF 2.1) Format (2/4)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
GEOPSB (Geographic position information)	DCD	Geodetic Datum Code	4	BCS-A (DIGEST part3-6,Table 6-2 Geodetic Datum Codes)	R	WGS84: "WGE" GRS80: "ZYX"(Other Known Datum) Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	ELL	Ellipsoid Name	80	BCS-A (DIGEST part3-6,Table 6-1 Ellipsoid Codes)	R	WGS84: "World Geodetic System 1984" GRS80: "Geodetic Reference System 1980" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	ELC	Ellipsoid Code	3	BCS-A (DIGEST part3-6,Table 6-1 Ellipsoid Codes)	R	WGS84: "WE" GRS80: "RF" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	DVR	Vertical Datum Reference	80	BCS-A (DIGEST part3-6)	<R>	"Geodetic" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	VDCDVR	Code (Category) of Vertical Reference	4	BCS-A (DIGEST part3-6)	<R>	"GEOD"	-
	SDA	Sounding Datum Name	80	BCS-A (DIGEST part3-6)	<R>	80 spaces	-
	VDCSDA	Code for Sounding Datum	4	BCS-A (DIGEST part3-6)	<R>	4 spaces	-
	ZOR	Z Values False Origin	15	BCS-N positive integer	R	Height of projection (Height from the surface of ellipsoid) [Meter] Right-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-

Table 7-3 GEOPSB, PRJPSB (NITF 2.1) Format (3/4)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
GEOPSB (Geographic position information)	GRD	Grid Code	3	BCS-A (DIGEST part3-6)	<R>	UTM: "UT" PS, MER: 3 spaces Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	GRN	Grid Description	80	BCS-A	<R>	UTM: "Universal Transverse Mercator" PS, MER: 80 spaces Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	ZNA	Grid Zone Number	4	BCS-A (DIGEST part3-6)	R	UTM: Northern hemisphere "0001" to "0060" Southern hemisphere "-001" to "-060" PS, MER: "0000"	-
PRJPSB (Projection Information)	CETAG	Unique Extension Identifier	6	"PRJPSB"	R	"PRJPSB"	-
	CEL	Length of Data to Follow	5	BCS-N 00113 to 00248	R	Data field length (byte) Size except CETAG and CEL is stored in CEL.	-
	PRN	Projection Name	80	Projection Name	R	UTM: "Transverse Mercator" PS: "Polar Stereographic" MER: "Mercator" Left-fill. If the values do not fill the allotted size, the remaining spaces are filled with blank.	-
	PCO	Projection Code	2	BCS-A (DIGEST Part 3-6, table 6-5)	R	UTM: "TC" PS: "PG" MER: "MC"	-
	NUM_ PRJ	Number of Projection Parameters	1	BCS-N positive integer 0 to 9	R	UTM: "3" PS: "2" MER: "3"	-
	PRJn	Projection Parameter	15	BCS-N	R	Refer to Table 7.4.	-

Table 7-3 GEOPSB, PRJPSB (NITF 2.1) Format (4/4)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
PRJPSB (Projection Information)	XOR	Projection False X(Easting) Origin	15	BCS-N positive integer	R	UTM: "500000" PS: "0" MER: "0" Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.	-
	YOR	Projection False Y(Northing) Origin	15	Projection False Y(Northing) Origin	R	UTM: Northern hemisphere: "0" Southern hemisphere: "10000000" PS: "0" MER: "0" Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.	-

Table 7-4 Projection Parameter (1/1)

PROJECTION METHOD	NAME	SIZE	VALUE RANGE	TYPE	OUTPUT	VALUE
UTM	PRJ1	15	BCS-N	R	O	Center longitude of zone Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
	PRJ2	15	BCS-N	R	O	0.9996 fixed Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
	PRJ3	15	BCS-N	R	O	Center latitude of zone Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
PS	PRJ1	15	BCS-N	R	O	Center longitude of projection Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
	PRJ2	15	BCS-N	R	O	Center latitude of projection Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
MER	PRJ1	15	BCS-N	R	O	Center longitude of projection Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
	PRJ2	15	BCS-N	R	O	Reference latitude Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.
	PRJ3	15	BCS-N	R	O	Center latitude of projection Right-fill. If the values do not fill the allotted size, the remaining spaces in the higher order are filled with zero.

Table 7-5 CSCRNA (NITF 2.1) Format (1/3)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
CSCRNA (Additional information of four corners position)	CETAG	Unique Extension Identifier	6	"CSCRNA"	R	"CSCRNA"	-
	CEL	Length of Data to Follow	5	"00109"	R	"00109"	
	PREDICT_CORNERS	Predicted Corners Flag (Coordinate flag)	1	BCS-A Y: predicted value N: measured value	R	"N"	
	ULCNR_LAT	Image Corner Latitude Upper Left Corner of Image	9	BCS-N -90.00000 to +90.00000	R	Latitude of upper left corner of Image. [Degree]	
	ULCNR_LONG	Image Corner Longitude Upper Left Corner of Image	10	BCS-N -179.99999 to +180.00000	R	Longitude of upper left corner of image [Degree]	
	ULCNR_HT	Image Corner Height at Upper Left Corner of Image	8	BCS-N -00610.0 to +10668.0	R	Height of projection plane from the reference ellipsoid of the upper left corner of image. [Meter]	
	URCNR_LAT	Image Corner Latitude Upper Right Corner of Image	9	BCS-N -90.00000 to +90.00000	R	Latitude of upper right corner of image.[Degree]	

Table 7-5 CSCRNA (NITF 2.1) Format (2/3)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
CSCRNA (Additional information of four corners position)	URCNR_LONG	Image Corner Longitude Upper Right Corner of Image	10	BCS-N -179.99999 to +180.00000	R	Longitude of upper right corner of image [Degree]	
	URCNR_HT	Image Corner Height at Upper Right Corner of Image	8	BCS-N -00610.0 to +10668.0	R	Height of projection plane from the reference ellipsoid of the upper right corner of image. [Meter]	
	LRCNR_LAT	Image Corner Latitude Lower Right Corner of Image	9	BCS-N -90.00000 to +90.00000	R	Latitude of lower right corner of image.[Degree]	
	LRCNR_LONG	Image Corner Longitude Lower Right Corner of Image	10	BCS-N -179.99999 to +180.00000	R	Longitude of lower right corner of image.[Degree]	
	LRCNR_HT	Image Corner Height at Lower Right Corner of Image	8	BCS-N -00610.0 to +10668.0	R	Height of projection plane from the reference ellipsoid of the lower right corner of image. [Meter]	
	LLCNR_LAT	Image Corner Latitude Lower Left Corner of Image	9	BCS-N -90.00000 to +90.00000	R	Latitude of lower left corner of image.[Degree]	
	LLCNR_LONG	Image Corner Longitude Lower Left Corner of Image	10	BCS-N -179.99999 to +180.00000	R	Longitude of lower left corner of image.[Degree]	

Table 7-5 CSCRNA (NITF 2.1) Format (3/3)

CLASS	FIELD	NAME	SIZE	VALUE RANGE	TYPE	ASNARO2 VALUE	REMARKS
CSCRNA (Additional information of four corners position)	LLCNR_HT	Image Corner Height at Lower Left Corner of Image	8	BCS-N -00610.0 to +10668.0	R	Height of projection plane from the reference ellipsoid of the lower left corner of image. [Meter]	

8. Level 1 Metadata Format

Level 1 Metadata format is shown in Table 8-1.

■Detail Format

Class	No.	Data type	File name	Newline
File	1	Metadata	MET-AAABBBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU.xml	LF

No.	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Element name	Child elements	Occurrences	Data type	String length(min)	String length(max)	Value range(min)	Value range(max)	Candidate	content	unit	Remark
1	sar:EarthObservation	–	–	–	–	–	–	–	sar:EarthObservation	Yes	1	-	-	-	-	-	-	-	-	Prolog and attributes of sar:EarthObservation are as follows: <?xml version="1.0" encoding="UTF-8"?> <sar:EarthObservation xmlns:sar="http://earth.esa.int/sar" xmlns:eop="http://earth.esa.int/eop" xmlns:gml="http://www.opengis.net/gml" xmlns:schemaLocation="http://earth.esa.int/sar" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" version="1.2.1">
2	–	gml:metaDataProperty	–	–	–	–	–	–	gml:metaDataProperty	Yes	1	-	-	-	-	-	-	-	-	-
3	–	–	eop:EarthObservationMetaData	–	–	–	–	–	eop:EarthObservationMetaData	Yes	1	-	-	-	-	-	-	-	-	-
4	–	–	–	eop:identifier	–	–	–	–	eop:identifier	Yes	1	string	-	-	-	-	-	Metadata ID AAABBBBBBCCCCCC-YYMMDD-DDDEFFFGHI AAABBBBBBCCCCCC: Scene ID DDDEFFFGHI: Product ID DDD：Observation mode E: Observation direction FFF: Processing level G: Processing option H: Map projection I: Orbit direction	-	-
5	–	–	–	eop：creationDate	–	–	–	–	eop：creationDate	No	1	dateTime	-	-	-	-	YYYY-MM-DDThh:mm:ssZ	Creation date (UTC) ISO8601 format	-	-
6	–	–	–	eop:acquisitionType	–	–	–	–	eop:acquisitionType	No	1	string	-	-	-	-	NOMINAL	Observation type NOMINAL: Observation mode CALIBRATION: Calibration mode * Users can order nominal product only.	-	-
7	–	–	–	eop:acquisitionSubType	–	–	–	–	eop:acquisitionSubType	No	1	string	-	-	-	-	SP_ | SP2 | SM_ | SS_	Observation mode SP_: Spotlight 1 SP2: Spotlight 2 SM_: Stripmap SS_: ScanSAR	-	-
8	–	–	–	eop:status	–	–	–	–	eop:status	No	1	string	-	-	-	-	ARCHIVED	Product status ARCHIVED	-	-
9	–	–	–	eop:downlinkedTo	–	–	–	–	eop:downlinkedTo	Yes	1	-	-	-	-	-	-	-	-	-
10	–	–	–	–	eop:DownlinkInformation	–	–	–	eop:DownlinkInformation	Yes	1	-	-	-	-	-	-	-	-	-
11	–	–	–	–	–	eop:acquisitionStation	–	–	eop:acquisitionStation	No	1	string	-	-	-	-	-	Data center where observation station belongs to	-	-
12	–	–	–	–	–	eop:acquisitionDate	–	–	eop:acquisitionDate	No	1	dateTime	-	-	-	-	-	Downlink date ISO8601 format	-	Empty tag
13	–	–	–	eop:archivedIn	–	–	–	–	eop:archivedIn	Yes	1	-	-	-	-	-	-	-	-	-
14	–	–	–	–	eop:ArchivingInformation	–	–	–	eop:ArchivingInformation	Yes	1	-	-	-	-	-	-	-	-	-
15	–	–	–	–	–	eop:archivingCenter	–	–	eop:archivingCenter	No	1	string	-	-	-	-	-	Data center where archive center belongs to	-	-
16	–	–	–	–	–	eop:archivingDate	–	–	eop:archivingDate	No	1	dateTime	-	-	-	-	YYYY-MM-DDThh:mm:ssZ	Archived date (UTC) ISO8601 format	-	Same as eop:creationDate
17	–	–	–	eop:imageQualityDegradation	–	–	–	–	eop:imageQualityDegradation	No	1	double	-	-	-	-	-	Degradation ratio of image quality	-	-
18	–	–	–	eop:imageQualityDegradationQuotationMode	–	–	–	–	eop:imageQualityDegradationQuotationMode	No	1	string	-	-	-	-	AUTOMATIC	How to calculate the ratio of quality degradation Automatic: AUTOMATIC Manual: MANUAL	-	-

Tabel 8-1 Metadata (2/5)

No.	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Element name	Child elements	Occurrences	Data type	String length(min)	String length(max)	Value range(min)	Value range(max)	Candidate	content	unit	Remark
19	–	–	–	eop:processing	–	–	–	–	eop:processing	Yes	1	-	-	-	-	-	-	-	-	-
20	–	–	–	–	eop:ProcessingInformation	–	–	–	eop:ProcessingInformation	Yes	1	-	-	-	-	-	-	-	-	-
21	–	–	–	–	–	eop:processingCenter	–	–	eop:processingCenter	No	1	string	-	-	-	-	-	Data center	-	-
22	–	–	–	–	–	eop:processingDate	–	–	eop:processingDate	No	1	dateTime	-	-	-	-	YYYY-MM-DDThh:mm:ssZ	Creation date (UTC) ISO8601 format	-	-
23	–	–	–	–	–	eop:method	–	–	eop:method	No	1	string	-	-	-	-	NN | BL | CC | CS	interpolation method Level 1.5: "NN" "BL" "CC" "CS" Level 1.1: "NO APPLIED"	-	-
24	–	–	–	–	–	eop:methodVersion	–	–	eop:methodVersion	No	1	string	-	-	-	-	NNN.NNN	Algorithm version of processing software	-	-
25	–	–	–	–	–	eop:processorName	–	–	eop:processorName	No	1	string	-	-	-	-	-	Name of processing software	-	-
26	–	–	–	–	–	eop:processorVersion	–	–	eop:processorVersion	No	1	string	-	-	-	-	-	Version of processing software	-	Same as eop:methodVersion
27	–	–	–	–	–	eop:processingLevel	–	–	eop:processingLevel	No	1	string	-	-	-	-	L1.1 | L1.5	Processing level	-	-
28	–	–	–	–	–	eop:nativeProductFormat	–	–	eop:nativeProductFormat	No	1	string	-	-	-	-	CEOS | GeoTIFF | NITF2.1	Product format	-	-
29	–	–	–	–	–	eop:auxiliaryDataSetFileName	–	–	eop:auxiliaryDataSetFileName	No	Unbounded	string	-	-	-	-		Attached data name	-	
30	–	–	–	eop:vendorSpecific	–	–	–	–	eop:vendorSpecific	Yes	1	-	-	-	-	-	-	-	-	-
31	–	–	–	–	eop:SpecificInformation	–	–	–	eop:SpecificInformation	Yes	Unbounded	-	-	-	-	-	-	-	-	-
32	–	–	–	–	–	eop:localAttribute	–	–	eop:localAttribute	No	Unbounded	string	-	-	-	-	-	sceneId: Scene ID CF_XXXXXX: Calibration factor using flag offnadiaAngle: Off nadia angle [deg] calibrationFactor: Physical quantity conversion factor of pixel value sceneCenterDateTime: Scene center date (ISO8601 format) gainControl: Gain control method orbitAccuracy: Orbit type orbitCheck: Orbit quality attitudeCheck: Attitude quality sceneCenterOrbitXXXX: Orbit position (16.7F, ECR) [m] and velocity (16.7F, ECR) [m/s] of the scene center compressionMode: Compression mode projectionHeight: Projection height [m]	-	Calibration factor using flag CF_absoluteCoef CF_timingErr CF_antennaPattern sceneCenterOrbitXXXX consists of the following six elements. sceneCenterOrbitPositionX sceneCenterOrbitPositionY sceneCenterOrbitPositionZ sceneCenterOrbitVelocityX sceneCenterOrbitVelocityY sceneCenterOrbitVelocityZ
33	–	–	–	–	–	eop:localValue	–	–	eop:localValue	No	Unbounded	-	-	-	-	-	-	Store the value corresponding to 'localAttribute'	-	Calibration factor using flag ON / OFF Gain control AGC / MGC Orbit type ONBOARD: On-board ELMD: Determined ephemeris ELMP: Predicted ephemeris (In ASNARO-2, it is not used when generating products.) Quality of oribt/attitude GOOD / FAIR / POOR Compression mode: No data compression = '0' 1/2 Compression = '1' 1/4 Compression = '2'

No.	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Element name	Child elements	Occurrences	Data type	String length(min)	String length(max)	Value range(min)	Value range(max)	Candidate	content	unit	Remark
34	–	qml:target	–	–	–	–	–	–	qml:target	Yes	1	-	-	-	-	-	-	-	-	-
35	–	–	eop:Footprint	–	–	–	–	–	eop:Footprint	Yes	1	-	-	-	-	-	-	-	-	-
36	–	–	–	qml:multiExtent	–	–	–	–	qml:multiExtentOf	Yes	1	-	-	-	-	-	-	-	-	-
37	–	–	–	–	qml:MultiSurface	–	–	–	qml:MultiSurface	Yes	1	-	-	-	-	-	-	-	-	-
38	–	–	–	–	–	qml:surfaceMembers	–	–	qml:surfaceMembers	Yes	1	-	-	-	-	-	-	-	-	-
39	–	–	–	–	–	–	qml:Polygon	–	qml:Polygon	Yes	1	-	-	-	-	-	-	-	-	-
40	–	–	–	–	–	–	–	gml:exterior/gml:LinearRing/gml:posList	gml:exterior/gml:LinearRing/gml:posList	No	1	geometry (MultiPolygon)	19	194	-	-	-	The value of latitude and longitude at the four corners of scene is stored as the following order. Left-top latitude Left-top longitude Right-top latitude Right-top longitude Right-bottom latitude Right-bottom longitude Left-bottom latitude Left-bottom longitude Left-top latitude Left-top longitude Latitude indicates as follows: "SNN.NNNNNNNNNNNNN", Longitude indicates as follows: "SNNN.NNNNNNNNNNNNN" Unit of both latitude and longitude is degree. It sets to 14 digits decimal place. Space is set between values. Space is not stored after the last value, left-top longitude.	deg	For plus (+), sign S is omitted. "zero" for setting the same digit in integer part is not given. In decimal part, "zero" for setting the same digit is given as 14-digit is fixed. 02.10250000000000 -> 2.10250000000000 Example: -2.10250000000000 43.51666700000000 - 2.86166700000000 43.38166700000000 - 2.65000000000000 42.86277800000000 -1.89694400000000 42.99638900000000 - 2.10250000000000 43.51666700000000
41	–	–	–	eop:orientation	–	–	–	–	eop:orientation	No	1	string	-	-	-	-	CW	Order of latitude and longitude at the four points of the scene CW (clockwise) CCW (counter-clockwise) OTHER (unspecified)	-	-
42	–	–	–	qml:centerOf	–	–	–	–	qml:centerOf	Yes	1	-	-	-	-	-	-	-	-	-
43	–	–	–	–	qml:Point	–	–	–	qml:Point	Yes	1	-	-	-	-	-	-	-	-	-
44	–	–	–	–	–	gml:pos	–	–	gml:pos	No	1	geometry	-	-	-	-	-	Latitude and longitude of the scene center Latitude indicates as follows: "SNN.NNNNNNNNNNNNN", Longitude indicates as follows: "SNNN.NNNNNNNNNNNNN" Unit of both latitude and longitude is degree. It sets to 14 digits decimal place. Space is set between values.	deg	For plus (+), sign S is omitted In integer part, "zero" for setting the same digit is not given. In decimal part, "zero" for setting the same digit is given as 14-digit is fixed. 02.10250000000000 -> 2.10250000000000 Example: 2.10250000000000 43.51666700000000
45	–	qml:validTime	–	–	–	–	–	–	qml:validTime	Yes	1	-	-	-	-	-	-	-	-	-
46	–	–	qml:TimePeriod	–	–	–	–	–	qml:TimePeriod	Yes	1	-	-	-	-	-	-	-	-	-
47	–	–	–	gml:beginPosition	–	–	–	–	gml:beginPosition	No	1	dateTime	-	-	-	-	YYYY-MM-DDThh:mm:ssZ	Observation start date (UTC) ISO8601 format	-	Example: 2015-10-28T14:05:12Z
48	–	–	–	gml:endPosition	–	–	–	–	gml:endPosition	No	1	dateTime	-	-	-	-	YYYY-MM-DDThh:mm:ssZ	Observation end date (UTC) ISO8601 format	-	Example: 2015-10-28T14:05:24Z
49	–	gml:using	–	–	–	–	–	–	gml:using	Yes	1	-	-	-	-	-	-	-	-	-
50	–	–	eop:EarthObservationEquipment	–	–	–	–	–	eop:EarthObservationEquipment	Yes	1	-	-	-	-	-	-	-	-	-
51	–	–	–	eop:platform	–	–	–	–	eop:platform	Yes	1	-	-	-	-	-	-	-	-	-
52	–	–	–	–	eop:Platform	–	–	–	eop:Platform	Yes	1	-	-	-	-	-	-	-	-	-
53	–	–	–	–	–	eop:shortName	–	–	eop:shortName	No	1	string	-	-	-	-	ASNARO	Abbreviated satellite name	-	-
54	–	–	–	–	–	eop:serialIdentifier	–	–	eop:serialIdentifier	No	1	string	-	-	-	-	2	Satellite serial ID	-	-
55	–	–	–	–	–	eop:orbitType	–	–	eop:orbitType	No	1	string	-	-	-	-	LEO	Orbit type GEO: Geostationary orbit LEO: Low earth orbit	-	-
56	–	–	–	eop:instrument	–	–	–	–	eop:instrument	Yes	1	-	-	-	-	-	-	-	-	-
57	–	–	–	–	eop:Instrument	–	–	–	eop:Instrument	Yes	1	-	-	-	-	-	-	-	-	-
58	–	–	–	–	–	eop:shortName	–	–	eop:shortName	No	1	string	-	-	-	-	SAR	Abbreviated observation apparatus	-	-
59	–	–	–	–	–	eop:description	–	–	eop:description	No	1	string	-	-	-	-	-	Description of observation apparatus	-	-
60	–	–	–	–	–	eop:instrumentType	–	–	eop:instrumentType	No	1	string	-	-	-	-	-	Type of observation apparatus	-	-

Tabel 8-1 Metadata (4/5)

No.	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Element name	Child elements	Occurrences	Data type	String length(min)	String length(max)	Value range(min)	Value range(max)	Candidate	content	unit	Remark
61	–	–	–	eop:sensor	–	–	–	–	eop:sensor	Yes	1	-	-	-	-	-	-	-	-	-
62	–	–	–	–	eop:Sensor	–	–	–	eop:Sensor	Yes	1	-	-	-	-	-	-	-	-	-
63	–	–	–	–	–	eop:sensorType	–	–	eop:sensorType	No	1	string	-	-	-	-	RADAR	Sensor type OPTICAL RADAR ALTIMETRIC ATMOSPHERIC	-	-
64	–	–	–	–	–	eop:operationalMode	–	–	eop:operationalMode	No	1	string	-	-	-	-	SP_ | SP2 | SM_ | SS_	Sensor mode	-	Same as eop:acquisitionSubType
65	–	–	–	–	–	eop:resolution	–	–	eop:resolution	No	1	double	-	-	-	-	-	Sensor resolution	-	-
66	–	–	–	–	–	eop:swathIdentifier	–	–	eop:swathIdentifier	No	1	string	-	-	-	-	1	Beam number	-	ASNARO-2: "1"
67	–	–	–	–	–	eop:wavelengthInformation	–	–	eop:wavelengthInformation	Yes	1	-	-	-	-	-	-	-	-	-
68	–	–	–	–	–	–	eop:WavelengthInformation	–	eop:WavelengthInformation	Yes	1	-	-	-	-	-	-	-	-	-
69	–	–	–	–	–	–	–	eop:endWavelength	eop:endWavelength	No	1	double	-	-	-	-	-	Set the end of measured wavelength range	-	-
70	–	–	–	–	–	–	–	eop:spectralRange	eop:spectralRange	No	1	string	-	-	-	-	-	Set measured wavelength range	-	-
71	–	–	–	–	–	–	–	eop:startWavelength	eop:startWavelength	No	1	double	-	-	-	-	-	Set the start of measured wavelength range	-	-
72	–	–	–	–	–	–	–	eop:wavelengthResolution	eop:wavelengthResolution	No	1	string	-	-	-	-	-	Resolution of wavelength	-	ASNARO-2: "N/A"
73	–	–	–	eop:acquisitionNos	–	–	–	–	eop:acquisitionNos	Yes	1	-	-	-	-	-	-	-	-	-
74	–	–	–	–	sar:Acquisition	–	–	–	sar:Acquisition	Yes	1	-	-	-	-	-	-	-	-	-
75	–	–	–	–	–	eop:orbitDirection	–	–	eop:orbitDirection	No	1	string	-	-	-	-	ASCENDING | DESCENDING	Orbit direction	-	-
76	–	–	–	–	–	eop:wrsLongitudeGrid	–	–	eop:wrsLongitudeGrid	No	1	int	-	-	0	224	-	Path number	-	-
77	–	–	–	–	–	eop:wrsLatitudeGrid	–	–	eop:wrsLatitudeGrid	No	1	int	-	-	0	71999	-	Frame number	-	-
78	–	–	–	–	–	eop:illuminationAzimuthAngle	–	–	eop:illuminationAzimuthAngle	No	1	double	-	-	-	-	-	Azimuth angle of solar light	deg	ASNARO-2: Empty tag
79	–	–	–	–	–	eop:illuminationZenithAngle	–	–	eop:illuminationZenithAngle	No	1	double	-	-	-	-	-	Zenith angle of solar light	deg	ASNARO-2: Empty tag
80	–	–	–	–	–	eop:illuminationElevationAngle	–	–	eop:illuminationElevationAngle	No	1	double	-	-	-	-	-	Minimum value of elevation angle of solar light	deg	ASNARO-2: Empty tag
81	–	–	–	–	–	eop:incidenceAngle	–	–	eop:incidenceAngle	No	1	double	-	-	-	-	-	Incident angle	deg	ASNARO-2: Empty tag
82	–	–	–	–	–	eop:acrossTrackIncidenceAngle	–	–	eop:acrossTrackIncidenceAngle	No	1	double	-	-	-	-	-	Incident angle of cross-track direction	deg	ASNARO-2: Empty tag
83	–	–	–	–	–	eop:alongTrackIncidenceAngle	–	–	eop:alongTrackIncidenceAngle	No	1	double	-	-	-	-	-	Incident angle of along-track direction	deg	ASNARO-2: Empty tag
84	–	–	–	–	–	eop:instrumentAzimuthAngle	–	–	eop:instrumentAzimuthAngle	No	1	double	-	-	-	-	-	Azimuth angle of observation apparatus	deg	ASNARO-2: Empty tag
85	–	–	–	–	–	eop:instrumentZenithAngle	–	–	eop:instrumentZenithAngle	No	1	double	-	-	-	-	-	Zenith angle of observation apparatus	deg	ASNARO-2: Empty tag
86	–	–	–	–	–	eop:instrumentElevationAngle	–	–	eop:instrumentElevationAngle	No	1	double	-	-	-	-	-	Elevation angle of observation apparatus	deg	ASNARO-2: Empty tag
87	–	–	–	–	–	eop:pitch	–	–	eop:pitch	No	1	double	-	-	-	-	-	Pitch angle of satellite attitude	deg	ASNARO-2: Empty tag
88	–	–	–	–	–	eop:roll	–	–	eop:roll	No	1	double	-	-	-	-	-	Roll angle of satellite attitude	deg	ASNARO-2: Empty tag
89	–	–	–	–	–	eop:yaw	–	–	eop:yaw	No	1	double	-	-	-	-	-	Yaw angle of satellite attitude	deg	ASNARO-2: Empty tag
90	–	–	–	–	–	sar:polarisationMode	–	–	sar:polarisationMode	No	1	string	-	-	-	-	S	Polarization mode S: single (Ex. HH, VV) D: dual (Ex. HH+HV、VV+VH) T: twin Q: quad (Ex. HH+HV+VH+VV) UNDEFINED:	-	ASNARO-2: Only single polarization mode
91	–	–	–	–	–	sar:polarisationChannels	–	–	sar:polarisationChannels	No	1	string	-	-	-	-	HH | VV	Combination of transmitted/received waveform (Horizontal polarization (H), Vertical polarization (V)) in polarization channel. It indicates in order of transmitted polarization and received polarization.	-	-
92	–	–	–	–	–	sar:antennaLookDirection	–	–	sar:antennaLookDirection	No	1	string	-	-	-	-	LEFT | RIGHT	Observation direction LEFT RIGHT	-	-

Tabel 8-1 Metadata (5/5)

No.	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Element name	Child elements	Occurrences	Data type	String length(min)	String length(max)	Value range(min)	Value range(max)	Candidate	content	unit	Remark
93	–	–	–	–	–	sar:minimumIncidenceAngle	–	–	sar:minimumIncidenceAngle	No	1	double	-	-	0	90	-	Minimum incident angle "NN.NNN"	deg	In integer part, "zero" for setting the same digit is not given. In decimal part, "zero" for setting the same digit is given as 3-digit is fixed. 02.100 -> 2.100
94	–	–	–	–	–	sar:maximumIncidenceAngle	–	–	sar:maximumIncidenceAngle	No	1	double	-	-	0	90	-	Maximum incident angle "NN.NNN"	deg	In integer part, "zero" for setting the same digit is not given. In decimal part, "zero" for setting the same digit is given as 3-digit is fixed. 02.100 -> 2.100
95	–	–	–	–	–	sar:incidenceAngleVariation	–	–	sar:incidenceAngleVariation	No	1	double	-	-	0	90	-	Change amount of incident angle "NN.NNN"	deg	In integer part, "zero" for setting the same digit is not given. In decimal part, "zero" for setting the same digit is given as 3-digit is fixed. 02.100 -> 2.100
96	–	–	–	–	–	sar:dopplerFrequency	–	–	sar:dopplerFrequency	No	1	double	-	-	-	-	-	Observation Doppler frequency	Hz	In ASNRO-2, since it is based on zero Doppler geometry, the value will be 0.
97	–	qml:resultOf	–	–	–	–	–	–	qml:resultOf	Yes	1	-	-	-	-	-	-	-	-	-
98	–	–	eop:EarthObservationResult	–	–	–	–	–	eop:EarthObservationResult	Yes	1	-	-	-	-	-	-	-	-	-
99	–	–	–	eop:browse	–	–	–	–	eop:browse	Yes	1	-	-	-	-	-	-	-	-	-
100	–	–	–	–	eop:BrowseInformation	–	–	–	eop:BrowseInformation	Yes	1	-	-	-	-	-	-	-	-	-
101	–	–	–	–	–	eop:type	–	–	eop:type	No	1	string	-	-	-	-	THUMBNAIL	Browse type	-	-
102	–	–	–	–	–	eop:referenceSystemIdentifier	–	–	eop:referenceSystemIdentifier	No	1	string	-	-	-	-	-	Browse geodetic ID L1.5: "epsg:4326": WGS84 "epsg:4918": ITRF97	-	L1.1: Empty tag
103	–	–	–	–	–	eop:fileName	–	–	eop:fileName	No	1	string	-	-	-	-	-	File name of browse image L1.1: File name of browse image L1.5: File name of browse image	-	-
104	–	–	–	eop:product	–	–	–	–	eop:product	Yes	1	-	-	-	-	-	-	-	-	-
105	–	–	–	–	eop:ProductInformation	–	–	–	eop:ProductInformation	Yes	1	-	-	-	-	-	-	-	-	-
106	–	–	–	–	–	eop:fileName	–	–	eop:fileName	No	1	string	-	-	-	-	-	File name of product	-	-
107	–	–	–	–	–	eop:referenceSystemIdentifier	–	–	eop:referenceSystemIdentifier	No	1	string	-	-	-	-	-	Product geodetic ID L1.5: "epsg:4326": WGS84 "epsg:4918": ITRF97	-	L1.1: Empty tag
108	–	–	–	–	–	eop:size	–	–	eop:size	No	1	long	-	-	-	-	-	Product size	-	ASNARO-2: Empty tag

9. Attached Data Format

Format of attached data (Orbit) and attached data (Attitude) are shown in Table 9-1 and Table 9-2 respectively.

■Detail of Attached Data (Orbit) Format

Class	Data type	Service name / File name
File	Attached data (orbit)	ORB-AAABBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU.bin

No.	Name	Type	Unit	Description	Remarks
1	Header length	uint64_t	Byte	Header length: 256	No.1 to 13: header part
2	ID	uint64_t	-	0	
3	Record length	uint64_t	Byte	1 record size of record part: 56	
4	Number of records	uint64_t	Record	The number of orbit data in file	Since each two points is stored before and after the product,the data corresponding to the line of product is required to interpolate.
5	Reference time/year	uint64_t	Year	TAI	The day (yyyy/mm/dd 00:00:00 (UTC)) of the first record is stored as TAI time system in reference time.
6	Reference time/month	uint64_t	Month	Same as above	
7	Reference time/day	uint64_t	Day	Same as above	
8	Reference time/hour	uint64_t	Hour	Same as above	
9	Reference time/minute	uint64_t	Minute	Same as above	
10	Reference time/second	double	Second	Same as above	
11	Source information	uint64_t	-	Source information of this data in decimal number 10: Level 0 data (low-speed data) 20: Orbit generation value (decision) ECR	
12	Coordinate system	uint64_t		Coordinate system in decimal number 10: ECR	
13	Fill	char[160]		Padding, filled with 0x00	
14	Time	double	Second	Time corresponding to No.15 to No.20 Relative second from reference time, indicated in No.5 to 10 in hearder part.	No.14 to 20: Record part In record part, repeat as many times as the number of record of No.4.
15	Position vector (X)	double	Meter	Satellite position vector (X)	
16	Position vector (Y)	double	Meter	Satellite position vector (Y)	
17	Position vector (Z)	double	Meter	Satellite position vector (Z)	
18	velocity vector (X)	double	Meter/ second	Satellite velocity vector (X)	

Tabel 9-1 Attached Data (Orbit) (2/2)

No.	Name	Type	Unit	Description	Remarks
19	velocity vector (Y)	double	Meter/ second	Satellite velocity vector (Y)	
20	velocity vector (Z)	double	Meter/ second	Satellite velocity vector (Z)	

Table 9-2 Attached Data (Attitude) (1/2)

■Detail of Attached Data (Attitude) Format

Class	Data type	File name
File	Attached data (attitude)	POS-AAABBBBBCCCCC-YYMMDDNNL-DDDEFFFGHIU.bin

No.	Name	Type	Unit	Description	Remarks
1	Header length	uint64_t	Byte	Header length: 256	No.1 to 13: header part
2	ID	uint64_t	-	0	
3	Record length	uint64_t	Byte	1 record size of record part: 88	
4	Number of records	uint64_t	Record	The number of attitude data in file	Since each two points is stored before and after the product,the data corresponding to the line of product is required to interpolate.
5	Reference time/year	uint64_t	Year	TAI	The day (yyyy/mm/dd 00:00:00 (UTC)) of the first record is stored as TAI time system in reference time.
6	Reference time/month	uint64_t	Month	Same as above	
7	Reference time/day	uint64_t	Date	Same as above	
8	Reference time/hour	uint64_t	Hour	Same as above	
9	Reference time/minute	uint64_t	Minute	Same as above	
10	Reference time/second	double	Second	Same as above	
11	Source information	uint64_t	-	Source information of this data in decimal number 10: On-board	
12	Coordinate system	uint64_t		Coordinate system in decimal number 10: ECR	
13	Fill	char[160]		Padding, filled with 0x00	
14	Time	double	Second	Time corresponding to No.15 to No.24 Relative second from reference time, indicated in No.5 to 10 in hearder part.	No.14 to 24: Record part In record part, repeat as many times as the number of record of No.4.
15	Satellite attitude q1	double	-	0: Quaternion between earth-fixed coordinate system and attitude-determination coordinate system (Scalar)	In ASNARO 2, since zero is stored in No.15 to No.21 without reservation, user can not use these numbers.
16	Satellite attitude q2	double	-	0: Quaternion between earth-fixed coordinate system and attitude-determination coordinate system (X)	
17	Satellite attitude q3	double	-	0: Quaternion between earth-fixed coordinate system and attitude-determination coordinate system (Y)	
18	Satellite attitude q4	double	-	0: Quaternion between earth-fixed coordinate system and attitude-determination coordinate system (Z)	

Table 9-2 Attached Data (Attitude) (2/2)

No.	Name	Type	Unit	Description	Remarks
19	Satellite rate ωx	double	-	0	
20	Satellite rate ωy	double	-	0	
21	Satellite rate ωz	double	-	0	
22	Three-axis attitude angle (roll)	double	Degree	Roll angle of satellite three-axis attitude angle The order of rotating: pich angle, roll angle and yaw angle.	
23	Three-axis attitude angle (pitch)	double	Degree	Pitch angle of satellite three-axis attitude angle The order of rotating: pich angle, roll angle and yaw angle.	
24	Three-axis attitude angle (yaw)	double	Degree	Yaw angle of satellite three-axis attitude angle The order of rotating: pich angle, roll angle and yaw angle.	

10. Guarantee range

Guarantee range of the contents of this document is written below.

・It should be noted that, the values in each table refer to nominal operational status, while actual values depend upon satellite configuration or observation condition. Nominal status is written outside of the table.

・We are not responsible for any defect of product due to natural events occurred in space or observation area. There is some possibility of appearing noise, moire, and ghost in product depending on condition of observation area (e.g. radio wave source, high reflection intensity, boundary between land and water surface) or condition of atmosphere (e.g. amount of water vapor).

・We are not responsible for any defect of product due to satellite trouble including defect of sensor.

・Any claim regarding defects in the product must be submitted within 40 days of the date the product was delivered to remedy deficiency or exchange product, after which time we will not accept any complaint.