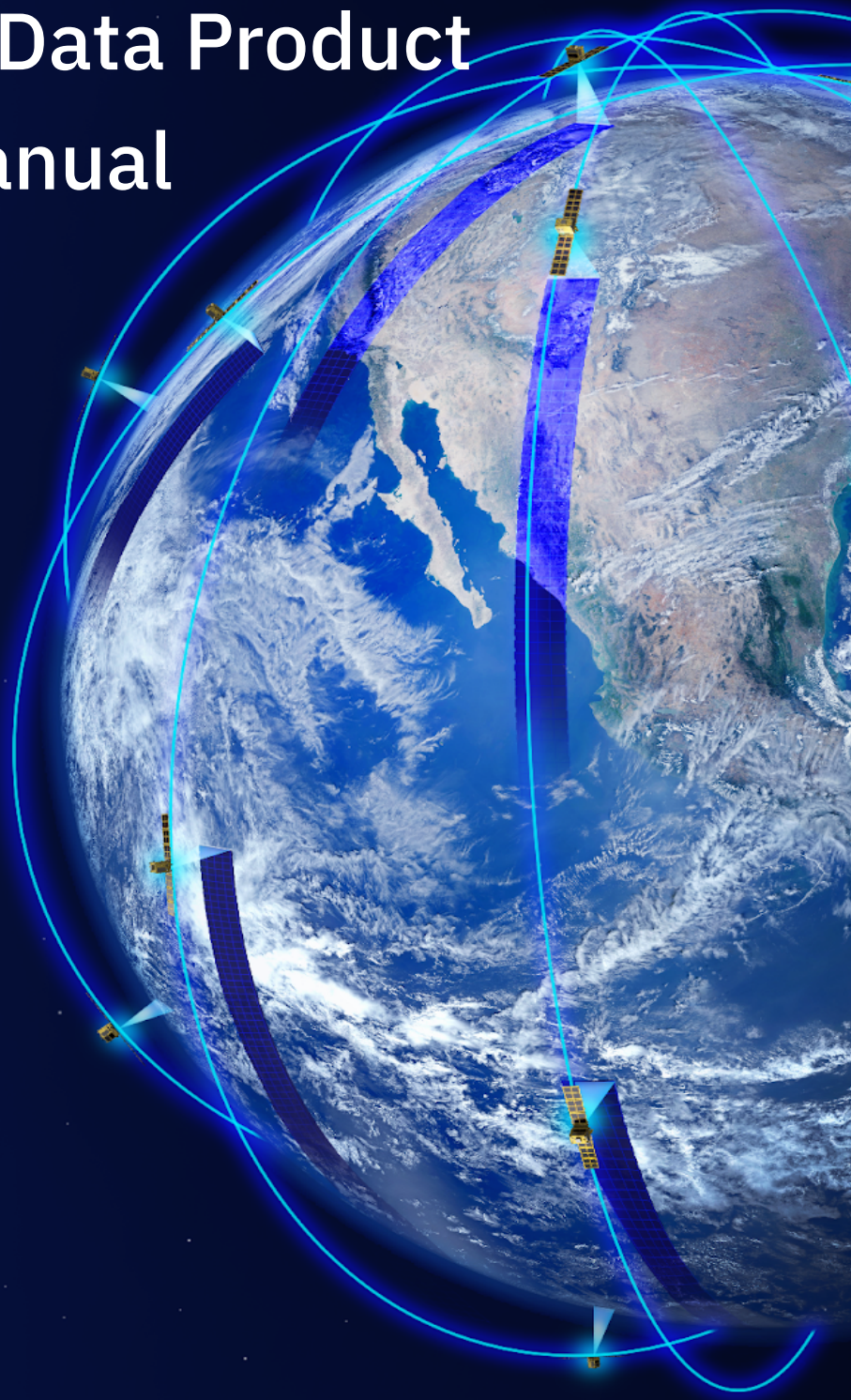


# StriX SAR Data Product Format Manual

Version 1.0  
17 Nov 2022



## Revision History

| Version | Date        | Description     |
|---------|-------------|-----------------|
| v1.0    | 17 Nov 2022 | Initial version |

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# Introduction

This document defines the format of Synspecive StriX SAR satellite imagery products. There are two types of products: Single Look Complex (SLC) and Ground Range Detected (GRD). SLC products are available in CEOS and SICD formats and GRD products are available in GeoTIFF + XML format.

## 1. SLC Product

The general specification of the StriX SLC product:

- Single Look Complex (SLC) data after range and azimuth compression
- single look in azimuth and range
- provided in slant range geometry
- phase information is preserved
- pixel spacing is in slant geometry
- data type: 32 bit (I) + 32 bit (Q)
- mode of observation: stripmap or sliding spotlight
- single polarization: VV

### 1.1 CEOS Product Format

CEOS standard format was published in 1988 and does not specify the naming convention. In practice, Synspecive's CEOS product format references to ALOS-2 PALSAR-2 CEOS format [\[1\]](#).

#### 1.1.1 Product Composition

SLC CEOS format is a wrapper, which combines multiple files:

- volume directory file (VOL),
- SAR leader file (LED),
- SAR image data (IMG),
- SAR trailer file (TRL)

CEOS product includes the following files as well.

- Summary information
- Thumbnail image

The naming convention for SLC CEOS product files are described in the table below.

Table 1.1-1 SLC CEOS Product File Naming Convention

| File Type             | Number of Files | File Name                                                    | Record Name                                                                                                                                                       | Contents                                                                                           |
|-----------------------|-----------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Volume Directory File | 1               | VOL-<Scene ID><br>-<Product ID>                              | - Volume descriptor<br>File Pointer                                                                                                                               | This stores the volume and file management information.                                            |
| SAR Leader File       | 1               | LED-<Scene ID><br>-<Product ID>                              | - File descriptor<br>- Data set summary<br>- Platform location data<br>- Attitude data<br>- Radiometric data<br>- Data quality summary<br>- Facility related data | This file stores information such as annotation data and ancillary data related to the image data. |
| SAR Image Data        | 1               | IMG-<Polarization><br>-<Scene ID><br>-<Product ID>           | - File descriptor<br>- Signal data                                                                                                                                | This file stores image data.                                                                       |
| SAR Trailer File      | 1               | TRL-<Scene ID><br>-<Product ID>                              | - File descriptor                                                                                                                                                 | This file stores the final information about the image data.                                       |
| Summary Information   | 1               | summary.txt                                                  |                                                                                                                                                                   |                                                                                                    |
| Thumbnail Image       | 1               | BRS-<Polarization><br>-YYYYMMDDThhm<br>mssZ-<Product ID>.png |                                                                                                                                                                   |                                                                                                    |

Where:

Scene ID = AAAAA-YYYYMMDDThhmmssZ

AAAAAA : Satellite type (STRIXA: StriX- $\alpha$ , STRIXB: StriX- $\beta$  and STRIX1: StriX-1)

- : Separator

YYYYMMDD: Scene center observation date (YYYY: year, MM: month, DD: day)

hhmmss: Scene center observation time\* (hh: hour, mm: minutes, ss: seconds)

\*precise orbit is used when available

Product ID = DDEEE

DD: Observation mode (SL: Sliding Spotlight mode, SM: Stripmap mode)

EEE: Processing level (SLC: Single Look Complex)

### 1.1.2 Product Record Description

The table below shows SLC CEOS format record structure.

Table 1.1-2 Record Structure SLC CEOS Format

| Record No. | Record Length [byte] | Number of Record | Record Name                 | File Name             |
|------------|----------------------|------------------|-----------------------------|-----------------------|
| 1          | 360                  | 1                | Volume descriptor           | Volume Directory File |
| 3          | 360                  | 3                | File pointer                |                       |
| 4          | 360                  | 1                | Text                        |                       |
| 1          | 720                  | 1                | SAR Leader file descriptor  | SAR Leader File       |
| 2          | 4,096                | 1                | Dataset summary             |                       |
| 3          | 4,680                | 1                | Platform location data      |                       |
| 4          | 16,384               | 1                | Attitude data               |                       |
| 5          | 9,860                | 1                | Radiometric data            |                       |
| 6          | 1,620                | 1                | Data quality summary        |                       |
| 7          | 5000                 | 1                | Facility related data       |                       |
| 1          | 720                  | 1                | SAR data file descriptor    | SAR Image Data        |
| 2 to n+1   | variable             | n                | Signal data                 |                       |
| 1          | 720                  | 1                | SAR trailer file descriptor | SAR Trailer           |

### 1.1.3 Record Data Type

The definition of data type is shown in the table below.

Table 1.1-3 Data Type

| Type (code) | Details                                                            |
|-------------|--------------------------------------------------------------------|
| Am          | ASCII character (Left fill if not specified)                       |
| Im          | Integer number in ASCII form (Right fill)                          |
| Fm.n        | Floating number in ASCII form (Right fill)                         |
| Em.n        | Exponential number in ASCII form (Right fill)                      |
| Bm          | Binary number (the first byte is the most significant, big endian) |

Where:

m : Number of digits

n : Number of decimal places

#### 1.1.4 Record Type Code and Record Subtype Code

Each record has record type code and record subtype code to distinguish each other.

Each record type is shown in the table below.

Table 1.1-4 Record Type of Each Record

| Record Name                | First Record Type | Record Type | Second Record Type | Third Record Type | Record Length [bytes] |
|----------------------------|-------------------|-------------|--------------------|-------------------|-----------------------|
| Volume descriptor          | 192               | 192         | 18                 | 18                | 360                   |
| File pointer               | 219               | 192         | 18                 | 18                | 360                   |
| Text                       | 18                | 192         | 18                 | 18                | 360                   |
| SAR Leader file descriptor | 11                | 192         | 18                 | 18                | 720                   |
| Dataset summary            | 18                | 10          | 18                 | 20                | 4096                  |
| Platform location data     | 18                | 30          | 18                 | 20                | 4680                  |
| Attitude data              | 18                | 40          | 18                 | 20                | 16384                 |

| Record Name                 | First Record Type | Record Type | Second Record Type | Third Record Type | Record Length [bytes] |
|-----------------------------|-------------------|-------------|--------------------|-------------------|-----------------------|
| Radiometric data            | 18                | 50          | 18                 | 20                | 9860                  |
| Data quality summary        | 18                | 60          | 18                 | 20                | 1620                  |
| Facility related data       | 18                | 200         | 18                 | 70                | 5000                  |
| SAR data file descriptor    | 50                | 192         | 18                 | 18                | 720                   |
| Signal data                 | 50                | 10          | 18                 | 20                | Variable              |
| SAR trailer file descriptor | 63                | 192         | 18                 | 18                | 720                   |

### 1.1.5 Contents of Records in SLC CEOS Files

The record formats are shown in the tables below.

Table 1.1-5 Volume Descriptor Record

| Field No. | Byte No. | Type | Description                           | Remarks |
|-----------|----------|------|---------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 1                     |         |
| 2         | 5        | B1   | First subtype code = 192              |         |
| 3         | 6        | B1   | Record type code = 192                |         |
| 4         | 7        | B1   | Second subtype code = 18              |         |
| 5         | 8        | B1   | Third subtype code= 18                |         |
| 6         | 9-12     | B4   | Record length = 360                   |         |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab' : ASCII      |         |
| 8         | 15-16    | A2   | Blank                                 |         |
| 9         | 17-28    | A12  | Format descriptor ID = 'CEOS-SARbbbb' |         |

| Field No. | Byte No. | Type | Description                                                                                                                                                                                                        | Remarks |
|-----------|----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 10        | 29-30    | A2   | Revision level of the document = 'bA', 'bB', ...                                                                                                                                                                   |         |
| 11        | 31-32    | A2   | Superstructure format revision level = 'bA', 'bB', ...                                                                                                                                                             |         |
| 12        | 33-44    | A12  | Software release and revision number = "NNN.NNNbbbbbb"                                                                                                                                                             |         |
| 13        | 45-60    | A16  | Physical Volume ID = 'SYNSbbbbbbbbbbbbbb'                                                                                                                                                                          |         |
| 14        | 61-76    | A16  | Logical volume ID = 'MMMMMNNYYYYmmDD'<br>MMMMM = Mission name ('STRIX')<br>N = Mission ID (Alpha='A', Beta='B', 1='1')<br>YYYY = Product creation year<br>mm = Product creation month<br>DD = Product creation day |         |
| 15        | 77-92    | A16  | Volume set ID = 'MMMMMMMMbbbbbbbbbb'<br>MMMMMM = Mission name ('Strix-A', 'Strix-B', 'Strix-1')                                                                                                                    |         |
| 16        | 93-94    | I2   | Number of physical volumes in the logical volume = 'b1'                                                                                                                                                            |         |
| 17        | 95-96    | I2   | First tape's sequence number of the physical volume = 'b1'                                                                                                                                                         |         |
| 18        | 97-98    | I2   | Last tape's sequence number of the physical volume = 'b1'                                                                                                                                                          |         |
| 19        | 99-100   | I2   | Current tape's sequence number of the physical volume = 'b1'                                                                                                                                                       |         |
| 20        | 101-104  | I4   | Number of files in the logical volume following the volume directory file = 'bbb3':                                                                                                                                |         |

| Field No. | Byte No. | Type | Description                                                                                                                                                                           | Remarks |
|-----------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 21        | 104-108  | I4   | Number of logical volumes in the volume set = 'bbb1'                                                                                                                                  |         |
| 22        | 109-112  | I4   | Number of logical volumes in a physical volume = 'bbb1'                                                                                                                               |         |
| 23        | 113-120  | A8   | Logical volume creation date<br>='YYYYMMDD' (without zero suppression)<br>YYYY: Year ('0001'-'9999')<br>MM: Month ('01'-'12')<br>DD: Day ('01'-'31')                                  |         |
| 24        | 121-128  | A8   | Logical volume creation time<br>='HHMMSSXX' (without zero suppression)<br>HH: Hour ('00'-'23')<br>MM: Minute ('00'-'59')<br>SS: Second ('00'-'59')<br>XX: 10 milliseconds ('00'-'99') |         |
| 25        | 129-140  | A12  | Logical volume creation country (Japan)<br>='JAPANbbbbbbb'                                                                                                                            |         |
| 26        | 141-148  | A8   | Logical volume creator = 'SYNSbbbb'                                                                                                                                                   |         |
| 27        | 149-160  | A12  | Logical volume creation facility = 'SYNSbbbbbbb'                                                                                                                                      |         |
| 28        | 161-164  | I4   | Number of file pointer records in the volume directory = 'bbb3'                                                                                                                       |         |
| 29        | 165-168  | I4   | Number of text records in the volume directory = 'bbb1'                                                                                                                               |         |
| 30        | 169-260  | A92  | Volume descriptor spare area = blank                                                                                                                                                  |         |
| 31        | 261-360  | A100 | Private fields = blank                                                                                                                                                                |         |

Table 1.1-6 File Pointer Record

| Field No. | Byte No. | Type | Description                                                                                                                                                                                                                                            | Remarks          |
|-----------|----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1         | 1-4      | B4   | Record Number = 1                                                                                                                                                                                                                                      |                  |
| 2         | 5        | B1   | First subtype code = 219                                                                                                                                                                                                                               |                  |
| 3         | 6        | B1   | Record type code = 192                                                                                                                                                                                                                                 |                  |
| 4         | 7        | B1   | Second subtype code = 18                                                                                                                                                                                                                               |                  |
| 5         | 8        | B1   | Third subtype code= 18                                                                                                                                                                                                                                 |                  |
| 6         | 9-12     | B4   | Record length = 360                                                                                                                                                                                                                                    |                  |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab'; ASCII                                                                                                                                                                                                                        |                  |
| 8         | 15-16    | A2   | Blank                                                                                                                                                                                                                                                  |                  |
| 9         | 17-20    | I4   | Reference file number<br>Leader file ='bbb1'<br>Image file ='bbb2'<br>Trailer file ='bbb3'                                                                                                                                                             |                  |
| 10        | 21-36    | A16  | Reference file ID<br>='MMMMMNbTFFFFbbbb'<br>MMMMM: Mission name ('STRIX')<br>N: Mission number (Alpha ='A', Beta='B', 1='1')<br>T: Processing level code (* 1)<br>FFFF: File type<br>'SARL': Leader file<br>'IMOP': Image file<br>'SART': Trailer file | (*1)<br>'B': SLC |
| 11        | 37-64    | A28  | Reference file class<br>='SARLEADERbFILEbbbbbbbbbbbbbb':<br>For leader file<br>='IMAGERYbOPTIONSbFILEbbbbbbbb':<br>For image file<br>='SARTRAILERbFILEbbbbbbbbbbbbbb':<br>For trailer file                                                             |                  |

| Field No. | Byte No. | Type | Description                                                                                                                                                            | Remarks |
|-----------|----------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 12        | 65-68    | A4   | Reference file class code<br>='SARL': For leader files<br>='IMOP': For image files<br>='SART': For trailer files                                                       |         |
| 13        | 69-96    | A28  | Reference file data type<br>='MIXEDbBINARYbANDBASCIIbBBBBB'                                                                                                            |         |
| 14        | 97-100   | A4   | Reference file data type code ='MBAA'                                                                                                                                  |         |
| 15        | 101-108  | I8   | Number of records in the reference file (zero suppression)<br>Leader file ='BBBBBBB7' (SLC)<br>Image file = number of SAR data records + 1<br>Trailer file ='BBBBBBB1' |         |
| 16        | 109-116  | I8   | Length of the first record in reference file<br>='BBBBB720'                                                                                                            |         |
| 17        | 117-124  | I8   | Maximum record length (byte length) of the reference file: 'bbbLLLL'                                                                                                   |         |
| 18        | 125-136  | A12  | Reference file record length type<br>='VARIABLEbLEN': For leader files<br>='VARIABLEbLEN': For image files<br>='VARIABLEbLEN': For trailer files                       |         |
| 19        | 137-140  | A4   | Reference file record length type code<br>='VARE': For leader files<br>='VARE': For image files<br>='VARE': For trailer files                                          |         |
| 20        | 141-142  | I2   | The number of the physical volume set containing the first record of the file ='b1'                                                                                    |         |
| 21        | 143-144  | I2   | The number of the physical volume set containing the last record of the file = 'b1'                                                                                    |         |
| 22        | 145-152  | I8   | Record number of the first record on this physical volume ='BBBBBBB1'                                                                                                  |         |

| Field No. | Byte No. | Type | Description                                                                                                                                                 | Remarks |
|-----------|----------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 23        | 153-160  | I8   | Record number of the last record on this physical volume<br>Leader file = 'bbbbbbb7' (SLC)<br>Image file = number of lines + 1<br>Trailer file = 'bbbbbbb1' |         |
| 24        | 161-260  | A100 | Blank                                                                                                                                                       |         |
| 25        | 261-360  | A100 | Private fields = blank                                                                                                                                      |         |

Table 1.1-7 Text Record

| Field No. | Byte No. | Type | Description                               | Remarks |
|-----------|----------|------|-------------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 5                         |         |
| 2         | 5        | B1   | First subtype code = 18                   |         |
| 3         | 6        | B1   | Record type code = 192                    |         |
| 4         | 7        | B1   | Second subtype code = 18                  |         |
| 5         | 8        | B1   | Third subtype code = 18                   |         |
| 6         | 9-12     | B4   | Record length = 360                       |         |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab' In case of ASCII |         |
| 8         | 15-16    | A2   | Blank                                     |         |

| Field No. | Byte No. | Type | Description                                                                                                                                                                                                                                                                                                                | Remarks |
|-----------|----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 9         | 17-56    | A40  | Deliverable ID (Product ID) ='PRODUCT:<br>DDEFFFGb ~ b'<br>DD: Observation mode<br>SL: Sliding spotlight mode<br>SM: Stripmap mode<br>E: Observation direction<br>L: Left looking<br>R: Right side observation<br>FFF: Processing level<br>SLC: Single Look Complex<br>G: Orbit direction<br>A: Ascending<br>D: Descending |         |
| 10        | 57-116   | A60  | Product creation location / date / time<br>(without zero suppression)<br>='PROCESS:<br>JAPAN-SYNS-STRIXNbYYYYMMDDbHHM<br>MSSb ~ b'<br>N: A, B, 1<br>YYYYMMDD: Creation date<br>HHMMSS: Creation time (UTC)                                                                                                                 |         |
| 11        | 117-156  | A40  | Physical tape ID ='TAPEbID: b ~ b'                                                                                                                                                                                                                                                                                         |         |
| 12        | 157-196  | A40  | Scene ID ='ORBITb:<br>AAAAABBBBBBCCCCC-YYMMDDb ~ b'<br>AAAAAA: Satellite type ('STRIXN') N:<br>A, B or 1<br>BBBBBB: Scene center orbit number<br>CCCCC: Scene center frame number<br>-: Separator<br>YYMMDD: Scene center observation<br>date (YY: the last two digits of the year,<br>MM: month, DD:the day)              |         |
| 13        | 197-236  | A40  | Scene location ID (without zero<br>suppression)<br>='FRAMEbCENTRE: b ~ b': SLC                                                                                                                                                                                                                                             |         |

| Field No. | Byte No. | Type | Description | Remarks |
|-----------|----------|------|-------------|---------|
| 14        | 237-360  | A124 | Blank       |         |

Table 1.1-8 Leader File Descriptor Record

| Field No. | Byte No. | Type | Description                                          | Remarks |
|-----------|----------|------|------------------------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 1                                    |         |
| 2         | 5        | B1   | First subtype code = 11                              |         |
| 3         | 6        | B1   | Record type code = 192                               |         |
| 4         | 7        | B1   | Second subtype code = 18                             |         |
| 5         | 8        | B1   | Third subtype code= 18                               |         |
| 6         | 9-12     | B4   | Record length = 720                                  |         |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab': ASCII                      |         |
| 8         | 15-16    | A2   | Continue flag = 'bb'                                 |         |
| 9         | 17-28    | A12  | Format control document ID='CEOS-SARbbbb'            |         |
| 10        | 29-30    | A2   | Format control document revision level = 'bA'        |         |
| 11        | 31-32    | A2   | Record format revision level = 'bA'                  |         |
| 12        | 33-44    | A12  | Software Release & Revision Number = 'NNN.NNNbbbbbb' |         |
| 13        | 45-48    | I4   | Number of files = 'bbb1'                             |         |

| Field No. | Byte No. | Type | Description                                                                                                                                                                                  | Remarks |
|-----------|----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 14        | 49-64    | A16  | File ID ='MMMMMNbTFFFFbbbb'<br>MMMMM: Mission name ('STRIX')<br>N: Mission ID (Alpha='A', Beta='B', 1='1')<br>T: Processing level code<br>SLC ='B'<br>FFFF: File type<br>Leader file ='SARL' |         |
| 15        | 65-68    | A4   | Record sequence and location type flag ='FSEQ'                                                                                                                                               |         |
| 16        | 69-76    | I8   | Sequence number of location = 'bbbbbbb1'                                                                                                                                                     |         |
| 17        | 77-80    | I4   | Field length of sequence number = 'bbb4'                                                                                                                                                     |         |
| 18        | 81-84    | A4   | Record code and location type flag = 'FTYP'                                                                                                                                                  |         |
| 19        | 85-92    | I8   | Record code position ='bbbbbbb5'                                                                                                                                                             |         |
| 20        | 93-96    | I4   | Field length of record code ='bbb4'                                                                                                                                                          |         |
| 21        | 97-100   | A4   | Record length and location type flag = 'FLGT'                                                                                                                                                |         |
| 22        | 101-108  | I8   | Location of record length ='bbbbbbb9'                                                                                                                                                        |         |
| 23        | 109-112  | I4   | Field length of record length ='bbb4'                                                                                                                                                        |         |
| 24        | 113-180  | A68  | Blank                                                                                                                                                                                        |         |
| 25        | 181-186  | I6   | Number of dataset summary records ='bbbbbb1'                                                                                                                                                 |         |
| 26        | 187-192  | I6   | Dataset summary record length ='bb4096'                                                                                                                                                      |         |
| 27        | 193-198  | I6   | Number of map projection data records ='bbbbbb0'                                                                                                                                             |         |

| Field No. | Byte No. | Type | Description                                            | Remarks |
|-----------|----------|------|--------------------------------------------------------|---------|
| 28        | 199-204  | I6   | Map projection data record length = 'bbbbbb0'          |         |
| 29        | 205-210  | I6   | Number of platform location data records = 'bbbbbb1'   |         |
| 30        | 211-216  | I6   | Platform location data record length = 'bb4680'        |         |
| 31        | 217-222  | I6   | Number of attitude data records = 'bbbbbb1'            |         |
| 32        | 223-228  | I6   | Attitude data record length = 16384                    |         |
| 33        | 229-234  | I6   | Number of radiometric data records = 'bbbbbb1'         |         |
| 34        | 235-240  | I6   | Radiometric record length = 'bb9860'                   |         |
| 35        | 241-246  | I6   | Number of radiometric compensation records = 'bbbbbb0' |         |
| 36        | 247-252  | I6   | Radiometric compensation record length = 'bbbbbb0'     |         |
| 37        | 253-258  | I6   | Number of data quality summary records = 'bbbbbb1'     |         |
| 38        | 259-264  | I6   | Data quality summary record length = 'bb1620'          |         |
| 39        | 265-270  | I6   | Number of data histogram records = 'bbbbbb0'           |         |
| 40        | 271-276  | I6   | Data histogram record length = 'bbbbbb0'               |         |
| 41        | 277-282  | I6   | Number of range spectra records = 'bbbbbb0'            |         |
| 42        | 283-288  | I6   | Range spectra record length = 'bbbbbb0'                |         |

| Field No. | Byte No. | Type | Description                                          | Remarks |
|-----------|----------|------|------------------------------------------------------|---------|
| 43        | 289-294  | I6   | Number of DEM descriptor records = 'bbbbbb0'         |         |
| 44        | 295-300  | I6   | DEM descriptor record length = 'bbbbbb0'             |         |
| 45        | 301-306  | I6   | Number of radar parameter update records = 'bbbbbb0' |         |
| 46        | 307-312  | I6   | Radar parameter update record length = 'bbbbbb0'     |         |
| 47        | 313-318  | I6   | Number of annotation data records = 'bbbbbb0'        |         |
| 48        | 319-324  | I6   | Annotation data record length = 'bbbbbb0'            |         |
| 49        | 325-330  | I6   | Number of detail processing records = 'bbbbbb0'      |         |
| 50        | 331-336  | I6   | Detail processing record length = 'bbbbbb0'          |         |
| 51        | 337-342  | I6   | Number of calibration records = 'bbbbbb0'            |         |
| 52        | 343-348  | I6   | Calibration record length = 'bbbbbb0'                |         |
| 53        | 349-354  | I6   | Number of GCP records = 'bbbbbb0'                    |         |
| 54        | 355-360  | I6   | GCP record length = 'bbbbbb0'                        |         |
| 55        | 361-420  | A60  | Blank                                                |         |
| 56        | 421-426  | I6   | Number of facility data records = 'bbbbbb1'          |         |
| 57        | 427-432  | I6   | Facility data record length = 'bb5000'               |         |
| 58        | 433-720  | A288 | Blank                                                |         |

Table 1.1-9 Data Set Summary Records

| Field No. | Byte No. | Type | Description                                                                                                                                                                                                                                                                                                               | Remarks |
|-----------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 2                                                                                                                                                                                                                                                                                                         |         |
| 2         | 5        | B1   | First subtype code = 18                                                                                                                                                                                                                                                                                                   |         |
| 3         | 6        | B1   | Record type code = 10                                                                                                                                                                                                                                                                                                     |         |
| 4         | 7        | B1   | Second subtype code = 18                                                                                                                                                                                                                                                                                                  |         |
| 5         | 8        | B1   | Third subtype code= 20                                                                                                                                                                                                                                                                                                    |         |
| 6         | 9-12     | B1   | Record length = 4096                                                                                                                                                                                                                                                                                                      |         |
| 7         | 13-16    | I4   | Dataset summary record sequence number = 'bbb1'                                                                                                                                                                                                                                                                           |         |
| 8         | 17-20    | I4   | SAR channel ID = blank                                                                                                                                                                                                                                                                                                    |         |
| 9         | 21-52    | A32  | Scene ID<br>='AAAAAABBBBBBCCCCCYMMDDb ~<br>b'<br>AAAAAA: Satellite type (='STRIXN') N:A,<br>B or 1<br>BBBBBB: Scene center accumulated<br>orbit number<br>CCCCCC: Scene center frame number<br>-: Separator (hyphen)<br>YYMMDD: Scene center observation date<br>(YY: last two digits of the year, MM:<br>month, DD: day) |         |
| 10        | 53-68    | A16  | Number of scene reference =<br>'bbbbbbbbbbbbbbbb'                                                                                                                                                                                                                                                                         |         |

| Field No. | Byte No. | Type  | Description                                                                                                                                                     | Remarks |
|-----------|----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 11        | 69-100   | A32   | Scene center time<br>='YYYYMMDDHHMMSSTTTbbbbbbbbbbbbb<br>bbbb'<br>(No zero suppression)<br>YYYYMMDD: YYYY: year, MM: month, DD:<br>day<br>HHMMSSTTT: Time (UTC) |         |
| 12        | 101-116  | A16   | Blank                                                                                                                                                           |         |
| 13        | 117-132  | F16.7 | Geodetic latitude (degrees) in the center<br>of the processed scene<br>= blank: SLC                                                                             |         |
| 14        | 133-148  | F16.7 | Geodetic longitude (degrees) in the<br>center of the processed scene<br>= blank: SLC                                                                            |         |
| 15        | 149-164  | F16.7 | Processed scene center true heading<br>(degrees) = blank: SLC                                                                                                   |         |
| 16        | 165-180  | A16   | Ellipsoidal model = 'WGS84b ~ b'                                                                                                                                |         |
| 17        | 181-196  | F16.7 | Semi-major axis of ellipsoid (km) =<br>6378.1370000                                                                                                             |         |
| 18        | 197-212  | F16.7 | Semi-minor axis of ellipsoid (km) =<br>6356.7523142                                                                                                             |         |
| 19        | 213-228  | F16.7 | Earth mass ( $10^{24}$ kg) = 5.9740000                                                                                                                          |         |
| 20        | 229-244  | F16.7 | Gravitational constant ( $10^{-14}$ m <sup>3</sup> / s <sup>2</sup> kg) =<br>3.9860050                                                                          |         |
| 21        | 245-260  | F16.7 | Ellipsoid J2 parameter = $0.1082629 \cdot 10^{-2}$                                                                                                              |         |
| 22        | 261-276  | F16.7 | Ellipsoid J3 parameter =<br>$-0.0000254 \cdot 10^{-1}$                                                                                                          |         |

| Field No. | Byte No. | Type  | Description                                                                                                                                                                                                                       | Remarks                   |
|-----------|----------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 23        | 277-292  | F16.7 | Oblong parameter (mechanical shape coefficient J4 term) ( $10^{-1}$ ) = $-0.0000162 \times 10^{-1}$                                                                                                                               |                           |
| 24        | 293-308  | A16   | Blank                                                                                                                                                                                                                             |                           |
| 25        | 309-324  | F16.7 | Average terrain height above ellipsoid at scene center                                                                                                                                                                            |                           |
| 26        | 325-332  | I8    | Scene center line No. (Including zero fill)                                                                                                                                                                                       | N/2 (N: number of lines)  |
| 27        | 333-340  | I8    | Scene center pixel No. (Including zero fill)                                                                                                                                                                                      | M/2 (M: number of pixels) |
| 28        | 341-356  | F16.7 | Processing scene length (km) = blank                                                                                                                                                                                              |                           |
| 29        | 357-372  | F16.7 | Processing scene width (km) = blank                                                                                                                                                                                               |                           |
| 30        | 373-388  | A16   | Blank                                                                                                                                                                                                                             |                           |
| 31        | 389-392  | I4    | Number of SAR channels = 'bbb1'                                                                                                                                                                                                   |                           |
| 32        | 393-396  | A4    | Blank                                                                                                                                                                                                                             |                           |
| 33        | 397-412  | A16   | Sensor platform name (ID) StriX: 'STRIXbbbbbbbbbb'                                                                                                                                                                                |                           |
| 34        | 413-444  | A32   | Sensor ID and operation mode<br>='AAAAAA-BB-CCbb-bbbbbbbbbbbbbbb<br>bb'<br>AAAAAA: Satellite type (= 'STRIXN') N:A,<br>B or 1<br>BB: SAR band ('Xb')<br>CC: Operation mode<br>'01': Stripmap mode<br>'02': Sliding spotlight mode |                           |
| 35        | 445-452  | I8    | Total satellite orbit number                                                                                                                                                                                                      |                           |

| Field No. | Byte No. | Type  | Description                                                                                                                                                                           | Remarks |
|-----------|----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 36        | 453-460  | F8.3  | Sensor platform geodetic latitude at nadir corresponding to scene center = blank: SLC                                                                                                 |         |
| 37        | 461-468  | F8.3  | Sensor platform geodetic longitude at nadir corresponding to scene center = blank: SLC                                                                                                |         |
| 38        | 469-476  | F8.3  | Sensor platform heading at nadir corresponding to scene center = blank: SLC                                                                                                           |         |
| 39        | 477-484  | F8.3  | Sensor angle (degrees) relative to the flight direction of the sensor platform = 'bb90.000' (90.0: left side), (-90.0: right side)                                                    |         |
| 40        | 485-492  | F8.3  | Incidence angle (degrees) at the scene center                                                                                                                                         |         |
| 41        | 493-500  | A8    | Blank                                                                                                                                                                                 |         |
| 42        | 501-516  | F16.7 | Radar wavelength (m): Nominal value                                                                                                                                                   |         |
| 43        | 517-518  | A2    | Motion compensation indicator = '00' fixed<br>= '00': no compensation<br>= '01': on board compensation<br>= '10': in processor compensation<br>= '11': both on board and in processor |         |
| 44        | 519-534  | A16   | Range pulse code<br>='LINEARbFMbCHIRPb'                                                                                                                                               |         |
| 45        | 535-550  | E16.7 | Range pulse amplitude coefficient #1 = Nominal Value<br>Center frequency $\xi_1$ with respect to pulse width $\tau$ of linear FM modulation chirp<br>(Constant term)                  |         |

| Field No. | Byte No. | Type  | Description                                                                                                                                                        | Remarks |
|-----------|----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 46        | 551-566  | E16.7 | Range pulse amplitude coefficient #2 = Nominal value<br>FM rate $\xi_2$ for pulse width $\tau$ of linear FM modulation chirp<br>(Linear coefficient term)          |         |
| 47        | 567-582  | E16.7 | Range pulse amplitude coefficient #3 = Nominal value (= 0.0)<br>FM rate $\xi_3$ for pulse width $\tau$ of linear FM modulation chirp (Quadratic coefficient terms) |         |
| 48        | 583-598  | E16.7 | Range pulse amplitude coefficient #4 = Nominal value (= 0.0)<br>FM rate $\xi_4$ for pulse width $\tau$ of linear FM modulation chirp (Cubic coefficient terms)     |         |
| 49        | 599-614  | E16.7 | Range pulse amplitude coefficient #5 = Nominal value (= 0.0)<br>FM rate $\xi_5$ for pulse width $\tau$ of linear FM modulation chirp (Quartic term coefficient)    |         |
| 50        | 615-630  | E16.7 | Range pulse phase coefficient #1 (constant term) = blank                                                                                                           |         |
| 51        | 631-646  | E16.7 | Range pulse phase coefficient #2 (linear coefficient term) = blank                                                                                                 |         |
| 52        | 647-662  | E16.7 | Range pulse phase coefficient #3 (secondary coefficient term) = blank                                                                                              |         |
| 53        | 663-678  | E16.7 | Range pulse phase coefficient #4 (third-order coefficient term) = blank                                                                                            |         |
| 54        | 679-694  | E16.7 | Range pulse phase coefficient #5 (quartic coefficient term) = blank                                                                                                |         |

| Field No. | Byte No. | Type  | Description                                                                                                                                      | Remarks |
|-----------|----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 55        | 695-702  | I8    | Down linked data chirp extraction index<br>linear-up chirp ='bbbbbbb0'<br>linear-down chirp ='bbbbbbb1'<br>linear-up and -down chirp ='bbbbbbb2' |         |
| 56        | 703-710  | A8    | Blank                                                                                                                                            |         |
| 57        | 711-726  | F16.7 | Sampling frequency (MHz) nominal value<br>Set the observation auxiliary data value of the first record                                           |         |
| 58        | 727-742  | F16.7 | Range gate (rise at the start of the image) (μsec)<br>Set the observation auxiliary data value of the first record                               |         |
| 59        | 743-758  | F16.7 | Range pulse width (μsec)<br>Set the observation auxiliary data value of the first record                                                         |         |
| 60        | 759-762  | A4    | Baseband conversion flag ='YESb' (fixed)                                                                                                         |         |
| 61        | 763-766  | A4    | Range compression flag = 'YESb':                                                                                                                 |         |
| 62        | 767-782  | F16.7 | Receiver gain for like polarized (at the start of the image) Nominal value                                                                       |         |
| 63        | 783-798  | F16.7 | Receiver gain for cross-polarized (at the start of the image) Nominal value                                                                      |         |
| 64        | 799-806  | I8    | Quantization in bits per channel = 'bbbbbbb'                                                                                                     |         |
| 65        | 807-818  | A12   | Quantization descriptor ='UNIFORMbI, Qb'                                                                                                         |         |
| 66        | 819-834  | F16.7 | DC bias nominal value of component I                                                                                                             |         |
| 67        | 835-850  | F16.7 | DC bias nominal value of Q component                                                                                                             |         |
| 68        | 851-866  | F16.7 | Gain imbalance for I & Q = Nominal value                                                                                                         |         |

| Field No. | Byte No.  | Type  | Description                                                                                                     | Remarks |
|-----------|-----------|-------|-----------------------------------------------------------------------------------------------------------------|---------|
| 69        | 867-882   | A16   | Blank                                                                                                           |         |
| 70        | 883-898   | A16   | Blank                                                                                                           |         |
| 71        | 899-914   | F16.7 | Electronic boresight                                                                                            |         |
| 72        | 915-930   | F16.7 | Mechanical boresight                                                                                            |         |
| 73        | 931-934   | A4    | Echo tracker-on/off = 'OFFb' (fixed value)                                                                      |         |
| 74        | 935-950   | F16.7 | Acquisition PRF (mHz)                                                                                           |         |
| 75        | 951-966   | F16.7 | Two-way antenna beam width [deg]<br>(Elevation, Effective value) = Nominal value                                |         |
| 76        | 967-982   | F16.7 | Two-way antenna beam width [deg]<br>(Azimuth, Effective value) = Nominal value                                  |         |
| 77        | 983-998   | I16   | Satellite encoded binary time code:<br>Standard satellite time counter of error time information = blank        |         |
| 78        | 999-1030  | A32   | Satellite clock time: Standard ground time of error time information (Tgref) = blank                            |         |
| 79        | 1031-1046 | I16   | Satellite clock increment [nsec]: Error time information of calculation<br>satellitecounter cycle (Psc) = blank |         |
| 80        | 1047-1062 | A16   | Processing equipment (ID) = 'SYNSbbbbbbbbbbb'                                                                   |         |
| 81        | 1063-1070 | A8    | Processing system name (ID) = 'SYNSbbbb'                                                                        |         |

| Field No. | Byte No.  | Type  | Description                                                                                                                                | Remarks |
|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 82        | 1071-1078 | A8    | Processing version ID<br>Same as the first 8 characters of the volume descriptor software release & revision number                        |         |
| 83        | 1079-1094 | A16   | Process code of processing equipment = 'bbbbbbbbbbbbbbbb'                                                                                  |         |
| 84        | 1095-1110 | A16   | Product level code = 'SLCbbbbbbbbbbbb' (SLC)                                                                                               |         |
| 85        | 1111-1142 | A32   | Product type specifier<br>For SLC: ='BASICbIMAGEbb ~ b'                                                                                    |         |
| 86        | 1143-1174 | A32   | Processing algorithm ID = blank                                                                                                            |         |
| 87        | 1175-1190 | F16.7 | Number of looks in the azimuth direction (nominal value)<br>SLC = 1.0                                                                      |         |
| 88        | 1191-1206 | F16.7 | Number of looks in the range direction (nominal value) = 1.0                                                                               |         |
| 89        | 1207-1222 | F16.7 | Bandwidth per look in azimuth (Hz)<br>Same as 1239-1254 bytes                                                                              |         |
| 90        | 1223-1238 | F16.7 | Bandwidth per look in the range direction (Hz)<br>(3dB down width of the power spectrum of the reference function for a sub aperture look) |         |
| 91        | 1239-1254 | F16.7 | Bandwidth in azimuth direction (Hz)<br>(3dB down width of power spectrum of the reference function for full aperture)                      |         |
| 92        | 1255-1270 | F16.7 | Bandwidth in the range direction (kHz)                                                                                                     |         |
| 93        | 1271-1302 | A32   | Window function in azimuth direction = 1: RECTANGLE                                                                                        |         |

| Field No. | Byte No.  | Type  | Description                                                                                                    | Remarks |
|-----------|-----------|-------|----------------------------------------------------------------------------------------------------------------|---------|
| 94        | 1303-1334 | A32   | Window function in the range direction = 1: RECTANGLE                                                          |         |
| 95        | 1335-1350 | A16   | Data input source (eq. HDDT-ID, etc.)<br>Online transmission ='ONLINEb ~ b'                                    |         |
| 96        | 1351-1366 | F16.7 | Resolution in the ground range direction (nominal value) (m)<br>= blank: For SLC                               |         |
| 97        | 1367-1382 | F16.7 | Resolution in azimuth direction (nominal value) (m)<br>= blank: For SLC                                        |         |
| 98        | 1383-1398 | F16.7 | Radiometric parameter (Bias) = blank                                                                           |         |
| 99        | 1399-1414 | F16.7 | Radiometric parameter (Gain) = blank                                                                           |         |
| 100       | 1415-1430 | F16.7 | Along track Doppler frequency (center) constant term at early edge of image (Hz)                               |         |
| 101       | 1431-1446 | F16.7 | Along track Doppler frequency (center) linear coefficient terms at early edge of image (Hz / pixel)            |         |
| 102       | 1447-1462 | F16.7 | Along track Doppler frequency (center) quadratic coefficient terms at early edge of image (Hz / pixel / pixel) |         |
| 103       | 1463-1478 | A16   | Blank                                                                                                          |         |
| 104       | 1479-1494 | F16.7 | Cross track Doppler frequency (center) constant term at early edge of image (Hz)                               |         |
| 105       | 1495-1510 | F16.7 | Cross track Doppler frequency (center) linear coefficient terms at early edge of image (Hz / pixel)            |         |
| 106       | 1511-1526 | F16.7 | Cross track Doppler frequency (center) quadratic coefficient terms at early edge of image (Hz / pixel / pixel) |         |

| Field No. | Byte No.  | Type  | Description                                                                                                        | Remarks |
|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------|---------|
| 107       | 1527-1534 | A8    | Time direction indicator along pixel direction= blank (fixed)                                                      |         |
| 108       | 1535-1542 | A8    | Time direction indicator along line direction<br>Ascending ='ASCENDbb'<br>Descending ='DESCENDb'                   |         |
| 109       | 1543-1558 | F16.7 | Along track Doppler frequency rate constant terms at early edge of the image (Hz / sec)                            |         |
| 110       | 1559-1574 | F16.7 | Along track Doppler frequency rate linear coefficient at early edge of the image (Hz / sec / pixel)                |         |
| 111       | 1575-1590 | F16.7 | Along track Doppler frequency rate quadratic coefficient at early edge of the imagedata (Hz / sec / pixel / pixel) |         |
| 112       | 1591-1606 | A16   | Blank                                                                                                              |         |
| 113       | 1607-1622 | F16.7 | Cross track Doppler frequency rate constant terms at early edge of the image (Hz / sec)                            |         |
| 114       | 1623-1638 | F16.7 | Cross track Doppler frequency rate linear coefficient at early edge of the image (Hz / sec / pixel)                |         |
| 115       | 1639-1654 | F16.7 | Cross track Doppler frequency rate quadratic coefficient at early edge of the image (Hz / sec / pixel / pixel)     |         |
| 116       | 1655-1670 | A16   | Blank                                                                                                              |         |
| 117       | 1671-1678 | A8    | Line content indicator<br>= SLC:'RANGEbbb'                                                                         |         |

| Field No. | Byte No.  | Type  | Description                                                                                                                                                                                                | Remarks |
|-----------|-----------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 118       | 1679-1682 | A4    | Clutter lock applied flag ='NOTb'<br>='YESb','NOTb'                                                                                                                                                        |         |
| 119       | 1683-1686 | A4    | Auto-focusing applied flag ='NOTb'<br>='YESb','NOTb'                                                                                                                                                       |         |
| 120       | 1687-1702 | F16.7 | Line spacing (m)<br>SLC: Calculated value of spacing in the azimuth direction                                                                                                                              |         |
| 121       | 1703-1718 | F16.7 | Pixel spacing (m)<br>SLC: Calculated value of spacing in the range direction                                                                                                                               |         |
| 122       | 1719-1734 | A16   | Processor range compression designator<br>= 'SYNTHETICbCHIRPb'                                                                                                                                             |         |
| 123       | 1735-1750 | F16.7 | Doppler center frequency approximation<br>coefficient constant term (a)                                                                                                                                    |         |
| 124       | 1751-1766 | F16.7 | Doppler center frequency approximation<br>coefficient Linear coefficient term (b)<br>$f_d = a + b \cdot R$<br>$f_d$ : Doppler center frequency (Hz)<br>R: Slant range (km)                                 |         |
| 125       | 1767-1770 | I4    | Calibration mode data position flag<br>='bbb0'<br>No calibration mode data area<br>='bbb0'<br>Observation start side<br>='bbb1'<br>Observation end side<br>='bbb2'<br>Observation start / end side ='bbb3' |         |
| 126       | 1771-1778 | I8    | Start line number of calibration at the side of start<br>In case of calibration location flag is '0',<br>always = 'bbbbbbb0'                                                                               |         |

| Field No. | Byte No.  | Type  | Description                                                                                                                    | Remarks                                             |
|-----------|-----------|-------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| 127       | 1779-1786 | I8    | End line number of calibration at the side of start<br>In case of calibration location flag is '0', always = 'bbbbbbb0'        |                                                     |
| 128       | 1787-1794 | I8    | Start line number of calibration at the side of end<br>In case of calibration location flag is '0', always = 'bbbbbbb0'        |                                                     |
| 129       | 1795-1802 | I8    | End line number of calibration at the side of end<br>In case of calibration location flag is '0', always = 'bbbbbbb0'          |                                                     |
| 130       | 1803-1806 | I4    | PRF switching indicator = 'bbb0'<br>If the PRF has not changed in one scene = 'bbb0'<br>When PRF changes in one scene = 'bbb1' |                                                     |
| 131       | 1807-1814 | I8    | Line number of PRF switching<br>No change point: 'bbbbbbb1'                                                                    |                                                     |
| 132       | 1815-1830 | F16.7 | Beam center direction (degrees) at the center of the scene                                                                     |                                                     |
| 133       | 1831-1834 | I4    | Yaw steering flag<br>If not yaw steering = 'bbb1'<br>If yaw steering = 'bbb0'                                                  |                                                     |
| 134       | 1835-1838 | I4    | Blank                                                                                                                          |                                                     |
| 135       | 1839-1854 | F16.7 | Off Nadir angle (degrees)                                                                                                      | +: Left side observation, -: Right side observation |
| 136       | 1855-1858 | A4    | Blank                                                                                                                          |                                                     |
| 137       | 1859-1886 | A28   | Blank                                                                                                                          |                                                     |

| Field No.        | Byte No.  | Type                  | Description                                         | Remarks                                                                                                |
|------------------|-----------|-----------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| 138              | 1887-1906 | E20.1<br>3            | Incidence angle constant term (a0)                  | $\Theta = a_0 + a_1 \cdot R + a_2 \cdot R^2$<br>$\Theta$ : Incident angle (rad)<br>R: Slant range (km) |
| 139              | 1907-1926 | E20.1<br>3            | Incidence angle linear coefficient term (a1)        |                                                                                                        |
| 140              | 1927-1946 | E20.1<br>3            | Incidence angle quadratic coefficient term (a2)     |                                                                                                        |
| 141              | 1947-1966 | A20                   | Blank                                               |                                                                                                        |
| 142              | 1967-1986 | A20                   | Blank                                               |                                                                                                        |
| 143              | 1987-2006 | A20                   | Blank                                               |                                                                                                        |
| Image annotation |           |                       |                                                     |                                                                                                        |
| 144              | 2007-2014 | I8                    | Number of annotation points (up to 64) = 'bbbbbbb0' |                                                                                                        |
| 145              | 2015-2022 | A8                    | Blank                                               |                                                                                                        |
| 146              | 2023-2030 | I8                    | Line number of 1st annotation start = blank         |                                                                                                        |
| 147              | 2031-2038 | I8                    | Pixel number of 1st annotation start = blank        |                                                                                                        |
| 148              | 2039-2054 | A16                   | 1st annotation text = blank                         |                                                                                                        |
| 149-337          | 2055-4070 | (I8 * 2, A * 16) * 63 | 2nd to 64th annotations                             |                                                                                                        |
| 338              | 4071-4096 | A26                   | System reserved = blank                             |                                                                                                        |

Table 1.1-10 Platform Position Data Record

| Field No. | Byte No. | Type  | Description                                                                                                                                        | Remarks |
|-----------|----------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1         | 1-4      | B4    | Record Number = 3                                                                                                                                  |         |
| 2         | 5        | B1    | First subtype code = 18                                                                                                                            |         |
| 3         | 6        | B1    | Record type code = 30                                                                                                                              |         |
| 4         | 7        | B1    | Second subtype code = 18                                                                                                                           |         |
| 5         | 8        | B1    | Third subtype code = 20                                                                                                                            |         |
| 6         | 9-12     | B1    | Record length = 4680                                                                                                                               |         |
| 7         | 13-44    | A32   | Orbital element type<br>Onboard orbit =<br>'1bbbbbbbbbbbbbbbbbbbbbbbbbbbbbb<br>bbb'<br>Precise orbit =<br>'2bbbbbbbbbbbbbbbbbbbbbbbbbbbbbb<br>bbb' |         |
| 8         | 45-60    | F16.7 | 1st orbital element<br>Position vector in the earth fixed<br>coordinate system of the scene center (x)<br>[m]                                      |         |
| 9         | 61-76    | F16.7 | 2nd orbital element<br>Position vector in the earth fixed<br>coordinate system of the scene center (y)<br>[m]                                      |         |
| 10        | 77-92    | F16.7 | 3rd orbital element<br>Position vector in the earth fixed<br>coordinate system of the scene center (z)<br>[m]                                      |         |
| 11        | 93-108   | F16.7 | 4th orbital element<br>Velocity vector in the earth fixed<br>coordinate system of the scene center<br>(x') [m/sec]                                 |         |

| Field No. | Byte No. | Type       | Description                                                                                                  | Remarks |
|-----------|----------|------------|--------------------------------------------------------------------------------------------------------------|---------|
| 12        | 109-124  | F16.7      | 5th orbital element<br>Velocity vector in the earth fixed coordinate system of the scene center (y') [m/sec] |         |
| 13        | 125-140  | F16.7      | 6th orbital element<br>Velocity vector in the earth fixed coordinate system of the scene center (z') [m/sec] |         |
| 14        | 141-144  | I4         | Number of data points variable up to 28<br>Example:<br>Onboard orbit ='bb28'<br>Precise orbit ='bb28'        |         |
| 15        | 145-148  | I4         | Year of first point ='YYYY'                                                                                  |         |
| 16        | 149-152  | I4         | Month of first point ='bbMM'                                                                                 |         |
| 17        | 153-156  | I4         | Day of first point = 'bbDD'                                                                                  |         |
| 18        | 157-160  | I4         | Day in the year of first point (Example February 2:'bb33')                                                   |         |
| 19        | 161-182  | E22.1<br>5 | Seconds of the first point (Example, 0:51:30.23 = 3090.23)                                                   |         |
| 20        | 183-204  | E22.1<br>5 | Interval time between points (seconds) = ss                                                                  |         |
| 21        | 205-268  | A64        | Reference Coordinate System (ECI, ECR) = 'ECRbb ~ b'                                                         |         |
| 22        | 269-290  | E22.1<br>5 | Greenwich mean hour angle (degrees) = blank                                                                  |         |
| 23        | 291-306  | F16.7      | Along track position error (m) = blank                                                                       |         |
| 24        | 307-322  | F16.7      | Across track position error (m) = blank                                                                      |         |
| 25        | 323-338  | F16.7      | Radial position error (m/sec) = blank                                                                        |         |

| Field No.                   | Byte No.  | Type            | Description                                             | Remarks |
|-----------------------------|-----------|-----------------|---------------------------------------------------------|---------|
| 26                          | 339-354   | F16.7           | Along track velocity error (m/sec) = blank              |         |
| 27                          | 355-370   | F16.7           | Across track velocity error (m / sec) = blank           |         |
| 28                          | 371-386   | F16.7           | Radial velocity error (m / sec) = blank                 |         |
| FIRST POSITIONAL DATA POINT |           |                 |                                                         |         |
| 29                          | 387-452   | 3E22.15         | First data point position vector (x, y, z) (m)          |         |
| 30                          | 453-518   | 3E22.15         | First data point velocity vector (x', y', z') (m / sec) |         |
|                             | 519-4082  | 27*6*E<br>22.15 | Repeat 387-518 for up to 28 points                      |         |
| 35                          | 4083-4199 | A18             | Blank                                                   |         |
| 36                          | 4101      | I1              | Leap second flag<br>0: None<br>1: Leap second present   |         |
| 37                          | 4102-4680 | A579            | Blank                                                   |         |

Table 1.1-11 Attitude Data Record

| Field No. | Byte No. | Type | Description                     | Remarks |
|-----------|----------|------|---------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 4               |         |
| 2         | 5        | B1   | First record subtype code = 18  |         |
| 3         | 6        | B1   | Record type code = 40           |         |
| 4         | 7        | B1   | Second record subtype code = 18 |         |
| 5         | 8        | B1   | Third record subtype code = 20  |         |

| Field No. | Byte No.              | Type                     | Description                                      | Remarks |
|-----------|-----------------------|--------------------------|--------------------------------------------------|---------|
| 6         | 9-12                  | B4                       | Record length = 16384                            |         |
| 7         | 13-16                 | I4                       | Number of points = 'nn'                          |         |
| 8         | 17-20                 | I4                       | Day of the year                                  |         |
| 9         | 21-28                 | I8                       | Milli-second of the day                          |         |
| 10        | 29-32                 | I4                       | Pitch data quality flag = blank                  |         |
| 11        | 33-36                 | I4                       | Roll data quality flag = blank                   |         |
| 12        | 37-40                 | I4                       | Yaw data quality flag = blank                    |         |
| 13        | 41-54                 | E14.6                    | Pitch [deg]                                      |         |
| 14        | 55-68                 | E14.6                    | Roll [deg]                                       |         |
| 15        | 69-82                 | E14.6                    | Yaw [deg]                                        |         |
| 16        | 83-86                 | I4                       | Pitch rate quality flag = blank                  |         |
| 17        | 87-90                 | I4                       | Roll rate quality flag = blank                   |         |
| 18        | 91-94                 | I4                       | Yaw quality flag = blank                         |         |
| 19        | 95-108                | E14.6                    | Pitch rate                                       |         |
| 20        | 109-122               | E14.6                    | Roll rate                                        |         |
| 21        | 123-136               | E14.6                    | Yaw rate                                         |         |
|           | 137-136+1<br>20*(n-1) | 120*(n-1)                | Repeat bytes 17-136 for the number of points (n) |         |
| 22        | 137+120*(n-1)-16384   | A(16384-(136+120*(n-1))) | Blank                                            |         |

Table 1.1-12 Radiometric Data Records

| Field No.            | Byte No. | Type  | Description                                                                                                                                                                                                                                                                                                                                                                          | Remarks |
|----------------------|----------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1                    | 1-4      | B4    | Record Number = 5                                                                                                                                                                                                                                                                                                                                                                    |         |
| 2                    | 5        | B1    | First record subtype code = 18                                                                                                                                                                                                                                                                                                                                                       |         |
| 3                    | 6        | B1    | Record type code = 50                                                                                                                                                                                                                                                                                                                                                                |         |
| 4                    | 7        | B1    | Second record subtype code = 18                                                                                                                                                                                                                                                                                                                                                      |         |
| 5                    | 8        | B1    | Third record subtype code= 20                                                                                                                                                                                                                                                                                                                                                        |         |
| 6                    | 9-12     | B1    | Record length = 9860                                                                                                                                                                                                                                                                                                                                                                 |         |
| 7                    | 13-16    | I4    | Radiometric data record sequence number ='bbb1'                                                                                                                                                                                                                                                                                                                                      |         |
| 8                    | 17-20    | I4    | Number of radiometric data fields ='bbb1'                                                                                                                                                                                                                                                                                                                                            |         |
| RADIOMETRIC DATA SET |          |       |                                                                                                                                                                                                                                                                                                                                                                                      |         |
| 9                    | 21-36    | F16.7 | Calibration factor (CF)<br>SLC: $\beta_{0dB} = 10 * \log 10 \langle I^2 + Q^2 \rangle + CF$<br>This means that the backscattering coefficient (beta-naught) of a pixel can be obtained by the ensemble averaging ( $\langle \rangle$ ), i.e., the spatial averaging of pixel values around the target. Here, I and Q in $\langle \rangle$ of the above formula are the pixel values. |         |
| 10                   | 37-9860  | A9824 | Blank                                                                                                                                                                                                                                                                                                                                                                                |         |

Table 1.1-13 Data Quality Summary Record

| Field No. | Byte No. | Type | Description                    | Remarks |
|-----------|----------|------|--------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 6              |         |
| 2         | 5        | B1   | First record subtype code = 18 |         |

| Field No.                         | Byte No. | Type  | Description                                                                                                  | Remarks                 |
|-----------------------------------|----------|-------|--------------------------------------------------------------------------------------------------------------|-------------------------|
| 3                                 | 6        | B1    | Record type code = 60                                                                                        |                         |
| 4                                 | 7        | B1    | Second record subtype code = 18                                                                              |                         |
| 5                                 | 8        | B1    | Third record subtype code= 20                                                                                |                         |
| 6                                 | 9-12     | B4    | Record length = 1620                                                                                         |                         |
| 7                                 | 13-16    | I4    | Data quality record number ='bbb1'                                                                           |                         |
| 8                                 | 17-20    | A4    | SAR channel ID ='ABbb'<br>A: Received polarization (V)<br>B: Receiving antenna (S: Single beam)              |                         |
| 9                                 | 21-26    | A6    | Date of the last calibration update = 'YYMMDD'<br>YY : lower 2 figures of the year<br>MM : Month<br>DD : Day | Blank: to be determined |
| 10                                | 27-30    | I4    | Number of channels (up to 8)                                                                                 |                         |
| ABSOLUTE RADIOMETRIC DATA QUALITY |          |       |                                                                                                              |                         |
| 11                                | 31-46    | F16.7 | ISLR (nominal value) [dB]                                                                                    | Blank                   |
| 12                                | 47-62    | F16.7 | PSLR (nominal value) [dB]                                                                                    | Blank                   |
| 13                                | 63-78    | F16.7 | Azimuth ambiguity rate (AAR) (Nominal value)                                                                 | Blank                   |
| 14                                | 79-94    | F16.7 | Range ambiguity rate (RAR) (Nominal value)                                                                   | Blank                   |
| 15                                | 95-110   | F16.7 | Estimate of SNR [dB]                                                                                         | Blank                   |
| 16                                | 111-126  | F16.7 | BER (Actual value)                                                                                           | Blank                   |
| 17                                | 127-142  | F16.7 | Slant range resolution (Nominal value) [m]                                                                   | Blank                   |
| 18                                | 143-158  | F16.7 | Azimuth resolution (Nominal value) [m]                                                                       | Blank                   |

| Field No.                       | Byte No.           | Type            | Description                                                                                                 | Remarks |
|---------------------------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------------|---------|
| 19                              | 159-174            | F16.7           | Radiometric resolution (Nominal value) [dB]                                                                 | Blank   |
| 20                              | 175-190            | F16.7           | Instantaneous dynamic range [dB]                                                                            | Blank   |
| 21                              | 191-206            | F16.7           | Nominal absolute radiometric calibration magnitude uncertainty of SAR channel indicated in bytes 17-20 [dB] | Blank   |
| 22                              | 207-222            | F16.7           | Nominal absolute radiometric calibration phase uncertainty of SAR channel indicated in bytes 17-20 [deg]    | Blank   |
| RELATIVE RADIOMETRIC QUALITY    |                    |                 |                                                                                                             |         |
| 23                              | 223-238            | F16.7           | Nominal relative radiometric calibration magnitude uncertainty of SAR channel indicated in bytes 17-20 [dB] |         |
| 24                              | 239-254            | F16.7           | Nominal relative radiometric calibration magnitude uncertainty of SAR channel indicated in bytes 17-20 [dB] |         |
| 25                              | 255 – (n-1)*32+254 | (n-1)*2F16.7    | Repetition of bytes 223 - 254 for the remaining channels (up to 8 channels)                                 |         |
| 26                              | (n-1)*32+255 - 734 | A(480-(n-1)*32) | Blank                                                                                                       |         |
| ABSOLUTE GEOMETRIC DATA QUALITY |                    |                 |                                                                                                             |         |
| 27                              | 735-750            | F16.7           | Absolute location error along track (Nominal value) [m]                                                     | Blank   |
| 28                              | 751-766            | F16.7           | Absolute location error cross track (Nominal value) [m]                                                     | Blank   |
| 29                              | 767-782            | F16.7           | Geometric distortion scale in line direction (Nominal value)                                                | Blank   |

| Field No.                       | Byte No.  | Type             | Description                                                                                            | Remarks |
|---------------------------------|-----------|------------------|--------------------------------------------------------------------------------------------------------|---------|
| 30                              | 783-798   | F16.7            | Geometric distortion scale in pixel direction (Nominal value)                                          | Blank   |
| 31                              | 799-814   | F16.7            | Geometric distortion skew                                                                              | Blank   |
| 32                              | 815-830   | F16.7            | Scene orientation error                                                                                | Blank   |
| RELATIVE GEOMETRIC DATA QUALITY |           |                  |                                                                                                        |         |
| 33                              | 831-846   | F16.7            | Along track relative misregistration error of other channels versus SAR channel (bytes 17-20) [meters] | Blank   |
| 34                              | 847-862   | F16.7            | Cross track relative misregistration error of other channels versus SAR channel (bytes 17-20) [meters] | Blank   |
| 35                              | 863-1086  | (n-1)*<br>2F16.7 | Repetition of bytes 831 - 862 for the other channels (up to 8 channels)                                | Blank   |
| 36                              | 1087-1620 | A532             | Blank                                                                                                  |         |

Table 1.1-14 Facility Related Data Record

| Field No. | Byte No. | Type | Description                     | Remarks |
|-----------|----------|------|---------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 7               |         |
| 2         | 5        | B1   | First record subtype code = 18  |         |
| 3         | 6        | B1   | Record type code = 200          |         |
| 4         | 7        | B1   | Second record subtype code = 18 |         |
| 5         | 8        | B1   | Third record subtype code= 18   |         |
| 6         | 9-12     | B1   | Record length = 5000            |         |
| 7         | 13-16    | A4   | Blank                           |         |

| Field No. | Byte No. | Type         | Description                                                                                                                  | Remarks |
|-----------|----------|--------------|------------------------------------------------------------------------------------------------------------------------------|---------|
| 8         | 17-416   | 20E2<br>0.10 | Twenty coefficients to convert from latitude and longitude to line(L) and pixel (P) position in the image.<br>For SLC: blank |         |
| 9         | 417-420  | A4           | Blank                                                                                                                        |         |
| 10        | 421-428  | A8           | Blank                                                                                                                        |         |
| 11        | 429-436  | A8           | Blank                                                                                                                        |         |
| 12        | 437-444  | A8           | Blank                                                                                                                        |         |
| 13        | 445-452  | A8           | Blank                                                                                                                        |         |
| 14        | 453-456  | I4           | PRF switching flag No change in a scene = 'bbb0' (fixed value)                                                               |         |
| 15        | 457-464  | I8           | Start line number of PRF switching No change = 'bbbbbbb1' (fixed value)                                                      |         |
| 16        | 465-472  | A8           | Blank                                                                                                                        |         |
| 17        | 473-480  | A8           | Blank                                                                                                                        |         |
| 18        | 481-488  | A8           | Blank                                                                                                                        |         |
| 19        | 489-800  | A312         | Blank                                                                                                                        |         |
| 20        | 801-1024 | A224         | Blank                                                                                                                        |         |

| Field No. | Byte No.  | Type         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|-----------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21        | 1025-2024 | 50E2<br>0.10 | <p>Coefficients of the 8th polynomial expression to convert from pixel (P) and line (L) to latitude (<math>\varphi</math>) and longitude (<math>\lambda</math>), say (<math>\varphi, \lambda</math>) where:</p> $\varphi = a_0 * L^4 * P^4 + a_1 * L^3 * P^4 + a_2 * L^2 * P^4 + a_3 * L * P^4 + a_4 * P^4 + a_5 * L^4 * P^3 + a_6 * L^3 * P^3 + a_7 * L^2 * P^3 + a_8 * L * P^3 + a_9 * P^3 + a_{10} * L^4 * P^2 + a_{11} * L^3 * P^2 + a_{12} * L^2 * P^2 + a_{13} * L * P^2 + a_{14} * P^2 + a_{15} * L^4 * P + a_{16} * L^3 * P + a_{17} * L^2 * P + a_{18} * L * P + a_{19} * P + a_{20} * L^4 + a_{21} * L^3 + a_{22} * L^2 + a_{23} * L + a_{24}$ $\lambda = b_0 * L^4 * P^4 + b_1 * L^3 * P^4 + b_2 * L^2 * P^4 + b_3 * L * P^4 + b_4 * P^4 + b_5 * L^4 * P^3 + b_6 * L^3 * P^3 + b_7 * L^2 * P^3 + b_8 * L * P^3 + b_9 * P^3 + b_{10} * L^4 * P^2 + b_{11} * L^3 * P^2 + b_{12} * L^2 * P^2 + b_{13} * L * P^2 + b_{14} * P^2 + b_{15} * L^4 * P + b_{16} * L^3 * P + b_{17} * L^2 * P + b_{18} * L * P + b_{19} * P + b_{20} * L^4 + b_{21} * L^3 + b_{22} * L^2 + b_{23} * L + b_{24}$ <p>(The order of storing: <math>a_0, a_1, a_2, \dots, a_{24}</math> &amp; <math>b_0, b_1, b_2, \dots, b_{24}</math>)</p>                                                                                                                                                                                                                                                                                                                                 | <p>(P, L) referred in the upper left pixel(p) and line (l) are substituted by the following expressions as <math>P = p - P_0, L = l - L_0</math>, 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 (<math>\varphi, \lambda</math>) is measured in "degrees"</p>              |
| 22        | 2025-2044 | E20.1<br>0   | Origin pixel ( $P_0$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 23        | 2045-2064 | E20.1<br>0   | Origin Line ( $L_0$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 24        | 2065-3064 | 50E2<br>0.10 | <p>Coefficients of the 8th polynomial expression to convert from latitude (<math>\Phi</math>) and longitude (<math>\Lambda</math>) to pixel (p) and line (l), say (p, l) where:</p> $p = c_0 * \Lambda^4 * \Phi^4 + c_1 * \Lambda^3 * \Phi^4 + c_2 * \Lambda^2 * \Phi^4 + c_3 * \Lambda * \Phi^4 + c_4 * \Phi^4 + c_5 * \Lambda^4 * \Phi^3 + c_6 * \Lambda^3 * \Phi^3 + c_7 * \Lambda^2 * \Phi^3 + c_8 * \Lambda * \Phi^3 + c_9 * \Phi^3 + c_{10} * \Lambda^4 * \Phi^2 + c_{11} * \Lambda^3 * \Phi^2 + c_{12} * \Lambda^2 * \Phi^2 + c_{13} * \Lambda * \Phi^2 + c_{14} * \Phi^2 + c_{15} * \Lambda^4 * \Phi + c_{16} * \Lambda^3 * \Phi + c_{17} * \Lambda^2 * \Phi + c_{18} * \Lambda * \Phi + c_{19} * \Phi + c_{20} * \Lambda^4 + c_{21} * \Lambda^3 + c_{22} * \Lambda^2 + c_{23} * \Lambda + c_{24}$ $l = d_0 * \Lambda^4 * \Phi^4 + d_1 * \Lambda^3 * \Phi^4 + d_2 * \Lambda^2 * \Phi^4 + d_3 * \Lambda * \Phi^4 + d_4 * \Phi^4 + d_5 * \Lambda^4 * \Phi^3 + d_6 * \Lambda^3 * \Phi^3 + d_7 * \Lambda^2 * \Phi^3 + d_8 * \Lambda * \Phi^3 + d_9 * \Phi^3 + d_{10} * \Lambda^4 * \Phi^2 + d_{11} * \Lambda^3 * \Phi^2 + d_{12} * \Lambda^2 * \Phi^2 + d_{13} * \Lambda * \Phi^2 + d_{14} * \Phi^2 + d_{15} * \Lambda^4 * \Phi + d_{16} * \Lambda^3 * \Phi + d_{17} * \Lambda^2 * \Phi + d_{18} * \Lambda * \Phi + d_{19} * \Phi + d_{20} * \Lambda^4 + d_{21} * \Lambda^3 + d_{22} * \Lambda^2 + d_{23} * \Lambda + d_{24}$ <p>(The order of storing: <math>c_0, c_1, c_2, \dots, c_{24}</math> &amp; <math>d_0, d_1, d_2, \dots, d_{24}</math>)</p> | <p>(<math>\Phi, \Lambda</math>) referred in the upper left latitude(<math>\varphi</math>), longitude(<math>\lambda</math>) are substituted by the following expressions as <math>F=f-F_0</math> (degrees), <math>L=l-L_0</math> (degrees), where (f, l) 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.</p> |
| 25        | 3065-3084 | E20.1<br>0   | Origin Latitude ( $\Phi_0$ ) scene center latitude                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 26        | 3085-3104 | E20.1<br>0   | Origin Longitude ( $\Lambda_0$ ) scene center longitude                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Field No. | Byte No.  | Type      | Description | Remarks |
|-----------|-----------|-----------|-------------|---------|
| 27        | 3105-5000 | A189<br>6 | Blank       |         |

Table 1.1-15 Image File Descriptor Record

| Field No. | Byte No. | Type | Description                                                                       | Remarks |
|-----------|----------|------|-----------------------------------------------------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 1                                                                 |         |
| 2         | 5        | B1   | First subtype code = 50                                                           |         |
| 3         | 6        | B1   | Record type code = 192                                                            |         |
| 4         | 7        | B1   | Second subtype code = 18                                                          |         |
| 5         | 8        | B1   | Third subtype code= 18                                                            |         |
| 6         | 9-12     | B4   | Record length = 720                                                               |         |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab' In case of ASCII                                         |         |
| 8         | 15-16    | A2   | Blank                                                                             |         |
| 9         | 17-28    | A12  | Format Manual ID ='CEOS-SARbbbb'                                                  |         |
| 10        | 29-30    | A2   | Format Manual Management Revision Number ='bA'                                    |         |
| 11        | 31-32    | A2   | Record format revision level ='bA'                                                |         |
| 12        | 33-44    | A12  | Software Release & Revision Number ='NNN.NNNbbbb'<br>001.000, 001.001,... 002.000 |         |
| 13        | 45-48    | I4   | File number = 'bbb1'                                                              |         |

| Field No.         | Byte No. | Type | Description                                                                                                                                                                                  | Remarks |
|-------------------|----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 14                | 49-64    | A16  | File ID ='MMMMMMNbTFFFFbbbb'<br>MMMMM: Mission name ('STRIX')<br>N: Mission ID (Alpha='A', Beta='B', 1='1')<br>T: Processing level code<br>SLC ='B'<br>FFFF: File type<br>Image file ='IMOP' |         |
| 15                | 65-68    | A4   | Record sequence and location type flag = 'FSEQ'                                                                                                                                              |         |
| 16                | 69-76    | I8   | Sequence number of location = 'bbbbbbb1'                                                                                                                                                     |         |
| 17                | 77-80    | I4   | Field length of sequence number = 'bbb4'                                                                                                                                                     |         |
| 18                | 81-84    | A4   | Record code and location type flag = 'FTYP'                                                                                                                                                  |         |
| 19                | 85-92    | I8   | Record code position ='bbbbbbb5'                                                                                                                                                             |         |
| 20                | 93-96    | I4   | Record code field length ='bbb4'                                                                                                                                                             |         |
| 21                | 97-100   | A4   | Record length and position format flag = 'FLGT'                                                                                                                                              |         |
| 22                | 101-108  | I8   | Record length position ='bbbbbbb9'                                                                                                                                                           |         |
| 23                | 109-112  | I4   | Record length bytes ='bbb4'                                                                                                                                                                  |         |
| 24                | 113-180  | A68  | Blank                                                                                                                                                                                        |         |
| 25                | 181-186  | I6   | Number of SAR data records<br>Number of signal data records                                                                                                                                  | 1056    |
| 26                | 187-192  | I6   | Data set summary record length                                                                                                                                                               |         |
| 27                | 193-216  | A24  | Blank                                                                                                                                                                                        |         |
| SAMPLE GROUP DATA |          |      |                                                                                                                                                                                              |         |
| 28                | 217-220  | I4   | Bit length per sample = 'bb32': SLC                                                                                                                                                          |         |

| Field No.                      | Byte No. | Type | Description                                                                | Remarks                                                                                                                                                             |
|--------------------------------|----------|------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 29                             | 221-224  | I4   | Number of samples per data group = 'bbb2': SLC                             |                                                                                                                                                                     |
| 30                             | 225-228  | I4   | Number of bytes per data group='bbb8': SLC                                 |                                                                                                                                                                     |
| 31                             | 229-232  | A4   | Justification and order of samples within data group = blank (fixed value) |                                                                                                                                                                     |
| SAR RELATED DATA IN THE RECORD |          |      |                                                                            |                                                                                                                                                                     |
| 32                             | 233-236  | I4   | Number of SAR channels ='bbb1'                                             |                                                                                                                                                                     |
| 33                             | 237-244  | I8   | Number of lines per data set (one channel) (Excluding border lines)        |                                                                                                                                                                     |
| 34                             | 245-248  | I4   | Number of left border pixels per line = 'bbb0'                             |                                                                                                                                                                     |
| 35                             | 249-256  | I8   | Number of data group (or pixels) per line                                  | For level SLC 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. |
| 36                             | 257-260  | I4   | Number of right border pixels per line = 'bbb0'                            |                                                                                                                                                                     |
| 37                             | 261-264  | I4   | Number of top border lines = 'bbb0'                                        |                                                                                                                                                                     |
| 38                             | 265-268  | I4   | Number of bottom border lines = 'bbb0'                                     |                                                                                                                                                                     |
| 39                             | 269-272  | A4   | Interleaving ID = 'BSQb' (fixed value)                                     |                                                                                                                                                                     |
| RECORD DATA IN THE FILE        |          |      |                                                                            |                                                                                                                                                                     |
| 40                             | 273-274  | I2   | Number of physical records per line = 'b1' (fixed value)                   |                                                                                                                                                                     |

| Field No.                     | Byte No. | Type | Description                                                                                                 | Remarks                                                                                                                                                       |
|-------------------------------|----------|------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 41                            | 275-276  | I2   | Number of physical records per multi-channel line in this file = 'b1' (fixed value)                         |                                                                                                                                                               |
| 42                            | 277-280  | I4   | Number of bytes of PREFIX DATA per record<br>SLC = '1056'                                                   |                                                                                                                                                               |
| 43                            | 281-288  | I8   | Number of bytes of SAR data per record (zero suppression)                                                   | For SLC 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. |
| 44                            | 289-292  | I4   | Number of bytes of suffix data per record = 'bbb0' (fixed value)                                            |                                                                                                                                                               |
| 45                            | 293-296  | I4   | Prefix/suffix repeat flag = 'bbbb' (fixed value)                                                            |                                                                                                                                                               |
| PREFIX / SUFFIX DATA LOCATORS |          |      |                                                                                                             |                                                                                                                                                               |
| 46                            | 297-304  | A8   | Sample data line number locator = 'bb13b4PB' 'P': Prefix, 'S': Suffix 'A': ASCII, 'B': Binary, 'N': Numeric |                                                                                                                                                               |
| 47                            | 305-312  | A8   | SAR channel number locator = 'bb49b2PB'                                                                     |                                                                                                                                                               |
| 48                            | 313-320  | A8   | Time of SAR data line locator = 'bb45b4PB'                                                                  |                                                                                                                                                               |
| 49                            | 321-328  | A8   | Left-fill count locator = 'bb21b4PB'                                                                        |                                                                                                                                                               |
| 50                            | 329-336  | A8   | Right-fill count locator = 'bb29b4PB'                                                                       |                                                                                                                                                               |
| 51                            | 337-340  | A4   | Pad pixels present indicator = 'bbbb'                                                                       |                                                                                                                                                               |

| Field No. | Byte No. | Type | Description                                                                                                                                                                                                                                                                                                                            | Remarks |
|-----------|----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 52        | 341-368  | A28  | Blank                                                                                                                                                                                                                                                                                                                                  |         |
| 53        | 369-376  | A8   | SAR data line quality code locator = 'bb97b4PB'                                                                                                                                                                                                                                                                                        |         |
| 54        | 377-384  | A8   | Calibration information field locator = 'bbbbbbbbb'                                                                                                                                                                                                                                                                                    |         |
| 55        | 385-392  | A8   | Gain values field locator = 'bbbbbbbbb'                                                                                                                                                                                                                                                                                                |         |
| 56        | 393-400  | A8   | Bias values field locator = 'bbbbbbbbb'                                                                                                                                                                                                                                                                                                |         |
| 57        | 401-428  | A28  | SAR data format type indicator = 'COMPLEX * 8bbbbbbbbbbbbbbbb': SLC                                                                                                                                                                                                                                                                    |         |
| 58        | 429-432  | A4   | SAR data format type code = 'C * 8b': SLC<br>'COMPLEX * 8bbbbbbbbbbbbbbbb'"C * 8b'(8 byte wide)<br>-The first half (4 bytes) in the 8-byte field is two's complement representation<br>Including real number components in floating point format<br>A complex representation in which the second half contains an imaginary component. |         |
| 59        | 433-436  | I4   | Pixel left justified bits = 'bbb0'                                                                                                                                                                                                                                                                                                     |         |
| 60        | 437-440  | I4   | Pixel right-justified bits = 'bbb0'                                                                                                                                                                                                                                                                                                    |         |
| 61        | 441-448  | I8   | Maximum pixel value (starting from 0) (zero suppression)= blank: SLC                                                                                                                                                                                                                                                                   |         |
| 62        | 449-452  | A4   | Blank                                                                                                                                                                                                                                                                                                                                  |         |
| 63        | 453-456  | A4   | Blank                                                                                                                                                                                                                                                                                                                                  |         |
| 64        | 457-460  | A4   | Blank                                                                                                                                                                                                                                                                                                                                  |         |
| 65        | 461-720  | A260 | Blank                                                                                                                                                                                                                                                                                                                                  |         |

Table 1.1-16 Signal Data Records

| Field No.                       | Byte No. | Type | Description                                                                                            | Remarks                                                                                                                                                                                  |
|---------------------------------|----------|------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                               | 1-4      | B4   | Record Number = 2,3,..                                                                                 |                                                                                                                                                                                          |
| 2                               | 5        | B1   | First record subtype code = 50                                                                         |                                                                                                                                                                                          |
| 3                               | 6        | B1   | Record type code = 10                                                                                  |                                                                                                                                                                                          |
| 4                               | 7        | B1   | Second record subtype code = 18                                                                        |                                                                                                                                                                                          |
| 5                               | 8        | B1   | Third record subtype code= 20                                                                          |                                                                                                                                                                                          |
| 6                               | 9-12     | B4   | Record length                                                                                          |                                                                                                                                                                                          |
| PREFIX DATA-GENERAL INFORMATION |          |      |                                                                                                        |                                                                                                                                                                                          |
| 7                               | 13-16    | B4   | SAR image data line number = 1, 2, 3 ...                                                               |                                                                                                                                                                                          |
| 8                               | 17-20    | B4   | SAR image data record index = 1 (fixed value) (indicates the record sequence number in the image line) |                                                                                                                                                                                          |
| 9                               | 21-24    | B4   | Actual count of left-fill pixels = 0 (fixed value)                                                     |                                                                                                                                                                                          |
| 10                              | 25-28    | B4   | Actual count of data pixels                                                                            | For SLC products, actual count of data pixels corresponds to the number of 1 image range pixels. 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 = 0                                                                  |                                                                                                                                                                                          |
| PREFIX DATA-SENSOR PARAMETERS   |          |      |                                                                                                        |                                                                                                                                                                                          |
| 12                              | 33-36    | B4   | Sensor parameters update flag = 0                                                                      |                                                                                                                                                                                          |

| Field No. | Byte No. | Type | Description                                                               | Remarks |
|-----------|----------|------|---------------------------------------------------------------------------|---------|
| 13        | 37-40    | B4   | Sensor acquisition year<br>Scene start line year                          |         |
| 14        | 41-44    | B4   | Sensor acquisition day of year<br>Scene start line day of year            |         |
| 15        | 45-48    | B4   | Sensor acquisition milli-seconds of day                                   |         |
| 16        | 49-50    | B2   | SAR channel ID<br>Single polarization = 1                                 |         |
| 17        | 51-52    | B2   | SAR channel code = 3<br>L = 0, S = 1, C = 2, X = 3, KU = 4, KA = 5        |         |
| 18        | 53-54    | B2   | Transmit pulse polarization (0 = H, 1 = V)                                |         |
| 19        | 55-56    | B2   | Received pulse polarization (0 = H, 1 = V)                                |         |
| 20        | 57-60    | B4   | Processing PRF [mHz]                                                      |         |
| 21        | 61-64    | B4   | 0 (fixed)                                                                 |         |
| 22        | 65-66    | B2   | Onboard range compressed flag = 0<br>NO = 0, YES = 1                      |         |
| 23        | 67-68    | B2   | Chirp type designator<br>LINEAR FM CHIRP = 0<br>PHASE MODULATORS = 1      |         |
| 24        | 69-72    | B4   | Chirp length (pulse width) [nsec]                                         |         |
| 25        | 73-76    | B4   | Chirp constant coefficient [Hz] = Nominal value                           |         |
| 26        | 77-80    | B4   | Chirp linear coefficient [Hz/ $\mu$ sec] = Nominal value                  |         |
| 27        | 81-84    | B4   | Chirp quadratic coefficient [Hz/ $\mu$ sec <sup>2</sup> ] = Nominal value |         |
| 28        | 85-92    | B8   | Sensor acquisition micro-seconds of day                                   |         |

| Field No.                                  | Byte No. | Type | Description                                                                      | Remarks |
|--------------------------------------------|----------|------|----------------------------------------------------------------------------------|---------|
| 29                                         | 93-96    | B4   | Receiver gain [dB] = Nominal value                                               |         |
| 30                                         | 97-100   | B4   | Invalid line flag<br>NO. (Effective line) = 0<br>YES (Loss line) = 1             |         |
| 31                                         | 101-104  | B4   | Electronic elevation angle at nadir of antenna [deg]                             |         |
| 32                                         | 105-108  | B4   | Mechanical elevation angle at nadir of antenna [deg]                             |         |
| 33                                         | 109-112  | B4   | Electronic antenna squint angle [deg]                                            |         |
| 34                                         | 113-116  | B4   | Mechanical antenna squint angle [deg]                                            |         |
| 35                                         | 117-120  | B4   | Slant range to 1st data sample [m]                                               |         |
| 36                                         | 121-124  | B4   | Data record window position (SAMPLE DELAY [nsec])                                |         |
| 37                                         | 125-128  | B4   | Blank                                                                            |         |
| PREFIX DATA-PLATFORM REFERENCE INFORMATION |          |      |                                                                                  |         |
| 38                                         | 129-132  | B4   | Platform position parameters update flag<br>= 0 (fixed)<br>Repeat = 0 Update = 1 |         |
| 39                                         | 133-136  | B4   | Platform latitude [1/1,000,000 deg] = 0                                          |         |
| 40                                         | 137-140  | B4   | Platform longitude [1/1,000,000 deg] = 0                                         |         |
| 41                                         | 141-144  | B4   | Platform altitude [m] = 0                                                        |         |
| 42                                         | 145-148  | B4   | Platform ground speed [cm/sec] = 0                                               |         |
| 43                                         | 148-160  | 3B4  | Platform velocity X', Y', Z'[cm/sec] = 0                                         |         |
| 44                                         | 161-172  | 3B4  | Platform acceleration X'', Y'', Z''[cm/sec <sup>2</sup> ] = 0                    |         |

| Field No.                                           | Byte No. | Type | Description                                                                                                 | Remarks                        |
|-----------------------------------------------------|----------|------|-------------------------------------------------------------------------------------------------------------|--------------------------------|
| 45                                                  | 173-176  | B4   | Platform track angle [1/1,000,000 deg] = 0                                                                  |                                |
| 46                                                  | 177-180  | B4   | Platform true track angle [1/1,000,000 deg] = 0                                                             |                                |
| 47                                                  | 181-184  | B4   | Platform pitch angle [1/1,000,000 deg] = 0                                                                  |                                |
| 48                                                  | 185-188  | B4   | Platform roll angle [1/1,000,000 deg] = 0                                                                   |                                |
| 49                                                  | 189-192  | B4   | Platform yaw angle [1/1,000,000 deg] = 0                                                                    |                                |
| PREFIX DATA-SENSOR/FACILITY SPECIFIC AUXILIARY DATA |          |      |                                                                                                             |                                |
| 50                                                  | 193-196  | B4   | Latitude of 1 st pixel [1/1,000,000 deg]                                                                    |                                |
| 51                                                  | 197-200  | B4   | Latitude of center-pixel [1/1,000,000 deg]                                                                  |                                |
| 52                                                  | 201-204  | B4   | Latitude of last pixel [1/1,000,000 deg]                                                                    |                                |
| 53                                                  | 205-208  | B4   | Longitude of 1st pixel [1/1,000,000 deg]                                                                    |                                |
| 54                                                  | 209-212  | B4   | Longitude of center-pixel [1/1,000,000 deg]                                                                 |                                |
| 55                                                  | 213-216  | B4   | Longitude of last pixel [1/1,000,000 deg]                                                                   |                                |
| 56                                                  | 217-288  | B72  | Blank                                                                                                       |                                |
| 57                                                  | 289-1056 | B768 | Observation auxiliary data = 0                                                                              |                                |
| SAR RAW SIGNAL DATA                                 |          |      |                                                                                                             |                                |
|                                                     | 1057-i   | jBk  | SAR data<br>i: Number of bytes of data + 1056<br>j: Number of pixels in this record<br>k: Pixel size (byte) | Repeat by the number of pixels |

Table 1.1-17 Trailer Descriptor Record

| Field No. | Byte No. | Type | Description                                                                                                                                                                                      | Remarks |
|-----------|----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1         | 1-4      | B4   | Record Number = 1                                                                                                                                                                                |         |
| 2         | 5        | B1   | First subtype code = 63                                                                                                                                                                          |         |
| 3         | 6        | B1   | Record type code = 192                                                                                                                                                                           |         |
| 4         | 7        | B1   | Second subtype code = 18                                                                                                                                                                         |         |
| 5         | 8        | B1   | Third subtype code= 18                                                                                                                                                                           |         |
| 6         | 9-12     | B4   | Record length = 720                                                                                                                                                                              |         |
| 7         | 13-14    | A2   | ASCII/EBCDIC flag = 'Ab' In case of ASCII                                                                                                                                                        |         |
| 8         | 15-16    | A2   | Blank                                                                                                                                                                                            |         |
| 9         | 17-28    | A12  | Format Manual ID = 'CEOS-SARbbbb'                                                                                                                                                                |         |
| 10        | 29-30    | A2   | Format Manual Management Revision Number = 'bA'                                                                                                                                                  |         |
| 11        | 31-32    | A2   | Record format revision level = 'bA'                                                                                                                                                              |         |
| 12        | 33-44    | A12  | Software Release & Revision Number<br>='NNN.NNNbbbb'<br>001.000, 001.001,... 002.000                                                                                                             |         |
| 13        | 45-48    | I4   | Number of files = 'bbb1'                                                                                                                                                                         |         |
| 14        | 49-64    | A16  | File ID ='MMMMMNbTFFFFbbbb'<br>MMMMM: Mission name ('STRIX')<br>N: Mission ID (Alpha='A', Beta='B',<br>1='1')<br>T: Processing level code<br>SLC ='B'<br>FFFF: File type<br>Trailer file ='SART' |         |

| Field No. | Byte No. | Type | Description                                          | Remarks |
|-----------|----------|------|------------------------------------------------------|---------|
| 15        | 65-68    | A4   | Command software v203 is used = 'FSEQ'               |         |
| 16        | 69-76    | I8   | Sequence number position = 'bbbbbbb1'                |         |
| 17        | 77-80    | I4   | Sequence number field length = 'bbb4'                |         |
| 18        | 81-84    | A4   | Record code and location type flag = 'FTYP'          |         |
| 19        | 85-92    | I8   | Record code location = 'bbbbbbb5'                    |         |
| 20        | 93-96    | I4   | Record code field length = 'bbb4'                    |         |
| 21        | 97-100   | A4   | Record length and location format flag = 'FLGT'      |         |
| 22        | 101-108  | I8   | Record length location = 'bbbbbbb9'                  |         |
| 23        | 109-112  | I4   | Record length field length = 'bbb4'                  |         |
| 24        | 113-180  | A68  | Blank                                                |         |
| 25        | 181-186  | I6   | Number of data set summary records = 'bbbbbb0'       |         |
| 26        | 187-192  | I6   | Dataset Summary Record Length = 'bbbbbb0'            |         |
| 27        | 193-198  | I6   | Number of map projection data records = 'bbbbbb0'    |         |
| 28        | 199-204  | I6   | Map projection data record length = 'bbbbbb0'        |         |
| 29        | 205-210  | I6   | Number of platform position data records = 'bbbbbb0' |         |
| 30        | 211-216  | I6   | Platform position data record length = 'bbbbbb0'     |         |

| Field No. | Byte No. | Type | Description                                            | Remarks |
|-----------|----------|------|--------------------------------------------------------|---------|
| 31        | 217-222  | I6   | Number of attitude data records = 'bbbbbb0'            |         |
| 32        | 223-228  | I6   | Attitude data record length = 'bbbbbb0'                |         |
| 33        | 229-234  | I6   | Number of radiometric data records = 'bbbbbb0'         |         |
| 34        | 235-240  | I6   | Radiometric data record length = 'bbbbbb0'             |         |
| 35        | 241-246  | I6   | Number of radiometric compensation records = 'bbbbbb0' |         |
| 36        | 247-252  | I6   | Radiometric Compensation Record Length = 'bbbbbb0'     |         |
| 37        | 253-258  | I6   | Number of data quality summary records = 'bbbbbb0'     |         |
| 38        | 259-264  | I6   | Data Quality Summary Record Length = 'bbbbbb0'         |         |
| 39        | 265-270  | I6   | Number of data histograms records = 'bbbbbb0'          |         |
| 40        | 271-276  | I6   | Data Histogram Record Length = 'bbbbbb0'               |         |
| 41        | 277-282  | I6   | Number of range spectra records = 'bbbbbb0'            |         |
| 42        | 283-288  | I6   | Range spectrum record length = 'bbbbbb0'               |         |
| 43        | 289-294  | I6   | Number of DEM descriptor records = 'bbbbbb0'           |         |
| 44        | 295-300  | I6   | DEM Descriptor Record Length = 'bbbbbb0'               |         |
| 45        | 301-306  | I6   | Number of radar parameter update records = 'bbbbbb0'   |         |

| Field No. | Byte No. | Type | Description                                                 | Remarks |
|-----------|----------|------|-------------------------------------------------------------|---------|
| 46        | 307-312  | I6   | Radar parameter update record length = 'bbbbbb0'            |         |
| 47        | 313-318  | I6   | Number of annotation data records = 'bbbbbb0'               |         |
| 48        | 319-324  | I6   | Annotation data record length = 'bbbbbb0'                   |         |
| 49        | 325-330  | I6   | Number of detailed processing parameter records = 'bbbbbb0' |         |
| 50        | 331-336  | I6   | Detailed processing parameter record length = 'bbbbbb0'     |         |
| 51        | 337-342  | I6   | Number of calibration records = 'bbbbbb0'                   |         |
| 52        | 343-348  | I6   | Calibration record length = 'bbbbbb0'                       |         |
| 53        | 349-354  | I6   | Number of GCP records = 'bbbbbb0'                           |         |
| 54        | 355-360  | I6   | GCP record length = 'bbbbbb0'                               |         |
| 55        | 361-420  | A60  | Blank                                                       |         |
| 56        | 421-426  | I6   | Number of facility data records = 'bbbbbb0'                 |         |
| 57        | 427-432  | I6   | Facility data (1) record length = 'bbbbbb0'                 |         |
| 58        | 433-720  | A288 | Blank                                                       |         |

### 1.1.6 Summary Information

The summary information file shows a snapshot of meta data for an SLC CEOS product and is included in the product. The table below shows the contents of the summary information.

Table 1.1-18 Contents of Summary Information

| No. | Section                            | Item Name                        | Keyword                       | Value                                                                                                                                                                                                                                                                   |
|-----|------------------------------------|----------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Ordering information (Odi)         | Processed Site/Date/Time         | Odi_SiteDateT<br>ime          | 'PROCESS:JAPAN-SYNS-STRIXAbYYYYMMDDb<br>HHMMSS'<br>YYYYMMDD : Processed date (YYYY: year, MM:<br>month, DD: day)<br>HHMMSS : Processed time (UTC)                                                                                                                       |
| 2   |                                    | Scene<br>descriptio<br>n ID      | Scs_SceneID                   | 'AAAAAABBBBBBCCCCC-YYMMDD'<br>AAAAAA : Satellite name (= 'STRIXN') N:A, B<br>or 1<br>BBBBBB : Orbit accumulation number of a<br>scene center<br>CCCCCC : Scene frame number of a scene<br>center<br>- : separator (hyphen)<br>YYMMDD : Observation date of scene center |
| 3   | Product<br>specificatio<br>n (Pds) | Product<br>ID                    | Pds_ProductI<br>D             | 'DDEFFFG'<br>SL : Sliding spotlight<br>SM : Stripmap<br>E : Observation direction<br>L : Left looking、 R : Right looking<br>FFF : Processing Level<br>SLC : SLC<br>G : Orbit direction<br>A : Ascending、 D : Descending                                                 |
| 4   |                                    | Precision<br>of orbit<br>data    | Pds_OrbitDat<br>aPrecision    | 'Precision' / 'Onboard'                                                                                                                                                                                                                                                 |
| 5   |                                    | Precision<br>of attitude<br>data | Pds_Attitude<br>DataPrecision | 'Onboard'                                                                                                                                                                                                                                                               |

| No. | Section                   | Item Name                      | Keyword                              | Value                                                                                                                                                                                                                                |
|-----|---------------------------|--------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6   | Image information (Img)   | Date and time of scene center  | Img_SceneCenterDateTime              | 'YYYYMMDDbhh:mm:ss.ttt' (UT)<br>YYYY : Year (A.D)<br>MM : Month (01~12)<br>DD : Day (01~31)<br>hh : Hour (00~23)<br>mm : Minute (00~59)<br>ss : Second (00~60) (ss=60 is used only by a leap second)<br>ttt : Milli-second (000~999) |
| 7   |                           | Date and time of scene start   | Img_SceneStartDateTime               |                                                                                                                                                                                                                                      |
| 8   |                           | Date and time of scene end     | Img_SceneEndDateTime                 |                                                                                                                                                                                                                                      |
| 9   |                           | Off-nadir angle                | Img_OffNadirAngle                    |                                                                                                                                                                                                                                      |
| 10  | Product information (Pdi) | Data size of product           | Pdi_ProductDataSize                  |                                                                                                                                                                                                                                      |
| 11  |                           | Number of files in SLC product | Pdi_CntOfSLCProductFileName          |                                                                                                                                                                                                                                      |
| 12  |                           | Filename of SLC product        | Pdi_SLCProductFileName<br>nn : 01~99 |                                                                                                                                                                                                                                      |
| 13  |                           | Number of pixels               | Pdi_NoOfPixels                       |                                                                                                                                                                                                                                      |
| 14  |                           | Number of lines                | Pdi_NoOfLines                        |                                                                                                                                                                                                                                      |
| 15  |                           | Product format                 | Pdi_ProductFormat                    |                                                                                                                                                                                                                                      |

| No. | Section                 | Item Name           | Keyword             | Value                                                     |
|-----|-------------------------|---------------------|---------------------|-----------------------------------------------------------|
| 16  | Label information (Lbi) | Satellite name      | Lbi_Satellite       | 'StriX-N' N: A, B or 1                                    |
| 17  |                         | Sensor name         | Lbi_Sensor          | 'SAR'                                                     |
| 18  |                         | Processing level    | Lbi_ProcessLevel    | 'SLC'                                                     |
| 19  |                         | Processing facility | Lbi_ProcessFacility | 'SYNS'                                                    |
| 20  |                         | Observation date    | Lbi_ObservationDate | 'YYYYMMDD'<br>YYYYMMDD : (YYYY: year, MM: month, DD: day) |

### 1.1.7 Thumbnail Image

A thumbnail image is generated by transforming a processed data type to 8 bit integer and by averaging neighbored pixels. The image format is PNG and map projection is in slant range.

## 1.2 SICD Product Format

Sensor Independent Complex Data (SICD) product is contained in National Imagery Transmission Format (NITF) and is presented by single file (.nitf) [2][3][4]. The NITF file includes both image and metadata. The SICD format follows the standard, NGA.STND.0024-1\_1.2.1.

### 1.2.1 Product Composition

SLC SICD product includes:

- image raster data and metadata (ntf)

The naming convention for SLC SICD product files is described in the table below.

Table 1.2-1 SLC SICD product file naming convention

| File Type  | Number of Files | File Name                                            | Type | Contents                                 |
|------------|-----------------|------------------------------------------------------|------|------------------------------------------|
| Image File | 1               | IMG-<Polarization>-<Scene ID>-<Product ID>-SICD.nitf | NITF | This file stores image file and metadata |

Where:

Scene ID = AAAAA-YYYYMMDDThhmmssZ

AAAAAA : Satellite type (STRIXA: StriX- $\alpha$ , STRIXB: StriX- $\beta$  and STRIX1: StriX-1)

- : Separator

YYYYMMDD: Scene center observation date (YYYY: year, MM: month, DD: day)

hhmmss: Scene center observation time\* (hh: hour, mm: minutes, ss: seconds)

\*precise orbit is used when available

Product ID = DDEEE

DD: Observation mode (SL: Sliding Spotlight mode, SM: Stripmap mode)

EEE: Processing level (SLC: Single Look Complex)

### 1.2.2 SICD XML Metadata

XML metadata of Synspective's SICD product are compliant with the table in Section 3.2 XML Metadata Parameter Lists in the SICD standard [\[2\]](#).

### 1.2.3 NITF Metadata

NITF metadata of Synspective's SICD product are compliant with the table in Section 3.3 NITF Header Parameters in the SICD standard [\[3\]](#).

## 2. GRD Product

The general specification of the StriX GRD product:

- image projected to ellipsoid (WGS 84)
- magnitude representation (DN, Digital Number)
- no phase information
- image is resampled
- approximate pixel spacing
- mode of observation: stripmap or sliding spotlight
- single polarization: VV
- bit depth: 16 bit

### 2.1 GeoTIFF + XML Product Format

#### 2.1.1 Product Composition

GRD GeoTIFF + XML product includes:

- image raster data (GeoTIFF)
- metadata (xml)

The naming convention for GRD GeoTIFF + XML product files is described in the table below.

Table 2.1-1 GRD GeoTIFF + XML Product File Naming Convention

| File Type     | Number of Files | File Name                                      | Type    | Contents                                                      |
|---------------|-----------------|------------------------------------------------|---------|---------------------------------------------------------------|
| Image File    | 1               | IMG-<Polarization>-<Scene ID>-<Product ID>.tif | GeoTIFF | This file stores image file                                   |
| Metadata file | 1               | PAR-<Scene ID>-<Product ID>.xml                | xml     | This file stores metadata for the image including observation |

Where:

Scene ID = AAAAA-YYYYMMDDThhmmssZ

AAAAAA : Satellite type (STRIXA: StriX- $\alpha$ , STRIXB: StriX- $\beta$  and STRIX1: StriX-1)

- : Separator

YYYYMMDD: Scene center observation date (YYYY: year, MM: month, DD: day)

hhmmss: Scene center observation time\* (hh: hour, mm: minutes, ss: seconds)

\*precise orbit is used when available

Product ID = DDEEE

DD: Observation mode (SL: Sliding Spotlight mode, SM: Stripmap mode)

EEE: Processing level (GRD: Ground Range Detected)

## 2.1.2 XML Metadata

The definition of data type is shown in the table below.

Table 2.1-2 XML Tag and Attribute Name

| Tag / Attribute Name   | Type     | Unit | Description                                                      | Example / Remarks    |
|------------------------|----------|------|------------------------------------------------------------------|----------------------|
| eop:creationDate       | datetime |      | Creation Date<br>ISO8601format<br>YYYY-MMDDThh:mm:ssZ            | 2021-12-14T18:29:37Z |
| eop:acquisitionType    | string   |      | Acquisition type<br>NOMINAL<br>CALIBRATION                       |                      |
| eop:acquisitionSubType | string   |      | Acquisition mode<br>Sliding Spotlight<br>Stripmap                | SlidingSpotlight     |
| eop:status             | string   |      | Product Status<br>ARCHIVED                                       |                      |
| eop:processingDate     | datetime |      | Processing date (UTC)<br>ISO8601 format<br>YYYY-MMDDThh:mm:ssZ   | 2021-12-14T18:29:37Z |
| eop:method             | string   |      | GRD interpolation method<br>NN: Nearest Neighbor<br>BL: Bilinear |                      |

| Tag / Attribute Name    | Type     | Unit | Description                                                                                                                           | Example / Remarks                                                              |
|-------------------------|----------|------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| eop:processorName       | string   |      | Processing software name: StrixProcessor                                                                                              |                                                                                |
| eop:processorVersion    | string   |      | Software version<br>Major version. Minor version<br>v000.000                                                                          | v003.005                                                                       |
| eop:processingLevel     | string   |      | Processing level<br>SLC   GRD   ORT                                                                                                   | GRD                                                                            |
| sar:rangePixelSpacing   | double   | m    | Pixel spacing in range at the scene center                                                                                            | 1.0                                                                            |
| sar:azimuthPixelSpacing | double   | m    | Pixel spacing in azimuth at the scene center                                                                                          | 1.0                                                                            |
| sar:processingPRF       | double   | Hz   | Pulse repetition frequency used for processing                                                                                        |                                                                                |
| eop:nativeProductFormat | string   |      | Data Format<br>GRD: GeoTIFF                                                                                                           | GeoTIFF                                                                        |
| calibrationFactor       | double   |      | CF (Calibration Factor) to convert DN (Digital Number) to $\sigma_0$<br>$\sigma_0 = DN^2 / CF^2$<br>Refer to Section 2.4 for details. | 9000                                                                           |
| offnadirAngle           | double   |      | Off-nadir angle                                                                                                                       | 43.5<br>Tagged as eop:SpecificInformation, The value written in localAttribute |
| sceneCenterDateTime     | datetime |      | Scene center time<br>ISO8601 format<br>(precise orbit is used when available)                                                         | 2021-12-12T07:24:21Z                                                           |

| Tag / Attribute Name | Type   | Unit | Description                                                                                                                                                                                                                                                                                                                                                                                                                                             | Example / Remarks                                                                                                                                                                                       |
|----------------------|--------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| gml:posList          | string | deg  | <p>4 corners of the scene (latitude, longitude)</p> <p>Left top, latitude longitude</p> <p>Left bottom, latitude longitude</p> <p>Right bottom, latitude longitude</p> <p>Right top, latitude longitude</p> <p>Left top, latitude longitude</p> <p>Latitude is expressed as "SNN.NNNNNNNN N",</p> <p>Longitude is expressed as " SNN.NNNNNNNN N "</p> <p>"S" is for polarity. The plus sign would be omitted.</p> <p>Values are separated by space.</p> | <p>-1.896944000</p> <p>42.996389000</p> <p>-2.650000000</p> <p>42.862778000</p> <p>-2.861667000</p> <p>43.381667000</p> <p>-2.102500000</p> <p>43.516667000</p> <p>-1.896944000</p> <p>42.996389000</p> |
| gml:pos              | string | deg  | <p>scene center (latitude, longitude)</p> <p>Latitude is expressed as "SNN.NNNNNNNN NNNNNN",</p> <p>Longitude is expressed as "SNNN.NNNNNNN NNNNNNN"</p> <p>"S" is for polarity. The plug sign would be omitted.</p> <p>Values are separated by space..</p>                                                                                                                                                                                             | <p>2.102500000000000</p> <p>43.51666700000000</p>                                                                                                                                                       |

| Tag / Attribute Name              | Type   | Unit | Description                                                                                                                                    | Example / Remarks |
|-----------------------------------|--------|------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <eop:platform><br>eop:shortName   | string |      | Satellite name                                                                                                                                 | StriX             |
| eop:serialIdentifier              | string |      | Satellite ID                                                                                                                                   | alpha<br>beta     |
| eop:orbitType                     | string |      | Orbit category<br>GEO : Geostationary Orbit<br>LEO : Low earth orbit                                                                           | LEO               |
| <eop:instrument><br>eop:shortName | string |      | Instrument name                                                                                                                                | SAR               |
| eop:sensorType                    | string |      | Sensor type<br>OPTICAL<br>RADAR<br>ALTIMETRIC<br>ATMOSPHERIC                                                                                   | RADAR             |
| eop:operationalMode               | string |      | Sliding Spotlight or<br>Stripmap                                                                                                               | SlidingSpotlight  |
| eop:orbitDirection                | string |      | Orbit direction<br>ASCENDING<br>DESCENDING                                                                                                     | ASCENDING         |
| sar:polarisationMode              | string |      | Polarization mode<br>S:single: (Example: VV,<br>HH)<br>D:dual: (Example: HH+HV,<br>VV+VH)<br>Q:quad: ( Example:<br>HH+HV+VH+VV)<br>UNDEFINED : | S                 |
| sar:polarisationChannels          | string |      | Polarization channels                                                                                                                          | VV                |
| sar:antennaLookDirection          | string |      | Observation direction<br>LEFT<br>RIGHT                                                                                                         | LEFT              |

| Tag / Attribute Name                   | Type   | Unit              | Description                                                                                     | Example / Remarks |
|----------------------------------------|--------|-------------------|-------------------------------------------------------------------------------------------------|-------------------|
| sar:satelliteHeadingAngle              | single | deg               | Satellite heading angle<br>North is set to 0 degree<br>Counter clockwise ranged from (0 to 360) |                   |
| sar:minimumIncidenceAngle              | single | deg               | Minimum incidence angle<br>"NN.NNN"                                                             |                   |
| sar:maximumIncidenceAngle              | single | deg               | Maximum incidence angle<br>"NN.NNN"                                                             |                   |
| sar:incidenceAngleVariation            | single | deg               | Difference between minimum and maximum incidence angle<br>"NN.NNN"                              |                   |
| sar:incidenceAngleConstant             | single | deg               | Incident angle constant terms                                                                   |                   |
| sar:incidenceAngleLinearCoefficient    | single | deg / pixel       | Incident angle linear term                                                                      |                   |
| sar:incidenceAngleQuadraticCoefficient | single | deg / pixel/pixel | Incident angle quadratic term                                                                   |                   |
| sar:acquisitionPRF                     | double | Hz                | Pulse repetition frequency used for the data acquisition                                        |                   |
| sar:carrierFrequency                   | single | Hz                | Carrier frequency                                                                               |                   |
| sar:rangeSamplingFrequency             | single | Hz                | Range sampling frequency                                                                        | 400000000         |
| sar:chirpBandWidth                     | single | Hz                | Frequency chirp bandwidth                                                                       | 300000000         |
| eop:referenceSystemIdentifier          | single |                   | Projection coordinate system ID<br>epsg:4326: WGS84                                             | epsg 4326         |

| Tag / Attribute Name  | Type   | Unit | Description                | Example / Remarks |
|-----------------------|--------|------|----------------------------|-------------------|
| eop:mapProjection     | string |      | EQR                        |                   |
| eop:size              | int    | byte | Raster file size           |                   |
| eop:numberOfPixel     | int    |      | Number of pixels           |                   |
| eop:numberOfLine      | int    |      | Number of lines            |                   |
| eop:imageNumberOfBits | bit    | bit  | Number of bits of an image | 16                |

### 2.1.3 GeoTIFF Tag

The definition of data type is shown in the table below.

Table 2.1-3 GeoTIFF Tag

| Tag / Attribute Name      | Key ID | Type  | Count | Description/ Example                                     |
|---------------------------|--------|-------|-------|----------------------------------------------------------|
| BitsPerSample             | 258    | SHORT | -     | 16                                                       |
| Compression               | 259    | SHORT | 1     | 1: no compress                                           |
| Copyright                 | 33432  | ASCII | -     | "Copyright(c) 2020 Synspcctive Inc. All Right Reserved." |
| ImageLength               | 257    | LONG  | -     | number of lines                                          |
| ImageWidth                | 256    | LONG  | -     | number of pixels                                         |
| PhotometricInterpretation | 262    | SHORT | 1     | 1                                                        |
| PlanarConfiguration       | 284    | SHORT | 1     | 1                                                        |
| RowPerStrip               | 278    | SHORT | 1     | 1                                                        |

| Tag / Attribute Name | Key ID | Type                | Count                                                           | Description/ Example                                                                                                 |
|----------------------|--------|---------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| SampleFormat         | 339    | SHORT               | SamplesPerPixel                                                 | 1 = unsigned integer<br>2 = signed integer<br>3 = float<br>4 = undefined<br>5 = complex integer<br>6 = complex float |
| SamplePerPixel       | 277    | SHORT               | 1                                                               | 1                                                                                                                    |
| Software             | 305    | ASCII               | -                                                               | StirxProcessor                                                                                                       |
| StripByteCounts      | 279    | SHORT<br>or<br>LONG | When<br>PlanarConfiguration=1,<br>number of strips per<br>image | Number of bytes for<br>each strip                                                                                    |
| StripOffsets         | 273    | LONG                | When<br>PlanarConfiguration=1,<br>number of strips per<br>image | Byte offset for each<br>strip                                                                                        |
| GeoKeyDirectoryTag   | 34735  | SHORT               | 4                                                               | Based on GeoTIFF<br>standards                                                                                        |
| GeoDoubleParamsTag   | 34736  | DOUBLE              | -                                                               | Based on GeoTIFF<br>standards                                                                                        |
| GeoAsciiParamsTag    | 34737  | ASCII               | -                                                               | Based on GeoTIFF<br>standards                                                                                        |
| ModelTiepointTag     | 33922  | DOUBLE              | 6*number of tie points                                          | longitude and latitude<br>of the left top corner                                                                     |
| ModelPixelScaleTag   | 33550  | DOUBLE              | 3                                                               | Pixel spacing (degree)                                                                                               |
| GTModelTypeGeoKey    | 1024   | SHORT               | 2                                                               | 1 =<br>ModelTypeProjected<br>2 =<br>ModelTypeGeographic<br>3 =<br>ModelTypeGeocentric                                |

| Tag / Attribute Name   | Key ID | Type  | Count | Description/ Example                                    |
|------------------------|--------|-------|-------|---------------------------------------------------------|
| GTRasterTypeGeoKey     | 1025   | SHORT | 1     | 1 = RasterPixelIsArea<br>2=RasterPixelIsPoint           |
| GTCitationGeoKey       | 1026   | ASCII | 1     | WGS 84                                                  |
| GeographicTypeGeoKey   | 2048   | SHORT | 1     | Geographic coordinate system<br>4326=WGS84              |
| GeogAngularUnitsGeoKey | 2054   | SHORT | 1     | 9102=Angular_Degree [deg]                               |
| GDALNoDataTag          | 42113  | ASCII | 1     | 0<br>Value for no data pixel. This tag is used by GDAL. |

### 3. Radiometric Calibration

The following corrections are applied to the StriX products.

Table 3-1 Radiometric Correction

| Satellite | Mode              | Antenna Pattern Correction | Range Spread Loss Correction | Incident Angle Correction | Intensity conversion factor |
|-----------|-------------------|----------------------------|------------------------------|---------------------------|-----------------------------|
| StriX-α   | Stripmap          |                            | ✓                            | ✓ (GRD only)              | ✓                           |
| StriX-β   | Stripmap          | ✓                          | ✓                            | ✓ (GRD only)              | ✓                           |
| StriX-β   | Sliding spotlight |                            | ✓                            | ✓ (GRD only)              | ✓                           |

- SLC CEOS

The following equation will be applied to convert I and Q values to beta naught ( $\beta_{\text{odB}}$ ) ,

$$\text{SLC: } \beta_{\text{odB}} = 10 * \log_{10} \langle I^2 + Q^2 \rangle + \text{CF}$$

To convert from  $\beta_0$  to  $\sigma_0$ , the incident angle correction will be applied by

$$\sigma_0 = \beta_0 * \sin(\theta),$$

where  $\theta$  is the incidence angle.

- SLC SICD

Follow the NITF format document in Section 4.10 [3] to perform radiometric calibration.

- GRD GeoTIFF

The following equation will be applied to convert Digital Number (DN) to sigma naught ( $\sigma_0$ ) using Calibration Factor (CF) ,

$$\begin{aligned} \sigma_0 &= \text{DN}^2 / \text{CF}^2 \\ \sigma_{\text{odB}} &= 10 \log_{10}(\sigma_0) \end{aligned}$$

Note: For StriX-α stripmap and StriX-β sliding spotlight antenna pattern correction is not applied. This results in 2~3dB uncertainty for the calibration factor when applying the above formula.

## 4. Product Version History

The following table shows the product version history.

Table 4-1 Product Version History

| Date       | Version<br>(SLC SICD) | Version<br>(SLC CEOS, GRD<br>GeoTIFF+XML) | Description                                                                                                                                        |
|------------|-----------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2022/05/24 | v0.0.3                | v003.009                                  | - StriX- $\beta$ is released                                                                                                                       |
| 2022/07/19 | v0.0.4                | v003.010                                  | - Calibration factor is added for<br>Stripmap StriX- $\beta$                                                                                       |
| 2022/09/07 | v0.0.5                | v004.000                                  | - Calibration factor is added for Sliding<br>Spotlight StriX- $\beta$<br>- Calculation for doppler frequency<br>(center) is updated in SLC product |
| 2022/10/24 | v0.0.6                | v005.000                                  | - Heading angle and incidence angle<br>polynomial is added in GRD product                                                                          |

## Reference

[1] ALOS-2/PALSAR-2 Level 1.1/1.5/2.1/3.1 CEOS SAR Product Format Description Dec. 06, 2021.

[https://www.eorc.jaxa.jp/ALOS/en/alos-2/pdf/product\\_format\\_description/PALSAR-2\\_xx\\_Format\\_CEOS\\_E\\_g.pdf](https://www.eorc.jaxa.jp/ALOS/en/alos-2/pdf/product_format_description/PALSAR-2_xx_Format_CEOS_E_g.pdf)

[2] Sensor Independent Complex Data (SICD), Volume 1, Design & Implementation Description Document, Version 1.2.1, 2018-12-13.

<https://nsgreg.nga.mil/doc/view?i=4900>

[3] Sensor Independent Complex Data (SICD), Volume 2, File Format Description Document, Version 1.2.1 2018-12-13. <https://nsgreg.nga.mil/doc/view?i=4901>

[4] National Imagery Transmission Format (Version 2.1) for the National Imagery Transmission Format Standard, 01 May 2006. <https://nsgreg.nga.mil/doc/view?i=4324>