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ALOS-PALSAR IPF SAR Products

CEOS FORMAT SPECIFICATIONS

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1 INTRODUCTION

1.1 Purpose of This Document

This document defines the CEOS format of the ALOS SAR products generated from ALOS SAR sensor data by the ESA ALOS PALSAR SAR Instrument Processing Facility (IPF).

1.2 ALOS PALSAR SAR IPF Product Family

A range of ALOS PALSAR CEOS formatted SAR products are available from the ESA IPF. The primary product characteristics and CEOS format for these products are intended to be broadly compatible with those of corresponding JAXA products. There are however some significant differences that we summarise below:

1.   L"1.1" SLC products. The characteristics and record format of the IPF SLC products are **different** from corresponding JAXA products.

In contrast to products distributed by JAXA, all ESA PALSAR SLC products are generated in a zero-Doppler azimuth timing projection, and the image data file records consequently have a "processed data record header" rather than the "signal data record header" used by RAW and JAXA L1.1 CEOS products. The IPF "L1.1" product is generated without side-lobe reduction to a 1500Hz Doppler bandwidth.

Users familiar with ESA CEOS products should also note that for compatibility with existing third party ALOS PALSAR product analysis software, pixel data is presented as (big-endian) 32-bit+32-bit IEE floating point I,Q as opposed to the usual 16+16 bit integer format.

2.   L "1.5" non-geocoded detected products. The JAXA CEOS specification has been supplemented by the introduction of a set of "slant range from ground range" cubic polynomial coefficients in the Data Set Summary Record to facilitate calculating zero-Doppler slant range from image range pixel position.

3.   In the interests of preserving dynamic range (and in contrast to JAXA policy) the radiometric calibration constant provided with each image product is **not** constant but varies from product to product. The JAXA convention of an implicit 32dB offset in the calibration constant between L1.1 (floating point) and other (16 bit integer) products is retained for compatibility reasons.

4.   The JAXA PALSAR CEOS products contains eleven Facility Related Data Records; these are the low-level source JAXA Auxiliary Data Files (ADF) used to generate the L1.0 product and work report, wrapped with a CEOS header. The ESA PALSAR CEOS provides these records for leader file compatibility in terms of structure and size, but these records are blank filled.

5.   The CEOS Trailer file of focused products (L1.1 and 1.5) does not contain a low-resolution quicklook. This is provided instead as a TIFF/GEOTIFF file incorporated within the product tarfile.

6.   The pixel spacing of the SCANSAR (WB1) products is at a finer spacing of 75m instead of the JAXA 100m spacing, in view of the product spatial resolution.

7.   The product dimensions in terms of pixels is not fixed for a given product type but varies according to product order parameters.

8.   Detected quad polarization products are available in both a conventional format (detected HH, VV, HV and VH channels) and in a Pauli product format (detected HH+VV, HH-VV, HV+VH and HV-VH channels). All quad polarization products are corrected for Faraday rotation and are polarimetrically calibrated.

9.   Additional annotations are provided in the Data Set Summary Record detailing parameters associated with Faraday rotation and Radio Frequency Interference (RFI) estimates.

The JAXA product filename convention is observed for output products. However a wider range of product types are available from ESA and as a consequence the product naming convention has been extended. The corresponding ESA product type is also provided in Field 13, bytes 45-60, of the Volume Descriptor Record.

In common with JAXA all image data products are compensated for antenna gain and spreading loss and are radiometrically calibrated.

The product family available in CEOS format is summarized below.

Table 1-1 CEOS-formatted SAR Products.

Order Type	PALSAR mode	Corresponding ESA Product Type	JAXA Processing level and identifier	Product Parameters		Description
RAW	All	RAW__0P	L1.0 H/W/D/P/1.0__	n/a	n/a	Unfocussed raw SAR data
SLC	FBS	FBS_SLC_1P	L1.1 H1.1__	Pixel size	Determined by PALSAR ADC rate and PRF	Single look complex (SLC) slant range, products.
	FBD	FBD_SLC_1P	L1.1 H1.1__			
	PLR	PLR_SLC_1P	L1.1 P1.1__	Processing Bandwidth	1500 Hz	Side-lobe reduction is **not** applied.
	DN	DN__SLC_1P	L1.1 D1.1__			
GDH	FBS	FBS_GDH_1P	L1.5 H1.5__	Pixel size	6.25 by 6.25 m	Multi-looked, detected ground range, products.
				No of looks	1 Range Look 2 Azimuth looks	

Order Type	PALSAR mode	Corresponding ESA Product Type	JAXA Processing level and identifier	Product Parameters		Description
				Look Bandwidth	800 Hz	Side-lobe reduction is applied.
				Total Bandwidth	1500Hz	
	FBD	FBD_GDH_1P	L1.5 H1.5__	Pixel size	12.5 by 12.5 m	
	PLR	PLR_GDH_1P	L1.5 P1.5__	No of looks	1 Range Look 4 Azimuth looks	
	DN	DN__GDH_1P	L1.5 D1.5__	Look Bandwidth	400 Hz	
				Total Bandwidth	1500Hz	
	WB1	WB1_GDH_1P	L1.5 W1.5__	Pixel size No of looks Look Bandwidth Total Bandwidth	75 by 75 m 4 Range looks 3 Azimuth looks Equivalent to ~ 75-100 Hz 1500Hz	SCANSAR products processed to 3 bursts per pixel (3 independent azimuth looks). Side-lobe reduction is applied.
GDL	FBS	FBS_GDL_1P	L1.5 H1.5D_	Pixel size	75 by 75 m	Multi-looked, detected ground range, low resolution products.
	FBD	FBD_GDL_1P	L1.5 H1.5D_	No of looks	Approximately equivalent to ~ 6 Range looks (12 for FBS) ~ 20 Azimuth looks	Side-lobe reduction is applied. Generated by processing to GDH parameters and then spatially
	PLR	PLR_GDL_1P	L1.5 P1.5D_	Look Bandwidth	Equivalent to ~ 75 Hz	averaging by a factor of 12 (24 for FBS_GDH) to provide a ground range
	DN	DN__GDL_1P	L1.5 D1.5D_	Total Bandwidth	1500Hz	spatial resolution ~ 150m and an ENL>100.

GEC	FBS	FBS_GEC_1P	L1.5 projected H1.5GU/P[1]	As per corresponding GDH products, but presented in an ellipsoid corrected, geocoded map projection (UTM or UPS)	Multi-looked, detected ground range, products.
	FBD	FBD_GEC_1P	L1.5 projected H1.5GU/P		Side-lobe reduction is applied.
	PLR	PLR_GEC_1P	L1.5 projected P1.5GU/P		In a specified map projection.
	DN	DN__GEC_1P	L1.5 projected D1.5GU/P		
	WB1	WB1_GEC_1P	L1.5 projected W1.5GU/P		
GDH GDL GEC	PLR	PLP_GDH_1P PLP_GDL_1P PLP_GEC_1P	L1.5 P1.5E_ P1.5F_ P1.5IU/P	As per corresponding conventional PLR products, but presented in Pauli format (with detected HH+VV, HH-VV, HV+VH and HV-VH channels)	

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[1] U=Universal Transverse Mercator, P=Universal Polar Stereographic

2   Documentation

2.1 Reference Documents

[RD-1] ALOS Product Format Description (PALSAR L1.0) Issue J, 6 October 2006, NEC/Toshiba
[RD-2] ALOS PALSAR Data Format (Level 1.1/1.5) Revision G, October 2005, RESTEC
[RD-3] PALSAR IPF ICD, Issue 6.0, PLSR-ICD001-v5.0, Logica, May 2010

2.2 Abbreviations

The tables in sections 3 and 4 below refer to various formats; the significance of the format abbreviations is as follows:

FORMAT DESCRIPTOR	SIGNIFICANCE
An	ASCII (text) field of n characters
Bn	BINARY number of n bytes. Data is in "big-endian" order.
FPn	BINARY number of n bytes in IEEE Floating point format. Data is in "big-endian" order.
In	Integer of field width n characters, formatted as text e.g. "1234"
Fn.m	Floating point number with a field width of n characters and a decimal precision of m characters e.g. 123.456
En.m	Floating point number in scientific notation with a field width of n characters and a decimal precision of m characters e.g. -0.123456E+07
Dn.m	Floating point number in scientific notation with a field width of n characters and a decimal precision of m characters e.g. -0.123456D+07

2.3   Document Overview

This document is presented with two principal sections.

In section 3 we describe the ALOS SAR products available in CEOS format, the overall structure of the products and details on the products naming and packaging.

In section 4 we present tables detailing the contents of the ESA ALOS-PALSAR IPF CEOS files and records.

3 PRODUCT DETAILS

3.1 Product Types

The level 1.0 product is a CEOS formatted transcript of a selected window of the unfocussed ALOS signal data.

The level 1.1 product is a focused SLC product with complex (I,Q) pixels in slant range sampled at the platform ADC/PRF and presented in zero-Doppler coordinates along track.

The level 1.5 products are orthogonal ground range projected detected products in either a native SAR projection (ground range/zero Doppler azimuth distance) or are ellipsoid geocoded to a specified map projection using a mean vertical datum for the scene.

3.2 Product Size

Products are generated to cover the full swath in range, which is of variable size according to the PALSAR beam and mode for the acquisition. For standard[2] scenes the extent of the product along track corresponds to 16.4 seconds of echo data in stripmode (approx 80Km of image data) and 57 seconds in scansar mode (WB1/2).

3.2.1 Product Structure

The CEOS record structure is a function of the product type, with CEOS records provided as appropriate to the product type.

Products are provided as separate split CEOS files, following the JAXA CEOS naming convention; for polarimetric acquisitions multiple signal/image data files are provided.

Table 3-1 summarizes the outline record structure of the ESA ALOS SAR products; the L1.0, L1.1 and L1.5 columns indicate if the relevant CEOS record is supplied with the product.

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[2] The ALOS-IPF has the capability to generate scenes of arbitrary length along track.

Table 3-1 ALOS PALSAR CEOS SAR Product Structure

	CEOS Codes	No of records, size	L1.0	L1.1	L1.5	Comment
Volume Directory File						
VOLUME DESCRIPTOR RECORD	192,192,18,18	1*360 Bytes	X	X	X	
LEADER FILE POINTER RECORD	219,192,18,18	1*360 Bytes	X	X	X	
IMAGERY OPTIONS FILE POINTER RECORDS	219,192,18,18	1, 2 or 4 *360 Bytes	X	X	X	1 per polarisation
TRAILER FILE PONTER RECORD	219,192,18,18	1*360 Bytes	X	X	X	
TEXT RECORD	18,192,18,18	1*360 Bytes	X	X	X	
Leader File						
FILE DESCRIPTOR RECORD	11,192,18,18	1*720 Bytes	X	X	X	
DATA SET SUMMARY RECORD	18,10,18,20	1*4096 Bytes	X	X	X	
MAP PROJECTION DATA RECORD	18,20,18,20	1*1620 Bytes	-	-	X	
PLATFORM POSITION DATA RECORD	18,30,18,20	1*4680 Bytes	X	X	X	
PLATFORM ATTITUDE DATA RECORD	18,40,18,20	1*8192 Bytes	X	X	X	
RADIOMETRIC DATA RECORD	18,50,18,20	1*9860 Bytes	-	X	X	
DATA QUALITY SUMMARY RECORD	18,60,18,20	1*1620 Bytes	-	X	X	
CALIBRATION DATA RECORD	18,120,18,20	1*8600 Bytes	X	-	-	
FACILITY RELATED DATA RECORDS	18,200,18,70	1*15400 Bytes 1*4314000 Bytes 1*345000 Bytes 1*325000 Bytes 1*325000 Bytes 1*3072 Bytes 1*511000 Bytes 1*4370000 Bytes 1*728000 Bytes 1*15000 Bytes 1*5000 Bytes	X	X	X	All blank filled; provided solely to ensure structure of Leader file is syntactically comparable to JAXA products, in support of compatibility with 3rd party product readers.

SAR Data File (1 file per polarization)						
FILE DESCRIPTOR RECORD	50,192,18,18	1*720 Bytes.	X	X	X	
SIGNAL DATA RECORDS IMAGE DATA RECORDS	50,10,18,20 50,11,18,20	M records (fixed length, length varying with product)	X -	- X	- X	
SAR Trailer File						
FILE DESCRIPTOR RECORD	63,192,18,18	1*720 Bytes	X	X	X	

3.2.2 Product Packaging and Naming Convention

The ESA ALOS CEOS products are supplied as a tarfile with a filename following JAXA naming conventions [RD-1] with the format:

Product_name = ALPSR<swath mode><orbit number><frame number>- <obs mode><level>< processing option code ><projection><asc/desc>.tar

where the fields in the name have the following significance:

Table 3-2 Product name fields

Field	Size in Characters	Description
< swath mode >	1	S – wideswath P - otherwise
< orbit number >	5	Absolute orbit number
< frame number >	4	Frame number
< obs mode >	1	H – High resolution mode W – Wide observation mode D – Direct downlink P – Polarimetry mode C – Calibration mode
<level >	3	1.0 (RAW), 1.1 (SLC), 1.5 (Detected)
<processing option code >	1	1-character identifier -see table below
< projection >	1	U – Universal Transverse Mercator P – Universal Polar Stereographic "-" – Not geocoded
< asc/desc >	1	A – Ascending D - Descending

Table 3-3 Processing Option Codes

Processing Option Code	Standard (JAXA) option codes		Additional ESA ALOS-PALSAR IPF option codes			
	"_"	"G"	"D"	"E"	"F"	"I"
Corresponding ESA product type	GDH	GEC	GDL (low resolution product)	PAULI GDH (PLP_GDH)	PAULI GDL (PLP_GDL)	PAULI GEC (PLP_GEC)

For example a L1.1 high resolution product might have the name ALPRSP0123450123-H1.1__A.tar

The product delivery tar file contains split CEOS files of the form:

VOL-ALPSR<wide swath mode><orbit number><frame number>- <obs mode>1.0__<asc/desc>   (Volume directory file)
LED-ALPSR<wide swath mode><orbit number><frame number>- <obs mode>1.0__<asc/desc>   (Leader file)
IMG-<TR>-ALPSR<wide swath mode><orbit number><frame number>- <obs mode>1.0__<asc/desc>   (Imagery options file)
(where "<TR>" is the transmit/receive polarization e.g. "HH","VH","VH", or "VV"[3])
TRL-ALPSR<wide swath mode><orbit number><frame number>- <obs mode>1.0__<asc/desc>   (Trailer file)

For Level 1.1 and 1.5 products a 'Quick-Look' (thumbnail) product is also included in the tarfile. The thumbnail is provided in a 1 byte/pixel TIFF/GEOTIFF format. The thumbnail is a power averaged and decimated representation of the main product. Quicklooks retain the projection and aspect ratio of the main product, and are averaged by an integer factor such that the thumbnail extent does not exceed 640 samples on either image axis. Quicklooks generated for Polarimetric products are presented with either a pseudocolour for dual polarization products or, for fully polarized products with colour channels assigned red=|HH|, green=|HV|, blue=|VV| (conventional), red=|HH+VV|, green=|HV+VH|, blue=|HH-VV| (Pauli format).

The thumbnails are presented with a filename of the form : <Product_name>.tbn.TIFF for images in native range/time projections or <Product_name>.tbn.GTIF for geocoded products.

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[3] Detected polarised products in Pauli format have correspondingly "HH+VV", "HH-VV", "HV+VH", and "HV-VH" as the TR string in the filename.

4 ALOS-IPF SAR Products - CEOS FORMAT

4.1 VOLUME DIRECTORY FILE FORMAT DEFINITION

4.1.1   VOLUME DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	1	
2	5-5	B1	1st record sub-type code	192	
3	6-6	B1	Record type code	192	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document	AIPF-CEOS3.1	
10	29-30	A2	Superstructure format control document	A	
11	31-32	A2	Superstructure record format revision	A	
12	33-44	A12	Logical volume generating facility software release and revision level	ALOSIPF.3.0	
13	45-60	A16	ESA Product ID	PLR_SLC_1P	
14	61-76	A16	Logical volume identifier	AL1PSRYYYYMMDD	
15	77-92	A16	Volume set identifier	ALOS PALSAR	
16	93-94	I2	Total number of physical volumes in the logical volume	1	
17	95-96	I2	Physical volume sequence number of the first tape within the logical volume	1	
18	97-98	I2	Physical volume sequence number of the last tape within the logical volume	1	
19	99-100	I2	Physical volume sequence number of current tape within the logical volume	1	
20	101-104	I4	First referenced file number in this physical volume within the logical volume	3	
21	105-108	I4	Logical volume number within volume set	1	

22	109-112	I4	Logical volume number within physical volume	1	
23	113-120	A8	Logical volume creation date (YYYYMMDD)	20080319	
24	121-128	A8	Logical volume creation time (HHMMSSDD, DD=deci-seconds) (DD not provided)	22264900	
25	129-140	A12	Logical volume generation country (GERMANY, ENGLAND, ITALY)	ITALY	
26	141-148	A8	Logical volume generating agency	ESA	
27	149-160	A12	Logical volume generating facility (D-PAF,UK-PAF, IPAF(ASI), ES, ,MS, KS, FS)	EOC-ALOS-DPS[4]	
28	161-164	I4	Number of file pointer records in volume directory	2+No of Polarisations	
29	165-168	I4	Number of text records in volume directory	1	
30	169-260	A92	Spare	(Not used – blank)	
31	261-360	A100	Local use segment	(Not used – blank)	

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[4] Some 3rd party image analysis packages fail to load the ESA ALOS PALSAR CEOS products unless this field is set to EOC-ALOS-DPS. This field may change to a more appropriate identifier in due course.

4.1.2   LEADER FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record number	2	
2	5	BI	1st record subtype code	219	
3	6	BI	Record type code	192	
4	7	BI	2nd subtype code	18	
5	8	B1	3rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	1	
10	21-36	A16	Referenced file name	AL1 PSRASARL	
11	37-64	A28	Referenced file class	SARLEADER FILE	
12	65-68	A4	Referenced file class code	SARL	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file (variable)	7	
16	109-116	I8	Referenced file 1st record length	720	
17	117-124	I8	Referenced file maximum record length	8600	
18	125-136	A12	Referenced file record length type	VARIABLE LEN	
19	137-140	A4	Referenced file record length type code	VARE	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1-st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume (variable)	5	
24	161-260	Al00	File pointer spare segment	(Not used – blank)	
25	261-360	Al00	Local use segment	(Not used – blank)	

4.1.3   DATA FILE POINTER RECORD (1 per polarization)

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record number	3	
2	5	BI	1st record subtype code	219	
3	6	BI	Record type code	192	
4	7	BI	2nd subtype code	18	
5	8	B1	3rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	2	
10	21-36	A16	Referenced file name	AL1 PSRAIMOP	
11	37-64	A28	Referenced file class	IMAGERY OPTIONS FILE	
12	65-68	A4	Referenced file class code	IMOP	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file (variable)	6529	
16	109-116	I8	Referenced file 1st record length	720	
17	117-124	I8	Referenced file maximum record length	12700	
18	125-136	A12	Referenced file record length type	VARIABLE LEN	
19	137-140	A4	Referenced file record length type code	VARE	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume (variable)	6529	
24	161-260	AI00	File pointer spare segment	(Not used – blank)	
25	261-360	AI00	Local use segment		

4.1.4   SAR TRAILER FILE POINTER RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record number	4	
2	5	BI	1st record subtype code	219	
3	6	BI	Record type code	192	
4	7	BI	2nd subtype code	18	
5	8	B1	3rd subtype code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC flag for referenced file	A	
8	15-16	A2	Blank		
9	17-20	I4	Referenced file number	1	
10	21-36	A16	Referenced file name	AL1 PSRASART	
11	37-64	A28	Referenced file class	SARTRAILER FILE	
12	65-68	A4	Referenced file class code	SART	
13	69-96	A28	Referenced file data type	MIXED BINARY AND ASCII	
14	97-100	A4	Referenced file data type code	MBAA	
15	101-108	I8	Number of records in referenced file (variable)	1	
16	109-116	I8	Referenced file 1st record length	720	
17	117-124	I8	Referenced file maximum record length	720	
18	125-136	A12	Referenced file record length type	FIXED LENGTH	
19	137-140	A4	Referenced file record length type code	FIXD	
20	141-142	I2	Referenced file physical volume start number	1	
21	143-144	I2	Referenced file physical volume end number	1	
22	145-152	I8	Referenced file portion start, 1st record number for this physical volume	1	
23	153-160	I8	Referenced file portion end, last record number for this physical volume (variable)	1	
24	161-260	AI00	File pointer spare segment	(Not used – blank)	
25	261-360	AI00	Local use segment	(Not used – blank)	

4.1.5   TEXT RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	5	
2	5-5	B1	1st record sub-type code	18	
3	6-6	B1	Record type code	63	
4	7-7	B1	2nd record sub-type code	18	
5	8-8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	360	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Continuation flag	(Not used – blank)	
9	17-56	A40	JAXA product type specifier (<obs mode><level><geo><projection><asc/desc>)	PRODUCT:H1.0__A	
10	57-116	A60	Location and date/time of product creation PROCESS:ESA-ALOS-IPF YYYYMMDDHHMMSS	PROCESS:ESA-ALOS-IPF 20090115093021	
11	117-156	A40	Physical volume identification	(Not used – blank)	
12	157-196	A40	Scene identification	ORBIT 18001 DATE:26-FE B-2001 10:17:39	
13	197-236	A40	Scene location	FRAME CENTRE N 69.02 E 17.03	
14	237-256	A20	Spares	(Not used – blank)	
15	257-360	A104	Spares	(Not used – blank)	

4.2 LEADER FILE FORMAT DEFINITION

4.2.1   SAR - LEADER FILE, FILE DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	11	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	AIPF-CEOS1.0	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	ALOSIPF 01.01	
13	45-48	I4	File number	1	
14	49-64	A16	File name	AL1 PSRASARL	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	
24-27	113-116	A1	Reserved	(Not used – blank)	
28	117-180	A64	Reserved segment	(Not used – blank)	

29	181-186	I6	Number of data set summary records	1	
30	187-192	I6	Data set summary record length	4096	
31	193-198	I6	Number of map projection data records 0 for Level 1.0,1.1 products 1 for Level 1.5 geocoded products	1	
32	199-204	I6	Map projection record length	1620	
33	205-210	I6	Number of platform pos. data records	1	
34	211-216	I6	Platform position record length	4680	
35	217-222	I6	Number of attitude data records	1	
36	223-228	I6	Attitude data record length	8192	
37	229-234	I6	Number of radiometric data records	1	
38	235-240	I6	Radiometric record length	9860	
39	241-246	I6	Number of rad. compensation records	0	
40	247-252	I6	Radiometric compensation rec. length	0	
41	253-258	I6	Number of data quality summary records	1	
42	259-264	I6	Data quality summary record length	1620	
43	265-270	I6	Number of data histograms records	0	
44	271-276	I6	Data histogram record length	0	
45	277-282	I6	Number of range spectra records	0	
46	283-288	I6	Range spectra record length	0	
47	289-294	I6	Number of DEM descriptor records	0	
48	295-300	I6	DEM descriptor record length	0	
49	301-306	I6	Number of radar par. update records	0	
50	307-312	I6	Radar par. update record length	0	
51	313-318	I6	Number of annotation data records	0	
52	319-324	I6	Annotation data record length	0	
53	325-330	I6	Number of det. processing records	8000	
54	331-336	I6	Det. processing record length	9216	
55	337-342	I6	Number of calibration records	1	
56	343-348	I6	Calibration record length	13212	
57	349-354	I6	Number of GCP records	0	

58	355-360	I6	GCP record length	0	
59-68	361-420	I6	Spare		
69	421-426	I6	Number of facility data records	0	
70	427-432	I6	Facility data record maximum length	0	
71	433-720	A2	Blanks		

4.2.2   DATA SET SUMMARY RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1 - 4	B4	Record sequence number	2	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record-type code	10	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	4096	
7	13-16	I4	Data Set Summary Record sequence number (starts at 1)	1	

SCENE PARAMETERS

8	17-20	I4	SAR channel indicator	(Not used – blank)	
9	21-52	A16	Reserved	(Not used – blank)	
10	53-68	A32	Scene reference number	(Not used – blank)	
11	69-100	A32	Scene centre time (UTC) <YYYYMMDDhhmmssttt>	19980226101739000	
12	101-116	A16	Spare	(Not used – blank)	
13	117-132	F16.7	Processed scene centre geodetic latitude (positive for North latitude, negative for South latitude)	69.0228420	degrees
14	133-148	F16.7	Processed scene centre geodetic longitude (negative for West longitude)	17.0369700	degrees
15	149-164	F16.7	Processed scene centre true heading as calculated relative to North	-166.8998000	degrees
16	165-180	A16	Ellipsoid designator	WGS84	
17	181-196	F16.7	Ellipsoid semimajor axis	6378.137	Km
18	197-212	F16.7	Ellipsoid semiminor axis	6356.752	Km
19	213-228	F16.7	Earth mass	5.9742000E+24	kg
20	229-244	F16.7	Earth mass * Gravitational constant	3.9865837E+14	kg.m/s2
21	245-260	F16.7	Ellipsoid J2 parameter	0.0010826	

22	261-276	F16.7	Ellipsoid J3 parameter	0.0000025	
23	277-292	F16.7	Ellipsoid J4 parameter	-0.0000017	
24	293-308	A16	Spare	(Not used – blank)	
25	309-324	F16.7	Reserved	(Not used – blank)	
26	325-332	I8	Scene centre line number	9000	
27	333-340	I8	Scene centre pixel number (the pixel number at the scene centre including zero fill) (nominal)	3072	
28	341-356	F16.7	Processed scene length including zero fill (nominal)	100.0	km
29	357-372	F16.7	Processed scene width including zero fill (nominal)	100.0	km
30	373-388	A16	Spare	(Not used – blank)	

GENERAL MISSION / SENSOR PARAMETERS

31	389-392	I4	Number of SAR channels	1	
32	393-396	A4	Spare	(Not used – blank)	
33	397-412	A16	Sensor platform mission identifier	ALOS1	
34	413-444	A32	Sensor ID and mode of operation for this channel <AAAAAA-BB-CC-DD-EF> where : AAAAAA = sensor identifier BB = SAR band CC = resolution mode code DD = imaging mode code E = transmit polarisation F = receiver polarisation	ALOS-1-L-HR-IM-HH	
35	445-452	A8	Orbit number	123	

36	453-460	F8.3	Not Used	(Not used – blank)	
37	461-468	F8.3	Not Used	(Not used – blank)	
38	469-476	F8.3	Not Used	(Not used – blank)	degrees
39	477-484	F8.3	Sensor clock angle as measured relative to sensor platform flight direction	90.0000	degrees
40	485-492	F8.3	Incidence angle at scene centre as derived from sensor platform orientation	35.0	degrees
41	493-500	F8.3	Radar frequency	1.25	GHz
42	501-516	F16.7	Radar wavelength	0.2351313	metres
43	517-518	A2	Motion compensation indicator (not applicable)	00	
44	519-534	A16	Range pulse code specifier	LINEAR FM CHIRP	
45	535-550	E16.7	Chirp start frequency	0.748247E+7	Hz
46	551-566	E16.7	Chirp linear FM rate	-0.42757E+12[5]	Hz sec-1
47	567-582	E16.7	Chirp frequency quadratic coefficient	0.0	Hz sec-2
48	583-598	E16.7	Chirp frequency cubic coefficient	0.0	Hz sec-3
49	599-614	E16.7	Chirp frequency quartic coefficient	0.0	Hz sec-4
50	615-630	E16.7	Not Used		
51	631-646	E16.7	Not Used		
52	647-662	E16.7	Not Used		
53	663-678	E16.7	Not Used		
54	679-694	E16.7	Not Used		
55	695-702	I8	Not Used		

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[5] In other CEOS formats the chirp FM parameters are found in fields 50-54 and amplitude coefficients found in fields 45-49.

56	703-710	A8	Spare		
57	711-726	F16.7	Range sampling rate	16.000000	MHz
58	727-742	F16.7	Range gate delay at early edge (in time) at the start of the image	5406.675	microsec
59	743-758	F16.7	Range pulse length	27.0000000	microsec
60	759-762	A4	Baseband conversion flag	NOT	
61	763-766	A4	Range compressed flag (YES = range compressed data)	NOT	
62-63	767-798	2 F16.7	Reserved		
64	799-806	I8	Quantization per channel I & Q	5	bits
65	807-818	A12	Quantizer descriptor	UNIFORM I Q	
66	819-834	F16.7	DC Bias for I-component (Not Used)	0	
67	835-850	F16.7	DC Bias for Q-component (Not Used)	0	
68	851-866	F16.7	Gain imbalance for I & Q (Not Used)	0	dB
69-70	867-898	F16.7	Spare		
71	899-914	F16.7	Reserved		
72	915-930	F16.7	Antenna mechanical boresight angle relative to platform vertical axis at the start of the image positive to the right, negative to the left	35.0	
73	931-934	A4	Echo Tracker flag	ON	
74	935-950	F16.7	Pulse Repetition Frequency (PRF) (actual value)	2132.196	Hz
75-76	951-966	F16.7	Elevation beamwidth (2-way 3dB in degrees)	6.0	Degrees
76	967-982	F16.7	Azimuth beamwidth (2-way 3dB in degrees)	1.1	Degrees

77	983-998	I16	Not Used		
78	999-1030	A32	Not Used		
79	1031-1046	I8	Not Used		
80	1047-1062	A16	Processing facility identifier	PAM	
81	1063-1070	A8	Processing system identifier	ALOS-IPF	
82	1071-1078	A8	Processing version identifier	01.01	
83	1079-1094	A16	Reserved		
84	1095-1110	A16	Product code	1.0 or 1.1 or 1.5	
85	1111-1142	A32	Product type specifier	UNPROCESSED SIGNAL DATA or BASIC IMAGE or STANDARD GEOCODED IMAGE	
86	1143-1174	A32	Processing Algorithm (focussed products)	PRECISION RANGE DOPPLER	
87	1175-1190	F16.7	Effective Number of looks in Azimuth (nominal value) (focussed products)	4.0	
88	1191-1206	F16.7	Effective Number of looks in Range (nominal value) (focussed products)	1.0	
89	1207-1222	F16.7	Azimuth Look Bandwidth (focussed products)	400.0	Hz
90	1223-1238	F16.7	Range Look Bandwidth (focussed products)	14000.0	kHz
91	1239-1254	F16.7	Total Azimuth Bandwidth (focussed products)	1500.0	Hz
92	1255-1270	F16.7	Total Range Bandwidth (focussed products)	14000.0	kHz

93	1271-1302	A32	Azimuth Weighting Function (focussed products)	HANNING	
94	1303-1334	A32	Range Weighting Function (focussed products)	HANNING	
95	1335-1350	A16	Data input source	ONLINE	
96	1351-1366	F16.7	3dB Range resolution (focussed products)	16.5	metres
97	1367-1382	F16.7	3dB Azimuth resolution (focussed products)	18.2	metres
98	1383-1398	F16.7	Reserved		
99	1399-1414	F16.7	Reserved		
100	1415-1430	F16.7	Along track Doppler frequency constant term at early edge of image (focussed products)		Hz
101	1431-1446	F16.7	Along track Doppler frequency linear term at early edge of the image (focussed products)		Hz/pixel
102	1447-1462	F16.4	Along track Doppler frequency quadratic term at early edge of the image (focussed products)		Hz/pixel/pixel
103	1463-1478	A16	Not Used		
104	1479-1494	F16.7	Cross track Doppler frequency at early edge of the image (focussed products)		Hz
105	1495-1510	F16.7	Cross track Doppler frequency linear term at early edge of the image (focussed products)		Hz/pixel
106	1511-1526	F16.7	Cross track Doppler frequency quadratic term at early edge of the image (focussed products)		Hz/pixel/pixel
107	1527-1534	A8	Time direction indicator along pixel direction	INCREASE	
108	1535-1542	A8	Time direction indicator along line direction	ASCEND or DESCEND	
109	1543-1558	F16.7	Not Used		
110	1559-1574	F16.7	Not Used		
111	1575-1590	F16.7	Not Used		
112	1591-1606	A16	Not Used		

113	1607-1622	F16.7	Not Used		
114	1623-1638	F16.7	Not Used		
115	1639-1654	F16.4	Not Used		
116	1655-1670	F16.7	% signal power rejected as RFI		
117	1671-1678	A8	Line Content Indicator 'RANGE' or, for geocoded products, 'OTHER'	RANGE	
118	1679-1682	A4	Clutter lock flag 'YES' or 'NOT' (focussed products)	NOT	
119	1683-1686	A4	Auto-focus flag	NOT	
120	1687-1702	F16.7	Line spacing (focussed products)	12.5	metres
121	1703-1718	F16.7	Pixel spacing (focussed products)	12.5	metres
122	1719-1734	A16	Range compression chirp 'SYNTHETIC CHIRP' or 'EXTRACTED CHIRP'	SYNTHETIC CHIRP	
123	1735-1751	A16	Spare		
124	1751-1766	A16	Spare		

SENSOR SPECIFIC LOCAL USE SEGMENT

125	1767-1770	I4	Calibration data indicator (always 0)	0	
126	1771-1778	I8	Always 0	0	
127	1779-1786	I8	Always 0	0	
128	1787-1794	I8	Always 0	0	
129	1795-1802	I8	Always 0	0	
130	1803-1806	I4	PRF change indicator – always 0 unless SCANSAR, when 1	0	
131	1807-1814	I8	Always 0	0	
132	1815−1830	A16	Spare		
133	1831-1834	I4	Not used	0	
134	1835-1838	I4	Telemetered beam table index 0-191 ("Parameter table number")	5	

135	1839-1854	F16.7	Beam off nadir angle	24.2	Degrees
136	1855-1858	I4	Beam number (0-22)	5	
137	1859-1874	F16.7	Estimated Faraday rotation angle		
138	1875-1876	I2	Faraday Rotation estimation method flag 0 – not applied 1 – estimated from TEC data and Earth Geomagnetic Field model 2 – estimated from data		
139	1877-1884	4I2	Polarimetric calibration options flags (0 = not applied, 1 = applied) Flag 1– Faraday rotation correction applied Flag 2– Crosstalk correction applied Flag 3 – Channel imbalance correction applied Flag 4 – Symmetrisation applied		
140	1885-1886	A2	Not used		
141	1887-2006	6E20.13	Six polynomial coefficients defining incidence angle as a function of slant range: Incidence angle (radians) = $a0 + a1\,R + a2\,R^2 + a3\,R^3 + a4\,R^4 + a5\,R^5$ Where R is slant range from the satellite in Km		
142	2007-2014	A8	Spare		
142	2015-2094	4E20.13	Four polynomial coefficients defining slant range as a cubic function of image range from near range pixel: Slant range (Km) = $a0 + a1\,g + a2\,g^2 + a3\,g^3$ where g is the image range from near range pixel in Km (= (pixel_no-1)*(field 121)/1000.0)		
143	2095-4096	A2000	Spare		

4.2.3   MAP PROJECTION DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1 - 4	B4	Record sequence number	3	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record-type code	20	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	1620	
7	13-28	A16	Spare		

MAP PROJECTION GENERAL INFORMATION

8	29-60	A32	Map projection descriptor (SLANT RANGE, GROUND RANGE, GEOCODED)	SLANT RANGE	
9	61-76	I16	Number of pixels per line of image	6208	pixels
10	77-92	I16	Number of lines (variable)	6528	lines
11	93-108	F16.7	Nominal inter-pixel distance in output scene	12.5	m
12	109-124	F16.7	Nominal inter-line distance in output scene	12.5	m
13	125-140	F16.7	Orientation at output scene centre [for geocoded products this is simply the convergence of the meridians, i.e.: the angle between geographic north and map grid north (Angle of projection axis from true North)]	-166.8998000	degrees
14	141-156	F16.7	Nominal platform orbital inclination	98.16	degrees
15	157-172	F16.7	Actual ascending node (longitude at Equator)	-165.0442300	degrees
16	173-188	F16.7	Geocentre to platform distance at input scene centre	7067.329	km
17	189-204	F16.7	Platform geodetic altitude over the ellipsoid	702.359	km
18	205-220	F16.7	Ground speed at nadir at input scene centre time (Not provided)		km/s
19	221-236	F16.7	Platform heading at nadir corresponding to scene centre	-166.8998000	degrees

20	237-268	A32	Name of reference ellipsoid	WGS84	
21	269-284	F16.7	Semimajor axis of ref.ellipsoid	6378.137	km
22	285-300	F16.7	Semiminor axis of ref.ellipsoid	6356.752	km
23	301-412	A412	Not used		
24	413-444	A32	Map Projection – NONE, UTM-PROJECTION or UPS-PROJECTION	UTM-PROJECTION	
25	445-476	A32	UTM descriptor (for UTM, blank otherwise)	UNIVERSAL TRANSVERSE MERCATOR	
26	477-480	I4	UTM Zone ID (only longitude) (for UTM, blank otherwise)	0012	
27	481-496	F16,5	False Easting (for UTM, blank otherwise)	500000.0	
28	497-512	F16.5	False Northing (for UTM, blank otherwise)	0.0	
29	513-528	F16.7	Projection centre longitude (for UTM, blank otherwise)	17,12345	degrees
30	529-544	F16.7	Projection centre latitude (for UTM, blank otherwise)	68.56789	Degrees
31	545-576	A32	Not Used		
32	577-592	F16.7	Scale Factor (for UTM, blank otherwise)	0.9996000	
33	593-624	A32	UPS descriptor (for UPS, blank otherwise)	UNIVERSAL POLAR STEREOGRAPHIC	
34	625-640	F16.7	Projection centre longitude (for UPS, blank otherwise)		
35	641-656	F16.7	Projection centre latitude (for UPS, blank otherwise)		

36	657-672	F16.7	Scale Factor (for UPS, blank otherwise)	0.9940000	
37	673-944	A272	Not Used		
38	945-960	F16.7	1st line 1st pixel Northing		Km
39	961-976	F16.7	1st line 1st pixel Easting		Km
40	977-992	F16.7	1st line last pixel Northing		Km
41	993-1008	F16.7	1st line last pixel Easting		Km
42	1009-1024	F16.7	Last line last pixel Northing		Km
43	1025-1040	F16.7	Last line last pixel Easting		Km
44	1041-1056	F16.7	Last line 1st pixel Northing		Km
45	1057-1072	F16.7	Last line 1st pixel Easting		Km
46	1073-1088	F16.7	1st line 1st pixel geodetic latitude (positive for North latitude)	69.295150	degrees
47	1089-1104	F16.7	1st line 1st pixel longitude (negative for West longitude)	18.2548100	degrees
48	1105-1120	F16.7	1st line last pixel geodetic latitude	69.4528700	degrees
49	1121-1136	F16.7	1st line last pixel longitude	16.3344800	degrees
50	1137-1152	F16.7	Last line last pixel geodetic latitude	68.7388500	degrees
51	1153-1168	F16.7	Last line last pixel longitude	15.9030100	degrees
52	1169-1184	F16.7	Last line 1st pixel geodetic latitude	68.5846100	degrees
53	1185-1200	F16.7	Last line 1st pixel longitude	17.7636640	degrees
54	1201-1264	A64	Not Used		
55	1265-1424	8E20.10	Eight coefficients (A11, A12, ..., A24) to convert a line (L) and pixel (P) position to the map projection frame of reference, say (E, N) where: E = A11 + A12*L + A13*P + A14*L*P N = A21 + A22*L + A23*P + A24*L*P (in the order A11, A12, A13, ..., A24)		
56	1425-1584	8E20.10	Eight coefficients (B11, B12, ..., B24) to convert from the map projection (E, N) to line (L) and pixel (P) position in the image, say (L, P) where: L = B11 + B12*E + B13*N + B14*E*N P = B21 + B22*E + B23*N + B24*E*N (in the order B11, B12, B13, ..., B24)		
57	1585-1620	A36	Not Used		

4.2.4 PLATFORM POSITION DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1 - 4	B4	Record sequence number	3	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record-type code	30	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	4680	
7	13-44	A32	Orbital elements designator	ECR	
8-10	45-92	3F16.7	First Position vector (X,Y,Z) (in ECR)	-0.1051104….D+07	metres
11-13	93-140	3F16.7	First Velocity vector (X,Y,Z) (in ECR)	-0.8515032…D+03 etc	m/s

POSITIONAL DATA POINTS

14	141-144	I4	Number of data points	5	
15	145-148	I4	Year of data point <YYYY>	1998	
16	149-152	I4	Month of data point <$$MM>	2	
17	153-156	I4	Day of data point <$$DD>	26	
18	157-160	I4	Day in the year <GMT> (1st January = Day 1)	56	
19	161-182	D22.15	Seconds of day of data	37020.000000000000000	sec
20	183-204	D22.15	Time interval between data points	60.000000000000000	sec
21	205-268	A64	Reference coordinate system	EARTH FIXED REFERENCE SYSTEM	
22	269-290	D22.15	Greenwich mean hour angle (Not Used)		degrees
23	291-306	F16.7	Along track position error (Not Used)		metres

24	307-322	F16.7	Across track position error (Not Used)		metres
25	323-338	F16.7	Radial position error (Not Used)		metres
26-28	339-386	F16.7	Reserved		
29	387-452	3D22.15	Position vector (X,Y,Z) (in ECR)	-0.105110487569652D+07	metres
30	453-518	3D22.15	Velocity vector (X,Y,Z) (in ECR)	-0.851503263939225D+03	m/s
Fields 29,30 repeat to end of record at a time spacing given by field 20					

4.2.5 PLATFORM ATTITUDE DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	4	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record sub-type code	40	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	8192	
7	13-16	I4	Number of data points	62	
8	17-20	I4	Day in the year <GMT> (1st January = Day 1)	56	
9	21-28	I8	Millisec of day		
10	29-32	I4	Pitch quality flag (0/= good)	0	
11	33-36	I4	Roll quality flag (0/= good)	0	
12	37-40	I4	Yaw quality flag (0/= good)	0	
13	41-54	E14.6	Pitch	0	degrees
14	55-68	E14.6	Roll		degrees
15	69-82	E14.6	Yaw		degrees
16	83-86	I4	Pitch rate quality flag (0/= good)	0	
17	87-90	I4	Roll rate quality flag (0/= good)	0	
18	91-94	I4	Yaw rate quality flag (0/= good)	0	
19	95-108	E14.6	Pitch rate	0	degrees/sec
20	109-122	E14.6	Roll rate		degrees/sec
21	123-136	E14.6	Yaw rate		degrees/sec
Fields 8-21 repeat according to number of points in field 7					

4.2.6 RADIOMETRIC DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	5	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record sub-type code	50	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	9860	
7	13-16	I4	Radiometric record sequence number (always 1)	1	
8	17-20	I4	No of fields (always 1)	1	
9	21-36	F16.7	Calibration Factor – sigma 0 is given by 10log10(pixel power) + Calibration Factor – B[6] where B = 0 for detected products and B = 32dB for complex products.	-31.3	dB
10	37-164	4(2F16.7)	Polarimetric transmission distortion matrix T (ordered as real and imaginary pairs for T(1,1),T(2,1),T(1,2),T(2,2)		
11	165-292	4(2F16.7)	Polarimetric reception distortion matrix R (ordered as real and imaginary pairs for R(1,1),R(2,1),R(1,2),R(2,2)		
12	293-9860	A9568	Not Used		

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[6] The bias B is provided for compatibility with JAXA products.

4.2.7 DATA QUALITY SUMMARY RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	6	
2	5	B1	1st record sub-type code	18	
3	6	B1	Record sub-type code	60	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	1620	
7	13-16	I4	Record sequence number (always 1)	1	
8	17-20	A4	Channel Indicator (always 1)	1	
9	21-26	A6	Calibration date YYMMDD	130501	
10	27-30	I4	Number of channels	4	
11	31-46	F16.7	Nominal Integrated Side Lobe Ratio (ISLR)		dB
12	47-62	F16.7	Nominal Peak Side Lobe to main lobe Ratio (PSLR)		dB
13	63-78	F16.7	Nominal azimuth ambiguity (AAR) – Not Used		
14	79-94	F16.7	Nominal range ambiguity (RAR) – Not Used		
15	95-110	F16.7	Estimate of SNR (from range spectra) – Not Used		
16	111-126	F16.7	Actual Bit Error Rate (BER) – Not Used		
17	127-142	F16.7	Nominal slant range resolution		metres
18	143-158	F16.7	Nominal azimuth resolution		metres
19	159-174	F16.7	Nominal radiometric resolution		dB
20	175-190	F16.7	Instantaneous dynamic range – Not Used		dB
21	191-206	F16.7	Nominal absolute radiometric calibration magnitude of uncertainty of first SAR channel – Not Used		dB
22	207-222	F16.7	Nominal absolute radiometric calibration magnitude uncertainty of first SAR channel – Not Used		degrees
23	223-1620	A1398	Not Used		

4.3 DATA SET FILE FORMAT DEFINITION

4.3.1 SAR DATA FILE, FILE DESCRIPTOR RECORD (FIXED SEGMENT)

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	1	
2	5	B1	1st record sub-type code	50	
3	6	B1	Record sub-type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	AIPF-CEOS1.0	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	ALOSIPF 01.01	
13	45-48	I4	File number	2	
14	49-64	A16	File name	AL1 PSRAIMOP	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	1	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	1	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	

24-27	113-116	A1	Reserved		
28	117-180	A64	Reserved segment		
29	181-186	I6	Number of SAR DATA records (nominal)	6528	
30	187-192	I6	SAR DATA record length	12700	bytes
31	193-216	A24	Reserved		
32	217-220	I4	Number of bits per sample	8	
33	221-224	I4	Number of samples per data group (or pixels)	2	
34	225-228	I4	Number of bytes per data group(or pixels)	2	
35	229-232	A4	Justification and order of samples within data group		

SAMPLE GROUP DATA

36	233-236	I4	Number of SAR channels in this file	1	
37	237-244	I8	Number of lines per data set (nominal)	6528	
38	245-248	I4	Number of left border pixels per line	0	
39	249-256	I8	Total number of data groups per line per SAR channel	6144	
40	257-260	I4	Number of right border pixels per line	0	
41	261-264	I4	Number of top border lines	0	
42	265-268	I4	Number of bottom border lines	0	
43	269-273	A4	Interleaving indicator	BSQ	

RECORD DATA IN THE FILE

44	273-274	I2	Number of physical records per line	1	
45	275-276	I2	Number of physical records per multi-channel line	1	
46	277-280	I4	Number of bytes of prefix data per record 412 (L1.0 or L1.1) or 192 for detected products	412	
47	281-288	I8	Number of bytes of SAR data(or pixel data) per record(nominal)	12288	
48	289-292	I4	Number of bytes of suffix data per record	0	
49-55	293-340	A48	Reserved		
56	341-368	A28	Blanks		
57-60	369-400	A32	Reserved		
61	401-428	A28	SAR Data format type identifier COMPLEX INTEGER*2 (Raw) UNSIGNED INTEGER*2 (Detected image data) COMPLEX*8 (Complex image data)	COMPLEX INTEGER*2	
62	429-432	A4	SAR Data format type code	CI*2	
63	433-436	I4	Number of left fill bits within pixel	5	
64	437-440	I8	Number of right fill bits within pixel	0	
65	441-448	I8	Maximum data range of pixel	7	
66	449-720	A372	Spare		

4.3.2   SIGNAL/IMAGE DATA RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record sequence number	2	
2	5	B1	1st record sub-type code	50	
3	6	B1	Record sub-type code 10 (raw signal data) or 11 (processed image data)	10	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	20	
6	9-12	B4	Length of this record	12700	

PREFIX DATA – GENERAL INFORMATION

7	13-16	B4	Line number	1234	
8	17-20	B4	Line index (record sequence number in the image line)	(always) 1	
9	21-24	B4	Left fill pixels	(always 0)	
10	25-28	B4	Number of samples	6144	
11	29-32	B4	Number of right fill pixels		
12	33-36	B4	Not Used		
13	37-40	B4	Acquisition year	1995	
14	41-44	B4	Acquisition day-of-year	213	
15	45-48	B4	Acquisition msec of day	3175000	
16	49-50	B2	Channel indicator (1,2 or 4 polarisations)	1	
17	51-52	B2	Channel code	0	
18	53-54	B2	TX Polarisation (H=0,V=1)	0	
19	55-56	B2	RX Polarisation (H=0,V=1)	0	
20	57-60	B4	PRF	2155172	mHz

Header information from byte 61 onwards differs between Unfocussed L1.0 Signal Data and Processed Image Data (L1.1/L1.5)

L1.0 UNFOCUSSED RAW SIGNAL DATA HEADER

21	61-64	B4	SCAN ID (1-50 for SCANSAR mode	0	
22	65-66	B2	OBRC flag	0	
23	67-68	B2	Chirp type	0	
24	69-72	B4	Chirp length	27000	nanosecs
25	73-76	B4	Chirp centre offset freq	0	KHz
26	77-80	B4	Chirp FM rate	-1037037	Hz/microsec
27	81-84	B4	Chirp quadratic coefficient	0	Hz/microsec^2
28	85-92	B8	Not Used		
29	93-96	B4	Receiver Gain (= - AGC attenuation)	25	dB
30	97-100	B4	Defective line indicator (Not populated)	0	
31	101-104	B4	Not Used		
32	105-108	B4	Not Used		
33	109-112	B4	Not Used		
34	113-116	B4	Not Used		
35	117-120	B4	Slant range to first sample in metres	849713	metres
36	121-124	B4	Sample window start time	100675	nanosecs
37	125-128	B4	Not Used		
38	129-192	A64	Not Used		
39	193-284	A92	Not Used		
40	285-288	B4	PALSAR frame counter	12345	
41	289-388	B100	Mission auxiliary telemetry (bit-packed data)		
42	389-412	A24	Not Used		
43	413-	B1	Signal data		

L1.1 SLC IMAGE DATA HEADER

21	61-64	B4	Not Used	0	
22	65-68	B4	Slant range to first pixel in metres		metres
23	69-72	B4	Slant range to mid-pixel in metres		metres
24	73-76	B4	Slant range to last pixel in metres		metres
25	77-80	B4	Centre doppler frequency at first pixel	75000	milliHz
26	81-84	B4	Centre doppler frequency at mid pixel	75000	milliHz
27	85-88	B4	Centre doppler frequency at last pixel	75000	milliHz
28	88-92	B4	Azimuth FM rate at first pixel	450000	Hz/millisec
29	93-96	B4	Azimuth FM rate at mid pixel	450000	Hz/millisec
30	97-100	B4	Azimuth FM rate at last pixel	450000	Hz/millisec
31	101-128	A28	Not Used	0	
			Georeferencing information		
32	129-132	B4	Repeat indicator = 1 -> geolocation parameters accurate for this range line	1	
33 *	133-136	B4	Latitude of first (near range) pixel in rangeline (0 for GEC products)		Degrees*1e6
34 *	137-140	B4	Latitude of middle pixel (0 for GEC products)		Degrees*1e6
35 *	141-144	B4	Latitude of last pixel (0 for GEC products)		Degrees*1e6
36	145-148	B4	Longtitude of first (near range) pixel (0 for GEC products)		Degrees*1e6
37 *	149-152	B4	Longtitude of middle pixel (0 for GEC products)		Degrees*1e6
38	153-156	B4	Longtitude of last pixel (0 for GEC products)		Degrees*1e6
39	157-160	B4	Northings of first pixel (Only for GEC products)		Metres
40	161-164	B4	Spare		
41	165-168	B4	Northings of last pixel (Only for GEC products)		Metres
42	169-172	B4	Eastings of first pixel (Only for GEC products)		Metres
43	173-176	B4	Spare		
44	177-180	B4	Eastings of last pixel (Only for GEC products)		Metres
45 *	181-184	B4	Platform heading re North		Degrees*1e6
46	185-412	72B4	Spare		
47	413-	FP4 (complex)	Image data		

L1.5 IMAGE DATA HEADER

21	61-64	B4	Not Used	0	
22	65-68	B4	Slant range to first pixel in metres (0 for GEC products)		metres
23	69-72	B4	Slant range to mid-pixel in metres (0 for GEC products)		metres
24	73-76	B4	Slant range to last pixel in metres (0 for GEC products)		metres
25	77-80	B4	Centre doppler frequency at first pixel (0 for GEC products)	75000	milliHz
26	81-84	B4	Centre doppler frequency at mid pixel (0 for GEC products)	75000	milliHz
27	85-88	B4	Centre doppler frequency at last pixel (0 for GEC products)	75000	milliHz
28	88-92	B4	Azimuth FM rate at first pixel (0 for GEC products)	450000	Hz/millisec
29	93-96	B4	Azimuth FM rate at mid pixel (0 for GEC products)	450000	Hz/millisec
30	97-100	B4	Azimuth FM rate at last pixel (0 for GEC products)	450000	Hz/millisec
31	101-128	A28	Not Used	0	
			Georeferencing information		
32	129-132	B4	Repeat indicator= 1 -> geolocation parameters accurate for this range line	1	
33	133-136	B4	Latitude of first (near range) pixel in rangeline (0 for GEC products)		Degrees*1e6
34	137-140	B4	Latitude of middle pixel (0 for GEC products)		Degrees*1e6
35	141-144	B4	Latitude of last pixel (0 for GEC products)		Degrees*1e6
36	145-148	B4	Longtitude of first (near range) pixel (0 for GEC products)		Degrees*1e6
37	149-152	B4	Longtitude of middle pixel (0 for GEC products)		Degrees*1e6
38	153-156	B4	Longtitude of last pixel (0 for GEC products)		Degrees*1e6
39	157-160	B4	Northings of first pixel (Only for GEC products)		Metres
40	161-164	B4	Spare		
41	165-168	B4	Northings of last pixel (Only for GEC products)		Metres
42	169-172	B4	Eastings of first pixel (Only for GEC products)		Metres
43	173-176	B4	Spare		
44	177-180	B4	Eastings of last pixel (Only for GEC products)		Metres
45	181-184	B4	Platform heading re North		Degrees*1e6
46	185-192	A8	Spare		
47	193-	B2 (detected)	Image data		

4.4 TRAILER FILE FORMAT DEFINITION

4.4.1 SAR TRAILER FILE, FILE DESCRIPTOR RECORD

FIELD	BYTES	FORMAT	DESCRIPTION	EXAMPLE	UNITS
1	1-4	B4	Record Sequence Number	1	
2	5	B1	1st record sub-type code	63	
3	6	B1	Record type code	192	
4	7	B1	2nd record sub-type code	18	
5	8	B1	3rd record sub-type code	18	
6	9-12	B4	Length of this record	720	
7	13-14	A2	ASCII/EBCDIC Flag	A	
8	15-16	A2	Blanks		
9	17-28	A12	Format control document ID for this data file format	AIPF-CEOS1.0	
10	29-30	A2	Format control document revision level	A	
11	31-32	A2	File design descriptor revision letter	A	
12	33-44	A12	Generating software release and revision level	ALOSIPF 01.01	
13	45-48	I4	File number	1	
14	49-64	A16	File name	AL1 PSRASART	
15	65-68	A4	Record sequence and location type flag	FSEQ	
16	69-76	I8	Sequence number location	1	
17	77-80	I4	Sequence number field length	4	
18	81-84	A4	Record code and location type flag	FTYP	
19	85-92	I8	Record code location	5	
20	93-96	I4	Record code field length	4	
21	97-100	A4	Record length and location type flag	FLGT	
22	101-108	I8	Record length location	9	
23	109-112	I4	Record length field length	4	

24-27	113-116	A1	Reserved	(Not used – blank)	
28	117-180	A64	Reserved segment	(Not used – blank)	
29	181-186	I6	Number of data set summary records	0	
30	187-192	I6	Data set summary record length	0	
31	193-198	I6	Number of map projection data records	0	
32	199-204	I6	Map projection record length	0	
33	205-210	I6	Number of platform pos. data records	0	
34	211-216	I6	Platform position record length	0	
35	217-222	I6	Number of attitude data records	0	
36	223-228	I6	Attitude data record length	0	
37	229-234	I6	Number of radiometric data records	0	
38	235-240	I6	Radiometric record length	0	
39	241-246	I6	Number of rad. compensation records	0	
40	247-252	I6	Radiometric compensation rec. length	0	
41	253-258	I6	Number of data quality summary records	0	
42	259-264	I6	Data quality summary record length	0	
43	265-270	I6	Number of data histograms records	0	
44	271-276	I6	Data histogram record length	0	
45	277-282	I6	Number of range spectra records	0	
46	283-288	I6	Range spectra record length	0	
47	289-294	I6	Number of DEM descriptor records	0	
48	295-300	I6	DEM descriptor record length	0	
49	301-306	I6	Number of radar par. update records	0	
50	307-312	I6	Radar par. update record length	0	
51	313-318	I6	Number of annotation data records	0	
52	319-324	I6	Annotation data record length	0	
53	325-330	I6	Number of det. processing records	0	

54	331-336	I6	Det. processing record length	0	
55	337-342	I6	Number of calibration records	0	
56	343-348	I6	Calibration record length	0	
54	331-336	I6	Det. processing record length	0	
55	337-342	I6	Number of calibration records	0	
56	343-348	I6	Calibration record length	0	
57	349-354	I6	Number of GCP records	0	
58	355-360	I6	GCP record length	0	
59-68	361-420	I6	Spare		
69	421-426	I6	Number of facility data records	0	
70	427-434	I8	Facility data record maximum length	0	
71	435-574	11(I6,I8)	"0","0"		
72	575-604	5(I6)	"0"		
73	605-720	A116	Not Used		