VOLUME 8: ASAR PRODUCTS SPECIFICATIONS

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DOCUMENT CATEGORY: ☒ Approval ☐ Review ☐ Information

SUMMARY: This document specifies the ENVISAT-1 products.

Company internal reference: PO-RS-50-7316 Proposition:

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CHANGE RECORD

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
1	A	12/01/96	Issue 1	
1	B	16/02/96	SCR #16, CR #16 Issue 1, Revision B Reason for Change: Updated to reflect information in PO-TN-ESA-GS-0381 and to address RIDs of Feb. 2/96 pertaining to the Level 0 structure. MPH, SPH, DSD, and DSR structures modified. Table added showing generalized Level 0 product structure. RIDs Addressed: ESA/0001: FEP header defined ESA/0002: PF-Host time stamp clarified ESA/0004: Processing PCD added ESA/0006: AF PCD ADS and DSD added ESA/0007: page A-3 updated ESA/0008: page B-3 updated ESA/0009: Table 8.1.1 modified ESA/0011: TBD changed to Range/Doppler ESA/0013: FEP header defined ESA/0014: Table 8.4.7.4-2 corrected	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
			CSF/1: filename in MPH corrected CSF/2: page A-3 updated CSF/3: MPH PCD information updated CSF/5: DSD added to Level 0 SPH CSF/6: Section on AATSR updated and re-issued CSF/8: AATSR_O Summary Sheet updated	
1	C	04/04/96	SCR #38, CR #38 Issue 1, Revision C Reason for Change: Updated Sections 1-6, 17 and Annex A to reflect changes discussed at the Products Review Meeting #1, March 58, 1996, as per action item "AI MDA 6 April 96" from POMNESA00416, Pg. 35.	Products Review Meeting #1
2	A	20/05/96	SCR #71, CR #71 Issue 2 Reason for Change: Created separate volume. Updated with new product information from Document A-3. Added Level 1B and Level 2 product specifications and Auxiliary data specifications.	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
2	B	11/10/96	SCR #102, CR #102 Issue 2, Revision B Reason for Change: SPH format updated. PCD ADS converted to PQS ADS. Additions and updates to several ADS structures. Additions and updates to several Auxiliary Data files. Size estimates updated. Wave Mode Products added.	Products Review Meeting #2
3	A	10/02/97	SCR #133, CR #133 Issue 3 Reason for Change: Updates due to ESA RIDs received 06/01/97 (fax: DPD/JMJ/ENV, 0021/97).	ESA RIDs
3	B	19/11/98	SCR #218, CR #218 Issue 3, Revision B Reason for Change: Updates for SPRs: SPR-42000-0152-CSF, SPR-42000-0153-CSF, and various typos. All changes indicated by change bars.	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
3	C	18/09/00	Issue 3, Revision C Reason for Change: Add specifications for WVW product. Update WVI and WVS product definitions to allow up to 400 cells (previously limited to 20) Update ASA_XCA_AX file specification to include product dependent calibration factors.	
3	D	19/12/00	Issue 3, Revision D Reason for Change: VGA gain compensation flags added to Main Processing Parameters ADSR (ASAR SCR 0124 Task 2). Updated Processing Scaling Factor description in Main Processing Parameters ADSR (SPR-100K0-0432-ESA). Beam merging flags added to Main Processing Parameters ADSR (ASAR SCR 0124 Task 6) Fixed SR/GR coefficient units in the SR/GR Conversion ADSR (SPR-100K0-0423-ESA). Fixed range and azimuth resolution fields in Wave Cross-Spectrum MDSR (ASAR-100K0-0002-ESA). Added per polarization elevation antenna pattern tables to External Calibration file (ASAR SCR 1204 Task 5)	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
3	E	21/02/01	Issue 3, Revision E Reason for change: Modified descriptions for VGA and beam merging parameters in the Main Processing Parameters. Added VGA parameters to the Instrument Characterization file (ASAR SCR 0124 Task 2) Updates to concatenation rules for stripline products (SPR-100K0-0445-ESA). Addition of per beam 2-way azimuth antenna patterns (SPR-100K0-0579-ESA). Modifications to output product for per-polarization elevation antenna pattern ADSs (ASAR SCR 0124 Task 5). Minor description fixes in Main Processing Parameters ADSR (SPR-100K0-0584-ESA).	
3	F	18/07/01	Issue 3, Revision F Reason for change: Product format and auxiliary data formatting changes for PF-ASAR Change Request for Instrument Characterization.	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
3	G	01/08/01	Issue 3, Revision G Reason for change: Minor fixes to previous revision changes, including: Modification of azimuth antenna pattern usage in Instrument Characterization Auxiliary file Recalculation of calibration pulse array sizes in Instrument Characterization Auxiliary file Renaming of VGA Gain Droop to Receive Gain Droop everywhere Modification of Data Set Name tables for Image and Wave mode data sets to include Data Set Names for file reference DSDs All changes since Issue 3, Revision E indicated by change bars	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
3	H	11/01/02	Issue 3, Revision H Reason for change: Minor fixes to previous revision changes, including: Added flag to Chirp Parameters ADS (ASAR CR 0032 WP 3). Update to format of Ocean Wave-Spectrum MDSR (ASAR CR 0032 WP 5). Removal of ABS_CAL_CONST field from Wave Mode SPH (SPR-100K0-1095-ESA). Changed Platform Velocity field to Ground Velocity in Wave Mode Processing Parameters (SPR-100K0-1097-ESA). Minor modifications to the Map Projection Param GADS. Misc description updates.	
3	I	17/12/02	Issue 3, Revision I Reason for change: Added flag missing from chirp parameters in Wave Processing Parameters ADSR.	
3	J	06/06/03	Issue 3, Revision J Reason for change: Added new parameters to Chirp ADS and Wave processing parameters. Added new processing parameters to ASA_CON_AX auxiliary data file.	

ISSUE	REVISION	DATE	CHANGE STATUS	ORIGIN
3	K	19/09/03	Issue 3, Revision K Reason for change: Added a new float parameter named "Average scene height above ellipsoid used for processing", in the spare field n.60 in the "Other Processing Information" section of the MPP. Size of the remaining spare field decreased by 4 bytes. Same modification applied in table 8.5.5.4.3-1.	Technical note from B.Rosich ENVIGS PEOPG- TN-03-0018 Of 11/09/03
4	A	11/05/04	Issue 4, Revision A Reason for change: Addition of new Wide Swath SLC product. Added new Doppler Grid ADS type.	
4	B	05/08/07	Issue 4, Revision B Reason for change: Updated Doppler Grid ADSR description and format. Added new Ambiguity factor field to Wave Ocean Spectra MDSR. Corrected ASA_CON_AX terrain threshold field format.	4
4	C	01/20/12	Issue 4, Revision C Reason for change: Adding new noise removal settings to the AUX CON file and Main Processing Parameters ADSR. Adding new elapsed time since ascending node to the Main Processing Parameters ADSR. Adding new calibration vector structures to the Main Processing Parameters ADSR.	4

REGISTER OF CHANGES

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8 ASAR PRODUCTS SPECIFICATIONS

8.1 INSTRUMENT OVERVIEW

The Advanced Synthetic Aperture Radar is a high resolution imaging radar. It can be operated in 5 distinct Measurement Modes, Image Mode (IM), Alternating Polarization Mode (AP), Wide Swath Mode (WS), Global Monitoring Mode (GM), and Wave Mode (WV). Within each mode, several different image swaths may be used. The swath layout is depicted in Figure 8.11. IM, AP, and WS modes are designated as High Rate (HR) modes and have a downlink rate of 100 Mbps. GM and WV are Low Rate (LR) modes and have a data generation of 0.9 Mbps.

In addition, ASAR supports 2 Auxiliary Modes (Test Mode, and Module Stepping Mode) and one Calibration Mode (External Characterization Mode) which are used for testing, calibration and instrument monitoring. Finally, one of five possible on-board data quantization methods may be used for each mode, though each has a default choice which will be used in most cases.

The nominal characteristics of the various ASAR measurement modes are summarized in Table 8.1-1.

Table 8.1-1 Nominal ASAR Characteristics

ASAR Image Mode
VV or HH polarization images from any of 7 selectable swaths. Swath width between approximately 56 km (swath 7) and 100 km (swath 1) across track. Spatial resolution of approximately 30 m (for Precision product).
ASAR Alternating Polarization Mode
Two co-registered images per acquisition, from any of 7 selectable swaths. HH/VV HH/HV or VV/VH polarization pairs possible. Spatial resolution of approximately 30 m (for Precision product).

Table 8.1-1 Nominal ASAR Characteristics

ASAR Wide Swath Mode
400 km by 400 km wide swath image. Spatial resolution of approximately 150 m by 150 m for nominal product. VV or HH polarization.
ASAR Global Monitoring Mode
Spatial resolution of approximately 1000 m in azimuth by 1000 m in range for nominal product. Up to a full orbit of coverage. HH or VV polarization.
ASAR Wave Mode
A small imagette (dimensions range between 10 km by 5 km to 5km by 5km) is acquired at regular intervals of 100 km along track. The imagette can be positioned anywhere in an image mode swath. Up to two positions in a single swath or in different swaths may be specified, with acquisitions alternating between one and the other (successive imagettes will hence have a separation of 200 km between acquisitions at a given position). HH or VV polarization may be chosen. Imagettes are converted to wave spectra for ocean monitoring.

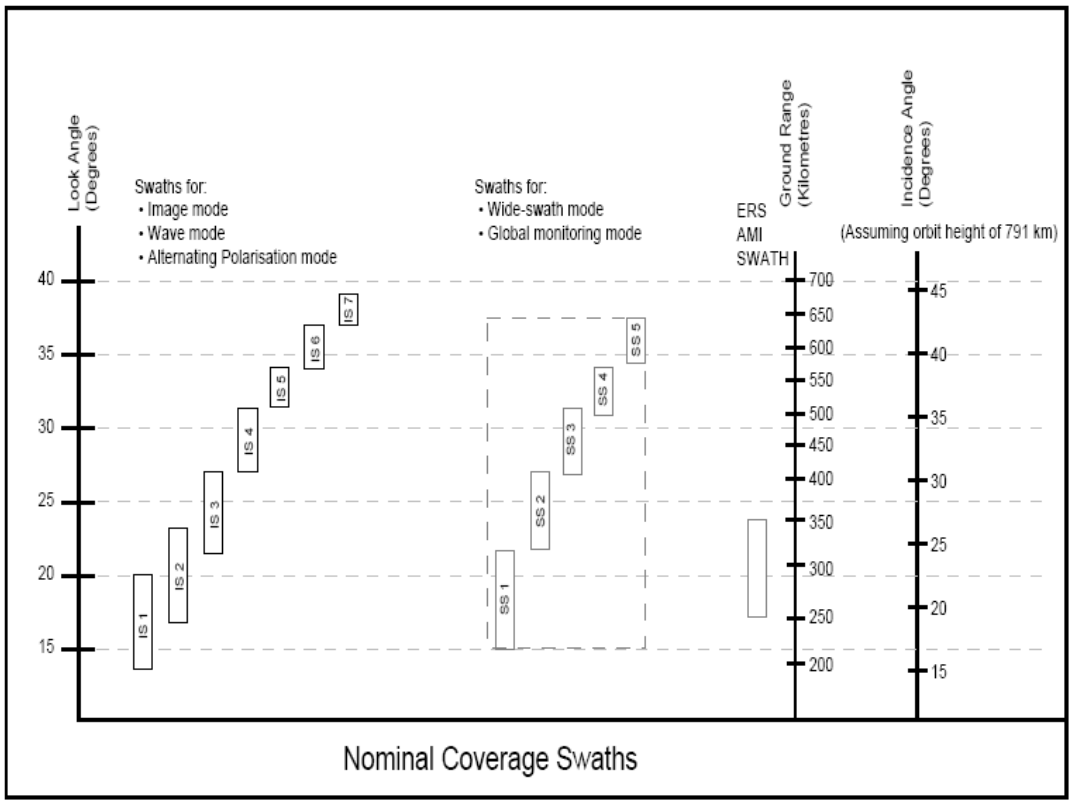


Figure 8.1-1 ASAR Swath Designations

8.2 PRODUCTS OVERVIEW

The ASAR products are summarized in Table 8.2-1, Figure 8.2-1 and Figure 8.2-2.

Table 8.2-1 ASAR Products

Instrument / mode	Product ID	Description
ASAR	ASA_EC__0P	ASAR Level 0 External Characterization
	ASA_MS__0P	ASAR Level 0 Module Stepping Mode
WV	ASA_WV__0P	ASAR Level 0 Wave Mode
	ASA_WVI_1P	Wave Mode SLC Imagette and Imagette Cross Spectra
	ASA_WVS_1P	Wave Mode Imagette Cross Spectra
	ASA_WVW_2P	Wave Mode Ocean Wave-Spectra Product
GM	ASA_GM__0P	ASAR Level 0 Global Monitoring Mode
	ASA_GM1_1P	Global Monitoring Mode Image (stripline)
	ASA_GM__BP	Global Monitoring Mode Browse Product (stripline)
IM	ASA_IM__0P	ASAR Level 0 Image Mode
	ASA_IMS_1P	Image Mode SLC Image
	ASA_IMP_1P	Image Mode Precision Image
	ASA_IMG_1P	Image Mode Geocoded Image
	ASA_IMM_1P	Image Mode Medium Resolution Image (stripline)
	ASA_IM__BP	Image Mode Browse Product (stripline)
AP	ASA_APH_0P	ASAR Level 0 Alternating Polarization (Xpolar H)
	ASA_APV_0P	ASAR Level 0 Alternating Polarization (Xpolar V)
	ASA_APC_0P	ASAR Level 0 Alternating Polarization (Copolar)
	ASA_APS_1P	Alternating Polarization SLC Image
	ASA_APP_1P	Alternating Polarization Precision Image
	ASA_APG_1P	Alternating Polarization Geocoded Image
	ASA_APM_1P	Alternating Polarization Medium resolution Image (stripline)
	ASA_AP__BP	Alternating Polarization Mode Browse Product (stripline)

Table 8.2-1 ASAR Products

Instrument / mode	Product ID	Description
WS	ASA_WS__0P	ASAR Level 0 Wide Swath
	ASA_WSS_1P	Wide Swath Mode SLC Image
	ASA_WSM_1P	Wide Swath Mode Medium Resolution Image (stripline)
	ASA_WS__BP	Wide Swath Mode Browse Image (stripline)

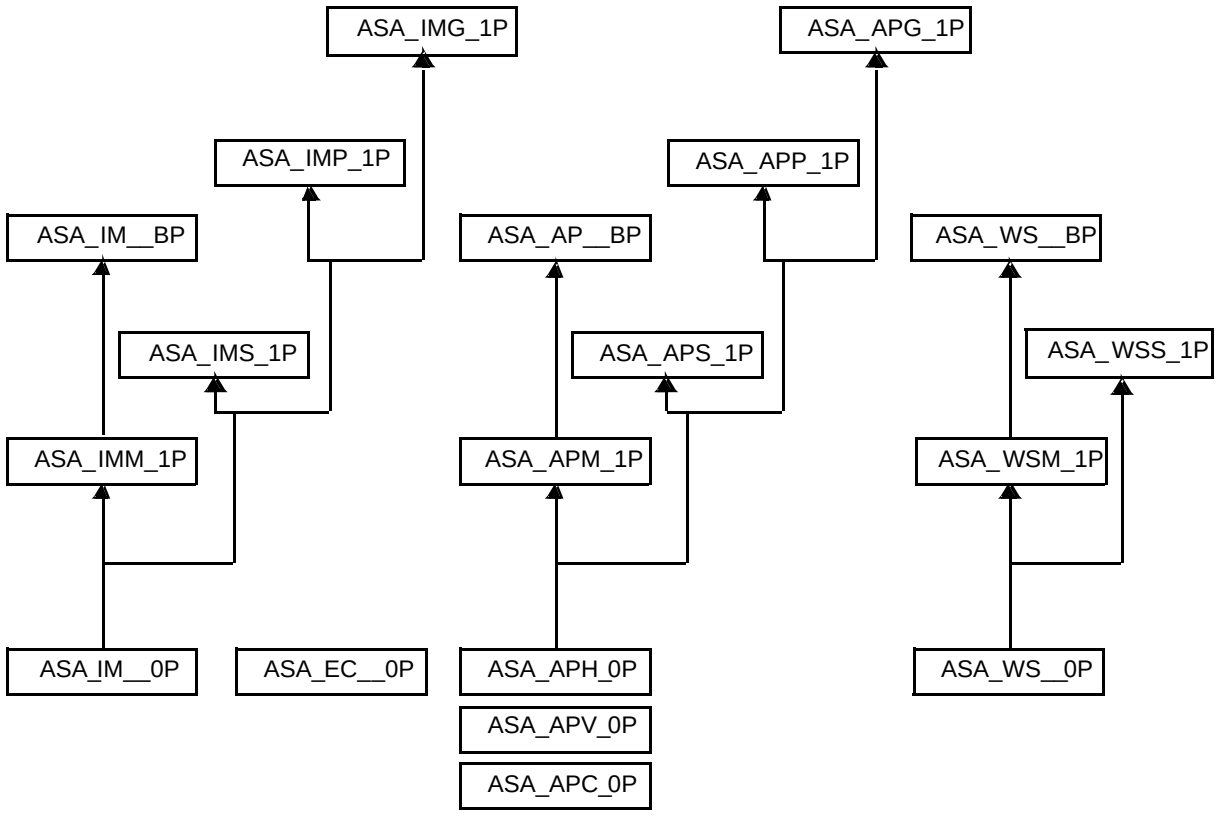


Figure 8.2-1 ASAR High Rate Data Product Tree

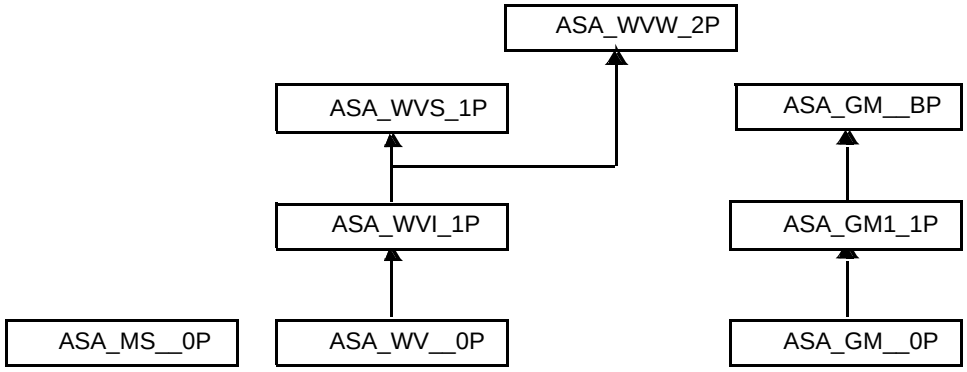


Figure 8.2-2 ASAR Low Rate Data Product Tree

8.3 LEVEL 0 PRODUCTS

There are nine Level 0 products for ASAR. The first seven correspond to the five main measurement modes, with the AP Level 0 divided into 3 possible products. The final two Level 0 products are the External Characterization Level 0 and Module Stepping Mode Level 0 products.

8.3.1 ASAR Image Mode Level 0 Product

The Image Mode Level 0 product consists of time ordered Annotated Instrument Source Packets (AISPs) collected while the instrument is in Image Mode. The echo samples contained in the AISPs have been compressed to 4 bits/sample using Flexible Block Adaptive Quantization (FBAQ). This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven possible image swaths. The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.2 ASAR Alternating Polarization Mode Level 0 Products

There are three AP Mode Level 0 products:

- AP Crosspolar H Level 0,
- AP Crosspolar V Level 0,
- AP Copolar Level 0.

These products contain time ordered AISPs corresponding to one of the three possible polarization combinations: HH & HV, VV & VH and HH & VV, respectively). The echo samples in the AISPs have been compressed to 4 bits/sample using FBAQ. This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven different image swaths. The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.3 ASAR Wide Swath Mode Level 0 Product

The WS Mode Level 0 product consists of time ordered AISPs collected while the instrument is in WS Mode. The echo samples in the AISPs have been compressed to 4 bits/sample using FBAQ. This is a high rate, wide swath (ScanSAR) mode so data is only acquired for partial orbit segments and is composed of data from five image swaths (SS1 to SS5). The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.4 ASAR Global Monitoring Mode Level 0 Product

The GM Mode Level 0 product consists of time ordered AISPs collected while the instrument is in GM Mode. The echo samples in the AISPs have been compressed to 4 bits/sample using FBAQ. This is a low rate, wide swath (ScanSAR) mode in which data may be acquired over the entire orbit and is composed of data from five image swaths (SS1 to SS5). The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1 day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.5 ASAR Wave Mode Level 0 Product

The WV Mode Level 0 product consists of time ordered AISPs collected while the instrument is in WV Mode. The echo samples in the AISPs have been compressed to 2 bits/sample using FBAQ. This is a low rate mode where data is acquired in small "imagettes" (nominally 10 km by 5km to 5 km by 5 km in size) allowing data acquisition to occur periodically (every 100km) around a full orbit. The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.6 ASAR Level 0 External Characterization

The External Characterization Level 0 product consists of time ordered AISPs collected while the instrument is in External Characterization Mode. All samples in the AISPs are represented by 8 bits/sample. This is a calibration mode, which allows one to characterize in orbit, departures from ground measured characteristics of the instrument

calibration loop and the passive part of the antenna during the overflight of a ground receiver. The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.7 ASAR Level 0 Module Stepping Mode

The Module Stepping Mode Level 0 product consists of time ordered AISPs collected while the instrument is in Module Stepping Mode. All samples contained within the AISPs are represented by 8 bits/sample. This mode provides an internal health checking facility on an individual module basis. The purpose of the mode is to identify malfunctioning modules which may need to be switched off, and to identify modules to which calibration offsets are to be applied. The Level 0 product is produced systematically for all data acquired within this mode. The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks.

8.3.8 Sizing Note

In some cases, the amount of Level 0 data received during an acquisition will be too large to store in a single file. In such cases, the data shall be contained in several files, each containing its own MPH and SPH, and each no larger in size than 2 GigaBytes.

8.3.9 Input Data

Annotated ISPs as received from the Front End Processor (FEP) plus auxiliary data.

8.3.10 Auxiliary Data Used

The Level 0 product requires the following auxiliary information (refer to Volume 6):

- ENVISAT orbital state vectors,
- Processor Configuration file, which includes PCD error codes and threshold values, and
- UTC to SBT conversion data.

8.3.11 Processing Performed

The determination of the satellite position and conversion of Satellite Binary Time (SBT) to Universal Time Co-ordinated (UTC) is accomplished using ESA software. These are the only algorithms applied when forming the Level 0 product.

8.3.12 Product Structure

As defined in Volume 6. The detailed description of the Instrument Source Packets is contained in Documents A-1 and R-5. The most recent of the two documents should be taken as the source description.

8.4 ASAR IMAGE PRODUCTS

ASAR Products produced from the Level 0 data can be classified as Image Products or Wave Mode Products. Wave Mode Products are discussed in Section 8.5. Further, the ASAR Image Products can be grouped into those produced as stand-alone products (described in Section 8.4.1), and those produced as stripline products (described in Section 8.4.2). All ASAR Image Products are stored in time-increasing order, except the geocoded products which are oriented such that the first pixel of the first line is the most north-west pixel.

8.4.1 Stand-alone (non-stripline) Image Products

Stand-alone image products are produced by request only and are created directly from the Level 0 data. They are ordered as a scene. For single beam modes, the scene size is 100 km along track by the swath width for the swath from which the data is acquired (between 56 and 100 km wide). For wide swath mode, the scene size is 400 km along track by 400 km wide. All of these products share a common format which is described in the following subsections.

8.4.1.1 Product Types

8.4.1.1.1 Image Mode Single Look Complex

This is a Single Look, Complex (SLC), phase preserved, slant range image generated from the Level 0 Image Mode product using the Range/Doppler algorithm. It may be in either HH or VV polarization. The SLC product is generated upon request and is intended for use in SAR quality assessment, calibration, and interferometric applications. A minimum number of corrections and interpolations are performed on the data. Absolute calibration parameters (when available) are provided in the product annotation.

8.4.1.1.2 Image Mode Precision Image

This is a multi-look, ground range, digital image generated from the Level 0 Image Mode Product using the Range/Doppler algorithm. May be in either HH or VV polarization. The processing uses up to date (at time of processing) auxiliary parameters and corrects for antenna elevation gain, and range spreading loss. The product is generated upon request and is intended for users wishing to perform applications

oriented analysis, as well as for multi-temporal imaging and to derive backscatter coefficients. Absolute calibration parameters (when available) are provided in the product annotation.

8.4.1.1.3 Image Mode Ellipsoid Geocoded Image

The Image Mode Geocoded SAR image is generated from the Level 0 Image Mode product using the Range/Doppler algorithm with the best available instrument corrections, and is systematically located and resampled on to a map projection. Product is generated upon request, and is intended for mapping applications and other uses requiring map projection images. Absolute calibration parameters (when available) are provided in the product annotation. All processing information in the geocoded product corresponds to the intermediate product created during processing. Only the Geolocation Grid ADS and Map Projection ADS are updated to reflect the map projection information.

8.4.1.1.4 Alternating Polarization Mode Single Look Complex

This is a complex, slant range image generated upon request from the Level 0 AP Product using the Range/Doppler algorithm and the most up to date processing parameters available at the time of processing. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV & VH). This product is intended for use in quality assessment, calibration, and interferometric applications. Absolute calibration parameters (when available) are provided in the product annotation.

8.4.1.1.5 Alternating Polarization Mode Precision Image

This is a multi-look, ground range, digital image generated upon request from the Level 0 AP product using the SPECAN algorithm and the most up to date auxiliary information available at the time of processing. Engineering corrections and relative calibration (antenna elevation gain, range spreading loss) are applied. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV& VH). Absolute calibration parameters (when available) are provided in the product annotation.

8.4.1.1.6 Alternating Polarization Ellipsoid Geocoded Image

This is a multi-look geocoded SAR image generated upon request from the Level 0 AP Product using the SPECAN algorithm and the most up to date auxiliary information available at the time of processing. Engineering corrections and relative calibration

(antenna elevation gain, range spreading loss) are applied and the image is systematically geolocated and resampled to a map projection. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV & VH). Absolute calibration parameters (when available) are provided in the product annotation. All processing information in the geocoded product corresponds to the intermediate product created during processing. Only the Geolocation Grid ADS and Map Projection ADS are updated to reflect the map projection information.

8.4.1.1.7 Wide Swath Mode Single Look Complex

This is a complex, slant range image generated upon request from the Level 0 WS Product using the Range/Doppler algorithm. This product is intended for use in interferometric applications. Absolute calibration parameters (when available) are provided in the product annotation.

Unlike other Image stand-alone products, WSS does not contain a single image per beam/polarisation, but instead a collection of small, overlapping images generated from each burst within a sub swath.

8.4.1.2 Input Data

The input for all the stand-alone products is the Level 0 data corresponding to the particular mode and auxiliary data.

8.4.1.3 Auxiliary Data Used

The auxiliary data required to create the stand-alone products is listed in the table below. Auxiliary data formats are described in Section 8.6.

Table 8.4.1.3-1 ASAR Auxiliary Data for Image Product Processing

Description	Auxiliary Data ID
External Characterization data file	ASA_XCH_AX
External Calibration data file	ASA_XCA_AX
Instrument Characterization file	ASA_INS_AX
PF-ASAR Processor Configuration file	ASA_CON_AX

Table 8.4.1.3-1 ASAR Auxiliary Data for Image Product Processing

Description	Auxiliary Data ID
Orbit State Vectors file (one file of five)	AUX_FRO_AX AUX_FPO_AX DOR_NAV_0P DOR_VOR_AX DOR_POR_AX

8.4.1.4 Processing Performed

This document is not the applicable document for ASAR algorithms. The following is intended only as a high level summary of the processing performed.

The following processing steps are applied to the Level 0 data to form the SAR image:

- data decompression;
- replica construction and power estimation;
- calibration pulse processing;
- noise power estimation;
- raw data correction (I/Q bias removal, I/Q gain imbalance correction, I/Q non-orthogonality correction);
- antenna elevation pattern compensation (not applied for IM and AP SLC images);
- image formation (SPECAN or Range/Doppler);
- geolocation;
- conversion to map projection (geocoded products only);
- interpolation to a common grid for all sub swaths (WS SLC products only).

The image formation algorithm used is either the Range Doppler Algorithm or the SPECAN algorithm, depending upon the product requested. The following table lists the type of image formation algorithm applied to the various stand-alone products.

Table 8.4.1.4-1 Image Formation Algorithms for Stand-alone Products

Product ID	Algorithm Applied
ASA_IMS_1P	Range/Doppler
ASA_IMP_1P	Range/Doppler
ASA_IMG_1P	Range/Doppler
ASA_APS_1P	Range/Doppler
ASA_APP_1P	SPECAN
ASA_APG_1P	SPECAN
ASA_WSS_1P	Range/Doppler

8.4.1.5 Product Structure

All ASAR Image products follow a standard structure as described in Figure 8.4.1.5-1.

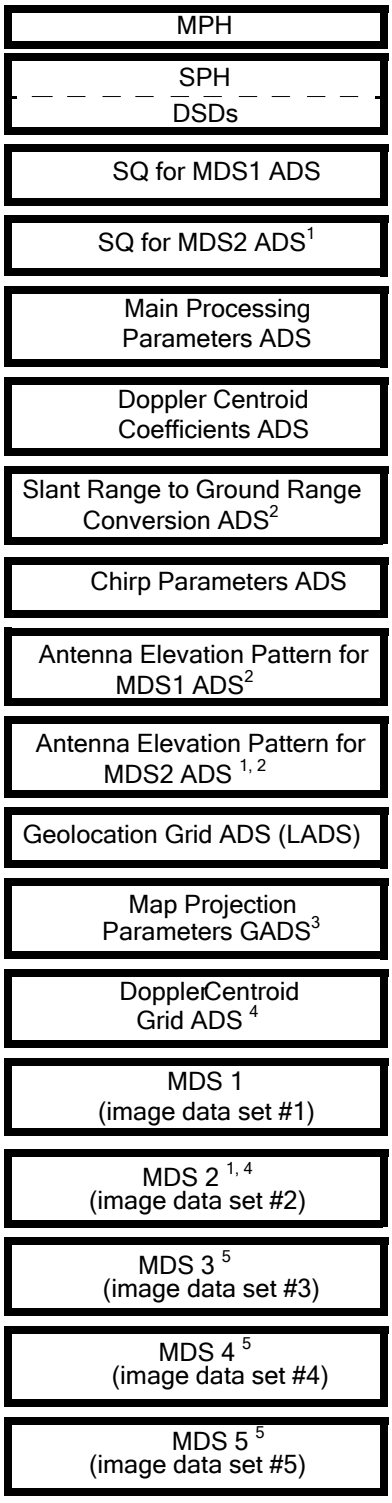


Figure 8.4.1.5-1 ASAR Stand-Alone Image Product Structure

8.4.1.6 Main Product Header

The ASAR MPH is of the same format as that given in Section 5.2.

8.4.1.7 Specific Product Header

The philosophy of the ASAR SPH is to provide only basic information needed to evaluate the product, and only information which applies to both an individual stand-alone product or a full stripline product. Thus, the SPH contents (other than positioning information and some minor DSD values) will not need to be updated during stripline formation or child product extraction. The format will be identical for all ASAR image products, whether they are stand-alone, slice, archived stripline, or child products extracted from a stripline.

The SPH is an ASCII header. Refer to Volume 5 for the conventions used when creating the ENVISAT ASCII header structures

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
1	**SPH_DESCRIPTOR=**	keyword	15	15*uc
	quotation mark (“)	-	1	uc
	SPH Descriptor ASCII string describing the product.	-	28	28*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
2	**STRIPLINE_CONTINUITY_INDICATOR=**	keyword	31	31*uc
	Value: 0= No stripline continuity, the product is a complete segment Other: Stripline Counter	-	4	Ac
	newline character	terminator	1	uc
3	**SLICE_POSITION=**	keyword	15	15*uc
	Value: +001 to NUM_SLICES Default value if no stripline continuity = +001	-	4	Ac
	newline character	terminator	1	uc
4	**NUM_SLICES=**	keyword	11	11*uc
	Number of slices in this stripline Default value if no continuity = +001	-	4	Ac
	newline character	terminator	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
	Product Time Information			
5	**FIRST_LINE_TIME=**	keyword	16	16*uc
	quotation mark (“)	-	1	uc
	First Zero Doppler Azimuth time of product UTC Time of first range line in the MDS of this product.	UTC	27	27*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
6	**LAST_LINE_TIME=**	keyword	15	15*uc
	quotation mark (“)	-	1	uc
	Last Zero Doppler Azimuth time of product Time of last range line in the MDS of this product.	UTC	27	27*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
	Product Positioning Information			
7	**FIRST_NEAR_LAT=**	keyword	15	15*uc
	Geodetic Latitude of the first sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
8	**FIRST_NEAR_LONG=**	keyword	16	16*uc
	East geodetic longitude of the first sample of the first line. Positive values East of Greenwich, negative values west of Greenwich.	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
9	**FIRST_MID_LAT=**	keyword	14	14*uc
	Geodetic Latitude of the middle sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
10	**FIRST_MID_LONG=**	keyword	15	15*uc
	East geodetic longitude of the middle sample of the first line. **Positive values East of Greenwich, negative values west of Greenwich.**	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
11	**FIRST_FAR_LAT=**	keyword	14	14*uc
	Geodetic Latitude of the last sample of the first line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
12	**FIRST_FAR_LONG=**	keyword	15	15*uc
	East geodetic longitude of the last sample of the first line. **Positive values East of Greenwich, negative values west of Greenwich.**	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
13	**LAST_NEAR_LAT=**	keyword	14	14*uc
	Geodetic Latitude of the first sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
14	**LAST_NEAR_LONG=**	keyword	15	15*uc
	East geodetic longitude of the first sample of the last line. **Positive values East of Greenwich, negative values west of Greenwich.**	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
15	**LAST_MID_LAT=**	keyword	13	13*uc
	Geodetic Latitude of the middle sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
16	**LAST_MID_LONG=**	keyword	14	14*uc
	East geodetic longitude of the middle sample of the last line. Positive values East of Greenwich, negative values west of Greenwich.	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
17	**LAST_FAR_LAT=**	keyword	13	13*uc
	Geodetic Latitude of the last sample of the last line A negative value denotes south latitude, a positive value denotes North latitude	10^{-6} degrees	11	Al
	<10-6degN>	units	10	10*uc
	newline character	terminator	1	uc
18	**LAST_FAR_LONG=**	keyword	14	14*uc
	East geodetic longitude of the last sample of the last line. Positive values East of Greenwich, negative values west of Greenwich.	10^{-6} degrees	11	Al
	<10-6degE>	units	10	10*uc
	newline character	terminator	1	uc
19	**Spare (blank characters)**	-	35	35*uc
	newline character	terminator	1	uc
	Additional Product Information			
20	**SWATH=**	keyword	6	6*uc
	quotation mark (“)	-	1	uc
	Swath number IS1, IS2, IS3, IS4, IS5, IS6, or IS7 for IM, and AP modes. Set to “WSØ” for WS and GM modes.	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
21	**PASS=**	keyword	5	5*uc
	quotation mark (“)	-	1	uc
	Ascending or descending orbit designator (defined at start of time pass) ASCENDINGØ, DESCENDING or FULLØORBIT	-	10	10*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
22	**SAMPLE_TYPE=**	keyword	12	12*uc
	quotation mark (“)	-	1	uc
	Detected or complex sample type designator DETECTED or COMPLEXØ	-	8	8*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
23	**ALGORITHM=**	keyword	10	10*uc
	quotation mark (“)	-	1	uc
	Processing Algorithm Used RAN/DOP or SPECANØ	-	7	7*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
24	**MDS1_TX_RX_POLAR=**	keyword	17	17*uc
	quotation mark (“)	-	1	uc
	Transmitter / Receiver Polarization for MDS 1 H/V or H/H or V/H or V/V	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
25	**MDS2_TX_RX_POLAR=**	keyword	17	17*uc
	quotation mark (“)	-	1	uc
	Transmitter/ Receiver Polarization for MDS2 H/V or H/H or V/H or V/V or blank (ØØØ) for all modes with only one MDS.	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
26	**COMPRESSION=**	keyword	12	12*uc
	quotation mark (“)	-	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
	Compression algorithm used on echo data on-board the satellite FBAQ2, FBAQ3, FBAQ4 (FBAQ: 8 bits reduced to 2, 3, and 4 bits respectively) others: S&M4Ø, and NONEØ	-	5	5*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
27	**AZIMUTH_LOOKS=**	keyword	14	14*uc
	Number of Looks in Azimuth	looks	4	Ac
	newline character	terminator	1	uc
28	**RANGE_LOOKS=**	keyword	12	12*uc
	Number of Looks in Range	looks	4	Ac
	newline character	terminator	1	uc
29	**RANGE_SPACING=**	keyword	14	14*uc
	Range sample spacing in meters	m	15	Afl
	<m>	units	3	3*uc
	newline character	terminator	1	uc
30	**AZIMUTH_SPACING=**	keyword	16	16*uc
	Nominal azimuth sample spacing in meters	m	15	Afl
	<m>	units	3	3*uc
	newline character	terminator	1	uc
31	**LINE_TIME_INTERVAL=**	keyword	19	19*uc
	Azimuth sample spacing in time (Line Time Interval)	s	15	Afl
	<s>	units	3	3*uc
	newline character	terminator	1	uc
32	**LINE_LENGTH=**	keyword	12	12*uc
	Number of samples per output line (includes zero filled samples) if a complex product, 1 sample = 1 I,Q pair, for a detected product, 1 sample = 1 pixel -1 indicates the length varies between each MDS (WSS products only). The actual length per MDS is reflected in the DSR_SIZE in each MDS DSD.	samples	6	As
	<samples>	units	9	9*uc
	newline character	terminator	1	uc

Table 8.4.1.7-1 ASAR Image Products SPH Content

Field #	Description	Units	Byte Length	Data Type
33	**DATA_TYPE=**	keyword	10	10*uc
	quotation mark (“)	-	1	uc
	Output data type SWORD, UWORD, or UBYTE The definition of a word here is a 16-bit integer.	-	5	5*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
34	**Spare (blank characters)**	-	50	50*uc
	newline character	terminator	1	uc
	Data Set Descriptors for Data included with the product1			
35-46	**See Table 8.4.1.7-2 for list of Data DSDs included for Non-WSS products and Table 8.4.1.7-3 for WSS products**	-	3080	11*dsd
	Data Set Descriptors for referenced filesa			
47	**DSD referencing the Level 0 product from which this product was created**	-	280	dsd
48	**DSD referencing PF-ASAR Processor Configuration file** (contains software parameters used by the processor and threshold values for PCD information)	-	280	dsd
49	**DSD referencing Instrument Characterization file used** Contains LUTs for ADC and data decompression, antenna elevation patterns, and other static instrument characteristics	-	280	dsd
50	**DSD referencing External Characterization file used**	-	280	dsd
51	**DSD referencing External Calibration file used**	-	280	dsd
52	**DSD referencing the Orbit State Vectors file used**	-	280	dsd
TOTAL			6099	

[1]DSD format is described in Section 5.4.

Table 8.4.1.7-2 SPH Data Set Descriptors for Data included in Non-WSS Products

Field #	Description	Units	Byte Length	Data Type
35	**DSD (A) for SQ for MDS1 ADS**	-	280	dsd
36	**DSD (A) for SQ for MDS2 ADS** **(filled only for AP products, set to NOT USED otherwise as described in Volume 5)**	-	280	dsd
37	**DSD (A) for Main Processing Parameters ADS**	-	280	dsd
38	**DSD (A) for Doppler Centroid Coefficients ADS**	-	280	dsd
39	**DSD (A) for Slant Range to Ground Range Conversion ADS** **(set to NOT USED for IM and AP SLC products and geocoded products as described in Volume 5)**	-	280	dsd
40	**DSD (A) for Chirp Parameters ADS**	-	280	dsd
41	**DSD (A) for Antenna Elevation Pattern for MDS 1 ADS** **(set to NOT USED for IM and AP SLC products as described in Volume 5)**	-	280	dsd
42	**DSD (A) for Antenna Elevation Pattern for MDS 2 ADS** **(filled only for AP products, set to NOT USED otherwise as described in Volume 5. Also, set to NOT USED for IM and AP SLC products as described in Volume 5)**	-	280	dsd
43	**DSD (A) for the Geolocation Grid ADS (LADS)**	-	280	dsd
44	**DSD (G) for Map Projection Parameters GADS** **(filled only for geocoded products, set to NOT USED otherwise as described in Volume 5)** **or** **DSD (A) for Doppler Centroid Grid ADS** **(for non-geocoded products where Doppler Centroid Grid estimation has been requested)**	-	280	dsd
45	**DSD (M) for MDS1 (image data 1)** **(for all IM and AP products)**	-	280	dsd
46	**DSD (M) for MDS2 (image data 2)** **(filled only for AP products, set to NOT USED for IM products)**	-	280	dsd

Table 8.4.1.7-3 SPH Data Set Descriptors for Data included in WSS Products

Field #	Description	Units	Byte Length	Data Type
35	**DSD (A) for SQ for MDS1 ADS**	-	280	dsd
36	**DSD (A) for Main Processing Parameters ADS**	-	280	dsd
37	**DSD (A) for Doppler Centroid Coefficients ADS**	-	280	dsd
38	**DSD (A) for Chirp Parameters ADS**	-	280	dsd
39	**DSD (A) for Antenna Elevation Pattern for MDS 1 ADS**	-	280	dsd
40	**DSD (A) for the Geolocation Grid ADS (LADS)**	-	280	dsd
41	**DSD (A) for the Doppler Centroid Grid ADS**	-	280	dsd
42	**DSD (M) for MDS1 (image data 1)**	-	280	dsd
43	**DSD (M) for MDS2 (image data 2)**	-	280	dsd
44	**DSD (M) for MDS3 (image data 3)**	-	280	dsd
45	**DSD (M) for MDS4 (image data 4)**	-	280	dsd
46	**DSD (M) for MDS5 (image data 5)**	-	280	dsd

8.4.1.8 Data Set Names

The following Data Set Names may appear in the ASAR Image Product SPH Data Set Descriptors:

Table 8.4.1.8-1 ASAR Image Products Data Set Descriptor Names

Data Set Type	Data Set Name
SQ for MDS 1 ADS	"MDS1 SQ ADS"
SQ for MDS 2 ADS	"MDS2 SQ ADS"
Main Processing Parameters ADS	"MAIN PROCESSING PARAMS ADS"
Doppler Centroid Parameters ADS	"DOP CENTROID COEFFS ADS"
Slant Range to Ground Range Conversion ADS	"SR GR ADS"
Chirp Parameters ADS	"CHIRP PARAMS ADS"
Antenna Elevation Pattern for MDS 1 ADS	"MDS1 ANTENNA ELEV PATT ADS"
Antenna Elevation Pattern for MDS 2 ADS	"MDS2 ANTENNA ELEV PATT ADS"

Table 8.4.1.8-1 ASAR Image Products Data Set Descriptor Names

Data Set Type	Data Set Name
Geolocation Grid ADS (LADS)	"GEOLOCATION GRID ADS"
Map Projection Parameters GADS	"MAP PROJECTION GADS"
Doppler Centroid Grid ADS	"DOP CENTROID GRID ADS"
Measurement Data Set 1	"MDS1"
Measurement Data Set 2	"MDS2"
Measurement Data Set 3	"MDS3"
Measurement Data Set 4	"MDS4"
Measurement Data Set 5	"MDS5"
DSD referencing the Level 0 product from which this product was created	"LEVEL 0 PRODUCT"
DSD referencing PF-ASAR Processor Configuration file	"ASAR PROCESSOR CONFIG"
DSD referencing Instrument Characterization file used	"INSTRUMENT CHARACTERIZATION"
DSD referencing External Characterization file used	"EXTERNAL CHARACTERIZATION"
DSD referencing External Calibration file used	"EXTERNAL CALIBRATION"
DSD referencing the Orbit State Vectors file used	"ORBIT STATE VECTOR 1"

8.4.1.9 Data Sets

The data sets which make up the ASAR Image product structure are defined in the following sections. Data Sets are in mixed-binary format. ASCII values may be included in the Data Sets, but they do not follow the Keyword-value format of the MPH and SPH, nor are they contained within quotation marks.

8.4.1.9.1 Summary Quality ADSs

There are two Summary Quality (SQ) ADSs. For all Image Products except WSS, the first contains information pertaining to MDS 1 and the second contains information pertaining to MDS 2. For WSS Image Products, the SQ ADS for MDS1 actually contains five ADSRs, one for each of the five MDSs for the product. The format of each SQ ADS is identical, however the values may differ as each describes a separate MDS.

The information contained in the SQ ADS is a summary of parameters used to establish the quality of the product. This includes PCD flags, the thresholds used to evaluate the flags, and numerical quality parameters.

For the basic image product, the SQ information ADS is updated once per product (i.e., updated once per slice for stripline). Each ADSR is time stamped with the zero Doppler time at which it was issued. The SQ ADS is included in the inventory so that the user may evaluate the quality of the product prior to ordering.

The product statistics which are evaluated at each time stamp (each ADSR) and the error message generated will be as follows:

Table 8.4.1.9.1-1 SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero doppler time at which SQ information applies**	MJD	12	mjd
2	**Attachment Flag (set to 1 if all MDSRs corresponding to this ADSR are zero, set to zero otherwise).** Note: in practice for ASAR products, this flag will always be zero since this ADSR is updated once per slice or scene. Therefore, if there are no MDSRs, this ADSR is not produced at all.	-	1	uc
	PCD Flags			
3	**Input data mean outside nominal range flag** 0 = mean of I and Q input values are both within specified range from expected mean. For expected mean of x, the measured mean must fall between x-threshold to x+threshold. 1 = otherwise	-	1	Uc
4	**Input data standard deviation outside nominal range flag** 0 = standard deviation values of I and Q input values are both within specified range of expected standard deviation. For expected std. dev. x, the measured std. dev. must fall between x-threshold to x+threshold. 1 = otherwise	-	1	Uc
5	**Significant gaps in the input data flag** An input data gap is defined as a contiguous block of N missing lines (the value of N is predefined for each product) 0 = number of input gaps <= threshold value 1 = number of input data gaps > threshold value	-	1	uc

Table 8.4.1.9.1-1 SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
6	**Missing lines significant flag** 0 = percentage of missing lines <= threshold value 1 = percentage of missing lines > threshold value The number of missing lines is the number of lines missing from the input data excluding data gaps.	-	1	uc
7	**Doppler Centroid Uncertain flag** 0 = confidence measure >= specified value 1 = confidence measure < specified value (note: if more than one Doppler centroid estimation is performed in a slice the flag is set if any confidence measure is less than the threshold).	-	1	uc
8	**Doppler ambiguity estimate uncertain flag** 0 = confidence measure >= specified value 1 = confidence measure < specified value	-	1	uc
9	**Output data mean outside nominal range flag** 0 = mean of I and Q output values for SLC image or mean of detected pixels for a detected product, are both within specified range from expected mean. For expected mean of x, the measured mean must fall between x-threshold to x+threshold. 1 = otherwise	-	1	uc
10	**Output data standard deviation outside nominal range flag** 0 = std. dev. of I and Q output values for SLC image or std. dev. of detected pixels for a detected product, are both within specified range from expected std. dev. For expected std. dev. of x, the measured std. dev. must fall between x-threshold to x+threshold. 1 = otherwise	-	1	uc
11	**Chirp reconstruction failed or is of low quality flag** 0 = able to reconstruct all chirps or chirp reconstruction not requested (nominal chirp used) AND all quality measures were acceptable. 1 = unable to reconstruct a chirp during processing and chirp reconstruction was requested or the quality is below the acceptable levels. If this is the case PF-ASAR uses the nominal range pulse for processing and a nominal elevation beam scaling factor.	-	1	uc
12	**Data sets missing flag** 0 = all data sets which are supposed to be in the product are present 1 = any data sets (including ADSs) are missing from the product which are supposed to be included under normal circumstances. Which data sets are missing can be determined by an examination of the DSDs in the SPH.	-	1	uc

Table 8.4.1.9.1-1 SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
13	**Invalid downlink parameters flag** 0 = all parameters read from the downlinked data were valid 1 = displayed if any downlink parameter is out of range and therefore a default value has been used during processing.	-	1	uc
14	**Spare**	-	7	7*uc
	Threshold Information			
15	**Threshold for setting the chirp quality flag - Maximum percentage broadening permitted in cross-correlation pulse width compared to theoretical width.**	%	4	fl
16	**Threshold for setting the chirp quality flag - First sidelobe of the chirp cross correlation function**	dB	4	fl
17	**Threshold for setting the chirp quality flag - ISLR of the chirp cross correlation function**	dB	4	fl
18	**Threshold for setting the mean of input data quality flag - For an expected mean value of x, this is the value T, such that the measured mean must fall between the x-T and x+T.**	-	4	fl
19	**Expected mean input value for this product for both I and Q.**	-	4	fl
20	**Threshold for setting the standard deviation of input data quality flag - For an expected std. dev. value of y, this is the value D, such that the measured std. dev. must fall between the y-D and y+D.**	-	4	fl
21	**Expected input std. dev. for this product for both I and Q.**	-	4	fl
22	**Threshold for setting the Doppler Centroid quality flag - Threshold for Doppler Centroid confidence**	-	4	fl
23	**Threshold for setting the Doppler Centroid ambiguity quality flag - Threshold for setting the Doppler Centroid ambiguity confidence flag**	-	4	fl
24	**Threshold for setting the mean of output data quality flag - For an expected mean value of x, this is the value T, such that the measured mean must fall between the x-T and x+T.**	-	4	fl
25	**Expected mean output value for this product. For an SLC product this is the expected mean of both the I and Q values.**	-	4	fl
26	**Threshold for setting the standard deviation of output data quality flag - For an expected std. dev. value of y, this is the value D, such that the measured std. dev. must fall between the y-D and y+D.**	-	4	fl
27	**Expected output std. dev. for this product. For an SLC product this is the expected output std. dev. for both I and Q values.**	-	4	fl
28	**Threshold for setting the missing lines quality flag - maximum percentage of missing lines to total lines.**	%	4	fl

Table 8.4.1.9.1-1 SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
29	**Threshold for setting the missing gaps quality flag - maximum number of missing gaps allowed.**	-	4	fl
30	**Number of missing lines which constitute a gap**	lines	4	ul
31	**Spare**	-	15	15*uc
	Other Quality Information			
32	**Input data mean (i channel, then q channel)**	-	8	2*fl
33	**Input data standard deviation (i channel, then q channel)**	-	8	2*fl
34	**Number of gaps (composed of a predetermined number of consecutive missing lines)**	-	4	fl
35	**Number of missing lines (excluding gaps)**	-	4	fl
36	**Output data mean - for SLC products, first value is for the i channel, second is for the q channel. For detected products, second value is set to zero**	-	8	2*fl
37	**Output data standard deviation - for SLC products, first value is for the i channel, second is for the q channel. For detected products, second value is set to zero**	-	8	2*fl
38	**Total number of errors detected in ISP headers**	-	4	ul
39	**Swath Number** IS1, IS2, IS3, IS4, IS5, IS6, or IS7 for IM, WV and AP modes. SS1, SS2, SS3, SS4, or SS5 for WSS products. WSØ for WS and GM modes where only one ADSR for the whole scene is provided.	ascii	3	3*uc
40	**Spare**		13	13*uc
TOTAL			170	

8.4.1.9.2 Main Processing Parameters ADS

The Main Processing Parameters ADS contains a summary of the parameters used to process a product that are constant over the length of the product (i.e., over the length of the slice in stripline processing). As such, one ADSR containing these parameters, preceded by a time stamp is issued per output product (per slice for stripline). For WSS products, one ADSR is provided per sub swath, each reflecting constant processing parameters for the sub swath in question, which may be different from other sub swaths.

The contents of each ADSR is shown below:

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	General Summary			
1	**First Zero Doppler Azimuth time of MDS which this data set describes** Time of first range line in the MDS described by this data set	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**Last Zero Doppler Azimuth time of MDS which this data set describes** Time of last range line in the MDS described by this data set	MJD	12	mjd
4	**Work Order ID (left-justified)**	-	12	12*uc
5	**Time difference between sensing time of first input line and zero Doppler time of first output image line (t_{delta}).** May be used during child product extraction from a stripline product.	s	4	fl
6	**Swath number** IS1, IS2, IS3, IS4, IS5, IS6, or IS7 for IM, WV and AP modes. SS1, SS2, SS3, SS4, or SS5 for WSS products. WSØ for WS and GM modes where only one ADSR for the whole scene is provided.	ascii	3	3*uc
7	**Range sample spacing**	m	4	fl
8	**Azimuth sample spacing at image center**	m	4	fl
9	**Azimuth sample spacing in time (Line Time Interval)**	s	4	fl
10	**Number of output range lines in the image described by this ADSR** **For WSS products, this number will vary for each sub swath.**	lines	4	ul
11	**Number of samples per output range line (includes zero filled samples) in the image described by this ADSR** **For WSS products, this number will vary for each sub swath.**	samples	4	ul
12	**Output data type** SWORD, UWORD, or UBYTE	ascii	5	5*uc
13	**Number of output range lines per burst** **Not used for single-beam products.**	lines	4	ul
14	**Time difference between zero Doppler time and acquisition time of output image lines**	-	4	fl
15	**Elapsed time between the zero Doppler time of first output image line and the preceding ascending node**	s	4	fl
16	**Spare**	-	39	39*uc

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	Image Processing Summary			
17	**Raw Data Analysis used for Raw Data Correction** **0 = correction done using default parameters** 1 = correction done using raw data analysis results	-	1	uc
18	**Antenna Elevation Pattern Correction Applied** 0 = no correction applied 1 = correction applied	-	1	uc
19	**Reconstructed Chirp to be used (if reconstruction successful)** 0 = nominal chirp replica to be used 1 = reconstructed chirp to be used	-	1	uc
20	**Slant Range to Ground Range Conversion Applied** 0 = no conversion applied 1 = conversion applied	-	1	uc
21	**Doppler Centroid Estimation Performed** 0 = no estimation done 1 = estimation done	-	1	uc
22	**Doppler Ambiguity Estimation Performed** 0 = no estimate done 1 = estimate done	-	1	uc
23	**Range-spreading loss compensation Applied** 0 = no compensation applied 1 = compensation applied	-	1	uc
24	**Detection Applied** 0 = output product is complex 1 = output product was detected	-	1	uc
25	**Look Summation Performed** 0 = product is single look 1 = product is multi-looked	-	1	uc
26	**RMS Equalization Performed** 0 = RMS equalization was not performed during FBAQ decoding 1 = RMS equalization was performed during FBAQ decoding	-	1	uc
27	**Antenna Elevation Gain Scaling Factor Applied** 0 = no scaling factor applied 1 = scaling factor applied	-	1	uc

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
28	**Receive Gain Droop Compensation Applied to Echo Data** 0 = no compensation applied 1 = compensation applied	-	1	uc
29	**Receive Gain Droop Compensation Applied to Calibration Pulse P2** 0 = no compensation applied 1 = compensation applied	-	1	uc
30	**Receive Gain Droop Compensation for Calibration Pulse P2 Order Zero: Nominal Time Delay Applied** 0 = do not use nominal time delay (compensation depends on P2 time delay with respect to the end of the echo window) 1 = use nominal time delay (compensation is constant)	-	1	uc
31	**Inverse Filter used for range compression (GM Mode only)** 0 = matched filter used for range compression 1 = inverse filter used for range compression	-	1	uc
32	**Noise Subtraction Applied (APP, APG, APM, WSM products only)** 0 = noise not subtracted 1 = noise subtracted	-	1	uc
33	**Spare**	-	5	5*uc
	Raw Data Analysis Information			
34	**The following 26 parameters form a structure which is repeated twice, once for MDS 1 and once for MDS 2. If MDS 2 is not included with the product, or if the product is a WSS, the second set of values is blanked (all values set to zero).**			
	Number of input data gaps (a gap is defined as a predetermined number of range lines)	gaps	4	ul
	Number of missing lines, excluding data gaps	lines	4	ul
	Range sample skipping factor for raw data analysis	samples	4	ul
	Range lines skipping factor for raw data analysis	lines	4	ul
	Calculated I channel bias	-	4	fl
	Calculated Q channel bias	-	4	fl
	Calculated I channel standard deviation	-	4	fl
	Calculated Q channel standard deviation	-	4	fl
	Calculated I/Q gain imbalance	-	4	fl
	Calculated I/Q quadrature departure	-	4	fl
	I bias upper bound	-	4	fl

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	I bias lower bound	-	4	fl
	Q bias upper bound	-	4	fl
	Q bias lower bound	-	4	fl
	I/Q gain lower bound	-	4	fl
	I/Q gain upper bound	-	4	fl
	I/Q quadrature departure lower bound	-	4	fl
	I/Q quadrature departure upper bound	-	4	fl
	I bias significance 0 = I bias falls within acceptable range 1 = I bias falls outside acceptable range	-	1	uc
	Q bias Significance 0 = Q bias falls within acceptable range 1 = Q bias falls outside acceptable range	-	1	uc
	I/Q Gain Significance 0 = Gain falls within acceptable range 1 = Gain falls outside acceptable range	-	1	uc
	I/Q Quadrature Departure Significance 0 = Quadrature departure falls within acceptable range 1 =Quadrature departure falls outside acceptable range	-	1	uc
	I channel bias used for correction (may be different from measured value)	-	4	fl
	Q channel bias used for correction (may be different from measured value)	-	4	fl
	I/Q gain imbalance used for correction (may be different from measured value)	-	4	fl
	I/Q quadrature departure used for correction (may be different from measured value)	-	4	fl
35	**Spare**	-	32	32*uc
	Information derived from Downlink Header			
36	**The following 2 parameters form a structure which is repeated twice. Once for values pertaining to MDS 1 and once for values pertaining to MDS 2. If MDS 2 is not included in the product, or if the product is a WSS, the fields in the second group are blanked (all values are set to zero).**			

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	On-board time of first input line processed LSB accurate to 15.26 μs. (Contained in two long integers)	-	8	2*ul
	Sensing time (MJD format) of first input line processed converted from satellite binary time	MJD	12	mjd
37	**Following fields each contain room for 5 values. Only one value is filled for each for IM and WV modes. Two values are filled for AP mode (for MDS1 and MDS2). Five values are filled for WS and GM modes (for SS1 to SS5, respectively). Unused values are set to zero:**			
	Sampling Window Start time code of first processed line	code	10	5*us
	Sampling Window Start time code of last processed line	code	10	5*us
	Pulse Repetition Interval code	code	10	5*us
	Tx pulse length	code	10	5*us
	Tx pulse bandwidth	code	10	5*us
	Echo Window Length	code	10	5*us
	Upconverter Level Upconverter gain set on the instrument	code	10	5*us
	Downconverter Level Downconverter gain set on the instrument	code	10	5*us
	Resampling factor for echo data	code	10	5*us
	Beam adjustment delta	code	10	5*us
	Antenna Beam Set Number	code	10	5*us
	Auxiliary Tx Monitor Level	code	10	5*us
38	**Spare**	-	60	60*uc
39	**Error counters. Each input line is analyzed for errors in the header using a majority polling technique. Errors are logged for each field of the header in the fields below.**			
	Number of errors detected in Sampling Window start time field.	-	4	ul
	Number of errors detected in PRI code field	-	4	ul
	Number of errors detected in Tx pulse length field	-	4	ul
	Number of errors detected in Tx pulse bandwidth field.	-	4	ul
	Number of errors detected in Echo Window Length field.	-	4	ul
	Number of errors detected in Upconverter Level field.	-	4	ul
	Number of errors detected in Downconverter Level field.	-	4	ul

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	Number of errors detected in Resampling factor for echo data field.	-	4	ul
	Number of errors detected in Beam adjustment delta field.	-	4	ul
	Number of errors detected in Antenna Beam Set Number field.	-	4	ul
40	**Spare**	-	26	26*uc
41	**Following fields each contain room for 5 values. Only one value is filled for each for IM and WV modes. Two values are filled (MDS1 and MDS2) if 2 MDSs are included in the product. Five values are filled for WS and GM modes (for SS1 to SS5, respectively). Unused values are set to zero:**			
	Sampling Window Start time of first processed line	s	20	5*fl
	Sampling Window Start time of last processed line	s	20	5*fl
	Number of Sample Window Start Time changes within a beam	-	20	5*ul
	Pulse Repetition Frequency	Hz	20	5*fl
	Tx pulse length	s	20	5*fl
	Tx pulse bandwidth	Hz	20	5*fl
	Echo Window Length	s	20	5*fl
	Upconverter Level Upconverter gain set on the instrument	dB	20	5*fl
	Downconverter Level Downconverter gain set on the instrument	dB	20	5*fl
	Resampling factor	-	20	5*fl
	Beam adjustment delta	deg.	20	5*fl
	Antenna Beam Set Number	-	10	5*us
	Auxiliary Tx Monitor Level	-	20	5*fl
	Rank **The number of PRI between transmitted pulse and return echo**	-	20	5*ul
42	**Spare**	-	62	62*uc
	Range Processing Information			
43	**First processed input range sample, first sample is 1**	samples	4	ul
44	**Range spreading loss reference range**	m	4	fl
45	**Range sampling rate**	Hz	4	fl
46	**Radar Frequency**	Hz	4	fl

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
47	**Number of range looks**	looks	2	us
48	**Matched filter window type:** HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
49	**Window coefficient for range-matched filter**	-	4	fl
50	**Following fields each contain room for 5 values. Only one value is filled for each for AP, IM, and WV modes. Five values are filled for WS and GM modes (for SS1 to SS5, respectively). Unused values are set to zero:**			
	Range Look Bandwidth (null to null)	Hz	20	5*fl
	Total processed range bandwidth (null to null)	Hz	20	5*fl
51	**Nominal chirp: Following 2 parameters form a structure which is repeated 5 times (one set for each WS beam, SS1 first, to SS5 last -- only one set of values given for narrow swath images):**			
	4 nominal chirp amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}	16	4*fl
	4 nominal chirp phase coefficients	cycles, Hz, Hz/s, Hz/s^2	16	4*fl
52	**Spare**	-	60	60*uc
	Azimuth Processing Information			
53	**Number of input lines processed**	lines	4	ul
54	**Number of Azimuth Looks**	looks	2	us
55	**Azimuth Look Bandwidth (null to null)**	Hz	4	fl
56	**Processed Azimuth bandwidth (null to null)**	Hz	4	fl
57	**Matched filter window type:** HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
58	**Window coefficient for azimuth-matched filter**	-	4	fl
59	**3 co-efficients for Azimuth FM rate:** **Azimuth FM rate = $C0 + C1(t_{SR}-t_0) + C2(t_{SR} - t_0)^2$** **$t_{SR}$ = 2 way slant range time**	Hz/s Hz/s^2 Hz/s^3	12	3*fl
60	**2 way slant range time origin (t_0) for Azimuth FM rate calculation**	ns	4	fl

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
61	**Doppler Centroid Ambiguity Confidence Measure** Value between 0 and 1, 0 = poorest confidence, 1= highest confidence	-	4	fl
62	**Spare**	-	68	68*uc
	Calibration Information			
63	**The following 2 parameters form a structure which is repeated twice. Once for values pertaining to MDS 1 and once for values pertaining to MDS 2. If MDS 2 is not included in the product, or if the product is WSS, the fields in the second group are set to zero.**			
	Processor scaling factor (factor units are linear when using the Range/Doppler algorithm, dB when Specan is used)	-	4	fl
	External Calibration Scaling Factor (mode/swath/polarization dependent)	-	4	fl
64	**Following fields each contain room for 5 values. Five values are filled for WS and GM modes (for SS1 to SS5, respectively). Up to 5 values may be provided for IM mode, each one is a separate noise estimate. For AP mode, up to 4 values may be provided in the order: first estimate for MDS1, second estimate for MDS1, first estimate for MDS2, second estimate for MDS2. For WV, there is one estimate provided.**			
	Noise power correction factor	-	20	5*fl
	Number of noise lines used to calculate correction factors	-	20	5*ul
65	**Spare**	-	64	64*uc
	Other Processing Information			
66	**Spare**	-	12	12*uc
67	**The following 4 parameters form a structure which is repeated twice. Once for values pertaining to MDS 1 and once for values pertaining to MDS 2. If MDS 2 is not included in the product, or if the product is WSS, the fields in the second group are set to zero.**			
	Output data mean Magnitude for detected products, real sample mean for SLC products	-	4	fl
	Output imaginary data mean Used for SLC products only (set to zero otherwise)	-	4	fl
	Output data standard deviation Magnitude std. dev. for detected products, real sample std. dev. for SLC products	-	4	fl
	Output imaginary data standard deviation Used for SLC products only (set to zero otherwise)	-	4	fl

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
68	**Average scene height above ellipsoid used for processing**	m	4	fl
69	**Spare**	-	48	48*uc
	Data Compression Information			
70	**Compression Method used for echo samples** FBAQ, S&MØ, NONE	ascii	4	4*uc
71	**Compression Ratio for echo samples** 8/4, 8/3, 8/2, or 8/8	ascii	3	3*uc
72	**Compression Method used for initial calibration samples** FBAQ, S&MØ, NONE	ascii	4	4*uc
73	**Compression Ratio for initial calibration samples** 8/4, 8/3, 8/2, or 8/8	ascii	3	3*uc
74	**Compression Method used for periodic calibration samples** FBAQ, S&MØ, NONE	ascii	4	4*uc
75	**Compression Ratio for periodic calibration samples** 8/4, 8/3, 8/2, or 8/8	ascii	3	3*uc
76	**Compression Method used for noise samples** FBAQ, S&MØ, NONE	ascii	4	4*uc
77	**Compression Ratio for noise samples** 8/4, 8/3, 8/2, or 8/8	ascii	3	3*uc
78	**Spare**	-	64	64*uc
	ScanSAR Specific Information			
79	**Number of slant range samples in beam merging, one value per merge region (1-2, 2-3, 3-4, 4-5)** This parameter is equivalent to N in the following beam merging formula: $xmerged(n) = (1 - (n/N)^P * xnear(n) + ((n/N)^P * xfar(n)$ These fields are set to zero for single beam and WSS products.	-	16	4*ul

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
80	**Beam merge algorithm parameter used for beam merging, one value per merge region (1-2, 2-3, 3-4, 4-5)** This parameter is equivalent to P in the above beam merging formula, and different values have the following affect: P = 1, linear weighting of the two beams (near and far) P = -1, (which represents infinity in the beam merging formula) only near beam contributes to the merged one P = 0, only far beam contributes to the merged one P > 1, near beam is favoured 0 < P < 1, far beam is favoured These fields are set to zero for single beam and WSS products.	-	16	4*fl
81	**Number of raw data lines per burst for this image** **5 values for beams SS1 to SS5 in WS and GM modes.** **Two values for AP mode, all others set to zero.**	lines	20	5*ul
82	**Time of first SS1 Echo Source Packet**	mjd	12	mjd
83	**Spare**	-	16	16*uc
	Orbit State Vectors Information			
84	**The following 7 parameters form a structure which is repeated 5 times, thus allowing the inclusion of up to 5 orbit state vectors which span the scene (or slice) to which this ADSR pertain.**			
	Time of state vector	mjd	12	mjd
	X position in Earth fixed reference frame	10^{-2}m	4	sl
	Y position in Earth fixed reference frame	10^{-2}m	4	sl
	Z position in Earth fixed reference frame	10^{-2}m	4	sl
	X velocity relative to Earth fixed reference frame	10^{-5}m/s	4	sl
	Y velocity relative to Earth fixed reference frame	10^{-5}m/s	4	sl
	Z velocity relative to Earth fixed reference frame	10^{-5}m/s	4	sl
85	**Spare**	-	64	64*uc
	Absolute Calibration Information			
86	**Calibration Vector Reference Look Angle (per swath)** The centre of the elevation antenna pattern for each swath.	degrees	20	5*fl

Table 8.4.1.9.2-1 Main Processing Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
87	**Sigma Calibration Vector** Multiplicative factor for DN^2 which yields sigma nought. One sample per 0.05 degrees of the look angle as per the elevation antenna profile, for a total of +/- 5 degrees around the reference look angle. Calculated at the first output image line zero Doppler time. 201 samples per swath (1005 samples for WSM and GM1 and 201 for AP, IM and WSS) NOTE: For WSM and GM1 there are 5 swaths. The 201 samples for each swath are placed contiguously in the 1005 sample array by swath. However, the samples for each swath overlap each other near the swath boundaries, just as with the antenna patterns. This must be taken into account when attempting to apply this information to the final product. The reader is referred to the *Absolute Calibration of ASAR Level 1 Products* document *(ENVI-CLVL-EOPG-TN-03-0010)* for additional information.	-	4020	**1005*fl**
88	**Gamma Calibration Vector** Multiplicative factor for DN^2 which yields gamma. One sample per 0.05 degrees of the look angle as per the elevation antenna profile, for a total of +/- 5 degrees around the reference look angle. Calculated at the first output image line zero Doppler time. 201 samples per swath (1005 samples for WSM and GM1 and 201 for AP, IM and WSS) NOTE: For WSM and GM1 there are 5 swaths. The 201 samples for each swath are placed contiguously in the 1005 sample array by swath. However, the samples for each swath overlap each other near the swath boundaries, just as with the antenna patterns. This must be taken into account when attempting to apply this information to the final product. The reader is referred to the *Absolute Calibration of ASAR Level 1 Products* document *(ENVI-CLVL-EOPG-TN-03-0010)* for additional information.	-	4020	**1005*fl**
TOTAL			**10069**	

8.4.1.9.3 Doppler Centroid Coefficients ADS

The Doppler centroid of the image is estimated once for stand-alone products, and is hence reported once. For stripline, however, a Doppler centroid estimate is performed at least at the start and end of a slice. To ensure the user is given a complete record of the Doppler parameters used during processing, the Doppler Centroid Coefficients ADS is updated with a new ADSR at every granule for stripline processing. Each update is time stamped with the zero Doppler time to which the update applies. The Doppler centroid coefficients used on range lines between two updates are found by linear interpolation between the updated and previous values. The contents of each update (each update is a single ADSR within the ADS) are as follows.

For Wide Swath products, a different Doppler polynomial will be used for each subswath. These five polynomials will differ only in the constant term. The slant range times corresponding to each sub swath can be found in the Geolocation Grid ADS.

Table 8.4.1.9.3-1 Doppler Centroid Coefficients ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler azimuth time at which estimate applies**	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**2-way slant range time origin (t_0)** When Delta Doppler coefficients are provided per swath, t_0 is the slant range time origin corresponding to SS1	ns	4	fl
4	**Doppler centroid coefficients as a function of slant range time: D0, D1, D2, D3, and D4.** where Doppler Centroid = $D0 + D1(t_{SR}-t_0) + D2(t_{SR}-t_0)^2 + D3(t_{SR}-t_0)^3 + D4(t_{SR}-t_0)^4$	Hz Hz/s Hz/s^2 Hz/s^3 Hz/s^4	20	5*fl
5	**Doppler Centroid Confidence Measure** Value between 0 and 1, 0 = poorest confidence, 1= highest confidence If multiple Doppler Centroid estimates were performed, this value is the lowest confidence value attained.	-	4	fl
6	**Doppler Confidence Below Threshold Flag** 0 = confidence above threshold, Doppler Centroid calculated from data 1 = confidence below threshold, Doppler Centroid calculated from orbit parameters	-	1	uc

Table 8.4.1.9.3-1 Doppler Centroid Coefficients ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
7	**Delta Doppler coefficients: ΔD0(SS1), ΔD0(SS2), ΔD0(SS3) ΔD0(SS4), ΔD0(SS5)** Constant Doppler Centroid coefficients for each swath to be added to D0 for reconstructing a different Doppler polynomial per swath. Only applicable to WS products, all values set to 0 for IM, AP, GM and WV products. Doppler Centroid polynomial for SSi = $\Delta D0(SSi) + D0 + D1(t_{SR}-t_{0\ SSi}) + D2(t_{SR}-t_{0\ SSi})^2 + D3(t_{SR}-t_{0\ SSi})^3 + D4(t_{SR}-t_{0\ SSi})^4$ Where SSi equals SS1, SS2, SS3, SS4, or SS5 and $t_{0\ SSi}$ is the slant range time to the first SSi range.	Hz Hz Hz Hz Hz	10	5*ss
8	**Spare**	-	3	3*uc
TOTAL			55	

8.4.1.9.4 Slant Range to Ground Range Conversion ADS

The SR/GR conversion coefficients may be updated more than once per product (or slice). Each update is time stamped with the zero Doppler time to which the update applies. For stripline products, the updates occur once for each granule. The SR/GR coefficients used on range lines between two updates are found by linear interpolation between the updated and previous values. The contents of each update (each update is a single ADSR within the ADS) are as follows. This ADS is not included for SLC products for which SR/GR conversion is not performed, and for Geocoded products.

Table 8.4.1.9.4-1 SR/GR Conversion ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler Time in azimuth from which parameters apply**	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**2 way slant range time to first range sample**	ns	4	fl
4	**Ground range origin of the polynomial (GR_0) measured from the first pixel of the line**	m	4	fl

Table 8.4.1.9.4-1 SR/GR Conversion ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
5	**The coefficients S0, S1, S2, S3, and S4 of the ground range to slant range conversion polynomial.** Slant range = S0 + S1(GR-GR_0) + S2 (GR-GR_0)^2 + S3(GR-GR_0)^3 + S4(GR-GR_0)^4 where GR is the ground range distance from the first pixel of the range line	m, m^{-1}, m^{-2}, m^{-3}, m^{-4}	20	5*fl
6	**Spare**	-	14	14*uc
TOTAL			55	

8.4.1.9.5 Chirp Parameters ADS

The chirp parameters derived from the calibration pulses may be updated more than once per product (or slice). Each update is stamped with the zero Doppler time to which the update applies, the swath to which it applies and polarization of the image to which it applies. This time stamping allows for unambiguous recording of the chirp parameters which were used for at any part of the image (for both MDS 1 and MDS 2 for AP products) and for any beam. The coefficients continue to apply until a new update is made, and new values added to the ADS with a new time stamp. The contents of each update (each update is a single ADSR within the ADS) are as follows.

Note, for GM and WS products, there is a separate ADSR for each beam. The ADSRs are ordered according to their time stamps. If the time stamps of several ADSRs are identical, the ADSRs are ordered by beam number from SS1 to SS5.

Table 8.4.1.9.5-1 Chirp Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler azimuth time in azimuth at which estimate applies**	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**Beam ID** SS1, SS2, SS3, SS4, or SS5 for WS and GM images. Set to NSØ for AP, IM, and WV images.	ascii	3	3*uc
4	**Tx/Rx polarization** H/H, H/V, V/V, or V/H	ascii	3	3*uc

Table 8.4.1.9.5-1 Chirp Parameters ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
5	**3-dB pulse width of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	samples	4	fl
6	**First side lobe level of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	dB	4	fl
7	**ISLR of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	dB	4	fl
8	**Peak location of cross-correlation function between reconstructed chirp and nominal chirp**	samples	4	fl
9	**Reconstructed chirp power**	dB	4	fl
10	**Equivalent chirp power**	dB	4	fl
11	**Reconstructed chirp exceeds quality thresholds** 0 = reconstructed chirp does not meet quality thresholds, chirp is invalid 1 = reconstructed chirp does meet quality thresholds	-	1	uc
12	**Reference chirp power**	dB	4	fl
13	**Normalisation source** REPLICA REFØØØØ EQVØØØØ or NONEØØØ (if normalisation not applied)	ascii	7	7*uc
14	**Spare**	-	4	4*uc
	Calibration pulse Reconstruction Information			
15	**The following 4 parameters form a structure which is repeated 32 times (once for each row). Each repetition consists of a total of 11 measurements of 4 different types as described below. The row order is row 1 to row 32.**		1408	
	Max of Cal pulses 1, 2, and 3 amplitude	-	12	3*fl
	Average of Cal pulse 1, 2, and 3 amplitude over the 3 dB on either side of the max amplitude	-	12	3*fl
	Average of Cal pulse 1A over the sample window	-	4	fl
	Extracted phase for calibration pulse 1, 1A, 2, and 3	degrees	16	4*fl
16	**Spare**	-	16	16*uc
TOTAL			1483	

8.4.1.9.6 Antenna Elevation Pattern ADS

There are two Antenna Elevation Pattern ADSs. The first contains information pertaining to MDS 1 and the second contains information pertaining to MDS 2.The format of each ADS is identical, however the values may differ as each describes a separate MDS.

The antenna elevation pattern values are updated several times along the azimuth direction. Each update is time stamped with the zero Doppler time to which the update applies. The values continue to apply until a new update is made, and new values added to the ADS with a new time stamp. The contents of each update (each update is a single ADSR within the ADS) are as follows. This ADS is not included for IM and AP SLC products where the antenna elevation pattern is not applied. It is included for WS SLC products, as for those products the antenna elevation pattern is applied.

Note, for WS and GM products, there is a separate ADSR for each beam. The ADSRs are ordered according to their time stamps. If the time stamps of several ADSRs are identical, the ADSRs are ordered by beam number from SS1 to SS5.

Table 8.4.1.9.6-1 Antenna Elevation Pattern ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler azimuth time at which pattern applies**	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**Beam ID to which pattern applies SS1 to SS5 or NSØ**	ascii	3	3*uc
4	**The following fields each contain 11 values spaced evenly across the image:**		132	132
	2 way slant range times	ns	44	11*fl
	Corresponding elevation angles	degrees	44	11*fl
	Corresponding two-way antenna elevation pattern values	dB	44	11*fl
5	**Spare**	-	14	14*uc
TOTAL			162	

8.4.1.9.7 Geolocation Grid ADS (or LADS)

The Geolocation Grid is a table which lists the slant range time, incidence angle, and geodetic latitude and longitude positions at various range/azimuth positions within the image. The location of each tie point (or grid point) in the image is specified by a line and sample co-ordinate system. Tie point locations in azimuth are specified using the Zero Doppler Time stamp found at the start of each range line in the MDS. The location in range is specified by the number of range samples. Tie points must be placed at points corresponding to an integer number of range samples, and tie points must be located at least the following 3 points within those reported: the first range sample of the range line, the mid swath range sample, and the last range sample of the range line.

For Geocoded products, the Zero Doppler Time stamp does not apply. Therefore, it is set to zero, and only the range line number is used to index the grid entries.

The grid spacing in azimuth defines the granule size of the ASAR product. That is, a grid line provides tie points for the first line and last line of a granule. There will be 11 grid updates in range per ADSR. In azimuth, a new ADSR will be added to the ADS nominally every:

- 10 km in azimuth for IM and AP;
- 40 km in azimuth for WS and GM.

For WS SLC products, the grid described by each ADSR applies to a single burst within a sub swath, and a new ADSR will be added to the ADS for every Nth burst within each sub swath. Since for WS SLC products there are separate ADSRs for each beam, these ADSRs are ordered according to their time stamps. If the time stamps of several ADSRs are identical, the ADSRs are ordered by beam number from SS1 to SS5.

The contents of a Geolocation Grid ADSR are shown below:

Table 8.4.1.9.7-1 Geolocation Grid ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler Time in azimuth of first line of the granule** Gives azimuth location of grid line for first line of the granule	MJD	12	mjd
2	**Attachment Flag (set to 1 if all MDSRs for this granule are set to zero, set to 0 otherwise)**	-	1	uc

Table 8.4.1.9.7-1 Geolocation Grid ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
3	**Range line number corresponding to the first line of the granule within the slice** Warning: 1) This is not always the record number of the corresponding image MDSR. Use the number of lines per granule field to determine the image MDS record corresponding to each record of tie points. 2) For a stripline product, which may consist of multiple slices in a single MDS, this number is reset to 1 at the beginning of each slice. 3) For child products, which are subsets of a full product, the range line number in the first record may not be 1.	-	4	ul
4	**Number of output lines in this granule**	lines	4	ul
5	**Subsatellite track heading (relative to North) for first line of granule** This is the heading on the ground (includes Earth rotation)	deg.	4	fl
6	**The following fields each contain 11 values corresponding to 11 tie points in the first line of the granule:**		220	
	Range sample number Gives the range location of the grid points. First range sample is 1, last is M. Zero filled samples are included.	-	44	11*ul
	2 way slant range time to range sample	ns	44	11*fl
	Incidence Angle at range sample	deg.	44	11*fl
	geodetic latitude (positive north)	$1x10^{-6}$ deg.	44	11*sl
	geodetic longitude (positive east)	10^{-6} deg.	44	11*sl
7	**Spare**	-	22	22*uc
8	**Zero doppler time for the last line of the granule**	MJD	12	mjd
9	**The following fields each contain 11 values corresponding to 11 tie points in the last line of the granule:**		220	
	Range sample number Gives the range location of the first grid point. First range sample is 1, last is M	-	44	11*ul
	2 way slant range time to range sample	ns	44	11*fl
	Incidence Angle at range sample	deg.	44	11*fl
	geodetic latitude (positive north)	$1x10^{-6}$ deg.	44	11*sl
	geodetic longitude (positive east)	$1x10^{-6}$ deg.	44	11*sl

Table 8.4.1.9.7-1 Geolocation Grid ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
10	**Swath number** IS1, IS2, IS3, IS4, IS5, IS6, or IS7 for IM, WV and AP modes. SS1, SS2, SS3, SS4, or SS5 for WSS products. **WSØ for WS and GM modes where only one ADSR for the whole scene is provided.**	ascii	3	3*uc
11	**Spare**	-	19	19*uc
TOTAL			521	

8.4.1.9.8 Map Projection GADS

If geocoding of the data set is performed (i.e., data is resampled to a map projection), a GADS containing all necessary information to describe the map projection used is included. Geocoding is only performed for stand-alone products. The PF-ASAR processor supports 6 map projections:

1. Universal Transverse Mercator
2. Universal Polar Stereographic
3. Lambert Conformal Conic
4. Transverse Mercator
5. Mercator
6. Polar Stereographic

The contents of the Map Projection Parameters GADS is shown below:

Table 8.4.1.9.8-1 Map Projection Parameters GADS

Field #	GADS Contents	Units	Byte Length	Data Type
	General Information			
1	**Map projection descriptor** one of: UNIVERSAL_TRANSVERSE_MERCATORØØØ UNIVERSAL_POLAR_STEREOGRAPHICØØØ LAMBERT_CONFORMAL_CONICØØØØØØØØØ TRANSVERSE_MERCATORØØØØØØØØØØØØØ MERCATORØØØØØØØØØØØØØØØØØØØØØØØØ POLAR_STEREOGRAPHICØØØØØØØØØØØØØ	ascii	32	32*uc
2	**Number of samples per line**	-	4	ul
3	**Number of lines**	-	4	ul
4	**Nominal inter-sample distance**	m	4	fl
5	**Nominal inter-line distance**	m	4	fl
6	**Output scene centre orientation**	deg	4	fl
7	**Spare**	-	40	40*uc
8	**Platform heading, degrees**	deg	4	fl
	Reference Ellipsoid Parameters			
9	**Reference ellipsoid name**	ascii	32	32*uc
10	**Ellipsoid semi-major axis, metres**	m	4	fl
11	**Ellipsoid semi-minor axis, metres**	m	4	fl
12	**Datum shift parameter referenced to Greenwich: dx (metres)**	m	4	fl
13	**Datum shift parameter perpendicular to Greenwich: dy (metres)**	m	4	fl
14	**Datum shift parameter direction of the rotation axis: dz (metres)**	m	4	fl
15	**Average scene height above ellipsoid used for geocoding**	m	4	fl
16	**Spare**	-	12	12*uc
	Map Projection Designator			
17	**Map projection alphanumeric description**	ascii	32	32*uc
	UTM Projection (first default)			
18	**UTM descriptor** UNIVERSAL_TRANSVERSE_MERCATORØØØ	ascii	32	32*uc

Table 8.4.1.9.8-1 Map Projection Parameters GADS

Field #	GADS Contents	Units	Byte Length	Data Type
19	**UTM zone signature**	ascii	4	4*uc
20	**Map origin, false easting**	m	4	fl
21	**Map origin, false northing**	m	4	fl
22	**Projection centre longitude, deg**	$1x10^{-6}$ deg	4	sl
23	**Projection centre latitude, deg**	$1x10^{-6}$ deg	4	sl
24	**1st standard parallel, deg**	deg	4	fl
25	**2nd standard parallel, deg**	deg	4	fl
26	**Scale factor**	-	4	fl
	UPS projection (second default)			
27	**UPS descriptor**	ascii	32	32*uc
28	**Projection centre longitude, deg**	$1x10^{-6}$ deg	4	sl
29	**Projection centre latitude, deg**	$1x10^{-6}$ deg	4	sl
30	**Scale factor**	-	4	fl
	National Systems Projection (any others)			
31	**NSP descriptor**	ascii	32	32*uc
32	**Map origin, false easting**	m	4	fl
33	**Map origin, false northing**	m	4	fl
34	**Projection centre longitude, deg**	$1x10^{-6}$ deg	4	sl
35	**Projection centre latitude, deg**	$1x10^{-6}$ deg	4	sl
36	**Standard parallels parameters:**		16	
	Standard parallel1, deg Latitude of first standard parallel (for Lambert Conformal Conic projection only, otherwise 0)	deg	4	fl
	Standard parallel2, deg Latitude of second standard parallel (for Lamber Conformal Conic projection only, otherwise 0)	deg	4	fl
	Spare	-	8	8*uc
37	**Central Meridian parameters:**		12	
	Central meridian1, deg Longitude of the central meridian or Longitude down below pole of map for Polar Sterographic	deg	4	fl
	Spare	-	8	8*uc

Table 8.4.1.9.8-1 Map Projection Parameters GADS

Field #	GADS Contents	Units	Byte Length	Data Type
38	**Projection dependent parameters:**		16	
	Projection dependent1 Scale factor at central meridian (for Transverse Mercator Projection, otherwise 0)	-	4	fl
	Spare	-	12	12*uc
	Positioning Information			
39	**Positioning Information in meters:**		32	
	Top left corner northing, meters;	m	4	fl
	Top left corner easting, meters;	m	4	fl
	Top right corner northing, meters;	m	4	fl
	Top right corner easting, meters;	m	4	fl
	Bottom right corner northing, meters;	m	4	fl
	Bottom right corner easting, meters;	m	4	fl
	Bottom left corner northing, meters;	m	4	fl
	Bottom left corner easting, meters;	m	4	fl
40	**Positioning Information in degrees:**		32	
	Top left corner latitude	$1x10^{-6}$ deg	4	sl
	Top left corner longitude	$1x10^{-6}$ deg	4	sl
	Top right corner latitude	$1x10^{-6}$ deg	4	sl
	Top right corner longitude	$1x10^{-6}$ deg	4	sl
	Bottom right corner latitude	$1x10^{-6}$ deg	4	sl
	Bottom right corner longitude	$1x10^{-6}$ deg	4	sl
	Bottom left corner latitude	$1x10^{-6}$ deg	4	sl
	Bottom left corner longitude	$1x10^{-6}$ deg	4	sl
41	**Spare**	-	32	32*uc
	Co-efficients for image to map conversion			
42	**8 coefficients to convert a line(L) and sample (S) position to the map projection frame of reference, say (E,N)** **E = A11 + A12*L + A13 *S + A14 *L*S** **N = A21 + A22*L + A23 *S + A24 *L*S**	-	32	8*fl

Table 8.4.1.9.8-1 Map Projection Parameters GADS

Field #	GADS Contents	Units	Byte Length	Data Type
	Co-efficients for map to image conversion			
43	**8 coefficients to convert from the map projection (E,N) to line (L) and sample(S) position in the image** **L = B11 + B12*E + B13 *N + B14 *E*N** **S = B21 + B22*E + B23 *N + B24 *E*N**	-	32	8*fl
44	**Spare**	-	35	35*uc
	TOTAL		591	

8.4.1.9.9 Doppler Centroid Grid ADS

The Doppler Centroid Grid is a table which provides the slant range time and fine Doppler frequencies at various range/azimuth positions within the image.

In each Doppler Centroid ADS record (ADSR), there are typically 20 tie points equally spaced per sub swath, with different spacing within each sub swath. Therefore, for ScanSAR products, there will be typically 100 tie points in range per ADSR, distributed across the full range extent. In azimuth, a new ADSR will be added to the ADS every N seconds, where N is typically 1.15 seconds.

The location in range is specified by the slant range time. The annotated 2 way slant range time corresponds to the centre of the raw data used for the estimate. The range extent of the estimate is 356 raw samples for Wide Swath products, with a raw range sample spacing of 5.206×10^{-8} seconds. For ScanSAR products, these Doppler estimates are computed using the raw data from individual swaths, and may use data in the overlap region between two swaths.

The location in azimuth is specified by the zero Doppler azimuth start and end time of the data to which the estimate applies. For Wide Swath products, each Doppler estimate will typically be performed along azimuth on blocks of 12 cycles of raw data in the azimuth extent, with a 6 cycle interval between estimates. Azimuth data used for consecutive estimates will therefore overlap in azimuth. Estimates will be provided typically every ~1.152s.

The presence of this ADS for each product type is configurable for IMP, IMS, IMM, APP, APS, APM, WSS, WSM, GM1. When included, this ADS replaces the Map Projection GADS DSD in the SPH.

As of PF-ASAR v4.05, this ADS is included by default for WSS and WSM products.

The contents of a Doppler Centroid Grid ADSR are as follows.

Table 8.4.1.9.9-1 Doppler Centroid Grid ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**First Zero Doppler Azimuth time of Level 1 data to which this estimate applies**	MJD	12	mjd
2	**Attachment Flag (always set to zero for this ADSR)**	-	1	uc
3	**The following fields each contain 100 values across the image**		800	
	2 way slant range times This time covers from SS1 to SS5 and there is therefore an overlap between consecutive sub-swaths.	ns	400	100*fl
	Fine Doppler Centroid frequency estimate Last Zero Doppler Azimuth time of Level 1 data to which this estimate applies	Hz	400	100*fl
4	**Last Zero Doppler Azimuth time of Level 1 data to which this estimate applies**	MJD	12	Mjd
5	**Spare**	-	388	388*uc
TOTAL			1213	

8.4.1.9.10 Measurement Data Set

The MDS consists of several MDSRs. Each MDSR contains the processed SAR data for one range line. The number of MDSRs within a given product depends on the number of range lines contained within the data set. The length of each MDSR depends on the product, the swath, and the data format used to represent the samples.

Each MDSR consists of a small header, followed by the processed SAR data. Note that for the Geocoded products there is no correlation between the MDSR and zero Doppler time, so the time entry is set to zeros. Zero Doppler times in the ADSs of the geocoded product refer to those of the intermediate image created before geocoding. For detected images the SAR data consists of real valued samples. For Single-Look Complex images, however, the samples are complex and arranged in real, imaginary complex pairs.

Table 8.4.1.9.10-1 Measurement Data Set Record

Field #	MDSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler Time in azimuth** MJD format	MJD	12	mjd
2	**Quality Indicator** For non-WSS products, this field is a signed character, where: Set to -1 if all entries in MDSR are zero Set to 0 if the MDSR contains imagery For WSS products, this field is an unsigned character, where: Set to 255 if all entries in MDSR are zero Set to 0-254, which indicates the number of zero samples to the first valid sample in the MDSR imagery	-	1	sc or uc
3	**Range line number** Numbered sequentially, for each product (or slice) first range line in MDS is 1 Warning: 1) For a stripline product, which may consist of multiple slices in a single MDS, this number is reset to 1 at the beginning of each slice. 2) For child products, which are subsets of a full product, the range line number in the first record may not be 1. 3) For WSS products, range lines are numbered according to their position within a processed burst. Each MDS will contain many bursts.	-	4	ul
4	**SAR Processed Data** Either real samples (detected products), or complex samples arranged as real part, imaginary part, real part, imaginary part...	see Table 8.4.1.9.10.1-1		
TOTAL				

8.4.1.9.10.1 MDSR Sizes for Stand-alone Image Products

The following table lists the swath width, pixel spacing, number of samples per MDSR, sample size, and total MDSR size in bytes of the ASAR MDSRs (including the 17 byte header). Note that the MDSR size will vary with swath choice for Narrow Swath products. The swath width is based on a maximum swath width (high orbit) calculation

Table 8.4.1.9.10.1-1 Maximum Estimated MDSR size for Stand-alone Products

Product	Max. Swath Width (km)	Pixel Spacing (m)	Estimated Number of samples	Sample size (bytes)	Total size of MDSR (bytes)
SLC Products (ASA_IMS and ASA_APS)					
IS1	103.85	natural	4800 I, 4800 Q	2I, 2Q	19217
IS2	103.94	natural	5650 I, 5650 Q	2I, 2Q	22617
IS3	83.16	natural	5550 I, 5550 Q	2I, 2Q	22217
IS4	89.35	natural	6850 I, 6850 Q	2I, 2Q	27417
IS5	65.48	natural	5550 I, 5550 Q	2I, 2Q	22217
IS6	72.13	natural	6550 I, 6550 Q	2I, 2Q	26217
IS7	57.56	natural	5550 I, 5500 Q	2I, 2Q	22217
PRI Products (ASA_IMP and ASA_APP)					
IS1	103.85	12.5	8350	2	16717
IS2	103.94	12.5	8350	2	16717
IS3	83.16	12.5	6750	2	13517
IS4	89.35	12.5	7200	2	14417
IS5	65.48	12.5	5300	2	10617
IS6	72.13	12.5	5850	2	11717
IS7	57.56	12.5	4650	2	9317
GEC Products (ASA_IMG, ASA_APG)					
IS1	103.85	12.5	11850	2	23717
IS2	103.94	12.5	11850	2	23717
IS3	83.16	12.5	9550	2	19117
IS4	89.35	12.5	10200	2	20417
IS5	65.48	12.5	7500	2	22517
IS6	72.13	12.5	8300	2	16617
IS7	57.56	12.5	6600	2	13217
WS SLC Products (ASA_WSS)					
SS1	103.94	natural	6400 I, 6400 Q	2I, 2Q	25617
SS2	83.16	natural	5150 I, 5150 Q	2I, 2Q	20617

Table 8.4.1.9.10.1-1 Maximum Estimated MDSR size for Stand-alone Products

Product	Max. Swath Width (km)	Pixel Spacing (m)	Estimated Number of samples	Sample size (bytes)	Total size of MDSR (bytes)
SS3	89.35	natural	6300 I, 6300 Q	2I, 2Q	25217
SS4	65.48	natural	5150 I, 5150 Q	2I, 2Q	20617
SS5	72.13	natural	6050 I, 6050 Q	2I, 2Q	24217

8.4.1.10 Stand-alone Product Sizes

Table 8.4.1.10-1 provides a breakdown of the maximum size of the stand-alone products for one scene. Scene sizes are based upon the maximum MDSR length and number of MDSRs per scene.

Assumptions made for the size estimates of IM and AP scenes:

- 1 Main Proc. Parameters ADSR per scene
- 1 Dop. Cen. ADSR per scene
- 1 SR/GR ADSR per scene, omitted for SLC scenes and Geocoded scenes
- 1 SQ ADSR for each MDS (i.e., 2 for AP)
- 1 Chirp Param. ADSR for each MDS (i.e., 2 for AP)
- 1 Ant. Elev. Pattern ADSR for each MDS (i.e., 2 for AP), omitted for SLC scenes
- 10 Geo. Grid ADSRs per scene

Assumptions made for the size estimates of WS scenes:

- 5 Main Proc. Parameters ADSR per scene, 1 for each MDS
- 3 Dop. Cen. ADSRs per scene
- 5 SQ ADSRs per scene, 1 for each MDS
- 75 Chirp Param. ADSR per scene, 15 for each MDS
- 15 Ant. Elev. Pattern ADSRs per scene, 3 for each MDS
- 75 Geo. Grid ADSRs per scene, 15 for each MDS
- 60 Dop. Grid ADSRs per scene

Table 8.4.1.10-1 Stand-alone Image Products Maximum Sizes (bytes/scene)[2]

	SLC[3]			PRI		GEC	
	IM	AP	WS[c]	IM	AP	IM	AP
MPH	1247	1247	1247	1247	1247	1247	1247
SPH	6099	6099	6099	6099	6099	6099	6099
SQ ADS 1	170	170	850	170	170	170	170
SQ ADS 2		170			170		170
Main. Proc. Params ADS	10069	10069	50345	10069	10069	10069	10069
Dop. Cen. Coefficients ADS	55	55	165	55	55	55	55
SR/GRADS				55	55		
Chirp Params ADS	1483	2966	111225	1483	2966	1483	2966
Ant. Elev. Pattern ADS 1			2430	162	162	162	162
Ant. Elev. Pattern ADS 2					162		162
Geolocation Grid ADS (LADS)	5210	5210	39075	5210	5210	5210	5210
Map Projection Parameters ADS						591	591
Dop. Cen. Grid ADS			72780				
MDS 1	7.4E+08	7.4E+08	3.84E+08	1.34E+08	1.34E+08	2.81E+08	2.81E+08
MDS 2		7.4E+08	3.09E+08		1.34E+08		2.81E+08
MDS 3			3.78E+08				
MDS 4			3.09E+08				
MDS 5			3.36E+08				
TOTAL in MB	740.1	1480.1	1716.1	134.1	268.1	281.1	562.1

[2]All sizes given for max. MDSR size

[3]Nominal PRF of 1800 Hz assumed

c. Nominal total of 15000 lines per sub swath over 60 seconds.

8.4.2 Stripline Processed Image Products

Stripline image products contain image data for an entire segment, up to a maximum size of 10 minutes per product for IM, AP and WS and up to a full orbit (100 minutes) for GM. The PF-HS concatenates together several sub-images called "slices" received from PF-ASAR on a data set by data set basis in order to form the entire stripline image.

Each slice produced by PF-ASAR follows the standard "stand-alone" image product format described previously. After concatenation of slices to form the stripline, the structure of the stripline image is identical to that of the stand-alone image products except the data sets contain data concatenated from several slices in time ordered sequence. The stripline product structure is shown in Figure 8.4.2.5-1.

Stripline Formation:

Each slice delivered to the PF-HS is in the form of a separate product (i.e., format shown in Figure 8.4.1.5-1). Thus the steps performed by the PF-HS to create the stripline product from the individual slices is as follows:

1. Data Sets of the same type for each slice are concatenated in zero Doppler time order sequence.
2. The SPH from the first slice is adopted as the SPH for the stripline. The following positioning information will be updated to reflect the size of the full stripline product:
    - Stripline continuity indicator (set to 0 for no stripline continuity);
    - Slice number (set to +001);
    - Number of slices (set to +001 for no continuity);
    - Last Zero Doppler Azimuth time of product (can be read from SPH of last slice);
    - Geodetic latitude and longitudes for the first, last, and middle samples of the last line of the stripline image (as read from the SPH of the last slice in the stripline);

    In addition, the following parameters must be updated for each DSD describing a data set contained in the product:

    - Data set offset (gives location of a data set relative to the start of the product);
    - Total size of a data set;
    - Number of DSRs within a data set.

3. The MPH from the first slice is adopted for the whole strip. Several fields in the MPH will need to be updated. These fields are:
   - sensing stop time[4] (can be read from MPH of last slice);
   - duration of product sensing (sensing stop time - sensing start time of MPH of first slice);
   - total size of product.

Child Product Extraction:

Child product extraction is performed as per specified in Document R-27.

8.4.2.1 Product Types

8.4.2.1.1 Image Mode Medium Resolution Image

This ASAR product is generated from the Image Mode Level 0 Product. The product is processed to approximately 150 m resolution and contains radiometric resolution good enough for ice applications.

8.4.2.1.2 Alternating Polarization Medium Resolution Image

This ASAR product is generated from the AP Level 0 Product. The product is processed to approximately 150 m resolution using the SPECAN algorithm and contains radiometric resolution good enough for ice applications. The product contains one image corresponding to one of the 4 possible polarization combinations (HH, VV, HV, or VH) when processed systematically in NRT. This product may also be generated on request with one or both polarizations included in the product.

8.4.2.1.3 Wide Swath Medium Resolution Image

This is the standard product for ASAR Wide Swath Mode. It is processed to approximately 150 m resolution using the SPECAN algorithm. The swath width is approximately 400 km.

[4]This is the on-board sensing time of the input source packets used to create each slice. On-board sensing time is also used for the sensing stop time field and to calculate the product duration. The goal is to provide input data times so that the data could be reprocessed at a later date if desired.

8.4.2.1.4 Global Monitoring Mode Image Product

This is the standard product for ASAR Global Monitoring Mode. It is processed to approximately 1 km resolution using the SPECAN algorithm. The swath width is approximately 400 km.

8.4.2.2 Input Data

The input for all the on-request products is the Level 0 data corresponding to the particular mode and auxiliary data.

8.4.2.3 Auxiliary Data Used

The same data used for On-request products is required for the production of stripline products. Auxiliary data formats are described in Section 8.6.

8.4.2.4 Processing Performed

This is not the applicable document for ASAR algorithms. The following is intended only as a high level summary of the processing performed.

The same processing steps are applied to stripline products as for stand-alone products. In addition a final concatenation step and MPH/SPH update step is performed by the PF-HS. The following image formation algorithms are used.

Table 8.4.2.4-1 Image Formation Algorithms for Stripline Products

Product ID	Algorithm Applied
ASA_IMM_1P	SPECAN
ASA_APM_1P	SPECAN
ASA_WSM_1P	SPECAN
ASA_GM1_1P	SPECAN

8.4.2.5 Product Structure

The product structure and contents for stripline products is identical to the on-request products. The stripline image product structure is shown in Figure 8.4.2.5-1. For a detailed description of the contents of the data sets refer to the sections for stand-alone products (8.4.1.6 to 8.4.1.9.10).

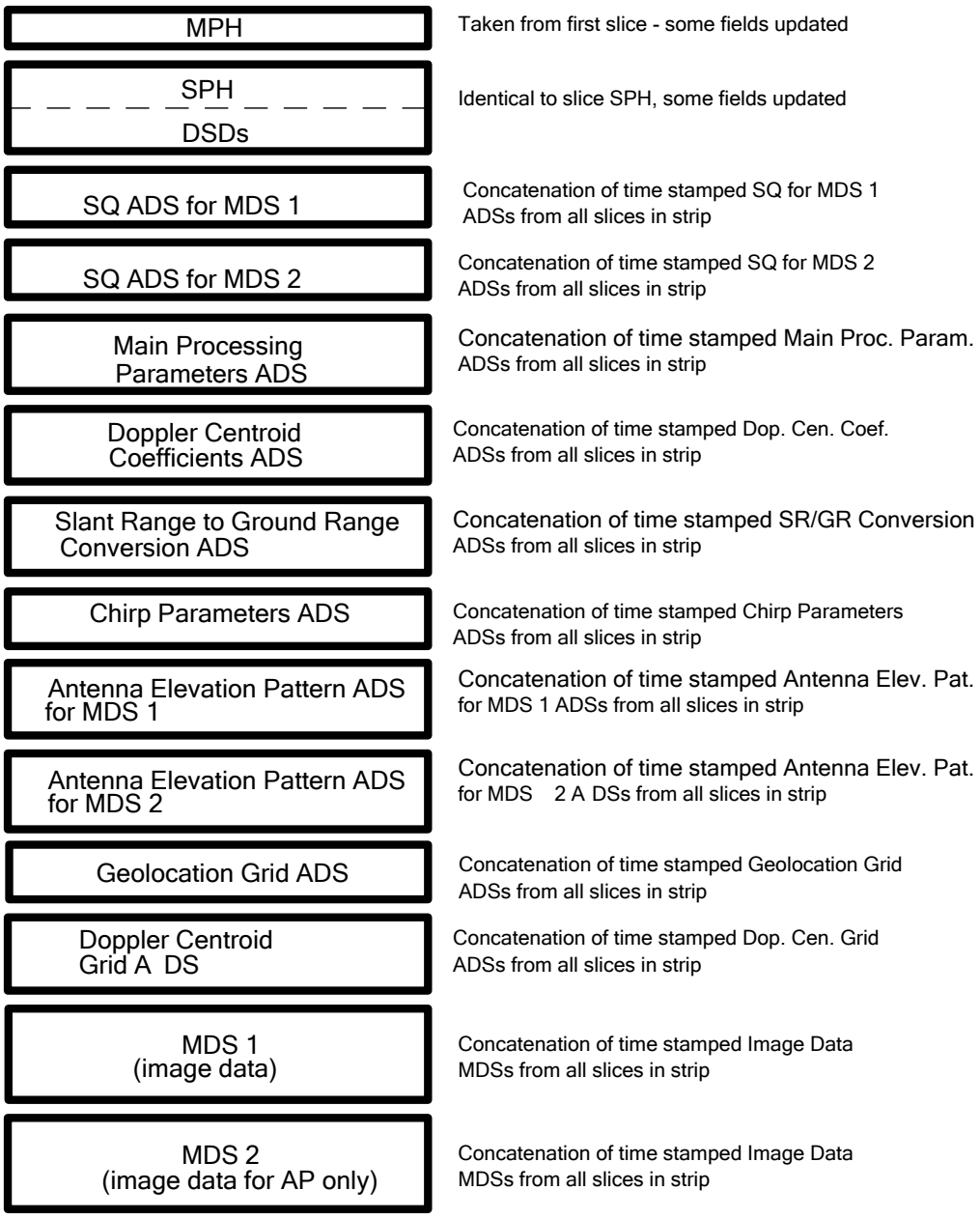


Figure 8.4.2.5-1 ASAR Stripline Image Product Structure

8.4.2.6 MDSR Sizes for Stripline Image Products

The following table lists the swath width, pixel spacing, number of samples per MDSR, sample size, and total MDSR size in bytes of the ASAR MDSRs (including the 16 byte header). Note that the MDSR size will vary with swath choice for Narrow Swath products. The swath width is based on a maximum swath width (high orbit) calculation.

Table 8.4.2.6-1 Maximum Estimated MDSR Size for Stripline Products

Product	Swath Width (km)	Pixel Spacing (m)	Number of samples	Sample size (bytes)	Total size of MDSR (bytes)
ASA_IMM and ASA_APM					
IS1	103.85	75	1400	2	2817
IS2	103.94	75	1400	2	2817
IS3	83.16	75	1150	2	2317
IS4	89.35	75	1200	2	2417
IS5	65.48	75	900	2	1817
IS6	72.13	75	1000	2	2017
IS7	57.56	75	800	2	1617
ASA_WSM	406	75	5450	2	10917
ASA_GM1	406	75	850	2	1717
ASA_IMB and ASA_APB					
IS1	103.85	225	480	1	497
IS2	103.94	225	480	1	497
IS3	83.16	225	400	1	417
IS4	89.35	225	400	1	417
IS5	65.48	225	300	1	317
IS6	72.13	225	400	1	417
IS7	57.56	225	300	1	317
ASA_WSB	406	900	500	1	517
ASA_GMB	406	1000	410	1	427

8.4.3 Browse Products

Browse products are a special form of stripline products. Browse products are also created as individual slices and then concatenated together by the PF-HS. However, browse products are intended only as a user aid when ordering data. Thus, many of the ADSs pertaining to detailed processing records may be discarded by the PF-HS for the browse product. There are 4 browse products as described in the following subsections.

8.4.3.1 Product Types

8.4.3.1.1 Image Mode Browse Image

This low resolution product will be produced systematically together with the Image Mode Medium Resolution Product. The image is intended for browse purposes only (pixel spacing is approximately 225 m). This product will be provided via electronic link in near real time.

8.4.3.1.2 Alternating Polarization Browse Image

This low resolution product will be produced systematically together with the AP Medium Resolution Product. The image is intended for browse purposes only (pixel spacing is approximately 225 m). This product will be provided via electronic link in near real time. The product will contain only one of the polarization options rather than two. The polarization used will be that of the MDS1 of the APM product. This means the polarization may vary depending upon which polarization option is chosen for MDS1 for the Medium Resolution AP product.

8.4.3.1.3 Wide Swath Browse Image

This low resolution product will be produced systematically together with the WS Medium Resolution Product. The image is intended for browse purposes only (pixel spacing is approximately 900 m). This product will be provided via electronic link in near real time.

8.4.3.1.4 Global Monitoring Mode Browse Image

This low resolution product will be produced systematically together with the GM Image Product from Level 0 GM data. The image is intended for browse purposes only (pixel spacing is approximately 1000 m). This product will be provided via electronic link in near real time.

8.4.3.2 Input Data

Medium resolution images created for the various modes.

8.4.3.3 Auxiliary Data Used

No further auxiliary data is required for the creation of a browse product.

8.4.3.4 Processing Performed

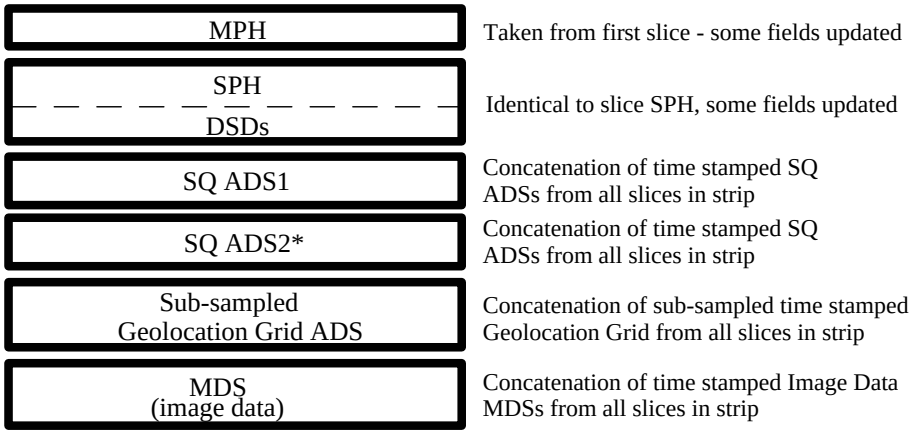
This is not the applicable document for ASAR algorithms. The following is intended only as a high level summary of the processing performed.

The following processing steps are applied after the medium resolution slice has been created:

- block averaging of medium resolution slice (by PF-ASAR);
- concatenation of browse slices by PF-HS.

8.4.3.5 Product Structure

The structure of the browse product is a the same as for the regular stripline products except that some data sets have been removed. The structure of the product is shown in Figure 8.4.3.5-1. For a detailed description of the contents of the data sets refer to the sections for on-request products (8.4.1.6 to 8.4.1.9.10).



* SQ ADS2 is included only if the browse product was created from a medium resolution AP product which contained 2 MDSs.

Figure 8.4.3.5-1 Browse Image Product Structure

8.4.3.5.1 Browse SQ ADS

The SQ ADS for the browse product is simply the SQ for the medium resolution image from which the browse was created. No fields are updated or changed during the formation of the browse product.

If the browse product is created from an AP medium resolution product containing 2 MDSs (both polarizations), then both SQ ADSs are left in the browse product to provide a complete quality record.

8.4.3.5.2 Sub-sampled Geolocation Grid ADS

During the formation of the browse product, the Geolocation Grid from the corresponding Medium Resolution Image is reduced approximately by a factor of 10 (i.e., approximately every 10th grid entry is left in the ADS, the rest are discarded. However, the last granule must remain to document the last line of the product.

8.4.3.5.3 Browse MDS

The browse product MDS is a sub-sampled version of the corresponding Medium resolution product. The browse MDS may also be jpeg compressed in the archiving facility to further reduce the size of the product (approximately be a factor of 8).

For AP browse products, the MDS used will correspond to MDS1 of the AP medium resolution product from which the browse was created.

8.4.3.6 Stripline Product Sizes

The following tables list the maximum data set sizes for the archived stripline products and for the user extracted products. The sizes estimated below are calculated based on the maximum swath sizes and acquisition times.

The following assumptions were made to derive the estimated sizes:

- Stripline product length is 10 minutes for AP, IM, and WS. It is 100 minutes for GM.
- The number of slices per stripline is approximately:
  - 10 for IM (60 s/slice)
  - 10 for AP (60 s/slice)
  - 20 for WS (30 s/slice)
  - 6 to 7 for GM (900 s/slice)
- Chirp parameters and Antenna Elevation parameters must be updated for 5 beams in ScanSAR mode (GM and WS).

Table 8.4.3.6-1 Stripline Products Maximum Sizes (archived product, bytes/product)

	MED					BROW				
	IM	AP[5]	AP[6]	WS	GM	IM	AP[a]	AP[a]	WS	GM
MPH	1247	1247	1247	1247	1247	1247	1247	1247	1247	1247
SPH	6099	6099	6099	6099	6099	6099	6099	6099	6099	6099
SQ ADS 1	1700	1700	1700	3400	1190	1700	1700	1700	3400	1190
SQ ADS 2			1700					1700		
Main Processing Parameters ADS	100690	100690	100690	201380	70483					

[5]size for an APM with only one polarization.

[6]size for an APM with both polarizations.

Table 8.4.3.6-1 Stripline Products Maximum Sizes (archived product, bytes/product)

Doppler Centroid Coefficients ADS	22000	22000	22000	5500	5500					
SR/GR Conversion ADS	22000	22000	22000	5500	5500					
Chirp Parameters ADS	56354	74150	74150	622860	7496565					
Antenna Elevation Pattern ADS 1	6480	6480	6480	32400	324000					
Antenna Elevation Pattern ADS 2			6480							
Geolocation Grid ADS (LADS)	208400	208400	208400	52100	521000	20840	20840	20840	5210	52100
Doppler Centroid Grid ADS				72780						
MDS 1	1.5E+08	1.5E+08	1.5E+08	5.82E+08	1.37E+08	4417833	4417833	4417833	2298065	17080000
MDS 2			1.5E+08					4417833		
TOTAL in MB	150.5	150.5	300.5	583.1	145.5	4.5	4.5	8.9	2.4	17.2

The following table provides estimates on the maximum size of a single scene extracted from the stripline product. The following assumptions are made:

- the extracted scene is assumed to be:
  - 100 km by 100 km for IM and AP
  - 400 km by 400 km for GM and WS
- the extraction is assumed to cross a slice boundary, and thus 2 ADSRs are provided for those ADSs which are updated on a per slice basis (Main Proc. Parameters ADS, and SQ ADSs).

Table 8.4.3.6-2 Maximum Sizes of Products Extracted from Stripline (bytes/scene)

Max. Extracted Scene size (single scene)	MED				
	IM	AP[7]	AP[8]	WS	GM
MPH	1247	1247	1247	1247	1247
SPH	6099	6099	6099	6099	6099
SQ ADS 1	340	340	340	340	340
SQ ADS 2			340		
Main Processing Parameters ADS	10069	10069	10069	10069	10069
Doppler Centroid Coefficients ADS	550	550	550	550	550
SR/GR Conversion ADS	550	550	550	550	550
Chirp Parameters ADS	1483	2966	2966	62286	74150
Antenna Elevation Pattern ADS 1	324	324	324	4050	4050
Antenna Elevation Pattern ADS 2			324		
Geolocation Grid ADS (LADS)	5210	5210	5210	5210	5210
Doppler Centroid Grid ADS				72780	
MDS 1	3943800	3943800	3943800	58951800	1373600
MDS 2			3943800		
TOTAL in MB	4.0	4.0	8.0	59.2	1.5

[7]size for an APM with only one polarization.

[8]size for an APM with both polarizations.

8.5 WAVE MODE PRODUCTS

Wave Mode products are those products produced from data acquired while the ASAR instrument is operating in Wave Mode. During Wave Mode operation, the ASAR instrument acquires small measurements called *wave cells* which are approximately 5 km along track by (up to) 10 km in across track. The wave cells are acquired at 100 km intervals. The cells may have alternating positions in the same swath or be in alternating swaths. In theory, up to 400 of these wave cells may be acquired per orbit, but in practice it is anticipated that the average number of acquisitions per orbit will be substantially lower. Each wave cell is processed into a small SLC image called an *imagette* and each imagette is further processed using the *cross-spectra methodology* to produce the *cross spectra* of the imagette. In addition, each *imagette* can be processed to generate the level 2 *ocean wave spectra* product.

8.5.1 Product Types

8.5.1.1 Wave Mode SLC Imagette and Imagette Cross Spectra

This is the basic Wave Mode product. The product includes up to 400 single look, complex, slant range, imagettes generated from Level 0 data and up to 400 imagette power spectra computed using the cross-spectra methodology. A minimum number of corrections and interpolations are performed. Absolute calibration parameters (when available) are provided in the product annotations.

8.5.1.2 Wave Mode Imagette Cross Spectra

This product contains up to 400 cross spectra extracted from the SLC Imagette and Imagette Cross Spectra product. It contains only the cross spectra derived using cross-spectra methodology.

8.5.1.3 Wave Mode OceanWave Spectra

This is the highest level Wave Mode product. It is produced from the SLC Imagette product. This is achieved by inverting the cross spectra computed from inter-look processing of the SLC imagettes to derive the directional ocean product ocean wave spectra. Auxiliary ADSs included with the product remains the same as for the Cross Spectra product.

8.5.2 Input Data

For the SLC Image and Cross Spectra product, the input data is the Level 0 Wave Mode product plus auxiliary data. The Cross Spectra product is simply an extraction of the Cross Spectra MDS and all ADSs from the SLC Image and Cross Spectra Product. The Ocean Wave Spectra product is derived directly from the SLC Imagette product (i.e. it is not derived from the Cross Spectra product).

8.5.3 Auxiliary Data Used

The auxiliary data used to create the Wave Mode products is the same as that used to create the on-request SLC Image Mode product (see Section 8.4.1.3). Auxiliary data formats are described in Section 8.6. An additional auxiliary data file may be used for the generation of Ocean Wave Level 2 products, and is listed in the following table. The data format for this auxiliary file is described in Volume 16, Section 16.3.6.

Table 8.5.3-1 Additional ASAR Auxiliary Data for Wave Product Processing

Description	Auxiliary Data ID
ECMWF forecast data file, or	AUX_ECF_AX
ECMWF analysis data file	AUX_ECA_AX

8.5.4 Processing Performed

The processing steps applied to create the SLC imagette are the same as those used to create the on-request SLC Image Mode product (see Section 8.4.1.4). The processing steps required to create the Cross Spectra products include:

- Look extraction;
- Slant range to ground range conversion;
- Cross covariance estimation;
- Azimuth cut-off;
- Cross spectra calculation;
- Cartesian to polar grid transformation;

- Spectral peak parameter extraction.

The processing steps required to create the Ocean Wave Spectra products include:

- Multi-look extraction,
- Cross covariance and cross spectra estimation,
- Fitting non-linear part to the observed data,
- Clutter noise estimation,
- Estimation of the RAR modulation transfer function,
- Retrieval of swell spectrum,
- Cartesian to polar grid transformation,
- Spectral peak parameter estimation.

8.5.4.1 Wave Mode Error Handling

If PF-ASAR is unable to produce an imagette or cross spectra, the following method is used to indicate the error and the location of the error within the product:

- CASE 1: PF-ASAR is able to produce the imagette but not the cross / wave spectra:
    - The MDSR containing the cross/wave spectra is given the correct time stamp (corresponding to the first line of the imagette), the Quality Flag is set to -1, and all entries pertaining to the cross spectra are set to zero.
    - Fields in all ADSRs pertaining to the cross / wave spectra are set to zero.
    - The Attachment Flags of the SQ ADSR and the Geolocation ADSR corresponding to the wave cell are set to 1.
    - The SPECTRA_FAILED counter in the SPH is incremented.
- CASE 2: PF-ASAR is unable to produce neither the imagette nor the cross / wave spectra:
    - The MDS which was supposed to hold the imagette is still created. It contains only 1 MDSR which consists only of the time stamp corresponding to the estimated location of where the imagette would have been located, a range line number of 1, and the Quality flag set to -1. If it is not possible to determine the approximate time stamp for the MDSR, the time stamp may be set to zeros.

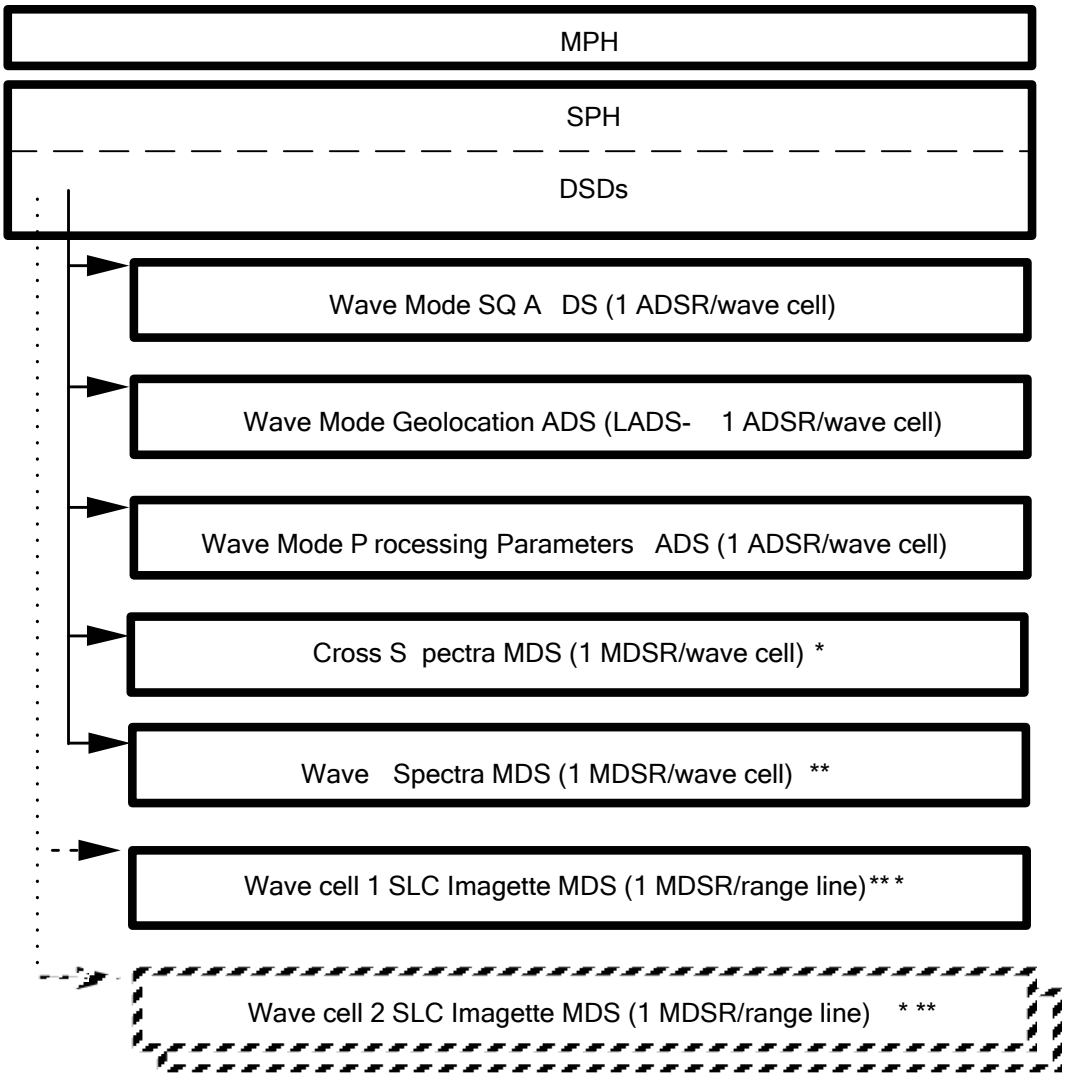
- The MDSR which was to have held the cross / wave spectra is still produced, but it is zero filled and the Quality Flag set to -1 (as in CASE 1). The time stamp is identical to that used in the single MDSR of the imagette MDS.
- Information in all ADSRs is set to zeros, and the Attachment flag of each ADSR is set to 1. The time stamp for each ADSR is identical to that of the single MDSR of the imagette MDS.
- The SPECTRA_FAILED and IMAGETTES_FAILED counters in the SPH are incremented.

The rationale for the error handling described above is that:

1. PF-ASAR should not fail completely just because one imagette or cross / wave spectra in a series could not be produced;
2. for extraction purposes, the number of MDSs containing imagettes and the number of DSRs in the other data sets must be the same;
3. by setting the MDSRs and ADSRs (if appropriate) to zero, a placeholder is inserted in the product which allows one to identify unambiguously which wave cell failed, in both the WVI product and in further extracted products.

8.5.5 Product Structure

The standard Wave Mode product structure is shown in Figure 8.5.5-1.



* only included for the WVI and WVS products
* * only included for the WVW product
* ** only included for the WVI product

Figure 8.5.5-1 Wave Mode Products Structure

8.5.5.1 Main Product Header

The MPH will be the same as described in Section 5.2.

8.5.5.2 Specific Product Header

The ASAR wave mode SPH provides only the information which applies to all wave cells within a product file. The format will be identical for all ASAR wave products, except for the DSD sections. The format of the SPH is described below

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
1	**SPH_DESCRIPTOR=**	keyword	15	15*uc
	quotation mark (“)	-	1	uc
	SPH Descriptor ASCII string describing the product.	-	28	28*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
	Product Time Information			
2	**FIRST_CELL_TIME=**	keyword	16	16*uc
	quotation mark (“)	-	1	uc
	First Zero Doppler Azimuth time of first line of first imagette UTC Time of first range line in the MDS containing the first imagette used to produce product.	UTC	27	27*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
3	**LAST_CELL_TIME=**	keyword	15	15*uc
	quotation mark (“)	-	1	uc
	Last Zero Doppler Azimuth time of first line of last imagette UTC Time of the first range line in the MDS containing the last imagette used to produce this product.	UTC	27	27*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
4	**Spare (blank characters (Ø))**	-	50	50*uc
	newline character	terminator	1	uc
	Imagette Information			
5	**SWATH_1=**	keyword	8	8*uc
	quotation mark (“)	-	1	uc
	First sub-cycle swath number IS1, IS2, IS3, IS4, IS5, IS6, or IS7.	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
6	**SWATH_2=**	keyword	8	8*uc
	quotation mark (“)	-	1	uc
	Second sub-cycle swath number IS1, IS2, IS3, IS4, IS5, IS6, or IS7.	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
7	**PASS=**	keyword	5	5*uc
	quotation mark (“)	-	1	uc
	Ascending or descending orbit designator (defined at start of time pass) ASCENDINGØ, DESCENDING or FULLØORBIT	-	10	10*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
8	**TX_RX_POLAR=**	keyword	12	12*uc
	quotation mark (“)	-	1	uc
	Transmitter / Receiver Polarization for MDS 1 H/V or H/H or V/H or V/V	-	3	3*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
9	**COMPRESSION=**	keyword	12	12*uc
	quotation mark (“)	-	1	uc

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
	Compression algorithm used on echo data on-board the satellite FBAQ2, FBAQ3, FBAQ4 (FBAQ: 8 bits reduced to 2, 3, and 4 bits respectively) others: S&MØ, and NONEØ	-	5	5*uc
	quotation mark (“)	-	1	uc
	newline character	terminator	1	uc
10	**Spare (blank characters)**	-	50	50*uc
	newline character	terminator	1	uc
	Spectra Size Information (NOTE: these fields do not pertain to the SLC Imagette in any way)			
11	**NUM_DIR_BINS=**	keyword	13	13*uc
	Number of Directional Bins	-	4	Ac
	newline character	terminator	1	uc
12	**NUM_WL_BINS=**	keyword	12	12*uc
	Number of Wavelength Bins	-	4	Ac
	newline character	terminator	1	uc
13	**FIRST_DIR_BIN=**	keyword	14	14*uc
	First Directional Bin	degrees	15	Afl
	<degrees>	units	9	9*uc
	newline character	terminator	1	uc
14	**DIR_BIN_STEP=**	keyword	13	13*uc
	Directional Bin Step	degrees	15	Afl
	<degrees>	units	9	9*uc
	newline character	terminator	1	uc
15	**FIRST_WL_BIN=**	keyword	13	13*uc
	First Wavelength Bin (Longest Wavelength)	m	15	Afl
	<m>	units	3	3*uc
	newline character	terminator	1	uc
16	**LAST_WL_BIN=**	keyword	12	12*uc
	Last Wavelength Bin (Shortest Wavelength) (NOTE: Logarithmic steps)	m	15	Afl
	<m>	units	3	3*uc

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
	newline character	terminator	1	uc
17	**Spare (blank characters (Ø))**	-	50	50*uc
	newline character	terminator	1	uc
	Spectra Processing Information *(NOTE: these fields do not pertain to the SLC Imagette in any way)*			
18	**LOOK_SEP=**	keyword	9	9*uc
	Look Separation period in seconds For the Ocean Wave Spectra product, this is the time period between the first and last looks	s	15	Afl
	<s>	units	3	3*uc
	newline character	terminator	1	uc
19	**LOOK_BW=**	keyword	8	8*uc
	Look bandwidth used during spectra processing	Hz	15	Afl
	<Hz>	units	4	4*uc
	newline character	terminator	1	uc
20	**FILTER_ORDER=**	keyword	13	13*uc
	Order of Butterworth filter used during cross-spectra processing If set to zero, a Gaussian filter was applied	-	4	Ac
	newline character	terminator	1	uc
21	**TREND_REMOVAL=**	keyword	14	14*uc
	Trend Removal applied during cross spectra computation 0 = trend removal not applied 1 = trend removal applied	ascii flag	1	uc
	newline character	terminator	1	uc
22	**ANTENNA_CORR=**	keyword	13	13*uc
	Antenna gain correction applied during cross spectra computation (note: this field does not pertain to the SLC imagette. Antenna Elevation gain correction is never applied to the SLC imagette) 0 = not applied 1 = applied	ascii flag	1	uc
	newline character	terminator	1	uc

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
23	**SR_GR=**	keyword	6	6*uc
	Slant range to ground range conversion applied during cross spectra computation (note: this field does not pertain to the SLC imagette. Slant range to ground range conversion is never applied to the SLC imagette) 0 = not applied 1 = applied	ascii flag	1	uc
	newline character	terminator	1	uc
24	**CC_WINDOW=**	keyword	10	10*uc
	Cross covariance window function was applied during cross spectra computation 0 = not applied 1 = applied	ascii flag	1	uc
	newline character	terminator	1	uc
25	**Spare (blank characters (Ø))**	-	29	29*uc
	newline character	terminator	1	uc
26	**NUM_LOOK_PAIRS=**	keyword	15	15*uc
	Number of look pairs in cross spectrum processing	-	4	Ac
	newline character	terminator	1	uc
27	**CC_RANGE_BINS=**	keyword	14	14*uc
	Range bins in Cross covariance estimation	-	11	Al
	newline character	terminator	1	uc
28	**CC_AZIMUTH_BINS=**	keyword	16	16*uc
	Azimuth bins in Cross covariance estimation	-	11	Al
	newline character	terminator	1	uc
29	**CC_HALF_WIDTH=**	keyword	14	14*uc
	Half-width of the cross-covariance window function	m	15	Afl
	<m>	units	3	3*uc
	newline character	terminator	1	uc

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
	Number of imagettes and spectra			
30	**IMAGETTES_FAILED=**	keyword	17	17*uc
	Number of imagettes PF-ASAR failed to produce in this product	-	4	Ac
	newline character	terminator	1	uc
31	**SPECTRA_FAILED=**	keyword	15	15*uc
	Number of cross spectra or ocean wave spectra PF-ASAR failed to produce in this product	-	4	Ac
	newline character	terminator	1	uc
32	**IMAGETTES_MADE=**	keyword	15	15*uc
	Number of imagettes successfully produced by PF-ASAR in this product	-	4	Ac
	newline character	terminator	1	uc
33	**SPECTRA_MADE=**	keyword	13	13*uc
	Number of cross spectra or ocean wave spectra successfully produced by PF-ASAR in this product	-	4	Ac
	newline character	terminator	1	uc
34	**Spare (blank characters (Ø))**	-	9	9*uc
	newline character	terminator	1	uc
	Data Set Descriptors for referenced filesa			
35	**DSD referencing the Level 0 product from which this product was created**	-	280	dsd
36	**DSD referencing PF-ASAR Processor Configuration file** (contains software parameters used by the processor and threshold values for PCD information)	-	280	dsd
37	**DSD referencing Instrument Characterization file used** Contains LUTs for ADC and data decompression, antenna elevation patterns, and other static instrument characteristics	-	280	dsd
38	**DSD referencing External Characterization file used**	-	280	dsd
39	**DSD referencing External Calibration file used**	-	280	dsd
40	**DSD referencing the Orbit State Vectors file used**	-	280	dsd

Table 8.5.5.2-1 ASAR Wave Mode Products SPH Content

Field #	Description	Units	Byte Length	Data Type
41	**DSD referencing the ECMWF file used**	-	280	dsd
	Data Set Descriptors for Data included with the product9			
42	**DSD for SQ ADS**	-	280	dsd
43	**DSD Geolocation ADS (LADS)**	-	280	dsd
44	**DSD for Processing Parameters ADS**	-	280	dsd
45	**DSD for the Cross Spectra or Ocean Wave Spectra MDS**	-	280	dsd
46	**DSD for SLC Imagettes** There are up to 400 DSDs. The actual number is determined at run time and can be derived as the sum of Fields 32 and 30 above (i.e. the sum of Imagettes_Made and Imagettes_Failed respectively). Each DSD describes one MDS. Each MDS contains 1 imagette. These DSDs are included only for the WVI product.	-	N*280 where N is an integer up to 400	N*dsd
TOTAL **For WVS and WVW products:** **For WVI product:**		**3981** **up to max of 115981**		

The ASA_WVI product SPH contains up to a maximum of 411 DSDs. The actual number of SLC Imagette DSDs is determined at run time and can be derived from the SPH as the sum of Fields 32 and 30 (i.e. as the sum of the number of Imagettes_Made and the number of Imagettes Failed respectively).

Note that the SLC Imagette MDS size and number of MDSRs may differ from cell to cell.

Fields 15 and 16 of the SPH give the wavelengths, λ_0 and λ_{N_k-1}, of the first and last wavelength bins. Field 12 gives the number of bins, N_k. The formula for reconstructing the wavelengths, λ_m, for each wavelength bin, *m*, from these first and last values is as follows:

For Level 1 WVI and WVS products:

[9]DSD format is described in Volume 5.

$$\lambda_m = \frac{\lambda_0}{\left(\frac{\lambda_0}{\lambda_{N_k-1}}\right)^{\frac{2m}{2N_k-1}}} \qquad \text{for} \qquad m \in [0, N_k - 1]$$

For Level 2 WVW products:

$$\lambda_m = \frac{\lambda_0}{\left(\frac{\lambda_0}{\lambda_{N_k-1}}\right)^{\frac{m}{N_k-1}}} \qquad \text{for} \qquad m \in [0, N_k - 1]$$

8.5.5.3 Data Set Names

The following Data Set Names may appear in the ASAR Wave Product SPH Data Set Descriptors:

Table 8.5.5.3-1 ASAR Wave Products Data Set Descriptor Names

Data Set Type	Data Set Name
DSD referencing the Level 0 product from which this product was created	"LEVEL 0 PRODUCT"
DSD referencing PF-ASAR Processor Configuration file	"ASAR PROCESSOR CONFIG"
DSD referencing Instrument Characterization file used	"INSTRUMENT CHARACTERIZATION"
DSD referencing External Characterization file used	"EXTERNAL CHARACTERIZATION"
DSD referencing External Calibration file used	"EXTERNAL CALIBRATION"
DSD referencing the Orbit State Vectors file used	"ORBIT STATE VECTOR 1"
DSD referencing the ECMWF file used	"ECMWF"
Wave Mode SQ ADS	"SQ ADS"
Wave Mode Geolocation ADS (LADS)	"GEOLOCATION ADS"
Wave Mode Processing Parameters ADS	"PROCESSING PARAMS ADS"
Cross Spectra MDS	"CROSS SPECTRA MDS"
Ocean Wave Spectra MDS	"OCEAN WAVE SPECTRA MDS"

Table 8.5.5.3-1 ASAR Wave Products Data Set Descriptor Names

Data Set Type	Data Set Name
Wave Cell SLC Imagette MDS	"SLC IMAGETTE MDS XXX" where XXX is a counter value from 000 to 399 indicating the cell number corresponding to the given imagette

8.5.5.4 Data Sets

The data sets which make up the ASAR Wave product structure are defined in the following sections. Data Sets are of mixed-binary format. ASCII strings may be included, but are not contained within quotes like for the MPH and SPH.

8.5.5.4.1 Wave Mode SQ ADS

There is one Wave Mode SQ ADSR per wave cell. The ADSR contains information pertaining to both the imagette and the spectrum. This consists of the ASAR image SQ information previously defined in Section 8.4.1.9.1, plus new information pertaining to the cross spectra. The contents and format of the ADSR are shown below.

Table 8.5.5.4.1-1 Wave Mode SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
	SQ pertaining to the Imagette:			
1-39	**Exact contents of the Image Product SQ ADSR (see Table 8.4.1.9.11).** Note: the attachment flag is set to 1 if PF-ASAR was unable to produce an imagette for the wave cell.	-	170	-
	SQ pertaining to the Spectra:			
40	**Land Flag** 0 = no land in imagette 1 = land in imagette	flag	1	uc
41	**Look image statistics confidence parameter flag** 1 = The ratio of the standard deviation to the mean of the first look image is outside the range given by a minimum and a maximum threshold. 0 =otherwise	flag	1	uc

Table 8.5.5.4.1-1 Wave Mode SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
42	**Inter-look confidence statistics confidence parameter flag** 1 = The normalised deviation of the two inter-look sub-images is greater than a maximum threshold. 0 = otherwise	flag	1	uc
43	**Azimuth cut-off convergence measure flag** 1 = The normalised RMS error between the fitted co-variance profile is greater than a maximum threshold. 0 = otherwise	flag	1	uc
44	**Azimuth cut-off Iteration count overflow flag** 1 = The Azimuth cut-off fit did not converge within a minimum number of iterations. 0 = otherwise	flag	1	uc
45	**Phase information confidence measure flag** 1 = The imaginary spectral peak is less than a minimum threshold, or the zero lag shift is greater than a minimum threshold. 0 = otherwise	flag	1	uc
46	**Spare**	-	4	4*uc
47	**Look image statistics confidence parameter thresholds (minimum and maximum)**	-	8	2*fl
48	**Inter-look confidence statistics confidence parameter threshold**	-	4	fl
49	**Azimuth cut-off convergence measure threshold**	-	4	fl
50	**Azimuth cut-off Iteration count overflow threshold**	-	4	ul
51	**Phase information confidence measure threshold for the spectral peak**	-	4	fl
52	**Phase information confidence measure threshold for cross covariance peak offset**	m	4	fl
53	**Spare**	-	12	12*uc
54	**Look image statistics confidence parameter** The ratio of the standard deviation to the mean of the first look image	-	4	fl
55	**Inter-look confidence statistics confidence parameter** The normalised deviation of the two inter-look sub-images	-	4	fl
56	**Azimuth cut-off convergence measure** The normalised RMS error between the fitted co-variance profile	-	4	fl
57	**Phase information confidence measure for the spectral peak** The imaginary spectral peak	-	4	fl

Table 8.5.5.4.1-1 Wave Mode SQ ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
58	**Phase information confidence measure for cross covariance peak offset**	m	4	fl
59	**Spare**	-	12	12*uc
TOTAL			252	

8.5.5.4.2 Wave Mode Geolocation Grid ADS (or LADS)

Due to the reduced size of the imagettes compared to normal ASAR images, each Wave Mode Geolocation ADSR contains only the geodetic latitude and longitude of the center point of the imagette. One ADSR is produced for each wave cell.

The center point given in the Geolocation ADSR corresponds to the ground range center point of the wave cell. This will not correspond exactly to the latitude and longitude of the center sample of the SLC imagette (in slant range) but provides a more accurate positioning of the location of the cross spectra center point.

Note that the imagettes do not cover a contiguous region geographically. Thus, Wave Mode Geolocation ADS entries may differ substantially for different imagettes.

Table 8.5.5.4.2-1 Wave Mode Geolocation ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
1	**Zero Doppler Time of first line of the first line of the imagette**	MJD	12	mjd
2	**Attachment Flag** (set to 1 if unable to compute the cross spectra for a given SLC imagette (i.e. no Cross Spectra MDSR corresponding to this ADSR), set to 0 otherwise)	-	1	uc
3	**Geodetic latitude of center point (positive north)** This is the center point of the wave cell. It is calculated after the cross spectra processing, and thus may differ from the center sample latitude of the SLC imagette if slant range to ground range conversion was performed during the cross spectra calculation.	10^{-6} deg.	4	sl

Table 8.5.5.4.2-1 Wave Mode Geolocation ADSR

Field #	ADSR Contents	Units	Byte Length	Data Type
4	**Geodetic longitude of center point (positive east)** This is the center point of the wave cell. It is calculated after the cross spectra processing, and thus may differ from the center sample latitude of the SLC imagette if slant range to ground range conversion was performed during the cross spectra calculation.	10^{-6} deg.	4	sl
5	**Subsatellite Track Heading (relative to north) of center point**	deg.	4	fl
TOTAL			25	

8.5.5.4.3 Wave Mode Processing Parameters ADS

The Wave Mode Processing parameters ADS details all the parameters used to create the imagette and other parameters specific to Wave Mode Imagette processing. These consist of those found in the Main Processing Parameters ADS of the Image Products format, plus Doppler Centroid parameters, Chirp Parameters, Antenna Elevation Patterns, Slant Range to Ground Range (SR/GR) parameters, Geolocation Grid Tie points, and parameters specific to Wave Mode. Note that the imagette is an SLC image. Therefore the SR/GR parameters and Antenna Elevation parameters pertain to the cross-spectra creation process, not the imagette itself.

There is one ADSR per wave cell. The format of each ADSR is shown below:

Table 8.5.5.4.3-1 Wave Mode Processing Parameters ADSR

Field #	Description	Units	Byte Length	Data Type
	PROCESSING PARAMETERS PERTAINING TO THE CREATION OF THE SLC IMAGETTE: ***(the following parameters pertain to the SLC imagette. They are a complete record of the processing parameters and values used during image formation)***			
	Main Processing Parameters			
1-85	**Exact contents of the Image Product Main Processing Parameters ADSR (see Table 8.4.1.9.2-1) up to field 85, but excluding the absolute calibration information fields 86-88.**	-	2009	-

Table 8.5.5.4.3-1 Wave Mode Processing Parameters ADSR

Field #	Description	Units	Byte Length	Data Type
	Doppler Centroid Parameters: (computed at mid-cell)			
86	**2-way slant range time origin (t_0)**	ns	4	fl
87	**Doppler centroid coefficients as a function of slant range time: D0, D1, D2, D3, and D4.** where Doppler Centroid = D0 + D1(t_{SR}-t_0) + D2(t_{SR}-t_0)^2 + D3(t_{SR}-t_0)^3 + D4(t_{SR}-t_0)^4	Hz Hz/s Hz/s^2 Hz/s^3 Hz/s^4	20	5*fl
88	**Doppler Centroid Confidence Measure** Value between 0 and 1, 0 = poorest confidence, 1= highest confidence **Doppler Confidence Below Threshold Flag** 0 = confidence above threshold, Doppler Centroid calculated from data 1 = confidence below threshold, Doppler Centroid calculated from orbit parameters	- -	4 1	fl uc
89	**Spare**	-	13	13*uc
	Chirp Parameters:			
90	**3-dB pulse width of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	samples	4	fl
91	**First side lobe level of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	dB	4	fl
92	**ISLR of chirp replica cross-correlation function between reconstructed chirp and nominal chirp**	dB	4	fl
93	**Peak location of cross-correlation function between reconstructed chirp and nominal chirp**	samples	4	fl
94	**Reconstructed chirp power**	dB	4	fl
95	**Equivalent chirp power**	dB	4	fl
96	**Reconstructed chirp exceeds quality thresholds** 0 = reconstructed chirp does not meet quality thresholds, chirp is invalid 1 = reconstructed chirp does meet quality thresholds	-	1	uc
97	**Reference chirp power**	dB	4	fl
98	**Normalisation source** REPLICA REFØØØØ EQVØØØØ or NONEØØØ (if normalisation not applied)	ascii	7	7*uc
99	**Spare**	-	4	4*uc
100	**This following 4 parameters form a structure that is repeated 32 times (once for each row). Each repetition consists of a total of 11 measurements of 4 different types as described below.**		1408	

Table 8.5.5.4.3-1 Wave Mode Processing Parameters ADSR

Field #	Description	Units	Byte Length	Data Type
	Max of Cal pulses 1, 2, and 3 amplitude	-	12	3*fl
	Average of Cal pulse 1, 2, and 3 amplitude above the predetermined threshold relative to the max amplitude (Nominal threshold is 0.707 of max amplitude)	-	12	3*fl
	Average of Cal pulse 1A over the sample window	-	4	fl
	Extracted phase for calibration pulse 1, 1A, 2, and 3	-	16	4*fl
101	**Spare**	-	16	16*uc
	Geolocation Grid:			
102	**Zero Doppler Time at first line of imagette**	mjd	12	mjd
103	**Tie points of first line for first, mid and last range samples** A Tie point consists of:	-		
	Range sample number Gives the range location of the grid points. First range sample is 1, last is M (includes zero filled samples)	-	12	3*ul
	2 way slant range time to range sample	ns	12	3*fl
	Incidence Angle at range sample	deg.	12	3*fl
	geodetic latitude of range sample (positive north)	10^{-6} deg.	12	3*sl
	geodetic longitude of range sample (positive east)	10^{-6} deg.	12	3*sl
104	**Zero Doppler Time at centre line of imagette**	mjd	12	mjd
105	**Range line number of the center range line**	-	4	ul
106	**Tie points of centre line at first, mid, and last range samples**	-	60	-
107	**Zero Doppler Time at last line of imagette**	mjd	12	mjd
108	**Range line number of the last range line**	-	4	ul
109	**Tie points of last line at first, mid, and last range samples**	-	60	-
	Other Imagette Parameters:			
110	**Wave cell SWST offset** from center of the sub-swath to start of imagette. 208 ns increments	ns	4	fl
111	**Wave cell Ground range bias** from centre of the Sub-Swath to the centre of the imagette (Ground range, km)	km	4	fl
112	**Wave cell Elevation angle bias** from centre of the Sub-Swath elevation to the centre of the imagette (deg)	deg	4	fl
113	**Imagette length in range** (m)	m	4	fl

Table 8.5.5.4.3-1 Wave Mode Processing Parameters ADSR

Field #	Description	Units	Byte Length	Data Type
114	**Imagette length in azimuth** (m)	m	4	fl
115	**Nominal Imagette resolution in slant range** (m)	m	4	fl
116	**Nominal resolution in ground range**	m	4	fl
117	**Nominal Imagette resolution in azimuth** (m)	m	4	fl
118	**Altitude (platform to ellipsoid) in metres** (centre of wave cell)	m	4	fl
119	**Ground Velocity** (m/s) w.r.t moving earth	m/s	4	fl
120	**Range to centre of imagette** (m) from platform to target	m	4	fl
121	**CW signal drift**	-	4	fl
122	**Wave sub-cycle** (1 or 2) of this wave cell	-	2	us
	PROCESSING PARAMETERS PERTAINING TO THE CREATION OF THE CROSS SPECTRA: ***(The following parameters pertain to slant range to ground range conversion and antenna elevation correction. These operations have NOT been applied to the SLC imagette contained within the WVI product. They are applied during the computation of the cross spectra).***			
	SR/GR Parameters:			
123	**Earth Radius at imagette center sample**	m	4	fl
124	**Satellite distance to earth center**	m	4	fl
125	**Distance from satellite to first range pixel in the full SLC image**	m	4	fl
126	**Spare**	-	12	12*uc
	Antenna Elevation Parameters:			
127	**The following fields each contain 11 values spaced evenly across the imagette**			
	2 way slant range times	ns	44	11*fl
	Corresponding elevation angles	deg.	44	11*fl
	Corresponding two-way antenna elevation pattern values	dB	44	11*fl
128	**Spare**	-	14	14*uc
TOTAL			**3959**	

8.5.5.4.4 Cross-Spectrum MDS

This MDS contains the cross spectrum of the imagette. There is one MDSR per wave cell. The format of each MDSR is described below:

Table 8.5.5.4.4-1 Cross-Spectrum MDSR

Field	Description	Units	Byte Length	Data Type
1	**First Zero Doppler Azimuth time of the wave cell** Time of first range line in the SLC Imagette MDS described by this data set	mjd	12	mjd
2	**Quality Indicator** (set to -1 if all values in MDSR are zero, set to 0 otherwise)	-	1	sc
	Processing Parameters			
3	**Range bin size of the cartesian cross spectrum**	-	4	fl
4	**Azimuth bin size of the cartesian cross spectrum**	-	4	fl
5	**Azimuth re-sampling factor in look extraction** (Swath specific)	-	4	fl
	Detected Spectrum Statistics			
6	**Spectrum Total Energy**	-	4	fl
7	**Spectrum Max Energy**	-	4	fl
8	**Direction of Spectrum Max** (deg) on higher resolution grid. Direction is counter-clockwise from satellite track heading	deg	4	fl
9	**Wavelength of Spectrum Max** (m) on higher resolution grid	m	4	fl
10	**Clutter Noise**	-	4	fl
11	**Azimuthal Clutter Cut-off length** (m)	m	4	fl
12	**Number of iterations to compute Azimuthal Clutter Cut-off**	-	4	fl
	Cross Covariance function			
13	**Range offset of peak of cross covariance function** (m)	m	4	fl
14	**Azimuth offset of peak of cross covariance function** (m)	m	4	fl
15	**Range bin size of cross covariance function** (m)	m	4	fl
16	**Azimuth bin size of cross covariance function** (m)	m	4	fl
	Sub-look Statistics			
17	**1st and last Sub-look Image Means**	-	8	2*fl

Table 8.5.5.4.4-1 Cross-Spectrum MDSR

Field	Description	Units	Byte Length	Data Type
18	**1st and last Sub-look Image Variance**	-	8	2*fl
19	**1st and last Sub-look Image Skewness**	-	8	2*fl
20	**1st and last Sub-look Image Kurtosis**	-	8	2*fl
21	**1st and last Sub-look de-trend coefficient in range**	-	8	2*fl
22	**1st and last Sub-look de-trend coefficient in azimuth**	-	8	2*fl
	Polar Spectrum scaling			
23	**Min value of Imaginary part of cross spectrum**	-	4	fl
24	**Max value of Imaginary part of cross spectrum**	-	4	fl
25	**Min value of Real part of cross spectrum**	-	4	fl
26	**Max value of Real part of cross spectrum**	-	4	fl
	Additional Statistic fields			
27	**Spare**	-	64	64*uc
	Complex Cross-Spectra			
28	**Real part of cross spectra polar grid** Number of bins in wavelength and direction defined in SPH (nominally 24 by 36). However, only 0 to 180 degree of the spectrum need be supplied (24 by 18). Arranged as: 24 wavelength values for [-5,5] deg. sector, 24 values for [5,15] deg. sector, ..., 24 values for [165,175] deg. sector, in the counter-clockwise direction. The 24 values for each sector are given in order from longest to shortest wavelength.	-	432	18*24*uc
29	**Complex part of cross spectra polar grid** Number of bins in wavelength and direction defined in SPH (nominally 24 by 36). However, only 0 to 180 degree of the spectrum need be supplied (24 by 18). Arranged as: 24 wavelength values for [-5,5] deg. sector, 24 values for [5,15] deg. sector, ..., 24 values for [165,175] deg. sector, in the counter-clockwise direction. The 24 values for each sector are given in order from longest to shortest wavelength.	-	432	18* 24 *uc
TOTAL			**1061**	

The cross spectrum is given in the MDS in complex form on a polar grid. The size of the cross spectrum grid is given in the SPH. Typically this will be 24 by 36 bins in wavelength and direction respectively. As the real part of the polar spectrum is symmetric, and the imaginary part is anti-symmetric, only 0° to 180° need to be given in order to reconstruct the entire spectrum (i.e., only 18 directional bins).

The cross spectrum values shall be stored in an unsigned integer format, each part linearly scaled to the maximum and minimum values of the representation (e.g., 0 to 255). The original maximum and minimum values for each part is reported.

The cross spectrum statistics are derived from a high resolution polar spectrum, prior to encoding for output to the product, or at other intermediate stages of the processing.

If the processor is unable to produce the cross spectra for a given wave cell, the MDSR is time stamped with the time that the cross spectra would have corresponded to, the Quality Flag is set to -1, and the MDSR data fields are all set to zero.

The format of the Wave Mode cross spectrum product is shown below.

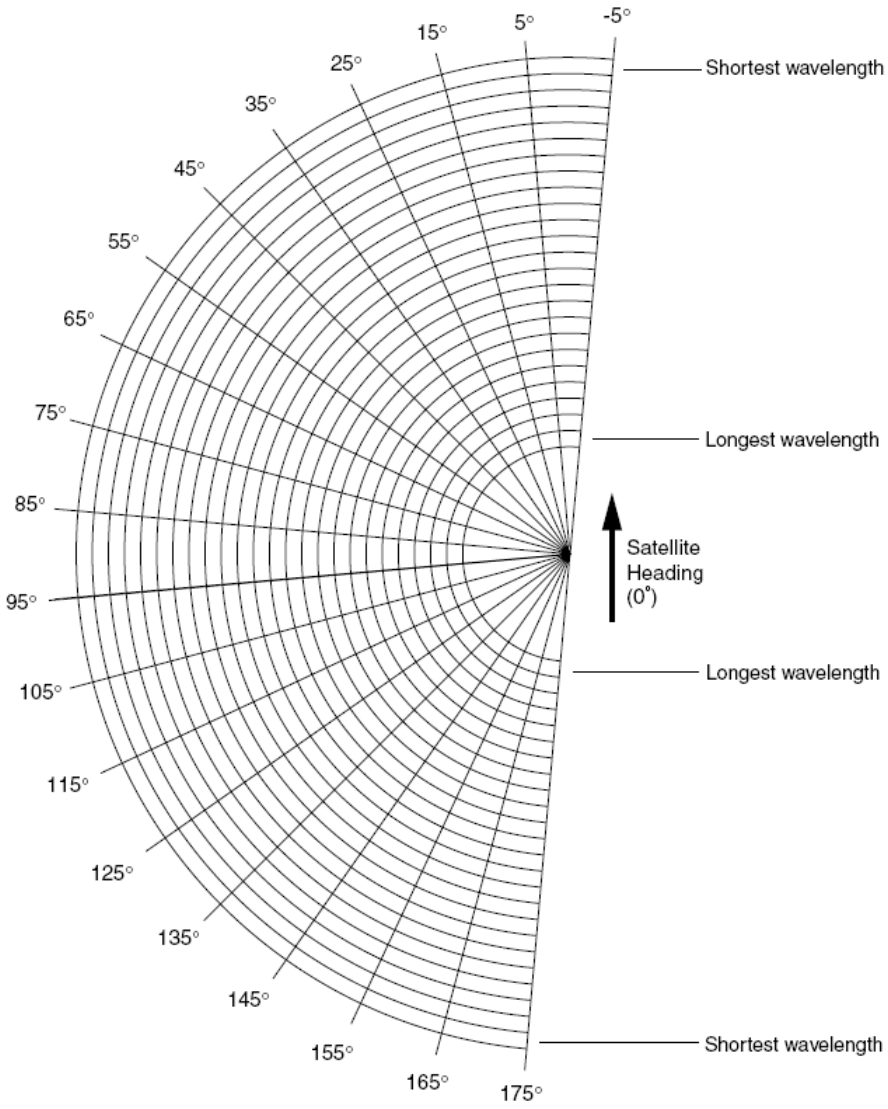


Figure 8.5.5.4.4-1 Wave Mode Cross Spectra Format

The method for reconstructing the entire cross spectrum from that stored in the cross spectrum MDS is shown in the figure below.

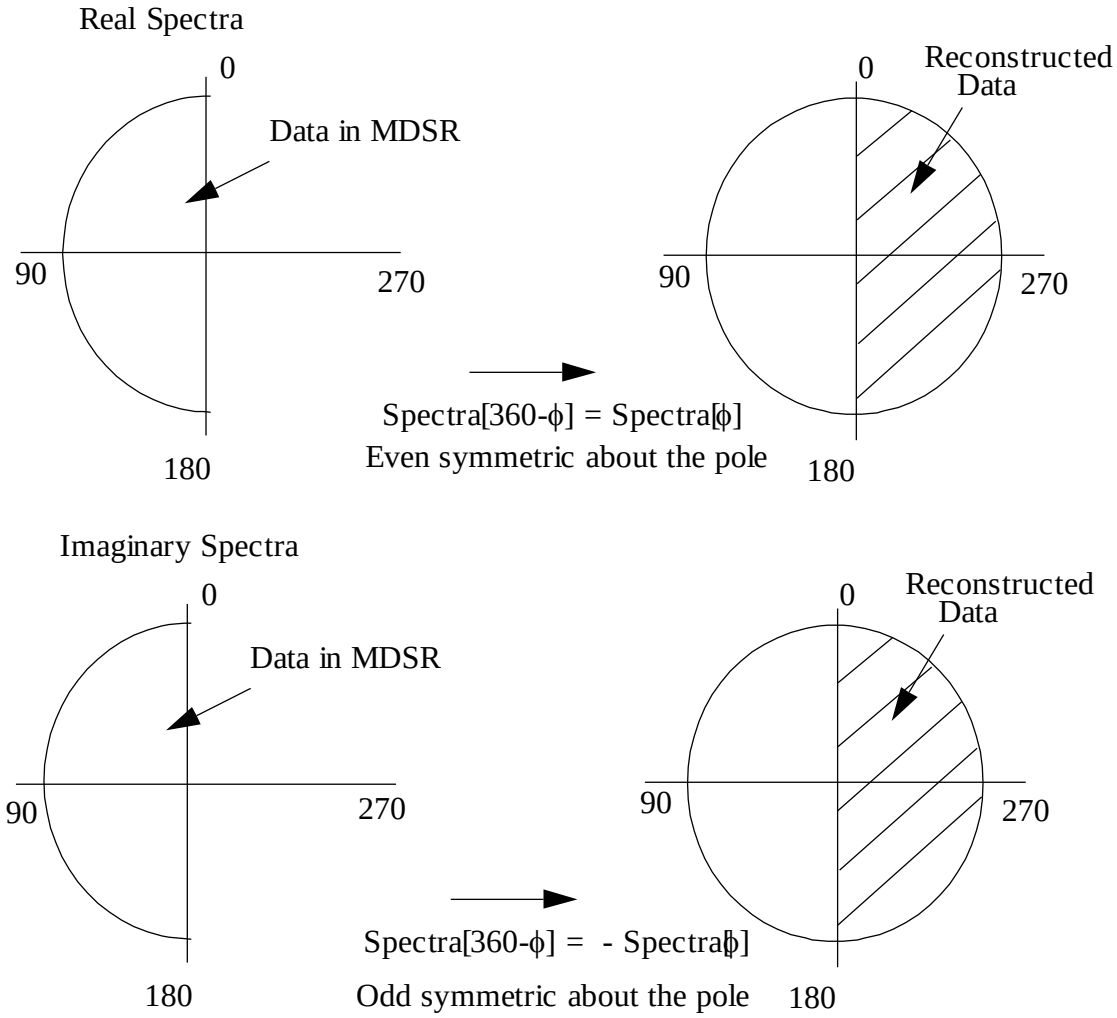


Figure 8.5.5.4.4-2 Method to reconstruct full cross spectra from product cross spectra

8.5.5.4.5 Ocean Wave-Spectrum MDS

This MDS contains the ocean wave spectrum of the imagette. There is one MDSR per wave cell. The format of the wave-spectrum MDS closely matches that of the cross spectrum MDS where some fields in the cross-spectrum MDS are substituted by new values pertaining to the ocean wave spectrum product. Each ocean wave spectrum MDSR is described below:

Table 8.5.5.4.5-1 Ocean Wave-Spectrum MDSR

Field	Description	Units	Byte Length	Data Type
1	**First Zero Doppler Azimuth time of the wave cell** Time of first range line in the SLC Imagette MDS described by this data set	mjd	12	mjd
2	**Quality Indicator** (set to -1 if all values in MDSR are zero, set to 0 otherwise)	-	1	sc
	Processing Parameters			
3	**Range spectral bin size of the cartesian cross spectrum**	-	4	fl
4	**Azimuth spectral bin size of the cartesian cross spectrum**	-	4	fl
5	**Ambiguity removal factor**	-	4	fl
	Detected Spectrum Statistics			
6	**Spectrum Total Energy**	-	4	fl
7	**Spectrum Max Energy**	-	4	fl
8	**Direction of Spectrum Max** (deg) Direction is given clockwise from north in the direction the wave propogates	deg	4	fl
9	**Wavelength of Spectrum Max** (m)	m	4	fl
10	**Variance of the azimuth image shift caused by the orbital velocity** (m^2)	m^2	4	fl
11	**Azimuthal Clutter Cut-off wavelength** (m)	m	4	fl
12	**Spectral width of non-linear part of the cross spectra**	-	4	fl
	Image Statistics			
13	**Image Intensity**	-	4	fl
14	**Normalized Image Variance**	-	4	fl
15	**Spare**	-	56	56*uc

Table 8.5.5.4.5-1 Ocean Wave-Spectrum MDSR

Field	Description	Units	Byte Length	Data Type
	Polar Spectrum Scaling			
16	**Min value of ocean wave spectrum**	m^4	4	fl
17	**Max value of ocean wave spectrum**	m^4	4	fl
18	**Spare**	-	8	8*uc
	Additional Product Parameter fields			
19	**Wind speed used in wave spectra retrieval** (m/s)	m/s	4	fl
20	**Wind direction used in the wave spectra retrieval (clockwise from north from where the wind from if confidence is 0, relative to range otherwise)** (deg)	deg	4	fl
21	**Normalized inverse wave age**	-	4	fl
22	**SAR swell wave height**	m	4	fl
23	**Variance of azimuth shift computed from the SAR swell wave spectra**	m^2	4	fl
24	**Radar backscatter cross section**	dB	4	fl
25	**Confidence measure of the swell inversion** 0 = inversion successful - a unique spectrum in terms of propogation direction can be given 1 = inversion not successful - symmetric spectrum	-	2	us
26	**Average signal-to-noise ratio**	-	4	fl
27	**Radar velocity offset correction**	m/s	4	fl
28	**Geophysical calibration constant (CMOD)**	-	4	fl
29	**Confidence measure of the wind retrieval** 0 = external wind direction used during inversion 1 = external wind direction not used during inversion	-	2	us
30	**Spare**	-	24	24*uc
	Ocean Wave Swell Spectra			
31	**Ocean Wave Swell spectra polar grid** Number of bins in wavelength and direction defined in SPH (nominally 24 by 36). Arranged as: 24 wavelength values for 0 deg., 24 values for 10 deg, ..., 24 values for 350 deg. The 24 values for each sector are given in order from longest to shortest wavelength in the clockwise direction).	-	864	36*24*uc
TOTAL			**1061**	

The ocean wave spectrum is given in the MDS as real samples distributed on a polar grid. The size of the ocean wave spectrum grid is given in the SPH. Typically this will be 24 by 36 bins in wavelength and direction respectively.

The ocean wave spectrum values shall be stored in an unsigned integer format, each part linearly scaled to the maximum and minimum values of the representation (e.g., 0 to 255). The original maximum and minimum values are reported.

If the processor is unable to produce the ocean wave spectra for a given wave cell, the MDSR is time stamped with the time that the ocean wave spectra would have corresponded to, the Quality Flag is set to -1, and the MDSR data fields are all set to zero.

8.5.5.4.6 MDS Containing Imagettes

The structure of the MDS containing an imagette will be identical to that specified in Section 8.4.1.9.10. There is one MDS per imagette. There are up to 400 MDSs per product. The MDSs are not included for WVS and WVW products.

If PF-ASAR is unable to produce an imagette, the MDS will consist of only one MDSR with the time stamp corresponding to what the first line of the imagette would have been, a range line number of 1, and the quality flag set to -1.

8.5.5.4.6.1 Imagette MDSR Sizes for Wave Mode Products

The following table lists the estimated swath width, pixel spacing, number of samples per MDSR, sample size, and total MDSR size in bytes of the maximum ASAR Imagette MDSR (including the 17 byte header). Note that the MDSR size will vary with swath choice. The swath width is based on a maximum swath width (high orbit) calculation.

Table 8.5.5.4.6-1 Estimated Imagette MDSR Size for Wave Mode Products

Product	Max. Swath Width (km)	Pixel Spacing (m)	Estimated Number of samples	Sample size (bytes)	Total size of MDSR (bytes)
Imagette (WVI)	10 km	natural	1100	2I, 2Q	4417

8.5.5.5 Wave Mode Product Sizes

The following two tables lists the data sets sizes for the ASAR Wave Mode products. The first table shows typical product sizes calculated assuming that each product contains 20 imagettes.

Table 8.5.5.5-1 Wave Mode Typical Product Sizes

	Wave		
	WVI	WVS	WVW
MPH	1247	1247	1247
SPH	9581	3981	3981
SQ ADS	5040	5040	5040
Geolocation ADS	500	500	500
Imagette Processing Parameters ADS	79180	79180	79180
Cross Spectra / Wave Spectra MDS	21220	21220	21220
Imagette MDSs (assume 400 MDSs)	119.2E+6		
TOTAL in MB	119.4	0.112	0.112

The next table show the maximum product sizes obtained assuming a maximum value of 400 imagettes per product.

Table 8.5.5.5-2 Wave Mode Maximum Product Sizes

	Wave		
	WVI	WVS	WVW
MPH	1247	1247	1247
SPH	115981	3981	3981
SQ ADS	100800	100800	100800
Geolocation ADS	10000	10000	10000
Imagette Processing Parameters ADS	1583600	1583600	1583600
Cross Spectra / Wave Spectra MDS	424400	424400	424400
Imagette MDSs (assume 400 MDSs)	2392E+6		
TOTAL in MB	2394.24	2.124	2.124

8.6 AUXILIARY DATA FILES

The following files are used by PF-ASAR to create the ASAR products.

8.6.1 External Characterization Data

The ASAR instrument has an External Characterization Mode which is operated overflying a receiver setup for H or V polarization located in the ground. During the mode, the ASAR transmits a sequence of pulses from each antenna row in turn. These pulses are received and digitized on the ground and the data recorded for off-line analysis. Simultaneously during the mode the calibration loop in the instrument is used to couple transmit pulses which are then sampled within a calibration window in order to provide comparative values. The External Characterization Data file is provided as the output of the external characterization analysis.

FILE_ID: ASA_XCH_AX

TYPE: Auxiliary

USE: Used for internal calibration processing correction

UPDATED: nominally every 6 months

SIZE: MPH(1247 bytes) + SPH (378 bytes) + GADS (596 bytes)

8.6.1.1 Format

The MPH and SPH of these files will follow the standard MPH, SPH structure of all Envisat-1 auxiliary data as described in Volume 16. There is one DSD in the SPH. The file will consist of a single GADS as shown below.

Table 8.6.1.1-1 Format of GADS for External Characterization File

Description	units	Byte length	Data Type
Time of characterization	MJD	12	mjd
DSR length **Length of this DSR in bytes**	bytes	4	ul
Complex Loop paths Characterization Factors relative to free space (from External Characterization data) **g_{np} where n is the index of the row (1 to 32) and p is the index of the polarization (H or V). Arranged H: 1 to 32, V: 1-32. Values are complex (I,Q) pairs.**		512	128*fl
Antenna pointing error ΔP1 (from External Characterization data) **This is used to calculate the elevation angle: elevation angle = reference elevation angle + ΔP1.**	deg.	4	fl
Spare		64	
TOTAL		596	

8.6.2 External Calibration Data

The external calibration scaling factor is determined by ESA using calibrated transponders, and the in-flight elevation pattern estimates are obtained using natural targets with known properties such as the rainforest.

FILE_ID: ASA_XCA_AX

TYPE: Auxiliary

USE: Used during image calibration

UPDATED: nominally every 6 months

SIZE: MPH(1247 bytes) + SPH (378 bytes) + GADS (26552 bytes)

8.6.2.1 Format

The MPH and SPH of these files will follow the standard MPH, SPH structure of all Envisat-1 auxiliary data as described in Volume 16. There is one DSD in the SPH. The file will consist of a single GADS as shown below.

Table 8.6.2.1-1 Format of GADS for External Calibration File

Description	units	Byte length	Data Type
Time of creation	MJD	12	mjd
DSR length Length of this DSR in bytes	bytes	4	ul
External Calibration scaling factors for IM mode, SLC image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, SLC image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Precision image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Precision image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Geocoded image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Geocoded image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Medium resolution image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for IM mode, Medium resolution image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, SLC image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, SLC image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, SLC image, HV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, SLC image, VH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Precision image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Precision image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Precision image, HV polar. (7 values from swath IS1 to IS7)	-	28	7*fl

Table 8.6.2.1-1 Format of GADS for External Calibration File

Description	units	Byte length	Data Type
External Calibration scaling factors for AP mode, Precision image, VH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Geocoded image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Geocoded image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Geocoded image, HV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Geocoded image, VH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Medium resolution image, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Medium resolution image, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Medium resolution image, HV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for AP mode, Medium resolution image, VH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for WV mode, HH polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for WV mode, VV polar. (7 values from swath IS1 to IS7)	-	28	7*fl
External Calibration scaling factors for WS mode, HH polar.	-	4	fl
External Calibration scaling factors for WS mode, VV polar.	-	4	fl
External Calibration scaling factors for GM mode, HH polar.	-	4	fl
External Calibration scaling factors for GM mode, VV polar.	-	4	fl
Reference elevation angle for IS1	deg.	4	fl
Reference elevation angle for IS2	deg.	4	fl
Reference elevation angle for IS3 / SS2	deg.	4	fl
Reference elevation angle for IS4 / SS3	deg.	4	fl
Reference elevation angle for IS5 / SS4	deg.	4	fl

Table 8.6.2.1-1 Format of GADS for External Calibration File

Description	units	Byte length	Data Type
Reference elevation angle for IS6 / SS5	deg.	4	fl
Reference elevation angle for IS7	deg.	4	fl
Reference elevation angle for SS1	deg.	4	fl
Two-way Antenna Elevation Pattern Gain Tables for IS1 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS2 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS3 / SS2 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS4 / SS3 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS5 / SS4 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS6 / SS5 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for IS7 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Two-way Antenna Elevation Pattern Gain Tables for SS1 (4 tables, 1 for each HH, VV, HV, VH polar.) (pattern is defined from reference elevation angle - 5 deg. to reference elevation angle + 5 deg. in 0.05 degree steps.)	dB	3216	804*fl
Spare	-	32	32*uc
TOTAL		26552	

8.6.3 Processor Configuration File

This file contains static processing parameters used by the PF-ASAR which includes the threshold values used for setting PCD flags. This file is available in the inventory so a user may check what the processing configuration and threshold values were for the product of interest.

FILE_ID: ASA_CON_AX

TYPE: Auxiliary

USE: Used during image formation

UPDATED: infrequently, only if static processing parameters change or PCD thresholds are updated.

SIZE: MPH(1247 bytes) + SPH (378 bytes) + GADS (4096 bytes)

8.6.3.1 Format

The MPH and SPH of these files will follow the standard MPH, SPH structure of all Envisat-1 auxiliary data as described in Volume 16. There is one DSD in the SPH. The file will consist of a single GADS as shown below.

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Thresholds			
Time of creation	MJD	12	mjd
DSR length Length of this DSR in bytes	bytes	4	ul
Threshold for setting the chirp quality flag - Maximum percentage broadening permitted in cross-correlation pulse width compared to theoretical width	%	4	fl
Threshold for setting the chirp quality flag - First sidelobe of the chirp cross correlation function	dB	4	fl
Threshold for setting the chirp quality flag - ISLR of the chirp cross correlation function	dB	4	fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Threshold for setting the mean of input data quality flag - For an expected mean value of x, this is the value T, such that the measured mean must fall between the x-T and x+T. Used for both I and Q channels.	-	4	fl
Threshold for setting the standard deviation of input data quality flag - For an expected std. dev. value of y, this is the value D, such that the measured std. dev. must fall between the y-D and y+D. Used for both I and Q channels.	-	4	fl
Threshold for setting the Doppler Centroid quality flag - Threshold for Doppler Centroid confidence	-	4	fl
Threshold for setting the Doppler Centroid ambiguity quality flag - Threshold for setting the Doppler Centroid ambiguity confidence flag	-	4	fl
Threshold for setting the mean of output data quality flag - For an expected mean value of x, this is the value T, such that the measured mean must fall between the x-T and x+T.	-	4	fl
Threshold for setting the standard deviation of output data quality flag - For an expected std. dev. value of y, this is the value D, such that the measured std. dev. must fall between the y-D and y+D.	-	4	fl
Threshold for setting the missing lines quality flag - maximum percentage of missing lines to total lines.	-	4	fl
Threshold for setting the missing gaps quality flag - maximum number of gaps allowed.	-	4	fl
Spare	-	64	64*uc
Processor parameters			
Number of missing lines which constitute a gap	lines	4	ul
Expected mean of I and Q samples for IM (and WV) SLC images	-	4	fl
Expected standard deviation of I and Q samples for IM (and WV) SLC images	-	4	fl
Expected mean of I and Q samples for AP SLC images	-	4	fl
Expected standard deviation of I and Q samples for AP SLC images	-	4	fl
Expected mean of IM PRI samples	-	4	fl
Expected standard deviation of IM PRI samples	-	4	fl
Expected mean of AP PRI samples	-	4	fl
Expected standard deviation of AP PRI samples	-	4	fl
Expected mean of IMM samples	-	4	fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Expected standard deviation of IMM samples	-	4	fl
Expected mean of APM samples	-	4	fl
Expected standard deviation of APM samples	-	4	fl
Expected mean of WSM samples	-	4	fl
Expected standard deviation of WSM samples	-	4	fl
Expected mean of GM1 samples	-	4	fl
Expected standard deviation of GM1 samples	-	4	fl
Expected I and Q input mean	-	4	fl
Expected I and Q input std dev.	-	4	fl
Wave Mode Processing Parameters			
Look image statistics confidence parameter thresholds (minimum and maximum) [d_{IS}^{min}, d_{IS}^{max}]	-	8	2*fl
Inter-look confidence statistics confidence parameter threshold [d_{IL}]	-	4	fl
Azimuth cut-off convergence measure threshold [$\Delta\lambda_c^{lim}$]	-	4	fl
Azimuth cut-off Iteration count overflow threshold [N_{iter}]	-	4	ul
Phase information confidence measure threshold for the spectral peak [d_{PI}]	-	4	fl
Phase information confidence measure threshold for the cross covariance peak offset [d_{CI}]	m	4	fl
Spare	-	64	64*uc
Receive Gain Droop Correction Parameters			
Apply Receive Gain Droop Correction? (1=yes, 0=no)	-	1	uc
Apply Receive Gain Droop Correction to Calibration Pulse P2? (1=yes, 0=no)	-	1	uc
Apply Receive Gain Droop Correction Nominal Delay to Calibration Pulse P2? (1=yes, 0=no)	-	1	uc
Spare	-	65	65*uc
Preprocessing parameters			
Reference chirp energy values for IM products Parameters are arranged in four lists (1 list each for HH, VV), each list containing 7 values for IS1 to IS7.	dB	56	14*fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Reference chirp energy values for AP products Parameters are arranged in four lists (1 list each for HH, VV, HV, VH), each list containing 7 values for IS1 to IS7.	dB	112	28*fl
Reference chirp energy values for WV products Parameters are arranged in four lists (1 list each for HH, VV), each list containing 7 values for IS1 to IS7.	dB	56	14*fl
Reference chirp energy values for WS products Parameters are arranged in four lists (1 list each for HH, VV), each list containing 5 values for SS1 to SS5.	dB	40	10*fl
Reference chirp energy values for GM products Parameters are arranged in four lists (1 list each for HH, VV), each list containing 5 values for SS1 to SS5.	dB	40	10*fl
Replica Energy Threshold for chirp energy comparison for IM	dB	4	fl
Replica Energy Threshold for chirp energy comparison for AP	dB	4	fl
Replica Energy Threshold for chirp energy comparison for WV	dB	4	fl
Replica Energy Threshold for chirp energy comparison for WS	dB	4	fl
Replica Energy Threshold for chirp energy comparison for GM	dB	4	fl
Normalisation for IM		8	
Perform Normalisation Flag (1=yes,0=no)	-	1	uc
Normalisation Type (only used if Normalisation flag is set to 1): REPLICA or REFØØØØ or EQVØØØØ	ascii	7	7*uc
Normalisation for AP		8	
Perform Normalisation Flag (1=yes,0=no)	-	1	uc
Normalisation Type (only used if Normalisation flag is set to 1): REPLICA or REFØØØØ or EQVØØØØ	ascii	7	7*uc
Normalisation for WV		8	
Perform Normalisation Flag (1=yes,0=no)	-	1	uc
Normalisation Type (only used if Normalisation flag is set to 1): REPLICA or REFØØØØ or EQVØØØØ	ascii	7	7*uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Normalisation for WS		8	
Perform Normalisation Flag (1=yes,0=no)	-	1	uc
Normalisation Type (only used if Normalisation flag is set to 1): REPLICA or REFØØØØ or EQVØØØØ	ascii	7	7*uc
Normalisation for GM		8	
Perform Normalisation Flag (1=yes,0=no)	-	1	uc
Normalisation Type (only used if Normalisation flag is set to 1): REPLICA or REFØØØØ or EQVØØØØ	ascii	7	7*uc
Replica reconstruction cutoff threshold for IM Cutoff threshold (0.0 for no cutoff)	-	4	fl
Replica reconstruction cutoff threshold for AP Cutoff threshold (0.0 for no cutoff)	-	4	fl
Replica reconstruction cutoff threshold for WV Cutoff threshold (0.0 for no cutoff)	-	4	fl
Replica reconstruction cutoff threshold for WS Cutoff threshold (0.0 for no cutoff)	-	4	fl
Replica reconstruction cutoff threshold for GM Cutoff threshold (0.0 for no cutoff)	-	4	fl
Calibration Pulse Amplitude Threshold for IM	dB	4	fl
Calibration Pulse Amplitude Threshold for AP	dB	4	fl
Calibration Pulse Amplitude Threshold for WV	dB	4	fl
Calibration Pulse Amplitude Threshold for WS	dB	4	fl
Calibration Pulse Amplitude Threshold for GM	dB	4	fl
Spare	-	256	256*uc
Range Doppler/Specan Parameters			
Processing gain values for IMP products (7 values from swath IS1 to IS7)	linear	28	7*fl
Processing gain values for IMS products (7 values from swath IS1 to IS7)	linear	28	7*fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Processing gain values for IMG products (7 values from swath IS1 to IS7)	linear	28	7*fl
Processing gain values for IMM products (7 values from swath IS1 to IS7)	dB	28	7*fl
Processing gain values for APP products (7 values from swath IS1 to IS7)	dB	28	7*fl
Processing gain values for APS products (7 values from swath IS1 to IS7)	linear	28	7*fl
Processing gain values for APG products (7 values from swath IS1 to IS7)	dB	28	7*fl
Processing gain values for APM products (7 values from swath IS1 to IS7)	dB	28	7*fl
Processing gain values for WV products (7 values from swath IS1 to IS7)	linear	28	7*fl
Processing gain values for WSS products	linear	20	5*fl
Processing gain values for WSM products (5 values from swath SS1 to SS5)	dB	20	5*fl
Processing gain values for GM1 products (5 values from swath SS1 to SS5)	dB	20	5*fl
Range Look Bandwidth values for IMP products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for IMS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for IMG products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for IMM products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for APP products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for APS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for APG products (7 values from swath IS1 to IS7)	Hz	28	7*fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Range Look Bandwidth values for APM products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Range Look Bandwidth values for WSS products (5 values from swath SS1 to SS5)	Hz	20	5*fl
Range Look Bandwidth values for WSM products (5 values from swath SS1to SS5)	Hz	20	5*fl
Range Look Bandwidth values for GM1 products (5 values from swath SS1 to SS5)	Hz	20	5*fl
Total Range Bandwidth values for IMP products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for IMS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for IMG products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for IMM products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for APP products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for APS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for APG products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for APM products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for WV products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Range Bandwidth values for WSS products (5 values from swath SS1 to SS5)	Hz	20	5*fl
Total Range Bandwidth values for WSM products (5 values from swath SS1to SS5)	Hz	20	5*fl
Total Range Bandwidth values for GM1 products (5 values from swath SS1 to SS5)	Hz	20	5*fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Number of Range Looks for IMP products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for IMS products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for IMG products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for IMM products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for APP products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for APS products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for APG products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for APM products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Range Looks for WSS products (5 values from swath SS1 to SS5)	looks	20	5*ul
Number of Range Looks for WSM products (5 values from swath SS1 to SS5)	looks	20	5*ul
Number of Range Looks for GM1 products (5 values from swath SS1 to SS5)	looks	20	5*ul
Azimuth Look Bandwidth values for IMP products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Azimuth Look Bandwidth values for IMS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Azimuth Look Bandwidth values for IMG products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Azimuth Look Bandwidth values for APS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Azimuth Bandwidth values for IMP products (7 values from swath IS1 to IS7)	Hz	28	7*fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Total Azimuth Bandwidth values for IMS products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Azimuth Bandwidth values for IMG products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Azimuth Bandwidth values for APS products (For APS products, this value corresponds to the AP burst bandwidth) (7 values from swath IS1 to IS7)	Hz	28	7*fl
Total Azimuth Bandwidth values for WV products (7 values from swath IS1 to IS7)	Hz	28	7*fl
Number of Azimuth Looks for IMP products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for IMS products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for IMG products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for IMM products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for APP products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for APS products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for APG products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for APM products (7 values from swath IS1 to IS7)	looks	28	7*ul
Number of Azimuth Looks for WSS products	looks	4	ul
Number of Azimuth Looks for WSM products	looks	4	ul
Number of Azimuth Looks for GM1 products	looks	4	ul
Descalloping flag for IMM products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Descalloping flag for APP products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc
Descalloping flag for APG products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc
Descalloping flag for APM products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc
Spare	-	1	uc
Descalloping flag for WSM products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc
Descalloping flag for GM1 products 1 = descalloping correction applied 0 = descalloping correction NOT applied	-	1	uc
Constant SNR filter flag for IMM products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc
Constant SNR filter flag for APP products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc
Constant SNR filter flag for APG products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc
Constant SNR filter flag for APM products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc
Spare	-	1	uc
Constant SNR filter flag for WSM products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc
Constant SNR filter flag for GM1 products 1 = use constant SNR descalloping 0 = use constant ENL	-	1	uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Azimuth Window Type and coefficients for IMP products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for IMS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for IMG products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for IMM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for APP products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for APS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for APG products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Azimuth Window Type and coefficients for APM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for WV products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for WSS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for WSM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Azimuth Window Type and coefficients for GM1 products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for IMP products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for IMS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Range Window Type and coefficients for IMG products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for IMM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for APP products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for APS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for APG products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for APM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for WV products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Range Window Type and coefficients for WSS products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for WSM products		11	
Window Type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Range Window Type and coefficients for GM1 products		11	
type: HAMMING or KAISERØ or NONEØØØ	ascii	7	7*uc
Window Coefficient	-	4	fl
Threshold for terrain height standard deviation for IMP products	m	4	fl
Threshold for terrain height standard deviation for IMS products	m	4	fl
Threshold for terrain height standard deviation for IMG products	m	4	fl
Threshold for terrain height standard deviation for IMM products	m	4	fl
Threshold for terrain height standard deviation for APP products	m	4	fl
Threshold for terrain height standard deviation for APS products	m	4	fl
Threshold for terrain height standard deviation for APG products	m	4	fl
Threshold for terrain height standard deviation for APM products	m	4	fl
Threshold for terrain height standard deviation for WSS products	m	4	fl
Threshold for terrain height standard deviation for WSM products	m	4	fl
Threshold for terrain height standard deviation for GM1 products	m	4	fl
Noise subtraction flag for APP products (1=yes,0=no)	-	1	uc
Noise subtraction flag for APM products (1=yes,0=no)	-	1	uc
Noise subtraction flag for APG products (1=yes,0=no)	-	1	uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Noise subtraction flag for WSM products (1=yes,0=no)	-	1	uc
Azimuth noise processing factor for APP products (7 values from swath IS1 to IS7)	-	28	7*fl
Azimuth noise processing factor for APM products (7 values from swath IS1 to IS7)	-	28	7*fl
Azimuth noise processing factor for APG products (7 values from swath IS1 to IS7)	-	28	7*fl
Azimuth noise processing factor for WSM products (MDS1) (5 values from swath SS1 to SS5)	-	20	5*fl
Spare	-	872	872*uc
Doppler Parameters			
Doppler Centroid Estimation flag for IMP products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for IMS products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for IMG products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for IMM products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for APP products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for APS products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for APG products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for APM products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for WV products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for WSS products (1=yes,0=no)	-	1	uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Doppler Centroid Estimation flag for WSM products (1=yes,0=no)	-	1	uc
Doppler Centroid Estimation flag for GM1 products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for IMP products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for IMS products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for IMG products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for IMM products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for APP products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for APS products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for APG products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for APM products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for WV products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for WSS products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for WSM products (1=yes,0=no)	-	1	uc
Perform Doppler Ambiguity Estimation flag for GM1 products (1=yes,0=no)	-	1	uc
Doppler Refinement flag for APP products (1=yes,0=no)	-	1	uc
Doppler Refinement flag for APS products (1=yes,0=no)	-	1	uc

Table 8.6.3.1-1 Format of GADS for Processor Configuration File

Description	units	Byte length	Data Type
Doppler Refinement flag for APG products (1=yes,0=no)	-	1	uc
Doppler Refinement flag for APM products (1=yes,0=no)	-	1	uc
Doppler Refinement flag for WSS products (1=yes,0=no)	-	1	uc
Doppler Refinement flag for WSM products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for IMP products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for IMS products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for IMM products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for APP products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for APS products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for APM products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for WSS products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for WSM products (1=yes,0=no)	-	1	uc
Perform Doppler Grid Estimation flag for GM1 products (1=yes,0=no)	-	1	uc
Spare	-	55	55*uc
TOTAL		4096	

8.6.4 Instrument Characterization File

This file contains key parameters which characterize the instrument. This includes look up tables and other parameters needed in the ground processing. It contains a subset of the data found in the Instrument Characterization database.

FILE_ID: ASA_INS_AX

TYPE: Auxiliary

USE: Used during image formation

UPDATED: infrequently, only if instrument operating parameters change

SIZE: MPH(1247 bytes) + SPH (378 bytes) + GADS (171648 bytes)

8.6.4.1 Format

The MPH and SPH of these files will follow the standard MPH, SPH structure of all Envisat-1 auxiliary data as described in Volume 16. There is one DSD in the SPH. The file will consist of a single GADS as shown below.

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Fixed lifetime parameters			
Time of creation	MJD	12	mjd
DSR length Length of this DSR in bytes	bytes	4	ul
Radar Frequency	Hz	4	fl
Radar Sampling Rate	Hz	4	fl
Offset frequency for wave mode calibration pulses	Hz	4	fl
Nominal values of amplitude and phase of calibration pulse 1 for Image Mode IS0. Parameters below form a structure which is repeated first for transmit polarization H, then for transmit polarization V:		512	
Nominal amplitude ($a^0_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal value of phase ($\phi^0_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1A for Image Mode IS0. Parameters below form a structure which is repeated first for transmit polarization H, then for transmit polarization V:		512	
Nominal amplitude ($a^0_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi^0_{1A,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 2 for Image Mode IS0. Parameters below form a structure which is repeated first for receive polarization H, then for receive polarization V:		512	
Nominal amplitude ($a^0_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi^0_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 3 for Image Mode IS0. Parameters below form a structure which is repeated first for H polarization, then for V polarization:		512	
Nominal amplitude ($a^0_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi^0_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1 for Image Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H, then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1A for Image Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H, then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1A,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal values of amplitude and phase of calibration pulse 2 for Image Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for receive polarization H, then for receive polarization V (14 times total):		3584	
Nominal amplitude ($a_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 3 for Image Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for H polarization, then for V polarization (14 times total):		3584	
Nominal amplitude ($a_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1 for AP Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1A for AP Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1A,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 2 for AP Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for receive polarization H then for receive polarization V (14 times total):		3584	
Nominal amplitude ($a_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal values of amplitude and phase of calibration pulse 3 for AP Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for H polarization, then for V polarization (14 times total):		3584	
Nominal amplitude ($a_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1 for WV Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H, then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1A for WV Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for transmit polarization H, then for transmit polarization V (14 times total):		3584	
Nominal amplitude ($a_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1An,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 2 for WV Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for receive polarization H, then for receive polarization V (14 times total):		3584	
Nominal amplitude ($a_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 3 for WV Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7, first for H polarization, then for V polarization (14 times total):		3584	
Nominal amplitude ($a_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal values of amplitude and phase of calibration pulse 1 for WS Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for transmit polarization H, then for transmit polarization V (10 times total):		2560	
Nominal amplitude ($a_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1A for WS Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for transmit polarization H, then for transmit polarization V (10 times total):		2560	
Nominal amplitude ($a_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1A,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 2 for WS Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for receive polarization H, then for receive polarization V (10 times total):		2560	
Nominal amplitude ($a_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 3 for WS Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for H polarization, then for V polarization (10 times total):		2560	
Nominal amplitude ($a_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 1 for GM Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for transmit polarization H, then for transmit polarization V (10 times total):		2560	
Nominal amplitude ($a_{1,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal values of amplitude and phase of calibration pulse 1A for GM Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for transmit polarization H, then for transmit polarization V (10 times total):		2560	
Nominal amplitude ($a_{1A,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{1A,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 2 for GM Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for receive polarization H, then for receive polarization V (10 times total):		2560	
Nominal amplitude ($a_{2,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{2,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of calibration pulse 3 for GM Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5, first for H polarization, then for V polarization (10 times total):		2560	
Nominal amplitude ($a_{3,n,nom}$) for antenna row 1 to antenna row 32	LSB	1	32*fl
Nominal value of phase ($\phi_{3,n,nom}$) for antenna row 1 to antenna row 32	degrees	1	32*fl
Nominal values of amplitude and phase of the transmitted chirp for Image Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7:		252	
4 pulse amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}		4*fl
4 pulse phase coefficients	cycles Hz, Hz/s, Hz/s^2		4*fl
Nominal pulse duration	s		fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal values of amplitude and phase of the transmitted chirp for AP Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7:		252	
4 pulse amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}		4*fl
4 pulse phase coefficients	cycles Hz, Hz/s, Hz/s^2		4*fl
Nominal pulse duration	s		fl
Nominal values of amplitude and phase of the transmitted chirp for WV Mode. Parameters below form a structure which is repeated for each swath (7 times), from swath IS1 to IS7:		252	
4 pulse amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}		4*fl
4 pulse phase coefficients	cycles Hz, Hz/s, Hz/s^2		4*fl
Nominal pulse duration	s		fl
Nominal values of amplitude and phase of the transmitted chirp for WS Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5:		180	
4 pulse amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}		4*fl
4 pulse phase coefficients	cycles Hz, Hz/s, Hz/s^2		4*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Nominal pulse duration	s		fl
Nominal values of amplitude and phase of the transmitted chirp for GM Mode. Parameters below form a structure which is repeated for each sub-swath (5 times), from swath SS1 to SS5:		180	
4 pulse amplitude coefficients	-, s^{-1}, s^{-2}, s^{-3}		4*fl
4 pulse phase coefficients	cycles Hz, Hz/s, Hz/s^2		4*fl
Nominal pulse duration	s		fl
2 way antenna azimuth pattern for swath IS1 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS2 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS3 / SS2 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS4 / SS3 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS5 / SS4 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS6 / SS5 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
2 way antenna azimuth pattern for swath IS7 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
2 way antenna azimuth pattern for swath SS1 (pattern values are from beam center - 0.25 deg to beam center + 0.25 deg. in 0.005 degree steps.)	dB	404	101*fl
Range Gate bias	s	4	fl
Range Gate bias for reduced bandwidth filter (GM Mode only)	s	4	fl
Look Up Table for ADC Characterization (I Channel) Contains 255 normalized amplitude levels corresponding to voltage thresholds. First value in LUT is for -128, last value is for +127. Format as is given in PO-TN-MMS-SR-0248.	-	1020	255*fl
Look Up Table for ADC Characterization (Q Channel) Contains 255 normalized amplitude levels corresponding to voltage thresholds. First value in LUT is for -128, last value is for +127. Format as is given in PO-TN-MMS-SR-0248.	-	1020	255*fl
Spare	-	648	648 *uc
Fixed baseline parameters			
Reconstruction Look Up Table for Full 8-bit Quantization (I Channel) Contains normalized amplitude levels corresponding to sample codewords. First value in LUT is for codeword 0, last value is for +255 (binary offset format). Format as is given in PO-TN-MMS-SR-0248. Table values account for ADC correction.	-	1024	256*fl
Reconstruction Look Up Table for Full 8-bit Quantization (Q Channel) Contains normalized amplitude levels corresponding to sample codewords. First value in LUT is for codeword 0, last value is for +255 (binary- offset format). Format as is given in PO-TN-MMS-SR-0248. Table values account for ADC correction.	-	1024	256*fl
Reconstruction Look Up Table for FBAQ 4-bit Quantization (I Channel) Gives 4096 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	16384	4096*fl
Reconstruction Look Up Table for FBAQ 3-bit Quantization (I Channel) Gives 2048 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	8192	2048*fl
Reconstruction Look Up Table for FBAQ 2-bit Quantization (I Channel) Gives 1024 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	4096	1024*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Reconstruction Look Up Table for FBAQ 4-bit Quantization (Q Channel) Gives 4096 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	16384	4096*fl
Reconstruction Look Up Table for FBAQ 3-bit Quantization (Q Channel) Gives 2048 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	8192	2048*fl
Reconstruction Look Up Table for FBAQ 2-bit Quantization (Q Channel) Gives 1024 normalized amplitude reconstruction levels which include ADC correction. Format as is given in PO-TN-MMS-SR-0248.	-	4096	1024*fl
Reconstruction Look Up Table for FBAQ 4-bit Quantization (no ADC) This is the FBAQ reconstruction LUT which does not have ADC correction incorporated into it. It gives 4096 reconstruction levels which decodes FBAQ codewords to floating point values on the 8-bit range (-128 to +127). This table is used for RMS Equalization. The format of this table is identical to that of the FBAQ 4-bit Reconstruction LUT for the I channel, as given in PO-TN-MMS-SR-0248.	values from -128 to +127	16384	4096*fl
Reconstruction Look Up Table for FBAQ 3-bit Quantization (no ADC) This is the FBAQ reconstruction LUT which does not have ADC correction incorporated into it. It gives 2048 reconstruction levels which decodes FBAQ codewords to floating point values on the 8-bit range (-128 to +127). This table is used for RMS Equalization. The format of this table is identical to that of the FBAQ 3-bit Reconstruction LUT for the I channel, as given in PO-TN-MMS-SR-0248	values from -128 to +127	8192	2048*fl
Reconstruction Look Up Table for FBAQ 2-bit Quantization (No ADC) This is the FBAQ reconstruction LUT which does not have ADC correction incorporated into it. It gives 1024 reconstruction levels which decodes FBAQ codewords to floating point values on the 8-bit range (-128 to +127). This table is used for RMS Equalization. The format of this table is identical to that of the FBAQ 2-bit Reconstruction LUT for the I channel, as given in PO-TN-MMS-SR-0248.	values from -128 to +127	4096	1024*fl
Reconstruction Look Up Table for Sign + Magnitude Quantization (I Channel) Contains normalized amplitude reconstruction levels corresponding to sample codewords. First value in LUT is for threshold -8, last value is for threshold +7. Format as is given in PO-TN-MMS-SR-0248.	-	64	16*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Reconstruction Look Up Table for Sign + Magnitude Quantization (Q Channel) Contains normalized amplitude reconstruction levels corresponding to sample codewords. First value in LUT is for threshold -8, last value is for threshold +7. Format as is given in PO-TN-MMS-SR-0248.	-	64	16*fl
Default data processing configuration table (the 12 parameters below form a structure which is repeated 5 times, once for Image Mode, once for Alternating Polarization Mode, once for Wide Swath Mode, once for Global Monitoring Mode, and once for Wave Mode):		160	
Compression Method used for echo samples **FBAQ, S+MØ, NONE**	ascii		4*uc
Compression Ratio for echo samples **8/4, 8/3, 8/2, 8/8**	ascii		3*uc
Resampling applied to echo samples? (1=yes, 0=no)	-		uc
Compression Method used for initial calibration samples **FBAQ, S+MØ, NONE**	ascii		4*uc
Compression Ratio for initial calibration samples **8/4, 8/3, 8/2, 8/8**	ascii		3*uc
Resampling applied to initial calibration samples? (1=yes, 0=no)	-		uc
Compression Method used for periodic calibration samples **FBAQ, S+MØ, NONE**	ascii		4*uc
Compression Ratio for periodic calibration samples **8/4, 8/3, 8/2, 8/8**	ascii		3*uc
Resampling applied to periodic calibration samples? (1=yes, 0=no)	-		uc
Compression Method used for noise samples **FBAQ, S+MØ, NONE**	ascii		4*uc
Compression Ratio for noise samples **8/4, 8/3, 8/2, 8/8**	ascii		3*uc
Resampling applied to noise samples? (1=yes, 0=no)	-		uc
Default Swath configuration table (the 5parameters below form a structure which is repeated 5 times, once for Image Mode, once for Alternating Polarization Mode, once for Wide Swath Mode, once for Global Monitoring Mode, and once for Wave Mode). Note entries for IS6 and IS7 not included for WS and GM:		420	

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Number of sample windows per source packet for echo samples (from beam 1 (IS1 or SS1) to beam 7 (IS7))	-		7*us
Number of sample windows per source packet for initial calibration samples (from beam 1 to beam 7)	-		7*us
Number of sample windows per source packet for periodic calibration samples (from beam 1 to beam 7)	-		7*us
Number of sample windows per source packet for noise samples (from beam 1 to beam 7)	-		7*us
Resampling factor (beam 1 to beam 7)	-		7*fl
Number of periodic calibration sample windows per source packet for External Characterization mode	-	2	us
Number of periodic calibration sample windows per source packet for Module Stepping mode	-	2	us
Default Swath Identification Table (the 2 parameters below form a structure which is repeated 5 times, once for Image Mode, once for Alternating Polarization Mode, once for Wide Swath Mode, once for Global Monitoring Mode, and once for Wave Mode). Note entries for IS6 and IS7 not included for WS and GM: **The default swaths corresponding to the Antenna Beam Set Parameter -- may be changed by macro-command during mission**		140	
Swath numbers (IS1 to IS7 or SS1 to SS5)	-		7*us
Antenna Beam Set numbers (IS1 to IS7 or SS1 to SS5)	-		7*us
Beam Set number for Wave Mode initial calibration	-	2	us
Beam Set number for External Characterization Mode	-	2	us
Beam Set number for Module Stepping Mode	-	2	us
Calibration Row Sequence Table (32 numbers give the Row number sequence used during initial and periodic calibration)	-	64	32*us
Mode timelines: the following 4 parameters form a structure which is repeated 5 times for Image, AP, WS, GM, and WV modes. Note entries for IS6 and IS7 not included for WS and GM: **M** is the number of echo sampling PTIs in a cycle or subcycle **R** is the rank (i.e., the number of PRI between transmitted pulse and return echo) **G** is the inter swath gap		280	
Swath numbers (IS1 to IS7 or SS1 to SS5)	-		7*us

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
M values (IS1 to IS7 or SS1 to SS5)	-		7*us
R values (IS1 to IS7 or SS1 to SS5)	-		7*us
G values (IS1 to IS7 or SS1 to SS5)	-		7*us
M value (see field above) for External Characterization	-	2	us
Spare	-	44	44*uc
Reference orbit parameters			
Reference elevation angles:		32	
Reference elevation angle for IS1	deg.		fl
Reference elevation angle for IS2	deg.		fl
Reference elevation angle for IS3 / SS2	deg.		fl
Reference elevation angle for IS4 / SS3	deg.		fl
Reference elevation angle for IS5 / SS4	deg.		fl
Reference elevation angle for IS6 / SS5	deg.		fl
Reference elevation angle for IS7	deg.		fl
Reference elevation angle for SS1	deg.		fl
Spare	-		64*uc
Additional parameters			
Ground Characterized Complex Amplitude f_{np} at the Swath Reference Elevation Angle for IS1 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS2 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS3/SS2 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS4/SS3 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS5/SS4 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS6/SS5 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for IS7 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Ground Characterized Complex Amplitude fnp at the Swath Reference Elevation Angle for SS1 (complex factor characterizing the path through the calibration loop and from the calibration coupler to the antenna face) 32 complex values for H polarization, followed by 32 complex values for V polarization	-	512	128*fl
Spare		5120	5120 * uc
Receive Gain Droop parameters			
Receive Gain Droop Compensation Curve for IM mode		68	
Operating temperature for IM mode	deg C	4	fl
Coefficients of receiver gain droop curve for IM mode	-	64	8*do

Table 8.6.4.1-1 Format of GADS for Instrument Characterization File

Description	units	Byte length	Data Type
Receive Gain Droop Compensation Curve for AP mode		68	
Operating temperature for AP mode	deg C	4	fl
Coefficients of receiver gain droop curve for AP mode	-	64	8*do
Receive Gain Droop Compensation Curve for WS mode		68	
Operating temperature for WS mode	deg C	4	fl
Coefficients of receiver gain droop curve for WS mode	-	64	8*do
Receive Gain Droop Compensation Curve for GM mode		68	
Operating temperature for GM mode	deg C	4	fl
Coefficients of receiver gain droop curve for GM mode	-	64	8*do
Receive Gain Droop Compensation Curve for WV mode		68	
Operating temperature for WV mode	deg C	4	fl
Coefficients of receiver gain droop curve for WV mode	-	64	8*do
Fixed SWST Offset for Calibration Pulse P2 Order Zero The fixed time delay of the calibration pulse order 0 from the start of the receive window.	-	4	fl
Spare		72	72*uc
TOTAL		171648	

8.6.5 Orbit State Vectors File

Vectors may be from the FOS or from the DORIS instrument. FOS vectors are described in Volume 16, Section 16.3.1. DORIS products are discussed in Volume 9.

8.7 ASAR PRODUCT SUMMARY SHEETS

The information presented on the following pages is a record of the data stored in the Data Dictionary Tool (DDT) Product Summary Sheets. The DDT contains data formats and descriptions for all products produced by the ENVISAT PDS.

ASAR Level 0 External Characterization

PRODUCT ID	ASA_EC__0P
PRODUCT NAME	ASAR Level 0 External Characterization
DESCRIPTION	The External Characterization Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in External Characterization Mode. This is a calibration mode, which provides absolute calibration measurements during the overflight of a ground receiver.
APPLICATIONS	This product is intended for instrument calibration only. No further PDS products are produced from this product. The results of analysis of this product are used during calibration of image products.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Calibration initiated only over designated receiving stations. Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS.
THROUGHPUT	Preformed nominally once every 6 months; satellite data generation at 100 Mbps.
PRODUCT SIZE	This is a high rate mode, so theoretically the product size could be as high as 22500 MB (30 min.). However, one calibration sequence lasts 0.5 s = 6.25 MB and generates 1376 source packets. Data is in full 8-bits/sample format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Level 0 Module Stepping Mode

PRODUCT ID	ASA_MS__0P
PRODUCT NAME	ASAR Level 0 Module Stepping Mode
DESCRIPTION	The Module Stepping Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in Module Stepping Mode. This mode provides an internal health checking facility on an individual module basis.
APPLICATIONS	The purpose of the mode is to identify malfunctioning modules which may need to be switched off, and to identify modules to which calibration offsets are to be applied.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the LRAC after 2 weeks
COVERAGE	N/A;
THROUGHPUT	1 product per acquisition; satellite data generation at 0.9 Mbps.
PRODUCT SIZE	Theoretical maximum of 100 ' x 0.9 Mbps = 675 MB / orbit. However, MS mode will run for less than 1 orbit. Typical size: 8.9 sec x 0.9 Mbps = 1 MB. Data is in full 8-bits/sample format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Image Mode Level 0

PRODUCT ID	ASA_IM__0P
PRODUCT NAME	ASAR Image Mode Level 0
DESCRIPTION	The Image Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in Image Mode. This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven possible image swaths.
APPLICATIONS	This product is archived and is the basis of further image mode processing.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS
THROUGHPUT	1 product per acquisition (see coverage above); satellite downlink at 100 Mbps.
PRODUCT SIZE	max. size is 22500 MB (30' of data). Data must be split across several files, each with their own MPH and SPH and a maximum size of 2 GB. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Image Mode Single Look Complex

PRODUCT ID	ASA_IMS_1P
PRODUCT NAME	ASAR Image Mode Single Look Complex
DESCRIPTION	This is a single look, complex, phase preserved, slant range image generated from the Level 0 Image Mode product using the Range/Doppler algorithm. It may be in either HH or VV polarization. A minimum number of corrections and interpolations are performed on the data.
APPLICATIONS	It is primarily intended for use in SAR quality assessment and calibration or applications requiring complex SAR images such as interferometry.
DELIVERY TIME	Product available from PACs starting 1 week after data take.
COVERAGE	Each minimum size scene is 100 km along track, 56 -100 km across track depending on swath. Location along swath specified by user.
THROUGHPUT	product generated on request
PRODUCT SIZE	Up to 741 MB (27000 MDSRs * (6850 samples/MDSR at 4 bytes per sample (2 bytes I, 2 bytes Q) + 17 bytes header)). Includes all headers and aux. data. size is for largest MDSR size.
GEOMETRIC SAMPLING	natural spacing in both slant range and azimuth. Azimuthpixel spacing depends on Earth-satellite relative velocity and actual PRF. slant range pixel spacing is given by ASAR sampling frequency.
GEOMETRIC RESOLUTION	approximately 9 m in slant range by 6 m in azimuth (slant range resolution depends on programmed chirp bandwidth)
GEOMETRIC ACCURACY	Absolute location accuracy = 10m + orbit data error
RADIOMETRIC RESOLUTION	1 look in azimuth, 1 look in slant range; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Geolocation Grid ADS, PQS ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; noise power estimation; image formation (Range/Doppler); geolocation.
NOTES	Produced from Image Mode Level 0. Products can be formed from either VV or HH polarized data but not both. The product covers a continuous area along the imaging swath.

ASAR Image Mode Precision Image

PRODUCT ID	ASA_IMP_1P
PRODUCT NAME	ASAR Image Mode Precision Image
DESCRIPTION	This is a multi-look, ground range, digital image generated from the Level 0 Image Mode Product using the Range/Doppler algorithm. May be in either HH or VV polarization. The processing uses up to date (at time of processing) auxiliary parameters and corrects for antenna elevation gain, and range spreading loss.
APPLICATIONS	It is for users wishing to perform applications-oriented analysis. It is intended for multi-temporal imaging and to derive radar cross sections.
DELIVERY TIME	NRT product available from PDHS or NS-Es from 3 hours after data take. OFL product available from PACs starting 3 days after data take.
COVERAGE	Each minimum size scene is 100 km along track, 56 -100 km across track depending on swath. Location along swath specified by user.
THROUGHPUT	generated on request
PRODUCT SIZE	Max. 134 MB (8000 MDSRs * (8350 samples * 2bytes/sample + 17 bytes header)). Total includes all aux. data and headers. Size is for IS1 and IS2, other swaths are smaller.
GEOMETRIC SAMPLING	pixel spacing 12.5 m by 12.5 m
GEOMETRIC RESOLUTION	approximately 30 m in ground range by 30 m in azimuth
GEOMETRIC ACCURACY	absolute location accuracy = 25 m + orbit data error
RADIOMETRIC RESOLUTION	Product ENL > 3; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, SR/GR ADS, Geolocation Grid ADS, PQS ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (Range/Doppler); geolocation.
NOTES	Product is generated from Level 0 Image Mode product. Products can be formed from either VV or HH polarized data but not both. The product covers a continuous area along the imaging swath.

ASAR Image Mode Ellipsoid Geocoded Image

PRODUCT ID	ASA_IMG_1P
PRODUCT NAME	ASAR Image Mode Ellipsoid Geocoded Image
DESCRIPTION	The Image Mode Geocoded SAR image is generated from the Level 0 Image Mode product using the Range/Doppler algorithm with the best available instrument corrections, and is geolocated and resampled on to a map projection with an orientation of north up.
APPLICATIONS	For users in the scientific or commercial community who require SAR imagery referenced to standard geographic or cartographic locations.
DELIVERY TIME	Product available from PACs starting 1 week after data take.
COVERAGE	images cover 100 km by 56 -100 km on reference map projection and use 12.5 m by 12.5 m pixels spacing --coverage will vary depending on swath Along track location specified by user.
THROUGHPUT	product generated by request
PRODUCT SIZE	max scene size: 282 MB (up to 11850 MDSRs *(11850 samples at 2 bytes/sample + 17 bytes header)). Total includes all auxiliary data and headers. Size is for swaths IS1 and IS2, other swaths have lower sizes.
GEOMETRIC SAMPLING	pixel spacing 12.5 m by 12.5 m
GEOMETRIC RESOLUTION	approximately 30 m in ground range by 30 m in azimuth
GEOMETRIC ACCURACY	absolute location accuracy: 25 m + orbit data error
RADIOMETRIC RESOLUTION	ENL > 3 looks; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, Geolocation Grid ADS, PQS ADS, Map Projection ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (Range/Doppler); geolocation; map projection resampling.
NOTES	Product is generated from IM Level 0 product. Products can be formed from either VV or HH polarized data but not both. The product covers a continuous area along the imaging swath.

ASAR Image Mode Medium Resolution Image

PRODUCT ID	ASA_IMM_1P
PRODUCT NAME	ASAR Image Mode Medium Resolution Image
DESCRIPTION	ASAR product generated from raw data collected when the instrument is in image mode. This product has lower spatial resolution and higher radiometric resolution than do the precision images and higher spatial resolution than the browse images.
APPLICATIONS	It is intended for users wishing to perform applications-oriented analysis on large scale phenomena such as ice monitoring. It is also intended for multi-temporal imaging.
DELIVERY TIME	NRT product available from PDHS or NS-Es from 3 hours after data take. OFL product available from PACs starting 3 days after data take.
COVERAGE	Max.stripline product coverage is 4000 km along track, 56 -100 km across track depending on swath. Minimum extracted scene size is 100 km along track.
THROUGHPUT	1 stripline product per segment acquired (maximum 10')
PRODUCT SIZE	Stripline Max. 151 MB (53334 MDSRs * (1400 samples* 2 bytes/sample + 17 bytes header)). Includes all aux. data. 1 Extracted scene max: 3.96 MB (1400 MDSRs). Sizes are for IS1 and IS2, other swaths are less.
GEOMETRIC SAMPLING	pixel spacing 75 m by 75 m
GEOMETRIC RESOLUTION	approximately 150 in ground range by 150 m in azimuth
GEOMETRIC ACCURACY	Absolute location accuracy: 150 m + orbit data error
RADIOMETRIC RESOLUTION	ENL > 30 looks; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, Geolocation Grid ADS, PQS ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation.
NOTES	Product systematically created in stripline from Level 0 IM product. Products can be formed from either VV or HH polarized data but not both. The product covers a continuous area along the imaging swath. User requests extraction of child product based upon the minimum scene size.

ASAR Image Mode Browse Image

PRODUCT ID	ASA_IM__BP
PRODUCT NAME	ASAR Image Mode Browse Image
DESCRIPTION	This low resolution product will be produced systematically together with the Medium Resolution Product. The image is intended for browse purposes only.
APPLICATIONS	To aid in user selection of data
DELIVERY TIME	Available in NRT within 3 hours of data acquisition.
COVERAGE	Max. stripline product coverage is 4000 km along track, 56 -100 km across track depending on swath.
THROUGHPUT	1 product generated per acquired segment (maximum 10')
PRODUCT SIZE	Stripline Max: 3 MB (8889 MDSRs * (240 samples * 1 byte/sample + 17 bytes header)). Total includes all aux. data. Size is for IS1 and IS2, other swaths are less.
GEOMETRIC SAMPLING	450 m by 450 m
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	ENL > 15
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit state vectors; Time correlation parameters; PQS ADS; Geolocation Grid ADS.
ALGORITHMS USED	subsampling of medium resolution image product
NOTES	Produced systematically from the Medium resolution image produced for this mode.

ASAR Alternating Polarization Level 0 (Copolar)

PRODUCT ID	ASA_APC_0P
PRODUCT NAME	ASAR Alternating Polarization Level 0 (Copolar)
DESCRIPTION	This AP Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in AP Mode and collecting co-polar data. Source packets alternate between HH and VV data. This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven possible image swaths.
APPLICATIONS	This product is archived and is the basis of further AP co-polar mode processing.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS
THROUGHPUT	1 product per acquisition (see coverage above); satellite downlink at 100 Mbps.
PRODUCT SIZE	max. size is 22500 MB (30' of data). Data must be split across several files, each with their own MPH and SPH and a maximum size of 2 GB. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Alternating Polarization Level 0 (Cross polar H)

PRODUCT ID	ASA_APH_0P
PRODUCT NAME	ASAR Alternating Polarization Level 0 (Cross polar H)
DESCRIPTION	This AP Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in AP Mode and collecting cross polar H data. The source packets alternate between HH and HV data. This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven possible image swaths.
APPLICATIONS	This product is archived and is the basis of further AP cross polar H mode processing.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS
THROUGHPUT	1 product per acquisition (see coverage above); satellite downlink at 100 Mbps.
PRODUCT SIZE	max. size is 22500 MB (30' of data). Data must be split across several files, each with their own MPH and SPH and a maximum size of 2 GB. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Alternating Polarization Level 0 (Cross polar V)

PRODUCT ID	ASA_APV_0P
PRODUCT NAME	ASAR Alternating Polarization Level 0 (Cross polar V)
DESCRIPTION	This AP Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in AP Mode and collecting cross polar V data. The source packets alternate between VV and VH data. This is a high rate, narrow swath mode so data is only acquired for partial orbit segments and may be from one of seven possible image swaths.
APPLICATIONS	This product is archived and is the basis of further AP cross polar V mode processing.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS
THROUGHPUT	1 product per acquisition (see coverage above); satellite downlink at 100 Mbps.
PRODUCT SIZE	max. size is 22500 MB (30' of data). Data must be split across several files, each with their own MPH and SPH and a maximum size of 2 GB. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Alternating Polarization Mode Single Look Complex

PRODUCT ID	ASA_APS_1P
PRODUCT NAME	ASAR Alternating Polarization Mode Single Look Complex
DESCRIPTION	This is a complex, slant range image generated upon request from the Level 0 AP Product using the Range Doppler and the most up to date processing parameters available at the time of processing. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV & VH).
APPLICATIONS	It is primarily intended for use in SAR quality assessment and calibration or applications requiring complex SAR images such as interferometry.
DELIVERY TIME	Product available from PACs starting 1 week after data take.
COVERAGE	Each minimum size scene is 100 km along track, 56 - 100 km across track depending on swath. Location along swath specified by user.
THROUGHPUT	product generated on request.
PRODUCT SIZE	Up to 1481 MB (27000 MDSRs * (6850 samples/MDSR at 4 bytes per sample (2 bytes I, 2 bytes Q) + 17 bytes header) * 2 MDSs). Includes all headers and aux. data. size is for largest MDSR size.
GEOMETRIC SAMPLING	natural spacing in both slant range and azimuth. Azimuth pixel spacing depends on Earth-satellite relative velocity and actual PRF. slant range pixel spacing is given by ASAR sampling frequency.
GEOMETRIC RESOLUTION	natural spacing. Approximately 9 m in slant range by 6 m in azimuth (slant range resolution depends on programmed chirp bandwidth)
GEOMETRIC ACCURACY	Absolute location accuracy = 10 m + orbit data error
RADIOMETRIC RESOLUTION	1 look in azimuth, 1 look in slant range; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Geolocation Grid ADS, PQS for MDS 1 ADS, PQS for MDS 2 ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; noise power estimation; image formation (Range/Doppler); geolocation.
NOTES	The product covers a continuous area along the imaging swath. The product is generated form AP Level 0 data. The two images in the product are co-registered within 0.25 of a sample.

ASAR Alternating Polarization Mode Precision Image

PRODUCT ID	ASA_APP_1P
PRODUCT NAME	ASAR Alternating Polarization Mode Precision Image
DESCRIPTION	This is a multi-look, ground range, digital image generated upon request from the Level 0 AP product using the SPECAN algorithm and the most up to date auxiliary information available at the time of processing. Engineering corrections and relative calibration (antenna elevation gain, range spreading loss) are applied. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV& VH).
APPLICATIONS	It is for users wishing to perform applications-oriented analysis. It is intended for multi -temporal imaging and to derive radar cross sections.
DELIVERY TIME	NRT product available from PDHS or NS-Es from 3 hours after data take. OFL product available from PACs starting 3 days after data take.
COVERAGE	Minimum scene size: 100 km along track, 56 - 100 km across track
THROUGHPUT	generated upon request
PRODUCT SIZE	Max. 268 MB (8000 MDSRs * (8350 samples * 2bytes/sample + 17 bytes header) * 2 MDSs). Includes all aux. data.
GEOMETRIC SAMPLING	pixel spacing 12.5 m by 12.5 m
GEOMETRIC RESOLUTION	approximately 30 m ground range (except IS 1) X 30m azimuth
GEOMETRIC ACCURACY	absolute location accuracy: 25 m + orbit data error
RADIOMETRIC RESOLUTION	ENL >2 looks*
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, SR/GR ADS, Geolocation Grid ADS, PQS for MDS 1 ADS, PQS for MDS 2 ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation.
NOTES	Produced from Level 0 AP products. The two images contained within the product are co-registered to within 0.25 of a sample. The product covers a continuous area along the imaging swath. * Rad. resolution = 10log(1+1/sqrt(ENL))

ASAR Alternating Polarization Ellipsoid Geocoded Image

PRODUCT ID	ASA_APG_1P
PRODUCT NAME	ASAR Alternating Polarization Ellipsoid Geocoded Image
DESCRIPTION	This is a multi-look geocoded SAR image generated upon request from the Level 0 AP Product using the SPECAN algorithm and the most up to date auxiliary information available at the time of processing. Engineering corrections and relative calibration (antenna elevation gain, range spreading loss) are applied and the image is geolocated and resampled to a map projection. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV & VH).
APPLICATIONS	For users in the scientific or commercial community who require SAR imagery referenced to standard geographic or cartographic locations.
DELIVERY TIME	Product available from PACs starting 1 week after data take.
COVERAGE	Each minimum size scene is 100 km along track, 56 - 100 km across track depending on swath. Location along swath specified by user.
THROUGHPUT	product generated upon request
PRODUCT SIZE	max scene size: 563 MB (up to 11850 MDSRs * (11850 samples * 2 bytes/sample + 17 bytes header) * 2 MDSs). Total includes all auxiliary data and headers. Size is for swaths IS1 and IS2, other swaths smaller.
GEOMETRIC SAMPLING	pixel spacing 12.5 m by 12.5 m
GEOMETRIC RESOLUTION	approximately 30 m ground range (except IS 1) X 30m azimuth
GEOMETRIC ACCURACY	absolute location accuracy: 25 m + orbit data error
RADIOMETRIC RESOLUTION	ENL >2 looks; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURAC	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, SR/GR ADS, Geolocation Grid ADS, PQS for MDS 1 ADS, PQS for MDS 2 ADS, Map Projection ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation; map projection resampling.
NOTES	Produced from Level 0 AP products. The two images contained within the product are co-registered to within 0.25 of a sample. The product covers a continuous area along the imaging swath

ASAR Alternating Polarization Medium Resolution Image product

PRODUCT ID	ASA_APM_1P
PRODUCT NAME	ASAR Alternating Polarization Medium Resolution Image product
DESCRIPTION	ASAR product generated from raw data collected when the instrument is in alternating polarisation mode. This product has lower spatial resolution and higher radiometric resolution than do the precision images and higher spatial resolution than the browse images. The product contains two co-registered images corresponding to one of the three possible polarization combinations (HH & VV, HH & HV, VV & VH).
APPLICATIONS	It is intended for users wishing to perform applications-oriented analysis on large scale phenomena. It is also intended for multi-temporal imaging.
DELIVERY TIME	NRT product available from PDHS or NS-Es from 3 hours after data take. OFL product available from PACs starting 3 days after data take.
COVERAGE	Max. coverage per stripline product is 4000 km along track, 56 -100 km across track depending on swath. Minimum extracted scene size is 100 km along track.
THROUGHPUT	1 product per segment acquired (maximum 10').
PRODUCT SIZE	Stripline max. 301 MB (53334 MDSRs * (1400 samples * 2 bytes/sample * 17 bytes header) * 2 MDSs). 1 Extracted scene max.: 7.91 MB (1400 MDSRs) * 2 MDSs. Totals include all aux. data. Sizes for IS1 and IS2, other swaths are less.
GEOMETRIC SAMPLING	pixel spacing 75 m by 75 m
GEOMETRIC RESOLUTION	approximately 150 in ground range by 150 m in azimuth
GEOMETRIC ACCURACY	Absolute location accuracy: 25 m + orbit data error
RADIOMETRIC RESOLUTION	ENL >30 looks; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Pattern ADS, Geolocation Grid ADS, PQS ADS for MDS 1; PQS ADS for MDS 2.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation.
NOTES	Produced systematically from AP Level 0 product. User extracts child product based on minimum scene size. The product covers a continuous area along the imaging swath. Products from the two polarization channels are co-registered to 0.25 of a sample.

ASAR Alternating Polarization Browse Image

PRODUCT ID	ASA_AP__BP
PRODUCT NAME	ASAR Alternating Polarization Browse Image
DESCRIPTION	This low resolution product will be produced systematically together with the Medium Resolution Product. The image is intended for browse purposes only. It contains only one of the two possible scenes generated in AP mode.
APPLICATIONS	To aid in user selection of data
DELIVERY TIME	Available in NRT within 3 hours of data acquisition.
COVERAGE	Max. stripline product coverage is 4000 km along track, 56 -100 km across track depending on swath.
THROUGHPUT	1 stripline product generated per acquired segment (maximum 10')
PRODUCT SIZE	Stripline Max: 3 MB (8889 MDSRs * (240 samples * 1 byte/sample + 17 bytes header)). Total includes all aux. data. Size is for IS1 and IS2, other swaths are less.
GEOMETRIC SAMPLING	450 m by 450 m
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	ENL > 15; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit state vectors; Time correlation parameters; PQS ADS for MDS1; PQS ADS for MDS 2; Geolocation Grid ADS.
ALGORITHMS USED	subsampling of medium resolution image product
NOTES	Produced systematically from the Medium resolution image produced for this mode.

ASAR Wide Swath Mode Level 0

PRODUCT ID	ASA_WS__0P
PRODUCT NAME	ASAR Wide Swath Mode Level 0
DESCRIPTION	The WS Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in WS Mode. This is a high rate, wide swath (ScanSAR) mode so data is only acquired for partial orbit segments and is composed of data from five image swaths (SS1 to SS5)..
APPLICATIONS	This product is archived and is the basis of further WS mode processing.
DELIVERY TIME	The NRT version of the product is available from the PDHS 1day after data acquisition, while the OFL (fully consolidated) version is available from the PAC after 2 weeks
COVERAGE	Max. 12.5' / orbit at PDHS-K; 30'/orbit at PDHS-E, 12.5'/orbit at PDAS
THROUGHPUT	1 product per acquisition (see coverage above); satellite downlink at 100 Mbps.
PRODUCT SIZE	max. size is 22500 MB (30' of data). Data must be split across several files, each with their own MPH and SPH and a maximum size of 2 GB. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning; Time correlation.
NOTES	Created systematically for all data acquired in this mode

ASAR Wide Swath Medium Resolution Image

PRODUCT ID	ASA_WSM_1P
PRODUCT NAME	ASAR Wide Swath Medium Resolution Image
DESCRIPTION	ASAR product systematically generated from Level 0 data collected when the instrument is in wide swath mode. This product has higher spatial resolution than the WS browse image.
APPLICATIONS	It is intended for users wishing to perform applications-oriented analysis on large scale phenomena over a wide region. It is also intended for multi-temporal imaging.
DELIVERY TIME	NRT product available from PDHS or NS-Es from 3 hours after data take. OFL product available from PACs starting 3 days after data take.
COVERAGE	Max stripline product of 406 km across track by 4000 km along track. Minimum extracted product size of 400 km along track
THROUGHPUT	1 stripline product per segment acquired (maximum of 10')
PRODUCT SIZE	Stripline Max: 583 MB (53334 MDSRs * (5450 samples * 2 bytes/sample * 17 bytes header)). 1 Extracted scene max: 58.98 MB (5400 MDSRs). Totals include all aux. data.
GEOMETRIC SAMPLING	pixel spacing 75 m by 75 m
GEOMETRIC RESOLUTION	approximately 150 in ground range by 150 m in azimuth
GEOMETRIC ACCURACY	Absolute location accuracy: 150 m + orbit data error
RADIOMETRIC RESOLUTION	ENL >15 looks (TBC); Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, Geolocation Grid ADS, PQS ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation.
NOTES	Produced systematically from WS Level 0 data. The product covers a continuous area along the imaging swath.

ASAR Wide Swath Browse Image

PRODUCT ID	ASA_WS__BP
PRODUCT NAME	ASAR Wide Swath Browse Image
DESCRIPTION	This low resolution product will be produced systematically together with the Medium Resolution Product. The image is intended for browse purposes only
APPLICATIONS	To aid in user selection of data
DELIVERY TIME	Available in NRT within 3 hours of data acquisition.
COVERAGE	Max. stripline product coverage is 4000 km along track, approx. 406 km across track.
THROUGHPUT	1 stripline product generated per acquired segment (maximum 10')
PRODUCT SIZE	Stripline Max: 3 MB (4445 MDSRs * (500 samples * 1 byte/sample + 17 bytes header)). Total includes all aux. data.
GEOMETRIC SAMPLING	900 m by 900 m
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	ENL > 15; Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit state vectors; Time correlation parameters; PQS ADS; Geolocation Grid ADS.
ALGORITHMS USED	subsampling of medium resolution image product
NOTES	Produced systematically from the Medium resolution image produced for this mode.

ASAR Global Monitoring Mode Level 0

PRODUCT ID	ASA_GM__0P
PRODUCT NAME	ASAR Global Monitoring Mode Level 0
DESCRIPTION	The GM Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in GM Mode. This is a low rate, wide swath (ScanSAR) mode in which data may be acquired over the entire orbit and is composed of data from five image swaths (SS1 to SS5).
APPLICATIONS	Archived, and this product is used to generate global monitoring mode image products.
DELIVERY TIME	Product available from PDHS within a day after data take. Product available from the LRAC starting 2 weeks after data take.
COVERAGE	400 km across track, up to full orbit along track (40 000 km)
THROUGHPUT	1 product per orbit; satellite data generation at 0.9 Mbps. Echo samples in 4 bit I, 4bit Q FBAQ compressed format.
PRODUCT SIZE	max product size/orbit = 100' per orbit * 0.9 Mbps = 675 MB
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters
ALGORITHMS USED	Satellite positioning, Time correlation
NOTES	Produced systematically for all data acquired within this mode.

ASAR Global Monitoring Mode Image

PRODUCT ID	ASA_GM1_1P
PRODUCT NAME	ASAR Global Monitoring Mode Image
DESCRIPTION	ASAR product generated from data collected when the instrument is in global monitoring mode. It is a multi-look coarse resolution image.
APPLICATIONS	It is for users wishing to perform applications-oriented analysis of large scale phenomena, where high resolution is not needed.
DELIVERY TIME	NRT product available from PDHS within 3 hours after data take. OFL product available from LRAC starting 3 weeks after data take.
COVERAGE	Up to 400 km across track by up to 40000 km along track.
THROUGHPUT	1 product per orbit
PRODUCT SIZE	Stripline Max: 139 MB (80000 MDSRs * (850 samples * 2 bytes/sample + 17 bytes header)). Extracted Scene Max: 1.40 MB (800 MDSRs). Totals include all aux. data.
GEOMETRIC SAMPLING	pixel spacing 500 m by 500 m
GEOMETRIC RESOLUTION	approximately 1000 in ground range by 1000 m in azimuth
GEOMETRIC ACCURACY	absolute location accuracy: 1000m + orbit data error
RADIOMETRIC RESOLUTION	Product ENL > 15 (TBC); Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation parameters, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Antenna Elevation Pattern ADS, Geolocation Grid ADS, PQS ADS.
ALGORITHMS USED	data decompression; raw data correction; replica construction and power estimation; calibration pulse processing; antenna elevation gain function calculation; noise power estimation; image formation (SPECAN); geolocation.
NOTES	Produced systematically from the GM Level 0 product. The product covers a continuous area along the imaging swath. User extracts child product of region of interest, subject to minimum scene size

ASAR Global Monitoring Mode Browse Image

PRODUCT ID	ASA_GM__BP
PRODUCT NAME	ASAR Global Monitoring Mode Browse Image
DESCRIPTION	This low resolution product will be produced systematically together with the Medium Resolution Product. The image is intended for browse purposes only.
APPLICATIONS	To aid in user selection of data
DELIVERY TIME	Available in NRT within 3 hours of data acquisition from the PDHS.
COVERAGE	Max. coverage is 40000 km along track, approx. 400 km across track
THROUGHPUT	1 product generated per orbit
PRODUCT SIZE	Stripline Max: 18 MB (40000 MDSRs * (410 samples * 1 byte/sample + 17 bytes header)). Total includes all aux. data.
GEOMETRIC SAMPLING	1000 m by 1000 m
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	ENL > 15 (TBC); Rad. resolution = 10log(1+1/sqrt(ENL))
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit state vectors; Time correlation parameters; PQS ADS; Geolocation Grid ADS.
ALGORITHMS USED	subsampling of medium resolution image product
NOTES	Produced systematically from the GM image.

ASAR Wave Mode Level 0

PRODUCT ID	ASA_WV__0P
PRODUCT NAME	ASAR Wave Mode Level 0
DESCRIPTION	The WV Mode Level 0 product consists of time ordered Annotated Instrument Source Packets collected while the instrument is in WV Mode. This is a low rate mode where data is acquired in small “imagettes” (nominally 10 km by 5km to 5 km by 5 km in size) allowing data acquisition to occur periodically (every 100km) around a full orbit.
APPLICATIONS	This product is used to generate level 1B wave mode products and for archiving.
DELIVERY TIME	Product available from PDHS within a day after data take. Product available from LRAC starting 2 weeks after data take.
COVERAGE	Imagettes acquired every 100 km for up to full orbit along track (40 000 km). Imagette size depends on swath selection. 6.04 km by 5 km in IS7, 9.44 km by 5 km in IS1.
THROUGHPUT	1 product per orbit; satellite data generation at 0.9 Mbps.
PRODUCT SIZE	Max. 608 MB /orbit. Echo samples in 2 bit I, 2 bit Q FBAQ compressed format.
GEOMETRIC SAMPLING	N/A
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	N/A
RADIOMETRIC RESOLUTION	N/A
RADIOMETRIC ACCURACY	N/A
AUXILIARY DATA INCLUDED	Orbit state vectors; time correlation parameters
ALGORITHMS USED	Satellite positioning, time correlation
NOTES	Produced systematically for all data acquired while in this mode

ASAR Wave Mode SLC Imagette and Imagette Cross Spectra

PRODUCT ID	ASA_WVI_1P
PRODUCT NAME	ASAR Wave Mode SLC Imagette and Imagette Cross Spectra
DESCRIPTION	This is the basic Wave Mode product. The product includes up to 400 single look, complex, slant range, imagettes generated from Level 0 data and up to 400 imagette power spectra computed using the cross-spectra methodology. A minimum number of corrections and interpolations are performed.
APPLICATIONS	Primarily used as an intermediate in the production of Level 2 wave mode products.
DELIVERY TIME	NRT product available from PDHS within 3 hours after data take. OFL product available from the LRAC starting 2 weeks after data take.
COVERAGE	1 Imagette acquired every 100 km for up to full orbit along track (40 000 km). Imagette size depends on swath selection. 6.04 km by 5 km in IS7, 9.44 km by 5 km in IS1. Each product contains up to 400 imagettes and associated spectra.
THROUGHPUT	1 product per orbit**
PRODUCT SIZE	Max Size : 2388 MB (400 Imagettes and Spectra)** Imagette size: 1350 MDSRs records * (1100 samples/record* 4 bytes/sample (2 I, 2Q) + 17 bytesheader)) Spectra size: 36 bins direction * 24 bins wavelen.* 4 bytes/bin (2I, 2Q) + 13 bytes header = 3469 Bytes
GEOMETRIC SAMPLING	Imagette: natural slant range and azimuth spacing Spectra: Wavelength range from 20 m to 1000 m in 24 logarithmic steps, direction 0-360 degrees in 10 degree steps.
GEOMETRIC RESOLUTION	Imagette:approximately 9 m in slant range by 6 m in azimuth (slant range resolution depends on programmed chirp bandwidth) Spectra: Information not available
GEOMETRIC ACCURACY	abs. loc. acc.10m+orbit data err.
RADIOMETRIC RESOLUTION	Imagette: 1 look slant range, 1 look azimuth Spectra: information not available
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors, Time correlation, Main Processing Parameters ADS, Doppler Centroid ADS, Chirp ADS, Wave Mode Geolocation Grid ADS; PQS ADS for MDS 1, PQS ADS for MDS2; Wave Mode ADS
ALGORITHMS USED	Imagette:data decompression; raw data correction; noise estimation; replica construction and power estimation; calibration pulse processing; image formation (Range/Doppler); geolocation; Spectra: Cross spectra algorithm.
NOTES	Imagettes can be formed from either VV or HH polarized data but not both **Products larger than 2 GB will be divided into more than one product

ASAR Wave Mode Imagette Cross Spectra

PRODUCT ID	ASA_WVS_1P
PRODUCT NAME	ASAR Wave Mode Imagette Cross Spectra
DESCRIPTION	This product is extracted from the combined SLC and Power Spectra product. It contains only the imagette power spectra derived using cross-spectra methodology
APPLICATIONS	The primary purpose of this product is to measure directional wave spectra --wave energy as a function of the directions and lengths of the waves at the ocean surface --from the backscattered radiation from sampled areas.
DELIVERY TIME	NRT product available from PDHS within 3 hours after data take. OFL product available from the LRAC starting 2 weeks after data take.
COVERAGE	Imagettes acquired every 100 km for up to full orbit along track (40 000 km). Imagette size depends on swath selection. 6.04 km by 5 km in IS7, 9.44 km by 5 km in IS1. I spectra per product.
THROUGHPUT	1 product per orbit
PRODUCT SIZE	Max size: 2 MB (400 spectra * (36 * 24 bins * 4 bytes/bin (2I, 2Q)+ 13 bytes header). Total includes all aux. data. (TBC)
GEOMETRIC SAMPLING	Spectra: Wavelength range from 20 m to 1000 m in 24 logarithmic steps, direction 0-360 degrees in 10 degree steps (TBC)
GEOMETRIC RESOLUTION	N/A
GEOMETRIC ACCURACY	Absolute location accuracy of imagette = 10 m + orbit data error
RADIOMETRIC RESOLUTION	Information not available
RADIOMETRIC ACCURACY	Information not available
AUXILIARY DATA INCLUDED	Orbit State Vectors; Time correlation parameters; Geolocation Grid ADS; PQS ADS for MDS 1; Wave Mode Processing Parameters ADS.
ALGORITHMS USED	Extraction of MDS 1 (Cross spectra) and auxiliary data from ASA_WVI_1P
NOTES	This product is formed from spectra extracted systematically from ASA_WVI_1P products

ASAR Wave Mode Wave Spectra

PRODUCT ID	ASA_WVW_2P
PRODUCT NAME	ASAR Wave Mode Wave Spectra
DESCRIPTION	This is the highest level Wave Mode product. It is produced from the Cross Spectra product and converts the cross spectra of the imagette to an ocean wave spectra. This product is similar to the ERS wave product, but will apply new algorithms to account for SAR ocean wave inversion.
APPLICATIONS	Ocean monitoring, shipping routes, meteorology.
DELIVERY TIME	Product available from PACs starting 2 weeks after data take.
COVERAGE	Imagettes acquired every 100 km for up to full orbit along track (40 000 km). Imagette size depends on swath selection. 6.04 km by 5 km in IS7, 9.44 km by 5 km in IS1. Spectra of 1 imagette per product.
THROUGHPUT	1 product per orbit
PRODUCT SIZE	Max: 2 MB (400 spectra * (36 * 24 bins * 4 bytes/bin (2I, 2Q) + 13 bytes header)). Total includes all auxiliary data.
GEOMETRIC SAMPLING	Spectra: Wavelength range from 20 m to 1000 m in 24 logarithmic steps, direction 0-360 degrees in 10 degree steps (TBC)
GEOMETRIC RESOLUTION	info. not available
GEOMETRIC ACCURACY	info. not available
RADIOMETRIC RESOLUTION	info. not available
RADIOMETRIC ACCURACY	info. not available
AUXILIARY DATA INCLUDED	Orbit State Vectors; Time correlation parameters; Geolocation Grid ADS; PQS ADS for MDS 1; Wave Mode Processing Parameters ADS
ALGORITHMS USED	info. not available
NOTES	This product is produced systematically from ASA_WVS_1P.