BPS Auxiliary Products Format

biomass

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Change history

Date	Issue	Change	Author
15/11/2021	1.0	First issue of the document	Riccardo Piantanida
23/03/2022	1.1	CDR1 issue of the document • PDR1-44: Parameter processingModeDetectionFlag removed from AUX_PP1___ file (Sec. 4.4) • PDR1-57: Parameter skpPhaseCorrectionFlag added (Sec. 4.5) • PDR1-64, PDR1-65, PDR1-71, PDR1-77, PDR1-78, PDR1-2-1, PDR1-2-4, PDR1-3-2, PDR1-3-5: Document ToC reviewed and updated to reflect classification of interfaces into Auxiliary Products and Internal Resources (not described in this document) (ALL) • PDR1-112: Type of parameter dcValue updated from float to double (Sec. 4.4) • PDR1-114: Master/slave images terminology replaced with primary/secondary one (Sec. 4.5, 5) • PDR1-115: InSAR Pre-Processing step replaced by Range Spectral Filtering step (Sec. 4.5) • PDR1-3-8: AUX_INS___ specification completed adding antenna pattern files description (Sec. 4.3.2) • PDR1-2-3: Parameter rfiDetectionFlag added (Sec. 4.4) • PDR1-2-6: Parameters types and range values clarified where missing (ALL) • PDR1-2-7: Meaning of parameter rfiImpactQualityThreshold clarified (Sec. 4.5) • PDR1-2-8: Parameters insarPreProcessingFlag and multiBaselineOptimizationFlag removed (Sec. 4.5) • PDR1-2-9: Baseline errors estimation flags replaced with more generic ones (Sec. 4.5) • PDR1-3-1: Document scope updated (Sec. 1.2) • PDR1-3-3: PARC_INFO_ product type corrected (Sec. 2, 4.11) • PDR1-3-4: IGRF model update to version 13 (Sec. 1.6, 2, 4.14) • PDR1-3-6: Clarified content of AUX_ORB___ product (Sec. 4.1) • PDR1-3-7: Clarified content of AUX_ATT___ product (Sec. 4.2) • PDR1-3-10: Parameter noisePower unit of measure clarified (Sec. 4.3) • PDR1-3-11: Parameters used for the description of acquisition timeline clarified; Managed different cases based on rank value (odd or even) (Sec. 4.3) • PDR1-3-12: Added parameters to manage azimuth resampling (Sec. 4.4) • PDR1-3-14: Meaning of parameters maxISPGap and maxTimeGap clarified (Sec. 4.4) • PDR1-3-16: Meaning of parameter maxInvalidDriftFraction clarified	Riccardo Piantanida

Date	Issue	Change	Author
		(Sec. 4.4) • PDR1-3-17: DOI annotation already included in MPH (no changes) • PDR1-3-18: Meaning of parameters ionosphereHeightEstimationMethod and ionosphereHeightValue clarified (Sec. 4.4) • PDR1-3-19: Meaning of parameters rfiDecorrelationThreshold and faradayDecorrelationThreshold clarified (Sec. 4.5) • PDR1-3-21: Meaning of parameter groundPhasesScreenQualityThreshold clarified (Sec. 4.5) • PDR1-3-22: Meaning of parameters validityStart and validityStop clarified (Sec. 4.11) • PDR1-3-23: Meaning of parameters ionosphereHeightSource and ionosphereHeight clarified (Sec. 4.5)	
09/06/2022	2.0	PDR2 issue of the document • Added content to L2a, L2b FD and L2b FH sections (Sec. 4.6, 4.7, 4.8)	Emanuele Giorgi Francesco Banda
29/06/2022	2.0.1	Post-CDR1 issue of the document • Various (minor) updates to align document to latest issues of L1 and Stack ATBDs (Sec. 4.4, 4.5) • CDR1-112: Added blocketization parameters to AUX_PP1 RFI mitigation section (Sec. 4.4) • CDR1-119: Added clarification about azimuthResamplingFlag parameter; added filter design parameters (Sec. 4.4) • CDR1-013, CDR1-036: Added parameters for configuration of data compression, back-geocoding posting, polarizations selection and management, DAG processing management (Sec. 4.4, 4.5, 5.1) • CDR1-107, CDR1-154: Description of auxiliary orbit and attitude data improved (Sec. 4.1, 4.2) • CDR1-110: Description of priNumber parameter updated (Sec. 4.3.1) • CDR1-111: Structure of antenna pattern files reviewed and updated (Sec. 4.3.2) • CDR1-115: Description of rangeReferenceFunctionSource parameter updated (Sec. 4.4) • CDR1-116: Added parameters for configuration of azimuth compression processing blocks and overlaps (Sec. 4.4) • CDR1-117: Description of dcValue parameter updated (Sec. 4.4) • CDR1-118: Added parameter to separately activate APC1 and APC2 corrections (Sec. 4.4) • CDR1-120: Absolute calibration constant specified per polarization (Sec. 4.4) • CDR1-121, CDR1-087: Advanced parameters for ionosphere calibration and autofocus added (Sec. 4.4)	Riccardo Piantanida

Date	Issue	Change	Author
		• CDR1-123: Description of pixelRepresentation parameter updated; pixelQuantity parameter added (Sec. 4.4, 4.5, 5.1) • CDR1-156: Parameter rfiImpactQualityThreshold removed as redundant (Sec. 4.5) • CDR1-157: Parameter to set output products DOI added (Sec. 4.4, 4.5) • CDR1-199: Added missing parameters (where considered meaningful) (ALL) • CDR1-200: L1a product import parameters removed as no meaningful for Stack processing (Sec. 4.5) • CDR1-250, CDR1-235: IoB low-pass filter parameters description improved (Sec. 4.5) • CDR1-012: Section rollSteeringParameters replaced by roll bias (Sec. 4.3) • CDR1-066: Absolute scaling factor for quick-looks generation added (Sec. 4.4, 4.5) • CDR1-114: Added missing parameters for frequency-domain RFI mitigation step (Sec. 4.4) • CDR1-194: Added internal chirp database description (Sec. 4.3.3)	
28/10/2022	2.1	CDR2 issue of the document • AUX_CLM___ interface removed (Sec. 2) • CDR1-108: Parameter channelImbalanceCorrectionFlag added to AUX_PP1 (Sec. 4.4) • CDR1-111: Description of antenna patterns files and internal chirp replica database files reviewed to follow NetCDF format specifications (Sec. 4.3.2, 4.3.3) • CDR1-118: Added clarification about APC1 and APC2 meaning (Sec. 4.4) • CDR1-157: Parameter to set output products DOI added also for AUX_PP2_* files (Sec. 4.6, 4.7, 4.8) • CDR1-191: Parameters minSNRCoherence and validPointsPercentage removed as not used by currently defined algorithms (Sec. 4.4) • BPSPDR2-6: updated name and description of the ground cancellation flag (Sec. 4.6) • BPSPDR2-7 and BPSPDR2-30: verticalReflectivityDefaultProfile function clarified (Sec. 4.6) • BPSPDR2-9: reordered acronyms in alphabetical order (Sec. 1.3) • BPSPDR2-30: default scenario specified for FH flags (Sec 4.6 Tab, 74) • BPSPDR2-32: solved TBD/TBC in delivery pack • BPSPDR2-34: added to processing parameters FH L2b, the FNF masking option, exploited from FD or from LCMFD usage removed from configuration moved to task table (Sec. 4.8) • BPSPDR2-46: added decimation factor, multi Looking Window Size	Emanuele Giorgi Francesco Banda

Date	Issue	Change	Author
		renamed as Product Resolution for L2a AGB (Sec. 4.6) • BPSPDR2-47: added “count” attribute for the number of val elements of the vertical reflectivity default profile (Tab. 75, Fig. 46) • BPSPDR2-51: added safetyinterpolation and coverage buffer and thresholds configuration parameter for FNF interpolation (Sec. 4.6) • Updated L2a and L2b FH and FD processing parameters, aligned with PFD 2.1 versions (Sec. 4.6, 4.7, 4.8)	
13/03/2023	2.1.1	Post-FAT1 issue of the document • CDR1-249, BPSPDR2-83, BPSCDR2-27: Overall update of the document to ensure consistency with ATBDs and PFDs documents (ALL) • CDR1-172: Added up-to-date details on SAR image MDS and LUT ADS compression (Sec. 4.4) • DEM extraction margin added to AUX_PP1 (Sec. 4.4) • Read and write blocks sizes added to AUX_PP1 (Sec. 4.4) • IoB phase unwrapping made configurable in AUX_PPS (Sec. 4.5) • Addressed CDR2 RIDs on AUX_PP2 files (BPSCDR2-23, BPSCDR2-27, BPSCDR2-31, BPSCDR2-43, BPSCDR2-45, BPSCDR2-71) (Sec. 4.7, 4.8, 4.9)	R. Piantanida, P. Mazzucchelli
16/6/2023	3.1	PDR3 issue of the document: • Section 4.9 inserted • Section 4.7, 4.8: added acquisitionIdImage • Table 93: added agbIndexingType • Section 4.10: added preliminary note	P. Mazzucchelli E. Giorgi S. Jourdain
31/07/2023	3.1.1	Post-FAT2 issue of the document • BPS-35: Added absMaxZErrorPercentile and phaseMaxZErrorPercentile parameters to both AUX_PP1 and AUX_PPS (Sec. 4.4, 4.5) • BPS-252: Added phaseUnwrappingFlag to AUX_PPS (Sec. 4.5) • BPS-267: Added Automatic option to AUX_PPS coregistrationMethod parameter (Sec. 4.5) • BPS-347: Duplication of blockQualityThreshold in AUX_PPS fixed (Sec. 4.5) • BPS-406: Clarified behaviour in case APC is activated and internal calibration is deactivated (Sec. 4.4) • BPS-409: Added dualPolarisationProcessingFlag, azimuthFocusingMarginsRemovalFlag and azimuthCoregistrationFlag to AUX_PP1 (Sec. 4.4) • BPS-419: Added lutLayersCompletenessFlag to AUX_PP1 (Sec. 4.4) • BPSPDR3-34: added note in section 4.9	R. Piantanida, P. Mazzucchelli
06/10/2023	3.1.2	Post-FAT2 issue of the document (associated to BPS V2.1.3) • Minor updates to AUX_PPS format (Sec. 4.5)	Riccardo Piantanida
17/11/2023	3.2	CDR3 issue of the document	Paolo

Date	Issue	Change	Author
		• Added configuration parameter minimumPercentageOfFillableVoids (Sec. 4.9) • Added “maintain all” subsetting rule (Sec. 5) • Added reference image attribute in AUX_PP2_2A (sec.4.6) Units of measurement fixed where needed (sections 4.6, 4.7, 4.8, 4.9) • Added allowDuplicateImagesFlag, minValidBlocks, and ionosphereSearchHeightStep to AUX-PPS (Sec. 4.5) • Update of AUX_PP3 (Sec. 4.10) • Review of the document to specify units of measure where missing (ALL)	Mazzucchelli Emanuele Giorgi Nathan Paillou Riccardo Piantanida Federico Boniardi
30/11/2023	3.2.1	Post-FAT2 issue of the document (associated to BPS V2.1.4) • imagesPairSelection type updated (AUX_PP_2A, Ground cancellation, Sec 4.6 and 5.1) • Update layerType and uomType enumerative (Sec. 7.1.1)	Paolo Mazzucchelli Emanuele Giorgi Riccardo Piantanida Federico Boniardi
10/12/2023	3.2.2	BPS v2.1.4 update • Corrected modelInversionType in tab. 77 • Corrected productType for L2 productIDs	Paolo Mazzucchelli
18/01/2024	3.2.3	DeltaFAT2 issue of the document • New parameters in AUX_PPS file (applyL1IonoPhaseScreenFlag, slowIonosphereQualityThreshold, baselineErrorQualityThreshold, overallProductQualityThreshold (for IoS and SKP)) (Sec. 4.5)	R. Piantanida F. Boniardi P. Mazzucchelli
05/02/2024	3.2.4	Post-CD3 issue of the document • Update of AUX_PP3 • Added referenceSelection in Sec. 4.9	N. Paillou
17/05/2024	3.2.5	Post-DeltaFAT2 issue of the document • BPS-221: PGA removed from autofocus methods (Sec. 4.4, 5.1) • BPS-505: LUT ADS decimation factors updated to distinguish between groups of variables (Sec. 4.4) • BPS-532, BPSFAT2-52, BPSFAT2-122: Removed pixelType field (Sec. 4.4, 4.5) • BPSCDR3-5: Reviewed list of acronyms (Sec. 1.3) • BPSCDR3-6: Added enumeration for acquisitionMode field (Sec. 4.3, 5.1) • BPSFAT2-25, BPSDFAT2-8: BPSDFAT2-8: GMF moved to L1_P internal resources and removed from this document (ALL) • BPSFAT2-26: Link to AUX_TEC reference updated (Sec. 1.6) • BPSFAT2-130: Improved description of rangeReferenceFunctionSource field (Sec. 4.4)	R. Piantanida F. Boniardi P. Mazzucchelli

Date	Issue	Change	Author
		• BPSPDR2-32: Remaining TBD/TBC removed from document (Sec. 4.4) • Added coregistrationExecutionPolicyType and related field in the coregistration configs to enable nominal, estimation only, and warping only executions of the coregistrator • Removed any reference to R^2 as a measure for coregistration quality • Added missing value in primaryImageInformation • Added exportDebugProductsFlag in coregistratorChanged default values in tab. 77, 84, 86 • BPSFAT2-45: Added configurable azimuth common spectral window.	
06/09/2024	3.2.6	FAT3 issue of the document • Remove unnecessary parameter *polarisationsUsed* from AUX_PPS • Uniform *polarization* vs *polarisation* in AUX_PPS • BPSFAT3-2: better specification of AUX_PP2_AB parameters minimumL2aCoverage and referenceSelection • Added correctTerrainSlopesFlag configuration to L2A FH	R. Piantanida F. Boniardi P. Mazzucchelli Emanuele Giorgi

13/12/2024	3.3.0	Post-FAT3 issue of the document
		• Updated AUX_ORB and AUX_ATT reference frame (from PEF to EF) (Sec. 4.1, 4.2)
		• Updated AUX_INS format (Sec. 4.3):
		  ○ Removed “swathParameters”
		  ○ Updated “section” cardinality (from 6 to 5)
		  ○ Updated “priNumber” description
		  ○ Added “repetitionNumber” and “returnAddressOffset”
		  ○ Updated “unBAQLUT” and “unBAQSmallASMLUT” cardinality (from 1 to 3)
		  ○ Other minor description updates
		  ○ Renamed “decimationFactor” to “upsamplingFactor”
		• Overall update of AUX_PP3 format (Sec. 4.10)
		• Overall review and update of data types (ALL)
		• Updated list of TBD/TBC (Sec. 6)
			R. Piantanida
			F. Boniardi
			P. Mazzucchelli
			Emanuele Giorgi

07/03/2025	3.4.0	Post-FAT3 issue of the document
		• AUX_PP1: removed fields backgeocodingPosting, brkFilesFormat and maxTimeGap (Sec. 4.4)
		• AUX_INS: added characterization data and attenuators settings sections to SAR instrument parameters file (Sec. 4.3.1)
		• Phase-like parameters now expressed in radians instead of degrees (ALL)
		• AUX_PPS: Added following configurations:
		  ○ use32bitFlag in AZF, BAE, and SKP
		  ○ use32bitFlagEstimation and use32bitFlagCorrection in IOS
		  ○ multibaselineCriticalBaselineThreshold for IOB and BAE
			R. Piantanida
			F. Boniardi
			P. Mazzucchelli
			E. Giorgi

Date	Issue	Change	Author
		○ New configurations for IOB (as per BIOTOMEX recommendations), which include use32bitFlag and mulitbaselineCriticalBaselineThreshold ○ Added new configurations for SKP as per FTO-BATCH-3	
30/04/2025	3.4.1	Post-FAT3 issue of the document • Fixing of residual issues on phase-like parameters conversion to radians instead of degrees (ALL) • AUX_PP1: L1 product DOI field split into two, one for L1a and one for L1b products (Sec. 4.4) • AUX_PP3: Adding Forest_Classes, Forest_ AGBvsFHTreshold, IsolatedPixelCorrectionMode and MinimalClassSize	R. Piantanida F. Boniardi P. Mazzucchelli E. Giorgi N. Paillou
08/06/2025	3.4.2	Post-FAT3 issue of the document • L3 Processor updates	N. Paillou
23/07/2025	3.4.3	Post-launch issue of the document (associated to BPS V4.0.0) • AUX_INS updates (Sec. 4.3) ○ Added txStartTime and calibrationSignalsSWP parameters • AUX_PP1 updates (Sec. 4.4) ○ Removed lut* parameters from antennaPatternCorrectionType ○ Added blockLines and blockOverlapLines parameters to ionosphereCalibrationType • AUX_PPS updates (Sec. 4.5) ○ Removed baselineErrorCorrectionType and fastIonosphereRemovalType ○ Added baselineAndIonosphereCorrectionType ○ Updated l1cProductExportType ○ Updated skpPhaseCalibrationType ○ Addressed requests from DISC (BPS-780)	R. Piantanida F. Boniardi P. Mazzucchelli E. Giorgi N. Paillou
28/11/2025	3.5.0	Post-launch issue of the document (associated to BPS V4.2.0) • AUX_PP1 updates (Sec. 4.4) ○ RFI related processing parameters ○ Added NetCDF file to include the RFI mitigation activation mask • AUX_PPS updates (Sec. 4.5) ○ Remove stale references to *skpPhaseCorrectionFlag* ○ Fix extra “s” in “Phase**s**Screen” ○ Deprecate BIC ○ Added configuration for InSAR calibration	R. Piantanida F. Boniardi P. Mazzucchelli E. Giorgi N. Paillou
13/03/2026	3.6.0	Post-launch issue of the document (associated to BPS V4.4.0) • AUX_INS updates (Sec. 4.3) ○ Added on-board filters file • AUX_PP1 updates (Sec. 4.4) ○ Added heightModelFallbackFlag flag ○ Added l1aQlColourCodingMethod and	R. Piantanida F. Boniardi P. Mazzucchelli E. Giorgi

Date	Issue	Change	Author
		I1bQlColourCodingMethod parameters • AUX_PPS updates (Sec. 4.5) ○ Deprecate configuration of Phase Plane Removal (PPR) ○ Added configuration of Multi-Squint Calibration (MSC) ○ Deprecate *rangeSpectralFilteringFlag* in coregistration conf ○ Added QL configurations for exporting coherence and interferogram quick looks (L1c), as well as the color code (HSV vs Pauli). • AUX_PP2_2A updates (Sec. 4.6) ○ Added polarization Combination Method to L2A General configurations ○ Updated L2A general, L2A FH and L2a GN default configuration values ○ Added non-operational Tomographic FH (TFH) section to AUX PP2 2A	
02/04/2026	3.6.1	Post-launch issue of the document (associated to BPS V4.4.1) • AUX_PPS updates (Sec. 4.5) ○ Removed deprecated field (calibration) from AUX_PPS (BPS-862) ○ Added parameters in skpPhaseCalibration section • AUX_PP2_2A updates (Sec. 4.6) ○ Clarified *polarisationCombinationMethod* usage in STA_P (Tab.88) and L2A_P (Tab.98)	R. Piantanida F. Boniardi P. Mazzucchelli E. Giorgi

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1. Introduction

1.1. Context

BIOMASS is ESA's 7th Earth Explorer mission. The purpose of the BIOMASS is to reduce the uncertainty in the worldwide spatial distribution and dynamics of forest biomass in order to improve current assessments and future projections of the global carbon cycle. This objective will be achieved by the implementation of a P-band SAR mission, providing global maps of forest biomass stocks, forest disturbance and growth.
The BIOMASS mission will also provide 3D views of forests through the "tomographic" phase and will also support additional science needs arising from the opportunity to explore the Earth for the first time with a P-band SAR system from space offering the possibility to "see" below the vegetated areas and in beneath bare soil or icy regions.

To achieve its challenging objectives, the BIOMASS mission requires a specific data processing strategy that combines different technologies at different processing level in order to generate the final Above Ground Biomass global map.

1.2. Scope of the document

The purpose of this document is to provide the "Auxiliary Products Format" for the BIOMASS Processing Suite (BPS) project.
This document is organized as follows:

- Section 2: Brief introduction about BPS and Auxiliary Products;
- Section 3: Overview of Auxiliary Products format;
- Section 4: Detailed description of Auxiliary Products format specifications;
- Section 5 (Appendix): Detailed description of common products format specifications.

1.3. Acronyms

Acronym	Description
ACM	Average Covariance Matrix
AD	Applicable Document
AGB	Above Ground Biomass
ADS	Annotation Data Set
APID	Application Process Identifier
ARESYS	Advanced Remote Sensing and Systems

Acronym	Description
ASM	Average Signal Magnitude
BAE	Estimation and removal of phase errors due to baseline errors module
BAQ	Block Adaptive Quantisation
BPS	BIOMASS Processing Suite
CDASP	Characterised Doublet Antenna Secondary Pattern
CFI	Customer Furnished Item
CFM	Computed Forest Mask (by Forest Disturbance processor)
COG	Cloud Optimized GeoTIFF
DEM	Digital Elevation Model
DGM	Detected Ground-range Multi-looked
DOI	Digital Object Identifier
ECEF	Earth-Centered Earth-Fixed
ECI	Earth-Centered Inertial
ESA	European Space Agency
FA	Forest Assembly
FD	Forest Disturbance
FH	Forest Height
FNF	Forest/Non-Forest Mask
FR	Faraday Rotation
GN	Ground Notch
GLS	Generalized Least Square
GSTL	Generic SAR Mode Timeline
ICD	Interface Control Document
INT	Interferometric Phase
IOB	Slow-varying ionosphere removal module
IOS	Fast-varying ionosphere removal module
ISP	Instrument Source Packet
L0	Level-0 product
L1a	Level-1a product
L1b	Level-1b product
L1c	Level-1c product
L1M	Level-1 Monitoring product
L1S	Level-1 Standard product

Acronym	Description
L2a	Level-2a product
L2b	Level-2b product
L3	Level-3 product
LCM	Land Cover Map (ESA CCI/C3S)
LUT	Look-Up Table
MB	Multi-Baseline
MDA	Map Drift Autofocus
MDS	Measurement Data Set
MS	Multi-Squint
NetCDF	Network Common Data Form
PARC	Polarimetric Active Radar Calibrator
PEF	Pseudo ECEF
PF	Processing Facility
PFD	Product Format Specification Document
PRF	Pulse Repetition Frequency
PRI	Pulse Repetition Interval
PSD	Power Spectral Density
PVT	Position, Velocity, Time
RASP	Reference Antenna Secondary Patterns
RCS	Radar Cross Section
RD	Reference Document
RDB	Radar Data-Base
RFI	Radio Frequency Interference
RGB	Red, Green, Blue
RMS	Root Mean Square
ROI	Region Of Interest
RO	RX-Only product
SAR	Synthetic Aperture Radar
SB	Single-Baseline
SCS	Single-look Complex Slant-range
SKP	Sum of Kronecker Products
SNR	Signal to Noise Ratio
STA	Coregistered Stack

Acronym	Description
TBC	To Be Confirmed
TBD	To Be Defined
TEC	Total Electron Content
TOM	Tomographic Phase

1.4. Symbols and Variables

Acronym	Description
/	/

1.5. Applicable documents

[AD1] [AUX_FMT] BIO-ESA-EOPG-EEGS-TN-0054, BIOMASS Auxiliary Product Format Definition, I/R 2/1

[AD2] [AUX_ICD] BIO-ESA-EOPG-EEGS-ID-0053, BIOMASS PDGS External Auxiliary Data Providers ICD, I/R 2/1

[AD3] [PROD_NAMING] BIO-ESA-EOPG-EEGS-TN-0050, BIOMASS Products Naming Convention, I/R 2/3

[AD4] [MPH] BIO-ESA-EOPG-EEGS-TN-0051, BIOMASS Products – Main Product Header Definition, I/R 2/3

[AD5] [EOCFI_FFS] PE-ID-ESA-GS-584, Earth Observation Mission Software File Format Specification, I/R 1/6

1.6. Reference documents

[RD1] [BPS_ICD] BPS Interface Control Document, I/R 3/0

[RD2] [BPS_IODD] BPS Processors Input and Output Data Definition, I/R 3/0/2

[RD3] Format description of IONEX 1, https://files.igs.org/pub/data/format/ionex1.pdf, February 1998

[RD4] International Reference Ionosphere (IRI), https://ccmc.gsfc.nasa.gov/modelweb/models/iri2016_vitmo.php

[RD5] Well-Known Text representation of coordinate reference systems, https://www.iso.org/standard/63094.html

[RD6] [L1_PDF] BIO-BPS-L1PFD-ARE-010076, BIOMASS L1 Product Format Specification, I/R 1/2/5

[RD7] [L2_FD_PFD] BIO-BPS-FDPFD-ARE-010258, BIOMASS Forest Disturbance Product Format Specification, I/R 3/0

[RD8] [L2_FH_PFD] BIO-BPS-FHPFD-ARE-010256, BIOMASS Forest Disturbance Product Format Specification, I/R 3/0

[RD9] [L2_AGB_PFD] BIO-BPS-AGBPFD-ARE-010257, BIOMASS Forest Disturbance Product Format Specification, I/R 3/0

[RD10] [L2_FH_ATBD] BIOMASS L2 FH ATBD, I/R, 2/1/2

[RD11] [L1_SAR_ATBD] BIO-BPS-L1-SAR-ATBD-ARE-010165, BIOMASS L1 SAR Product ATBD, I/R 1/1/2

[RD12] Network Common Data Form (NetCDF) format, https://www.unidata.ucar.edu/software/netcdf/

[RD13] Network Common Data Form (NetCDF), Python, https://unidata.github.io/netcdf4-python/

2. BPS and Auxiliary Products Overview

BIOMASS is a fully polarimetric SAR mission with its radar instrument relying on a single imaging mode, being Stripmap (SM), declined into 3 different swaths (S1, S2, S3) to achieve the global coverage.

During routine phase a wide family of products, including Level-1, Level-2 and Level-3 ones, is generated by the BIOMASS Processors running in the operational processing environment which is part of the PDGS. The generation of such products requires supporting data (named “Auxiliary Products”) that contains information not available in the Instrument Source Packets (ISP). Such information must be retrieved from external inputs in order to allow the processing performed by the BIOMASS Processors. All the details about Auxiliary Products main characteristics are reported in [RD2], while their usage by BPS Processors is described in [RD1].

The complete list is reported in the following table.

Product Type	Name	Description
AUX_ORB___	Auxiliary Orbit	Navigation PVT sequence generated by the satellite platform.
AUX_ATT___	Auxiliary Attitude	Quaternions sequence generated by the satellite platform
AUX_INS___	Auxiliary Instrument Parameters	BIOMASS SAR instrument parameters needed by the L1 Processor.
AUX_PP1___	Auxiliary L1 Processing Parameters	Configuration parameters for the L1 Processor.
AUX_PPS___	Auxiliary Stack Processing Parameters	Configuration parameters for the Stack Processor.
AUX_PP2_2A	Auxiliary L2a Processing Parameters	Configuration parameters for the L2a Processor.
AUX_PP2_FD	Auxiliary L2b FD Processing Parameters	Configuration parameters for the L2b Processor (FD task).
AUX_PP2_FH	Auxiliary L2b FH Processing Parameters	Configuration parameters for the L2b Processor (FH task).
AUX_PP2_AB	Auxiliary L2b AB Processing Parameters	Configuration parameters for the L2b Processor (AGB task).
AUX_PP3___	Auxiliary L3 Processing	Configuration parameters for the L3 Processor.

	Parameters	
PARC_INFO_	Auxiliary Calibration Site Information	Transponder information, including geographic position and scattering delays.
AUX_TEC___	Auxiliary TEC Map	IONEX maps providing the Total Electron Content (TEC). Used during ionospheric correction step.

Tab.1 BPS Auxiliary Products.

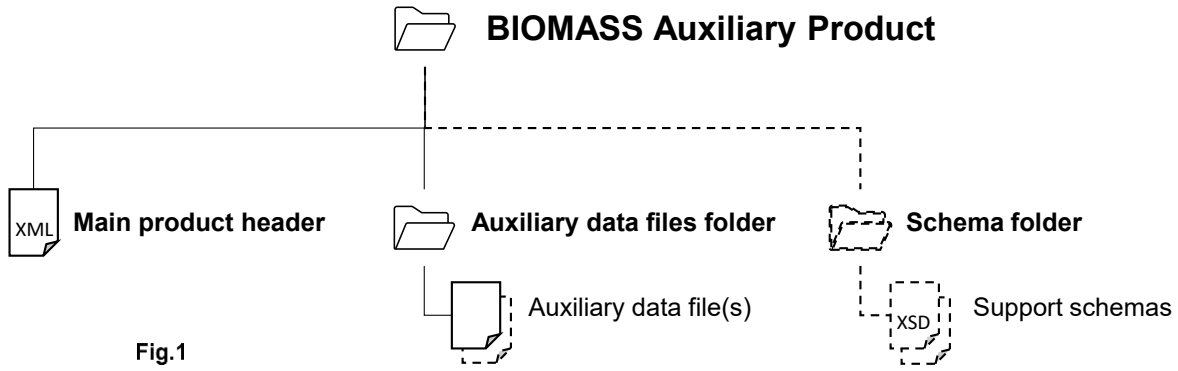
In Sec. 3 an overview of Auxiliary Products format is provided, while their detailed description is included in Sec 4.

3. Auxiliary Products Format Overview

The BIOMASS Auxiliary Products are structured as a collection of files that are grouped together and formatted as a folder containing the following components:

- a main product header, an XML file including high-level information about the product origin, structure and main metadata;
- an auxiliary data set, constituted by one or more files that contains the specific information required by the BIOMASS Processors for image processing. The exact content and format of these files depends on the type of information they contain;
- a representation data set, constituted by one or more XML Schema Definition (XSD) files defining the format and content of the auxiliary data files to which they apply. This component has to be considered optional because it shall not be used in case auxiliary data files format is not XML. They can be used to validate the structure and content of the auxiliary data files and to read them.

This generic structure is depicted in the following figure. The customizations applied for each Auxiliary Product are described in the corresponding sub-section of Sec. 4.



Auxiliary Products generic structure.

3.1. Format definition guidelines

The structure presented in the previous section is applicable to all the Auxiliary Products. While this is automatically achieved for those which format has been defined from the scratch following provided guidelines [AD1], some actions are required in order to apply it also to those already having their own native format (e.g., TEC Map, …).

This procedure can be summarised by the following steps:

- the auxiliary data set is copied as content of the data sub-folder of the Auxiliary Product structure. In this way the native file(s) format is not impacted and the applicable specifications are still valid;

- if the file(s) copied are in XML format, the related XSD file(s) are inserted as content of the support sub-folder of Auxiliary Product structure;
- the main product header file is created and inserted as main leaf of the Auxiliary Product tree;
- all the files and folders, including the main one constituting the Auxiliary Product itself, are renamed according to [AD3].

3.2. Naming convention

The Auxiliary Products and all data sets files naming are addressed and described in details in [AD3].
Recalling the main points, the naming of the products directories is the following:

`<MMM>_<TTTTTTTTTT>_<yyyymmddThhmmss>_<YYYYMMDDTHHMMSS>_<BB>_<DDDDDD>`

where:

- `<MMM>`: Satellite ID;
- `<TTTTTTTTTT>`: Product Type/File Type, padded with underscores "_" if needed (e.g.: `AUX_ORB___`, `AUX_ATT___`, `AUX_INS___`, `AUX_PP1___`, …);
- `<yyyymmddThhmmss>`: UTC start date and time;
- `<YYYYMMDDTHHMMSS>`: UTC stop date and time;
- `<BB>`: Baseline Identifier;
- `<DDDDDD>`: Compact creation date.

The internal files in the Auxiliary Products inherit the same naming convention, with the following changes:

- capital letters conversion to lowercase;
- "Baseline Identifier and "Compact Creation Date" naming parts removal, except for Main Product Header file;
- addition of a dataset type depending suffix (optional, typically not used) and extension (related to file format, e.g. `.xml`, `.xsd`, …).

3.3. Format description guidelines and conventions

The content of auxiliary data files exploiting XML format is described throughout the whole document making use of tables like the one here below depicted.

Name	Description	Data Type	Cardinality

Tab.2 Generic DSR format description table.

All the tables share the same structure and are filled following the same conventions, i.e.:

- Name: defines the name of the element or attribute;
- Description: describes the purpose of the element or attribute including the units (if applicable). The absence of a unit designation for string data types implies a string literal and for numerical data types (integers, floats, etc…) the absence of a unit designation implies an absolute number;
- Data Type: defines the data type of the element or attribute;
- Cardinality: for elements, this column defines the number of occurrences of the element in the form `minOccurs..maxOccurs`; for attributes, “optional” means the attribute may or may not be present and “required” means the presence of the attribute is mandatory. For L3 products, TE (Total Existing) refers to the number of existing L2b product over current tiles. L3 processor take in input TE AGB,FH and FD L2b products.

In general, elements are displayed in normal font, attributes are displayed in *italics*.
Data types requiring a dedicated definition table are underlined, for all the others the common reference is Sec. 5.1.

4. Auxiliary Products Format Specification

4.1. AUX_ORB___: Auxiliary Orbit

The Auxiliary Orbit product (file type AUX_ORB___) contains the navigation PVT sequence generated by the satellite platform. The position and velocity records are represented as ECEF reference frame state vectors pointing to SAR reference frame origin, stored as a unique file (located in the Auxiliary Product *data* subfolder) following the format of the EO Mission CFI SW Format Specification [AD5].

4.2. AUX_ATT___: Auxiliary Attitude

The Auxiliary Attitude product (file type AUX_ATT___) contains the quaternions sequence generated by the satellite platform. The attitude records are represented as quaternions describing the rotation from ECEF to SAR reference frame (then already converted from ECI reference frame), stored as a unique file (located in the Auxiliary Product *data* subfolder) following the format of the EO Mission CFI SW Format Specification [AD5].

4.3. AUX_INS___: Auxiliary Instrument Parameters

The Auxiliary Instrument Parameters product (file type AUX_INS___) contains the BIOMASS SAR instrument parameters needed by the L1 Processor. The relevant parameters for the L1 processing are copied from the instrument Radar Data Base (RDB) and from the Antenna Model outputs.

This product is composed by:

- an XML file, plus the corresponding XSD one, describing all the needed SAR instrument parameters;
- a NetCDF file, describing the antenna patterns;
- six NetCDF files, describing the internal chirp database;
- a NetCDF file, describing the on-board filters;

included in the folder structure described in Sec. 3.

This section describes in details the content of these files.

4.3.1. SAR instrument parameters file

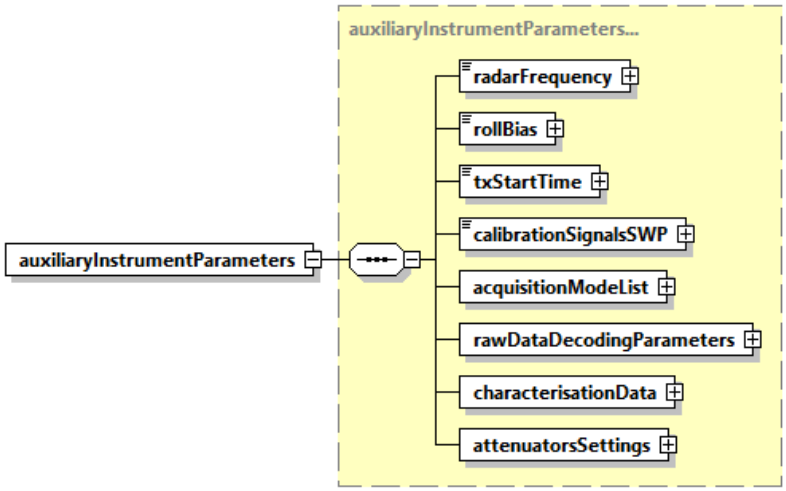


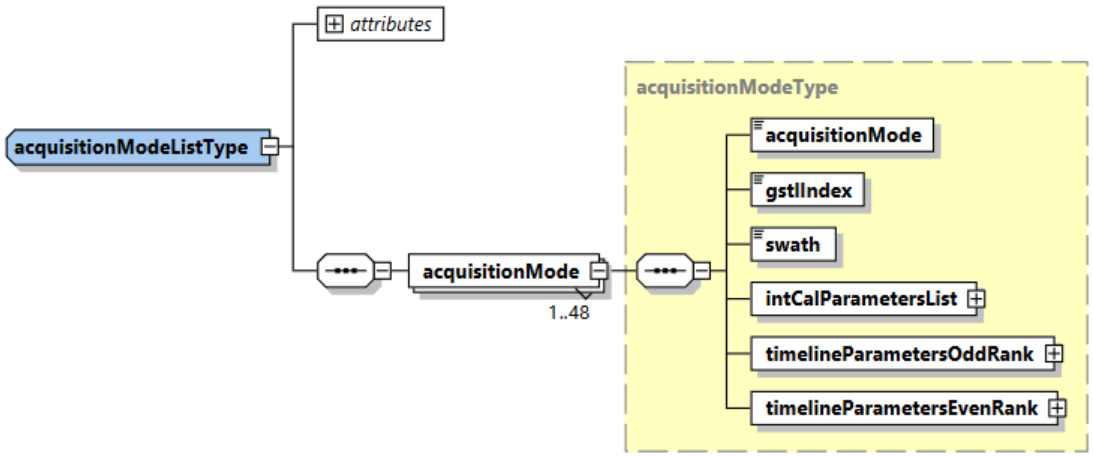
Fig.2

Auxiliary Instrument Parameters (auxiliaryInstrumentParametersType).

Name	Description	Data Type	Cardinality
radarFrequency	Radar frequency [Hz].	floatWithUnit	1
rollBias	Bias to be added to roll estimated from attitude to offset	floatWithUnit	1

	it (by default set to 0) [deg].		
txStartTime	TX start time (T9) [s].	floatWithUnit	1
calibrationSignalsSWP	Calibration signals Sampling Window Position (SWP) [s].	floatWithUnit	1
acquisitionModeList	List of instrument parameters for each foreseen acquisition mode (i.e., S1 INT, S1 TOM, S2 INT, ...). Each acquisition mode is one-to-one associated with a GSTL index.	acquisitionModeListType	1
rawDataDecodingParameters	Raw data decoding parameters.	rawDataDecodingParametersType	1
characterisationData	Characterization data.	characterisationDataType	1
attenuatorsSettings	Attenuators settings.	attenuatorsSettingsType	1

Tab.3 Auxiliary Instrument Parameters (auxiliaryInstrumentParametersType description).



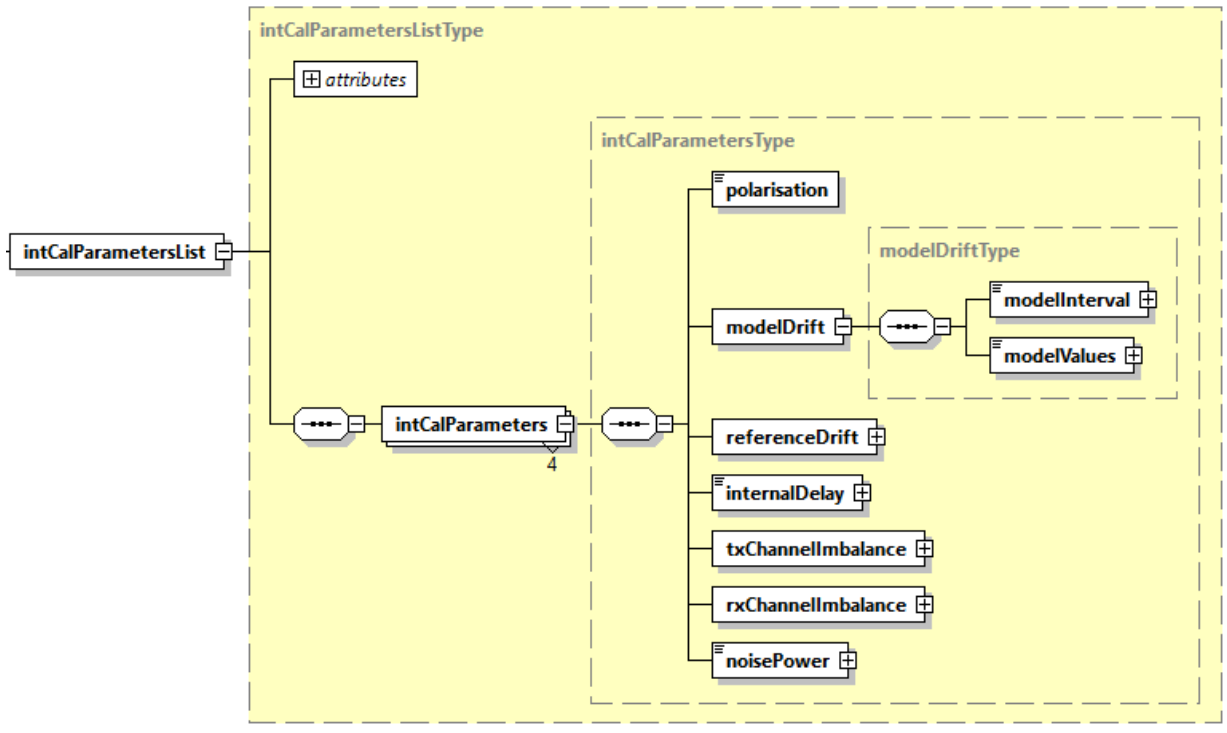
Auxiliary Instrument Parameters (acquisitionModeListType).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
acquisitionMode	Instrument parameters for a given acquisition mode. The maximum number of entries in the list is set to 48, i.e. the currently foreseen number of GSTL indexes.	acquisitionModeType	1.. 48

Tab.4 Auxiliary Instrument Parameters (acquisitionModeListType description).

Name	Description	Data Type	Cardinality
acquisitionMode	Acquisition mode (i.e., S1 INT, S1 TOM, S2 INT, ...).	acquisitionModeIDType	1
gstlIndex	Generic SAR Mode Timeline (GSTL) index.	Xsd:unsignedInt	1
swath	Swath (S1, S2, S3).	swathType	1
intCalParametersList	Swath- and polarization-dependent instrument parameters.	intCalParametersListType	1
timelineParametersOddRank	Expected packet transmission sequence in case of odd rank.	timelineParametersType	1
timelineParametersEvenRank	Expected packet transmission sequence in case of even rank.	timelineParametersType	1

Tab.5 Auxiliary Instrument Parameters (acquisitionModeType description).



Auxiliary Instrument Parameters (intCalParametersListType).

Name	Description	Data Type	Cardinality

count		*xsd:unsignedInt*	*required*
intCalParameters	Instrument parameters for all the polarizations of a given swath.	intCalParametersType	4 .. 4

Tab.6 Auxiliary Instrument Parameters (intCalParametersListType description).

Name	Description	Data Type	Cardinality
polarisation	Polarisation to which this set of internal calibration parameters applies.	polarisationType	1
modelDrift	Model drift. The model is relative to the ascending node of the current orbit. Already includes transmit and receive channel imbalances.	modelDriftType	1
referenceDrift	Reference value for the normalization of the drifts.	Complex	1
internalDelay	Internal time delay [s] to be applied to range compressed data. The L1 Processor uses this parameter only in case ideal chirp is used and internal delay cannot be derived from internal calibration pulses.	floatWithUnit	1
txChannelImbalance	Transmit channel imbalance to be applied to range compressed data. The L1 Processor uses this parameter only in case ideal chirp is used and channel imbalance cannot be derived from internal calibration pulses.	Complex	1
rxChannelImbalance	Receive channel imbalance to be applied to range compressed data. The L1 Processor uses this parameter only in case ideal chirp is used and channel imbalance cannot be derived from internal calibration pulses.	Complex	1
txPowerTracking	Transmit power tracking to be used for the computation of the combined secondary transmit patterns from the individual doublet patterns. The L1 Processor uses this parameter only in case it cannot be derived from internal calibration pulses.	Complex	1
noisePower	Nominal noise power value used in processing in case it cannot be derived from noise pulses [dB].	floatWithUnit	1

Tab.7 Auxiliary Instrument Parameters (intCalParametersType description).

Name	Description	Data Type	Cardinality
modelInterval	Interval between adjacent model values in the list [s].	floatWithUnit	1
modelValues	Array of modelled complex values. The array contains "count"	complexArray	1

	complex floating point values separated by spaces. The first value in the array corresponds to the time at the ascending node of the current orbit. Model values for times that fall between the points in the model are obtained by linear interpolation between the two nearest points.		

Tab.8 Auxiliary Instrument Parameters (modelDriftType description).

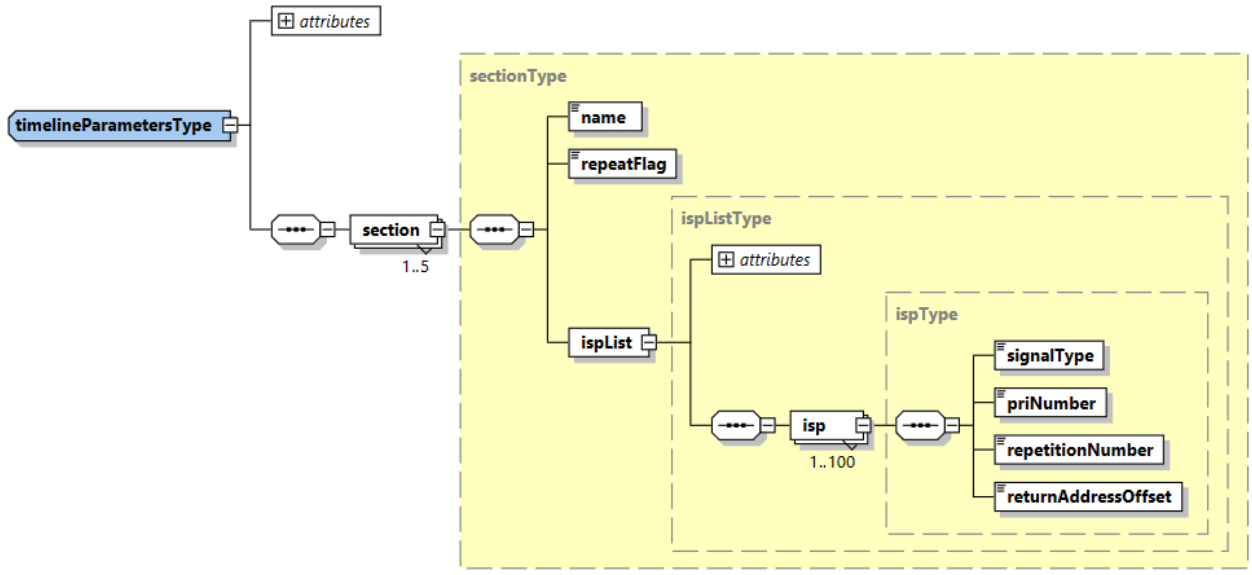


Fig.5 Auxiliary Instrument Parameters (timelineParametersType).

Name	Description	Data Type	Cardinality
count		*Xsd:unsignedInt*	*required*
section	Timeline section. The maximum number of timeline sections is set to 5: preamble, initial slot, central slot (including internal calibration sequence followed by science data sequence), final slot, postamble. Initial and final slots are typically partial, while central slot is typically repeated.	sectionType	1 .. 5

Tab.9 Auxiliary Instrument Parameters (timelineParametersType description).

Name	Description	Data Type	Cardinality
name	Section name.	xsd:string	1
repeatFlag	Section repeat flag. True for central slot, False otherwise.	Bool	1
ispList	List of expected ISP within this section in the order they should be	ispListType	1

	received.		

Tab.10 Auxiliary Instrument Parameters (sectionType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
isp	Element describing one unique or a series of unique transmission packets. The packets are identified by the packet signal type, the number of PRIs, the number of repetitions and the Return Address Offset (RAO).	ispType	1.. 100

Tab.11 Auxiliary Instrument Parameters (ispListType description).

Name	Description	Data Type	Cardinality
signalType	Signal type.	signalType	1
priNumber	Number of repetition of the current entry.	Xsd:unsignedInt	1
repetitionNumber	Number of repetition of the block framed by the current entry and the entry identified together with the Return Address Offset (RAO) parameter. Set to -1 in case the number is not fixed (e.g., for initial and final slots).	Xsd:int	1
returnAddressOffset	Offset identifying the entry where a repeated block starts.	Xsd:unsignedInt	1

Tab.12 Auxiliary Instrument Parameters (ispType description).

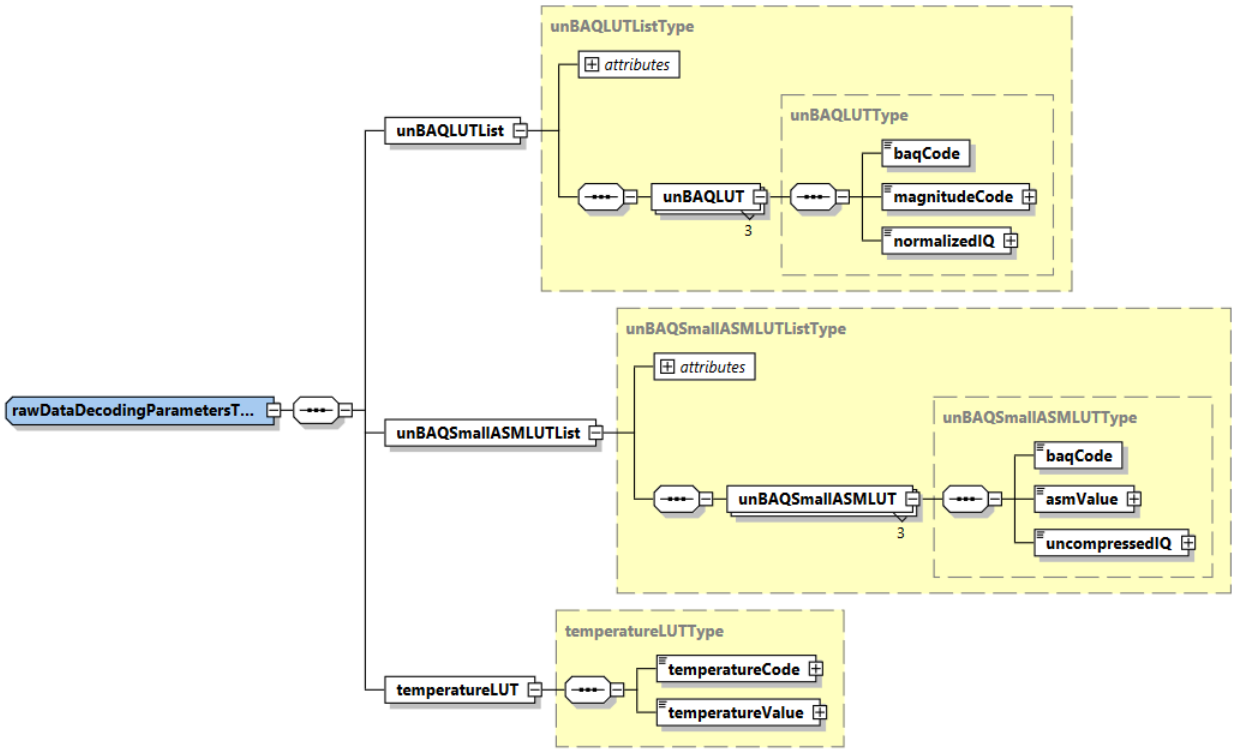


Fig.6 Auxiliary Instrument Parameters (rawDataDecodingParametersType).

Name	Description	Data Type	Cardinality
unBAQLUTList	BAQ uncompressing look-up tables. These LUT are taken from SAR Data ICD document.	unBAQLUTListType	1
unBAQSmallASMLUTList	BAQ uncompressing look-up tables for small ASM values and maximum magnitude. These LUT are taken from SAR Data ICD document.	unBAQSmallASMLUTListType	1
temperatureLUT	Temperature calibration curve. This LUT is taken from SAR Data ICD document.	temperatureLUTType	1

Tab.13 Auxiliary Instrument Parameters (rawDataDecodingParametersType description).

Name	Description	Data Type	Cardinality
unBAQLUT	BAQ uncompressing look-up table for given BAQ code.	unBAQLUTType	3

Tab.14 Auxiliary Instrument Parameters (unBAQLUTListType description).

Name	Description	Data Type	Cardinality
baqCode	BAQ code (BAQ 4 Bit, BAQ 5 Bit or BAQ 6 Bit).	dataFormatModeType	1
magnitudeCode	Magnitude codes array.	intArray	1
normalizedIQ	Normalized I and Q value for each magnitude code in magnitudeCode array.	floatArray	1

Tab.15 Auxiliary Instrument Parameters (unBAQLUTType description).

Name	Description	Data Type	Cardinality
unBAQSmallASMLUT	BAQ uncompressing look-up table for small ASM values and maximum magnitude for given BAQ code.	unBAQSmallASMLUTType	3

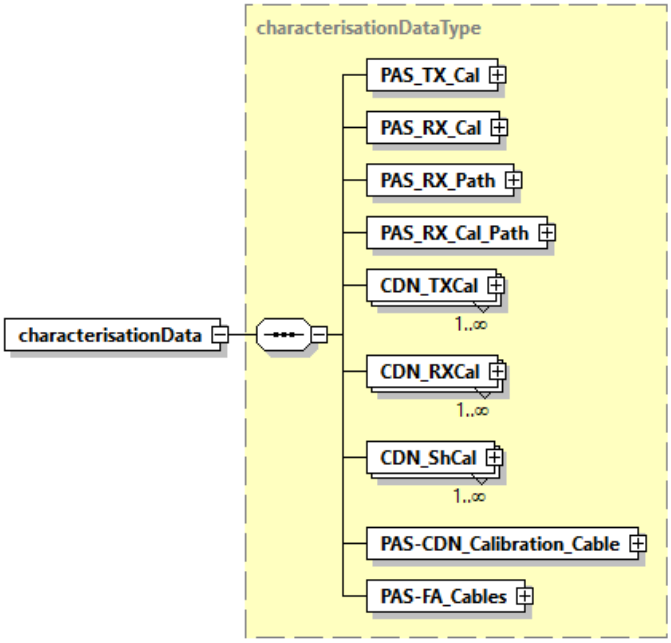
Tab.16 Auxiliary Instrument Parameters (unBAQSmallASMLUTListType description).

Name	Description	Data Type	Cardinality
baqCode	BAQ code (BAQ 4 Bit, BAQ 5 Bit or BAQ 6 Bit).	dataFormatModeType	1
asmValue	Average Signal Magnitude (ASM) values array.	intArray	1
uncompressedIQ	Uncompressed I and Q value for each ASM value in asmValue array.	floatArray	1

Tab.17 Auxiliary Instrument Parameters (unBAQSmallASMLUTType description).

Name	Description	Data Type	Cardinality
temperatureCode	Temperature codes array.	intArray	1
temperatureValue	Temperature value [C] for each temperature code in temperatureCode array.	floatArray	1

Tab.18 Auxiliary Instrument Parameters (temperatureLUTType description).



Auxiliary Instrument Parameters (characterisationDataType).

Fig.7

Name	Description	Data Type	Cardinality
PAS_TX_Cal	PAS characterization data for PAS TX Cal (PAS-4452)	PAS_TX_Cal_Type	1
PAS_RX_Cal	Derived PAS RX Cal polynomial based on PAS characterization data	PAS_RX_Cal_Type	1
PAS_RX_Path	Derived PAS RX Cal polynomial based on PAS characterization data	PAS_RX_Path_Type	1
PAS_RX_Cal_Path	PAS characterization data for PAS RX Cal Path (PAS-4454)	PAS_RX_Cal_Path_Type	1
CDN_TXCal	CDN characterization data TXCal (CDN-390) for each combination of attenuators settings	CDN_TXCal_Type	1..inf
CDN_RXCal	CDN characterization data RXCal (CDN-390) for each combination of attenuators settings	CDN_RXCal_Type	1..inf
CDN_ShCal	CDN characterization data ShCal (CDN-390) for each combination of attenuators settings	CDN_ShCal_Type	1..inf

PAS-CDN_Calibration_Cable	PAS-CDN Calibration cable characterization data (HAR-5524)	PAS-CDN_Calibration_Cable_Type	1
PAS-FA_Cables	PAS-FA cable characterization data (HAR-5525)	PAS-FA_Cables_Type	1

Tab.19 Auxiliary Instrument Parameters (characterisationDataType description).

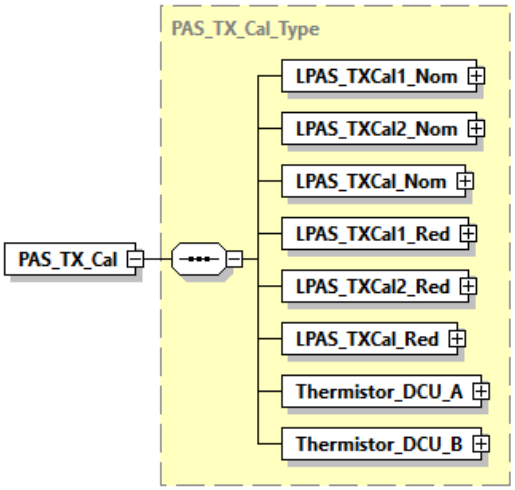
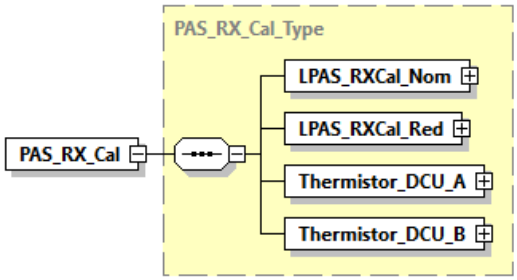


Fig.8 Auxiliary Instrument Parameters (PAS_TX_Cal_Type).

Name	Description	Data Type	Cardinality
LPAS_TXCal1_Nom	LPAS_TXCal1_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_TXCal2_Nom	LPAS_TXCal2_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_TXCal_Nom	LPAS_TXCal_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_TXCal1_Red	LPAS_TXCal1_Red polynomials	Temp_Freq_Variation_Type	1
LPAS_TXCal2_Red	LPAS_TXCal2_Red polynomials	Temp_Freq_Variation_Type	1
LPAS_TXCal_Red	LPAS_TXCal_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.20 Auxiliary Instrument Parameters (PAS_TX_Cal_Type description).



Auxiliary Instrument Parameters (PAS_RX_Cal_Type).

Name	Description	Data Type	Cardinality
LPAS_RXCal_Nom	LPAS_RXCal_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_RXCal_Red	LPAS_RXCal_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.21 Auxiliary Instrument Parameters (PAS_RX_Cal_Type description).

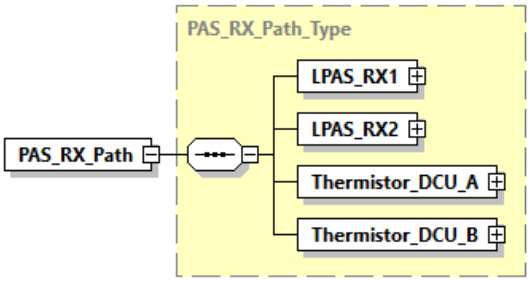
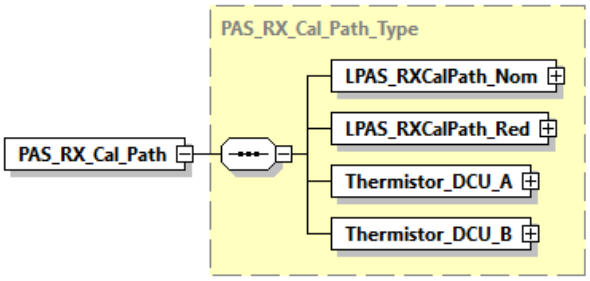


Fig.10

Auxiliary Instrument Parameters (PAS_RX_Path_Type).

Name	Description	Data Type	Cardinality
LPAS_RX1	LPAS_RX1 polynomials	Temp_Freq_Variation_Type	1
LPAS_RX2	LPAS_RX2 polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.22 Auxiliary Instrument Parameters (PAS_RX_Path_Type description).



Auxiliary Instrument Parameters (PAS_RX_Cal_Path_Type).

Name	Description	Data Type	Cardinality
LPAS_RXCalPath_Nom	LPAS_RXCalPath_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_RXCalPath_Red	LPAS_RXCalPath_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.23 Auxiliary Instrument Parameters (PAS_RX_Cal_Path_Type description).

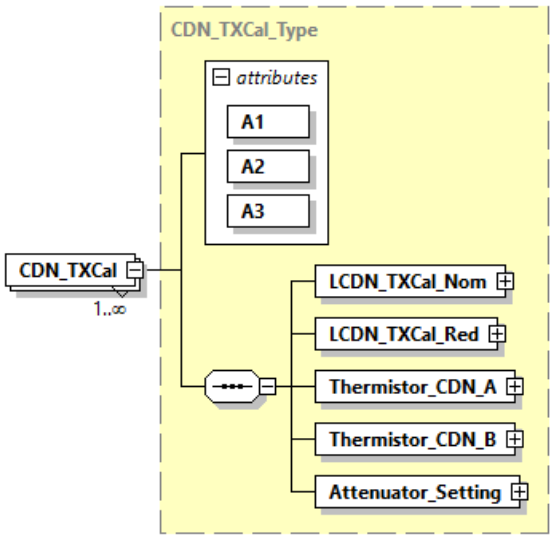


Fig.12

Auxiliary Instrument Parameters (CDN_TXCal_Type).

Name	Description	Data Type	Cardinality
LCDN_TXCal_Nom	LCDN_TXCal_Nom polynomials	Temp_Freq_Variation_Type	1
LCDN_TXCal_Red	LCDN_TXCal_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_CDN_A	Thermistor CDN A weights	Temp_Freq_Variation_2_Type	1
Thermistor_CDN_B	Thermistor CDN B weights	Temp_Freq_Variation_2_Type	1
Attenuator_Setting	Attenuators setting	Attenuator_Setting_Type	1

Tab.24 Auxiliary Instrument Parameters (CDN_TXCal_Type description).

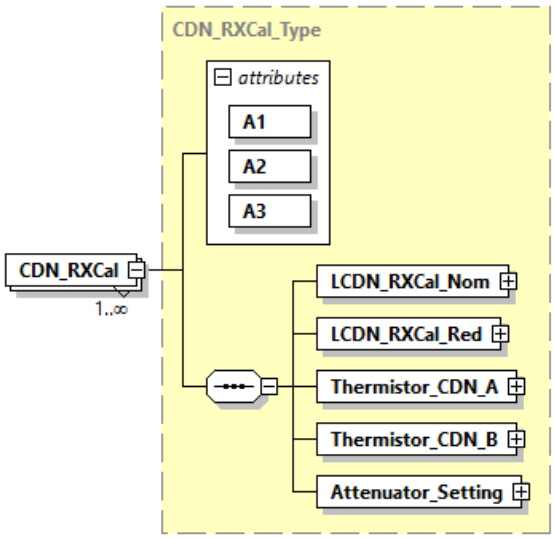
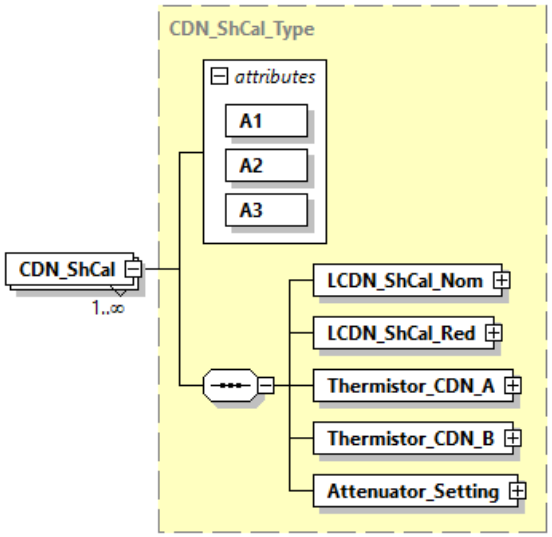


Fig.13 Auxiliary Instrument Parameters (CDN_RXCal_Type).

Name	Description	Data Type	Cardinality
LCDN_RXCal_Nom	LCDN_RXCal_Nom polynomials	Temp_Freq_Variation_Type	1
LCDN_RXCal_Red	LCDN_RXCal_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_CDN_A	Thermistor CDN A weights	Temp_Freq_Variation_2_Type	1
Thermistor_CDN_B	Thermistor CDN B weights	Temp_Freq_Variation_2_Type	1
Attenuator_Setting	Attenuators setting	Attenuator_Setting_Type	1

Tab.25 Auxiliary Instrument Parameters (CDN_RXCal_Type description).



Auxiliary Instrument Parameters (CDN_ShCal_Type).

Fig.14

Name	Description	Data Type	Cardinality
LCDN_ShCal_Nom	LCDN_ShCal_Nom polynomials	Temp_Freq_Variation_Type	1
LCDN_ShCal_Red	LCDN_ShCal_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_CDN_A	Thermistor CDN A weights	Temp_Freq_Variation_2_Type	1
Thermistor_CDN_B	Thermistor CDN B weights	Temp_Freq_Variation_2_Type	1
Attenuator_Setting	Attenuators setting	Attenuator_Setting_Type	1

Tab.26 Auxiliary Instrument Parameters (CDN_ShCal_Type description).

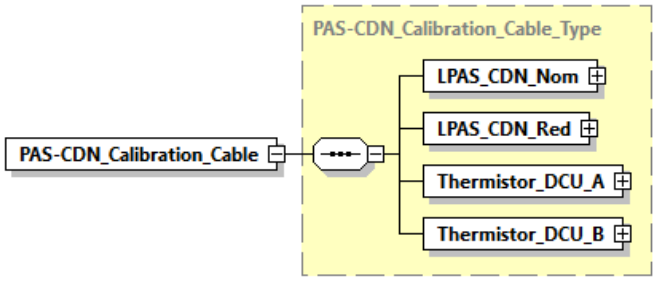


Fig.15

Auxiliary Instrument Parameters (PAS-CDN_Calibration_Cable_Type).

Name	Description	Data Type	Cardinality
LPAS_CDN_Nom	LPAS_CDN_Nom polynomials	Temp_Freq_Variation_Type	1
LPAS_CDN_Red	LPAS_CDN_Red polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.27 Auxiliary Instrument Parameters (PAS-CDN_Calibration_Cable_Type description).

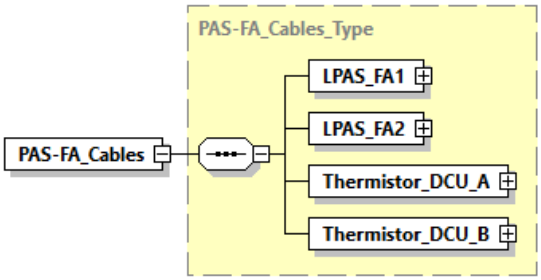
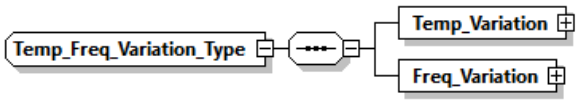


Fig.16 Auxiliary Instrument Parameters (PAS-FA_Cable_Type).

Name	Description	Data Type	Cardinality
LPAS_FA1	LPAS_FA1 polynomials	Temp_Freq_Variation_Type	1
LPAS_FA2	LPAS_FA2 polynomials	Temp_Freq_Variation_Type	1
Thermistor_DCU_A	Thermistor DCU A weights	Temp_Freq_Variation_2_Type	1
Thermistor_DCU_B	Thermistor DCU B weights	Temp_Freq_Variation_2_Type	1

Tab.28 Auxiliary Instrument Parameters (PAS-FA_Cable_Type description).

Fig.17



Auxiliary Instrument Parameters (Temp_Freq_Variation_Type).

Name	Description	Data Type	Cardinality

Temp_Variation	Polynomials describing variation with temperature	Temp_Variation_Type	1
Freq_Variation	Polynomials describing variation with frequency	Freq_Variation_Type	1

Tab.29 Auxiliary Instrument Parameters (Temp_Freq_Variation_Type description).

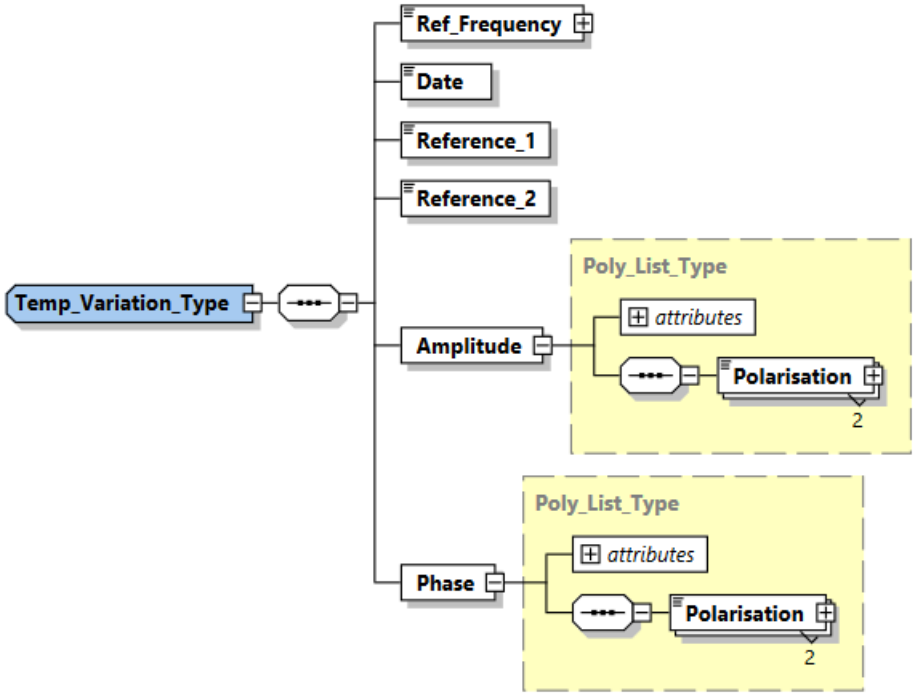


Fig.16 Auxiliary Instrument Parameters (Temp_Variation_Type).

Name	Description	Data Type	Cardinality
Ref_Frequency	Reference frequency [MHz]	floatWithUnit	1
Date	Reference date [UTC]	xsd:string	1
Reference_1	Reference document #1	xsd:string	1
Reference_2	Reference document #2	xsd:string	1
Amplitude	Amplitude polynomials	Poly_List_Type	1
Phase	Phase polynomials	Poly_List_Type	1

Tab.30 Auxiliary Instrument Parameters (Temp_Variation_Type description).

Name	Description	Data Type	Cardinality
Polarisation	Polynomial coefficients for current polarization	Poly_Type (extension of floatArray)	2

Tab.31 Auxiliary Instrument Parameters (Poly_List_Type description).

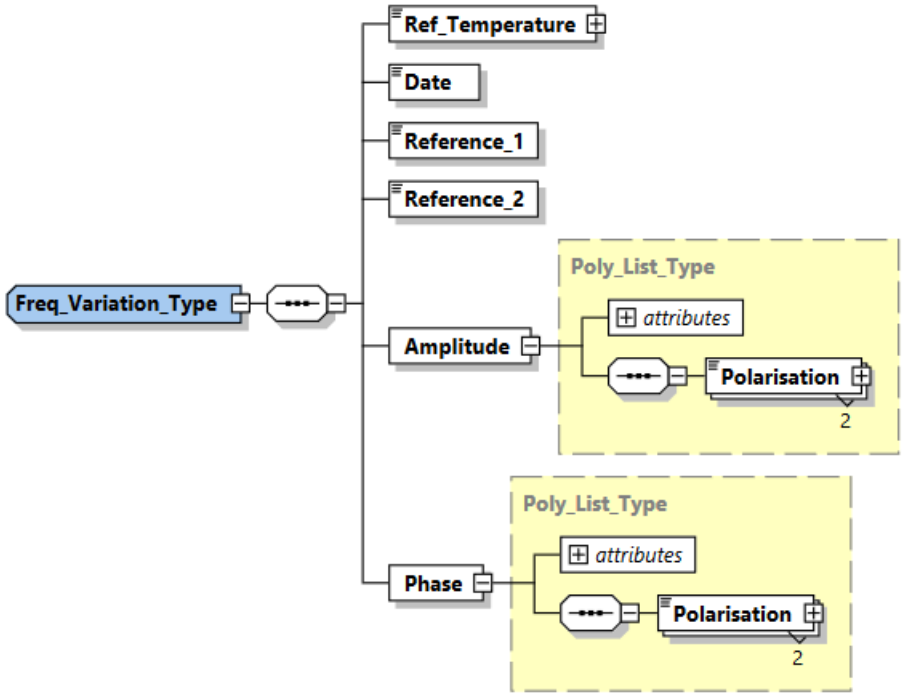


Fig.19 Auxiliary Instrument Parameters (Freq_Variation_Type).

Name	Description	Data Type	Cardinality
Ref_Temperature	Reference temperature [C]	floatWithUnit	1
Date	Reference date [UTC]	xsd:string	1
Reference_1	Reference document #1	xsd:string	1
Reference_2	Reference document #2	xsd:string	1
Amplitude	Amplitude polynomials	Poly_List_Type	1
Phase	Phase polynomials	Poly_List_Type	1

Tab.32 Auxiliary Instrument Parameters (Freq_Variation_Type description).

Auxiliary Instrument Parameters (Temp_Freq_Variation_2_Type).

Name	Description	Data Type	Cardinality
Freq_Variation	Weights describing variation with frequency	Freq_Variation_2_Type	1

Tab.33 Auxiliary Instrument Parameters (Temp_Freq_Variation_2_Type description).

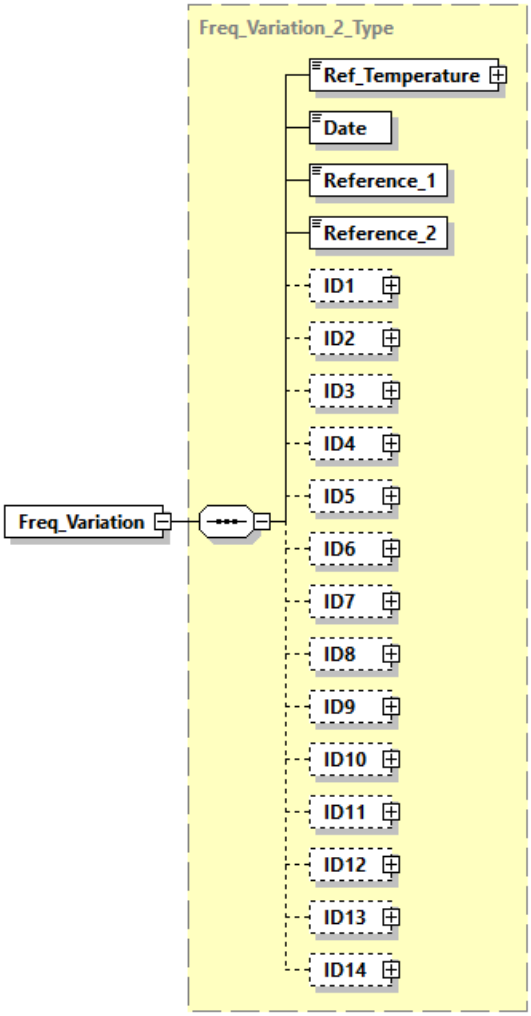


Fig.21

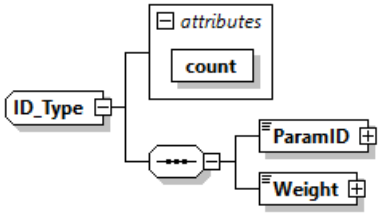
Auxiliary Instrument Parameters (Freq_Variation_2_Type).

Name	Description	Data Type	Cardinality

Ref_Temperature	Reference temperature [C]	floatWithUnit	1
Date	Reference date [UTC]	xsd:string	1
Reference_1	Reference document #1	xsd:string	1
Reference_2	Reference document #2	xsd:string	1
ID1	ID1 weigths	ID_Type	0..1
ID2	ID2 weigths	ID_Type	0..1
ID3	ID3 weigths	ID_Type	0..1
ID4	ID4 weigths	ID_Type	0..1
ID5	ID5 weigths	ID_Type	0..1
ID6	ID6 weigths	ID_Type	0..1
ID7	ID7 weigths	ID_Type	0..1
ID8	ID8 weigths	ID_Type	0..1
ID9	ID9 weigths	ID_Type	0..1
ID10	ID10 weigths	ID_Type	0..1
ID11	ID11 weigths	ID_Type	0..1
ID12	ID12 weigths	ID_Type	0..1
ID13	ID13 weigths	ID_Type	0..1
ID14	ID14 weigths	ID_Type	0..1

Tab.34 Auxiliary Instrument Parameters (Freq_Variation_2_Type description).

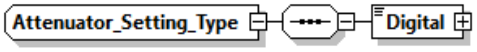
Fig.22



Auxiliary Instrument Parameters (ID_Type).

Name	Description	Data Type	Cardinality
ParamID	ParamID list	floatArray	1
Weight	Weights list	floatArray	1

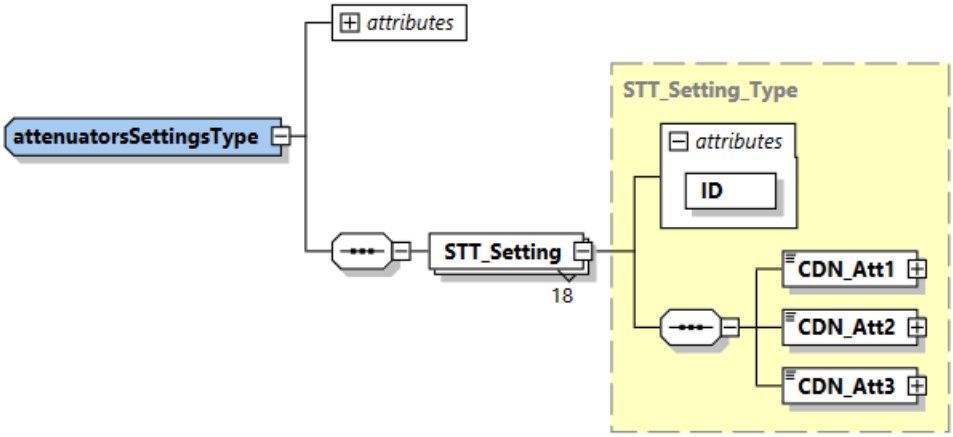
Tab.35 Auxiliary Instrument Parameters (ID_Type description).



Auxiliary Instrument Parameters (Attenuator_Setting_Type).

Name	Description	Data Type	Cardinality
Digital	List of settings for the 3 attenuators (A1, A2, A3)	floatArray	1

Tab.36 Auxiliary Instrument Parameters (Attenuator_Setting_Type description).



Fi

Auxiliary Instrument Parameters (attenuatorsSettingsType).

Name	Description	Data Type	Cardinality
STT_Setting	List of attenuators settings (one for each ID=XY, with X=[A..I] and Y=[A..I])	STT_Setting_Type	18

Tab.37 Auxiliary Instrument Parameters (attenuatorsSettingsType description).

Name	Description	Data Type	Cardinality
CDN_Att1	List of settings for attenuator A1 (one for each signal type)	floatArray	1
CDN_Att2	List of settings for attenuator A2 (one for each signal type)	floatArray	1
CDN_Att3	List of settings for attenuator A3 (one for each signal type)	floatArray	1

Tab.38 Auxiliary Instrument Parameters (STT_Setting_Type description).

4.3.2. Antenna patterns files

The antenna patterns NetCDF file [RD12] [RD13] contains the two-dimensional H and V polarisation doublet 1 and 2 antenna patterns to be used during processing.
The file is organised as follows:

- a series of root level *attributes*, containing all those global attributes referring to the file as a whole;
- a *dimensions* group, where names and lengths of the dimensions used when creating data arrays (variables) are defined;
- a series of *coordinate variables*, containing special variables to store the axes data values for each dimension in the *dimensions* group;
- a series of *components*, each one composed by a group of variables which can be divided in:
    - the data arrays, storing the antenna patterns themselves. A variable represents an array of values of the same data type and it is defined over two or more dimensions from the *dimensions* group;
    - ancillary scalar variables containing other useful metadata to complete the data definition.

Attributes
The table below describes the attributes.

Name	Description	Data Type	Cardinality
description	High-level description of the file content.	string	1
type	Antenna pattern type (RASP or CDASP).	string	1
frequency	Carrier frequency [Hz].	double	1

source	Applicable document code.	string	1
sourceVersion	Applicable document version.	string	1
sourceFile	Source file (Antenna Model output).	string	1
fileOriginator	File originator.	string	1
fileOriginationDate	File origination date.	string	1

Tab.39 Antenna patterns file attributes

Dimensions / Coordinate variables

The table below describes the dimensions and coordinate variables.

Name	Description	Data Type	Cardinality
elevationAngle	Elevation angle axis (default: 351 samples from -37.24 deg to 37.24 deg) [deg].	float	1
azimuthAngle	Azimuth angle axis (default: 351 samples from -37.24 deg to 37.24 deg) [deg].	float	1

Tab.40 Antenna patterns file dimensions and coordinate variables

Group of variables

The table below describes the group of variables.

Name	Description	Data Type	Cardinality
group: antennaPatterns variable: patternD1HH	Two-dimensional map describing the antenna pattern for doublet D1 and polarization HH (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: patternD1HV	Two-dimensional map describing the antenna pattern for doublet D1 and polarization HV (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: patternD1VH	Two-dimensional map describing the antenna pattern for doublet D1 and polarization VH (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: patternD1VV	Two-dimensional map describing the antenna pattern for doublet D1 and polarization VV (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns	Two-dimensional map describing the antenna pattern for doublet D2 and polarization HH (dimensions: elevationAngle,	compound	1

variable: patternD2HH	azimuthAngle).	float complex	
group: antennaPatterns variable: patternD2HV	Two-dimensional map describing the antenna pattern for doublet D2 and polarization HV (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: patternD2VH	Two-dimensional map describing the antenna pattern for doublet D2 and polarization VH (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: patternD2VV	Two-dimensional map describing the antenna pattern for doublet D2 and polarization VV (dimensions: elevationAngle, azimuthAngle).	compound float complex	1
group: antennaPatterns variable: pixelType	Pixels data type.	string	1
group: antennaPatterns variable: noDataValue	Pixel value in case of invalid data.	double	1

Tab.41 Antenna patterns file group of variables

4.3.3. Internal chirp database files

The internal chirp database NetCDF files [RD12] [RD13] contain reference chirp replicas to be optionally used during processing. There will be in total six files, one per each swath (S1, S2 and S3) and one per each mission phase (Interferometric and Tomographic).
Each file is organised as follows:

- a series of root level *attributes*, containing all those global attributes referring to the file as a whole;
- a *dimensions* group, where names and lengths of the dimensions used when creating data arrays (variables) are defined;
- a series of *coordinate variables*, containing special variables to store the axes data values for each dimension in the *dimensions* group;
- a series of *components*, each one composed by a group of variables which can be divided in:
    - the data arrays, storing the chirp replicas themselves. A variable represents an array of values of the same data type and it is defined over two or more dimensions from the *dimensions* group;
    - ancillary scalar variables containing other useful metadata to complete the data definition.

Attributes
The table below describes the attributes.

Name	Description	Data Type	Cardinality
description	High-level description of the file content.	string	1
swath	Swath identifier (S1, S2, S3).	string	1
missionPhase	Mission phase (INTERFEROMETRIC, TOMOGRAPHIC).	string	1
fileOriginator	File originator.	string	1
fileOriginationDate	File origination date.	string	1
referenceTime	Reference time	string	1

Tab.42 Internal chirp database file attributes

Dimensions / Coordinate variables

The table below describes the dimensions and coordinate variables.

Name	Description	Data Type	Cardinality
slantRangeTime	Slant range time axis [s].	float	1

Tab.43 Internal chirp database file dimensions and coordinate variables

Group of variables

The table below describes the group of variables.

Name	Description	Data Type	Cardinality
group: chirpReplicas variable: chirpReplicaHH	Array describing the chirp replica for polarization HH (dimensions: slantRangeTime).	compound float complex	1
group: chirpReplicas variable: chirpReplicaHV	Array describing the chirp replica for polarization HV (dimensions: slantRangeTime).	compound float complex	1
group: chirpReplicas variable: chirpReplicaVH	Array describing the chirp replica for polarization VH (dimensions: slantRangeTime).	compound float complex	1
group: chirpReplicas variable: chirpReplicaVV	Array describing the chirp replica for polarization VV (dimensions: slantRangeTime).	compound float complex	1
group: chirpReplicas variable: pixelType	Pixels data type.	string	1

group: chirpReplicas variable: noDataValue	Pixel value in case of invalid data.	double	1

Tab.44 Internal chirp database file group of variables

4.3.4. On-board filters file

The on-board filters NetCDF file [RD12] [RD13] contains description of the on-board filters to be used during processing to compute in/out-of-band power ratios values.
The file is organised as follows:

- a series of root level *attributes*, containing all those global attributes referring to the file as a whole;
- a *dimensions* group, where names and lengths of the dimensions used when creating data arrays (variables) are defined;
- a series of *coordinate variables*, containing special variables to store the axes data values for each dimension in the *dimensions* group;
- a series of *components*, each one composed by a group of variables which can be divided in:
  - the data arrays, storing the on-board filters themselves. A variable represents an array of values of the same data type and it is defined over two or more dimensions from the *dimensions* group;
  - ancillary scalar variables containing other useful metadata to complete the data definition.

Attributes
The table below describes the attributes.

Name	Description	Data Type	Cardinality
description	High-level description of the file content.	string	1
fileOriginator	File originator.	string	1
fileOriginationDate	File origination date.	string	1

Tab.45 On-board filters file attributes

Dimensions / Coordinate variables
The table below describes the dimensions and coordinate variables.

Name	Description	Data Type	Cardinality

rangeFreq	Range frequency axis [Hz].	float	1

Tab.46 On-board filters file dimensions and coordinate variables

Group of variables

The table below describes the group of variables.

Name	Description	Data Type	Cardinality
group: onBoardFilters variable: onBoardFilterHH	Array describing the on-board filter for polarization HH (dimensions: rangeFreq).	float	1
group: onBoardFilters variable: onBoardFilterHV	Array describing the on-board filter for polarization HV (dimensions: rangeFreq).	float	1
group: onBoardFilters variable: onBoardFilterVH	Array describing the on-board filter for polarization VH (dimensions: rangeFreq).	float	1
group: onBoardFilters variable: onBoardFilterVV	Array describing the on-board filter for polarization VV (dimensions: rangeFreq).	float	1
group: onBoardFilters variable: pixelType	Pixels data type.	string	1
group: onBoardFilters variable: noDataValue	Pixel value in case of invalid data.	double	1

Tab.47 On-board filters file group of variables

4.4. AUX_PP1___: Auxiliary L1 Processing Parameters

The Auxiliary L1 Processing Parameters product (file type AUX_PP1___) contains the configuration parameters for the L1 Processor.

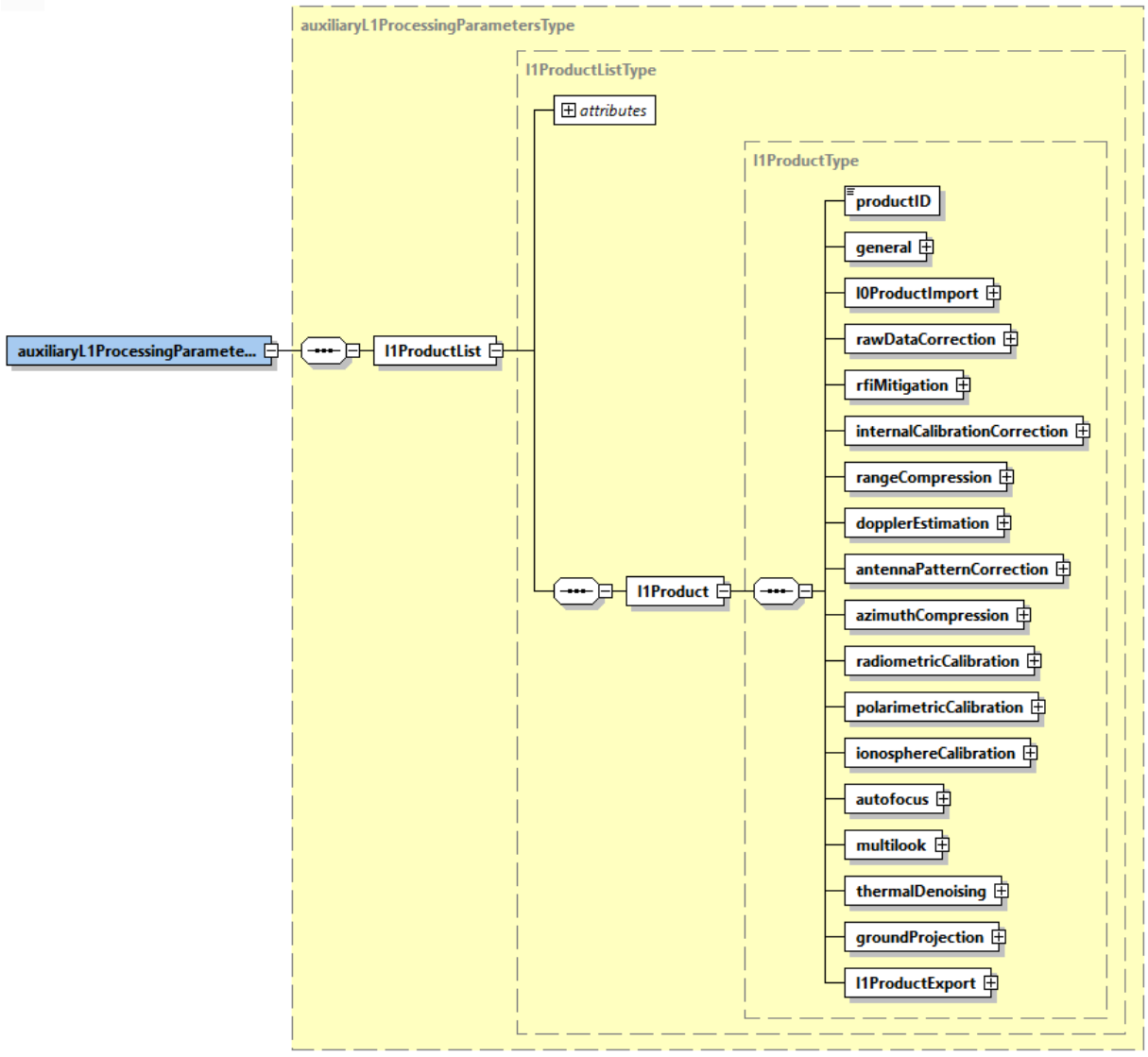
This product is composed by:

- an XML file, plus the corresponding XSD one, describing all the needed L1 processing parameters;
- a NetCDF file, describing the RFI mitigation activation mask;

included in the folder structure described in Sec. 3.

This section describes in details the content of these file.

4.4.1. L1 processing parameters file



Auxiliary L1 Processing Parameters (auxiliaryL1ProcessingParametersType).

Name	Description	Data Type	Cardinality
l1ProductList	List of L1 processing parameters for each product the L1 Processor is capable of generating (i.e., SM_SCS__1S, SM_DGM__1S, RO_SCS__1S, ...).	l1ProductListType	1

Tab.48 Auxiliary L1 Processing Parameters (auxiliaryL1ProcessingParametersType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
l1Product	L1 processing parameters for a given product ID.	L1ProductType	1

Tab.49 Auxiliary L1 Processing Parameters (l1ProductListType description).

Name	Description	Data Type	Cardinality
productID	Product identifier (SM_SCS__1S, SM_DGM__1S or RO_SCS__1S).	xsd:string	1
general	General processing parameters.	generalType	1
l0ProductImport	L0 product import processing parameters.	L0ProductImportType	1
rawDataCorrection	Raw data correction processing parameters.	rawDataCorrectionType	1
rfiMitigation	RFI mitigation processing parameters.	rfiMitigationType	1
internalCalibrationCorrection	Internal calibration corrections processing parameters.	internalCalibrationCorrectionType	1
rangeCompression	Range compression processing parameters.	rangeCompressionType	1
dopplerEstimation	Doppler Centroid and Doppler Rate estimation processing parameters.	dopplerEstimationType	1

antennaPatternCorrection	Antenna pattern correction processing parameters.	antennaPatternCorrectionType	1
azimuthCompression	Azimuth compression processing parameters.	azimuthCompressionType	1
radiometricCalibration	Radiometric calibration processing parameters.	radiometricCalibrationType	1
polarimetricCalibration	Polarimetric calibration processing parameters.	polarimetricCalibrationType	1
ionosphereCalibration	Ionosphere calibration processing parameters.	ionosphereCalibrationType	1
autofocus	Autofocus processing parameters.	autofocusType	1
multilook	Multilook processing parameters.	multilookType	1
thermalDenoising	Thermal denoising processing parameters.	thermalDenoisingType	1
groundProjection	Ground projection processing parameters.	groundProjectionType	1
l1ProductExport	L1 product export processing parameters.	L1ProductExportType	1

Tab.50 Auxiliary L1 Processing Parameters (l1ProductType description).

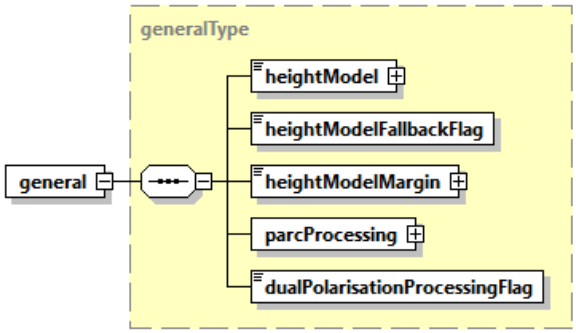


Fig.26 Auxiliary L1 Processing Parameters (generalType).

Name	Description	Data Type	Cardinality
heightModel	Digital Elevation Model (DEM) to be used during processing (with version as attribute).	heightModelType	1

heightModelFallbackFlag	True to allow fallback to Ellipsoid in case selected Digital Elevation Model (DEM) is not found, False otherwise. Default value is False.	bool	1
heightModelMargin	Margin kept during the extraction of Digital Elevation Model (DEM) to be used during processing [deg].	floatWithUnit	1
parcProcessing	PARC processing mode processing parameters.	parcProcessingType	1
dualPolarisationProcessingFlag	True if processing has to be forced in case input data contain just two polarisations, False otherwise. Default value is False, to be set to True to manage contingency cases.	Bool	1

Tab.51 Auxiliary L1 Processing Parameters (generalType description).

Name	Description	Data Type	Cardinality
parcROISamples	Number of samples of the ROI selected around PARC position in the image. Used only in case PARC processing mode is activated.	Xsd:unsignedInt	1
parcROILines	Number of lines of the ROI selected around PARC position in the image. Used only in case PARC processing mode is activated.	Xsd:unsignedInt	1

Tab.52 Auxiliary L1 Processing Parameters (parcProcessingType description).

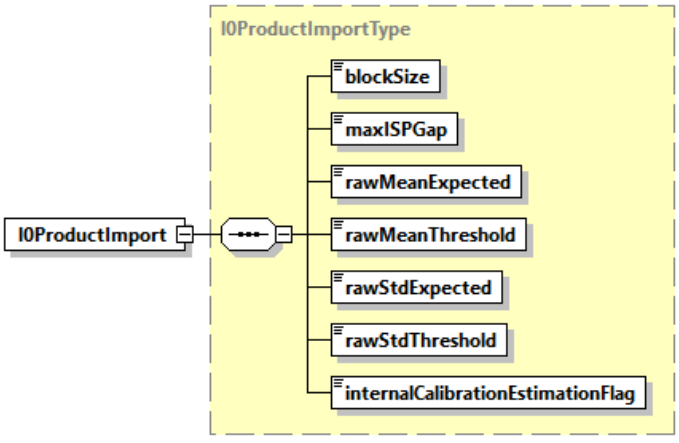


Fig.27

Auxiliary L1 Processing Parameters (l0ProductImportType).

Name	Description	Data Type	Cardinality
blockSize	Number of ISPs read in block during import.	Xsd:unsignedInt	1

maxISPGap	Maximum number of gaps between science data ISPs. If the number of consecutive missing packets for one APID exceeds this parameter, the processing will not continue.	Xsd:unsignedInt	1
rawMeanExpected	This parameter specifies the expected mean of the samples in the extracted raw data and it is used for verifying that the calculated mean is within the tolerated threshold.	Xsd:float	1
rawMeanThreshold	Threshold for setting the corresponding quality parameter in the L1 product annotations. This is the value X such that the measured mean must fall between the rawMeanExpected-X and rawMeanExpected+X.	xsd:float	1
rawStdExpected	This parameter specifies the expected standard deviation of the samples in the extracted raw data and it is used for verifying that the calculated standard deviation is within the tolerated threshold.	Xsd:float	1
rawStdThreshold	Threshold for setting the corresponding quality parameter in the L1 product annotations. This is the value X such that the measured standard deviation must fall between the rawStdExpected-X and rawStdExpected+X.	xsd:float	1
internalCalibrationEstimationFlag	True if internal calibration estimation has to be performed, False otherwise.	Bool	1

Tab.53 Auxiliary L1 Processing Parameters (l0ProductImportType description).

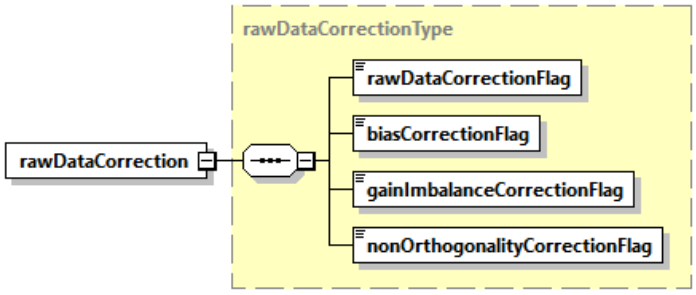


Fig.28 Auxiliary L1 Processing Parameters (rawDataCorrectionType).

Name	Description	Data Type	Cardinality
rawDataCorrectionFlag	True if raw data correction has to be performed, False otherwise.	Bool	1

biasCorrectionFlag	True if bias correction has to be performed, False otherwise.	Bool	1
gainImbalanceCorrectionFlag	True if gain imbalance correction has to be performed, False otherwise.	Bool	1
nonOrthogonalityCorrectionFlag	True if non-orthogonality correction has to be performed, False otherwise.	Bool	1

Tab.54 Auxiliary L1 Processing Parameters (rawDataCorrectionType description).

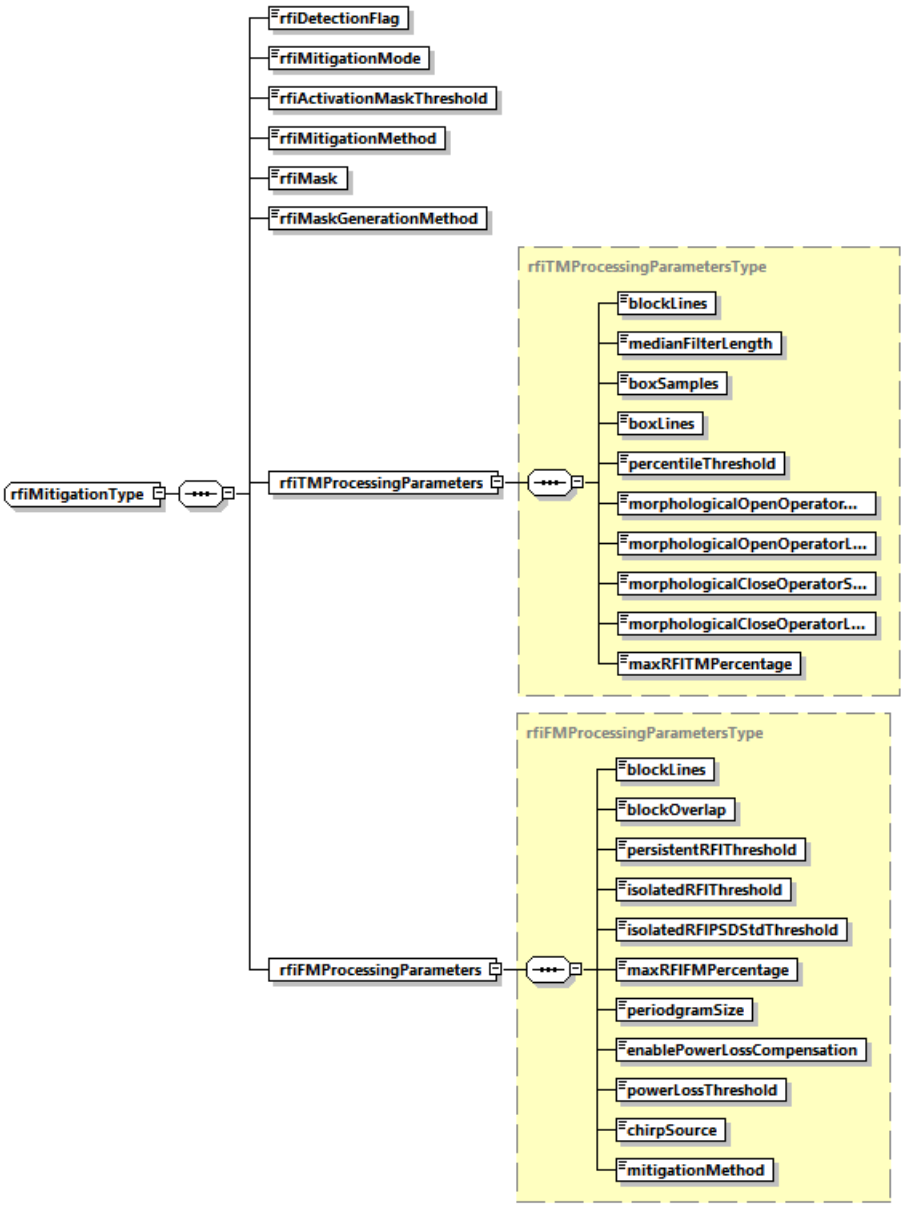


Fig.

Auxiliary L1 Processing Parameters (rfiMitigationType).

Name	Description	Data Type	Cardinality
rfiDetectionFlag	True if RFI detection has to be performed, False otherwise.	Bool	1
rfiMitigationMode	Enabled/Disabled to activate RFI mitigation. MaskBased decides if to activate the mitigation using the activation mask.	Xsd:string	1
rfiActivationMaskThreshold	Threshold on the overlap between L0 Footprint and activation mask active region above which RFI mitigation is activated (if rfiMitigationMode is MaskBased).	floatNormalizedPercentage	1
rfiMitigationMethod	Domain where the RFI mitigation step has to be performed (Time, Frequency, Time and Frequency, Frequency and Time).	rfiMitigationMethodType	1
rfiMask	RFI mask to be used for mitigation. Valid values are: "Single", to use the same mask for all the polarizations; "Multiple", to use a dedicated mask for each polarization.	rfiMaskType	1
rfiMaskGenerationMethod	Polarization-dependent RFI masks combination method (AND, OR). Used only in case rfiMask is set to Single.	rfiMaskGenerationMethodType	1
rfiTMProcessingParameters	Time-domain RFI mitigation processing parameters.	rfiTMProcessingParametersType	1
rfiFMProcessingParameters	Frequency-domain RFI mitigation processing parameters.	rfiFMProcessingParametersType	1

Tab.55 Auxiliary L1 Processing Parameters (rfiMitigationType description).

Name	Description	Data Type	Cardinality
blockLines	Number of lines in the processing block.	Xsd:unsignedInt	1
medianFilterLength	Median filter length.	Xsd:unsignedInt	1
boxSamples	Number of samples in the boxes used to compute space-variant statistics.	Xsd:unsignedInt	1

boxLines	Number of lines in the boxes used to compute space-variant statistics.	Xsd:unsignedInt	1
percentileThreshold	Normalized threshold on percentile of the signal distribution model. Lower values imply more false positives, higher values imply more missing detection.	floatNormalizedPercentage	1
morphologicalOpenOperatorSamples	Size in samples of the morphological open operator.	Xsd:unsignedInt	1
morphologicalOpenOperatorLines	Size in lines of the morphological open operator.	Xsd:unsignedInt	1
morphologicalCloseOperatorSamples	Size in samples of the morphological close operator.	Xsd:unsignedInt	1
morphologicalCloseOperatorLines	Size in lines of the morphological close operator.	Xsd:unsignedInt	1
maxRFITMPercentage	Maximum normalized percentage of image pixels impacted by time-domain RFI. If the percentage exceeds this parameter, the processing will not continue.	floatNormalizedPercentage	1

Tab.56 Auxiliary L1 Processing Parameters (rfiTMProcessingParametersType description).

Name	Description	Data Type	Cardinality
blockLines	Number of lines in the blocks used to compute Power Spectral Density.	Xsd:unsignedInt	1
blockOverlap	Overlap between blocks.	Xsd:unsignedInt	1
persistentRFIThreshold	Threshold for the detection of persistent RFI.	Xsd:float	1
isolatedRFIThreshold	Threshold for the detection of isolated RFI.	Xsd:float	1
isolatedRFIPSDStdThreshold	Threshold on PSD standard deviation for isolated RFI.	Xsd:float	1
maxRFIFMPercentage	Maximum normalized percentage of image spectrum impacted by frequency-domain RFI. If the percentage exceeds this parameter, the processing will not continue.	floatNormalizedPercentage	1
periodgramSize	Size of the periodgram.	Xsd:unsignedInt	1
enablePowerLossCompensation	Whether to apply power loss compensation.	Xsd:boolean	1

powerLossThreshold	Power loss compensation threshold.	Xsd:float	1
chirpSource	Chirp source for RFI frequency mitigation (Nominal (i.e. ideal chirp), Replica (i.e. chirp derived from internal calibration) or Internal (i.e. chirp taken from AUX_INS file)).	rangeReferenceFunctionType	1
mitigationMethod	method for RFI frequency mitigation: NOTCH_FILTER or NEAREST_NEIGHBOUR_INTERPOLATION.	rfiFMMitigationMethodType	1

Tab.57 Auxiliary L1 Processing Parameters (rfiFMProcessingParametersType description).

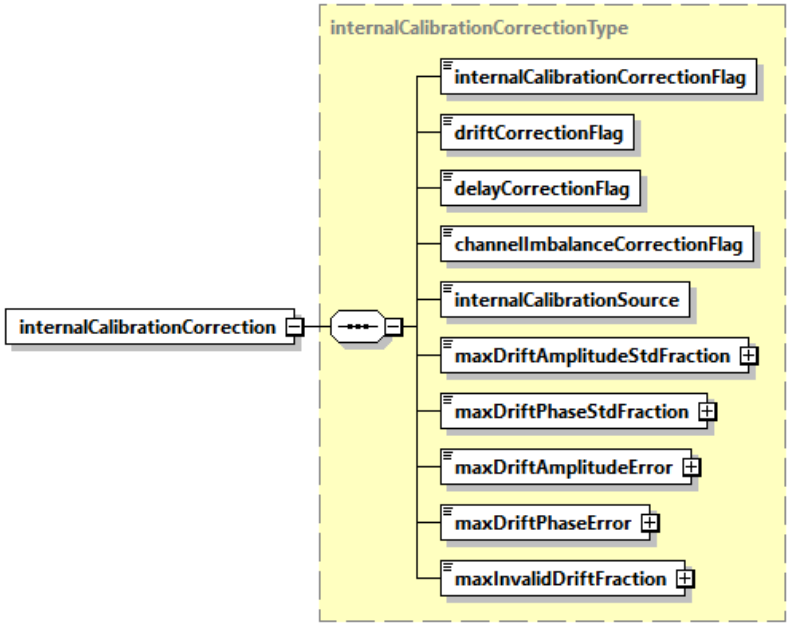


Fig.30 Auxiliary L1 Processing Parameters (internalCalibrationCorrectionType).

Name	Description	Data Type	Cardinality
internalCalibrationCorrectionFlag	True if internal calibration correction has to be performed, False otherwise. Used only in case internalCalibrationEstimationFlag is set to True.	Bool	1
driftCorrectionFlag	True if instrument drift correction has to be performed, False otherwise. Implies correction of channel imbalances.	Bool	1

delayCorrectionFlag	True if instrument delay correction has to be performed, False otherwise.	Bool	1
channelImbalanceCorrectionFlag	True if instrument channel imbalance correction has to be performed, False otherwise. This flag is ignored if driftCorrectionFlag is True.	Bool	1
internalCalibrationSource	Internal calibration parameters to be used during processing (Model or Extracted). Used only in case internalCalibrationCorrectionFlag is set to True.	internalCalibrationSourceType	1
maxDriftAmplitudeStdFraction	Maximum deviation from the mean allowed for the drift amplitude, measured as a fraction of the standard deviation. Relative drift validation shall fail if this value is exceeded.	Xsd:float	1
maxDriftPhaseStdFraction	Maximum deviation from the mean allowed for the drift phase, measured as a fraction of the standard deviation. Relative drift validation shall fail if this value is exceeded.	Xsd:float	1
maxDriftAmplitudeError	Maximum deviation allowed for a drift amplitude from the corresponding model value. Absolute drift validation shall fail if this value is exceeded.	Xsd:float	1
maxDriftPhaseError	Maximum deviation allowed for a drift phase from the corresponding model value [rad]. Absolute drift validation shall fail if this value is exceeded.	floatWithUnit	1
maxInvalidDriftFraction	Maximum number of invalid drift values allowed, expressed as a normalized fraction of the total number of drifts. If the percentage of the invalid drifts does not exceed this value, then the invalid drifts will be discarded and only the valid ones will be further used in the processing. Otherwise, all the calculated drift values will be discarded and replaced with the corresponding model values.	floatNormalizedPercentage	1

	Used only in case internalCalibrationSource is set to Extracted.		

Tab.58 Auxiliary L1 Processing Parameters (internalCalibrationCorrectionType description).

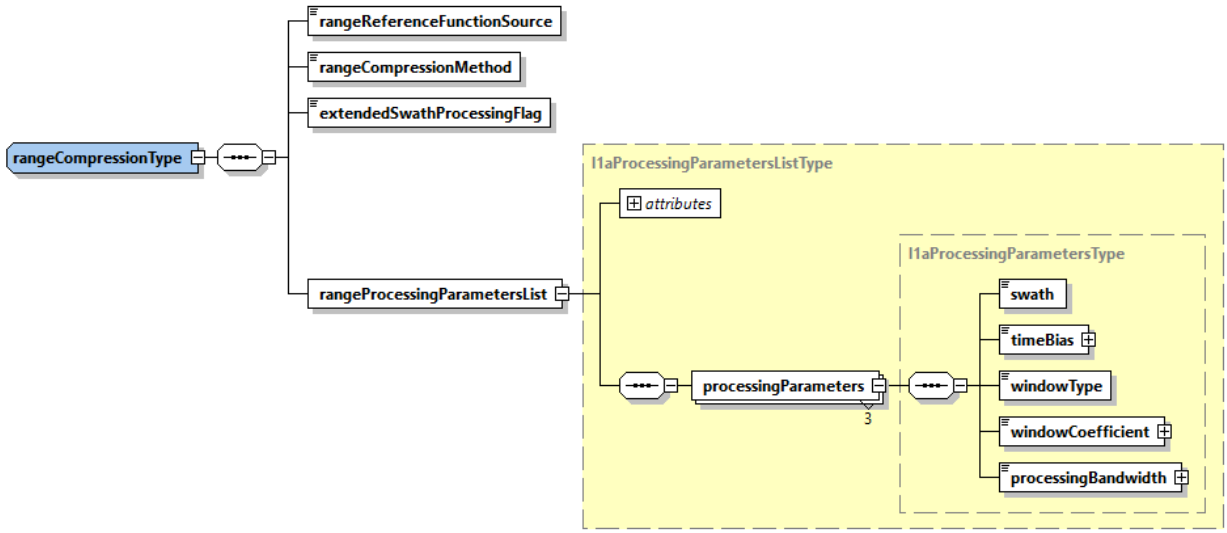


Fig.31 Auxiliary L1 Processing Parameters (rangeCompressionType).

Name	Description	Data Type	Cardinality
rangeReferenceFunctionSource	Chirp source to be used for range compression (Nominal (i.e. ideal chirp), Replica (i.e. chirp derived from internal calibration) or Internal (i.e. chirp taken from AUX_INS file).	rangeReferenceFunctionType	1
rangeCompressionMethod	Range compression method to be used during processing (Matched Filter or Inverse Filter).	rangeCompressionMethodType	1
extendedSwathProcessingFlag	True if processing has to be extended in the range direction including samples not having the full phase history, False otherwise.	Bool	1
rangeProcessingParametersList	Swath-dependent parameters to be used during range processing. The list includes one entry	L1aProcessingParametersListType	1

	per swath.		

Tab.59 Auxiliary L1 Processing Parameters (rangeCompressionType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
processingParameters	Parameters to be used during processing for a given swath.	L1aProcessingParametersType	3 .. 3

Tab.60 Auxiliary L1 Processing Parameters (l1aProcessingParametersListType description).

Name	Description	Data Type	Cardinality
swath	Swath (S1, S2, S3).	swathType	1
timeBias	Time bias to be applied on data during processing [s].	doubleWithUnit	1
windowType	Name of the weighting window type to be used during processing.	weightingWindowType	1
windowCoefficient	Value of the weighting window coefficient to be used during processing.	floatNormalizedPercentage	1
processingBandwidth	Bandwidth to be used during processing [Hz].	floatWithUnit	1

Tab.61 Auxiliary L1 Processing Parameters (l1aProcessingParametersType description).

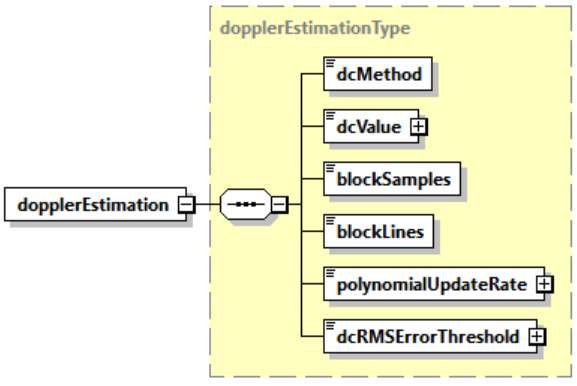


Fig.32 Auxiliary L1 Processing Parameters (dopplerEstimationType).

Name	Description	Data Type	Cardinality
dcMethod	Doppler Centroid estimation method to be used during processing (Geometry, Combined, Fixed).	dcMethodType	1
dcValue	Doppler Centroid value to be used during processing [Hz]. Used only in case dcMethod is set to Fixed. Note that in any case the Doppler Centroid value used for Antenna Pattern Correction is always the estimated one (in this case with Combined method), while this value is used for spectrum filtering operations.	doubleWithUnit	1
blockSamples	Number of samples in the blocks used to estimate Doppler Centroid from data. Used only in case dcMethod is set to Combined.	Xsd:unsignedInt	1
blockLines	Number of lines in the blocks used to estimate Doppler Centroid from data. Used only in case dcMethod is set to Combined.	Xsd:unsignedInt	1
polynomialUpdateRate	Estimated Doppler polynomials update rate [s]. Default value is 5s.	floatWithUnit	1
dcRMSErrorThreshold	Doppler Centroid estimation root mean squared (RMS) error threshold [Hz]. If the RMS error of the Doppler Centroid combined estimates is above this threshold they shall not be used during processing; instead, the Doppler Centroid calculated from geometry shall be used.	floatWithUnit	1

Tab.62 Auxiliary L1 Processing Parameters (dopplerEstimationType description).

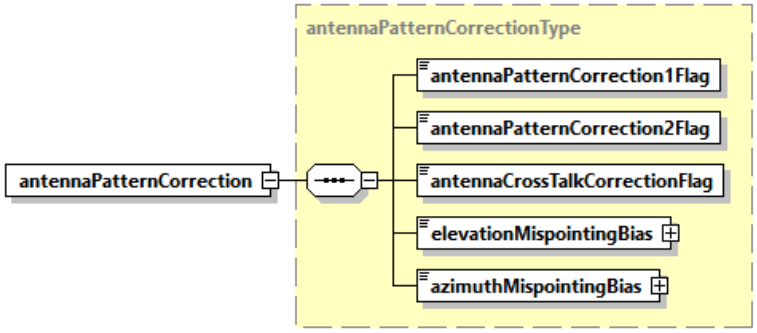
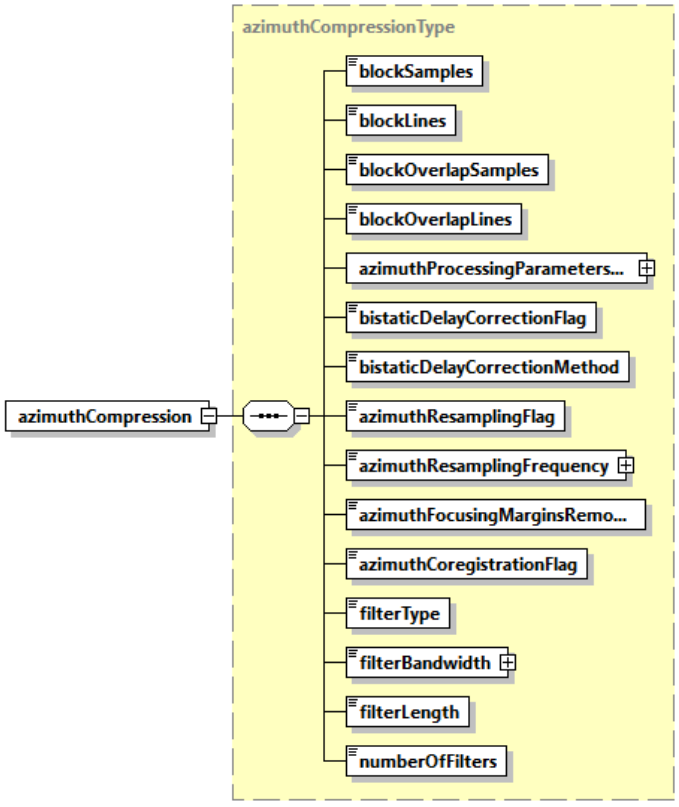


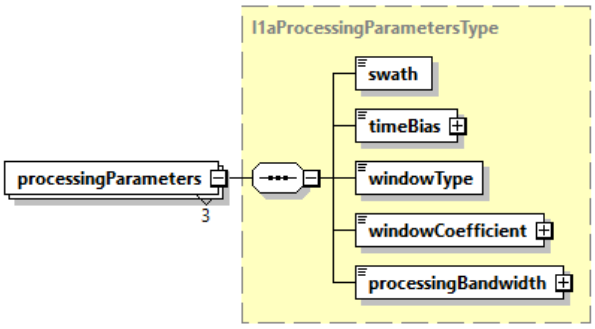
Fig.33 Auxiliary L1 Processing Parameters (antennaPatternCorrectionType).

Name	Description	Data Type	Cardinality
antennaPatternCorrection1Flag	True if antenna pattern correction (first step, i.e., compensation for an average off-nadir profile	Bool	1

	[RD11]) has to be applied, False otherwise. Note that in case internalCalibrationEstimationFlag is False, Transmit Power Tracking default values are taken from AUX_INS file.		
antennaPatternCorrection2Flag	True if antenna pattern correction (second step, i.e., topography-adaptive compensation of radiometric bias [RD11]) has to be applied, False otherwise. Note that in case internalCalibrationEstimationFlag is False, Transmit Power Tracking default values are taken from AUX_INS file.	Bool	1
antennaCrossTalkCorrectionFlag	True if antenna cross-talk correction has to be applied, False otherwise. Note that in case internalCalibrationEstimationFlag is False, Transmit Power Tracking default values are taken from AUX_INS file.	Bool	1
elevationMispointingBias	Mis-pointing bias in elevation to be applied during antenna pattern compensation [deg].	floatWithUnit	1
azimuthMispointingBias	Mis-pointing bias in azimuth to be applied during antenna pattern compensation [deg].	floatWithUnit	1

Tab.63 Auxiliary L1 Processing Parameters (antennaPatternCorrectionType description).



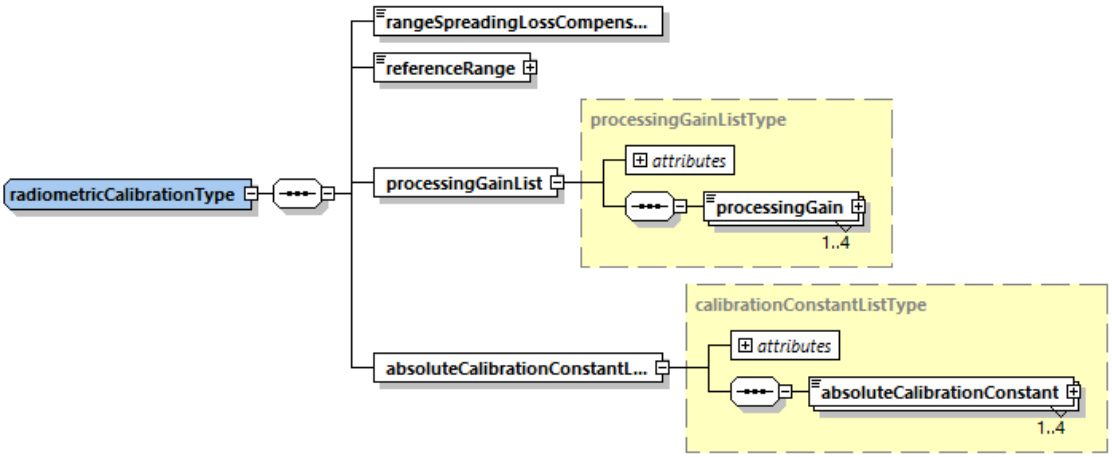


Auxiliary L1 Processing Parameters (azimuthCompressionType).

Name	Description	Data Type	Cardinality
blockSamples	Number of samples in the processing blocks.	Xsd:unsignedInt	1
blockLines	Number of lines in the processing blocks.	Xsd:unsignedInt	1
blockOverlapSamples	Number of samples in the overlap between range processing blocks.	Xsd:unsignedInt	1
blockOverlapLines	Number of lines in the overlap between azimuth processing blocks.	Xsd:unsignedInt	1
azimuthProcessingParametersList	Swath-dependent parameters to be used during azimuth processing. The list includes one entry per swath.	L1aProcessingParametersListType	1
bistaticDelayCorrectionFlag	True if bistatic delay correction has to be applied, False otherwise.	Bool	1
bistaticDelayCorrectionMethod	Method used for bistatic delay correction (Bulk or Full).	bistaticDelayCorrectionMethodType	1
azimuthResamplingFlag	True if resampling along azimuth direction has to be applied, False otherwise. Note that PRF changes are *always* managed: if this flag is False and there is a PRF change, data are resampled to the higher PRF. If this flag is true,	Bool	1

	data are resampled to azimuthResamplingFrequency set by user.		
azimuthResamplingFrequency	Azimuth resampling frequency [Hz]. Used only in case azimuthResamplingFlag is set to True.	floatWithUnit	1
azimuthFocusingMarginsRemovalFlag	True if azimuth focusing margins have to be removed, False otherwise. Default value is True.	Bool	1
azimuthCoregistrationFlag	True if all the four data polarisations have to be coregistered over the same azimuth sampling grid, False otherwise. Default value is True.	Bool	1
filterType	Type of filters used for azimuth resampling (FIR, SINC).	Xsd:string	1
filterBandwidth	Filter bandwidth [Hz].	floatWithUnit	1
filterLength	Filter length (in samples).	Xsd:unsignedInt	1
numberOfFilters	Number of filters in the bank.	Xsd:unsignedInt	1

Tab.64 Auxiliary L1 Processing Parameters (azimuthCompressionType description).



Auxiliary L1 Processing Parameters (radiometricCalibrationType).

Name	Description	Data Type	Cardinality
rangeSpreadingLossCompensationFlag	True if range spreading loss compensation has to be performed, False otherwise.	Bool	1
referenceRange	Range spreading loss reference slant range [m]. The range spreading loss is compensated by amplitude scaling each range sample by 1/Grsl(R) where: Grsl(R) = cuberoot(rRef/R); and, R = slant range of sample.	floatWithUnit	1
processingGainList	Processing gain to be applied multiplicatively to the image during processing for all the polarisations. Note that these gains are applied on top of those automatically computed and applied by the processor.	processingGainListType	1
absoluteCalibrationConstantList	Absolute calibration constant to be applied to the image during processing for all the polarisations.	calibrationConstantListType	1

Tab.65 Auxiliary L1 Processing Parameters (radiometricCalibrationType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
processingGain	Processing gain to be applied multiplicatively to the image during processing for the current polarisation.	floatWithPolarisation	1 .. 4

Tab.66 Auxiliary L1 Processing Parameters (processingGainListType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
absoluteCalibrationConstant	Absolute calibration constant to be applied multiplicatively to the image during processing for the current polarisation.	floatWithPolarisation	1 .. 4

Tab.67 Auxiliary L1 Processing Parameters (calibrationConstantListType description).

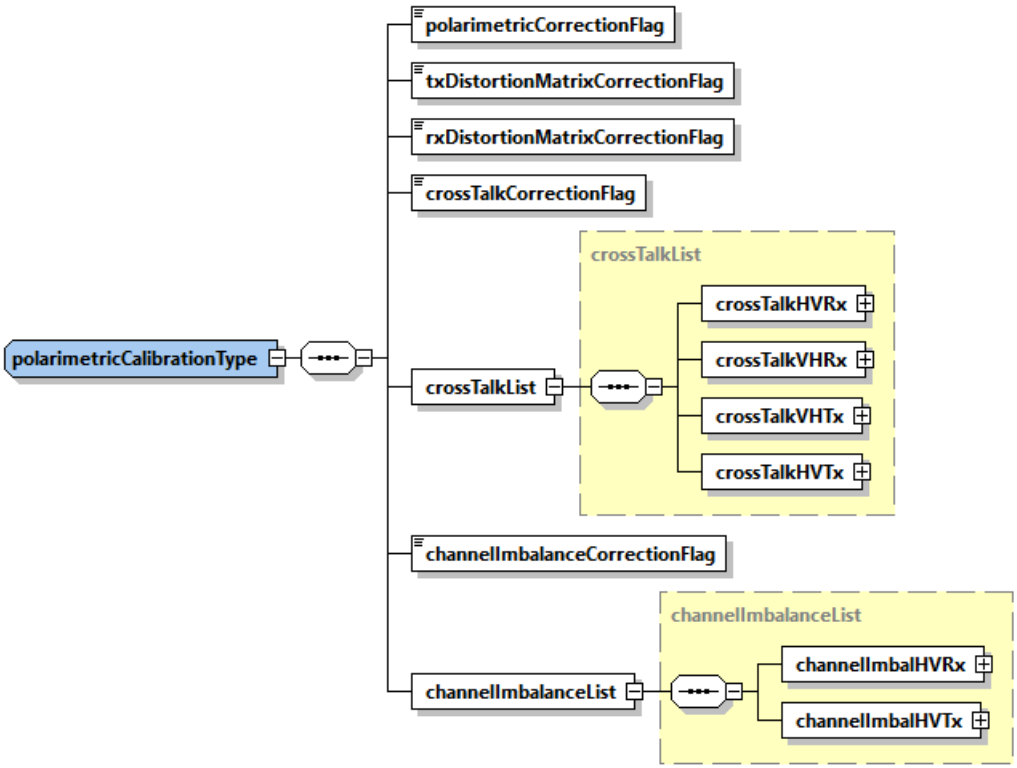


Fig.36 Auxiliary L1 Processing Parameters (polarimetricCalibrationType).

Name	Description	Data Type	Cardinality
polarimetricCorrectionFlag	True if polarimetric correction has to be performed, False otherwise.	bool	1
txDistortionMatrixCorrectionFlag	True if TX polarimetric distortion matrix correction has to be performed, False otherwise.	bool	1
rxDistortionMatrixCorrectionFlag	True if RX polarimetric distortion matrix correction has to be performed, False otherwise.	bool	1
crossTalkCorrectionFlag	True if cross-talk correction has to be performed, False otherwise.	bool	1
crossTalkList	Cross-talk values to be used during processing if crossTalkCorrectionFlag is True.	crossTalkList	1
channelImbalanceCorrectionFlag	True if channel imbalance correction has	bool	1

	to be performed, False otherwise.		
channelImbalanceList	Channel imbalance values to be used during processing if channelImbalanceCorrectionFlag is True.	channelImbalanceList	1

Tab.68 Auxiliary L1 Processing Parameters (polarimetricCalibrationType description).

Name	Description	Data Type	Cardinality
crossTalkHVRx	H to V cross-talk on receive across swath.	complex	1
crossTalkVHRx	V to H cross-talk on receive across swath.	complex	1
crossTalkVHTx	V to H cross-talk on transmit across swath.	complex	1
crossTalkHVTx	H to V cross-talk on transmit across swath.	complex	1

Tab.69 Auxiliary L1 Processing Parameters (crossTalkList description).

Name	Description	Data Type	Cardinality
channelImbalHVRx	H to V channel imbalance on receive across swath.	complex	1
channelImbalHVTx	H to V channel imbalance on transmit across swath.	complex	1

Tab.70 Auxiliary L1 Processing Parameters (channelImbalanceList description).

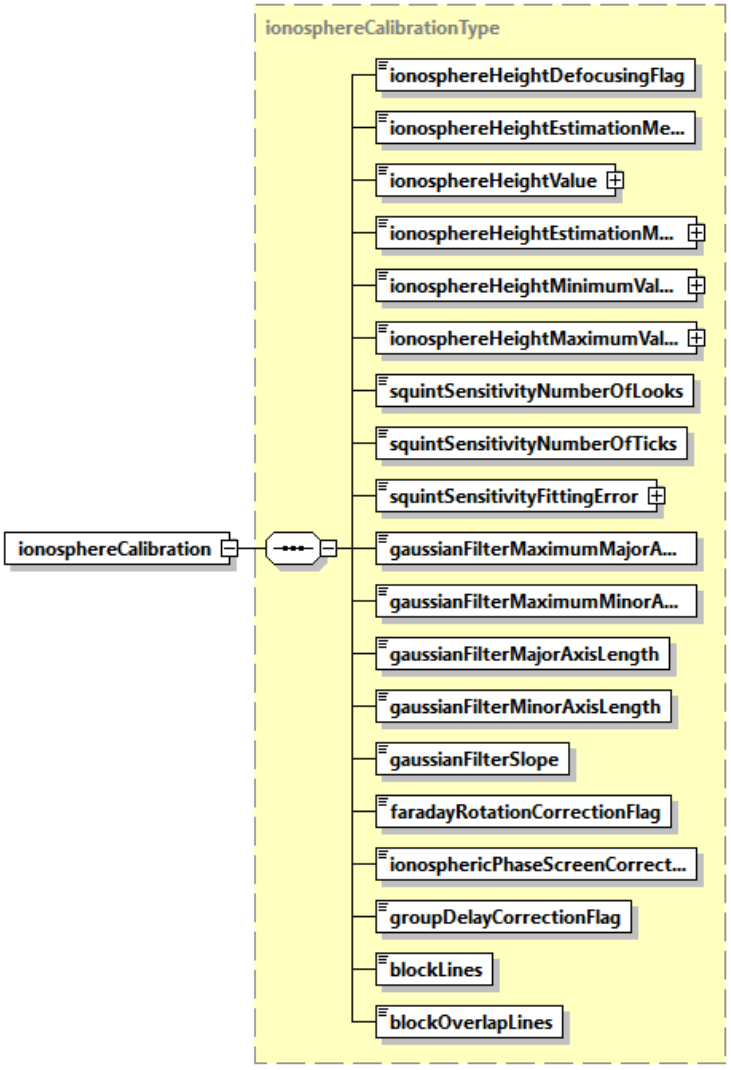


Fig.37

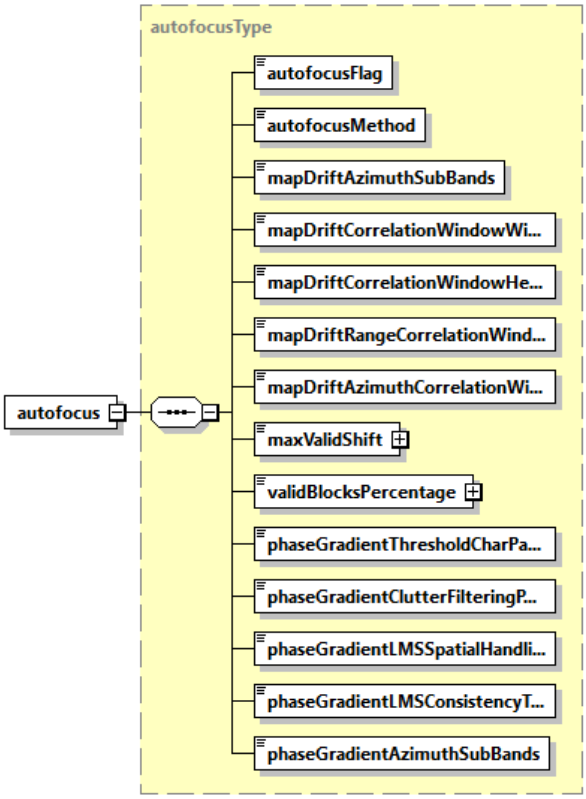
Auxiliary L1 Processing Parameters (ionosphereCalibrationType).

Name	Description	Data Type	Cardinality
ionosphereHeightDefocusingFlag	True if defocusing at ionosphere height has to be performed, False otherwise.	bool	1
ionosphereHeightEstimationMethod	Ionosphere height estimation method (Automatic, Feature Tracking, Squint Sensitivity, Model, Fixed).	ionosphereHeightEstimationMethodType	1
ionosphereHeightValue	Ionosphere height value to be used during processing [m]. Used only in case ionosphereHeightEstimation	floatWithUnit	1

	Method is set to Fixed.		
ionosphereHeightEstimationMethodLatitudeThreshold	Latitude threshold for ionosphere height estimation method selection [deg]. If latitude is below this threshold the squint sensitivity method is used, otherwise the feature tracking one is selected.	floatWithUnit	1
ionosphereHeightMinimumValue	Minimum value for ionosphere height estimation [m]. If ionosphere height is estimated and estimated value is lower than this value, it is discarded and input model is used instead.	floatWithUnit	1
ionosphereHeightMaximumValue	Maximum value for ionosphere height estimation [m]. If ionosphere height is estimated and estimated value is higher than this value, it is discarded and input model is used instead.	floatWithUnit	1
squintSensitivityNumberOfLooks	Number of looks used for ionosphere height estimation through squint sensitivity method.	xsd:unsignedInt	1
squintSensitivityNumberOfTicks	Number of height ticks to be processed for ionosphere height estimation through squint sensitivity method.	xsd:unsignedInt	1
squintSensitivityFittingError	Fitting error for TEC and ionosphere height estimates through squint sensitivity method [(rad/nT)^2].	floatArray	1
gaussianFilterMaximumMajorAxisLength	Gaussian filter maximum length of major Axis.	xsd:unsignedInt	1
gaussianFilterMaximumMinorAxisLength	Gaussian filter maximum length of minor Axis.	xsd:unsignedInt	1
gaussianFilterMajorAxisLength	Gaussian filter length of major axis. Used in case computed filter dimensions exceed above reported values.	xsd:unsignedInt	1
gaussianFilterMinorAxisLength	Gaussian filter length of minor axis. Used in case computed filter dimensions exceed	xsd:unsignedInt	1

	above reported values.		
gaussianFilterSlope	Gaussian filter slope. Used in case computed filter dimensions exceed above reported values.	xsd:float	1
faradayRotationCorrectionFlag	True if Faraday Rotation correction has to be performed, False otherwise.	bool	1
ionosphericPhaseScreenCorrectionFlag	True if ionospheric phase screen correction has to be performed, False otherwise.	bool	1
groupDelayCorrectionFlag	True if group delay correction has to be performed, False otherwise.	bool	1
blockLines	Number of lines in the processing blocks.	xsd:unsignedInt	1
blockOverlapLines	Number of lines in the overlap between azimuth processing blocks.	xsd:unsignedInt	1

Tab.71 Auxiliary L1 Processing Parameters (ionosphereCalibrationType description).



Auxiliary L1 Processing Parameters (autofocusType).

Name	Description	Data Type	Cardinality
autofocusFlag Fig.38	True if autofocus has to be performed, False otherwise.	bool	1
autofocusMethod	Autofocus method to be used during processing (Map Drift).	autofocusMethodType	1
mapDriftAzimuthSubBands	Number of azimuth sub-bands for map-drift autofocus.	xsd:unsignedInt	1
mapDriftCorrelationWindowWidth	Width of amplitude correlation window for map-drift autofocus.	xsd:unsignedInt	1
mapDriftCorrelationWindowHeight	Height of amplitude correlation window for map-drift autofocus.	xsd:unsignedInt	1
mapDriftRangeCorrelationWindows	Number of amplitude correlation windows in range for map-drift autofocus.	xsd:unsignedInt	1
mapDriftAzimuthCorrelationWindows	Number of amplitude correlation windows in azimuth for map-drift autofocus.	xsd:unsignedInt	1
maxValidShift	Maximum allowed shift between sub-looks (map-drift autofocus) in order to consider the measurement as valid. If the measurement is larger than the threshold, the estimation for that block will be considered invalid.	xsd:float	1
validBlocksPercentage	Minimum normalized percentage of blocks within the image that need to have estimated an azimuth shift smaller than the maxValidShift threshold. If the minimum percentage is not met, no correction based on the azimuth shift estimates will be applied.	floatNormalizedPercentage	1

Tab.72 Auxiliary L1 Processing Parameters (autofocusType description).

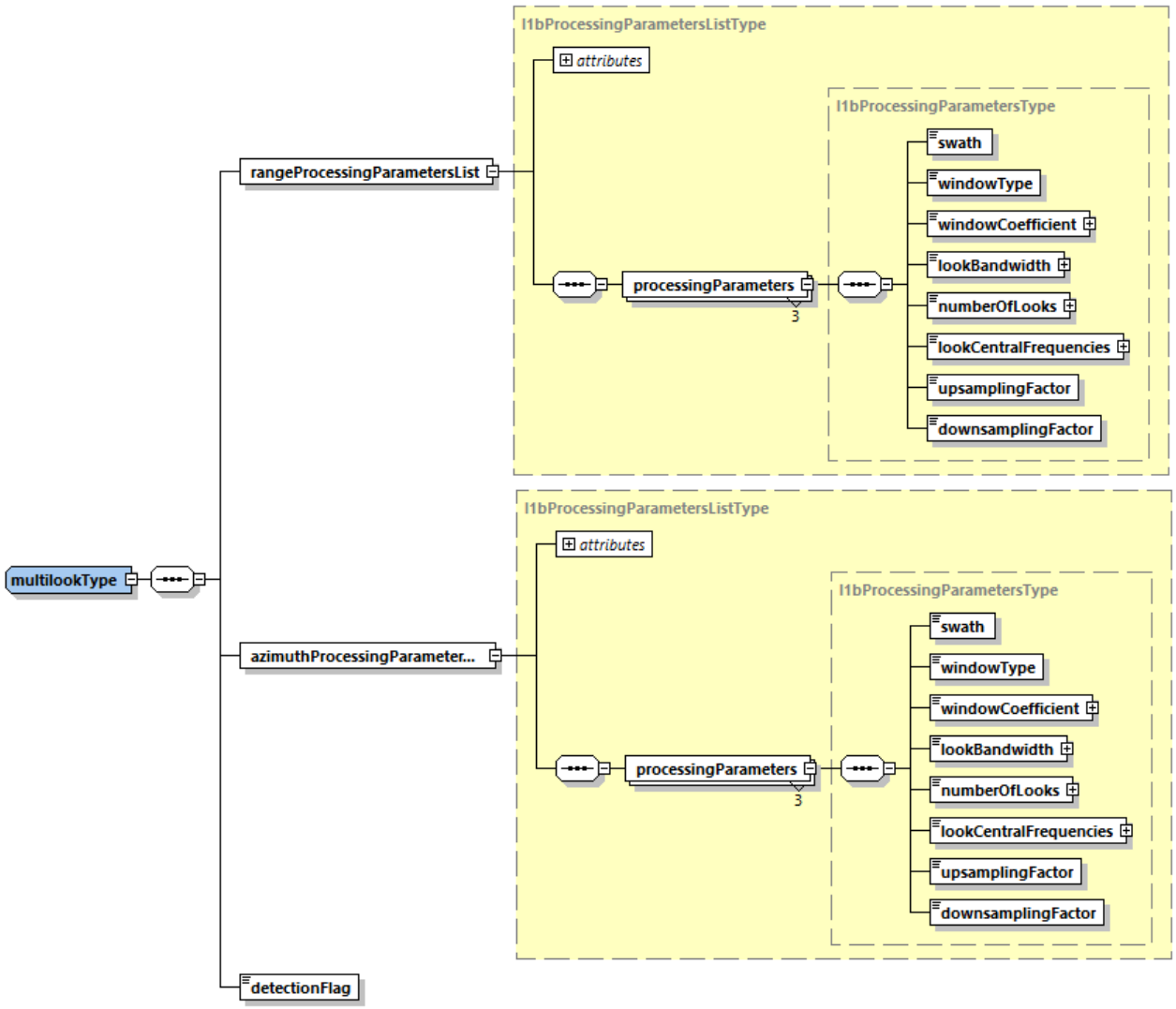


Fig.39 Auxiliary L1 Processing Parameters (multilookType).

Name	Description	Data Type	Cardinality
rangeProcessingParametersList	List of parameters to be used during range processing (one entry per swath).	L1bProcessingParametersListType	1
azimuthProcessingParametersList	List of parameters to be used during azimuth processing (one entry per swath).	L1bProcessingParametersListType	1
detectionFlag	True if detection has to be performed, False otherwise.	Bool	1

Tab.73 Auxiliary L1 Processing Parameters (multilookType description).

Name	Description	Data Type	Cardinality
count		*unsignedInt*	*required*
processingParameters	Parameters to be used during processing for a given swath.	L1bProcessingParametersType	3 .. 3

Tab.74 Auxiliary L1 Processing Parameters (l1bProcessingParametersListType description).

Name	Description	Data Type	Cardinality
swath	Swath (S1, S2, S3).	swathType	1
windowType	Name of the weighting window type to be used during processing.	weightingWindowType	1
windowCoefficient	Value of the weighting window coefficient to be used during processing.	xsd:float	1
lookBandwidth	Bandwidth for each look to be used during processing [Hz].	floatWithUnit	1
numberOfLooks	Number of looks.	xsd:unsignedInt	1
lookCentralFrequencies	Central frequency for each look [Hz]. Array shall contain numberOfLooks values.	floatArrayWithUnits	1
upsamplingFactor	Upsampling factor.	xsd:unsignedInt	1
downsamplingFactor	Downsampling factor.	xsd:unsignedInt	1

Tab.75 Auxiliary L1 Processing Parameters (l1bProcessingParametersType description).

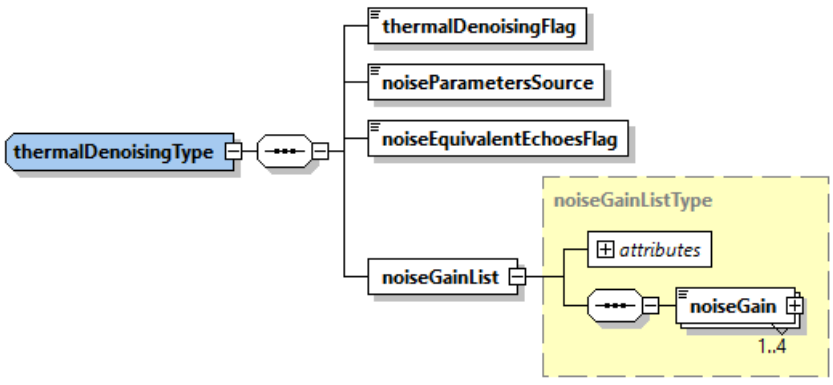


Fig.40 Auxiliary L1 Processing Parameters (thermalDenoisingType).

Name	Description	Data Type	Cardinality
thermalDenoisingFlag	True if thermal denoising has to be performed, False otherwise.	bool	1
noiseParametersSource	Noise parameters to be used during processing (Model or Extracted). Used only in case thermalDenoisingFlag is set to True.	internalCalibrationSourceType	1
noiseEquivalentEchoesFlag	True if noise-equivalent echoes have to be used to derive noise parameters, False otherwise.	bool	1
noiseGainList	Processing gain to be applied multiplicatively to the thermal noise level before using it during denoising step for all the polarisations. Note that these gains are applied on top of those automatically computed and applied by the processor.	noiseGainListType	1

Tab.76 Auxiliary L1 Processing Parameters (thermalDenoisingType description).

Name	Description	Data Type	Cardinality
count		*xsd:unsignedInt*	*required*
noiseGain	Processing gain to be applied multiplicatively to the thermal noise level before using it during denoising step for the current polarisation.	floatWithPolarisation	1 .. 4

Tab.77 Auxiliary L1 Processing Parameters (noiseGainListType description).

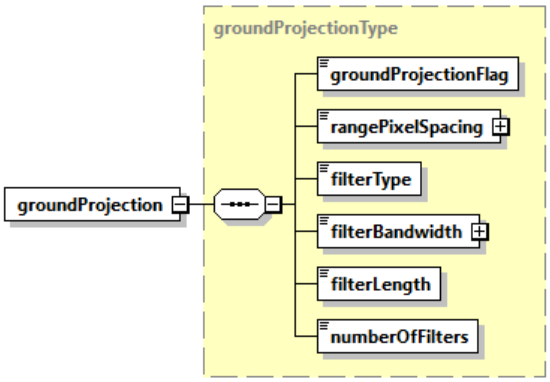


Fig.41 Auxiliary L1 Processing Parameters (groundProjectionType).

Name	Description	Data Type	Cardinality
groundProjectionFlag	True if slant range to ground range conversion has to be performed, False otherwise.	bool	1
rangePixelSpacing	Pixel spacing between ground range samples [m].	floatWithUnit	1
filterType	Type of filters used for slant range to ground range interpolation (FIR, SINC, GLS).	xsd:string	1
filterBandwidth	Filter bandwidth [Hz].	floatWithUnit	1
filterLength	Filter length (in samples).	xsd:unsignedInt	1
numberOfFilters	Number of filters in the Bank.	xsd:unsignedInt	1

Tab.78 Auxiliary L1 Processing Parameters (groundProjectionType description).

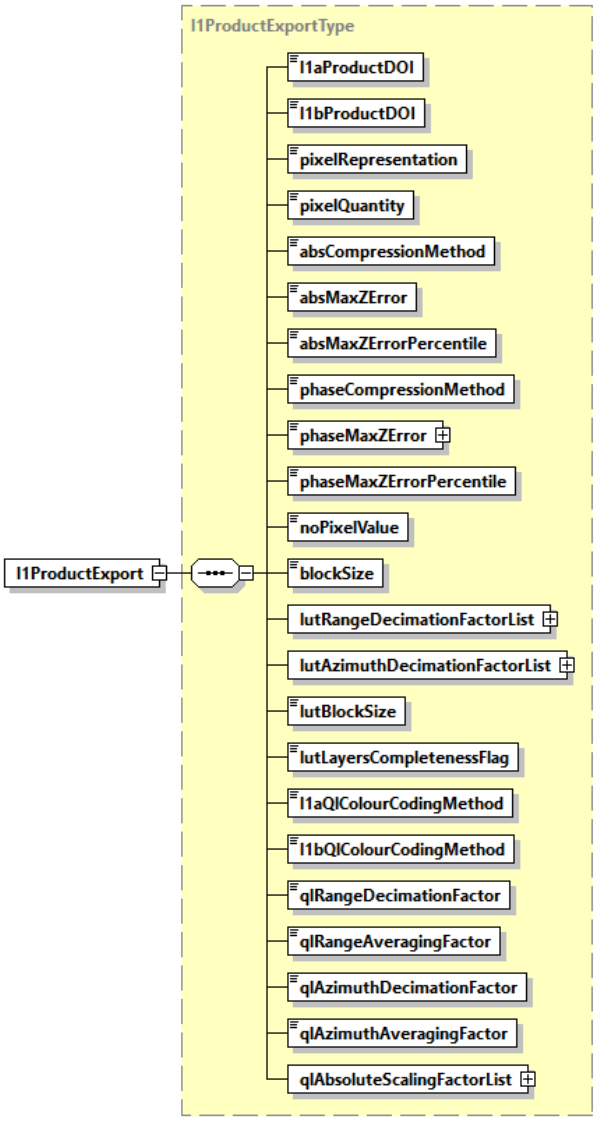


Fig.42

Auxiliary L1 Processing Parameters (I1ProductExportType).

Name	Description	Data Type	Cardinality
I1aProductDOI	Digital Object Identifier (DOI) to be written in output L1a (SCS) products.	xsd:string	1
I1bProductDOI	Digital Object Identifier (DOI) to be written in output L1b (DGM) products.	xsd:string	1
pixelRepresentation	Representation of the image pixels within the image MDS (I Q, Abs Phase, Abs, Pow Phase, Pow).	pixelRepresentationType	1
pixelQuantity	Physical quantity stored in output data (Beta-Nought, Sigma-Nought	pixelQuantityType	1

	or Gamma-Nought).		
absCompressionMethod	Abs values TIFF compression method.	compressionMethodType	1
absMaxZError	Maximum error threshold on abs values. Used only in case absCompressionMethod is set to LERC, LERC_DEFLATE or LERC_ZSTD. If set to 0, compression is lossless. If set to -1, value is computed dynamically w.r.t. a percentile value defined by absMaxZErrorPercentile.	xsd:float	1
absMaxZErrorPercentile	Percentile value to compute dynamically absMaxZError. Used only in case absMaxZError is set to -1.	floatNormalizedPercentage	1
phaseCompressionMethod	Phase values TIFF compression method.	compressionMethodType	1
phaseMaxZError	Maximum error threshold on phase values [rad]. Used only in case phaseCompressionMethod is set to LERC, LERC_DEFLATE or LERC_ZSTD. If set to 0, compression is lossless. If set to -1, value is computed dynamically w.r.t. a percentile value defined by phaseMaxZErrorPercentile.	floatWithUnit	1
phaseMaxZErrorPercentile	Percentile value to compute dynamically phaseMaxZError. Used only in case phaseMaxZError is set to -1.	floatNormalizedPercentage	1
noPixelValue	Pixel value in case of invalid Data.	xsd:float	1
blockSize	Size of block written during TIFF files export.	xsd:unsignedInt	1
lutRangeDecimationFactorList	Look-Up Tables (LUT) ADS range decimation factors (one value per LUT group) w.r.t. output L1 product sampling grid.	lutDecimationFactorListType	1
lutAzimuthDecimationFactorList	Look-Up Tables (LUT) ADS azimuth decimation factors (one value per LUT group) w.r.t. output L1 product sampling grid.	lutDecimationFactorListType	1
lutBlockSize	Size of block written during NetCDF files export.	xsd:unsignedInt	1

lutLayersCompletenessFlag	True if all the layers of the Look-Up Tables (LUT) ADS have to be included in output L1M product too, False if RFI masks and ionosphere binary layers shall be removed. Default value is True.	bool	1
l1aQlColourCodingMethod	Colour coding method to be used for output L1a (SCS) products quick-look. Default value is Pauli.	l1acQlColourCodingMethodType	1
l1bQlColourCodingMethod	Colour coding method to be used for output L1b (DGM) products quick-look. Default value is Lexicographic.	l1bQlColourCodingMethodType	1
qlRangeDecimationFactor	Quick-look ADS range decimation factor w.r.t. output L1 product sampling Grid.	xsd:unsignedInt	1
qlRangeAveragingFactor	Quick-look ADS range averaging factor.	xsd:unsignedInt	1
qlAzimuthDecimationFactor	Quick-look ADS azimuth decimation factor w.r.t. output L1 product sampling Grid.	xsd:unsignedInt	1
qlAzimuthAveragingFactor	Quick-look ADS azimuth averaging factor.	xsd:unsignedInt	1
qlAbsoluteScalingFactorList	Absolute scaling factors (one value per RGB channel) to be applied to quick-look ADS.	qlAbsoluteScalingFactorListType	1

Tab.79 Auxiliary L1 Processing Parameters (l1ProductExportType description).

Name	Description	Data Type	Cardinality
count		xsd:unsignedInt	*required*
lutDecimationFactor	Look-Up Tables (LUT) ADS decimation factor w.r.t. output L1 product sampling grid for the current LUT group.	unsignedIntWithGroup	3 .. 3

Tab.80 Auxiliary L1 Processing Parameters (lutDecimationFactorListType description).

Note that for LUT group containing information derived from DEM (latitude, longitude, height, incidence and look angles, …) the default decimation factors for a 90m-resolution

DEM are 2(range) x 12(azimuth), while for a 30m one they are 1 x 4 (these allows to get LUT sampling steps close to the one of the input DEM).

Name	Description	Data Type	Cardinality
count		xsd:unsignedInt	*required*
qlAbsoluteScalingFactor	Absolute scaling factor to be applied to quick-look ADS for the current RGB channel.	floatWithChannel	3 .. 3

Tab.81 Auxiliary L1 Processing Parameters (qlAbsoluteScalingFactorListType description).

4.4.2. RFI mitigation activation mask file

The RFI mitigation activation mask NetCDF file [RD12] [RD13] contains the two-dimensional geographical mask to be used during processing to decide if RFI mitigation shall be activated or not (in combination with rfiMitigationMode and rfiActivationMaskThreshold fields in AUX_PP1).
The file is organised as follows:

- a series of root level *attributes*, containing all those global attributes referring to the file as a whole;
- a *dimensions* group, where names and lengths of the dimensions used when creating data arrays (variables) are defined;
- a series of *coordinate variables*, containing special variables to store the axes data values for each dimension in the *dimensions* group;
- a series of *components*, each one composed by a group of variables which can be divided in:
    - the data array, storing the mask itself. A variable represents an array of values of the same data type and it is defined over two or more dimensions from the *dimensions* group;
    - ancillary scalar variables containing other useful metadata to complete the data definition.

Attributes
The table below describes the attributes.

Name	Description	Data Type	Cardinality
description	High-level description of the file content.	string	1
source	Applicable document Code.	string	1

sourceVersion	Applicable document version.	string	1
fileOriginator	File originator.	string	1
fileOriginationDate	File origination Date.	string	1

Tab.82 RFI mitigation activation mask file attributes

Dimensions / Coordinate variables

The table below describes the dimensions and coordinate variables.

Name	Description	Data Type	Cardinality
latitude	Latitude axis (default: 180 samples from -89.5 deg to 89.5 deg) [Deg].	float	1
longitude	Longitude axis (default: 360 samples from -179.5 deg to 179.5 deg) [Deg].	float	1

Tab.83 RFI mitigation activation mask file dimensions and coordinate variables

Group of variables

The table below describes the group of variables.

Name	Description	Data Type	Cardinality
group: rfiActivationMask variable: mask	Two-dimensional mask describing the RFI mitigation activation areas (dimensions: longitude, latitude).	bool	1
group: rfiActivationMask variable: pixelType	Pixels data Type.	string	1
group: rfiActivationMask variable: noDataValue	Pixel value in case of invalid Data.	double	1

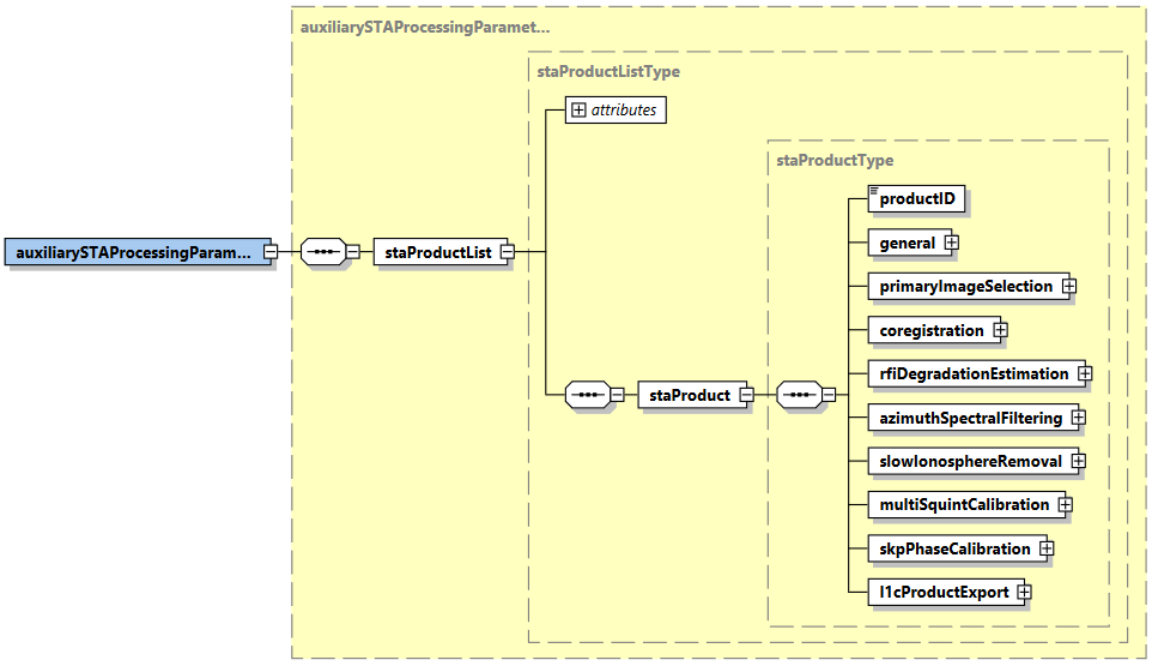
Tab.84 RFI mitigation activation mask file group of variables

4.5. AUX_PPS___: Auxiliary Stack Processing Parameters

The Auxiliary Stack Processing Parameters product (file type AUX_PPS___) contains the configuration parameters for the Stack Processor.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in detail the content of this file.



Auxiliary Stack Processing Parameters (auxiliarySTAProcessingParametersType).

Name	Description	Data Type	Cardinality
staProductList	List of stack processing parameters for each product the Stack Processor is capable of generating (i.e., SM_STA__1S, ...).	staProductListType	1

Tab.85 Auxiliary Stack Processing Parameters (auxiliarySTAProcessingParametersType description).

Name	Description	Data Type	Cardinality
count		xsd:unsignedInt	*required*

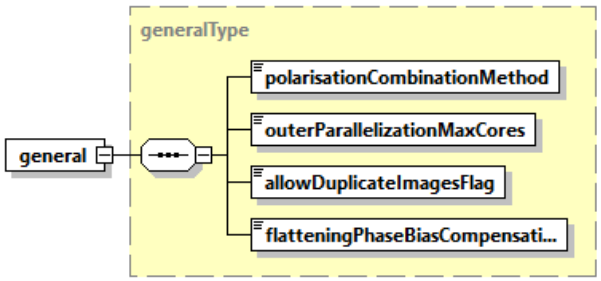
staProduct	Stack processing parameters for a given product ID.	staProductType	1

Tab.86 Auxiliary Stack Processing Parameters (staProductListType description).

Name	Description	Data Type	Cardinality
productID	Product identifier.	xsd:string	1
general	General processing parameters.	generalType	1
primaryImageSelection	Primary image selection processing parameters.	primaryImageSelectionType	1
coregistration	Coregistration processing parameters.	coregistrationType	1
rfiDegradationEstimation	RFI degradation estimation processing parameters.	rfiDegradationEstimationType	1
azimuthSpectralFiltering	Azimuth spectral filtering processing parameters.	azimuthSpectralFilteringType	1
slowIonosphereRemoval	Slow-varying ionospheric phase screen estimation and removal processing parameters.	slowIonosphereRemovalType	1
multiSquintCalibration	Processing parameters of the Multi-Squint Calibration step.	multiSquintCalibrationType	1
skpPhaseCalibration	Ground steering phases estimation processing parameters.	skpPhaseCalibrationType	1
l1cProductExport	L1c product export processing parameters.	l1cProductExportType	1

Tab.87 Auxiliary Stack Processing Parameters (staProductType description).

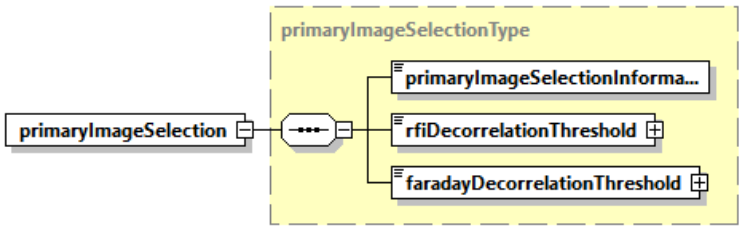
Fig.44



Auxiliary Stack Processing Parameters (generalType).

Name	Description	Data Type	Cardinality
polarisationCombinationMethod	Polarisations combination method: “HV” or “VH”, if just one of the two is selected (in addition to HH and VV ones); “Average”, if the average of HV and VH is computed and used; “None” if no combination is performed (all the four polarizations are used). Note that selecting “None” requires the combination to be handled by the L2A processor(s) via AUX_PP2_2A.	polarisationCombinationMethodType	1
outerParallelizationMaxCores	Maximum number of parallel instances (outer parallelization). This number shall be lower or equal to the total number of cores specified in the Job Order. It allows to control memory consumption. Default value is 0, i.e., the number of cores set in the Job Order is Used.	xsd:unsignedInt	1
allowDuplicateImagesFlag	Allow duplicated products in job-order. When set to false, the processor exits with an error if the input stack contains duplicated images.	bool	1
flatteningPhaseBiasCompensationFlag	If true, biases due to DEM upsampling residuals are compensated. Defaults to True.	bool	1

Tab.88 Auxiliary Stack Processing Parameters (generalType description).



Auxiliary Stack Processing Parameters (primaryImageSelectionType).

Name	Description	Data Type	Cardinality
Fig.45 primaryImageSelectionInformation	Information to be used to select coregistration primary image (Geometry, Geometry and RFI Correction, Geometry and FR Correction, Geometry and RFI+FR Corrections, Temporal Baseline).	primaryImageSelectionInformationType	1
rfiDecorrelationThreshold	Maximum decorrelation factor due to RFI strength admissible to use the image as the primary image.	xsd:float	1
faradayDecorrelationThreshold	Maximum decorrelation factor due to Faraday residual admissible to use the image as the primary image.	xsd:float	1

Tab.89 Auxiliary Stack Processing Parameters (primaryImageSelectionType description).

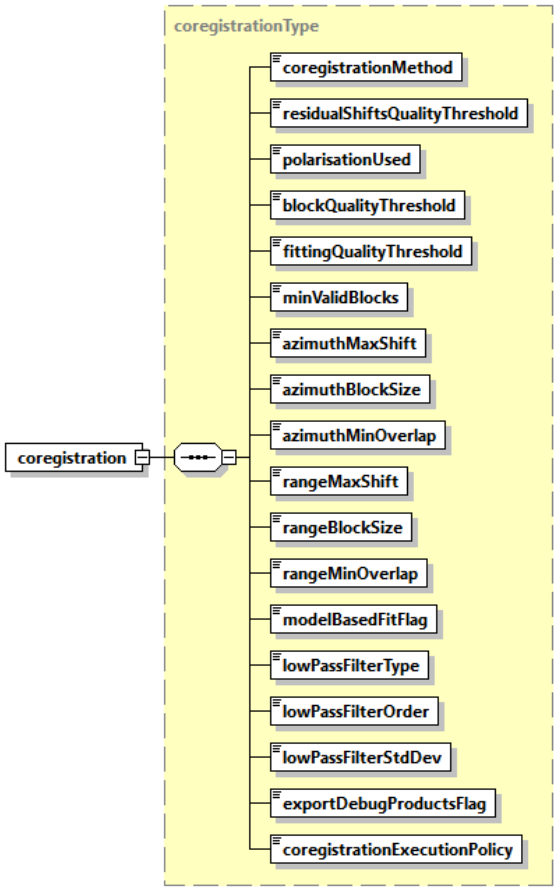


Fig.46 Auxiliary Stack Processing Parameters (coregistrationType).

Name	Description	Data Type	Cardinality
coregistrationMethod	Coregistration method (Geometry, Geometry and Data, Automatic).	coregistrationMethodType	1
residualShiftsQualityThreshold	Threshold on residual coregistration shifts quality (between 0 and 1). Residual shifts with a quality lower than this threshold are not used for processing. Used only in case coregistrationMethod is set to Geometry and Data.	xsd:float	1
polarisationUsed	Polarization used as primary for coregistration.	polarisationType	1
blockQualityThreshold	Threshold on the cross-correlation, as a measure of coregistration quality (between 0 and 1).	xsd:float	1
fittingQualityThreshold	Threshold on quality for the estimated	xsd:float	1

	shifts to be accepted as valid (between 0 and 1)		
minValidBlocks	Minimum number of valid blocks to accept a coregistration result (negative to disable).	xsd:short	1
azimuthMaxShift	Maximum pixel residua shift that can be estimated in azimuth direction (in pixel). Recommended value: 5.	xsd:unsignedInt	1
rangeMaxShift	Maximum pixel residual shift that can be estimated in range direction (in pixel). Recommended value: 5.	xsd:unsignedInt	1
rangeBlockSize	Size of the estimation blocks used for speckle tracking in range direction (in pixel). Recommended value: 51.	xsd:unsignedInt	1
azimuthBlockSize	Size of the estimation blocks used when computing cross-correlation in azimuth direction (in pixel). Recommended value: 101.	xsd:unsignedInt	1
azimuthMinOverlap	Minimum azimuth overlap required for shifts estimated using cross-correlation (in pixel). Recommended value: 0.	xsd:unsignedInt	1
rangeMinOverlap	Minimum range overlap required for shifts estimated using cross-correlation (in pixel). Recommended value: 0.	xsd:unsignedInt	1
modelBasedFitFlag	True if model-based fit should be performed after estimating shifts via cross-correlation. Defaults to false.	bool	1
lowPassFilterType	Type of low-pass filter applied to shifts estimated via cross-correlation. This parameter is ignored/unused when 'modelBasedFitFlag' is set to 'true'. Supported values are "Average" and "Gaussian". Recommended value is "Average".	“Average” or “Gaussian”	1
lowPassFilterOrder	Low-pass filter order. Used only if "Average" is selected. Recommended value is 9.	xsd:unsignedInt	1
lowPassFilterStdDev	Standard deviation of the Gaussian low-pass filter. Recommended value is 0.84089642.	xsd:float	1
exportDebugProductsFlag	True if all products for debugging need be exported. Defaults to False.	bool	1

coregistrationExecutionPolicy	As to whether the coregistration should be run nominally (i.e. shift estimation and image warping), shift estimation only, or image warping only (which requires user provided coregistration shifts). Accepted policies are 'Nominal', 'Shift Estimation Only', 'Warping Only'. Defaults to 'Nominal'.	coregistrationExecutionPolicyType	1

Tab.90 Auxiliary Stack Processing Parameters (coregistrationType description).

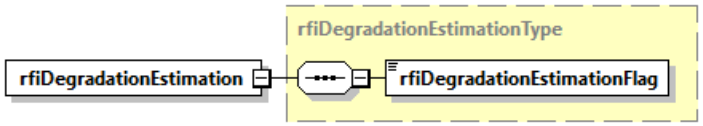


Fig.47 Auxiliary Stack Processing Parameters (rfiDegradationEstimationType).

Name	Description	Data Type	Cardinality
rfiDegradationEstimationFlag	True if estimation of degradation due to RFI filtering must be performed, False otherwise. Note that if the L1a input product was processed without RFI estimation, the RFI degradation estimation will be skipped irrespectively of what specified by this flag.	bool	1

Tab.91 Auxiliary Stack Processing Parameters (rfiDegradationEstimationType description).

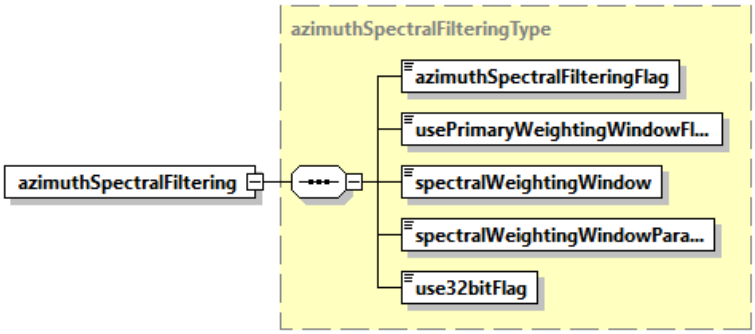


Fig.48 Auxiliary Stack Processing Parameters (azimuthSpectralFilteringType).

Name	Description	Data Type	Cardinality
azimuthSpectralFilteringFlag	True if azimuth spectral filtering has to be performed, False otherwise.	bool	1
usePrimaryWeightingWindowFlag	True if azimuth spectral filtering should use the azimuth spectral window of the primary as common azimuth window (recommended configuration). Otherwise, use the selected window.	bool	1
spectralWeightingWindow	The user provided common spectral window (default: Hamming).	weightingWindowType	1
spectralWeightingWindowParameter	The parameter of the spectral weighting window (to be interpreted depending on the window type).	xsd:float	1
use32bitFlag	True if 32-bit precision (aka complex64 and float32) must be used for model estimations instead of 64-bit precision (aka complex128 and float64), False otherwise.	bool	1

Tab.92 Auxiliary Stack Processing Parameters (azimuthSpectralFilteringType description).

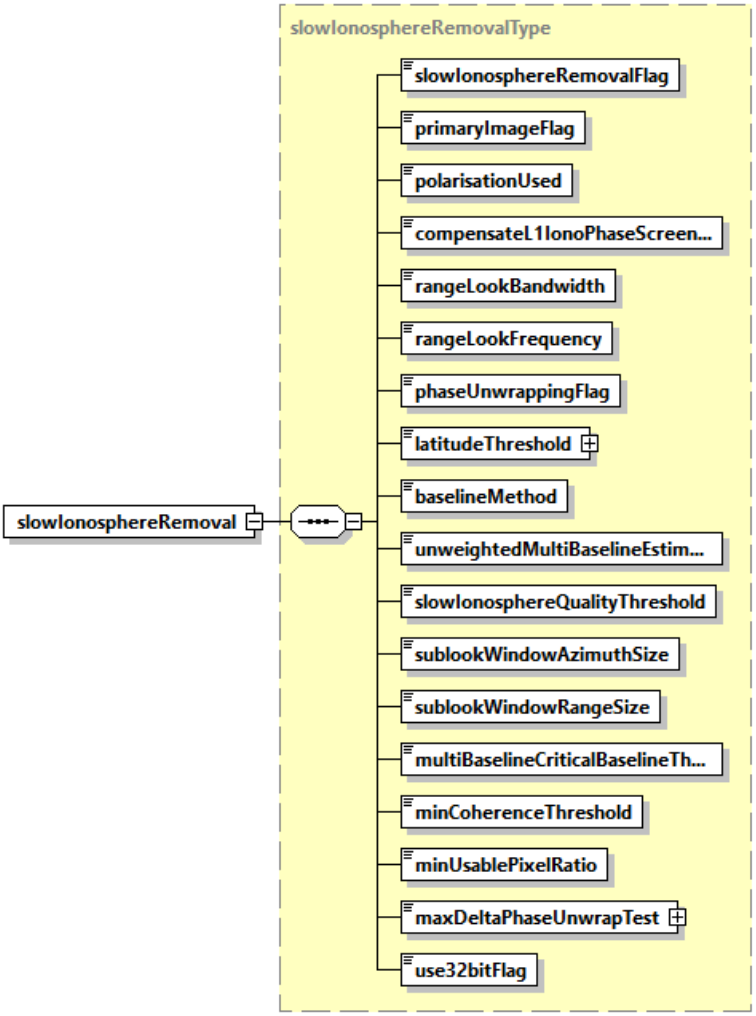


Fig.49

Auxiliary Stack Processing Parameters (slowIonosphereRemovalType).

Name	Description	Data Type	Cardinality
slowIonosphereRemovalFlag	True if slow-varying ionospheric phase screen estimation and removal must be performed, False otherwise.	bool	1
primaryImageFlag	True if image to be used as primary for multi-baseline calibration steps is the same as the one to be used for coregistration, False otherwise.	bool	1
polarisationUsed	Polarisation used in the estimation of the slow-varying ionosphere removal step. Recommended value is HH.	polarisationType	1
compensateL1IonoPhaseScreenFlag	True if the ionospheric phase screen from L1 should be compensated during split-	bool	1

	spectrum. Defaults to True.		
rangeLookBandwidth	Range looks bandwidth percentage (from 0 to 1).	xsd:float	1
rangeLookFrequency	Range looks center frequency (from 0 to 0.5).	xsd:float	1
phaseUnwrappingFlag	True if the single-baseline phase slope estimation should perform a prelimimnary phase unwrapping, False otherwise. Defaulted to True.	bool	1
latitudeThreshold	Latitude threshold above/below (North/South) which the IOB will be skipped [deg] (even if the IOB is enabled by flag)	floatWithUnit	1
baselineMethod	The baseline method, i.e. Single-Baseline or Multi-Baseline. Defaulted to Multi-Baseline.	baselineMethodType	1
unweightedMultiBaselineEstimation	True if the Multi-Baseline estimation should use uniform weighting instead of weights from Single-Baseline estimation. Defaulted to false.	bool	1
slowIonosphereQualityThreshold	Ionosphere estimations below this threshold will be ignored. Values between 0 and 1.	xsd:float	1
sublookWindowAzimuthSize	Window size in along-track direction to generate the sub-looks interferograms [px]. Recommended value is 501, *i.e.*, approximately 200m.	xsd:unsignedInt	1
sublookWindowRangeSize	Window size in slant-range direction to generate the sub-looks interferograms [px]. Recommended value is 41, *i.e.*, approximately 200m.	xsd:unsignedInt	1
multiBaselineCriticalBaselineThreshold	Maximum allowed percentage of CB displacement for multi-baseline pairs. Suggested value 0.45 (i.e. 45% CB).	xsd:float	1
minCoherenceThreshold	Pixels whose coherence is less than the value specified by this threshold are not used to estimate the slow-varying ionosphere (phase-plane fitting). Recommended value is 0.0.	xsd:float	1
minUsablePixelRatio	Minimum fraction of valid pixel according to coherence and phase unwrapping test to perform the slow-varying phase screen estimation (phase-plane fitting). Recommended value is 0.05 (5%).	xsd:float	1

maxDeltaPhaseUnwrapTest	Pixelwise threshold applied to the phase difference between high and low interferogram downstream of phase unwrapping [rad]. If the phase difference exceeds this threshold value, the pixel is discarded during phase screen estimation. (See stack ATBD). Recommended value is 0.5 rad. If negative, the test is disabled (*i.e.* negative values are interpreted as the threshold is set to $+\infty$).	floatWithUnit	1
use32bitFlag	True if 32-bit precision (aka complex64 and float32) must be used for model estimations instead of 64-bit precision (aka complex128 and float64), False otherwise.	bool	1

Tab.93 Auxiliary Stack Processing Parameters (slowIonosphereRemovalType description).

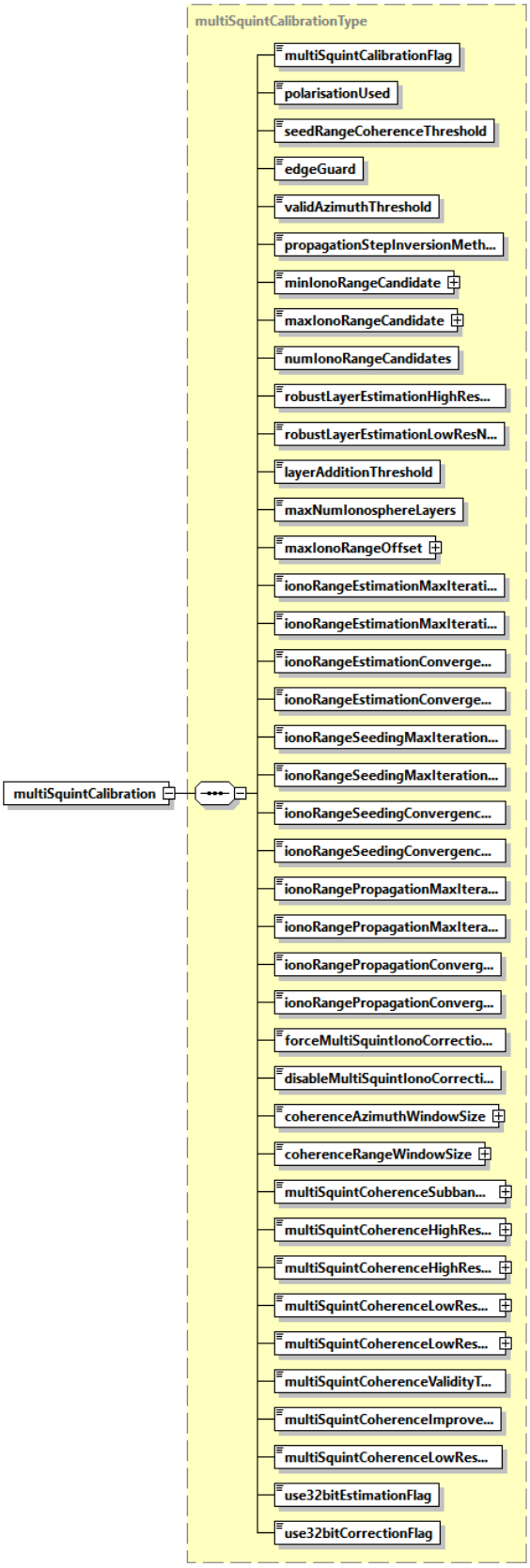


Fig.50

Auxiliary Stack Processing Parameters (multiSquintCalibrationType).

Name	Description	Data Type	Cardinality
multiSquintCalibrationFlag	True if the Multi-Squint calibration step is active. False otherwise	bool	1
polarisationUsed	Polarisation used in the estimation of the Multi-Squint Calibration step. Recommended value is HH.	polarisationType	1
seedRangeCoherenceThreshold	Coherence threshold used for range seeding during the ionosphere model inversion. Recommended value is 0.3.	xsd:float	1
edgeGuard	Ignore border pixels (in along-track direction). Recommended value is 10.	xsd:unsignedInt	1
validAzimuthThreshold	Ratio of valid lines used to fallback to central range during range seeding. Recommended value is 0.1.	xsd:float	1
propagationStepInversionMethod	Inversion method used during the ionosphere range propagation step. Supported values are "Propagation" and "Derivative". Recommended value is "Projection".	xsd:string	1
minIonoRangeCandidate	Minimum ionospheric range candidate used for estimating the ionosphere layers [m]. Recommended value is 200,000 meters.	floatWithUnit	1
maxIonoRangeCandidate	Maximum ionospheric range	floatWithUnit	1

	candidate used for estimating the ionosphere layers [m]. Recommended value is 700,000 meters.		
numIonoRangeCandidates	Number of ionosphere range candidates used for estimating the ionosphere layers. Recommended value is 25.	xsd:unsignedInt	1
robustLayerEstimationHighResNumSlices	Number of range slices for high resolution ionosphere layer estimation. Recommended value is 3.	xsd:unsignedInt	1
robustLayerEstimationLowResNumSlices	Number of range slices for low resolution ionosphere layer estimation. Recommended value is 5.	xsd:unsignedInt	1
layerAdditionThreshold	Minimum required coherence gain to accept a new ionospheric layer candidate. Recommended value is 5e-3.	xsd:float	1
maxNumIonosphereLayers	Cap the number of ionosphere layers used for calibration. Use 0 to disable capping. Recommended value is 5.	xsd:unsignedInt	1
maxIonoRangeOffset	Global buffer for ionosphere (celestial) axis in along-track direction [m]. Recommended value is 50,000 meters.	floatWithUnit	1
ionoRangeEstimationMaxIterationsDerivative	Max iterations for the ionosphere range estimation's composite iterative step ("Derivative").	xsd:unsignedInt	1

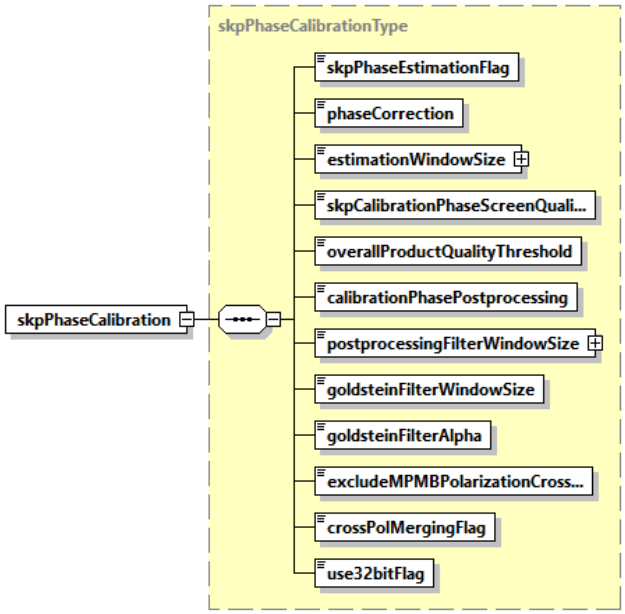
	Recommended value is 25.		
ionoRangeEstimationMaxIterationsProjection	Max iterations for the ionosphere range estimation's composite iterative step ("Projection"). Recommended value is 75.	xsd:unsignedInt	1
ionoRangeEstimationConvergenceThresholdDerivative	Convergence threshold for the ionosphere range estimation's composite iterative step ("Derivative"). Recommended value is 5e-4.	xsd:float	1
ionoRangeEstimationConvergenceThresholdProjection	Convergence threshold for the ionosphere range estimation's composite iterative step ("Projection"). Recommended value is 5e-4.	xsd:float	1
ionoRangeSeedingMaxIterationsDerivative	Max iterations for the ionosphere range seeding's composite iterative step ("Derivative"). Recommended value is100.	xsd:unsignedInt	1
ionoRangeSeedingMaxIterationsProjection	Max iterations for the ionosphere range seeding's composite iterative step ("Projection"). Recommended value is 300.	xsd:unsignedInt	1
ionoRangeSeedingConvergenceThresholdDerivative	Convergence threshold for the ionosphere range seeding's composite iterative step ("Derivative"). Recommended value is 0.0.	xsd:float	1
ionoRangeSeedingConvergenceThresholdProjection	Convergence threshold for the ionosphere range	xsd:float	1

	seeding's composite iterative step ("Projection"). Recommended value is 0.0.		
ionoRangePropagationMaxIterationsDerivative	Max iterations for the ionosphere range propagation's composite iterative step ("Derivative"). Recommended value is 10.	xsd:unsignedInt	1
ionoRangePropagationMaxIterationsProjection	Max iterations for the ionosphere range propagation's composite iterative step ("Projection"). Recommended value is 10.	xsd:unsignedInt	1
ionoRangePropagationConvergenceThresholdDerivative	Convergence threshold for the ionosphere range propagation's composite iterative step ("Derivative"). Recommended value is 0.0.	xsd:float	1
ionoRangePropagationConvergenceThresholdProjection	Convergence threshold for the ionosphere range propagation's composite iterative step ("Projection"). Recommended value is 0.0.	xsd:float	1
forceMultiSquintIonoCorrectionFlag	If true, force the Multi-Squint ionosphere estimation irrespectively of the coherence gain. This is ignored if *disableMultiSquintIonoCorrectionFlag* is set to true.	bool	1
disableMultiSquintIonoCorrectionFlag	If true, disable the Multi-Squint ionosphere estimation irrespectively of the coherence gain. If set to true, it overrides	bool	1

	forceMultiSquintIonoCorrectionFlag.		
coherenceAzimuthWindowSize	The multi-looking window in along-track direction used for estimating the coherence (coherence test) [m]. Recommended value is 100 meters.	floatWithUnit	1
coherenceRangeWindowSize	The multi-looking window in slant-range direction used for estimating the coherence (coherence test) [m]. Recommended value is 100 meters.	floatWithUnit	1
multiSquintCoherenceSubbandResolution	Sub-band resolution of the Multi-Squint coherence matrix [m]. Recommended value is 300 meters.	floatWithUnit	1
multiSquintCoherenceHighResAzimuthWindowSize	The high resolution multi-look window in along-track direction for the Multi-Squint cohrence matrix [m]. Recommended value is 0 meters (full resolution).	floatWithUnit	1
multiSquintCoherenceHighResRangeWindowSize	The high resolution multi-look window in slant-range direction for the Multi-Squint cohrence matrix [m]. Recommended value is 250 meters.	floatWithUnit	1
multiSquintCoherenceLowResAzimuthWindowSize	The low resolution multi-look window in along-track direction for the Multi-Squint cohrence matrix [m]. Recommended value is 250 meters (full resolution).	floatWithUnit	1
multiSquintCoherenceLowResRangeWindowSize	The low resolution multi-look window in slant-range direction for the Multi-Squint	floatWithUnit	1

	cohrence matrix [m]. Recommended value is 300 meters.		
multiSquintCoherenceValidityThreshold	Restrict the area for the coherence gain check. Recommended value is 0.3.	xsd:float	1
multiSquintCoherenceImprovementThreshold	Threshold on the coherence gian to trigger the Multi-Squint ionosphere calibration. Recommended value is 0.3.	xsd:float	1
multiSquintCoherenceLowResThreshold	Threshold on the average Multi-Squint coherence to trigger a lowering of the resolution. Recommended value is 0.1.	xsd:float	1
use32bitEstimationFlag	True if 32-bit precision (aka complex64 and float32) has to be used for model estimations instead of 64-bit precision (aka complex128 and float64), False otherwise. Recommended value is *true*.	bool	1
use32bitCorrectionFlag	True if 32-bit precision (aka complex64 and float32) has to be used ionosphere correction instead of 64-bit precision (aka complex128 and float64), False otherwise. Recommended value is *false*.	bool	1

Tab.94 Auxiliary Stack Processing Parameters (multiSquintCalibrationType description).



Auxiliary Stack Processing Parameters (skpPhaseCalibrationType).

Fig.51

Name	Description	Data Type	Cardinality
skpPhaseEstimationFlag	True if ground steering phases estimation must be performed, False otherwise.	bool	1
phaseCorrection	Type of phase correction executed by the SKP. “None”: Disable the SKP Phase correction. “Flattening Phase Screen”: Correct DSI only. “Ground Phase Screen”: Correct DSI and forest disturbance.	skpPhaseCorrectionType	1
estimationWindowSize	Estimation window size (ground-range and along-track) [m]. Note that this window size must be larger than the LUT resolution grid in both ground-range and azimuth. Recommended value is 500 meters by default.	floatWithUnit	1
skpCalibrationPhaseScreenQualityThreshold	Threshold on ground phase screen estimation quality (between 0 and 1). Estimates with a quality lower than this threshold are not corrected. Used only in the case of *phaseCorrection* being set to *“Ground Phase Screen”.*	xsd:float	1
overallProductQualityThreshold	Threshold on the percentage of valid ground phase estimations to consider the overall estimation valid. Between 0 and 1.	xsd:float	1
calibrationPhasePostprocessing	Whether to post-process the SKP	skpPhaseCalib	1

	calibration phase screen via Goldstein filter (“Goldstein”), boxcar filter (“Boxcar”), or pivotal median filter (“Median”, see Stack ATBD Section 5.4.2.6), or no filtering ("None"). It defaults to "None".	rationPostprocessingType	
postprocessingFilterWindowSize	Size of the filtering window to be used for post-processing the SKP phase screen [m] (Only "Boxcar" and "Median"). Recommended value is 1,000 meters.	floatWithUnit	1
goldsteinFilterWindowSize	Size of the filtering window applied to the Goldstein filtering weights in post-processing the SKP phase screen [px] (only "Goldstein"). Recommended value is 5 pixels (5 frequency bins).	xsd:unisignedInt	1
goldsteinFilterAlpha	The Goldstein filtering α parameter used Goldstein in post-processing the SKP phase screen [px] (only "Goldstein"). Values are in [0-1]. Recommended value is 0.5.	xsd:float	1
excludeMPMBPolarizationCrossCovarianceFlag	If set to true, do not populate the entries of the MPMB coherence matrix associated to cross-polarizations so the MPMB coherence matrix is diagonal wrt the polarizations. Recommended value is *false*.	bool	1
crossPolMergingFlag	If set to true, temporarily merge the polarizations HV and VH as described in Stack ATBD Section 3.2 to estimate the SKP phase screen. Note that this step does not mutate the stack. Recommended value is *true*	bool	1
use32bitFlag	True if 32-bit precision (aka complex64 and float32) must be used for model estimations instead of 64-bit precision (aka complex128 and float64), False otherwise. Recommended value is *true*.	bool	1

Tab.95 Auxiliary Stack Processing Parameters (skpPhaseCalibrationType description).

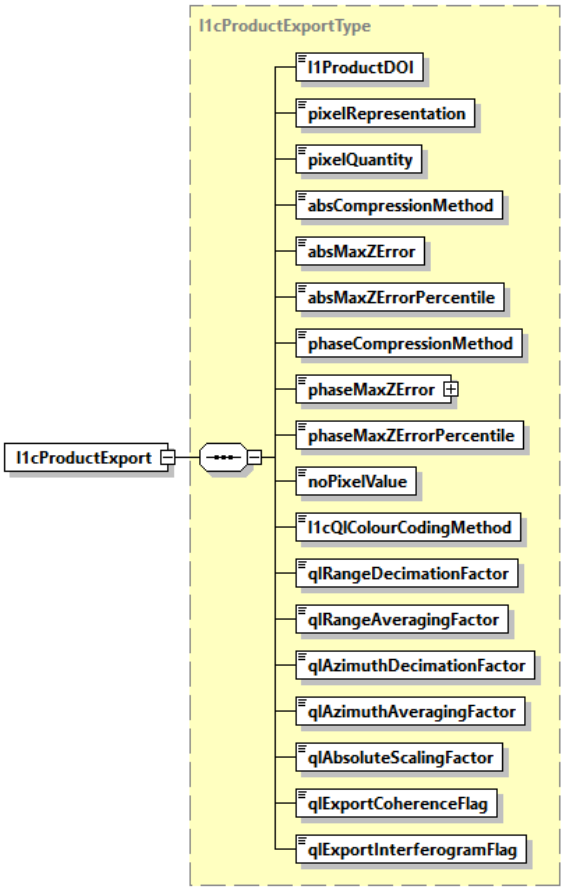


Fig.52 Auxiliary Stack Processing Parameters (l1cProductExportType).

Name	Description	Data Type	Cardinality
l1ProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
pixelRepresentation	Representation of the image pixels within the image MDS (I Q, Abs Phase, Abs, Pow Phase, Pow).	pixelRepresentationType	1
pixelQuantity	Physical quantity stored in output data (Beta-Nought, Sigma-Nought or Gamma-Nought).	pixelQuantityType	1
absCompressionMethod	Abs values TIFF compression method.	compressionMethodType	1
absMaxZError	Maximum error threshold on abs values. Used only in case	xsd:float	1

	absCompressionMethod is set to LERC, LERC_DEFLATE or LERC_ZSTD. If set to 0, compression is lossless. If set to -1, value is computed dynamically w.r.t. a percentile value defined by absMaxZErrorPercentile.		
absMaxZErrorPercentile	Percentile value to compute dynamically absMaxZError. Used only in case absMaxZError is set to -1.	xsd:float	1
phaseCompressionMethod	Phase values TIFF compression method.	compressionMethodType	1
phaseMaxZError	Maximum error threshold on phase values [rad]. Used only in case phaseCompressionMethod is set to LERC, LERC_DEFLATE or LERC_ZSTD. If set to 0, compression is lossless. If set to -1, value is computed dynamically w.r.t. a percentile value defined by phaseMaxZErrorPercentile.	floatWithUnit	1
phaseMaxZErrorPercentile	Percentile value to compute dynamically phaseMaxZError. Used only in case phaseMaxZError is set to -1.	xsd:float	1
noPixelValue	Pixel value in case of invalid data.	xsd:float	1
l1cQlColourCodingMethod	Colour coding method to be used for output products quick-look. Default value is “Pauli and HSV”	l1acQlColourCodingMethodType	1
qlRangeDecimationFactor	Quick-look ADS range decimation factor w.r.t. output L1 product sampling grid. Recommended value is 4.	xsd:unsignedInt	1
qlRangeAveragingFactor	Quick-look ADS range averaging factor. Recommended value is 5.	xsd:unsignedInt	1
qlAzimuthDecimationFactor	Quick-look ADS azimuth decimation factor w.r.t. output L1 product sampling grid.	xsd:unsignedInt	1

	Recommended value is 12.		
qlAzimuthAveragingFactor	Quick-look ADS azimuth averaging factor. Recommended value is 13.	xsd:unsignedInt	1
qlAbsoluteScalingFactor	Absolute scaling factor to be applied to quick-look ADS. Recommended value is 1.0.	xsd:float	1
qlExportCoherenceFlag	If true, export the coherence quick-look ADS for secondary frames.	bool	1
qlExportInterferogramFlag	If true, export the interferogram quick-look ADS for secondary frames.	Bool	1

Tab.96 Auxiliary Stack Processing Parameters (l1cProductExportType description).

Note that, differently from the L1 parameters configuration file, *l1cProductExportType* does not allow for configuring the resolution of the stack LUTs, the reason for this being that all stack LUTs except for the LUT that contains the fast-ionosphere phase screen and quality are defined over the same sampling grid, which is derived from the geometric LUTs of the L1a primary product. The sampling grid for all LUTs except the *ionospherePhaseScreens* LUTs (henceforth MSC LUTs) will be that of the DEM LUTs of the L1a product used as coregistration primary. Under default configuration of the L1_P processor, all stack LUTs, except for the MSC LUTs, will have a ground resolution of approximately 90m x 90m (range x azimuth), which is the resolution of the DEM used (Copernicus DEM). That is, they will be defined on a grid obtained by subsampling the primary data grid using range and azimuth steps that best approximate the target resolution for each axis, irrespectively of the resolution of the LUTs in the source L1a products. For more details on LUT grids and axes, we refer to Section 6.3.4.1 of BPS_L1_PFD. All available LUTs in the stack are reported in Section 6.3.4 of BPS_L1_PFD.

4.6. AUX_PP2_2A: Auxiliary L2a Processing Parameters

The Auxiliary L2a Processing Parameters product (file type AUX_PP2_2A) contains the configuration parameters for the L2a Processor.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in detail the content of this file.

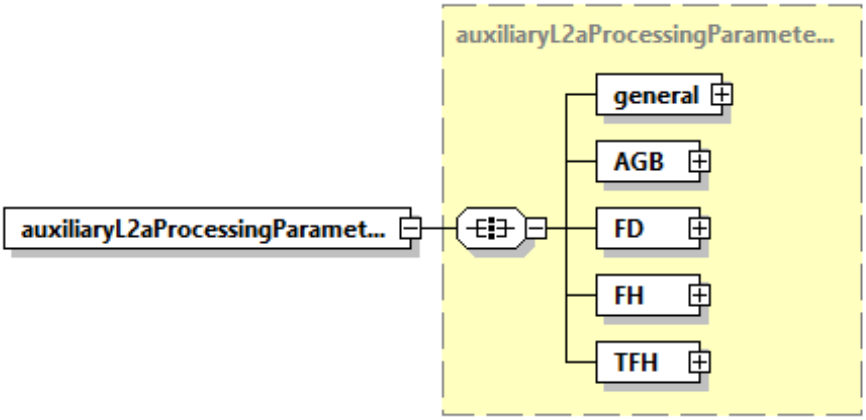
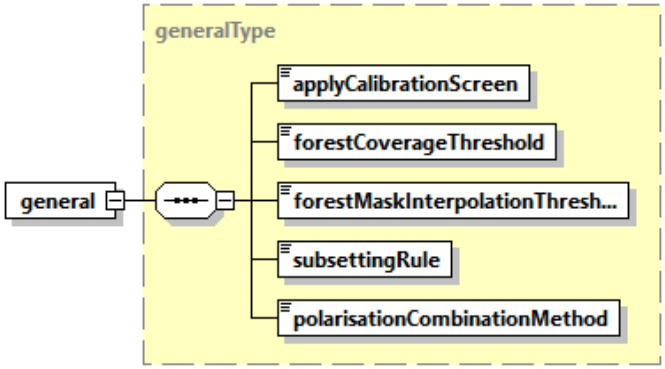


Fig.53 Auxiliary L2a Processing Parameters (auxiliaryL2aProcessingParametersType).

Name	Description	Data Type	Cardinality
general	L2a common processing parameters shared by the L2a products (AGB, FD, FH, TFH).	generalType	1
AGB	L2a processing parameters for the AGB product.	agbType	1
FD	L2a processing parameters for the FD product.	fdType	1
FH	L2a processing parameters for the FH product.	fhType	1
TFH	L2a processing parameters for the Tomographic FH product (note: this is not an official BPS product; it is for debug purposes only)	tfhType	1

Tab.97 Auxiliary L2a Processing Parameters (auxiliaryL2aProcessingParametersType description).



General L2a Processing Parameters (generalType).

Fig 54

Name	Description	Data Type	Cardinality
applyCalibrationScreen	Choose the phase calibration to be performed: “none”: no phase screen is applied “geometry”: only flattening phase screen is applied (i.e., as computed from acquisition geometry) “skp”: complete phase screen is applied (default)	calibrationScreenType	1
forestCoverageThreshold	Minimum percentage forest coverage in L2a product footprint, triggering L2a processing. Range of values from 0.0% to 100.0%, default 0.0%.	xsd:float	1
forestMaskInterpolationThreshold	This parameter is a threshold to fix rounding of pixels with decimal values originated from binary FNF interpolation onto L2a grid. This creates a safety buffer around forest border. Range of values from 0 to 1, default 0.5.	xsd:float	1
subsettingRule	Select acquisitions from TOM phase: one can choose, with a geometrical rule, the baselines corresponding to the ones of INT phase, or all acquisitions can be	subsettingRuleType	1

	processed. Applicable only in TOM phase. Default value: “geometry”.		
polarisationCombinationMethod	If the combination was not performed during the Stacking phase, it must be activated in L2A. If the Stack did not combine the polarizations, one of the following options must be selected (these are ignored if the Stack has already performed the combination): "HV" or "VH": to select only one of the two (in addition to HH and VV); "Average": to compute the average of HV and VH. If the Stack has already performed the combination, "None" must be selected; otherwise, an error will be raised. (Default: None)	polarisationCombinationMethodType	1

Tab.98 General L2a Processing Parameters (generalType)

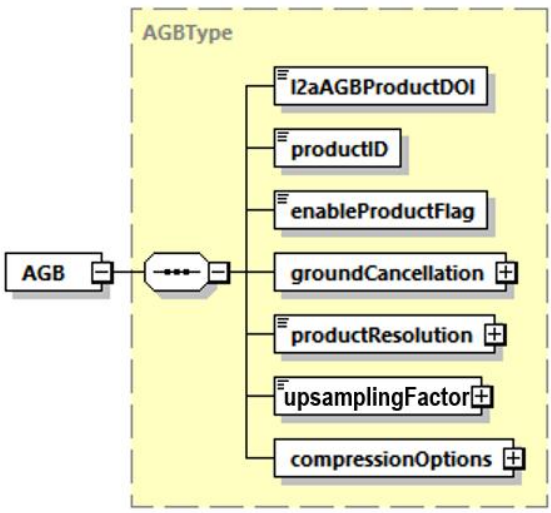
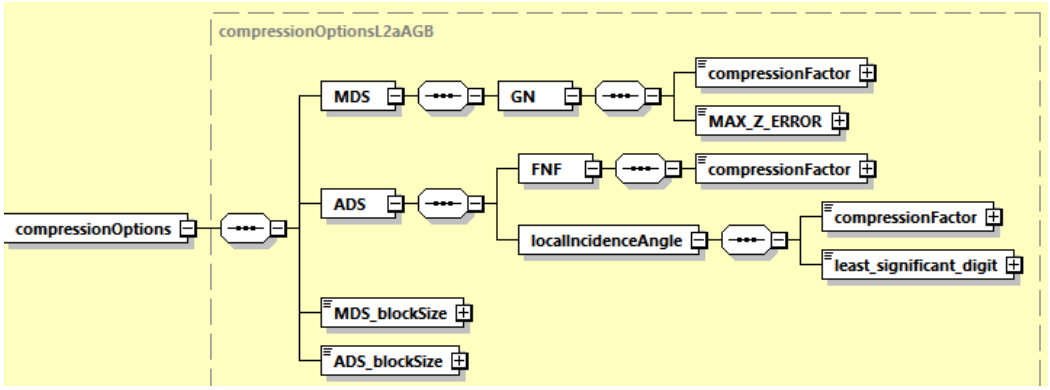


Fig.55 AGB L2a Processing Parameters (agbType)

Name	Description	Data Type	Cardinality
L2aAGBProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
productID	Product identifier: “GN_L2A”.	productType	1
enableProductFlag	True to enable the AGB product computation (default behaviour), False to skip AGB chain.	bool	1
groundCancellation	Ground Cancellation algorithm parameters.	GroundCancellationAGBType	1
productResolution	Ground cancelled data averaging window size in [m] (product resolution), to be applied during multi looking.	floatWithUnit	1
upsamplingFactor	Upsampling factor that modules downsamplingafter multilooking, default value is 2.	xsd:unsignedByte	1
compressionOptions	Configurable compression options for each L2a MDS and ADS separately. (See [RD9] for details).	compressionOptionsL2aAGBType	1

Tab.99 AGB L2a Processing Parameters (agbType)

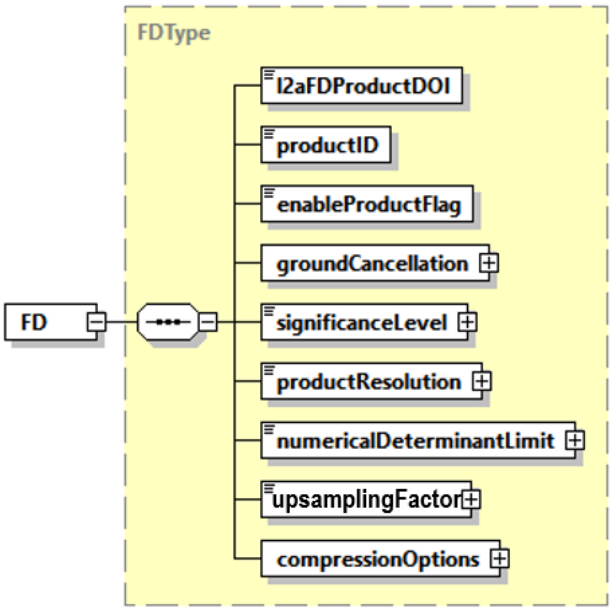


AGB L2a Processing Parameters (compressionOptionsL2aAGBType)

Name	Description	Data Type	Cardinality
MDS → GN →compressionFactor	LERC_ZSTD algorithm compression factor for the	xsd:unsignedShort	1

	ground cancelled backscatter images MDS. From 0 to 9, where zero means no compression. Default is 5.		
MDS → GN →MAX_Z_ERROR	For the ground cancelled backscatter images MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1
ADS →FNF → compressionFactor ADS → localIncidenceAngle → compressionFactor	ZLIB algorithm compression factor for the FNF and Incidence Angle ADS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
ADS → localIncidenceAngle → least_significant_digit	For the local incidence angle ADS, define exactly how lossy the ZLIB compression algorithm is allowed to be, specifying the power of ten of the smallest decimal place in the data that is a reliable value. Can be disabled with special value [string] “none”. Default is 5.	xsd:unsignedShort	1
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1
ADS_blockSize	NetCDF ADS chunking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Tab.100 AGB L2a Processing Parameters (compressionOptionsL2aAGBType)



FD L2a Processing Parameters (fdType)

Fig.57

Name	Description	Data Type	Cardinality
L2aFDProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
productID	Product identifier: “FD_L2A”.	productType	1
enableProductFlag	True to enable the FD product computation (default behaviour), False to skip FD chain.	bool	1
groundCancellation	Ground Cancellation algorithm parameters.	GroundCancellationFDType	1
significanceLevel	Significance level, expressed as a percentage, to be applied in the change detection algorithm. Range of values [0.0, 100.0], default is 1.0.	xsd:float	1
productResolution	Value in [m] to be used as the resolution on ground range map and also to perform the covariance averaging in radar coordinates. Default value is 50.0 [m].	floatWithUnit	1
numericalDeterminantLimit	Lower threshold to avoid numerical errors when computing pol covariance matrices	xsd:float	1

	determinants. Positive float number, default is 1.0e-12		
upsamplingFactor	upsampling factor that modules covariance multilooking, default value is 2.	xsd:unsignedByte	1
compressionOptions	Configurable compression options for all the L2a MDS and ADS. (See [RD7] for details).	compressionOptionsL2aFDType	1

Tab.101 FD L2a Processing Parameters (fdType)

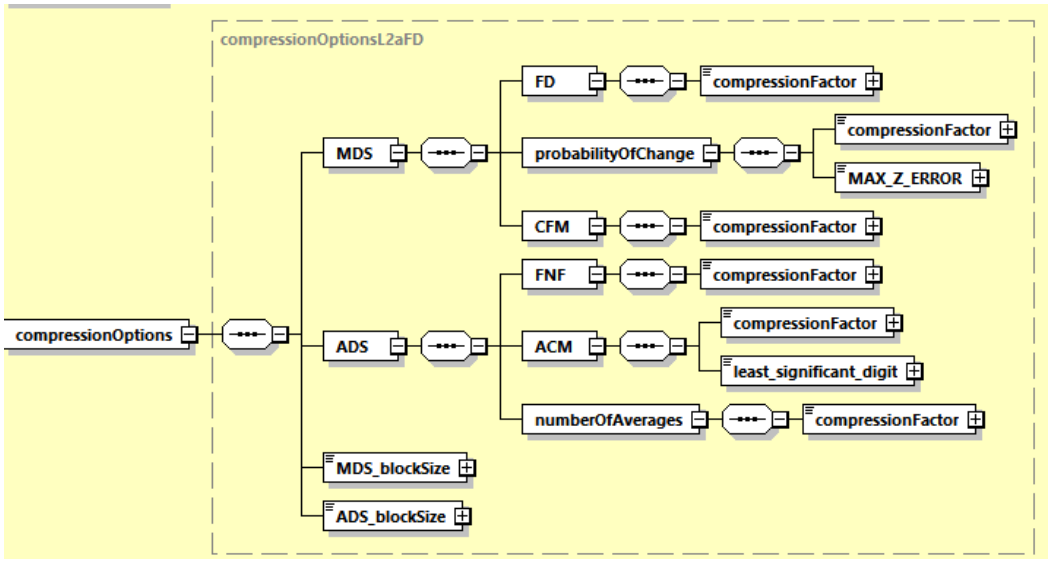


Fig.58

FD L2a Processing Parameters
(compressionOptionsL2aFDType)

Name	Description	Data Type	Cardinality
MDS → FD → compressionFactor MDS → probabilityOfChange → compressionFactor MDS → CFM → compressionFactor	Compression factor for the probability of all the image MDS. From 0 to 9, where zero means no compression. Default is 5. (Compression algorithms: ZSTD or LERC_ZSTD when the maximum error is set)	xsd:unsignedShort	1
MDS → probabilityOfChange → MAX_Z_ERROR	For the probability of change image MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less	xsd:float	1

	compression. Default is 0.0001.		
ADS →FNF → compressionFactor ADS → ACM → compressionFactor ADS → numberOfAverages → compressionFactor	ZLIB algorithm compression factor for all the ADS images. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
ADS → ACM → least_significant_digit	For all the layers of covariance LUT ADS, define exactly how lossy the ZLIB compression algorithm is allowed to be, specifying the power of ten of the smallest decimal place in the data that is a reliable value. Can be disabled with special value [string] “none”. Default is 5.	xsd:unsignedShort	1
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1
ADS_blockSize	NetCDF ADS chunking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Fig.59

FD L2a Processing Parameters

(compressionOptionsL2aFDType)

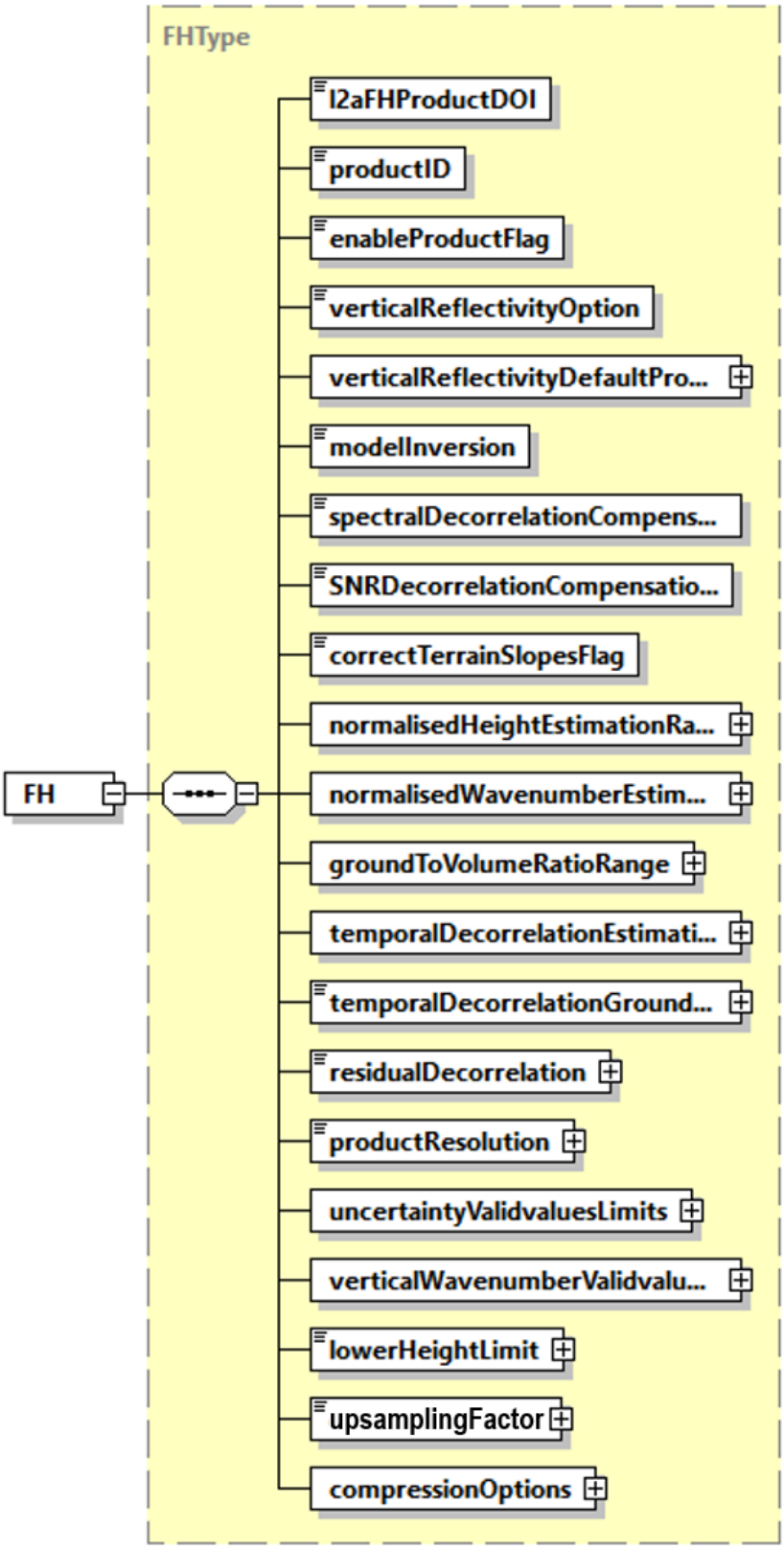


Fig.6(

FH L2a Processing Parameters (fhType)

Name	Description	Data Type	Cardinality
L2aFHProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
productID	Product identifier: “FH_L2A”.	productType	1
enableProductFlag	True to enable the FH product computation (default behaviour), False to skip FH chain.	bool	1
verticalReflectivityOption	Specify which vertical reflectivity profile to use: default modelled profile or tomographic profile (out of BPS scope). Default is ““default profile”. See also verticalReflectivityDefaultProfile .	verticalProfileOptionType	1
verticalReflectivityDefaultProfile	Modeled tomographic volume-only reflectivity profile normalized to unit height; deterministic and fixed for all the globe, for details see [RD10] . To be used if verticalReflectivityOption is set to “default profile”.	verticalReflectivityProfileType	1
modelInversion	Model inversion algorithm to be used among single or dual (baseline). Default is “dual”.	ModelInversionType	1
spectralDecorrelationCompensationFlag	True (default) if range spectral decorrelation compensation has to be performed, False otherwise.	bool	1
SNRDecorrelationCompensationFlag	True (default) if SNR decorrelation compensation has to be performed, False otherwise.	bool	1
correctTerrainSlopesFlag	True (Default) if terrain slope correction is to be applied, False otherwise.	bool	1
normalisedHeightEstimationRange	Range of normalized height values where the canopy height estimation process has to be performed. Default is	minMaxType	1

	[0.0, 1.0].		
normalisedWavenumberEstimationRange	Range of normalized wavenumbers values where the canopy height estimation process has to be performed, in normalized values. Default is [0.0, 2π, 100].	minMaxNumType	1
groundToVolumeRatioRange	Range of ground to volume ratio values to be used as valid ones during the canopy height estimation process, default [min, max, num] = [0, 3, 40] linear values.	minMaxNumType	1
temporalDecorrelationEstimationRange	Range of temporal decorrelation values to be used as valid ones, during the canopy height estimation process, default [min, max, num] = [0.4, 1.0, 20].	minMaxNumType	1
temporalDecorrelationGroundToVolumeRatio	Ratio of temporal decorrelation between ground and volume (0.0 means no temporal decorrelation for ground, while 1.0 means ground and volume are equally impacted by temporal decorrelation) Default:0.0	xsd:float	1
residualDecorrelation	Residual non-volumetric decorrelation to be used in error model computation. Range of values [0.0, 1.0], default is 0.97.	xsd:float	1
productResolution	Value in [m] to be used as the resolution on ground grange map and also to perform the coherence averaging in radar coordinates. Default value is 200.0 [m].	floatWithUnit	1
uncertaintyValidvaluesLimits	Uncertainty valid values limits, expressed as a percentage: estimates out of this limits are discarded and set to no data value. Default [0.0%, 100.0%].	minMaxTypeWithUnit	1
verticalWavenumberValidvaluesLimits	Vertical wavenumber valid values limits in [rad/m]: estimations out of this limits are discarded and set to no data	minMaxTypeWithUnit	1

	value. Default [0.01, 0.2].		
lowerHeightLimit	FH estimates lower this limit [m] are discarded and set to no data value. Default 0.0 [m]	floatWithUnit	1
upsamplingFactor	upsampling factor, that modules coherence multilooking, default value is 2.	xsd:unsignedByte	1
compressionOptions	Configurable compression options for all the L2 MDS and ADS. (See [RD8] for details).	compressionOptionsL2FHType	1

Tab.102 FH L2a Processing Parameters (fhType)

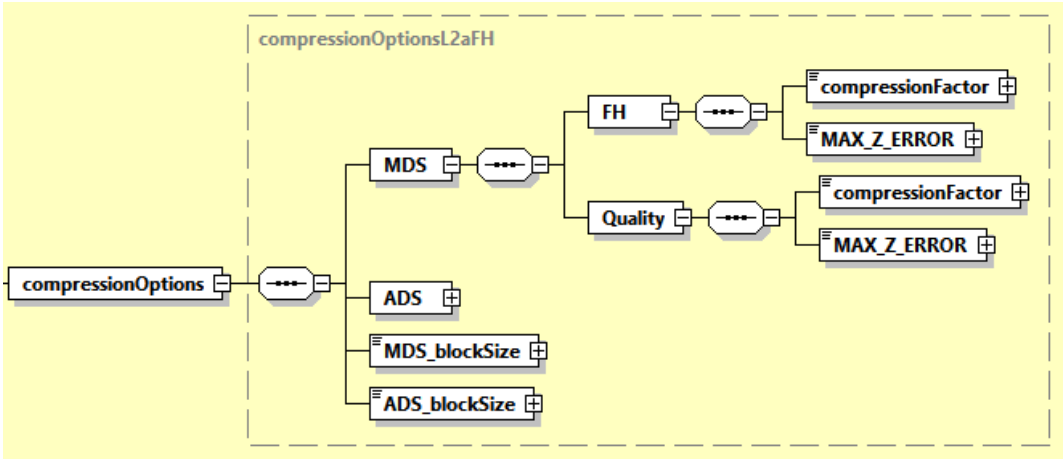


Fig.61

FH L2a Processing Parameters (compressionOptionsL2FHType)

Name	Description	Data Type	Cardinality
MDS →FH → compressionFactor MDS →Quality → compressionFactor	LERC_ZSTD algorithm compression factor for both FH and Quality images MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS → FH → MAX_Z_ERROR MDS → Quality → MAX_Z_ERROR	For both FH and Quality images MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1

ADS →FNF → compressionFactor	ZLIB algorithm compression factor for the FNF ADS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1
ADS_blockSize	NetCDF ADS chunking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Tab.103 FH L2a Processing Parameters (compressionOptionsL2FHType)

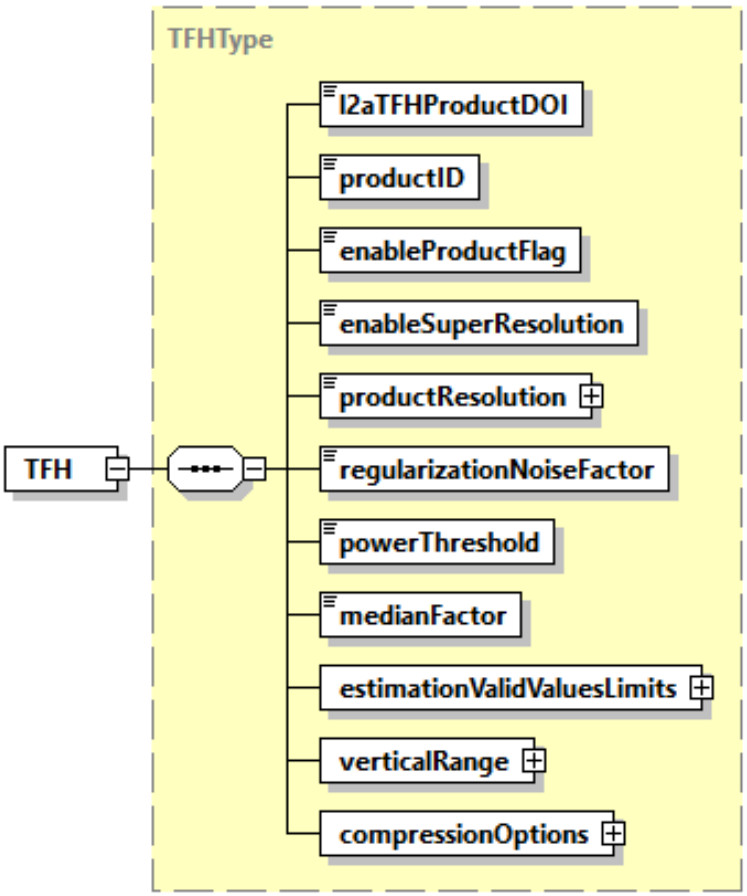
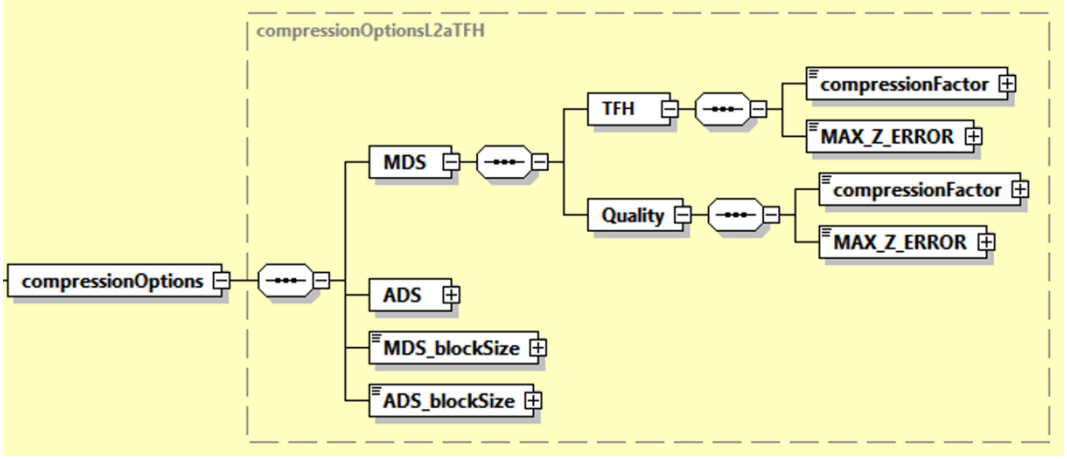


Fig.62 TFH L2a Processing Parameters (tfhType)

Name	Description	Data Type	Cardinality
L2aTFHProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
productID	Product identifier: “TFH_L2A”.	productType	1
enableProductFlag	True to enable the TFH product computation (default behaviour), False to skip TFH chain.	bool	1
enableSuperResolution	True (default) to enable the TOMO FH super resolution algorithm	bool	1
productResolution	Value to be used as the resolution on ground map and also to perform the covariance averaging in radar coordinates. In [m]. Default value is 200.0 [m].	floatWithUnit	1
regularizationNoiseFactor	regularization Noise Factor, default: 1e-3	xsd:float	1
powerThreshold	power threshold, default: 0.8	xsd:float	1
medianFactor	median Factor, default_ 5	xsd:unsignedInt	1
estimationValidValuesLimits	Estimation valid values limits [m], values of estimations out of these limits are discarded and set to no data value. Default: [5, 100]	minMaxTypeWithUnit	1
verticalRange	Vertical range minimum and maximum height [m], sampling	verticalRangeWithUnitsType	1
compressionOptions	Configurable compression options for all the L2a MDS and ADS NetCDF LUT variables.	compressionOptionsL2aTFH	1

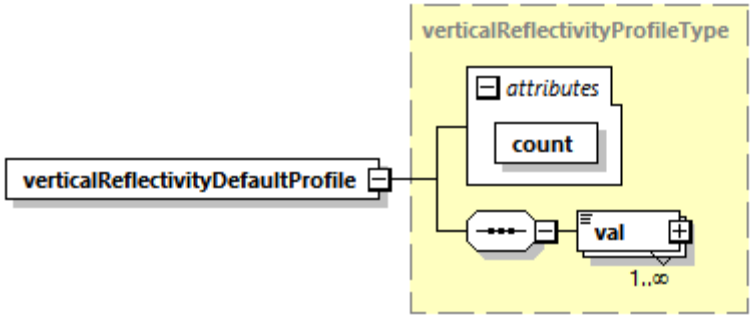
Tab.104 TFH L2a Processing Parameters (tfhType)



TFH L2a Processing Parameters (compressionOptionsL2aTFH)

Name	Description	Data Type	Cardinality
MDS →TFH → compressionFactor MDS →Quality → compressionFactor	LERC_ZSTD algorithm compression factor for both TFH and Quality images MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS →❄FH → MAX_Z_ERROR MDS → Quality → MAX_Z_ERROR	For both TFH and Quality images MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1
ADS →FNF → compressionFactor	ZLIB algorithm compression factor for the FNF ADS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1
ADS_blockSize	NetCDF ADS chunking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Tab.105 TFH L2a Processing Parameters (compressionOptionsL2TFHType)



FH default vertical profile function L2a Processing Parameters (verticalReflectivityProfileType)

Fig.64

Name	Description	Data Type	Cardinality
count	*Number of values composing the function.*	*xsd:unsignedInt*	*required*
val	Nfloating point values which composes the default modeled tomographic volume-only reflectivity profile function.	xsd:float	1..N

Tab.106 FH default vertical profile function L2a Processing Parameters (verticalReflectivityProfileType)

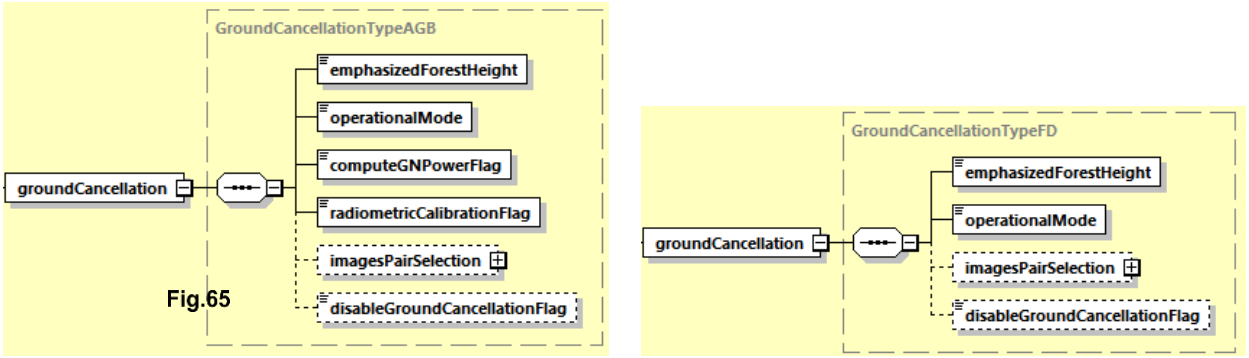


Fig.65

(a) (b)

Ground Cancellation L2a Processing Parameters (a): GroundCancellationAGBType; (b) GroundCancellationFDType

Name	Description	Data Type	Cardinality
computeGNPowerFlag	AGB only Flag.	bool	1

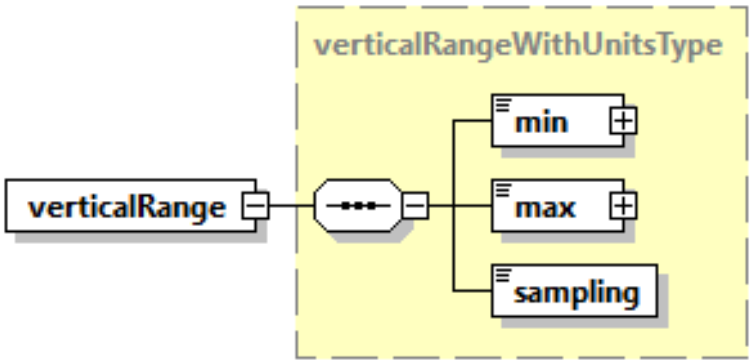
	True (default) to return the absolute squared value (power) of GN L2a. False to return the GN as complex value for Insar pair and single reference operational modes or absolute intensity value in case of multi reference operational mode		
radiometricCalibrationFlag	AGB only Flag. True to apply incidence angle radiometric calibration, False otherwise.	bool	1
emphasizedForestHeight	Value of the height [m] to be emphasized during ground cancellation. Default value is 30.0 [m].	floatWithUnit	1
operationalMode	Choose the Ground Cancellation method to use. “multi reference”: multiple data computation using each image as reference, followed by data averaging. *It is the default for AGB and applicable only for AGB.* “single reference”: direct computation with a preliminary automatic reference image selection. *It is the default for FD.* “insar pair”: debug operational mode, perform computation with only the two images specified in the optional element	operationalModeType	1

	imagesPairSelection. Note: in case of only two images available, the operationalMode is automatically set to “insar pair” (without the need of *imagesPairSelection* element).		
imagesPairSelection	Optional: if *operationalMode* is “insar pair”, ground cancellation is performed using only the two images specified here, otherwise this element is ignored and can be omitted. It is ignored also in case of only two images available for processing.	AUXPPacquisitionListType	0..1
disableGroundCancellationFlag	True to disable ground cancellation: for debug. Optional, default is False: perform ground cancellation.	bool	0..1

Tab.107 Ground Cancellation L2a Processing Parameters (GroundCancellationAGBType and GroundCancellationFDType)

Name	Description	Data Type	Cardinality
count	*Number of acquisitionFolderName entries.*	*unsignedInt*	*required*
acquisitionFolderName	Two folder names as defined in [RD6], which univocally identifies two acquisitions from the stack, to be used for debug Ground Cancellation computation.	acquisitionFolderNameType	2

Tab.108 Ground Cancellation L2a Processing Parameters (AUXPPacquisitionListType)



TFH vertical range type, L2a Processing Parameters (verticalRangeWithUnitsType)

Fig.66

Name	Description	Data Type	Cardinality
min	Min value [m], default -10	xsd:floatWithUnit	1
max	Max value [m], default 80	xsd:floatWithUnit	1
sampling	Sampling step [m], default 5	xsd:unsignedShort	1

Tab.109 TFH default vertical profile function L2a Processing Parameters (verticalRangeWithUnitsType)

4.7. AUX_PP2_FD: Auxiliary L2b FD Processing Parameters

The Auxiliary L2b Processing Parameters for Forest Disturbance product (file type AUX_PP2_FD) contains the configuration parameters for the L2b FD Processor.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in details the content of this file.

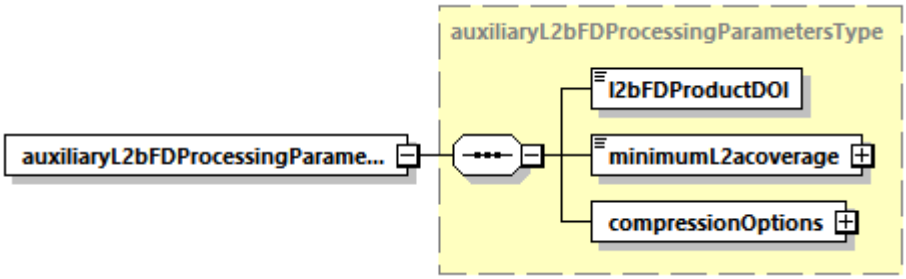
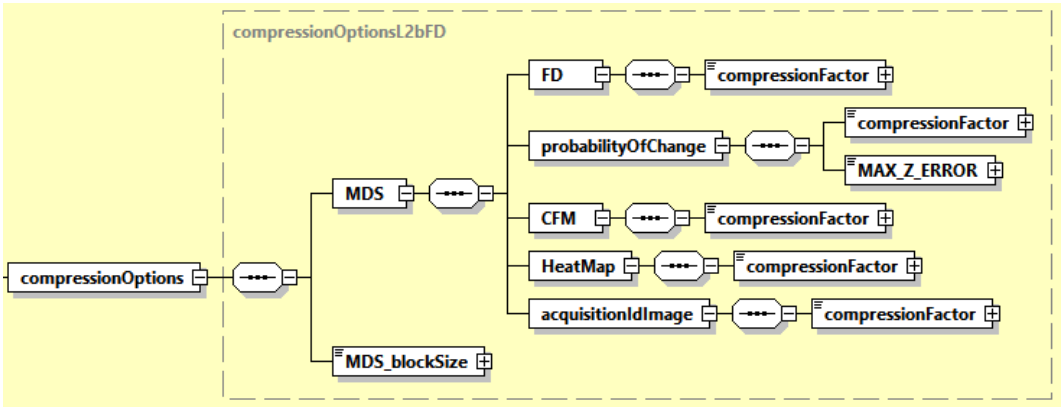


Fig.67 L2b FD Processing Parameters (auxiliaryL2bFDprocessingparametersType)

Name	Description	Data Type	Cardinality
L2bFDProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
compressionOptions	Configurable compression options for all the L2b MDS. (See [RD7] for details).	compressionOptionsL2bFDType	1
minimumL2aCoverage	Minimum configurable percentage of the output tile to be processed, which the inputs provided to L2b processor shall coverage. Values: 0.0 – 100.0. Default: 10.0	xsd:float	1

Tab.110 L2b FD Processing Parameters (auxiliaryL2bFDprocessingparametersType)



L2b FD Processing Parameters
(compressionOptionsL2bFDType)

Fig.68

Name	Description	Data Type	Cardinality
MDS → FD → compressionFactor MDS →CFM → compressionFactor MDS → probabilityOfChange → compressionFactor MDS → HeatMap → compressionFactor MDS → acquisitionIdImage → compressionFactor	LERC_ZSTD algorithm compression factor for all the MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS → probabilityOfChange → MAX_Z_ERROR	For the probability of change and Heat Map images MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Tab.111 L2b FD Processing Parameters (compressionOptionsL2bFDType)

4.8. AUX_PP2_FH: Auxiliary L2b FH Processing Parameters

The Auxiliary L2b Processing Parameters for Forest Height product (file type AUX_PP2_FH) contains the configuration parameters for the L2b FH Processor.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in details the content of this file.

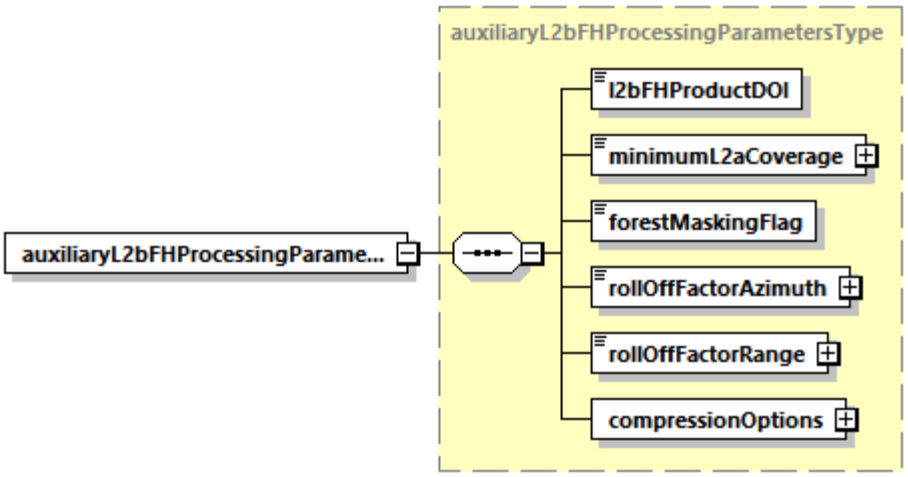


Fig.69 L2b FH Processing Parameters (auxiliaryL2bFHprocessingparametersType)

Name	Description	Data Type	Cardinality
L2bFHProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
forestMaskingFlag	True if forest/non-forest map masking should be performed during L2a products merging, false otherwise. Default: False	bool	1
minimumL2aCoverage	The minimum tile coverage, expressed as a percentage, that triggers the computations. Values: 0.0 – 100.0. Default: 10.0	xsd:float	1
rollOffFactorAzimuth	Feathering roll-off factor. Values: 0.0 – 1.0. Default: 0.1	xsd:float	1
rollOffFactorRange	Feathering roll-off factor. Values: 0.0 – 1.0. Default: 0.1	xsd:float	1

compressionOptions	Configurable compression options for all the L2b MDS. (See [RD8] for details).	compressionOptionsL2bFHType	1

Tab.112 L2b FH Processing Parameters (auxiliaryL2bFHprocessingparametersType)

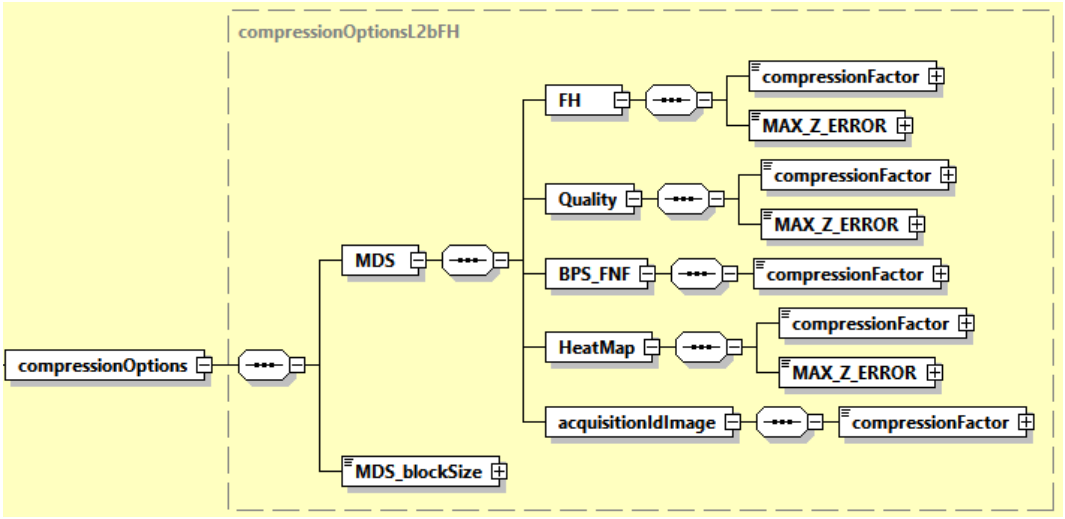


Fig.70 L2b FH Processing Parameters (compressionOptionsL2bFHType)

Name	Description	Data Type	Cardinality
MDS → FH → compressionFactor MDS → Quality → compressionFactor MDS →BPS_FNF → compressionFactor MDS → HeatMap → compressionFactor MDS → acquisitionIdImage → compressionFactor	LERC_ZSTD algorithm compression factor for all the images MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS → FH → MAX_Z_ERROR MDS → Quality → MAX_Z_ERROR MDS → HeatMap → MAX_Z_ERROR	For the FH, Quality and Heat Map images MDS, define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1

MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedInt	1

Tab.113 L2b FH Processing Parameters (compressionOptionsL2bFHType)

4.9. AUX_PP2_AB: Auxiliary L2b AB Processing Parameters

The Auxiliary L2b Processing Parameters for Above Ground product (file type AUX_PP2_AB) contains the configuration parameters for the L2b AGB Processor.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in details the content of this file.

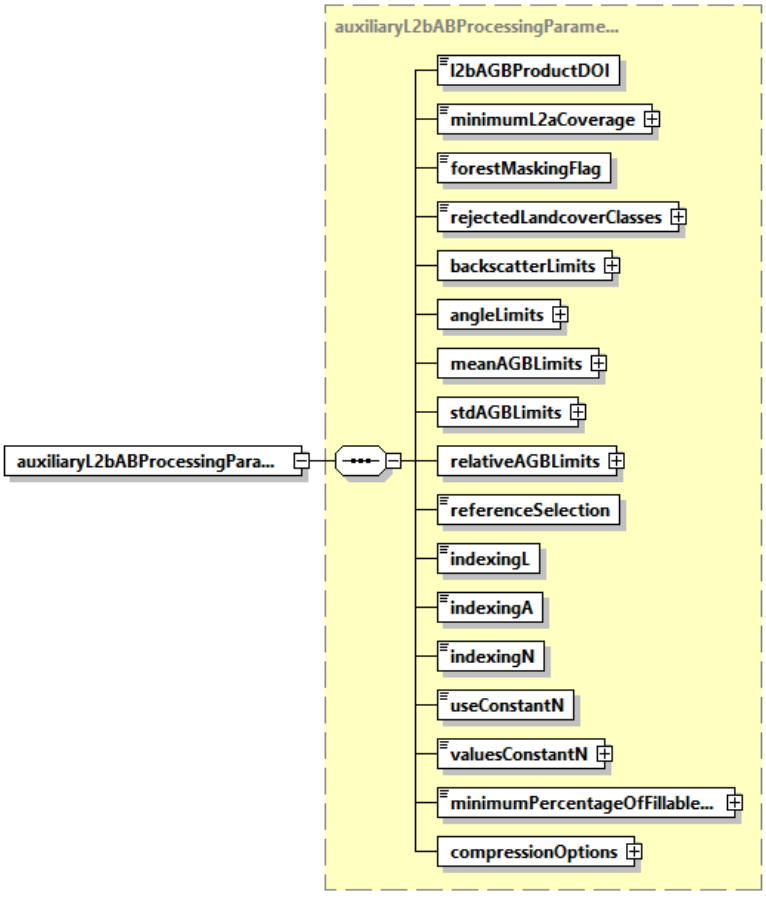


Fig.71

L2b AGB Processing Parameters
(auxiliaryL2bABprocessingparametersType)

Name	Description	Data Type	Cardinality
L2bAGBProductDOI	Digital Object Identifier	xsd:string	1

	(DOI) to be written in output products.		
forestMaskingFlag	True if forest/non-forest map masking should be performed on AGB estimate, false otherwise. Default: False	bool	1
minimumL2aCoverage	The minimum tile coverage, expressed as a percentage, that triggers the computations. Values: 0.0 – 100.0. Default: 10.0. The minimum required coverage is computed over the whole input 5°×5° neighbourhood, for each tile separately.	xsd:float	1
rejectedLandcoverClasses	Set of landcover class indices to ignore	intArray	1
backscatterLimits	Lower and upper limits on backscatter in linear units. Default values are 0.0001,100 for all polarisations	BackscatterLimitsType	1
angleLimits	Lower and upper limits on the local incidence angle [rad]. Default values are 0, π/2	minMaxTypeWithUnit	1
meanAGBLimits	Lower and upper limits on the AGB mean in [t/ha]. Default values are 10^{-3},10^{3}	minMaxTypeWithUnit	1
stdAGBLimits	Lower and upper limits on the AGB std in [t/ha]. Default values are 10^{-3},10^{3}	minMaxTypeWithUnit	1
relativeAGBLimits	Lower and upper limits on AGB standard deviation relative AGB mean (coefficient of variability), in linear units. Default values are 0, 0.3	MinMaxType	1
referenceSelection	Selection of reference data (second iteration only). String with following possible values: *"refOnly"*: reference estimates values are preferred when both data are available at the same	referenceSelectionType	1

	pixel (default behaviour). *"firstIterationOnly":* AGB previously estimated values are preferred when both data are available at the same pixel *"weightedMean":* a weighted mean (where weights are the inverse of corresponding AGB standard deviation) is computed when both data are available at the same pixel		
indexingL	L parameter variability with polarization 'p', date 'j', forest class 'k'. Default is 'pj'	agbIndexingType	1
indexingA	a parameter variability with polarization 'p', date 'j', forest class 'k'. Default is 'pk'	agbIndexingType	1
indexingN	n parameter variability with polarization 'p', date 'j', forest class 'k'. Default is 'p'	agbIndexingType	1
useConstantN	If True, indexingN=p is forced. Default is false	bool	1
valuesConstantN	Values to use if useConstantN=True. Default values is 1.0 for all polarizations	floatArray	1
regressionSolver	Select the computational complexity for the regression: "double" (default) "float"	xsd:string	1
minimumPercentageOfFillableVoids	The minimum percentage of invalid pixels in a tile that triggers a new iteration. Default value is 5.0	xsd:float	1
compressionOptions	Configurable compression options for all the L2b MDS. (See [RD8] for details).	compressionOptionsL2bABType	1

Tab.114 L2b AGB Processing Parameters (auxiliaryL2bABprocessingparametersType)

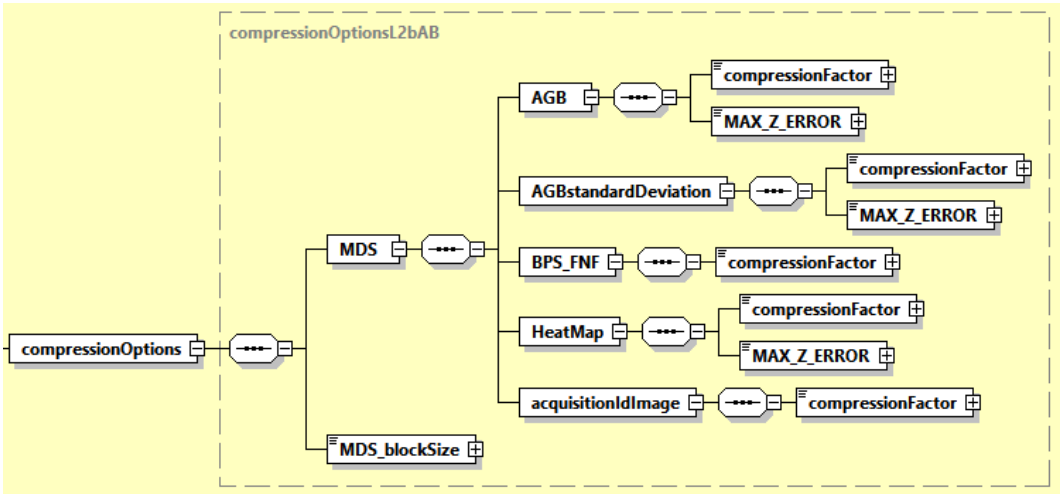


Fig.72 L2b AGB Processing Parameters (compressionOptionsL2bABType)

Name	Description	Data Type	Cardinality
MDS → AGB → compressionFactor MDS → AGBstandardDeviation → compressionFactor MDS →BPS_FNF → compressionFactor MDS → HeatMap → compressionFactor MDS → acquisitionIdImage → compressionFactor	LERC_ZSTD algorithm compression factor for all the images MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedShort	1
MDS → AGB → MAX_Z_ERROR MDS → AGBstandardDeviation → MAX_Z_ERROR MDS → HeatMap → MAX_Z_ERROR	Define exactly how lossy the LERC compression algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.	xsd:float	1

MDS_blockSize	xsd:unsignedByte	xsd:unsignedInt	1

Tab.115 L2b AGB Processing Parameters (compressionOptionsL2bABType)

Name	Description	Data Type	Cardinality
BackscatterLimitsType	Used lower and upper limits on backscatter in linear units: three enumerates elements “HH”, “VH”, “VV”, each of MinMaxType	MinMaxType	3…3

Tab.116 BackscatterLimitsType L2b DSR

4.10.AUX_PP3___: Auxiliary L3 Processing Parameters

The Auxiliary L3 Processing Parameters (file type AUX_PP3) contains the configuration parameters for the L3.

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in detail the content of this file.

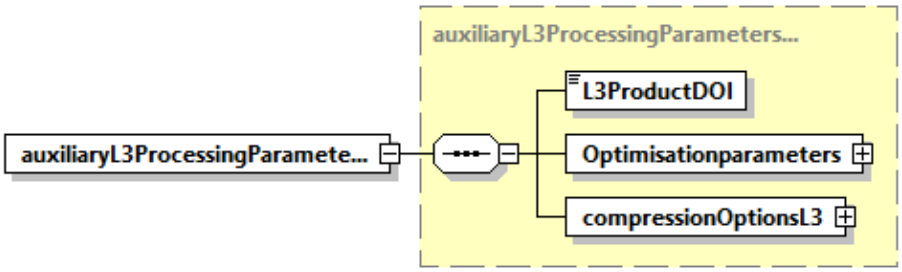


Fig.73 L3 Processing Parameters (auxiliaryL3processingparametersType)

Name	Description	Data Type	Cardinality
L3ProductDOI	Digital Object Identifier (DOI) to be written in output products.	xsd:string	1
Optimisationparameters	Configurable optimisation parameters for the L3 process.	OptimisationparametersType	1
compressionOptionsL3	Configurable compression options for all the L3 MDS. (See [RD8] for details).	compressionOptionsL3Type	1

Tab.117 L3 Processing Parameters (auxiliaryL3processingparametersType)

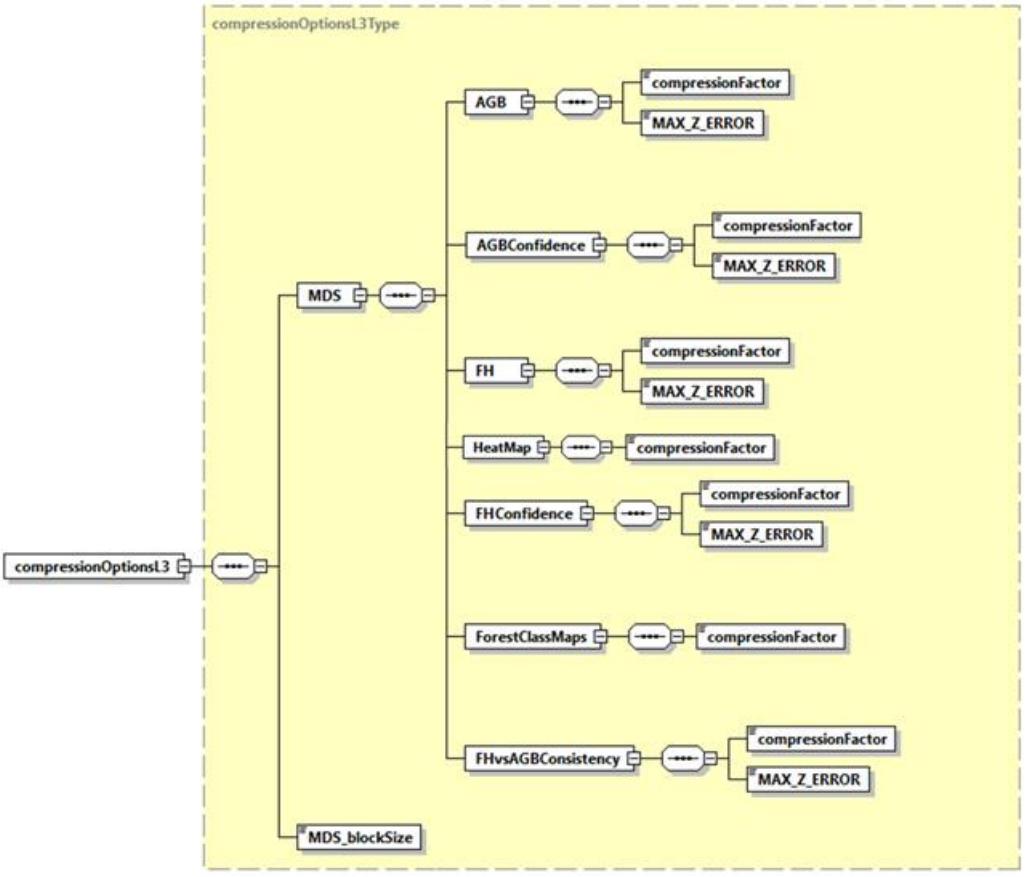
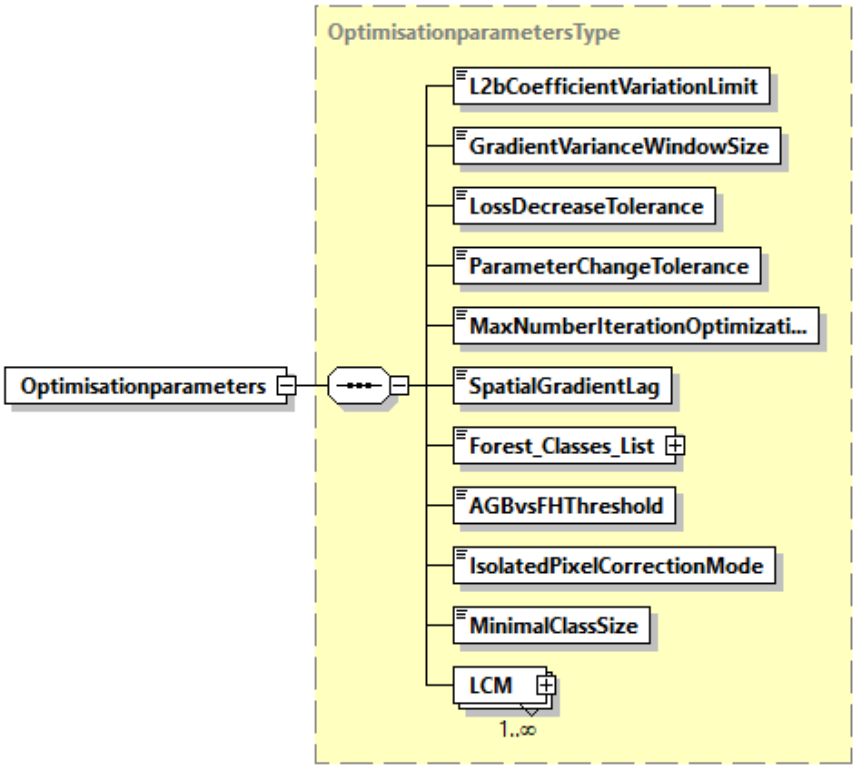


Fig.74 L3 Processing Parameters (compressionOptionsL3Type)

Name	Description	Data Type	Cardinality
MDS → AGB → compressionFactor MDS → AGBConfidence → compressionFactor MDS →FH → compressionFactor MDS → FHConfidence → compressionFactor MDS → ForestClassMaps → compressionFactor MDS → HeatMap → compressionFactor MDS → FHvsAGBConsistency → compressionFactor	LERC_ZSTD algorithm compression factor for all the images MDS. From 0 to 9, where zero means no compression. Default is 5.	xsd:unsignedByte	1
MDS → AGB →	Define exactly how lossy the LERC compression	xsd:float	1

MAX_Z_ERROR MDS → AGBConfidence → MAX_Z_ERROR MDS → FH → MAX_Z_ERROR MDS → FHConfidence → MAX_Z_ERROR MDS → FHvsAGBConsistency → MAX_Z_ERROR	algorithm is allowed to be, specifying the absolute maximum error admitted. Zero means loss-less compression. Default is 0.0001.		
MDS_blockSize	MDS COG blocking algorithm size. Same value is used for both data array dimensions	xsd:unsignedByte	1

Tab.118 L3 Processing Parameters (compressionOptionsL3Type)



L3 Processing Parameters (OptimisationparametersType)

Name	Description	Data Type	Cardinality
classes	*String of integer indicating LCM classes*	*xsd:string*	*required*

LCM	List the different parameters used in the process for the LCM classes specified in the attribute.	LCMTypeOpt	1..N
L2bCoefficientVariationLimit	The limit value of the coefficient of variation of L2b products. Default is 1.0.	xsd:float	1
GradientVarianceWindowSize	The size of gradient variance estimation window. Default is 3.	xsd:int	1
LossDecreaseTolerance	The value of the criteria to stop the optimisation loop on change of loss function L. Default is 0.000001.	xsd:float	1
ParameterChangeTolerance	The value of the criteria to stop the optimisation loop on change of parameters. Default is 0.000001.	xsd:float	1
MaxNumberIterationOptimization	The maximum number of iterations to stop the optimisation loop. Default is 4.	xsd:int	1
SpatialGradientLag	Lag used to compute spatial derivatives. Default is 1.	xsd:int	1
Forest_Classes_List	The list of class to consider as forest. Default is [50 60 61 62 70 72 80 81 82 90 100 151 160 170]	xsd:intArray	1
AGBvsFHThreshold	The value under which a pixel is flagged as non-validating the AGB vs FH consistency test. Default is 0.95.	xsd:float	1
IsolatedPixelCorrectionMode	The method used to select the class to assign to an isolated pixel. The two options are Majority (most represented class is the neighbouring pixels) and Nearest (the closest LCM class). Default is Majority.	xsd:string	1
MinimalClassSize	The minimal number of pixels to have in a forest class to keep it. Otherwise,	xsd:int	1

	his pixels are assigned to the nearest class. Default value is 100.		

Tab.119 L3 Processing Parameters (OptimisationparametersType)

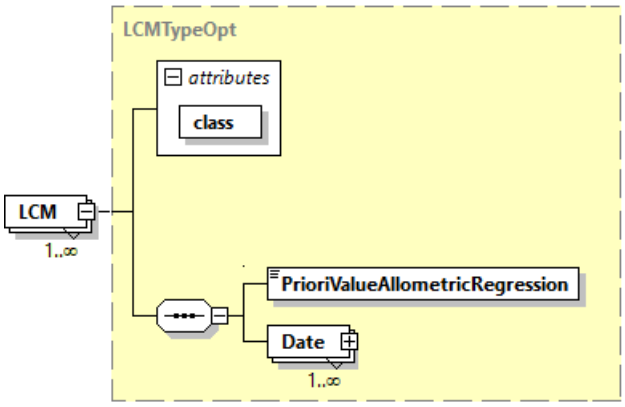
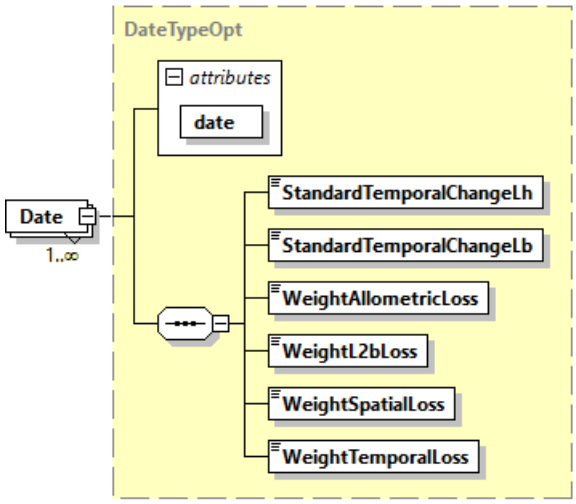


Fig.76 L3 Processing Parameters (LCMTypeOpt)

Name	Description	Data Type	Cardinality
dates	*String containing one Global Cycle index (the string format is GXX where XX refer to the number of the Global Cycle, for example G01 refers to the first Global Cycle).*	*xsd:string*	*required*
date	List the different parameters used in the process for the date specified in the attribute.	DateTypeOpt	1..TE
PrioriValueAllometricRegression	A priori value of allometric regression error variance ratio. Default is 1.	xsd:float	1

Tab.120 L3 Processing Parameters (LCMTypeOpt)



L3 Processing Parameters (DateTypeOpt)

Name	Description	Data Type	Cardinality
StandardTemporalChangeLh	The standard value of the temporal change of lh since the last date. Default is log(1.15).	xsd:float	1
StandardTemporalChangeLb	The standard value of the temporal change of lb since the last date. Default is log(1.15).	xsd:float	1
WeightAllometricLoss	The values of the weight of the allometric loss component. Default is 1.	xsd:float	1
WeightL2bLoss	The values of the weight of the L2B loss component. Default is 1.	xsd:float	1
WeightSpatialLoss	The values of to the weight of the Spatial loss component. Default is 1.	xsd:float	1
WeightTemporalLoss	The values of to the weight of the Temporal loss component. Default is 1.	xsd:float	1

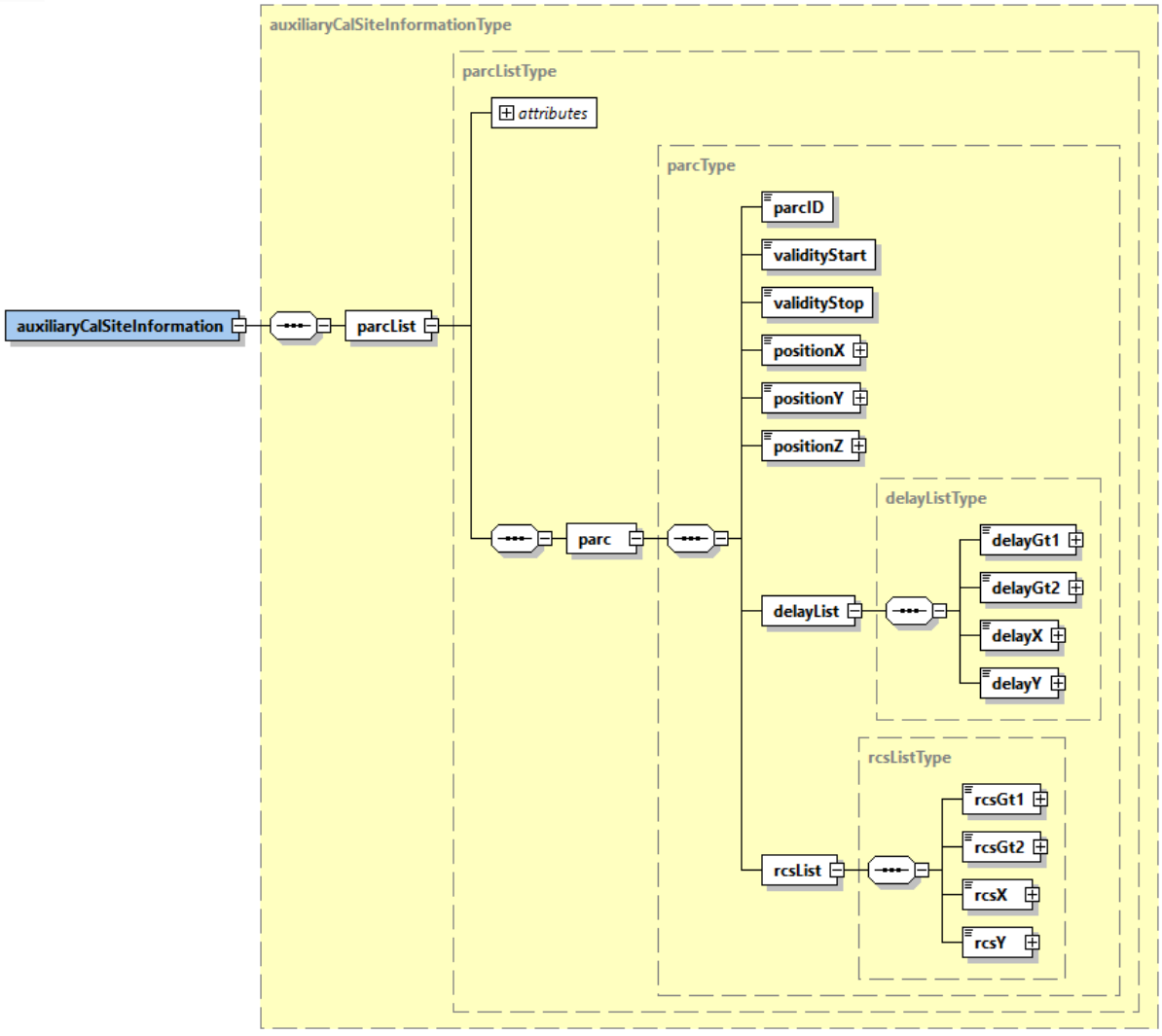
Tab.121 L3 Processing Parameters (DateTypeOpt)

4.11.PARC_INFO_: Auxiliary Calibration Site Information

The Auxiliary Calibration Site Information product (file type PARC_INFO_) contains the transponder information, including geographic position and scattering delays. This product is used by the L1 Processor to be able to detect scenes acquired on the transponder and activate the dedicated processing (standard + processing with custom range delay for IRF measurement).

This product is composed by a single XML file, plus the corresponding XSD one, included in the folder structure described in Sec. 3.

This section describes in details the content of this file.



Auxiliary Calibration Site Information (auxiliaryCalSiteInformationType).

Name	Description	Data Type	Cardinality
parcList	List of calibration targets (PARC) parameters.	parcListType	1

Tab.122 Auxiliary Calibration Site Information (auxiliaryCalSiteInformationType description).

Name	Description	Data Type	Cardinality
count		*unsignedInt*	*required*
parc	Parameters for a given calibration target (PARC).	parcType	1

Tab.123 Auxiliary Calibration Site Information (parcListType description).

Name	Description	Data Type	Cardinality
parcID	PARC identifier.	xsd:string	1
validityStart	PARC validity start time. Indicates when the calibrator starts being active (and then can be seen in the acquired images).	timeType	1
validityStop	PARC validity stop time. Indicates when the calibrator stops being active (and then cannot be seen anymore in the acquired images).	timeType	1
positionX	PARC ECEF X coordinate.	floatWithUnit	1
positionY	PARC ECEF Y coordinate.	floatWithUnit	1
positionZ	PARC ECEF Z coordinate.	floatWithUnit	1
delayList	List of PARC delays for each scattering response.	delayListType	1
rcsList	List of PARC RCS values for each scattering response.	rcsListType	1

Tab.124 Auxiliary Calibration Site Information (parcType description).

Name	Description	Data Type	Cardinality
delayGt1	Delay for PARC Gt1 scattering response [s].	floatWithUnit	1
delayGt2	Delay for PARC Gt2 scattering response [s].	floatWithUnit	1
delayX	Delay for PARC X scattering response [s].	floatWithUnit	1

delayY	Delay for PARC Y scattering response [s].	floatWithUnit	1

Tab.125 Auxiliary Calibration Site Information (delayListType description).

Name	Description	Data Type	Cardinality
rcsGt1	RCS for PARC Gt1 scattering response [dBm2].	floatWithUnit	1
rcsGt2	RCS for PARC Gt2 scattering response [dBm2].	floatWithUnit	1
rcsX	RCS for PARC X scattering response [dBm2].	floatWithUnit	1
rcsY	RCS for PARC Y scattering response [dBm2].	floatWithUnit	1

Tab.126 Auxiliary Calibration Site Information (rcsListType description).

4.12.AUX_TEC___: Auxiliary TEC Map

The Auxiliary TEC Map product (file type AUX_TEC___) contains the IONEX maps, providing the Total Electron Content (TEC), used during ionospheric correction step.

The format of these maps is described in [RD3]. The Auxiliary TEC Map product is generated including these files into the data sub-folder of the folder structure described in Sec. 3 and applying the proper convention to the folder name and data files.

5. Appendix: Common Auxiliary Products Format Specification

5.1. Primitive and common types

The following table summarizes and describes primitive product types used throughout the document.

Name	Description	Base Type	Values
missionType	Enumeration of valid BIOMASS mission names.	xsd:string	BIOMASS
swathType	Enumeration of all valid swath identifiers.	xsd:string	S1 S2 S3
acquisitionModeIDType	Enumeration of all valid acquisition modes.	xsd:string	S1 INT S2 INT S3 INT S1 TOM S2 TOM S3 TOM Rx Only
productType	Enumeration of valid product types.	xsd:string	SCS DGM STA FH_L2A FH_L2B FD_L2A FD_L2B GN_L2A AGB_L2B TFH_L2A
polarisationType	Enumeration of valid polarisations.	xsd:string	H V HH HV VH VV XX
groupType	Enumeration of valid LUT groups of variables.	xsd:string	DEM based LUT RFI based LUT Image based LUT

channelType	Enumeration of valid RGB channels.		RED GREEN BLUE
timeType	UTC time expressed according to ISO 8601 standard (1 microsecond resolution).	xsd:dateTime	
subsettingRuleType	Enumeration of available rules for INT subsetting: select three acquisitions from all the ones in input (when input is TOM phase).	xsd:string	geometry maintain all
calibrationType	Enumeration of available rules for phase screen application in Stack processor	xsd:string	geometry skp
calibrationScreenType	Enumeration of available rules for phase screen application in L2A processor	xsd:string	none geometry skp
missionPhaseIDType	Enumeration of all valid BIOMASS mission phases.	xsd:string	COM TOM INT
sensorModeType	Enumeration of valid sensor mode abbreviations.	xsd:string	Measurement RX Only External Calibration
l1acQlColourCodingMethodType	Enumeration of L1a and L1c products quick-looks colour coding methods.	xsd:string	Pauli HSV Pauli and HSV
l1bQlColourCodingMethodType	Enumeration of L1b products quick-looks colour coding methods.	xsd:string	Lexicographic
referenceSelectionType	Enumeration of AGB selection of reference data (second iteration only). String	xsd:string	refOnly firstIterationOnly weightedMean
signalType	Enumeration of valid signal types.	xsd:string	TxVandRx TxHandRx RxOnly TxOnly-V TxOnly-H TxCal-V TxCal-H TxCal-V1 TxCal-V2 TxCal-H1

			TxCal-H2 RxCal ShCal Idle TxVandRx_S TxHandRx_S Noise
orbitPassType	Enumeration of the orbit pass direction values.	xsd:string	Ascending Descending
projectionType	Enumeration of the image projection.	xsd:string	Slant Range Ground Range Latitude longitude based on DGG DGG
pixelRepresentationType	Enumeration of image pixel representation types.	xsd:string	I Q Abs Phase Abs Probability of change Computed forest mask Forest Disturbance Heat Map Forest Height [m] Forest height quality Forest mask Ground Cancelled Backscatter Above Ground Biomass [t/ha] Above Ground Biomass quality [t/ha] Acquisition ID image
pixelTypeType	Enumeration of image pixel data types.	xsd:string	32 bit Float 16 bit Signed Integer 16 bit Unsigned Integer 8 bit Unsigned Integer
pixelQuantityType	Enumeration of pixel quantity types.	xsd:string	Beta-Nought Sigma-Nought Gamma-Nought
compressionMethodType	Enumeration of TIFF compression methods.	xsd:string	NONE DEFLATE ZSTD LERC LERC_DEFLATE LERC_ZSTD

productCompositionType	Enumeration of product composition indicators. The valid values are: “Nominal”, to indicate a framed product of nominal length; “Merged”, if the product is resulting from the merging of a “short” frame with the contiguous one; “Partial”, if the product length is not nominal, but it is not merged to a contiguous one since it is “long enough”; “Incomplete”, if the product length is not nominal due to contingency (e.g., data loss); “Not Framed”, if the product is not framed, i.e., as long as input L0 one.	xsd:string	Nominal Merged Partial Incomplete Not Framed
dataFormatModeType	Enumeration of compression method names.	xsd:string	BAQ 4 Bit BAQ 5 Bit BAQ 6 Bit Bypass
agbIndexingType	Enumeration of AGB algorithm indexings	xsd:string	none p j k pj pk jk pjk
processingModeType	Enumeration of processing modes.	xsd:string	Nominal PARC
orbitAttitudeSourceType	Enumeration of value sources of orbit and attitude data. "Downlink" or "Auxiliary".	xsd:string	Downlink Auxiliary
rfiMitigationMethodType	Enumeration of RFI mitigation methods.	xsd:string	Time Frequency Time and Frequency Frequency and Time
rfiMaskType	Enumeration of RFI masks.	xsd:string	Single Multiple
rfiMaskGenerationMethodType	Enumeration of RFI mask generation methods.	xsd:string	AND OR
rangeReferenceFunctionType	Enumeration of the available	xsd:string	Nominal Replica

	range reference functions.		Internal
rangeCompressionMethodType	Enumeration of the available range compression methods.	xsd:string	Matched Filter Inverse Filter
rfiFMMitigationMethodType	Enumeration of the available RFI Frequency Domain mitigation methods.	xsd:string	NOTCH_FILTER NEAREST_NEIGHBOUR_INTERPOLATION
dcMethodType	Enumeration of Doppler Centroid calculation/estimation methods.	xsd:string	Geometry Combined Fixed
weightingWindowType	Enumeration of weighting window names.	xsd:string	Kaiser Hamming None
bistaticDelayCorrectionMethodType	Enumeration of bistatic delay correction methods.	xsd:string	Bulk Full
ionosphereHeightEstimationMethodType	Enumeration of ionosphere height estimation methods.	xsd:string	Automatic Feature Tracking Squint Sensitivity Model Fixed
ionosphereHeightSourceType	Enumeration of stack ionosphere height sources.	xsd:string	None Reference Image Manual
autofocusMethodType	Enumeration of autofocus methods.	xsd:string	Map Drift
internalCalibrationSourceType	Enumeration of the available internal calibration sources.	xsd:string	Extracted Model
heightModelType *Attribute: version*	Enumeration of Digital Elevation Models (DEM). *Attribute: DEM version. Default values:* • *COP-DEM_GLO-90-DGED-2021_1 EGM2008-2.5 for Copernicus DEM (convention: <format>-<delivery name> <geoid>-<resolution>)* • *SRTM_v1 EGM96 for SRTM (convention: SRTM_<version> <geoid>)* • *Empty value for Ellipsoid* *Version value has a one-to-*	xsd:string *Attribute: xsd:string*	Ellipsoid SRTM Copernicus DEM BIOMASS DTM

	one mapping with the physical folder where DEM to be used has been installed.		
coordinateReferenceSystemType	Coordinate reference systems, as per WKT representation [RD5].	xsd:string	
geodeticReferenceFrameType	Enumeration of geodetic reference frames.	xsd:string	WGS84 ITRF2000
polarisationCombinationMethodType	Enumeration of polarisations combination methods.	xsd:string	HV VH Average None
primaryImageSelectionMethodType	Enumeration of coregistration primary image selection methods.	xsd:string	Geometry Geometry and Quality Temporal Baseline
coregistrationMethodType	Enumeration of coregistration methods.	xsd:string	Geometry Geometry and Data Automatic
baselineMethodType	Enumeration of baseline method types (e.g. SingleBaseline or MultiBaseline).	xsd:string	Single-Baseline Multi-Baseline
ionosphereTypeType	Enumeration of the ionosphere types estimated by the BIC.	xsd:string	Linear Fast-varying None
coregistrationExecutionPolicyType	Enumeration of coregistration execution policies	xsd:string	Nominal Shift Estimation Only Warping Only
skpPhaseCorrectionType	Enumeration of supported corrections executed by SKP.	xsd:string	None Flattening Phase Screen Ground Phase Screen
skpPhaseCalibrationPostprocessingType	Postprocessing methods for the SKP calibration phase screen.	xsd:string	None Goldstein Boxcar Median
primaryImageSelectionInformationType	Enumeration of information used to select coregistration primary image.	xsd:string	Geometry Geometry and RFI Correction Geometry and FR Correction Geometry and RFI+FR Correction Temporal Baseline
layerType	Enumeration of LUT layer contents.	xsd:string	Faraday Rotation plane [rad]

			Faraday Rotation [rad] Faraday Rotation std [rad] Phase screen [rad] TEC [TECU] Range shifts [m] Azimuth shifts [m] Autofocus phase screen [rad] Autofocus phase screen std [rad] RFI time domain mask HH RFI time domain mask HV RFI time domain mask VH RFI time domain mask VV RFI frequency domain mask HH RFI frequency domain mask HV RFI frequency domain mask VH RFI frequency domain mask VV Sigma-nought LUT Gamma-nought LUT Denoising map HH Denoising map HV Denoising map VH Denoising map VV Denoising map XX Latitude [deg] Longitude [deg] Height [m] Incidence angle [deg] Elevation angle [deg] Range terrain slope [deg] Azimuth terrain slope [deg] FNF ACM numberOfAverages Azimuth coregistration shifts [m] Azimuth orbit coregistration shifts [m] Range coregistration shifts [m] Range orbit coregistration shifts [m] Coregistration shifts quality Wavenumbers [rad/m] Flattening phase screen [rad] Ionosphere Phase Screens [rad] SKP calibration phase screen [rad] SKP calibration phase screen quality

			Interferogram [rad] Coherence
uomType	Enumeration of unit of measures.	xsd:string	s UTC m samples lines deg rad Hz Hz/s MHz dB Mbps C K deg/s rad/2 mm/Km deg/m rad/m 1/m t/ha (rad/nT)^2 *[empty string]*
operationalModeType	Enumeration of Ground Cancellation algorithms available.	xsd:string	multi reference single reference insar pair
verticalProfileOptionType	Vertical profile choice.	xsd:string	default profile
modelInversionType	Forest height inversion option	xsd:string	single dual
bool	Boolean (true or false).	xsd:boolean	(false)|(true)
string	Character string containing up to 512 characters in UTF-8 encoding.	xsd:string	

Tab.127 Primitive product types.

The following table summarizes and describes those primitive product types for which attributes have been added with respect to base types.

Name	Description	Base Type	Attributes
timeTypeWithPolarisation	Extension of timeType with the indication of the corresponding	timeType	polarisation

	polarisation.		
unsignedIntWithGroup	Extension of unsignedInt with the indication of the corresponding LUT group of variables. Attribute type is groupType	xsd:unsignedInt	group
floatWithPolarisation	Extension of float with the indication of the corresponding polarisation.	xsd:float	polarisation
floatWithChannel	Extension of float with the indication of the corresponding RGB channel.	xsd:float	channel
intArray	String containing an array of int values separated by spaces. The mandatory count attribute defines the number of elements in the array.	xsd:string	count
floatArray	String containing an array of float values separated by spaces. The mandatory count attribute defines the number of elements in the array.	xsd:string	count
floatArrayWithUnits	String containing an array of float values separated by spaces. The mandatory count attribute defines the number of elements in the array.	xsd:string	count units
doubleArray	String containing an array of double precision floating point values separated by spaces. The mandatory count attribute defines the number of elements in the array.	xsd:string	count
doubleArrayWithUnits	String containing an array of double precision floating point values separated by spaces. The mandatory count attribute defines the number of elements in the array.	xsd:string	count units
complexArray	String containing an array of complex value pairs separated by spaces in the form of I Q I Q I Q ... The mandatory count attribute defines the number of complex elements in the array.	xsd:string	count units
acquisitionFolderNameType	String containing an acquisition folder name; The mandatory *referenceImage* attribute is a *bool* to indicate if the acquisition is the reference one. The optional *averageWavenumber* attribute is a float with the average value of the vertical wavenumber of the acquisition. Not used in image pair	xsd:string	referenceImage (mandatory, bool) averageWavenumber (optional, xsd:float)

	acquisitions (imagesPairSelection in Tab.107)		

Tab.128 Primitive product types with custom attributes.

The following tables describe common product types used throughout the document.

Name	Description	Data Type	Cardinality
re	32 bit single precision floating point real number.	xsd:float	1
im	32 bit single precision floating point imaginary number.	xsd:float	1

Tab.129 Common product types (complex).

Name	Description	Data Type	Cardinality
azimuthTime	Zero Doppler azimuth time of current value [UTC].	timeType	1
value	Current value.	xsd:float	1

Tab.130 Common product types (stateType).

Name	Description	Data Type	Cardinality
azimuthTime	Zero Doppler azimuth time corresponding to the start of the current polynomial validity area [UTC].	timeType	1
t0	Two-way slant range time origin for polynomial [s].	doubleWithUnit	1
polynomial	Local estimate expressed as the following polynomial: `X = c0+c1(tSR-t0)+c2(tSR-t0)^2+...` where `tSR` is the two-way slant range time.	doubleArray	1

Tab.131 Common product types (slantRangePolynomialType).

Name	Description	Data Type	Cardinality
slantRangeTime	Two-way slant range time corresponding to the start of the current polynomial validity area [s].	xsd:double	1
t0	Zero Doppler azimuth time origin for polynomial [UTC].	timeType	1

polynomial	Local estimate expressed as the following polynomial: `X = c0+c1(tSR-t0)+c2(tSR-t0)^2+...` where tAZ is the Zero Doppler azimuth time.	doubleArray	1

Tab.132 Common product types (azimuthPolynomialType).

Name	Description	Data Type	Cardinality
coordinateReferenceSystem	Coordinate reference system.	coordinateReferenceSystemType	1
geodeticReferenceFrame	Geodetic reference frame.	geodeticReferenceFrameType	1

Tab.133 Common product types (datumType).

Name	Description	Data Type	Cardinality
min	Minimum value.	xsd:float	1
max	Maximum value.	xsd:float	1

Tab.134 Common product types (minMaxType)

Name	Description	Data Type	Cardinality
min	Minimum value.	xsd:float	1
max	Maximum value.	xsd:float	1
num	Number of values	xsd:unsignedShort	1

Tab.135 Common product types (minMaxNumType)

Name	Description	Data Type	Cardinality
min	Minimum value.	floatWithUnit	1
max	Maximum value.	floatWithUnit	1

Tab.136 Common product types (minMaxTypeWithUnit)