Ministerio de Ciencia, Tecnología e Innovación
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CONAE

SAOCOM – 1

LEVEL 1 PRODUCTS FORMAT

SAOCOM PROJECT

COMISION NACIONAL DE ACTIVIDADES ESPACIALES
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1 Document overview

1.1 Purpose

This document is the specification for the SAOCOM SAR Processors Level 1 product format.

The document covers all the SAOCOM 1A/1B level 1 products, which are in this document listed and classified according to the following characteristics:

- The mission: SAOCOM-1A/1B
- The acquisition mode: It can be SM (Stripmap), TN (Topsar Narrow) and TW (Topsar Wide).
- The polarization
- The Processing Level

Section 1 (this section) contains the document overview and reports the reference documents.

Section 2 provides the L1 product format specification, starting from a L1 product overview, describing the SAR Level-1 product structure and contents, and finally providing the L1 naming convention strategy.

1.2 Acronyms

BAQ	Block Adaptative Quantizer
BATQ	Block Adaptive Truncation Quantizer
BP	Browsing Product
CP	Compact Polarization (LH/LV or RH/RV)
CUSS	CONAE User Ground Segment Service
DI	Detected Image (ground range projected)
DP	Dual Polarization (HH/HV or VV/VH)
GEC	Ground Ellipsoid Corrected
GS	Ground Segment
GTC	Ground Terrain Corrected
QP	Quadruple Polarization (HH/HV/VH/VV)
SLC	Single Look Complex
SM	Stripmap
SP	Single Polarization (HH or VV)
SSP	SAOCOM SAR Processor
TN	TOPSAR Narrow
TW	TOPSAR Wide
XML	eXtensible Markup Language
XSD	XML Schema Definition

1.3 Reference documents

[1] Geotiff specification http://www.alternatiff.com/resources/TIFF6.pdf.

[2] GeoTIFF Format Specification GeoTIFF Revision 1.http://geotiff.maptools.org/spec/geotiffhome.html

1.4 **Data type convention**

The following data type convention applies to element data type used within this document

DataTYPE	Description
S	String
E	Enumerate String
I	Integer
UI	Positive integer
L	Long integer
SF	Single (float32)
D	Double (Float64)
B	Boolean
UTC	String of type dd-mmm-yyyy hh:mm:ss.uuuuuuuuuuuu representing the UTC date and time E.g. “01-JAN-1985 03:22:11.000000000000”
POLY	Polynomial type (7 double values)

Tab.1 Convention used throughout the document for datatypes.

2 SAOCOM L1 product format

The purpose of this chapter is to provide a definition of the SAOCOM SAR L1 product and a description of the structure and content of a product generated according to this format. The section contains:

- An overview of the organization and content of a Level 1 product;
- A description of the content of the product components;
- A definition of naming convention for the product and for the product components;

2.1 **L1 product overview**

This section contains an overview of the SAOCOM SAR Level 1 products.

SAOCOM SAR instrument can operate in the following imaging modes:

- Stripmap Mode (SM)
- Topsar Narrow (TN)
- Topsar Wide (TW)

Within each imaging mode, different polarization capabilities are provided. The following polarization modes are available (each polarization mode is composed by one or more polarization combination, each coded with two letters representing the transmitted and received polarization respectively:

- Two single polarization modes (HH, VV)
- Two dual polarization modes (HH/HV, VV/VH)
- One full polarization mode (HH/HV/VH/VV)
- One (technological[1]) compact polarization mode (CP)

For each one of the satellite acquisition modes (imaging mode plus polarization mode), the foreseen Level 1 processing products are reported inTab.2.

Product Name	Level	Description
Single Look Complex (SLC)	Level-1A	Complex data in slant range, radiometrically calibrated with no geometric corrections. Generated from Level-0 products.
Detected Image (DI)	Level-1B	Data projected to ground range, radiometrically calibrated and georeferenced. Generated from Level-0 products.
Ground Ellipsoid Corrected (GEC)	Level-1C	Radiometrically calibrated, geocoded and georeferenced exploiting ellipsoid. Generated from Level-0 products.
Ground Terrain Corrected (GTC)	Level-1D	Radiometrically calibrated, geocoded and georeferenced exploiting topography. Generated from Level-0 products.

Tab.2 SAOCOM 1A/1B Level 1 processing products.

[1]The *technological working modes* are intended to include some kind of technological changes in order to appraise performance improvements. The CP technological mode was originally foreseen for TOPSAR Wide imaging mode, and its extension to other imaging modes is under analysis. Nevertheless, this document includes some references to potential future CP products, if appropriate.

2.2 Level 1 Product family Tree

The following figure shows the family tree for the SAOCOM Level 1 products.

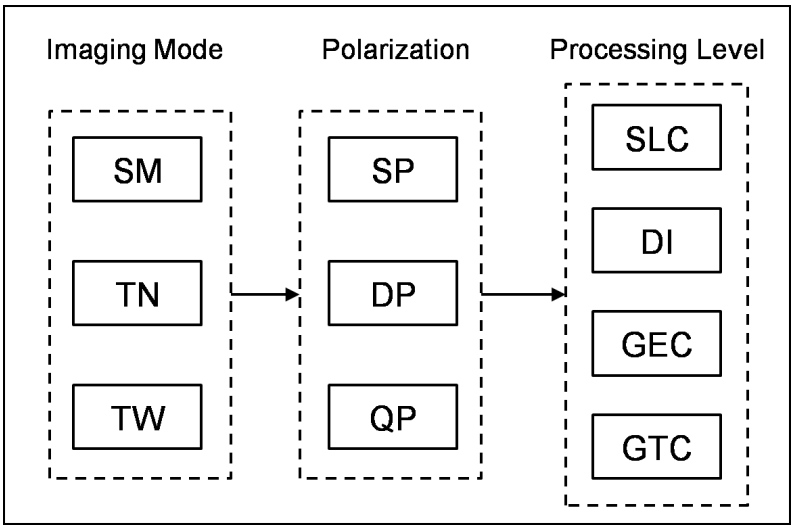


Fig.1 Product Family Tree.

2.3 Level 1 Product main characteristics

The following figure shows a graphical representation of the different acquisition modes including Stripmap, TOPSAR Narrow and TOPSAR Wide imaging modes with Single, Dual and Quad Polarization.

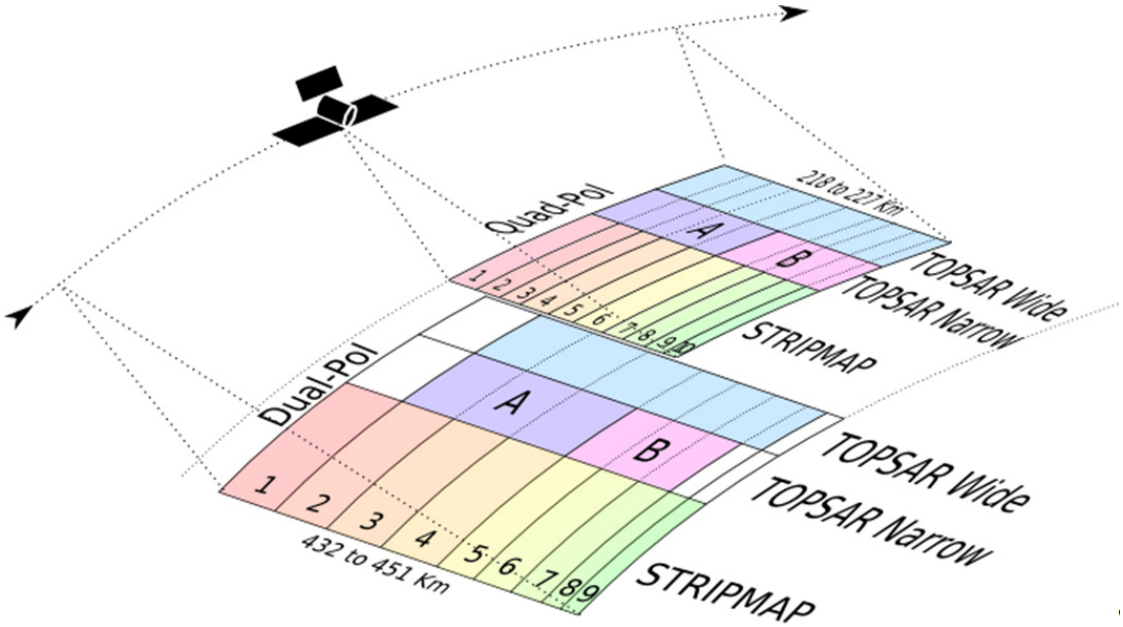


Fig.2 Graphical representation of the SAOCOM-1 acquisition modes. The ones labeled as Dual-Pol encompass also Single-Pol modes.

The following Table presents the main characteristics of the Level 1 products of the SAOCOM-1 mission.

Beam Mode	Beam Position	Minimum Incidence Angle Range		Nominal Spatial Resolution		Minimum Swath Width (ground range) [km]	Nominal Azimuth Length [km]	Nominal Equivalent Number of Looks	
				L1A Products	L1B, L1C, and L1D Products			L1A (SLC)	L1B (DI), L1C (GEC), L1D (GTC)
		Near range [deg]	Far range [deg]	Ground Range x Azimuth [m x m]	Ground Range x Azimuth [m x m]				
Stripmap Single Pol and Dual Pol	S1	20.7	25.0	10 x 5	10 x 10	49.7	74.1	1	2
	S2	24.9	29.2			52.3			
	S3	29.1	33.8			61.4			
	S4	33.7	38.3			65.7			
	S5	38.2	41.3			49.1			
	S6	41.3	44.5			55.6			
	S7	44.6	47.1			48.0			
	S8	47.2	48.7			31.9			
	S9	48.8	50.2			31.1			
Stripmap Quad Pol	S1	17.6	19.6	10 x 6	10 x 10	21.9	74.1	1	2
	S2	19.5	21.5			22.0			
	S3	21.4	23.3			21.0			
	S4	23.2	25.4			25.4			
	S5	25.3	27.3			23.4			
	S6	27.2	29.6			29.4			
	S7	29.6	31.2			20.9			
	S8	31.2	33.0			25.1			
	S9	33.0	34.6			22.1			
	S10	34.6	35.5			14.2			
TOPSAR Narrow Single Pol and Dual Pol	TNA	24.9	38.3	10 x 30	30 x 30	176.3	222.3	1	3
	TNB	38.2	47.1			150.2			
TOPSAR Narrow Quad Pol	TNA	17.6	27.3	10 x 50	50 x 50	109.9	222.3	1	5
	TNB	27.2	35.5			108.8			
TOPSAR Wide Single Pol and Dual Pol	TW	24.9	48.7	10 x 50	50 x 50	353.7	444.6	1	5
TOPSAR Wide Quad Pol	TW	17.6	35.5	10 x 100	100 x 100	218.1	444.6	1	10

Tab.3 Level 1 Products main characteristics.

2.4 Product Classifications Description

2.4.1 Polarization

The difference between single and multiple polarization products is in the number of images contained in the product itself (one image for single, two for double and four for quadruple polarization for each swath) and then in its whole dimensions.

2.4.2 Processing Level

The SLC acronym is used to indicate images that are in slant-range and azimuth coordinates plane, not multi-looked and represented by complex values. For STRIPMAP data this product is sampled at the natural pixel spacing. For TOPSAR case the azimuth sampling is kept fixed for all the sub-swaths through a proper re-sampling performed at focusing time. Moreover, each sub-swath is stored in a separated image, juxtaposing all the independently processed bursts.

For TOPSAR case it is also foreseen a mosaicked version (complex) of SLC called SLC merged. The subswaths are debursted and merged together.

The DI acronym is used to indicate images that are in ground-range and azimuth coordinates plane, multi-looked and represented by detected values in amplitude. For the TOPSAR case all the bursts and sub-swaths are merged together to have a single image, as in the STRIPMAP case.

The GEC and GTC acronyms are used to indicate images that are projected according to a cartographic projection, multi-looked and represented by detected values in amplitude. The main difference respect to the DI data consists in the image geocoding and then in its projection (from SAR to cartographic coordinates). In order to perform this step, for GEC the Ellipsoid model is exploited, while for GTC a Digital Elevation Model is needed. For the TOPSAR case all the bursts and sub-swaths are merged together to have a single image, as in the STRIPMAP case.

2.4.2.1 Calibration

The images are already calibrated in sigma0 and there is no need to apply any calibration constant. For this reason the pixel data type is float or complex. This is the case for both Stripmap and TOPSAR modes.

L1A products are distributed in I and Q format, and L1B, L1C and L1D in absolute values (amplitude). Then, if the radiometry is needed in [dB], it should be applied 20*log10() (for L1B, L1C and L1D).

2.5 SAR Level 1 product structure

As described in Fig.3, a SAOCOM Level 1 product consists of the following components:

- A **CUSS metadata file** (XML) that describes the overall content of the product, and some other details regarding download and processing performed on data during the data processing. The file is described in section 2.6.1.1.
- A **CUSS data file** (zip) containing all the scientific and ancillary data composing the product.

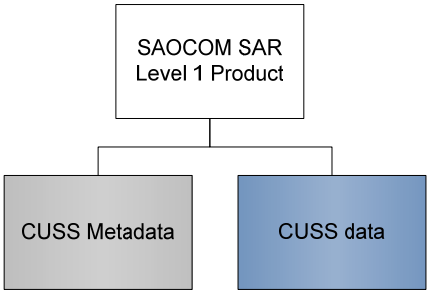


Fig.3 SAOCOM SAR L1 product components

The content of the CUSS data file depends on the processing level..

2.5.1 SAOCOM SAR L1 standard product

The L1 standard product is composed, as previously described, by a CUSS structure (metadata in XML format + data in zip file). The content of the CUSS data file depends on the level 1 data type. We can distinguish 4 different standard products (Level 1A, 1B, 1C and 1D). Each product contains a variable number of files depending on the acquisition mode and polarizations. The data is composed by the scientific raster data in geoTIFF format (see section 2.6.2) coupled with a corresponding annotation file in XML format; by a browser product in PNG and by input and configuration files used to process the data.

2.5.1.1 Level-1A Standard product

The Level-1A standard product contains the complex data in slant range, radiometrically calibrated with no geometric corrections. The general structure of the data is reported in Fig.4

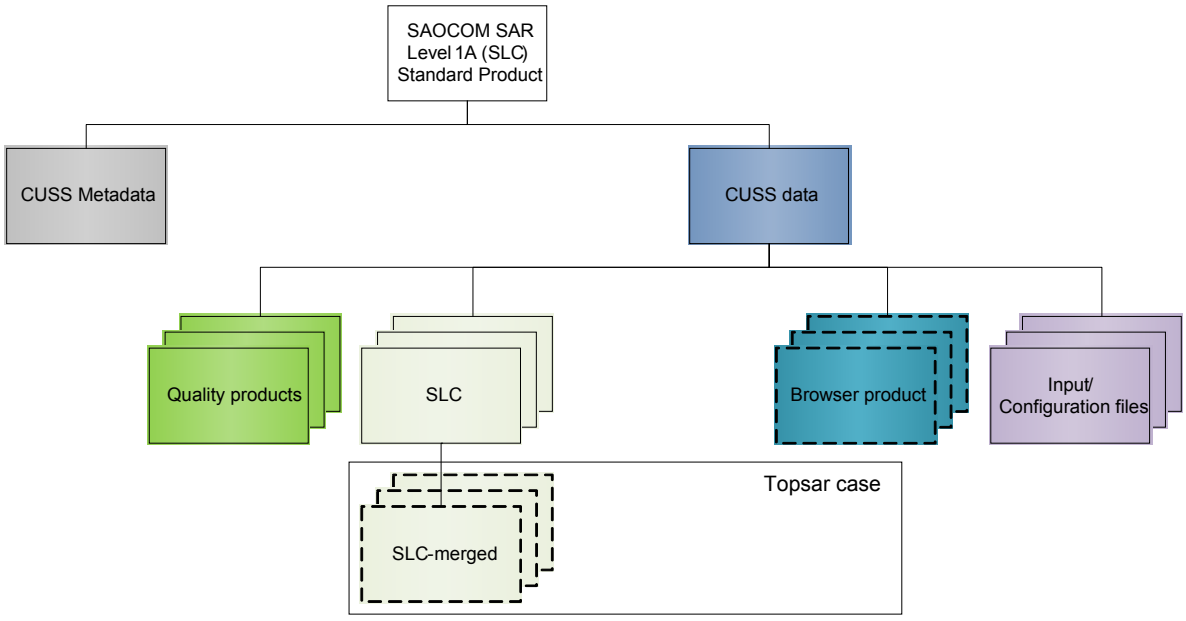


Fig.4 SAOCOM SAR Level-1A standard product general structure.

The number of measurement data and XML files contained in CUSS data zip depends on acquisition mode and polarization according to the following table.

Mode	Measurement data + XML	Browsing product	SLC merged + XML
Stripmap SP	1 for pol (1)	1	0
Stripmap DP	1 for pol (2)	1	0
Stripmap QP	1 for pol (4)	1	0
Stripmap CP	1 for pol (2)	1	0
Topsar Narrow A SP	1 for pol and swath (3)	3	1 for pol (1)
Topsar Narrow A DP	1 for pol and swath (6)	3	1 for pol (2)
Topsar Narrow A QP	1 for pol and swath (20)	5	1 for pol (4)
Topsar Narrow A CP	1 for pol and swath (6)	3	1 for pol (2)
Topsar Narrow B SP	1 for pol and swath (3)	3	1 for pol (1)
Topsar Narrow B DP	1 for pol and swath (6)	3	1 for pol (2)
Topsar Narrow B QP	1 for pol and swath (20)	5	1 for pol (4)
Topsar Narrow B CP	1 for pol and swath (6)	3	1 for pol (2)
Topsar Wide SP	1 for pol and swath (7)	7	1 for pol (1)
Topsar Wide DP	1 for pol and swath (14)	7	1 for pol (2)
Topsar Wide QP	1 for pol and swath (40)	10	1 for pol (4)
Topsar Wide CP	1 for pol and swath (14)	7	1 for pol (2)
Elevation Notch EN	1 for pol (2)	1	0

Tab.4 SAOCOM Level-1A number of measurement and XML files in the products.

2.5.1.2 Level-1B Standard product

The Level-1B standard product contains the Data projected to ground range, radiometrically calibrated and georeferenced. The general structure of the data is reported in Fig.5.

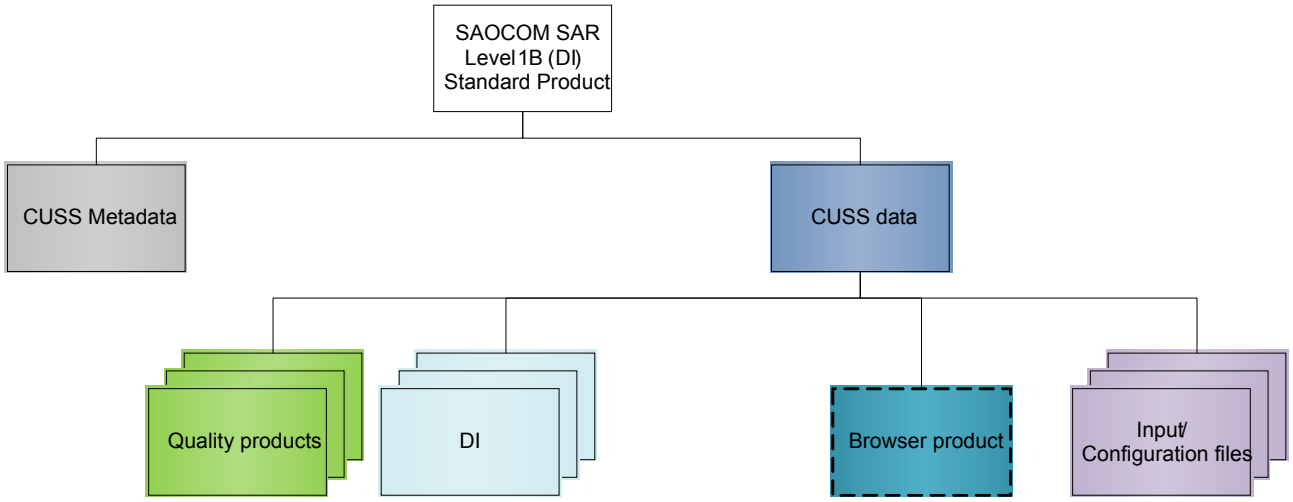


Fig.5 SAOCOM SAR Level-1B standard product general structure.

The number of measurement data and XML files contained in CUSS data zip depends on acquisition mode and polarization according to the following table. Concerning the browsing product, it will contain only one image for each product.

Mode	Measurement data +XML
Stripmap SP	1 for pol (1)
Stripmap DP	1 for pol (2)
Stripmap QP	1 for pol (4)
Stripmap CP	1 for pol (2)
Topsar Narrow A SP	1 for pol (1)
Topsar Narrow A DP	1 for pol (2)
Topsar Narrow A QP	1 for pol (4)
Topsar Narrow A CP	1 for pol (2)
Topsar Narrow B SP	1 for pol (1)
Topsar Narrow B DP	1 for pol (2)
Topsar Narrow B QP	1 for pol (4)
Topsar Narrow B CP	1 for pol (2)
Topsar Wide SP	1 for pol (1)
Topsar Wide DP	1 for pol (2)
Topsar Wide QP	1 for pol (4)
Topsar Wide CP	1 for pol (2)

Tab.5 SAOCOM Level-1B number of measurement data and XML files in the products.

2.5.1.3 Level-1C Standard product

The Level-1C standard product contains the radiometrically calibrated, geocoded and georeferenced data exploiting ellipsoid[2]. The general structure of the data is reported in Fig.6

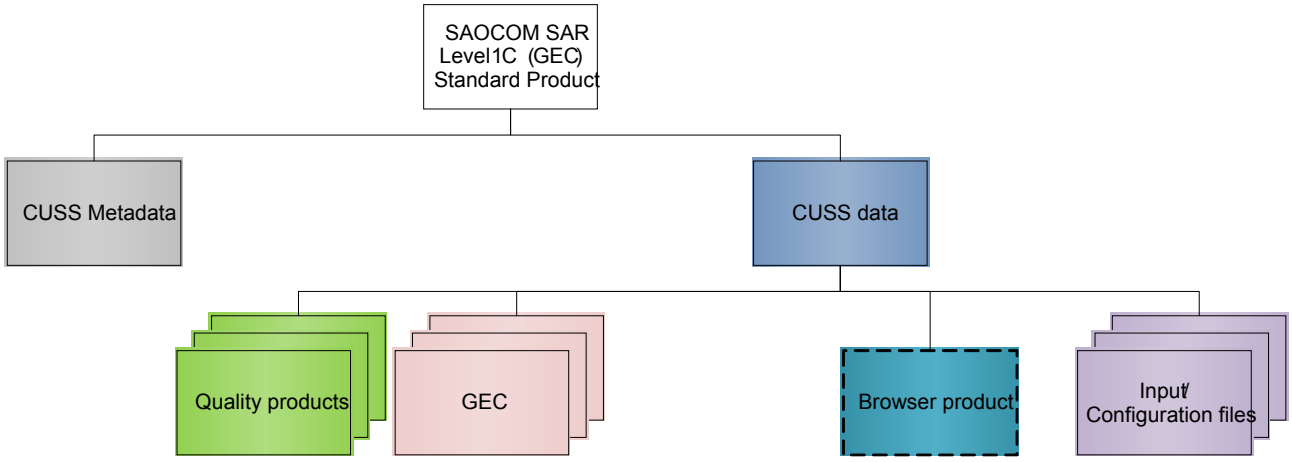


Fig.6 SAOCOM SAR Level-1C standard product general structure.

The number of measurement data and XML files contained in CUSS data zip depends on acquisition mode and polarization according to the following table. Concerning the browsing product, it will contain only one image for each product.

[2] For Level-1C (GEC) products the projection is done over the ellipsoid without taking into account the average height of the terrain, which is considered to be 0. So, a displacement of the georeference may be present according to the actual terrain height.

Mode	Measurement data +XML
Stripmap SP	1 for pol (1)
Stripmap DP	1 for pol (2)
Stripmap QP	1 for pol (4)
Stripmap CP	1 for pol (2)
Topsar Narrow A SP	1 for pol (1)
Topsar Narrow A DP	1 for pol (2)
Topsar Narrow A QP	1 for pol (4)
Topsar Narrow A CP	1 for pol (2)
Topsar Narrow B SP	1 for pol (1)
Topsar Narrow B DP	1 for pol (2)
Topsar Narrow B QP	1 for pol (4)
Topsar Narrow B CP	1 for pol (2)
Topsar Wide SP	1 for pol (1)
Topsar Wide DP	1 for pol (2)
Topsar Wide QP	1 for pol (4)
Topsar Wide CP	1 for pol (2)

Tab.6 SAOCOM Level-1C number of measurement data and XML files in the products.

2.5.1.4 Level-1D Standard product

The Level-1D standard product contains the radiometrically calibrated, geocoded and georeferenced data exploiting topography. The general structure of the data is reported in Fig.7.

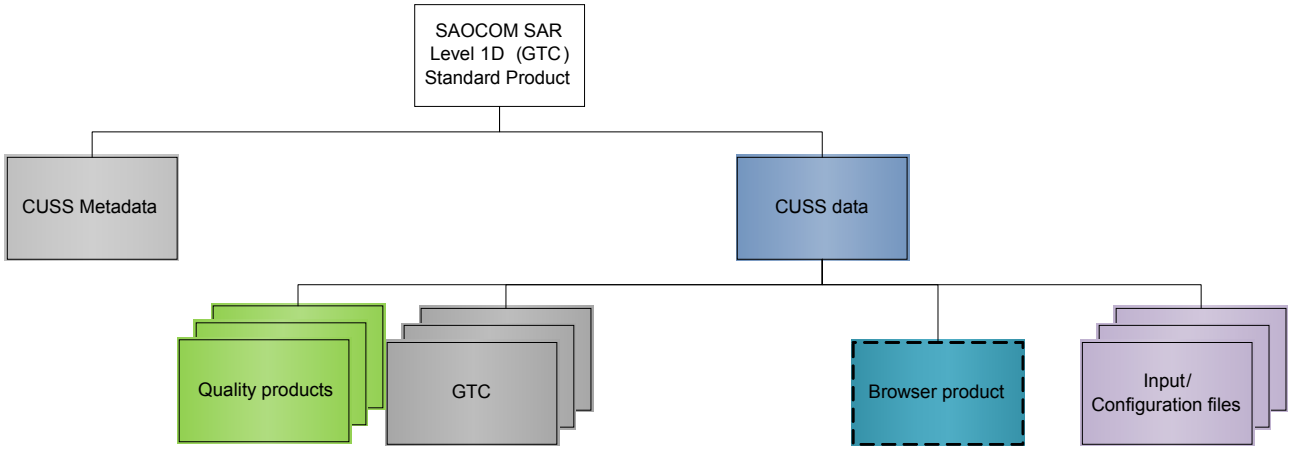


Fig.7 SAOCOM SAR Level-1D standard product general structure.

The number of measurement data and XML files contained in CUSS data zip depends on acquisition mode and polarization according to the following table. Concerning the browsing product, it will contain only one image for each product.

Mode	Measurement data + XML
Stripmap SP	1 for pol (1)
Stripmap DP	1 for pol (2)
Stripmap QP	1 for pol (4)
Stripmap CP	1 for pol (2)
Topsar Narrow A SP	1 for pol (1)
Topsar Narrow A DP	1 for pol (2)
Topsar Narrow A QP	1 for pol (4)
Topsar Narrow A CP	1 for pol (2)
Topsar Narrow B SP	1 for pol (1)
Topsar Narrow B DP	1 for pol (2)
Topsar Narrow B QP	1 for pol (4)
Topsar Narrow B CP	1 for pol (2)
Topsar Wide SP	1 for pol (1)
Topsar Wide DP	1 for pol (2)
Topsar Wide QP	1 for pol (4)
Topsar Wide CP	1 for pol (2)

Tab.7 SAOCOM Level-1D number of measurement data and XML files in the products.

2.6 Detailed file format

2.6.1 CUSS products

The product exchange between the ground segment and the SAR processor will be formatted in a product wrapper in CUSS structure. The general structure of the product is described as a DATA file (a zip file containing the products itself) and a description metadata XML file in XEMT format. While the DATA file is described later in the corresponding sections, the general structure of the XEMT file is described by the XML schema definition reported in Tab.8. The general physical structure of the product is reported in Fig.8.

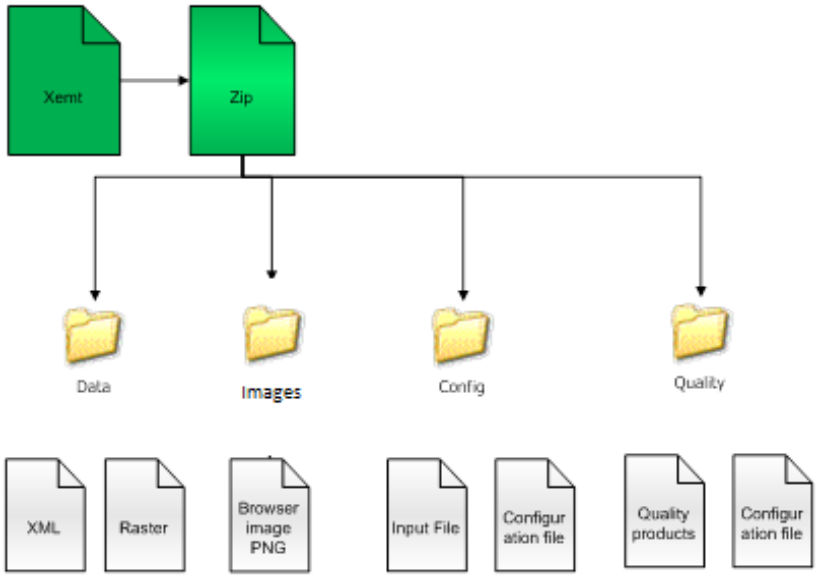
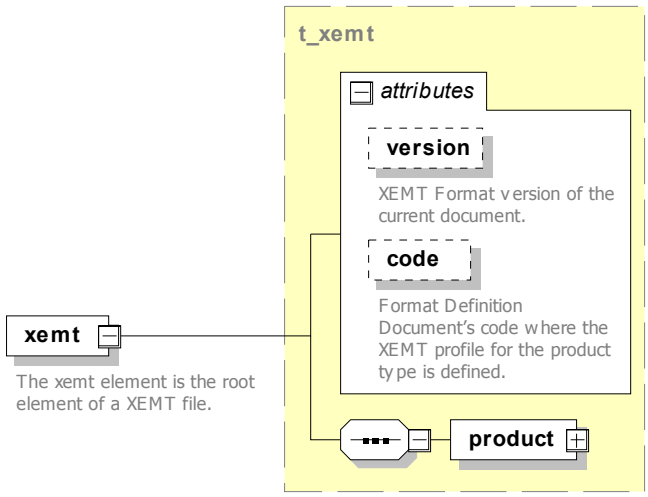


Fig.8 SAOCOM SAR Level-1 product general physical structure.

2.6.1.1 CUSS Metadata

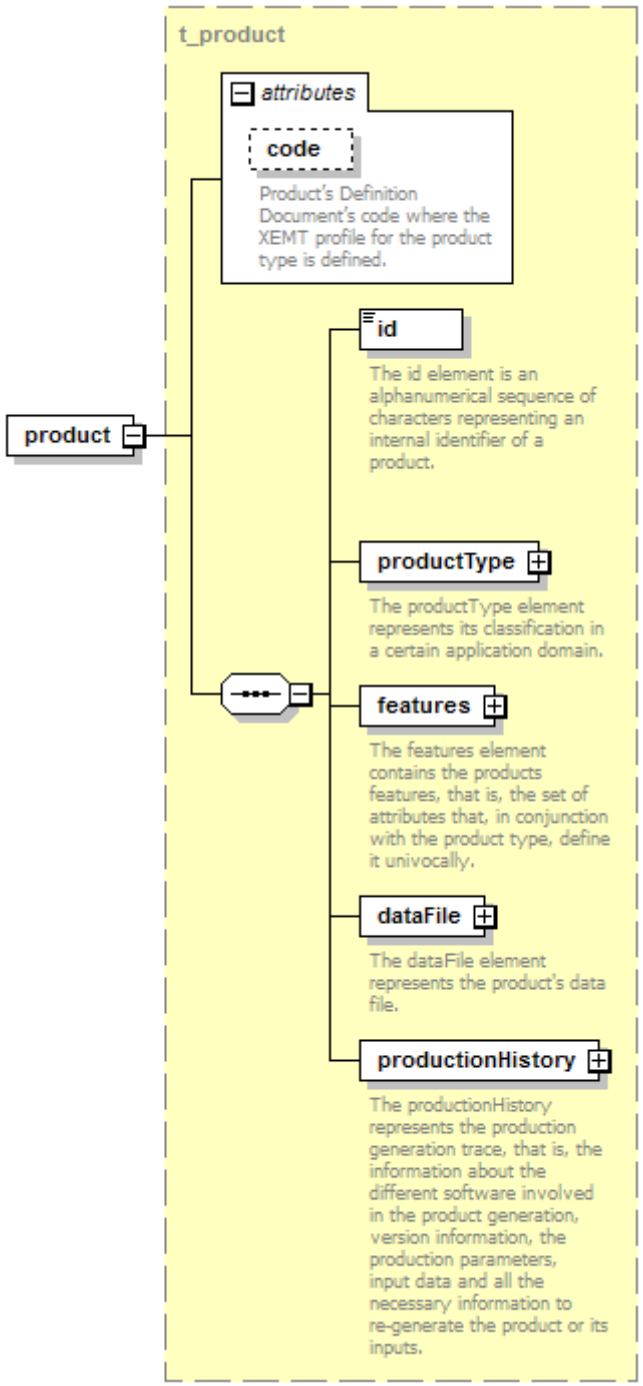
The CUSS metadata is defined according to the xsd scheme.

element **xemt**

diagram	
type	**t_xemt**
properties	content complex
attributes	Name / Type / Use / Default / Fixed / Annotation version — **t_version** — documentation: XEMT Format version of the current document. code — **t_code** — documentation: Format Definition Document's code where the XEMT profile for the product type is defined.
annotation	documentation The xemt element is the root element of a XEMT file.

Tab.8 CUSS root element for xml

Diagram



Type	**t_product**
Properties	content complex

attributes

Name	Type	Use	Default	Fixed	Annotation
code	**t_code**				documentation Product's Definition Document's code where the XEMT profile for the product type is defined.

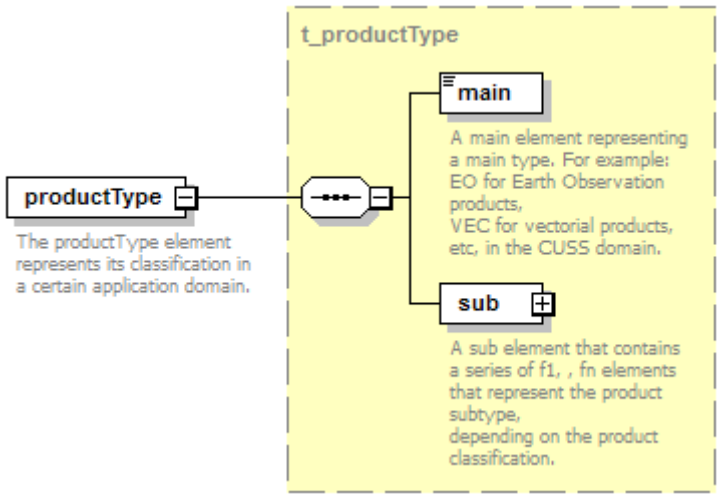
Tab.9 CUSS product element for xml

The described structure includes several tags that will be used by the ground segment to trace the product. The processor will extract information in particular from the subfield:

- ProductType
- dataFile
- features
- productionHistory.

2.6.1.2 ProductType element

The productType element describes the product classification. It is defined by the following structure:

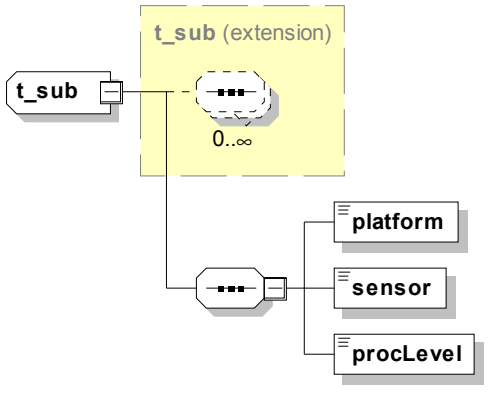
diagram	
type	**t_productType**
properties	content complex
annotation	Documentation The productType element represents its classification in a certain application domain.

Tab.10 ProductType element for CUSS xml

In particular for the Level-1 data this element identifies the level-1 CUSS product;

In case of Earth Observation files the following sub element should also be defined:

redefinition of complexType **t_sub**

diagram	

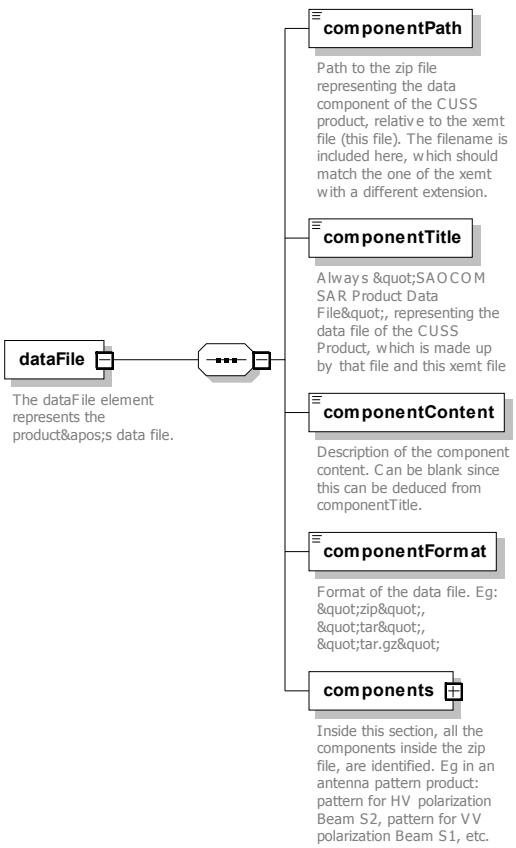
type	extension of **t_sub**
properties	base t_sub

Tab.11 Sub element for CUSS xml

Element	Possible values
platform	SAOCOM 1A SAOCOM 1B
Sensor	SAR
procLevel	L0A L0B L0C L1A L1B L1C L1D CE Chirp Replica Chirp Replica iCAL Antenna Matrix Antenna Pattern iCAL CE Phase Gain Precision Attitude Rapid Precision Orbit Final Precision Orbit

2.6.1.3 dataFile element

The datafile element is described by the following schema:

diagram	
type	**t_dataFile**
properties	content complex
annotation	documentation The dataFile element represents the product's data file.

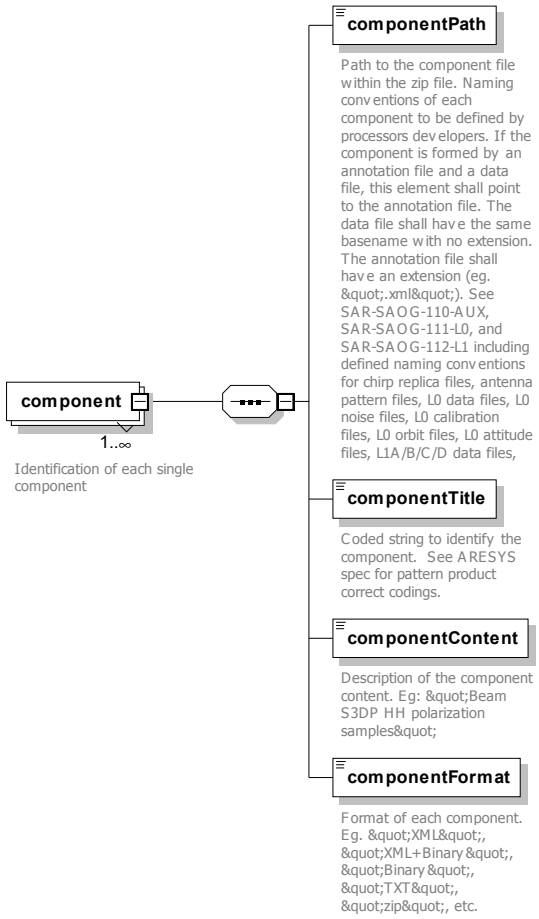
Tab.12 dataFile element for CUSS xml

Element	Possible values
componentTitle	SAOCOM SAR L0A Product Data File
	SAOCOM SAR L0B Product Data File
	SAOCOM SAR L0C Product Data File
	SAOCOM SAR L1A Product Data File
	SAOCOM SAR L1B Product Data File
	SAOCOM SAR L1C Product Data File
	SAOCOM SAR L1D Product Data File
	SAOCOM SAR CE Chirp Replica Product Data File
	SAOCOM SAR Chirp Replica Product Data File
	SAOCOM SAR Antenna ICAL Matrix Product Data File
	SAOCOM SAR Antenna Pattern Product Data File
	SAOCOM SAR CE ICAL Phase and Gain Product Data File
	SAOCOM CODS Precision Orbit Product Data File

Element	Possible values
	SAOCOM CODS Precision Attitude Product Data File SAOCOM SAR Total Electron Content CUSS Product
componentFormat	XML TXT BIN XML+BIN ZIP TAR TAR.GZ CSV “”

The datafile tag contains a description of the path of the product in componentPath subfield; the componentFormat contains the format of the data file contained in the package (i.e. for L-1 product a zip format will be used to contains all the file and metadata necessary to process).
The components subfield is described by the following schema:

element **t_dataFile/components/component**

diagram	
type	**t_component**
properties	minOcc 1 maxOcc unbounded content complex

Tab.13 dataFile/Component element for CUSS xml

That contains the format and the description of all the subfiles contained in the packet (i.e. for the zip packet contains the description of all the file and metadata packed in the zip file).

Element	Possible Values
componentTitle	Science samples Interleaved SAR characterization samples Pre-acquisition noise samples Post-acquisition noise samples Pre-acquisition antenna characterization samples Post-acquisition antenna characterization samples Pre-acquisition ce characterization samples Post-acquisition ce characterization samples Acquisition telemetry Orbit Pos and Vel Attitude Quaternions Elementary Antenna Pattern Elevation Antenna Pattern Azimuth Antenna Pattern Azimuth Single Element Elementary Pattern Chirp Replica CE Chirp Replica SAR Antenna ICAL Matrix Scene Quicklook Scene Image Map Overlay Quality Log SAR CE Phase and Gain Total Electron Content Map Faraday Rotation Angle Map Incidence Angle Map Radar Coordinate Map Nesz Map Configuration
componentContent	Beam S1DP HH polarization samples Beam S2DP HH polarization samples Beam S3DP HH polarization samples Beam S4DP HH polarization samples Beam S5DP HH polarization samples Beam S6DP HH polarization samples Beam S7DP HH polarization samples Beam S8DP HH polarization samples Beam S9DP HH polarization samples Beam S1DP HV polarization samples

Element	Possible Values
	Beam S2DP HV polarization samples
	Beam S3DP HV polarization samples
	Beam S4DP HV polarization samples
	Beam S5DP HV polarization samples
	Beam S6DP HV polarization samples
	Beam S7DP HV polarization samples
	Beam S8DP HV polarization samples
	Beam S9DP HV polarization samples
	Beam S1DP VH polarization samples
	Beam S2DP VH polarization samples
	Beam S3DP VH polarization samples
	Beam S4DP VH polarization samples
	Beam S5DP VH polarization samples
	Beam S6DP VH polarization samples
	Beam S7DP VH polarization samples
	Beam S8DP VH polarization samples
	Beam S9DP VH polarization samples
	Beam S1DP VV polarization samples
	Beam S2DP VV polarization samples
	Beam S3DP VV polarization samples
	Beam S4DP VV polarization samples
	Beam S5DP VV polarization samples
	Beam S6DP VV polarization samples
	Beam S7DP VV polarization samples
	Beam S8DP VV polarization samples
	Beam S9DP VV polarization samples
	Beam S1DP CLH polarization samples
	Beam S2DP CLH polarization samples
	Beam S3DP CLH polarization samples
	Beam S4DP CLH polarization samples
	Beam S5DP CLH polarization samples
	Beam S6DP CLH polarization samples
	Beam S7DP CLH polarization samples
	Beam S8DP CLH polarization samples
	Beam S9DP CLH polarization samples
	Beam S1DP CLV polarization samples
	Beam S2DP CLV polarization samples
	Beam S3DP CLV polarization samples
	Beam S4DP CLV polarization samples

Element	Possible Values
	Beam S5DP CLV polarization samples Beam S6DP CLV polarization samples Beam S7DP CLV polarization samples Beam S8DP CLV polarization samples Beam S9DP CLV polarization samples Beam S1DP CRH polarization samples Beam S2DP CRH polarization samples Beam S3DP CRH polarization samples Beam S4DP CRH polarization samples Beam S5DP CRH polarization samples Beam S6DP CRH polarization samples Beam S7DP CRH polarization samples Beam S8DP CRH polarization samples Beam S9DP CRH polarization samples Beam S1DP CRV polarization samples Beam S2DP CRV polarization samples Beam S3DP CRV polarization samples Beam S4DP CRV polarization samples Beam S5DP CRV polarization samples Beam S6DP CRV polarization samples Beam S7DP CRV polarization samples Beam S8DP CRV polarization samples Beam S9DP CRV polarization samples Beam S1QP HH polarization samples Beam S2QP HH polarization samples Beam S3QP HH polarization samples Beam S4QP HH polarization samples Beam S5QP HH polarization samples Beam S6QP HH polarization samples Beam S7QP HH polarization samples Beam S8QP HH polarization samples Beam S9QP HH polarization samples Beam S10QP HH polarization samples Beam S1QP HV polarization samples Beam S2QP HV polarization samples Beam S3QP HV polarization samples Beam S4QP HV polarization samples Beam S5QP HV polarization samples Beam S6QP HV polarization samples

Element	Possible Values
	Beam S7QP HV polarization samples
	Beam S8QP HV polarization samples
	Beam S9QP HV polarization samples
	Beam S10QP HV polarization samples
	Beam S1QP VH polarization samples
	Beam S2QP VH polarization samples
	Beam S3QP VH polarization samples
	Beam S4QP VH polarization samples
	Beam S5QP VH polarization samples
	Beam S6QP VH polarization samples
	Beam S7QP VH polarization samples
	Beam S8QP VH polarization samples
	Beam S9QP VH polarization samples
	Beam S10QP VH polarization samples
	Beam S1QP VV polarization samples
	Beam S2QP VV polarization samples
	Beam S3QP VV polarization samples
	Beam S4QP VV polarization samples
	Beam S5QP VV polarization samples
	Beam S6QP VV polarization samples
	Beam S7QP VV polarization samples
	Beam S8QP VV polarization samples
	Beam S9QP VV polarization samples
	Beam S10QP VV polarization samples
	Beam S1DP CTxH polarization samples
	Beam S2DP CTxH polarization samples
	Beam S3DP CTxH polarization samples
	Beam S4DP CTxH polarization samples
	Beam S5DP CTxH polarization samples
	Beam S6DP CTxH polarization samples
	Beam S7DP CTxH polarization samples
	Beam S8DP CTxH polarization samples
	Beam S9DP CTxH polarization samples
	Beam S1CP CTxH polarization samples
	Beam S2CP CTxH polarization samples
	Beam S3CP CTxH polarization samples
	Beam S4CP CTxH polarization samples
	Beam S5CP CTxH polarization samples
	Beam S6CP CTxH polarization samples

Element	Possible Values
	Beam S7CP CTxH polarization samples
	Beam S8CP CTxH polarization samples
	Beam S9CP CTxH polarization samples
	Beam S1QP CTxH polarization samples
	Beam S2QP CTxH polarization samples
	Beam S3QP CTxH polarization samples
	Beam S4QP CTxH polarization samples
	Beam S5QP CTxH polarization samples
	Beam S6QP CTxH polarization samples
	Beam S7QP CTxH polarization samples
	Beam S8QP CTxH polarization samples
	Beam S9QP CTxH polarization samples
	Beam S10QP CTxH polarization samples
	Beam S1DP CTxV polarization samples
	Beam S2DP CTxV polarization samples
	Beam S3DP CTxV polarization samples
	Beam S4DP CTxV polarization samples
	Beam S5DP CTxV polarization samples
	Beam S6DP CTxV polarization samples
	Beam S7DP CTxV polarization samples
	Beam S8DP CTxV polarization samples
	Beam S9DP CTxV polarization samples
	Beam S1CP CTxV polarization samples
	Beam S2CP CTxV polarization samples
	Beam S3CP CTxV polarization samples
	Beam S4CP CTxV polarization samples
	Beam S5CP CTxV polarization samples
	Beam S6CP CTxV polarization samples
	Beam S7CP CTxV polarization samples
	Beam S8CP CTxV polarization samples
	Beam S9CP CTxV polarization samples
	Beam S1QP CTxV polarization samples
	Beam S2QP CTxV polarization samples
	Beam S3QP CTxV polarization samples
	Beam S4QP CTxV polarization samples
	Beam S5QP CTxV polarization samples
	Beam S6QP CTxV polarization samples
	Beam S7QP CTxV polarization samples
	Beam S8QP CTxV polarization samples

Element	Possible Values
	Beam S9QP CTxV polarization samples
	Beam S10QP CTxV polarization samples
	Beam S1DP CRxH polarization samples
	Beam S2DP CRxH polarization samples
	Beam S3DP CRxH polarization samples
	Beam S4DP CRxH polarization samples
	Beam S5DP CRxH polarization samples
	Beam S6DP CRxH polarization samples
	Beam S7DP CRxH polarization samples
	Beam S8DP CRxH polarization samples
	Beam S9DP CRxH polarization samples
	Beam S1CP CRxH polarization samples
	Beam S2CP CRxH polarization samples
	Beam S3CP CRxH polarization samples
	Beam S4CP CRxH polarization samples
	Beam S5CP CRxH polarization samples
	Beam S6CP CRxH polarization samples
	Beam S7CP CRxH polarization samples
	Beam S8CP CRxH polarization samples
	Beam S9CP CRxH polarization samples
	Beam S1QP CRxH polarization samples
	Beam S2QP CRxH polarization samples
	Beam S3QP CRxH polarization samples
	Beam S4QP CRxH polarization samples
	Beam S5QP CRxH polarization samples
	Beam S6QP CRxH polarization samples
	Beam S7QP CRxH polarization samples
	Beam S8QP CRxH polarization samples
	Beam S9QP CRxH polarization samples
	Beam S10QP CRxH polarization samples
	Beam S1DP CRxV polarization samples
	Beam S2DP CRxV polarization samples
	Beam S3DP CRxV polarization samples
	Beam S4DP CRxV polarization samples
	Beam S5DP CRxV polarization samples
	Beam S6DP CRxV polarization samples
	Beam S7DP CRxV polarization samples
	Beam S8DP CRxV polarization samples
	Beam S9DP CRxV polarization samples

Element	Possible Values
	Beam S1CP CRxV polarization samples
	Beam S2CP CRxV polarization samples
	Beam S3CP CRxV polarization samples
	Beam S4CP CRxV polarization samples
	Beam S5CP CRxV polarization samples
	Beam S6CP CRxV polarization samples
	Beam S7CP CRxV polarization samples
	Beam S8CP CRxV polarization samples
	Beam S9CP CRxV polarization samples
	Beam S1QP CRxV polarization samples
	Beam S2QP CRxV polarization samples
	Beam S3QP CRxV polarization samples
	Beam S4QP CRxV polarization samples
	Beam S5QP CRxV polarization samples
	Beam S6QP CRxV polarization samples
	Beam S7QP CRxV polarization samples
	Beam S8QP CRxV polarization samples
	Beam S9QP CRxV polarization samples
	Beam S10QP CRxV polarization samples
	Beam ENDP CRxV polarization samples
	Beam ENQP CRxV polarization samples
	Beam ENDP CTxH polarization samples
	Beam ENQP CTxH polarization samples
	Beam ENDP CTxV polarization samples
	Beam ENQP CTxV polarization samples
	Beam ENDP CRxH polarization samples
	Beam ENQP CRxH polarization samples
	Beam ENDP HH polarization samples
	Beam ENDP VH polarization samples
	Beam ENDP HV polarization samples
	Beam ENDP VV polarization samples
	Beam ENQP VV polarization samples
	Beam ENQP VH polarization samples
	Beam ENQP HV polarization samples
	Beam ENQP HH polarization samples
	Beam ENDP HH polarization samples
	Beam ENDP VH polarization samples
	Beam ENDP HV polarization samples
	Beam ENDP VV polarization samples

Element	Possible Values
	Beam ENQP VV polarization samples
	Beam ENQP VH polarization samples
	Beam ENQP HV polarization samples
	Beam ENQP HH polarization samples
	Merged TNADP Beams HH polarization samples
	Merged TNBDP Beams HH polarization samples
	Merged TWDP Beams HH polarization samples
	Merged TNADP Beams HV polarization samples
	Merged TNBDP Beams HV polarization samples
	Merged TWDP Beams HV polarization samples
	Merged TNADP Beams VH polarization samples
	Merged TNBDP Beams VH polarization samples
	Merged TWDP Beams VH polarization samples
	Merged TNADP Beams VV polarization samples
	Merged TNBDP Beams VV polarization samples
	Merged TWDP Beams VV polarization samples
	Merged TNACP Beams CLH polarization samples
	Merged TNBCP Beams CLH polarization samples
	Merged TWCP Beams CLH polarization samples
	Merged TNACP Beams CLV polarization samples
	Merged TNBCP Beams CLV polarization samples
	Merged TWCP Beams CLV polarization samples
	Merged TNACP Beams CRH polarization samples
	Merged TNBCP Beams CRH polarization samples
	Merged TWCP Beams CRH polarization samples
	Merged TNACP Beams CRV polarization samples
	Merged TNBCP Beams CRV polarization samples
	Merged TWCP Beams CRV polarization samples
	Merged TNAQP Beams VV polarization samples
	Merged TNBQP Beams VV polarization samples
	Merged TWQP Beams VV polarization samples
	Merged TNAQP Beams VH polarization samples
	Merged TNBQP Beams VH polarization samples
	Merged TWQP Beams VH polarization samples
	Merged TNAQP Beams HV polarization samples
	Merged TNBQP Beams HV polarization samples
	Merged TWQP Beams HV polarization samples
	Merged TNAQP Beams HH polarization samples
	Merged TNBQP Beams HH polarization samples

Element	Possible Values
	Merged TWQP Beams HH polarization samples
	SAR Antenna ICAL Matrix Tx H S1DP
	SAR Antenna ICAL Matrix Tx H S2DP
	SAR Antenna ICAL Matrix Tx H S3DP
	SAR Antenna ICAL Matrix Tx H S4DP
	SAR Antenna ICAL Matrix Tx H S5DP
	SAR Antenna ICAL Matrix Tx H S6DP
	SAR Antenna ICAL Matrix Tx H S7DP
	SAR Antenna ICAL Matrix Tx H S8DP
	SAR Antenna ICAL Matrix Tx H S9DP
	SAR Antenna ICAL Matrix Tx V S1DP
	SAR Antenna ICAL Matrix Tx V S2DP
	SAR Antenna ICAL Matrix Tx V S3DP
	SAR Antenna ICAL Matrix Tx V S4DP
	SAR Antenna ICAL Matrix Tx V S5DP
	SAR Antenna ICAL Matrix Tx V S6DP
	SAR Antenna ICAL Matrix Tx V S7DP
	SAR Antenna ICAL Matrix Tx V S8DP
	SAR Antenna ICAL Matrix Tx V S9DP
	SAR Antenna ICAL Matrix Rx H S1DP
	SAR Antenna ICAL Matrix Rx H S2DP
	SAR Antenna ICAL Matrix Rx H S3DP
	SAR Antenna ICAL Matrix Rx H S4DP
	SAR Antenna ICAL Matrix Rx H S5DP
	SAR Antenna ICAL Matrix Rx H S6DP
	SAR Antenna ICAL Matrix Rx H S7DP
	SAR Antenna ICAL Matrix Rx H S8DP
	SAR Antenna ICAL Matrix Rx H S9DP
	SAR Antenna ICAL Matrix Rx V S1DP
	SAR Antenna ICAL Matrix Rx V S2DP
	SAR Antenna ICAL Matrix Rx V S3DP
	SAR Antenna ICAL Matrix Rx V S4DP
	SAR Antenna ICAL Matrix Rx V S5DP
	SAR Antenna ICAL Matrix Rx V S6DP
	SAR Antenna ICAL Matrix Rx V S7DP
	SAR Antenna ICAL Matrix Rx V S8DP
	SAR Antenna ICAL Matrix Rx V S9DP
	SAR Antenna ICAL Matrix Tx H S1QP
	SAR Antenna ICAL Matrix Tx H S2QP

Element	Possible Values
	SAR Antenna ICAL Matrix Tx H S3QP
	SAR Antenna ICAL Matrix Tx H S4QP
	SAR Antenna ICAL Matrix Tx H S5QP
	SAR Antenna ICAL Matrix Tx H S6QP
	SAR Antenna ICAL Matrix Tx H S7QP
	SAR Antenna ICAL Matrix Tx H S8QP
	SAR Antenna ICAL Matrix Tx H S9QP
	SAR Antenna ICAL Matrix Tx H S10QP
	SAR Antenna ICAL Matrix Tx V S1QP
	SAR Antenna ICAL Matrix Tx V S2QP
	SAR Antenna ICAL Matrix Tx V S3QP
	SAR Antenna ICAL Matrix Tx V S4QP
	SAR Antenna ICAL Matrix Tx V S5QP
	SAR Antenna ICAL Matrix Tx V S6QP
	SAR Antenna ICAL Matrix Tx V S7QP
	SAR Antenna ICAL Matrix Tx V S8QP
	SAR Antenna ICAL Matrix Tx V S9QP
	SAR Antenna ICAL Matrix Tx V S10QP
	SAR Antenna ICAL Matrix Rx H S1QP
	SAR Antenna ICAL Matrix Rx H S2QP
	SAR Antenna ICAL Matrix Rx H S3QP
	SAR Antenna ICAL Matrix Rx H S4QP
	SAR Antenna ICAL Matrix Rx H S5QP
	SAR Antenna ICAL Matrix Rx H S6QP
	SAR Antenna ICAL Matrix Rx H S7QP
	SAR Antenna ICAL Matrix Rx H S8QP
	SAR Antenna ICAL Matrix Rx H S9QP
	SAR Antenna ICAL Matrix Rx H S10QP
	SAR Antenna ICAL Matrix Rx V S1QP
	SAR Antenna ICAL Matrix Rx V S2QP
	SAR Antenna ICAL Matrix Rx V S3QP
	SAR Antenna ICAL Matrix Rx V S4QP
	SAR Antenna ICAL Matrix Rx V S5QP
	SAR Antenna ICAL Matrix Rx V S6QP
	SAR Antenna ICAL Matrix Rx V S7QP
	SAR Antenna ICAL Matrix Rx V S8QP
	SAR Antenna ICAL Matrix Rx V S9QP
	SAR Antenna ICAL Matrix Rx V S10QP
	SAR Antenna ICAL Matrix Tx H S1CP

Element	Possible Values
	SAR Antenna ICAL Matrix Tx H S2CP
	SAR Antenna ICAL Matrix Tx H S3CP
	SAR Antenna ICAL Matrix Tx H S4CP
	SAR Antenna ICAL Matrix Tx H S5CP
	SAR Antenna ICAL Matrix Tx H S6CP
	SAR Antenna ICAL Matrix Tx H S7CP
	SAR Antenna ICAL Matrix Tx H S8CP
	SAR Antenna ICAL Matrix Tx H S9CP
	SAR Antenna ICAL Matrix Tx V S1CP
	SAR Antenna ICAL Matrix Tx V S2CP
	SAR Antenna ICAL Matrix Tx V S3CP
	SAR Antenna ICAL Matrix Tx V S4CP
	SAR Antenna ICAL Matrix Tx V S5CP
	SAR Antenna ICAL Matrix Tx V S6CP
	SAR Antenna ICAL Matrix Tx V S7CP
	SAR Antenna ICAL Matrix Tx V S8CP
	SAR Antenna ICAL Matrix Tx V S9CP
	SAR Antenna ICAL Matrix Rx H S1CP
	SAR Antenna ICAL Matrix Rx H S2CP
	SAR Antenna ICAL Matrix Rx H S3CP
	SAR Antenna ICAL Matrix Rx H S4CP
	SAR Antenna ICAL Matrix Rx H S5CP
	SAR Antenna ICAL Matrix Rx H S6CP
	SAR Antenna ICAL Matrix Rx H S7CP
	SAR Antenna ICAL Matrix Rx H S8CP
	SAR Antenna ICAL Matrix Rx H S9CP
	SAR Antenna ICAL Matrix Rx V S1CP
	SAR Antenna ICAL Matrix Rx V S2CP
	SAR Antenna ICAL Matrix Rx V S3CP
	SAR Antenna ICAL Matrix Rx V S4CP
	SAR Antenna ICAL Matrix Rx V S5CP
	SAR Antenna ICAL Matrix Rx V S6CP
	SAR Antenna ICAL Matrix Rx V S7CP
	SAR Antenna ICAL Matrix Rx V S8CP
	SAR Antenna ICAL Matrix Rx V S9CP
	SAR Antenna Pattern HH S1DP
	SAR Antenna Pattern HH S2DP
	SAR Antenna Pattern HH S3DP
	SAR Antenna Pattern HH S4DP

Element	Possible Values
	SAR Antenna Pattern HH S5DP
	SAR Antenna Pattern HH S6DP
	SAR Antenna Pattern HH S7DP
	SAR Antenna Pattern HH S8DP
	SAR Antenna Pattern HH S9DP
	SAR Antenna Pattern VV S1DP
	SAR Antenna Pattern VV S2DP
	SAR Antenna Pattern VV S3DP
	SAR Antenna Pattern VV S4DP
	SAR Antenna Pattern VV S5DP
	SAR Antenna Pattern VV S6DP
	SAR Antenna Pattern VV S7DP
	SAR Antenna Pattern VV S8DP
	SAR Antenna Pattern VV S9DP
	SAR Antenna Pattern VH S1DP
	SAR Antenna Pattern VH S2DP
	SAR Antenna Pattern VH S3DP
	SAR Antenna Pattern VH S4DP
	SAR Antenna Pattern VH S5DP
	SAR Antenna Pattern VH S6DP
	SAR Antenna Pattern VH S7DP
	SAR Antenna Pattern VH S8DP
	SAR Antenna Pattern VH S9DP
	SAR Antenna Pattern HV S1DP
	SAR Antenna Pattern HV S2DP
	SAR Antenna Pattern HV S3DP
	SAR Antenna Pattern HV S4DP
	SAR Antenna Pattern HV S5DP
	SAR Antenna Pattern HV S6DP
	SAR Antenna Pattern HV S7DP
	SAR Antenna Pattern HV S8DP
	SAR Antenna Pattern HV S9DP
	SAR Antenna Pattern CLH S1CP
	SAR Antenna Pattern CLH S2CP
	SAR Antenna Pattern CLH S3CP
	SAR Antenna Pattern CLH S4CP
	SAR Antenna Pattern CLH S5CP
	SAR Antenna Pattern CLH S6CP
	SAR Antenna Pattern CLH S7CP

Element	Possible Values
	SAR Antenna Pattern CLH S8CP
	SAR Antenna Pattern CLH S9CP
	SAR Antenna Pattern CLV S1CP
	SAR Antenna Pattern CLV S2CP
	SAR Antenna Pattern CLV S3CP
	SAR Antenna Pattern CLV S4CP
	SAR Antenna Pattern CLV S5CP
	SAR Antenna Pattern CLV S6CP
	SAR Antenna Pattern CLV S7CP
	SAR Antenna Pattern CLV S8CP
	SAR Antenna Pattern CLV S9CP
	SAR Antenna Pattern CRH S1CP
	SAR Antenna Pattern CRH S2CP
	SAR Antenna Pattern CRH S3CP
	SAR Antenna Pattern CRH S4CP
	SAR Antenna Pattern CRH S5CP
	SAR Antenna Pattern CRH S6CP
	SAR Antenna Pattern CRH S7CP
	SAR Antenna Pattern CRH S8CP
	SAR Antenna Pattern CRH S9CP
	SAR Antenna Pattern CRV S1CP
	SAR Antenna Pattern CRV S2CP
	SAR Antenna Pattern CRV S3CP
	SAR Antenna Pattern CRV S4CP
	SAR Antenna Pattern CRV S5CP
	SAR Antenna Pattern CRV S6CP
	SAR Antenna Pattern CRV S7CP
	SAR Antenna Pattern CRV S8CP
	SAR Antenna Pattern CRV S9CP
	SAR Antenna Pattern HH S1QP
	SAR Antenna Pattern HH S2QP
	SAR Antenna Pattern HH S3QP
	SAR Antenna Pattern HH S4QP
	SAR Antenna Pattern HH S5QP
	SAR Antenna Pattern HH S6QP
	SAR Antenna Pattern HH S7QP
	SAR Antenna Pattern HH S8QP
	SAR Antenna Pattern HH S9QP
	SAR Antenna Pattern HH S10QP

Element	Possible Values
	SAR Antenna Pattern VV S1QP
	SAR Antenna Pattern VV S2QP
	SAR Antenna Pattern VV S3QP
	SAR Antenna Pattern VV S4QP
	SAR Antenna Pattern VV S5QP
	SAR Antenna Pattern VV S6QP
	SAR Antenna Pattern VV S7QP
	SAR Antenna Pattern VV S8QP
	SAR Antenna Pattern VV S9QP
	SAR Antenna Pattern VV S10QP
	SAR Antenna Pattern VH S1QP
	SAR Antenna Pattern VH S2QP
	SAR Antenna Pattern VH S3QP
	SAR Antenna Pattern VH S4QP
	SAR Antenna Pattern VH S5QP
	SAR Antenna Pattern VH S6QP
	SAR Antenna Pattern VH S7QP
	SAR Antenna Pattern VH S8QP
	SAR Antenna Pattern VH S9QP
	SAR Antenna Pattern VH S10QP
	SAR Antenna Pattern HV S1QP
	SAR Antenna Pattern HV S2QP
	SAR Antenna Pattern HV S3QP
	SAR Antenna Pattern HV S4QP
	SAR Antenna Pattern HV S5QP
	SAR Antenna Pattern HV S6QP
	SAR Antenna Pattern HV S7QP
	SAR Antenna Pattern HV S8QP
	SAR Antenna Pattern HV S9QP
	SAR Antenna Pattern HV S10QP
	Chirp Replica HH S1DP
	Chirp Replica HH S2DP
	Chirp Replica HH S3DP
	Chirp Replica HH S4DP
	Chirp Replica HH S5DP
	Chirp Replica HH S6DP
	Chirp Replica HH S7DP
	Chirp Replica HH S8DP
	Chirp Replica HH S9DP

Element	Possible Values
	Chirp Replica VV S1DP
	Chirp Replica VV S2DP
	Chirp Replica VV S3DP
	Chirp Replica VV S4DP
	Chirp Replica VV S5DP
	Chirp Replica VV S6DP
	Chirp Replica VV S7DP
	Chirp Replica VV S8DP
	Chirp Replica VV S9DP
	Chirp Replica VH S1DP
	Chirp Replica VH S2DP
	Chirp Replica VH S3DP
	Chirp Replica VH S4DP
	Chirp Replica VH S5DP
	Chirp Replica VH S6DP
	Chirp Replica VH S7DP
	Chirp Replica VH S8DP
	Chirp Replica VH S9DP
	Chirp Replica HV S1DP
	Chirp Replica HV S2DP
	Chirp Replica HV S3DP
	Chirp Replica HV S4DP
	Chirp Replica HV S5DP
	Chirp Replica HV S6DP
	Chirp Replica HV S7DP
	Chirp Replica HV S8DP
	Chirp Replica HV S9DP
	Chirp Replica CLH S1CP
	Chirp Replica CLH S2CP
	Chirp Replica CLH S3CP
	Chirp Replica CLH S4CP
	Chirp Replica CLH S5CP
	Chirp Replica CLH S6CP
	Chirp Replica CLH S7CP
	Chirp Replica CLH S8CP
	Chirp Replica CLH S9CP
	Chirp Replica CLV S1CP
	Chirp Replica CLV S2CP
	Chirp Replica CLV S3CP

Element	Possible Values
	Chirp Replica CLV S4CP
	Chirp Replica CLV S5CP
	Chirp Replica CLV S6CP
	Chirp Replica CLV S7CP
	Chirp Replica CLV S8CP
	Chirp Replica CLV S9CP
	Chirp Replica CRH S1CP
	Chirp Replica CRH S2CP
	Chirp Replica CRH S3CP
	Chirp Replica CRH S4CP
	Chirp Replica CRH S5CP
	Chirp Replica CRH S6CP
	Chirp Replica CRH S7CP
	Chirp Replica CRH S8CP
	Chirp Replica CRH S9CP
	Chirp Replica CRV S1CP
	Chirp Replica CRV S2CP
	Chirp Replica CRV S3CP
	Chirp Replica CRV S4CP
	Chirp Replica CRV S5CP
	Chirp Replica CRV S6CP
	Chirp Replica CRV S7CP
	Chirp Replica CRV S8CP
	Chirp Replica CRV S9CP
	Chirp Replica HH S1QP
	Chirp Replica HH S2QP
	Chirp Replica HH S3QP
	Chirp Replica HH S4QP
	Chirp Replica HH S5QP
	Chirp Replica HH S6QP
	Chirp Replica HH S7QP
	Chirp Replica HH S8QP
	Chirp Replica HH S9QP
	Chirp Replica HH S10QP
	Chirp Replica VV S1QP
	Chirp Replica VV S2QP
	Chirp Replica VV S3QP
	Chirp Replica VV S4QP
	Chirp Replica VV S5QP

Element	Possible Values
	Chirp Replica VV S6QP
	Chirp Replica VV S7QP
	Chirp Replica VV S8QP
	Chirp Replica VV S9QP
	Chirp Replica VV S10QP
	Chirp Replica VH S1QP
	Chirp Replica VH S2QP
	Chirp Replica VH S3QP
	Chirp Replica VH S4QP
	Chirp Replica VH S5QP
	Chirp Replica VH S6QP
	Chirp Replica VH S7QP
	Chirp Replica VH S8QP
	Chirp Replica VH S9QP
	Chirp Replica VH S10QP
	Chirp Replica HV S1QP
	Chirp Replica HV S2QP
	Chirp Replica HV S3QP
	Chirp Replica HV S4QP
	Chirp Replica HV S5QP
	Chirp Replica HV S6QP
	Chirp Replica HV S7QP
	Chirp Replica HV S8QP
	Chirp Replica HV S9QP
	Chirp Replica HV S10QP
	Beam S1DP Quicklook
	Beam S2DP Quicklook
	Beam S3DP Quicklook
	Beam S4DP Quicklook
	Beam S5DP Quicklook
	Beam S6DP Quicklook
	Beam S7DP Quicklook
	Beam S8DP Quicklook
	Beam S9DP Quicklook
	Beam S1CP Quicklook
	Beam S2CP Quicklook
	Beam S3CP Quicklook
	Beam S4CP Quicklook
	Beam S5CP Quicklook

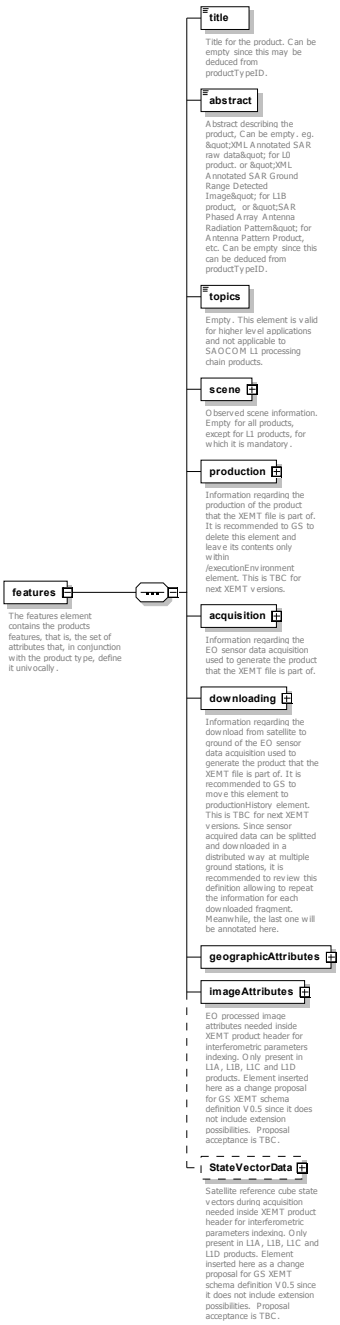
Element	Possible Values
	Beam S6CP Quicklook
	Beam S7CP Quicklook
	Beam S8CP Quicklook
	Beam S9CP Quicklook
	Beam S1QP Quicklook
	Beam S2QP Quicklook
	Beam S3QP Quicklook
	Beam S4QP Quicklook
	Beam S5QP Quicklook
	Beam S6QP Quicklook
	Beam S7QP Quicklook
	Beam S8QP Quicklook
	Beam S9QP Quicklook
	Beam S10QP Quicklook
	Merged Beams Quicklook
	Scene Quicklook Map Overlay
	Beam S1DP Incidence Angle Map
	Beam S2DP Incidence Angle Map
	Beam S3DP Incidence Angle Map
	Beam S4DP Incidence Angle Map
	Beam S5DP Incidence Angle Map
	Beam S6DP Incidence Angle Map
	Beam S7DP Incidence Angle Map
	Beam S8DP Incidence Angle Map
	Beam S1QP Incidence Angle Map
	Beam S2QP Incidence Angle Map
	Beam S3QP Incidence Angle Map
	Beam S4QP Incidence Angle Map
	Beam S5QP Incidence Angle Map
	Beam S6QP Incidence Angle Map
	Beam S7QP Incidence Angle Map
	Beam S8QP Incidence Angle Map
	Beam S9QP Incidence Angle Map
	Beam ENDP Incidence Angle Map
	Beam ENQP Incidence Angle Map
	Merged TNADP Beams Incidence Angle Map
	Merged TNBDP Beams Incidence Angle Map
	Merged TWDP Beams Incidence Angle Map
	Merged TNAQP Beams Incidence Angle Map

Element	Possible Values
	Merged TNBQP Beams Incidence Angle Map Merged TWQP Beams Incidence Angle Map Merged TNACP Beams Incidence Angle Map Merged TNBCP Beams Incidence Angle Map Merged TWCP Beams Incidence Angle Map Merged Beams Incidence Angle Map NESZ Map Ellipsoid Radar Coordinate Map Terrain Radar Coordinate Map Processing Configuration file Decoded telemetry associated to the acquisition Acquisition orbit data Acquisition attitude data Scene Quality Report Azimuth Single Element Elementary Pattern
componentFormat	XML TXT BIN XML+BIN ZIP TAR TAR.GZ PNG KML CSV FOLDER

2.6.1.4 Features element

The features element contains information about the history of data and about the geometric reference of the scene.

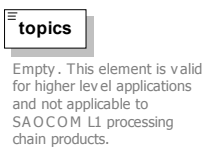
element **t_product/features**

Diagram	
Type	extension of **t_features**
properties	base t_features
annotation	documentation The features element contains the products features, that is, the set of attributes that, in conjunction with the product type, define it univocally.

Tab.14 Product features element.

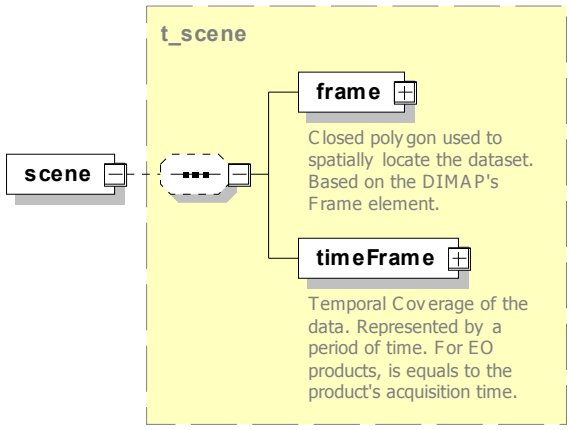
Element	Possible Values
Title	SAOCOM SAR L0 Product SAOCOM SAR L1A Product SAOCOM SAR L1B Product SAOCOM SAR L1C Product SAOCOM SAR L1D Product SAOCOM SAR CE Chirp Replica Product SAOCOM SAR Chirp Replica Product SAOCOM SAR Antenna ICAL Matrix Product SAOCOM SAR Antenna Pattern Product SAOCOM SAR CE ICAL Phase and Gain Product SAOCOM SAR Nesz Map SAOCOM SAR Incidence Angle Map SAOCOM SAR L1C Radar Coordinate Map SAOCOM SAR L1D Radar Coordinate Map
Abstract	XML SAR raw data in IF and BAQ/BATQ compressed XML SAR raw data in IF and decompressed XML SAR raw data in IQ and decompressed XML SAR Single Look Complex Image XML SAR Ground Range Detected Image XML SAR Ground Elipsoid Corrected Image XML SAR Ground Terrain Corrected Image SAR Central Electronics level chirp replica derived from short loop pulses SAR Instrument chirp replica SAR Phased Array Antenna ICAL Paths Transference Matrix Product SAR Phased Array Antenna Radiation Pattern SAR Central Electronics ICAL Paths Transference Product

element **t_features/topics**

diagram	
type	**t_topics**
properties	content complex

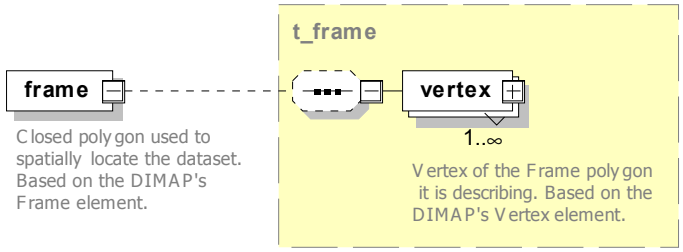
Tab.15 Features topics element.

element **t_features/scene**

diagram	
type	**t_scene**
properties	content complex

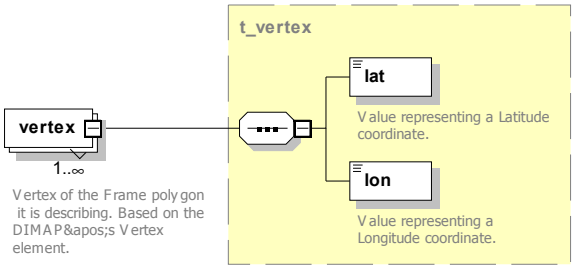
Tab.16 Scene element.

element **t_scene/frame**

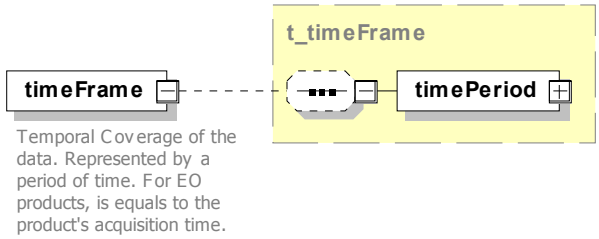
diagram	
type	**t_frame**
properties	content complex
annotation	documentation Closed polygon used to spatially locate the dataset. Based on the DIMAP's Frame element.

Tab.17 Scene/frame element.

element **xemt/product/features/scene/frame/vertex**

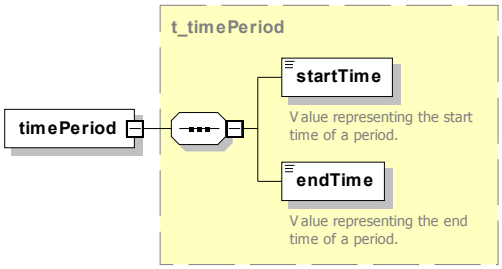
diagram	
type	**t_vertex**
properties	isRef 0 minOcc 1 maxOcc unbounded content complex
children	**latlon**
annotation	documentation Vertex of the Frame polygon it is describing. Based on the DIMAP's Vertex element.

element **t_scene/timeFrame**

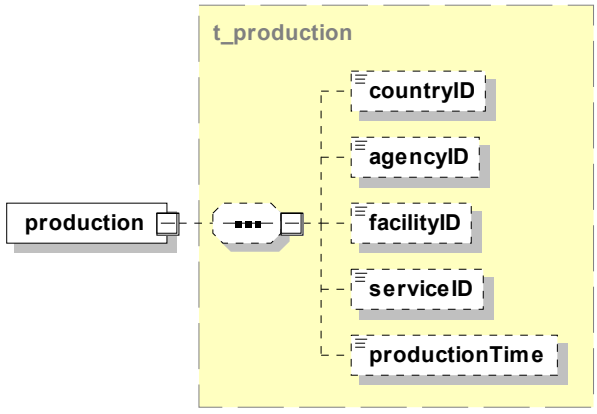
diagram	
type	**t_timeFrame**
properties	content complex
annotation	documentation Temporal Coverage of the data. Represented by a period of time. For EO products, is equals to the product's acquisition time.

Tab.18 Scene/timeframe element.

element **xemt/product/features/scene/timeFrame/timePeriod**

diagram	
type	**t_timePeriod**
properties	isRef 0 content complex
children	**startTimeendTime**

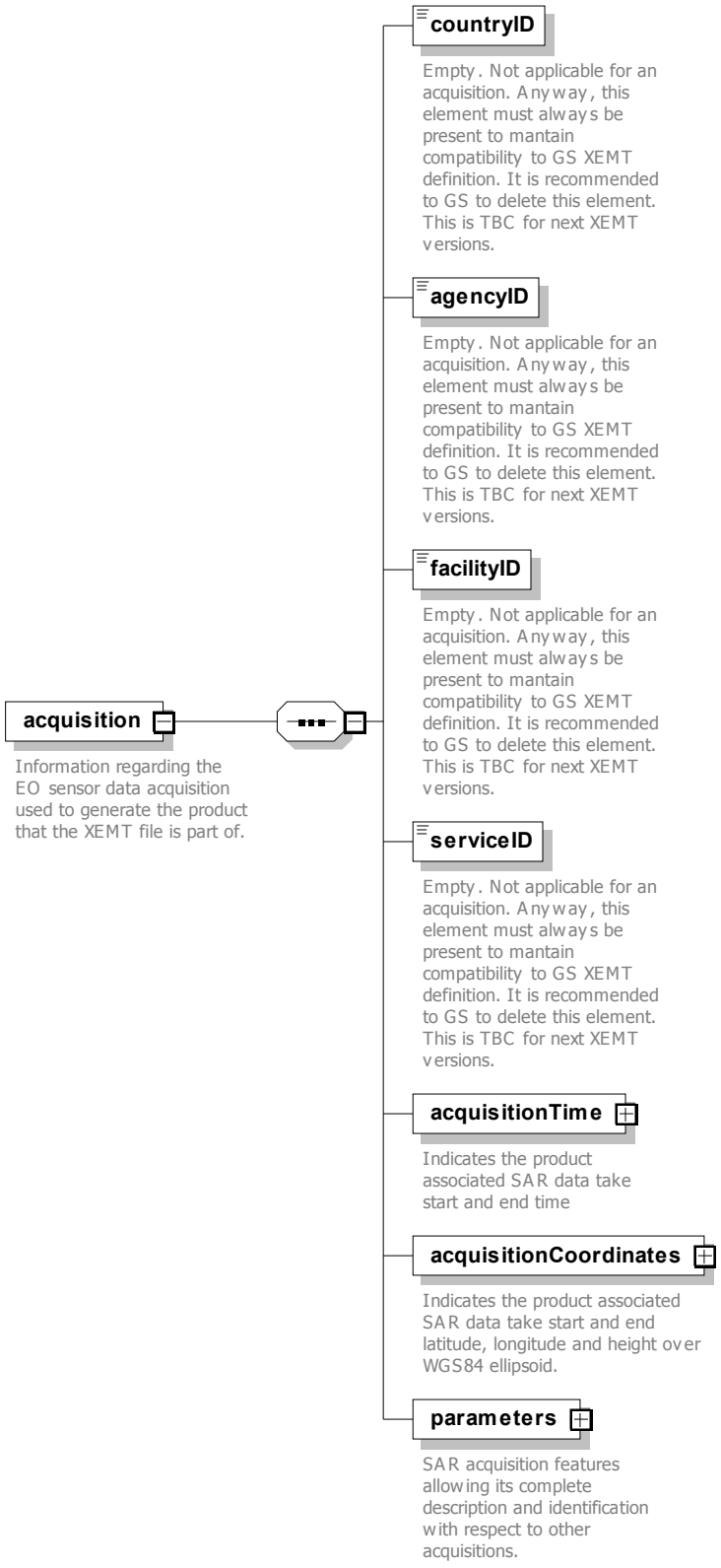
element **t_features/production**

diagram	
type	**t_production**
properties	content complex

Tab.19 Features/Production element.

element **t_features/acquisition**

diagram



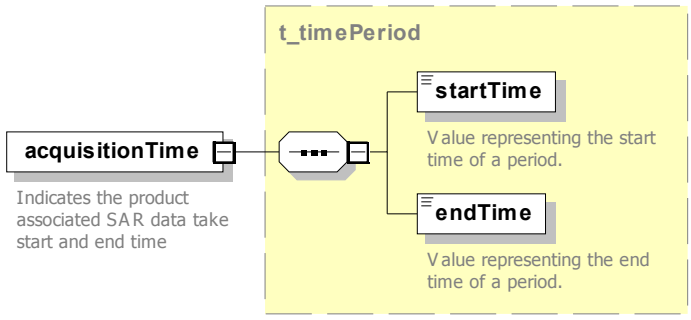
properties

isRef	0
content	complex
nillable	true

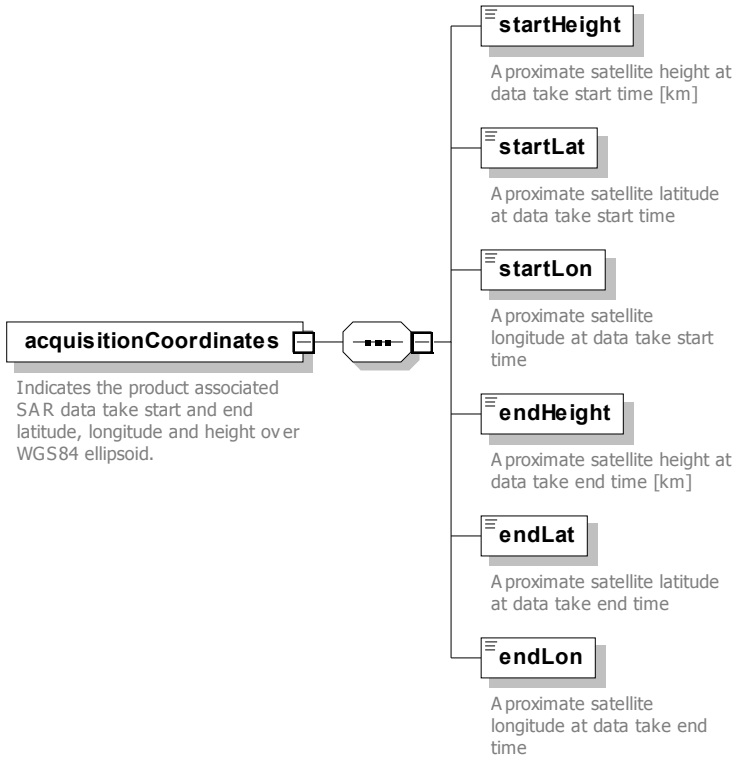
children	countryIDagencyIDfacilityIDserviceIDacquisitionTimeacquisitionCoordinatespar ameters
annotati on	documentation Information regarding the EO sensor data acquisition used to generate the product that the XEMT file is part of.

Tab.20 Features/acquisition element.

element **xemt/product/features/acquisition/acquisitionTime**

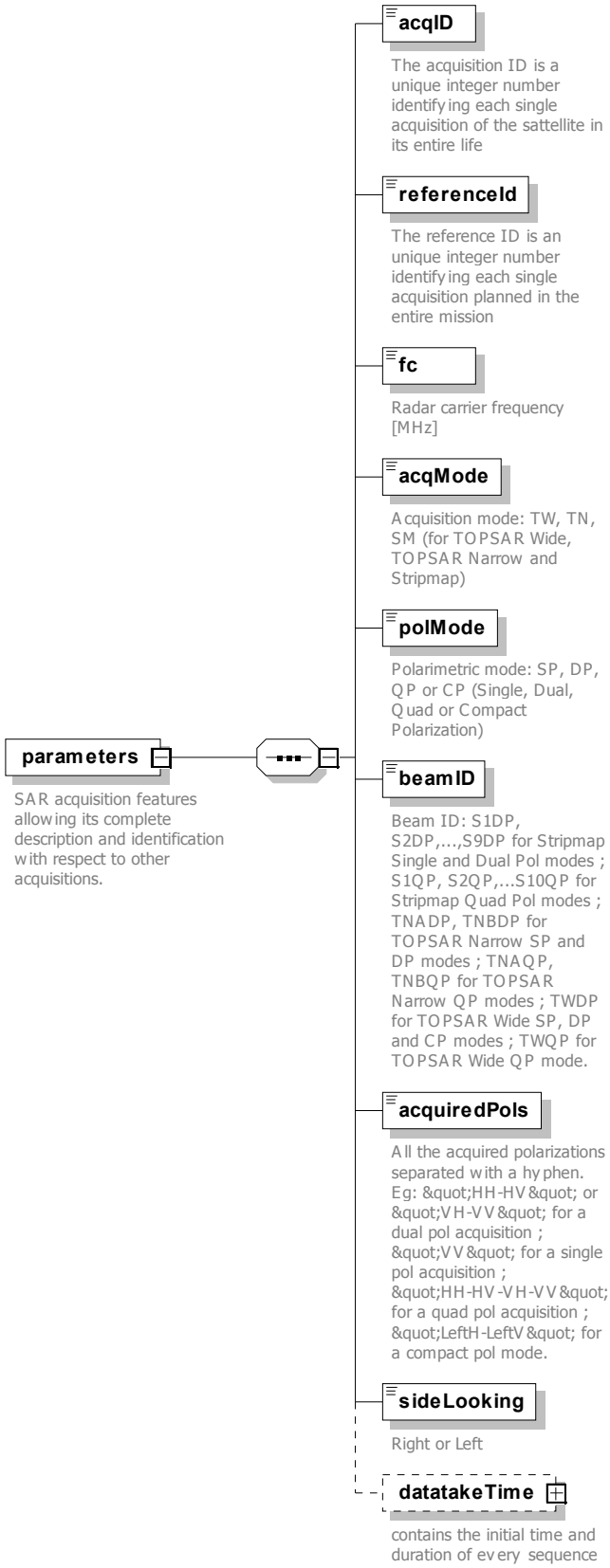
diagram	
type	**t_timePeriod**
properties	isRef 0 content complex nillable true
children	**startTime endTime**
annotation	documentation Indicates the product associated SAR data take start and end time

element **xemt/product/features/acquisition/acquisitionCoordinates**

diagram	
properties	isRef 0 content complex nillable true
children	**startHeight startLat startLon endHeight endLat endLon**
annotation	documentation Indicates the product associated SAR data take start and end latitude, longitude and height over WGS84 ellipsoid.

element **xemt/product/features/acquisition/parameters**

diagram



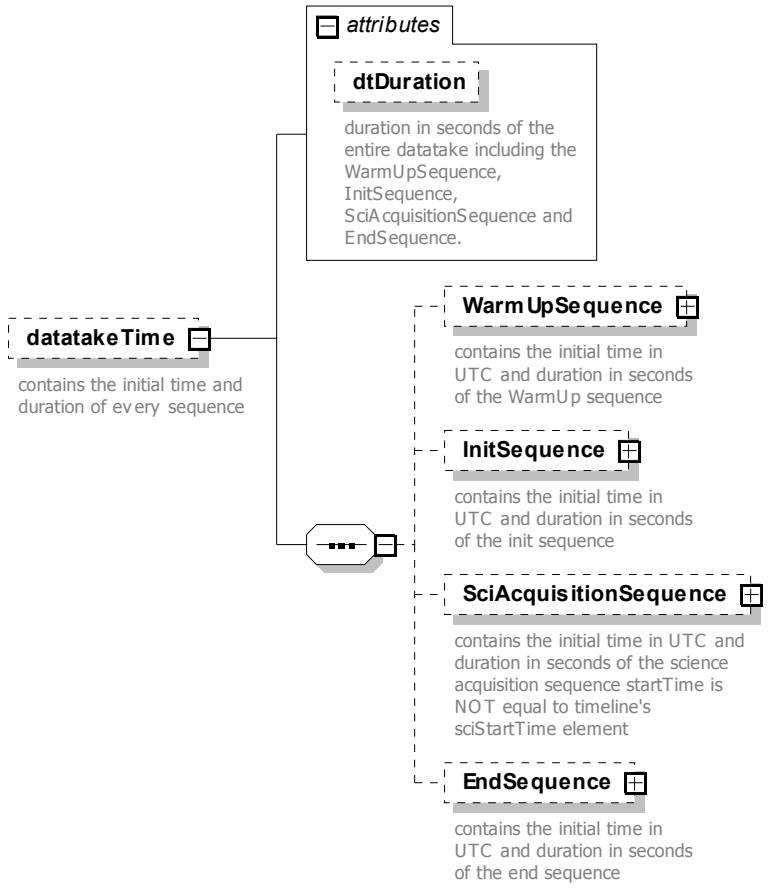
properties	isRef 0 content complex form unqualified
children	**acqID referenceId fc acqMode polMode beamID acquiredPols sideLooking datatakeTime**

annotation	documentation SAR acquisition features allowing its complete description and identification with respect to other acquisitions.

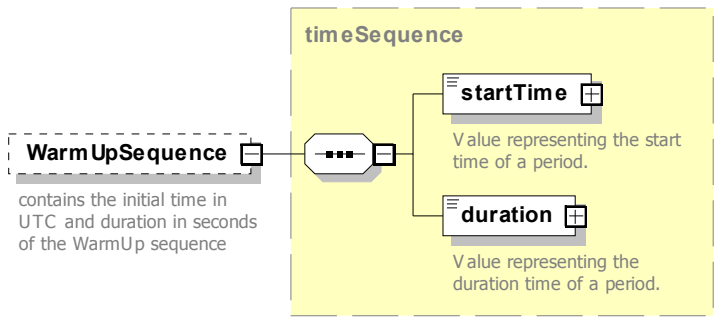
Element	Possible Values
acqMode	TW TN SM
polMode	SP DP QP CP
beamID	S1DP S2DP S3DP S4DP S5DP S6DP S7DP S8DP S9DP S1CP S2CP S3CP S4CP S5CP S6CP S7CP S8CP S9CP S1QP S2QP S3QP S4QP S5QP S6QP S7QP S8QP S9QP S10QP

	TNADP TNBDP TNACP TNBCP TNAQP TNBQP TWDP TWCP TWQP
acquiredPols	HH HV VH VV HH-HV VH-VV HH-HV-VH-VV LeftH-LeftV RightH-RightV
sideLooking	Right Left

element **xemt/product/features/acquisition/parameters/datatakeTime**

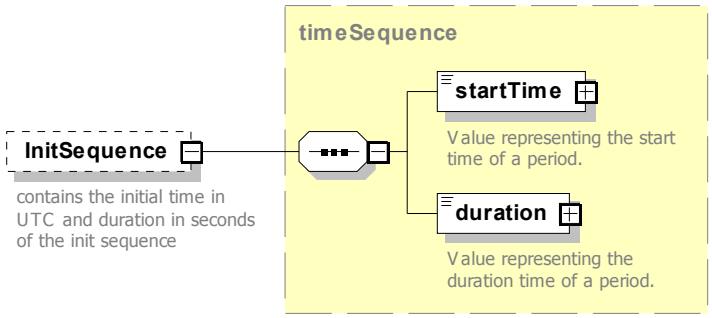
diagram	
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**WarmUpSequence InitSequence SciAcquisitionSequence EndSequence**
attributes	Name: dtDuration; Type: **xs:float**; Use: ; Default: ; Fixed: ; annotation documentation: duration in seconds of the entire datatake including the WarmUpSequence, InitSequence, SciAcquisitionSequence and EndSequence.
annotation	documentation contains the initial time and duration of every sequence

element **xemt/product/features/acquisition/parameters/datatakeTime/WarmUpSequence**

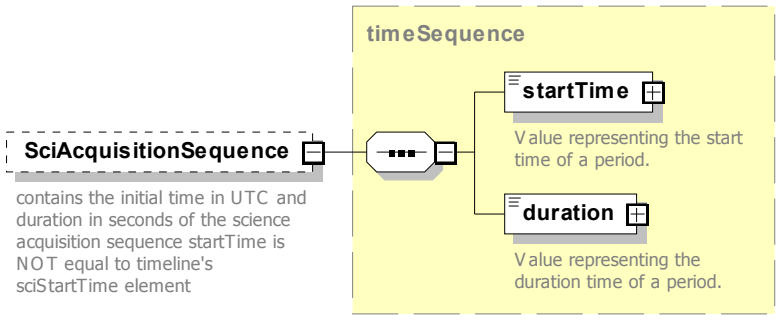
diagram	

type	**timeSequence**
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**startTime duration**
annotation	documentation contains the initial time in UTC and duration in seconds of the WarmUp sequence

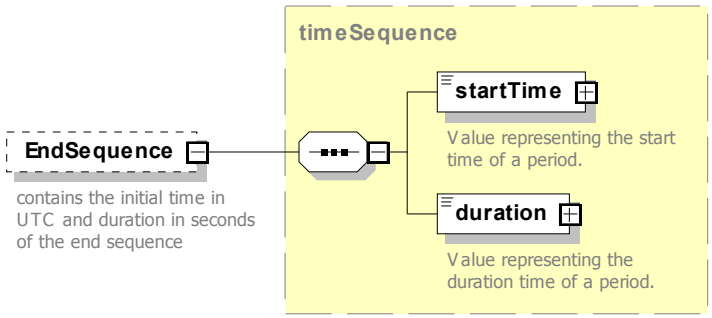
element **xemt/product/features/acquisition/parameters/datatakeTime/InitSequence**

diagram	
type	**timeSequence**
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**startTime duration**
annotation	documentation contains the initial time in UTC and duration in seconds of the init sequence

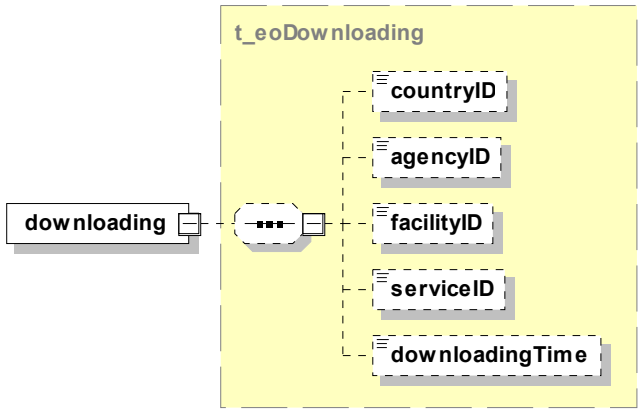
element **xemt/product/features/acquisition/parameters/datatakeTime/SciAcquisitionSequence**

diagram	
type	**timeSequence**
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**startTime duration**
annotation	documentation contains the initial time in UTC and duration in seconds of the science acquisition sequence startTime is NOT equal to timeline's sciStartTime element

element **xemt/product/features/acquisition/parameters/datatakeTime/EndSequence**

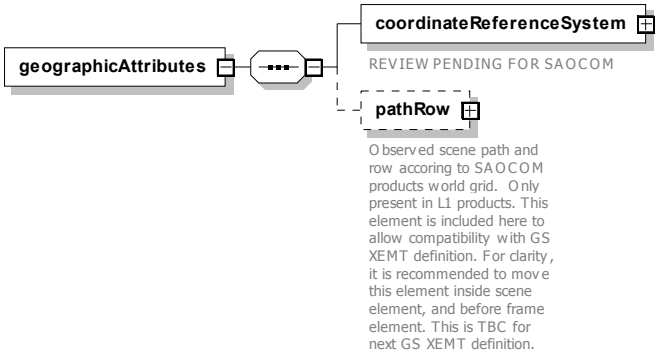
diagram	
type	**timeSequence**
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**startTime duration**
annotation	documentation contains the initial time in UTC and duration in seconds of the end sequence

element **t_features/downloading**

diagram	
type	**t_eoDownloading**
properties	content complex

Tab.21 Features/downloading element.

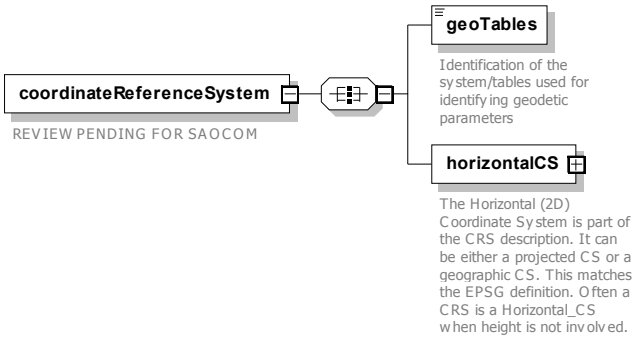
element **t_features/geographicAttributes**

diagram	

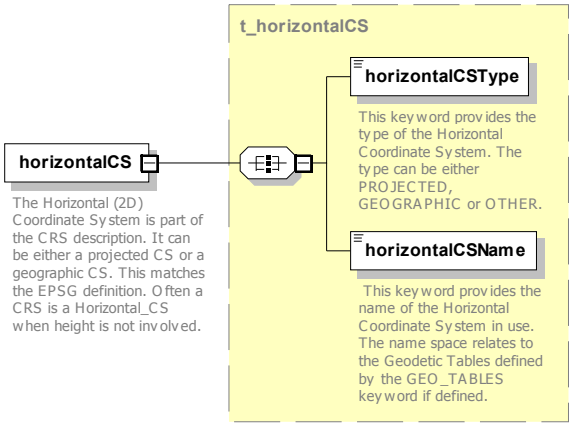
type	**t_geographicAttributes**
properties	content complex

Tab.22 Features/geographicAttributes element.

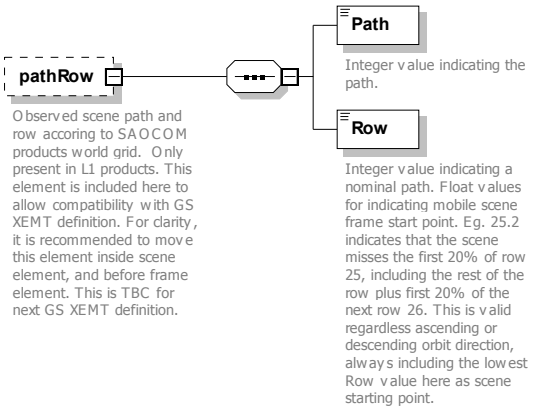
element **xemt/product/features/geographicAttributes/coordinateReferenceSystem**

diagram	
properties	isRef 0 content complex nillable true
children	**geoTables horizontalCS**

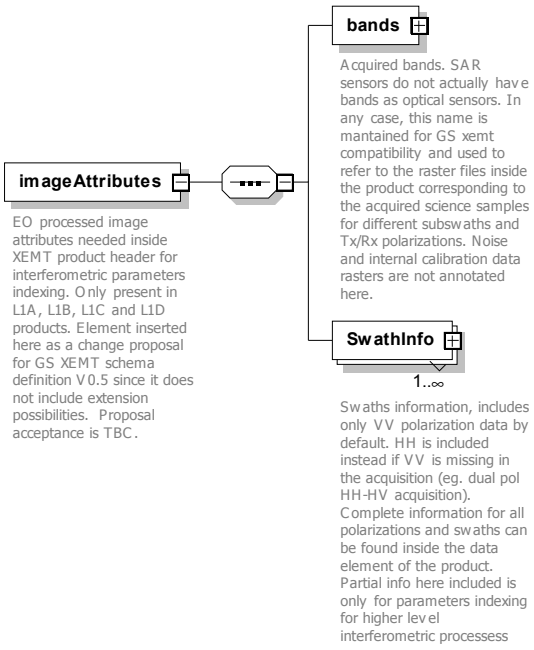
element **xemt/product/features/geographicAttributes/coordinateReferenceSystem/horizontalCS**

diagram	
type	**t_horizontalCS**
properties	isRef 0 content complex nillable true

element **xemt/product/features/geographicAttributes/pathRow**

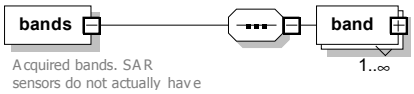
diagram	
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**Path Row**

element **t_features/imageAttributes**

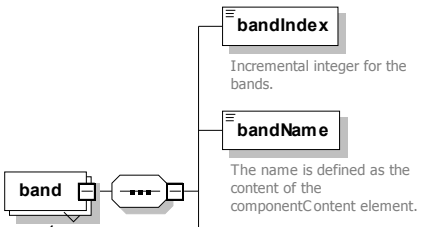
diagram	
type	**t_eoImageAttributes**
properties	content complex

Tab.23 Features/imageAttributes element.

element **xemt/product/features/imageAttributes/bands**

diagram	 Acquired bands. SAR sensors do not actually have bands as optical sensors. In any case, this name is mantained for GS xemt compatibility and used to refer to the raster files inside the product corresponding to the acquired science samples for different subswaths and Tx/Rx polarizations. Noise and internal calibration data rasters are not annotated here.
properties	isRef 0 content complex nillable true
children	**band**

element **xemt/product/features/imageAttributes/bands/band**

diagram	
properties	isRef 0 minOcc 1 maxOcc unbounded content complex

Element	Possible Values
bandName	Beam S1DP HH polarization samples Beam S2DP HH polarization samples Beam S3DP HH polarization samples Beam S4DP HH polarization samples Beam S5DP HH polarization samples Beam S6DP HH polarization samples Beam S7DP HH polarization samples Beam S8DP HH polarization samples Beam S9DP HH polarization samples Beam S1DP HV polarization samples Beam S2DP HV polarization samples Beam S3DP HV polarization samples

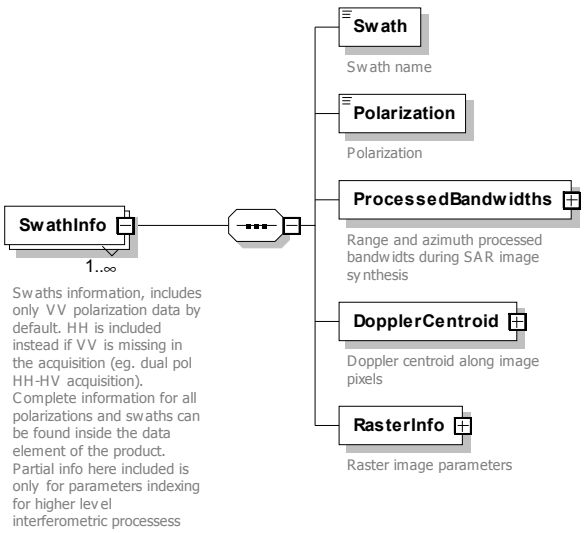
	Beam S4DP HV polarization samples Beam S5DP HV polarization samples Beam S6DP HV polarization samples Beam S7DP HV polarization samples Beam S8DP HV polarization samples Beam S9DP HV polarization samples Beam S1DP VH polarization samples Beam S2DP VH polarization samples Beam S3DP VH polarization samples Beam S4DP VH polarization samples Beam S5DP VH polarization samples Beam S6DP VH polarization samples Beam S7DP VH polarization samples Beam S8DP VH polarization samples Beam S9DP VH polarization samples Beam S1DP VV polarization samples Beam S2DP VV polarization samples Beam S3DP VV polarization samples Beam S4DP VV polarization samples Beam S5DP VV polarization samples Beam S6DP VV polarization samples Beam S7DP VV polarization samples Beam S8DP VV polarization samples Beam S9DP VV polarization samples Beam S1CP CLH polarization samples Beam S2CP CLH polarization samples Beam S3CP CLH polarization samples Beam S4CP CLH polarization samples Beam S5CP CLH polarization samples Beam S6CP CLH polarization samples Beam S7CP CLH polarization samples Beam S8CP CLH polarization samples Beam S9CP CLH polarization samples Beam S1CP CLV polarization samples Beam S2CP CLV polarization samples Beam S3CP CLV polarization samples Beam S4CP CLV polarization samples Beam S5CP CLV polarization samples Beam S6CP CLV polarization samples Beam S7CP CLV polarization samples

	Beam S8CP CLV polarization samples Beam S9CP CLV polarization samples Beam S1CP CRH polarization samples Beam S2CP CRH polarization samples Beam S3CP CRH polarization samples Beam S4CP CRH polarization samples Beam S5CP CRH polarization samples Beam S6CP CRH polarization samples Beam S7CP CRH polarization samples Beam S8CP CRH polarization samples Beam S9CP CRH polarization samples Beam S1CP CRV polarization samples Beam S2CP CRV polarization samples Beam S3CP CRV polarization samples Beam S4CP CRV polarization samples Beam S5CP CRV polarization samples Beam S6CP CRV polarization samples Beam S7CP CRV polarization samples Beam S8CP CRV polarization samples Beam S9CP CRV polarization samples Beam S1QP HH polarization samples Beam S2QP HH polarization samples Beam S3QP HH polarization samples Beam S4QP HH polarization samples Beam S5QP HH polarization samples Beam S6QP HH polarization samples Beam S7QP HH polarization samples Beam S8QP HH polarization samples Beam S9QP HH polarization samples Beam S10QP HH polarization samples Beam S1QP HV polarization samples Beam S2QP HV polarization samples Beam S3QP HV polarization samples Beam S4QP HV polarization samples Beam S5QP HV polarization samples Beam S6QP HV polarization samples Beam S7QP HV polarization samples Beam S8QP HV polarization samples Beam S9QP HV polarization samples Beam S10QP HV polarization samples

	Beam S1QP VH polarization samples Beam S2QP VH polarization samples Beam S3QP VH polarization samples Beam S4QP VH polarization samples Beam S5QP VH polarization samples Beam S6QP VH polarization samples Beam S7QP VH polarization samples Beam S8QP VH polarization samples Beam S9QP VH polarization samples Beam S10QP VH polarization samples Beam S1QP VV polarization samples Beam S2QP VV polarization samples Beam S3QP VV polarization samples Beam S4QP VV polarization samples Beam S5QP VV polarization samples Beam S6QP VV polarization samples Beam S7QP VV polarization samples Beam S8QP VV polarization samples Beam S9QP VV polarization samples Beam S10QP VV polarization samples Merged TNADP Beams HH polarization samples Merged TNBDP Beams HH polarization samples Merged TWDP Beams HH polarization samples Merged TNADP Beams HV polarization samples Merged TNBDP Beams HV polarization samples Merged TWDP Beams HV polarization samples Merged TNADP Beams VH polarization samples Merged TNBDP Beams VH polarization samples Merged TWDP Beams VH polarization samples Merged TNADP Beams VV polarization samples Merged TNBDP Beams VV polarization samples Merged TWDP Beams VV polarization samples Merged TNACP Beams CLH polarization samples Merged TNBCP Beams CLH polarization samples Merged TWCP Beams CLH polarization samples Merged TNACP Beams CLV polarization samples Merged TNBCP Beams CLV polarization samples Merged TWCP Beams CLV polarization samples Merged TNACP Beams CRH polarization samples Merged TNBCP Beams CRH polarization samples

	Merged TWCP Beams CRH polarization samples Merged TNACP Beams CRV polarization samples Merged TNBCP Beams CRV polarization samples Merged TWCP Beams CRV polarization samples Merged TNAQP Beams VV polarization samples Merged TNBQP Beams VV polarization samples Merged TWQP Beams VV polarization samples Merged TNAQP Beams HV polarization samples Merged TNBQP Beams HV polarization samples Merged TWQP Beams HV polarization samples Merged TNAQP Beams VH polarization samples Merged TNBQP Beams VH polarization samples Merged TWQP Beams VH polarization samples Merged TNAQP Beams HH polarization samples Merged TNBQP Beams HH polarization samples Merged TWQP Beams HH polarization samples

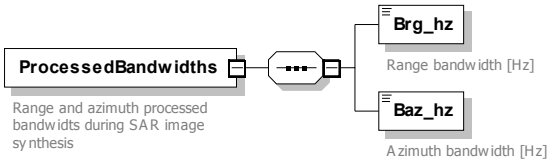
element **xemt/product/features/imageAttributes/SwathInfo**

diagram	
properties	isRef 0 minOcc 1 maxOcc unbounded content complex
children	**Swath Polarization ProcessedBandwidths DopplerCentroid RasterInfo**

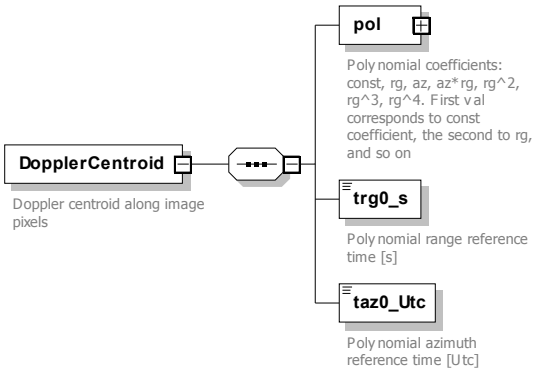
Element	Possible Values
Swath	S1DP S2DP S3DP S4DP

	S5DP S6DP S7DP S8DP S9DP S1CP S2CP S3CP S4CP S5CP S6CP S7CP S8CP S9CP S1QP S2QP S3QP S4QP S5QP S6QP S7QP S8QP S9QP S10QP
Polarization	HH VV HV VH CL/H CL/V CR/H CR/V

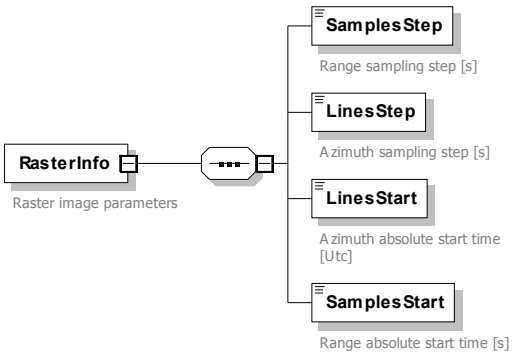
element **xemt/product/features/imageAttributes/SwathInfo/ProcessedBandwidths**

diagram	
properties	isRef 0 content complex
children	**Brg_hz Baz_hz**

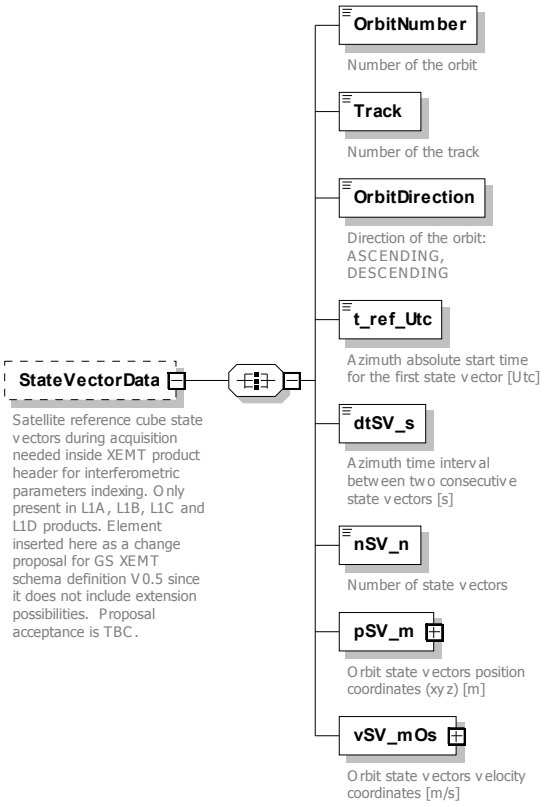
element **xemt/product/features/imageAttributes/SwathInfo/DopplerCentroid**

diagram	
properties	isRef 0 content complex
children	**pol trg0_s taz0_Utc**

element **xemt/product/features/imageAttributes/SwathInfo/RasterInfo**

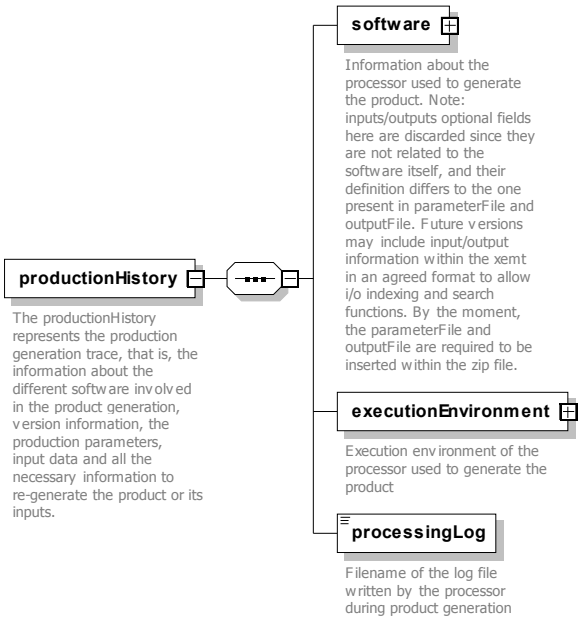
diagram	
properties	isRef 0 content complex
children	**SamplesStep LinesStep LinesStart SamplesStart**

element **xemt/product/features/StateVectorData**

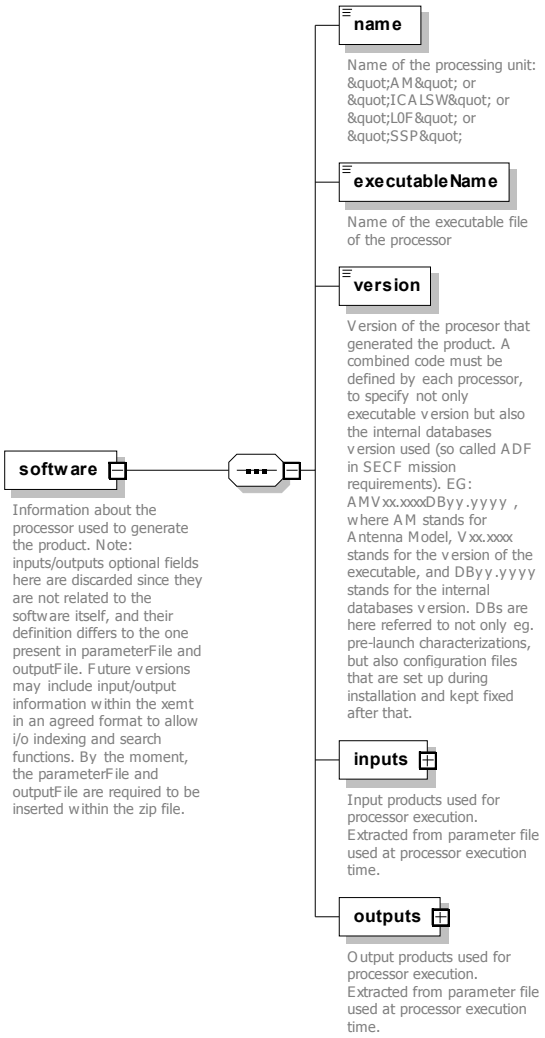
diagram	
properties	isRef 0 minOcc 0 maxOcc 1 content complex
children	**OrbitNumber Track OrbitDirection t_ref_Utc dtSV_s nSV_n pSV_m vSV_mOs**

2.6.1.5 productionHistory element

element **xemt/product/productionHistory**

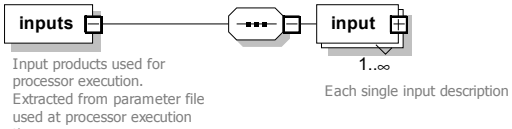
diagram	
properties	isRef 0 content complex
children	**software executionEnvironment processingLog**

element **xemt/product/productionHistory/software**

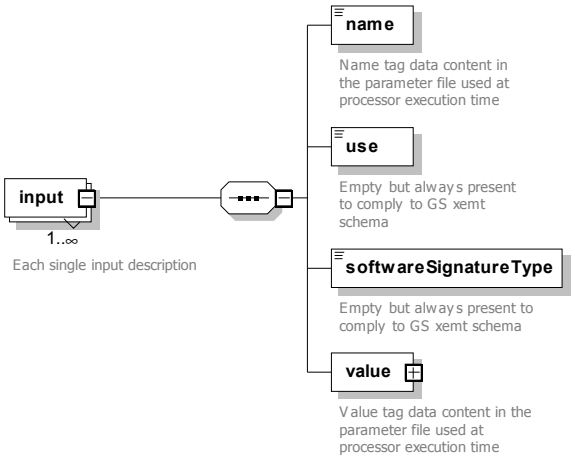
diagram	
properties	isRef 0 content complex
children	**name executableName version inputs outputs**

Element	Possible Values
Name	SSP
Version	SSPV[\d]{2}\.[\d]{4}DB[\d]{2}\.[\d]{4}

element **xemt/product/productionHistory/software/inputs**

diagram	
properties	isRef 0 content complex
children	**input**

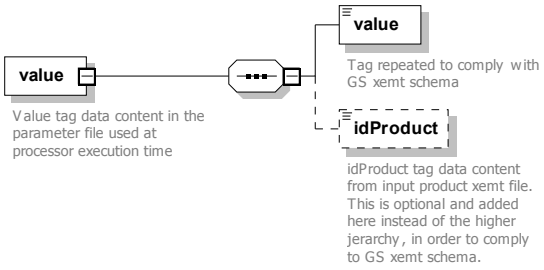
element **xemt/product/productionHistory/software/inputs/input**

diagram	
properties	isRef 0 minOcc 1 maxOcc unbounded content complex
children	**name use softwareSignatureType value**

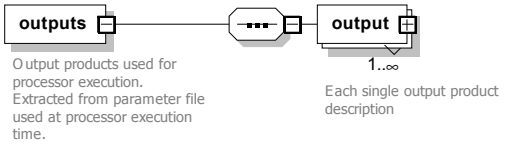
Element	Possible Values
name	Acquisition ID Acquisition Timeline Product Associated Telemetry Product Processor Configuration File Data To Skip Data To Process Total Electron Content CUSS Product Precision Orbit Product Precision Attitude Product Digital Elevation Model Output Resolution Azimuth Bias RAS Product SAOCOM SAR L0A Product SAOCOM SAR L0B Product SAOCOM SAR L0C Product SAOCOM SAR L1A Product SAOCOM SAR L1B Product SAOCOM SAR L1C Product SAOCOM SAR L1D Product

	SAOCOM SAR CE Chirp Replica Product SAOCOM SAR Chirp Replica Product SAOCOM SAR Antenna Excitation Matrix Product SAOCOM SAR Antenna ICAL Matrix Product SAOCOM SAR Antenna Pattern Product Projection Path Row

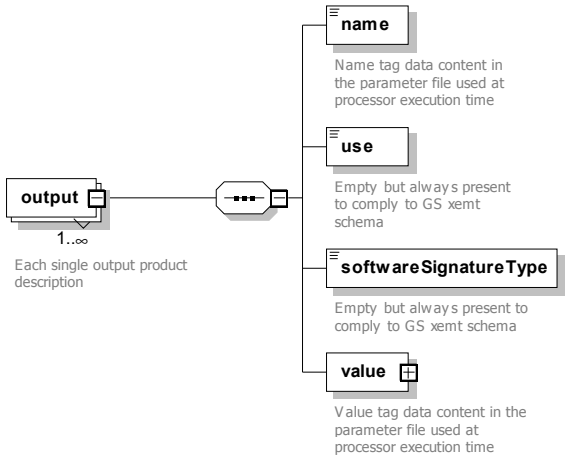
element **xemt/product/productionHistory/software/inputs/input/value**

diagram	
properties	isRef 0 content complex
children	**value idProduct**

element **xemt/product/productionHistory/software/outputs**

diagram	
properties	isRef 0 content complex
children	**output**

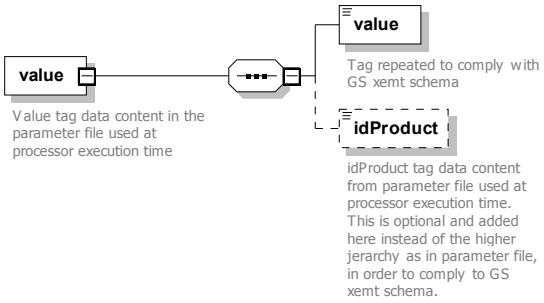
element **xemt/product/productionHistory/software/outputs/output**

diagram	
properties	isRef 0 minOcc 1 maxOcc unbounded content complex
children	**name use softwareSignatureType value**

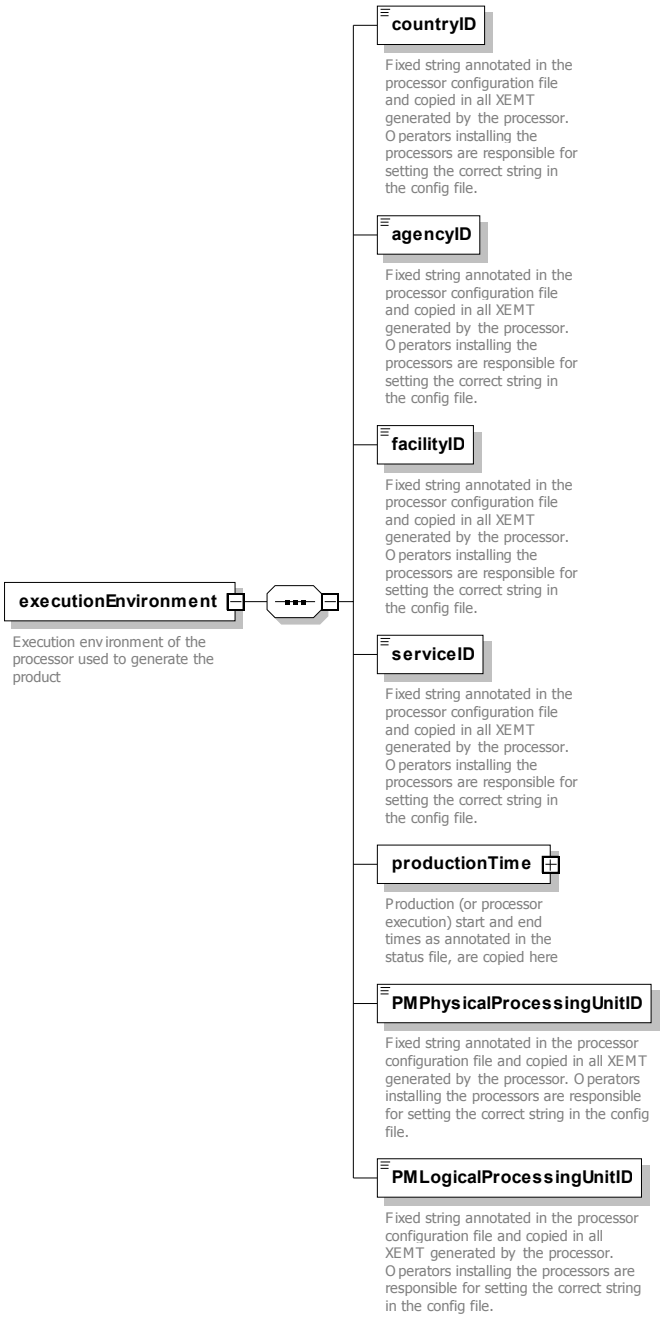
Element	Possible Values
Name	SAOCOM SAR L0A Product
	SAOCOM SAR L0B Product
	SAOCOM SAR L0C Product
	SAOCOM SAR L0A Product Annotated
	SAOCOM SAR L1A Product
	SAOCOM SAR L1A Product Annotated
	SAOCOM SAR L1B Product
	SAOCOM SAR L1B Product Annotated
	SAOCOM SAR L1C Product
	SAOCOM SAR L1C Product Annotated
	SAOCOM SAR L1D Product
	SAOCOM SAR L1D Product Annotated
	SAOCOM SAR CE Chirp Replica Product
	SAOCOM SAR Chirp Replica Product
	SAOCOM SAR Antenna ICAL Matrix Product
	SAOCOM SAR NESZ Map
	SAOCOM SAR Antenna Pattern Product
	SAOCOM SAR CE Phase and Gain Product
	SAOCOM SAR L1A Incidence Angle Map
	SAOCOM SAR L1C Radar Coordinate Map
	SAOCOM SAR L1D Radar Coordinate Map
	SAOCOM SAR L1A Merged Product

	SAOCOM SAR L1A Merged Product Annotated ... Others TBD with developers ...

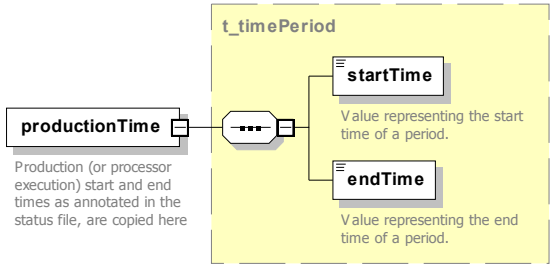
element **xemt/product/productionHistory/software/outputs/output/value**

diagram	
properties	isRef 0 content complex
children	**value idProduct**

element **xemt/product/productionHistory/executionEnvironment**

diagram	
properties	isRef 0 content complex
children	**countryID agencyID facilityID serviceID productionTime PMPhysicalProcessingUnitID PMLogicalProcessingUnitID**

element **xemt/product/productionHistory/executionEnvironment/productionTime**

diagram	
type	**t_timePeriod**
properties	isRef 0 content complex
children	**startTime endTime**

2.6.1.6 CUSS data component

The CUSS data component is a single file compressed in standard zip format containing all measurement data file and all the corresponding annotation files.

2.6.2 Measurement Data format

Measurement Data Level-1 file given in output are encoded as a binary big geoTIFF + annotation file in xml format, i.e.:

- The binary geoTIFF file contains the SAR image written in single precision floating point (8 bytes for each sample of SLC products, being 4 for the real part and 4 for the imaginary part, and 4 bytes for each sample of DI, GEC and GTC products), as reported in Fig.9 the fixed prefix contains all the information to the geoTIFF;
- The XML file contains all the metadata associated to the SAR image. It is generated univocally from an XML Schema Definition (XSD) and it's organized in a set of complex types, as reported in Section 2.6.2.3.

2.6.2.1 GeoTIFF data structure.

The geoTIFF file is encoded as a big tiff file (support to data bigger than 4 Gbytes) in agreement with the specification in [1] .

File is composed by a Header offset containing all the necessary information to create a compliant geoTIFF file. This includes the mandatory code (GeoTIFF and big GeoTIFF tags), the pointers to data and to raw prefix.

In particular it contains also the necessary tags to geolocate the data.

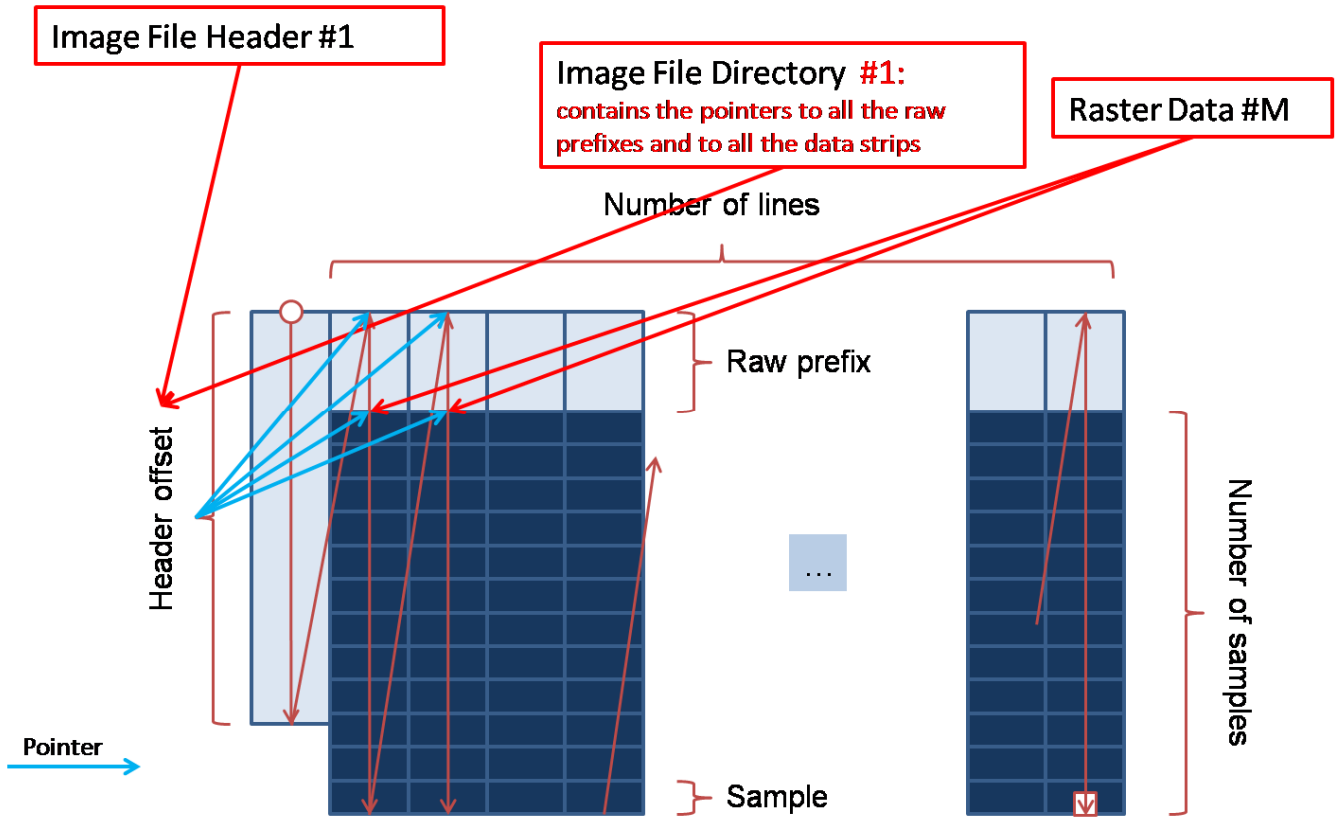


Fig.9 Schematic representation of geoTIFF binary file format.

2.6.2.2 GeoTIFF Tags

The list of geoTIFF tags used to describe the data are reported in Tab.24

		KeyID
1	GTModelTypeGeoKey	1024
2	GTRasterTypeGeoKey	1025
3	GTCitationGeoKey	1026
4	GeographicTypeGeoKey	2048
5	GeogCitationGeoKey	2049
6	GeogGeodedicDatumGeoKey	2050
7	GeogLinearUnitsGeoKey	2052
8	GeogAngularUnitsGeoKey	2054
9	GeogEllipsoidGeoKey	2056
10	GeoSemiMajorAxisGeoKey	2057
11	GeogSemiMinorAxisGeoKey	2058

Tab.24 GeoTIFF tags used to describe the data.

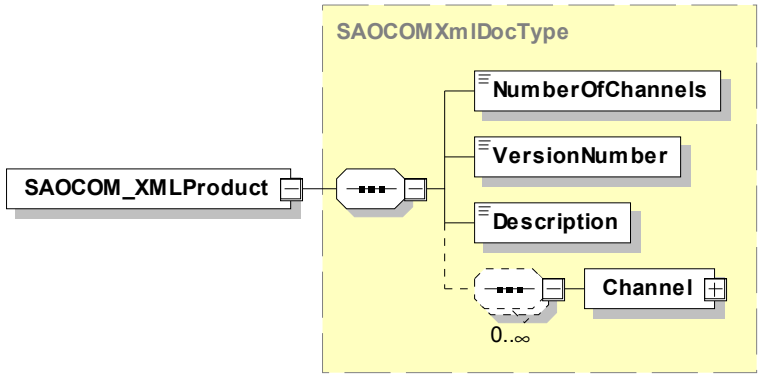
See [2] for more details about each tag.

2.6.2.3 *Measurement data XML Header*

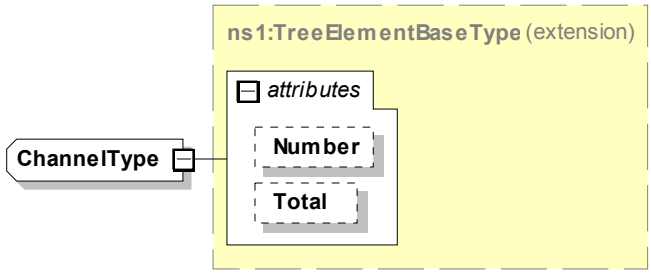
The XML file contains all the metadata associated to the SAR image. It is generated univocally from an XML Schema Definition (XSD) and it's organized in a set of complex types, as reported in the following schema:

The root element of the product is reported hereafter.

element **SAOCOM_XMLProduct**

diagram	
type	**SAOCOMXmlDocType**
properties	content complex

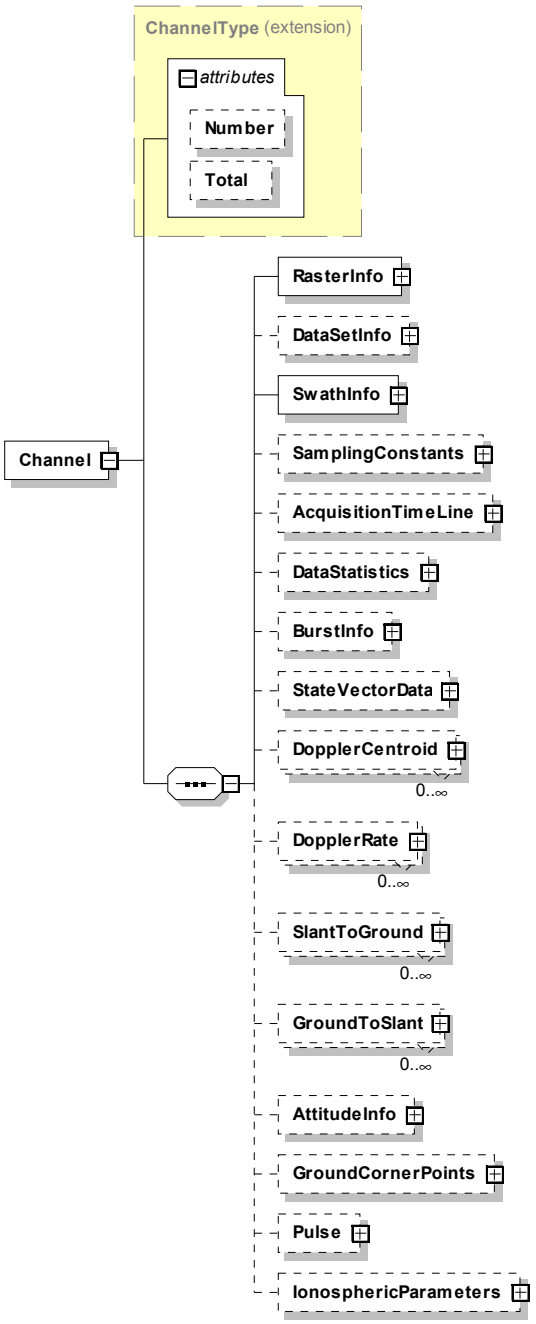
Tab.25 Root element of Level-1 data.

diagram	
type	extension of **ns1:TreeElementBaseType**
properties	base ns1:TreeElementBaseType mixed False
attributes	Name Type Use Default Fixed Annotation Number **xs:unsignedInt** optional Total **xs:unsignedInt** optional

Tab.26 Attribute of element Channel

element **SAOCOM_XMLProduct/Channel**

diagram



type	extension of **ChannelType**
properties	isRef 0 content complex mixed false

attributes

Name	Type	Use	Default	Fixed	Annotation
Number	**xs:unsignedInt**	optional			
Total	**xs:unsignedInt**	optional			

Tab.27 SAOCOM_XMLProduct/Channel element description

The channel element contains as sub tags all the information related to one acquisition. It contains mandatory the RasterInfo section with information about the geoTIFF data (number of samples, number of lines, header offset size) and SwathInfo, useful to identify univocally the data.

The other sections are optional. The following table summarizes the inclusion of sections in the levels of L1 products:

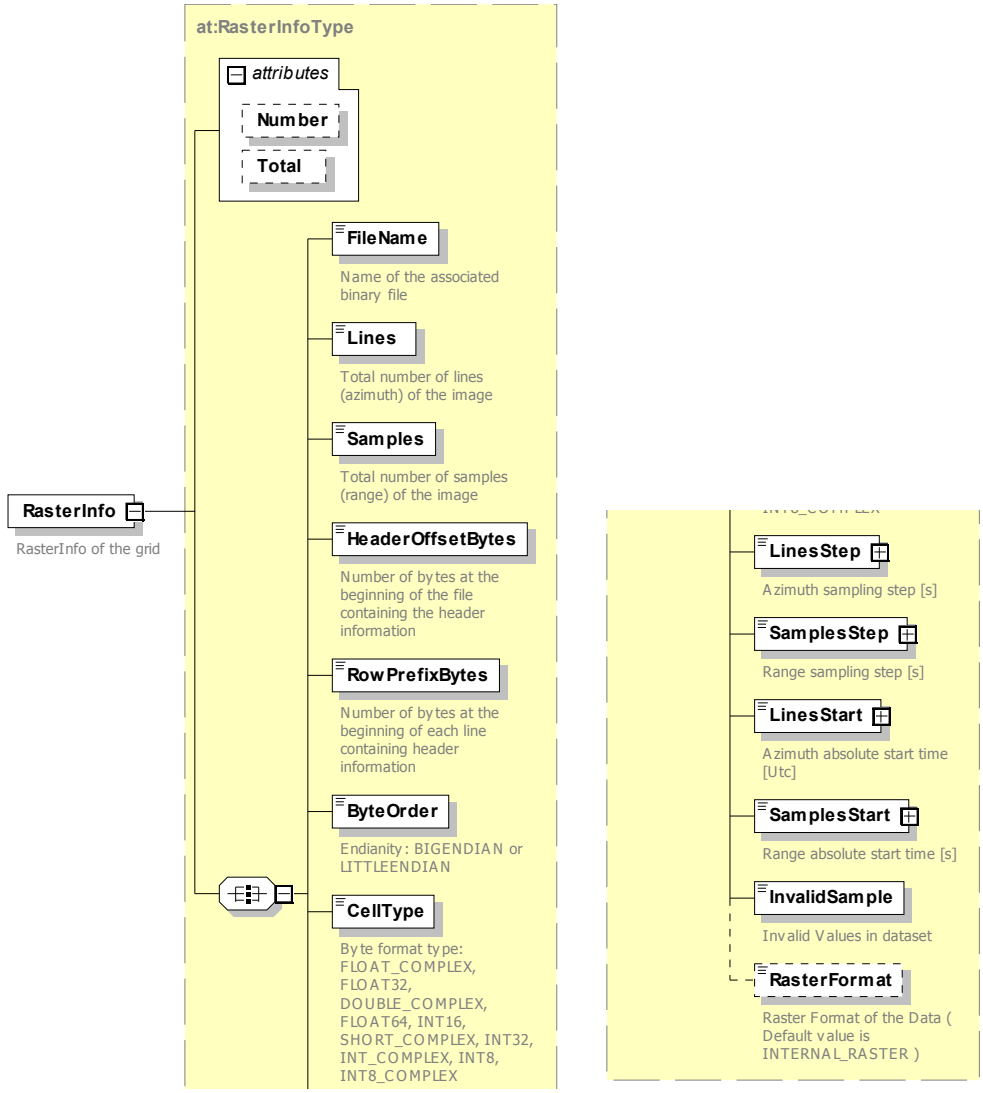
Element	Level 1A	Level 1B	Level 1C	Level 1D
RasterInfo (mandatory)	yes	yes	yes	yes
DataSetInfo	yes	yes	yes	yes
SwathInfo (mandatory)	yes	yes	yes	yes
SamplingConstants	yes	yes	-	-
AcquisitionTimeLine	yes	-	-	-
DataStatistics	yes	yes	yes	yes
BurstInfo	yes	-	-	-
StateVectorData	yes	yes	yes	yes
DopplerCentroid	yes	-	-	-
DopplerRate	yes	-	-	-
SlantToGround	yes	-	-	-
GroundToSlant	yes	yes	-	-
AttitudeInfo	yes	yes	-	-
GroundCornerPoints	-	-	yes	yes
Pulse	yes	yes	yes	yes
IonosphericParameters	yes	yes	yes	yes

Tab.28 XML elements in L1 metadata

2.6.2.4 RasterInfo

The RasterInfo information block contains the main properties and parameters of the raster binary data. The description of all its elements is reported in Tab.29.

element **SAOCOM_XMLProduct/Channel/RasterInfo**

diagram	
type	**ns1:RasterInfoType**
properties	isRef 0 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.29 RasterInfo element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
Number of channels		Number of the total channels available	UI		-
VersionNumber		Product definition version	S		-

Element Name		Description	Datatype	Possible values	Unit
description		General description of the product	S		-
RasterInfo					
	FileName	Name of the associate raster file	S		-
	Lines	Number of lines in raster	UI		-
	Samples	Number of samples in Raster	UI		-
	HeaderOffsetBytes	Number of bytes in the header offset	UI		-
	RowPrefixBytes	Number of bytes at beginning of each lines	UI		-
	ByteOrder	Endianity of the raster file	E	LITTLEENDIAN, BIGENDIAN	-
	CellType	Encoding of the raster file	E	FLOAT_COMPLEX, FLOAT32, DOUBLE_COMPLEX, FLOAT64, INT16, SHORT_COMPLEX, INT32, INT_COMPLEX, INT8, INT8_COMPLEX	-
	LinesStep	Separation in time of each lines	D		s
	SamplesStep	Separation in time of each samples in the same line	D		s
	LinesStart	Starting time of the first line. In L1A/B products it is the Zero Doppler time corresponding to the first line of the azimuth sampling grid..	UTC/D		UTC(for L0 and L1A/B) deg or m (for L1C/D depending on the projection)
	SamplesStart	Starting time of the first Sample.	D		s (for L0 and L1A m (for L1B)

Element Name		Description	Datatype	Possible values	Unit
		Two ways range time in Zero Doppler geometry of the first sample of the data matrix.			deg or m (for L1C/D depending on the projection)
	InvalidSampleValue	Invalid value	-		-
	RasterFormat	Description of simple raster or geotiff	-	INTERNAL_RASTER DATA_GEOTIFF RASTER	

Tab.30 RasterInfo complex type definition.

In Tab.31 the correspondences between CellType element values and the data layout in the raster binary file are described.

CellType	Integer or floating point	Byte occupation	Description
INT8	Integer	1	Real value
INT8_COMPLEX	Integer	1+1	Real part followed by imaginary part
INT16	Integer	2	Real value
SHORT_COMPLEX	Integer	2+2	Real part followed by imaginary part
INT32	Integer	4	Real value
INT_COMPLEX	Integer	4+4	Real part followed by imaginary part
FLOAT32	Floating point	4	Real value
FLOAT_COMPLEX	Floating point	4+4	Real part followed by imaginary part

Tab.31 Possible types of samples in the binary data file w.r.t. the value specified as CellType

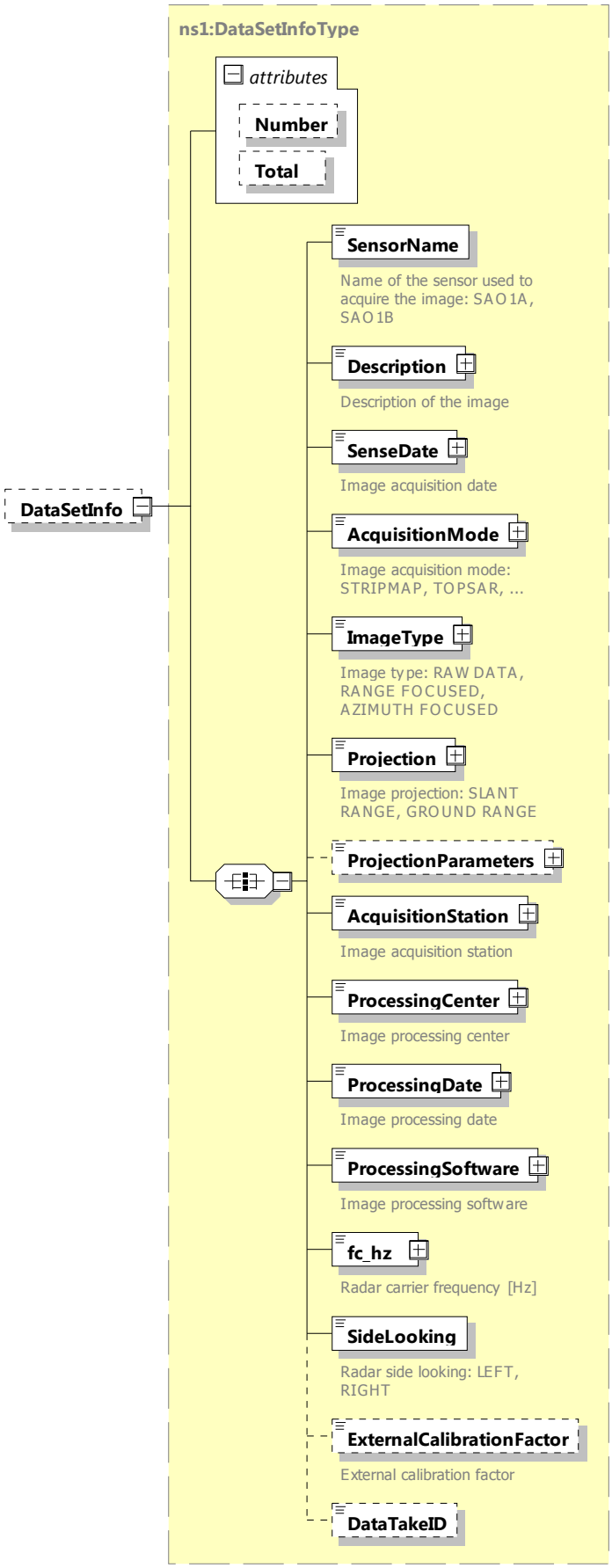
The dataType in output depends on the nature of the Level 1 product (complex for SLC, real for the other) and by configuration.

2.6.2.5 DataSetInfo

The DataSetInfo information block contains high-level information regarding the data set (acquisition mode, sensor, etc.). The description of all its elements is reported in Tab.32.

element **SAOCOM_XMLProduct/Channel/DataSetInfo**

diagram



type	**ns1:DataSetInfoType**					
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false					
attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.32 DataSetInfo element description

The physical content of each xml key is reported in the following table

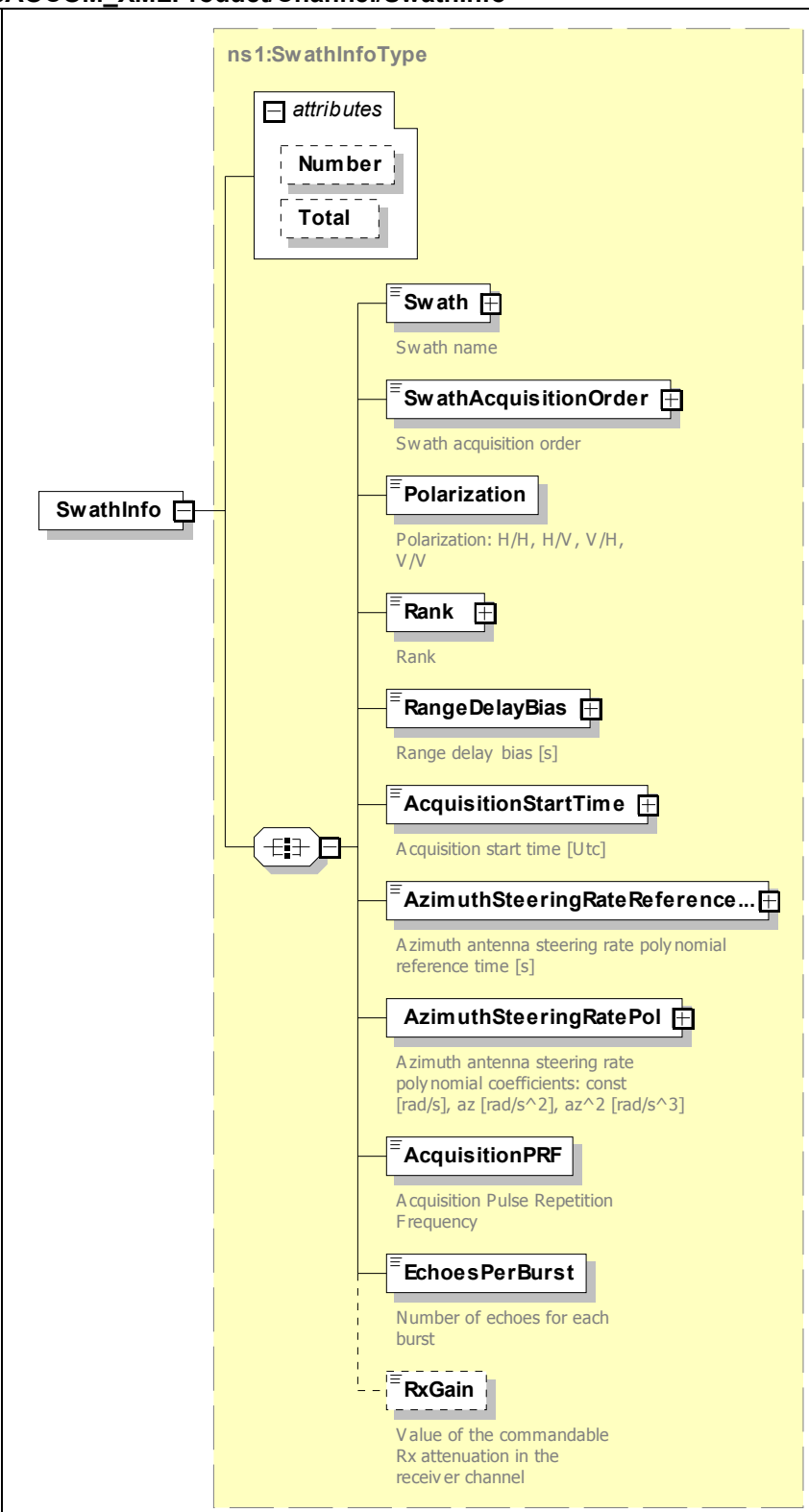
Element Name		Description	Datatype	Possible values	Unit
DatasetInfo					
	SensorName	Sensor name	E	SAO1A, SAO1B	-
	Description	Description of the data	S		-
	SenseDate	Date of acquistion of data	UTC	-	UTC
	AcquisitionMode	Data acquisition mode	E	STRIPMAP, TOPSAR	-
	ImageType	Description of image typology	E	RAW DATA	-
	Projection	Description of image projection	E	SLANT RANGE CUSTOM	-
	ProjectionParamaeters		S		-
	AcquisitionStation	Name of the acquisition station	S		-
	ProcessingCenter	Name of processing center	S		-
	ProcessingDate	Date of processing	UTC		UTC
	ProcessingSoftware	Version of level 1processor	S		-
	fc_hz	Frequency of signal carrier	D		Hz
	sideLooking	Sensor side looking during acquisition	E	LEFT, RIGHT	-

Tab.33 DatasetInfo complex type definition.

2.6.2.6 *SwathInfo*

The SwathInfo information block contains information about the specific swath. The description of all its elements is reported in Tab.34.

element **SAOCOM_XMLProduct/Channel/SwathInfo**

Diagram	
Type	**ns1:SwathInfoType**

properties	isRef 0 content complex mixed false					
Attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.34 SwathInfo element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
SwathInfo					
	Swath	Swath name	E		-
	SwathAcquisitionOrder	index referring to acquisition order of the data	UI		-
	Polarization	Acquisition polarization	E	H/H, H/V, V/V, V/H, CL/H, CL/V, CR/H, CR/V	-
	Rank	Acquisition rank	UI		-
	RangeDelayBias	delay associated to the swath	D		s
	AcquisitionStartTime	Acquisition time	UTC		UTC
	AzimuthSteeringRateReferenceTime	Reference time for evaluating the Steering rate polynomial (offset in seconds wrt to the centre of the burst)	D		s
	AzimuthSteeringRatePol	Azimuth antenna steering rate polynomial coefficients: N=1 const, N=2 az, N=3 az^2.	D		rad/s (N1) rad/s^2 (N2) rad/s^3 (N3)
	AcquisitionPRF	Acquisition PRF	D		Hz
	EchoesPerBurst	number of echoes in each acquisition burst	UI		-
	RxGain	Value of the	D		dB

Element Name		Description	Datatype	Possible values	Unit
		commandable gain in the receiver channel.It is swath dependant.If specified it is applied as a multiplicative factor to each swath independently			

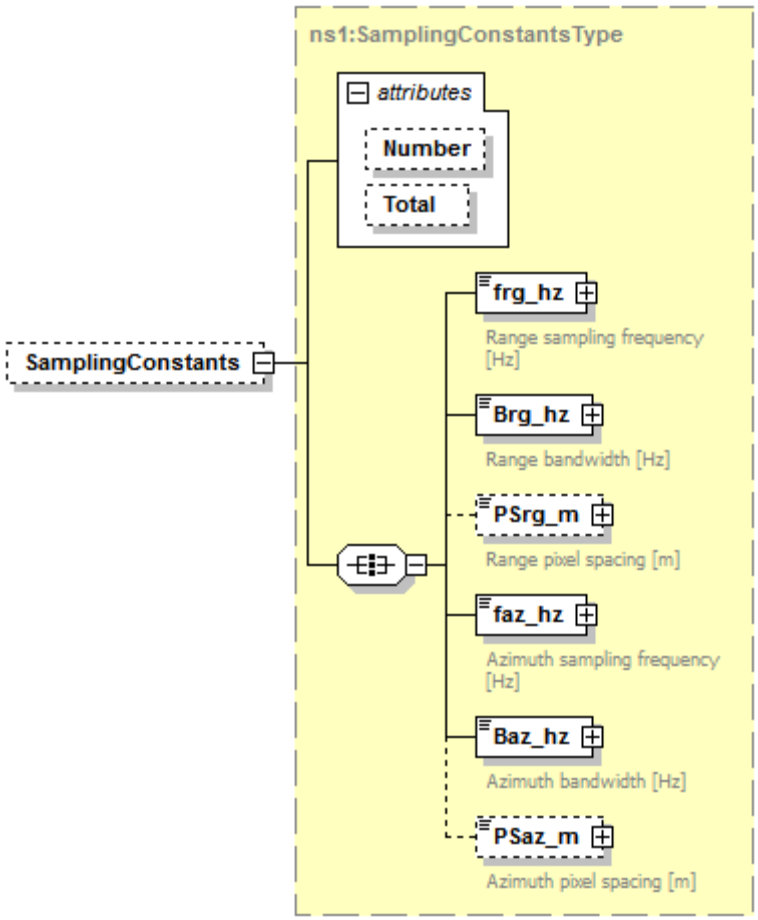
Tab.35 SwathInfo complex type definition.

2.6.2.7 SamplingConstants

The SamplingConstants information block contains information about the sampling frequencies and bandwidths related to the data acquisition. The description of all its elements is reported in Tab.36.

All the four elements contain sensible values only in case of L1-A (single look complex images) product. In case of L1-B (ground detected images), L1-C (geocoded images) or L1-D (geocoded images) products, they are set to zero.

element **SAOCOM_XMLProduct/Channel/SamplingConstants**

diagram	
type	**ns1:SamplingConstantsType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.36 SamplingConstants element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
SamplingConstants					
	frg_hz	Range sampling frequency	D		Hz
	Brg_hz	Range Bandwidth	D		Hz
	PSrg_m	Range pixel spacing [m]	D		m
	faz_hz	Azimuth sampling frequency	D		Hz
	Baz_hz	Azimuth bandwidth	D		Hz
	PSaz_m	Azimuth pixel spacing [m]	D		m

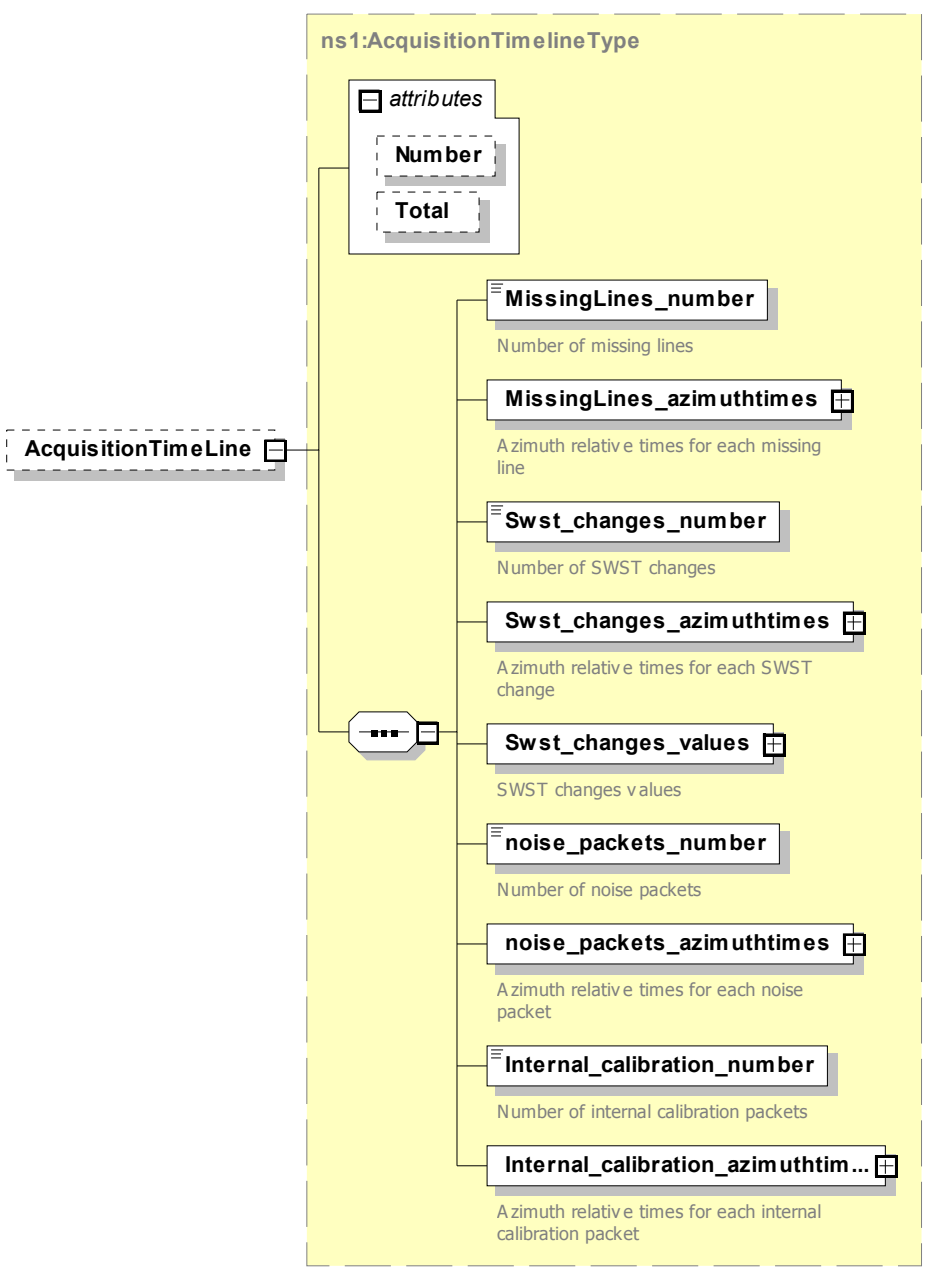
Tab.37 SamplingConstants complex type definition.

2.6.2.8 *AcquisitionTimeLine*

The AcquisitionTimeLine information block contains information about the echoes acquisition time line. The description of all its elements is reported in Tab.38.

element **SAOCOM_XMLProduct/Channel/AcquisitionTimeLine**

diagram



type	**ns1:AcquisitionTimelineType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.38 AcquisitionTimeLine element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
AcquisitionTimeline					
	MissingLines_number	Number of missing line detected in the product	UI		-
	MissingLines_azimuthtimes	Time position of the missing line detected	UTC		UTC
	Swst_changes_number	Number of SWST change in the product	UI		-
	Swst_changes_azimuthtimes	Time position of the SWST change	UTC		UTC
	Swst_changes_values	Values of SWST for each change	D		s
	noise_packets_number	Number of noise packet in the product	UI		-
	noise_packets_azimuthtimes	time position of noise packet in the product	UTC		UTC
	Internal_calibration_number	Number of internal calibration present in the data	UI		-
	Internal_calibration_azimuthtimes	Time position of internal calibration data	UTC		UTC

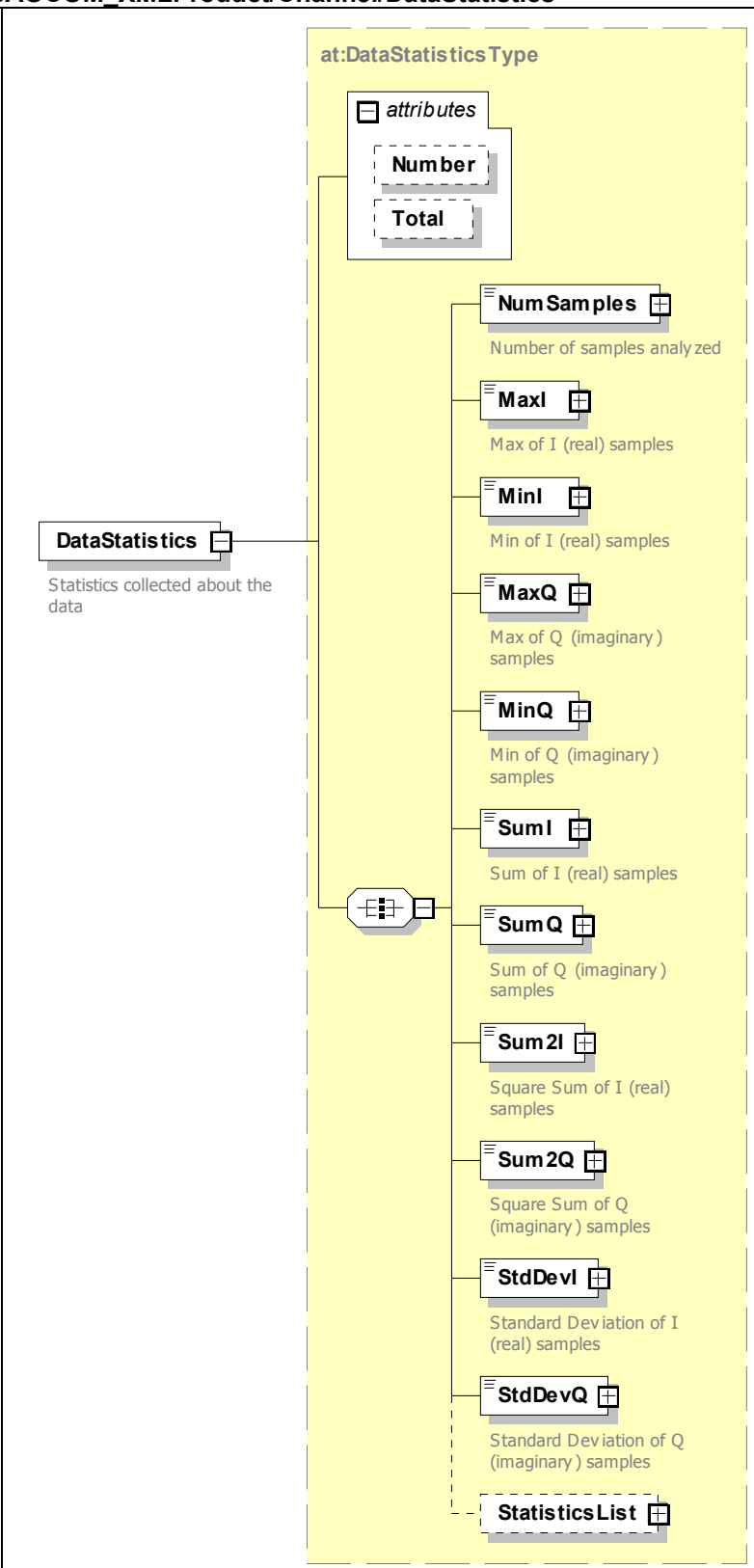
Tab.39 AcquisitionTimeline complex type definition.

Please note that elements in the AcquisitionTimeLine section are typically never updated since they refer to the acquisition phase.

2.6.2.9 DataStatistics

The DataStatistics information block contains information about some important statistics computed from image data. The description of all its elements is reported in Tab.40.

element **SAOCOM_XMLProduct/Channel/DataStatistics**

diagram	
type	**ns1:DataStatisticsType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

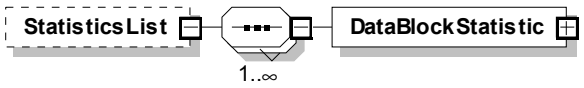
Tab.40 DataStatistics element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
DataStatistics					
	NumSamples	Number of samples analyzed	UI		-
	MaxI	Max of real samples	D		-
	MinI	Min of real samples	D		-
	MaxQ	Max of imaginary samples	D		-
	MinQ	Min of imaginary samples	D		-
	SumI	Sum of real samples	D		-
	SumQ	Sum of imaginary samples	D		-
	Sum2I	Square sum of real samples	D		-
	Sum2Q	Square sum of imaginary samples	D		-
	StdDevI	Standard deviation of real samples	D		-
	StdDevQ	Standard deviation of imaginary samples	D		-
	StatisticList	Statistic relative to a single block	-		-

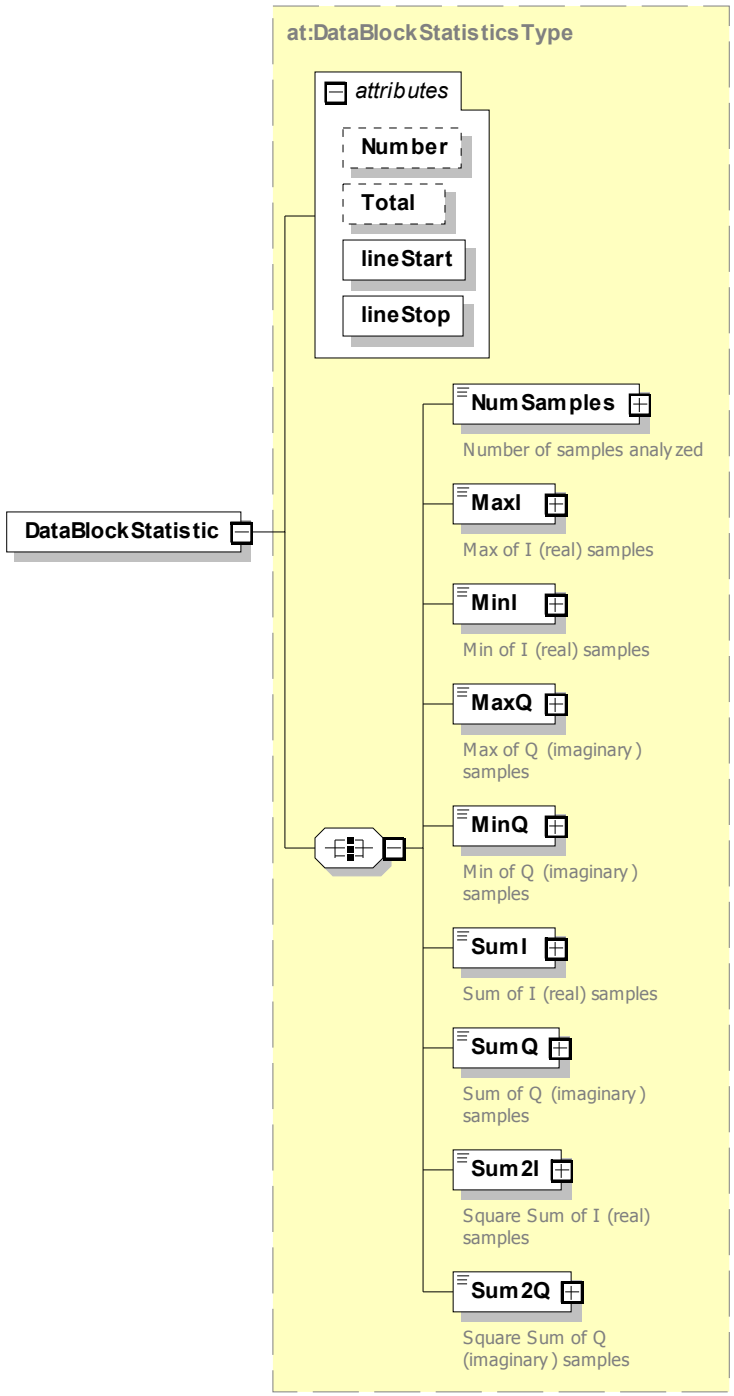
Tab.41 DataStatistics complex type definition.

element **DataStatisticsType/StatisticsList**

diagram	
properties	isRef 0 minOcc 0 maxOcc 1 content complex

element **DataStatisticsType/StatisticsList/DataBlockStatistic**

diagram



type **at:DataBlockStatisticsType**

properties

isRef	0
content	complex
mixed	false

attributes

Name	Type	Use	Default	Fixed	annotation
Number	**xs:unsignedInt**	optional			
Total	**xs:unsignedInt**	optional			
lineStart	**xs:unsignedLong**	required			
lineStop	**xs:unsignedLong**	required			

Tab.42 DataBlock Statistics element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
DataBlockStatistics					
Linestart		Starting time of the analyzed block	Utc		Utc
Linestop		Stopping time of the analyzed block	Utc		Utc
	NumSamples	Number of samples analyzed	UI		-
	MaxI	Max of real samples	D		-
	MinI	Min of real samples	D		-
	MaxQ	Max of imaginary samples	D		-
	MinQ	Min of imaginary samples	D		-
	SumI	Sum of real samples	D		-
	SumQ	Sum of imaginary samples	D		-
	Sum2I	Square sum of real samples	D		-
	Sum2Q	Square sum of imaginary samples	D		-

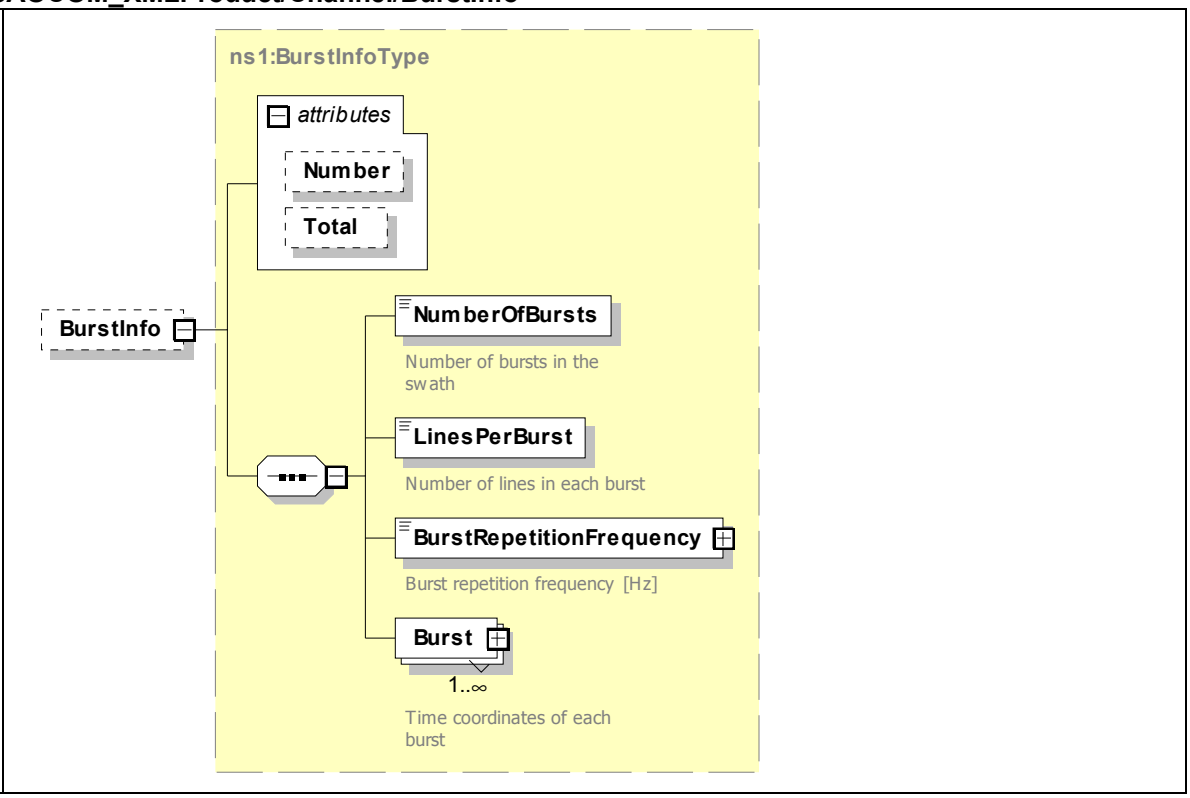
Tab.43 DataStatistics complex type definition.

2.6.2.10 BurstInfo

The BurstInfo information block contains information about the burst subdivision of the image. The description of all its elements is reported in Tab.44.

element **SAOCOM_XMLProduct/Channel/BurstInfo**

diagram



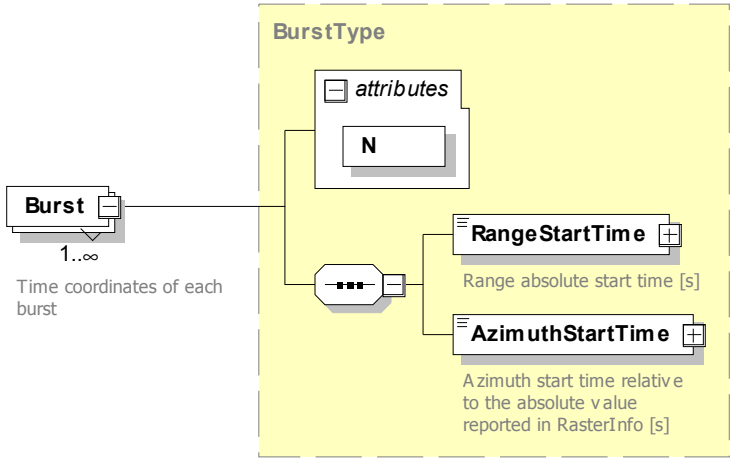
type	**ns1:BurstInfoType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	Annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.44 BurstInfo element description

element **BurstInfoType/Burst**

diagram



type	**BurstType**
properties	minOcc 1 maxOcc unbounded content complex

attributes	Name	Type	Use	Default	Fixed	Annotation
	N	**xs:unsignedInt**	required			

annotation	
	documentation Time coordinates of each burst

Tab.45 BurstInfo/Burst complex type.

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
BurstInfo					
NumberOfBursts		Number of burst in BurstInfo	UI		-
LinesPerBurst		Number of Lines in each burst	UI		-
BurstRepetitionFrequency		Frequency of the repetition of burst	D		Hz
Burst	RangeStartTime	Range Starting time of the N° burst Please note that in L1 products all bursts of each swath are aligned so all RangeStartTime elements in a swath have the same value that is also equal to RasterInfo.SamplesStart.	D		s

Element Name		Description	Datatype	Possible values	Unit
Burst	AzimuthStartTime	Azimuth starting time of the N° burst	UTC		UTC

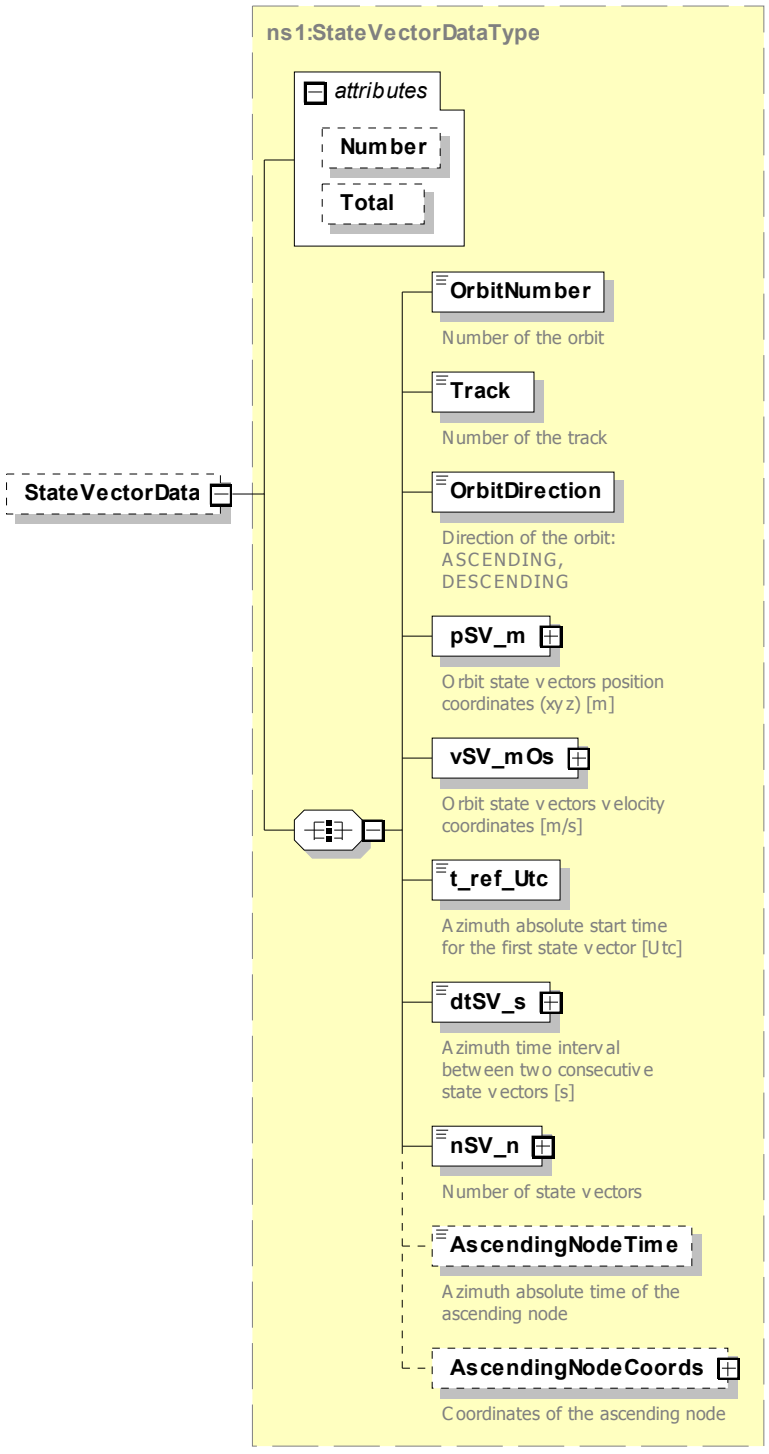
Tab.46 BurstInfo complex type data definition for Level-1.

2.6.2.11 StateVectorData

The StateVectorData information block contains information regarding position and velocity of the sensor along the orbit. The description of all its elements is reported in Tab.47.

element **SAOCOM_XMLProduct/Channel/StateVectorData**

diagram



type	**ns1:StateVectorDataType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes

Name	Type	Use	Default	Fixed	annotation
Number	**xs:unsignedInt**	optional			
Total	**xs:unsignedInt**	optional			

Tab.47 StateVectorData element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
StateVectorData					
	OrbitNumber	Orbit Number	UI		-
	Track	Orbit track number	UI		-
	OrbitDirection	Direction of the orbit	E	ASCENDING, DESCENDING	-
	pSV_m	Orbit state vectors position coordinates (xyz) in ECEF [m]	D		m
	vSV_mOs	Orbit state vectors velocity coordinates (x,y,z) in ECEF [m/s]	D		m/s
	t_ref_Utc	Azimuth absolute start time for the first state vector [Utc]	UTC		UTC
	dtSV_s	Azimuth time interval between two consecutive state vectors [s]	D		s
	nSV_n	Number of state vectors	UI		-
	AscendingNodeTime	Azimuth absolute time of the ascending node	UTC		UTC
	AscendingNodeCoords	Coordinates of the ascending node	D		m

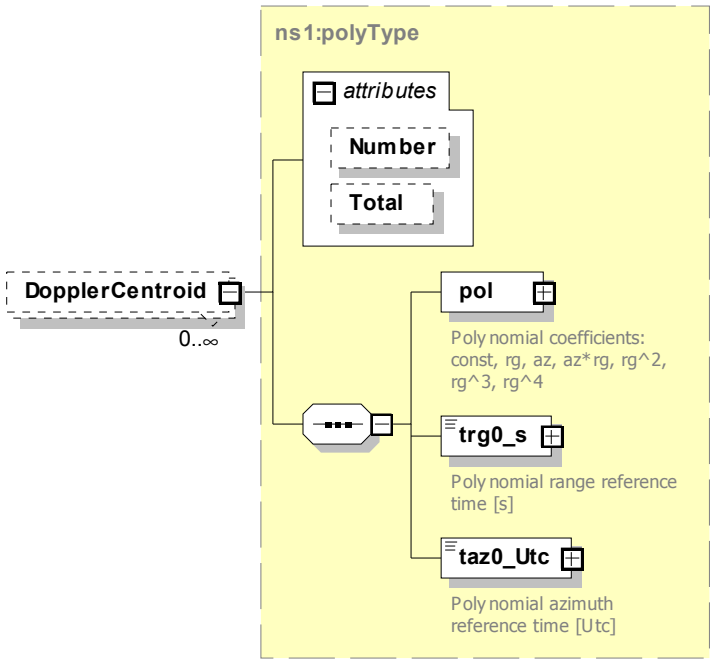
Tab.48 : StateVectorData description datatype.

2.6.2.12 DopplerCentroid

The DopplerCentroid information block contains information about the Doppler centroid frequency polynomial. If present, one or more instances of DopplerCentroid blocks are allowed to be stored in the header. The description of DopplerCentroid elements is reported in Tab.49.

element **SAOCOM_XMLProduct/Channel/DopplerCentroid**

diagram



type	**ns1:polyType**
properties	isRef 0 minOcc 0 maxOcc unbounded content complex mixed false

attributes

Name	Type	Use	Default	Fixed	annotation
Number	**xs:unsignedInt**	optional			
Total	**xs:unsignedInt**	optional			

Tab.49 DopplerCentroid element description

The physical content of each xml key is reported in the following table

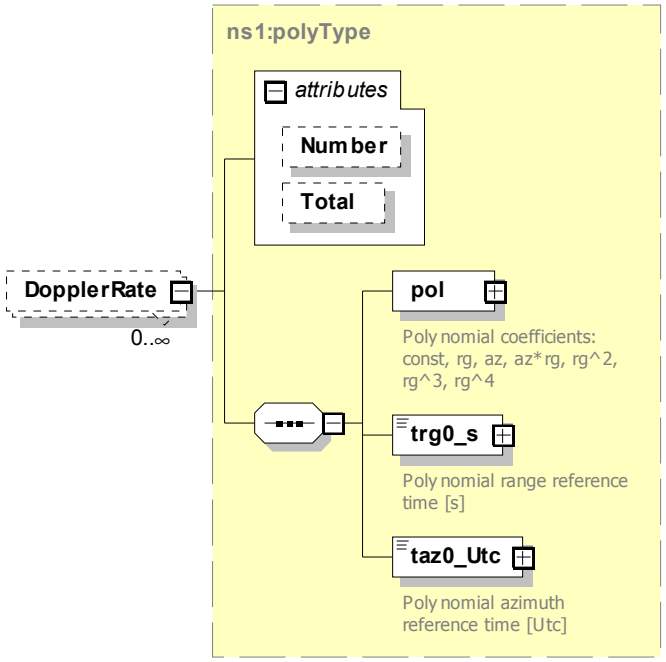
Element Name		Description	Datatype	Possible values	Unit
DopplerCentroid					
	pol	Polynomial coefficients. The value at a specific (az, rg) coordinate can be computed as follows: value(az, rg) = pol(N=1) + pol(N=2)*rg + pol(N=3)*az + pol(N=4)* az*rg + pol(N=5)*rg^2 + pol(N=6)*rg^3 + pol(N=7)*rg^4	POLY		Hz (N=1) Hz/s (N=2) Hz/s (N=3) Hz/s^2 (N=4) Hz/s^2 (N=5) Hz/s^3 (N=6) Hz/s^4 (N=7)
	trg0_s	Polynomial range reference time [s]	D		s
	taz0_Utc	Polynomial azimuth reference time [Utc]	UTC		UTC

Tab.50 DopplerCentroid description datatype

2.6.2.13 DopplerRate

The DopplerRate information block contains information about the Doppler rate polynomial. If present, one or more instances of DopplerRate blocks are allowed to be stored in the header. The description of DopplerRate elements is reported in Tab.51.

element **SAOCOM_XMLProduct/Channel/DopplerRate**

diagram	
type	**ns1:polyType**
properties	isRef 0 minOcc 0 maxOcc unbounded content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.51 DopplerRate element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
DopplerRate					
	pol	Polynomial coefficients. The value at a specific (az, rg) coordinate can be computed as follows: value(az, rg) = pol(N=1) + pol(N=2)*rg + pol(N=3)*az + pol(N=4)* az*rg + pol(N=5)*rg^2 + pol(N=6)*rg^3 + pol(N=7)*rg^4	POLY		Hz/s (N=1) Hz/s^2 (N=2) Hz/s^2 (N=3) Hz/s^3 (N=4) Hz/s^3 (N=5) Hz/s^4 (N=6) Hz/s^5 (N=7)

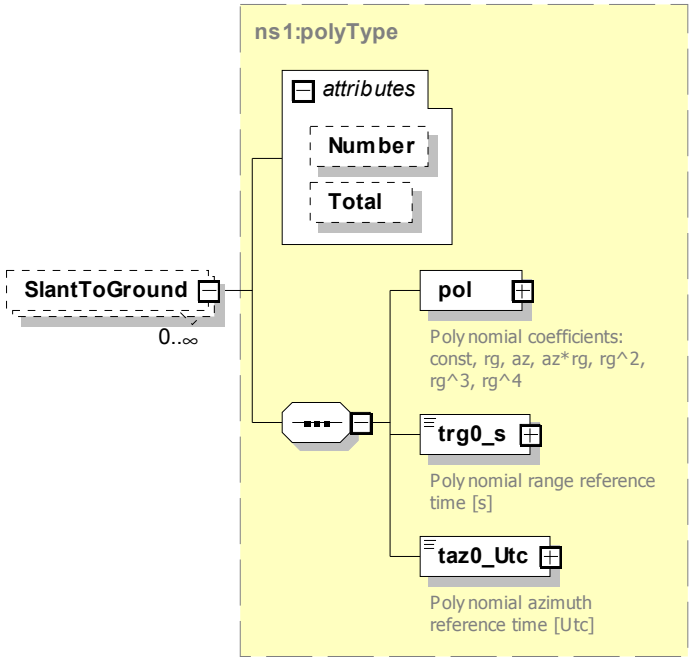
	trg0_s	Polynomial range reference time [s]	D		s
	taz0_Utc	Polynomial azimuth reference time [Utc]	UTC		UTC

Tab.52 DopplerRatedescription datatype

2.6.2.14 SlantToGround

The SlantToGround information block contains the polynomial to pass from Slant-range coordinates to Ground-range coordinates. If present, one or more instances of SlantToGround blocks are allowed to be stored in the header. The description of SlantToGround elements is reported in Tab.53.

element **SAOCOM_XMLProduct/Channel/SlantToGround**

diagram	
type	**ns1:polyType**
properties	isRef 0 minOcc 0 maxOcc unbounded content complex mixed false
attributes	Name Type Use Default Fixed annotation Number **xs:unsignedInt** optional Total **xs:unsignedInt** optional

Tab.53 SlantToGround element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
SlantToGround					
	pol	Polynomial coefficients. The value at a specific (az, rg) coordinate can be computed as follows:			

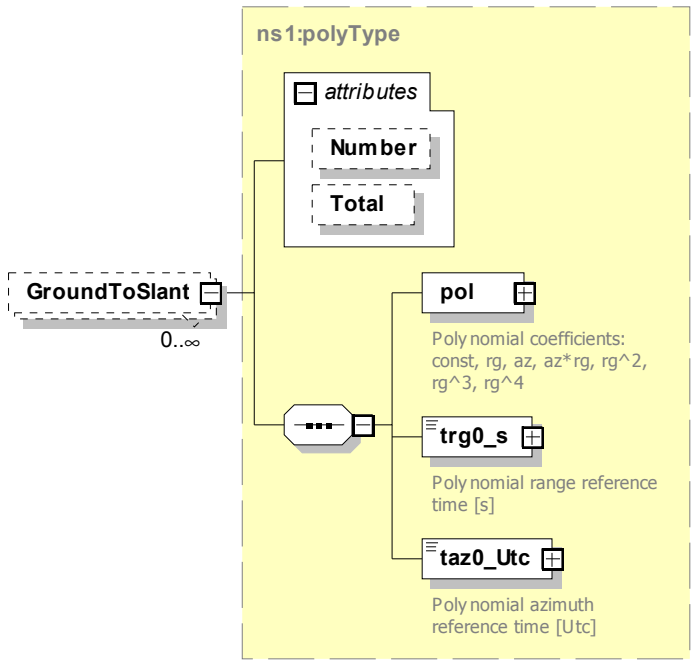
		value(az, rg) = pol(N=1) + pol(N=2)*rg + pol(N=3)*az + pol(N=4)* az*rg + pol(N=5)*rg^2 + pol(N=6)*rg^3 + pol(N=7)*rg^4	POLY		m (N=1) m/s (N=2) m/s (N=3) m/s^2 (N=4) m/s^2 (N=5) m/s^3 (N=6) m/s^4 (N=7)
	trg0_s	Polynomial range reference time [s]	D		s
	taz0_Utc	Polynomial azimuth reference time [Utc]	UTC		UTC

Tab.54 SlantToGrounddescription datatype

2.6.2.15 GroundToSlant

The GroundToSlant information block contains the polynomial to pass from Ground-range coordinates to Slant-range coordinates. If present, one or more instances of GroundToSlant blocks are allowed to be stored in the header. The description of GroundToSlant elements is reported in Tab.55.

element **SAOCOM_XMLProduct/Channel/GroundToSlant**

diagram	
type	**ns1:polyType**
properties	isRef 0 minOcc 0 maxOcc unbounded content complex mixed false
attributes	Name / Type / Use / Default / Fixed / annotation Number **xs:unsignedInt** optional Total **xs:unsignedInt** optional

Tab.55 GroundToSlant element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
GroundToSlant					
	pol	Polynomial coefficients. The value at a specific (az, rg) coordinate can be computed as follows: value(az, rg) = pol(N=1) + pol(N=2)*rg + pol(N=3)*az + pol(N=4)* az*rg + pol(N=5)*rg^2 + pol(N=6)*rg^3 + pol(N=7)*rg^4	POLY		s (N=1) s/m (N=2) s/m (N=3) s/m^2 (N=4) s/m^2 (N=5) s/m^3 (N=6) s/m^4 (N=7)
	trg0_s	Polynomial range reference time [s]	D		s
	taz0_Utc	Polynomial azimuth reference time [Utc]	UTC		UTC

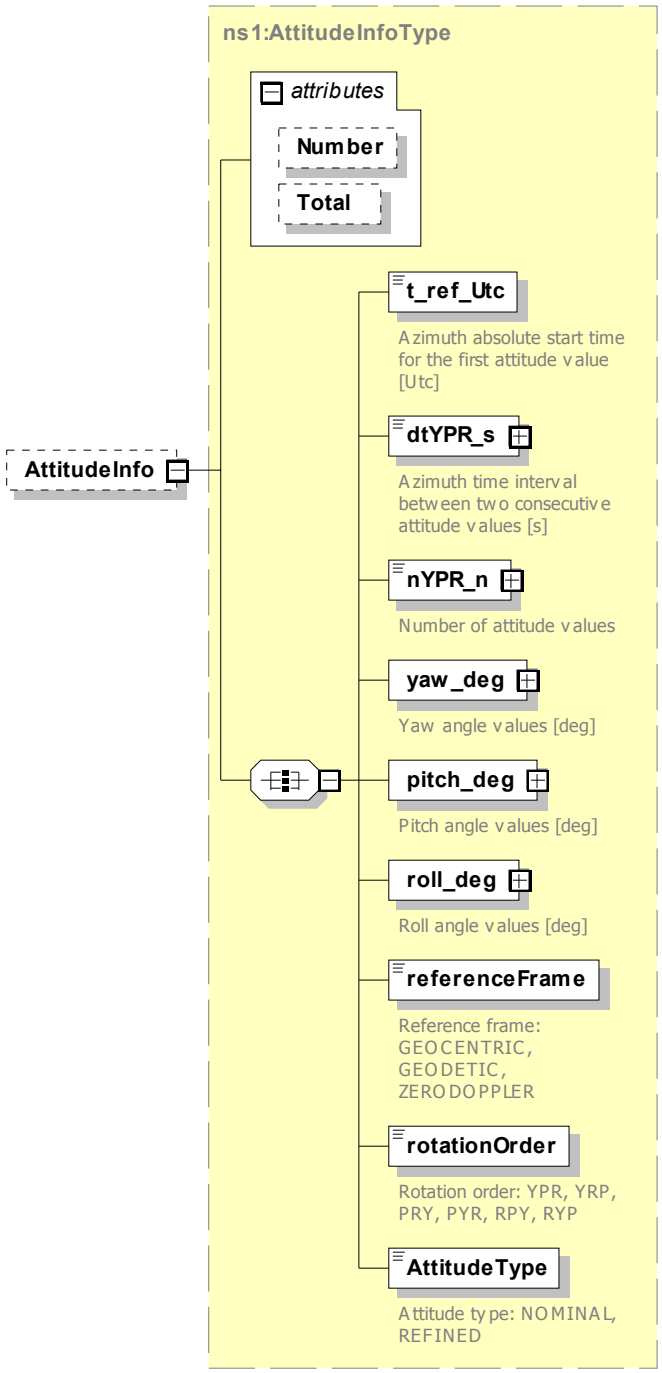
Tab.56 GroundToSlantdescription datatype

2.6.2.16 AttitudeInfo

This complex type contains information regarding the sensor attitude. The description of all its elements is reported in Tab.57.

element **SAOCOM_XMLProduct/Channel/AttitudeInfo**

diagram



type **ns1:AttitudeInfoType**

properties

isRef	0
minOcc	0
maxOcc	1
content	complex
mixed	false

attributes

Name	Type	Use	Default	Fixed	annotation
Number	**xs:unsignedInt**	optional			
Total	**xs:unsignedInt**	optional			

Tab.57 AttitudeInfo element description

The physical content of each xml key is reported in the following table

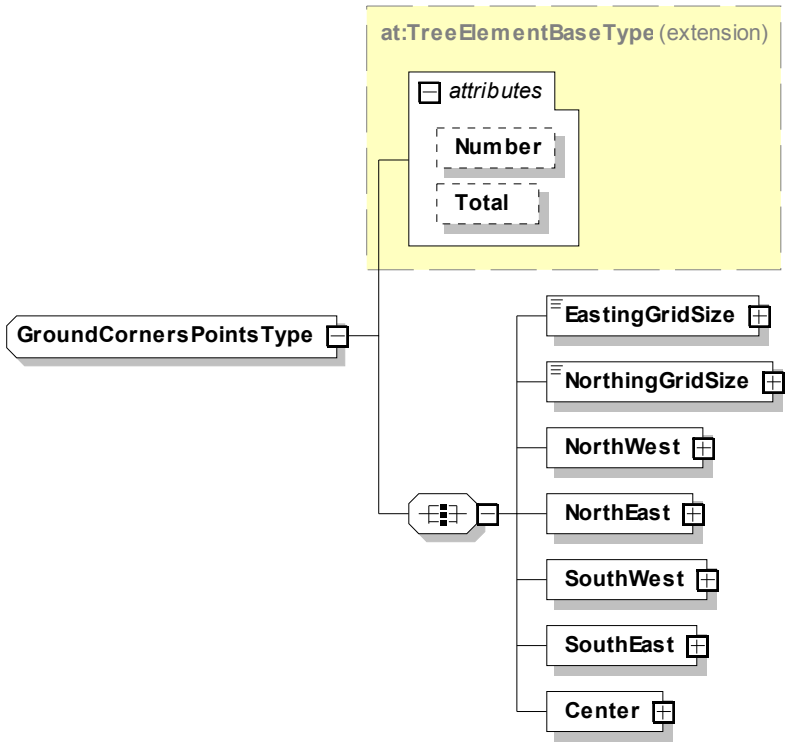
Element Name		Description	Datatype	Possible values	Unit
AttitudeInfo					
	t_ref_Utc	Azimuth absolute start time for the first attitude value [Utc]	UTC		UTC
	dtYPR_s	Azimuth time interval between two consecutive attitude values [s]			s
	nYPR_n	Number of attitude values			-
	yaw_deg	Yaw angle values referred to orbit reference frame [deg]	D		deg
	pitch_deg	Pitch angle values referred to orbit reference frame [deg]	D		deg
	roll_deg	Roll angle values referred to orbit reference frame [deg]	D		deg
	referenceFrame	Reference frame	E	ORBIT GEOCENTRIC, ORBIT GEODETIC	-
	rotationOrder	Rotation order	E	YPR, YRP, PRY, PYR, RPY, RYP	-
	AttitudeType	Attitude data type	E	reference, predicted, on-board nominal, on-board degraded, precise nominal, precise degraded	-

Tab.58 AttitudeInfo/AttytudeType complex type.

2.6.2.17 GroundCornersPoints

This complex type contains information about the ground position of the corners of the image. If present, only one instance will be available per swath. The tag is described by the following schema:

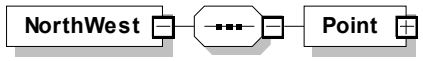
complexType **GroundCornersPointsType**

diagram	
type	extension of **at:TreeElementBaseType**
properties	base at:TreeElementBaseType mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

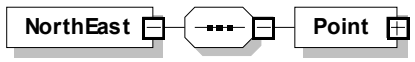
Tab.59 GroundCornersPoints element description

element **GroundCornersPointsType/NorthWest**

diagram	
properties	isRef 0 content complex

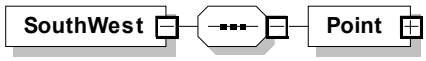
Tab.60 GroundCornersPoints/NW element description

element **GroundCornersPointsType/NorthEast**

diagram	
properties	isRef 0 content complex

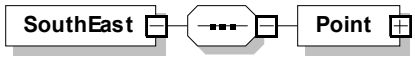
Tab.61 GroundCornersPoints/NE element description

element **GroundCornersPointsType/SouthWest**

diagram	
properties	isRef 0 content complex

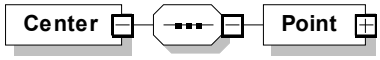
Tab.62 GroundCornersPoints/SW element description

element **GroundCornersPointsType/SouthEast**

diagram	
properties	isRef 0 content complex

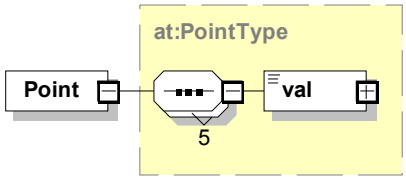
Tab.63 GroundCornersPoints/SE element description

element **GroundCornersPointsType/Center**

diagram	
properties	isRef 0 content complex

Tab.64 GroundCornersPoints/Center element description

element **GroundCornersPointsType->Point**

diagram	
type	**at:PointType**
properties	isRef 0 content complex

Tab.65 GroundCornersPoints/Point element description

Element Name		Description	Datatype	Possible values	Unit
GroundCornerPoints					
	EastingGridSize	ROI dimensioni in longitude direction	lon		Deg
	NortingGridSize	Azimuth time interval between two consecutive attitude values [s]	lat		s
	NorthWest	Point at North West	-		-
	NorthEast	Point at North East	-		

Element Name		Description	Datatype	Possible values	Unit
	SouthWest	Point at South West	-		
	SouthEast	Point at South East	-		
	Center	Point at image center	-		
	Point	Element containing 5 different elements val with the following sequence ECEF XYZ, Lat long	-		
	val	Different meaning	D	ECEF XYZ LAT/LON	m/ deg

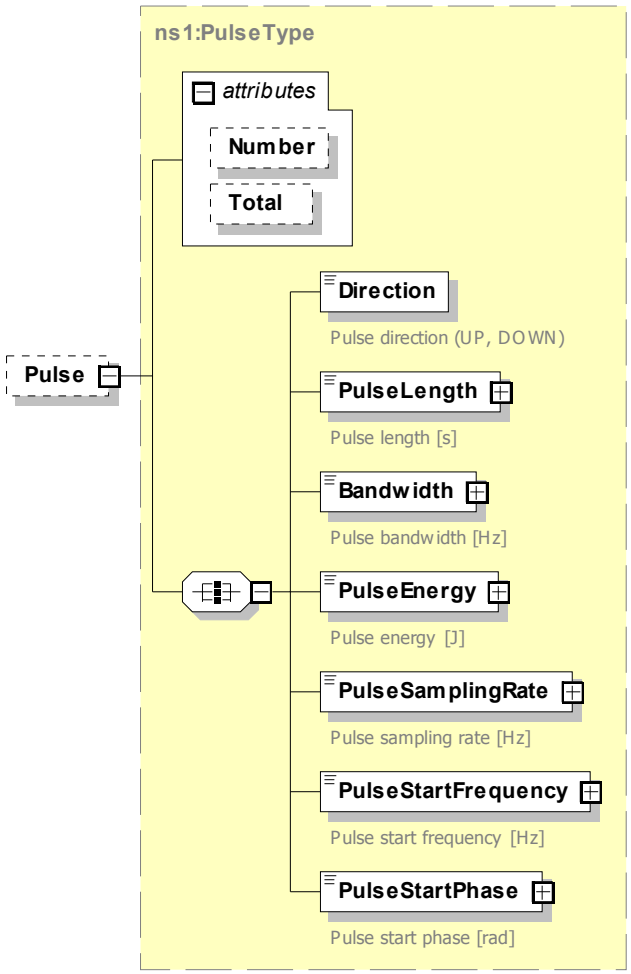
Tab.66 GroundCornerPoints complex type.

2.6.2.18 Pulse

The Pulse information block contains information regarding the parameters of the nominal chirp replica associated to the current image. The description of all its elements is reported in Tab.67.

element **SAOCOM_XMLProduct/Channel/Pulse**

diagram



type	**ns1:PulseType**
properties	isRef 0 minOcc 0 maxOcc 1 content complex mixed false

attributes	Name	Type	Use	Default	Fixed	annotation
	Number	**xs:unsignedInt**	optional			
	Total	**xs:unsignedInt**	optional			

Tab.67 Pulse element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
Pulse					
	Direction	Direction of chirp	E	UP, DOWN	-
	PulseLength	Length of the pulses	D		s
	Bandwidth	Bandwidth of the chirp	D		Hz
	PulseEnergy	Energy of chirp	D		J
	PulseSamplingRate	Sampling frequency of the chirp signal	D		Hz

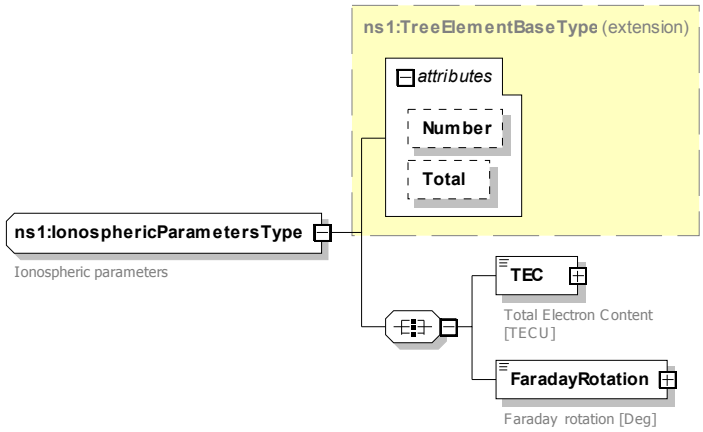
	PulseStartFrequency	Starting frequency of pulse	D		Hz
	PulseStartPhase	Starting phase of pulse	D		rad

Tab.68 Pulsedescription datatype

2.6.2.19 IonosphericParameters

The IonosphericParameters information block contains information regarding the parameters of the ionosphere to the current image. The description of all its elements is reported inTab.69.

complexType **SAOCOM_XMLProduct/Channel/IonosphericParameters**

diagram	
namespace	SaocomTypes
type	extension of **ns1:TreeElementBaseType**
properties	base at:TreeElementBaseType mixed false
children	**TEC FaradayRotation**
used by	element **SaocomXmlDocType/Channel/IonosphericParameters**
attributes	Name / Type / Use / Default / Fixed / annotation Number **xs:unsignedInt** optional Total **xs:unsignedInt** optional

Tab.69 IonosphericParameters element description

The physical content of each xml key is reported in the following table

Element Name		Description	Datatype	Possible values	Unit
IonosphericParameters					
	TEC	Total Electron Content	D		TECU
	FaradayRotation	Faraday rotation angle	D		deg

Tab.70 IonosphericParameters description datatype

2.7 **PNG quick look images**

Browsing product (BP) images are low-resolution images created for each product and are intended as a fast reference to the main image.

2.7.1 Browsing product

2.7.2 generation

The BP images are produced one image at time, by basic sample averaging in both azimuth and range directions. The averaging is performed convolving the data with a boxcar filter on the data with dimension equal to the averaging factor. Please note that the projection of the BP image is always the same of the full resolution product.

For single polarization data, PNGs will be created in gray scale.

For dual and quad polarization data, PNGs are created as RGB images according to the following color combinations:

Channel	DP/CP	QP
Red	crossPol	HV
Green	crossPol + coPol / 2	HV + HH / 2
Blue	coPol	HH

Tab.71 Quicklooks channel combinations for DP and QP data

In all cases data is opportunely scaled to use the full dynamic of 8 bit provided by the single gray scale channel (SP) or by each of the RGB channels, respectively (DP and QP).

Browsing products are physically stored in the “Images” folder of the CUSS archive.

2.7.3 KML auxiliary browsing files

In order to easily display the scene bounding boxes on a geographic software, L1 products also include a KML file (see https://developers.google.com/kml/documentation), with the only exception of non-merged L1A TOPSAR products.

The KML file also points to the quick-look images included in L1 products (“Images” folder) so that also product previews can be displayed in the geographic SW as well. In this case the KML stores the lat/lon coordinates of the BP image corners to allow an approximate geolocation of the image. Please note that as the BP is generated with the same projection of the full resolution product while the KML file always contains lat/lon coordinates for the corners, this may result in an apparent error in the position of the quick-look when displayed in a geographic software.

The auxiliary KML file is physically stored in the “Images” folder of the CUSS archive.

2.8 Level 1 product naming convention

This section defines the naming convention of SAOCOM Level-1 products. The product is designed to be stored as a single zip file (CUSS file) that contains the data component coupled with an xml file in xemt format. The following sections provide a description of the naming convention adopted for the product and the internal files.

2.8.1 Product name

The product name in CUSS format is composed by alphanumeric characters separated by underscores (one or two) or by the “T” character, according to the following structure:

```
S1<X>_OPER_SAR_EOSSP__CORE_<LLL>_<Orbit>_<DDDDDDDD>T<TTTTTT>
```

Where

Placeholder	Format	Description
<X>	1 alphabetic	A for SAOCOM-1A, B for SAOCOM-1B
OPER	4 alphabetic	Operative
EOSSP	5 alphabetic	Earth Observation – SAOCOM SAR Processor
<LLL>	3 alphabetic	Level 1 Data product: L1A for SLC processing level. L1B for DI processing level. L1C for GEC processing level. L1D for GTC processing level.
<Orbit>	3 or 4 alphabetic	Orbit estimation OLVF for On Line Very Fast OLF for Off Line Fast
<DDDDDDDD>	8 numeric	Product L1 date in format yyyymmdd (date of processing)
<TTTTTT>	6 numeric	Processing time in format hhmmss

Tab.72 Product name convention.

This structure is used for both components of the product, i.e., for the xemt and the zip files. Example of the name can be found hereafter:

```
S1A_OPER_SAR_EOSSP__CORE_L1C_OLVF_20190313T232519.xemt
S1A_OPER_SAR_EOSSP__CORE_L1C_OLVF_20190313T232519.zip
```

2.8.2 Level-1A Data files

This section defines the naming standard common to all the data component of SAOCOM Level 1A Product. The file name is composed by a common root, containing lower case alphanumeric characters, separated by a hyphen character, in accordance to the following specification:

```
slc-acqId<ccccccccc>-<x>-<mmm>-<hhhhhhhhhh>-<ssss>-<pp>
```

Where:

Placeholder	Format	Description
<cccccccccc>	10 numeric	Acquisition ID identifier
<x>	1 alphabetic	a for SAOCOM-1A, b for SAOCOM-1B
<mmm> or <mmmm>	3/4 alphanumeric	Acquisition mode: smx for stripmap x, with x the beam number 1 to 10. tna for topsar narrow A; tnb for topsar narrow B; tw- for topsar wide.
<hhhhhhhhhh>	10 alphanumeric	Reserved field for future use.
<ssss> or <sssss>	4/5 alphanumeric	Swath name: s1dp, s2dp, s3dp, s4dp, s5dp, s6dp, s7dp, s8dp, s9dp, s1qp, s2qp, s3qp, s4qp, s5qp, s6qp, s7qp, s8qp, s9qp, s10qp, merg for topsar SLC merged products.
<pp>	2 alphabetic	Polarization: hh, vv, hv, vh for the different linear polarization combination; ch, cv for compact polarization;

Tab.73 Measurements file name convention for Level 1A data files.

The extension ".xml" is added to the corresponding file name to identify the annotation product accompanying the data.

Example of the name can be found hereafter:

```
slc-acqId0000068910-a-sm8-0000000000-s8qp-vv
slc-acqId0000068910-a-sm8-0000000000-s8qp-vv.xml
```

2.8.3 Level-1B/1C/1D Data files

This section defines the naming standard common to all the data component of SAOCOM Level 1B/1C/1D Product. The file name is composed by a common root, containing lower case alphanumeric characters, separated by a hyphen character, in accordance to the following specification:

```
<level>-acqId<cccccccccc>-<x>-<mmm>-<hhhhhhhhhh>-<pp>-<r>
```

Where:

Placeholder	Format	Description
<level>	3 alphabetic	Level 1 Data product: di- for Level-1B gec for Level-1C gtc for Level-1D.
<cccccccccc>	10 numeric	Acquisition ID identifier
<x>	1 alphabetic	a for SAOCOM-1A, b for SAOCOM-1B
<mmm> or <mmmm>	3/4 alphanumeric	Acquisition mode: smx for stripmap x, with x the beam number 1 to 10. tna for topsar narrow A; tnb for topsar narrow B; tw- for topsar wide.
<hhhhhhhhhh>	10 alphanumeric	Reserved field for future use.

<pp>	2 alphabetic	Polarization: hh, vv, hv, vh for the different linear polarization combination; ch, cv for compact polarization;
<r>	1 alphabetic	Resolution: A qualitative indication of the image resolution v, l, m, h for very low, low, medium, high resolution, respectively

Tab.74 Measurements file name convention for Level 1B/1C/1D data files.

The extension ".xml" is added to the corresponding file name to identify the annotation product accompanying the data.

Example of the name can be found hereafter:

```
gec-acqId0000100468-a-tw--0000000000-vh-l
gec-acqId0000100468-a-tw--0000000000-vh-l.xml
```

2.8.4 Browsing product filename convention

This section defines the naming standard for SAOCOM Level 1 Product browsing product. The file name is composed by a common root, containing lower case alphanumeric characters, separated by a hyphen character, in accordance to the following specification:

```
<lll>-acqId<ccccccccc>-<x>-<mmm>-<hhhhhhhhhh>-<ssss>-<r>.png
```

Where:

Placeholder	Format	Description
<lll>	3 alphabetic	Level 1 Data product: slc for Level-1A di- for Level-1B gec for Level-1C gtc for Level-1D.
<ccccccccc>	10 numeric	Acquisition ID identifier
<x>	1 alphabetic	a for SAOCOM-1A, b for SAOCOM-1B
<mmm> or <mmmm>	3/4 alphanumeric	Acquisition mode: smx for stripmap x, with x the beam number 1 to 10. tna for topsar narrow A; tnb for topsar narrow B; tw- for topsar wide.
<hhhhhhhhhh>	10 alphanumeric	Reserved field for future use
<ssss> or <sssss>	4/5 alphanumeric	Swath name: s1dp, s2dp, s3dp, s4dp, s5dp, s6dp, s7dp, s8dp, s9dp, s1qp, s2qp, s3qp, s4qp, s5qp, s6qp, s7qp, s8qp, s9qp, s10qp. It will be applicable only to level-1A data. For other level-1 product it will not be applied
<r>	1 alphabetic	Resolution: A qualitative indication of the image resolution v, l, m, h for very low, low, medium, high resolution, respectively

Tab.75 Measurements file name convention for Browsing products.

The extension ".png" is added to the file name to identify the data typology.

The same name is applied to the KML auxiliary browsing file.

Examples of the name can be found hereafter:

For Level-1A data

slc-acqId0000076100-a-sm10-0000000000-s10qp-h.png

slc-acqId0000076100-a-sm10-0000000000-s10qp-h.kml

For other Level-1 data

gtc-acqId0000072901-a-sm2-0000000000-h.png

gtc-acqId0000072901-a-sm2-0000000000-h.kml