TerraSAR-X Ground Segment

Level 1b Product Format Specification

CAF – Cluster Applied Remote Sensing

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Document Distribution

This document is an annex document to the Basic Product Specification document [AD 1] and distributed along with it.

Document Change Log

Issue	Date	Page	Change Description	Note (i.e. reason of change)
1.0 Draft	09.05.2005	all	Initial Draft Version	
1.1	05.10.2005	all	Editorial changes Product delivery package structure description added. Composite quicklook redefined as mandatory for all product variants. Clarifications in COSAR file format description. Image coordinate annotation, geo-grid and mapping grid figures added. GeoTIFF details added. Chapters reordered (3 and 6 exchanged). DEM coverage map details added. *Changes in the product annotation:* Raw data / signal analysis parameter annotation classified as optional. Further minor changes in XML annotation and parameter documentation. Image data statistics either complex or detected. Attitude quaternions indices changed to reflect changes in attitude product spec. Calibration factor annotation restructured. Product order info adapted to TMSP order file content	End of draft status & first official document release
1.2	27.03.2006	Table. 3-1 all	comment added for product component geometric layer indicator product component beam indicator is now taken from the order file. For SM, SL and complex SC products: identical with elevation beamID of the image layer. In detected ScanSAR products: scan_xyz with xyz as number of the SM beamID of nearest beam.	Post-G/S-TAR issue. Changes in IOCS Aux Product and MOS-IOCS I/F incorporated. Open GrdSeg-NCR-0007 (MOS)

		p. 18	due to limitations of the instrument and commanding, the range sampling frequency may change in-between ScanSAR swathes. Hence for experimental complex ScanSAR products, the annotated relative range position (RSRI) of bursts in the CO-SAR file now refers to a virtual sample position on the common raster derived from the ADC sampling rate. An oversampling factor of actual sampling and RSRI sampling (1,2 or 3) is annotated along.	
		all	The map plot format changed from GIF to PNG and the browse image may also be in TIFF format. Extension of mapping grid changed to ".bin" to underline that it is not a SUN raster file (.ras).	
		Ch. 6	***Changes in the XML product annotation:***	
			editorials in comments	
			attitude section: manoeuver „NA" added	
			ScanSAR beam overlap documentation extended	
			georeferencing annotation: included optional polynomial azimuthShift in signalPropagationEffects	
			beamPointingVector unbound and identified with beamID attribute	
			productComponents: type of size changed to long	
			elevationBeamConfiguration is now taken from the order file. For SM, SL: identical with elevation beamID. In ScanSAR: SCAN_xyz with xyz as number of the SM beamID of nearest beam.	Open GrdSeg-NCR-0007
			elevation and azimuth antenna sampling and coverage changed	GrdSeg-SCR-0017
			GPSAntennaPosition multiplicity set to 4	
			combinedDoppler (fusion of baseband and geometric estimates) added to dopplerEstimate and geometricDoppler content modified to support antenna pattern/pointing verification by IOCS	
			image quality statistics: complex and detected product differentiation reverted	

			(not meaningful for phase values). Same for quality limits. range compression chirp description now reflects new annotation and selection strategy in the new IOCS Aux product (as of Feb. 2006) all Attitude Product related elements are set to optional to allow (off-nominal) NRT processing without any attitude data. attitude accuracy: added LREF and RREF for left and right looking reference attitude products (used for nominal NRT processing). product quality limits for raw data and Doppler centroid limits adopted from revised IOCS Aux Product DT Quality Limits Table added optional beamID identifier to geometry parameters to allow a more detailed B parameter description for ScanSAR due to variing RSF between ScanSAR beams, the farRangeBeamBorderTime is also required for SSCs. optionality of pixel and timing info in scene coordinates corrected. quicklook image data scaling polarisation layer multiplicity set to 0...1 elevationPatternCorrectedFlag typo corrected quicklookDataStartWith added to complexImageInfo to ensure a more uniform QL orientation. Comments for map plot and browse components changed.	
1.3	10.12.2007	Ch. 4.2 Ch. 4.1 Ch. 5.2.1 Annex B	SPECAN scaling rate included in COSAR burst annotation Packbits compression in GeoTIFF description added Quicklook image sizes adapted **New section "How to..."** introduced with basic recipes on how to use the annotated information.	Post-commissioning phase issue for operational readiness

			Changes in XML annotation schema: editorials comments added for azimuth processing parameter annotation. optional user order data included and updated optional order parameter procGainAttenuation included optional processing / geometry parameter zeroDopplerVelocity added optional sceneInfo parameter sceneRangeExtent introduced optional processing parameter correctedInstrumentDelay added to handle chirp type & bandwidth dependent delays optional section on signal data analysis (for internal calibration and test purposes in the commissioning phase) removed in user product	

Table of Contents

1 Introduction

1.1 Scope

This document defines the format of the level 1b product components as introduced in [AD 1]**.** In that sense it is an annex document to [AD 1] which details the image file and preview data representation and gives a comprehensive list of the product annotation parameters.

1.2 Applicable Documents

This document is based on the requirements and specifications given in the following documents.

[AD 1]	TX-GS-DD-3302	Basic Product Specification 1.5
[AD 2]	TX-GS-DD-3303	Experimental Product Description 1.4

1.3 Reference Documents

Reference	Document Number	Document Title
[RD 1]	TX-GS-DD-4111	IOCS Auxiliary Product Specification 1.12
[RD 2]	TX-GS-SP-2601	Orbit And Attitude Product Specification 2.8
[RD 3]	TX-GS-DD-3306	Product and Data Conventions
[RD 4]	TX-GS-ICD-3202	GS to User Interface Control Document
[RD 5]		GeoTIFF Format Specification GeoTIFF Revision 1.0, Specification Version 1.8.1 N. Ritter and M. Ruth; 1995
[RD 6]		TIFF Revision 6.0 Specification Final – June 3 1992

1.4 Document Structure

This document is structured as follows:

Chapter 1 introduces to the structure and scope of the document.

Chapter 2 gives an overview of the TerraSAR-X level 1b product format.

Chapter 3 describes the structure of the delivered level 1b products.

Chapter 4 describes the binary data format of the image components (GeoTIFF and COSAR).

Chapter 5 lists further product components (e.g. quicklooks, auxiliary raster files).

Chapter 6 details the parameter annotation components.

Annex A explains the abbreviations used.

1.5 General Aspects

The term "Level 1b Product" as used in this document comprises the TerraSAR-X basic products and the experimental products as given in [AD 1] and [AD 2]. They are generated by the operational TerraSAR Multi Mode SAR Processor (TMSP).

The basic products are the operational products offered by the TerraSAR-X PGS to commercial and scientific customers. These products can be ordered through and will be delivered by the PGS user services at DLR. The experimental product ordering and delivery may be restricted.

2 Level 1b Product Format Rationale

The huge variety of level 1b product types for TerraSAR-X (complex, detected, geocoded, …) requires product annotation in an extensible and dynamic format. The Extensible Markup Language (XML – see http://w3.org/XML) is such a format and has therefore been selected. In chapter 6 the parameters are given in a XML formatted annotation similar to the one implemented for Radarsat-2 and to the one proposed for TerraSAR-L. The TerraSAR-X product annotation is however much more comprehensive than the one of Radarsat-2 due to the additional spotlight imaging modes and additional instrument capabilities. Nevertheless, one branch of the main product annotation component contains all the basic information on the delivered product as uniform as possible for all product types.

Further annotation and pointers to additional annotation components generated by the archiving system or post processing steps like look-up-tables, map projection or propagation correction can simply be added to the existing XML files. In general, new generated data components like enumeration matrices for map projection or binary masks can be directly included in the product directory. The product annotation comprises detailed parameters on the actual format of the binary product components (e.g. bits per pixel, byte order, …). These are however fixed for all product components contained in this specification and are given for informative purposes in those cases. Additional components can be described easily this way. Parameters like size or pixel spacing of the image data are obviously variable from product to product. Some annotation parameters are extracted or derived from the IOCS auxiliary product, the orbit product and the attitude product used for processing. Details on those products can be found in [RD 1] and [RD 2].

The image data consists of one or more polarimetric channel files in separate binary data matrices. In detected (MGD) and geocoded products (GEC, EEC) the polarimetric (and DRA channel) image layers are stored in individual GeoTIFF files. This format is used in many remote sensing and GIS applications and for Radarsat-2. It allows to annotate map projection parameters as TIFF tags in the image layers. Details are given in chapter 4. Quicklooks are provided in the common TIFF format.

In complex products (SSCs), the individual bursts of each ScanSAR beam are stored together in one individual binary file for each beam. The stripmap and spotlight SSCs are equivalent with a one beam / one burst ScanSAR product in this context. This format also contains image raster positioning annotation in the binary file which facilitates data handling and interferometric data processing. Thus the "*COmplex SAR*" (COSAR) format is defined for the complex TerraSAR-X image data of all modes. The structure and content of such a COSAR file, containing complex focused ScanSAR bursts of one beam, is described in chapter 4.

The COSAR file is in a plain binary raster file since formats which could serve as a container hosting complex SAR data (e.g. GeoTIFF) are using 4 byte offsets and are thus limited in file size to 4 GB. The quicklooks of complex products however use the same TIFF format as the ones of detected or geocoded products.

3 Product Delivery Package

This chapter describes the delivered product package. The package directory structure and the file naming conventions are given. Note that the Level 1b Product as specified in this document is self-contained and that all product components are referenced in the "productComponents" section of the main annotation file. *The paths and file names (except for the one of the main annotation file) described here may thus be extended or even made obsolete by the annotated ones.*

3.1 Package Structure and File Names

Upon delivery, the level 1b products are packed in a delivery package which may also contain other products. It is supplemented by additional administrative information and either archived into a tar file or put onto a medium. These packages and the delivery mechanisms will be specified in [RD 3] and [RD 4]. Figure 3-1 gives an example for the directory structure inside such a delivery shell. The yellow folders contain the individual level 1b products.

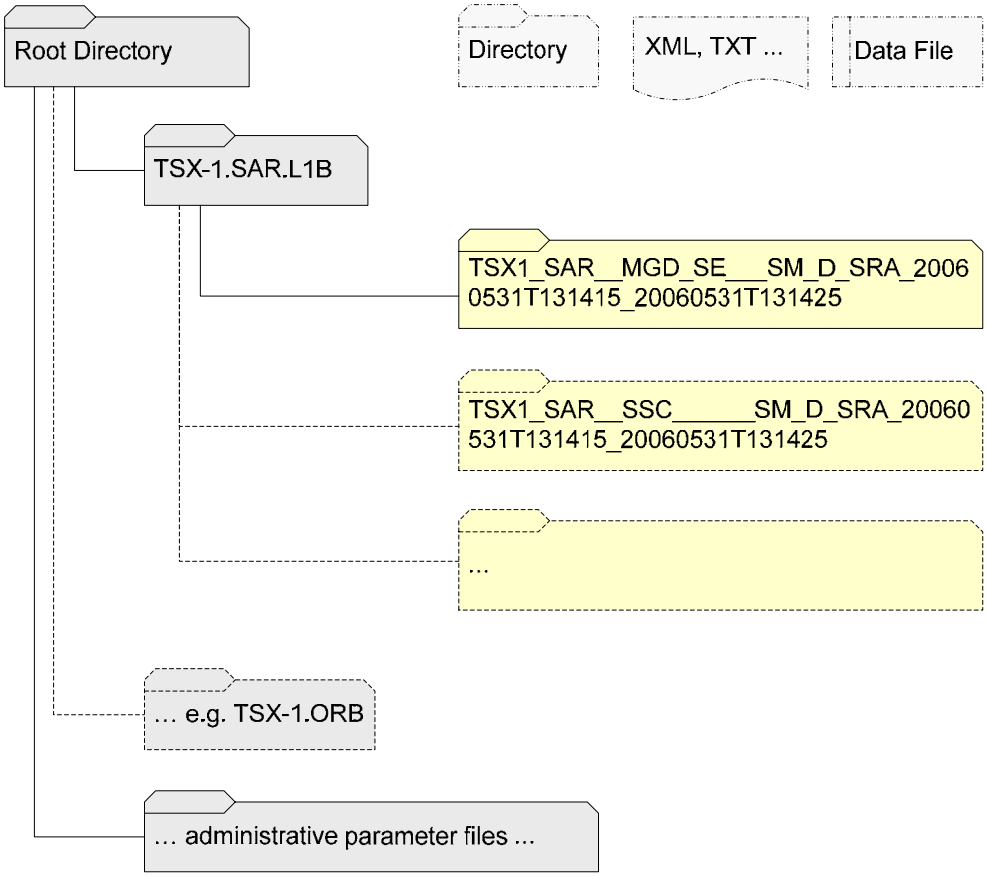


Figure 3-1: Example for the high-level directory structure of delivered products.

The folders hosting the level 1b products are conveniently named using the product naming convention of [RD 3]. The directory structure and components of the level 1b product itself are indicated in Figure 3-2. Table **3-1** gives an overview of the relevant file name constituents.

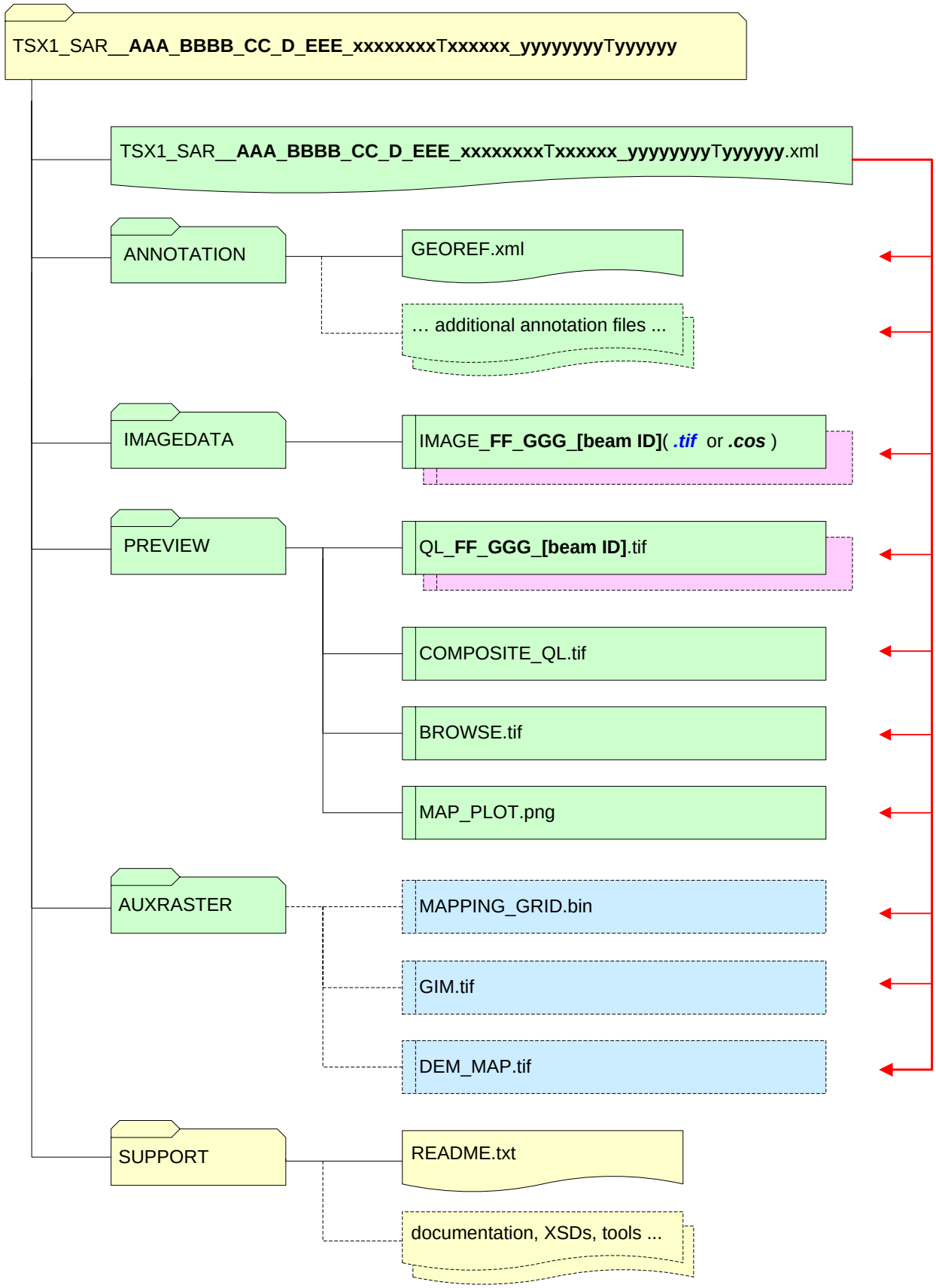


Figure 3-2: Directory structure and files of the TerraSAR-X Level 1b Product.

In Figure 3-2, the yellow color indicates components of the product delivery shell and the SUPPORT directory which includes some documentation on the delivered product (e.g. this document and the XML schema files in the versions valid at time of the product generation). The other objects are the specified level 1b product components. Optional or supplemental components are marked with dashed lines. Additional image layers (e.g. polarimetric channels) are colored magenta. The components which exist only for projected or geocoded products are indicated with blue color.

The main annotation file in the product directory carries the product name with the extension "`.xml`". The file naming scheme is outlined here using constituents (e.g. **AAA**) which are separated by underscores ("_"). Note again that only the main annotation file / product naming follows the specified convention and that the components may be named and located differently as referenced in the relevant "productComponents" annotation section (indicated by the red arrows in the figure).

Constituent ID	*Constituent Name*	*Value Range*	*Remark*
L1b product names:			
-	mission	TSX1	fixed
-	sensor	SAR_	fixed
AAA	product variant	SSC, MGD, GEC, EEC	product class
BBBB	resolution variant	SE__, RE__	product sub-class: spatially or radiometrically enhanced. No entry (____) for SSCs.
CC	imaging mode	SM, SC, SL, HS	example: HS for High-Resolution SpotLight
D	polarisation mode	S, D, T, Q	example: T for TWIN polarization mode
EEE	antenna receive configuration	SRA, DRA	SRA for single-receive antenna DRA for dual-receive antenna
xxxxxxxxTxxxxxx	UTC start time	-	format: YYYYMMDD**T**hhmmss
yyyyyyyyTyyyyyy	UTC stop time	-	
Variable parts of the product component file names:			
FF	polarization channel image layer	HH, HV, VH, VV	TxRx polarization
GGG	geometric (antenna receive channel) image layer	SRA, FWD, AFT	geometric layers for DRA/ATI mode (forward and after). QuadPol data is processed with the "SRA" geometric phase center offset (thus 0).
[beam ID]	elevation beam (configuration) ID	e.g. strip_007, scan_009, …	as taken from the order file for detected products (e.g. scan_009, strip_009, stripFar_009). Identifying the different image layers for each subswath of (experimental) complex ScanSAR products (e.g. strip_009, strip_010, strip_011 and strip_012).

Table 3-1: File name constituents.

The file name extensions used are:

- "`.xml`" for the annotation files following the schema definitions in this document
- "`.tif`" for TIFF and GeoTIFF images with different depths and representations
- "`.cos`" for the COSAR image format specified herein
- "`.bin`" for a binary raster file
- "`.png, .txt`" for standard PNG and text files.

3.2 Administrative Parameter File Set

This part of the delivered item describes the product delivery package and contains additional facility related information (e.g. detailed copyright information). It comprises the product and processing facility identifiers as well as the data set descriptors in the format of the product library data base "item information file" (IIF). It is to be specified in the GS-to-User-ICD [RD 4] and not part of this level 1b product format specification.

4 SAR Image Raster Files

4.1 Detected and Geocoded Products

The individual polarization layers of the image data of projected products are given as separate files in the GeoTIFF file format in unsigned 16 bit representation and a subset of commonly used tags.

GeoTIFF is an extension of the TIFF (Tagged Image File Format) standard which defines additional tags concerning map projection information. It is readable with standard image processing and GIS software packages (see http://www.remotesensing.org/geotiff/geotiff.html). Large files which would exceed the 4GB limit are compressed using the standard TIFF packbits algorithm.

The GeoTIFF format version 1, key revision 1.0 as specified in [RD 5] with a very limited number of tags and keys is used for the detected and projected image data. The projection tags and GeoTIFF keys set by the TMSP are listed in Table 4-1 using the conventions of [RD 5]. The TIFF Revision 6.0 tags used are given in Table 4-2 (see [RD 6]).

GeoTIFFs main information, the transformation of the raster coordinate system to the target model coordinate system, is given by a 4x4 transformation matrix which can be evaluated by every standard GeoTIFF reader. The result is referenced to WGS84. UTM zones and UPS projection are annotated.

GeoTIFF Tags and Keys	**Content / Example**
`ModelTransformationTag`	4x4 transformation matrix between raster and model "space" (only 2 dimensions used)
`GTModelTypeGeoKey`	This GeoKey defines the general type of model coordinate system to which the raster will be transformed: e.g. `ModelTypeProjected`
`GTRasterTypeGeoKey`	The raster space coordinate system used; either a pixel is a point or an area: e.g. `RasterPixelIsPoint`
`GeographicTypeGeoKey`	Specifies the code for the geographic coordinate system (GCS) used to map lat-long coordinates onto a specific earth ellipsoid: e.g. `GCS_WGS_84`
`GeogLinearUnitsGeoKey`	Geocentric linear units for the defined GCS: e.g. `Linear_Meter`
`GeogAngularUnitsGeoKey`	Geocentric linear units for the defined GCS: e.g. `Angular_Degree`
Annotation for UTM / UPS Projection	
`ProjectedCSTypeGeoKey`	The number of the UTM zone with N or S for North and South: e.g. `PCS_WGS84_UTM_zone_30N`
`ProjCoordTransGeoKey`	e.g. `CT_TransverseMercator` or `CT_PolarStereographic`
`ProjectedCSCitationGeoKey`	ASCII string e.g. `"UTM Zone 32 N with WGS84"` or `"UPS N"`
`ProjNatOriginLongGeoKey`	(-177…177 deg)
`ProjNatOriginLatGeoKey`	e.g. 0.000000 deg (0d 0' 0.00"N)

ProjScaleAtNatOriginGeoKey	e.g. 0.9996 for UTM
ProjFalseEastingGeoKey	e.g. 500000.0 m
ProjFalseNorthingGeoKey	e.g. 0.0 m
Reference System	*code / value*
GCS	4326/WGS 84
Datum	6326/World Geodetic System 1984
Ellipsoid	7030/WGS 84 (6378137.00,6356752.31)
Prime Meridian	8901/Greenwich (0.000000/ 0d 0' 0.00"E)

Table 4-1: GeoTIFF tags and keys.

TIFF Tags and Keys	**Value Code / Example**
ImageWidth	image width
ImageLength	image length
Orientation	TOPLEFT
Compression	e.g. NONE or DEFLATE (the gzip compression)
SamplesPerPixel	1 sample for one layer
BitsPerSample	16 bit for the detected images
RowsPerStrip	1 = line by line
PlanarConfiguration	1 (required although only 1 layer present)
PhotometricInterpretation	1 = minimum is black (grey value)

Table 4-2: TIFF tags and keys.

4.2 Complex Products

One COSAR (COmplex SAR) file contains all focused complex SAR data of one beam in a burst by burst order *together* with sample validity and position annotation. Note that stripmap and spotlight images consist of one burst in that sense.

The focused complex SAR data of one beam (or swath) are stored in one beam file. That way, the focused complex SAR data of a ScanSAR configuration with *n* beams (4 beams are used for TerraSAR-X) is stored in *n* beam files. Hence there are 1 to 4 files for each of polarization channels in the TerraSAR-X case. In the simplest case of a SSC stripmap with one polarization channel, the user will obtain a product with 1 image data file.

The bursts are not merged with each other and all valid data of each focused burst are preserved. The valid (thus all completely correlated) data can be stored in a rectangular matrix this way. This matrix has the range extent of the widest burst. The "invalid data" are simply filling the matrix to compensate the different burst width and also the smaller azimuth extent in near range of each burst. For a system like TerraSAR-X which uses the Total Zero Doppler Steering, the excess in storage space is marginal. The SAR data sample validity and position annotation is interspersed in a way that a simple visualization of the entire file as a rectangular matrix is not spoiled by the misinterpretation of the annotation data as SAR data.

The SAR data samples are stored in the same order as they are recorded by the SAR instrument, range line by range line, near range sample first.

The following figures give an overview of the COSAR file format. Figure 4-1 outlines the storage of the bursts in one matrix. Figure 4-2 and Figure 4-3 detail the sample validity and position annotation for an azimuth column and a range line of a burst respectively. The annotation and structure of each burst is depicted in Figure 4-4. Figure 4-5 shows the actual storage order of the entire file. Figure 4-6 and Figure 4-7 illustrate the advantages of skewed versus deskewed data storage for squinted SAR imaging. The positioning and validity annotation in the COSAR file is put in relation to the product annotation of a stripmap SSC in Figure 4-8. Figure 4-9 sketches the interrelation of COSAR positioning information and product annotation for a complex ScanSAR product.

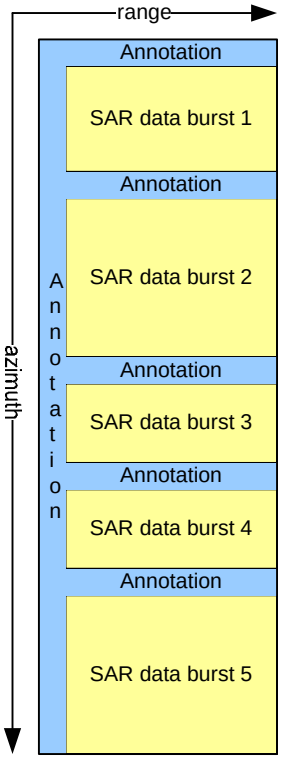


Figure 4-1: Visualization of the image and annotation data of a COSAR file as a rectangular matrix.

Azimuth Annotation

The beam file format allows either to store the focused complex burst images deskewed in azimuth (Doppler-zero geometry) or skewed in azimuth, which saves storage space in the case of a squinted SAR imaging geometry. In both cases, deskewed or skewed, the number of samples in azimuth direction must be constant within one burst. Since the number of valid azimuth samples in one azimuth column may vary with range, the azimuth columns have to be zero-padded in order to keep the number of samples per azimuth column constant with range.
Each azimuth column is annotated by three parameters:

- **ASRI** = **A**zimuth **S**ample **R**elative **I**ndex: An azimuth index, giving the location of the first sample of the actual azimuth column relative to the Doppler-zero location of the reference sample in the intermediate raster. This index not only locates the individual bursts but also allows a "compressed" skewed image data storage.
- **ASFV** = **A**zimuth **S**ample **F**irst **V**alid: An azimuth index, starting with 1 and indicating the first valid azimuth sample with respect to the first azimuth sample of the actual azimuth column.

- **ASLV** = **A**zimuth **S**ample **L**ast **V**alid: An azimuth index, starting with 1 and indicating the last valid azimuth sample with respect to the first azimuth sample of the actual azimuth column.

Thus the deskewed location of the start of a column of valid azimuth samples of one burst results from ASRI+ASFV-1. In case of a deskewed storage, ASRI is constant for all columns of a burst.

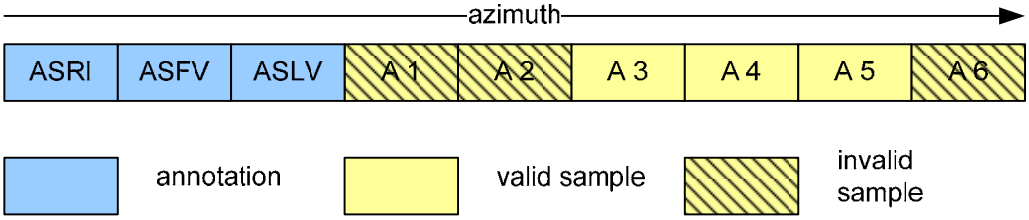


Figure 4-2: Annotation and optional zero-padding of an azimuth column

Range Annotation

In order to ensure a correct azimuth annotation of all samples within one burst, potential echo window start time (echo window position EWP) shifts within one burst - which are not foreseen for ScanSAR but are likely present in a stripmap "burst" – have to be considered. In the focussed burst, the zero-padding in the course of EWP change adjustments has to be tracked within the annotation part of each range line. Thus, the range delay time of the first sample of each range line within one burst is constant and the valid range data are indicated.
Each range line is annotated by two parameters:

- **RSFV** = **R**ange **S**ample **F**irst **V**alid: A range index, starting with 1 and indicating the first valid range sample with respect to the first range sample of the actual range line.
- **RSLV** = **R**ange **S**ample **L**ast **V**alid: A range index, starting with 1 and indicating the last valid range sample with respect to the first range sample of the actual range line.

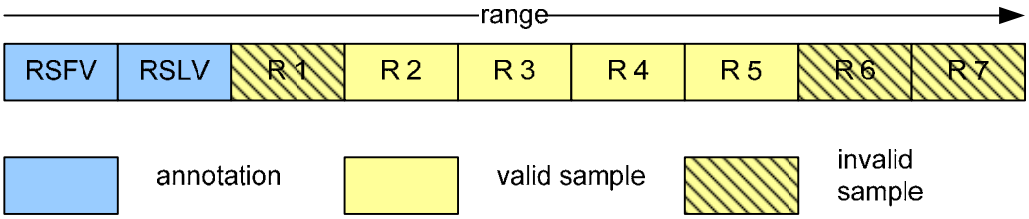


Figure 4-3: Annotation and optional zero-padding of a range line

Compared to the number of samples in one azimuth column, which may vary from burst to burst, the number of samples in one range line has to be the same for each burst in one beam file. While EWP changes within one burst / block have to be adjusted, EWP changes from burst to burst need not to be physically compensated. If these changes are adjusted from burst to burst, range zero-padding has to ensure that the number of samples for all range lines is kept constant for the entire beam file.

Burst Annotation
The annotation of a burst consists of the range line and azimuth column annotation supplemented by an additional annotation line giving information about the burst as well as about the complete file.

1. The number of bytes in the actual burst (**BIB** = **B**ytes **I**n **B**urst). Including the annotation and valid only for ScanSAR bursts.
2. A range index, giving the relative range location on a virtual common raster with the ADC sampling (its rate is approx. 330MHz) of the bursts first range sample with respect to the reference value (**RSRI** = **R**ange **S**ample **R**elative **I**ndex).
3. The length of a range line given in samples. This value has to be same for all bursts and is repeated at every burst (**RS** = **R**ange **S**amples).
4. The length of an azimuth column of the actual burst given in samples. This value may vary from burst to burst (**AS** = **A**zimuth **S**amples).
5. The index number of the burst (**BI** = **B**urst **I**ndex).
6. The total number of bytes in a line in range direction (the "width" of the entire file including the annotation bytes). As the TNL, this parameter is given only once in the first line of the file (**RTNB** = **R**angeline **T**otal **N**umber of **B**ytes).
7. The extent in azimuth direction (the "height" of the entire file including the annotation lines). This parameter is given only once in the first line of the file in order to facilitate the reading of the file and replaced by the special filler value for the other bursts (**TNL** = **T**otal **N**umber of **L**ines). The file size can be derived from RTNB times TNL.
8. For the convenience of multi-format reader software the following 2 samples identify the file format (not visible in Figure 4-4). The first sample reads hex. 43534152 which is the ASCII string CSAR and the second sample gives a version number.
9. The following sample gives the oversampling factor of the RSRI sample position with respect to the current range sampling (1 for 330MHz, 2 for 165MHz or 3 for 110MHz).
10. The following *two* samples contain the 8-byte floating point value (MSB order) of the inverse SPECAN scaling rate 1/k applied in processing of the burst. This information may facilitate interferometric processing but it is not meaningfull for Stripmap modes (1/k -> 0).
11. The next samples of the annotation line of each burst are reserved for processor internal use and may contain in the future further imaging mode dependant information useful for interferometric processing of complex ScanSAR (and SpotLight) data. They are not contained in Figure 4-4. If unset, the filler value is used here as for the rest of the line.

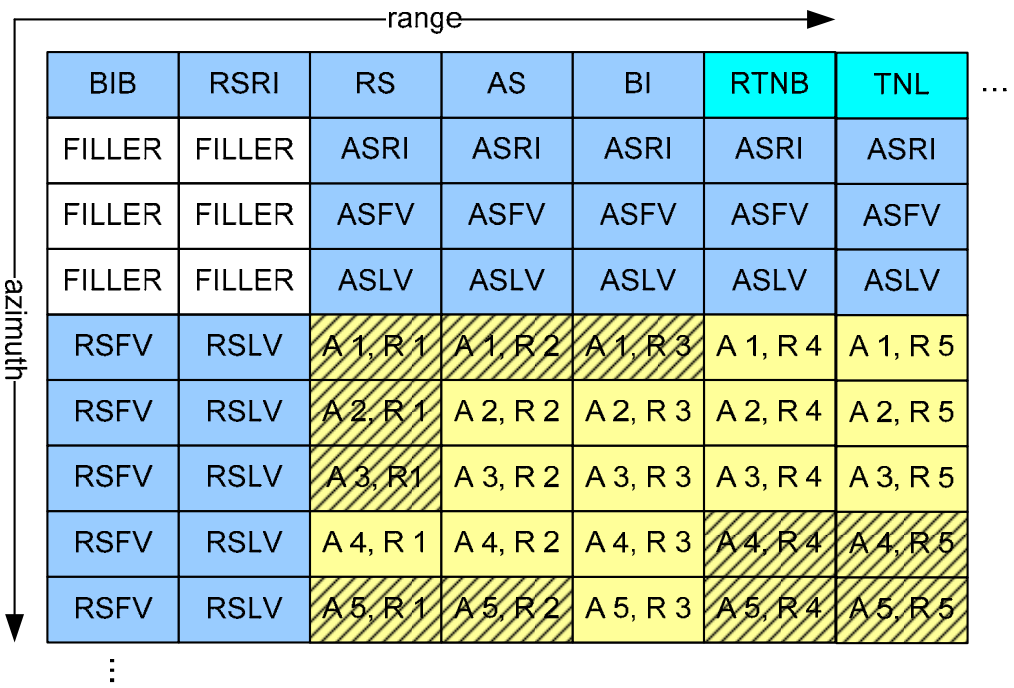


Figure 4-4: Burst annotation

A SAR image sample is regarded invalid either if it lies outside of the interval of valid range samples, indicated by RSFV and RSLV, *or* outside the interval of valid azimuth samples, indicated by ASFV and ASLV, *or* outside of both intervals. Image samples are marked as invalid *only* by the validity annotation. They do not necessarily contain the filler or any other special value.

Those fields within the burst annotation area (rectangular 2-D burst representation) which are not needed for annotation purposes are filled with the special filler value.

Binary File Format
The complex SAR image samples are stored as 16 bit / 16 bit complex integer (4 bytes). The byte order is big-endian (most significant byte (MSB) first). All annotation values are stored as 32 bit integer (4 bytes). The filler value is a 32 bit integer with a constant value of hex. 7F7F7F7F.

That way, an annotation or filler value requires the same storage size as an image sample. Now, any visualization software, which is able to display 16 bit / 16 bit complex integer data, is allowed to "misinterpret" the annotation values as complex samples and will display the image data. In the case, that the amplitude of the complex samples is displayed, the filler data will show up as a white line separating the burst images. The 32 bit items are stored in range line by range line order, see Figure 4-5.

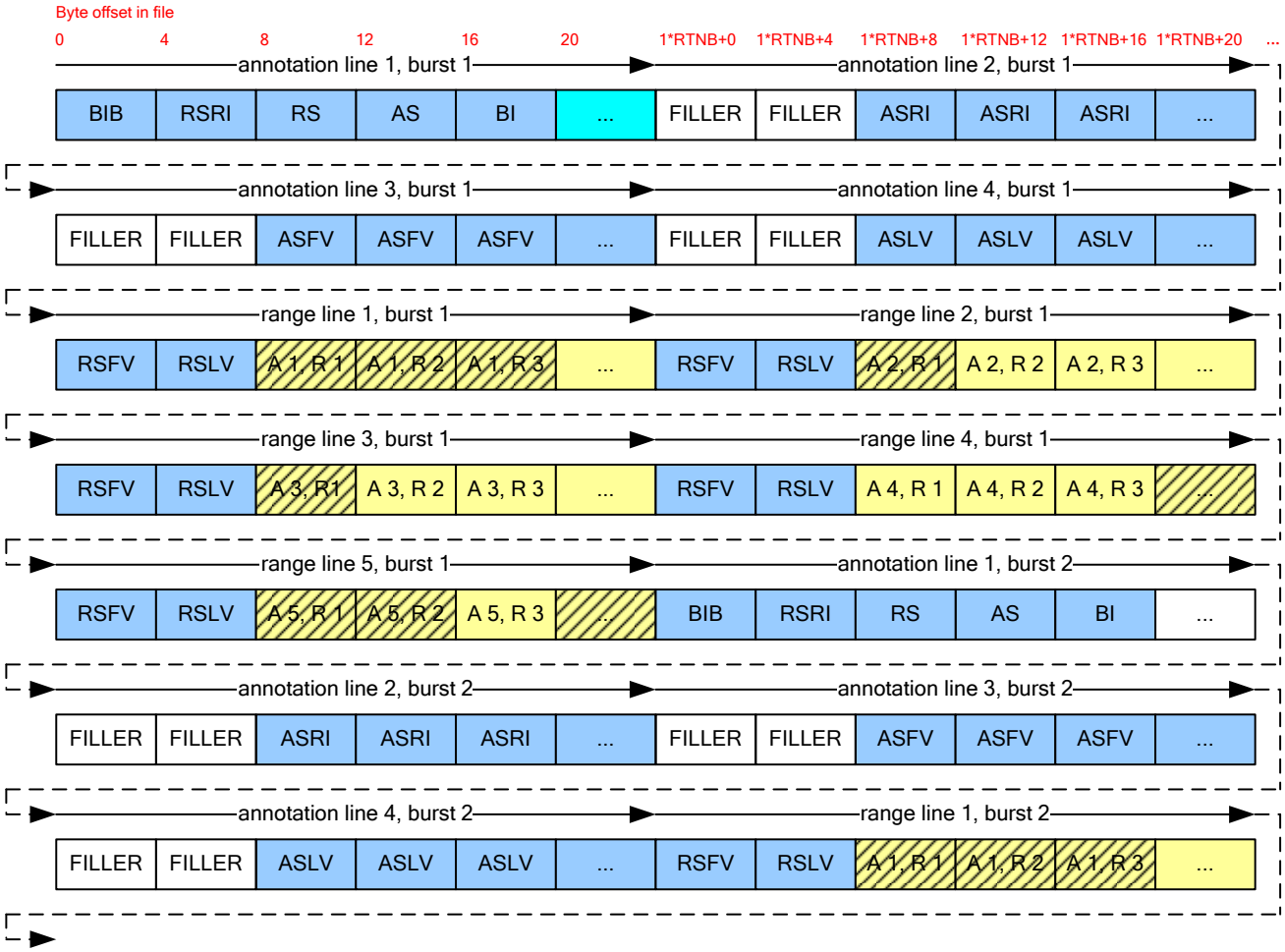


Figure 4-5: Beam file storage order

Skewed Versus Deskewed Storage Organization

In the case of a squinted SAR imaging geometry the size of the beam file can be significantly reduced, if the SAR image data is organized in skewed geometry (see Figure 4-6).

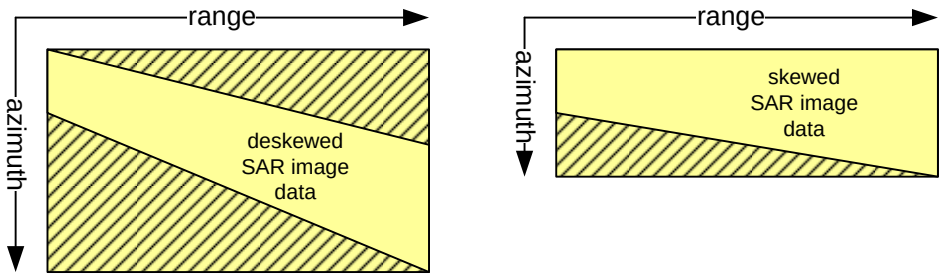


Figure 4-6: Deskewed versus skewed storage organization in the case of a squinted SAR imaging geometry

In the case of yaw steered or zero-Doppler steered SAR instruments the saving of storage space is marginal or even zero. Thus, for convenience the SAR image data of TerraSAR-X is stored in a deskewed geometry (see Figure 4-7).

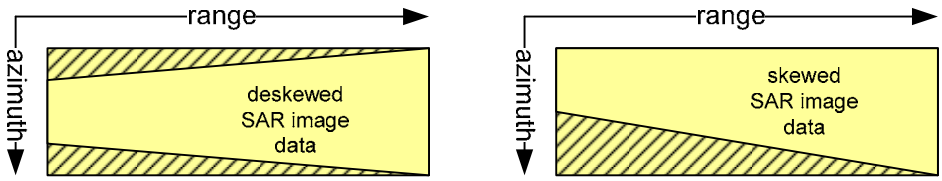


Figure 4-7: Deskewed versus skewed storage organization for total zero-Doppler steered SAR instruments like TerraSAR-X

COSAR Image Coordinates and Geolocation

Figure 4-8 sketches the relation of the localization information given in the product annotation in relation to the image positions in the COSAR frame for a deskewed complex Stripmap product with echo window position shifts. The annotated scene coordinates are indicated with *blue dots*. Only a part of the geo-grid annotation (*red dots*) of the scene (*yellow*) is shown here in order to keep the figure readable.

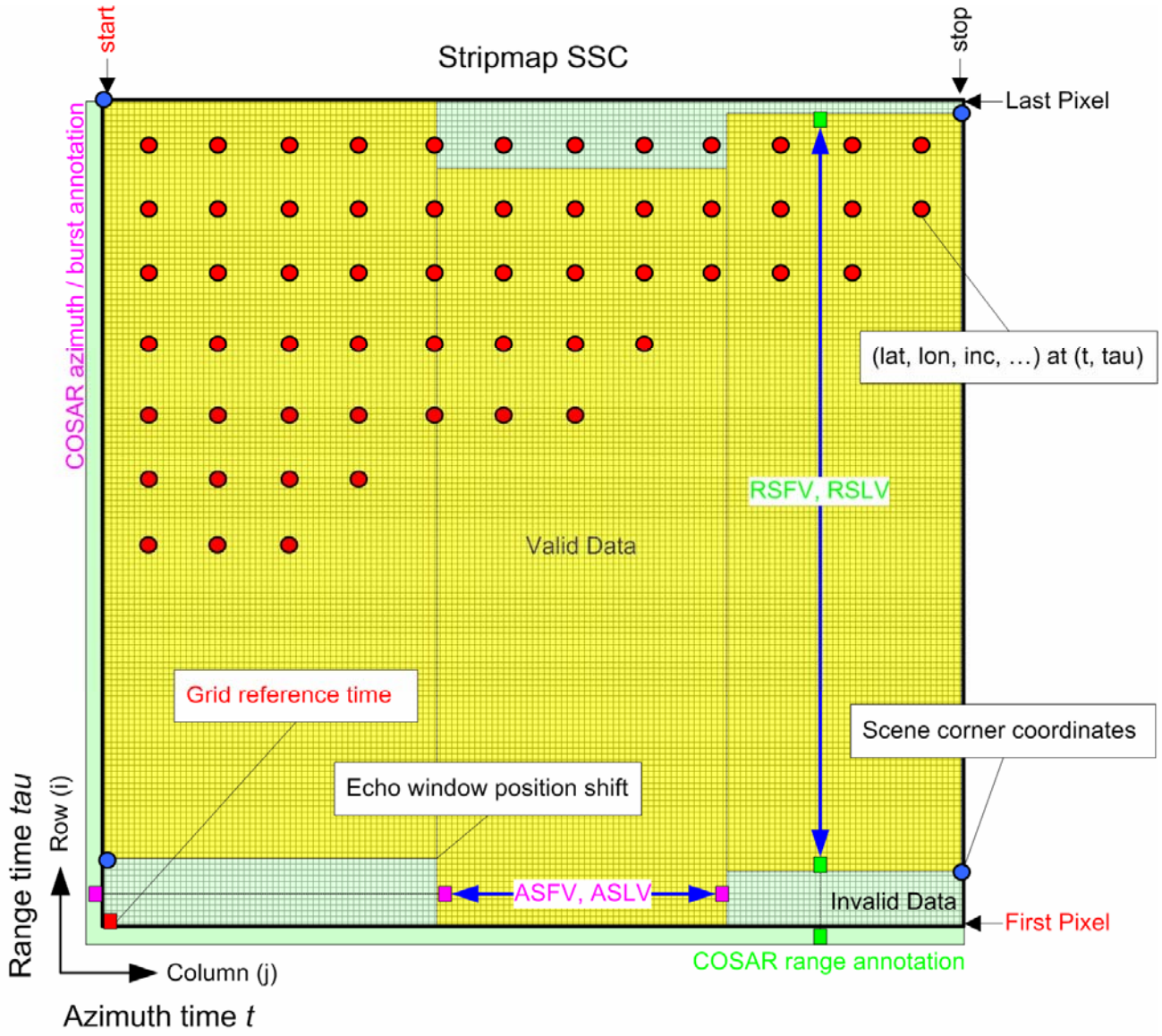


Figure 4-8: Geo-grid, scene coordinates and COSAR image raster for SSCs.

Figure 4-9 outlines the positioning of 4 deskewed bursts without squint of 2 beams of a ScanSAR sequence onto a virtual common raster which covers the entire "scene" using the COSAR burst annotation. The annotated coordinates and the geolocation grid (only partly drawn) of the product refer to the whole scene. This sketch gives of course only a very rough idea of how the ScanSAR beam stiching/burst concatenation and multi-looking works and the true beam/burst offsets and overlaps will depend on the actual commanded ScanSAR cycle and the corresponding processing parameters.

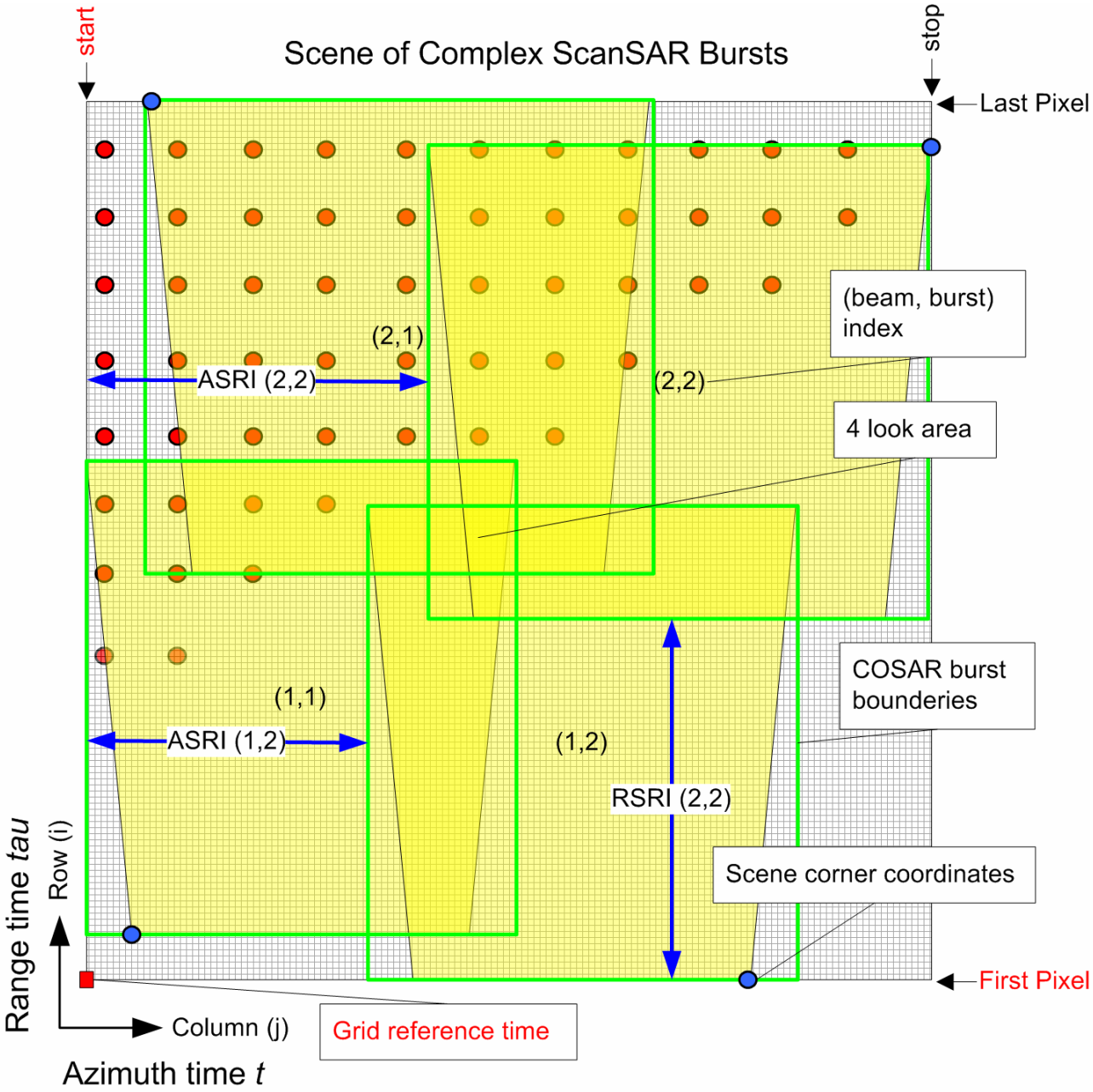


Figure 4-9: Hypothetical ScanSAR SSC burst positions from COSAR annotation on a (virtual) common raster.

5 Further Product Components

5.1 Auxiliary Raster Files

5.1.1 Projected Products

Detected and geocoded products comprise a mapping grid which gives the azimuth and range times for a coarse grid of equidistantly sampled GeoTIFF frame pixels. Thus, all parameters annotated in slant-range geometry can be related to the projected image geometry. It is e.g. possible to trace (or reverse) the calibration corrections which were applied in slant-range geometry for the detected products. The mapping grid is in given plain binary format with two 32 bit floating point values for each sample. Details (e.g. extent, spacing) will be annotated in the mappingGridInfo section of the actual product. Figure 5-1 depicts the relation between the geo-grid annotation (*red dots*) of the scene (*yellow*) and the mapping grid (*green dots*) of the GeoTIFF image frame for projected and geocoded products.

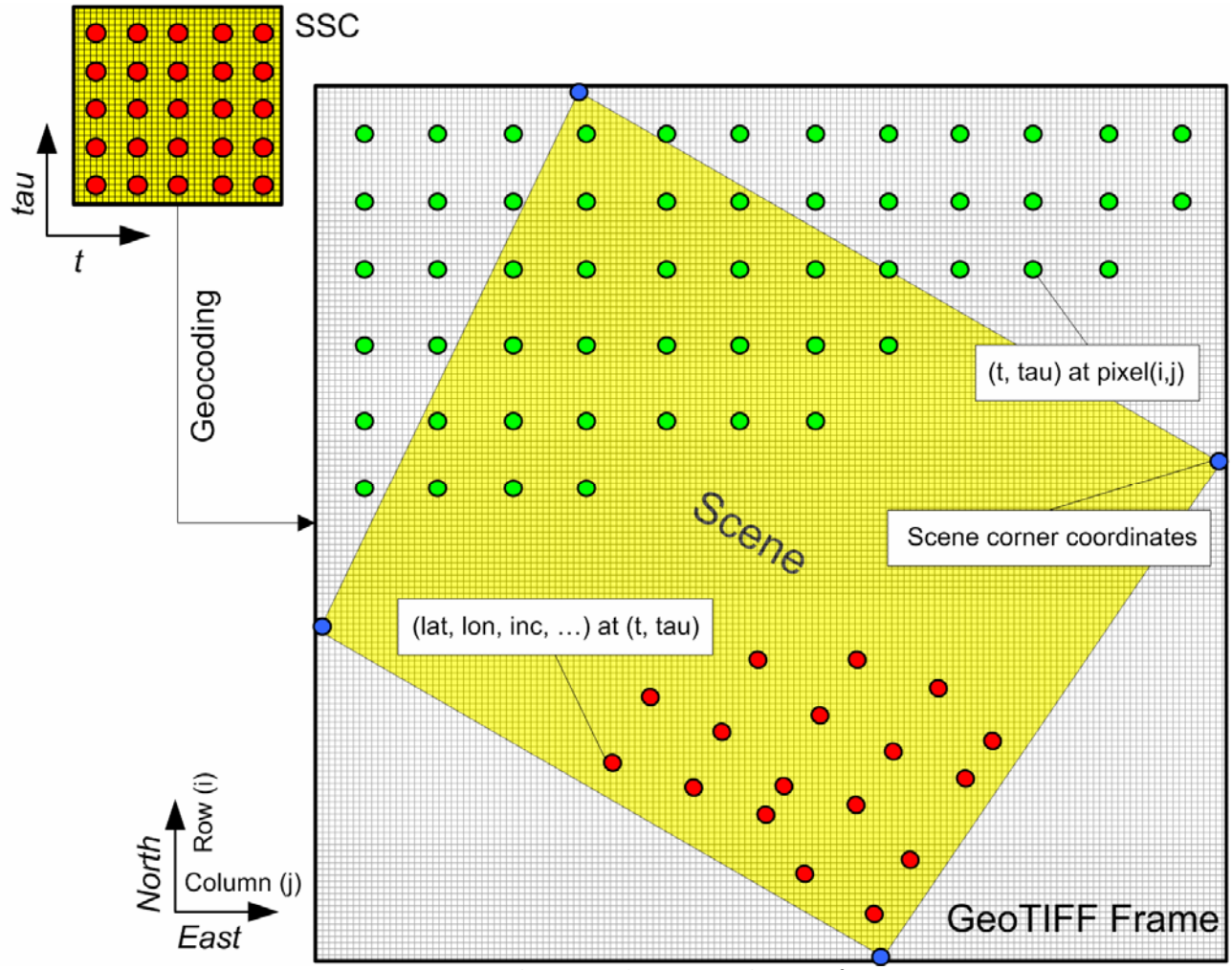


Figure 5-1: Mapping grid, geo-grid, scene and image frame raster.

5.1.2 EEC Geocoded Products

The geocoded incidence angle mask (GIM) and the DEM map for EEC products contain the slope dependent local incidence angle for each image pixel (including a flag indicating shadow or layover conditions as detailed in [AD 1]) and the reference to the DEM used during geocoding of this pixel.

The GIM is formatted the same way as the individual image layers (i.e. in GeoTIFF format) with identical resolution using a 16 bit integer representation.

The DEM map format and its extent are also identical to the image files (GeoTIFF). The resolution of the DEM coverage map depends on the best available DEM for the geocoding (e.g. 1 arcsec for SRTM X-band DEM). Each cell of the matrix contains an index that identifies the name(s) of the DEM(s). A lookup table, which describes the index, is added as a textfile in the SUPPORT directory. The DEM map data depth is 16bit.

5.2 Image Preview Files

5.2.1 Quicklook Images

One image quicklook rescaled to a height of approximately 2000 pixels (depending on the imaging mode and product size) is provided for each image layer in TIFF format, thus readable with common display tools. Targeted pixel spacings for detected products are approx. 25m for Stripmap, 10m for SpotLight and 50m for ScanSAR. The quicklooks use an unsigned 16 bit per sample greyscale representation.

The composite colour coded quicklook for polarimetric acquisitions uses a true colour 24bit TIFF format. For convenience, it is also present for single polarization acquisitions representing the image channel with the same information in each of the three color channels. Thus resulting in a greyscale representation with an effective depth of 8 bit only.

A smaller browse color image bitmap (in JPEG or TIFF format) with approx. 1000 pixels size derived from the composite quicklook is additionally contained for cataloguing purposes.

5.2.2 Map Plot

A coarse geographical map showing the footprint of the scene as a low resolution PNG image.

6 Level 1b Product Annotation

Data types, valid entries and allowed attributes (e.g. units) are defined in detail for each element in the following description of the XSD schema files (the files themselves are also available to the user). Since XML is ASCII based and readable by common tools (e.g. a web browser or simple text editors) and not a binary format, the indicated data types (strings, integers, doubles, …) for most of the annotation are the intrinsic default types. Some data types are restricted (e.g. in string length or in the validity range). The delivered *XML* files themselves do not contain information on these restrictions – they can only be derived from the *XSD* schema files which will be included in the deliverd product packages.

The hierarchy level is as flat as possible to facilitate the interpretation of the product annotation. In the diagrams, blocks of annotation which are repeated a number of times (depending e.g. on the number of ScanSAR bursts or orbit state vectors), are underlaid with a second frame and the minimal and maximal occurrence (infinity for unbound elements) is listed. Optional elements (e.g. annotation for geocoded products only) are indicated by dashed lines. Some items may contain different elements depending on the product variant (e.g. ScanSAR or spotlight parameters). Those alternatives are denoted by the "choice" symbol. XML sample sequences resulting from the given schemes are then

```
<productInfo>
    <missionInfo>
        <mission>TSX-1</mission>
        …
    </missionInfo>
    <acquisitionInfo>
        …
    </acquisitionInfo>
    …
</productInfo>

<platform>
    <orbit>
        …
        <stateVec num="95" qualInd="1" maneuver="NO">
            …
        </stateVec>
        <stateVec …>
            …
        </stateVec>
        …
    </orbit>
    …
</platform>
```

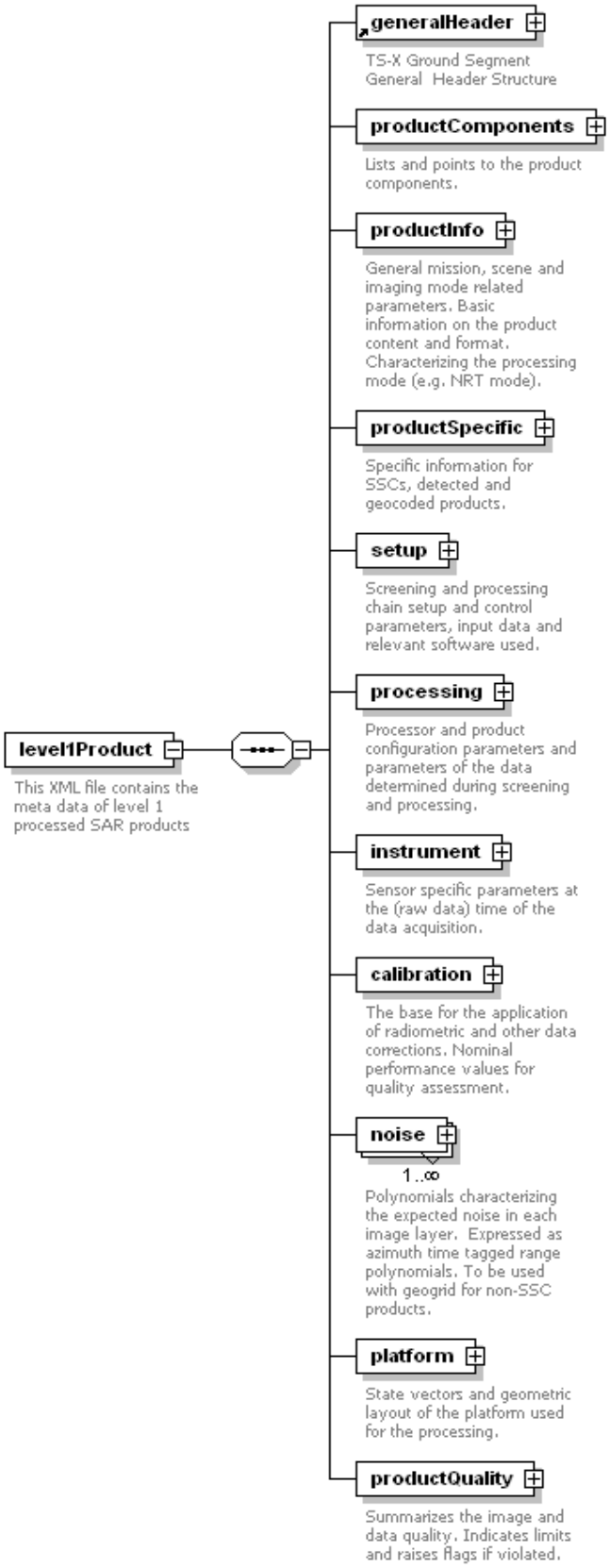
6.1 Main Annotation Component

level1Product	
generalHeader	
TS-X Ground Segment general header of XML files	
productComponents	
annotation, imageData, auxRaster-Files, quicklooks, composite-Quicklook, browseImage, mapPlot	pointers to the listed product components.
productInfo	
generationInfo	key parameters of the product generation and delivery
missionInfo	mission and orbit parameters at start of scene
acquisitionInfo	SAR sensor configuration and instrument modes during acquisition
productVariantInfo	product type and variant description
imageDataInfo	image layer format
sceneInfo	time and scene location information
previewInfo	quicklook information
productSpecific	
complexImageInfo, projectedImage-Info, geocodedImageInfo	specific information for SSCs, detected and geocoded products (e.g. image frames and coordinates).
setup	
orderInfo, inputData, processing-Steps	screening and processing chain setup and control parameters, input data and relevant software used.
processing	
signalDataAnalysis	datatake structure, cal- & noise pulse and raw data analysis and correction results
geometry	geometric parameters for focussing
doppler	Doppler centriod estimates and derived parameters
processingParameter	range and azimuth processing parameters
processingFlags	flags indicating which processing steps have been performed
instrument	
radarParameters, settings	sensor specific parameters at the time of the data acquisition
calibration	
calibrationData	input parameters used for calibration of this product
nominalGeometricPerformance	nominal performance parameters for this product variant
calibrationConstant	calibration factors to obtain calibrated data from the digital numbers of the image layers
noise	
polynomials characterizing the expected noise in each image layer	
platform	
referenceData	geometric layout of the platform
orbit	mainly relevant segment of the orbit file
attitude	mainly relevant segment of the attitude file
productQuality	
rawDataQuality, auxDataQuality, processingParameterQuality, im-ageDataQuality, limits	summarize the image and data quality. Indicates limits and raises flags if violated.

Table 6-1: Overview of main segments and hierarchical structure of the main product annotation file

element **level1Product**

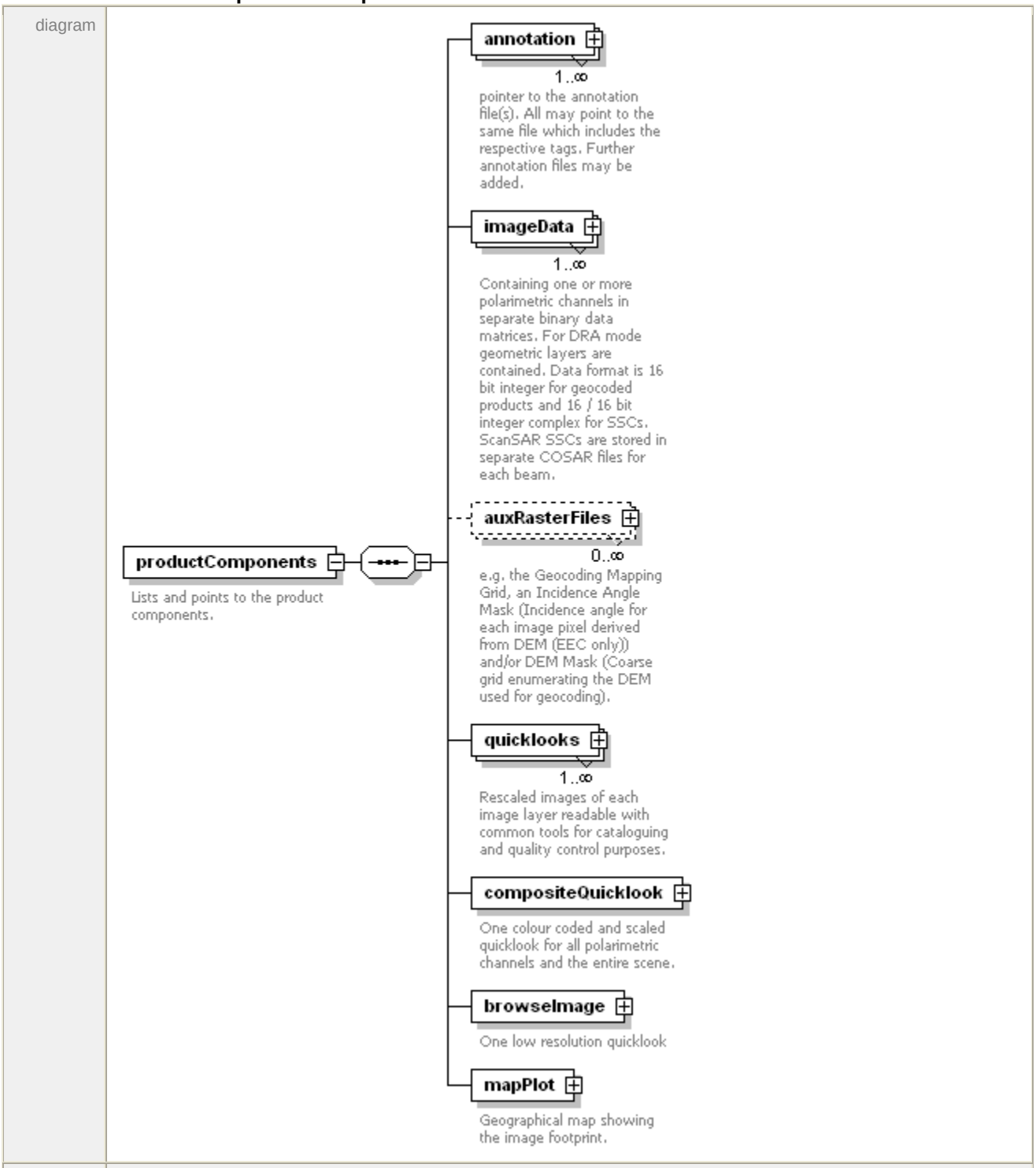
diagram



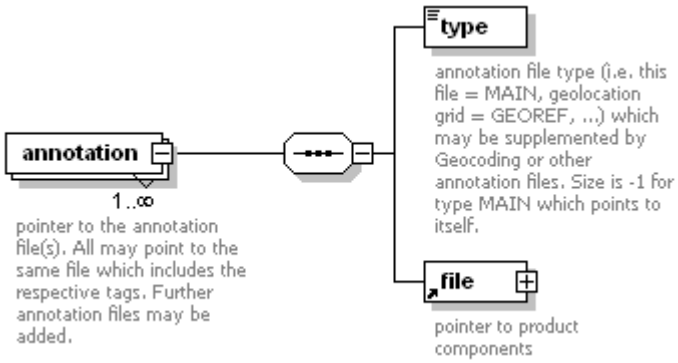
annotation documentation This XML file contains the meta data of level 1 processed SAR products

6.1.1 Product Components

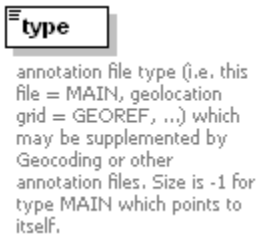
element **level1Product/productComponents**



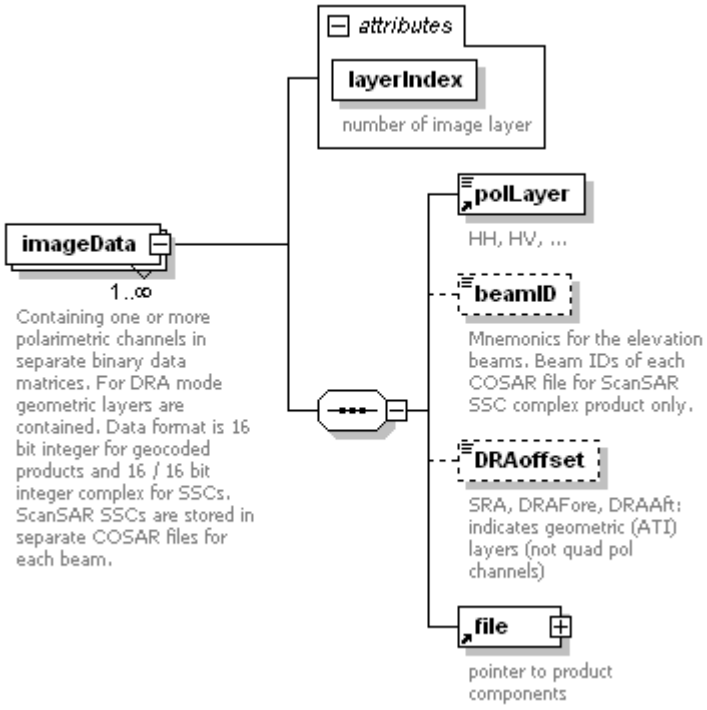
element **level1Product/productComponents/annotation**

diagram	
annotation	documentation pointer to the annotation file(s). All may point to the same file which includes the respective tags. Further annotation files may be added.

element **level1Product/productComponents/annotation/type**

diagram	
type	restriction of **string255**
facets	maxLength 255 enumeration MAIN enumeration GEOREF enumeration GEOCODE enumeration OTHER enumeration UNDEFINED
annotation	documentation annotation file type (i.e. this file = MAIN, geolocation grid = GEOREF, ...) which may be supplemented by Geocoding or other annotation files. Size is -1 for type MAIN which points to itself.

element **level1Product/productComponents/imageData**

diagram	

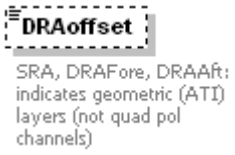
attributes	Name	Type	Use	Default	Fixed	Annotation
	layerIndex	**xs:unsignedInt**	required			documentation number of image layer

annotation	documentation Containing one or more polarimetric channels in separate binary data matrices. For DRA mode geometric layers are contained. Data format is 16 bit integer for geocoded products and 16 / 16 bit integer complex for SSCs. ScanSAR SSCs are stored in separate COSAR files for each beam.

element **level1Product/productComponents/imageData/beamID**

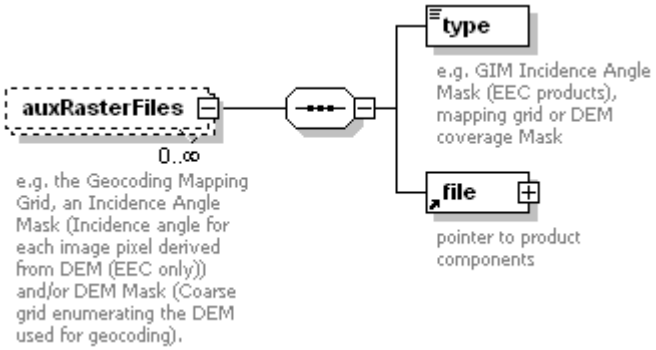
diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Mnemonics for the elevation beams. Beam IDs of each COSAR file for ScanSAR SSC complex product only.

element **level1Product/productComponents/imageData/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft

annotation	documentation SRA, DRAFore, DRAAft: indicates geometric (ATI) layers (not quad pol channels)

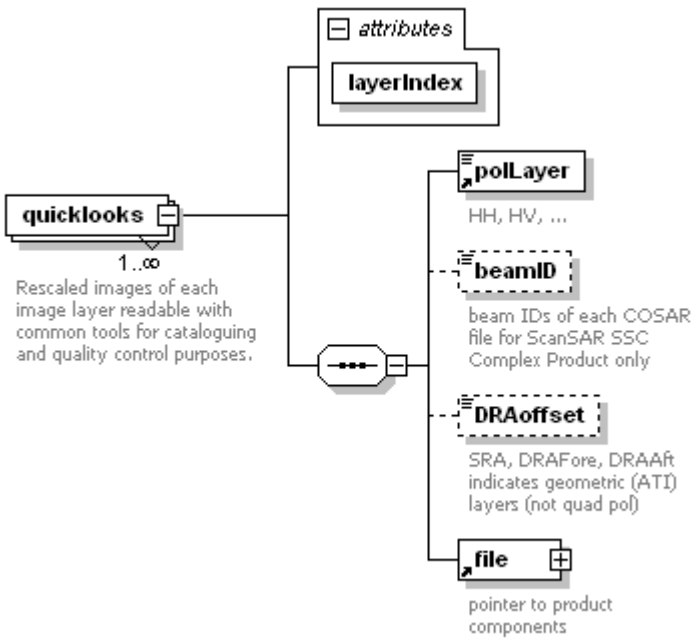
element **level1Product/productComponents/auxRasterFiles**

diagram	
annotation	documentation e.g. the Geocoding Mapping Grid, an Incidence Angle Mask (Incidence angle for each image pixel derived from DEM (EEC only)) and/or DEM Mask (Coarse grid enumerating the DEM used for geocoding).

element **level1Product/productComponents/auxRasterFiles/type**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation e.g. GIM Incidence Angle Mask (EEC products), mapping grid or DEM coverage Mask

element **level1Product/productComponents/quicklooks**

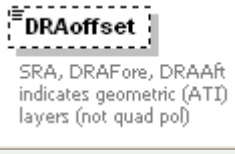
diagram	
attributes	Name Type Use Default Fixed Annotation

	layerIndex **xs:unsignedInt** required
annotation	documentation Rescaled images of each image layer readable with common tools for cataloguing and quality control purposes.

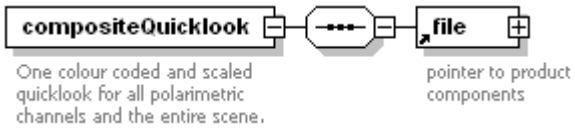
element **level1Product/productComponents/quicklooks/beamID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation beam IDs of each COSAR file for ScanSAR SSC Complex Product only

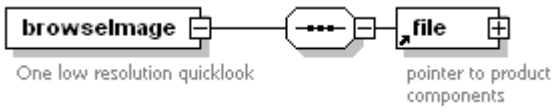
element **level1Product/productComponents/quicklooks/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft indicates geometric (ATI) layers (not quad pol)

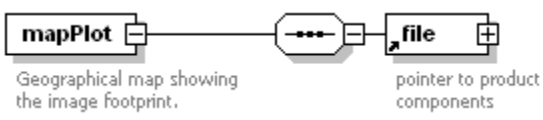
element **level1Product/productComponents/compositeQuicklook**

diagram	
annotation	documentation One colour coded and scaled quicklook for all polarimetric channels and the entire scene.

element **level1Product/productComponents/browseImage**

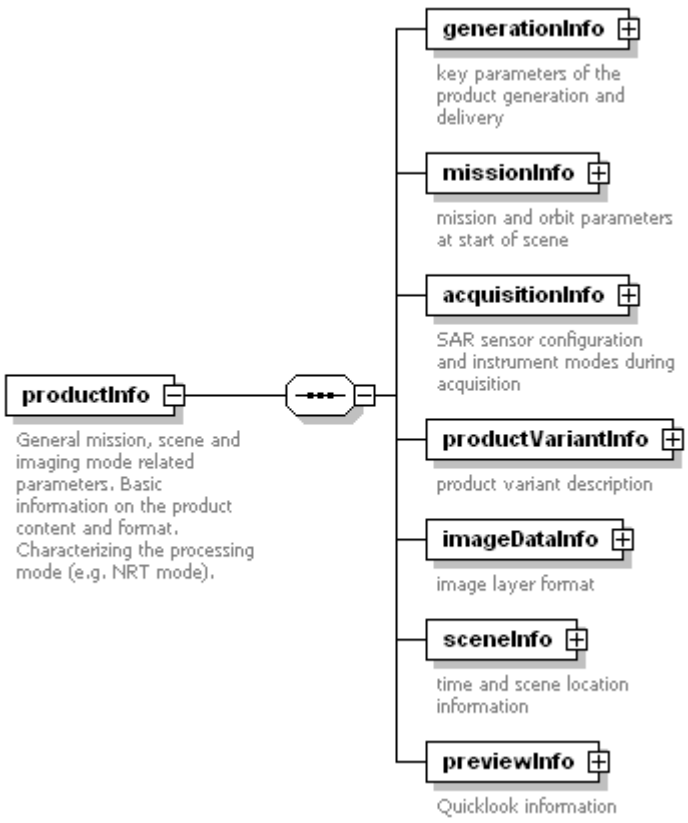
diagram	
annotation	documentation One low resolution quicklook

element **level1Product/productComponents/mapPlot**

diagram	
annotation	documentation Geographical map showing the image footprint.

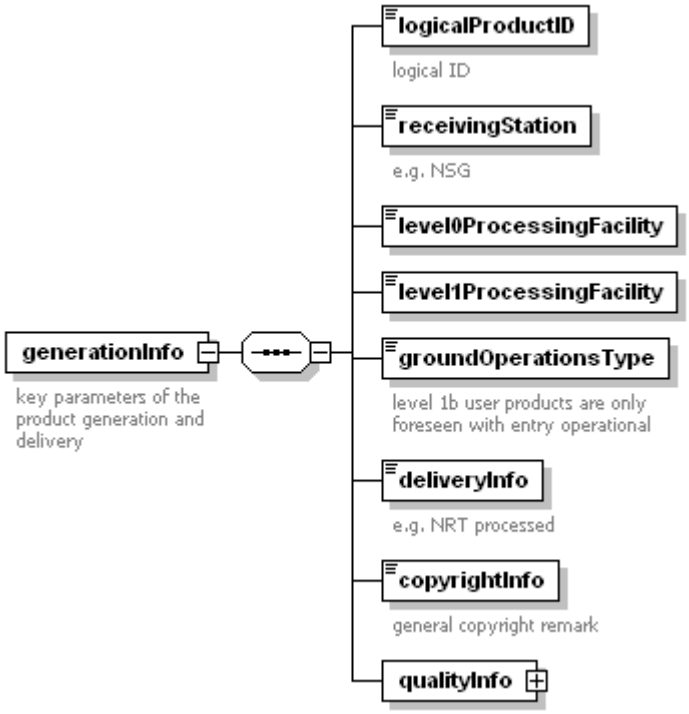
6.1.2 Product Info

element **level1Product/productInfo**



annotation	documentation General mission, scene and imaging mode related parameters. Basic information on the product content and format. Characterizing the processing mode (e.g. NRT mode).

element **level1Product/productInfo/generationInfo**

diagram	
annotation	documentation key parameters of the product generation and delivery

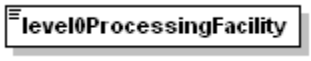
element **level1Product/productInfo/generationInfo/logicalProductID**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation logical ID

element **level1Product/productInfo/generationInfo/receivingStation**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation e.g. NSG

element **level1Product/productInfo/generationInfo/level0ProcessingFacility**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/productInfo/generationInfo/level1ProcessingFacility**

diagram	level1ProcessingFacility
type	**string20**
facets	maxLength 20

element **level1Product/productInfo/generationInfo/groundOperationsType**

diagram	groundOperationsType level 1b user products are only foreseen with entry operational
type	restriction of **xs:NMTOKENS**
facets	enumeration operational enumeration preoperational enumeration instrument enumeration test enumeration UNDEFINED
annotation	documentation level 1b user products are only foreseen with entry operational

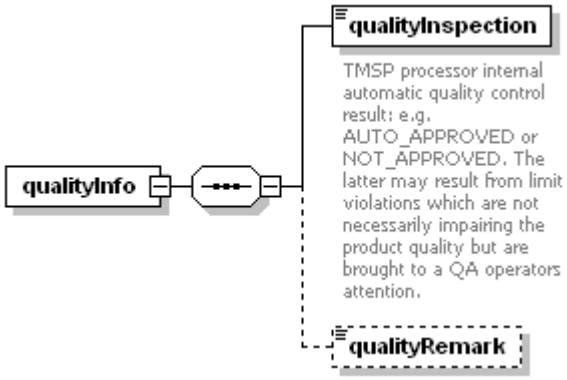
element **level1Product/productInfo/generationInfo/deliveryInfo**

diagram	deliveryInfo e.g. NRT processed
type	**string1024**
facets	maxLength 1024
annotation	documentation e.g. NRT processed

element **level1Product/productInfo/generationInfo/copyrightInfo**

diagram	copyrightInfo general copyright remark
type	**string1024**
facets	maxLength 1024
annotation	documentation general copyright remark

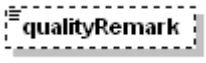
element **level1Product/productInfo/generationInfo/qualityInfo**

diagram	

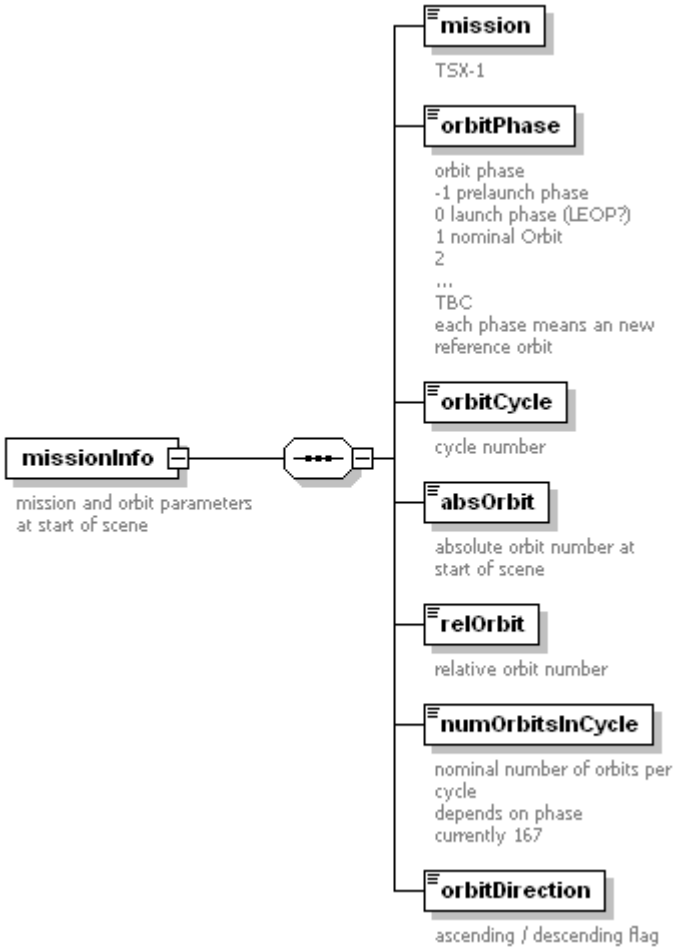
element **level1Product/productInfo/generationInfo/qualityInfo/qualityInspection**

diagram	
type	restriction of **string255**
facets	maxLength 255 enumeration AUTO_APPROVED enumeration OPERATOR_APPROVED enumeration NOT_APPROVED enumeration UNDEFINED
annotation	documentation TMSP processor internal automatic quality control result: e.g. AUTO_APPROVED or NOT_APPROVED. The latter may result from limit violations which are not necessarily impairing the product quality but are brought to a QA operators attention.

element **level1Product/productInfo/generationInfo/qualityInfo/qualityRemark**

diagram	
type	**string1024**
facets	maxLength 1024

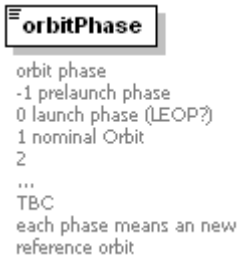
element **level1Product/productInfo/missionInfo**

diagram	
annotation	documentation mission and orbit parameters at start of scene

element **level1Product/productInfo/missionInfo/mission**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation TSX-1

element **level1Product/productInfo/missionInfo/orbitPhase**

diagram	
type	**xs:int**

annotation	documentation orbit phase -1 prelaunch phase 0 launch phase (LEOP?) 1 nominal Orbit 2 ... TBC each phase means an new reference orbit

element **level1Product/productInfo/missionInfo/orbitCycle**

diagram	
type	**xs:int**
annotation	documentation cycle number

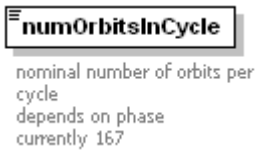
element **level1Product/productInfo/missionInfo/absOrbit**

diagram	
type	restriction of **xs:int**
facets	minInclusive -1
annotation	documentation absolute orbit number at start of scene

element **level1Product/productInfo/missionInfo/relOrbit**

diagram	
type	**xs:int**
annotation	documentation relative orbit number

element **level1Product/productInfo/missionInfo/numOrbitsInCycle**

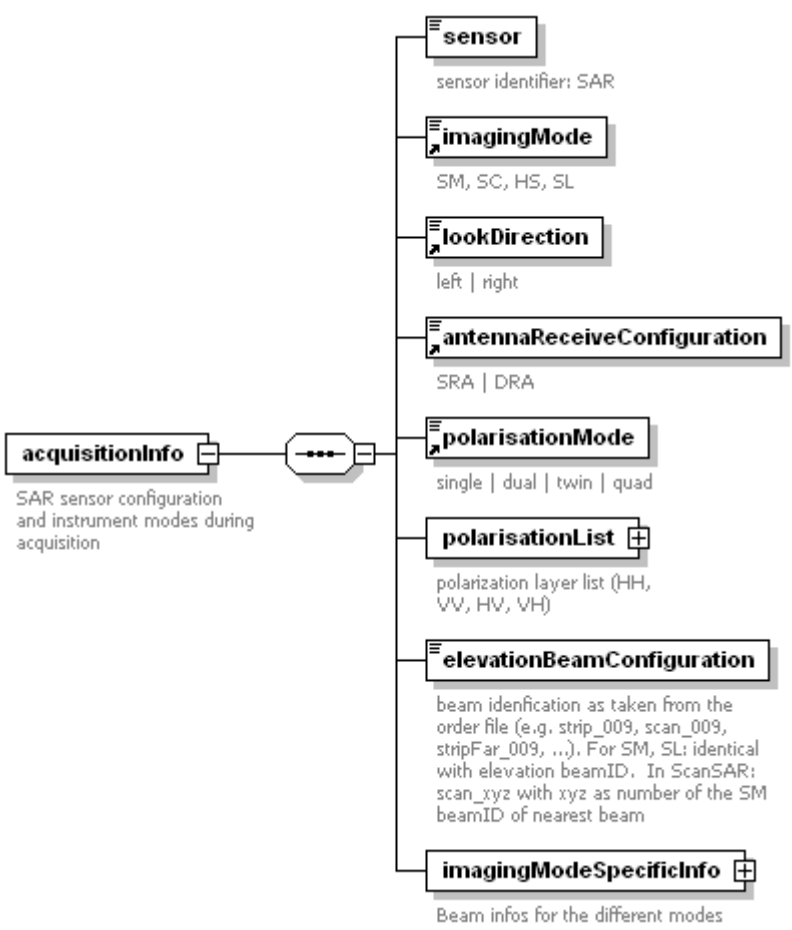
diagram	
type	**xs:int**
annotation	documentation nominal number of orbits per cycle depends on phase currently 167

element **level1Product/productInfo/missionInfo/orbitDirection**

diagram	
type	restriction of **xs:NMTOKENS**

facets	enumeration ASCENDING enumeration DESCENDING enumeration UNDEFINED
annotation	documentation ascending / descending flag

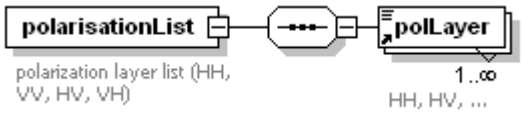
element **level1Product/productInfo/acquisitionInfo**

diagram	
annotation	documentation SAR sensor configuration and instrument modes during acquisition

element **level1Product/productInfo/acquisitionInfo/sensor**

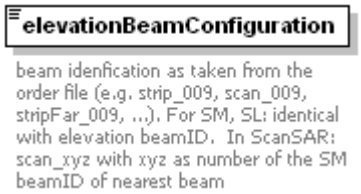
diagram	
type	**string20**
facets	maxLength 20
annotation	documentation sensor identifier: SAR

element **level1Product/productInfo/acquisitionInfo/polarisationList**

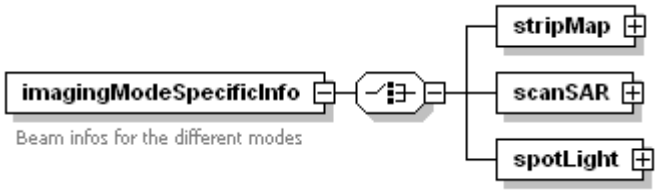
diagram	

annotation	documentation polarization layer list (HH, VV, HV, VH)

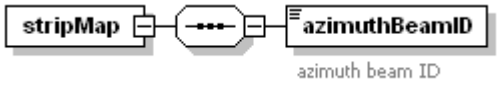
element **level1Product/productInfo/acquisitionInfo/elevationBeamConfiguration**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation beam idenfication as taken from the order file (e.g. strip_009, scan_009, stripFar_009, ...). For SM, SL: identical with elevation beamID. In ScanSAR: scan_xyz with xyz as number of the SM beamID of nearest beam

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo**

diagram	
annotation	documentation Beam infos for the different modes

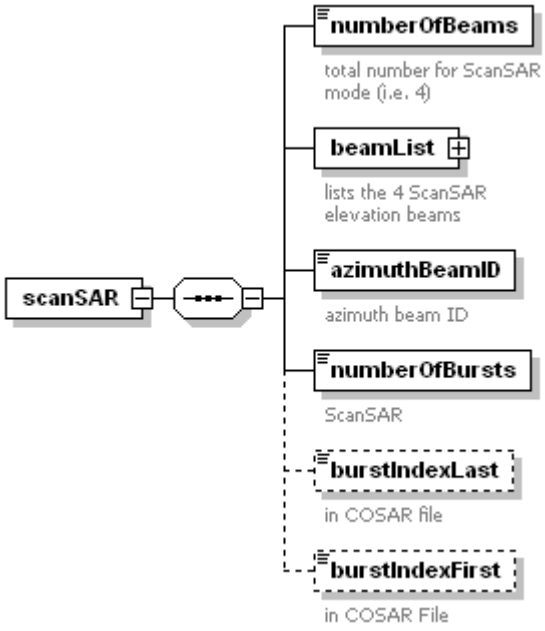
element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/stripMap**

diagram	

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/stripMap/azimuthBeamID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation azimuth beam ID

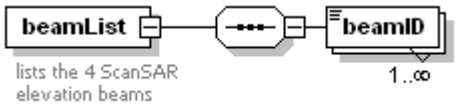
element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR**

diagram	

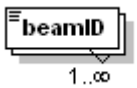
element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/numberOfBeams

diagram	
type	**xs:int**
annotation	documentation total number for ScanSAR mode (i.e. 4)

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/beamList**

diagram	
annotation	documentation lists the 4 ScanSAR elevation beams

element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/beamList/beamID

diagram	
type	**string20**
facets	maxLength 20

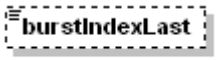
element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/azimuthBeamID

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation azimuth beam ID

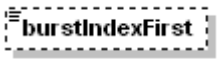
element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/numberOfBursts**

diagram	
type	**xs:int**
annotation	documentation ScanSAR

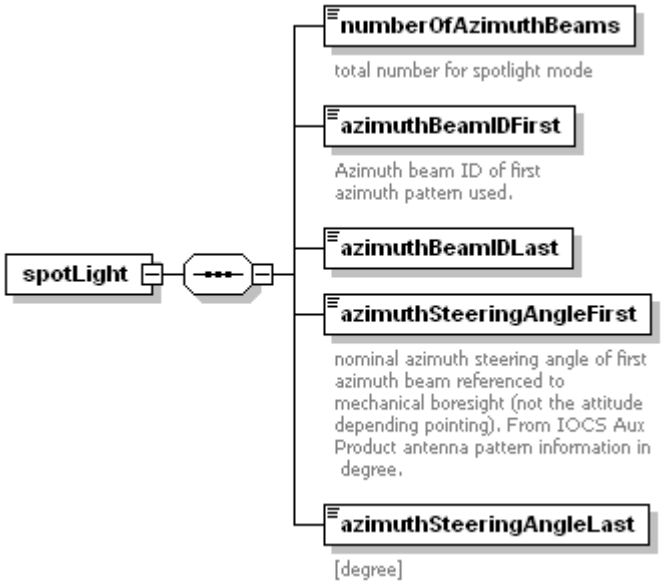
element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/burstIndexLast**

diagram	
type	**xs:int**
annotation	documentation in COSAR file

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/scanSAR/burstIndexFirst**

diagram	
type	**xs:int**
annotation	documentation in COSAR File

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight**

diagram	

element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight/numberOfAzimuthBeams

diagram	
type	**xs:int**
annotation	documentation total number for spotlight mode

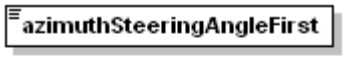
element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight/azimuthBeamIDFirst

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Azimuth beam ID of first azimuth pattern used.

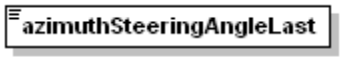
element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight/azimuthBeamIDLast

diagram	
type	**string20**
facets	maxLength 20

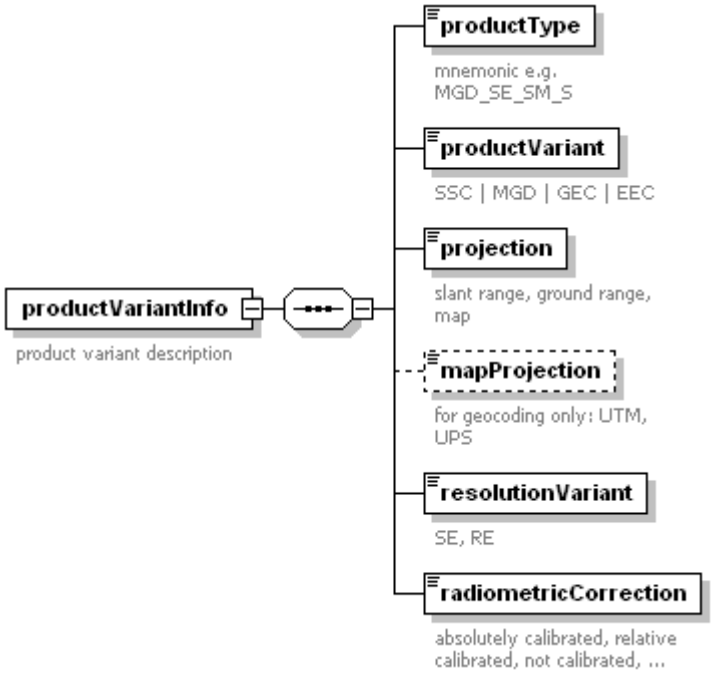
element
level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight/azimuthSteeringAngleFirst

diagram	 nominal azimuth steering angle of first azimuth beam referenced to mechanical boresight (not the attitude depending pointing). From IOCS Aux Product antenna pattern information in degree.
type	**xs:float**
annotation	documentation nominal azimuth steering angle of first azimuth beam referenced to mechanical boresight (not the attitude depending pointing). From IOCS Aux Product antenna pattern information in degree.

element **level1Product/productInfo/acquisitionInfo/imagingModeSpecificInfo/spotLight/azimuthSteeringAngleLast**

diagram	 [degree]
type	**xs:float**
annotation	documentation [degree]

element **level1Product/productInfo/productVariantInfo**

diagram	
annotation	documentation product variant description

element **level1Product/productInfo/productVariantInfo/productType**

diagram	 mnemonic e.g. MGD_SE_SM_S
type	**string128**

facets	maxLength 128
annotation	documentation mnemonic e.g. MGD_SE_SM_S

element **level1Product/productInfo/productVariantInfo/productVariant**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SSC enumeration MGD enumeration GEC enumeration EEC enumeration UNDEFINED
annotation	documentation SSC | MGD | GEC | EEC

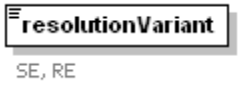
element **level1Product/productInfo/productVariantInfo/projection**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SLANTRANGE enumeration UNDEFINED enumeration GROUNDRANGE enumeration MAP
annotation	documentation slant range, ground range, map

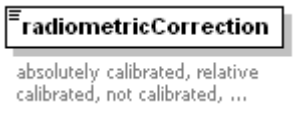
element **level1Product/productInfo/productVariantInfo/mapProjection**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration UTM enumeration UPS enumeration UNDEFINED
annotation	documentation for geocoding only: UTM, UPS

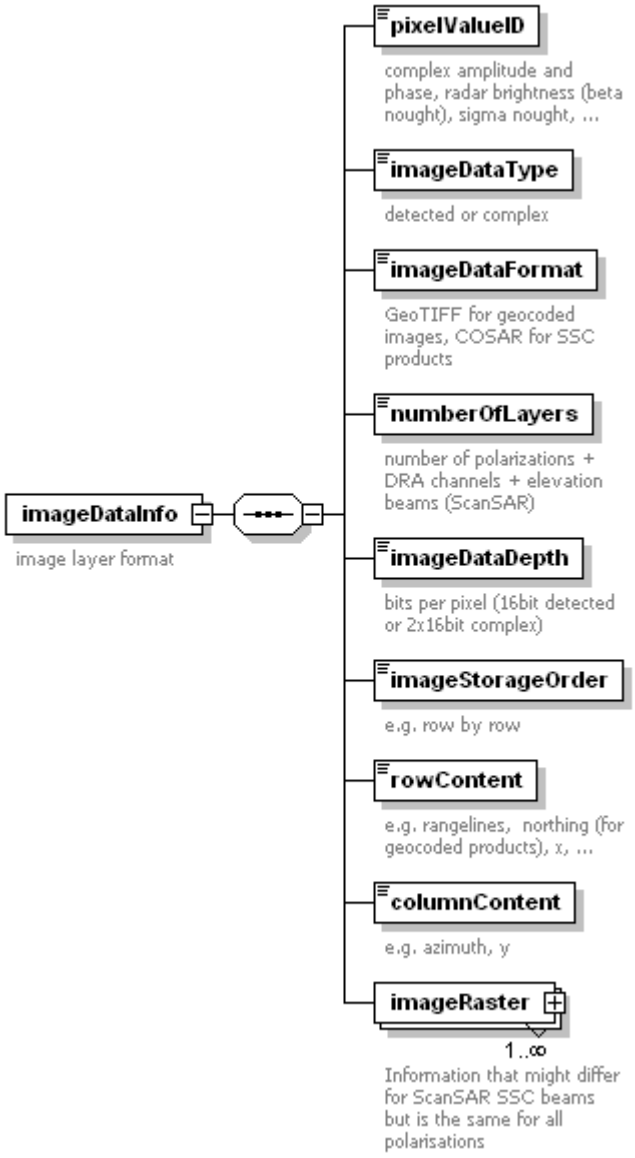
element **level1Product/productInfo/productVariantInfo/resolutionVariant**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SE enumeration RE enumeration UNDEFINED
annotation	documentation SE, RE

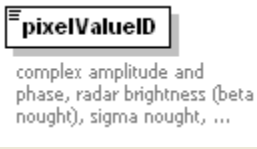
element **level1Product/productInfo/productVariantInfo/radiometricCorrection**

diagram	
type	restriction of **string128**
facets	maxLength 128 enumeration CALIBRATED enumeration NOTCALIBRATED enumeration UNDEFINED enumeration RELCALIBRATED
annotation	documentation absolutely calibrated, relative calibrated, not calibrated, ...

element **level1Product/productInfo/imageDataInfo**

diagram	
annotation	documentation image layer format

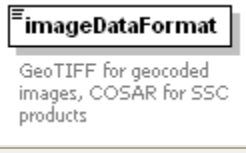
element **level1Product/productInfo/imageDataInfo/pixelValueID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation complex amplitude and phase, radar brightness (beta nought), sigma nought, ...

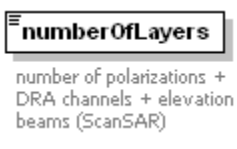
element **level1Product/productInfo/imageDataInfo/imageDataType**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration COMPLEX enumeration DETECTED
annotation	documentation detected or complex

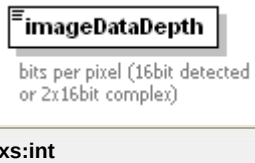
element **level1Product/productInfo/imageDataInfo/imageDataFormat**

diagram	
type	restriction of **string255**
facets	maxLength 255 enumeration GEOTIFF enumeration COSAR enumeration UNDEFINED
annotation	documentation GeoTIFF for geocoded images, COSAR for SSC products

element **level1Product/productInfo/imageDataInfo/numberOfLayers**

diagram	
type	**xs:int**
annotation	documentation number of polarizations + DRA channels + elevation beams (ScanSAR)

element **level1Product/productInfo/imageDataInfo/imageDataDepth**

diagram	
type	**xs:int**

annotation	documentation bits per pixel (16bit detected or 2x16bit complex)

element **level1Product/productInfo/imageDataInfo/imageStorageOrder**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration ROWBYROW enumeration COLBYCOL enumeration UNDEFINED
annotation	documentation e.g. row by row

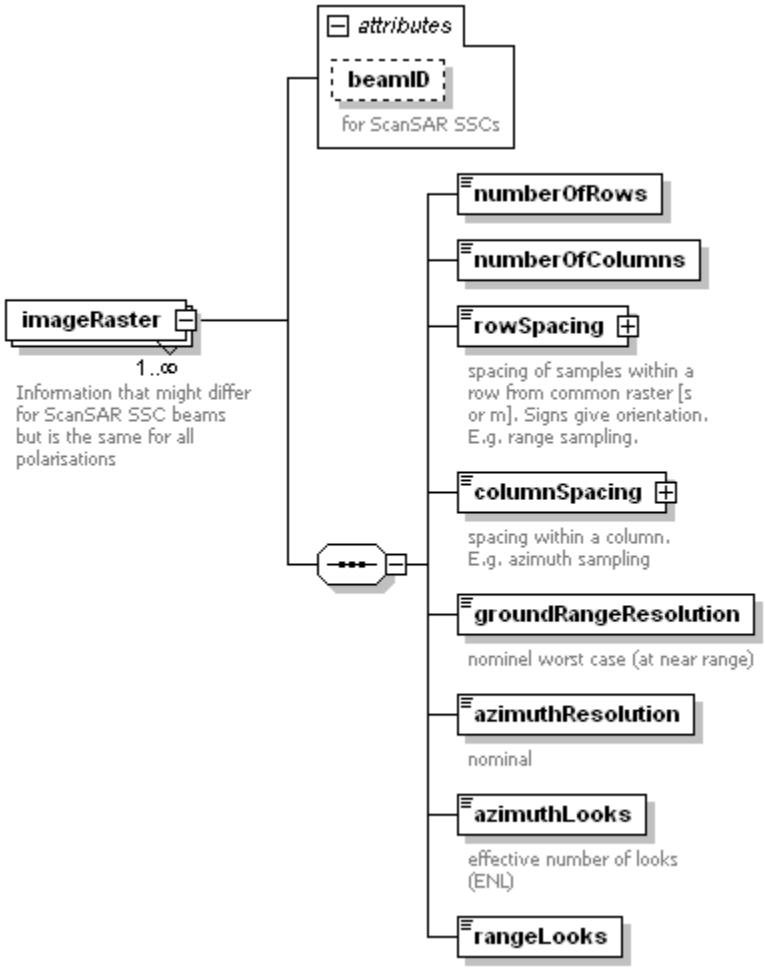
element **level1Product/productInfo/imageDataInfo/rowContent**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation e.g. rangelines, northing (for geocoded products), x, ...

element **level1Product/productInfo/imageDataInfo/columnContent**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation e.g. azimuth, y

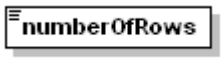
element **level1Product/productInfo/imageDataInfo/imageRaster**

diagram	

attributes	Name	Type	Use	Default	Fixed	Annotation
	beamID	**string20**				documentation for ScanSAR SSCs

annotation	documentation Information that might differ for ScanSAR SSC beams but is the same for all polarisations

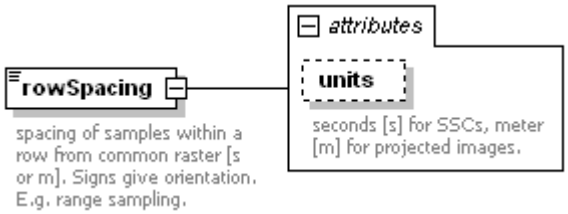
element **level1Product/productInfo/imageDataInfo/imageRaster/numberOfRows**

diagram	
type	**xs:int**

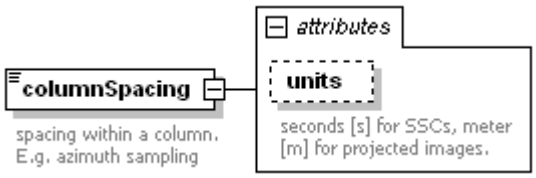
element **level1Product/productInfo/imageDataInfo/imageRaster/numberOfColumns**

diagram	
type	**xs:int**

element **level1Product/productInfo/imageDataInfo/imageRaster/rowSpacing**

diagram	
type	extension of **xs:float**
attributes	Name: units Type: **derived by: xs:NMTOKENS** Use: Default: Fixed: Annotation documentation: seconds [s] for SSCs, meter [m] for projected images.
annotation	documentation spacing of samples within a row from common raster [s or m]. Signs give orientation. E.g. range sampling.

element **level1Product/productInfo/imageDataInfo/imageRaster/columnSpacing**

diagram	
type	extension of **xs:float**
attributes	Name: units Type: **derived by: xs:NMTOKENS** Use: Default: Fixed: Annotation documentation: seconds [s] for SSCs, meter [m] for projected images.
annotation	documentation spacing within a column. E.g. azimuth sampling

element **level1Product/productInfo/imageDataInfo/imageRaster/groundRangeResolution**

diagram	
type	**xs:double**
annotation	documentation nominel worst case (at near range)

element **level1Product/productInfo/imageDataInfo/imageRaster/azimuthResolution**

diagram	
type	**xs:double**
annotation	documentation nominal

element **level1Product/productInfo/imageDataInfo/imageRaster/azimuthLooks**

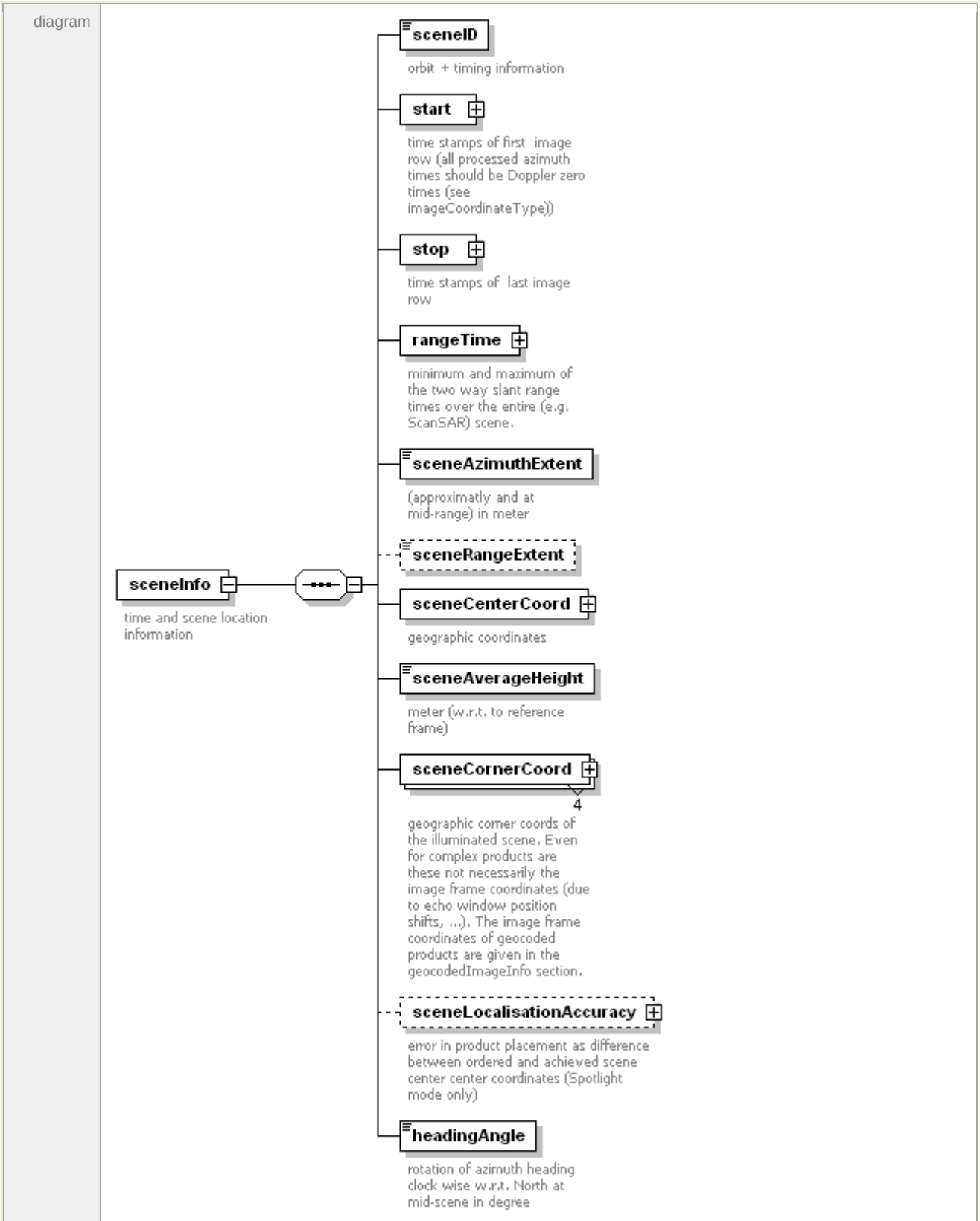
diagram	
type	**xs:float**

annotation	documentation effective number of looks (ENL)

element **level1Product/productInfo/imageDataInfo/imageRaster/rangeLooks**

diagram	
type	**xs:float**

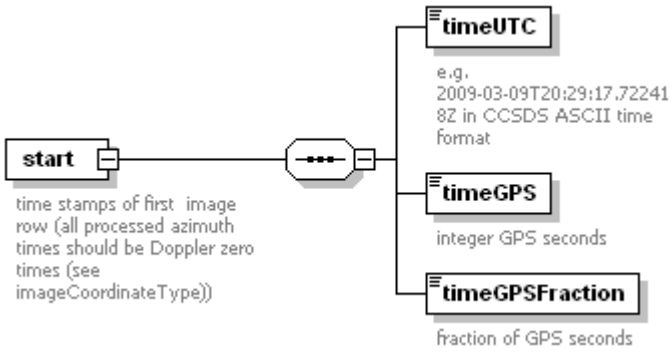
element **level1Product/productInfo/sceneInfo**



element **level1Product/productInfo/sceneInfo/sceneID**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation orbit + timing information

element **level1Product/productInfo/sceneInfo/start**

diagram	
annotation	documentation time stamps of first image row (all processed azimuth times should be Doppler zero times (see imageCoordinateType))

element **level1Product/productInfo/sceneInfo/start/timeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation e.g. 2009-03-09T20:29:17.722418Z in CCSDS ASCII time format

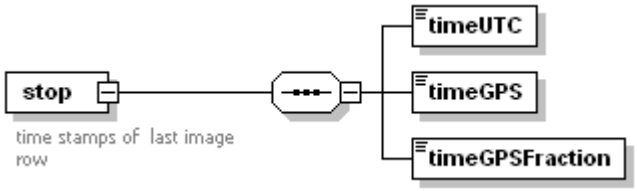
element **level1Product/productInfo/sceneInfo/start/timeGPS**

diagram	
type	**xs:long**
annotation	documentation integer GPS seconds

element **level1Product/productInfo/sceneInfo/start/timeGPSFraction**

diagram	
type	**xs:float**
annotation	documentation fraction of GPS seconds

element **level1Product/productInfo/sceneInfo/stop**

diagram	
annotation	documentation time stamps of last image row

element **level1Product/productInfo/sceneInfo/stop/timeUTC**

diagram	
type	**xs:dateTime**

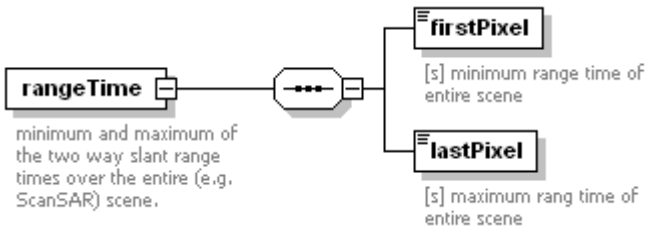
element **level1Product/productInfo/sceneInfo/stop/timeGPS**

diagram	
type	**xs:long**

element **level1Product/productInfo/sceneInfo/stop/timeGPSFraction**

diagram	
type	**xs:float**

element **level1Product/productInfo/sceneInfo/rangeTime**

diagram	
annotation	documentation minimum and maximum of the two way slant range times over the entire (e.g. ScanSAR) scene.

element **level1Product/productInfo/sceneInfo/rangeTime/firstPixel**

diagram	
type	**xs:double**
annotation	documentation [s] minimum range time of entire scene

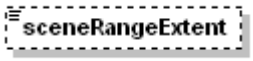
element **level1Product/productInfo/sceneInfo/rangeTime/lastPixel**

diagram	
type	**xs:double**
annotation	documentation [s] maximum rang time of entire scene

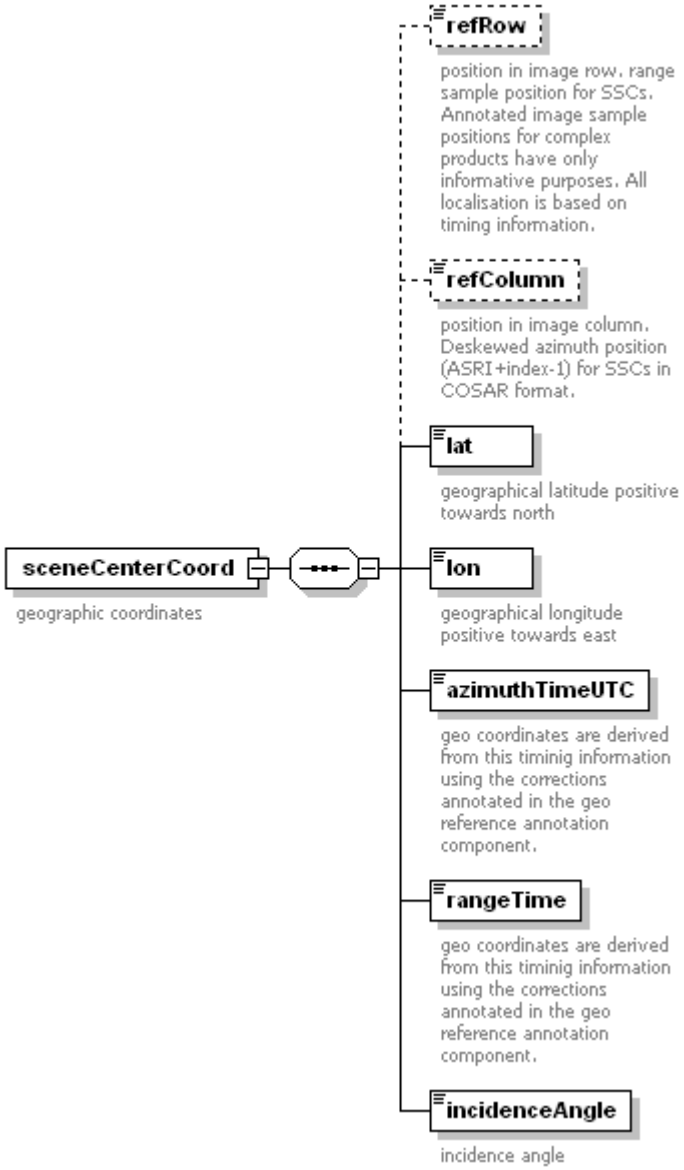
element **level1Product/productInfo/sceneInfo/sceneAzimuthExtent**

diagram	
type	**xs:double**
annotation	documentation (approximatly and at mid-range) in meter

element **level1Product/productInfo/sceneInfo/sceneRangeExtent**

diagram	
type	**xs:double**

element **level1Product/productInfo/sceneInfo/sceneCenterCoord**

diagram	
annotation	documentation geographic coordinates

element **level1Product/productInfo/sceneInfo/sceneCenterCoord/refRow**

diagram	
type	**xs:int**
annotation	documentation position in image row. range sample position for SSCs. Annotated image sample positions for complex products have only informative purposes. All localisation is based on timing information.

element **level1Product/productInfo/sceneInfo/sceneCenterCoord/refColumn**

diagram	
type	**xs:int**
annotation	documentation position in image column. Deskewed azimuth position (ASRI+index-1) for SSCs in COSAR format.

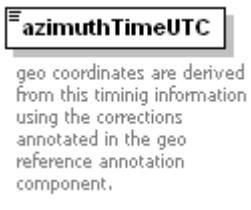
element **level1Product/productInfo/sceneInfo/sceneCenterCoord/lat**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude positive towards north

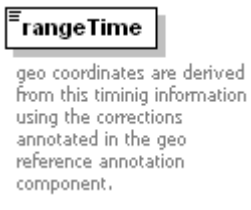
element **level1Product/productInfo/sceneInfo/sceneCenterCoord/lon**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude positive towards east

element **level1Product/productInfo/sceneInfo/sceneCenterCoord/azimuthTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation geo coordinates are derived from this timinig information using the corrections annotated in the geo reference annotation component.

element **level1Product/productInfo/sceneInfo/sceneCenterCoord/rangeTime**

diagram	

type	**xs:double**
annotation	documentation geo coordinates are derived from this timinig information using the corrections annotated in the geo reference annotation component.

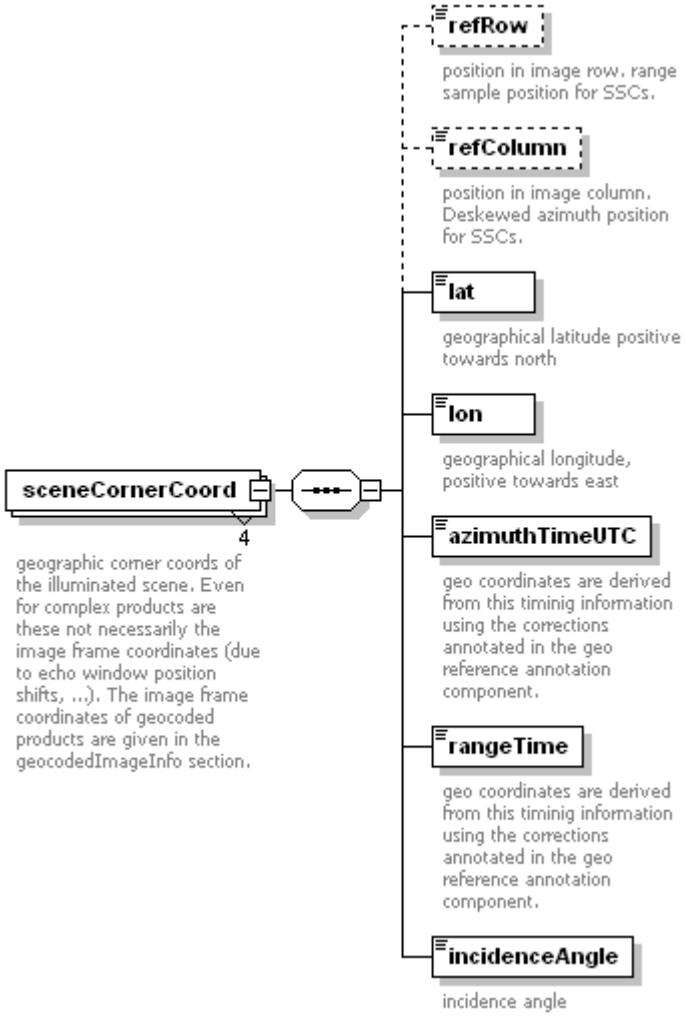
element **level1Product/productInfo/sceneInfo/sceneCenterCoord/incidenceAngle**

diagram	
type	**xs:double**
annotation	documentation incidence angle

element **level1Product/productInfo/sceneInfo/sceneAverageHeight**

diagram	
type	**xs:double**
annotation	documentation meter (w.r.t. to reference frame)

element **level1Product/productInfo/sceneInfo/sceneCornerCoord**

diagram	
annotation	documentation geographic corner coords of the illuminated scene. Even for complex products are these not necessarily the image frame coordinates (due to echo window position shifts, ...). The image frame coordinates of geocoded products are given in the geocodedImageInfo section.

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/refRow**

diagram	
type	**xs:int**
annotation	documentation position in image row. range sample position for SSCs.

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/refColumn**

diagram	
type	**xs:int**
annotation	documentation position in image column. Deskewed azimuth position for SSCs.

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/lat**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude positive towards north

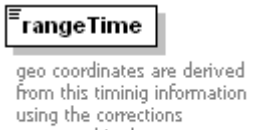
element **level1Product/productInfo/sceneInfo/sceneCornerCoord/lon**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/azimuthTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation geo coordinates are derived from this timinig information using the corrections annotated in the geo reference annotation component.

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/rangeTime**

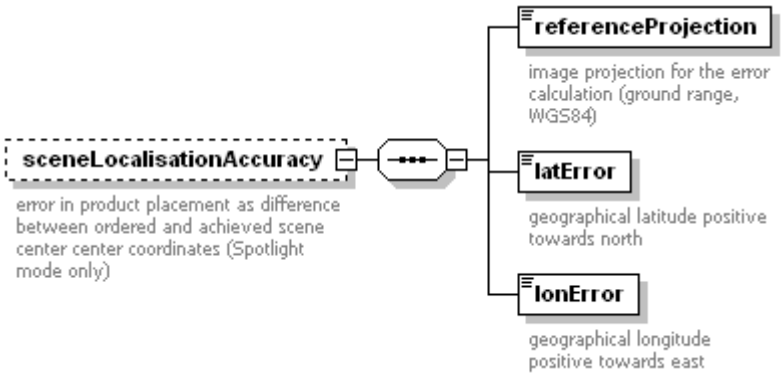
diagram	
type	**xs:double**
annotation	documentation geo coordinates are derived from this timinig information using the corrections annotated in the geo reference annotation component.

element **level1Product/productInfo/sceneInfo/sceneCornerCoord/incidenceAngle**

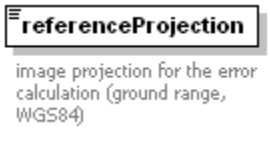
diagram	

type	**xs:double**
annotation	documentation incidence angle

element **level1Product/productInfo/sceneInfo/sceneLocalisationAccuracy**

diagram	
annotation	documentation error in product placement as difference between ordered and achieved scene center center coordinates (Spotlight mode only)

element **level1Product/productInfo/sceneInfo/sceneLocalisationAccuracy/referenceProjection**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation image projection for the error calculation (ground range, WGS84)

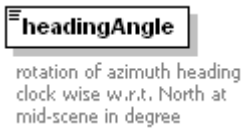
element **level1Product/productInfo/sceneInfo/sceneLocalisationAccuracy/latError**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude positive towards north

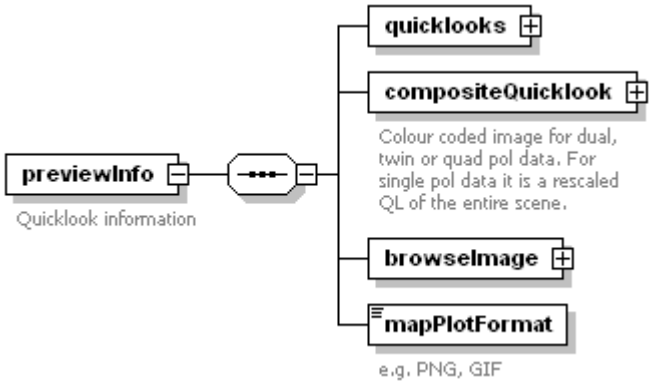
element **level1Product/productInfo/sceneInfo/sceneLocalisationAccuracy/lonError**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude positive towards east

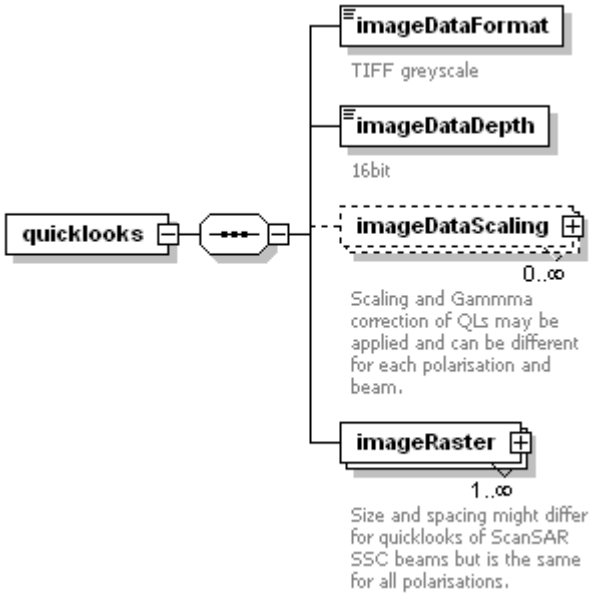
element **level1Product/productInfo/sceneInfo/headingAngle**

diagram	
type	**xs:float**
annotation	documentation rotation of azimuth heading clock wise w.r.t. North at mid-scene in degree

element **level1Product/productInfo/previewInfo**

diagram	
annotation	documentation Quicklook information

element **level1Product/productInfo/previewInfo/quicklooks**

diagram	

element **level1Product/productInfo/previewInfo/quicklooks/imageDataFormat**

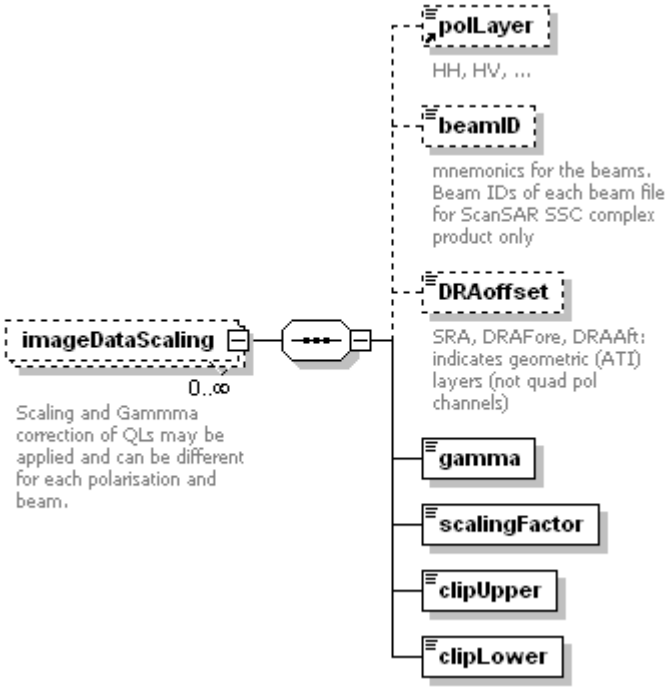
diagram	

type	**string255**
facets	maxLength 255
annotation	documentation TIFF greyscale

element **level1Product/productInfo/previewInfo/quicklooks/imageDataDepth**

diagram	
type	**xs:int**
annotation	documentation 16bit

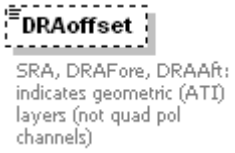
element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling**

diagram	
annotation	documentation Scaling and Gammma correction of QLs may be applied and can be different for each polarisation and beam.

element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/beamID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation mnemonics for the beams. Beam IDs of each beam file for ScanSAR SSC complex product only

element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/DRAoffset**

diagram	 SRA, DRAFore, DRAAft: indicates geometric (ATI) layers (not quad pol channels)
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft: indicates geometric (ATI) layers (not quad pol channels)

element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/gamma**

diagram	
type	**xs:double**

element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/scalingFactor**

diagram	
type	**xs:double**

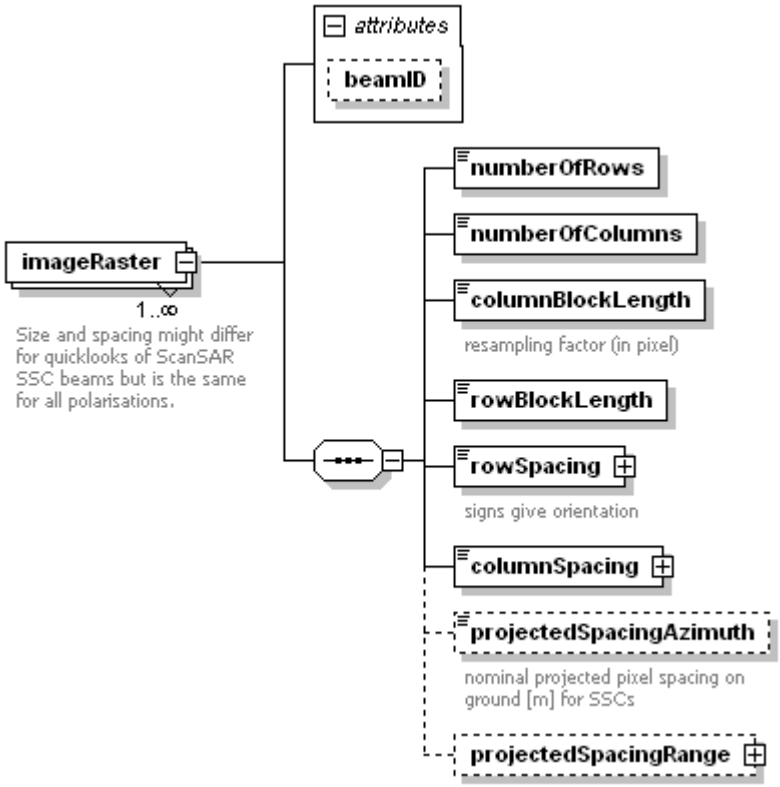
element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/clipUpper**

diagram	
type	**xs:double**

element **level1Product/productInfo/previewInfo/quicklooks/imageDataScaling/clipLower**

diagram	
type	**xs:double**

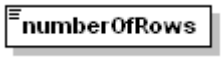
element **level1Product/productInfo/previewInfo/quicklooks/imageRaster**

diagram	

attributes	Name	Type	Use	Default	Fixed	Annotation
	beamID	**string20**				

annotation	documentation Size and spacing might differ for quicklooks of ScanSAR SSC beams but is the same for all polarisations.

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/numberOfRows**

diagram	
type	**xs:int**

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/numberOfColumns**

diagram	
type	**xs:int**

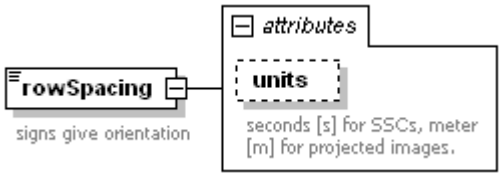
element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/columnBlockLength**

diagram	
type	**xs:float**
annotation	documentation resampling factor (in pixel)

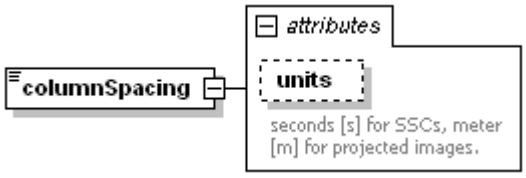
element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/rowBlockLength**

diagram	
type	**xs:float**

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/rowSpacing**

diagram	
type	extension of **xs:float**
attributes	Name: units Type: Use: Default: Fixed: Annotation documentation: seconds [s] for SSCs, meter [m] for projected images.
annotation	documentation signs give orientation

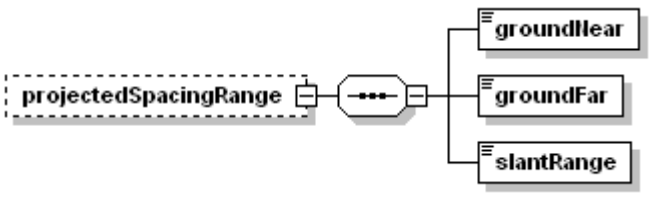
element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/columnSpacing**

diagram	
type	extension of **xs:float**
attributes	Name: units Type: Use: Default: Fixed: Annotation documentation: seconds [s] for SSCs, meter [m] for projected images.

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/projectedSpacingAzimuth**

diagram	
type	**xs:float**
annotation	documentation nominal projected pixel spacing on ground [m] for SSCs

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/projectedSpacingRange**

diagram	

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/projectedSpacingRange/groundNear**

diagram	groundNear
type	**xs:float**

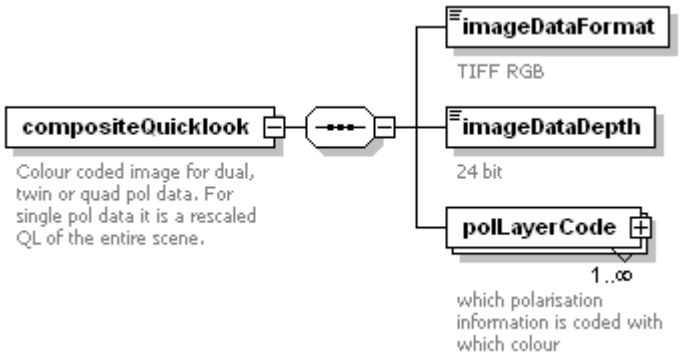
element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/projectedSpacingRange/groundFar**

diagram	groundFar
type	**xs:float**

element **level1Product/productInfo/previewInfo/quicklooks/imageRaster/projectedSpacingRange/slantRange**

diagram	slantRange
type	**xs:float**

element **level1Product/productInfo/previewInfo/compositeQuicklook**

diagram	
annotation	documentation Colour coded image for dual, twin or quad pol data. For single pol data it is a rescaled QL of the entire scene.

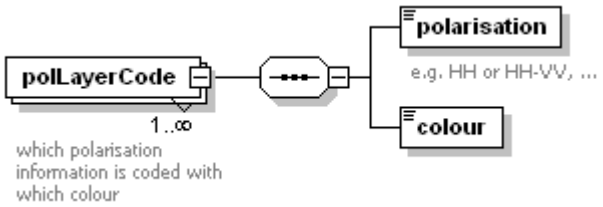
element **level1Product/productInfo/previewInfo/compositeQuicklook/imageDataFormat**

diagram	imageDataFormat TIFF RGB
type	**string255**
facets	maxLength 255
annotation	documentation TIFF RGB

element **level1Product/productInfo/previewInfo/compositeQuicklook/imageDataDepth**

diagram	imageDataDepth 24 bit
type	**xs:int**
annotation	documentation 24 bit

element **level1Product/productInfo/previewInfo/compositeQuicklook/polLayerCode**

diagram	
annotation	documentation which polarisation information is coded with which colour

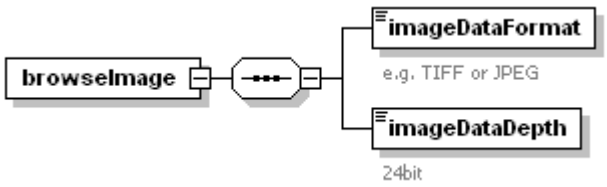
element **level1Product/productInfo/previewInfo/compositeQuicklook/polLayerCode/polarisation**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation e.g. HH or HH-VV, ...

element **level1Product/productInfo/previewInfo/compositeQuicklook/polLayerCode/colour**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/productInfo/previewInfo/browseImage**

diagram	

element **level1Product/productInfo/previewInfo/browseImage/imageDataFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation e.g. TIFF or JPEG

element **level1Product/productInfo/previewInfo/browseImage/imageDataDepth**

diagram	

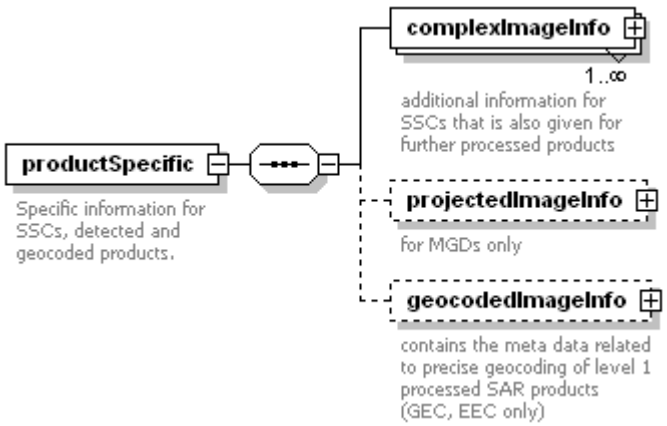
type	**xs:int**
annotation	documentation 24bit

element **level1Product/productInfo/previewInfo/mapPlotFormat**

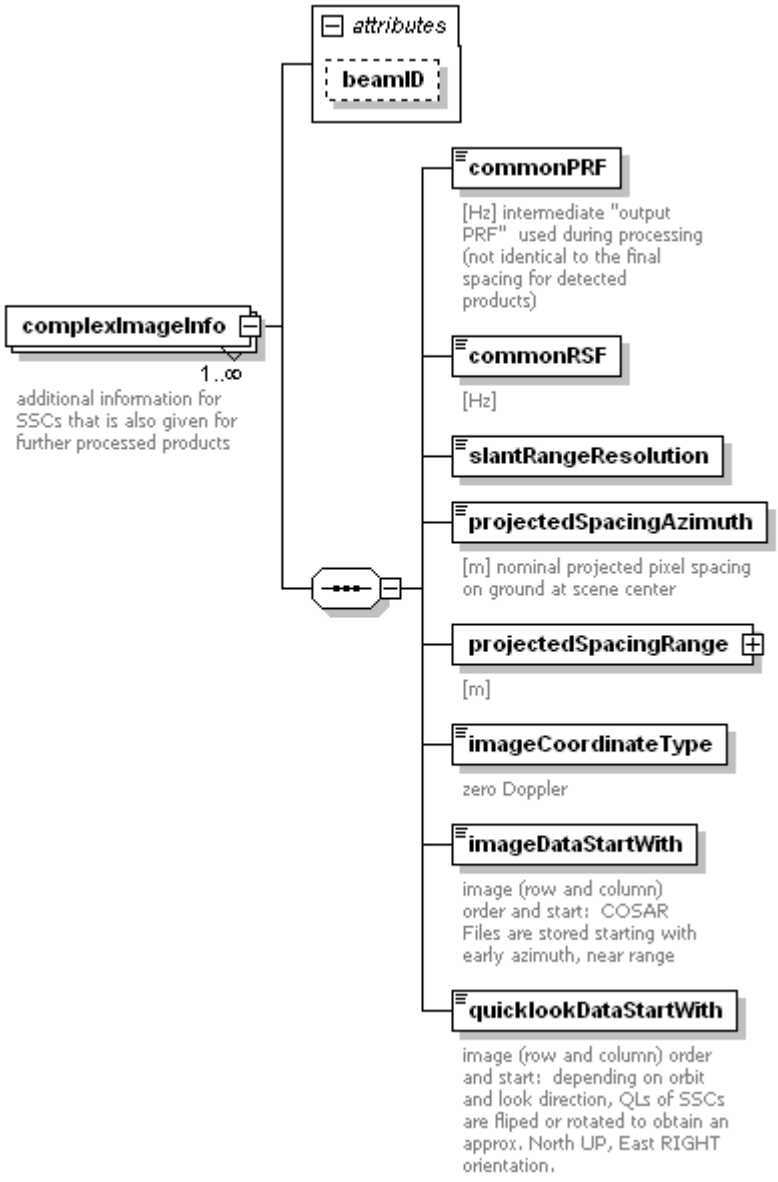
diagram	
type	**string255**
facets	maxLength 255
annotation	documentation e.g. PNG, GIF

6.1.3 Product Specific

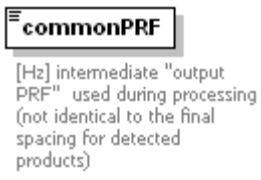
element **level1Product/productSpecific**

diagram	
annotation	documentation Specific information for SSCs, detected and geocoded products.

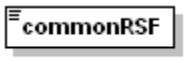
element **level1Product/productSpecific/complexImageInfo**

diagram	
attributes	Name Type Use Default Fixed Annotation beamID **string20**
annotation	documentation additional information for SSCs that is also given for further processed products

element **level1Product/productSpecific/complexImageInfo/commonPRF**

diagram	
type	**xs:double**
annotation	documentation [Hz] intermediate "output PRF" used during processing (not identical to the final spacing for detected products)

element **level1Product/productSpecific/complexImageInfo/commonRSF**

diagram	
type	**xs:double**
annotation	documentation [Hz]

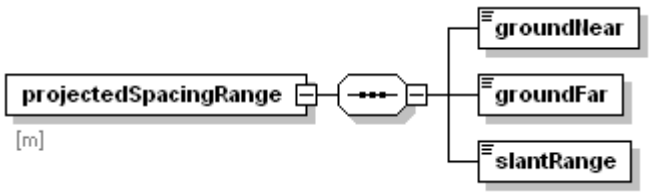
element **level1Product/productSpecific/complexImageInfo/slantRangeResolution**

diagram	
type	**xs:double**

element **level1Product/productSpecific/complexImageInfo/projectedSpacingAzimuth**

diagram	
type	**xs:float**
annotation	documentation [m] nominal projected pixel spacing on ground at scene center

element **level1Product/productSpecific/complexImageInfo/projectedSpacingRange**

diagram	
annotation	documentation [m]

element **level1Product/productSpecific/complexImageInfo/projectedSpacingRange/groundNear**

diagram	
type	**xs:float**

element **level1Product/productSpecific/complexImageInfo/projectedSpacingRange/groundFar**

diagram	
type	**xs:float**

element **level1Product/productSpecific/complexImageInfo/projectedSpacingRange/slantRange**

diagram	
type	**xs:float**

element **level1Product/productSpecific/complexImageInfo/imageCoordinateType**

diagram	**imageCoordinateType** zero Doppler
type	restriction of **string128**
facets	maxLength 128 enumeration RAW enumeration ZERODOPPLER enumeration UNDEFINED
annotation	documentation zero Doppler

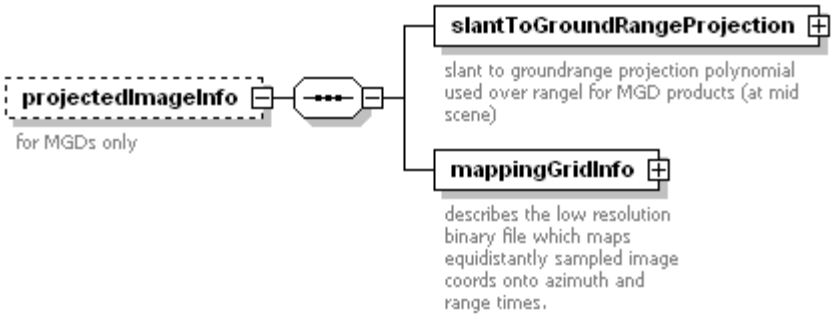
element **level1Product/productSpecific/complexImageInfo/imageDataStartWith**

diagram	**imageDataStartWith** image (row and column) order and start: COSAR Files are stored starting with early azimuth, near range
type	restriction of **xs:NMTOKENS**
facets	enumeration EARLYAZNEARRG enumeration EARLYAZFARRG enumeration LATEAZNEARRG enumeration LATEAZFARRG enumeration UNDEFINED
annotation	documentation image (row and column) order and start: COSAR Files are stored starting with early azimuth, near range

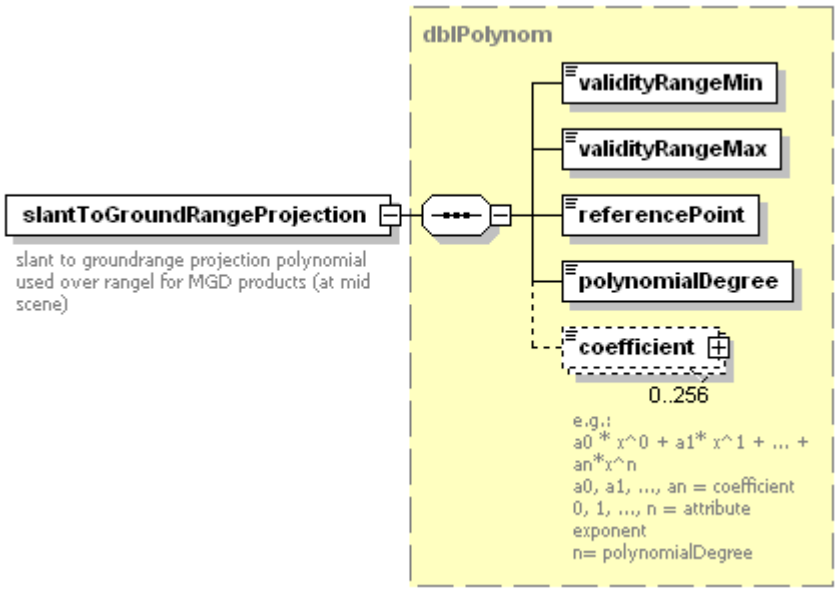
element **level1Product/productSpecific/complexImageInfo/quicklookDataStartWith**

diagram	**quicklookDataStartWith** image (row and column) order and start: depending on orbit and look direction, QLs of SSCs are fliped or rotated to obtain an approx. North UP, East RIGHT orientation.
type	restriction of **xs:NMTOKENS**
facets	enumeration EARLYAZNEARRG enumeration EARLYAZFARRG enumeration LATEAZNEARRG enumeration LATEAZFARRG enumeration UNDEFINED
annotation	documentation image (row and column) order and start: depending on orbit and look direction, QLs of SSCs are fliped or rotated to obtain an approx. North UP, East RIGHT orientation.

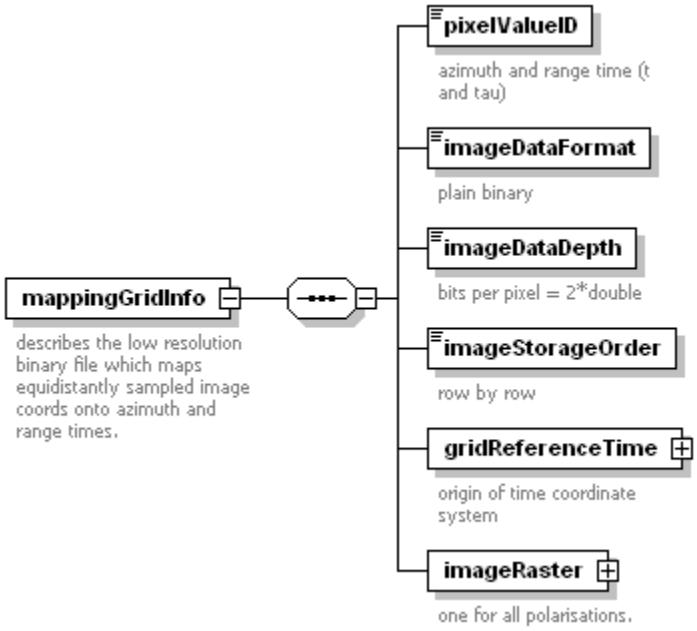
element **level1Product/productSpecific/projectedImageInfo**

diagram	
annotation	documentation for MGDs only

element **level1Product/productSpecific/projectedImageInfo/slantToGroundRangeProjection**

diagram	
type	**dblPolynom**
annotation	documentation slant to groundrange projection polynomial used over rangel for MGD products (at mid scene)

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo**

diagram	
annotation	documentation describes the low resolution binary file which maps equidistantly sampled image coords onto azimuth and range times.

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/pixelValueID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation azimuth and range time (t and tau)

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageDataFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation plain binary

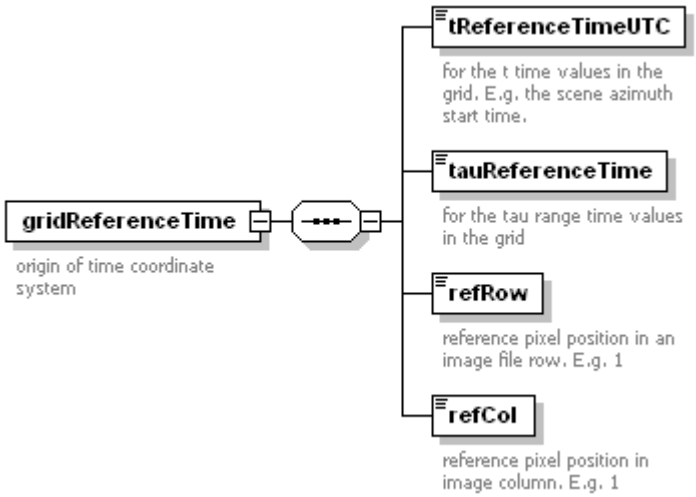
element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageDataDepth**

diagram	
type	**xs:int**
annotation	documentation bits per pixel = 2*double

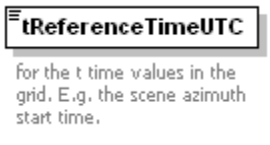
element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageStorageOrder**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration ROWBYROW enumeration COLBYCOL enumeration UNDEFINED
annotation	documentation row by row

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/gridReferenceTime**

diagram	
annotation	documentation origin of time coordinate system

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/gridReferenceTime/tReferenceTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation for the t time values in the grid. E.g. the scene azimuth start time.

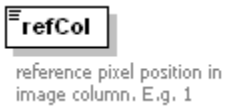
element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/gridReferenceTime/tauReferenceTime**

diagram	
type	**xs:double**
annotation	documentation for the tau range time values in the grid

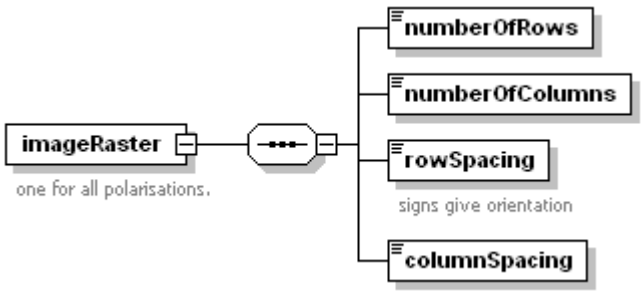
element
level1Product/productSpecific/projectedImageInfo/mappingGridInfo/gridReferenceTime/refRow

diagram	
type	**xs:long**
annotation	documentation reference pixel position in an image file row. E.g. 1

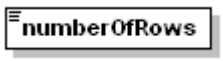
element
level1Product/productSpecific/projectedImageInfo/mappingGridInfo/gridReferenceTime/refCol

diagram	
type	**xs:long**
annotation	documentation reference pixel position in image column. E.g. 1

element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageRaster**

diagram	
annotation	documentation one for all polarisations.

element
level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageRaster/numberOfRows

diagram	
type	**xs:int**

element
level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageRaster/numberOfColumns

diagram	
type	**xs:int**

element
level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageRaster/rowSpacing

diagram	
type	**xs:float**
annotation	documentation signs give orientation

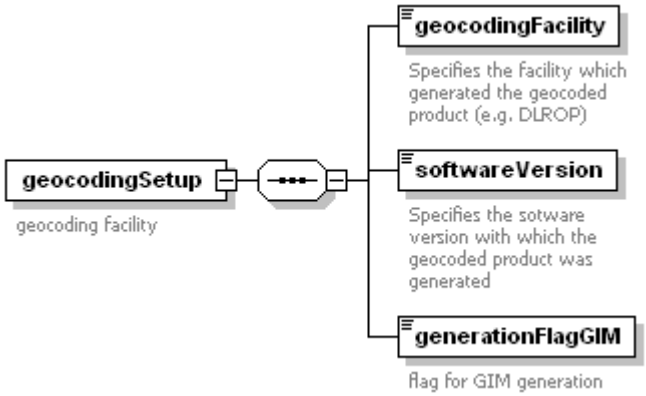
element **level1Product/productSpecific/projectedImageInfo/mappingGridInfo/imageRaster/columnSpacing**

diagram	
type	**xs:float**

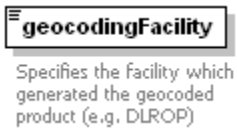
element **level1Product/productSpecific/geocodedImageInfo**

diagram	
annotation	documentation contains the meta data related to precise geocoding of level 1 processed SAR products (GEC, EEC only)

element **level1Product/productSpecific/geocodedImageInfo/geocodingSetup**

diagram	
annotation	documentation geocoding facility

element **level1Product/productSpecific/geocodedImageInfo/geocodingSetup/geocodingFacility**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation Specifies the facility which generated the geocoded product (e.g. DLROP)

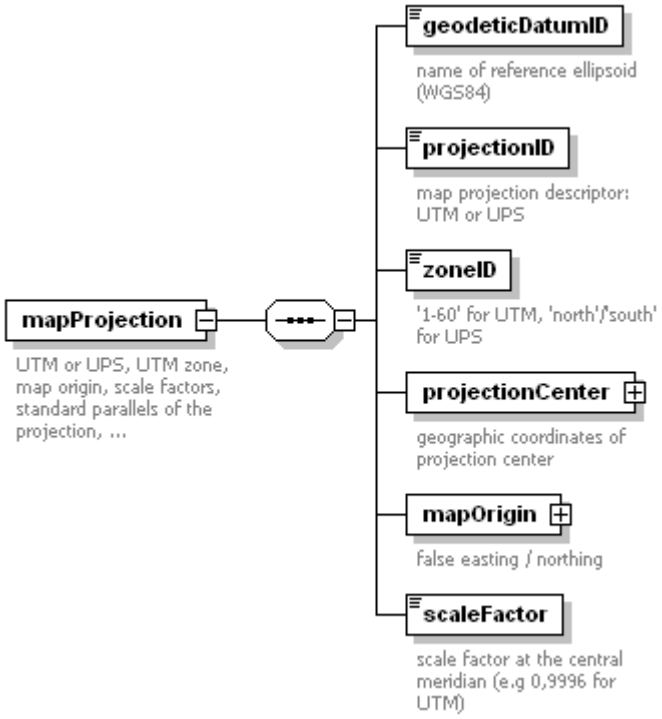
element **level1Product/productSpecific/geocodedImageInfo/geocodingSetup/softwareVersion**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Specifies the sotware version with which the geocoded product was generated

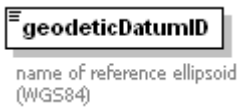
element **level1Product/productSpecific/geocodedImageInfo/geocodingSetup/generationFlagGIM**

diagram	
type	**xs:boolean**
annotation	documentation flag for GIM generation

element **level1Product/productSpecific/geocodedImageInfo/mapProjection**

diagram	
annotation	documentation UTM or UPS, UTM zone, map origin, scale factors, standard parallels of the projection, ...

element **level1Product/productSpecific/geocodedImageInfo/mapProjection/geodeticDatumID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation name of reference ellipsoid (WGS84)

element **level1Product/productSpecific/geocodedImageInfo/mapProjection/projectionID**

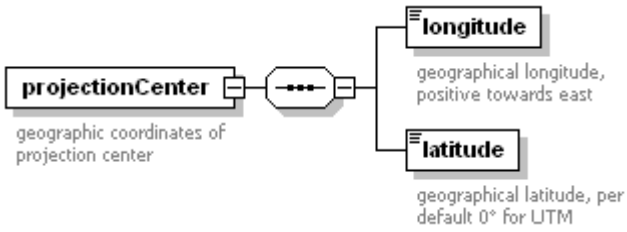
diagram	
type	**string20**
facets	maxLength 20
annotation	documentation map projection descriptor: UTM or UPS

element **level1Product/productSpecific/geocodedImageInfo/mapProjection/zoneID**

diagram	
type	**string20**

facets	maxLength 20
annotation	documentation '1-60' for UTM, 'north'/'south' for UPS

element **level1Product/productSpecific/geocodedImageInfo/mapProjection/projectionCenter**

diagram	
annotation	documentation geographic coordinates of projection center

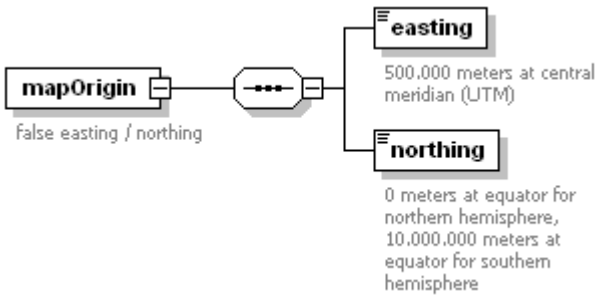
element **level1Product/productSpecific/geocodedImageInfo/mapProjection/projectionCenter/longitude**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element **level1Product/productSpecific/geocodedImageInfo/mapProjection/projectionCenter/latitude**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, per default 0° for UTM

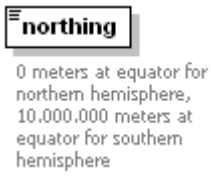
element **level1Product/productSpecific/geocodedImageInfo/mapProjection/mapOrigin**

diagram	
annotation	documentation false easting / northing

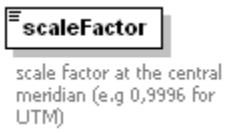
element **level1Product/productSpecific/geocodedImageInfo/mapProjection/mapOrigin/easting**

diagram	
type	**xs:float**
annotation	documentation 500.000 meters at central meridian (UTM)

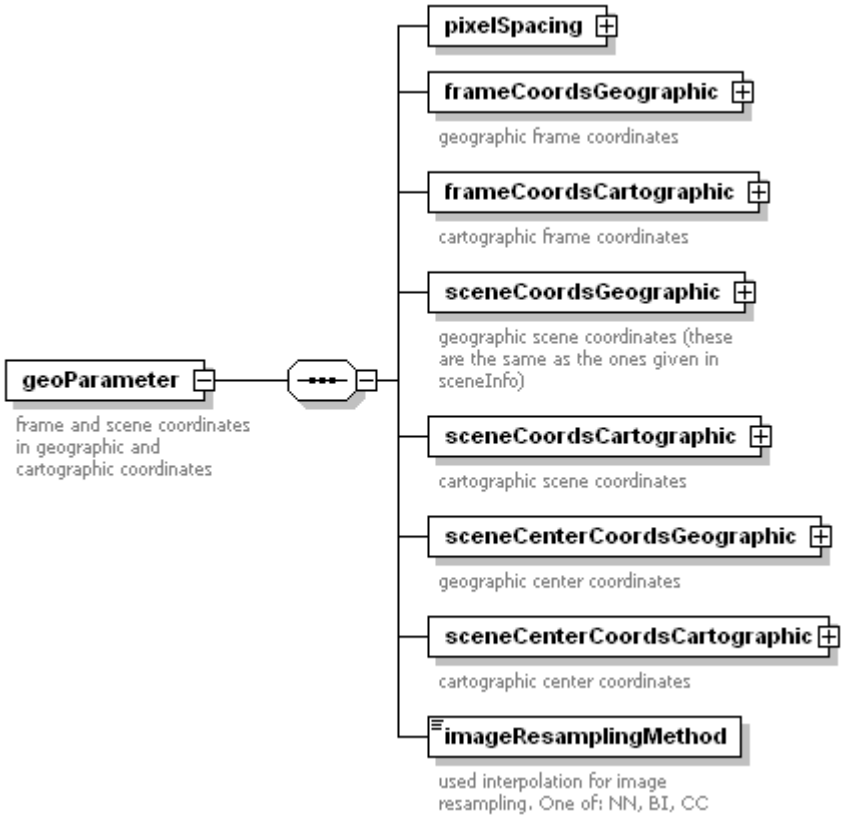
element **level1Product/productSpecific/geocodedImageInfo/mapProjection/mapOrigin/northing**

diagram	
type	**xs:float**
annotation	documentation 0 meters at equator for northern hemisphere, 10.000.000 meters at equator for southern hemisphere

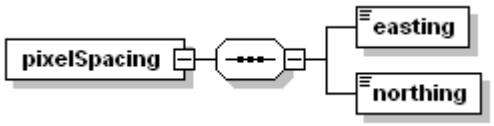
element **level1Product/productSpecific/geocodedImageInfo/mapProjection/scaleFactor**

diagram	
type	**xs:float**
annotation	documentation scale factor at the central meridian (e.g 0,9996 for UTM)

element **level1Product/productSpecific/geocodedImageInfo/geoParameter**

diagram	
annotation	documentation frame and scene coordinates in geographic and cartographic coordinates

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/pixelSpacing**

diagram	

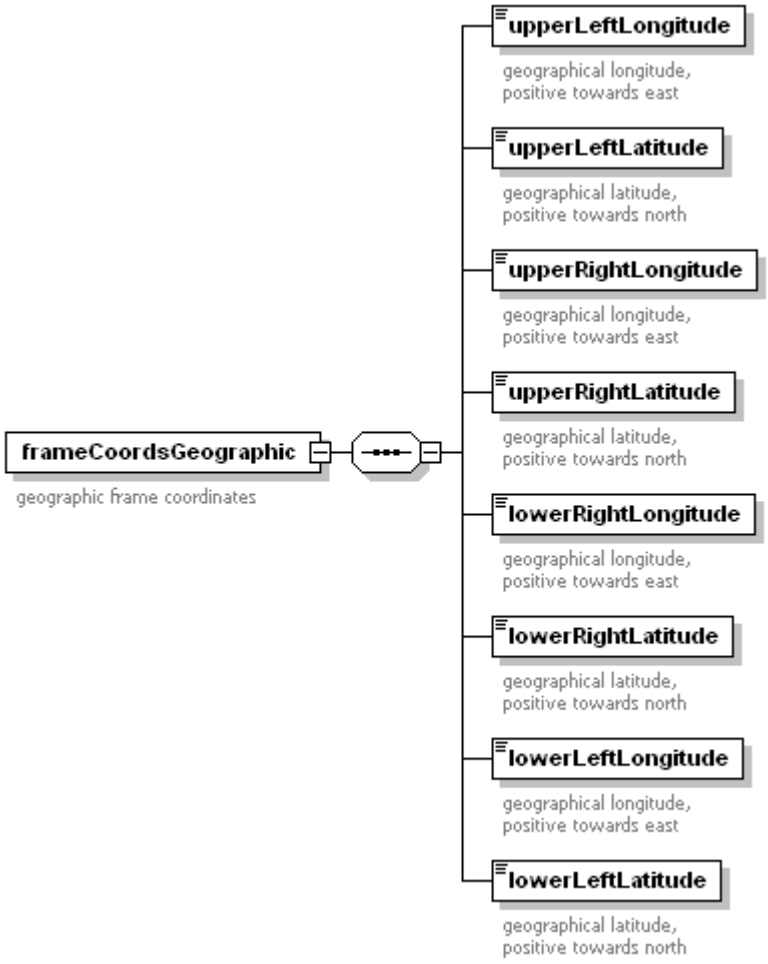
element **level1Product/productSpecific/geocodedImageInfo/geoParameter/pixelSpacing/easting**

diagram	
type	**xs:float**

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/pixelSpacing/northing**

diagram	
type	**xs:float**

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic**

diagram	
annotation	documentation geographic frame coordinates

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/upperLeftLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/upperLeftLatitude

diagram	

type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/upperRightLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/upperRightLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/lowerRightLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/lowerRightLatitude

diagram	

type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

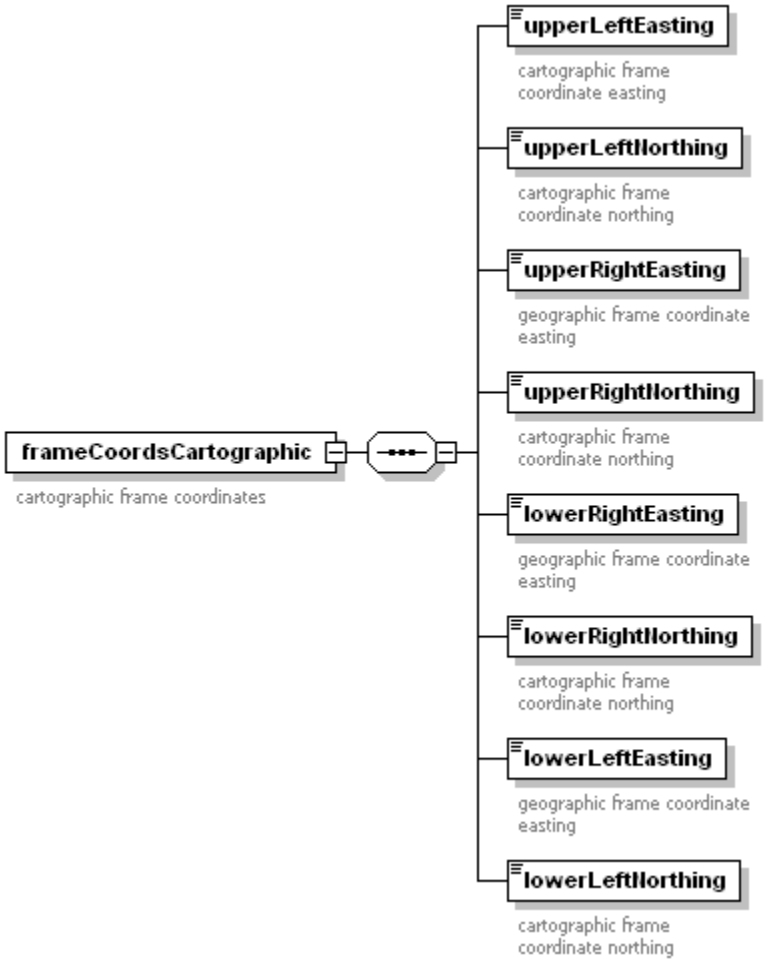
element **level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/lowerLeftLongitude**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsGeographic/lowerLeftLatitude**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic**

diagram	
annotation	documentation cartographic frame coordinates

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/upperLeftEasting

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/upperLeftNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/upperRightEasting

diagram	
type	**xs:double**
annotation	documentation geographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/upperRightNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/lowerRightEasting

diagram	
type	**xs:double**
annotation	documentation geographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/lowerRightNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/lowerLeftEasting

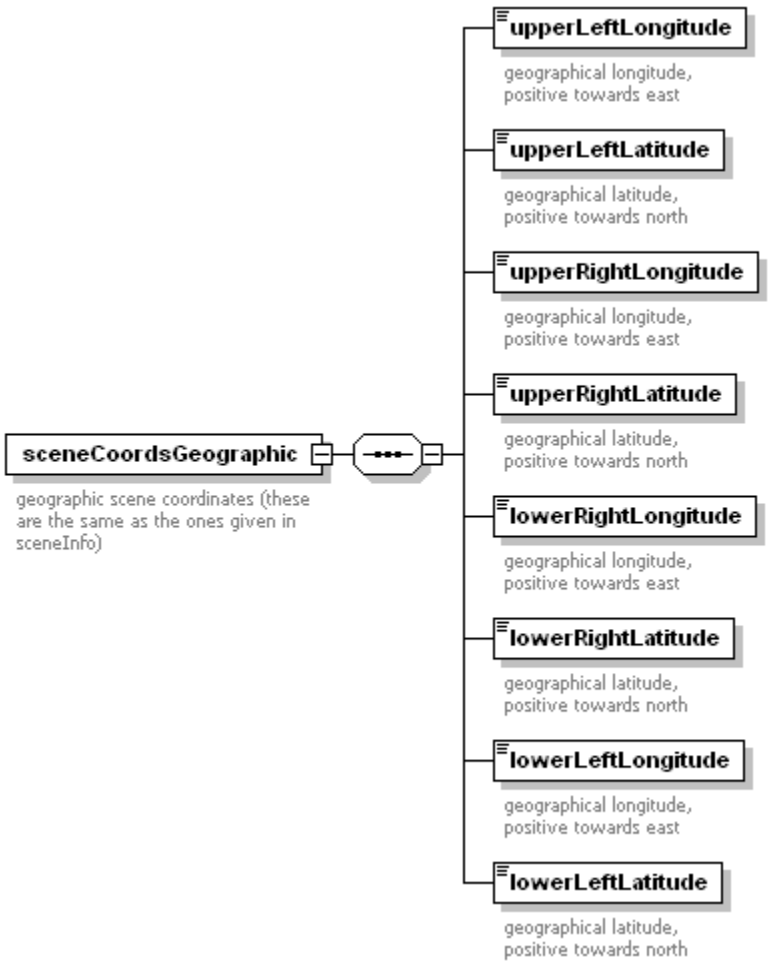
diagram	
type	**xs:double**

annotation	documentation geographic frame coordinate easting

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/frameCoordsCartographic/lowerLeftNorthing**

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic**

diagram	
annotation	documentation geographic scene coordinates (these are the same as the ones given in sceneInfo)

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/upperLeftLongitude**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/upperLeftLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/upperRightLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/upperRightLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/lowerRightLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/lowerRightLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

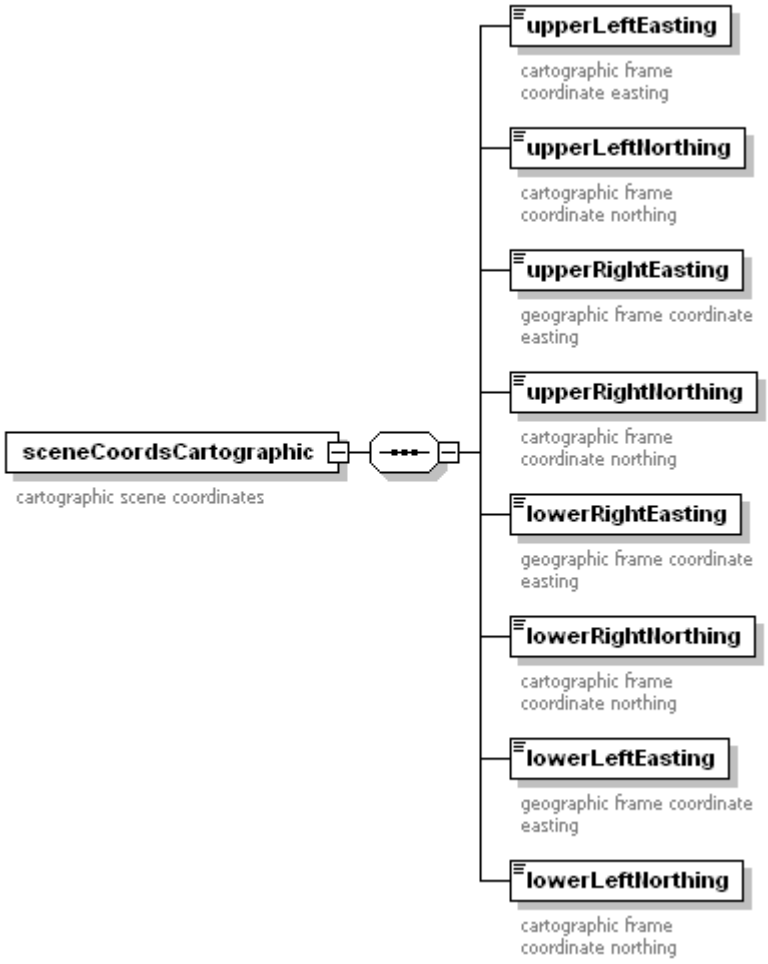
element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/lowerLeftLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsGeographic/lowerLeftLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic**

diagram	
annotation	documentation cartographic scene coordinates

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/upperLeftEasting

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/upperLeftNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/upperRightEasting

diagram	
type	**xs:double**
annotation	documentation geographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/upperRightNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/lowerRightEasting

diagram	
type	**xs:double**
annotation	documentation geographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/lowerRightNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/lowerLeftEasting

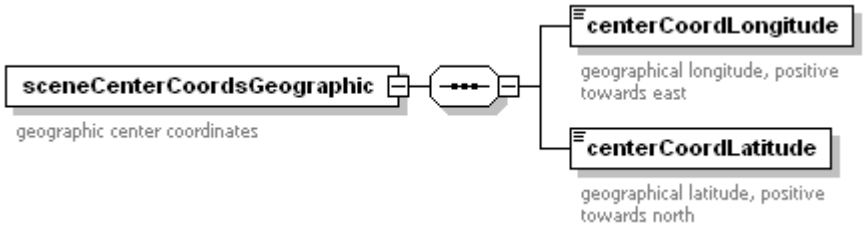
diagram	
type	**xs:double**

annotation	documentation geographic frame coordinate easting

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCoordsCartographic/lowerLeftNorthing

diagram	
type	**xs:double**
annotation	documentation cartographic frame coordinate northing

element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsGeographic

diagram	
annotation	documentation geographic center coordinates

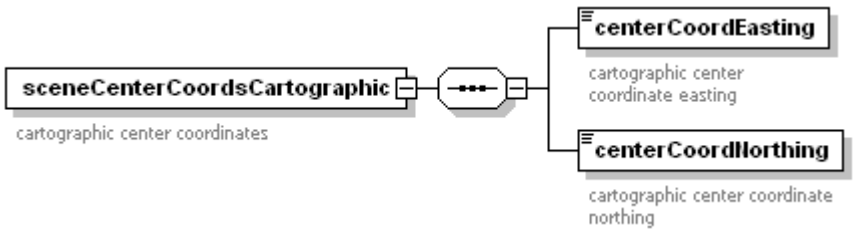
element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsGeographic/centerCoordLongitude

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

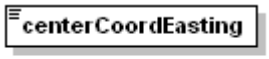
element
level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsGeographic/centerCoordLatitude

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude, positive towards north

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsCartographic**

diagram	
annotation	documentation cartographic center coordinates

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsCartographic/centerCoordEasting**

diagram	
type	**xs:double**
annotation	documentation cartographic center coordinate easting

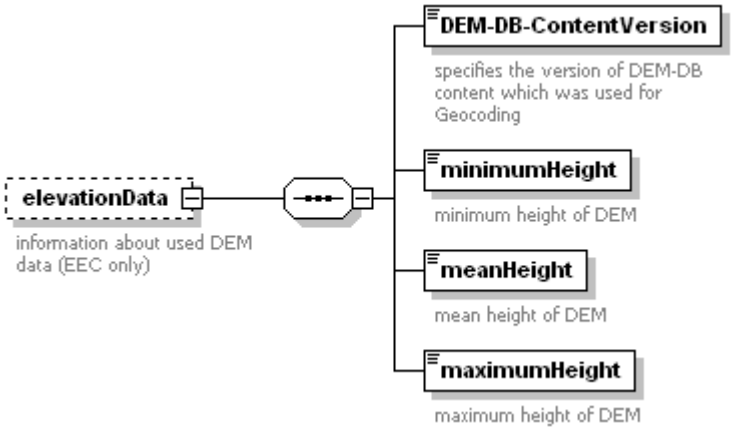
element **level1Product/productSpecific/geocodedImageInfo/geoParameter/sceneCenterCoordsCartographic/centerCoordNorthing**

diagram	
type	**xs:double**
annotation	documentation cartographic center coordinate northing

element **level1Product/productSpecific/geocodedImageInfo/geoParameter/imageResamplingMethod**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation used interpolation for image resampling. One of: NN, BI, CC

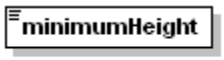
element **level1Product/productSpecific/geocodedImageInfo/elevationData**

diagram	
annotation	documentation information about used DEM data (EEC only)

element **level1Product/productSpecific/geocodedImageInfo/elevationData/DEM-DB-ContentVersion**

diagram	
type	extension of **string80**
facets	maxLength 80
annotation	documentation specifies the version of DEM-DB content which was used for Geocoding

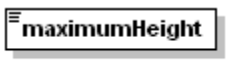
element **level1Product/productSpecific/geocodedImageInfo/elevationData/minimumHeight**

diagram	
type	**xs:float**
annotation	documentation minimum height of DEM

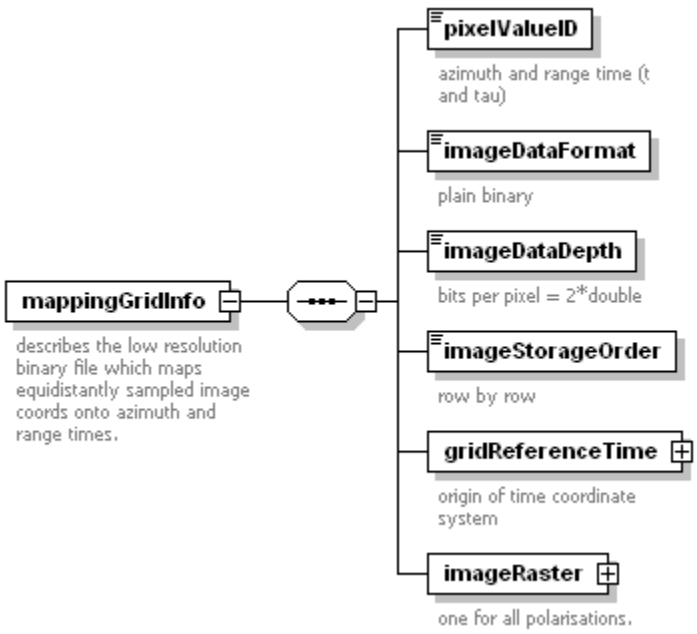
element **level1Product/productSpecific/geocodedImageInfo/elevationData/meanHeight**

diagram	
type	**xs:float**
annotation	documentation mean height of DEM

element **level1Product/productSpecific/geocodedImageInfo/elevationData/maximumHeight**

diagram	
type	**xs:float**
annotation	documentation maximum height of DEM

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo**

diagram	
annotation	documentation describes the low resolution binary file which maps equidistantly sampled image coords onto azimuth and range times.

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/pixelValueID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation azimuth and range time (t and tau)

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageDataFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation plain binary

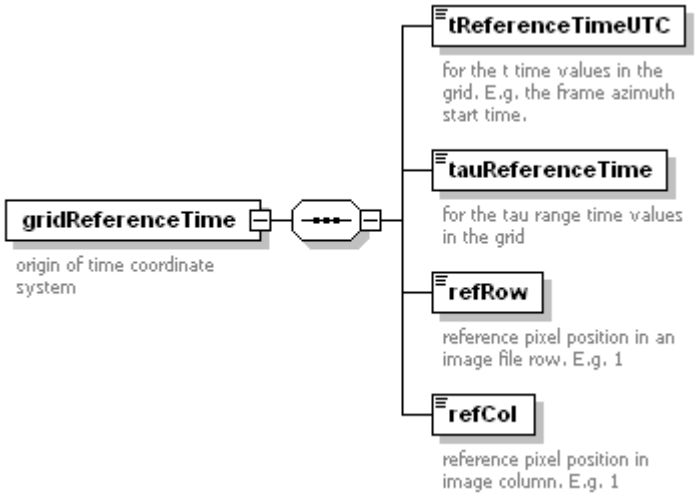
element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageDataDepth**

diagram	
type	**xs:int**
annotation	documentation bits per pixel = 2*double

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageStorageOrder**

diagram	 row by row
type	restriction of **xs:NMTOKENS**
facets	enumeration ROWBYROW enumeration COLBYCOL enumeration UNDEFINED
annotation	documentation row by row

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/gridReferenceTime**

diagram	
annotation	documentation origin of time coordinate system

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/gridReferenceTime/tReferenceTimeUTC**

diagram	 for the t time values in the grid. E.g. the frame azimuth start time.
type	**xs:dateTime**
annotation	documentation for the t time values in the grid. E.g. the frame azimuth start time.

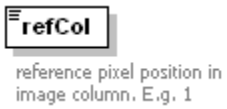
element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/gridReferenceTime/tauReferenceTime**

diagram	 for the tau range time values in the grid
type	**xs:double**
annotation	documentation for the tau range time values in the grid

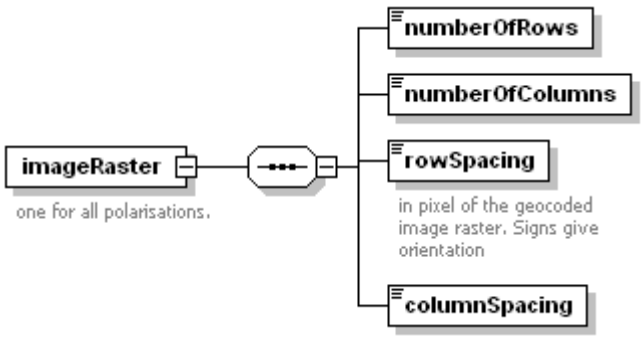
element
level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/gridReferenceTime/refRow

diagram	
type	**xs:long**
annotation	documentation reference pixel position in an image file row. E.g. 1

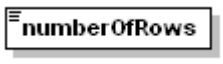
element
level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/gridReferenceTime/refCol

diagram	
type	**xs:long**
annotation	documentation reference pixel position in image column. E.g. 1

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageRaster**

diagram	
annotation	documentation one for all polarisations.

element
level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageRaster/numberOfRows

diagram	
type	**xs:int**

element
level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageRaster/numberOfColumns

diagram	
type	**xs:int**

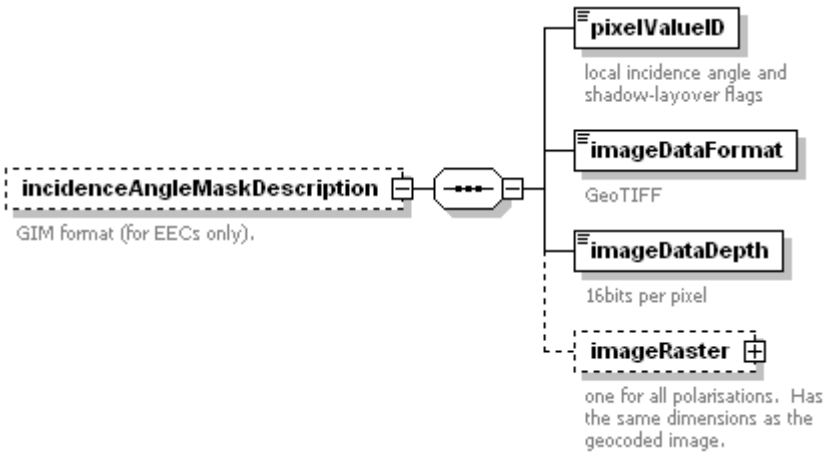
element
level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageRaster/rowSpacing

diagram	rowSpacing in pixel of the geocoded image raster. Signs give orientation
type	**xs:float**
annotation	documentation in pixel of the geocoded image raster. Signs give orientation

element **level1Product/productSpecific/geocodedImageInfo/mappingGridInfo/imageRaster/columnSpacing**

diagram	columnSpacing
type	**xs:float**

element **level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription**

diagram	
annotation	documentation GIM format (for EECs only).

element **level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/pixelValueID**

diagram	pixelValueID local incidence angle and shadow-layover flags
type	**string128**
facets	maxLength 128
annotation	documentation local incidence angle and shadow-layover flags

element **level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageDataFormat**

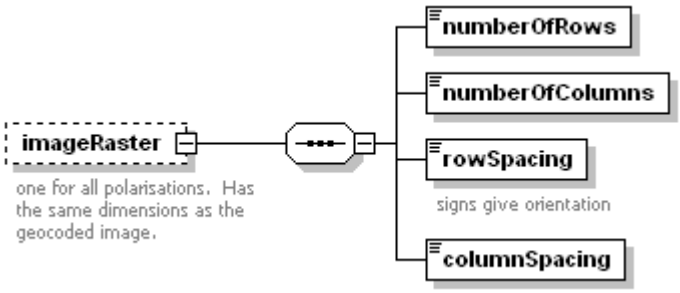
diagram	imageDataFormat GeoTIFF

type	**string255**
facets	maxLength 255
annotation	documentation GeoTIFF

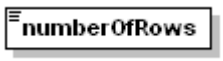
element
level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageDataDepth

diagram	
type	**xs:int**
annotation	documentation 16bits per pixel

element
level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageRaster

diagram	
annotation	documentation one for all polarisations. Has the same dimensions as the geocoded image.

element
level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageRaster/numberOfRows

diagram	
type	**xs:int**

element
level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageRaster/numberOfColumns

diagram	
type	**xs:int**

element
level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageRaster/rowSpacing

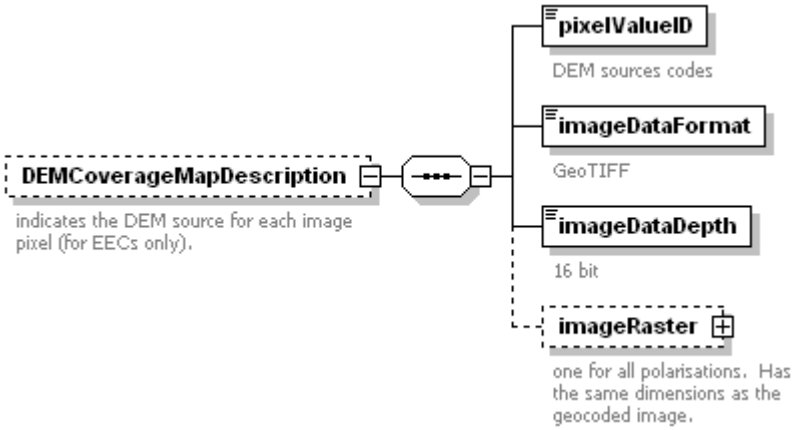
diagram	
type	**xs:float**

annotation	documentation signs give orientation

element **level1Product/productSpecific/geocodedImageInfo/incidenceAngleMaskDescription/imageRaster/columnSpacing**

diagram	
type	**xs:float**

element **level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription**

diagram	
annotation	documentation indicates the DEM source for each image pixel (for EECs only).

element **level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/pixelValueID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation DEM sources codes

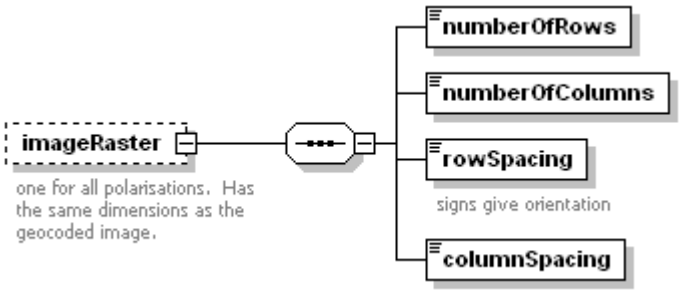
element **level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageDataFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation GeoTIFF

element **level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageDataDepth**

diagram	
type	**xs:int**
annotation	documentation 16 bit

element
level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageRaster

diagram	
annotation	documentation one for all polarisations. Has the same dimensions as the geocoded image.

element
level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageRaster/numberOfRows

diagram	
type	**xs:int**

element
level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageRaster/numberOfColumns

diagram	
type	**xs:int**

element
level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageRaster/rowSpacing

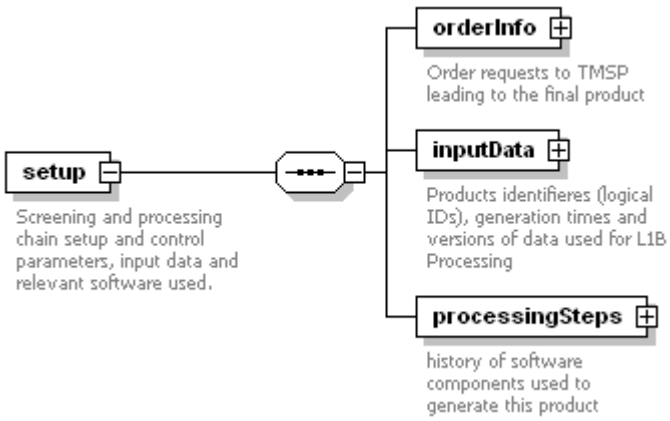
diagram	
type	**xs:float**
annotation	documentation signs give orientation

element
level1Product/productSpecific/geocodedImageInfo/DEMCoverageMapDescription/imageRaster/columnSpacing

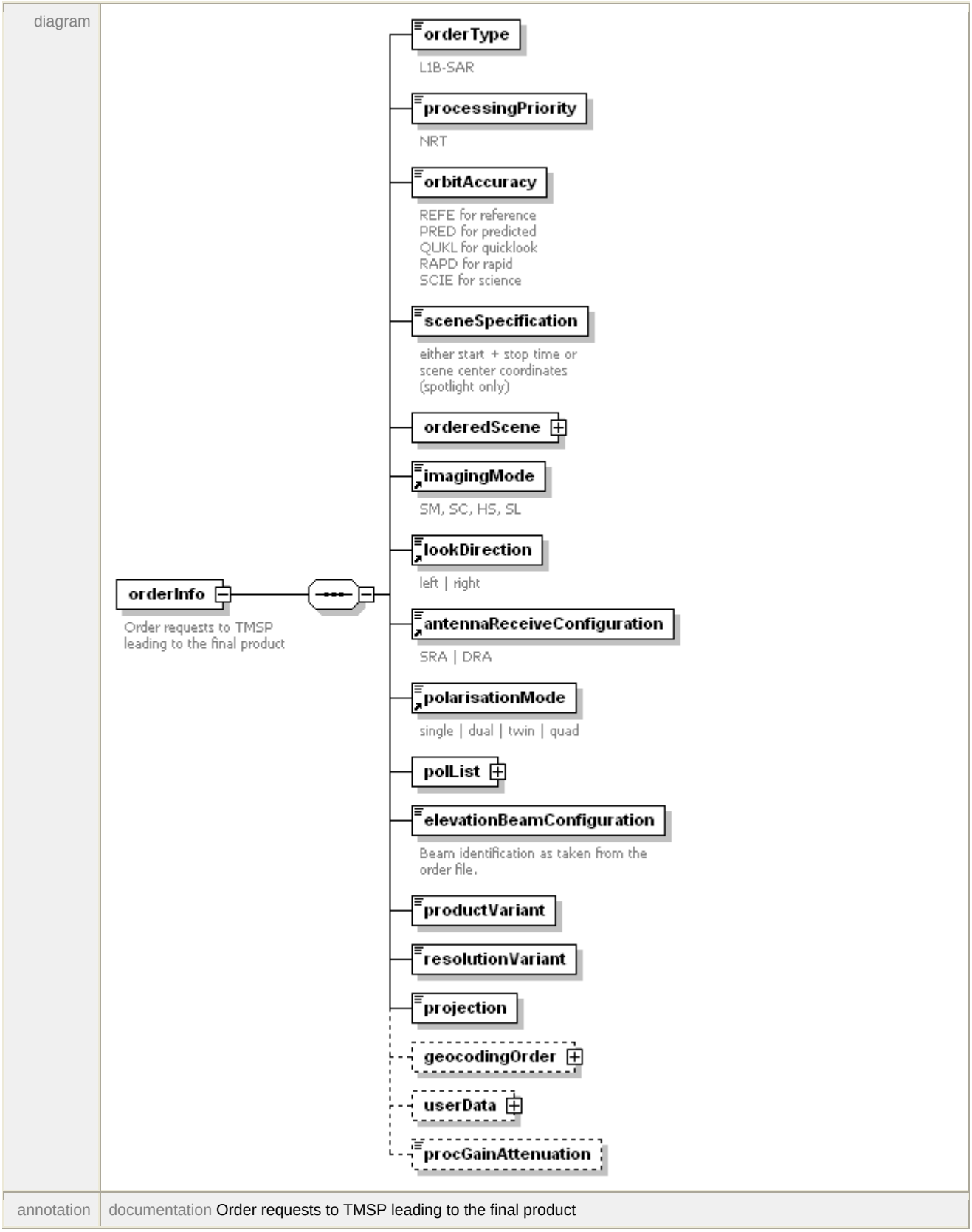
diagram	
type	**xs:float**

6.1.4 Setup

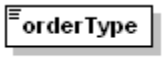
element **level1Product/setup**

diagram	
annotation	documentation Screening and processing chain setup and control parameters, input data and relevant software used.

element **level1Product/setup/orderInfo**



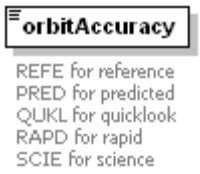
element **level1Product/setup/orderInfo/orderType**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation L1B-SAR

element **level1Product/setup/orderInfo/processingPriority**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation NRT

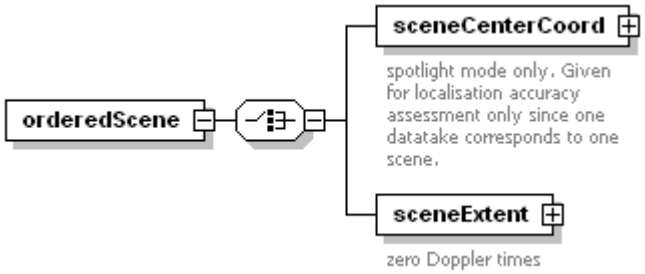
element **level1Product/setup/orderInfo/orbitAccuracy**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration REFE enumeration PRED enumeration QUKL enumeration RAPD enumeration SCIE enumeration UNDEFINED
annotation	documentation REFE for reference PRED for predicted QUKL for quicklook RAPD for rapid SCIE for science

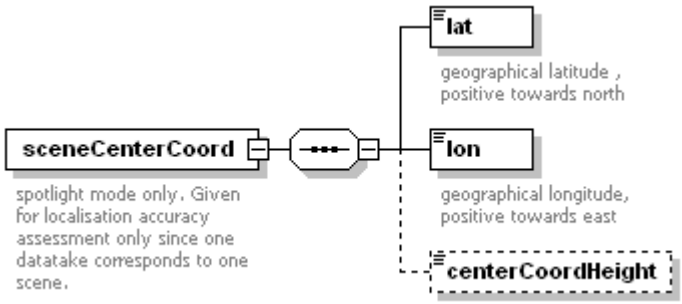
element **level1Product/setup/orderInfo/sceneSpecification**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration TIME enumeration CENTERCOORDS enumeration UNDEFINED
annotation	documentation either start + stop time or scene center coordinates (spotlight only)

element **level1Product/setup/orderInfo/orderedScene**

diagram	

element **level1Product/setup/orderInfo/orderedScene/sceneCenterCoord**

diagram	
annotation	documentation spotlight mode only. Given for localisation accuracy assessment only since one datatake corresponds to one scene.

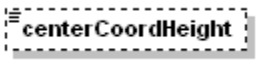
element **level1Product/setup/orderInfo/orderedScene/sceneCenterCoord/lat**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude , positive towards north

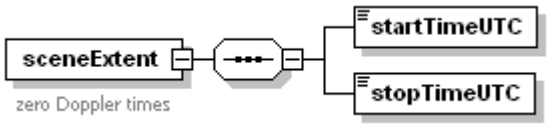
element **level1Product/setup/orderInfo/orderedScene/sceneCenterCoord/lon**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude, positive towards east

element **level1Product/setup/orderInfo/orderedScene/sceneCenterCoord/centerCoordHeight**

diagram	
type	**xs:double**

element **level1Product/setup/orderInfo/orderedScene/sceneExtent**

diagram	
annotation	documentation zero Doppler times

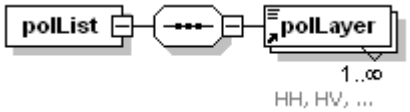
element **level1Product/setup/orderInfo/orderedScene/sceneExtent/startTimeUTC**

diagram	
type	**xs:dateTime**

element **level1Product/setup/orderInfo/orderedScene/sceneExtent/stopTimeUTC**

diagram	
type	**xs:dateTime**

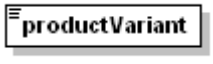
element **level1Product/setup/orderInfo/polList**

diagram	

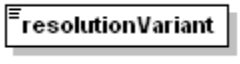
element **level1Product/setup/orderInfo/elevationBeamConfiguration**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Beam identification as taken from the order file.

element **level1Product/setup/orderInfo/productVariant**

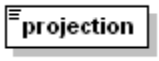
diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SSC enumeration MGD enumeration GEC enumeration EEC enumeration UNDEFINED

element **level1Product/setup/orderInfo/resolutionVariant**

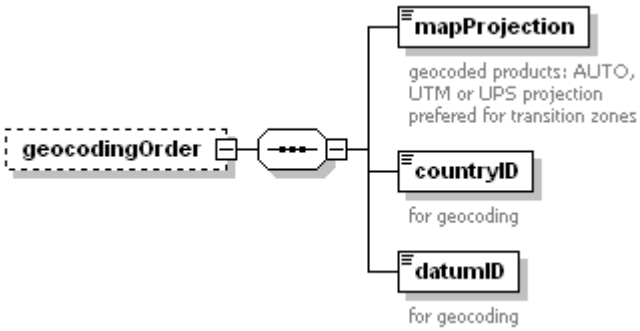
diagram	

type	restriction of **xs:NMTOKENS**
facets	enumeration SE enumeration RE enumeration UNDEFINED

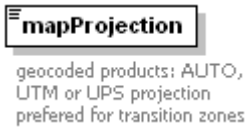
element **level1Product/setup/orderInfo/projection**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration GROUNDRANGE enumeration SLANTRANGE enumeration UNDEFINED enumeration MAP

element **level1Product/setup/orderInfo/geocodingOrder**

diagram	

element **level1Product/setup/orderInfo/geocodingOrder/mapProjection**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration UTM enumeration UPS enumeration UNDEFINED enumeration AUTO
annotation	documentation geocoded products: AUTO, UTM or UPS projection prefered for transition zones

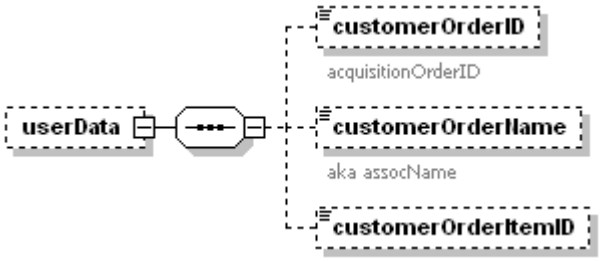
element **level1Product/setup/orderInfo/geocodingOrder/countryID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation for geocoding

element **level1Product/setup/orderInfo/geocodingOrder/datumID**

diagram	datumID for geocoding
type	**string128**
facets	maxLength 128
annotation	documentation for geocoding

element **level1Product/setup/orderInfo/userData**

diagram	

element **level1Product/setup/orderInfo/userData/customerOrderID**

diagram	customerOrderID acquisitionOrderID
type	**xs:string**
annotation	documentation acquisitionOrderID

element **level1Product/setup/orderInfo/userData/customerOrderName**

diagram	customerOrderName aka assocName
type	**xs:string**
annotation	documentation aka assocName

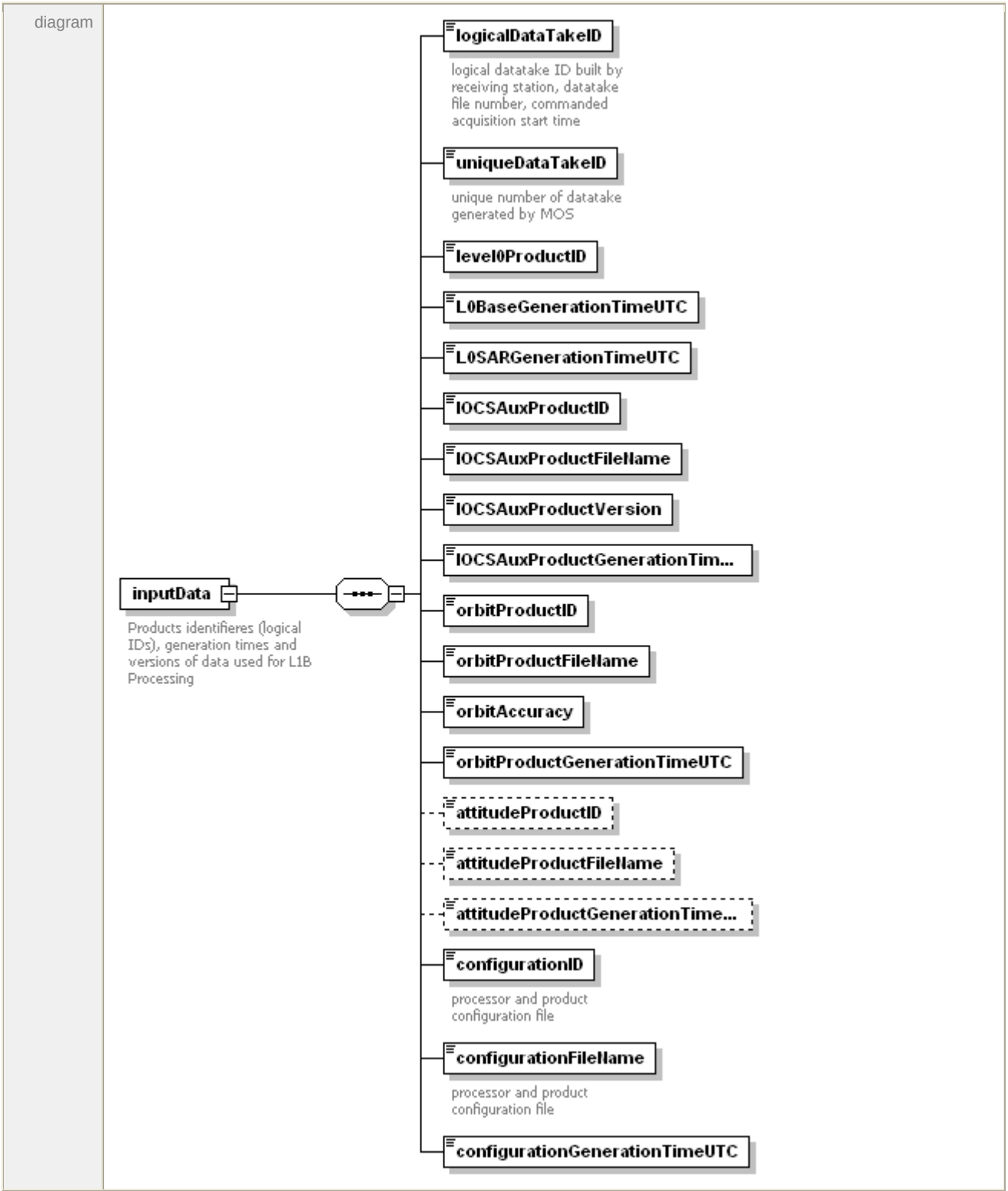
element **level1Product/setup/orderInfo/userData/customerOrderItemID**

diagram	customerOrderItemID
type	**xs:string**

element **level1Product/setup/orderInfo/procGainAttenuation**

diagram	procGainAttenuation
type	**xs:double**

element **level1Product/setup/inputData**



element **level1Product/setup/inputData/logicalDataTakeID**

diagram	**logicalDataTakeID** logical datatake ID built by receiving station, datatake file number, commanded acquisition start time
type	**string1024**
facets	maxLength 1024
annotation	documentation logical datatake ID built by receiving station, datatake file number, commanded acquisition start time

element **level1Product/setup/inputData/uniqueDataTakeID**

diagram	**uniqueDataTakeID** unique number of datatake generated by MOS
type	**string1024**
facets	maxLength 1024
annotation	documentation unique number of datatake generated by MOS

element **level1Product/setup/inputData/level0ProductID**

diagram	**level0ProductID**
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/L0BaseGenerationTimeUTC**

diagram	**L0BaseGenerationTimeUTC**
type	**xs:dateTime**

element **level1Product/setup/inputData/L0SARGenerationTimeUTC**

diagram	**L0SARGenerationTimeUTC**
type	**xs:dateTime**

element **level1Product/setup/inputData/IOCSAuxProductID**

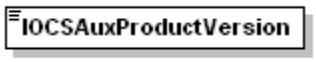
diagram	**IOCSAuxProductID**
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/IOCSAuxProductFileName**

diagram	**IOCSAuxProductFileName**

type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/IOCSAuxProductVersion**

diagram	
type	**string80**
facets	maxLength 80

element **level1Product/setup/inputData/IOCSAuxProductGenerationTimeUTC**

diagram	
type	**xs:dateTime**

element **level1Product/setup/inputData/orbitProductID**

diagram	
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/orbitProductFileName**

diagram	
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/orbitAccuracy**

diagram	
type	restriction of **xs:string**
facets	maxLength 20 enumeration REFE enumeration PRED enumeration QUKL enumeration RAPD enumeration SCIE

element **level1Product/setup/inputData/orbitProductGenerationTimeUTC**

diagram	
type	**xs:dateTime**

element **level1Product/setup/inputData/attitudeProductID**

diagram	attitudeProductID
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/attitudeProductFileName**

diagram	attitudeProductFileName
type	**string1024**
facets	maxLength 1024

element **level1Product/setup/inputData/attitudeProductGenerationTimeUTC**

diagram	attitudeProductGenerationTime...
type	**xs:dateTime**

element **level1Product/setup/inputData/configurationID**

diagram	configurationID processor and product configuration file
type	**string1024**
facets	maxLength 1024
annotation	documentation processor and product configuration file

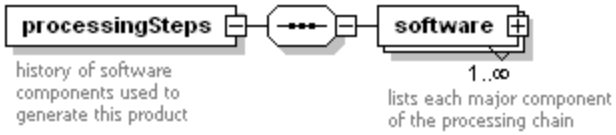
element **level1Product/setup/inputData/configurationFileName**

diagram	configurationFileName processor and product configuration file
type	**string1024**
facets	maxLength 1024
annotation	documentation processor and product configuration file

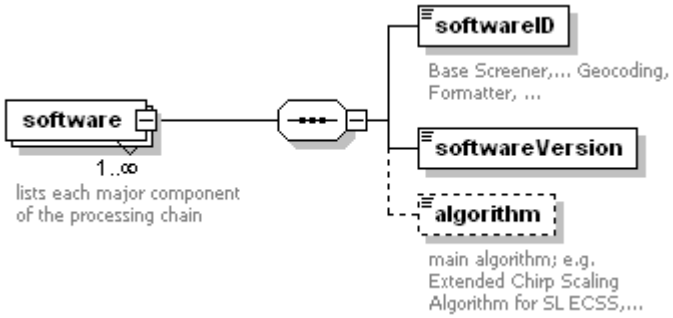
element **level1Product/setup/inputData/configurationGenerationTimeUTC**

diagram	configurationGenerationTimeUTC
type	**xs:dateTime**

element **level1Product/setup/processingSteps**

diagram	
annotation	documentation history of software components used to generate this product

element **level1Product/setup/processingSteps/software**

diagram	
annotation	documentation lists each major component of the processing chain

element **level1Product/setup/processingSteps/software/softwareID**

diagram	
type	**string128**
facets	maxLength 128
annotation	documentation Base Screener,... Geocoding, Formatter, ...

element **level1Product/setup/processingSteps/software/softwareVersion**

diagram	
type	**string128**
facets	maxLength 128

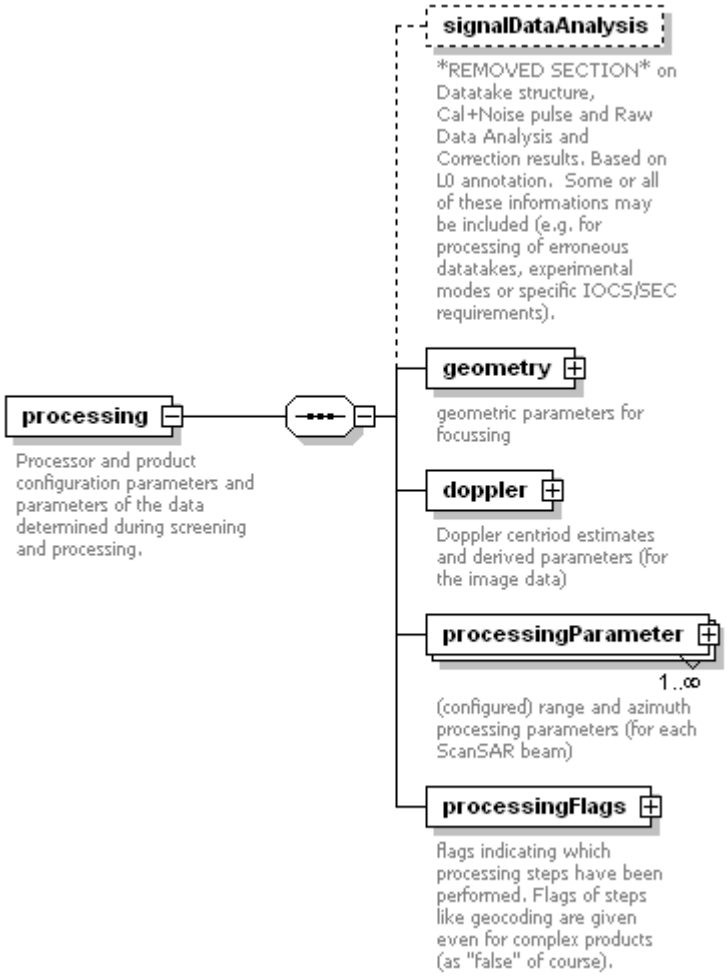
element **level1Product/setup/processingSteps/software/algorithm**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation main algorithm; e.g. Extended Chirp Scaling Algorithm for SL ECSS,...

6.1.5 Processing

element **level1Product/processing**

diagram



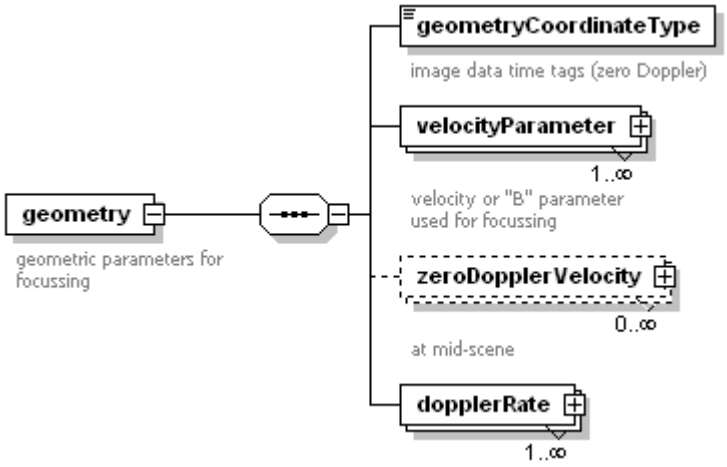
annotation — documentation: Processor and product configuration parameters and parameters of the data determined during screening and processing.

element **level1Product/processing/signalDataAnalysis**

diagram

annotation — documentation: *REMOVED SECTION* on Datatake structure, Cal+Noise pulse and Raw Data Analysis and Correction results. Based on L0 annotation. Some or all of these informations may be included (e.g. for processing of erroneous datatakes, experimental modes or specific IOCS/SEC requirements).

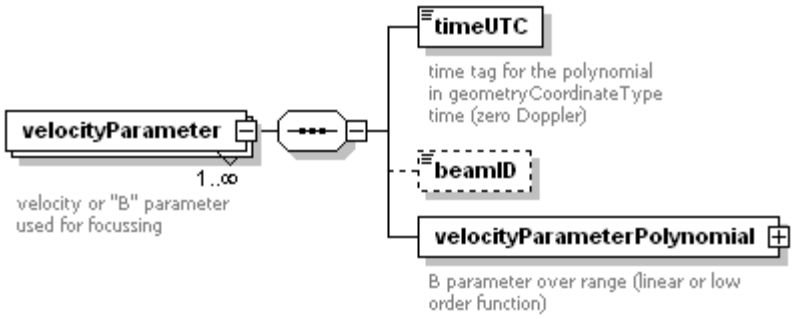
element **level1Product/processing/geometry**

diagram	
annotation	documentation geometric parameters for focussing

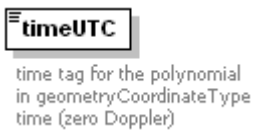
element **level1Product/processing/geometry/geometryCoordinateType**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation image data time tags (zero Doppler)

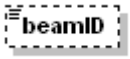
element **level1Product/processing/geometry/velocityParameter**

diagram	
annotation	documentation velocity or "B" parameter used for focussing

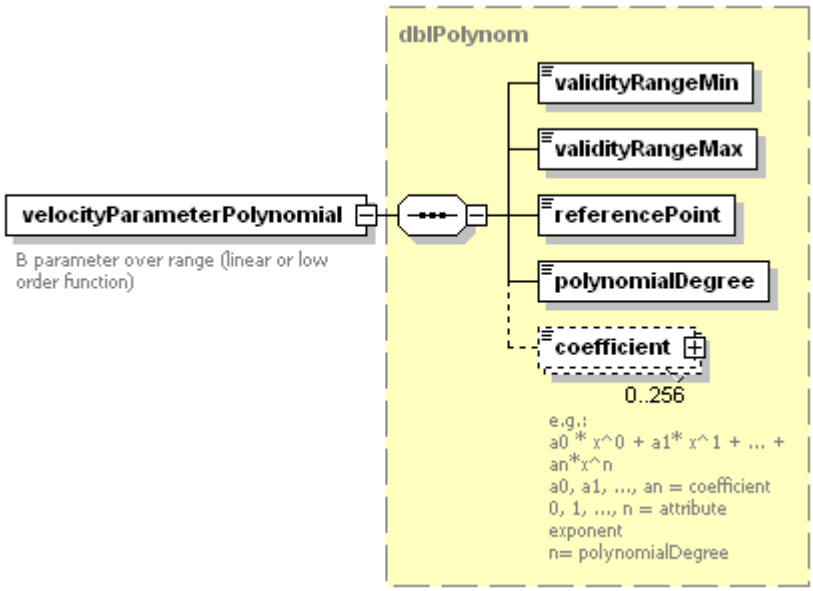
element **level1Product/processing/geometry/velocityParameter/timeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation time tag for the polynomial in geometryCoordinateType time (zero Doppler)

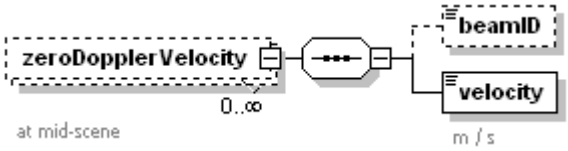
element **level1Product/processing/geometry/velocityParameter/beamID**

diagram	
type	**string20**
facets	maxLength 20

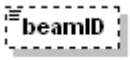
element **level1Product/processing/geometry/velocityParameter/velocityParameterPolynomial**

diagram	
type	**dblPolynom**
annotation	documentation B parameter over range (linear or low order function)

element **level1Product/processing/geometry/zeroDopplerVelocity**

diagram	
annotation	documentation at mid-scene

element **level1Product/processing/geometry/zeroDopplerVelocity/beamID**

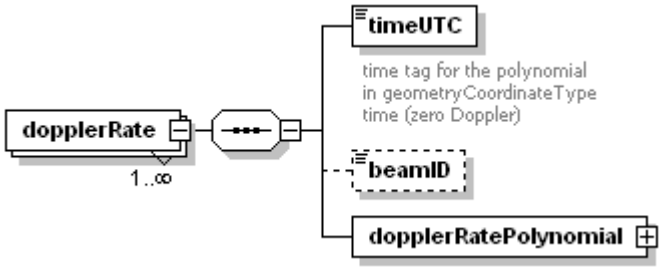
diagram	
type	**string20**
facets	maxLength 20

element **level1Product/processing/geometry/zeroDopplerVelocity/velocity**

diagram	
type	**xs:double**

annotation	documentation m / s

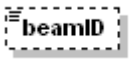
element **level1Product/processing/geometry/dopplerRate**

diagram	

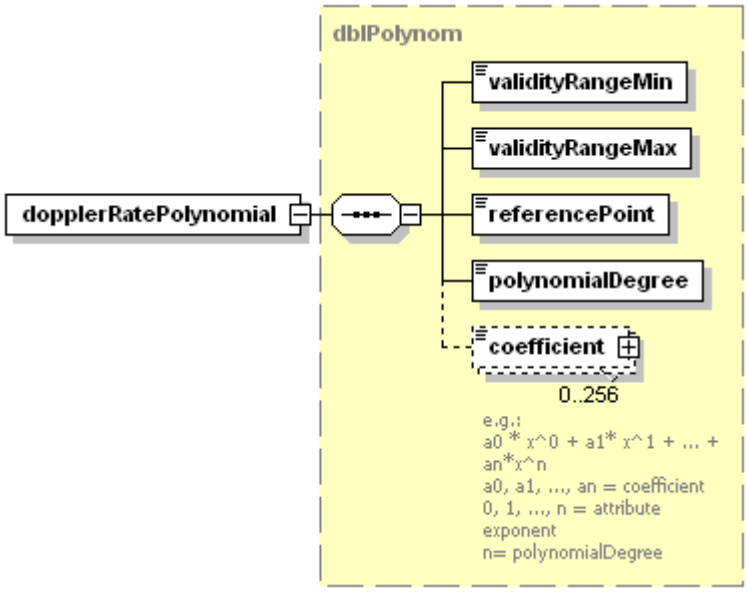
element **level1Product/processing/geometry/dopplerRate/timeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation time tag for the polynomial in geometryCoordinateType time (zero Doppler)

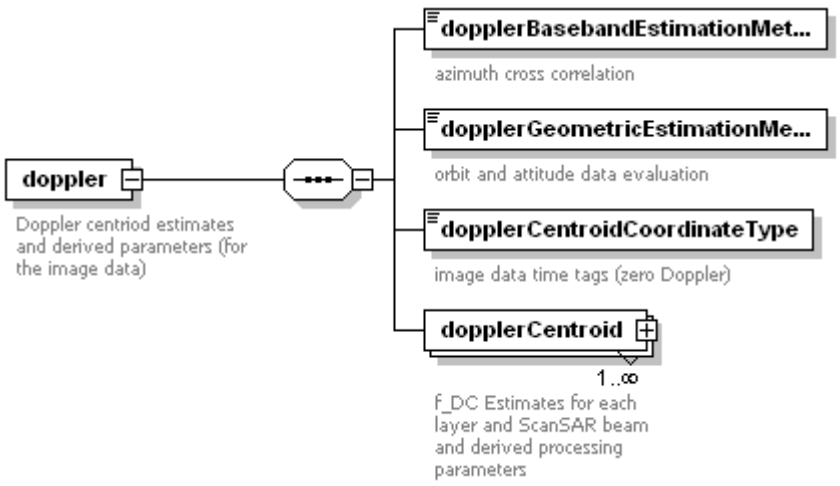
element **level1Product/processing/geometry/dopplerRate/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/processing/geometry/dopplerRate/dopplerRatePolynomial**

diagram	
type	**dblPolynom**

element **level1Product/processing/doppler**

diagram	
annotation	documentation Doppler centriod estimates and derived parameters (for the image data)

element **level1Product/processing/doppler/dopplerBasebandEstimationMethod**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation azimuth cross correlation

element **level1Product/processing/doppler/dopplerGeometricEstimationMethod**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation orbit and attitude data evaluation

element **level1Product/processing/doppler/dopplerCentroidCoordinateType**

diagram	
type	restriction of **string20**
facets	maxLength 20 enumeration RAW enumeration ZERODOPPLER enumeration UNDEFINED
annotation	documentation image data time tags (zero Doppler)

element **level1Product/processing/doppler/dopplerCentroid**

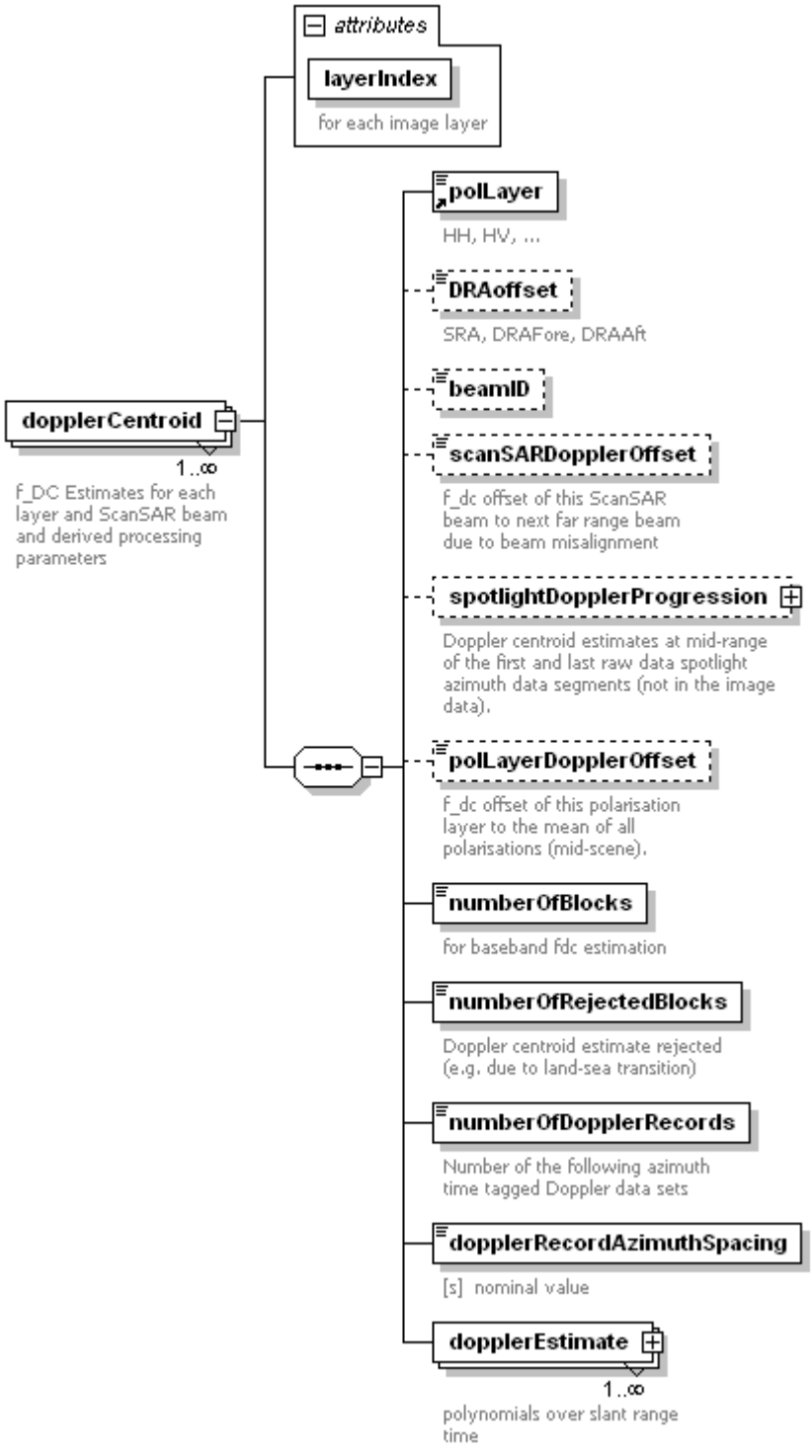
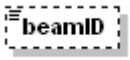


diagram					
attributes	Name	Type	Use	Default Fixed	Annotation
	layerIndex	**xs:int**	required		documentation for each image layer
annotation	documentation f_DC Estimates for each layer and ScanSAR beam and derived processing parameters				

element **level1Product/processing/doppler/dopplerCentroid/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

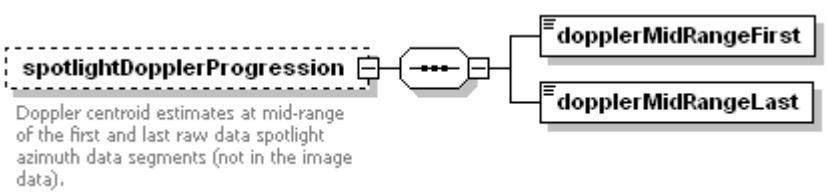
element **level1Product/processing/doppler/dopplerCentroid/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/processing/doppler/dopplerCentroid/scanSARDopplerOffset**

diagram	
type	**xs:double**
annotation	documentation f_dc offset of this ScanSAR beam to next far range beam due to beam misalignment

element **level1Product/processing/doppler/dopplerCentroid/spotlightDopplerProgression**

diagram	
annotation	documentation Doppler centroid estimates at mid-range of the first and last raw data spotlight azimuth data segments (not in the image data).

element **level1Product/processing/doppler/dopplerCentroid/spotlightDopplerProgression/dopplerMidRangeFirst**

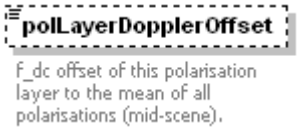
diagram	
type	**xs:double**

element **level1Product/processing/doppler/dopplerCentroid/spotlightDopplerProgression/dopplerMidRangeLast**

diagram	

type	**xs:double**

element **level1Product/processing/doppler/dopplerCentroid/polLayerDopplerOffset**

diagram	
type	**xs:double**
annotation	documentation f_dc offset of this polarisation layer to the mean of all polarisations (mid-scene).

element **level1Product/processing/doppler/dopplerCentroid/numberOfBlocks**

diagram	
type	**xs:int**
annotation	documentation for baseband fdc estimation

element **level1Product/processing/doppler/dopplerCentroid/numberOfRejectedBlocks**

diagram	
type	**xs:int**
annotation	documentation Doppler centroid estimate rejected (e.g. due to land-sea transition)

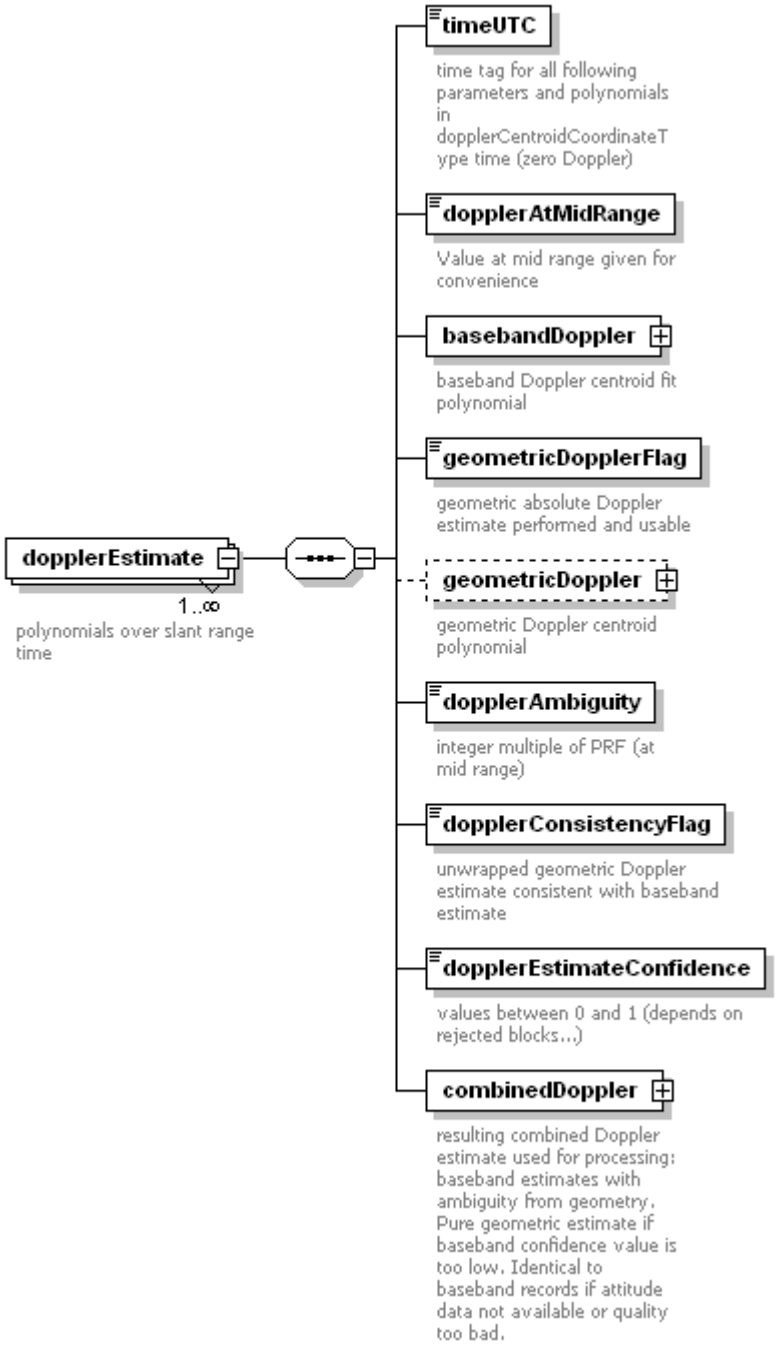
element **level1Product/processing/doppler/dopplerCentroid/numberOfDopplerRecords**

diagram	
type	**xs:int**
annotation	documentation Number of the following azimuth time tagged Doppler data sets

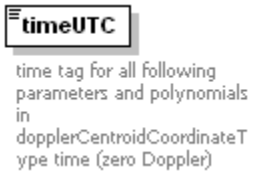
element **level1Product/processing/doppler/dopplerCentroid/dopplerRecordAzimuthSpacing**

diagram	
type	**xs:float**
annotation	documentation [s] nominal value

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate**

diagram	
annotation	documentation polynomials over slant range time

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/timeUTC**

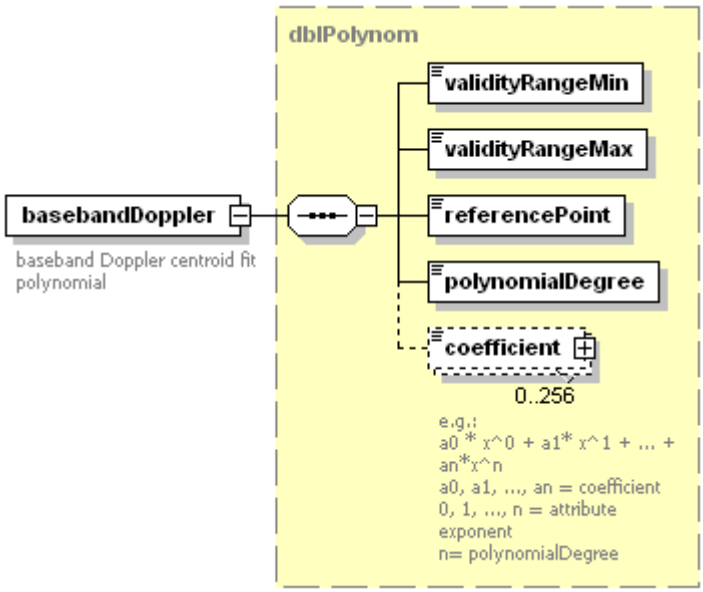
diagram	
type	**xs:dateTime**

annotation	documentation time tag for all following parameters and polynomials in dopplerCentroidCoordinateType time (zero Doppler)

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/dopplerAtMidRange**

diagram	
type	**xs:double**
annotation	documentation Value at mid range given for convenience

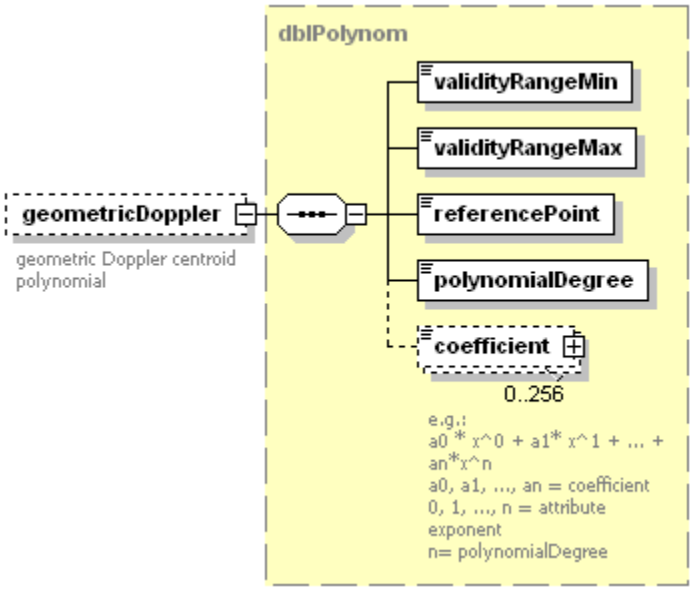
element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/basebandDoppler**

diagram	
type	**dblPolynom**
annotation	documentation baseband Doppler centroid fit polynomial

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/geometricDopplerFlag**

diagram	
type	**xs:boolean**
annotation	documentation geometric absolute Doppler estimate performed and usable

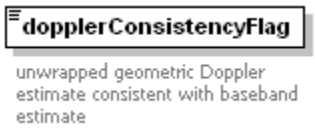
element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/geometricDoppler**

diagram	
type	**dblPolynom**
annotation	documentation geometric Doppler centroid polynomial

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/dopplerAmbiguity**

diagram	
type	**xs:int**
annotation	documentation integer multiple of PRF (at mid range)

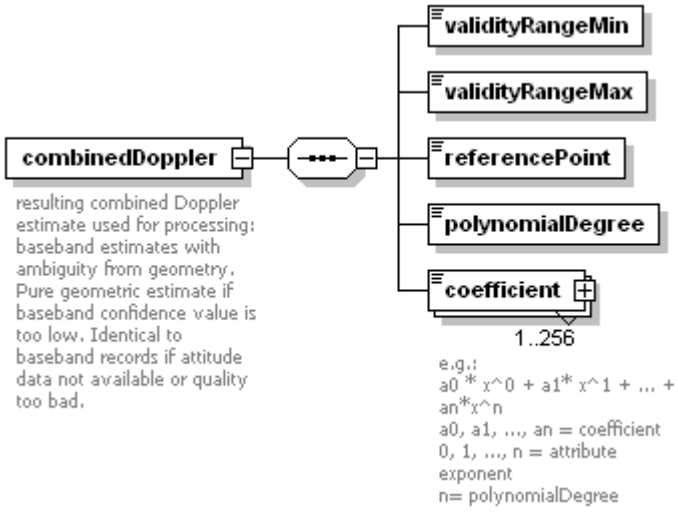
element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/dopplerConsistencyFlag**

diagram	
type	**xs:boolean**
annotation	documentation unwrapped geometric Doppler estimate consistent with baseband estimate

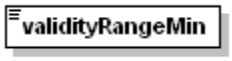
element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/dopplerEstimateConfidence**

diagram	
type	**xs:float**
annotation	documentation values between 0 and 1 (depends on rejected blocks...)

element **level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler**

diagram	
annotation	documentation resulting combined Doppler estimate used for processing: baseband estimates with ambiguity from geometry. Pure geometric estimate if baseband confidence value is too low. Identical to baseband records if attitude data not available or quality too bad.

element
level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler/validityRangeMin

diagram	
type	**xs:double**

element
level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler/validityRangeMax

diagram	
type	**xs:double**

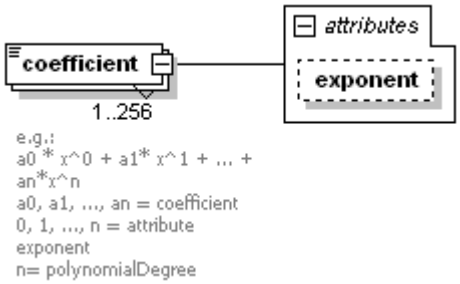
element
level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler/referencePoint

diagram	
type	**xs:double**

element
level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler/polynomialDegree

diagram	
type	**xs:unsignedInt**

element
level1Product/processing/doppler/dopplerCentroid/dopplerEstimate/combinedDoppler/coefficient

diagram	
type	extension of **xs:double**
attributes	Name: exponent Type: **xs:unsignedInt** Use: Default: Fixed: Annotation:
annotation	documentation: e.g.: a0 * x^0 + a1* x^1 + ... + an*x^n a0, a1, ..., an = coefficient 0, 1, ..., n = attribute exponent n= polynomialDegree

element **level1Product/processing/processingParameter**

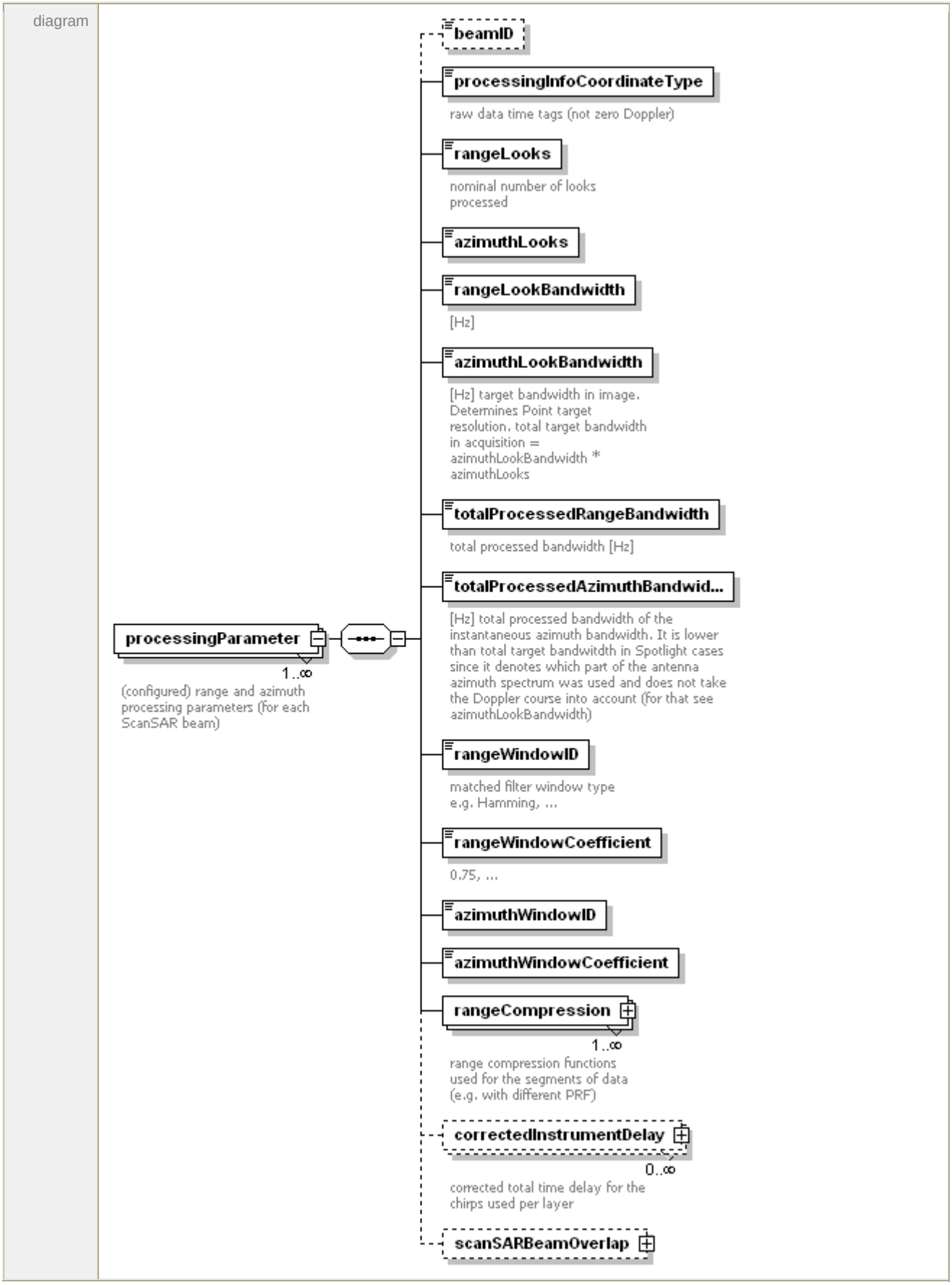
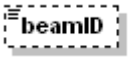


diagram
processingParameter
1..∞
(configured) range and azimuth processing parameters (for each ScanSAR beam)
beamID
processingInfoCoordinateType
raw data time tags (not zero Doppler)
rangeLooks
nominal number of looks processed
azimuthLooks
rangeLookBandwidth
[Hz]
azimuthLookBandwidth
[Hz] target bandwidth in image. Determines Point target resolution. total target bandwidth in acquisition = azimuthLookBandwidth * azimuthLooks
totalProcessedRangeBandwidth
total processed bandwidth [Hz]
totalProcessedAzimuthBandwid...
[Hz] total processed bandwidth of the instantaneous azimuth bandwidth. It is lower than total target bandwitdth in Spotlight cases since it denotes which part of the antenna azimuth spectrum was used and does not take the Doppler course into account (for that see azimuthLookBandwidth)
rangeWindowID
matched filter window type e.g. Hamming, ...
rangeWindowCoefficient
0.75, ...
azimuthWindowID
azimuthWindowCoefficient
rangeCompression
1..∞
range compression functions used for the segments of data (e.g. with different PRF)
correctedInstrumentDelay
0..∞
corrected total time delay for the chirps used per layer
scanSARBeamOverlap

annotation	documentation (configured) range and azimuth processing parameters (for each ScanSAR beam)

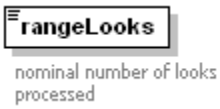
element **level1Product/processing/processingParameter/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/processing/processingParameter/processingInfoCoordinateType**

diagram	
type	restriction of **string20**
facets	maxLength 20 enumeration RAW enumeration ZERODOPPLER enumeration UNDEFINED
annotation	documentation raw data time tags (not zero Doppler)

element **level1Product/processing/processingParameter/rangeLooks**

diagram	
type	**xs:float**
annotation	documentation nominal number of looks processed

element **level1Product/processing/processingParameter/azimuthLooks**

diagram	
type	**xs:float**

element **level1Product/processing/processingParameter/rangeLookBandwidth**

diagram	
type	**xs:double**
annotation	documentation [Hz]

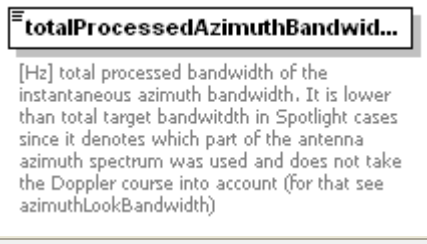
element **level1Product/processing/processingParameter/azimuthLookBandwidth**

diagram	
type	**xs:double**
annotation	documentation [Hz] target bandwidth in image. Determines Point target resolution. total target bandwidth in acquisition = azimuthLookBandwidth * azimuthLooks

element **level1Product/processing/processingParameter/totalProcessedRangeBandwidth**

diagram	
type	**xs:double**
annotation	documentation total processed bandwidth [Hz]

element **level1Product/processing/processingParameter/totalProcessedAzimuthBandwidth**

diagram	
type	**xs:double**
annotation	documentation [Hz] total processed bandwidth of the instantaneous azimuth bandwidth. It is lower than total target bandwitdth in Spotlight cases since it denotes which part of the antenna azimuth spectrum was used and does not take the Doppler course into account (for that see azimuthLookBandwidth)

element **level1Product/processing/processingParameter/rangeWindowID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation matched filter window type e.g. Hamming, ...

element **level1Product/processing/processingParameter/rangeWindowCoefficient**

diagram	
type	**xs:float**
annotation	documentation 0.75, ...

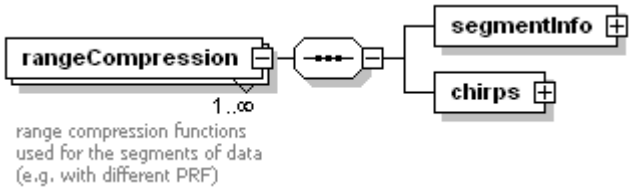
element **level1Product/processing/processingParameter/azimuthWindowID**

diagram	
type	**string20**
facets	maxLength 20

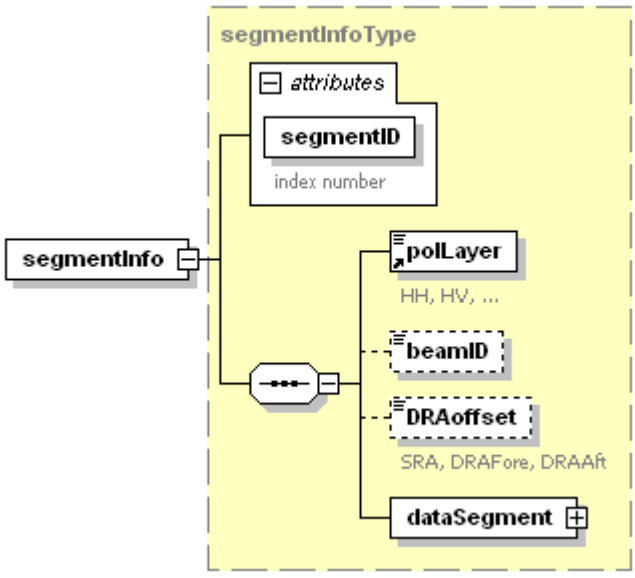
element **level1Product/processing/processingParameter/azimuthWindowCoefficient**

diagram	
type	**xs:float**

element **level1Product/processing/processingParameter/rangeCompression**

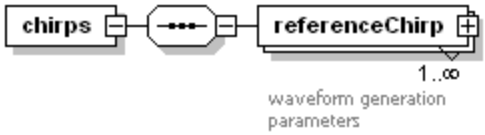
diagram	
annotation	documentation range compression functions used for the segments of data (e.g. with different PRF)

element **level1Product/processing/processingParameter/rangeCompression/segmentInfo**

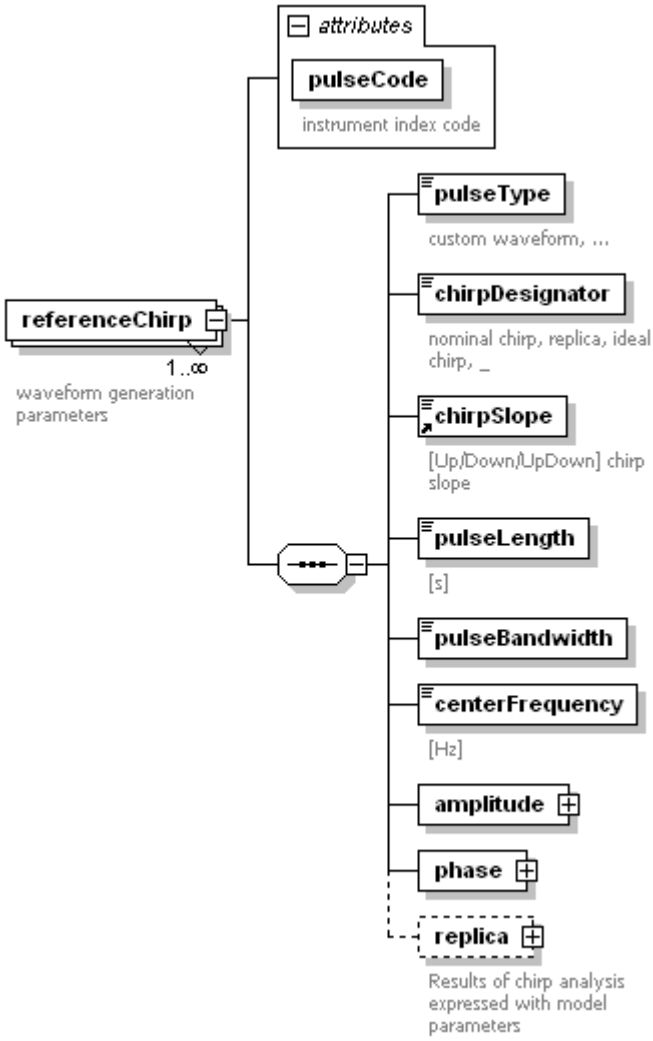
diagram	
type	**segmentInfoType**

attributes	Name	Type	Use	Default	Fixed	Annotation
	segmentID	**xs:int**	required			documentation index number

element **level1Product/processing/processingParameter/rangeCompression/chirps**

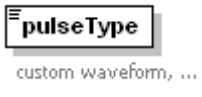
diagram	

element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp**

diagram	

attributes	Name	Type	Use	Default	Fixed	Annotation
	pulseCode	**xs:int**	required			documentation instrument index code
annotation	documentation waveform generation parameters					

element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/pulseType**

diagram	
type	**string80**
facets	maxLength 80

annotation	documentation custom waveform, ...

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/chirpDesignator

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration IDEAL enumeration NOMINAL enumeration REPLICA enumeration MODEL enumeration CUSTOM enumeration UNDEFINED
annotation	documentation nominal chirp, replica, ideal chirp, _

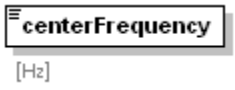
element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/pulseLength

diagram	
type	**xs:double**
annotation	documentation [s]

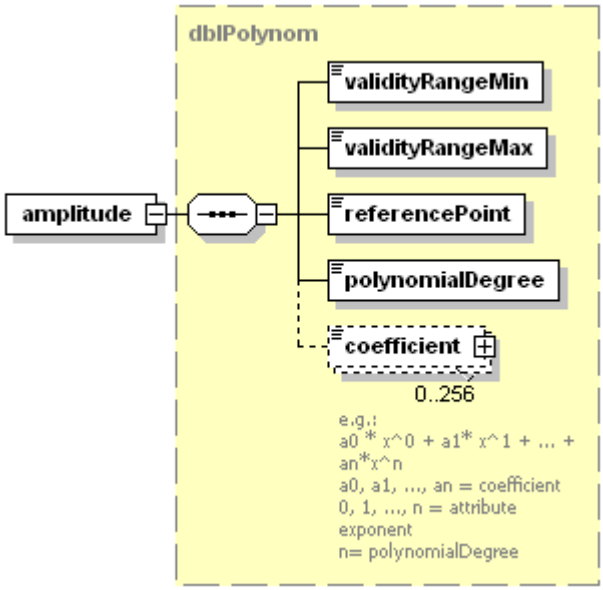
element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/pulseBandwidth

diagram	
type	**xs:double**

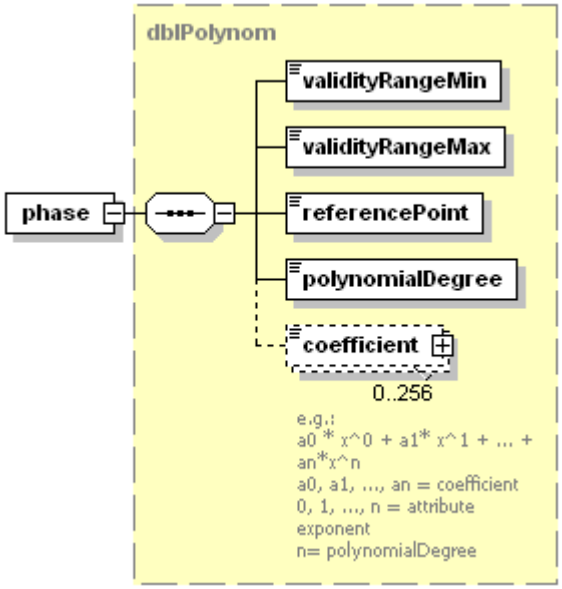
element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/centerFrequency

diagram	
type	**xs:double**
annotation	documentation [Hz]

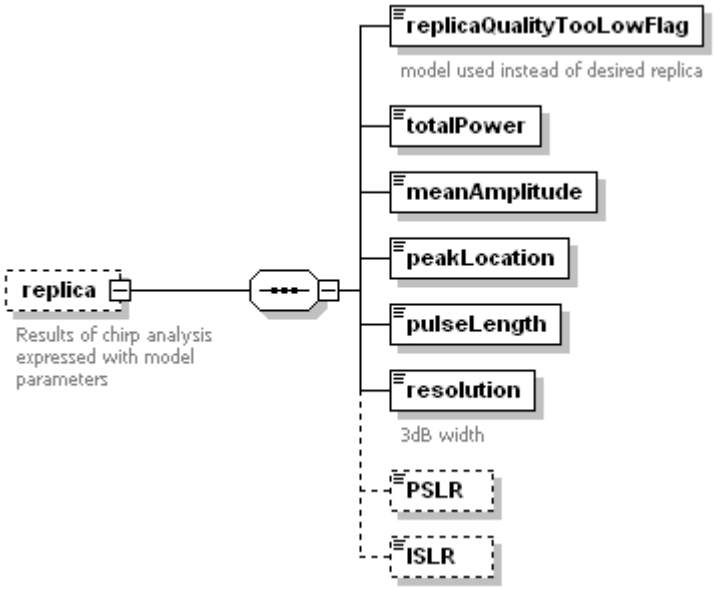
element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/amplitude

diagram	
type	**dblPolynom**

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/phase

diagram	
type	**dblPolynom**

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica

diagram	
annotation	documentation Results of chirp analysis expressed with model parameters

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/replicaQualityTooLowFlag

diagram	
type	**xs:boolean**
annotation	documentation model used instead of desired replica

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/totalPower

diagram	
type	**xs:float**

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/meanAmplitude

diagram	
type	**xs:float**

element
level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/peakLocation

diagram	

type	**xs:double**

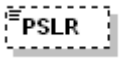
element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/pulseLength**

diagram	
type	**xs:float**

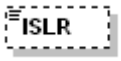
element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/resolution**

diagram	
type	**xs:float**
annotation	documentation 3dB width

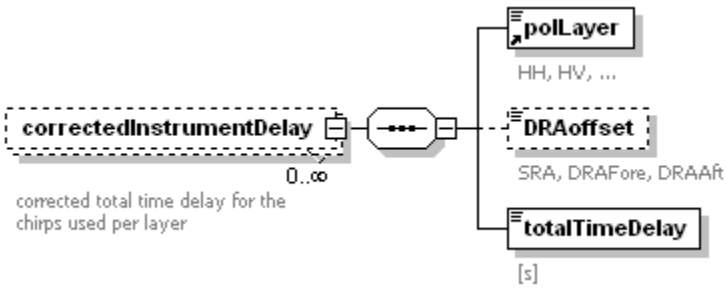
element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/PSLR**

diagram	
type	**xs:float**

element **level1Product/processing/processingParameter/rangeCompression/chirps/referenceChirp/replica/ISLR**

diagram	
type	**xs:float**

element **level1Product/processing/processingParameter/correctedInstrumentDelay**

diagram	
annotation	documentation corrected total time delay for the chirps used per layer

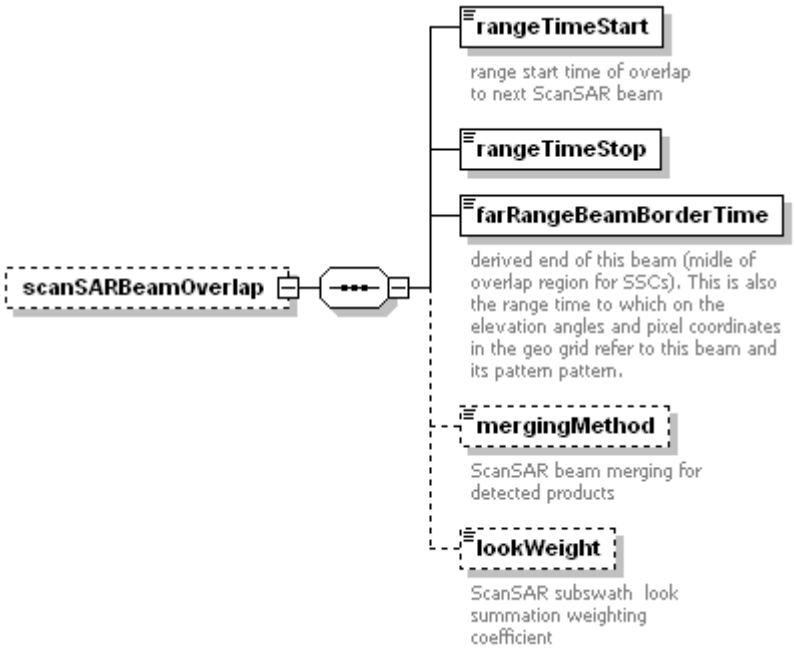
element **level1Product/processing/processingParameter/correctedInstrumentDelay/DRAoffset**

diagram	DRAoffset SRA, DRAFore, DRAAft
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **level1Product/processing/processingParameter/correctedInstrumentDelay/totalTimeDelay**

diagram	totalTimeDelay [s]
type	**xs:double**
annotation	documentation [s]

element **level1Product/processing/processingParameter/scanSARBeamOverlap**

diagram	

element **level1Product/processing/processingParameter/scanSARBeamOverlap/rangeTimeStart**

diagram	rangeTimeStart range start time of overlap to next ScanSAR beam
type	**xs:double**
annotation	documentation range start time of overlap to next ScanSAR beam

element **level1Product/processing/processingParameter/scanSARBeamOverlap/rangeTimeStop**

diagram	rangeTimeStop
type	**xs:double**

element **level1Product/processing/processingParameter/scanSARBeamOverlap/farRangeBeamBorderTime**

diagram	farRangeBeamBorderTime derived end of this beam (midle of overlap region for SSCs). This is also the range time to which on the elevation angles and pixel coordinates in the geo grid refer to this beam and its pattern pattern.
type	**xs:double**
annotation	documentation derived end of this beam (midle of overlap region for SSCs). This is also the range time to which on the elevation angles and pixel coordinates in the geo grid refer to this beam and its pattern pattern.

element **level1Product/processing/processingParameter/scanSARBeamOverlap/mergingMethod**

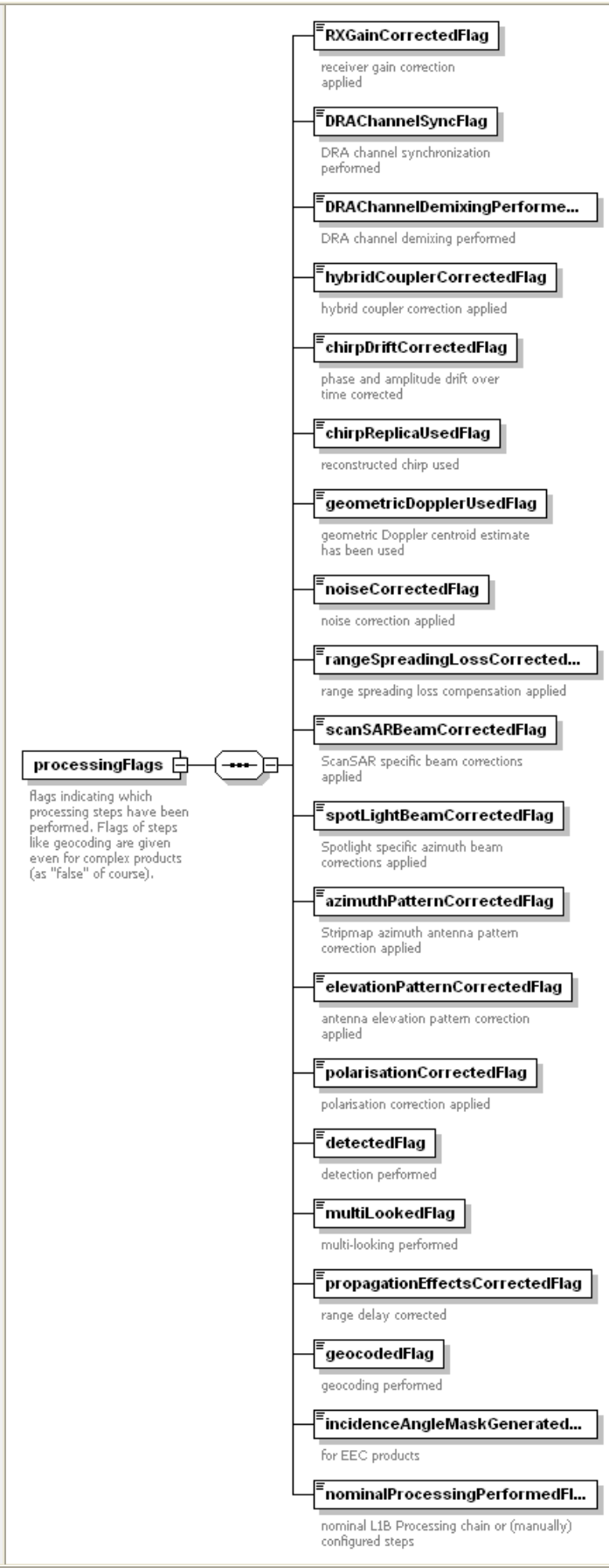
diagram	mergingMethod ScanSAR beam merging for detected products
type	**string128**
facets	maxLength 128
annotation	documentation ScanSAR beam merging for detected products

element **level1Product/processing/processingParameter/scanSARBeamOverlap/lookWeight**

diagram	lookWeight ScanSAR subswath look summation weighting coefficient
type	extension of **xs:float**
annotation	documentation ScanSAR subswath look summation weighting coefficient

element **level1Product/processing/processingFlags**

diagram


processingFlags
flags indicating which processing steps have been performed. Flags of steps like geocoding are given even for complex products (as "False" of course).
RXGainCorrectedFlag
receiver gain correction applied
DRAChannelSyncFlag
DRA channel synchronization performed
DRAChannelDemixingPerforme...
DRA channel demixing performed
hybridCouplerCorrectedFlag
hybrid coupler correction applied
chirpDriftCorrectedFlag
phase and amplitude drift over time corrected
chirpReplicaUsedFlag
reconstructed chirp used
geometricDopplerUsedFlag
geometric Doppler centroid estimate has been used
noiseCorrectedFlag
noise correction applied
rangeSpreadingLossCorrected...
range spreading loss compensation applied
scanSARBeamCorrectedFlag
ScanSAR specific beam corrections applied
spotLightBeamCorrectedFlag
Spotlight specific azimuth beam corrections applied
azimuthPatternCorrectedFlag
Stripmap azimuth antenna pattern correction applied
elevationPatternCorrectedFlag
antenna elevation pattern correction applied
polarisationCorrectedFlag
polarisation correction applied
detectedFlag
detection performed
multiLookedFlag
multi-looking performed
propagationEffectsCorrectedFlag
range delay corrected
geocodedFlag
geocoding performed
incidenceAngleMaskGenerated...
for EEC products
nominalProcessingPerformedFl...
nominal L1B Processing chain or (manually) configured steps

annotation	documentation flags indicating which processing steps have been performed. Flags of steps like geocoding are given even for complex products (as "false" of course).

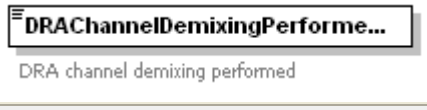
element **level1Product/processing/processingFlags/RXGainCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation receiver gain correction applied

element **level1Product/processing/processingFlags/DRAChannelSyncFlag**

diagram	
type	**xs:boolean**
annotation	documentation DRA channel synchronization performed

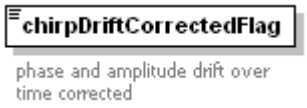
element **level1Product/processing/processingFlags/DRAChannelDemixingPerformedFlag**

diagram	
type	**xs:boolean**
annotation	documentation DRA channel demixing performed

element **level1Product/processing/processingFlags/hybridCouplerCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation hybrid coupler correction applied

element **level1Product/processing/processingFlags/chirpDriftCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation phase and amplitude drift over time corrected

element **level1Product/processing/processingFlags/chirpReplicaUsedFlag**

diagram	

type	**xs:boolean**
annotation	documentation reconstructed chirp used

element **level1Product/processing/processingFlags/geometricDopplerUsedFlag**

diagram	
type	**xs:boolean**
annotation	documentation geometric Doppler centroid estimate has been used

element **level1Product/processing/processingFlags/noiseCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation noise correction applied

element **level1Product/processing/processingFlags/rangeSpreadingLossCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation range spreading loss compensation applied

element **level1Product/processing/processingFlags/scanSARBeamCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation ScanSAR specific beam corrections applied

element **level1Product/processing/processingFlags/spotLightBeamCorrectedFlag**

diagram	
type	**xs:boolean**
annotation	documentation Spotlight specific azimuth beam corrections applied

element **level1Product/processing/processingFlags/azimuthPatternCorrectedFlag**

diagram	**azimuthPatternCorrectedFlag** Stripmap azimuth antenna pattern correction applied
type	**xs:boolean**
annotation	documentation Stripmap azimuth antenna pattern correction applied

element **level1Product/processing/processingFlags/elevationPatternCorrectedFlag**

diagram	**elevationPatternCorrectedFlag** antenna elevation pattern correction applied
type	**xs:boolean**
annotation	documentation antenna elevation pattern correction applied

element **level1Product/processing/processingFlags/polarisationCorrectedFlag**

diagram	**polarisationCorrectedFlag** polarisation correction applied
type	**xs:boolean**
annotation	documentation polarisation correction applied

element **level1Product/processing/processingFlags/detectedFlag**

diagram	**detectedFlag** detection performed
type	**xs:boolean**
annotation	documentation detection performed

element **level1Product/processing/processingFlags/multiLookedFlag**

diagram	**multiLookedFlag** multi-looking performed
type	**xs:boolean**
annotation	documentation multi-looking performed

element **level1Product/processing/processingFlags/propagationEffectsCorrectedFlag**

diagram	**propagationEffectsCorrectedFlag** range delay corrected
type	**xs:boolean**
annotation	documentation range delay corrected

element **level1Product/processing/processingFlags/geocodedFlag**

diagram	
type	**xs:boolean**
annotation	documentation geocoding performed

element **level1Product/processing/processingFlags/incidenceAngleMaskGeneratedFlag**

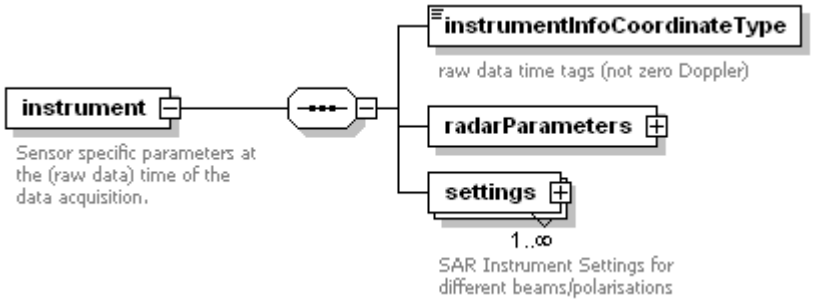
diagram	
type	**xs:boolean**
annotation	documentation for EEC products

element **level1Product/processing/processingFlags/nominalProcessingPerformedFlag**

diagram	
type	**xs:boolean**
annotation	documentation nominal L1B Processing chain or (manually) configured steps

6.1.6 Instrument

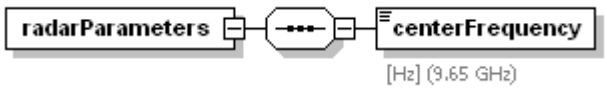
element **level1Product/instrument**

diagram	
annotation	documentation Sensor specific parameters at the (raw data) time of the data acquisition.

element **level1Product/instrument/instrumentInfoCoordinateType**

diagram	
type	restriction of **string20**
facets	maxLength 20 enumeration RAW enumeration ZERODOPPLER enumeration UNDEFINED
annotation	documentation raw data time tags (not zero Doppler)

element **level1Product/instrument/radarParameters**

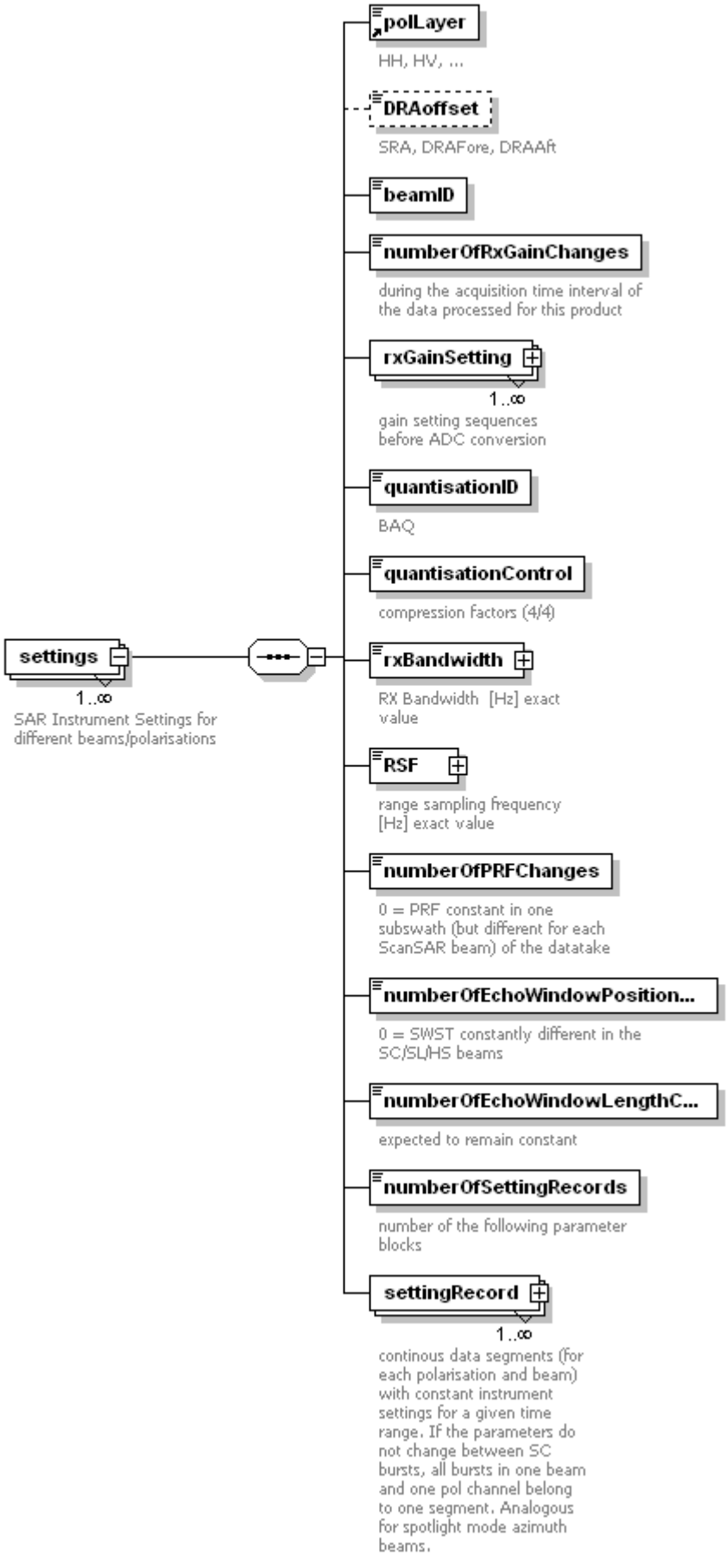
diagram	

element **level1Product/instrument/radarParameters/centerFrequency**

diagram	
type	**xs:double**
annotation	documentation [Hz] (9.65 GHz)

element **level1Product/instrument/settings**

diagram


polLayer
HH, HV, ...
DRAoffset
SRA, DRAFore, DRAAft
beamID
numberOfRxGainChanges
during the acquisition time interval of the data processed for this product
rxGainSetting
1..∞
gain setting sequences before ADC conversion
quantisationID
BAQ
quantisationControl
compression factors (4/4)
settings
1..∞
SAR Instrument Settings for different beams/polarisations
rxBandwidth
RX Bandwidth [Hz] exact value
RSF
range sampling frequency [Hz] exact value
numberOfPRFChanges
0 = PRF constant in one subswath (but different for each ScanSAR beam) of the datatake
numberOfEchoWindowPosition...
0 = SWST constantly different in the SC/SL/HS beams
numberOfEchoWindowLengthC...
expected to remain constant
numberOfSettingRecords
number of the following parameter blocks
settingRecord
1..∞
continous data segments (for each polarisation and beam) with constant instrument settings for a given time range. If the parameters do not change between SC bursts, all bursts in one beam and one pol channel belong to one segment. Analogous for spotlight mode azimuth beams.

annotation	documentation SAR Instrument Settings for different beams/polarisations

element **level1Product/instrument/settings/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

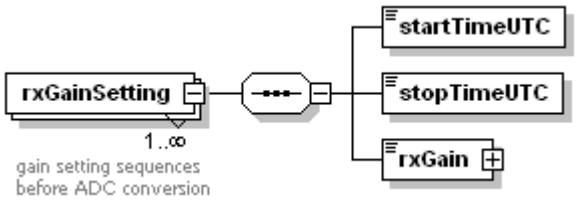
element **level1Product/instrument/settings/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/instrument/settings/numberOfRxGainChanges**

diagram	
type	**xs:int**
annotation	documentation during the acquisition time interval of the data processed for this product

element **level1Product/instrument/settings/rxGainSetting**

diagram	
annotation	documentation gain setting sequences before ADC conversion

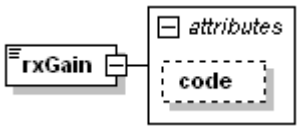
element **level1Product/instrument/settings/rxGainSetting/startTimeUTC**

diagram	
type	**xs:dateTime**

element **level1Product/instrument/settings/rxGainSetting/stopTimeUTC**

diagram	
type	**xs:dateTime**

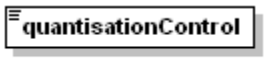
element **level1Product/instrument/settings/rxGainSetting/rxGain**

diagram	
type	extension of **xs:float**
attributes	Name Type Use Default Fixed Annotation code

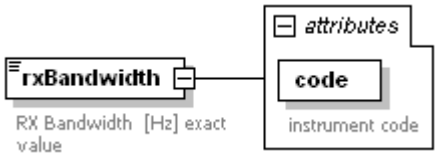
element **level1Product/instrument/settings/quantisationID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation BAQ

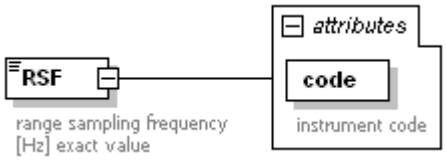
element **level1Product/instrument/settings/quantisationControl**

diagram	
type	extension of **string20**
facets	maxLength 20
annotation	documentation compression factors (4/4)

element **level1Product/instrument/settings/rxBandwidth**

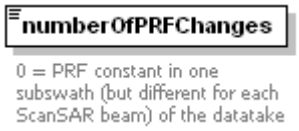
diagram	
type	extension of **xs:double**
attributes	Name Type Use Default Fixed Annotation code **string20** required documentation instrument code
annotation	documentation RX Bandwidth [Hz] exact value

element **level1Product/instrument/settings/RSF**

diagram	
type	extension of **xs:double**

attributes	Name	Type	Use	Default	Fixed	Annotation
	code	**string20**	required			documentation instrument code
annotation	documentation range sampling frequency [Hz] exact value					

element **level1Product/instrument/settings/numberOfPRFChanges**

diagram	
type	**xs:int**
annotation	documentation 0 = PRF constant in one subswath (but different for each ScanSAR beam) of the datatake

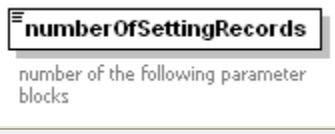
element **level1Product/instrument/settings/numberOfEchoWindowPositionChanges**

diagram	
type	**xs:int**
annotation	documentation 0 = SWST constantly different in the SC/SL/HS beams

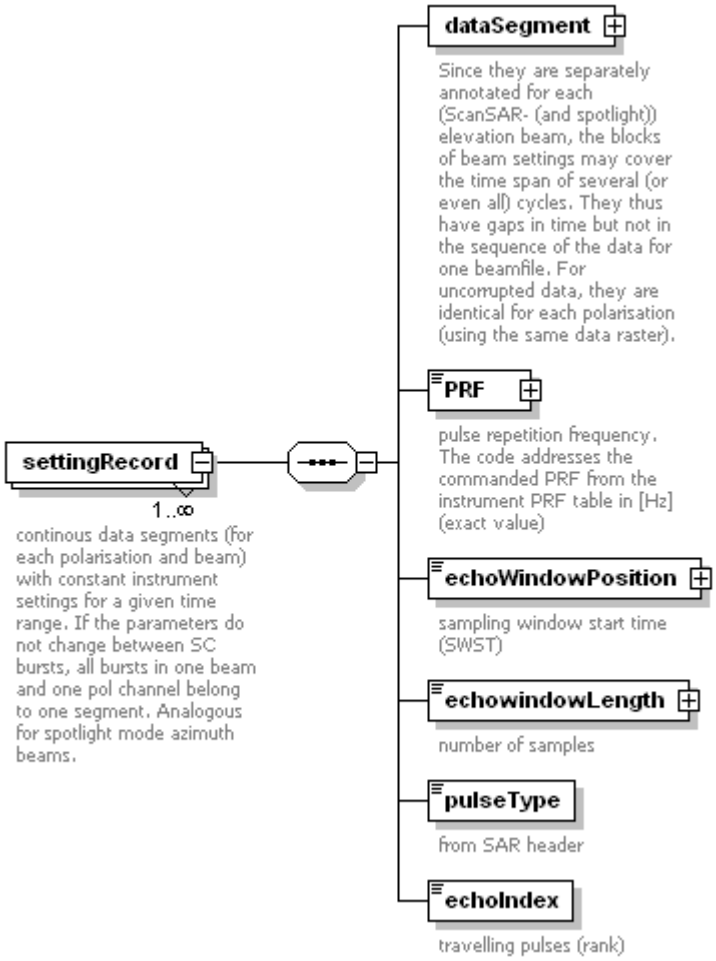
element **level1Product/instrument/settings/numberOfEchoWindowLengthChanges**

diagram	
type	**xs:int**
annotation	documentation expected to remain constant

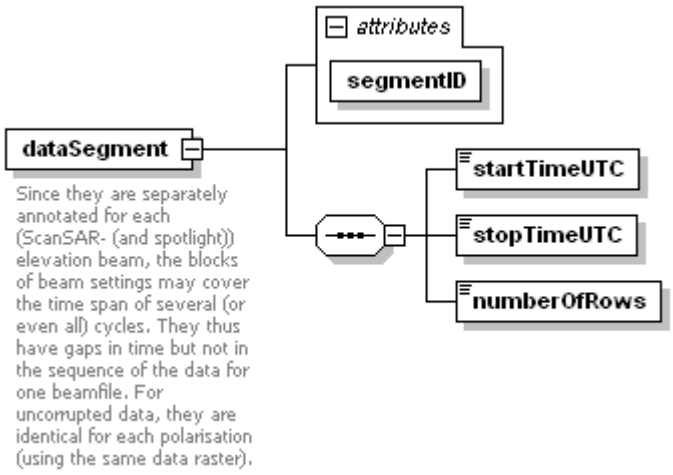
element **level1Product/instrument/settings/numberOfSettingRecords**

diagram	
type	**xs:int**
annotation	documentation number of the following parameter blocks

element **level1Product/instrument/settings/settingRecord**

diagram	
annotation	documentation continous data segments (for each polarisation and beam) with constant instrument settings for a given time range. If the parameters do not change between SC bursts, all bursts in one beam and one pol channel belong to one segment. Analogous for spotlight mode azimuth beams.

element **level1Product/instrument/settings/settingRecord/dataSegment**

diagram	
attributes	Name: segmentID; Type: **xs:int**; Use: required; Default; Fixed; Annotation

annotation	documentation	Since they are separately annotated for each (ScanSAR- (and spotlight)) elevation beam, the blocks of beam settings may cover the time span of several (or even all) cycles. They thus have gaps in time but not in the sequence of the data for one beamfile. For uncorrupted data, they are identical for each polarisation (using the same data raster).

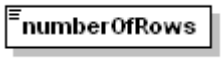
element **level1Product/instrument/settings/settingRecord/dataSegment/startTimeUTC**

diagram	
type	**xs:dateTime**

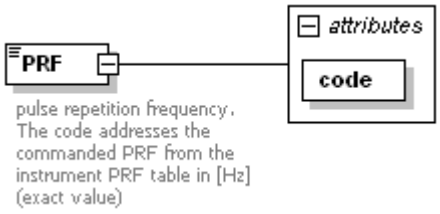
element **level1Product/instrument/settings/settingRecord/dataSegment/stopTimeUTC**

diagram	
type	**xs:dateTime**

element **level1Product/instrument/settings/settingRecord/dataSegment/numberOfRows**

diagram	
type	**xs:int**

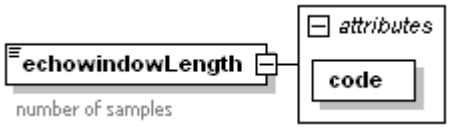
element **level1Product/instrument/settings/settingRecord/PRF**

diagram	
type	extension of **xs:double**
attributes	Name: code; Type: **string20**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation pulse repetition frequency. The code addresses the commanded PRF from the instrument PRF table in [Hz] (exact value)

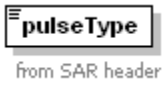
element **level1Product/instrument/settings/settingRecord/echoWindowPosition**

diagram	
type	extension of **xs:double**
attributes	Name: code; Type: **string20**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation sampling window start time (SWST)

element **level1Product/instrument/settings/settingRecord/echowindowLength**

diagram	
type	extension of **xs:double**
attributes	Name: code; Type: **string20**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation number of samples

element **level1Product/instrument/settings/settingRecord/pulseType**

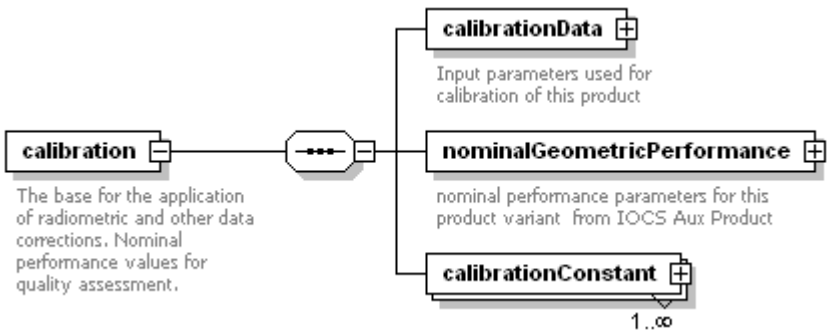
diagram	
type	**string20**
facets	maxLength 20
annotation	documentation from SAR header

element **level1Product/instrument/settings/settingRecord/echoIndex**

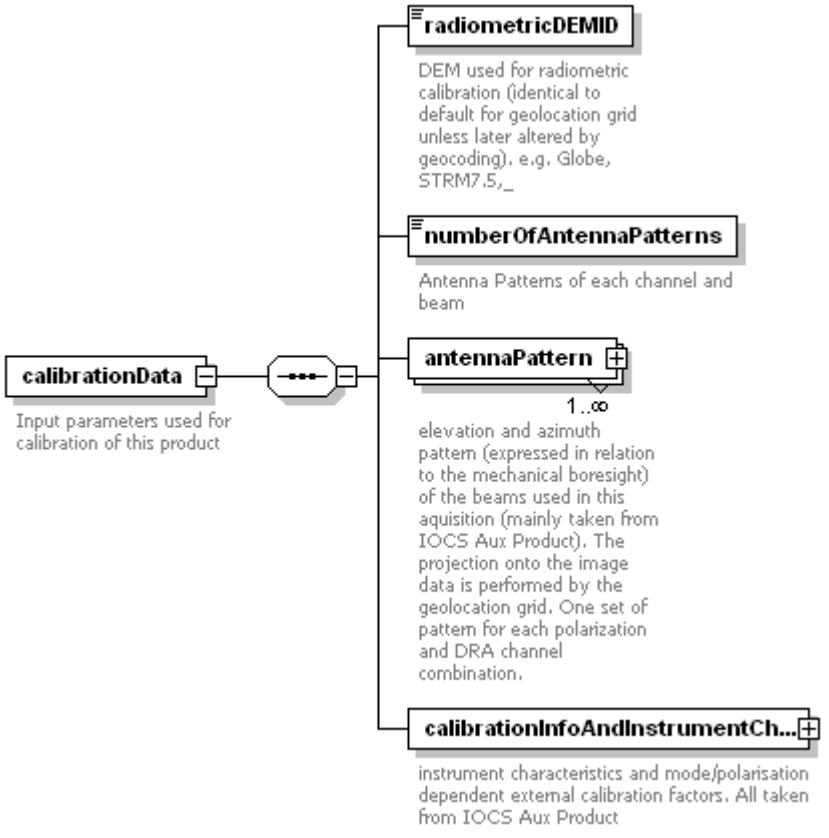
diagram	
type	**xs:int**
annotation	documentation travelling pulses (rank)

6.1.7 Calibration

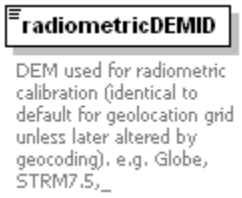
element **level1Product/calibration**

diagram	
annotation	documentation The base for the application of radiometric and other data corrections. Nominal performance values for quality assessment.

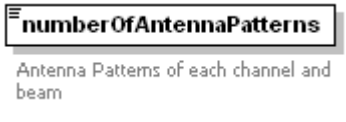
element **level1Product/calibration/calibrationData**

diagram	
annotation	documentation Input parameters used for calibration of this product

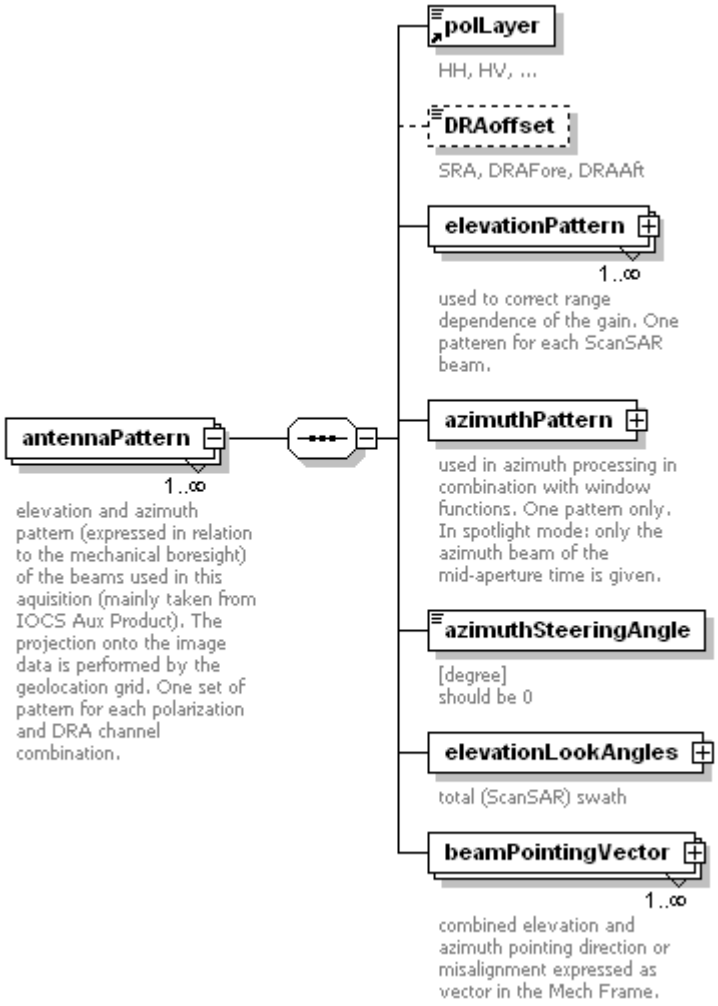
element **level1Product/calibration/calibrationData/radiometricDEMID**

diagram	
type	extension of **string255**
facets	maxLength 255
annotation	documentation DEM used for radiometric calibration (identical to default for geolocation grid unless later altered by geocoding). e.g. Globe, STRM7.5,_

element **level1Product/calibration/calibrationData/numberOfAntennaPatterns**

diagram	
type	**xs:int**
annotation	documentation Antenna Patterns of each channel and beam

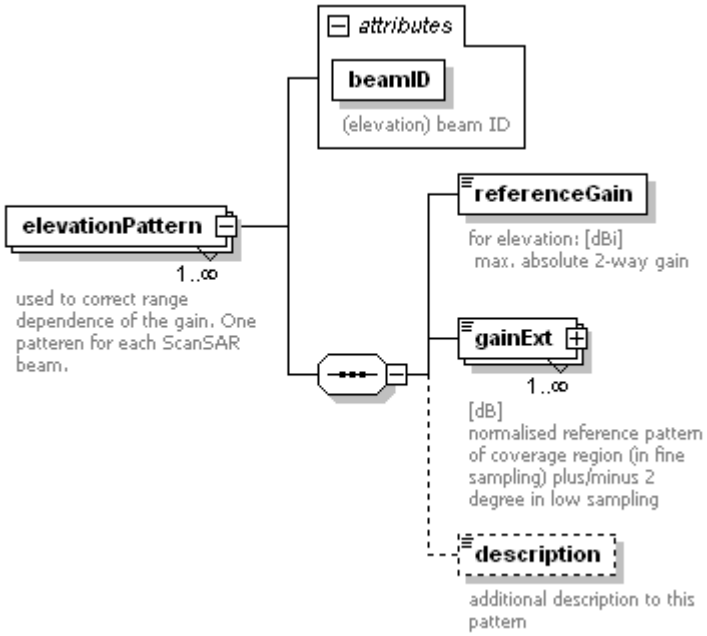
element **level1Product/calibration/calibrationData/antennaPattern**

diagram	
annotation	documentation elevation and azimuth pattern (expressed in relation to the mechanical boresight) of the beams used in this aquisition (mainly taken from IOCS Aux Product). The projection onto the image data is performed by the geolocation grid. One set of pattern for each polarization and DRA channel combination.

element **level1Product/calibration/calibrationData/antennaPattern/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **level1Product/calibration/calibrationData/antennaPattern/elevationPattern**

diagram	

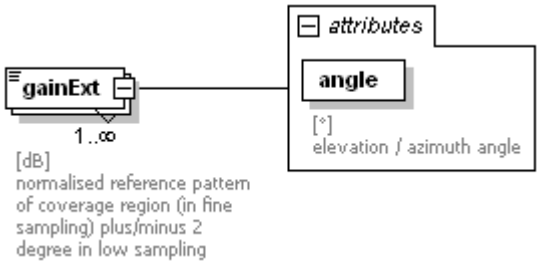
attributes	Name	Type	Use	Default	Fixed	Annotation documentation
	beamID	**string20**	required			(elevation) beam ID

annotation	documentation used to correct range dependence of the gain. One patteren for each ScanSAR beam.

element **level1Product/calibration/calibrationData/antennaPattern/elevationPattern/referenceGain**

diagram	
type	**xs:float**
annotation	documentation for elevation: [dBi] max. absolute 2-way gain

element **level1Product/calibration/calibrationData/antennaPattern/elevationPattern/gainExt**

diagram	
type	extension of **xs:float**

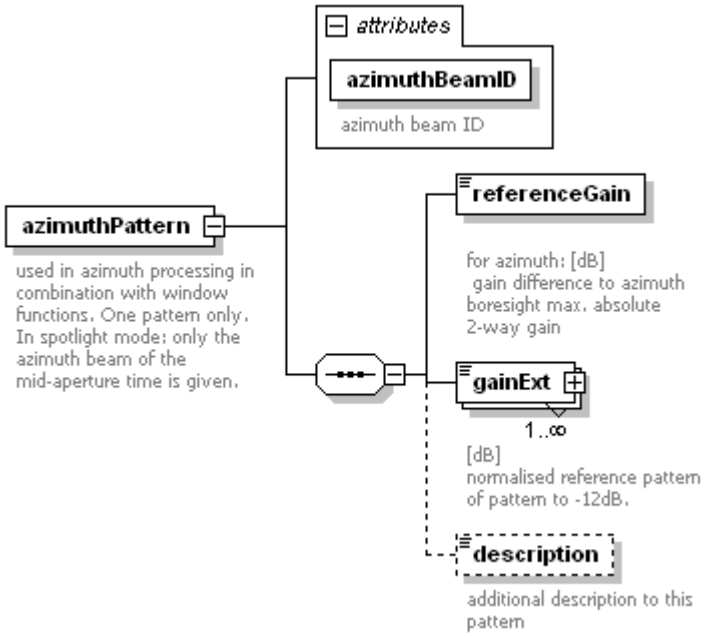
attributes	Name	Type	Use	Default	Fixed	Annotation documentation
	angle	**xs:float**	required			[°] elevation / azimuth angle

annotation	documentation [dB] normalised reference pattern of coverage region (in fine sampling) plus/minus 2 degree in low sampling

element **level1Product/calibration/calibrationData/antennaPattern/elevationPattern/description**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation additional description to this pattern

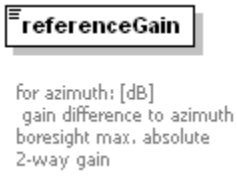
element **level1Product/calibration/calibrationData/antennaPattern/azimuthPattern**

diagram	

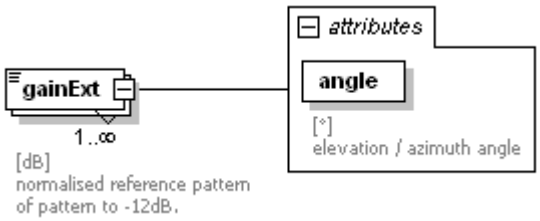
attributes	Name	Type	Use	Default	Fixed	Annotation
	azimuthBeamID	**string20**	required			documentation azimuth beam ID

annotation	documentation used in azimuth processing in combination with window functions. One pattern only. In spotlight mode: only the azimuth beam of the mid-aperture time is given.

element **level1Product/calibration/calibrationData/antennaPattern/azimuthPattern/referenceGain**

diagram	
type	**xs:float**
annotation	documentation for azimuth: [dB] gain difference to azimuth boresight max. absolute 2-way gain

element **level1Product/calibration/calibrationData/antennaPattern/azimuthPattern/gainExt**

diagram	
type	extension of **xs:float**
attributes	Name: angle; Type: **xs:float**; Use: required; Default: ; Fixed: ; Annotation documentation [°] elevation / azimuth angle
annotation	documentation [dB] normalised reference pattern of pattern to -12dB.

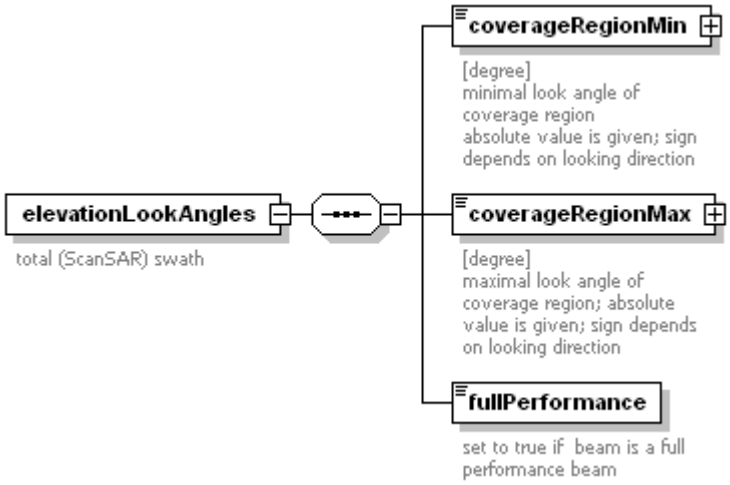
element **level1Product/calibration/calibrationData/antennaPattern/azimuthPattern/description**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation additional description to this pattern

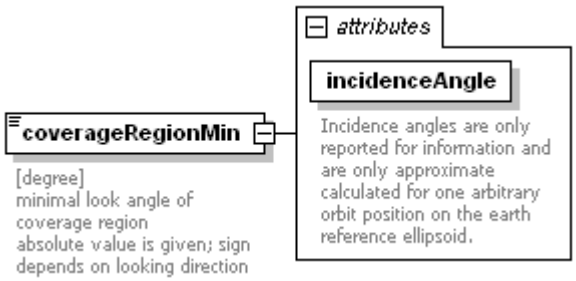
element **level1Product/calibration/calibrationData/antennaPattern/azimuthSteeringAngle**

diagram	
type	**xs:float**
annotation	documentation [degree] should be 0

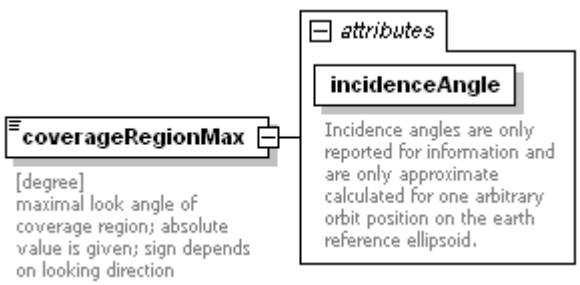
element **level1Product/calibration/calibrationData/antennaPattern/elevationLookAngles**

diagram	
annotation	documentation total (ScanSAR) swath

element
level1Product/calibration/calibrationData/antennaPattern/elevationLookAngles/coverageRegionMin

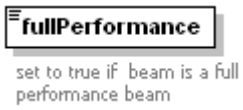
diagram	
type	extension of **xs:float**
attributes	Name: incidenceAngle; Type: **xs:float**; Use: required; Default: ; Fixed: ; Annotation documentation: Incidence angles are only reported for information and are only approximate calculated for one arbitrary orbit position on the earth reference ellipsoid.
annotation	documentation [degree] minimal look angle of coverage region absolute value is given; sign depends on looking direction

element
level1Product/calibration/calibrationData/antennaPattern/elevationLookAngles/coverageRegionMax

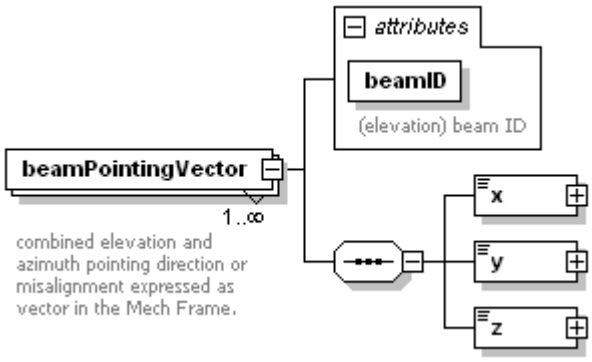
diagram	
type	extension of **xs:float**

attributes	Name	Type	Use	Default	Fixed	Annotation
	incidenceAngle	**xs:float**	required			documentation Incidence angles are only reported for information and are only approximate calculated for one arbitrary orbit position on the earth reference ellipsoid.
annotation	documentation [degree] maximal look angle of coverage region; absolute value is given; sign depends on looking direction					

element **level1Product/calibration/calibrationData/antennaPattern/elevationLookAngles/fullPerformance**

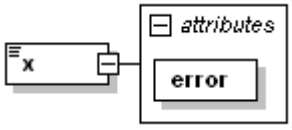
diagram	
type	**xs:boolean**
annotation	documentation set to true if beam is a full performance beam

element **level1Product/calibration/calibrationData/antennaPattern/beamPointingVector**

diagram	

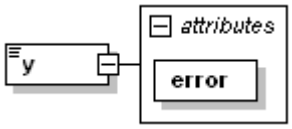
attributes	Name	Type	Use	Default	Fixed	Annotation
	beamID	**string20**	required			documentation (elevation) beam ID
annotation	documentation combined elevation and azimuth pointing direction or misalignment expressed as vector in the Mech Frame.					

element **level1Product/calibration/calibrationData/antennaPattern/beamPointingVector/x**

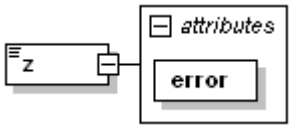
diagram	
type	extension of **xs:double**

attributes	Name	Type	Use	Default	Fixed	Annotation
	error	**xs:double**	required			

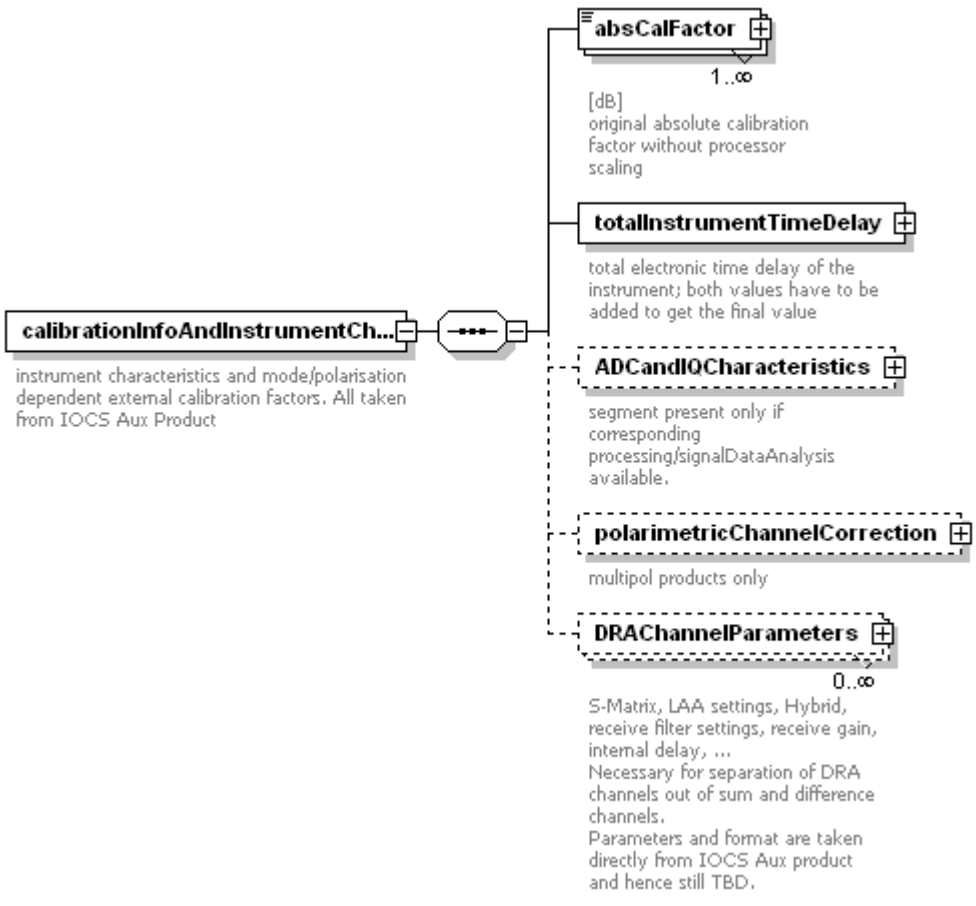
element **level1Product/calibration/calibrationData/antennaPattern/beamPointingVector/y**

diagram	
type	extension of **xs:double**
attributes	Name Type Use Default Fixed Annotation error **xs:double** required

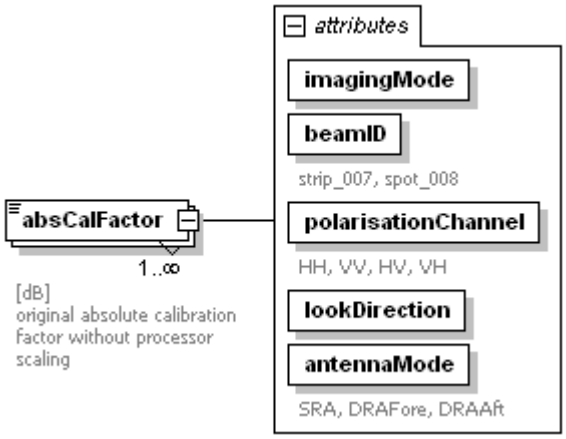
element **level1Product/calibration/calibrationData/antennaPattern/beamPointingVector/z**

diagram	
type	extension of **xs:double**
attributes	Name Type Use Default Fixed Annotation error **xs:double** required

element **level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics**

diagram	
annotation	documentation instrument characteristics and mode/polarisation dependent external calibration factors. All taken from IOCS Aux Product

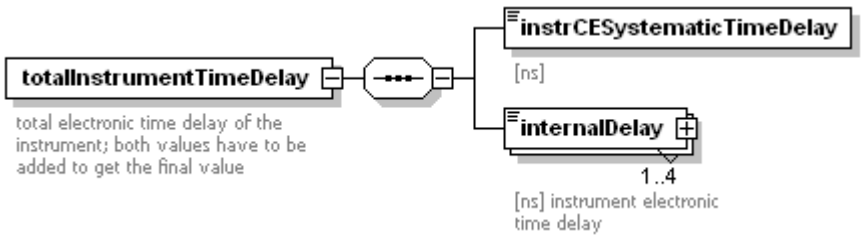
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/absCalFactor

diagram	
type	extension of **xs:float**

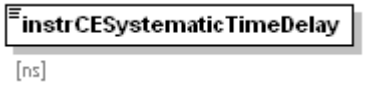
attributes	Name	Type	Use	Default	Fixed	Annotation
	imagingMode		required			
	beamID	**string20**	required			documentation strip_007, spot_008
	polarisationChannel	**derived by: xs:NMTOKENS**	required			documentation HH, VV, HV, VH
	lookDirection	**derived by: xs:NMTOKENS**	required			
	antennaMode	**derived by: xs:NMTOKENS**	required			documentation SRA, DRAFore, DRAAft

annotation	documentation [dB] original absolute calibration factor without processor scaling

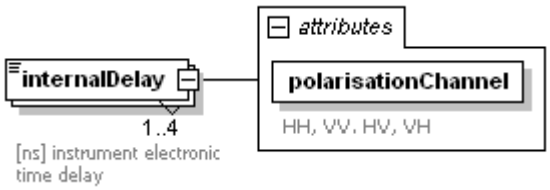
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/totalInstrumentTimeDelay

diagram	
annotation	documentation total electronic time delay of the instrument; both values have to be added to get the final value

element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/totalInstrumentTimeDelay/instrCESystematicTimeDelay

diagram	
type	**xs:float**
annotation	documentation [ns]

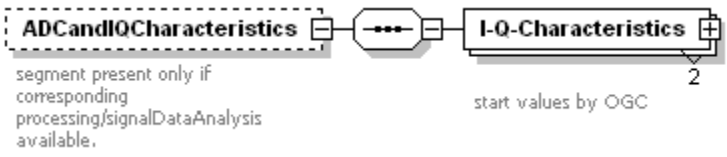
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/totalInstrumentTimeDelay/internalDelay

diagram	
type	extension of **xs:float**

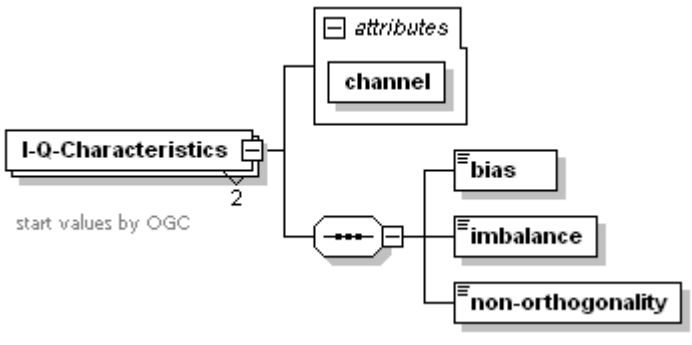
attributes	Name	Type	Use	Default	Fixed	Annotation
	polarisationChannel	**derived by: xs:NMTOKEN**	required			documentation HH, VV. HV, VH

annotation	documentation [ns] instrument electronic time delay

element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/ADCandIQCharacteristics

diagram	
annotation	documentation segment present only if corresponding processing/signalDataAnalysis available.

element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/ADCandIQCharacteristics/I-Q-Characteristics

diagram	

attributes	Name	Type	Use	Default	Fixed	Annotation
	channel	**derived by: xs:NMTOKEN**	required			

annotation	documentation start values by OGC

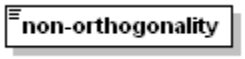
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/ADCandIQCharacteristics/I-Q-Characteristics/bias

diagram	
type	**xs:double**

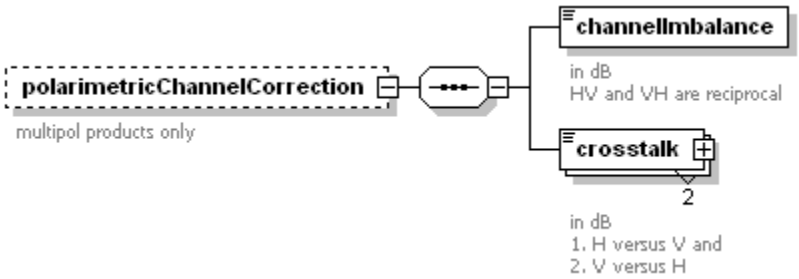
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/ADCandIQCharacteristics/I-Q-Characteristics/imbalance

diagram	
type	**xs:double**

element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/ADCandIQCharacteristics/I-Q-Characteristics/non-orthogonality

diagram	
type	**xs:double**

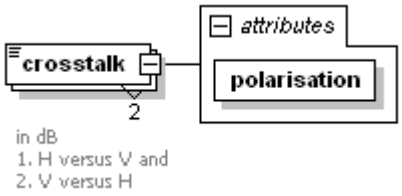
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/polarimetricChannelCorrection

diagram	
annotation	documentation multipol products only

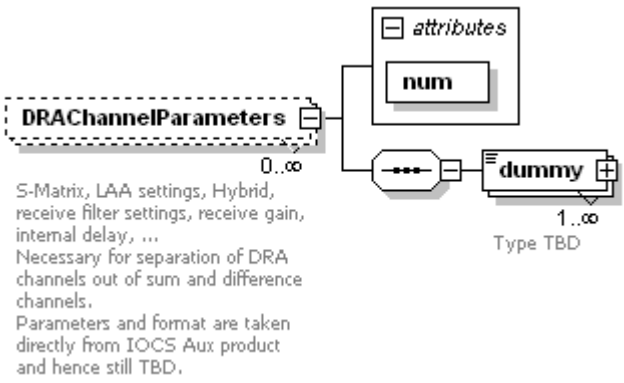
element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/polarimetricChannelCorrection/channelImbalance

diagram	
type	**xs:float**
annotation	documentation in dB HV and VH are reciprocal

element
level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/polarimetricChannelCorrection/crosstalk

diagram	
type	extension of **xs:float**
attributes	Name: polarisation; Type: **derived by: xs:NMTOKEN**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation: in dB 1. H versus V and 2. V versus H

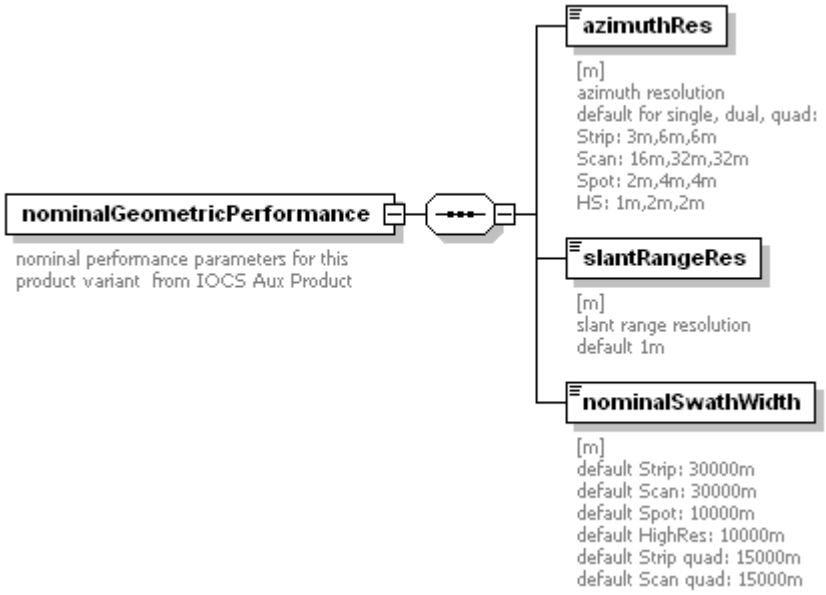
element **level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/DRAChannelParameters**

diagram	
attributes	Name: num; Type: **xs:unsignedLong**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation: S-Matrix, LAA settings, Hybrid, receive filter settings, receive gain, internal delay, ... Necessary for separation of DRA channels out of sum and difference channels. Parameters and format are taken directly from IOCS Aux product and hence still TBD.

element **level1Product/calibration/calibrationData/calibrationInfoAndInstrumentCharacteristics/DRAChannelParameters/dummy**

diagram	
type	extension of **xs:double**
attributes	Name: num; Type: **xs:unsignedLong**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation: Type TBD

element **level1Product/calibration/nominalGeometricPerformance**

diagram	
annotation	documentation nominal performance parameters for this product variant from IOCS Aux Product

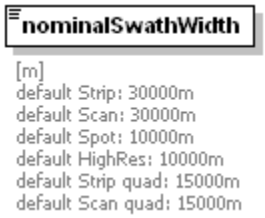
element **level1Product/calibration/nominalGeometricPerformance/azimuthRes**

diagram	
type	**xs:float**
annotation	documentation [m] azimuth resolution default for single, dual, quad: Strip: 3m,6m,6m Scan: 16m,32m,32m Spot: 2m,4m,4m HS: 1m,2m,2m

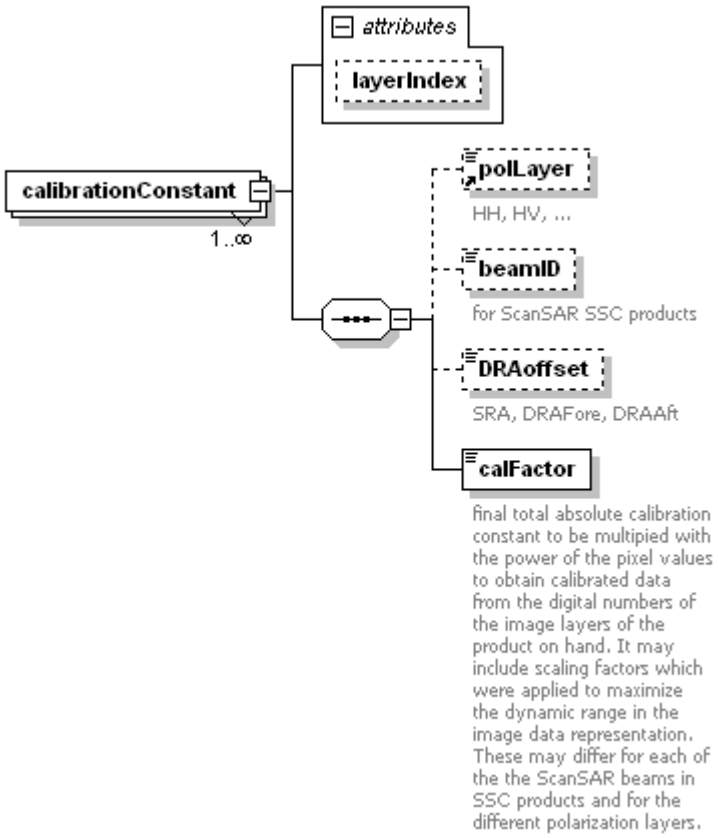
element **level1Product/calibration/nominalGeometricPerformance/slantRangeRes**

diagram	
type	**xs:float**
annotation	documentation [m] slant range resolution default 1m

element **level1Product/calibration/nominalGeometricPerformance/nominalSwathWidth**

diagram	
type	**xs:float**
annotation	documentation [m] default Strip: 30000m default Scan: 30000m default Spot: 10000m default HighRes: 10000m default Strip quad: 15000m default Scan quad: 15000m

element **level1Product/calibration/calibrationConstant**

diagram	
attributes	Name Type Use Default Fixed Annotation layerIndex

element **level1Product/calibration/calibrationConstant/beamID**

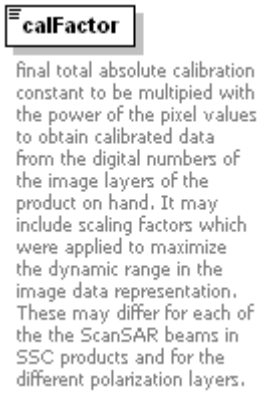
diagram	
type	**string20**

facets	maxLength 20
annotation	documentation for ScanSAR SSC products

element **level1Product/calibration/calibrationConstant/DRAoffset**

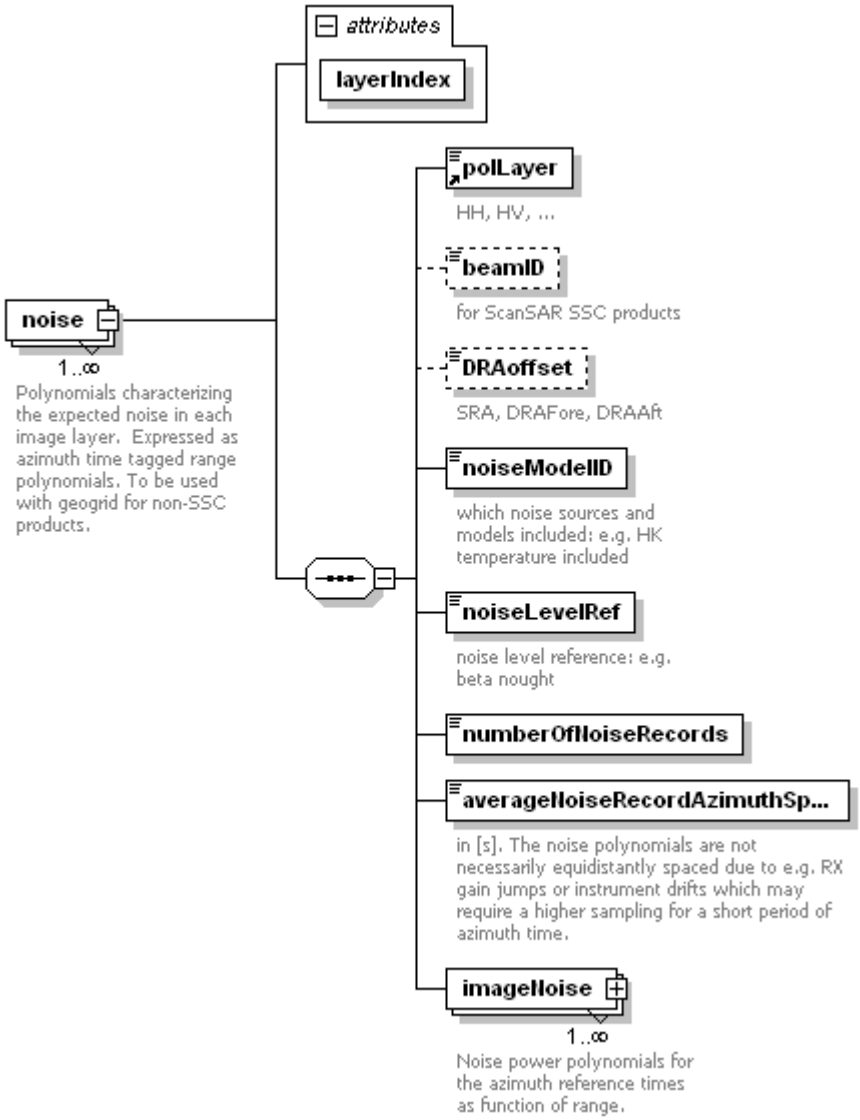
diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **level1Product/calibration/calibrationConstant/calFactor**

diagram	
type	extension of **xs:double**
annotation	documentation final total absolute calibration constant to be multipied with the power of the pixel values to obtain calibrated data from the digital numbers of the image layers of the product on hand. It may include scaling factors which were applied to maximize the dynamic range in the image data representation. These may differ for each of the the ScanSAR beams in SSC products and for the different polarization layers.

6.1.8 Noise

element **level1Product/noise**

diagram	
attributes	Name: layerIndex; Type: **xs:int**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation: Polynomials characterizing the expected noise in each image layer. Expressed as azimuth time tagged range polynomials. To be used with geogrid for non-SSC products.

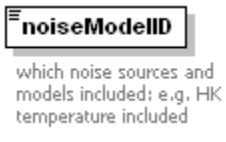
element **level1Product/noise/beamID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation for ScanSAR SSC products

element **level1Product/noise/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **level1Product/noise/noiseModelID**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation which noise sources and models included: e.g. HK temperature included

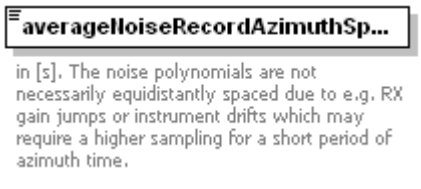
element **level1Product/noise/noiseLevelRef**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation noise level reference: e.g. beta nought

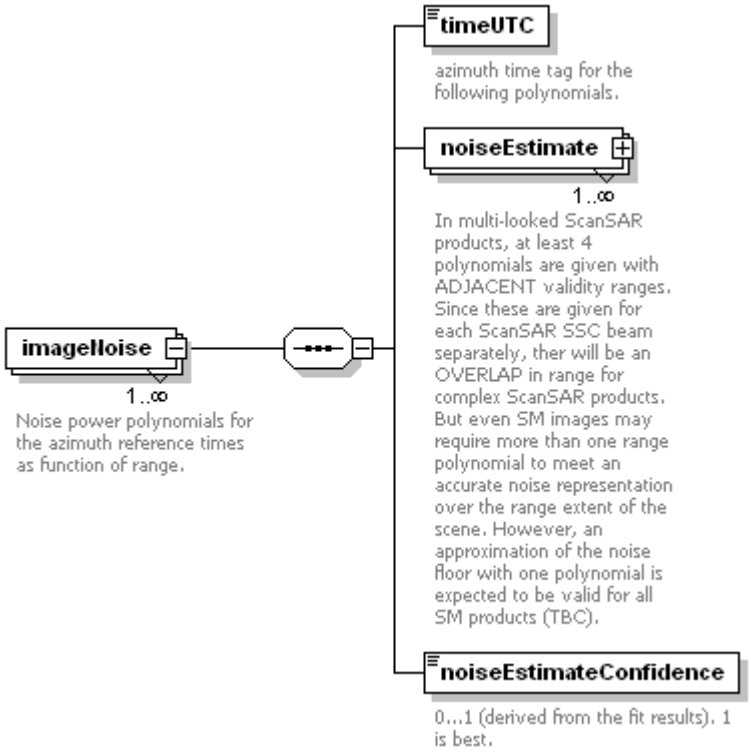
element **level1Product/noise/numberOfNoiseRecords**

diagram	
type	**xs:int**

element **level1Product/noise/averageNoiseRecordAzimuthSpacing**

diagram	
type	**xs:float**
annotation	documentation in [s]. The noise polynomials are not necessarily equidistantly spaced due to e.g. RX gain jumps or instrument drifts which may require a higher sampling for a short period of azimuth time.

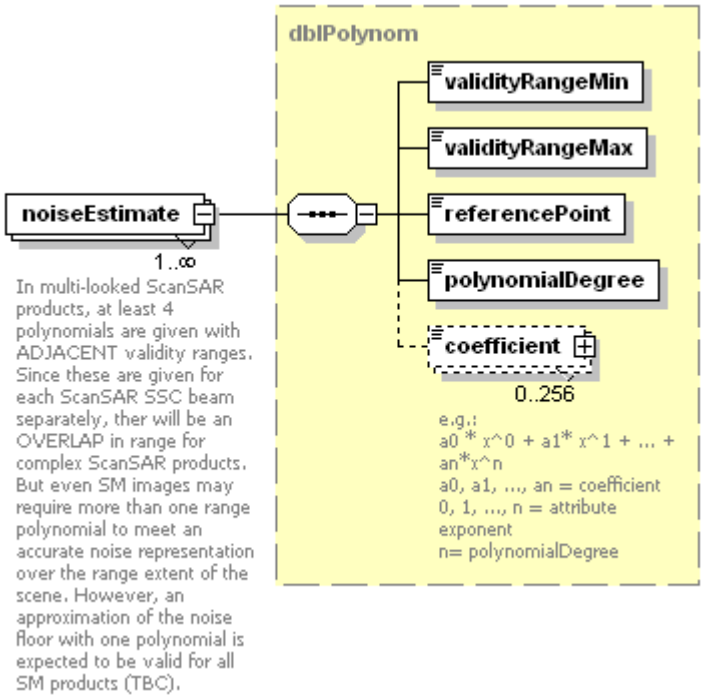
element **level1Product/noise/imageNoise**

diagram	
annotation	documentation Noise power polynomials for the azimuth reference times as function of range.

element **level1Product/noise/imageNoise/timeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation azimuth time tag for the following polynomials.

element **level1Product/noise/imageNoise/noiseEstimate**

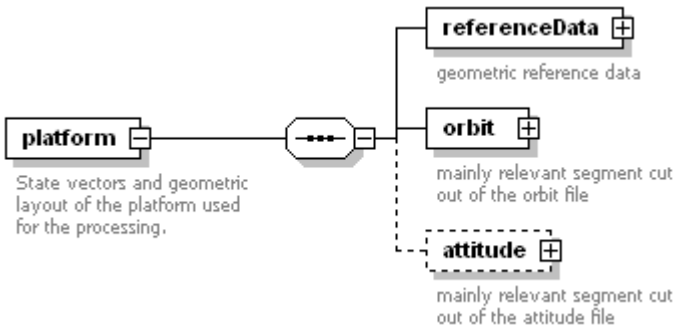
diagram	
type	**dblPolynom**
annotation	documentation In multi-looked ScanSAR products, at least 4 polynomials are given with ADJACENT validity ranges. Since these are given for each ScanSAR SSC beam separately, ther will be an OVERLAP in range for complex ScanSAR products. But even SM images may require more than one range polynomial to meet an accurate noise representation over the range extent of the scene. However, an approximation of the noise floor with one polynomial is expected to be valid for all SM products (TBC).

element **level1Product/noise/imageNoise/noiseEstimateConfidence**

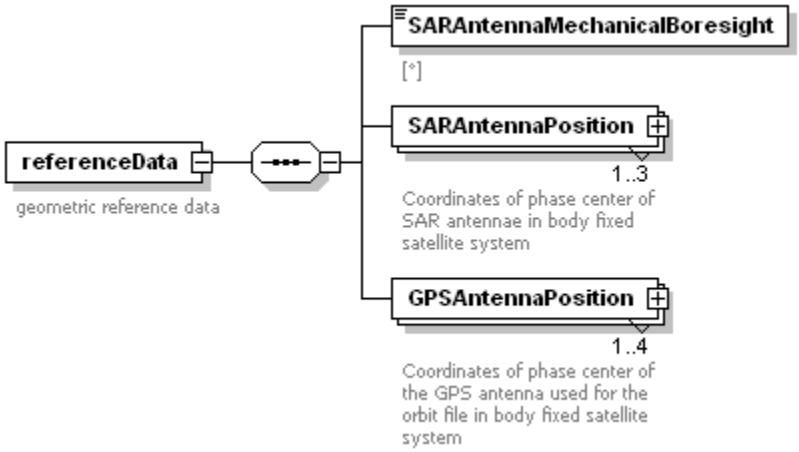
diagram	
type	**xs:float**
annotation	documentation 0...1 (derived from the fit results). 1 is best.

6.1.9 Platform

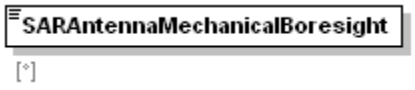
element **level1Product/platform**

diagram	
annotation	documentation State vectors and geometric layout of the platform used for the processing.

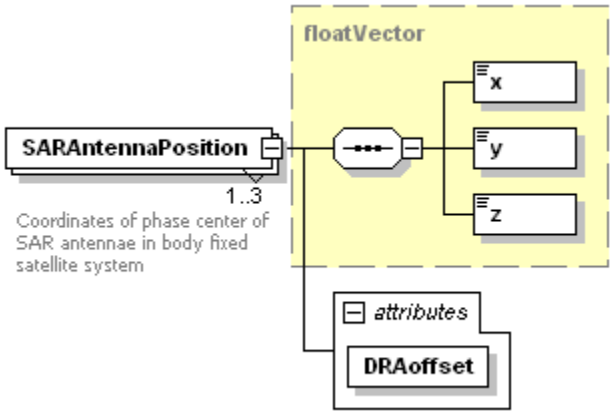
element **level1Product/platform/referenceData**

diagram	
annotation	documentation geometric reference data

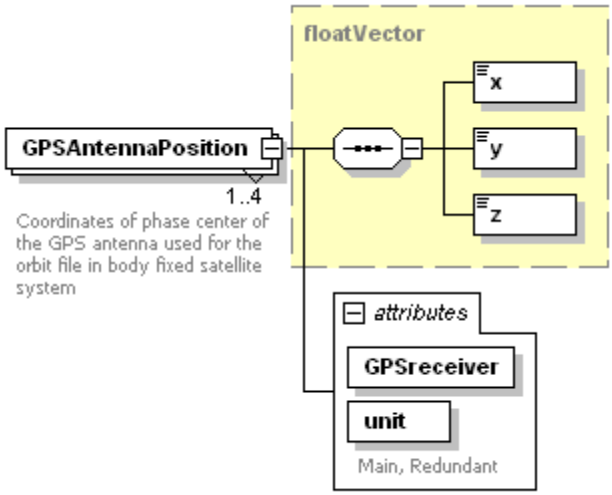
element **level1Product/platform/referenceData/SARAntennaMechanicalBoresight**

diagram	
type	**xs:double**
annotation	documentation [°]

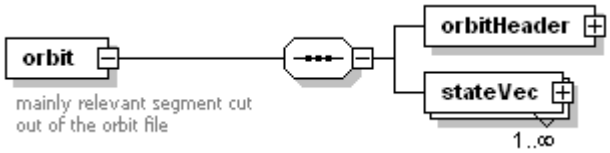
element **level1Product/platform/referenceData/SARAntennaPosition**

diagram	
type	extension of **floatVector**
attributes	Name: DRAoffset; Type: **derived by: xs:NMTOKENS**; Use: required; Default: ; Fixed: ; Annotation:
annotation	documentation Coordinates of phase center of SAR antennae in body fixed satellite system

element **level1Product/platform/referenceData/GPSAntennaPosition**

diagram	
type	extension of **floatVector**
attributes	Name: GPSreceiver; Type: **derived by: xs:NMTOKEN**; Use: required; Default: ; Fixed: ; Annotation: Name: unit; Type: **derived by: xs:NMTOKEN**; Use: required; Default: ; Fixed: ; Annotation: documentation Main, Redundant
annotation	documentation Coordinates of phase center of the GPS antenna used for the orbit file in body fixed satellite system

element **level1Product/platform/orbit**

diagram	
annotation	documentation mainly relevant segment cut out of the orbit file

element **level1Product/platform/orbit/orbitHeader**

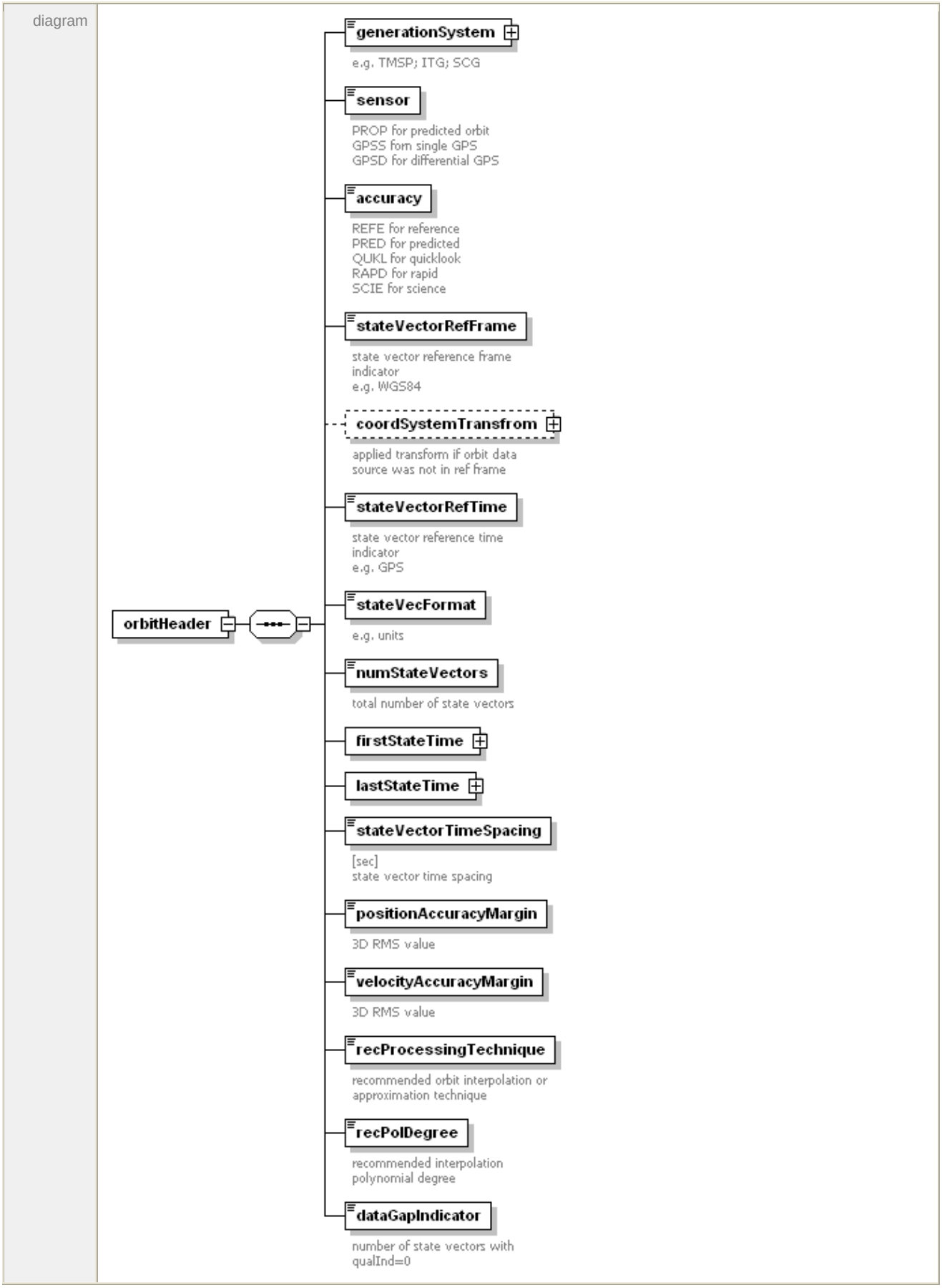
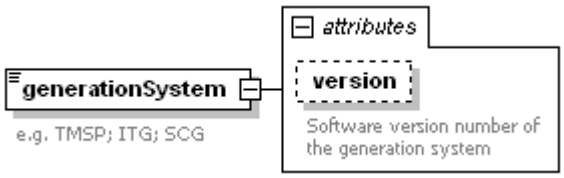


diagram
orbitHeader
generationSystem
e.g. TMSP; ITG; SCG
sensor
PROP for predicted orbit
GPSS for single GPS
GPSD for differential GPS
accuracy
REFE for reference
PRED for predicted
QUKL for quicklook
RAPD for rapid
SCIE for science
stateVectorRefFrame
state vector reference frame indicator
e.g. WGS84
coordSystemTransfrom
applied transform if orbit data source was not in ref frame
stateVectorRefTime
state vector reference time indicator
e.g. GPS
stateVecFormat
e.g. units
numStateVectors
total number of state vectors
firstStateTime
lastStateTime
stateVectorTimeSpacing
[sec]
state vector time spacing
positionAccuracyMargin
3D RMS value
velocityAccuracyMargin
3D RMS value
recProcessingTechnique
recommended orbit interpolation or approximation technique
recPolDegree
recommended interpolation polynomial degree
dataGapIndicator
number of state vectors with qualInd=0

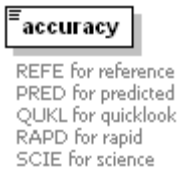
element **level1Product/platform/orbit/orbitHeader/generationSystem**

diagram	
type	extension of **string255**
facets	maxLength 255
attributes	Name: version; Type: **string80**; Use: ; Default: ; Fixed: ; Annotation documentation: Software version number of the generation system
annotation	documentation e.g. TMSP; ITG; SCG

element **level1Product/platform/orbit/orbitHeader/sensor**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration PROP enumeration GPSS enumeration GPSD
annotation	documentation PROP for predicted orbit GPSS forn single GPS GPSD for differential GPS

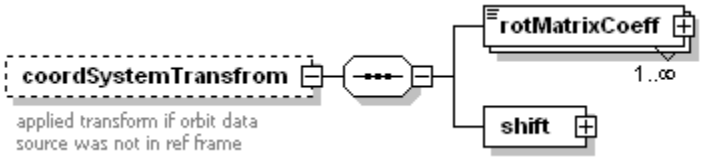
element **level1Product/platform/orbit/orbitHeader/accuracy**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration REFE enumeration PRED enumeration QUKL enumeration RAPD enumeration SCIE
annotation	documentation REFE for reference PRED for predicted QUKL for quicklook RAPD for rapid SCIE for science

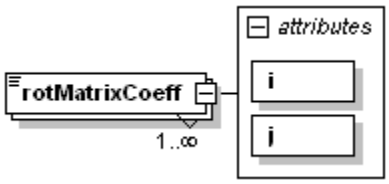
element **level1Product/platform/orbit/orbitHeader/stateVectorRefFrame**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation state vector reference frame indicator e.g. WGS84

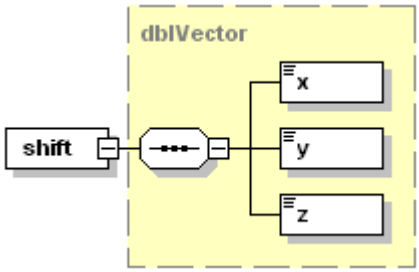
element **level1Product/platform/orbit/orbitHeader/coordSystemTransfrom**

diagram	
annotation	documentation applied transform if orbit data source was not in ref frame

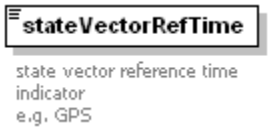
element **level1Product/platform/orbit/orbitHeader/coordSystemTransfrom/rotMatrixCoeff**

diagram	
type	extension of **xs:double**
attributes	Name Type Use Default Fixed Annotation i **xs:int** required j **xs:int** required

element **level1Product/platform/orbit/orbitHeader/coordSystemTransfrom/shift**

diagram	
type	**dblVector**

element **level1Product/platform/orbit/orbitHeader/stateVectorRefTime**

diagram	

type	**string20**
facets	maxLength 20
annotation	documentation state vector reference time indicator e.g. GPS

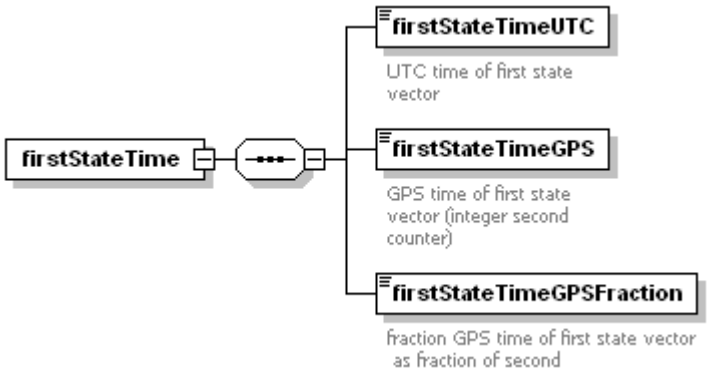
element **level1Product/platform/orbit/orbitHeader/stateVecFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation e.g. units

element **level1Product/platform/orbit/orbitHeader/numStateVectors**

diagram	
type	**xs:unsignedLong**
annotation	documentation total number of state vectors

element **level1Product/platform/orbit/orbitHeader/firstStateTime**

diagram	

element **level1Product/platform/orbit/orbitHeader/firstStateTime/firstStateTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation UTC time of first state vector

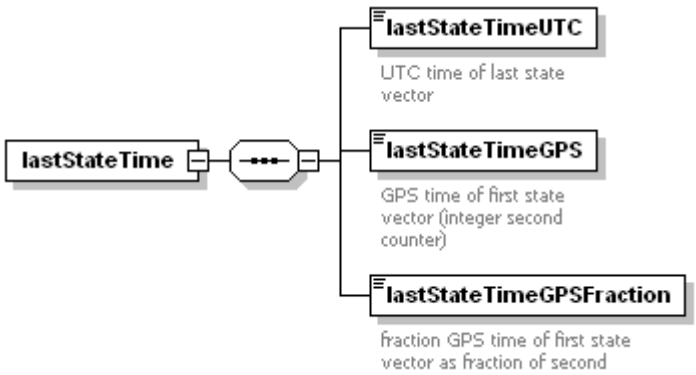
element **level1Product/platform/orbit/orbitHeader/firstStateTime/firstStateTimeGPS**

diagram	
type	**xs:unsignedInt**
annotation	documentation GPS time of first state vector (integer second counter)

element **level1Product/platform/orbit/orbitHeader/firstStateTime/firstStateTimeGPSFraction**

diagram	
type	**xs:double**
annotation	documentation fraction GPS time of first state vector as fraction of second

element **level1Product/platform/orbit/orbitHeader/lastStateTime**

diagram	

element **level1Product/platform/orbit/orbitHeader/lastStateTime/lastStateTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation UTC time of last state vector

element **level1Product/platform/orbit/orbitHeader/lastStateTime/lastStateTimeGPS**

diagram	
type	**xs:unsignedInt**
annotation	documentation GPS time of first state vector (integer second counter)

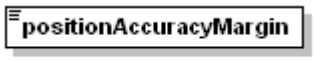
element **level1Product/platform/orbit/orbitHeader/lastStateTime/lastStateTimeGPSFraction**

diagram	
type	**xs:double**
annotation	documentation fraction GPS time of first state vector as fraction of second

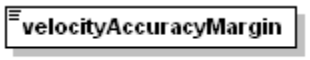
element **level1Product/platform/orbit/orbitHeader/stateVectorTimeSpacing**

diagram	
type	**xs:double**
annotation	documentation [sec] state vector time spacing

element **level1Product/platform/orbit/orbitHeader/positionAccuracyMargin**

diagram	
type	**xs:float**
annotation	documentation 3D RMS value

element **level1Product/platform/orbit/orbitHeader/velocityAccuracyMargin**

diagram	
type	**xs:float**
annotation	documentation 3D RMS value

element **level1Product/platform/orbit/orbitHeader/recProcessingTechnique**

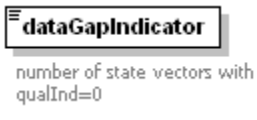
diagram	
type	**string255**
facets	maxLength 255
annotation	documentation recommended orbit interpolation or approximation technique

element **level1Product/platform/orbit/orbitHeader/recPolDegree**

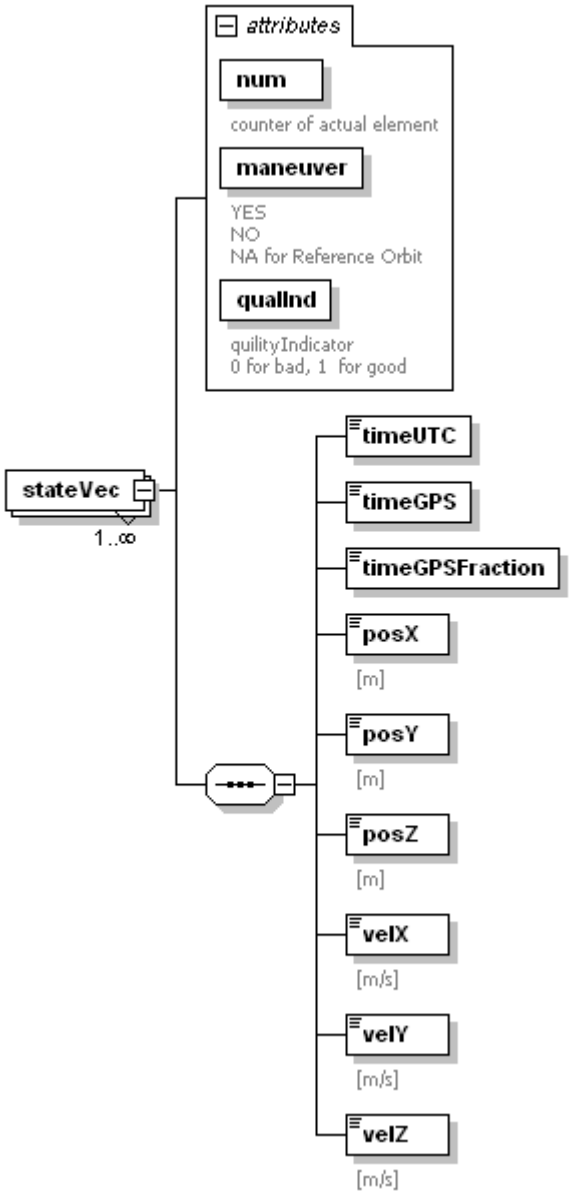
diagram	
type	restriction of **xs:int**

facets	minInclusive 1 maxInclusive 20
annotation	documentation recommended interpolation polynomial degree

element **level1Product/platform/orbit/orbitHeader/dataGapIndicator**

diagram	
type	**xs:int**
annotation	documentation number of state vectors with qualInd=0

element **level1Product/platform/orbit/stateVec**

diagram	
attributes	Name Type Use Default Fixed Annotation

	num	**derived by: xs:unsignedLong**	required	documentation	counter of actual element
	maneuver	**derived by: xs:NMTOKEN**	required	documentation	YES NO NA for Reference Orbit
	qualInd	**derived by: xs:unsignedByte**	required	documentation	quilityIndicator 0 for bad, 1 for good

element **level1Product/platform/orbit/stateVec/timeUTC**

diagram	
type	**xs:dateTime**

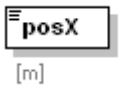
element **level1Product/platform/orbit/stateVec/timeGPS**

diagram	
type	**xs:unsignedLong**

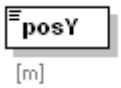
element **level1Product/platform/orbit/stateVec/timeGPSFraction**

diagram	
type	**xs:double**

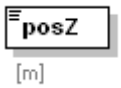
element **level1Product/platform/orbit/stateVec/posX**

diagram	
type	**xs:double**
annotation	documentation [m]

element **level1Product/platform/orbit/stateVec/posY**

diagram	
type	**xs:double**
annotation	documentation [m]

element **level1Product/platform/orbit/stateVec/posZ**

diagram	
type	**xs:double**
annotation	documentation [m]

element **level1Product/platform/orbit/stateVec/velX**

diagram	
type	**xs:double**
annotation	documentation [m/s]

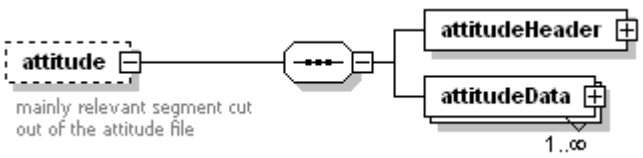
element **level1Product/platform/orbit/stateVec/velY**

diagram	
type	**xs:double**
annotation	documentation [m/s]

element **level1Product/platform/orbit/stateVec/velZ**

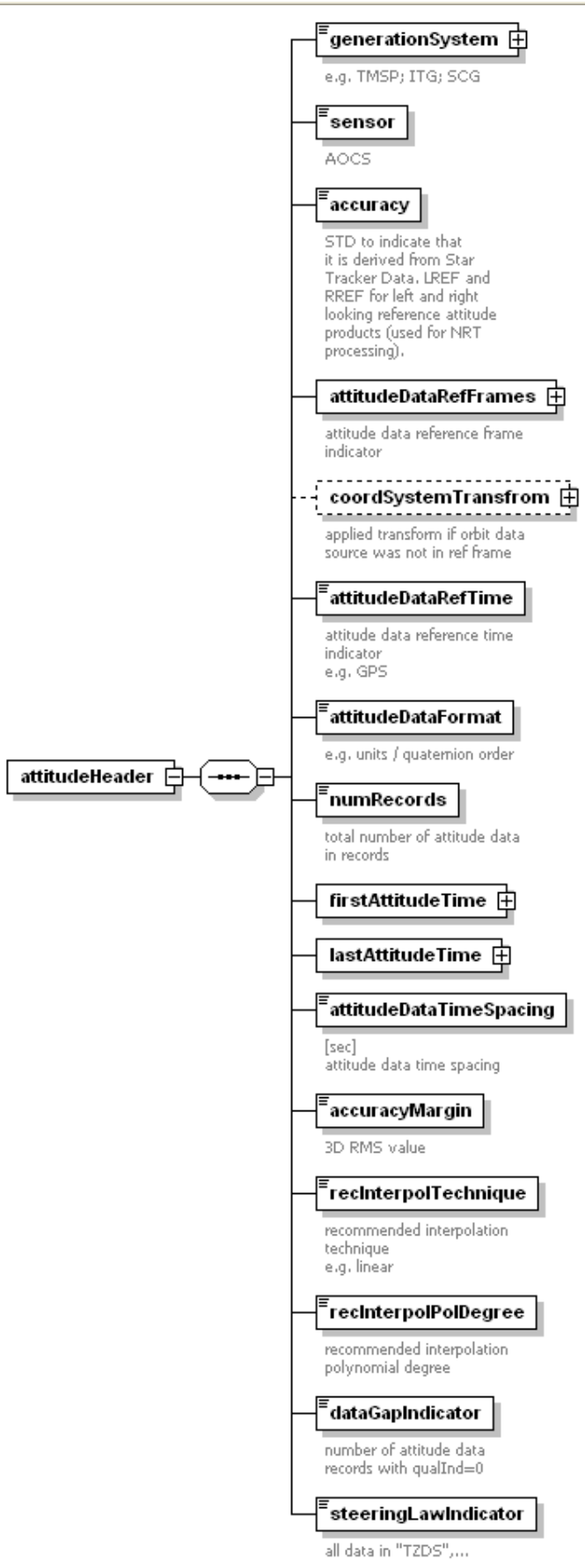
diagram	
type	**xs:double**
annotation	documentation [m/s]

element **level1Product/platform/attitude**

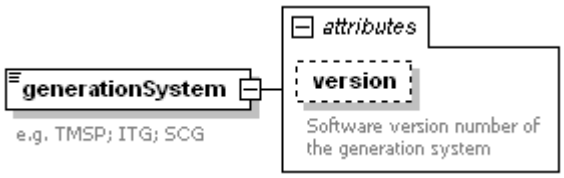
diagram	
annotation	documentation mainly relevant segment cut out of the attitude file

element **level1Product/platform/attitude/attitudeHeader**

diagram


attitudeHeader
generationSystem
e.g. TMSP; ITG; SCG
sensor
AOCS
accuracy
STD to indicate that it is derived from Star Tracker Data. LREF and RREF for left and right looking reference attitude products (used for NRT processing).
attitudeDataRefFrames
attitude data reference frame indicator
coordSystemTransfrom
applied transform if orbit data source was not in ref frame
attitudeDataRefTime
attitude data reference time indicator
e.g. GPS
attitudeDataFormat
e.g. units / quaternion order
numRecords
total number of attitude data in records
firstAttitudeTime
lastAttitudeTime
attitudeDataTimeSpacing
[sec]
attitude data time spacing
accuracyMargin
3D RMS value
recInterpolTechnique
recommended interpolation technique
e.g. linear
recInterpolPolDegree
recommended interpolation polynomial degree
dataGapIndicator
number of attitude data records with qualInd=0
steeringLawIndicator
all data in "TZDS",...

element **level1Product/platform/attitude/attitudeHeader/generationSystem**

diagram	
type	extension of **string255**
facets	maxLength 255
attributes	Name: version; Type: **string80**; Use: ; Default: ; Fixed: ; Annotation documentation: Software version number of the generation system
annotation	documentation e.g. TMSP; ITG; SCG

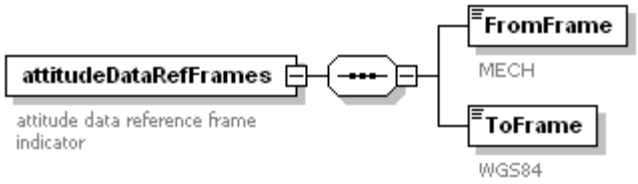
element **level1Product/platform/attitude/attitudeHeader/sensor**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration AOCS
annotation	documentation AOCS

element **level1Product/platform/attitude/attitudeHeader/accuracy**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration STD enumeration RREF enumeration LREF enumeration REFE enumeration UNDEFINED
annotation	documentation STD to indicate that it is derived from Star Tracker Data. LREF and RREF for left and right looking reference attitude products (used for NRT processing).

element **level1Product/platform/attitude/attitudeHeader/attitudeDataRefFrames**

diagram	
annotation	documentation attitude data reference frame indicator

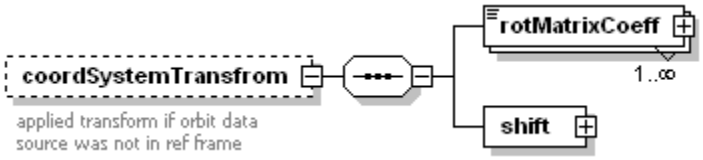
element **level1Product/platform/attitude/attitudeHeader/attitudeDataRefFrames/FromFrame**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation MECH

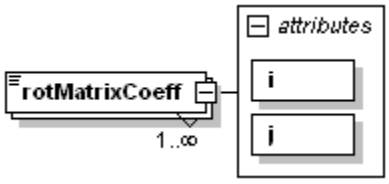
element **level1Product/platform/attitude/attitudeHeader/attitudeDataRefFrames/ToFrame**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation WGS84

element **level1Product/platform/attitude/attitudeHeader/coordSystemTransfrom**

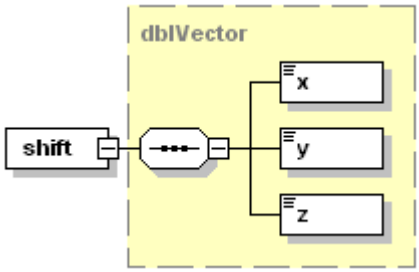
diagram	
annotation	documentation applied transform if orbit data source was not in ref frame

element **level1Product/platform/attitude/attitudeHeader/coordSystemTransfrom/rotMatrixCoeff**

diagram	
type	extension of **xs:double**

attributes	Name	Type	Use	Default	Fixed	Annotation
	i	**xs:int**	required			
	j	**xs:int**	required			

element **level1Product/platform/attitude/attitudeHeader/coordSystemTransfrom/shift**

diagram	
type	**dblVector**

element **level1Product/platform/attitude/attitudeHeader/attitudeDataRefTime**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation attitude data reference time indicator e.g. GPS

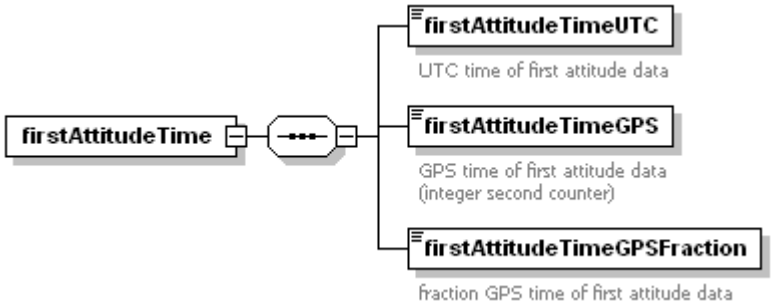
element **level1Product/platform/attitude/attitudeHeader/attitudeDataFormat**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation e.g. units / quaternion order

element **level1Product/platform/attitude/attitudeHeader/numRecords**

diagram	
type	**xs:unsignedLong**
annotation	documentation total number of attitude data in records

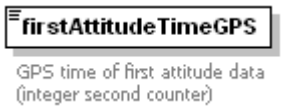
element **level1Product/platform/attitude/attitudeHeader/firstAttitudeTime**

diagram	

element **level1Product/platform/attitude/attitudeHeader/firstAttitudeTime/firstAttitudeTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation UTC time of first attitude data

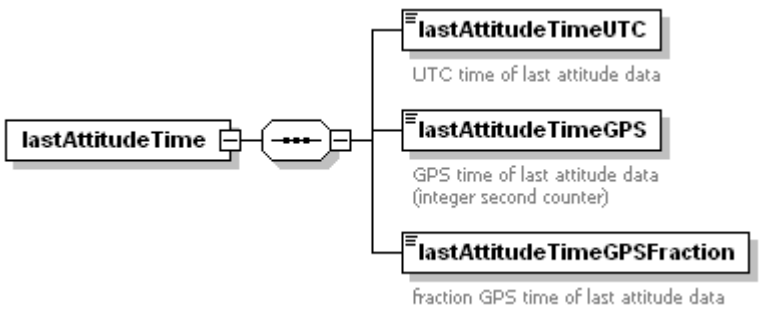
element **level1Product/platform/attitude/attitudeHeader/firstAttitudeTime/firstAttitudeTimeGPS**

diagram	
type	**xs:unsignedInt**
annotation	documentation GPS time of first attitude data (integer second counter)

element **level1Product/platform/attitude/attitudeHeader/firstAttitudeTime/firstAttitudeTimeGPSFraction**

diagram	
type	**xs:double**
annotation	documentation fraction GPS time of first attitude data

element **level1Product/platform/attitude/attitudeHeader/lastAttitudeTime**

diagram	

element **level1Product/platform/attitude/attitudeHeader/lastAttitudeTime/lastAttitudeTimeUTC**

diagram	**lastAttitudeTimeUTC** UTC time of last attitude data
type	**xs:dateTime**
annotation	documentation UTC time of last attitude data

element **level1Product/platform/attitude/attitudeHeader/lastAttitudeTime/lastAttitudeTimeGPS**

diagram	**lastAttitudeTimeGPS** GPS time of last attitude data (integer second counter)
type	**xs:unsignedInt**
annotation	documentation GPS time of last attitude data (integer second counter)

element **level1Product/platform/attitude/attitudeHeader/lastAttitudeTime/lastAttitudeTimeGPSFraction**

diagram	**lastAttitudeTimeGPSFraction** fraction GPS time of last attitude data
type	**xs:double**
annotation	documentation fraction GPS time of last attitude data

element **level1Product/platform/attitude/attitudeHeader/attitudeDataTimeSpacing**

diagram	**attitudeDataTimeSpacing** [sec] attitude data time spacing
type	**xs:double**
annotation	documentation [sec] attitude data time spacing

element **level1Product/platform/attitude/attitudeHeader/accuracyMargin**

diagram	**accuracyMargin** 3D RMS value
type	**xs:float**
annotation	documentation 3D RMS value

element **level1Product/platform/attitude/attitudeHeader/recInterpolTechnique**

diagram	**recInterpolTechnique** recommended interpolation technique e.g. linear
type	**string255**
facets	maxLength 255

annotation	documentation recommended interpolation technique e.g. linear

element **level1Product/platform/attitude/attitudeHeader/recInterpolPolDegree**

diagram	
type	restriction of **xs:int**
facets	minInclusive 1 maxInclusive 20
annotation	documentation recommended interpolation polynomial degree

element **level1Product/platform/attitude/attitudeHeader/dataGapIndicator**

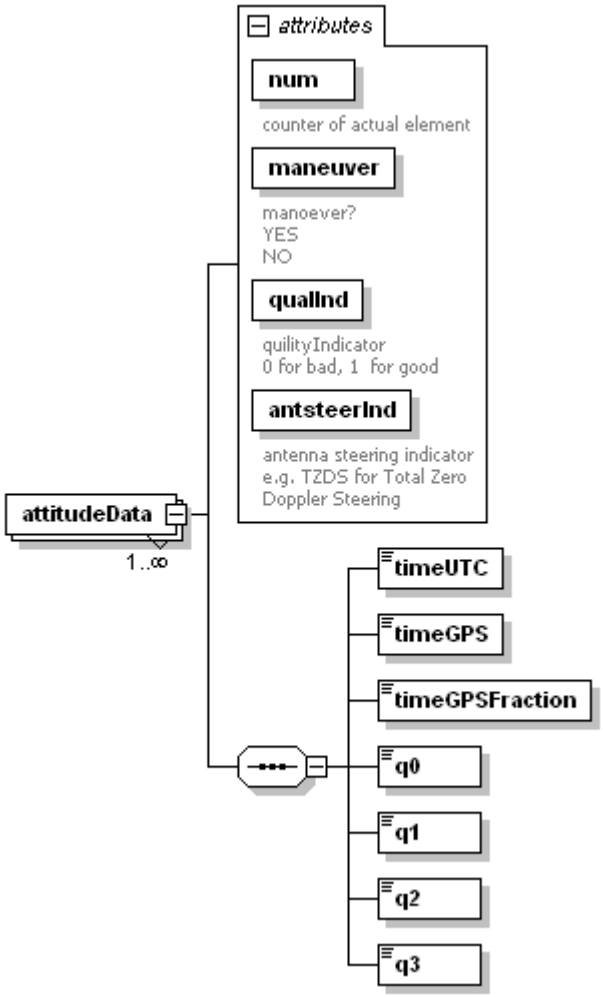
diagram	
type	**xs:int**
annotation	documentation number of attitude data records with qualInd=0

element **level1Product/platform/attitude/attitudeHeader/steeringLawIndicator**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation all data in "TZDS",...

element **level1Product/platform/attitude/attitudeData**

diagram



attributes

Name	Type	Use	Default	Fixed	Annotation
num	**derived by: xs:unsignedLong**	required			documentation counter of actual element
maneuver	**derived by: xs:NMTOKEN**	required			documentation manoever? YES NO
qualInd	**derived by: xs:unsignedByte**	required			documentation quilityIndicator 0 for bad, 1 for good
antsteerInd	**string20**	required			documentation antenna steering indicator e.g. TZDS for Total Zero Doppler Steering

element **level1Product/platform/attitude/attitudeData/timeUTC**

diagram

type **xs:dateTime**

element **level1Product/platform/attitude/attitudeData/timeGPS**

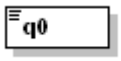
diagram

type **xs:unsignedLong**

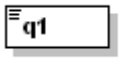
element **level1Product/platform/attitude/attitudeData/timeGPSFraction**

diagram	
type	**xs:double**

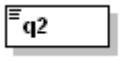
element **level1Product/platform/attitude/attitudeData/q0**

diagram	
type	**xs:double**

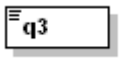
element **level1Product/platform/attitude/attitudeData/q1**

diagram	
type	**xs:double**

element **level1Product/platform/attitude/attitudeData/q2**

diagram	
type	**xs:double**

element **level1Product/platform/attitude/attitudeData/q3**

diagram	
type	**xs:double**

6.1.10 Product Quality

element **level1Product/productQuality**

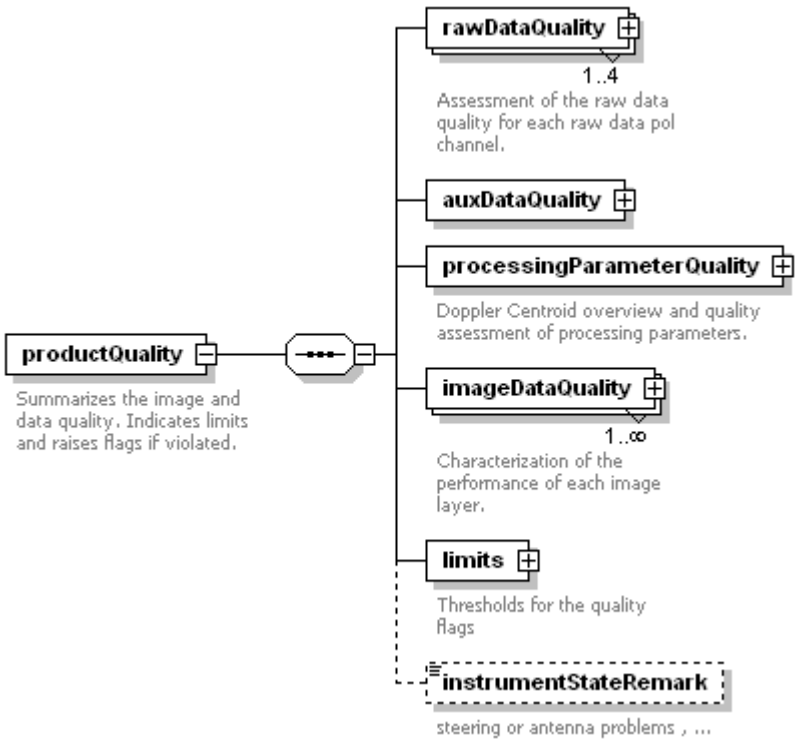
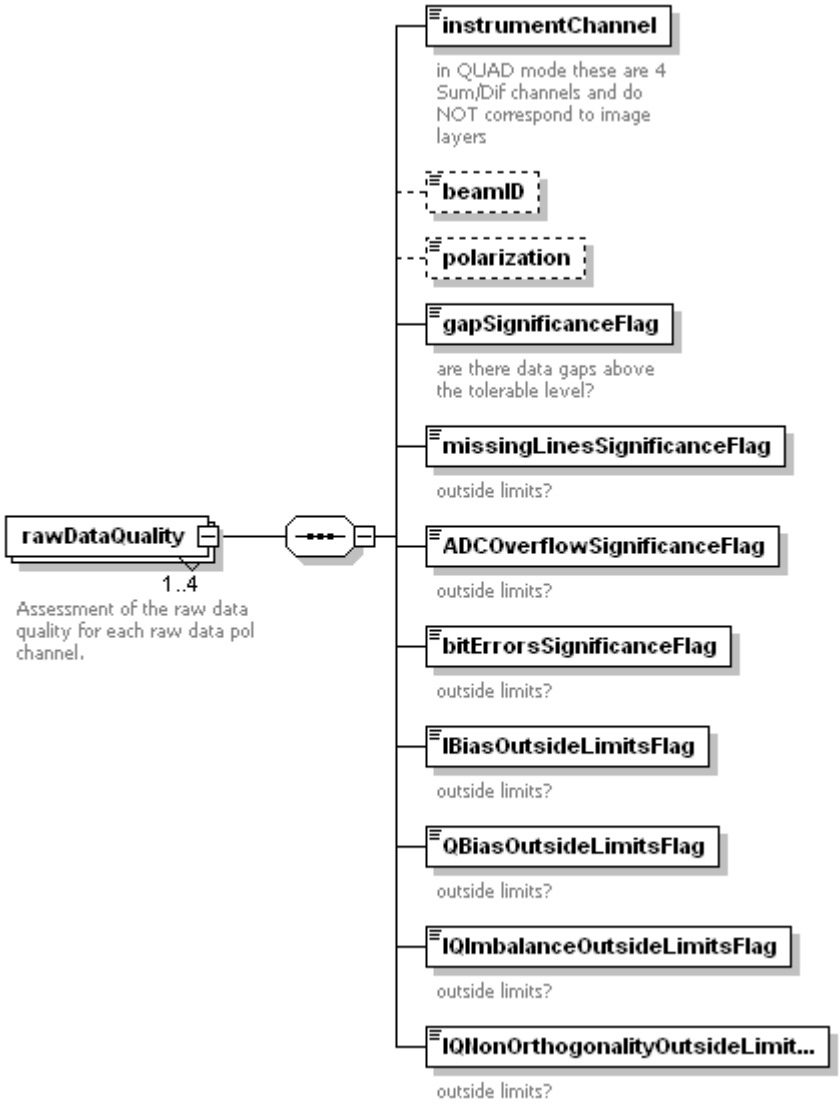
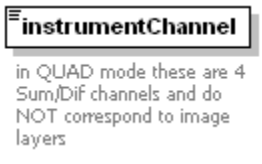


diagram	
annotation	documentation Summarizes the image and data quality. Indicates limits and raises flags if violated.

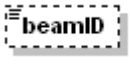
element **level1Product/productQuality/rawDataQuality**

diagram	
annotation	documentation Assessment of the raw data quality for each raw data pol channel.

element **level1Product/productQuality/rawDataQuality/instrumentChannel**

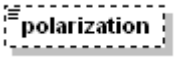
diagram	
type	**xs:string**
annotation	documentation in QUAD mode these are 4 Sum/Dif channels and do NOT correspond to image layers

element **level1Product/productQuality/rawDataQuality/beamID**

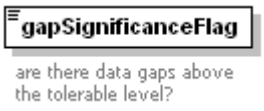
diagram	
type	**string20**

facets	maxLength 20

element **level1Product/productQuality/rawDataQuality/polarization**

diagram	
type	**string20**
facets	maxLength 20

element **level1Product/productQuality/rawDataQuality/gapSignificanceFlag**

diagram	
type	**xs:boolean**
annotation	documentation are there data gaps above the tolerable level?

element **level1Product/productQuality/rawDataQuality/missingLinesSignificanceFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

element **level1Product/productQuality/rawDataQuality/ADCOverflowSignificanceFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

element **level1Product/productQuality/rawDataQuality/bitErrorsSignificanceFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

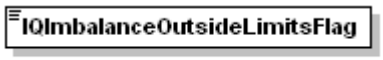
element **level1Product/productQuality/rawDataQuality/IBiasOutsideLimitsFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

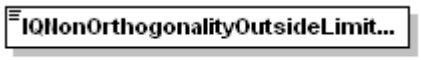
element **level1Product/productQuality/rawDataQuality/QBiasOutsideLimitsFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

element **level1Product/productQuality/rawDataQuality/IQImbalanceOutsideLimitsFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

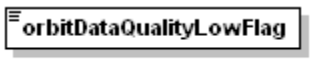
element **level1Product/productQuality/rawDataQuality/IQNonOrthogonalityOutsideLimitsFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

element **level1Product/productQuality/auxDataQuality**

diagram	

element **level1Product/productQuality/auxDataQuality/orbitDataQualityLowFlag**

diagram	
type	**xs:boolean**
annotation	documentation too many gaps

element **level1Product/productQuality/auxDataQuality/attitudeDataQualityLowFlag**

diagram	**attitudeDataQualityLowFlag** too many gaps or missing
type	**xs:boolean**
annotation	documentation too many gaps or missing

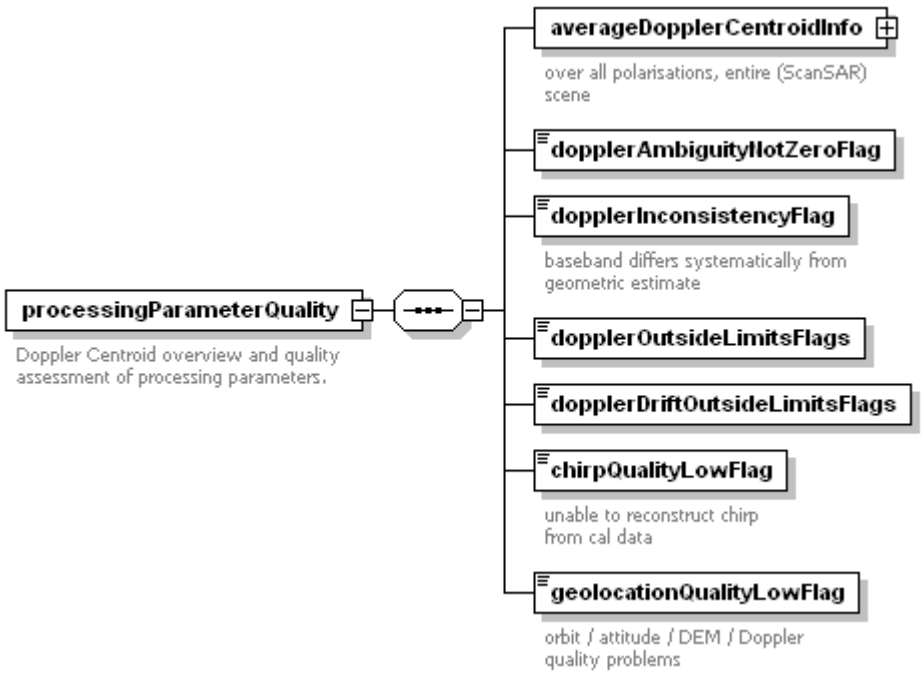
element **level1Product/productQuality/auxDataQuality/DEMqualityLowFlag**

diagram	**DEMqualityLowFlag** e.g. only low resolution DEM data available (poles)
type	**xs:boolean**
annotation	documentation e.g. only low resolution DEM data available (poles)

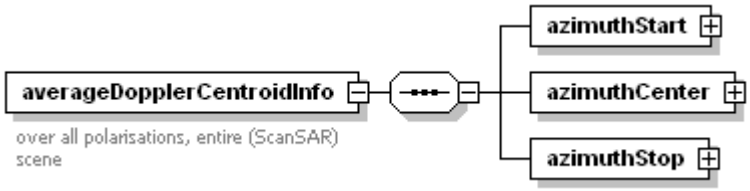
element **level1Product/productQuality/auxDataQuality/missingAuxDataFlag**

diagram	**missingAuxDataFlag** No housekeeping data available, undefined values encountered, ...
type	**xs:boolean**
annotation	documentation No housekeeping data available, undefined values encountered, ...

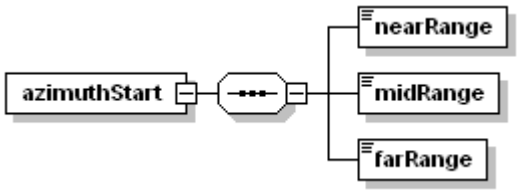
element **level1Product/productQuality/processingParameterQuality**

diagram	
annotation	documentation Doppler Centroid overview and quality assessment of processing parameters.

element **level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo**

diagram	
annotation	documentation over all polarisations, entire (ScanSAR) scene

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStart

diagram	

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStart/nearRange

diagram	
type	**xs:double**

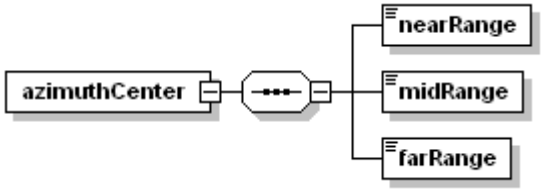
element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStart/midRange

diagram	
type	**xs:double**

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStart/farRange

diagram	
type	**xs:double**

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthCenter

diagram	

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthCenter/nearRange

diagram	
type	**xs:double**

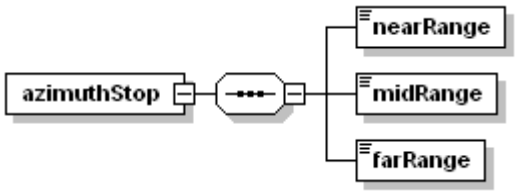
element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthCenter/midRange

diagram	
type	**xs:double**

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthCenter/farRange

diagram	
type	**xs:double**

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStop

diagram	

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStop/nearRange

diagram	
type	**xs:double**

element
level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStop/midRange

diagram	
type	**xs:double**

element

level1Product/productQuality/processingParameterQuality/averageDopplerCentroidInfo/azimuthStop/farRange

diagram	farRange
type	**xs:double**

element **level1Product/productQuality/processingParameterQuality/dopplerAmbiguityNotZeroFlag**

diagram	dopplerAmbiguityNotZeroFlag
type	**xs:boolean**

element **level1Product/productQuality/processingParameterQuality/dopplerInconsistencyFlag**

diagram	dopplerInconsistencyFlag baseband differs systematically from geometric estimate
type	**xs:boolean**
annotation	documentation baseband differs systematically from geometric estimate

element **level1Product/productQuality/processingParameterQuality/dopplerOutsideLimitsFlags**

diagram	dopplerOutsideLimitsFlags
type	**xs:boolean**

element **level1Product/productQuality/processingParameterQuality/dopplerDriftOutsideLimitsFlags**

diagram	dopplerDriftOutsideLimitsFlags
type	**xs:boolean**

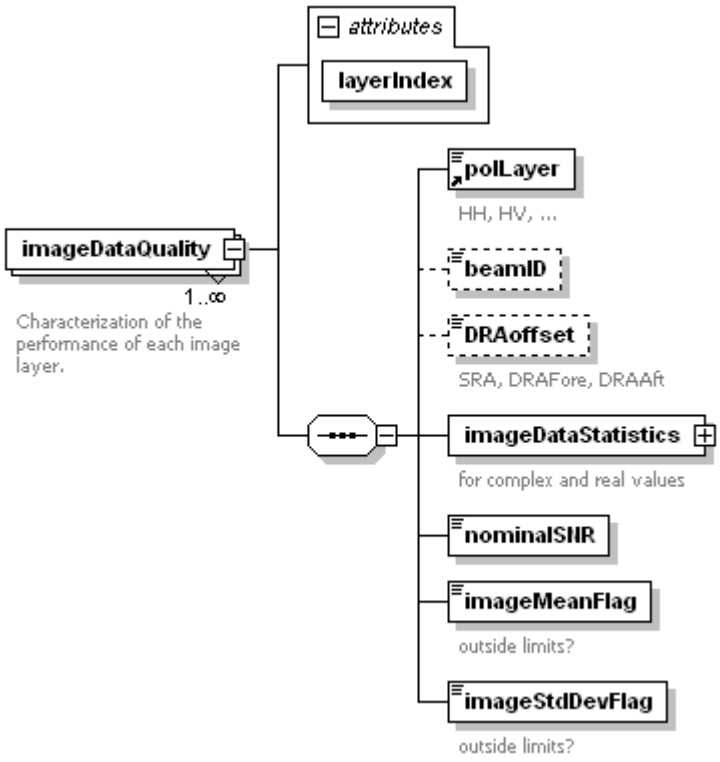
element **level1Product/productQuality/processingParameterQuality/chirpQualityLowFlag**

diagram	chirpQualityLowFlag unable to reconstruct chirp from cal data
type	**xs:boolean**
annotation	documentation unable to reconstruct chirp from cal data

element **level1Product/productQuality/processingParameterQuality/geolocationQualityLowFlag**

diagram	geolocationQualityLowFlag orbit / attitude / DEM / Doppler quality problems
type	**xs:boolean**
annotation	documentation orbit / attitude / DEM / Doppler quality problems

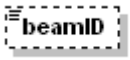
element **level1Product/productQuality/imageDataQuality**

diagram	

attributes	Name	Type	Use	Default	Fixed	Annotation
	layerIndex	**xs:int**	required			

annotation	documentation Characterization of the performance of each image layer.

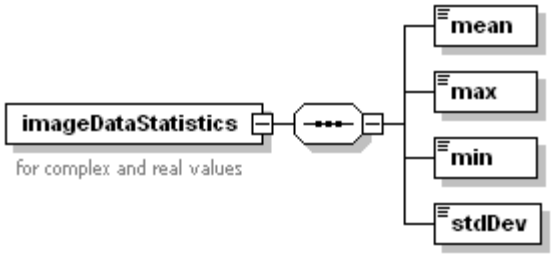
element **level1Product/productQuality/imageDataQuality/beamID**

diagram	
type	**string20**
facets	maxLength 20

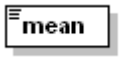
element **level1Product/productQuality/imageDataQuality/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

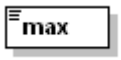
element **level1Product/productQuality/imageDataQuality/imageDataStatistics**

diagram	
annotation	documentation for complex and real values

element **level1Product/productQuality/imageDataQuality/imageDataStatistics/mean**

diagram	
type	**xs:double**

element **level1Product/productQuality/imageDataQuality/imageDataStatistics/max**

diagram	
type	**xs:double**

element **level1Product/productQuality/imageDataQuality/imageDataStatistics/min**

diagram	
type	**xs:double**

element **level1Product/productQuality/imageDataQuality/imageDataStatistics/stdDev**

diagram	
type	**xs:double**

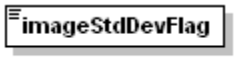
element **level1Product/productQuality/imageDataQuality/nominalSNR**

diagram	
type	**xs:float**

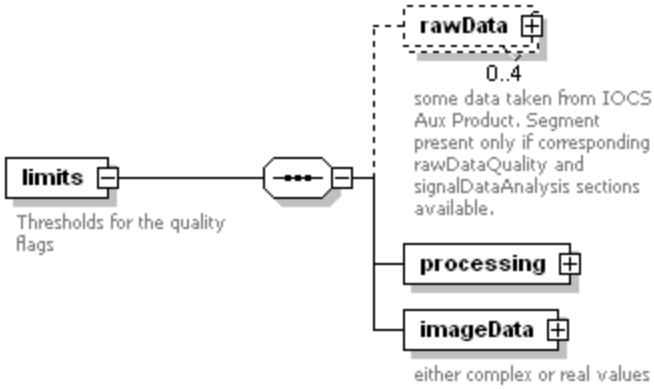
element **level1Product/productQuality/imageDataQuality/imageMeanFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

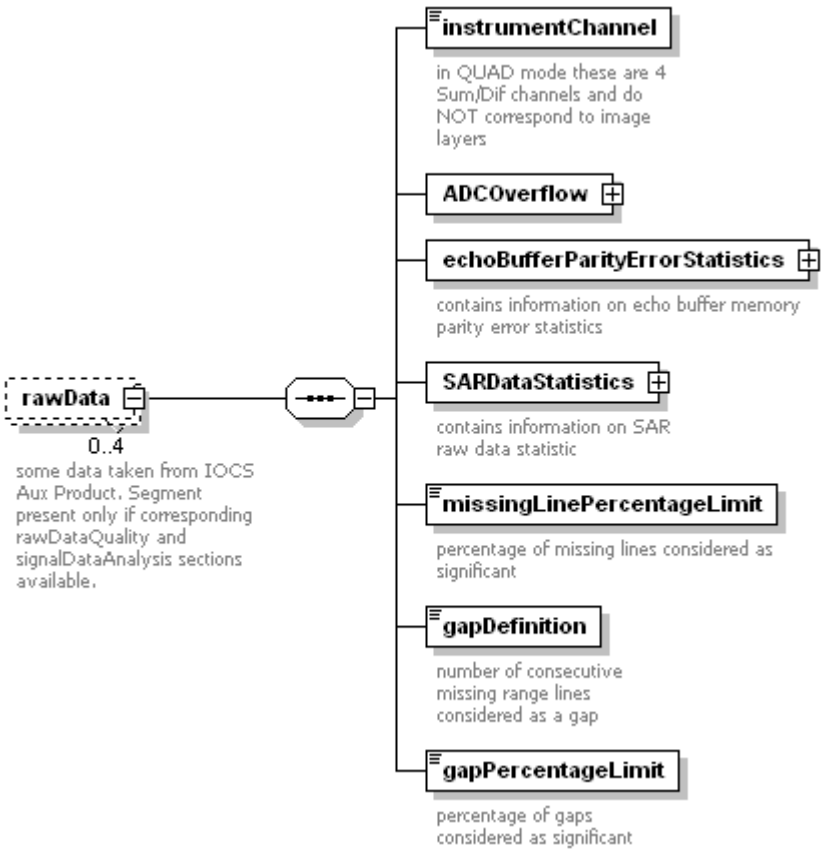
element **level1Product/productQuality/imageDataQuality/imageStdDevFlag**

diagram	
type	**xs:boolean**
annotation	documentation outside limits?

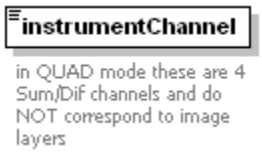
element **level1Product/productQuality/limits**

diagram	
annotation	documentation Thresholds for the quality flags

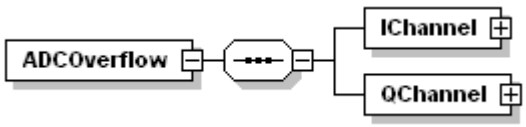
element **level1Product/productQuality/limits/rawData**

diagram	
annotation	documentation some data taken from IOCS Aux Product. Segment present only if corresponding rawDataQuality and signalDataAnalysis sections available.

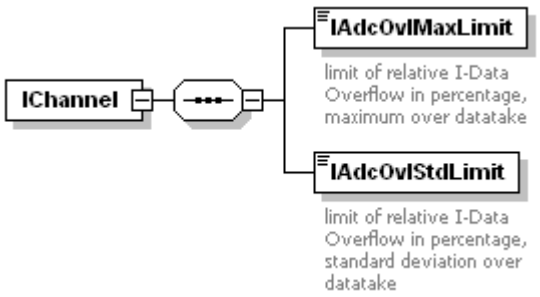
element **level1Product/productQuality/limits/rawData/instrumentChannel**

diagram	
type	**xs:string**
annotation	documentation in QUAD mode these are 4 Sum/Dif channels and do NOT correspond to image layers

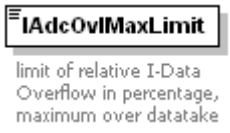
element **level1Product/productQuality/limits/rawData/ADCOverflow**

diagram	

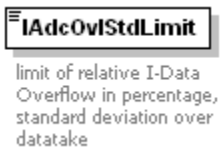
element **level1Product/productQuality/limits/rawData/ADCOverflow/IChannel**

diagram	

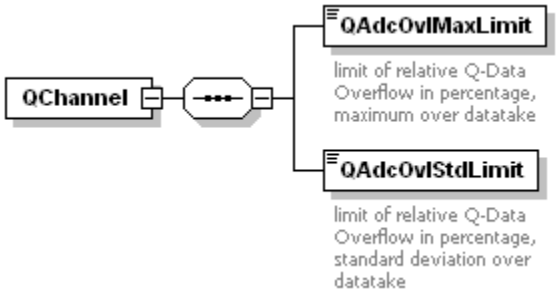
element **level1Product/productQuality/limits/rawData/ADCOverflow/IChannel/IAdcOvlMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit of relative I-Data Overflow in percentage, maximum over datatake

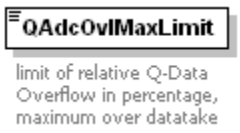
element **level1Product/productQuality/limits/rawData/ADCOverflow/IChannel/IAdcOvlStdLimit**

diagram	
type	**xs:float**
annotation	documentation limit of relative I-Data Overflow in percentage, standard deviation over datatake

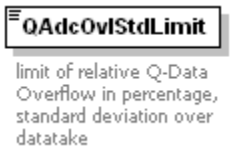
element **level1Product/productQuality/limits/rawData/ADCOverflow/QChannel**

diagram	

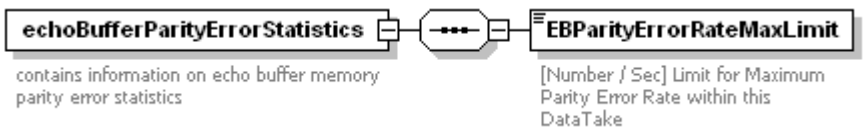
element **level1Product/productQuality/limits/rawData/ADCOverflow/QChannel/QAdcOvlMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit of relative Q-Data Overflow in percentage, maximum over datatake

element **level1Product/productQuality/limits/rawData/ADCOverflow/QChannel/QAdcOvlStdLimit**

diagram	
type	**xs:float**
annotation	documentation limit of relative Q-Data Overflow in percentage, standard deviation over datatake

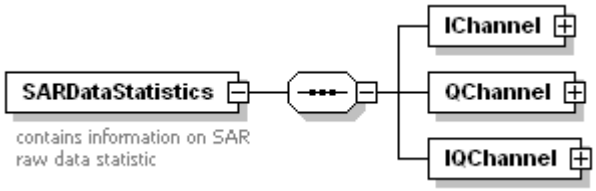
element **level1Product/productQuality/limits/rawData/echoBufferParityErrorStatistics**

diagram	
annotation	documentation contains information on echo buffer memory parity error statistics

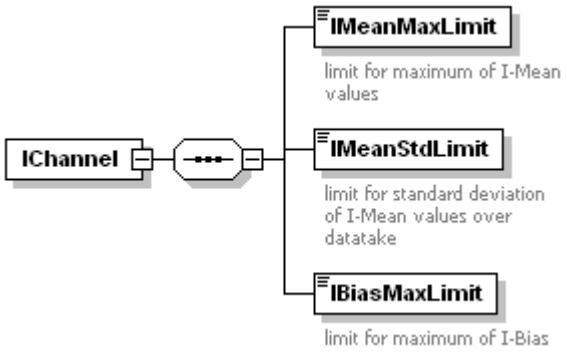
element **level1Product/productQuality/limits/rawData/echoBufferParityErrorStatistics/EBParityErrorRateMaxLimit**

diagram	
type	extension of **xs:float**
annotation	documentation [Number / Sec] Limit for Maximum Parity Error Rate within this DataTake

element **level1Product/productQuality/limits/rawData/SARDataStatistics**

diagram	
annotation	documentation contains information on SAR raw data statistic

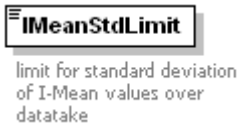
element **level1Product/productQuality/limits/rawData/SARDataStatistics/IChannel**

diagram	

element **level1Product/productQuality/limits/rawData/SARDataStatistics/IChannel/IMeanMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit for maximum of I-Mean values

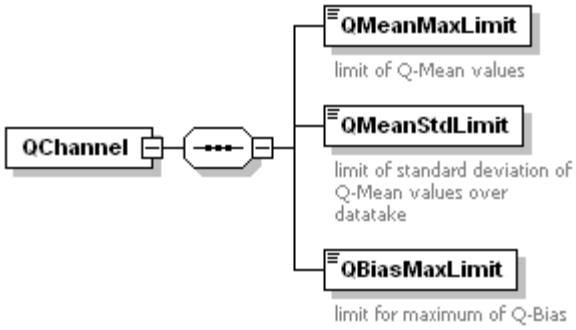
element **level1Product/productQuality/limits/rawData/SARDataStatistics/IChannel/IMeanStdLimit**

diagram	
type	**xs:float**
annotation	documentation limit for standard deviation of I-Mean values over datatake

element **level1Product/productQuality/limits/rawData/SARDataStatistics/IChannel/IBiasMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit for maximum of I-Bias

element **level1Product/productQuality/limits/rawData/SARDataStatistics/QChannel**

diagram	

element **level1Product/productQuality/limits/rawData/SARDataStatistics/QChannel/QMeanMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit of Q-Mean values

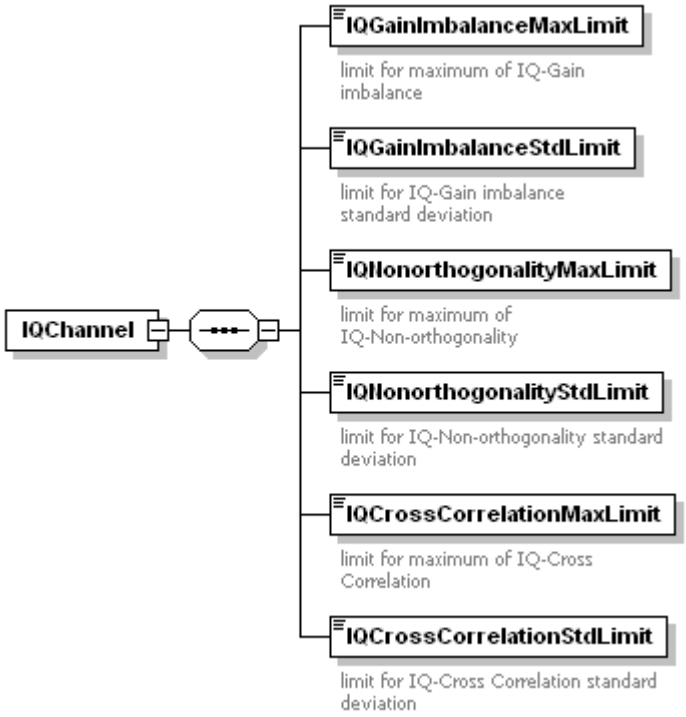
element **level1Product/productQuality/limits/rawData/SARDataStatistics/QChannel/QMeanStdLimit**

diagram	
type	**xs:float**
annotation	documentation limit of standard deviation of Q-Mean values over datatake

element **level1Product/productQuality/limits/rawData/SARDataStatistics/QChannel/QBiasMaxLimit**

diagram	
type	**xs:float**
annotation	documentation limit for maximum of Q-Bias

element **level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel**

diagram	

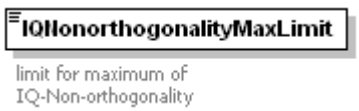
element
level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQGainImbalanceMaxLimit

diagram	
type	**xs:float**
annotation	documentation limit for maximum of IQ-Gain imbalance

element
level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQGainImbalanceStdLimit

diagram	
type	**xs:float**
annotation	documentation limit for IQ-Gain imbalance standard deviation

element
level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQNonorthogonalityMaxLimit

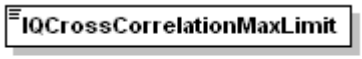
diagram	
type	**xs:float**

annotation	documentation limit for maximum of IQ-Non-orthogonality

element **level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQNonorthogonalityStdLimit**

diagram	 limit for IQ-Non-orthogonality standard deviation
type	**xs:float**
annotation	documentation limit for IQ-Non-orthogonality standard deviation

element **level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQCrossCorrelationMaxLimit**

diagram	 limit for maximum of IQ-Cross Correlation
type	**xs:float**
annotation	documentation limit for maximum of IQ-Cross Correlation

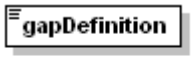
element **level1Product/productQuality/limits/rawData/SARDataStatistics/IQChannel/IQCrossCorrelationStdLimit**

diagram	 limit for IQ-Cross Correlation standard deviation
type	**xs:float**
annotation	documentation limit for IQ-Cross Correlation standard deviation

element **level1Product/productQuality/limits/rawData/missingLinePercentageLimit**

diagram	 percentage of missing lines considered as significant
type	**xs:float**
annotation	documentation percentage of missing lines considered as significant

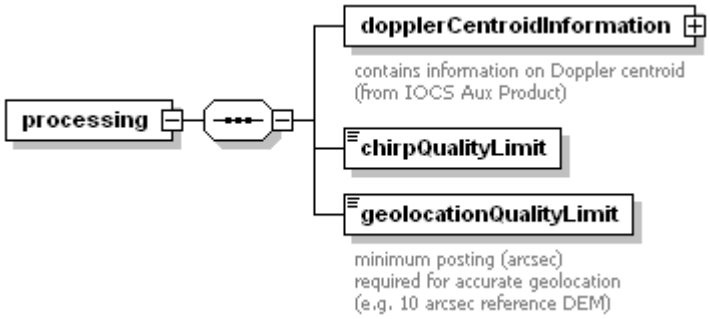
element **level1Product/productQuality/limits/rawData/gapDefinition**

diagram	 number of consecutive missing range lines considered as a gap
type	**xs:int**
annotation	documentation number of consecutive missing range lines considered as a gap

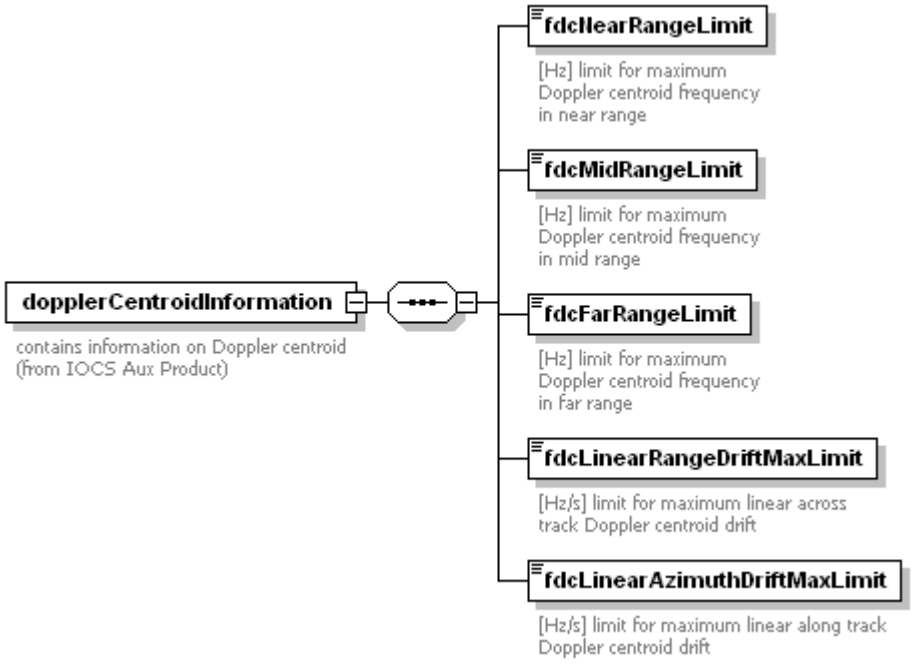
element **level1Product/productQuality/limits/rawData/gapPercentageLimit**

diagram	
type	**xs:float**
annotation	documentation percentage of gaps considered as significant

element **level1Product/productQuality/limits/processing**

diagram	

element **level1Product/productQuality/limits/processing/dopplerCentroidInformation**

diagram	
annotation	documentation contains information on Doppler centroid (from IOCS Aux Product)

element **level1Product/productQuality/limits/processing/dopplerCentroidInformation/fdcNearRangeLimit**

diagram	**fdcNearRangeLimit** [Hz] limit for maximum Doppler centroid frequency in near range
type	**xs:float**
annotation	documentation [Hz] limit for maximum Doppler centroid frequency in near range

element **level1Product/productQuality/limits/processing/dopplerCentroidInformation/fdcMidRangeLimit**

diagram	**fdcMidRangeLimit** [Hz] limit for maximum Doppler centroid frequency in mid range
type	**xs:float**
annotation	documentation [Hz] limit for maximum Doppler centroid frequency in mid range

element **level1Product/productQuality/limits/processing/dopplerCentroidInformation/fdcFarRangeLimit**

diagram	**fdcFarRangeLimit** [Hz] limit for maximum Doppler centroid frequency in far range
type	**xs:float**
annotation	documentation [Hz] limit for maximum Doppler centroid frequency in far range

element **level1Product/productQuality/limits/processing/dopplerCentroidInformation/fdcLinearRangeDriftMaxLimit**

diagram	**fdcLinearRangeDriftMaxLimit** [Hz/s] limit for maximum linear across track Doppler centroid drift
type	**xs:float**
annotation	documentation [Hz/s] limit for maximum linear across track Doppler centroid drift

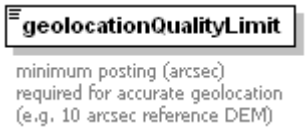
element **level1Product/productQuality/limits/processing/dopplerCentroidInformation/fdcLinearAzimuthDriftMaxLimit**

diagram	**fdcLinearAzimuthDriftMaxLimit** [Hz/s] limit for maximum linear along track Doppler centroid drift
type	**xs:float**
annotation	documentation [Hz/s] limit for maximum linear along track Doppler centroid drift

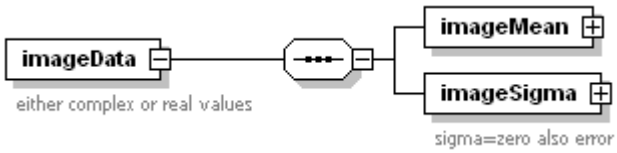
element **level1Product/productQuality/limits/processing/chirpQualityLimit**

diagram	
type	**xs:float**

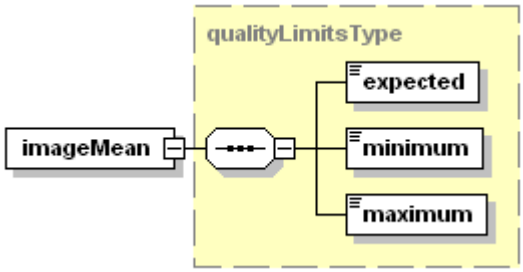
element **level1Product/productQuality/limits/processing/geolocationQualityLimit**

diagram	
type	**xs:float**
annotation	documentation minimum posting (arcsec) required for accurate geolocation (e.g. 10 arcsec reference DEM)

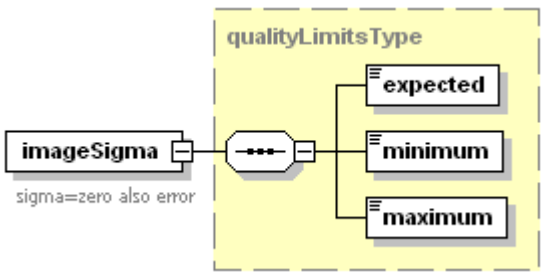
element **level1Product/productQuality/limits/imageData**

diagram	
annotation	documentation either complex or real values

element **level1Product/productQuality/limits/imageData/imageMean**

diagram	
type	**qualityLimitsType**

element **level1Product/productQuality/limits/imageData/imageSigma**

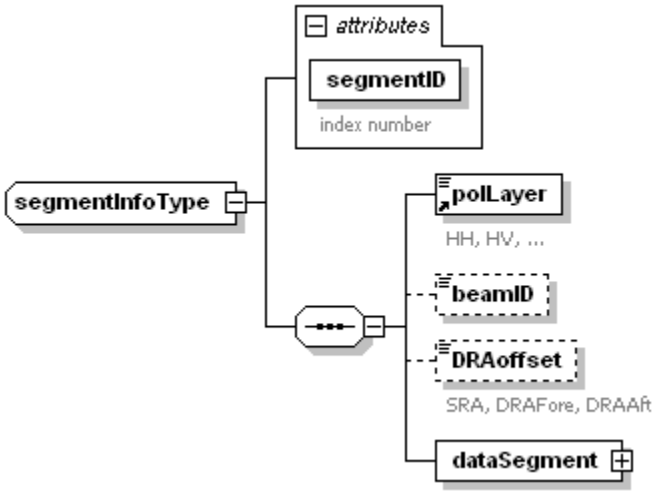
diagram	
type	**qualityLimitsType**
annotation	documentation sigma=zero also error

element **level1Product/productQuality/instrumentStateRemark**

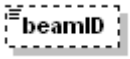
diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation steering or antenna problems , ...

6.1.11 General Header and Data Type Definitions

complexType **segmentInfoType**

diagram						
attributes	Name segmentID	Type **xs:int**	Use required	Default	Fixed	Annotation documentation index number

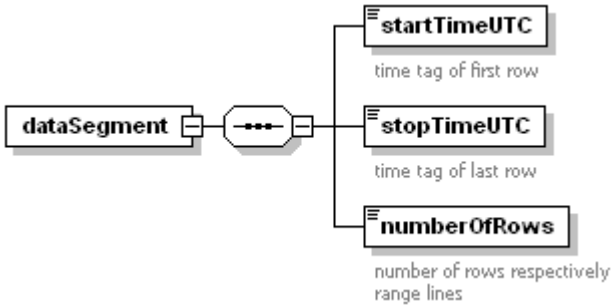
element **segmentInfoType/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **segmentInfoType/DRAoffset**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **segmentInfoType/dataSegment**

diagram	

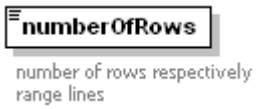
element **segmentInfoType/dataSegment/startTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation time tag of first row

element **segmentInfoType/dataSegment/stopTimeUTC**

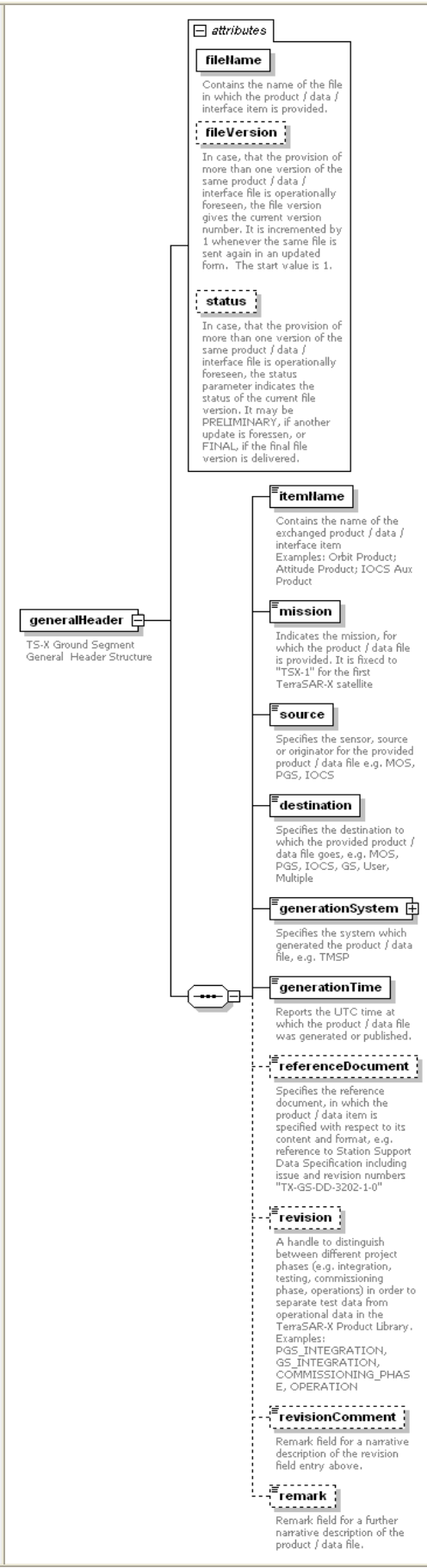
diagram	
type	**xs:dateTime**
annotation	documentation time tag of last row

element **segmentInfoType/dataSegment/numberOfRows**

diagram	
type	**xs:int**
annotation	documentation number of rows respectively range lines

element **generalHeader**

diagram


attributes
fileName
Contains the name of the file in which the product / data / interface item is provided.
fileVersion
In case, that the provision of more than one version of the same product / data / interface file is operationally foreseen, the file version gives the current version number. It is incremented by 1 whenever the same file is sent again in an updated form. The start value is 1.
status
In case, that the provision of more than one version of the same product / data / interface file is operationally foreseen, the status parameter indicates the status of the current file version. It may be PRELIMINARY, if another update is foressen, or FINAL, if the final file version is delivered.
generalHeader
TS-X Ground Segment General Header Structure
itemName
Contains the name of the exchanged product / data / interface item
Examples: Orbit Product; Attitude Product; IOCS Aux Product
mission
Indicates the mission, for which the product / data file is provided. It is fixecd to "TSX-1" for the first TerraSAR-X satellite
source
Specifies the sensor, source or originator for the provided product / data file e.g. MOS, PGS, IOCS
destination
Specifies the destination to which the provided product / data file goes, e.g. MOS, PGS, IOCS, GS, User, Multiple
generationSystem
Specifies the system which generated the product / data file, e.g. TMSP
generationTime
Reports the UTC time at which the product / data file was generated or published.
referenceDocument
Specifies the reference document, in which the product / data item is specified with respect to its content and format, e.g. reference to Station Support Data Specification including issue and revision numbers "TX-GS-DD-3202-1-0"
revision
A handle to distinguish between different project phases (e.g. integration, testing, commissioning phase, operations) in order to separate test data from operational data in the TerraSAR-X Product Library. Examples: PGS_INTEGRATION, GS_INTEGRATION, COMMISSIONING_PHASE, OPERATION
revisionComment
Remark field for a narrative description of the revision field entry above.
remark
Remark field for a further narrative description of the product / data file.

attributes	Name	Type	Use	Default	Fixed	Annotation
	fileName	**string128**	required			documentation Contains the name of the file in which the product / data / interface item is provided.
	fileVersion	**string20**	optional			documentation In case, that the provision of more than one version of the same product / data / interface file is operationally foreseen, the file version gives the current version number. It is incremented by 1 whenever the same file is sent again in an updated form. The start value is 1.
	status	**string20**	optional			documentation In case, that the provision of more than one version of the same product / data / interface file is operationally foreseen, the status parameter indicates the status of the current file version. It may be PRELIMINARY, if another update is foressen, or FINAL, if the final file version is delivered.
annotation	documentation TS-X Ground Segment General Header Structure					

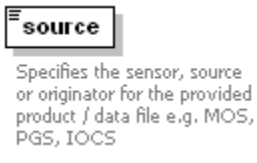
element **generalHeader/itemName**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation Contains the name of the exchanged product / data / interface item Examples: Orbit Product; Attitude Product; IOCS Aux Product

element **generalHeader/mission**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Indicates the mission, for which the product / data file is provided. It is fixecd to "TSX-1" for the first TerraSAR-X satellite

element **generalHeader/source**

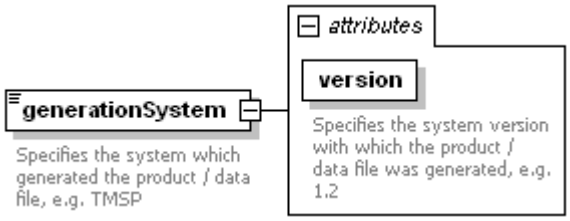
diagram	
type	**string20**

facets	maxLength 20
annotation	documentation Specifies the sensor, source or originator for the provided product / data file e.g. MOS, PGS, IOCS

element **generalHeader/destination**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation Specifies the destination to which the provided product / data file goes, e.g. MOS, PGS, IOCS, GS, User, Multiple

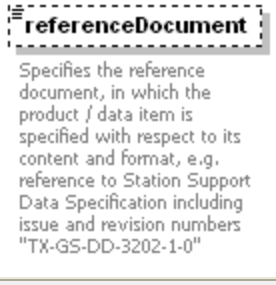
element **generalHeader/generationSystem**

diagram	
type	extension of **string80**
facets	maxLength 80
attributes	Name: version; Type: **string20**; Use: required; Default: ; Fixed: ; Annotation documentation: Specifies the system version with which the product / data file was generated, e.g. 1.2
annotation	documentation Specifies the system which generated the product / data file, e.g. TMSP

element **generalHeader/generationTime**

diagram	
type	**xs:dateTime**
annotation	documentation Reports the UTC time at which the product / data file was generated or published.

element **generalHeader/referenceDocument**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation Specifies the reference document, in which the product / data item is specified with respect to its content and format, e.g. reference to Station Support Data Specification including issue and revision numbers "TX-GS-DD-3202-1-0"

element **generalHeader/revision**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation A handle to distinguish between different project phases (e.g. integration, testing, commissioning phase, operations) in order to separate test data from operational data in the TerraSAR-X Product Library. Examples: PGS_INTEGRATION, GS_INTEGRATION, COMMISSIONING_PHASE, OPERATION

element **generalHeader/revisionComment**

diagram	
type	**string1024**
facets	maxLength 1024
annotation	documentation Remark field for a narrative description of the revision field entry above.

element **generalHeader/remark**

diagram	

type	**string1024**
facets	maxLength 1024
annotation	documentation Remark field for a further narrative description of the product / data file.

simpleType **string1024**

type	restriction of **xs:string**
facets	maxLength 1024

simpleType **string128**

type	restriction of **xs:string**
facets	maxLength 128

simpleType **string20**

type	restriction of **xs:string**
facets	maxLength 20

simpleType **string255**

type	restriction of **xs:string**
facets	maxLength 255

simpleType **string80**

type	restriction of **xs:string**
facets	maxLength 80

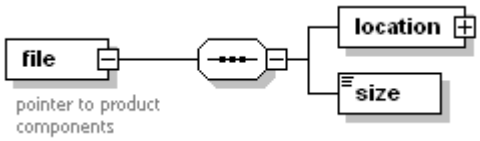
element **antennaReceiveConfiguration**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRA enumeration UNDEFINED
annotation	documentation SRA | DRA

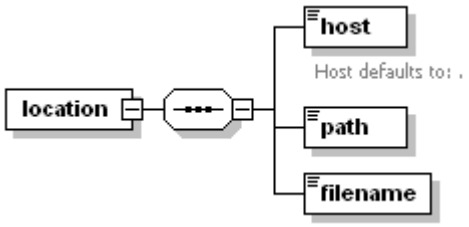
element **chirpSlope**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration UP enumeration DOWN enumeration UPDOWN
annotation	documentation [Up/Down/UpDown] chirp slope

element **file**

diagram	
annotation	documentation pointer to product components

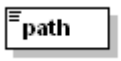
element **file/location**

diagram	

element **file/location/host**

diagram	
type	**xs:string**
annotation	documentation Host defaults to: .

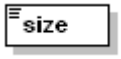
element **file/location/path**

diagram	
type	**xs:string**

element **file/location/filename**

diagram	
type	**xs:string**

element **file/size**

diagram	
type	**xs:long**

element **imagingMode**

diagram	
type	restriction of **xs:NMTOKENS**

facets	enumeration SM enumeration SL enumeration SC enumeration HS enumeration UNDEFINED
annotation	documentation SM, SC, HS, SL

element **lookDirection**

diagram	
type	restriction of **xs:NMTOKEN**
facets	enumeration LEFT enumeration RIGHT enumeration UNDEFINED
annotation	documentation left | right

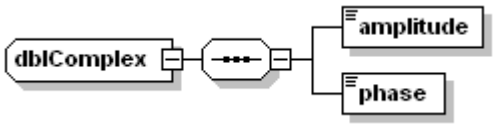
element **polarisationMode**

diagram	
type	restriction of **xs:NMTOKENS**
facets	enumeration SINGLE enumeration DUAL enumeration TWIN enumeration QUAD
annotation	documentation single | dual | twin | quad

element **polLayer**

diagram	
type	restriction of **xs:string**
facets	enumeration HH enumeration HV enumeration VH enumeration VV enumeration UNDEFINED
annotation	documentation HH, HV, ...

complexType **dblComplex**

diagram	

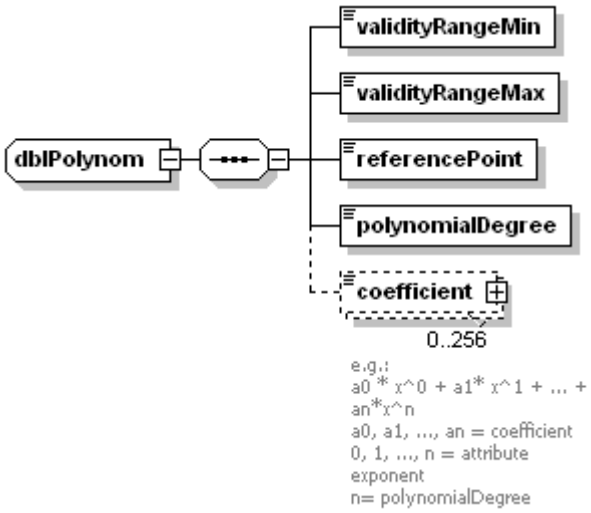
element **dblComplex/amplitude**

diagram	amplitude
type	**xs:double**

element **dblComplex/phase**

diagram	phase
type	**xs:double**

complexType **dblPolynom**

diagram	

element **dblPolynom/validityRangeMin**

diagram	validityRangeMin
type	**xs:double**

element **dblPolynom/validityRangeMax**

diagram	validityRangeMax
type	**xs:double**

element **dblPolynom/referencePoint**

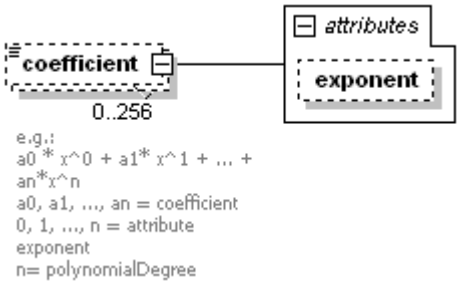
diagram	referencePoint
type	**xs:double**

element **dblPolynom/polynomialDegree**

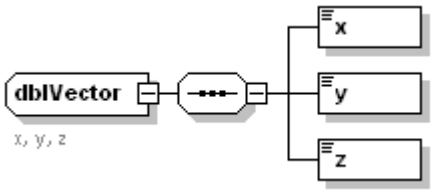
diagram	polynomialDegree

type	**xs:unsignedInt**

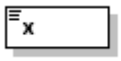
element **dblPolynom/coefficient**

diagram	
type	extension of **xs:double**
attributes	Name: exponent; Type: **xs:unsignedInt**; Use: ; Default: ; Fixed: ; Annotation:
annotation	documentation e.g.: a0 * x^0 + a1* x^1 + ... + an*x^n a0, a1, ..., an = coefficient 0, 1, ..., n = attribute exponent n= polynomialDegree

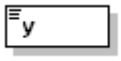
complexType **dblVector**

diagram	
annotation	documentation x, y, z

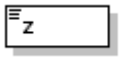
element **dblVector/x**

diagram	
type	**xs:double**

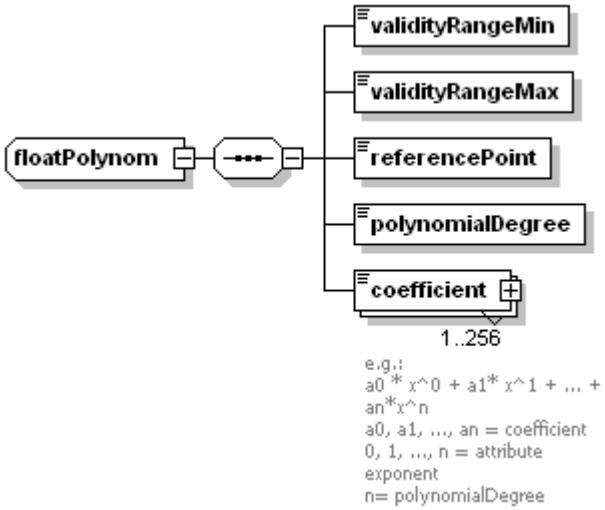
element **dblVector/y**

diagram	
type	**xs:double**

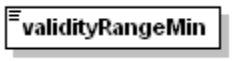
element **dblVector/z**

diagram	
type	**xs:double**

complexType **floatPolynom**

diagram	

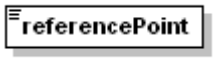
element **floatPolynom/validityRangeMin**

diagram	
type	**xs:float**

element **floatPolynom/validityRangeMax**

diagram	
type	**xs:float**

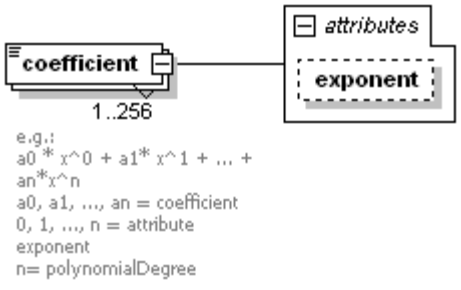
element **floatPolynom/referencePoint**

diagram	
type	**xs:float**

element **floatPolynom/polynomialDegree**

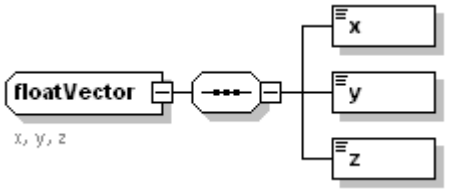
diagram	
type	**xs:unsignedInt**

element **floatPolynom/coefficient**

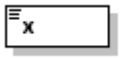
diagram	

type	extension of **xs:float**
attributes	Name: exponent; Type: **xs:unsignedInt**; Use; Default; Fixed; Annotation
annotation	documentation e.g.: a0 * x^0 + a1* x^1 + ... + an*x^n a0, a1, ..., an = coefficient 0, 1, ..., n = attribute exponent n= polynomialDegree

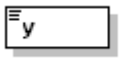
complexType **floatVector**

diagram	
annotation	documentation x, y, z

element **floatVector/x**

diagram	
type	**xs:float**

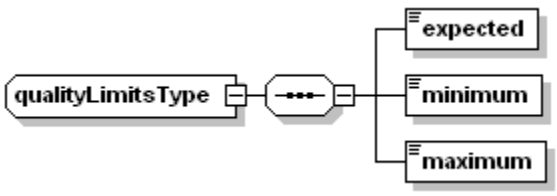
element **floatVector/y**

diagram	
type	**xs:float**

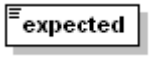
element **floatVector/z**

diagram	
type	**xs:float**

complexType **qualityLimitsType**

diagram	

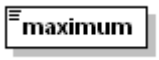
element **qualityLimitsType/expected**

diagram	
type	**xs:float**

element **qualityLimitsType/minimum**

diagram	
type	**xs:float**

element **qualityLimitsType/maximum**

diagram	
type	**xs:float**

simpleType **latitudeDegType**

type	restriction of **xs:float**
facets	minInclusive -90 maxInclusive 90

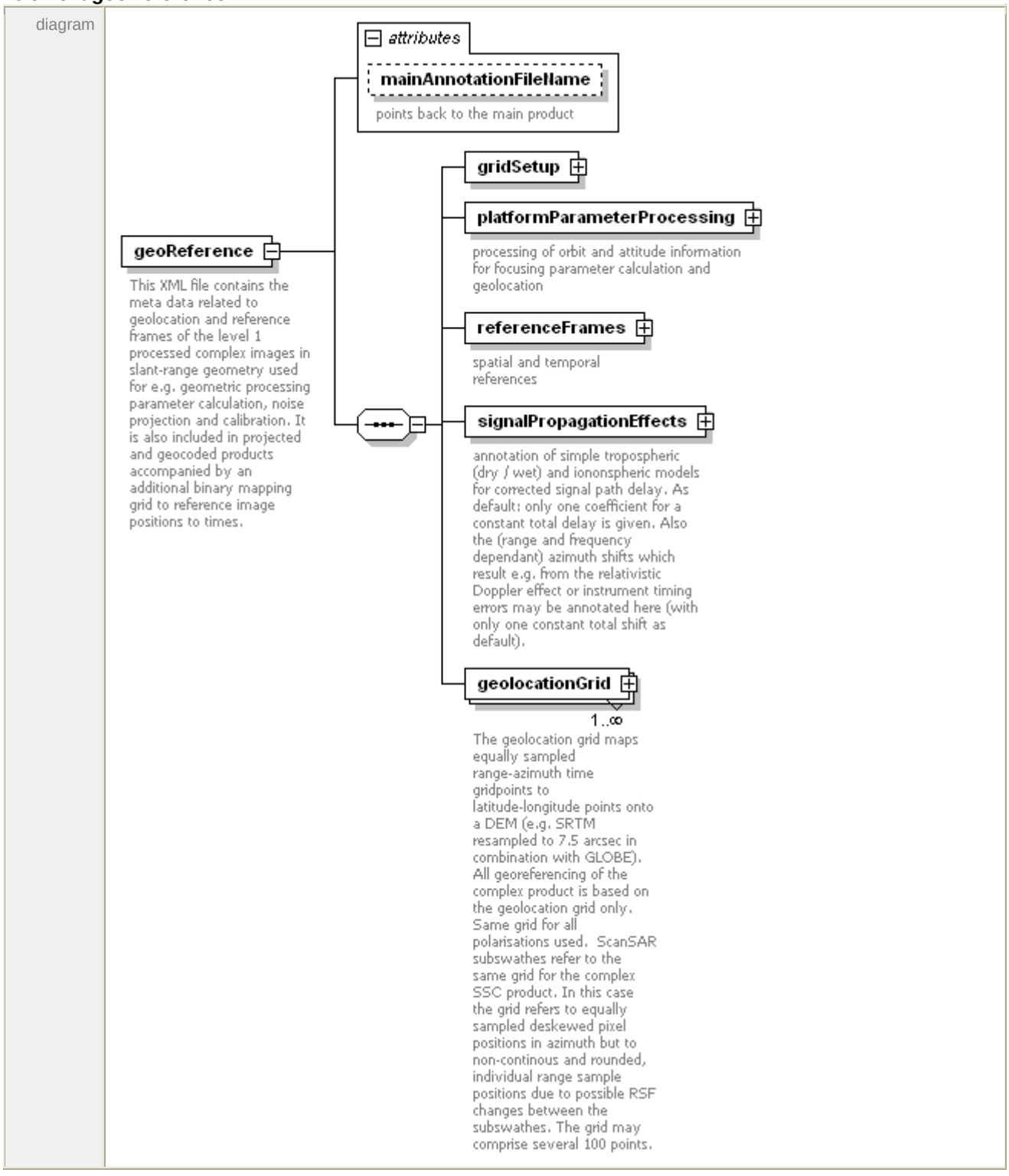
simpleType **longitudeDegType**

type	restriction of **xs:float**
facets	minInclusive -180 maxInclusive 180

6.2 Georeferencing Annotation Component

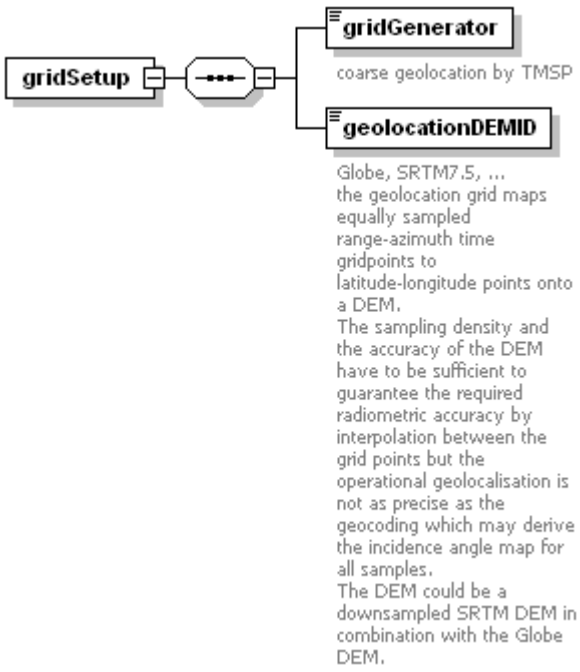
This is an external annotation component in order to facilitate data handling. The geolocation grid contained within may comprise a large number (100s) of grid points.

element **geoReference**



attributes	Name	Type	Use	Default	Fixed	Annotation	
	mainAnnotationFileName	**string1024**				documentation	points back to the main product
annotation	documentation	This XML file contains the meta data related to geolocation and reference frames of the level 1 processed complex images in slant-range geometry used for e.g. geometric processing parameter calculation, noise projection and calibration. It is also included in projected and geocoded products accompanied by an additional binary mapping grid to reference image positions to times.					

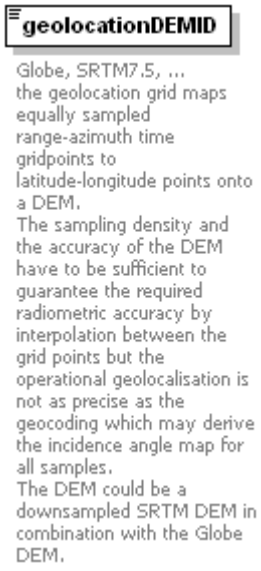
element **geoReference/gridSetup**

diagram	

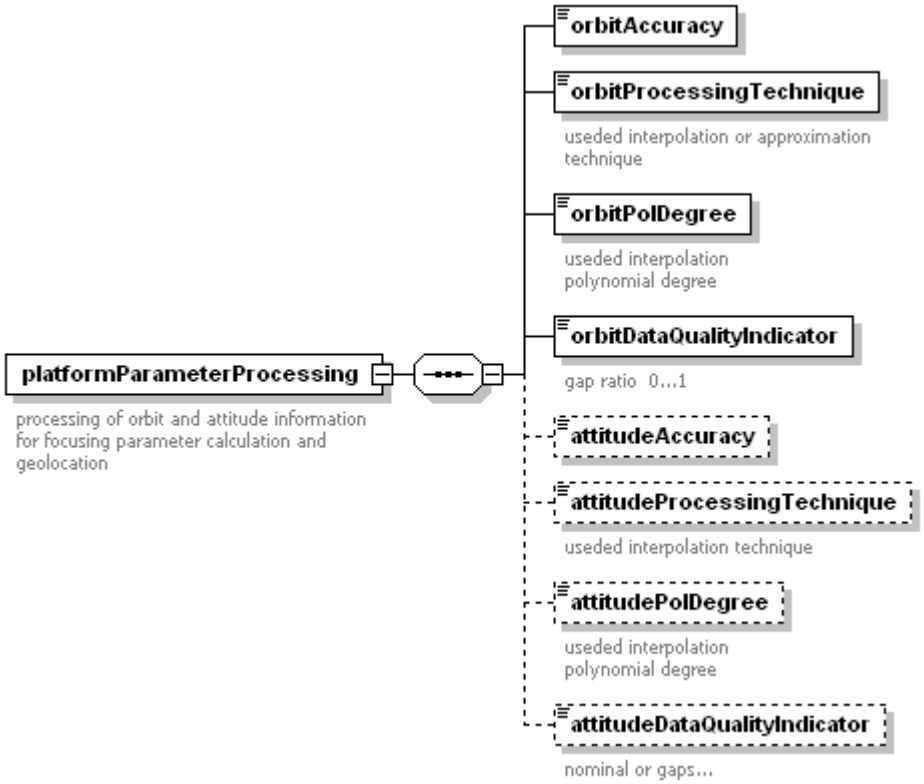
element **geoReference/gridSetup/gridGenerator**

diagram	
type	**string80**
facets	maxLength 80
annotation	documentation coarse geolocation by TMSP

element **geoReference/gridSetup/geolocationDEMID**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation Globe, SRTM7.5, ... the geolocation grid maps equally sampled range-azimuth time gridpoints to latitude-longitude points onto a DEM. The sampling density and the accuracy of the DEM have to be sufficient to guarantee the required radiometric accuracy by interpolation between the grid points but the operational geolocalisation is not as precise as the geocoding which may derive the incidence angle map for all samples. The DEM could be a downsampled SRTM DEM in combination with the Globe DEM.

element **geoReference/platformParameterProcessing**

diagram	
annotation	documentation processing of orbit and attitude information for focusing parameter calculation and geolocation

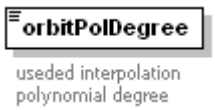
element **geoReference/platformParameterProcessing/orbitAccuracy**

diagram	
type	**string20**
facets	maxLength 20

element **geoReference/platformParameterProcessing/orbitProcessingTechnique**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation useded interpolation or approximation technique

element **geoReference/platformParameterProcessing/orbitPolDegree**

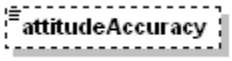
diagram	
type	restriction of **xs:int**

facets	minInclusive 1 maxInclusive 20
annotation	documentation useded interpolation polynomial degree

element **geoReference/platformParameterProcessing/orbitDataQualityIndicator**

diagram	
type	**xs:float**
annotation	documentation gap ratio 0...1

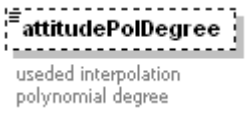
element **geoReference/platformParameterProcessing/attitudeAccuracy**

diagram	
type	**string20**
facets	maxLength 20

element **geoReference/platformParameterProcessing/attitudeProcessingTechnique**

diagram	
type	**string255**
facets	maxLength 255
annotation	documentation useded interpolation technique

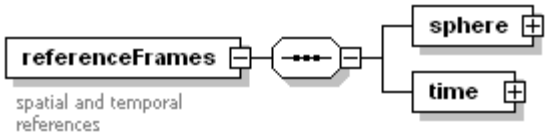
element **geoReference/platformParameterProcessing/attitudePolDegree**

diagram	
type	restriction of **xs:int**
facets	minInclusive 1 maxInclusive 20
annotation	documentation useded interpolation polynomial degree

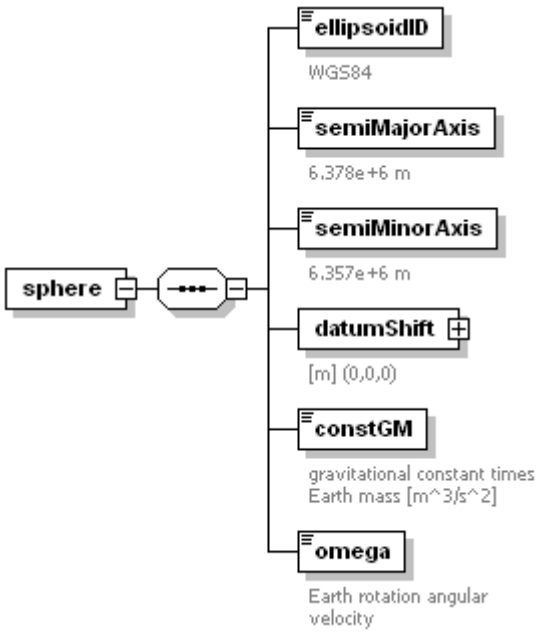
element **geoReference/platformParameterProcessing/attitudeDataQualityIndicator**

diagram	
type	**xs:float**
annotation	documentation nominal or gaps...

element **geoReference/referenceFrames**

diagram	
annotation	documentation spatial and temporal references

element **geoReference/referenceFrames/sphere**

diagram	

element **geoReference/referenceFrames/sphere/ellipsoidID**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation WGS84

element **geoReference/referenceFrames/sphere/semiMajorAxis**

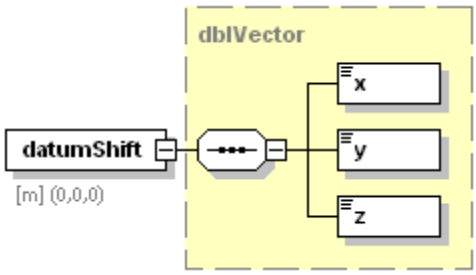
diagram	
type	**xs:double**
annotation	documentation 6.378e+6 m

element **geoReference/referenceFrames/sphere/semiMinorAxis**

diagram	

type	**xs:double**
annotation	documentation 6.357e+6 m

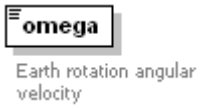
element **geoReference/referenceFrames/sphere/datumShift**

diagram	
type	**dblVector**
annotation	documentation [m] (0,0,0)

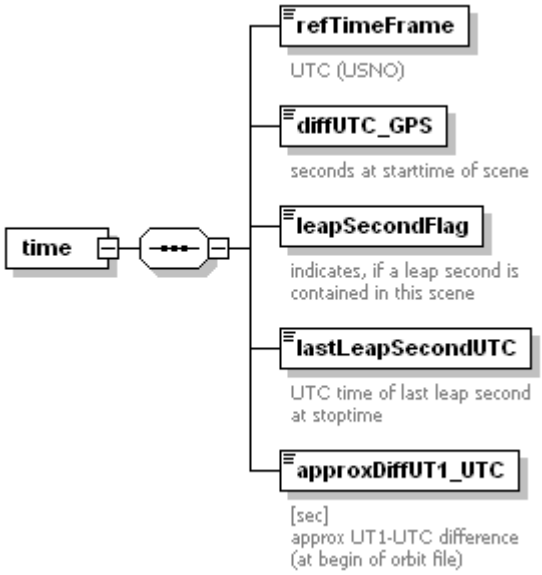
element **geoReference/referenceFrames/sphere/constGM**

diagram	
type	**xs:double**
annotation	documentation gravitational constant times Earth mass [m^3/s^2]

element **geoReference/referenceFrames/sphere/omega**

diagram	
type	**xs:double**
annotation	documentation Earth rotation angular velocity

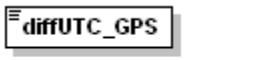
element **geoReference/referenceFrames/time**

diagram	

element **geoReference/referenceFrames/time/refTimeFrame**

diagram	
type	**string20**
facets	maxLength 20
annotation	documentation UTC (USNO)

element **geoReference/referenceFrames/time/diffUTC_GPS**

diagram	
type	**xs:float**
annotation	documentation seconds at starttime of scene

element **geoReference/referenceFrames/time/leapSecondFlag**

diagram	
type	restriction of **xs:int**
facets	minInclusive -1 maxInclusive 1
annotation	documentation indicates, if a leap second is contained in this scene

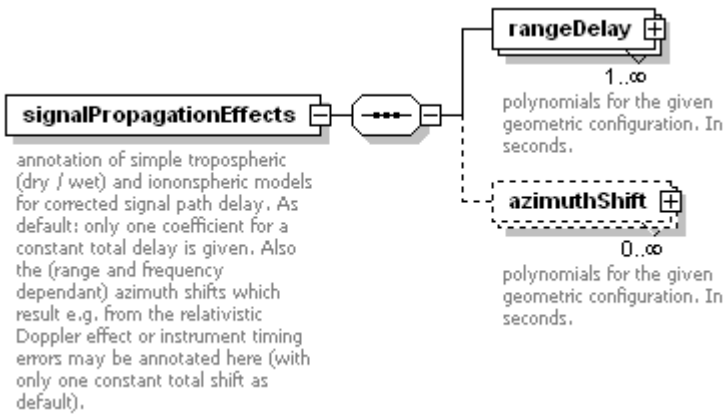
element **geoReference/referenceFrames/time/lastLeapSecondUTC**

diagram	
type	**xs:dateTime**
annotation	documentation UTC time of last leap second at stoptime

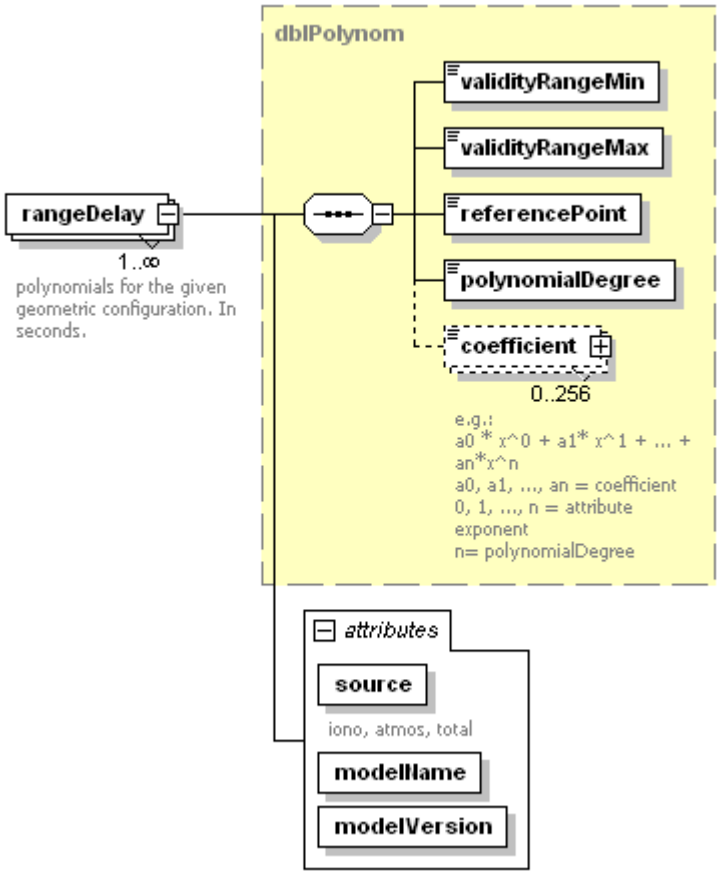
element **geoReference/referenceFrames/time/approxDiffUT1_UTC**

diagram	
type	**xs:float**
annotation	documentation [sec] approx UT1-UTC difference (at begin of orbit file)

element **geoReference/signalPropagationEffects**

diagram	
annotation	documentation annotation of simple tropospheric (dry / wet) and ionospheric models for corrected signal path delay. As default: only one coefficient for a constant total delay is given. Also the (range and frequency dependant) azimuth shifts which result e.g. from the relativistic Doppler effect or instrument timing errors may be annotated here (with only one constant total shift as default).

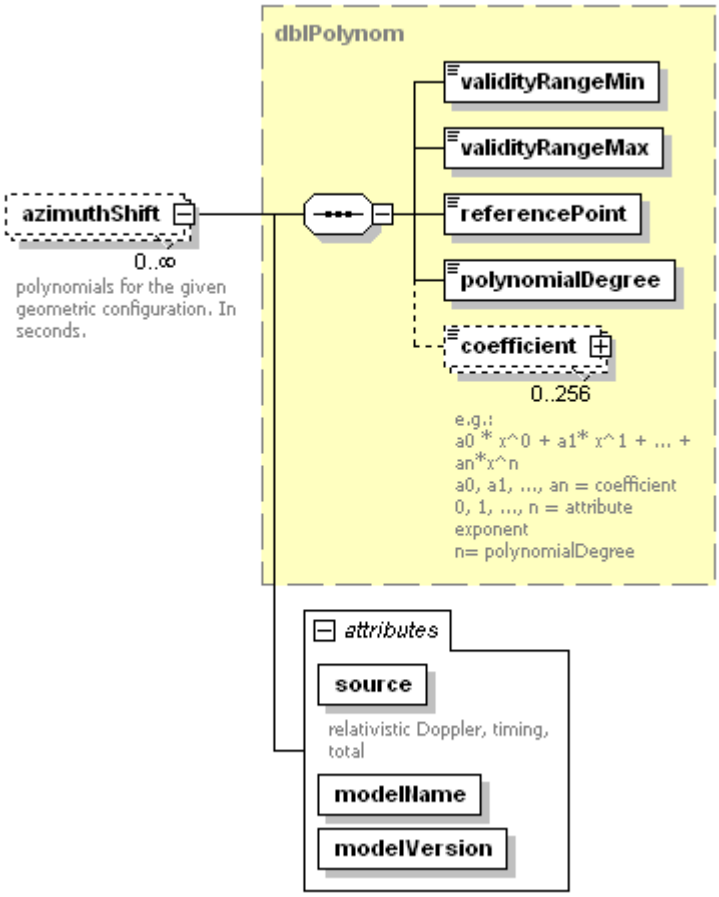
element **geoReference/signalPropagationEffects/rangeDelay**

diagram	
type	extension of **dblPolynom**

attributes	Name	Type	Use	Default	Fixed	Annotation
	source	**derived by: xs:NMTOKENS**	required			documentation iono, atmos, total
	modelName	**string255**	required			
	modelVersion	**string80**	required			

annotation	documentation polynomials for the given geometric configuration. In seconds.

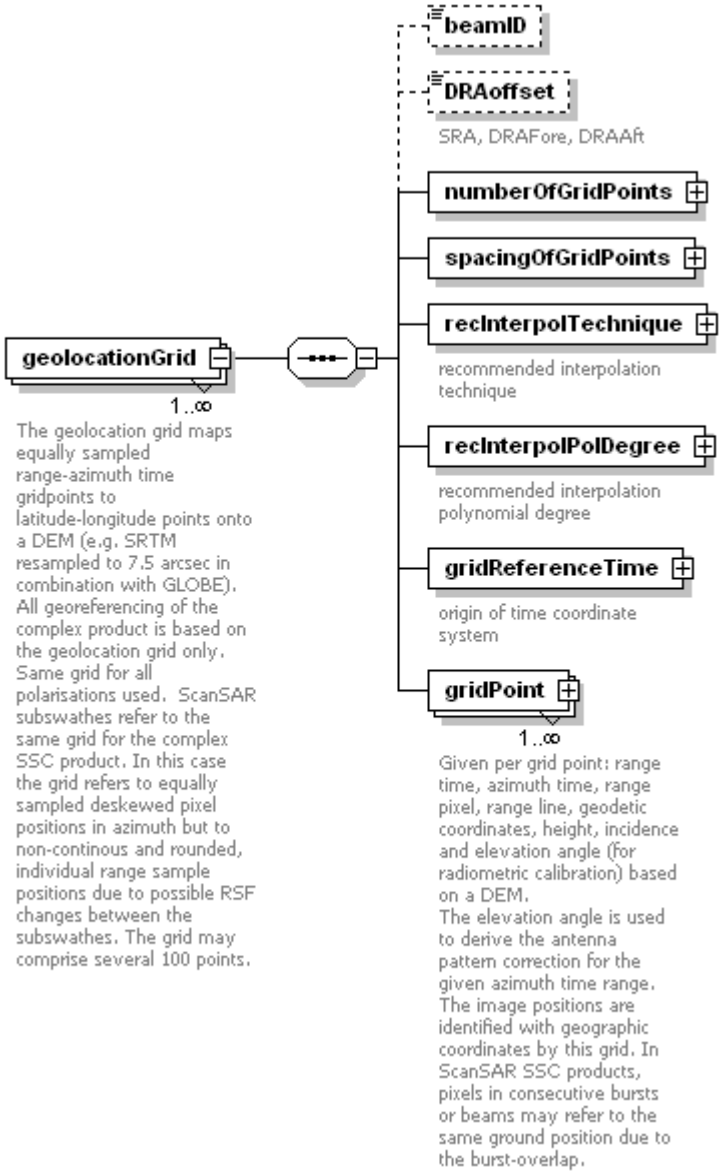
element **geoReference/signalPropagationEffects/azimuthShift**

diagram	
type	extension of **dblPolynom**

attributes	Name	Type	Use	Default	Fixed	Annotation
	source	**derived by: xs:NMTOKENS**	required			documentation relativistic Doppler, timing, total
	modelName	**string255**	required			
	modelVersion	**string80**	required			

annotation	documentation polynomials for the given geometric configuration. In seconds.

element **geoReference/geolocationGrid**

diagram	
annotation	documentation The geolocation grid maps equally sampled range-azimuth time gridpoints to latitude-longitude points onto a DEM (e.g. SRTM resampled to 7.5 arcsec in combination with GLOBE). All georeferencing of the complex product is based on the geolocation grid only. Same grid for all polarisations used. ScanSAR subswathes refer to the same grid for the complex SSC product. In this case the grid refers to equally sampled deskewed pixel positions in azimuth but to non-continous and rounded, individual range sample positions due to possible RSF changes between the subswathes. The grid may comprise several 100 points.

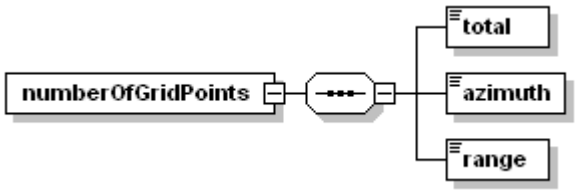
element **geoReference/geolocationGrid/beamID**

diagram	
type	**string20**
facets	maxLength 20

element **geoReference/geolocationGrid/DRAoffset**

diagram	DRAoffset SRA, DRAFore, DRAAft
type	restriction of **xs:NMTOKENS**
facets	enumeration SRA enumeration DRAFore enumeration DRAAft
annotation	documentation SRA, DRAFore, DRAAft

element **geoReference/geolocationGrid/numberOfGridPoints**

diagram	

element **geoReference/geolocationGrid/numberOfGridPoints/total**

diagram	total
type	**xs:int**

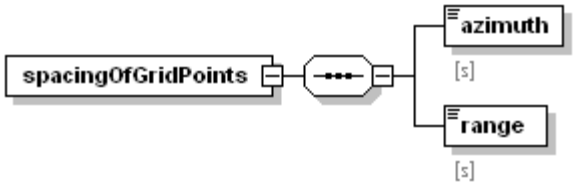
element **geoReference/geolocationGrid/numberOfGridPoints/azimuth**

diagram	azimuth
type	**xs:int**

element **geoReference/geolocationGrid/numberOfGridPoints/range**

diagram	range
type	**xs:int**

element **geoReference/geolocationGrid/spacingOfGridPoints**

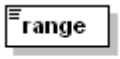
diagram	

element **geoReference/geolocationGrid/spacingOfGridPoints/azimuth**

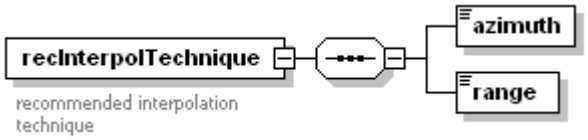
diagram	azimuth [s]
type	**xs:float**

annotation	documentation [s]

element **geoReference/geolocationGrid/spacingOfGridPoints/range**

diagram	 [s]
type	**xs:float**
annotation	documentation [s]

element **geoReference/geolocationGrid/recInterpolTechnique**

diagram	
annotation	documentation recommended interpolation technique

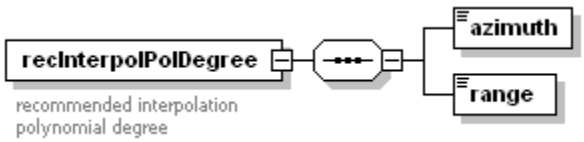
element **geoReference/geolocationGrid/recInterpolTechnique/azimuth**

diagram	
type	**string255**
facets	maxLength 255

element **geoReference/geolocationGrid/recInterpolTechnique/range**

diagram	
type	**string255**
facets	maxLength 255

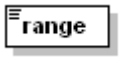
element **geoReference/geolocationGrid/recInterpolPolDegree**

diagram	
annotation	documentation recommended interpolation polynomial degree

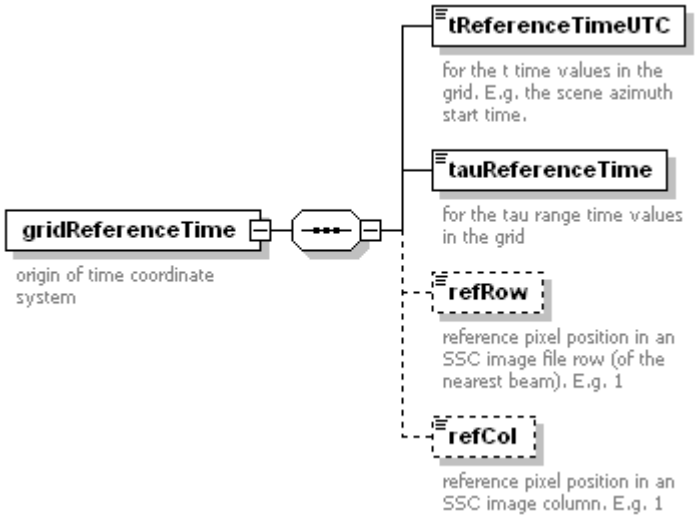
element **geoReference/geolocationGrid/recInterpolPolDegree/azimuth**

diagram	
type	**xs:int**

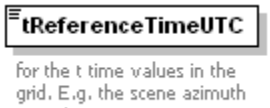
element **geoReference/geolocationGrid/recInterpolPolDegree/range**

diagram	
type	**xs:int**

element **geoReference/geolocationGrid/gridReferenceTime**

diagram	
annotation	documentation origin of time coordinate system

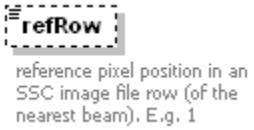
element **geoReference/geolocationGrid/gridReferenceTime/tReferenceTimeUTC**

diagram	
type	**xs:dateTime**
annotation	documentation for the t time values in the grid. E.g. the scene azimuth start time.

element **geoReference/geolocationGrid/gridReferenceTime/tauReferenceTime**

diagram	
type	**xs:double**
annotation	documentation for the tau range time values in the grid

element **geoReference/geolocationGrid/gridReferenceTime/refRow**

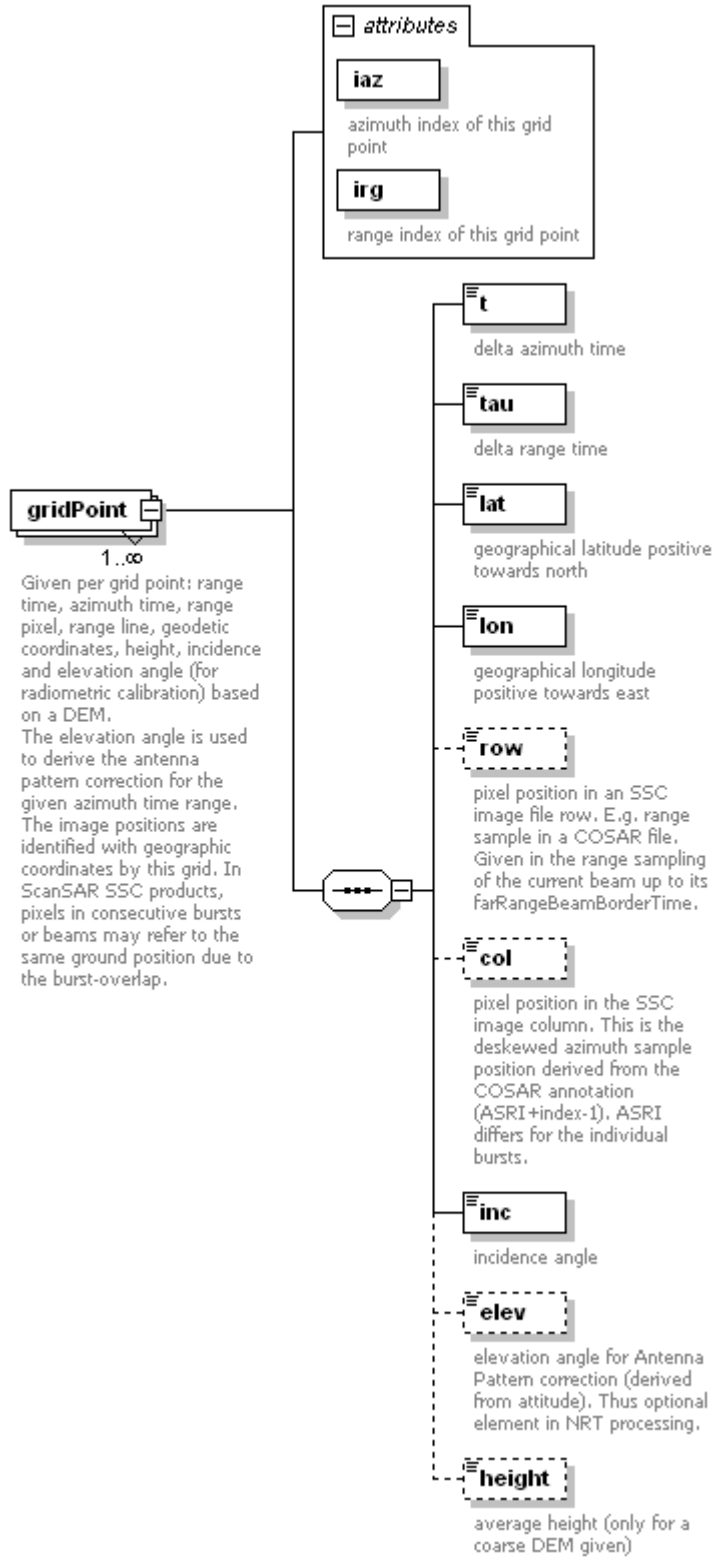
diagram	
type	**xs:long**
annotation	documentation reference pixel position in an SSC image file row (of the nearest beam). E.g. 1

element **geoReference/geolocationGrid/gridReferenceTime/refCol**

diagram	
type	**xs:long**
annotation	documentation reference pixel position in an SSC image column. E.g. 1

element **geoReference/geolocationGrid/gridPoint**

diagram



attributes

Name	Type	Use	Default	Fixed	Annotation
iaz	**xs:int**	required			documentation azimuth index of this grid point
irg	**xs:int**	required			documentation range index of this grid point

annotation	documentation Given per grid point: range time, azimuth time, range pixel, range line, geodetic coordinates, height, incidence and elevation angle (for radiometric calibration) based on a DEM. The elevation angle is used to derive the antenna pattern correction for the given azimuth time range. The image positions are identified with geographic coordinates by this grid. In ScanSAR SSC products, pixels in consecutive bursts or beams may refer to the same ground position due to the burst-overlap.

element **geoReference/geolocationGrid/gridPoint/t**

diagram	
type	**xs:double**
annotation	documentation delta azimuth time

element **geoReference/geolocationGrid/gridPoint/tau**

diagram	
type	**xs:double**
annotation	documentation delta range time

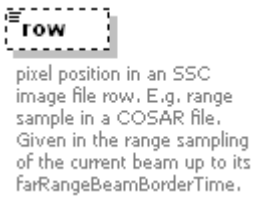
element **geoReference/geolocationGrid/gridPoint/lat**

diagram	
type	**latitudeDegType**
facets	minInclusive -90 maxInclusive 90
annotation	documentation geographical latitude positive towards north

element **geoReference/geolocationGrid/gridPoint/lon**

diagram	
type	**longitudeDegType**
facets	minInclusive -180 maxInclusive 180
annotation	documentation geographical longitude positive towards east

element **geoReference/geolocationGrid/gridPoint/row**

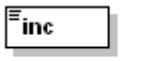
diagram	

type	**xs:long**
annotation	documentation pixel position in an SSC image file row. E.g. range sample in a COSAR file. Given in the range sampling of the current beam up to its farRangeBeamBorderTime.

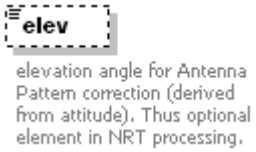
element **geoReference/geolocationGrid/gridPoint/col**

diagram	
type	**xs:long**
annotation	documentation pixel position in the SSC image column. This is the deskewed azimuth sample position derived from the COSAR annotation (ASRI+index-1). ASRI differs for the individual bursts.

element **geoReference/geolocationGrid/gridPoint/inc**

diagram	
type	**xs:double**
annotation	documentation incidence angle

element **geoReference/geolocationGrid/gridPoint/elev**

diagram	
type	**xs:double**
annotation	documentation elevation angle for Antenna Pattern correction (derived from attitude). Thus optional element in NRT processing.

element **geoReference/geolocationGrid/gridPoint/height**

diagram	
type	**xs:double**
annotation	documentation average height (only for a coarse DEM given)

ANNEX A) Acronyms and Abbreviations

ADC	Analog to Digital Converter
D	Dual Polarization
DAC	Direct Access Customer
DEM	Digital Elevation Model
DRA	Dual Receive Antenna
DTAR	Distributed Target Ambiguity Ratio
EEC	Enhanced Ellipsoid Corrected
EWP	Echo Window Position
GEC	Geocoded Ellipsoid Corrected
GTC	Geocoded Terrain Corrected
H	Horizontal Polarization
HS	High Resolution spotlight Mode
ID	Identifier
ISLR	Integrated Sidelobe Ratio
IRF	Impulse Response Function
L0	Level 0 Product
L1b	Level 1b Product
MGD	Multi Look Ground Range Detected
PRF	Pulse Repetition Frequency
PSLR	Peak Sidelobe Ratio
PTR	Point Target Response
Q	Quad Polarization
RAW	Raw Data
S	Single Polarization
SAAR	Signal Azimuth Ambiguity Ratio
SC	ScanSAR Mode
SL	Spotlight Mode
SM	Stripmap Mode
SRA	Single Receive Antenna
SRTM	Shuttle Radar Topography Mission
SSC	Single Look Slant Range Complex
T	Twin Polarization
TBC	to be confirmed
TBD	to be defined
TIFF	Tagged Image File Format
TMSP	TerraSAR Multi Mode SAR Processor
UPS	Universal Polar Stereographic
UTM	Universal Transverse Mercator
V	Vertical Polarization
XML	Extensible Markup Language

ANNEX B) How to Use the Annotated Information

How to obtain calibrated image data?

The calFactor contains the calibration constant (as provided in the IOCS Aux Product) as well as the individual scaling factors for each image layer (adjusted for optimal use of the 16bit dynamic range). It can be found in the section

```
<calibration>
    …
  <calibrationConstant layerIndex="1">
    <polLayer>VV</polLayer>
    <beamID>strip_003</beamID>
    <DRAoffset>SRA</DRAoffset>
    <calFactor>1.80629044778196933E-04</calFactor>
  </calibrationConstant>
</calibration>
```

To obtain calibrated data in radar brightness (beta nought) from the image (amplitude) data, you have to multiply (!) this combined calFactor with the power of the digital numbers (integer pixel values)

$$\beta 0 = \text{calFactor} * DN^2$$

for detected products. Complex data calibrated intensity respectively is then derived from the real and imaginary components

$$\beta 0 = \text{calFactor} * (I^2 + Q^2)$$

This calibration is only applicable for those L1b products which are flagged as "CALIBRATED" in

```
<productVariantInfo>
    <productType>SSC____SM_S</productType>
    …
    <radiometricCorrection>CALIBRATED</radiometricCorrection>
  </productVariantInfo>
```

The factor is usually in the range of 10^-6 to 10^-4, depending on incidence angle (beam) and polarisation channel. However, a detected ScanSAR product has one single calFactor for all beams while SSCs may be scaled individually. The statistical image data mean amplitude of typical products is 50…200.

Note that, if your product is "NOTCALIBRATED", you may either have an experimental product at hand or an anomaly prevented the availability of auxiliary (housekeeping) data on instrument temperature (at the time of generation of your product). Such an anomaly is indicated in

```
<productQuality>
  …
  <auxDataQuality>
    …
```

```
<missingAuxDataFlag>true</missingAuxDataFlag>
</auxDataQuality>
```

Then the digital numbers (amplitude) are lower than calibrated ones by a factor of approx. (1.1 +/- 0.05), depending on the real temperature.

How to evaluate the annotated polynomials?

If not explicitly otherwise stated, all annotated polynomials refer to slant range time. These are updated in azimuth time if necessary. The product component "mapping grid" provides you with the instrument times for a given pixel position (see below).

All the polynomials are described in the same way. This description contains 4 main parameters which are:

- Validity Range
- Reference point
- Polynomial degree
- Coefficients

Here is an example of a polynomial for the baseband Doppler:

```
<basebandDoppler>
    <validityRangeMin>3.62780829992259343E-03</validityRangeMin>
    <validityRangeMax>3.70847362284670249E-03</validityRangeMax>
    <referencePoint>3.66814096138464796E-03</referencePoint>
    <polynomialDegree>2</polynomialDegree>
    <coefficient exponent="0">7.99610899222934677E+01</coefficient>
    <coefficient exponent="1">8.54081711240112782E+02</coefficient>
    <coefficient exponent="2">-1.20015648802765274E+09</coefficient>
</basebandDoppler>
```

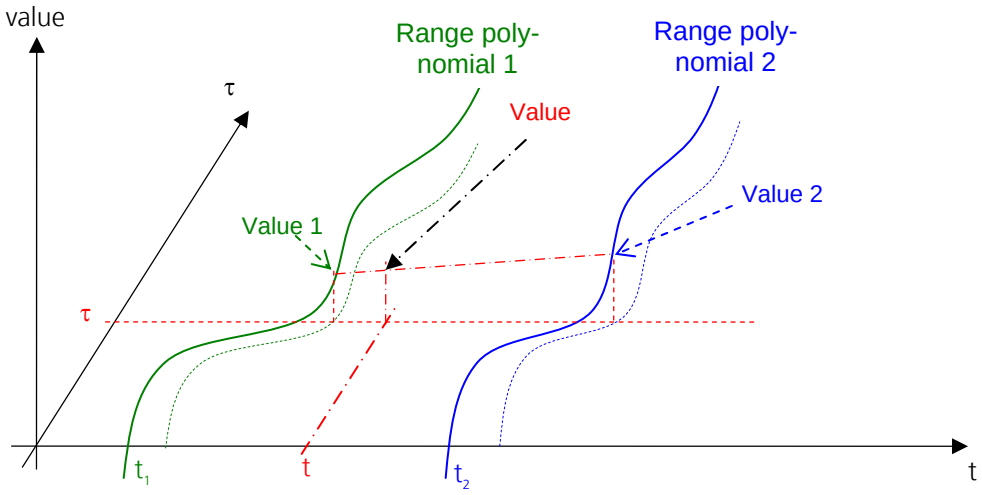
The polynomials are functions of range time and are valid between validityRangeMin and validityRangeMax.

The mathematical formulation is:

$$R = \sum_{i=0}^{\deg} coeff_i (\tau - \tau_{ref})^i, \tau \in \left[\tau_{\min}; \tau_{\max} \right]$$

where: - *deg* is polynomialDegree
- $coeff_i$ is coefficient exponent="i"
- τ_{ref} is referencePoint
- τ_{min} is validityRangeMin
- τ_{max} is validityRangeMax
- *R* is the result, for the example above, it would be a baseband Doppler frequency

When several polynomials are given with each one having a different azimuth time (e.g. Doppler, Doppler rate, velocity parameter, etc.), linear interpolation between the two values obtained from the evaluation at τ of the both nearest polynomials in azimuth is needed to obtain the value at the wanted times.



How to evaluate the grid components?

1. **Mapping grid** evaluation:

Given a position in the image which can be in UTM/UPS (easting/northing in meters) for GEC/EEC or in pixels for MGD (pixel/line - easier than latitude/longitude to find the grids coordinates), the Mapping Grid (MG) provides azimuth and range instrument times for this point.

For a MGD, Mapping grid indexes (floating point precision) are obtained using the ratio between mapping grid row (resp. column) spacing and image row (resp. column) spacing:

$$idx\_row_{MGD} = line * image\ Row\ Spacing / MG\ Row\ Spacing + MG\ ref\ row$$
$$idx\_col_{MGD} = pixel * image\ Col\ Spacing / MG\ Col\ Spacing + MG\ ref\ col$$

For EEC/GEC, Mapping grid indexes are obtained using MG row (resp. column) spacing:

$$idx\_row_{GEC/EEC} = (image\ UpperLeft\ northing - northing) / MG\ Row\ Spacing + MG\ ref\ row$$
$$idx\_col_{GEC/EEC} = (easting - image\ UpperLeft\ easting) / MG\ Col\ Spacing + MG\ ref\ col$$

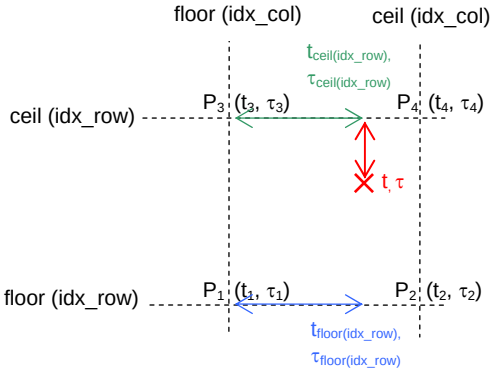
NB: Since MG is in binary format, it is easier to read the whole grid and to store it in a matrix before looking for any indexes.

To obtain the instrument times (t and τ), it is needed to read the four grid points which are surrounding the wanted point and then to interpolate (linear interpolation is sufficient) them:

Point 1: P_1 (floor(idx_row), floor(idx_col)) → t_1 & τ_1
Point 2: P_2 (floor(idx_row), ceil(idx_col)) → t_2 & τ_2
Point 3: P_3 (ceil (idx_row), floor(idx_col)) → t_3 & τ_3
Point 4: P_4 (ceil (idx_row), ceil(idx_col)) → t_4 & τ_4

First interpolation can take place for a constant row (floor(idx_row) and ceil(idx_row)):

$$t_{floor(idx\_row)} = (t_2 - t_1) * (idx\_col - floor(idx\_col)) + t_1$$
$$\tau_{floor(idx\_row)} = (\tau_2 - \tau_1) * (idx\_col - floor(idx\_col)) + \tau_1$$
$$t_{ceil(idx\_row)} = (t_4 - t_3) * (idx\_col - floor(idx\_col)) + t_3$$
$$\tau_{ceil(idx\_row)} = (\tau_4 - \tau_3) * (idx\_col - floor(idx\_col)) + \tau_3$$



Then interpolation is done between these two interpolated values to obtain the wanted times:

$$t = (t_{ceil(idx\_row)} - t_{floor(idx\_row)}) * (idx\_row - floor(idx\_row)) + t_{floor(idx\_row)}$$
$$\tau = (\tau_{ceil(idx\_row)} - \tau_{floor(idx\_row)}) * (idx\_row - floor(idx\_row)) + \tau_{floor(idx\_row)}$$

Instrument times obtained are relative to MG reference times *tReferenceTimeUTC* and *tauReferenceTime* provided in the main annotation file.

NB: The MG is smaller than the actual image (contained in) i.e. some points have to be extrapolated from the two last grid values.

2. **Geo grid** evaluation:

For a given azimuth and range instrument time, the Geo Grid (GG) delivers the position (latitude/longitude), height incidence and elevation angle of this point. Since it refers to instrument times, it does not matter which kind of product it is.

To obtain Geo Grid indexes it is only needed to divide the different times (referenced to GG reference times *tReferenceTimeUTC* and *tauReferenceTime*) by the spacing (azimuth or range).

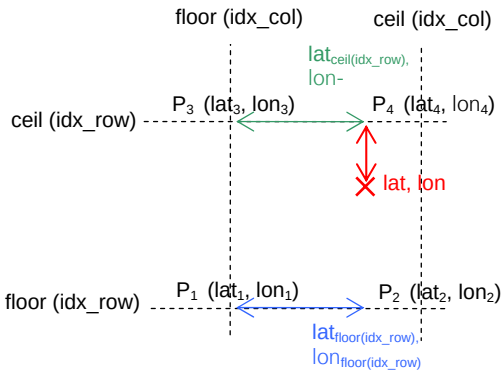
idx_row = t / GG azimuth Spacing + GG ref row
idx_col = τ / GG range Spacing + GG ref col

The interpolation way is exactly the same as for Mapping Grid (linear interpolation is also sufficient):

Point 1: P_1 (floor(idx_row), floor(idx_col)) → lat_1 & lon_1
Point 2: P_2 (floor(idx_row), ceil(idx_col)) → lat_2 & lon_2
Point 3: P_3 (ceil(idx_row), floor(idx_col)) → lat_3 & lon_3
Point 4: P_4 (ceil(idx_row), ceil(idx_col)) → lat_4 & lon_4

First interpolation can take place for a constant row (floor(idx_row) and ceil(idx_row)):

$$lat_{floor(idx\_row)} = (lat_2 - lat_1) * (idx\_col - floor(idx\_col)) + lat_1$$
$$lon_{floor(idx\_row)} = (lon_2 - lon_1) * (idx\_col - floor(idx\_col)) + lon_1$$
$$lat_{ceil(idx\_row)} = (lat_4 - lat_3) * (idx\_col - floor(idx\_col)) + lat_3$$
$$lon_{ceil(idx\_row)} = (lon_4 - lon_3) * (idx\_col - floor(idx\_col)) + lon_3$$



Then interpolation is done between these two interpo-

lated values to obtain the wanted times:

$$lat = (lat_{ceil(idx\_row)} - lat_{floor(idx\_row)}) * (idx\_row - floor(idx\_row)) + lat_{floor(idx\_row)}$$
$$lon = (lon_{ceil(idx\_row)} - lon_{floor(idx\_row)}) * (idx\_row - floor(idx\_row)) + lon_{floor(idx\_row)}$$

NB:

1. GG points are geolocalized using a DEM so when the terrain is not smooth, the interpolated height can be quite different from the real one and thus the position can be misestimated by several meters depending on the terrain variations.

2. The geolocation which derives coordinates for a given instrument times uses besides the orbit, DEM and timing information also the signal propagation corrections (range and azimuth) derived for that specific scene and annotated in the GG. Specifically the tropospheric range delay causes slant range shifts of several meters.

3. Mapping Grid times can be used as input for Geo Grid (GG) which delivers back the position (latitude/longitude) and the height for a consistency check.

How to determine the Doppler centroid in the focussed data of Spotlight acquisitions?
&
How to correctly translate raw data times to zero-Doppler times?

Here we briefly describe how the essential Doppler centroid parameters can be extracted from the XML-formatted TerraSAR-X products and how the time system is converted from the annotated echo receive time system to the zero Doppler time system of the focused product.

Step 1: The zero Doppler start time t_{start} of the focused scene is extracted from

```
<level1Product  …><productInfo><sceneInfo><start>
  <timeUTC>2007-07-06T13:41:01.860822Z</timeUTC>
```

Step 2: The raw data time tags of the estimated Doppler polynomials are extracted from

```
<level1Product  …><processing><doppler><dopplerEstimate>
  <timeUTC>2007-07-06T13:41:01.284119Z</timeUTC>,
```

and the polynomial coefficients from the following parameter

```
<level1Product  …><processing><doppler><dopplerEstimate>
  <combinedDoppler>
    <validityRangeMin>4.69567739437280491E-03</validityRangeMin>
    <validityRangeMax>4.76343238282169595E-03</validityRangeMax>
    <referencePoint>4.72955488859725000E-03</referencePoint>
    <polynomialDegree>1</polynomialDegree>
    <coefficient exponent="0">1.54256856028094353E+03</coefficient>
    <coefficient exponent="1">6.89245227436726509E+03</coefficient>
  </combinedDoppler>
```

Remark: the Doppler centroid as a function of range time t is calculated from the parameters
$f_{DC}(t)$ = <coefficient exponent= »0 »>+ <coefficient exponent= »1 »> *(t-<referencePoint>)

In this example product **47** Doppler polynomials were annotated. This number can be extracted from the parameter

```
<level1Product  …><processing><doppler>
  <numberOfDopplerRecords>47</numberOfDopplerRecords>
```

Step 3: The FM-Rate which is required to convert echo receive times to Doppler-zero times is extracted from the two annotated Doppler rates for start and end of the scene. Both Doppler rates are given as polynomials over range:

```
<level1Product  ...><processing><geometry>
  <dopplerRate>
    <timeUTC>2007-07-06T13:41:01.967413Z</timeUTC>
    <dopplerRatePolynomial>
      <validityRangeMin>4.69567739437280491E-03</validityRangeMin>
      <validityRangeMax>4.76343238282169595E-03</validityRangeMax>
      <referencePoint>4.72955488859725000E-03</referencePoint>
      <polynomialDegree>3</polynomialDegree>
      <coefficient exponent= »0 »>-4.92544351670694778E+03</coefficient>
      <coefficient exponent= »1 »>1.06548420383506734E+06</coefficient>
      <coefficient exponent= »2 »>-2.78686983145142853E+08</coefficient>
      <coefficient exponent= »3 »>1.11414280644123263E-03</coefficient>
    </dopplerRatePolynomial>
  </dopplerRate>
```

For the purpose of time correction it is sufficient to use the average of the two zero order coefficients for the whole scene.

Step 4: The echo receive time tags of the Doppler polynomials are converted to Zero Doppler times of the focused data as described in the equation

$$t_{SSC} = t_{RAW} + \frac{f_{DC}(t_{RAW})}{FM}$$