

Euro-Maps Product Format

Project Reference: IRS

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Summary: Naming conventions and meta data formats for IRS scene based products provided by GAF

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12	28-Jul-2015	Self motivated	Table 16	Added band specific sub-section and parameters: SCALE_FACTOR, OFFSET
13	30-Jul-2015	Self-motivated	Figure 1	'Calibration' information section is mandatory now
14	30-Jul-2015	Self-motivated	Table 17	Projection definition is provided in OGC well known text (WKT) syntax
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16	03-Aug-2015	Self-motivated	Appendix A	Sample XML files
17	06-Aug-2015	Self-motivated	Table 13	Addition of Geolayer
18	08-Sep-2016	Self-motivated	Table 11 Table 12 Table 13 Table 14	Addition of cloud mask shape file
19	08-Sep-2016	Self-motivated	Section 4.4.3	GeoTIFF is available for all supported projections
20	08-Sep-2016	Self-motivated	Table 20	Fixed QUALITY_PARAMETER_CODE
21	08-Sep-2016	Self-motivated	Section 5.1.7	Geo-Layer is also available for products shipped in GeoTIFF
22	13-Sep-2016	Self-motivated	Table 23	Added Reference to the XML equivalent
23	07-Nov-2016	Self-motivated	Table 10 Table 11	Replaced "EM_Tiff_Kit_1" with "EM_TIFF_Kit_1"
24	24-Nov-2016	Self-motivated	Section 4.4.1	Changed section name
25	06-Jan-2017	Self-motivated	Table 13	Fixed ortho imagery file name and description

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1 Introduction

1.1 Reference Documents

- [RD 1] Top Level ICD for GCMs
OSME-GSCDA-SEDA-IS-08-0019, Issue 2.3, ESA, 24-April-2009
- [RD 2] Naming Conventions for EM Product Directories
EM.NCEMPD, Version 1.3, 12 October 2009
- [RD 3] GMES Fast Track Land Service 2006-2008 Orthorectification of SPOT and
IRS-P6 products
Image2006-ICD, Version 1.6, 22 February 2008
- [RD 4] IRS-1C/1D Digital Data Products Format
Space Applications Center (ISRO), Ahmedabad, Department of Space,
Government of India, August 1998
<http://Euro-Maps.gaf.de/download/ss.pdf>
- [RD 5] IRS-P6 LGSOWG (Super Structure) Digital Data Products Format
DPSD/SIPG/SIIPA, Space Applications Centre, ISRO, Ahmedabad, India,
May 2003
http://Euro-Maps.gaf.de/download/p6super_20050222.pdf

2 Common Definitions

Table 1: Basic definitions

Place Holder	Definition	Description
<Digit>	'0' '1' ... '9'	The digits 0, 1, ..., 9.
<UCLetter>	'A' 'B' ... 'Z'	The upper case letters A, B, ..., Z.
<LCLetter>	'a' 'b' ... 'z'	The lower case letters a, b, ..., z.
<AlphaNum>	<Digit> <UCLetter> <LCLetter>	An alphanumerical character, either in upper or lower case.

Table 2: Dates

Place Holder	Definition	Description
<YYYY>	4 * <Digit>	A year in long format, e.g. 2006.
<YY>	2 * <Digit>	A year in short format, e.g. 06 for 2006.
<MM>	2 * <Digit>	A month.
<DD>	2 * <Digit>	A day.
<DateL>	<YYYY><MM><DD>	A date in long format.
<DateS>	<YY><MM><DD>	A date in short format.

2.1 Product Base Name

The “Product Base Name” described in this section serves for directory names (see Section 3) but also for base names for other files related to a product package (ZIP-Archive).

The version 4 was introduced to support the IRS-P5 Cartosat-1 data products that require four digits for path and row. It is defined as:

<PBN> ::= <Date><Mission><Path><Row><Sensor><UU><SAT><Format><Ver>

with the place holders defined in Table 1, Table 2 and Table 3.

Table 3: Version 4 definitions

Place Holder	Definition	Description
<Date>	<DateS>	Date in short format. See Table 2.
<Mission>	'1C' '1D' 'P6' 'P5' 'R2'	1C IRS-1C 1D IRS-1D P6 IRS-P6 Resourcesat-1 P5 IRS-P5 Cartosat-1 R2 Resourcesat-2
<Path>	4 * <Digit>	A path number. (in case of LISS-IV MX: seg(1)str(2))
<Row>	4 * <Digit>	A row number. (in case of LISS-IV MX: scenenr)

Place Holder	Definition	Description
<Sensor>	1 * <UCLetter>	L LISS-III P PAN (means 1C/1D PAN as well as P5 PAN-Aft and PAN-Fore) W WiFS A AWiFS M LISS-IV Mono mode X LISS-IV Multispectral mode
<UU>	See Table 4	See Table 4
<SAT>	2 * <Digit>	Shift along track of a scene in percent.
<Format>	'F' 'S' 'G' 'O'	Format of the DPS-generated product F Fast Format S Super Structure G GeoTIFF O OrthoKit
<Ver>	'4'	Version 4 directory naming convention.

Table 4: Field <UU> in case of version 4

In Case of		Place Holder <UU>	
<Sensor>	<Mission>	Definition	Description
L	1C, 1D, P6, R2	2 * <Digit>	00 Indicates full scenes 01, ..., 12 Quadrant number
P	1C, 1D	('A' 'B' 'C' 'D') (<Digit> 'L' 'M' 'R')	A...D Scene 0 Indicates full scene 1...9 Subscenes L, M, R Strips e.g.: A0 Full scene A B8 Subscene 8 out of scene B DM Middle strip of scene D
	P5	'A_' 'F_' 'AF'	A_ PAN-Aft camera data F_ PAN-Fore camera data AF Stereoscopic data set including PAN-Aft and PAN-Fore data
W	1C, 1D	2 * '_'	Not used.
A	P6, R2	('A' 'B' 'C' 'D' '_')'_'	A_ Quarter A B_ Quarter B C_ Quarter C D_ Quarter D _ Full Scene
M	P6, R2	('A' 'B' 'C' 'D')'_'	A_ Scene A B_ Scene B C_ Scene C D_ Scene D
X	P6, R2	2 * '_'	Not used.

2.2 Product ID

In the frame of the GSC-DA project, the definition of a Product ID was necessary (see [RD 1], Section 3.3.2).

The intention is to define a Product ID that allows us, the data provider, to identify exactly which data have to be processed into a certain high level product.

As new missions or new product levels may require extensions, a version number is included. The Product ID was introduced in October 2009 starting with version 4 which is based on the Product Directory version 4 as defined in Section 2.1.

Table 5: Use of different versions of the EM Product ID

Version	Supporting	In Use
4	IRS-1C/1D/P6/P5/R2	From Oct 2009 until present.

The convention version 4 is defined as

`<PID> ::= <Date><Mission><Path><Row><Sensor><UU><SAT>_<Ver>`

with the place holders defined in Table 3, Table 1 and Table 4.

3 Product Directory Names

EM Product Directories were introduced to bundle a product, as generated by the Indian Data Processing System (DPS), and additional files and directories, e.g. product quick looks, Ortho Kits, and TIFF Kits, generated by former Euromap and now GAF.

Table 6 indicates the use of the different versions of the EM Product Directory naming schema. Version 2 and 3 are subject of older revisions of this document (see [RD 2]), Version 0 and 1 are not described in this document, as they were not used for products actually delivered to clients.

Table 6: Use of different versions of the EM Product Directories

Version	Supporting	In Use
4	IRS-1C/1D/P6/P5/R2	Until present.
3	IRS-1C/1D/P6	For IRS-P6 only, until 10-Nov-2008.
2	IRS-1C/1D	For IRS-1C/1D only, until 10-Nov-2008.

From 11 November 2008 onwards, version 4 is used for all data products.

The EM Product Directories facilitate the handling of products in case of orders consisting of several products ordered with the same processing options. The naming conventions are not unambiguous when the same scene is ordered with different processing options, e.g. map projection, ellipsoid, or resampling kernel.

4 Product Directory Content

In order to provide our customers a common product package for IRS scene based products that is independent from the mission specific software version which was used to generate them, former Euromap introduced a standard directory content schema.

The EM product directory as defined in Section 3 contains:

- Generic product Meta data files provided by GAF in the root
- Product files as generated by the IRS DPS in a separate sub-directory
- Enhancements made to the product by GAF in separate sub-directories

These are described in detail in the following sub-sections.

4.1 Definitions

The table below contains some definitions used later in this section.

Table 7: Generic definitions

Place Holder	Definition	Description
<Extension>	3 * <LCLetter>	file extension
<Band No>	1 * <Digit>	Band number in case of band sequential (BSQ) file formats
<Band Name>	'synblue' 'green' 'red' 'nir' 'swir' 'pan' 'pana' 'panf'	Band name in case of band sequential (BSQ) file formats

4.2 Generic Product Meta Data

Table 8: Generic Product Meta Data

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
<PBN>_oid.txt	ASCII text file containing a reference to the order this product belongs to and also customer provided order and product references (strings)
<PBN>_ql.tif <PBN>_ql.tfw	a down sampled GeoTIFF image of the highest level component included in the product package
<PBN>_stat.tif <PBN>_stat.txt	deprecated; histogram as TIFF and ASCII text file provided for some Level 1 products

4.3 Native IRS Product Files

Depending on the requested product level and mission the native product files generated by the ISRO IRS DPS are included in the product packages in a separate sub-directory.

Table 9: Native Product directory structure

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
PRODUCT1/	the content of this directory depends on the specific native product format (e.g. Fast Format, Super Structure etc.) and is subject of documentation provided by ISRO

4.4 GAF added IRS Product Files

As the ISRO DPS software only generates basic "Level 1" data products in ISRO- specific formats, GAF offers various enhancements ranging from basic format conversion up to high level image correction. All files that belong to a specific enhancement are grouped into a sub-directory under the product root folder <PBN>/.

Table 10: Product enhancement directory structure

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
EM_TIFF_Kit_1/	GeoTIFF version of native product
EM_Ortho_Kit_1/	GeoTIFF version of native product + RPC
EM_Ortho_Image_1/	GeoTIFF/EHdr ortho rectified product

All files provided share a common naming schema where the Product Base Name is also part of the file names. This is to identify a single product/image when more than one scene is opened in e.g. a customer GIS application.

<PBN>_<AlphaNum>{<AlphaNum>}{_<AlphaNum>{<AlphaNum>}}.<Extension>

4.4.1 TIFF Kit

Table 11: TIFF Kit

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
EM_TIFF_Kit_1/	See Table 10
<PBN>_<Band No>_<Band Name>.tif	product image data as GeoTIFF, number of files depends on the number of bands
<PBN>_cloudmask.tif	optional; product cloud mask as GeoTIFF
<PBN>_cloudmask.dbf <PBN>_cloudmask.shp <PBN>_cloudmask.shx <PBN>_cloudmask.prj	optional; product cloud mask as ESRI shape file
<PBN>_inf.txt	product meta data
<PBN>_ssd.txt	deprecated; Super Structure meta data dump

4.4.2 Ortho Kit

With this enhancement GAF provides necessary files for RPC based ortho correction using COTS software e.g. ERDAS Imagine.

Table 12: Ortho Kit

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
EM_Ortho_Kit_1/	See Table 10
<PBN>_<Band No>_<Band Name>.tif	product image data as GeoTIFF, number of files depends on the number of bands
<PBN>_<Band No>_<Band Name>_rpc.txt	a corresponding RPC file, number of files depends on the number of bands
<PBN>_cloudmask.tif	optional; product cloud mask as GeoTIFF
<PBN>_cloudmask.dbf <PBN>_cloudmask.shp <PBN>_cloudmask.shx <PBN>_cloudmask.prj	optional; product cloud mask as ESRI shape file
<PBN>_inf.txt	product meta data
<PBN>_ssd.txt	deprecated; Super Structure meta data dump

4.4.3 Ortho Image

Ortho products are available in different image formats depending on the requested map projection and user preference:

- GeoTIFF: band sequential
- ESRI Header (EHdr): band interleave by line, no compression

Table 13: Ortho Image in GeoTIFF

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
EM_Ortho_Image_1/	See Table 10
<PBN>_imagery.tif	ortho rectified product image data as GeoTIFF
<PBN>_cloudmask.tif	optional; product cloud mask as GeoTIFF
<PBN>_cloudmask.dbf <PBN>_cloudmask.shp <PBN>_cloudmask.shx <PBN>_cloudmask.prj	optional; product cloud mask as ESRI shape file
<PBN>_geolayer.tif	optional; coordinates in map projection for each pixel of the corresponding L1 product as 32-bit float where the x (Easting) values are stored in the first band and y (Northing) values are stored in the second band.
<PBN>_metadata.xml	product meta data in XML format
<PBN>_ssd.txt	deprecated; Super Structure meta data dump
<PBN>_calib.dat	deprecated; Super Structure meta data dump radiance section extract for image calibration purpose, the file contains information on radiance conversion from pixel values

Table 14: Ortho Image in ESRI Header Format

File/Directory	Description
<PBN>/	Base directory of the product; see Section 2.1
EM_Ortho_Image_1/	See Table 10
<PBN>_imagery.hdr <PBN>_imagery.bil <PBN>_imagery.prj	ortho rectified product image data in ESRI Header format
<PBN>_cloudmask.hdr <PBN>_cloudmask.bil <PBN>_cloudmask.prj	optional; product cloud mask in ESRI Header format
<PBN>_cloudmask.dbf <PBN>_cloudmask.shp <PBN>_cloudmask.shx <PBN>_cloudmask.prj	optional; product cloud mask as ESRI shape file
<PBN>_geolayer.hdr <PBN>_geolayer.bil	optional; coordinates in map projection for each pixel of the corresponding L1 product as 32-bit float where the x (Easting) values are stored in the first band and y (Northing) values are stored the second band.
<PBN>_metadata.xml	product meta data in XML format
<PBN>_ssd.txt	deprecated; Super Structure meta data dump
<PBN>_calib.dat	deprecated; Super Structure meta data dump radiance section extract for image calibration purpose, the file contains information on radiance conversion from pixel values

5 Product Meta Data Formats

5.1 XML-Format

<PBN>_metadata.xml is the latest meta data implementation for products provided by GAF. It was defined following an ICD by DLR (see [RD 3]).

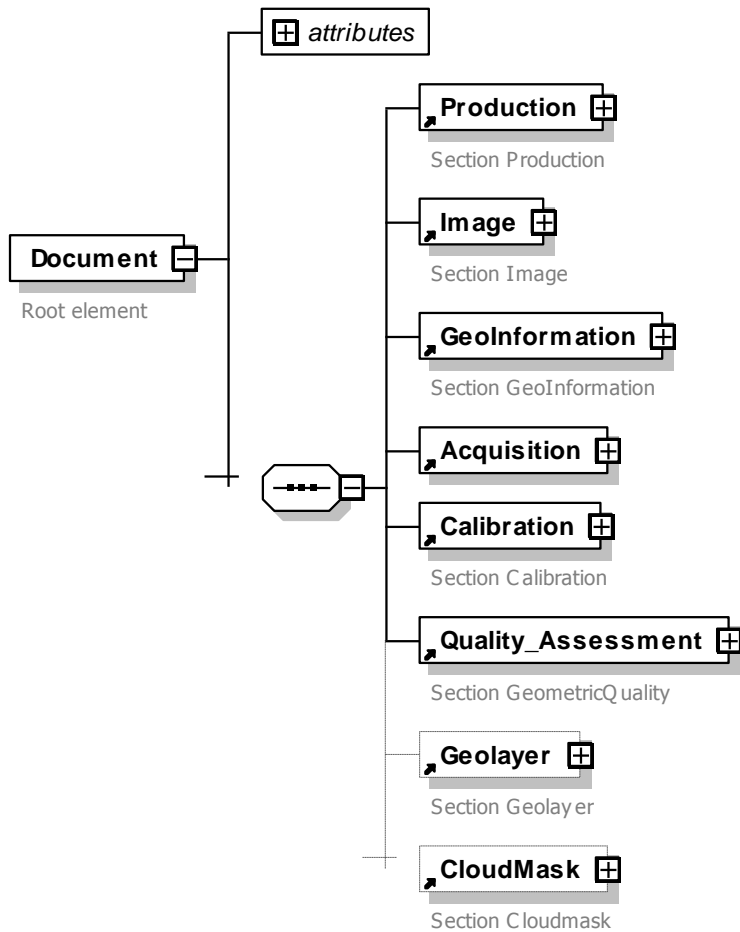


Figure 1: XML Meta Data Structure

5.1.1 Production Section

This section contains production related information.

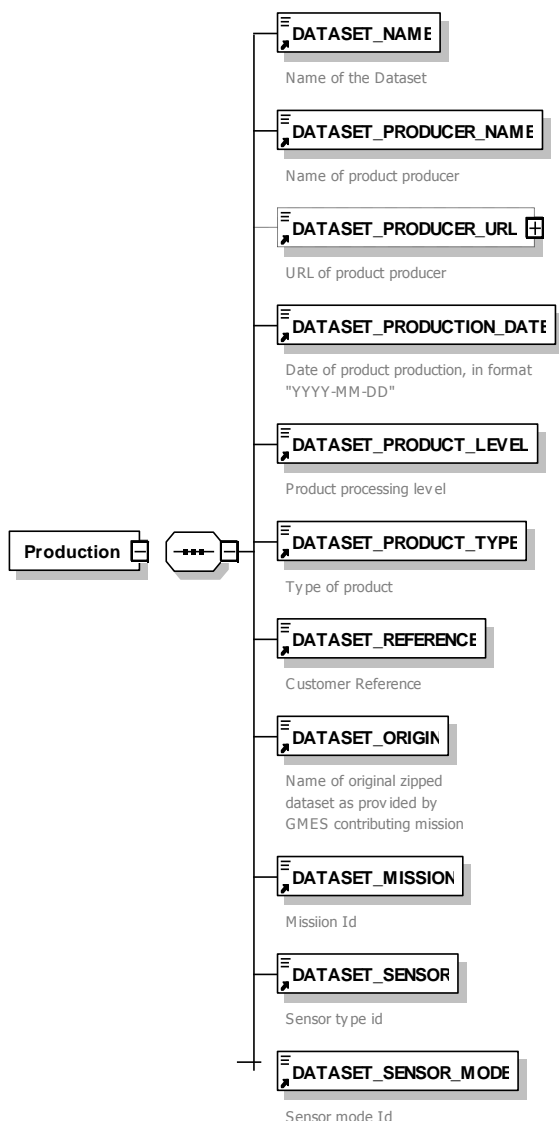


Figure 2: XML Production Structure

Table 15: XML Format – Production Section

XML Tag	Cnt.	Description/Example
Production	1	Section Production
DATASET_NAME	1	Name of Dataset
DATASET_PRODUCER_NAME	1	Name of product producer: 'GAF'
DATASET_PRODUCER_URL	0..1	URL of product producer: 'http://www.gaf.de'
DATASET_PRODUCTION_DATE	1	Date of product production, in format "YYYY-MM-DD"
DATASET_PRODUCT_LEVEL	1	Product processing level: '1A' Radiometrically corrected '1B' System corrected '10' System corrected with RPC file

XML Tag	Cnt.	Description/Example
		'30' Ortho corrected DN '3T' Ortho corrected TOA Reflectance '3X' Ortho corrected Surface Reflectance
DATASET_PRODUCT_TYPE	1	Type of product: 'L1-Product' 'Orthoimage'
DATASET_REFERENCE	1	Customer reference
DATASET_ORIGIN	0..1	Optional; Name of the original dataset this product has been derived from (e.g. the product name of the related L1 product)
DATASET_MISSION	1	Mission id: 'IC01' IRS-1C 'ID01' IRS-1D 'IR05' IRS-P5 Cartosat-1 'IR06' IRS-P6 Resourcesat-1 'IR07' IRS-R2 Resourcesat-2
DATASET_SENSOR	1	Sensor type id: 'AWF' AWiFS 'LI3' LISS-III 'LI4' LISS-IV 'PAN' PAN 'WIF' WiFS
DATASET_SENSOR_MODE	1	Sensor mode id: 'P' PAN 'PM' PAN merged with MS (PAN sharpened) 'X' Multispectral (MS) 'XA' Multispectral from sensor 'A' 'XB' Multispectral from sensor 'B' 'XS' Multispectral incl. synthetic blue band 'XAS' Multispectral from sensor 'A' incl. synthetic blue band 'XBS' Multispectral from sensor 'B' incl. synthetic blue band 'M' Mono Mode (MS single band) 'MM' Mono Mode merged with MS

5.1.2 Image Section

This section describes how the image file has technically to be interpreted.

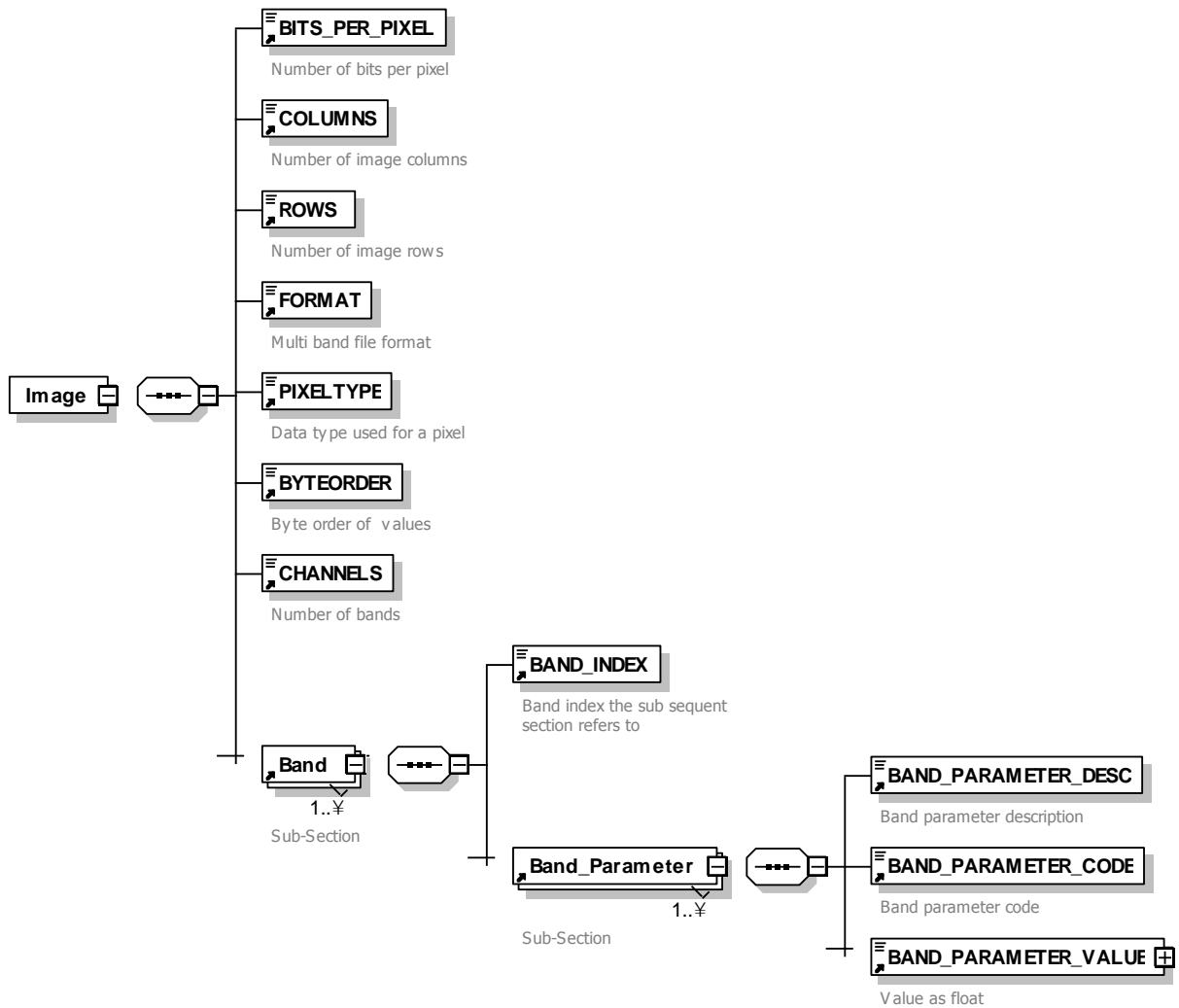


Figure 3: XML Image Structure

Table 16: XML Format – Image Section

XML Tag	Cnt.	Description/Example
Image	1	Section
BITS_PER_PIXEL	1	Number of bits per pixel (8 or 16)
COLUMNS	1	Number of image columns
ROWS	1	Number of image rows
FORMAT	1	Multi band file format: 'BIL' band interleaved by line 'BSQ' band sequential 'BIP' band interleaved by pixel
PIXELTYPE	1	Data type used for a pixel: '1' signed char '2' unsigned char '3' signed short '4' unsigned short '5' signed int '6' unsigned int '7' float '8' double '9' complex
BYTEORDER	1	Byte order of values: '0' big endian '1' little endian
CHANNELS	1	Number of bands
Band	1..n	Sub-Section
BAND_INDEX	1	Band index the sub sequent section refers to (int)
Band_Parameter	1..n	Sub-Section
BAND_PARAMETER_DESC	1	Band parameter description
BAND_PARAMETER_CODE	1	'SCALE_FACTOR' factor the pixel value has to be multiplied with 'OFFSET' value that has to be added to product of SCALE_FACTOR and pixel value (SCALE_FACTOR * pixel value + OFFSET)
BAND_PARAMETER_VALUE	1	Value as float

5.1.3 Geo-Information Section

This section contains information about the spatial reference system used in this product.

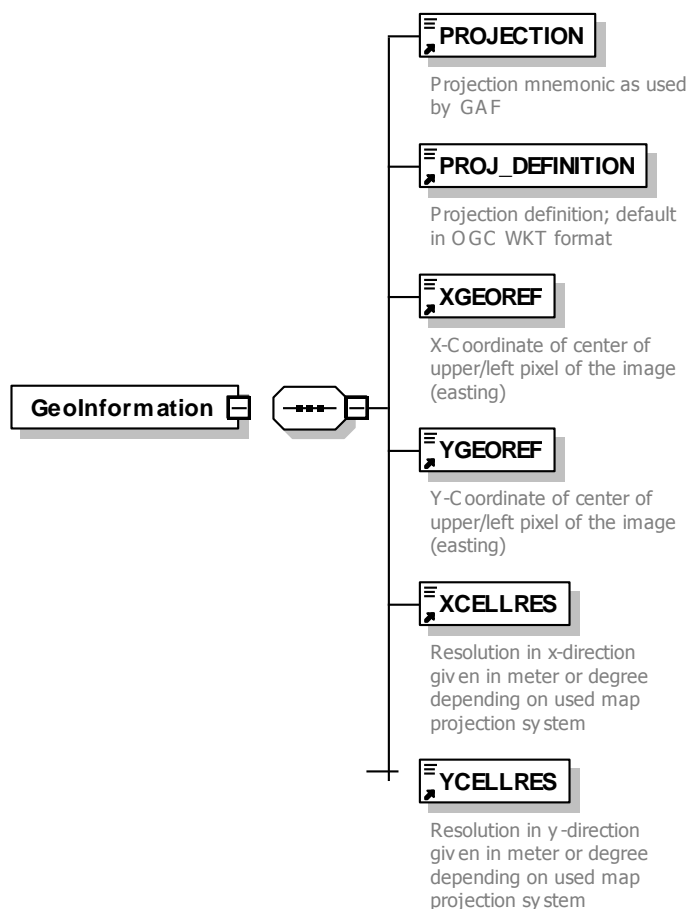


Figure 4: XML Geo-Information Structure

Table 17: XML Format – Geo-Information Section

XML Tag	Cnt.	Description/Example
GeoInformation	1	Section
PROJECTION	1	Projection mnemonic as used by GAF
PROJECTION_DEFINITION	1	Projection definition in OGC WKT format
XGEOREF	1	X-Coordinate of centre of upper left pixel of the image (easting)
YGEOREF	1	Y-Coordinate of centre of upper left pixel of the image (northing)
XCELLRES	1	Resolution in x-direction given in meters or degrees depending on used map projection system
YCELLRES	1	Resolution in y-direction given in meters or degrees depending on used map projection system.

5.1.4 Acquisition Section

This section contains information about acquisition specific parameters.

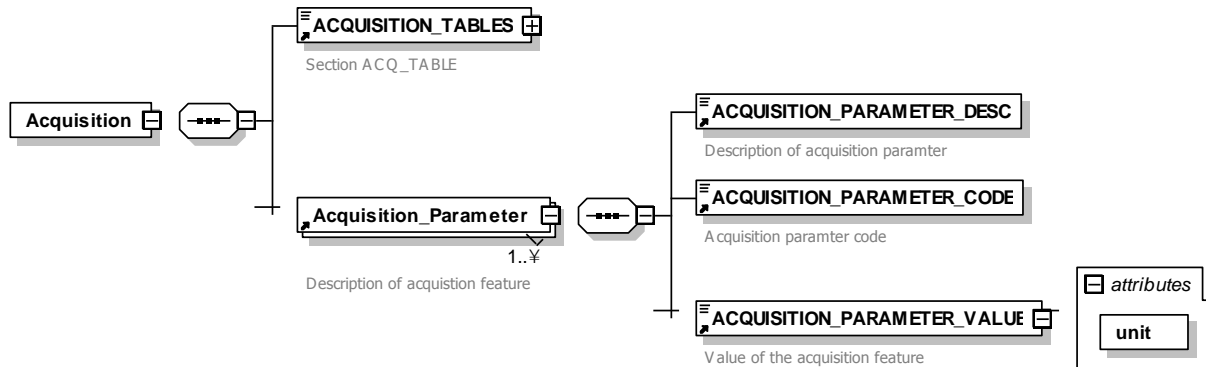


Figure 5: XML Acquisition Structure

Table 18: XML Format – Acquisition Section

XML Tag	Cnt.	Description/Example
Acquisition	1	Section
ACQUISITION_TABLES	1	Type of acquisitions parameters: 'OPTICAL'
Acquisition_Parameter	1..n	Sub-Section
ACQUISITION_PARAMETER_DESC	1	Description of acquisition parameter
ACQUISITION_PARAMETER_CODE	1	'Orbit_no' Imaging orbit number 'Sun_azimuth' Sun azimuth at center 'Sun_elevation' Sun elevation at center 'Tilt_angle' across-track tilt angle
ACQUISITION_PARAMETER_VALUE	1	Value of the acquisition feature, specified with an attribute 'unit': 'deg.' degrees 'no unit' the value has no unit, e.g. for Orbit_no

5.1.5 Calibration Section

This section contains sensor calibration information.

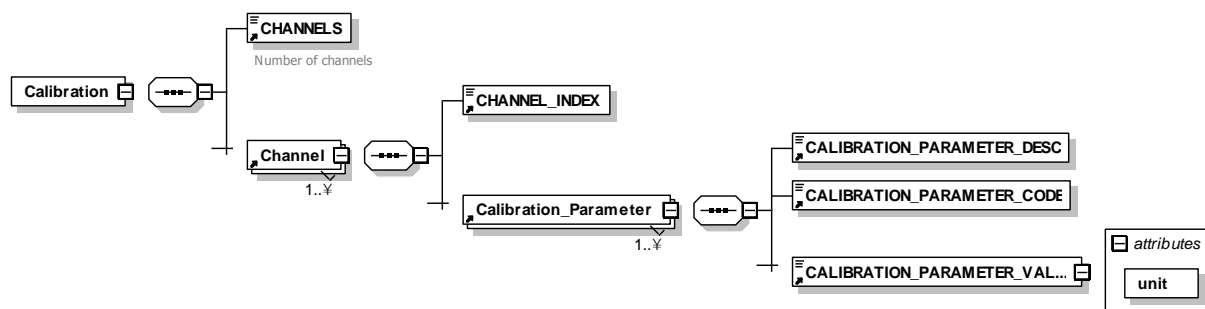


Figure 6: XML Calibration Structure

Table 19: XML Format – Calibration Section

XML Tag	Cnt.	Description/Example
Calibration	1	Section
CHANNELS	1	Number of channels
Channel	1..n	Sub-Section
CHANNEL_INDEX	1	Band index the sub sequent section refers to (int)
Calibration_Parameter	1..n	Sub-Section
CALIBRATION_PARAMETER_DESC	1	Calibration parameter description
CALIBRATION_PARAMETER_CODE	1	'QUANTISATION' Band[n] radiometric resolution in bits 'LMIN' Band[n] min. radiance in mW/cm ² /sr/μm 'LMAX' Band[n] max. radiance in mW/cm ² /sr/μm 'WR_MIN' Band[n] lower limit of wavelength range in nm 'WR_MAX' BAND[n] upper limit of wavelength range in nm
CALIBRATION_PARAMETER_VALUE	1	Value as float

5.1.6 Quality Assessment Section

This section is about the quality assessment. At present it contains one quality table about the geometric product quality.

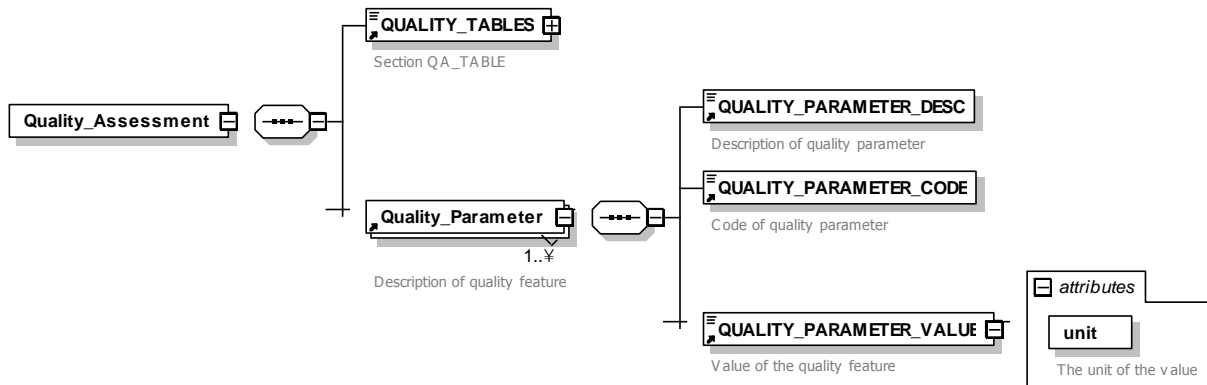


Figure 7: XML Quality Assessment Structure

Table 20: XML Format – Quality Assessment Section

XML Tag	Cnt.	Description/Example
Quality_Assessment	1	Section
QUALITY_TABLES	1	Name of quality parameter set: 'SPACEMETRIC'
Quality_Parameter	1..n	Subsection
QUALITY_PARAMETER_DESC	1..n	Description of quality parameter:
QUALITY_PARAMETER_CODE	1..n	'NIPC' Number of independent control points 'RMEX' root mean square error x 'RMEY' root mean square error y
QUALITY_PARAMETER_VALUE	1..n	Value of the quality feature

5.1.7 Geo-Layer Section

This section is only applicable for Ortho Images that are shipped with an optional Geo-Layer file. It contains the same information as provided in the <PBN>_geolayer.hdr file (see Table 14).

Please note that the Geo-Layer is only useful in combination with the original Level 1 product this ortho-product was derived from. It contains corrected map coordinates (in the projection of the ortho-image) for each pixel of the original image data in binary format. The x (Easting) and y (Northing) integer values are stored in the defined format (x first layer, y second layer). It is intended to derive an ortho-product in a different resolution or using a different resampling kernel.

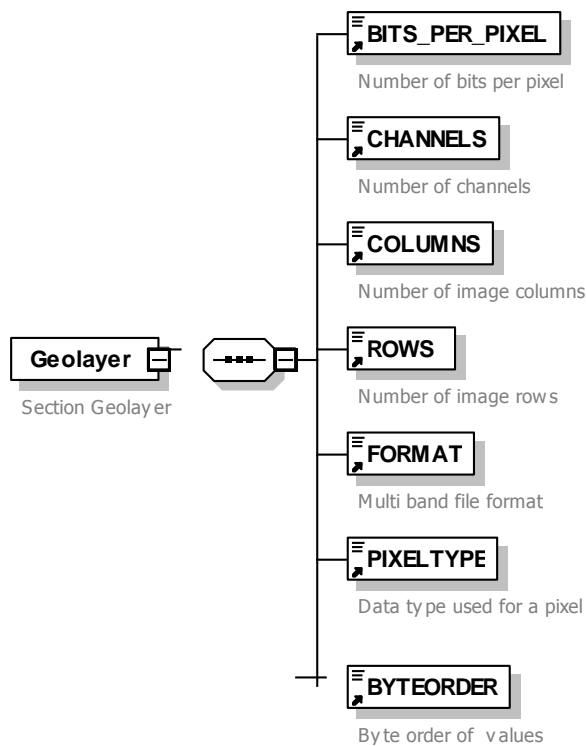


Figure 8: XML Geo-Layer Structure

Table 21: XML Format – Geo-Layer Section

XML Tag	Cnt.	Description/Example
Geolayer	0..1	Section
BITS_PER_PIXEL	1	Number of bits per pixel
CHANNELS	1	Number of channels of the Geo-Layer: '2' first channel contains x (Easting) values and second channel contains y (Northing) values
BYTEORDER	1	Byte order of values: '0' big endian '1' little endian
FORMAT	1	Multi band file format: 'BIL' band interleaved by line
PIXELTYPE	1	Data type used for a pixel: '1' signed char '2' unsigned char '3' signed short '4' unsigned short '5' signed int '6' unsigned int '7' float '8' double '9' complex
COLUMNS	1	Number of columns
ROWS	1	Number of rows

5.1.8 Cloud Mask Section

This section describes how the cloud mask file has technically to be interpreted. Clouds and medium haze are mapped to a pixel value of 255.

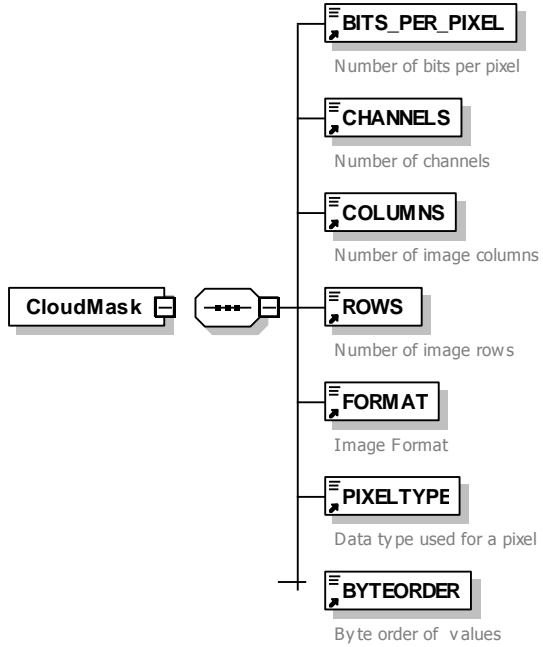


Figure 9: XML Cloudmask Structure

Table 22: XML Format – Cloudmask Section

XML Tag	Cnt.	Description/Example
CloudMask	1	Section
BITS_PER_PIXEL	1	Number of bits per pixel
CHANNELS	1	Number of channels
COLUMNS	1	Number of image columns
ROWS	1	Number of image rows
FORMAT	1	Image formats used: 'BIL' Band interleaved by line 'BSQ' Band sequential 'BIP' Band interleaved by pixel
PIXELTYPE	1	Data type used for a pixel: '1' Signed char '2' Unsigned char '3' Signed short '4' Unsigned short '5' Signed integer '6' Unsigned integer '7' Float '8' Double '9' Complex
BYTEORDER	1	Byte order of values '0' big endian '1' little endian

5.2 INF-Format

<PBN>_inf.txt is a meta data file introduced with the EM Ortho Kit for Resourcesat-1. It is only used for Level 1 products and it will be superseded by XML-Format meta data.

Table 23: INF meta data format version 0.4

Field Name	Data Type	XML equivalent	Description/Example
INF_version	float	n/a	version of this format
INF_file_header_bytes INF_line_header_bytes INF_line_image_bytes INF_line_trailer_bytes	int	n/a	deprecated
INF_Image_format	char	n/a	Image data file format: 'GEOTIFF', 'EHdr'
INF_Number_of_spectral_bands	int	5.1.2	number of spectral bands (channels)
INF_Number_of_lines	int	5.1.2	image rows
INF_Pixels_per_line	int	5.1.2	image columns
INF_Bytes_per_pixel	int	5.1.2	Bytes per pixel, not radiometric resolution may differ e.g. only 11 bit out of 2 byte: 1..2
INF_Satellite	char	5.1.1	satellite name: 'IRS-1C', 'IRS-1D', 'IRS-P6', 'IRS-P5', 'IRS-R2',
INF_Sensor	char	5.1.1	three character short name: 'PAN', 'LIS', 'L4M', 'L4X', 'WIF', 'AWF'
INF_Path	int	5.1.1 ¹	LISS-III reference path No.
INF_Row	int	5.1.1 ¹	LISS-III reference row No.
INF_Scene	char	5.1.1 ¹	only valid for 1C/1D PAN, P6 LISS-IV Mono: 'A', 'B', 'C', 'D'
INF_Subscene_no	int	5.1.1 ¹	only valid for 1C/1D PAN: 0..9
INF_Quadrant_no	int	5.1.1 ¹	only valid for LISS-III: 0..12
INF_AWiFS_Subscene	char	5.1.1 ¹	only valid for AWiFS: 'A', 'B', 'C', 'D'
INF_Shift	int	5.1.1 ¹	shift along track: 0..90
INF_Acquisition_day	int	5.1.1 ¹	day of month: 1..31
INF_Acquisition_month	int	5.1.1 ¹	as number: 1..12
INF_Acquisition_year	int	5.1.1 ¹	full year e.g.: 2010
INF_Product_Code	char	n/a	for internal use only
INF_Resampling	char	n/a	resampling method: 'CC' for cubic convolution 'NN' for nearest neighbour
INF_Processed_pixel_spacing	float	5.1.3	spatial resolution
INF_Processed_line_spacing	float	5.1.3	spatial resolution
INF_Sun_azimuth	float	5.1.4	Sun angle azimuth at the scene centre in degrees
INF_Sun_elevation	float	5.1.4	Sun angle elevation at the scene centre in degrees
INF_Satellite_altitude	float	n/a	Satellite altitude at scene centre in kilometres
INF_Image_heading_angle	float	n/a	Image/Satellite heading angle in degrees

¹ This information is encoded in the DATASET_ORIGIN attribute as reference to the Product Base Name (see Section 2.1)

Field Name	Data Type	XML equivalent	Description/Example
INF_Incidence_angle	float	n/a	Angle of incidence at scene centre (Zenith Angle) in degrees
INF_Tilt_angle	float	5.1.4	Across track tilt angle in degrees
INF_Band[n]_radiance_lmin	float	5.1.5	Minimum saturation radiance for band No. <n> (n::=2 3 4 5) in mW/cm ² /sr/μm
INF_Band[n]_radiance_lmax	float	5.1.5	Maximum saturation radiance for band No. <n> (n::=2 3 4 5) in mW/cm ² /sr/μm
INF_geo_UL_lat INF_geo_UL_lon INF_geo_UR_lat INF_geo_UR_lon INF_geo_LL_lat INF_geo_LL_lon INF_geo_LR_lat INF_geo_LR_lon	float	n/a	the corners of the image in decimal degrees (DD)
INF_Map_projection	char	5.1.3	'TM' Transverse Mercator 'UTM' Universal Transverse Mercator 'LCC' Lambert Conformal Conic
INF_Earth_ellipsoid	char	5.1.3 ²	'WGS_84'
INF_Reference_Datum	char	5.1.3 ²	'Datum_WGS84'
INF_usgs_parmeter_01 INF_usgs_parmeter_02 INF_usgs_parmeter_03 INF_usgs_parmeter_04 INF_usgs_parmeter_05 INF_usgs_parmeter_06 INF_usgs_parmeter_07 INF_usgs_parmeter_08 INF_usgs_parmeter_09 INF_usgs_parmeter_10 INF_usgs_parmeter_11 INF_usgs_parmeter_12 INF_usgs_parmeter_13 INF_usgs_parmeter_14 INF_usgs_parmeter_15	float	5.1.3 ²	USGS map projection parameters 15 parameters; if not applicable (n/a) for the given projection, values are set to '0.0000000'

² This information is encoded in the PROJ_DEFINITION that contains an ESRI conform WKT projection definition

Table 24: USGS Parameters

USGS Parameter No.	Projection Name Mnemonic		
	LCC	TM	UTM
1	Semi Major Axis	Semi Major Axis	Longitude
2	Semi Minor Axis	Semi Minor Axis	Latitude
3	Std. Parallel 1	Scale Factor	Zone No.
4	Std. Parallel 2	n/a	n/a
5	Central Meridian	Central Meridian	n/a
6	Latitude of Origin	Latitude of Origin	n/a
7	False Easting	False Easting	n/a
8	False Northing	False Northing	n/a
9	n/a	n/a	n/a
10	n/a	n/a	n/a
11	n/a	n/a	n/a
12	n/a	n/a	n/a
13	n/a	n/a	n/a
14	n/a	n/a	n/a
15	n/a	n/a	n/a

5.3 SSD-Format

<PBN>_ssd.txt is not a real meta data file. The native Super Structure Format uses binary files to store product metadata that require an import module to be used within an application. For customers using COTS software that is missing a proper import module a human readable dump is provided to allow them to enter required information manually. This file has never been intended to be used as a metadata file by software and therefore no further documentation is provided. The original Super Structure documents [RD 4] and [RD 5] are available for download at: http://Euro-Maps.gaf.de/docs/doc_009.html.

Please note: The Super Structure format has been abandoned by NRSC for future missions and it is marked as 'deprecated'.

Appendix A Sample XML Files

Appendix A.1 XML File of Ortho Corrected TOA Reflectance Product

```
<?xml version="1.0" encoding="ISO-8859-1"?>
<Document lang="en" xml:lang="en-us" xi="http://www.altova.com"
xsi:noNamespaceSchemaLocation="EM_XML_Metadata.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <Production>
    <DATASET_NAME>IR07_AWF_XA_3T_20141001T095605_20141001T095609_NSG_17906_3A55.TIF</DATASET_NAME>
    <DATASET_PRODUCER_NAME>GAF</DATASET_PRODUCER_NAME>
    <DATASET_PRODUCER_URL href="http://www.gaf.de" />
    <DATASET_PRODUCTION_DATE>2015-08-03</DATASET_PRODUCTION_DATE>
    <DATASET_PRODUCT_LEVEL>3T</DATASET_PRODUCT_LEVEL>
    <DATASET_PRODUCT_TYPE>Orthoimage</DATASET_PRODUCT_TYPE>
    <DATASET_REFERENCE>MR_IMAGE_2015/2014_10/Level_3</DATASET_REFERENCE>
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    <DATASET_SENSOR>AWF</DATASET_SENSOR>
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    <ROWS>11544</ROWS>
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    <Band>
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      <Band_Parameter>
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value</BAND_PARAMETER_DESC>
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,SPHEROID["GRS_1980",6378137,298.257222101]],PRIMEM["Greenwich",0],UNIT["Degree",0.01
7453292519943295]],PROJECTION["Lambert_Azimuthal_Equal_Area"],PARAMETER["latitude_of
origin",52],PARAMETER["central_meridian",10],PARAMETER["false_easting",4321000],PARAM
ETER["false_northing",3210000],UNIT["Meter",1]]</PROJ_DEFINITION>
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<!-- metadata3.tpl Rev. 2015-07-28 -->

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