Reference: S2-PDGS-MPC-L2A-PFS-V14.2
Issue: 01
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S2 MPC

Level 2A Product Format Specification

Ref. S2-PDGS-MPC-L2A-PFS-V14.2

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Change Log

Issue	Change in issue	Reason for change	Section(s)
1	1.1	Structure of Appendix A File naming convention has been updated. Two new sections have been created for User Product and PDI Naming conventions.	Appendix A
2	1.1	Based on S2PDGS PSD v.06, File naming conventions have been adapted to Level-2A product and PDI characteristics.	Appendix A
3	1.2	Consolidation of references with glossary	1.3
4	1.3	Added of new ANNEX C: Conversion formulae to indicate the conversion formulae to apply to image digital numbers (DN) to obtain physical values.	Appendix C
5	1.3	Update of document structure section. Correction of missing Appendix B: XSDs Directory Structure. Insertion of new Appendix C: Conversion formulae	1.2
6	1.3	The name of the folder containing the surface reflectance, aerosol optical thickness and water vapour tiles has been renamed: Atmosphericallly_Corrected_Tiles (folder)	A.2.5.1
7	1.4	The Level-2A User Product Naming Convention has been updated to follow [S2PFS]	A.1, A.2
8	1.4	The folder containing the surface reflectance, aerosol optical thickness and water vapour tiles in the product tree has been removed and the name of directories containing the different resolutions of Image Data have been renamed respectively R10m, R20m, R30m.	Figure 3-4
9	1.5	Figures have been updated to reflect changes in L2A XSDs.	All figures
10	1.5	File naming conventions have been updated.	Appendix A

11	1.5	All references to DIMAP format have been cancelled from the document.	All
12	1.6	Updated references to [S2PFS]	All
13	1.6	Updated figure of the XSD type to include the xfdu.xsd schema used to validate the SAFE Manifest file for L2A User Product	Figure 3-1
14	1.6	Updated figure to represent the Level-2A user product – physical organisation consistent with the outputs of Sen2Cor v.2.2	Figure 3-2
15	1.6	New section added to present the xfdu.xsd schema with a figure and reference to S2 PFS for details about SAFE format.	3.2.6
16	1.6	Updated conversion formula for Surface Reflectance computation	Appendix D
17	1.0	Added changes for PSD V.14.2	All

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1. Introduction

1.1 Purpose of the document

This document is produced in the context of the development and maintenance of the Level-2A prototype processor Sen2Cor. Its purpose is to define the organisation of the XSD schemas describing Sentinel-2 Level 2A Product Format Specifications. The XSD schemas structure is based on Sentinel-2 Level 2A Product Format Specifications [S2-PSD].

1.2 Document structure

The document is structured as follows:

Chapter 1: This introductive chapter

Chapter 2: Product format approach

Chapter 3: Organisation of XML Schema Definitions Files

Appendix A: The L2A File Naming Convention

Appendix B: XSDs Directory Structure

Appendix C: Conversion Formulae

1.3 References

The reference list of all project related documents with their version number and issue date is given in:

[L2A-GLODEF] S2PAD Project Glossary S2PAD-VEGA-GLO-0001, version 3.5, 22.05.2015

1.3.1 Normative Reference Documents

[GS-FFS] Ground Segment File Format Standard

[GS-FFS-TSM] Earth Observation GS File Format Standard - Tailoring for the Sentinel Missions PDGS

1.3.2 Informative Reference Documents

[ECMWF] ECMWF Deterministic Atmospheric Model Products, http://www.ecmwf.int/products/forecasts/

[GSCDA-DAP] GMES Space Component - Data Access Portfolio Requirement Document (DAP/R)

[S2-PDD] GMES Space Component – Sentinel-2 Payload Data Ground Segment (PDGS), Product Definition Document

[S2-PSD] Sentinel-2 Products Specification Document

[S2-MRD] Sentinel-2 Mission Requirements Document

[L2A-PDD]	Sentinel-2 MSI – Level 2A Products Definition Technical Note
[L2A-ATBD]	Sentinel-2 MSI - Level 2A Products, Algorithm Theoretical Basis Document
[L2A-DPM]	Sentinel-2 MSI – Level 2A Detailed Processing Model
[L2A-SUM]	Sentinel-2 MSI – Level 2A Prototype Processor Installation and User Manual

1.4 Relation to other Documents

The *Sentinel-2 MSI - Level 2A Products Algorithm Theoretical Basis Document* [L2A-ATBD] defines the algorithms used during Level 2A processing which are labelled as 2A-SC for Level 2A Scene Classification and 2A-AC for Level-2A Atmospheric Correction.

The *Sentinel-2 MSI - Level 2A Products Definition* [L2A-PDD] defines the content of the Sentinel-2 Level-2A product. It delivers a collection of the Level-2A related input and output data, covering Scenes, AOT and Water Vapour maps and Quality Indicators. The document has to be considered as a specialisation of the definition provided in [S2-PDD] for the Level-2A product.

1.5 Definitions of Terms and Conventions

Please refer to chapter 2 of [L2A-PDD] for the definitions required for comprehension of the document, e.g. Datatake, Datastrip, UTM Tiled Grid, etc....

2 Product Format approach

Please refer to section 1.7 of [S2-PSD] for more information on the Sentinel-2 Product Format.

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3 Organisation of XML Schema Definition files (XSD)

A set of XML Schema Definition Files (XSD) is provided for the specification of Level-2A products. These XSD files can be divided in two groups:

1) XSD schemas with "_Structure" suffix, created to define the "physical organization" of each product components (PDI) on disk, described in section 3.1 (no XML are generated and validated using these schemas)

2) XSD schemas with "_Metadata" suffix that will be used to validate the XML main metadata file inside each product components (PDI, e.g. Datastrip and Tile) and User product described in section 3.2. As well as the evolution of the item2A.xsd and dimap2A.xsd schemas.
The xfdu.xsd schema used to validate the SAFE Manifest for L2A User Product.

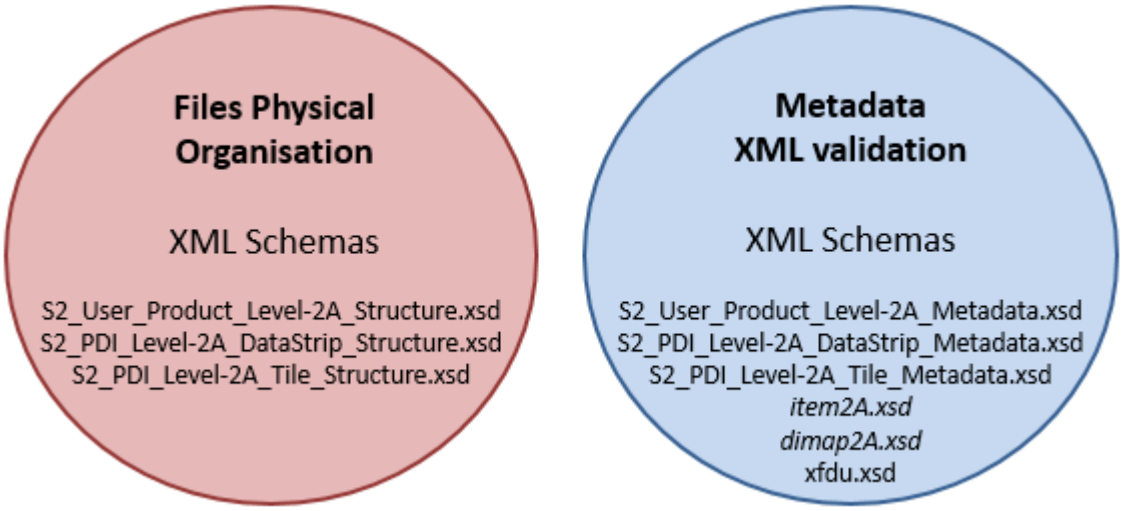

Figure 3-1 Different types of XSD files

3.1 Physical organisation XSD schemas:

1) S2_User_product_Level-2A_Structure.xsd
2) S2_PDI_Level-2A_DataStrip_Structure.xsd
3) S2_PDI_Level-2A_Tile_Structure.xsd

3.1.1 S2_User_product_Level-2A_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A User Product directory.

Figure 3-2 shows a partial view of the L2A user product structure.

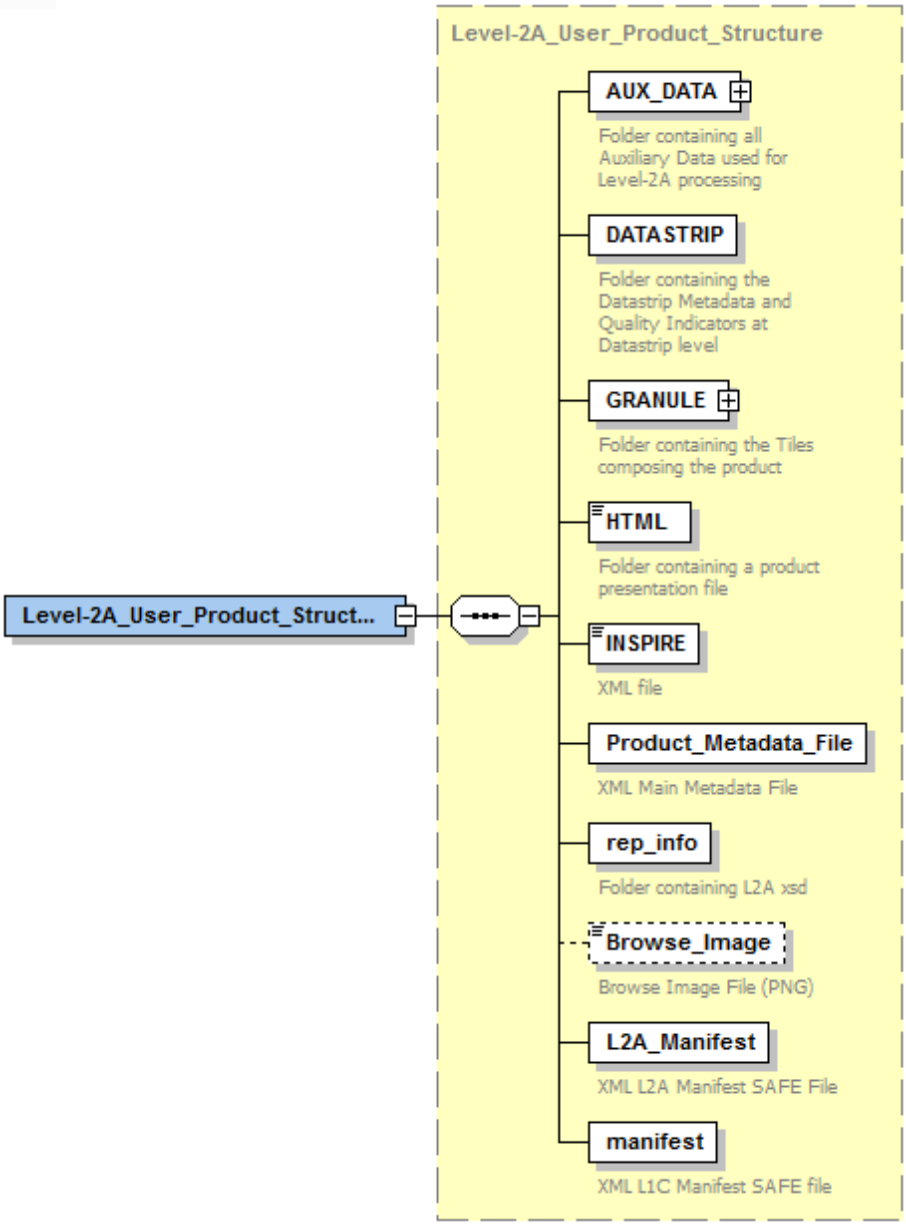

Figure 3-2 Level-2A user product – physical organisation

3.1.2 S2_PDI_Level-2A_DataStrip_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A DataStrip directory.

Figure 3-3 shows a view of the structure.

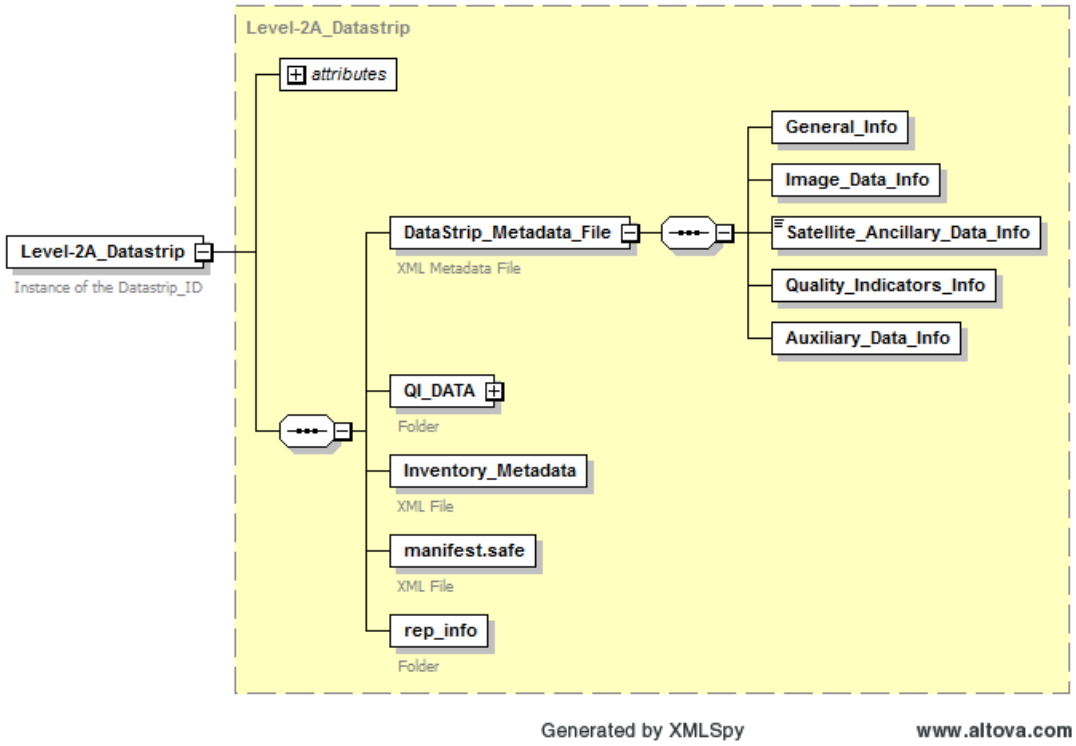

Figure 3-3 Level-2A Datastrip directory – physical organisation

3.1.3 S2_PDI_Level-2A_Tile_Structure.xsd

This XML schema describes the physical structure and contents of the Level-2A tile directory.

Figure 3-4 shows a partial view of the overall structure, except the IMG_DATA folder. This structure is common for both supported PSD Versions 13.1 and 14.2.

Figure 3-5 shows the IMG_DATA folder for PSD version 13.1. Here, the Scene Classification image is located at the level of the IMG_DATA folder, using the given resolution as part of the filename for identification.

Figure 3-6 shows the IMG_DATA folder for PSD version 14.2. Here, the Scene Classification image is located within the corresponding resolution subfolders and its file naming conventions are in accordance with the other images contained in this folder. Additionally, a new image labelled 'TCI' is present. This is a True Colour composite Image of bands B2, B3 and B4 at given resolution as specified for [S2-PSD] V.14.2.

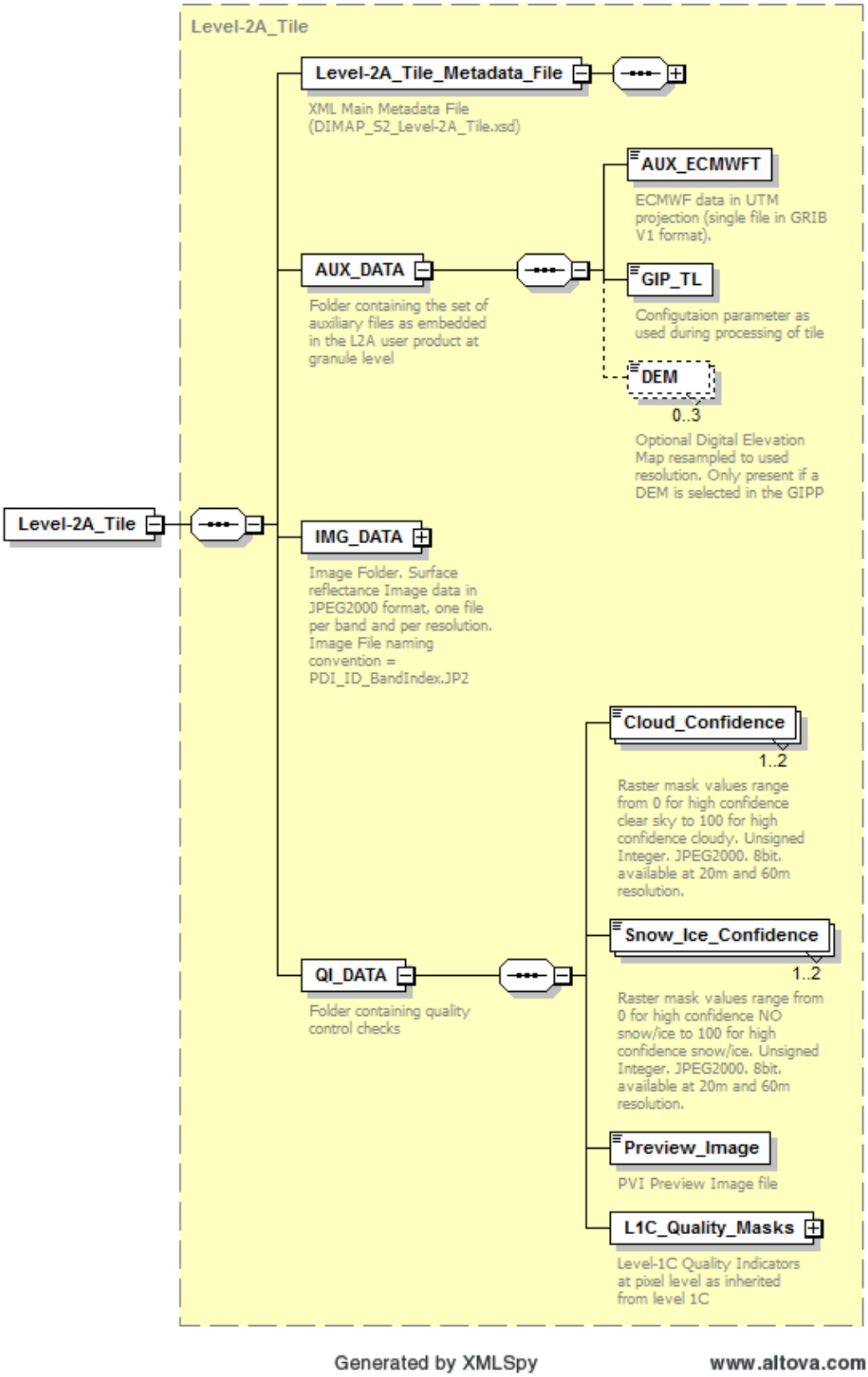

Figure 3-4 Level-2A tile – physical organisation except IMG_DATA folder

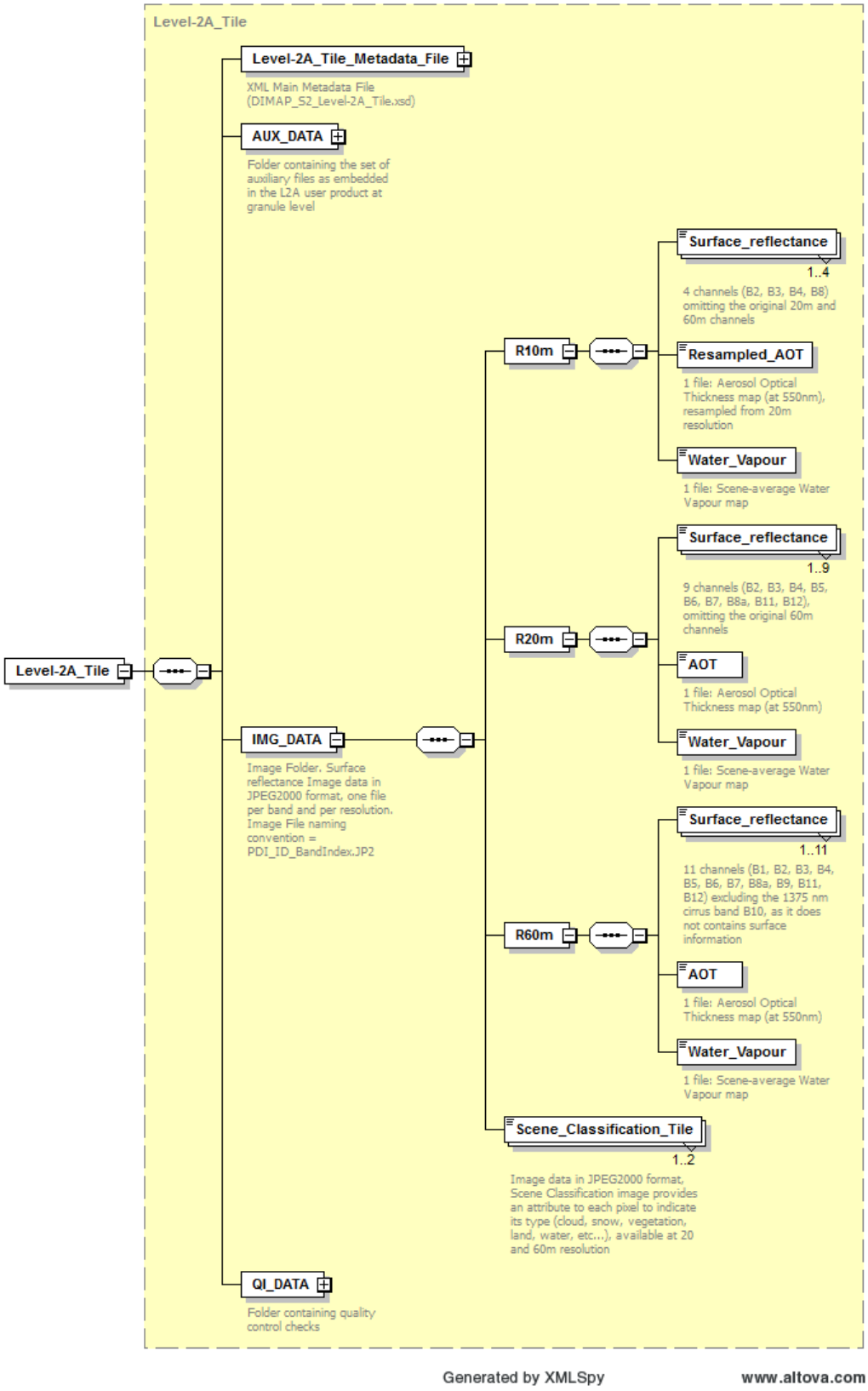

Figure 3-5 Level-2A tile IMG_DATA – physical organisation PSD V 13.1

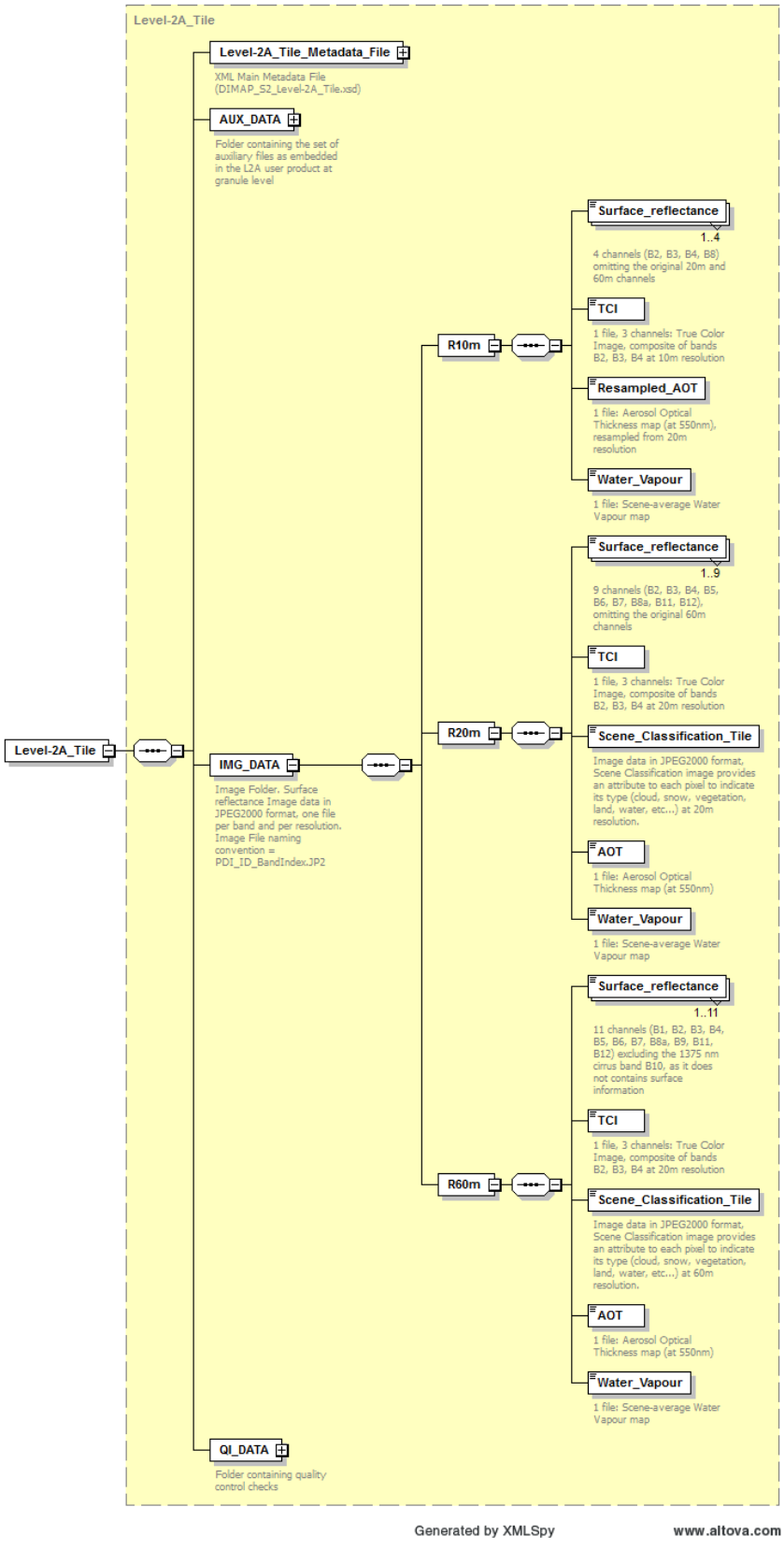

Figure 3-6 Level-2A tile IMG_DATA – physical organisation PSD V 14.2

3.2 Metadata XML validation schemas

1) S2_User_Product_Level-2A_Metadata.xsd
2) S2_PDI_Level-2A_DataStrip_Metadata.xsd
3) S2_PDI_Level-2A_Tile_Metadata.xsd
4) logical_definitions2A.xsd
5) item2A.xsd
6) xfdu.xsd

3.2.1 S2_User_Product_Level-2A_Metadata.xsd

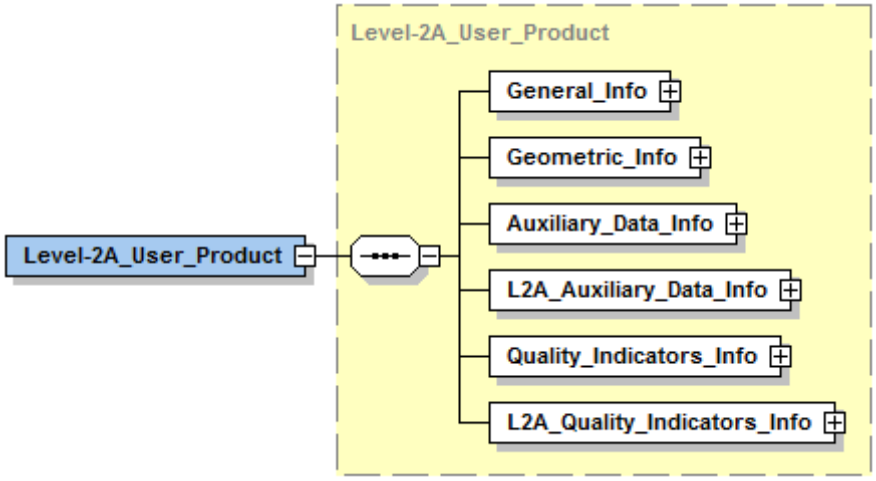

Figure 3-7 XML Schema metadata file L2A A user product

3.2.2 S2_PDI_Level-2A_DataStrip_Metadata.xsd

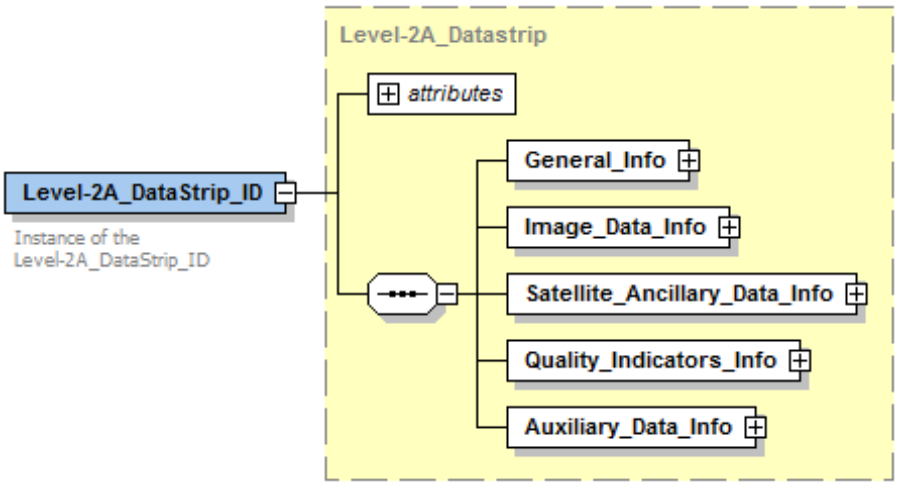

Figure 3-8 XML Schema metadata file L2A Datastrip

3.2.3 S2_PDI_Level-2A_Tile_Metadata.xsd

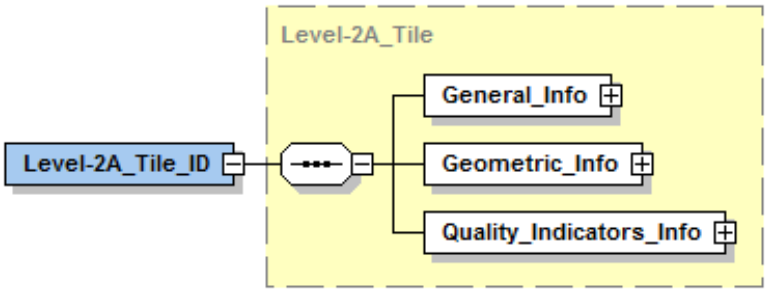

Figure 3-9 XML Schema metadata file L2A Tile

3.2.4 Item2A.xsd

Item2A.xsd schema has been updated with 19 new simple Types that describe the L2A Product Data Items (Granule, Tile, Datastrip, GIPP, DEM, GRI, IERS, POD, ECMWF, HKTM, SAD):

Table 1: XSD types added to logical_definitions2A.xsd

Type	Name	Description
SimpleType	DATASTRIP_ID_2A	Product Data Item identification
SimpleType	DATATAKE_ID_2A	Datatake identification
SimpleType	DEM_ID_2A	Product Data Item identification
SimpleType	ECMWF_ID_2A	Product Data Item identification
SimpleType	GIPP_ID_2A	Product Data Item identification
SimpleType	GLOBAL_SAD_ID_2A	Product Data Item identification
SimpleType	GRANULE_ID_2A	Product Data Item identification

Type	Name	Description
SimpleType	GRANULE_TILE_ID_2A	Product Data Item identification
SimpleType	GRI_ID_2A	Product Data Item identification
SimpleType	HKTM_ID_2A	Product Data Item identification
SimpleType	IERS_ID_2A	Product Data Item identification
SimpleType	IMAGE_ID_2A	Product Data Item identification
SimpleType	Item_ID_2A	a PDI_ID_2A or a Product ID
SimpleType	PDI_ID_2A	Product Data Item identification list: Granule, Tile, Datastrip, GIPP, DEM, GRI, IERS, POD, ECMWF, HKTM, SAD)
SimpleType	POD_ID_2A	Product Data Item identification
SimpleType	Product_ID_2A	Product Identifier in the archive (auxiliary, DEM, GIPP,...)
SimpleType	Product_ID_1C	New for PSD 14.2: references the Product Identifier of the L1C parent product
SimpleType	PVI_ID_2A	Preview Image identification
SimpleType	SAD_ID_2A	Product Data Item identification
SimpleType	TILE_ID_2A	Product Data Item identification

3.2.5 dimap2A.xsd

This XML schema has been updated with 16 new complex Types for the description L2A of XML metadata. The list of new complex types is given in Table 2 hereafter with a short description:

Table 2: XSD types added to dimap2A.xsd

Type	Name	Description
ComplexType	A_GIPP_LIST_2A	
ComplexType	A_PRODUCT_ORGANIZATION_2A	General PDGS Product Information on Level 2A
ComplexType	A_L2A_Product_Info	Common general Product Information
ComplexType	A_PRODUCT_INFO_USERL2A	General PDGS Product Information
ComplexType	A_L2A_SCENE_CLASSIFICATION_LIST	A list of L2A Scene Classification IDs
ComplexType	A_L2A_SCENE_CLASSIFICATION_ID	Pixel values assigned to L2A Scene Classification Image Data
ComplexType	AN_AUXILIARY_DATA_INFO_USERL2A	Auxiliary Data information L2A on product level
ComplexType	A_QUALITY_INDICATORS_INFO_USERL2A	Quality Indicators information on product level (L2A + L1C Technical assessment info)
ComplexType	AN_IMAGE_DATA_INFO_DSL1C_DSL2A	List of L2A tiles + L1C Geometric and Radiometric info
ComplexType	A_QUALITY_INDICATORS_INFO_DSL1B_DSL1C_DSL2A	Quality Indicators information on Datastrip level (L2A + L1C Geometric and Radiometric QI info)

Type	Name	Description
ComplexType	AN_AUXILIARY_DATA_INFO_DSL1C_DSL2A	Auxiliary Data information on Datastrip level (L2A and L1C reference)
ComplexType	A_GENERAL_INFO_L2A	General information on L2A Tile
ComplexType	A_QUALITY_INDICATORS_INFO_TILE_L2A	Quality Indicators information on L2A Tile and Pixel level
ComplexType	A_L2A_IMG_CONTENT_QI	Image content Quality Indicators (percentages of pixel type)
ComplexType	A_L2A_PIXEL_LEVEL_QI_LIST	Filenames of L2A QI Masks (Cloud confidence map, Snow/Ice confidence map)
ComplexType	A_L1C_L2A_QUANTIFICATION_VALUES_LIST	A list of L1C, L2A quantification values for digital counts on pixel level

3.2.6 xfdu.xsd

Figure 3-10 presents the XFDUType structure of the xfdu.xsd schema used to validate the SAFE Manifest for L2A User Product.

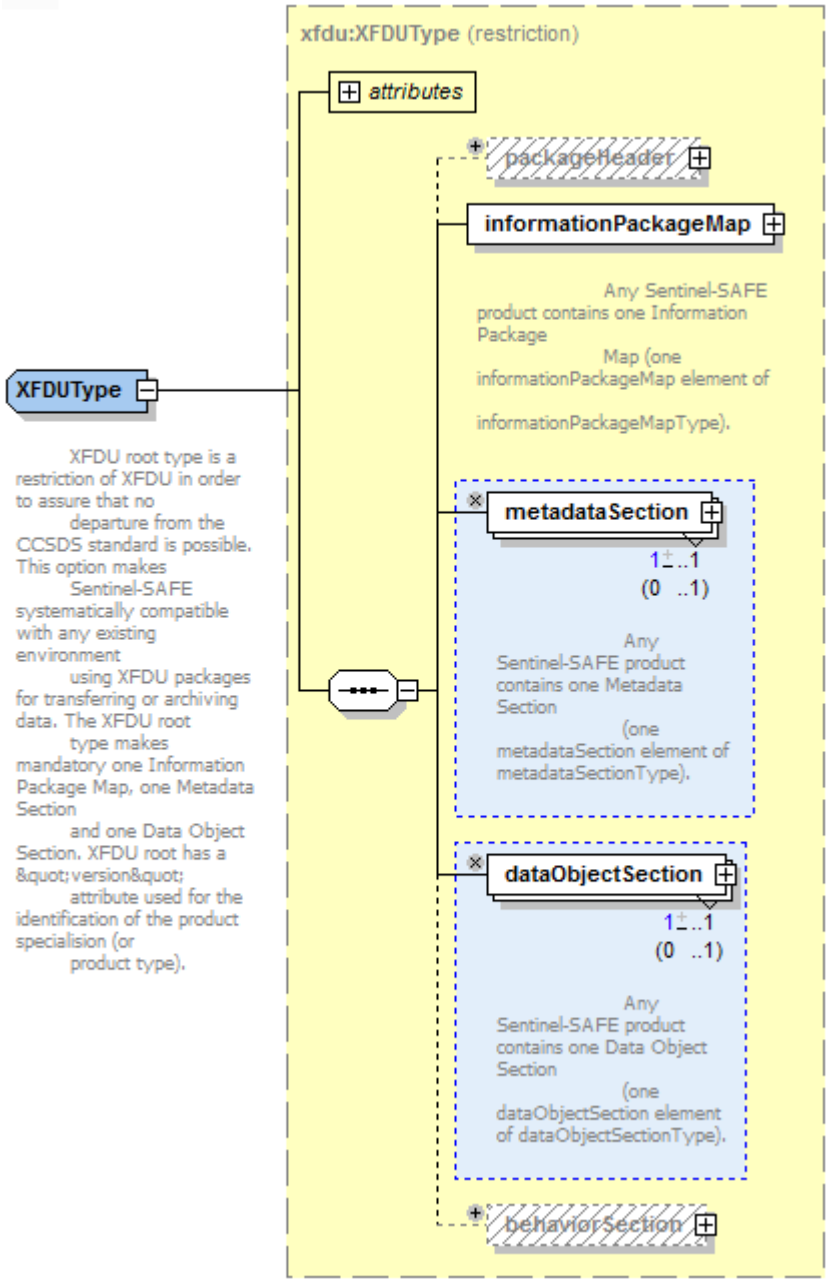

Figure 3-10 XML Schema for validation of the SAFE Manifest

For more details about SAFE format please refer to section 1.7.2 of [S2 PFS].

Appendix A File Naming Convention

1.4 Level-2A User Product Naming Convention

1.4.1 Product Main Directory SAFE_STANDARD

Level-2A main product directory is identified according to the following syntax derived from [GS-FFS] and [GS-FFS-TSM]:

MMM_CCCC_TTTTTTTTTT_<Instance_ID>

Where: <Instance_ID> = SSSS_[Creation Date]_ROOO_V[Start Time]_[End Time]

Table 3: Level-2A Product name Nomenclature

Field	Signification	Length (max)	Example Value
MMM	Mission ID, e.g. S2A, S2B	3	S2A
n/a	Separator	1	_
CCCC	File Class, i.e. the type of activity for which the file is used. Examples include: - USER for L2A production with Sen2Cor or S2 Toolbox - OPER for routine operations	4	USER
n/a	Separator	1	_
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (PRD_) DDDDDD = Semantic Descriptor	10	PRD_MSIL2A
n/a	Separator	1	_
SSSS	Site Centre of the file originator	4	PDMC
n/a	Separator	1	_
Creation Date	UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss	15	20140814T102032
n/a	Separator	1	_
ROOO	Orbit Number (Relative orbit number) R000-R143	4	R047
n/a	Separator	1	_
Start Time	UTC Date/Time of observation start with seconds resolution: VYYYYMMDDThhmmss	16	V20140325T223444
n/a	Separator	1	_
End Time	UTC Date/Time of observation end with seconds resolution : YYYYMMDDThhmms	15	20140325T223747
	Total length for main product directory name without extension.	**78**	

Example of S2 L2A product main directory:

S2A_USER_PRD_MSIL2A_PDMC_20140915T120000_R069_V20091211T165928_20091211T170025

1.4.2 Product Main Directory_SAFE_COMPACT

Level-2A main product directory is identified according to the following syntax derived from section 4.0.10 of [S2_PSD] V 14.2:

MMM_DDDDDD_<Instance_ID>

Where: <Instance_ID> = [Datatake Sensing Time]_Nxxyy_ROOO_[Product Discriminator]

Table 4: Level-2A Product name Nomenclature

Field	Signification	Length (max)	Example Value
MMM	Mission ID, e.g. S2A, S2B	3	S2A
n/a	Separator	1	_
DDDDDD	Semantic Descriptor, fixed string to identify Level-2A products	6	MSIL2A
n/a	Separator	1	_
Datatake Sensing Time	UTC Date/Time with second's resolution. Format: YYYYMMDDThhmmss	15	20160814T102032
n/a	Separator	1	_
Nxxyy	Production baseline	5	N0201
n/a	Separator	1	_
ROOO	Orbit Number (Relative orbit number) R000-R143	4	R047
n/a	Separator	1	_
Product Discriminator	Fixed string to distinguish different end user products associated to the same datatake. Format: YYYYMMDDThhmmss	15	20160803T124046
	Total length for main product directory name without extension.	**53**	

Example of S2 L2A product main directory:

S2A_MSIL2A_20160802T105414_N0102_R008_20160803T124046

The product directory contains the product main components shown in the Figure 3-2, listed in the following sections:

1.4.3 Product_Metadata_File SAFE_STANDARD (XML file)

The product metadata file name follows the same convention defined for the V 13.1 L2A main product directory where the File Type field is defined in the following table:

Table 5: Level-2A Product Metadata File – Naming Convention

Field	Signification	Length (max)	Example Value

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MTD_) DDDDDD = Semantic Descriptor (SAFL2A for SAFE L2A)	10	**MTD_SAFL2A**

Example of S2 L2A product metadata in SAFE_STANDARD format file is:

S2A_USER_MTD_SAFL2A_PDMC_20140915T120000_R069_V20091211T165928_20091211T170025.xml

1.4.4 Product Metadata File SAFE COMPACT (XML file)

The product metadata file name is combined by the two fields MMM + DDDDDD separated with '_'.

Table 6: Level-2A Product Metadata File – Naming Convention

Field	Signification	Length (max)	Example Value
MMM	MTD, fixed string to identify a metadata file	3	MTD
n/a	Separator	1	_
DDDDDD	Semantic Descriptor, fixed string to identify Level-2A products	6	MSIL2A

Fixed filename of S2 L2A product metadata in SAFE_COMPACT format is:

MTD_MSIL2A.xml

1.4.5 GRANULE (folder)

GRANULE folder contains a list of folders; each one corresponding to a tile composing the Level-2A user product. The file naming convention of its content is described in 1.5.

1.4.6 DATASTRIP (folder)

DATASTRIP folder contains the list of folders each one corresponding to the Datastrips composing the Level-2A user product. The name of each folder follows the syntax defined in the chapter 3 of [S2-PSD].

1.4.7 AUX DATA (folder)

AUX_DATA folder contains the auxiliary data files used for the processing. The naming convention used to identify each auxiliary file is defined in the chapter 3 for each PDI-Type Auxiliary:

- GIPP
- ECMWF
- DEM

1.4.8 Product Browse Image (optional, PNG file)

The product browse image is extracted from Level-1C product and follows therefore the same convention defined in [S2-PSD], where the file type definition is recalled in the table hereafter:

Table 7: Level-1C Product Preview image – Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (BWI_) DDDDDD = Semantic Descriptor (MSIL1C for L1C product)	10	**BWI_MSIL1C**

Examples of S2 L1C product preview image file are:

S2A_OPER_BWI_MSIL1C_PDMC__20140915T120000_R069_V20091211T165928_20091211T170025.png

Note that Level-2A tile preview image files are available at tile level in the TILE/QI_DATA folder.

1.5 Level-2A PDI Naming Convention

1.5.1 Datastrip_ID SAFE_STANDARD

The PDI_ID (Datastrip ID) used to identify a Level-2A Datastrip PDI, follows the description provided in chapter 3 of [S2-PSD].

PDI_ID = MMM_CCCC_TTTTTTTTTT_<Instance_Id>

Where file type (TTTTTTTTTT) is **MSI_L2A_DS**.

<Instance_Id>=<SiteCentre>_<CreationDate>_S<SensingTime>_<Processing Baseline>

Other sub-fields are described in the following table:

Table 8: Level-2A Datastrip_ID – Instance_Id Naming Convention

Field	Signification	Length (max)	Example Value
Creation Date	UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss	15	20101020T102032
Sensing Time	This time refers to the sensing time of the first line of the PDI in UTC time. 14 digits, date and time separated by the character T.	15	20101020T102032
Processing Baseline	Nxx.yy where x,y={0;9}, An increase of the Processing Baseline code is generated by a change of the elements listed above. A major change is traced by the “xx” digits, a minor change is traced by the “yy” digits.	6	N01.02

Example of a S2 L2A Datastrip_ID name is:

S2A_USER_MSI_L2A_DS_MPS__20140915T120000_S20130707T171925_N01.01

1.5.2 Datastrip_ID SAFE_COMPACT

The PDI_ID (Datastrip ID) used to identify a Level-2A Datastrip PDI, follows the description provided in section 4.9.10 of [S2-PSD] V 14.2.

PDI_ID = DS_<Centre>_<CreationDate>_S<SensingStart>

The sub-fields are described in the following table:

Table 9: Level-2A Datastrip_ID – Instance_Id Naming Convention

Field	Signification	Length (max)	Example Value
Centre	Site Centre as listed for [S2-PSD] V 14.2, section 3.4.2	4	MPS_
Creation Date	UTC Date/Time of creation date with seconds resolution : YYYYMMDDThhmmss	15	20101020T102032

Field	Signification	Length (max)	Example Value
Sensing Start	This time refers to the sensing start time of the Datastrip in UTC time. 14 digits, date and time, preceded by the character 'S' and separated by the character 'T'.	15	20101020T102032

Example of a S2 L2A Datastrip_ID filename is:
DS_SGS__20150802T122135_S20150802T105331

1.5.3 Datastrip_Metadata File SAFE_STANDARD (XML file)

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.xml

Where file type (TTTTTTTTTT) is **MTD_L2A_DS**.

<Instance_Id>=<SiteCentre>_<Creation Date>_S<Sensing Time>

Where <Site Centre>, <Creation Date>, <Sensing Time> are inherited from the L2A Datastrip ID.

Example of S2 L2A Datastrip_Metadata_filename:
S2A_USER_MTD_L2A_DS_MPS__20140915T120000_S20130707T171925.xml

1.5.4 Datastrip_Metadata File SAFE_COMPACT (XML file)

File naming = MTD_DS.xml. The name is fixed.

1.5.5 Tile_ID_SAFE_STANDARD

The PDI_ID (Tile ID) used to identify a Level-2A Tile PDI, follows the description provided in chapter 3 of [S2-PSD].

Tile_ID = MMM_CCCC_TTTTTTTTTT_<Instance_Id>

where the TTTTTTTTTT File Type field is defined in the following table:

Table 10: Level-2A Tile_ID – File Type Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MSI_) DDDDDD = Semantic Descriptor (L2A_TL for L2A tile)	10	**MSI_L2A_TL**

The Tile Instance_ID is defined hereafter.

<Instance_Id> = <Site Centre>_<Creation Date>_<Absolute Orbit>_<Tile>_<Processing Baseline>

Other sub-fields are described in the following table:

Table 11: Level-2A Tile ID – Instance_Id Naming Convention

Field	Signification	Length (max)	Example Value

Field	Signification	Length (max)	Example Value
Absolute Orbit	Absolute Orbit Number AOOOOOO	7	A000469
Tile	According to US-MGRS naming convention. (Inherited from Level-1C tile)	6	T15SWC
Processing Baseline	Nxx.yy where x,y={0;9}, An increase of the Processing Baseline code is generated by a change of the elements listed above. A major change is traced by the "xx" digits, a minor change is traced by the "yy" digits.	6	N01.02

Example of a S2 L2A tile name (Tile ID) is:
S2A_USER_MSI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_N01.01
The "N01.01" substring represents the processing baseline.

1.5.6 Tile_ID_SAFE_COMPACT

The PDI_ID (Tile ID) used to identify a Level-2A Tile PDI, follows the description provided in section 4.9.10 of [S2-PSD] V 14.2.
Tile_ID = L2A_<Tile>_<AbsoluteOrbit>_<TileDiscriminator>
as described in the following table:

Table 12: Level-2A Tile ID – Naming Convention

Field	Signification	Length (max)	Example Value
Tile	According to US-MGRS naming convention. (Inherited from Level-1C tile)	6	T15SWC
Absolute Orbit	Absolute Orbit Number AOOOOOO	7	A000469
Tile Discriminator	String discriminator to distinguish between partial tiles generated out of the same datatake	15	20160302T190048

Example of S2 L2A tile name (Tile ID) is:
L2A_T15SWC_A000069_20160302T190048
The "N01.01" substring represents the processing baseline.

1.5.7 Tile_Metadata_File SAFE_STANDARD (XML file)

The tile metadata file name follows the convention defined for the L2A main product directory where the File Type field is defined in the following table:

Table 13: Level-2A Tile_Metadata_File – Naming Convention

Field	Signification	Length (max)	Example Value
TTTTTTTTTT	File Type (File Category + File semantic) composed as follow: FFFFDDDDDD, where: FFFF = File Category (MTD_) DDDDDD = Semantic Descriptor (L2A_TL for L2A tile)	10	**MTD_L2A_TL**

Example of S2 L2A product metadata file:
S2A_USER_MTD_L2A_TL_MPS__20150302T190048_A000069_T14RMQ.xml

1.5.8 Tile_Metadata_File SAFE_COMPACT (XML file)

File naming = MTD_TL.xml. The name is fixed.

1.5.9 IMG_DATA (folder)

IMG_DATA folder contains the items listed in the following subsections.

1.5.9.1 Three resolutions folders (R10m, R20m, R60m)

1.5.9.1.1 Surface_Reflectance images (JPEG2000)

SAFE_STANDARD:
File naming convention = <Tile_ID>_<Band_Index>_<Resolution>.JP2
Where:

Table 14: Level-2A Image files – Naming Convention

Field	Signification	Note
Tile_ID	Tile_ID without Processing Baseline sub-string	
Band_Index	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	Field identifying the spectral bands
Resolution	xxm where: xx = 10, 20, 60	Field identifying the resolution of the image.

Level-2A surface reflectance image filename:
S2A_USER_MSI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_B03_10m.jp2

SAFE_COMPACT:
File naming convention =
L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2
Where:

Table 15: Level-2A Image files – Naming Convention

Field	Signification	Length (max)	Example Value

Field	Signification	Length (max)	Example Value
Tile	According to US-MGRS naming convention. (Inherited from Level-1C tile)	6	T15SWC
Datatake Sensing Time	This time refers to the sensing time of the first line of the PDI in UTC time. 15 digits, date and time, separated by the character T.	15	20101020T102032
Band_Index	Bxx where: xx = 01, 02, 03, 04, 05, 06, 07, 08, 8A, 09, 10, 11, 12	3	B01
Resolution	xxm where: xx = 10, 20, 60	3	60m

Level-2A surface reflectance image file example name:
L2A_T15SWC_20160302T190048_B03_10m.jp2

1.5.9.1.2 Resampled_AOT images (JPEG2000)

SAFE_STANDARD:

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.JP2

Where file type (TTTTTTTTTT) is **AOT_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>_<Resolution>

Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID. <Resolution> is described inTable 14

Example of a S2 L2A AOT tile name:
S2A_USER_AOT_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:

File naming convention = L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2

Where: Band_Index = 'AOT', all other parameters as for Table 15.

Example of a S2 L2A AOT tile name:
L2A_T15SWC_20160302T190048_AOT_10m.jp2

1.5.9.1.3 Water_Vapour images (JPEG2000)

SAFE_STANDARD:

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_Id>.JP2

Where file type (TTTTTTTTTT) is **WVP_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>_<Resolution>

Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID. <Resolution> is described in Table 14.

Example of S2 L2A Water Vapour tile name:
S2A_USER_WVP_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2

SAFE_COMPACT:

File naming convention =
L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2

Where: Band_Index = 'WVP', all other parameters as for Table 15.

Examples of a S2 L2A Water Vapour tile name:

L2A_T15SWC_20160302T190048_WVP_20m.jp2

1.5.9.2 Scene_Classification_Tile (JPEG2000)

SAFE_STANDARD:

File naming convention =
MMM_CCCC_TTTTTTTTTT_<Instance_Id>_<Resolution>.JP2

Where file type (TTTTTTTTTT) is **SCL_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>

Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID.

Examples of S2 L2A Scene_Classification_Tile:

S2A_USER_SCL_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2
S2A_USER_SCL_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:

File naming convention =
L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2

Where: Band_Index = 'SCL', all other parameters as for Table 15.

Examples of S2 L2A Scene_Classification_Tile:

L2A_T15SWC_20160302T190048_SCL_20m.jp2
L2A_T15SWC_20160302T190048_SCL_60m.jp2

1.5.9.3 True Color_Images (JPEG2000)

Only present with PSD V >= 14.2

SAFE_STANDARD:

File naming convention =
MMM_CCCC_TTTTTTTTTT_<Instance_Id>_<Resolution>.JP2

Where file type (TTTTTTTTTT) is **TCI_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>

Where <Site Centre>, <Creation Date>, <AbsoluteOrbit> and <Tile> are inherited from the L2A Tile ID.

Examples of S2 L2A TCI filename:

S2A_USER_TCI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2
S2A_USER_TCI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:

File naming convention = L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2

Where: Band_Index = 'TCI', all other parameters as for Table 15.

Level-2A surface reflectance image file example name:

L2A_T15SWC_20160302T190048_TCI_20m.jp2

1.5.10 QI_DATA (folder)

QI_DATA folder contains the items listed in the following subsections.

1.5.10.1 L1C Quality_Masks

Their file naming convention is described in [S2-PSD].

1.5.10.2 L2A Quality_Masks (JPEG2000)

SAFE_STANDARD:

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_ID>.JP2

The two L2A Masks file types (TTTTTTTTTT) are listed hereafter:

1. **CLD_L2A_TL** (Confidence cloud mask files)
2. **SNW_L2A_TL** (Confidence snow mask files)

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>_<Resolution>

Where <Site Centre>, <Creation Date>, <AboluteOrbit>and <Tile> are inherited from the L2A Tile ID.

Examples of filenames:

S2A_USER_CLD_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_20m.jp2

S2A_USER_SNW_L2A_TL_MPS__20150302T190048_A000069_T14RMQ_60m.jp2

SAFE_COMPACT:

File naming convention = L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>_<Resolution>.JP2

Where: Band_Index = 'CLD | SNW', all other parameters as for Table 15.

Examples of filenames:

L2A_T15SWC_20160302T190048_CLD_60m.jp2

L2A_T15SWC_20160302T190048_SNW_20m.jp2

1.5.10.3 PVI Tile Preview Image (JPEG2000, GML)

SAFE_STANDARD:

File naming convention = MMM_CCCC_TTTTTTTTTT_<Instance_ID>.JP2

Where file type (TTTTTTTTTT) is **PVI_L2A_TL**.

<Instance_Id> = <Site Centre>_<Creation Date>_<AbsoluteOrbit>_<Tile>

Where <Site Centre>, <Creation Date>, <AbsoluteOrbit>and <Tile> are inherited from the L2A Tile ID.

Example of S2 L2A preview image file:
S2A_USER_PVI_L2A_TL_MPS__20150302T190048_A000069_T14RMQ.jp2

SAFE_COMPACT:

File naming convention =
L2A_<Tile>_<Datatake_Sensing_Time>_<Band_Index>.JP2

Where: Band_Index = 'PVI', all other parameters as for Table 15.

Example of S2 L2A preview image file:
L2A_T15SWC_20160302T190048_PVI_20m.jp2

Appendix B XSDs Directory Structure

S2-L2A-PSD-V13.1-XSD_Schema directory structure: New or updated files appear in red italic.

```
|  S2-PDGS-MPC-L2A-PFS-V14.2.docx
|  S2-PDGS-MPC-L2A-PFS-V14.2.pdf
\--- S2-PDGS-TAS-DI-PSD-V13.1_Schema
\--- S2-PDGS-TAS-DI-PSD-V14.2_Schema
   |  S2_PDI_Level-2A_Datastrip_Metadata.xsd
   |  S2_PDI_Level-2A_Tile_Metadata.xsd
   |  S2_User_Product_Level-2A_Metadata.xsd
   |  S2_PDI_Level-2A_Datastrip_Structure.xsd
   |  S2_PDI_Level-2A_Tile_Structure.xsd
   |  S2_User_Product_Level-2A_Structure.xsd
   |
   \---DICO
      \---12
      \---14
         +---DataAccess
         |  +---item
         |        item.xsd
         |        item2A.xsd
         |
         +---DPC
         |
         +---FOS
         |
         +---GS
         |
         +---IPF
         |
         +---PDGS
         |  +---archive
         |  |
         |  +---base
         |  |
         |  +---center
         |  |
         |  +---component
         |  |
```

```
|   +---configuration
|   |
|   +---dimap
|   |       dimap.xsd
|   |       dimap2A.xsd
|   |
|   +---fileNaming
|   |
|   +---header
|   |
|   +---logical_definitions
|   |
|   +---spacecraft
|   |
|   \---station
|
\---SY
```

Appendix C XFDU - L2A User Product SAFE Manifest

The xfdu.xsd file used to validate the L2A User Product Safe Manifest is located in:

S2-PDGS-TAS-DI-PSD-V13.1_SAFE/resources/xsd/int/esa/safe/sentinel/1.1/sentinel-2/msi/archive_l2a_user_product/xfdu.xsd

S2-PDGS-TAS-DI-PSD-V14.2_SAFE/resources/xsd/int/esa/safe/sentinel/1.1/sentinel-2/msi/archive_l2a_user_product/xfdu.xsd

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Appendix D Conversion Formulae

The table below lists the conversion formulae to apply to image digital numbers (DN) to obtain physical values.

Image Type	Conversion formula	Physical Units	Comments
Surface_reflectance	SR = DN / 10000.	Unit less	Surface Reflectance values lies usually between 0.0 and 1.0. Specular effects on surface or clouds could lead to values higher than 1.0. The L2A Quantification Value is aligned with the L1C Quantification Value of the L1C product from which the L2A product is generated.
Resampled_AOT	AOT = DN / 1000.	Unit less	The aerosol optical thickness (τ) is defined as the integrated extinction coefficient over a vertical column of atmosphere of unit cross section. Extinction coefficient is the fractional depletion of radiance per unit path length (also called attenuation for radar frequencies). Example in formula: $I = I_0 (e^{-\tau})$
Water_Vapour	WVP = DN / 1000.	cm (or $g.cm^{-2}$)	Typical ranges of water vapour columns are (sea-level-to space): tropical conditions: wvp = 3-5 cm midlatitude summer: wvp = 2-3 cm dry summer, spring, fall: wvp = 1-1.5 cm dry desert or winter: wvp = 0.3-0.8 cm
Digital_Elevation_Map	DEM = DN - 10000	m	OpenJPEG is only able to store unsigned integer values, thus an offset of +10.000 has been applied in order to allow negative heights. The scale of the DEM is thus (meter – 10.000).