



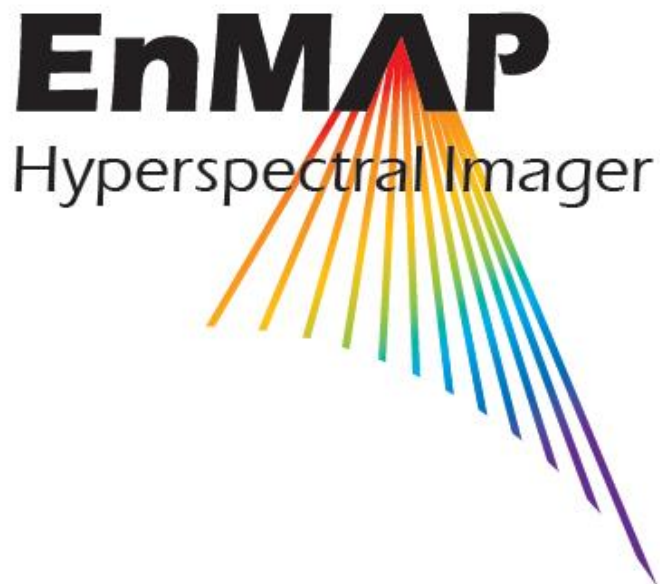
EnMAP Ground Segment

EnMAP HSI Level 1 / Level 2 Product Specification Document

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German Remote Sensing Data Center (DFD)
Remote Sensing Technology Institute (IMF)
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DISTRIBUTION LIST

The EnMAP HSI Level 1 / Level 2 Product Specification Document is stored in the Technical Specification (TS) within the PCV sub-folder of the EnMAP Ground Segment Teamsite.

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CHANGE RECORD

Version	Date	Chapter	Comment
1	21.05.2010	all	First issue
1.1	21.10.2010	4.4 Appendix A	DataQC parameters separately for VNIR and SWIR cameras[LAN-R-0271]
	21.10.2010	4.4 Appendix A	DataQC parameter for dead pixels (from Instrument Monitoring) [LAN-R-0272]
	27.10.2010	4.7	KAU-H-0224 Haze Absorption
	31.01.2011	Appendices	Introduction of units in metadata
1.2	12.07.2011	4.4 and Appendix	Re-working of sensorModel and Boresight metadata (including example in the appendix)
1.3	17.05.2016	Preamble	Update of author list (SCR-00033)
	17.05.2016	All	Updated product names (SCR-00018)
	17.05.2016	4	System change request SCR-00044, Requirement PCV-SR-0155-L0P-FUN for generation of orthorectified quicklooks and quality masks (in response to GS requirement GRD-US-0170)
	17.05.2016	5	System change request SCR-00044, Requirement PCV-SR-0155-L0P-FUN for generation of orthorectified quicklooks and quality masks (in response to GS requirement GRD-US-0170)
	17.05.2016	6	System change request SCR-00044, Requirement PCV-SR-0155-L0P-FUN for generation of orthorectified quicklooks and quality masks (in response to GS requirement GRD-US-0170)
	17.05.2016	4	Included additional files into L1C internal product: Digital Elevation Model, tables to map raster data from sensor to ground geometry
1.4	01.12.2016	4.7, 4.8, 4.9, 7	Response to RID FIS-S-0084: Removed TBCs for the Quicklooks Removed TBCs for thresholds and replaced this by reference to the document where these are defined, i.e. AR-5.
1.4	09.12.2016	4.5	Changed the naming of three parameter from receiver/x to destination/x, to conform with the names defined in EN-GS-DD-2011_Product_Conventions.
1.4	09.12.2016	Appendix A	Fixed some syntax issues in the metadata examples
1.4		4.4	More detailed explanation of instrumentStatus entries
1.4	09.12.2016	4.4	Set "search key" to yes for multiple parameters. Added remarks for the "qualityFlag" entries.
1.4	09.12.2016	4.4	Metadata keywords added to table 4-4 (results of the screening procedure, DPM version numbers, list of expected channels for VNIR/SWIR)
1.4	09.12.2016	4.4	Examples for value range of expectedChannelList in {vnir swir}ProductQuality added, value range of screeningResult in {vnir swir}DarkBeforeQuality changed
1.4	09.12.2016	Annendix A	Examples for L2A have been reviewed and extended by new metadata keys
1.4	09.12.2016	Annex A.1	Updated examples for L1B, L1C, L2A reg. "qualityFlag" entries
1.4	13.12.2016	4.9	Quality test flags split into two files in L1B
1.4	14.12.2016	Tab 5-4	Removed ...testflags_ortho in L2A internal products
1.4	10.01.2017	4.4, A	Update of Metadata specification for L0 (SCR-00076)
1.4	19.01.2017	4, 5, 7	Version format changed
1.4	03.02.2017	4	Figure 4-1 and tables are updated for correct number of masks
1.4	13.02.2017	4.4	SCR-00081: New Calibration Table Product – added new parameter auxDataVersion/calTabSLCVersion
1.4	21.02.2017		Signature of Martin Habermeyer is added. In file names "DTnnnnnn" is changed into "DTnnnnnnnn_nnn_"
1.5	20.10.2017	4.4 Appendix A	- Parameters related to DataQuality modified according to telecom with RM & GFZ on the handling of low quality data (ICR-00085-1, SCR-00085) - proposal to add snowCover and waterCover which are included in L0, but missing so far in L1/L2
	18.12.2017	4.4	Change processorVersion entry to archivedVersion
	05.06.2018	all	Update of product specification due to SCR-00104 (Update of HSI Product Names). Update of metadata items.
	07.06.2018	all	Fixed typos, small changes, updated estimated sizes.
	12.06.2018	4.1	Added frame time and jitter to metadata.
	13.06.2018	4.1	Removed entries refTabSunVersion, refTabLampVersion, refTabSpecVersion,



			refTabLinearityVersion, refTabDpmVersion from metadata, as these are not available for Level1/2
	15.06.2018	4.1 & 4.5	Adjusted qualityFlag – related entries to be consistent with 2009-1
	15.06.2018	4	Updated tables with highlighted not delivered products.
	18.06.2018	4	Updated description of quality layers scene, updated sizes of files.
	21.06.2018	all	Fixed comments on product format, metadata items and other.
	22.06.2018	4.1	Added the WARNING value for all status flags set by the screening (see also 2009-1).
	07.11.2018	4.1	Updated remark field for expectedChannelsList and missingChannelsList for both SWIR and VNIR. Updated remarks of fields not applicable to individual products. (SCR-00076)
	23.11.2018	all	Correction of typos, update of example metadata, history and log, update of issue.
	26.11.2018	all	Updated contents, page numbering, list of tables, list of figures, reference issues.
	30.11.2018	all	Finalised document for release of issue 1.5.
1.6	17.01.2019	4.1	Update of metadata cards: product/image/merge (NCR-00131), specific/instrumentStatus and product/calibration/cal.
	23.01.2019	4.1, Appendix A	Removed leap second flag. Added spatialCoverageOfOrthoScene (NCR-00159)
	11.04.2019	Appendix A	Updated metadata example, as the old one included the errors now fixed for NCR-00131 (ICR-00131-03)
	23.04.2019	4, 5	Updated metadata (SCR-00181), data types and units (SCR-00183) and product specification (SCR-00189).
	24.04.2019	4.1	Updated units of bandStatistics (SCR-00183). Updated several metadata fields (SCR-00181): - product/image/merge - screeningResult*/listOf*/parameter - spatialCoverageOfOrthoScene - instrumentStatus - vnirProductQuality, swirProductQuality
	29.04.2019	4.5	Updated quality layers (SCR-00189).
	02.05.2019	4.1	Updated metadata field instrumentStatus (SCR-00181).
	03.05.2019	4.1	Updated metadata field vnir/swirProductStatus (SCR-00181).
	06.05.2019	4.1	Fixed typo in metadata field swirProductStatus (SCR-00181).
	03.07.2019	4.1	Added metadata entry citation. (SCR-00191)
	26.01.2020	App. A, B, C	Updated metadata, history and log examples with output from ITVV Re-test2 jobs (SCR-00189).
	26.10.2020	2, 4, 5, 6, App. A, B, C	Small editorial changes in preparation for issue release; updated reference issues; added smile parameter structure in metadata and corresponding TBC-1 (SCR-00212); updated datatake ID to 10 digits (SCR-00207); added TBC-2 regarding quicklook wavelengths.
	23.11.2020		Editorial changes following internal review. Prepared issue 1.6.
1.7	21.07.2021	4.1	Added entry and description of Water_Reflectance_Product Metadata
	21.07.2021	4.1	Added to citation metadata entry regarding Water_Reflectance_Product value
	21.07.2021	App A	Added example entry for Water_Reflectance_Product
	21.07.2021	4.1, p. 28	Changed units of QC parameters (ICR-00230-07)
	11.10.2021	4.1	Extended the remark for metadata entry "specific / status".
	17.12.2021	2.1	Removed superseded AR-16 from Applicable Reference
	21.12.2021	2,1	Updated issues of references. Resolved several comments. Deleted TBC-1 (Smile parameterization).
	18.01.2022		Prepared issue 1.7.
1.8	24.02.2022	4.1	Adapted metadata field status, numChannelsMissing and missingChannelsList and added metadata fields numChannelsDSHAIssue and affectedDSHAIssueChannels due to DSHA radiation issue (SCR-00302).
	11.05.2022	4.1	Adapted description of central wavelength and FWHM in metadata item bandCharacterisation (trac ticket #269).
	19.05.2022	4.1	Updated description of deadPixelsVNIR/deadPixelsSWIR, as these can never have the value -999. Updated unit of sceneWV from "cm * 10" to "cm * 1000" to match the current implementation. Updated description of citation entry: the processing date (in general block) and the projection (in parameter block) are separated by a "+", not a "_".
	19.07.2022	4.1	Updated the number of bands of VNIR & SWIR (see Trac Ticket #300)
	26.09.2022	4.4, 6	Updated the quicklook bands and removed respective TBC-1.



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	04.10.2022	2.1, App A, B, C	Updated ATBD issues in applicable references. Updated examples of metadata, history and log files in Appendices A, B and C. Prepared issue 1.8 for public release.
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1. Introduction

1.1 Purpose

The current document defines the product files to be generated by the high-level processors L1B, L1C and L2A. Its purpose is to specify thoroughly all the created files and directory structure.

1.2 Scope

The document defines the format, content and naming of the EnMAP product files for L1B, L1C and L2A as well as the corresponding directory structure. In case file formats are specified in detail elsewhere, the relevant documents are referenced and the file format description is not duplicated here.

2. References

2.1 Applicable references

The following documents are applicable to the extent specified herein.

Document ID	Document Title	Issue
AR-1	EN-GS-TN-2005: Product Tree: Subsystems and Components	3.0
AR-2	EN-GS-DD-2023: EnMAP Ground Segment Design Document	1.7
AR-3	EN-GS-ICD-2002: EnMAP Ground Segment Master Interface Control Document	2.0
AR-4	EN-PCV-TN-3006: Level 0 Processor: Transcription and Screening	1.7
AR-5	EN-PCV-TN-4006: Level 1B Processor: Systematic and Radiometric Correction	1.7
AR-6	EN-PCV-TN-5006: Level 1C Processor: Geometric Correction	1.6
AR-7	EN-PCV-TN-6007: Level 2A Processor (Atmospheric Correction Land) ATBD	2.2
AR-8	EN-PCV-TN-6008: Level 2A Processor (Atmospheric Correction Water) ATBD	3.1
AR-9	EN-PCV-ICD-2009-1: EnMAP HSI Level 0 Product Specification Document	1.6
AR-10	EN-PGS-DD-4005: DIMS Configuration for EnMAP	1.4
AR-11	EN-PCV-UM-2005: Processor User Manual	1.2
AR-12	EN-PCV-RSP-2013: PCV System Requirements Specifications	1.3
AR-13	EN-PCV-TN-8005: HSI Geometric Calibration and Quality Control Concept	1.1
AR-14	EN-MOS-ICD-5023: MOS Orbit and Attitude Products Description	2.4
AR-15	EN-GS-UM-2024: History File Reference Implementation	1.0

Table 2-1 Applicable references.

2.2 Normative references

The following documents are normative to the extent specified herein.

Document ID	Document Title	Issue
NR-1	ECSS-E-70 Part 1A: Ground Systems and Operations – Part 1: Principles and requirements	25.04.2000
NR-2	ECSS-E-40 Part 1B: Software – Part 1: Principles and requirements	31.03.2005
NR-3	ECSS-E-40 Part 2B: Software – Part 2: Documents requirements definition	31.03.2005
NR-4	ECSS-E-10A: System Engineering	19.04.1996

Table 2-2 Normative references.

2.3 Informative references

The following documents, though not formally part of this document, amplify or clarify its content.



Document ID	Document Title	Issue
IR-1	EN-PCV-PLN-1001: Subsystem Development Plan – S310	1.0
IR-2	EN-PCV-ICD-2002: PCV Internal Interfaces Control Document	1.5
IR-3	EN-GS-ICD-2021: PGS-PCV Interfaces Control Document	2.0
IR-4	EN-GS-PLN-1001-6: Project Plan Phases C/D, E - Part A: PCV Work Package Descriptions	2.3
IR-5	EN-GS-PLN-2001: EnMAP Ground Segment Information/Documentation Management Plan	2.0
IR-6	EN-GS-PLN-2002: EnMAP Ground Segment Configuration and Information Management Plan	1.1
IR-7	EN-GS-PLN-2003: EnMAP Ground Segment Product Assurance Plan	3.1
IR-8	EN-GS-PLN-2004: EnMAP Ground Segment Risk Management Plan	3.3
IR-9	EN-GS-ICD-2002: EnMAP Ground Segment Master ICD	2.0
IR-10	EN-PGS-DD-6006: HSI Processing System Design Document	1.5

Table 2-3 Informative references.

3. Terms, Definitions and Abbreviations

Terms, definitions and abbreviations for the EnMAP Ground Segment and the EnMAP Space Segment are collected and published on <http://www.enmap.org/>, together with the mission description.

4. Product Files and Formats

Depending on the requested output product, ENMAP.HSI.Lx contains the spectral image corrected by the corresponding processing level, quicklooks and quality information as well as the product metadata and the processing history and log files. The corrected scene contains one tile of the origin data take which corresponds to approximately 30 km × 30 km.

The spectral images contain scaled pixel values, which have to be converted to physical units using the corresponding parameter set in the metadata. The format of the spectral images in each product level is detailed in Table 4-1. The user can read the gains and offsets from the metadata item specific/bandCharacterisation and the background value from specific/backgroundValue, cf. Table 4-5.

Product	Data type	Gain	Offset	Background value	Physical quantity	Physical unit
L1B	little-endian uint16	variable for each band	variable for each band	0	at-sensor radiance	W/m ² /sr/nm
L1C	little-endian uint16	variable for each band	variable for each band	0	at-sensor radiance	W/m ² /sr/nm
L2A	little-endian int16	10000	0	-32768	reflectance	absolute value

Table 4-1 Format of spectral images in L1B, L1C and L2A products.

The files contained in the L1B, L1C and L2A products are shown in Figure 4-1, Figure 4-2 and Figure 4-3 and detailed in Table 4-2, Table 4-3 and Table 4-4. For all levels, the extension of the spectral images is selectable by the user and the history and log files are for internal use only and thus not delivered to the user. Note that the quality layers (classes, cloud, cloud shadow, haze, cirrus, snow) for all levels use the VNIR scene as spatial reference [AR-6].

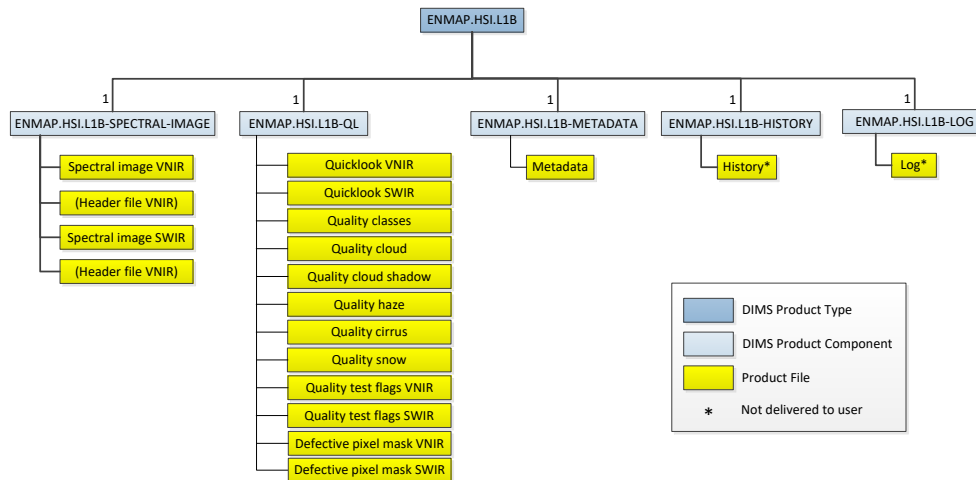


Figure 4-1 L1B product files.

Name	Description	File	Format	Estimated Size
ENMAP.HSI.L1B-METADATA	Provided metadata	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-METADATA.XML	xml	10 MB
ENMAP.HSI.L1B-HISTORY	History file for L1B processing, not delivered to user	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-HISTORY.XML	xml	1 MB
ENMAP.HSI.L1B-LOG	Log file providing processing information, not delivered to user	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-LOG.XML	xml	50 KB
ENMAP.HSI.L1B-SPECTRAL-IMAGE	Earth image measurement data covering 1 tile (30x30km) in sensor geometry	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE_VNIR.{TIF,BSQ,BIP,BIL,JPEG2000}	geotiff, bsq, bip, bil, jpeg2000 (selectable by user)	<172 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE_VNIR.HDR	Envi header file (only for bsq, bip and bil)	10 KB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE_SWIR.{TIF,BSQ,BIP,BIL,JPEG2000}	geotiff, bsq, bip, bil, jpeg2000 (selectable by user)	<254 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE_SWIR.HDR	Envi header file (only for bsq, bip and bil)	10 KB
ENMAP.HSI.L1B-QL	Quicklooks in sensor geometry	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_VNIR.TIF	geotiff	<3 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_SWIR.TIF	geotiff	<3 MB

Name	Description	File	Format	Estimated Size
	Quality layers in sensor geometry	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLASSES.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLOUD.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLOUDSHADOW.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_HAZE.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CIRRUS.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_SNOW.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_TESTFLAGS_VNIR.TIF	geotiff	<1 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_TESTFLAGS_SWIR.TIF	geotiff	<1 MB
	Defective pixel mask in sensor geometry	ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_PIXELMASK_VNIR.TIF	geotiff	<86 MB
		ENMAP01-____L1B-DTnnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnnnnn_yyyymmddThhmmssZ-QL_PIXELMASK_SWIR.TIF	geotiff	<127 MB

Table 4-2 List of component files for L1B product. Shaded files are not delivered to the user. For the sizes, the following convention is used: 1 KB = 1024 bytes, 1MB = 1024 KB. Note that for image files the size depends crucially on compression format and content, so for these files only the maximum size is indicated.

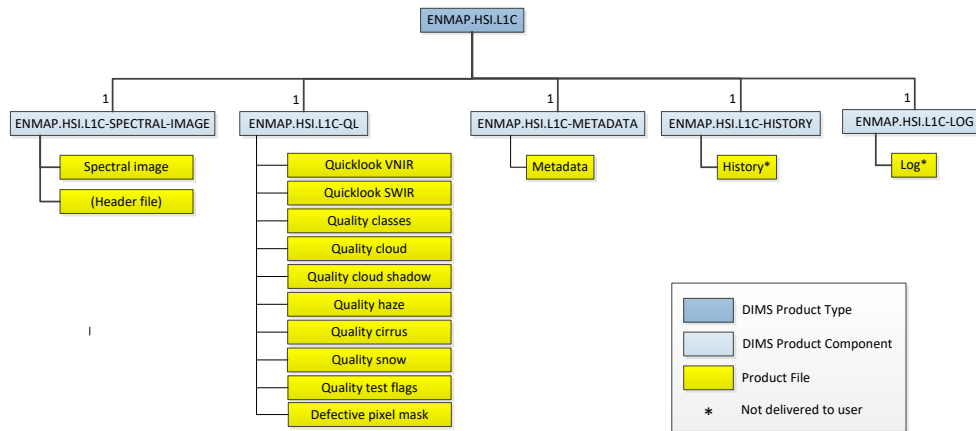


Figure 4-2 L1C product files.

Name	Description	File	Format	Estimated Size
ENMAP.HSI.L1C-METADATA	Provided metadata	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-METADATA.XML	xml	10 MB
ENMAP.HSI.L1C-HISTORY	History file for L1C processing, not delivered to user	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-HISTORY.XML	xml	1 MB
ENMAP.HSI.L1C-LOG	Log file providing processing information, not delivered to user	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-LOG.XML	xml	50 KB
ENMAP.HSI.L1C-SPECTRAL-IMAGE	Earth image measurement data covering 1 tile (30x30km) in orthorectified geometry	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE.{TIF,BSQ,BIP,BIL,JPEG2000}	geotiff, bsq, bip, bil, jpeg2000 (selectable by user)	<639 MB
		ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE.HDR	Envi header file (only for bsq, bip and bil)	10 KB
ENMAP.HSI.L1C-QL	Quicklook in orthorectified geometry	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-QL_VNIR.TIF	geotiff	<4 MB
		ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-QL_SWIR.TIF	geotiff	<4 MB
	Quality layers in orthorectified geometry	ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLASSES.TIF	geotiff	<1 MB
		ENMAP01-____L1C-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLOUD.TIF	geotiff	<1 MB



Name	Description	File	Format	Estimated Size
		ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_QUALITY_CLOUDSHADOW.TIF	geotiff	<1 MB
		ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_QUALITY_HAZE.TIF	geotiff	<1 MB
		ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_QUALITY_CIRRUS.TIF	geotiff	<1 MB
		ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_QUALITY_SNOW.TIF	geotiff	<1 MB
		ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_QUALITY_TESTFLAGS.TIF	geotiff	<1 MB
	Defective pixel mask in orthorectified geometry	ENMAP01-___L1C-DTnnnnnnnnnnyyyymmddThhmmssZ_nnn_VnnnnnnyyyymmddThhmmssZ-QL_PIXELMASK.TIF	geotiff	<320 MB

Table 4-3 List of component files for L1C product. Shaded files are not delivered to the user. The sizes of spectral images, quicklooks, quality layers and pixel masks were estimated considering that the orthorectified scene is a factor 1.5 larger than the original scene. For the sizes, the following convention is used: 1 KB = 1024 bytes, 1MB = 1024 KB. Note that for image files the size depends crucially on compression format and content, so for these files only the maximum size is indicated.

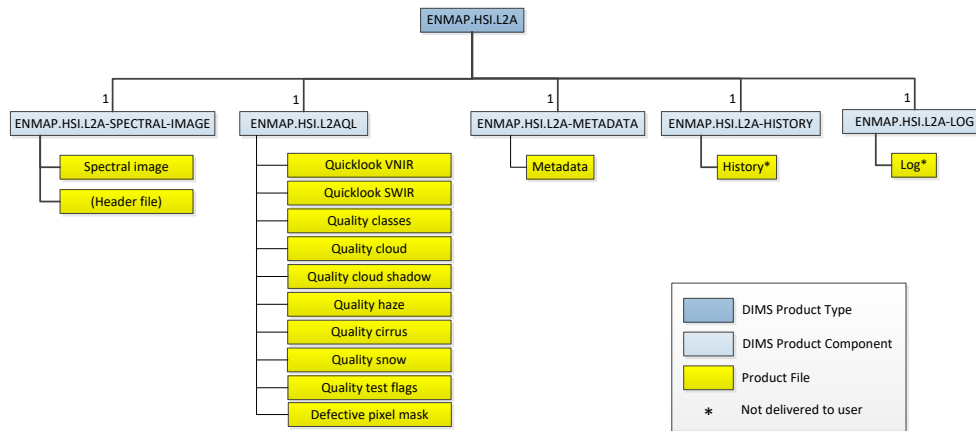


Figure 4-3 L2A product files.

Name	Description	File	Format	Estimated Size
ENMAP.HSI.L2A-METADATA	Provided metadata	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-METADATA.XML	xml	10 MB
ENMAP.HSI.L2A-HISTORY	History file for L2A processing, not delivered to user	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-HISTORY.XML	xml	1 MB
ENMAP.HSI.L2A-LOG	Log file providing processing information, not delivered to user	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-LOG.XML	xml	50 KB
ENMAP.HSI.L2A-SPECTRAL-IMAGE	Earth image measurement data covering 1 tile (30x30km) in orthorectified geometry	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE.{TIF,BSQ,BIP,BIL,JPEG2000}	geotiff, bsq, bip, bil, jpeg2000 (selectable by user)	<639 MB
		ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-SPECTRAL_IMAGE.HDR	Envi header file (only for bsq, bip and bil)	10 KB
ENMAP.HSI.L2A-QL	Quicklook in orthorectified geometry	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_VNIR.TIF	geotiff	<4 MB
		ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_SWIR.TIF	geotiff	<4 MB
	Quality layers in orthorectified geometry	ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLASSES.TIF	geotiff	<1 MB
		ENMAP01-____L2A-DTnnnnnnnnnn_yyyymmddThhmmssZ_ynn_Vnnnnnn_yyyymmddThhmmssZ-QL_QUALITY_CLOUD.TIF	geotiff	<1 MB

Name	Description	File	Format	Estimated Size
		ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_QUALITY_CLOUDSHADOW.TIF	geotiff	<1 MB
		ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_QUALITY_HAZE.TIF	geotiff	<1 MB
		ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_QUALITY_CIRRUS.TIF	geotiff	<1 MB
		ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_QUALITY_SNOW.TIF	geotiff	<1 MB
		ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_QUALITY_TESTFLAGS.TIF	geotiff	<1 MB
	Defective pixel mask in orthorectified geometry	ENMAP01-___L2A-DTnnnnnnnnn_yyyymmddThhmmssZ_nnn_Vnnn_nnn_yyyymmddThhmmssZ-QL_PIXELMASK.TIF	geotiff	<320 MB

Table 4-4 List of component files for L2A product. Shaded files are not delivered to the user. The sizes of spectral images, quicklooks, quality layers and pixel masks were estimated considering that the orthorectified scene is a factor 1.5 larger than the original scene. For the sizes, the following convention is used: 1 KB = 1024 bytes, 1MB = 1024 KB. Note that for image files the size depends crucially on compression format and content, so for these files only the maximum size is indicated.

4.1 Metadata file

The metadata file contains all the necessary information for the user to be able to process and interpret the product. The file is in xml format and it is organized in five information blocks, namely:

- metadata file information;
- processing parameters;
- base parameters;
- specific parameters; and
- product specific parameters.

Table 4-5 provides a full list of the metadata parameters for each product level along with the corresponding data type and range. An example metadata file can be found in Appendix A.



Parameter Type	Parameter	Data Type	Value Range	Remarks
metadata	name	string	{ENMAP01-<productType>-DT<datatakeID>_<tileID>_<Version>_<dateTime>Z-METADATA.XML}	
metadata	comment	string		
metadata	copyright	string		
metadata	schema name	string	{metadata.xsd}	
metadata	schema processing_level	string	{L1B, L1C, L2A}	
metadata	schema versionSchema	string	{nn.nn.nn}	
metadata	schema copyright	string		
metadata	schema crc	string		Variable length.
metadata	citation	string	<p>This entry shall contain the product ID and DOI.</p> <p>The product ID has the following format:</p> <p><Datatake_ID>_<Tile_ID>_<Product_Type>_<Acquisition_Date_Time_UTC>_<Processor_Version>_<Processing_Date>+<Projection><Resampling><Correction><Cirrus_Haze><Interpolation><Water_Reflectance_Product><Water_Type><Season><Ozone_Column><Format></p> <p>Each field above have the following formats:</p> <ul style="list-style-type: none"> - Datatake ID: 000000000-999999999 - Tile ID: 01-99 - Product Type: {1B, 1C, 2A} - Acquisition Date/Time UTC: YYYYMMDDTHHMMSS - Processor Version: 000000-999999 - Processing Date: YYYYMMDD - Projection: {U0, U+, U-, UD, GE, EU} <p style="margin-left: 40px;">U0: UTM_Zone_of_Scene_Center</p> <p style="margin-left: 40px;">U-: UTM_Zone_of_Scene_Center(-1)</p>	Unique ID for EnMAP products and corresponding DOI.



Parameter Type	Parameter	Data Type	Value Range	Remarks
			U+: UTM_Zone_of_Scene_Center(+1) UD: UTM_Zone_of_Datatake_Center GE: Geographic EU: European_Projection_LAEA - Resampling: {N, B, C} N: Nearest_Neighbour B: Bilinear_Interpolation C: Cubic_Convolution - Correction: {C, L, W} C: Combined L: Land_Mode W: Water_Mode - Cirrus Haze: {H, C, N} H: Cirrus_and_Haze C: Cirrus N: No - Interpolation: {Y, N} Y: Yes N: No - Water Reflectance Product: {N, S} N: Normalized_Rrs S: Subsurface_RE - Water Type: {C, T, H} C: Clear T: Turbid	



Parameter Type	Parameter	Data Type	Value Range	Remarks
			<p>H: Highly_Turbid</p> <p>- Season: {A, S, W}</p> <p>A: Automatic</p> <p>S: Summer</p> <p>W: Winter</p> <p>- Ozone Column: {200-500, AUT}</p> <p>200-500: ozone value in Dobson units</p> <p>AUT: Automatic</p> <p>- Format: {P, L, B, G, J}</p> <p>P: BIP</p> <p>L: BIL</p> <p>B: BSQ</p> <p>G: GeoTIFF</p> <p>J: JPEG2000</p> <p>Example product ID: 000034578_04_2A_20211128T160515_010200_20211206_U+BCHYTS250G</p> <p>The product DOI has the following format: doi:<prefix>/<suffix></p> <p>Example product DOI: doi:10.15489/rlyibn8gjc58</p> <p>Example citation with product ID and DOI: DLR (2021): EnMAP Product 000034578_04_2A_20211128_010200_20211206T160515_U+BCHYTS250G. doi:10.15489/rlyibn8gjc58</p>	



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Parameter Type	Parameter	Data Type	Value Range	Remarks
processing	mapProjection	String	{UTM_Zone_of_Scene_Center, UTM_Zone_of_Scene_Center(-1), UTM_Zone_of_Scene_Center(+1), UTM_Zone_of_Datatake_Center, Geographic, European_Projection_LAEA, NA}	For L1B, the value is NA.
processing	imageResampling	string	{Nearest_Neighbour, Bilinear_Interpolation, Cubic_Convolution, NA}	For L1B, the value is NA.
processing	DEMDBVersion	string	{SRTM-C-X, TDM_COP1ARC_OCEAN, TDM_COP3ARC_OCEAN, ASTER-GDEM, NA}	Internal processing parameter. For L1B, the value is NA.
processing	correctionType	string	{Combined, Land_Mode, Water_Mode, NA}	For L1B and L1C, the value is NA.
processing	cirrusHazeRemoval	string	{Cirrus_and_Haze, Cirrus, No, NA}	For L1B and L1C, the value is NA.
processing	bandInterpolation	string	{Yes, No, NA}	For L1B and L1C, the value is NA.
processing	terrainCorrection	string	{Yes, No, NA}	Actually used terrain correction mode. For L1B and L1C, the value is NA. For L2A, the value is only relevant if land correction is performed.
processing	waterReflectanceProduct	string	{Normalized_Rrs, Subsurface_RE, NA}	For L1B and L1C, the value is NA. For L2A, the value is only relevant if water correction is performed ("Combined", "Water Mode")
processing	waterType	string	{Clear, Turbid, Highly_Turbid, NA}	For L1B and L1C, the value is NA. For L2A, the value is only relevant if water correction is performed.
processing	productFormat	string	{BSQ+Metadata, BIL+Metadata, BIP+Metadata, JPEG2000+Metadata, GeoTiff+Metadata}	
processing	ozoneValue	number	{[200-500], NA}	Actually used ozone value. For L1B and L1C, the value is NA.
processing	season	string	{summer, winter, NA}	Actually used season. For L1B and L1C, the value is NA. For L2A, the value is only relevant if land correction is performed.
base	revision	string	{nn.nn.nn}	Version of the processing chain (used in filename).
base	archivedVersion	string	{nn.nn.nn}	Version of the processor used to produce the archived L0 product (called revision in L0 metadata).



Parameter Type	Parameter	Data Type	Value Range	Remarks
base	sphere	string	{earth}	
base	size	string		Size of product. Attribute unit {byte, Kbyte, Mbyte, Gbyte}.
base	level	string	{L1B, L1C, L2A}	
base	format	string	{ENMAP_L1B, ENMAP_L1C, ENMAP_L2A}	
base	spatialCoverage boundingPolygon	structure	elements: point	Closed 5-point Polygon bounding the entire scene (including non-usable pixels, but not background dark pixels) in counter-clockwise order, starting with upper left. A sixth point specifies the center of the scene. The element point is also a structure and consists on the following elements: <ul style="list-style-type: none"> - frame (upper right,..) - longitude - latitude - utcTime These values are valid for the image of the corresponding product.
base	altitudeCoverage	number	{0 – 1000000}	Mean altitude of satellite for scene in m.
base	temporalCoverage startTime	dateTime	2013-04-15 T01:45:11.123456Z	
base	temporalCoverage stopTime	dateTime	2013-04-13 T02:42:01.340870Z	
specific	mission	string	EnMAP	
specific	satellitID	string	{01,02}	Constant.
specific	sensor	string	HSI	Constant.
specific	acquisitionMode	string	{earth}	
specific	code	string	{L1B, L1C, L2A}	Product specific constant.
specific	cyclogramVersion	string	{123}	3 digits.
specific	cyclogramType	string	{EARTH}	5 char.



Parameter Type	Parameter	Data Type	Value Range	Remarks
specific	macrocommandVersion	string	{123}	3 digits.
specific	MCSequenceId	string	{123}	3 digits (macrocommand ID from VC).
specific	datatakeID	string	{0000345780}	10 digits.
specific	imageID	string	{0003562870}	10 digits.
specific	tileID	string	{03}	2 digits, id with the datatake.
specific	numberOfTiles	string	{05}	2 digits, total number of tiles of the datatake.
specific	numberOfVNIRBands	number	91	Number of VNIR bands of the corresponding product.
specific	numberOfSWIRBands	number	131	Number of SWIR bands of the corresponding product.
specific	bandCharacterisation	structure	elements: - bandID (number attribute)	Each bandID element has the following children: - WavelengthCenterOfBand (central wavelength averaged over illuminated pixels of band in nm) - FWHMOfBand (full width half maximum averaged over illuminated pixels of band in nm) - GainOfBand (band gain) - OffsetOfBand (band offset) Filled for all bands in the corresponding product and with the same ordering as the spectral image. The gain and offset can be used to transform the pixel values to physical units ($W/m^2/sr/nm$ for L1B/L1C and absolute value for L2A).
specific	acquisitionType	string	{EARTH}	
specific	acquisitionSubtype	string	{earth}	
specific	productType	string	{STANDARD,MAXIMUM}_{ALL,VNIR,SWIR}, OTHER	
specific	URLToProductType	string	enmap.org/product_{Product type}	
specific	compressionType	string	{COMPRESSED,UNCOMPRESSED,NA}	
specific	status	string	{NOMINAL, REDUCED, LOW, FAILED, DSHA_NOMINAL, DSHA_REDUCED, DSHA_LOW,	Overall datatake quality rating based on screening and DataQC information. The prefix



Parameter Type	Parameter	Data Type	Value Range	Remarks
			DSHA_FAILED}	"DSHA" is added in case there is at least one SWIR or VNIR channel affected by the DSHA radiation issue (cf. numChannelsDSHAIssue and affectedDSHAIssueChannels).
specific	datatakeStart	dateTime	2013-04-12 T12:12:11.123456Z	
specific	datatakeStop	dateTime	2013-04-12 T16:09:55.458921Z	
specific	spatialCoverageOfDatatake boundingPolygon	structure	elements: point	<p>The element point is also a structure and consists on the following elements:</p> <p>frame (upper right,..) longitude latitude utcTime</p> <p>Latitude and longitude (this order) in signed decimal geographic degrees of upper left (maximum of all bands), upper right (maximum of all bands), lower right (maximum of all bands), lower left (maximum of all bands),</p>
specific	spatialCoverageOfOrthoScene boundingPolygon	structure	elements: point	<p>Closed 5-point Polygon bounding the entire scene (including non-usable pixels and background dark pixels) in counter-clockwise order, starting with upper left.</p> <p>A sixth point specifies the center of the scene.</p> <p>The element point is also a structure and consists on the following elements:</p> <p>frame (upper right,..) longitude latitude utcTime</p>
specific	pixelSize	number	30	Pixel resolution (unit meter).



Parameter Type	Parameter	Data Type	Value Range	Remarks
specific	widthOfScene	number	1000	Value in pixel as integer or NA (unit pixel).
specific	heightOfScene	number	1024	Value in pixel as integer or NA (unit pixel).
specific	pixelSizeOfOrthoScene	number	30	Value in meters (unit meter), decimal degrees (unit degree) or NA.
specific	widthOfOrthoScene	number	1020	Value in pixel as integer or NA (unit pixel).
specific	heightOfOrthoScene	number	1032	Value in pixel as integer or NA (unit pixel).
specific	missionPhase	string	{pre-launch, leap, commissioning, routine}	
specific	orbitNo	number		
specific	orbitDirection	string	{ASCENDING, DESCENDING}	
specific	processingDateTime	dateTime	2013-04-15 T01:45:11.123456Z	
specific	processingCenter	string	{NZ, OP}	
specific	processingNode	string	IP	
specific	receivingStations	string	{NZ, OP}	List of identifiers of receiving stations.
specific	receivingDateTime	dateTime	2009-31-12T05:21:13.234523Z	List of date and time in UTC of receiving (last transmission).
specific	archivingStation	string	{NZ, OP}	Identifier or archiving station.
specific	archivingDateTime	string	2009-31-12T05:32:18.325122Z	Date and time in UTC of archiving.
specific	referenceDatabase	string	S2	Identifier of reference database or NA.
specific	referenceImageDatabase Accuracy	float	3.42	Value as decimal in meters or NA.
specific	digitalElevationModelDatabase	string	TDM_COP3ARC_OCEAN	Identifier of digital elevation model database or NA.
specific	digitalElevationModelDatabaseAccuracy	float	3.42	Value as decimal in meters or NA.
specific	processable	number	{0,1}	Hard-coded to 1.
specific	qualityFlag	structure	Elements (all INTEGER, 6 digits) - overallQuality - overallQualityVNIR - overallQualitySWIR	Values (all INTEGER, 6 digits) - {0}: nominal quality; {1}: reduced quality, {2}: low quality; {-999}: not produced - {0}: nominal quality; {1}: reduced quality, {2}: low quality; {-999}: not produced - {0}: nominal quality; {1}: reduced quality,



Parameter Type	Parameter	Data Type	Value Range	Remarks
			<ul style="list-style-type: none"> - qualityRadiometryVNIR - qualityRadiometrySWIR - qualityAtmosphere - stripingBandingVNIR - stripingBandingSWIR - saturationCrosstalkVNIR - saturationCrosstalkSWIR - generalArtifactsVNIR - generalArtifactsSWIR - deadPixelsVNIR - deadPixelsSWIR - defectivePixelsVNIR - defectivePixelsSWIR - smileIndicationVNIR - smileIndicationSWIR - sensorLogVNIR - sensorLogSWIR - processorLogVNIR 	<ul style="list-style-type: none"> - {2}: low quality; {-999}: not produced - {0}: nominal quality; {1}: reduced quality, {2}: low quality; {-999}: not produced - {0}: nominal quality; {1}: reduced quality, {2}: low quality; {-999}: not produced - {0}: nominal quality; {1}: reduced quality, {2}: low quality; {-999}: not produced - {0-1000} value in per mille of affected pixels in dataset; {-999}: not produced - {0-1000} value in per mille of affected pixels in dataset; {-999}: not produced - {0-1000} value in per mille of affected pixels in dataset; {-999}: not produced - {0-1000} value in per mille of affected pixels in dataset; {-999}: not produced - {0-1000} value in per mille of affected pixels in dataset; {-999}: not produced - {0-999999} absolute number of dead pixels on chip; - {0-999999} absolute number of dead pixels on chip; - {0-1000} value in percent of affected pixels in dataset; {-999}: not produced - {0-1000} value in percent of affected pixels in dataset; {-999}: not produced - {0}: no indication for spectral smile; {1}: indication for spectral smile, {-999}: not produced - {0}: no indication for spectral smile; {1}: indication for spectral smile, {-999}: not produced - {0}: no critical log message; {1}: minor issues documented in log; {2}: major issues documented in log; {-999}: not produced - {0}: no critical log message; {1}: minor issues documented in log; {2}: major issues documented in log; {-999}: not produced - {0}: no critical log message; {1}: minor issues documented in log; {2}: major issues documented in log; {-999}: not produced



Parameter Type	Parameter	Data Type	Value Range	Remarks
			<ul style="list-style-type: none"> - processorLogSWIR - sceneSZA - sceneSunglint - cloudCover - hazeCover - cirrusCover - snowCover - waterCover - cloudShadow - sceneWV - sceneAOT - sceneAtmParam - sceneTerrain - orthoTerrain - orthoRMSE - orthoRMSE_x - orthoRMSE_y 	<ul style="list-style-type: none"> - {0}: no critical log message; {1}: minor issues documented in log; {2}: major issues documented in log; {255}: not produced - Scene-average SZA Value in degree; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - {0-100} value in percent of affected pixels in dataset; {255}: not produced - Scene-average WV value [in cm * 1000]; {255}: not produced - Scene-average AOT value [units * 1000]; {-999}: not produced {0}: nominal quality; {1}: DDV warnings; {2}: negative values warning; {3} other log warnings; {4}: DDV and negative values warning; {5}: DDV and other log warnings; {6}: negative values warning and other log warnings; {7}: DDV warnings and negative values warnings and other log warnings; {255}: not produced - {0}: nominal; {1}: log entries related to scene terrain; {255}: not produced - {0}: nominal; {1}: log entries related to ortho terrain; {255}: not produced - RMSE (xy) of ortho-rectification based on ICPs [units: pixels * 10] ; {255}: not produced - RMSE (x) of ortho-rectification based on ICPs [units: pixels * 10] ; {255}: not produced - RMSE (y) of ortho-rectification based on



Parameter Type	Parameter	Data Type	Value Range	Remarks
			<ul style="list-style-type: none"> - orthoResidual - orthoResidual_x - orthoResidual_y - orthoMean - orthoMean_x - orthoMean_y - numPointsAll - numPointsGCP - numPointsICP - numPointsDiscardedGCP - numTilesUsed - levelOfRejection - spare_1 - spare_2 - spare_3 	<ul style="list-style-type: none"> ICPs [units: pixels * 10] ; {255}: not produced - RMSE (xy) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - RMSE (x) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - RMSE (y) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - Mean (xy) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - Mean (x) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - Mean (y) of ortho-rectification based on GCPs [units: pixels * 10] ; {255}: not produced - Total number of matched points - Number of GCPs - Number of ICPs - Number of discarded GCPs - Number of tiles (datatake) used for image matching and GCP / ICP generation - Threshold parameter in estimate - Spare parameter, currently not in use but might be required as new details on HSI performance are available - Spare parameter, currently not in use but might be required as new details on HSI performance are available - Spare parameter, currently not in use but might be required as new details on HSI performance are available
specific	meanGroundElevation	string	532	Value in meter.
specific	meanSlope	float	12.5	Value as decimal and in per cent or NA (unit percent).
specific	biomeType	string	{desert, rain forest etc.}	



Parameter Type	Parameter	Data Type	Value Range	Remarks
specific	acrossOffNadirAngle	float	elements: - upper_left - upper_right - lower_right - lower_left - center	This element has an attribute (DEG) which defines the unit of the displayed value. Value range: {-30,0;30,0} Value as mean in decimal degree or NA.
specific	alongOffNadirAngle		elements: - upper_left - upper_right - lower_right - lower_left - center	Value as mean in decimal degree or NA Value as mean in decimal degree or NA.
specific	sunAzimuthAngle	float	elements: - upper_left - upper_right - lower_right - lower_left - center	This element has an attribute (DEG) which defines the unit of the displayed value. Value range: {-180,0;180,0} Value as mean in decimal degree or NA.
specific	sceneAzimuthAngle	structure	elements: - upper_left - upper_right - lower_right - lower_left - center	This element has an attribute (DEG) which defines the unit of the displayed value. Value range: {-180,0;180,0} Value as mean in decimal degree or NA.
specific	sunElevationAngle	float	elements: - upper_left - upper_right - lower_right - lower_left - center	This element has an attribute (DEG) which defines the unit of the displayed value. Value range: {-90,0;90,0} Value as mean in decimal degree or NA.
specific	instrumentStatus	structure	elements:	Possible values:
		string	- statusOK	{true; false}
		string	- statusVNIR	{on; off}
		string	- statusSWIR	{on; off}
		string	- configVNIR	{standard, maximum, NA}



Parameter Type	Parameter	Data Type	Value Range	Remarks
		string	- configSWIR	{standard, maximum, NA}
		string	- statusSCM	{OK, WARNING, FAILED}
		string	- statusDiffuserProtectionHatch	{OK, WARNING, FAILED}
		string	- statusSunDiffuserHatch	{OK, WARNING, FAILED}
		number	- emergencyStatusOfSCM	{0; 1}
		number	- emergencyStatusOfSSM	{0; 1}
		number	- emergencyStatusOfSDH	{0; 1}
		string	- SWIRAOrSWIRBSelected	{SWIRA; SWIRB}
		number	- mcsSequenceType	{0, 1, 2, 3, 4} (the only valid value is 1, others are errors)
specific	productQuality screeningResult	structure	elements: - status - failedGroups	Summarized VNIR quality status assessment by the screening processor: <ul style="list-style-type: none"> {OK, WARNING, FAILED} {NONE, string containing failed test group names separated by white spaces}. Test groups are coded as: TEMPERATURE, CURRENT, VOLTAGE, DEVSTATUS, DC
specific	productQuality screeningResultTemp	structure	elements: - status - listOfTemps <ul style="list-style-type: none"> o parameter (name attribute) 	List of temperatures: <ul style="list-style-type: none"> {OK, WARNING, FAILED} for all status flags List of checked temperatures written using the parameter data structure. The parameter structure contains the following fields (field names and number of appearances in the parameter structure): <ul style="list-style-type: none"> - description [0..1] - device [0..1] - units [0..1]



Parameter Type	Parameter	Data Type	Value Range	Remarks
				<ul style="list-style-type: none"> - status [1] - info [0..1] - value [1] - minValue [0..1] - maxValue [0..1]
specific	productQuality screeningResultCurr	structure	elements: <ul style="list-style-type: none"> - status - listOfCurrents <ul style="list-style-type: none"> o parameter (name attribute) 	List of currents: <ul style="list-style-type: none"> • {OK, WARNING, FAILED} • List of checked currents written using the parameter data structure (structure see above)
specific	productQuality screeningResultVolt	structure	elements: <ul style="list-style-type: none"> - status - listOfVoltages <ul style="list-style-type: none"> o parameter (name attribute) 	List of voltages: <ul style="list-style-type: none"> • {OK, WARNING, FAILED} • List of checked voltages written using the parameter data structure (structure see above).
specific	productQuality screeningResultDevStatus	structure	elements: <ul style="list-style-type: none"> - status - listOfDevStatus <ul style="list-style-type: none"> o parameter (name attribute) 	List of device status parameters: <ul style="list-style-type: none"> • {OK, WARNING, FAILED} • List of checked items written using the parameter data structure (structure see above).
specific	vnirProductQuality vnirProductStatus	string	{OK, WARNING, FAILED}	Superior quality status for VNIR.
specific	vnirProductQuality vnirDarkBeforeQuality	structure	elements: <ul style="list-style-type: none"> - available - screeningResult 	Quality of dark current measurement before data take: <ul style="list-style-type: none"> • {yes, no} • {OK, WARNING, FAILED}
specific	vnirProductQuality vnirDarkAfterQuality	structure	elements: <ul style="list-style-type: none"> - available - screeningResult 	Quality of dark current measurement after data take: <ul style="list-style-type: none"> • {yes, no}



Parameter Type	Parameter	Data Type	Value Range	Remarks
				<ul style="list-style-type: none"> {OK, WARNING, FAILED}
specific	vnirProductQuality numChannelsExpected	number	95 (99 maximum configuration)	Number of VNIR channels in product.
specific	vnirProductQuality numChannelsMissing	number		Number of VNIR channels missing or affected by the DSHA radiation issue (cf. numChannelsDSHAissue and affectedDSHAissueChannels).
specific	vnirProductQuality numChannelsDSHAissue	number		Number of VNIR channels affected by the DSHA radiation issue.
specific	vnirProductQuality expectedChannelsList	string		List of expected VNIR channels in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	vnirProductQuality missingChannelsList	string		List of VNIR channels missing or affected by the DSHA radiation issue in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	vnirProductQuality affectedDSHAissueChannels	string		List of VNIR channels affected by the DSHA radiation issue in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	swirProductQuality swirProductStatus	string	{OK, WARNING, FAILED}	Superior quality status for SWIR.
specific	swirProductQuality swirDarkBeforeQuality	structure	elements: - available - screeningResult	Quality of dark current measurement before data take: <ul style="list-style-type: none"> {yes, no} {OK, WARNING, FAILED}
specific	swirProductQuality swirDarkAfterQuality	structure	elements:	Quality of dark current measurement after



Parameter Type	Parameter	Data Type	Value Range	Remarks
			- available - screeningResult	data take: <ul style="list-style-type: none"> {yes, no} {OK, WARNING, FAILED}
specific	swirProductQuality numChannelsExpected	number	135 (163 maximum configuration)	Number of SWIR channels in product.
specific	swirProductQuality numChannelsMissing	number		Number of SWIR channels missing or affected by the DSHA radiation issue (cf. numChannelsDSHAissue and affectedDSHAissueChannels).
specific	swirProductQuality numChannelsDSHAissue	number		Number of SWIR channels affected by the DSHA radiation issue.
specific	swirProductQuality expectedChannelsList	string		List of expected SWIR channels in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	swirProductQuality missingChannelsList	string		List of SWIR channels missing or affected by the DSHA radiation issue in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	swirProductQuality affectedDSHAissueChannels	string		List of SWIR channels affected by the DSHA radiation issue in terms of bandCharacterisation numbering as comma-separated values or ranges, e.g. 1, 2, ..., 100 or 1-100.
specific	downlink dtakeNumMissingIsps	number		Total number of missing source packets for all transmitted channel files.
specific	downlink dtakeNumErrorIsps	number	0	Total number of source packets with missing transfer frames for all transmitted channel files.
specific	orbitType	string	{determined}	Constant.



Parameter Type	Parameter	Data Type	Value Range	Remarks
specific	auxDataVersion orbitVersion	string	{nn.nn.nn}	
specific	auxDataVersion attitudeVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabAtmSpecVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabGeoVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabRadVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabLinearityVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabDeepSpaceVersion	string	{nn.nn.nn}	
specific	auxDataVersion calTabDPMVersion	string	{nn.nn.nn}	NA if not applicable.
specific	auxDataVersion refTabDarkVersion	string	{nn.nn.nn}	
specific	inputDatatake datatakeRevision	string	{nn.nn.nn}	
specific	inputDatatake datatakeAssemblyTime	dateTime	2013-04-15 T01:45:11.123456Z	
specific	backgroundValue	int	[0, 65535, -32768]	Background value of the spectral image(s) delivered to the user.
product	image vnir	structure	elements: channels qiChannels red green blue name size version format dimension columns rows dimensionGeographic longitude latitude	Only valid for L1B. The element format specifies the data type of the image.



Parameter Type	Parameter	Data Type	Value Range	Remarks
product	image swir	structure	elements: channels qChannels red green blue name size version format dimension columns rows dimensionGeographic longitude latitude	Only valid for L1B. The element format specifies the data type of the image.
product	image merge	structure	elements: channels qChannelsSWIR red green blue qChannelsVNIR red green blue name size version format dimension columns rows dimensionGeographic longitude latitude	Only valid for L1C/L2A. The element format specifies the data type of the image.
product	quicklook vnir	structure	elements: channels	The element format specifies the data type of the image.



Parameter Type	Parameter	Data Type	Value Range	Remarks
			qlChannels red green blue name size version format dimension columns rows dimensionGeographic longitude latitude	
product	quicklook swir	structure	elements: channels qlChannels red green blue name size version format dimension columns rows dimensionGeographic longitude latitude	The element format specifies the data type of the image.
product	calibration orbit	structure	elements: phase absOrbit timeInterval maneuverCounter stateVector	The element stateVector includes information about UTC and GPS time as about position , velocity . The state vector has the attribute number . For a description of stateVector see description of orbit data record in 0.
product	calibration attitude	structure	elements: accuracy	The element stateVector includes information about UTC and GPS time as about



Parameter Type	Parameter	Data Type	Value Range	Remarks
			referenceFrame fromFrame toFrame stateVector	quaternion. The state vector has the attribute number . For a description of stateVector see description of attitude data record in 0.
product	matching pyramidLevel	number	5	Value or NA.
product	matching match (ident attribute)	structure	elements: points percent	Values or NA.
product	navigation boresight	structure	elements: instrumentMountingAngles <ul style="list-style-type: none"> ○ initialValues ○ variationValues ○ estimatedValues 	The element instrumentMountingAngles contains the initial mounting angles (initialValues) and polynomial coefficients for the variations (variationValues) of the instrument mounting angles. If a reference is used an additional rotation is given by estimatedValues .
product	navigation interiorOrientation	structure	elements vnir swir	The elements vnir and swir contain the polynomial coefficients for the calculation of the view vector of each pixel.
product	navigation RPC bandID (number attribute)	structure	elements: - LAT_OFF - LONG_OFF - HIGHT_OFF - LAT_SCALE - LONG_SCALE - HIGHT_SCALE - ROW_OFF - COL_OFF - ROW_SCALE - COL_SCALE - - COL_NUM_01 - ... - COL_NUM_20 - COL_DEN_01 - ... - COL_DEN_20	<ul style="list-style-type: none"> • Coefficients of Rational Polynomial Function, where: • OFF identifies the offset values of the normalized coefficients for latitude (LAT), longitude (LONG), height (HIGHT), row (ROW), and column (COL) • SCALE identifies the scale of the normalized coefficients for latitude (LAT), longitude (LONG), height (HIGHT), row (ROW), and column (COL) • ROW identifies row (also called line) • COL identifies column (also called samp)



Parameter Type	Parameter	Data Type	Value Range	Remarks
			- ROW_NUM_01 - ... - ROW_NUM_20 - ROW_DEN_01 - ... - ROW_DEN_20	<ul style="list-style-type: none"> • NUM identifies numerator • DEN identifies denominator • INDEX identifies degree
product	time swir	array	elements: - frameTime (attrib number)	Time (UTC) of each SWIR frame.
product	time vnir	array	elements: - frameTime (attrib number) - jitter (attrib number)	Time (UTC) and jitter (FR_VNIR_JITTER in VC) entry of each VNIR frame.
product	ortho projection	string	{UTM_ZoneX_North, UTM_ZoneX_South (where X in {1..60}), Geographic, LAEA-ETRS89, NA}	For L1B, the value is NA.
product	ortho resolution	number		Value given in meters or decimal degree. For L1B, the value is NA.
product	ortho resampling	string	{Nearest_Neighbour, Bilinear_Interpolation, Cubic_Convolution, NA}	For L1B, the value is NA.
product	bandStatistics bandID (number attribute)	structure	elements: - waveLength - mean - stdDeviation	Mean and standard deviation of product physical quantity (in corresponding physical unit) for each band.
product	smileCorrection (applied attribute, parametrization attribute)	structure	elements: VNIR bandID (number attribute) wavelength (unit attribute) coeff0 (unit attribute) coeff1 (unit attribute) coeff2 (unit attribute) coeff3 (unit attribute) coeff4 (unit attribute) SWIR bandID (number attribute) wavelength (unit attribute) coeff0 (unit attribute) coeff1 (unit attribute) coeff2 (unit attribute)	Coefficients of smile parametrization for each VNIR and SWIR band.



Parameter Type	Parameter	Data Type	Value Range	Remarks
			coeff3 (unit attribute) coeff4 (unit attribute)	
product	productFileInformation file (number attribute)	structure	elements: - name - size - format - version	

Table 4-5 Metadata information provided for L1B, L1C and L2A products. Note that the same schema is used for the metadata of the three levels.

4.3 Log file

The log file provides detailed information about the processing and any eventual problems that may have occurred. The file is written in xml format with the parameters specified in Table 4-7.

An example log file can be found in Appendix C. Note that the log file is for internal use only and accordingly not delivered to the user.

Parameter Type	Parameter	Mandatory	Data Type	Value Range	Remarks
metadata	name	Yes	String	ENMAP01-____{L1B,L1C,L2A}-DTnnnnnnnnn_yyymmddThhmmssZ_nnn_Vnnnnnnn_yyyymmddThhmmssZ-LOG.XML	File name of the product.
metadata	comment	No	String		
metadata	copyright	No	String	(c) DLR EnMAP 04/21/2011	
processor	number (attribute)	Yes	string	{L1B, L1C, L2A}	
processor	name	Yes	string	{EnMAP L1B Processor, EnMAP L1C Processor, EnMAP L2A Processor}	
processor	status	Yes	string	{error-free, error}	
processor	processing_unit	Yes	string	{Oberpaffenhofen xx, Neustrelitz xx}	Where data are processed.
processor	processing_period time_start	Yes	dateTime		When processing starts.
processor	processing_period time_stop	Yes	dateTime		When processing stops.
subtask	name	Yes	string	{radi, ortho, atm_land, atm_water, ...}	Name of the processor step.
subtask	status	Yes	string	{error-free, error}	
subtask	processing_period time_start	Yes	dateTime		When processing starts.
subtask	processing_period time_stop	Yes	dateTime		When processing stops.
subtask	messages	Yes	xml parent-element	child: - message	Encloses the task messages.
subtask	messages message	Yes	string		Processor messages.

Table 4-7 Log file parameters.

4.4 Quicklooks

The quicklooks of the VNIR and SWIR scenes are stored in tif format and contain an 8-bit RGB image radiometrically adjusted for optimal displaying. The following wavelengths are used as input for the generation of the quicklook images:

- VNIR: 463 nm (blue), 553 nm (green), 637 nm (red);

- SWIR: 1050 nm (blue), 1650 nm (green), 2200 nm (red).

The L1B product quicklooks are in sensor geometry, while the L1C and L2A product quicklooks are orthorectified, cf. Table 4-2, Table 4-3 and Table 4-4.

4.5 Quality layers

The quality layers are stored in separate geotiff files with all available quality information listed in Table 4-8.

The L1B product quality layers are in sensor geometry, while the L1C and L2A product quality layers are orthorectified, cf. Table 4-2, Table 4-3 and Table 4-4. Note that quality layers 1 through 6 (classes, cloud, cloud shadow, haze, cirrus, snow) in Table 4-8 use the VNIR scene as spatial reference [AR-6]. The pixel mask (layers 7 and 8) and the quality test flags (layers 9 and 10) are registered to the corresponding spectral images in all levels: in L1B products these layers are separately provided for VNIR and SWIR, while in L1C and L2A products the layers are provided for the merged scene.

Value	0	1	2	3	Number of bits	Dimensions
Quality layer						
1 (classes)	None	Land	Water	Background	2	IxJ
2 (cloud)	None	Cloud			1	IxJ
3 (cloud shadow)	None	Cloud shadow			1	IxJ
4 (haze)	None	Haze			1	IxJ
5 (cirrus)	None	Thin	Medium	Thick	2	IxJ
6 (snow)	None	Snow			1	IxJ
7 (pixel mask VNIR)	Normal	Defective			1	IxJxK _{VNIR}
8 (pixel mask SWIR)	Normal	Defective			1	IxJxK _{SWIR}
9 (quality test flags VNIR)	-see below for the description of the bits-				8	IxJ
10 (quality test flags SWIR)	-see below for the description of the bits-				8	IxJ

Table 4-8 Quality information encoded into the quality layers of L1B, L1C and L2A products. In the dimensions column, I denotes the number of frames, J the number of spatial pixels and K the number of channels. Note that, regardless of the number of encoded bits, all masks are provided as 8-bit tif files. For L1C and L2A products, the pixel mask and the quality test flags are provided as a single layer each.

For the data quality test flags, the 8 bits are assigned as specified in Table 4-9. Note that for consistency with existing quality flags (incl. MODIS, MERIS, Landsat 8 or Hyperion missions), the bits are read from right to left, starting with bit 0. The quality information is encoded as follows:

- for the double bit (0-1),
 - 00: nominal quality;
 - 01: reduced quality;
 - 10: low quality;
 - 11: not produced;
- For the bits (2, 3, 4, 5, 6, and 7):
 - 0: this condition does not exist at all, or for less than a certain number of bands;
 - 1: this condition exists for more than a certain number of bands.

The detailed information including the thresholds is provided in [AR-5].



BIT	7	6	5	4	3	2	1	0
DESCRIPTION VNIR	artefactVNIR	artefactSWIR	saturationVNIR	saturationSWIR	interpolatedPixelVNIR	interpolatedPixelSWIR	Overall Quality	

Table 4-9 Specification of data quality flags.

5. Filename Structure

The files described in previous sections are stored with the following naming convention:

**ENMAP01-*<productType>*-
 DT*<dataTakeID>*_*<timeStartDataTake>*_*<tileID>*_*<version>*_*<timeProcessing>*Z-
<file_name>.*<extension>***

A more detailed description of each key in the file name is presented in Table 5-1. Table 5-2, Table 5-3 and Table 5-4 present example file names for L1B, L1C and L2A products, respectively.

Product File Naming Scheme				
Parameter Group	Parameter Name	Length	Value Range	Remarks
Unique Product Identifier	mission	5	ENMAP	
	satellite	2	01	
	separator	1	-	Hyphen.
	product type	7	___L1B, ___L1C, ___L2A	
	separator	1	-	Hyphen.
	dataTake id	12	DT1234543210	
	separator	1	_	Underscore.
	dataTake start time	16	<yyyymmddThmmss>Z	UTC time.
	tile id	3	007	
	separator	1	_	Underscore.
	product version	7	V<010000>	Version of the processing chain (revision in metadata).
	separator	1	_	Underscore.
	processing date time	16	<yyyymmddThmmss>Z	Value identical for all product files UTC time.
separator	1	-	Hyphen.	
Product File Parameters	product file	(variable)	(see rules below)	
	dot	1	.	
	file extension	3-8	{TIF, BIL, BSQ, BIP, JPEG2000, HDR, XML}	

Table 5-1 Product file name convention.

Product File Names	
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-METADATA.XML
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-HISTORY.XML
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-LOG.XML
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE_VNIR.BIP
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE_VNIR.HDR
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE_SWIR.BIP
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE_SWIR.HDR
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_VNIR.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_SWIR.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLASSES.TIF



Product File Names	
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUD.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUDSHADOW.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_HAZE.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CIRRUS.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_SNOW.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_TESTFLAGS_VNIR.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_TESTFLAGS_SWIR.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_PIXELMASK_VNIR.TIF
ENMAP01-	L1B-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_PIXELMASK_SWIR.TIF

Table 5-2 Example of L1B product file names. For illustration, it was assumed here that user selected the BIP format for the spectral images. Shaded files are not delivered to the user.

Product File Names	
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-METADATA.XML
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-HISTORY.XML
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-LOG.XML
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE.BIP
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE.HDR
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_VNIR.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_SWIR.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLASSES.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUD.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUDSHADOW.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_HAZE.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CIRRUS.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_SNOW.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_TESTFLAGS.TIF
ENMAP01-	L1C-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_PIXELMASK.TIF

Table 5-3 Example of L1C product file names. For illustration, it was assumed here that user selected the BIP format for the spectral images. Shaded files are not delivered to the user.

Product File Names	
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-METADATA.XML
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-HISTORY.XML
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-LOG.XML
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE.BIP
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-SPECTRAL_IMAGE.HDR
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_VNIR.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_SWIR.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLASSES.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUD.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CLOUDSHADOW.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_HAZE.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_CIRRUS.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_SNOW.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_QUALITY_TESTFLAGS.TIF
ENMAP01-	L2A-DT1030047110_20180201T011433Z_007_V010000_20180603T000728Z-QL_PIXELMASK.TIF

Table 5-4 Example of L2A product file names. For illustration, it was assumed here that user selected the BIP format for the spectral images. Shaded files are not delivered to the user.

6. List of On-Going TBC/TBD

Table 6-1 lists the on-going issues TBC (to be confirmed) and TBD (to be defined).

Number	Type	Topic	Status	Section	Due

Table 6-1 List of TBC/TBD.



Appendix A Example of Metadata File

```
<level_X xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="metadata_Lx_00-06-00.xsd">
  <metadata>
    <schema>
      <copyright>(c) DLR EnMAP 2022</copyright>
      <versionSchema>00.06.00</versionSchema>
      <name>metadata_Lx_00-06-00.xsd</name>
      <crc>1EACA5A7</crc>
      <processingLevel>L1B</processingLevel>
    </schema>
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
METADATA.XML</name>
    <comment>EnMAP Level 1B Product of datatake 1130, tile 2</comment>
    <copyright>(c) DLR EnMAP 2022</copyright>
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EnMAP Ground Segment
EnMAP HSI Level 1 / Level 2 Product
Specification Document
- Restricted: Public -

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    <frameTime number="1">2022-06-20T19:15:41.442314Z</frameTime>
    ...
    number="1024">2022-06-20T19:15:45.890031Z</frameTime>
  </swir>
  <vnir>
    <frameTime number="1">2022-06-20T19:15:41.440341Z</frameTime>
    <jitter number="1">4.7026631455e-05</jitter>
    ...
    <frameTime number="1024">2022-06-20T19:15:45.888058Z</frameTime>
    <jitter number="1024">4.28585064749e-05</jitter>
  </vnir>
</time>
<ortho>
  <projection>NA</projection>
  <resolution>NA</resolution>
  <resampling>NA</resampling>
</ortho>
<smileCorrection applied="no" parametrization="polynomial">
  <VNIR>
    <bandID number="1">
      <wavelength unit="nm">418.20</wavelength>
      <coeff0 unit="nm">-2.04178E-01</coeff0>
      <coeff1 unit="nm">4.43701E-04</coeff1>
      <coeff2 unit="nm">-2.08746E-08</coeff2>
      <coeff3 unit="nm">-4.22394E-11</coeff3>
      <coeff4 unit="nm">8.74335E-17</coeff4>
    </bandID>
    ...
    <bandID number="91">
      <wavelength unit="nm">993.03</wavelength>
      <coeff0 unit="nm">1.59367E-01</coeff0>
      <coeff1 unit="nm">-1.96419E-03</coeff1>
      <coeff2 unit="nm">3.59190E-06</coeff2>
      <coeff3 unit="nm">-1.49430E-09</coeff3>
      <coeff4 unit="nm">-4.78713E-15</coeff4>
    </bandID>
  </VNIR>
  <SWIR>
    <bandID number="1">
      <wavelength unit="nm">902.26</wavelength>
      <coeff0 unit="nm">1.65434E-01</coeff0>
      <coeff1 unit="nm">2.46215E-04</coeff1>
      <coeff2 unit="nm">-1.48996E-06</coeff2>
      <coeff3 unit="nm">8.39779E-10</coeff3>
      <coeff4 unit="nm">-1.02758E-14</coeff4>
    </bandID>
    ...
    <bandID number="133">
      <wavelength unit="nm">2445.53</wavelength>
      <coeff0 unit="nm">6.05703E-01</coeff0>
      <coeff1 unit="nm">-3.32892E-03</coeff1>
      <coeff2 unit="nm">3.76043E-06</coeff2>
      <coeff3 unit="nm">-7.87861E-10</coeff3>
      <coeff4 unit="nm">1.04426E-14</coeff4>
    </bandID>
  </SWIR>
</smileCorrection>
</ortho>
</time>
</navigation>
</RPC>
```



```
</bandID>
</SWIR>
</smileCorrection>
<productFileInformation>
  <file number="1">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
METADATA.XML</name>
    <size unit="Kbyte">4310</size>
    <version>01.01.00</version>
    <format>xml</format>
  </file>
  <file number="2">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_PIXELMASK_SWIR.TIF</name>
    <size unit="Kbyte">2754</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="3">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_PIXELMASK_VNIR.TIF</name>
    <size unit="Kbyte">535</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="4">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_CIRRUS.TIF</name>
    <size unit="Kbyte">41</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="5">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_CLASSES.TIF</name>
    <size unit="Kbyte">27</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="6">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_CLOUD.TIF</name>
    <size unit="Kbyte">28</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="7">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_CLOUDSHADOW.TIF</name>
    <size unit="Kbyte">21</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="8">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_HAZE.TIF</name>
    <size unit="Kbyte">25</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="9">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_SNOW.TIF</name>
    <size unit="Kbyte">21</size>
    <version>01.01.00</version>
    <format>binary</format>
  </file>
  <file number="10">
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-
QL_QUALITY_TESTFLAGS_SWIR.TIF</name>
    <size unit="Kbyte">19</size>
    <version>01.01.00</version>
    <format>binary</format>
```




```
</file>
<file number="11">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-
  QL_QUALITY_TESTFLAGS_VNIR.TIF</name>
  <size unit="Kbyte">19</size>
  <version>01.01.00</version>
  <format>binary</format>
</file>
<file number="12">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-QL_SWIR.TIF</name>
  <size unit="Kbyte">1335</size>
  <version>01.01.00</version>
  <format>binary</format>
</file>
<file number="13">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-QL_VNIR.TIF</name>
  <size unit="Kbyte">1538</size>
  <version>01.01.00</version>
  <format>binary</format>
</file>
<file number="14">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-
  SPECTRAL_IMAGE_SWIR.BIL</name>
  <size unit="Kbyte">272384</size>
  <version>01.01.00</version>
  <format>binary</format>
</file>
<file number="15">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-
  SPECTRAL_IMAGE_SWIR.HDR</name>
  <size unit="Kbyte">2</size>
  <version>01.01.00</version>
  <format>hdr</format>
</file>
<file number="16">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-
  SPECTRAL_IMAGE_VNIR.BIL</name>
  <size unit="Kbyte">186368</size>
  <version>01.01.00</version>
  <format>binary</format>
</file>
<file number="17">
  <name>ENMAP01-____L1B-DT000001130_20220620T191541Z_002_V010100_20220802T115050Z-
  SPECTRAL_IMAGE_VNIR.HDR</name>
  <size unit="Kbyte">1</size>
  <version>01.01.00</version>
  <format>hdr</format>
</file>
</productFileInformation>
<bandStatistics>
  <bandID number="1">
    <waveLength>418.2</waveLength>
    <mean>0.110603</mean>
    <stdDeviation>0.0239023</stdDeviation>
  </bandID>
  ...
  <bandID number="224">
    <waveLength>2445.53</waveLength>
    <mean>0.00264337</mean>
    <stdDeviation>0.000706678</stdDeviation>
  </bandID>
</bandStatistics>
</product>
</level_X>
```



Appendix B Example of History File

```
<base xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="history_01-31-00.xsd">
  <mission>EnMAP</mission>
  <satellite>01</satellite>
  <source>
    <name>Development Processor 05</name>
    <version>01.01.00</version>
    <time>2022-08-02T11:50:50.759667Z</time>
  </source>
  <productType>Level 1B Product</productType>
  <productParameter>tile_002_of_datatake_0000001130_at_2022-08-02T115050.759667Z(0000001130_002D20220802T115050Z)</productParameter>
  <productFile>
    <name>ENMAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-SPECTRAL_IMAGE_SWIR.BIL</name>
  </productFile>
  ...
  <status>FAULTLESS</status>
  <base xsi:noNamespaceSchemaLocation="history_01-31-00.xsd">
    <mission>EnMAP</mission>
    <satellite>01</satellite>
    <source>
      <name>Development Processor 05</name>
      <version>00.05.00</version>
      <time>2022-02-28T14:32:09</time>
    </source>
    <destination>
      <name>Onboard Calibration Processor</name>
      <version>01.00.00</version>
      <time>2022-01-01T00:00:00</time>
    </destination>
    <productType>CTB_DPM</productType>
    <productParameter>absolute radiometric calibration</productParameter>
    <productFile>
      <name>ENMAP01-CTB_DPM-20220401T000000Z_V010000_20220101T000000Z-HISTORY.XML</name>
    </productFile>
    ...
    <status>FAULTLESS</status>
    <remark>Everything OK</remark>
  </base>
  ...
</base>
```



Appendix C Example of Log File

```
<?xml version='1.0' encoding='utf-8'?>
<log xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="log_01-30-00.xsd">
  <metadata>
    <name>/data/quaternion-
space/home/enmap/testoutput/commissioning_phase1/DT0000001130_L1B_TILE2_20220802T140000_V010100/out/OP/L1B-
1130/EN
MAP01-____L1B-DT0000001130_20220620T191541Z_002_V010100_20220802T115050Z-LOG.XML</name>
    <comment>EnMAP Level L1B Product of datatake 1130</comment>
    <copyright>(c) DLR EnMAP 04/21/2017</copyright>
  </metadata>
  <processor number="L1B">
    <name>EnMAP L1B Processor</name>
    <status>error-free</status>
    <version>01.01.00</version>
    <processing_unit>01.01.00.quaternion-vm</processing_unit>
    <processing_period>
      <time_start>2022-08-02T11:50:50.759Z</time_start>
      <time_stop>2022-08-02T13:20:49.066Z</time_stop>
    </processing_period>
  </processor>
  <subtask>
    <name>EnMAP_chain</name>
    <status>error-free</status>
    <processing_period>
      <time_start>2022-08-02T11:50:50.775Z</time_start>
      <time_stop>2022-08-02T11:54:22.214Z</time_stop>
    </processing_period>
    <messages>
      <message>2022-08-02T11:50:50.775Z [I] OP processing parameters:</message>
      ...
    </messages>
  </subtask>
  ...
</log>
```