

COPERNICUS POD SERVICE FILE FORMAT SPECIFICATION

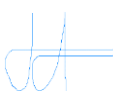
COPERNICUS PRECISE ORBIT DETERMINATION SERVICE (CPOD)

31/03/2022

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Document ID:	GMV-CPOD-FFS-0001
ESA Reference	GMES-GSEG-EOPG-FS-10-0075
DIL Code:	TD-01
Internal Code:	GMV 22590/13 V29/22
Version:	2.0
Date:	01/04/2022
ESA contract number:	4000132155/21/I-BG

DOCUMENT STATUS SHEET

Version	Date	Pages	Changes
0.2	21/10/2010	N/A	Included summary on POD Service and types of orbits (section 1) Moved information (baseline and source) from Fixed Header to Variable Header (sections 2.1.6.2, 2.6.2, 2.3.6.2 and 2.4.8) Sentinel-2 orbit products: included 3σ confidence for position accuracy and TBC in naming convention (sections 2.1.4, 2.1.5, 2.2.4 and 2.2.5) Included details on Platform Data files for Sentinel-3 (section 4.3) Included footnote Table 1, column File Type (section 1.2) Clarification on description of GN_1_ROE_AX orbit file (section 2.5) Minor amendments and editorials
1.0	10/01/2011	N/A	Document updated to take into account the Sentinel-1 PDGS PDR RIDs: - IF-36 (section 4.2.1) - IF-31 (section 2.2.6.3, table 10; section 2.3.6.3, table 14; section 2.4.6.3, table 18 and section 2.5.6.3, table 21) - IF-32 (sections 3.2.1, 3.2.3, 3.3.3, 3.4.3, 3.5.1 and 3.5.3) - IF-29 (sections 2.1.1, 2.2.1, 2.3.1, 2.4.1 and 2.5.1) - IF-30 (sections 2.1.1) - IF-35 (sections 3.1.6.2, 3.2.6.2, 3.3.6.2 and 3.4.6.2) Document updated to be in-line with the new applicable document [AD-02] EEFF Tailoring for the payload Data Ground Segment of the Sentinel Missions [GMES-GSEG-EOPG-TN-2010-0099] (All sections on file naming definition)
1.1	13/05/2011	N/A	Update to take into account comments from Sentinel-3 PDGS Team before the PDGS PDR - Definition of the Site Centre, sub-field of the Mandatory Prefix of the instance id, for S3 PDGS (section 2) - Rewording of Predicted orbit file description (section 3.1.1) - Reformatting of all tables (all sections) - Added one column on Table 2 named "Originator" (section 1.2) Update to take into account request from S-2 PDGS Team: S2 MAIS Action ID #13315 - C Format specification for Restituted Orbit Files (section 3.2.6.3) - Inclusion of an example for S-2 Restituted Orbit File (section 3.2.6.5 – new) - C Format specification for Predicted Orbit Files (section 3.1.6.3)
1.2	25/06/2011	N/A	Document updated to take into account the S-3 PDGS PDR RIDs: RID 149: S-3 NRT POD orbit file name and usage (section 3.5) RID 433: Platform File names (sections 1.2, 2 and 4.3) RID 575: Restituted Attitude in POD (section 4.2)
1.3	06/02/2013	63	Document updated to take into account the S-1 GS&PDGS CDR RIDs: (sections 4.3) - RID PDGS-187: Time_Reference tag Applies to all Sentinels (sections 3.1.6.2, 3.2.6.2, 3.2.6.4, 3.4.6.2 and 3.4.6.4) - RID PDGS-150: File version Applies to all Sentinels (sections 3.1.6.1, 3.2.6.1, 3.3.6.1 and 3.4.6.1) - RID PDGS-152: Absolute orbit Applies to all Sentinels (sections 3.1.6.3, 3.3.6.3, 3.5.6.3 and 4.2.7) Updated to ensure alignment with POD-S1PDGS ICD (files coverage) (section 4.3.7) Inconsistencies between files definitions and examples solved (sections 3.2.6.3 and 3.4.6.3) POD Restituted Attitude file format definition and example aligned to EO CFI expected format (sections 4.2.7, 4.2.9.1, 4.2)

Version	Date	Pages	Changes
1.4	17/07/2013	168	Document updated to take into account the POD Service Design activities: • Include angle biases in S-3 Auxiliary Data Files • Change of title: Sentinels POD Service File Format Specifications (includes products from POD service centre and S-3 NRT POD IPF) • Distinction between POD Service Centre and S-3 NRT POD IPF, previously described as Off-Line POD and NRT POD facility (for S-2 and S-3). Renaming due to the fact that the Sentinels POD Service Centre computes NRT orbits for S-1 and S-2. • Removal of word GMES from the document (programme is now Copernicus) • Removal of future sense ("will") in sentences Addition of a paragraph with the contents of the document (page 19) Completion of the list of products to be generated by the Sentinels POD Service, including Quality Report, GNSS sensor performance reports and anomaly reports (Section 1.2) Update of section on applicable and reference documents (Section 1.3 and 1.4) Addition of new acronyms and others that were not previously included (Section 1.5) Split of section 2 into File naming convention of the Sentinels PDGS and the Sentinel-3 PDGS (different conventions) (Section 2) Addition of a new section describing the file formatting convention in the Sentinels PDGS and the Sentinel-3 PDGS. (Section 3) Remove the requirement to have identical SVs for the overlapping periods of the orbit files (Section 4) Clarify and correct accuracy requirements based on inputs from ESA & EUMETSAT (Section 4) Correct naming convention of files for S-2PDGS. The centre in charge of the generation of S-2 NRT products is PODS rather than MPC (Sections 4.1 and 4.2) Clarification of the Quality Flag of the products (Section 4.5) Clarification of the coverage and timeliness of MOE product (Section 4.3) Correction of file type of product (Section 4) Explanation of possible "Source Data" values for the products with two options: GNSS only solution, GNSS+SLR solution (Section 4.3) Correction of coverage of POE product to make it in line with the specification in the SoW of the GMESPOD activity (overlap of 2 hours between daily files 26 h coverage) (Section 4.4) Clarification of the timeliness of the SR__ROE_AX product (30 minutes from reception) (Section 4.5) Moving the S-3 PDGS naming convention from section 4.5.5 to section 2.2 (Section 4.5) Clarification about the naming convention of the SR__ROE_AX product due to an update of the applicable document (e.g., Class ID is now properly defined) (Section 4.5.5) Creator of SR__ROE_AX product is S3PODIPF (Section 4.5.6.1) Replacement of creator OPOD (Off-line POD) with PODS (POD Service) (Section 5.1) Completion of the S-3 GNSS USO specification (Section 5.1) Completion of the specification of the Restituted Attitude Data for S-1 (Section 5.2) Completion of the specification of the Platform Data File for S-3 including off-nadir angles in antenna reference frame (Section 5.3) Completion of GNSS RINEX L1B RINEX specification (Section 6) Addition of CPF orbit predictions (Section 7) Addition of POD Quality Reports (daily, weekly, monthly) (Section 8) Addition of GNSS sensor performance reports (daily, weekly, monthly) (Section 9) Addition of Anomaly Reports (Section 10) Addition of all external auxiliary data files (for Sentinels POD Service Centre and for the S-3 POD IPF) (Section 11) Accuracy of attitude products added (Section 5.2 and 5.3)

Version	Date	Pages	Changes
1.5	06/09/2013	203	Replacement of "Source Data" with "Source_Data" (with underscore) in MOE and POE orbit files to ensure proper validation with XSD/XML libraries (pages 51, 52,56 and 57) Correction of the GNSS USO Frequency tag in example xml (page 67) Combination of 15M NRT GPS orbit and clock product in a single SP3 file (Section 12.1) Confirmation of accuracy requirements of EGP (Section 12) Included ESA approval (RID GMESPOD-S1-SDR-1) (Page 2) To include S3A as it is showed as an example (RID GMESPOD-S1-SDR-3) (Section 4.4.5) To change the definition of Max_Gap to include a margin of 0.5s (RID GMESPOD-S1-SDR-63) (Sections 5.2.6.3 and 5.2.6.4) To change PODS to OPOD in name convention and System / Creator (RID GMESPOD-S1-SDR-68) (Sections 4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3, 6.1, 8.1, 8.2, 8.3, 9.1, 9.2, 9.3 and 10.1) To change "Restituted Attitude Data File" to "Attitude Restituted data File" in the File_Description field of the XML (RID GMESPOD-S1-SDR-68) (Section 5.2) To add the Data block description section of the quality reports and the Gnss receiver performance monitoring report (RID GMESPOD-S1-SDR-7, RID GMESPOD-S1-SDR-11, RID GMESPOD-S1-SDR-13) (Page 23 and Sections 8 and 9) To add the Sentinel mission ID for which each report is applicable (RID GMESPOD-S1-SDR-9) (Sections 8 and 9) To add a description of the PDF version of the reports (RID GMESPOD-S1-SDR-52) (Sections 8 and 9) To add the latency of the Quality control reports (RID GMESPOD-S1-SDR-12) (Section 8) To replace monthly with cyclic Quality control reports (RID GMESPOD-S1-SDR-14, RID GMESPOD-S1-SDR-15) (Section 8) To add intermediate products from the S-3 NRT POD IPF (RID S3PODIPF-PDR-4) (Section 13) To add NRT platform data product from the S-3 NRT POD IPF (S3PODIPF PDR) (Section 5) To correct the format of the File_Version (Section 5.3) To group daily, weekly and cyclic quality reports into one single report product fulfilling the requirements of all report types (Sections 8 and 9) To add a description of the manifest file of the S-3 POD IPF (RID S3PODIPF-PDR-4) (Section 3.3) To correct the coverage, timeliness and latency of the S-1 attitude product (GMESPOD-S1-SDR-67) (Section 5.2) To correct the content of the anomaly reports (GMESPOD-S1-SDR_16) (Section 10.1) To add the description of the PDF format (GMESPOD-S1-SDR_10) (Section 8.1.6.4) To clarify that the GNSS USO is operating as slave of DORIS USO. Also specify the reporting latency. (RID GMESPOD-S1-SDR-62) (Section 5.1) Clarification about the evolution of the Quality Report based on the discussions of the quality working group (RID GMESPOD-S1-SDR-52) (Section 8.1) Addition of a inventory report describing the contents of the POD archive (S1SDR-GMV-AI-003) (Section 11) Addition of quality flags definition to the S-1 products (RID GMESPOD-S1-SDR-4, GMESPOD-S1-SDR-8) (Section 4.2, 4.4 and 5.2)

Version	Date	Pages	Changes
1.6	09/10/2013	240	Change name of leap seconds file Update description of file name convention of Sentinel-3 PDGS to be in line with document GMES-S3GS-EOPG-TN-09-0009 v1.3 [AD-1] (Section 2.2, 4.5.5, 5.4.5, 13.1.5, 13.2.5 and 13.3.5) Change reference frame for ascending node crossing in Predicted Orbit File product (use ECEF instead of J2000). Reference: S2 GSCDR RID POD - PDGS-116 (Section 4.1) Clarify name of IGS ANTEX file (Section 12.11.8) Clarify name of RSGA file for solar activity file (Section 12.20.5) Clarification about the time in the filenames of the external auxiliary files (Section 12) Disambiguation of filename of tai-utc.dat and finals2000A files by adding a field to the filename corresponding to the time of retrieval (Sections 12.18 and 12.19) Use of 30 seconds sampling rate as default for the Restituted Orbit Files. Reference: S2 GSCDR RID POD-PDGS-117 (Section 4.2) Correction about the contents of the document (Section 1.2) Change of ADs due to the merging of the Sentinel-2 PDGS ICDs (from/to) Update of versions of applicable documents (Section 1.3) Correction of the list of products from the Sentinels POD Service and for each Sentinel mission (Section 1.2) Clarification about S-1 restituted orbit file coverage (Section 4.2) Clarification about S-1 attitude restituted data reference frame (ECEF) (Section 5.2) GNSS RINEX files for Sentinel-3 as hourly files (Section 6.1) Clarification of ICDB format (Section 12.27) Addition of values for quality flags (Sections 4 and 5) Removal of quality information from GNSS USO as it is now a report rather than a product (Section 5.1)
1.7	20/12/2013	247	Removal of quality flag from GNSS report (Section 5.1) Clarification about the coverage of the NRT Platform data file to make it equal to the NRT Restituted Orbit File (Section 5.4) Low level ICDs and Master ICD as RDs in PFS (GMESPOD-S3-SDR-45) (Sections 1.3 and 1.4) Change AUX for REP in Quality Control Reports, GNSS Sensor Performance Report and Anomaly report (RID GMESPOD-S3-SDR-8) (Sections 5.1, 8.1, 8.2, 8.3, 9.1, 10.1, 11.1) The Product Generating Centre GGG for the S3PODIPF is POD, not SPS (RID GMESPOD-S3-SDR-9) (Sections 4.5.5, 5.5.5, 13.1.5, 13.2.5, 13.3.5, 13.25.8, 13.26.8, 13.27.8, 13.28.8) Change the reference to the filename of the S3PODIPF inputs / outputs (RID GMESPOD-S3-SDR-10) (Sections 4.5.5, 5.4.5, 12.1.7, 12.2.7, 12.3.7, 12.4.7, 12.8.7, 12.9.7, 12.10.7, 12.11.7, 12.18.7, 12.19.7, 12.20.7, 12.24.7, 12.25.7, 12.26.7, 12.27.7, 13.1.5, 13.2.5, 13.3.5) Change ICDB filetype for S3PODIPF (RID GMESPOD-S3-SDR-10) (section 12.27) Change External Auxiliary Data Files Naming/Formatting to specify a manifest + measurement data file (RID GMESPOD-S3-SDR-12, GMESPOD-S3-SDR-13) (Sections 12.1.8, 12.2.8, 12.3.8, 12.4.8, 12.8.8, 12.9.8, 12.10.8, 12.11.8, 12.18.8, 12.19.8, 12.20.8, 12.24.8, 12.25.8, 12.26.8, 12.27.8) Change 000000000000 value of quality with NOMINAL (section 4) Addition of mission applicability per section (GMESPOD-S3-SDR-2) (Sections 4, 5, 6, 7,8,9,10,11,12,13) Change of applicable document version, from 1.1 to 1.2 for GMES-GSEG-EOPG-TN-2010-0099 (GMESPOD-S3-SDR-25) (Section 1.2) Increase of coverage of the NRT Orbit Product to ensure an overlap of 1 orbital revolution with the next product (GMESPOD-S2-SDR-32) (Section 4.1) Addition of information about external orbital information for quality reports, and possible constraints in the generation frequency of the reports (GMESPOD-S2-SDR-39) (Section 8.2)

Version	Date	Pages	Changes
			Specification of sampling rate for ground-track constraints evaluation (GMESPOD-S2-SDR-42) (Sections 8.1, 8.2, 8.3) Clarification about the data used to generate the predicted orbits for S-2 (GMESPOD-S2-SDR-44) (Section 4.1) Addition of quality flags definition for each product (GMESPOD-S2-SDR-45) (Sections 4 and 5) Update of coverage of IERS files (GMESPOD-S3-SDR-53) (Section 12.18) Addition of summary table with the external auxiliary data files (GMESPOD-S3-SDR-14, GMESPOD-S3-SDR-18) (Section 1.2) Update of names of applicable documents AD-2 and AD-3 (GMESPOD-S3-SDR-14, GMESPOD-S3-SDR-20) (Section 1.3 and 1.4) Move section 5.1 to 9 and change AUX_GNSUSO to REP_GNSUSO (GMESPOD-S3-SDR-22) (Section 5 and section 9) Clarification about the timeliness and frequency of the GNSS USO report (GMESPOD-S3-SDR-23) (Section 9.1) Clarification about how to distinguish different reports with the same identifier (GMESPOD-S3-SDR-24) (Section 8.3) Correction of cross-reference pointing to missing "table 28" (GMESPOD-S3-SDR-27) (Section 5.1) Correction of captions of tables (GMESPOD-S3-SDR-38) (Section 5.3) Clarification about acceptable overlap between two consecutive NRT restituted orbit files (GMESPOD-S3-SDR-96) (Section 4.4) Addition of skewness and kurtosis variables to the quality reports as required in the quality control plans (GMESPOD-S3-SDR-98) (Sections 8.1, 8.2, 8.3) Align NTC to STC coverage for S-3 products (GMESPOD-S3-SDR-69) (Sections 4.3, 4.4, 5.2) Remove sampling rate of platform data files as it is to be tuned during S-3 Cal/Val (Sections 5.2, 5.3) Correction of accuracy requirement for platform data file products of S-3 (GMESPOD-S3-SDR-35, GMESPOD-S3-SDR-36) (Sections 5.2 and 5.3) Addition of a summary table with the accuracy specifications of the POD products (GMESPOD-S2-SDR-2) (Section 1.2) Addition of GPS problems database file (Section 13.11) Addition of S-3 POD IPF Metrics File (Section 8.4) Change the description of the GNSS L1b File type (Section 6) Use POD_ instead of OPOD for products generated by the POD Service Centre for S-3 PDGS. (Sections 2.1, 4.3, 4.4) Removal of unnecessary fields in reports (Mean_1D, Mean_2D, Mean_3D, Max_1D, Max_2D, Max_3D) (Section 8) Change the provider of NAPEOS DB for GPS, from EGP to POD (Sections 13.9.8, 13.10.8 and 13.11.8) Add the description of the file name convention for Sentinel-3 PDGS (RID GMESPOD-S3-SDR-67) (Sections 4.3.6.1, 4.4.6.1, 5.2.6.1, 8.3.6.1, 9.1.6.1, 10.1.6.1, 11.1.6.1)
1.8	17/01/2014	250	Addition of information about GNSS sensor performance monitoring in quality reports (Section 8) Change of location of IPF Metrics file from section 8.4 to section 10.1 (Section 8.4 and section 10)
1.9	11/02/2014	252	Update of report information with inputs availability (Section 8) Update the description of the manifest that applies to the NRT products for S-3. The file NRT metrics files is included as an annotation file inside the NRT Restituted orbit file (Sections 3.3, 4.4, 5.3 and 10.1) Change Earth Explorer for Earth Observation GS (Sections 2, 2.1, 3.1, 5.1, 5.2, 8.1, 8.2, 8.3, 11.1 and 12.1)
1.10	28/02/2014	250	Update of reference and applicable documents (Sections 1.3 and 1.4) Minor grammatical corrections (All sections) Removal of GNSS sensor performance reports (Section 1)

Version	Date	Pages	Changes
			Addition of RINEX files for all missions (Section 1) Removal of GPS tracking data (Section 13.14)
1.11	20/03/2014	250	Change SW name to S3PODIPF (Section 3.3, 4.5, 5.3 and 10.1) Correct discrepancies with OD NRT Metrics file (RID: S3PODIPF-deltaQR_15) (Section 10.1) Describe more in detail the NRT Restituted Orbit file (RID: S3PODIPF-deltaQR_16) (Section 4.5) Specify the content of baselineCollection (RID: GMESPOD-S1-ORR-3) (Table 3-6, Sections 3.3, 4.5, 5.3, 14.1, 14.2, 14.3) Include details of EGP in Table 3-7 (RID: GMESPOD-S1-ORR-4) and remove TBC (RID: GMESPOD-S1-ORR-5) (Table 3-7) Specify adfQualityCheck with default value PASSED (RID: GMESPOD-S1-ORR-6) (Table 3-8) Describe the status of the files in Table 12-4 (RID GMESPOD-S1-ORR-7) (Table 12-4) Minor editorial typos (RIDs: GMESPOD-S1-ORR-8, GMESPOD-S1-ORR-14) (Table 11-1, Section 11.1) Clarify that the OSV refers to CoG (RID: GMESPOD-S1-ORR-66) (Sections 4.1, 4.2, 4.3, 4.4 and 4.5) Change number of state-vectors before the ascending node ANX to 593 (Ref. Change Request COPE-PDGS-EOPG-CR-14-0010) (Section 4.2)
1.12	02/04/2014	260	Include data volume (RID GMESPOD-S1-ORR-13) (A new section in each file; Table 1.5)
1.13	13/06/2014	267	Update description of manifest (Action S3IPFAR-GMV-AI-009) (Section 3.3) Change File_Class Fix Header in S3 products (RID S3PODIPF-AR-2) (Sections 4.5, 5.3, 10.1, 13.27) Change Creator in Fix Header of S3 products (RID S3PODIPF-AR-3) (Sections 4.5, 5.3, 10.1) Update the examples of S3PODIPF products (SR__ROE_AX, SR_2_NRPPAX, GN_1_IPFMET, GN_1_GPS[N/R]RO, GN_1_GPSRN_, GN_1_NAVSOL. This include the manifest, measurement files and filenames (Section 4.5, 5.3, 10.1, 14.1, 14.2, 14.3) Include the schemas of the products defined by the Sentinels POD Service and include a sentence to point to the schema that describe the format (S3IPFAR-GMV-AI-003) (Section 4.[1-5].8, 5.[1-3].8, 8.[1-3].8, 9.1.8, 10.1.8, 11.1.8) Include format of NAPEOS satellite, transponder and problems DB (Section 13.9, 13.10 and 13.11) Inclusion of NAPEOS EOP format (Section 13.4 and 13.7)
1.14	01/10/2014	275	Update applicable documents (RID GMESPOD-S3-ICD-v1.3-8) (Section 1.3) Change S-3 Product types for S-3 PDGS (Section 4.3.7.1, 4.4.7.1 and 5.2.7.1) In Section 5.2.7.1 (GMESPOD-S3-ICD-v1.3-9): - replace PRLPTF with PMPPAX - replace PRCPTF with PCPPAX - replace processing level "_" with "2" In Section 4.3.7.1 (GMESPOD-S3-ICD-v1.3-10): - replace MOEORB with MGNPAX In Section 4.4.7.1 (GMESPOD-S3-ICD-v1.3-11): - replace POEORB with POEPAX Update description GNSS L1B RINEX Files: (Section 6.1) - Change ZIP to TGZ for the product package (RID GMESPOD-S3-ICD-v1.3-6) - Update description of XML Header file Remove generation of RINEX for S-1 and S-2 (ref. RID GMESPOD-S2-ORR-1) (Section 6.1.3) Clarify data latency in GNSS RINEX files of S-3 (RID GMESPOD-S2-ORR-2) (Section 6.1.4) Specify 1 Hz for S-3 GNSS L1B RINEX files (RID GMESPOD-S3-ICD-v1.3-17) (Section 6.1.4)

Version	Date	Pages	Changes
			Include reference to GNSS measurements accuracy (RID GMESPOD-S2-ORR-3) (Section 6.1.5) Remove references to other filename conventions (RID GMESPOD-S3-ICD-v1.3-7) (Section 6.1.8) Update timeliness, coverage and data volume of cyclic reports (Sections 8.1, 8.2 and 8.3) Clarify that 24H product filename is referred to start time of file (Section 13.2.7) Change latency of GPS Navigation Message to 1 hour (Section 13.8.4) Remove TBD and correct typos in table 13-8 (RID GMESPOD-S2-ORR-7), table 13-10 (RID GMESPOD-S2-ORR-5) and table 13-12 (RID GMESPOD-S2-ORR-22) (Section 13.9.8, 13.10.8, 13.11.8) Specify Data Volume, Naming Convention and format for the GPS Products Quality Reports (RID GMESPOD-S2-ORR-4) (Section 1.2, Section 13.13) Clarify that the data structure of leap second is the actual file (RID GMESPOD-S2-ORR-6) (Section 1.4, 13.19.8)
1.15	13/02/2015	279	Update list of applicable and reference documents (Section 1.3, 1.4) Update reference to format of NAPEOS Satellite and Transponder DB for S-3 PDGS (Sections 13.24 and 13.25) Correct the filename convention of the external orbital products (Section 13.28.7) Specify the coverage and data rate of orbital and attitude products, instead of specifying that it is configurable (ref. PM-008-GMV-AI-002 001) (Sections 4.1, 4.2, 4.3, 4.4, 4.5, 5.1) Update type of NRT Restituted Orbit File, NRT Platform Data for Sentinel-3, POD NRT Metrics File (Table 1-5, 10.1) Update description of S-1 attitude restituted data file (Table 5-3) Correct Product Generating Centre for S-3 PODIPF (MAR/SVL) (Section 2.2, 4.5, 5.3, 10.1, 14.1, 14.2 and 14.3) Correct coverage of Earth Orientation parameters file (Section 3.3.1) (Section 13.18.4)
1.16	27/03/2015	283	Rename S-3 PDGS aux file types with the POD service reference (RID GMESPOD-S3-ORR-1) (Table 1-1) Complete the Acronyms list (RID GMESPOD-S3-ORR-4) (Section 1.5) Complete the Acronyms list and section explaining S3PODIPF (RID GMESPOD-S3-ORR-5) (Section 1.5 and Section 3.2) To clarify that the GNSS does not have an USO, but only an oscillator (RID GMESPOD-S3-ORR-83) The POD metrics file has been expanded to include information of the pre-processing of GNSS measurements. (Section 10.1.8.4 and Section 10.1.8.5)
1.17	31/08/2015	284	Update applicable and reference documents (Sections 1.3 / 1.4) Complete filename description of CPF (Section 7.1.7) Change File_Class in S-3 ICDB (Table 13-21) Typo in variable name corrected (Table 13-30)
1.18	18/12/2015	274	Update applicable and reference documents (Sections 1.3 / 1.4) Removal of GNSS USO Monitoring Report as this information is provided in the POD QC Reports (PDFs) (Sections 1.1, 1.2, 2.1 and old section 9) Removal of anomaly reports as the anomaly management is done with ARTS (Sections 1.1, 1.2 and old section 11) Clarify that coverage of STC / NTC orbital and platform data files is GPS time; Change examples of filenames and update examples of files (Section 4.3, 4.4, 5.1, 5.2) Correct typos in inventory report (Section 10)
1.19	08/02/2016	278	Update list of applicable and reference documents (Section 1.3, 1.4) Include new interface with pass segment list (Sections 7, 7.2) Include two addendum to the SP3 files generated by the EGP: "Version Symbol" a, b and c are accepted and "End of File" symbol could be missing (ref. ADC-SPR#2556) (Section 11.1.8, 11.2.8)

Version	Date	Pages	Changes
			Include RINEX v_2.10 format for EGP RINEX Navigation files (ref. ADC-SPR#2566) (Section 1.3, 11.8.8) Correct format of NAPEOS Transponder DB (ref. ADC-SPR#2562, 2564) (Section 11.10.8, 11.25.8) Include an addendum to the ANTEX file generated by IGS: Start and End of frequency should allow to use "I" for IRNSS (ref. ADC-SPR#2565) (Section 11.12.8) Correct typo in ICDB file: GPSRA -> GPSR_A (ref: (ref. ADC-SPR#2560, 2563) (Section 11.27.8)
1.20	10/06/2016	277	Update Reference documents (Section 1.4) Include the resources (input files) used for the computation of a product, in the manifest of the product (Section 3.3.4) Specify 25 days to deliver precise orbits and platform data file for Sentinel-3 (Section 4.4.4) Include the frequency of values for NRT Platform Data files for Sentinel-3 (Section 5.3.4) Include the filename description of daily GNSS RINEX files of Sentinel-3 (Section 6.1.4 and 6.1.7) Remove Sentinel-3 Pass Segment files as they are not needed because it is decided (QWG#3 meeting) not to use powerful SLR stations (Section 7) Correct a typo in the transponder DB format (Section 11.10.8)
1.21	15/11/2016	277	Update Reference documents (Section 1.4) Update timeliness specification for MOEORB orbit files for Sentinel-3 following request from S-3 PDGS (Section 4.3.4) Specify that the Platform Data files of S-3 (preliminary and precise) have the same frequency of values as the corresponding orbital products (Section 5.2.4)
1.22	18/01/2018	286	Update RINEX version in Applicable documents (Section 1.3) Update Reference documents, adding AGRA specification from International Mass Loading Service (Section 1.4) Separate GNSS Hourly and GNSS Daily RINEX in different types, clarifying differences between both. (Section 1.2, 6.1 and new section 6.2) Correct data volume of GNSS Hourly RINEX files. Include GNSS L1B RINEX files for Copernicus Data Hub in Daily RINEX file type. Correct filename description of GPS Navigation Message (Section 11.8.7) Change validity start and stop time in S-3A naming convention of ADF: NAPEOS DB of satellite, transponder, and problem, plus ANTEX, and ICDB files (Sections 11.9.9, 11.10.9, 11.11.9, 11.12.9, 11.24.9, 11.25.9, 11.26.9, 11.27.9.) Update Atmospheric Gravity (AGRA) files format specification (Sections 1.2 and 11.21) Include DCB files from DLR as External Auxiliary Data for Sentinels POD (Section 1.2 and new section 11.29)
1.23	16/09/2019	293	Include Processed Quaternions Files (AUX_PROQUA) under a new section named Quaternions Files (Table 1-1, Table 1-2, Table 1-3, Table 1-4, Table 1-5, Section 2.1, Section 7) Update applicable and reference documents. Not referenced document are removed (Section 1.3 and 1.4) List of Acronyms (Section 1.5) Clarify corrections applied to the RINEX observation files (Section 2.1, Section 6) Incorporate specifications of version 2.00 of CPF files (Section 8) Include Sentinel-1 AUX_PREORB product specification (Table 1.1, Table 1.2, Section 4.1)
1.24	18/11/2019	294	Clarify the difference between AUX_GNSSRD and AUX_GNSRXD RINEX products. (Section 6.2) Update list of acronyms (Section 1.5)
1.25	17/02/2021	305	Include Sentinel-6 in the introduction, including the applicable documentation (Sections 1, 1.1, 1.2, 1.3) Update the schemas (Section 1.4)

Version	Date	Pages	Changes
			Include missing description of quaternions files in the introduction (Sections 1.1, 1.2) Include the description of the S-6 ROE product (Section 4.6) Include the description of the S-6 RINEX files (Section 6.3)
2.0	01/04/2022	141	This is a major update that includes: - Change the word template to a GMV's doc template (change not tracked) - Editorial changes to harmonize the use of Copernicus POD Service, and include clarifications to easy the readability of the document (all document, but not all changes tracked) - Update several applicable and reference documents (section 1.4.1), including change version and date, removal of not needed docs, update link to examples, and added new docs. - Change the source of EGP from Veripos to magicGNSS (main) and DLR's RETICLE (back-up) and include Galileo products. This impacts: - o Table 1-7, Table 1-8 - o Section 4 and 9. - o Remove old section 12.13 (GPS QC reports) (not tracked) - Change to make applicable Sentinel-6. This impacts: - o Section 1 and subsections, Table 1-4 - o Table 2-1, new section 2.3 - o Section 3 - o Section 4, 6 and 9. - Change the generation of S-3 NRT products from Marine/Land centres using S3PODIPF to the CPOD Service. This impacts: - o Section 1, section 1.1 (remove POD metrics file and intermediate products), 1.5, Figure 1-1, Table 1-5, Table 1-7, Table 1-8 - o Section 2, Table 2-1 - o Section 3.2, 3.3 and subsections. - o Section 4 and 9. - o Remove old section 10 (POD metrics file) (not tracked). - o Remove old section 12.9, 12.10, 12.11, 12.24, 12.25, 12.26 (ADF) (not tracked), - o Remove old section 13 (intermediate products) (not tracked). - Substitute IGS with CODE for NTC GNSS products. This impacts: - o Table 1-7, Table 1-8 - o Section 12.10 to 12.15 (CODE products) - Substitute NASA with GFZ for atmospheric loading. This impacts: - o Table 1-7, Table 1-8, section 9.19 - Remove the Quality Control Reports (as they have been substituted with Grafana) and the inventory report (as it has no use). This impacts: - o Sections 1.1, 1.5, Figure 1-1, Table 1-4, Table 1-5, Table 1-8 - o Remove old sections 9 and 11 (not tracked). - Correct the File Type of the Daily GNSS L1b RINEX files (table 1-4, table 2-1) - Correct the timeliness of quaternions files to be STC (table 1-4) - Update the data volume (Table 1-8 and all subsections in 4, 5, 6, 7, 8 and 9)

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1. INTRODUCTION

The Sentinel Missions (Sentinel-1, Sentinel-2, Sentinel-3 and Sentinel-6) embark a common GNSS Receiver. The following types of orbits are generated for each Sentinel mission:

- On-ground Precise Orbit Determination (POD) solutions
- On-board Navigation solutions

The on-ground POD solutions are generated by the Copernicus Precise Orbit Determination (CPOD) Service.

On-ground solutions (i.e., predicted and restituted orbits) are also generated by the Flight Operations System (FOS) for all Sentinel missions. The FOS orbit products are passed to the CPOD Service by the PDGS and are used for off-line monitoring purposes only. The FOS orbit products are not described in this document.

The on-board navigation solutions are used for processing S-1 and S-2 fast delivery products and are passed to the CPOD Service by the PDGS for off-line monitoring purposes. The formats of the on-board navigation solutions are not described in this document.

The present document describes the format of all products and auxiliary data used and generated on-ground by the CPOD Service.

1.1. PURPOSE

The purpose of the document is to define the product structure and the content of each file generated and delivered by the CPOD Service across its interfaces to the respective Sentinels PDGSs (S-1, S-2 and S-3), and S-6 Payload Data Acquisition and Processing (PDAP) Facility.

For the sake of simplicity, the products generated by the CPOD Service are referred as "CPOD Service Products" in the remainder of this document.

Additionally, this document also contains the description of the structure of all external auxiliary data files needed by the CPOD Service. These external auxiliary data files are transferred according to the interfaces defined in [RD.12].

The document is divided into the following sections:

- Section 1 is this **introduction**.
- Section 2 describes the **file naming convention** to be used for the files.
- Section 3 presents the **file formatting convention** to be used for the files.
- Section 4 focuses on the **orbit files** products generated by the CPOD Service.
- Section 5 deals with the **auxiliary files** products generated by the CPOD Service.
- Section 6 is devoted to the **Global Navigation Satellite System (GNSS) Level 1B** RINEX files.
- Section 7 includes information about the **Quaternions files**.
- Section 8 is devoted to the **Consolidated Prediction Format (CPF)** orbital predictions to be sent from the CPOD Service to the International Laser Ranging Service (ILRS).
- Section 9 defines the format of the **External Auxiliary Data Files** needed by the CPOD Service.

1.2. SCOPE

This document is a deliverable by GMV in the frame of the Copernicus POD Service project.

1.3. DEFINITIONS AND ACRONYMS

Acronyms used in this document and needing a definition are included in the following table:

Table 1-1: Acronyms

Acronym	Definition	Acronym	Definition
ADC	Auxiliary Data Circulation	NAPEOS	NAvigation Package for Earth Orbiting Satellites
ADF	Auxiliary Data File	NASA	National Aeronautics and Space Agency
AGRA	Atmospheric Gravity	NOAA	National Oceanic and Atmospheric Administration
ANTEX	Antenna Exchange format	NOM	Normal Operational Mode
ANX	Ascending Node Crossing	NORAD	NORth American aerospace Defense command
AOCS	Attitude and Orbit Control System	NPM	Normal Pointing Mode
ARP	Antenna Reference Point	NRT	Near Real Time
ARTS	Anomaly Report Tracking System	NTC	Non Time Critical
ASCII	American Standard Code for Information Interchange	OPOD	Offline POD
CAS	Chinese Academy of Sciences	ORR	Operational Readiness Review
CCDB	Calibration and Characterization Data Base	OSV	Orbit State Vector
CCSDS	Consultative Committee for Space Data Systems	PCV	Phase Centre Variations
CDR	Critical Design Review	PDF	Portable Document Format
CFI	Customer Furnished Items	PDGS	Payload Data Ground Segment
CNES	Centre National d'Études Spatiales	PDI	Product Data Item
CODE	Center for Orbit Determination in Europe	PDR	Preliminary Design Review
COG	Center of Gravity	PFS	Product Format Specification
COM	Centre of Mass	POD	Precise Orbit Determination
COSPAR	Committee on Space Research	PODS	POD Service
CPF	Consolidated Prediction Format	POE	Precise Orbit Ephemerides
CPOD	Copernicus POD	PPP	Precise Point Positioning
CPR	Cycle Per Revolution	PRN	Pseudo-Random Number
CRC	Cyclic Redundancy Check	PTF	Platform File
CRD	Consolidated Range Data	PVT	Position, Velocity and Timing
DBL	Data Block	QWG	Quality Working Group
DCB	Differential Code Biases	QZSS	Quasi-Zenith Satellite System
DEOS	Delft Institute of Earth Observation and Space Systems	REQ	Requirement
DLR	Deutsche Zentrum für Luft- und Raumfahrt	RID	Review Item Discrepancy
DORIS	Doppler Orbitography and Radio-positioning Integrated by Satellite	RINEX	Receiver Independent Exchange Format
ECEF	Earth-Centered, Earth-Fixed	REP	Reprocessed (IGS products)
EGP	External GNSS Provider	RMS	Root Mean Square
EOF	Earth Observation File	ROE	Rapid Orbit Ephemerides
EOP	Earth Orientation Parameters	RSGA	Report of Solar-Geophysical Activity
ESA	European Space Agency	S/C	Space-craft
ESOC	European Space Operation Centre	S-1	Sentinel-1
EUMETSAT	EUropean organisation for the exploitation of METeorological SATellites	S-2	Sentinel-2
FOS	Flight Operation Segment	S-3	Sentinel-3
FTP	File Transfer Protocol	S3PODIPF	Sentinel-3 Precise Orbit Determination inside the Instrument Processing Facility
GEO	Geostationary Orbit	SAFE	Standard Archive Format for Europe

Acronym	Definition	Acronym	Definition
GFZ	GeoForschungsZentrum	SALP	Service d'Altimetrie et Localisation Precise
GLONASS	GLObalnaya NAVigatsionnaya Sputnikovaya Sistema (GLObal NAVigation SATellite System)	SAR	Synthetic Aperture Radar
GMES	Global Monitoring for Environment and Security	SDR	Software Defined Radio
GNSS	Global Navigation Satellite System	SINEX	Solution Independent Exchange Format
GPS	Global Positioning System	SLR	Satellite Laser Ranging
GPSR	Global Positioning System Receiver	SPH	Specific Product Header
GPST	GPS Time	SPR	Software Problem Report
GSFC	Goddard Space Flight Center	SRAL	SAR Radar Altimetry
GUF	GNSS USO frequency	STC	Short Time Critical
HDR	Header	SVL	Svalbard
ICD	Interface Control Document	SVN	Space Vehicle Number
ICDB	Instrument Calibration Database	TAI	International Atomic Time
IERS	International Earth Rotation and Reference System Service	TBC	To Be Confirmed
IGS	International GNSS Service	TBD	To Be Defined
ILRS	International Laser Ranging Service	TDS	Test Data Set
IMLS	International Mass Loading Service	TGZ	Tar Gzip
IMT	Instrument Measurement Time	TUM	Technische Universität München
IPF	Instrument Processing Facility	URL	Uniform Resource Locator
IRNSS	Indian Regional Navigation Satellite System	USNO	United States Naval Observatory
ITRF	International Terrestrial Reference Frame	USO	Ultra-Stable Oscillator
L0	Level 0	UT1	Universal Time
L1B	Level 1B	UTC	Universal Time Convention
LEO	Low Earth Orbit	UTF	Unicode Transformation Format
MIME	Multipurpose Internet Mail Extensions	XML	eXtensible Mark-up Language
MOE	Medium Orbit Ephemerides	XSD	XML Schema
MPC	Mission Performance Centre		

1.4. APPLICABLE AND REFERENCE DOCUMENTS

1.4.1. APPLICABLE DOCUMENTS

The following documents, of the exact issue shown, form part of this document to the extent specified herein. Applicable documents are those referenced in the Contract or approved by the Approval Authority. They are referenced in this document in the form [AD.X]:

Table 1-2: Applicable Documents

Ref.	Title	Code	Version	Date
[AD.1]	Sentinel 3 PDGS File Naming Convention	GMES-S3GS-EOPG-TN-09-0009	1.4	24/06/2016
[AD.2]	Earth Observation GS File Format Standard - Tailoring for the Sentinel Missions PDGS	GMES-GSEG-EOPG-TN-2010-0099	1.3	26/04/2016
[AD.3]	Earth Observation Ground Segment File Format Standard	PE-TN-ESA-GS-0001	2.0	07/03/2011
[AD.4]	Sentinels POD Service Sentinel-1 Products Quality Control Plan	GMV-GMESPOD-TN-0003	1.2	28/02/2014

Ref.	Title	Code	Version	Date
[AD.5]	Sentinels POD Service Sentinel-2 Products Quality Control Plan	GMV-GMESPOD-TN-0004	1.3	01/10/2014
[AD.6]	Sentinels POD Service Sentinel-3 Products Quality Control Plan	GMV-GMESPOD-TN-0005	1.3	27/03/2015
[AD.7]	Sentinel-3 Core PDGS Instrument Processing Facility (IPF) Implementation	S3IPF.PDS.007	2.6	25/04/2017
[AD.8]	Product Data Format Specification - Product Structures	S3IPF.PDS.002	1.6	10/02/2015
[AD.9]	Metadata Specification.xlsx	S3IPF.PDS.008	3.3	N/A
[AD.10]	RINEX, The Receiver Independent Exchange Format, Version 3.03, https://files.igs.org/pub/data/format/rinex303.pdf	N/A	3.03	N/A
[AD.11]	SP3 c format specification, https://files.igs.org/pub/data/format/sp3c.txt	N/A	c	N/A
[AD.12]	Sentinel-1 ORR Test Data Set	GMV-GMESPOD-TDS-0002	1.0	N/A
[AD.13]	SINEX_BIAS, The Solution Independent Exchange Format for GNSS Biases, Version 1.00, https://files.igs.org/pub/data/format/sinex_bias_100.pdf		1.00	N/A
[AD.14]	Jason-CS_Sentinel-6 Generic File Naming Convention (GFNC)	EUM/LEO-JASCS/SPE/17/899011	4A	13/04/2020
[AD.15]	Sentinel-6_Jason-CS - Metadata Specification	EUM/LEO-JASCS/DOC/17/912241	4	21/10/2019
[AD.16]	SP3 d format specification, https://files.igs.org/pub/data/format/sp3d.pdf	N/A	d	21/02/2016

1.4.2. REFERENCE DOCUMENTS

The following documents, although not part of this document, extend or clarify its contents. Reference documents are those not applicable and referenced within this document. They are referenced in this document in the form [RD.X]:

Table 1-3: Reference Documents

Ref.	Title	Code	Version	Date
[RD.1]	Solar activity information specifications, ftp://ftp.swpc.noaa.gov/pub/latest/README		N/A	N/A
[RD.2]	Leap second file, ftp://maia.usno.navy.mil/ser7/tai-utc.dat		N/A	N/A
[RD.3]	Earth Orientation Parameters specification, ftp://maia.usno.navy.mil/ser7/readme.finals2000A		N/A	N/A
[RD.4]	RINEX clock format specification, https://files.igs.org/pub/data/format/rinex_clock300.txt		3.00	N/A
[RD.5]	Antenna exchange format, https://files.igs.org/pub/data/format/antex14.txt		1.4	15/09/2010
[RD.6]	ILRS SLR data CRD format, http://ilrs.gsfc.nasa.gov/data_and_products/formats/crd.html			
[RD.7]	ILRS orbit prediction CPF format, http://ilrs.gsfc.nasa.gov/data_and_products/formats/cpf.html			
[RD.8]	AGRA format specification, http://gemini.gsfc.nasa.gov/loading/agra_format.txt			

Ref.	Title	Code	Version	Date
[RD.9]	RINEX DORIS 3.0, ftp://cddis.gsfc.nasa.gov/reports/formats/RINEX_DORIS.pdf		3.0	
[RD.10]	GMES Sentinel-1 System Requirements Document	S1-RS-ESA-SY-0001	3.2	04/03/2009
[RD.11]	Sentinel-3 Spacecraft Design Specification SA-1	S3-DS-TAF-SC-00156	7.0	17/01/2011
[RD.12]	External Auxiliary Data Providers to Sentinels POD Service Interface Control Document	GMV-CPOD-ICD-0002	2.0	02/06/2021
[RD.13]	Sentinels POD Service Schemas		1.3	
[RD.14]	Sentinel GPSR Instrument Specification,	S1-DS-AAE-SC-0001	6.0	15/06/2012
[RD.15]	Update including Galileo, BeiDou, QZSS and IRNSS satellites: https://igscb.jpl.nasa.gov/pipermail/igsmail/2015/008316.html			
[RD.16]	Product Description Document for AOD1B Release 06 (Rev. 6.1, October 19, 2017): https://isdc.gfz-potsdam.de/esmdata/aod1b/ (under Documentation section)			

1.5. CPOD SERVICE PRODUCTS OVERVIEW

This section provides an overview of the products and auxiliary files generated by the CPOD Service with indication on the Sentinel Mission applicability.

The CPOD Service generates the following products, which are schematised in Figure 1-1:

1. **POD Orbit Files**, (i.e. Orbit State Vectors OSVs) from the orbit determination performed by the CPOD Service based on the GNSS Receiver (GPSR) input data. This set of files includes all orbit files generated by the CPOD Service.
2. **Auxiliary Files**, (i.e. products requested by the Sentinels Missions PDGSs) to be used in support to the Mission data processing. This is set of files includes the S-1 attitude restituted data file and the S-3 platform attitude data files.
3. **GNSS L1b RINEX** files for all Sentinels missions to be used by CNES/SALP and the ESA Copernicus Open Access Hub.
4. **Quaternions files**, calculated for each Sentinel mission and delivered to the ESA Copernicus Open Access Hub.
5. **CPF** orbit predictions for S-3 mission to be used by the ILRS community.
6. **External Auxiliary Data Files**, (i.e., products retrieved from external sources) to be used during the processing of the products generated by the CPOD Service.

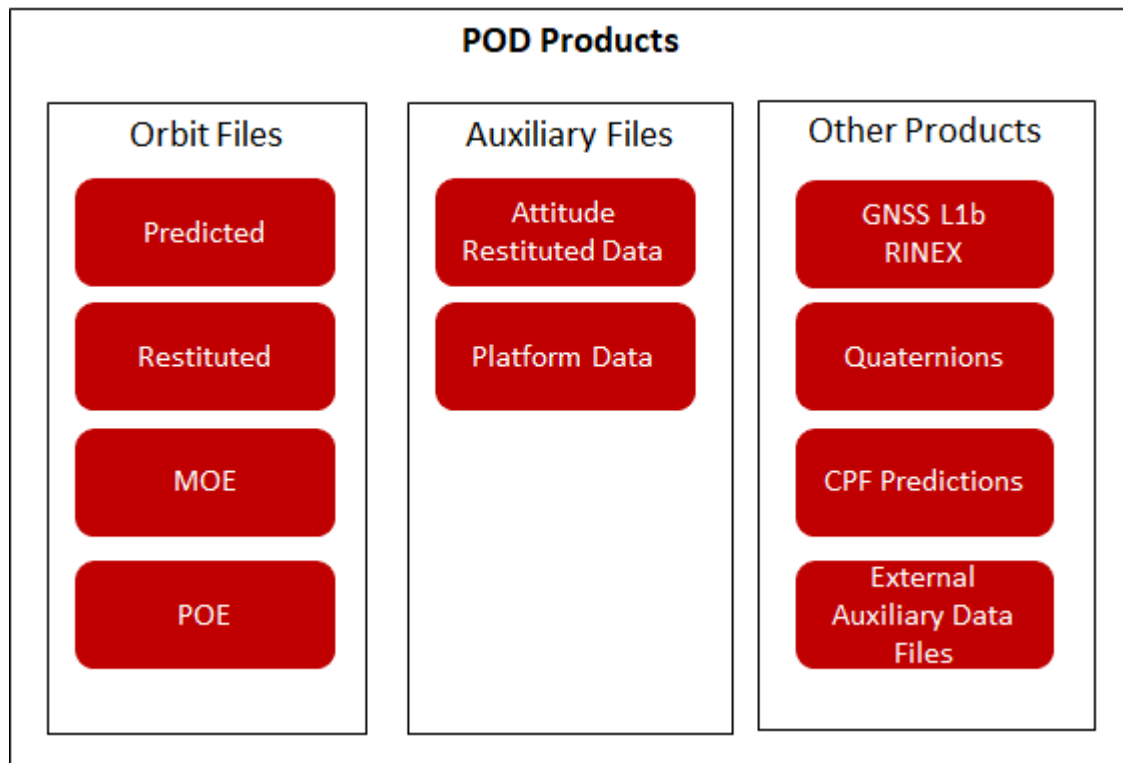


Figure 1-1: POD Service Products Overview

Table 1-4 summarises the CPOD Service products with indication on the applicability of each product to the Sentinel Mission.

Table 1-4: POD Service Products and Auxiliary Data Files Overview vs. Sentinels mission

Product Type	Description	Type	File Type	S-1	S-2	S-3	S-6
POD Orbit Files	Predicted Orbit File	NRT	AUX_PREORB	X	X		
	Restituted Orbit File	NRT	AUX_RESORB	X	X		
	Medium Orbit Ephemerides (MOE) Orbit File	STC	AUX_MOEORB			X	
	Precise Orbit Ephemerides (POE) Orbit File	NTC	AUX_POEORB	X		X	
	NRT Restituted Orbit File	NRT	ROE_AX			X	
	NRT Restituted Orbit File	NRT	AX____ROE_AX				X
Auxiliary Files for Sentinels	Attitude Restituted Data for S-1	NRT	AUX_RESATT	X			
	Preliminary Platform Data File	STC	AUX_PRLPTF			X	
	Precise Platform Data File	NTC	AUX_PRCPTF			X	
	NRT Platform Data File	NRT	SR_2_NRPPAX			X	
GNSS L1b RINEX files	Hourly GNSS L1b RINEX File	NRT	AUX_GNSSRX			X	
	Daily GNSS L1b RINEX File	STC	AUX_GNSSRD			X	
	Daily GNSS L1b RINEX File	STC	AUX_GNSSRD	X	X	X	
	Hourly GNSS RINEX File	NRT	GN_1B_RNXH_AX				X
	Daily GNSS RINEX File	STC	GN_1B_RNXD_AX				X
Quaternions Files	Processed Quaternions Files	STC	AUX_PROQUA	X	X	X	

Product Type	Description	Type	File Type	S-1	S-2	S-3	S-6
CPF predictions	CPF orbit predictions	STC	AUX_STCCPF			X	

Table 1-5 presents the CPOD Service Products generated for each Sentinel Mission.

Table 1-5: CPOD Service Products per Sentinel Mission and originator

Mission	CPOD Service Product	Originator
Sentinel-1	Predicted Orbit File	POD Service
	Restituted Orbit File	POD Service
	Precise Orbit Ephemerides (POE) Orbit File	POD Service
	Attitude Restituted Data	POD Service
	Daily GNSS L1b RINEX File	POD Service
	Processed Quaternions Files	POD Service
Sentinel-2	Predicted Orbit File	POD Service
	Restituted Orbit File	POD Service
	Daily GNSS L1b RINEX File	POD Service
	Processed Quaternions Files	POD Service
Sentinel-3	NRT Restituted Orbit File	POD Service
	Medium Orbit Ephemerides (MOE) Orbit File	POD Service
	Precise Orbit Ephemerides (POE) Orbit File	POD Service
	NRT Platform Data	POD Service
	Preliminary Platform Data	POD Service
	Precise Platform Data	POD Service
	Hourly/Daily GNSS L1b RINEX Files	POD Service
	Processed Quaternions Files	POD Service
	CPF orbit predictions for the ILRS	POD Service
Sentinel-6	NRT Restituted Orbit File	POD Service
	Hourly/Daily GNSS L1b RINEX Files	POD Service

Table 1-6 provides a summary of the specifications of the main products, orbits and platform data files, generated by the CPOD Service.

Table 1-6: Summary of accuracy specifications for each of the POD products

Mission	CPOD Service Product	Requirement metric	Accuracy Requirement
Sentinel-1	Predicted Orbit File	Position accuracy in 2D (along- and cross-track) 1-sigma RMS	1 m
	Restituted Orbit File	Position accuracy in 2D (along- and cross-track) 1-sigma RMS	10 cm
	Precise Orbit Ephemerides (POE) Orbit File	Position accuracy in 3D 1-sigma RMS	5 cm
	Attitude Restituted Data File	Roll, pitch and yaw accuracy in 1-sigma RMS independently	0.005 deg
Sentinel-2	Predicted Orbit File	Position accuracy in 2D (along- and cross-track) 3-sigma RMS	10 m
	Restituted Orbit File	Position accuracy in 3D 3-sigma RMS	3 m
Sentinel-3	NRT Restituted Orbit File	Position accuracy in radial 1-sigma RMS	10 cm

Mission	CPOD Service Product	Requirement metric	Accuracy Requirement
	Medium Orbit Ephemerides (MOE) Orbit File	Position accuracy in radial 1-sigma RMS	4 cm
	Precise Orbit Ephemerides (POE) Orbit File	Position accuracy in radial 1-sigma RMS	3 cm
	NRT Platform Data File	Accuracy of roll, pitch and yaw axis biases (3- sigma)	0.05 deg for pitch and roll 0.5 deg for yaw
	Preliminary Platform Data File	Accuracy of roll, pitch and yaw axis biases (3- sigma)	0.05 deg for pitch and roll 0.5 deg for yaw
	Precise Platform Data File	Accuracy of roll, pitch and yaw axis biases (3- sigma)	0.05 deg for pitch and roll 0.5 deg for yaw
Sentinel-6	NRT Restituted Orbit File	Position accuracy in radial 1-sigma RMS	5 cm, with the goal of 3cm

Table 1-7 lists all the external auxiliary data files used by the CPOD Service (see section 9) and highlights which Sentinel mission makes use of them.

Table 1-7: Traceability matrix for External Auxiliary Data and Sentinel mission

Product Description	Type	File Type in the CPOD Service		Original file name	S-1	S-2	S-3	S-6
EGP 15M NRT GNSS Orbits and clocks	NRT	AUX_GSVMAX		gpnwwwdHHMM.sp3.gzip	x	x	x	x
EGP 24H NRT GNSS Orbits	NRT	AUX_GSVHAX		gpuwwwdHH.sp3.gzip	x	x	x	x
EGP 24H NRT GNSS Clocks	NRT	AUX_GCLHAX		gpuwwwdHH.clk.gzip	x	x	x	x
EGP 24H NRT EOPs	NRT	AUX_EOPHAX		gpuwwwdHH.eop	x	x	x	x
EGP STC GNSS Orbits	STC	AUX_GSVSTC		gprwwwd.sp3.gzip			x	
EGP STC GNSS Clocks	STC	AUX_GCLSTC		gprwwwd.clk.gzip			x	
EGP STC EOPs	STC	AUX_EOPSTC		gprwwwd.eop			x	
EGP GNSS Navigation Message	NRT	AUX_NAV_AX		brdcdddf.yyn.Z	x	x	x	x
GPS Constellation ANTEX file	NRT	AUX_ATX_AX		igsnn_www.atx	x	x	x	x
CODE NTC GNSS Orbits	NTC	AUX_GSVCOR		CODwwwd.EPH_M.Z	x	x	x	x
CODE NTC GNSS Clocks	NTC	AUX_GCLCOR		CODwwwd.CLK_M.Z	x	x	x	x
CODE NTC GNSS Biases	NTC	AUX_GBICOR		CODwwwd.BIA_M.Z	x	x	x	x
CODE REP GNSS Orbits	NTC	AUX_GSVREP	N/A	CORyydoy.EPH.gz	x	x	x	x
CODE REP GNSS Clocks	NTC	AUX_GCLREP	N/A	CORyydoy_5s.CLK.gz	x	x	x	x
CODE REP GNSS Biases	NTC	AUX_GBIREP	N/A	CORyydoy.BIA.gz	x	x	x	x
IERS Earth Orientation parameters	NRT	AUX_EOP_AX		finals2000A.data finals2000A.daily	x	x	x	x
IERS Leap seconds	NRT	AUX_LSC_AX		tai-utc.dat	x	x	x	x
NOAA Solar flux and geomagnetic activity	NRT	AUX_SAC_AX		YYYYMMDDRSGA.txt	x	x	x	x
Atmospheric gravity	STC	AOD1B		AOD1B_YYYY-MM-DD_X_NN.asc.gz	x	x	x	x
ILRS SLR data	STC NTC	AUX_SLR____		satellitename_yyyymmdd.npt			x	
CNES/SALP DORIS RINEX	NRT	AUX_DORIS_		DS3A/B_MEP_1P<a>D<StartTime>			x	
Sentinel ANTEX file	NTC	AUX_ATXSAX		sennn_www.atx			x	
External Orbit Solutions	STC NTC	AUX_EXTORB		centwwwd.sp3.gzip	x	x	x	x

Product Description	Type	File Type in the CPOD Service		Original file name	S-1	S-2	S-3	S-6
GNSS Differential Code Biases	NTC	AUX_DCB____		DLR0MGXFIN_yyyyddd0000_03L_01D_DCB.BSX.gz	x	x	x	x

Table 1-8 summarises the data volume of each of the files described within this document.

Table 1-8: Data Volume of each file

Description	Type	File Type	Data Volume
Predicted Orbit File	NRT	AUX_PREORB	1.2 Mbytes (S1) 4 Kbytes (S2)
Restituted Orbit File	NRT	AUX_RESORB	552 Kbytes (S1) 196 Kbytes (S2)
Medium Orbit Ephemerides (MOE) Orbit File	STC	AUX_MOEORB	4.3 Mbytes (S3)
Precise Orbit Ephemerides (POE) Orbit File	NTC	AUX_POEORB	4.3 Mbytes (S1, S3)
NRT Restituted Orbit File	NRT	SR__ROE_AX ROE__AX	410 Kbytes (S3) 370 Kbytes (S6)
Attitude Restituted Data for Sentinel-1	NRT	AUX_RESATT	10 Mbytes (S1)
Preliminary Platform Data for Sentinel-3	STC	AUX_PRLPTF	6.7 Mbytes (S3)
Precise Platform Data for Sentinel-3	NTC	AUX_PRCPTF	6.7 Mbytes (S3)
NRT Platform Data for Sentinel-3	NRT	SR_2_NRPPAX	530 Kbytes (S3)
Hourly GNSS L1b RINEX files	NRT	AUX_GNSSRX RNXH_AX	1 Mbyte (S3) 1 Mbyte (S6)
Daily GNSS L1b RINEX files	STC	AUX_GNSSRD RNXD_AX	24 Mbytes (S3) 22 Mbytes (S6)
Daily GNSS L1b RINEX files	STC	AUX_GNSRXD	2.6 (S1, S2) 24 (S3) Mbytes
Processed Quaternions Files	NTC	AUX_PROQUA	1.5 Mbytes (S1, S2, S3)
CPF predictions	STC	AUX_STCCPF	700 Kbytes (S3)
EGP 15M NRT GNSS Orbits and clocks	NRT	AUX_GSVMAX	90 Kbytes
EGP 24H NRT GNSS Orbits	NRT	AUX_GSVHAX	230 Kbytes
EGP 24H NRT GNSS Clocks	NRT	AUX_GCLHAX	1.5 Mbytes
EGP 24H NRT EOPs	NRT	AUX_EOPHAX	4 Kbytes
EGP STC GNSS Orbits	STC	AUX_GSVSTC	124 Kbytes
EGP STC GNSS Clocks	STC	AUX_GCLSTC	1.5 Mbytes
EGP STC EOPs	STC	AUX_EOPSTC	4 Kbytes
EGP GNSS Navigation Message	NRT	AUX_NAV_AX	50 Kbytes
GPS Constellation ANTEX file	NRT	AUX_ATX_AX	18 Mbytes
CODE NTC GNSS Orbits	STC	AUX_GSVCOR	200 Kbytes
CODE NTC GNSS Clocks	STC	AUX_GCLCOR	3.2 Mbytes
NTC GNSS Biases	NTC	AUX_GBICOR	108 Kbytes
REP GNSS Orbits	NTC	AUX_GSVREP	200 Kbytes
REP GNSS Clocks	NTC	AUX_GCLREP	3.2 Mbytes
REP GNSS Biases	NTC	AUX_GBIREP	108 Kbytes
IERS Earth Orientation parameters	NRT	AUX_EOP_AX	2.1 Mbytes (data) 40 Kbytes (daily)
IERS Leap seconds	NRT	AUX_LSC_AX	4 Kbytes
NOAA Solar flux and geomagnetic activity	NRT	AUX_SAC_AX	4 Kbytes

Description	Type	File Type	Data Volume
GFZ Atmospheric gravity	STC	AOD1B	20 Mbytes
ILRS SLR data	STC	AUX_SLR____	50 Kbytes
CNES/SALP DORIS RINEX	NRT	AUX_DORIS_	1.3 Kbytes
Sentinel ANTEX file	NRT	AUX_ATXSAX	5 Mbytes
External Orbit Solutions	STC/NTC	AUX_EXTORB	160 Kbytes
GNSS Differential Code Biases	NTC	AUX_DCB____	2.2 Mbytes

2. FILE NAMING CONVENTION

The applicable file naming convention for the files generated by the CPOD Service is the tailoring of the Earth Observation GS File Format Standard for the Payload Data Ground Segment (PDGS) of the Sentinel missions defined in [AD.2]. All files generated by the CPOD Service follow that convention except for the Sentinel-3 NRT Restituted Orbit File and the Sentinel-3 NRT Platform Data File, which follow the Sentinel-3 File naming convention defined in [AD.1]

2.1. FILE NAMING CONVENTION OF THE SENTINELS MISSIONS

The tailoring of the Earth Observation GS File Format Standard file naming convention explained in [AD.2] is detailed below.

The filename must comply with the following pattern:

MMM_CCCC_TTTTTTTTTT_<instance_id>.EOF

The file name must be in the exact format as shown (characters shall only be in uppercase), where:

Table 2-1: Logical filename elements (Sentinels missions)

Naming Element	Description
MMM	It is the Mission ID, a 3-characters field alphanumeric defined as follows: - S1A, S1B (applicable to Sentinel-1A and Sentinel-1B), S1_ is applicable to the constellation; - S2A, S2B (applicable to Sentinel-2A and Sentinel-2B), S2_ is applicable to the constellation; - S3A, S3B (applicable to Sentinel-3A and Sentinel-3B), S3_ is applicable to the constellation; - S6A (applicable to Sentinel-6A).
_	It is an underscore separator (1 character fixed string).
CCCC	It is the File Class. Allowed values are: - OPER for "Routine Operations" files; - TEST for internal tests; - REP_x for reprocessing (x being a figure from 1 to n); - TD_{xx} for processing Test Data Sets (xx=00..99).
_	It is an underscore separator (1 character fixed string).
TTTTTTTTTT	It is the File Type field a 10-characters field subdivided into two sub-fields as follows: - FFFF = File Category To the maximum feasible extent, the File Category field shall be shared across the Sentinels Missions from a default list, as defined below: - AUX_: auxiliary data files; - CNF_: configuration files; - LOG_: log files; - MPL_: mission-planning files; - REP_: reporting files of performed operations (acquisition, production, etc); - Etc. - DDDDDD = Semantic Descriptor The Semantic Descriptor can be composed of uppercase letters, digits or underscores "_". The Semantic Descriptor is unique for a given File Type and must be as descriptive as possible given the 6 character limitation to characterise the information contained by the file. For the POD Files, the following is defined: - PREORB: Predicted Orbit File; - RESORB: Restituted Orbit File;

Naming Element	Description
	• MOEORB: Medium Orbit Ephemerides (MOE) Orbit File; • POEORB: Precise Orbit Ephemerides (POE) Orbit File; • RESATT: Attitude Restituted Data (for Sentinel-1); • PRLPTF: Preliminary Platform Data (for Sentinel-3); • PRCPTF: Precise Platform Data (for Sentinel-3); • GNSSRX: Hourly GNSS L1b RINEX files (for CNES/SALP); • GNSSRD: Daily GNSS L1b RINEX files (for CNES/SALP); • GNSSRD: Daily GNSS L1b RINEX files (for ESA Copernicus Open Access Hub); • PROQUA: Processed Quaternions files (for ESA Copernicus Open Access Hub);
<instance_id>	It is the File Instance ID. It is used to define several sub-fields within the filename according to the nature of the file. For usage for the Sentinel PDGS, the File Instance ID is further decomposed into a set of mandatory sub-fields in the prefix, complemented by optional ones in the trailing portion of the filename. Mandatory Prefix: • The File Instance ID mandatory part is subdivided into sub-fields as follows: ssss_yyyymmddThhmmss where: ◦ ssss is the Site Centre of the file originator (OPOD for S-1 and S-2 and POD_ for S-3) ◦ yyyymmddThhmmss is the Creation Date Optional Suffix: • Based on every file-type, the optional suffix allows further characterisation of the scope of every file as specifically relevant to the type of file. The suffix may be simply omitted when unnecessary to the defined file-type. When applicable to the file-type, the optional suffix is appended to the mandatory prefix starting with an underscore character immediately followed by a one-character field defining the specific tailoring of the remainder of the suffix from a list of well-defined options: <optional-suffix> = _Ivvvvvvvv... where: ◦ I is a one-character option Identifier (e.g. 'V', 'B', 'D', etc); ◦ vvvvvvvv... contains the trailing Option Value. Option_V – Applicability Time Period < Option_V suffix> = _VyyyymmddThhmmss_YYYYMMDDTHHMMSS where: ◦ yyyymmddThhmmss is the Validity Start Time; ◦ YYYYMMDDTHHMMSS is the Validity Stop Time. Option_D – Data Source < Option_D suffix> = _Dvvv Consisting in a one-letter text indicating the source data. Allowed values are: ◦ GNS for GNSS data; ◦ G_D for GNSS + DORIS data; ◦ GDS for GNSS + DORIS + SLR data; ◦ G_S for GNSS + SLR data.
AAA	It is the file extension. Allowed values are EOF, HDR, DBL, and ZIP.

2.2. FILE NAMING CONVENTION OF THE SENTINEL-3 PDGS

The file naming convention used by the Sentinel-3 PDGS is identified by the sequence of fields described here below ([AD.1]):

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

The above fields constitute the smaller set of information, which ensures that each Logical File name is unique, within the context of the Sentinel-3 PDGS. The part in brackets indicates that the relevant field content can vary by case as described in the following table.

Table 2-2: Logical filename elements (Sentinel-3 PDGS)

Naming Element	Description
MMM	It is the Mission ID. It consists of 3 characters, either uppercase letters or digits. - S3A = Sentinel-3A; - S3B = Sentinel-3B; - S3_ = for both Sentinel-3A and -3B.
SS	It is the Data Source/Consumer. It consists of 2 uppercase letters, which indicates the data source of the instrument data or the data consumer of the auxiliary data: - SR = SRAL; - GN = GNSS; - AX = for multi instrument auxiliary data.
L	It is the Processing Level. It consists of 1 digit or 1 underscore "_" if the processing level is not applicable. This field can indicate the instrument data product processing stage or the processing level of applicability for the auxiliary data. "0" for Level-0; "1" for Level-1; "2" for Level-2.
TTTTTT	It is the Data Type ID. It consists of 6 characters, either uppercase letters or digits or underscores "_". The suffix "AX " in the last 2 digits indicates an auxiliary data.
yyymmddThhmmss	It is the Data Start Time. It consists of 15 characters, either uppercase letters or digits. The following date and time format is applicable as: - Sensing time for the instrument data products; - Validity time for the Auxiliary Data. Format: 8 characters (all digits) for the date: "yyymmdd" (year, month and day); 1 uppercase T: "T"; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds)
yyymmddThhmmss	It is the Data Stop time. It consists of 15 characters, either uppercase letters or digits. The following date and time format is applicable as: - Sensing time for the Instrument data products; - Validity time for the Auxiliary Data. Format: 8 characters (all digits) for the date: "yyymmdd" (year, month and day); 1 uppercase T: "T"; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds).

Naming Element	Description
yyyymmddThhmmss	It is the Creation Date time. It consists of 15 characters, either uppercase letters or digits and it is applicable both to the Instrument Data Products and to the Auxiliary Data. Format: 8 characters (all digits) for the date: "yyyymmdd" (year, month and day); 1 uppercase T: "T"; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds).
<instance ID>	It is the Field Instance ID. It consists of 17 characters, either uppercase letters or digits or underscores "_". - Instance ID for the instrument data products disseminated in "stripes" (DDDD_CCC_LLL____), where: - DDDD = 4 digits; orbit duration Sensing data time interval in seconds; - CCC = 3 digits; cycle number at the start sensing time of the product; - LLL = 3 digits; relative orbit number within the cycle at the start sensing time of the product; - Underscores "_"; - Instance ID for auxiliary data: 17 underscores "_".
GGG	It is the Product Generating Centre. It consists of 3 characters, either uppercase letters or digits. - Generating Centres for the Instrument data products: - MAR = Marine Processing and Archiving Centre - LN3 = Land Processing and Archiving Centre - Generating Centres for the Auxiliary data file (the list is not exhaustive): - EUM = EUMETSAT - LN3 = ESA - POD = Copernicus POD Service - EGP = External GNSS Provider - USN = USNO - NOA = NOAA - If not applicable: 3 underscores "_"
<class ID>	It is the Class ID for auxiliary data. It consists of 8 characters, either uppercase letters or digits or underscores (P_XX_NNN), where: - P = 1 uppercase letter indicating the platform ("O" for operational, "F" for reference, "D" for development, "R" for reprocessing or 1 underscore "_" if not relevant). - XX = 2 uppercase letters/digits indicating the applicability of the file in terms of timeliness: "NR" for NRT; "ST" for STC; "NT" for NTC; "SN" for files used on both STC & NTC; "NS" for files used on both NRT & STC; "NN" for files used on both NRT & NTC; "AL" for files used for NRT & STC & NTC; - or 2 underscores "_" if not relevant. - NNN = 3 letters/digits. Free text for indicating the baseline collection (001, 002) or data usage (e.g. test, GSV, etc) or 3 underscores "_" if not relevant. If not applicable: 8 underscores "_"
<extension>	It is the Filename extension. Up to 4 characters. The adopted extension is "SEN3".

2.3. FILE NAMING CONVENTION FOR SENTINEL-6

The file naming convention used to name Sentinel-6 Product Files and Auxiliary Data Files is identified by the sequence of fields described here below [AD.14]:

MMM_SS_LL_TTTTTT_<start_time>_<end_time>_<generation_time>_<instance_id>_<source>_<environment>_<class_id>.<extension>.tar

The fields constitute the smaller set of information ensuring that the file name of each internal measurement file is unique, within the context of Jason-CS/S6 Payload Data Acquisition and Processing (PDAP) Facility. The part in brackets indicates that the relevant field content can vary by case as described in the following table.

Table 2-3: Logical filename elements (Sentinel-6)

Naming Element	Description
MMM	It is the Mission ID . It consists of 3 characters, either uppercase letters or digits or underscore. S6A, S6B (applicable to Sentinel-6A and Sentinel-6B), S6_ is applicable to the constellation.
SS	It is the Data Source/Consumer . It consists of 2 uppercase letters, which indicates the data source of the instrument data or the data consumer of the auxiliary data: - P4 = POSEIDON-4: Radar Altimeter; - DO = DORIS receiver; - MW = AMR-C: Advanced Microwave Radiometer; - GN = GNSS-POD receiver; - ST = Star Tracker; - RO = GNSS-RO receiver; - TM = House Keeping Telemetry, Navigation and Attitude Information ; - AX = for multi instrument auxiliary data.
LL	It is the Processing Level (identifier of product generation function) . It consists of 2 digits or 1 digit plus 1 underscore "_" or 2 underscores "__" if the processing level is not applicable. This field can indicate the instrument data product processing stage or the processing level of applicability for the auxiliary file (the content in brackets represents possible values). "0_" for Level-0; "1["_", "A", "B", ...]" for Level-1; "2["_", "A", "B", "P", "W", ...]" for Level-2; "3["_", "W", ...]" for Level-3.
TTTTTT	It is the Data Type ID . It consists of 7 characters, either uppercase letters or digits or underscores "_". The suffix "AX " in the last 2 digits indicates an auxiliary data.
<start_time>	It is the Data Start Time . It consists of 15 characters, either uppercase letters or digits (yyyyMMddThhmmss). The following date and time format is applicable as: - Sensing time for the instrument data products; - Validity time for the Auxiliary Data. Format: 8 characters (all digits) for the date: "yyyyMMdd" (year, month and day); 1 uppercase T: "T", time; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds).

Naming Element	Description
<end_time>	It is the Data End Time. It consists of 15 characters, either uppercase letters or digits (yyyyMMddThhmmss). The following date and time format is applicable as: - Sensing time for the instrument data products; - Validity time for the Auxiliary Data. Format: 8 characters (all digits) for the date: "yyyyMMdd" (year, month and day); 1 uppercase T: "T", time; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds).
<generation_time>	It is the Data Generation Time. It consists of 15 characters, either uppercase letters or digits and it is applicable both to the Instrument Data Products and the Auxiliary Data (yyyyMMddThhmmss). Format: 8 characters (all digits) for the date: "yyyyMMdd" (year, month and day); 1 uppercase T: "T", time; 6 characters (all digits) for the time: "hhmmss" (hour, minutes and seconds).
<instance_id>	It is the File Instance ID. It consists of 16 characters, either uppercase letters or digits or underscores "_" (DDDD_CCC_PPP_RRR). <u>Instance ID for the instrument data products:</u> - DDDD = 4 digits, orbit duration; sensing data time interval in seconds; - CCC = 3 digits, cycle number at the start sensing time of the product; - PPP = 3 digits, relative pass number at the start sensing time of the product; - RRR = 3 digits, relative orbit number within the cycle at the start sensing time of the product (1-127). <u>Instance ID for the RO L1b NTC instrument data products:</u> - DDDD = 1 char plus 3 digits, identifies the occulting GNSS satellite. - All other fields (CCC, PPP and RRR) are set to underscores. <u>Instance ID for auxiliary data:</u> 16 underscores "_".
<source>	It is the Source Data Provider. It consists of 4 characters, uppercase letters and/or underscores. <u>Generating Centres for the Instrument data product:</u> - EUM_ = EUMETSAT; - JPL_ = Jet Propulsion Laboratory; - CNES = Centre National d'Études Spatiales. <u>Generating Centres for the Auxiliary Data File</u> (the list is not exhaustive): - PGF_ = Product Generating Function; - CALV = Cal/Val; - CPOD = Copernicus POD Service; - SALP = SALP/CNES; - NASA = National Aeronautics and Space Administration; - USNO = U.S. Naval Observatory; - NOAA = National Oceanic and Atmospheric Administration;

Naming Element	Description
	- IGS_ = International GNSS Service; - IERS = International Earth Rotation and Reference Systems Service. 3. <u>If not applicable</u>: 4 underscores "_____".
<environment>	It is the Environments at MCC and at External Sites. It consists of 3 characters, uppercase or underscores: - OPE = Operational; - VAL = Validation; - DEV = Development; - DEP = Deployment; - REP = Reprocessing; "____" = Data received from external providers. <u>NOTE</u>: the 3 underscores are used as reference for environments external to EUMETSAT. For this reason, they are expected to be used for the products and auxiliary files received from external providers.
<class_id>	It is the Timeliness and processing baseline/version or data usage. It consists of 6 characters, either uppercase letters or digits or underscores (XX_NNN), where: - XX = 2 uppercase letters/digits indicating the applicability of the file in terms of timeliness ("NR" for NRT, "ST" for STC, "NT" for NTC, "SN" for files used on both STC & NTC, "NS" for files used on both NRT & STC, "NN" for files used on both NRT & NTC, "AL" for files used for NRT & STC & NTC or 2 underscores "_" if not relevant). - NNN = 3 letters/digits. Free text for identifying the file versioning ("000", "001", "002") or data usage (e.g., "TST", "GSV", "SVT", etc.) or 3 underscores "_" if not relevant. If not applicable: 6 underscores "_____".
<extension>	It is the Representation of data. It consists of 3 characters (uppercase letters) and 1 digit. The adopted extension is: SEN6 = package containing the complete Products and ADF (Manifest and Data File(s)).
.tar	The product/auxiliary filenames must be delivered on a compressed .tar file.

3. FILE FORMATTING CONVENTION

3.1. FILE FORMATTING CONVENTION OF THE SENTINEL MISSIONS

The CPOD Service products follow by default the Earth Observation GS File Format Standard [AD.3] and the Tailoring of the Earth Observation GS File Format Standard of the PDGS of the Sentinel missions defined in [AD.2]. When no specific tailoring is described, the standard [AD.3] directly applies.

The format is applicable to all CPOD Service products generated for the four Sentinel Missions.

The POD Service products structure is composed of a single file (*.EOF) containing both the Header and the Datablock Sections. The Datablock section includes one Data set consisting of one list of OSVs in the case of the orbit products. Other data sets are defined for other types of products.

This structure is represented in the following figure for the case of orbit products:

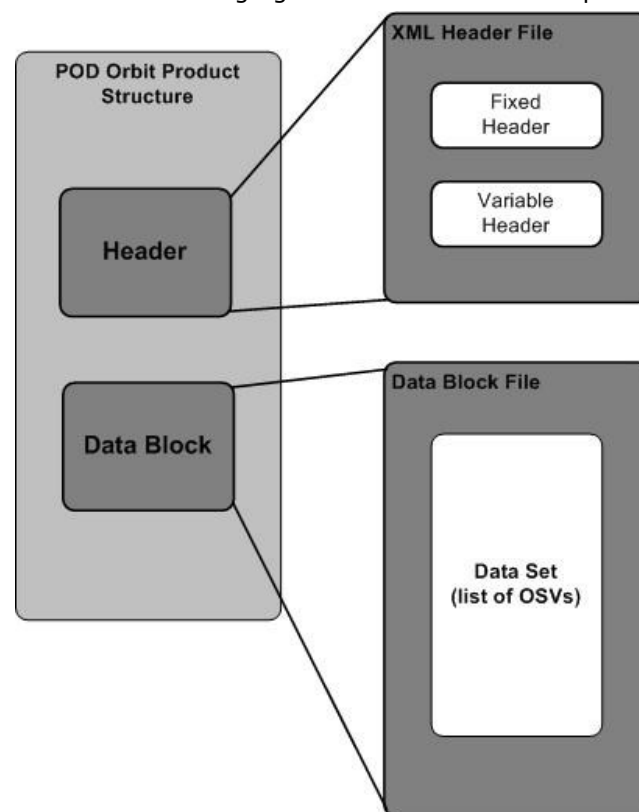


Figure 3-1: POD Service Products Structure (example of POD orbit product)

3.2. FILE FORMATTING CONVENTION OF FILES FOR THE S-3 PDGS

The file formatting convention of the Files for the S-3 PDGS is described in [AD.7]. Every product is packaged in a directory, which includes a Manifest and a Measurement Data File. The manifest follows the standard manifest structure of the S-3 product as described in [AD.8] and [AD.9], and it is described in section 3.3. It has a fixed name **xfdumanifest.xml**.

Auxiliary data originated outside the PDGS is converted to the S-3 Format by the ADC Component upon entry into the PDGS, just adding a manifest and filling the relevant fields. The manifest file includes a Data Object Section pointing to the original auxiliary file received from the External Provider. The original file is kept as received.

S-3 NRT POD outputs (NRT Restituted Orbit file, NRT Platform data file) includes the Manifest and a Measurement Data file.

3.3. FILE FORMATTING CONVENTION OF MANIFEST FILES OF S-3 PDGS

S-3 PDGS specifies that each output and external auxiliary data file has a Manifest. The structure of the Manifest element is as follows:

Table 3-1: Manifest File Main Structure

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
version			Attribute containing the relative path for the xfdx.xsd XML schema corresponding to the product
informationPackageMap		See Section 3.3.1	Contains a high-level textual description of the product and references to all product components
metadataSection		See Section 3.3.2	Contains the product Metadata
dataObjectSection		See Section 3.3.3	Contains references to the physical information needed to get the location of each file composing the package

3.3.1. INFORMATION PACKAGE MAP

Table 3-2: InformationPackageMap Structure

Name				Description
contentUnit				
	ID			Value: packageUnit
	unitType			Describes the type of data referenced by this content unit. Value: "Information Package"
	textInfo			Textual description of the content unit. Value: "SENTINEL-3 ADF"
	pdiID			Identifier of the Preservation Description; Information applicable to this content unit. Value: "processing"
	dmdID			Identifier of the Metadata applicable to this content unit.
	contentUnit			
		ID		Data Object pointer ID
		unitType		Describes the type of data referenced by this content unit.
		textInfo		Textual description of the content unit.
		dataObjectPointer		
			dataObjectID	Data Object element ID

3.3.2. METADATA SECTION

Table 3-3: Metadata Section of Manifest

Name				Description
metadataObject				processing

Name				Description
	See Table 3-4			
	metadataWrap			
		See Table 3-5		
		xmlData		
			processing	Table 3-7
metadataObject				generalProductInformation
	See Table 3-4			
	metadataWrap			
		See Table 3-5		
		xmlData		
			generalProductInforma tion	Table 3-6
metadataObject				measurementQualityInformation
	See Table 3-4			
	metadataWrap			
		See Table 3-5		
		xmlData		
			qualityInformation	Table 3-8

3.3.2.1. Metadata Wrap

Table 3-4: MetadataObject Structure

Name	Value
ID	Values: - processing - generalProductInformation - measurementQualityInformation
classification	Values: - PROVENANCE (for processing) - DESCRIPTION (others)
category	Values: - PDI (for processing) - DMD (others)

Table 3-5: MetadataWrap Structure

Name	Value
contentType	Value: text/xml
vocabularyName	Value: Sentinel-SAFE
textInfo	Values: - Processing (for processing) - General Product Information (for generalProductInformation) - Quality Information (for measurementQualityInformation)

Table 3-6: generalProductInformation Structure

Name	Value
fileName	Full product name (see section 2.2)
fileType	Auxiliary data identification corresponding to the concatenation between the Data Source (2*uc), Processing Level (1*uc) and the Data Type (6*uc) fields of the product name (e.g. SR__ROE_AX, ref. section 2.2)
timeliness	NR for NRT

Name	Value
baselineCollection	_____
familyName	Sentinel-3
Number	An alphanumeric identifier of the platform within the mission. Values: "A", "B", " _"
productSize	Size of the full package
creationTime	Product Creation date Consists of 15 characters, either uppercase letters or digits and is applicable both to the Instrument Data Products and the Auxiliary Data Format: 8 char., all digits, for the date: "YYYYMMDD", year, month, day 1 uppercase T: "T" 6 char., all digits, for the time: "HHMMSS", hour, minutes, seconds
validityStartTime	Time in UTC format when the auxiliary data becomes valid in the PDGS Format: "YYYY-MM-DDTHH:MM:SS.SSSSSSZ"
validityStopTime	Time in UTC format when the auxiliary data becomes invalid in the PDGS Format: "YYYY-MM-DDTHH:MM:SS.SSSSSSZ"

Table 3-7: processing Structure

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value
facility		
	name	Value: - Marine Processing and Archiving Centre [MAR] - Land Processing and Archiving Centre [LN3] - External GNSS Provider [EGP] - CPOD Service [CPOD] - USNO [USN] - NOAA [NOA]
	organisation	Value for each facility: - MAR => European Organisation for the Exploitation of Meteorological Satellites - LN3 => European Space Agency - EGP => External GNSS Provider - POD => Copernicus POD Service - USN => U.S. Naval Observatory - NOA => National Oceanic and Atmospheric Administration
	site	Value for each facility - MAR => Darmstadt - LN3 => Frascati (TBC) - EGP => Tres Cantos - POD => Tres Cantos - USN => Washington - NOA => Silver Spring
	country	Value for each facility - MAR => Germany - LN3 => Italy - EGP => Spain - POD => Spain - USN => U.S. - NOA => U.S.
	hardware	
	name	Name of the hardware in the facility used for the processing Values: - OPE - REF - DEV - REP

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value
	software	
	name	Name of the software component Value: SPOD_SYSTEM_vX.X
	version	The version or release identifier of the software.
resource		
	name	Name of the resource (document)
	role	Description

Table 3-8: qualityInformation Structure

XML Tag Name (Level 1)	XML Tag Name (Level 2)	XML Tag Name (Level 3)	XML Tag Name (Level 4)	Value
qualityInformation				
	Extension			
		adfQuality		
			adfQualityCheck	Online quality flag (based on the results of quality checks). This value is updated by the ADC Value (default): PASSED
			overallProductQuality	Values can be: - NOMINAL (only for NRT Restituted orbit file) - DEGRADED (only for NRT Restituted orbit file) - NOT_AVAILABLE (for others than NRT Restituted orbit file)

3.3.3. DATA OBJECT SECTION

Table 3-9: dataObject Structure

XML Tag Name (Level 1)	XML Tag Name (Level 2)	XML Tag Name (Level 3)	XML Tag Name (Level 4)	Value
dataObject				
	ID			Data Component
	byteStream			
		contentType		The MIME type for the referenced Data Component
		size		Size of the package
		fileLocation		Describe the location of file
			locatorType	URL
			href	Relative path of the file (in the file system) containing the referenced Data Component
		checksum		
			checksumName	

3.3.4. EXAMPLE OF A FILE

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
```

```
<xfd version="http://www.esa/safe/sentinel/1.1/sentinel-3/adf" xmlns:sentinel-3="http://www.esa.int/safe/sentinel/1.1/sentinel-3" xmlns:sentinel-safe="http://www.esa.int/safe/sentinel/1.1" xmlns:sentinel3aux="http://www.esa.int/safe/sentinel/1.1/sentinel-3/adf" xmlns:xfdu="urn:ccsds:schema:xfdu:1">

  <informationPackageMap>
    <xfdu:contentUnit ID="packageUnit" dmdID="generalProductInformation measurementQualityInformation " pdiID="processing" textInfo="SENTINEL-3 ADF" unitType="Information Package">
      <xfdu:contentUnit ID="ADFUnit" textInfo="ADF processed automatically" unitType="Measurement Data Unit">
        <dataObjectPointer dataObjectID="ADFData"/>
      </xfdu:contentUnit>
      <xfdu:contentUnit ID="MetricsAnnotationUnit" textInfo="metrics annotation info" unitType="Annotation Data Unit">
        <dataObjectPointer dataObjectID="MetricsAnnotationData"/>
      </xfdu:contentUnit>
    </xfdu:contentUnit>
  </informationPackageMap>

  <metadataSection>
    <metadataObject ID="generalProductInformation" category="DMD" classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="General Product Information" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel3aux:generalProductInformation>
<sentinel3aux:fileName>S3A_SR__ROE_AX_20131103T162124_20131103T180403_20140206T140224_____MA
R_O_NR____.SEN3</sentinel3aux:fileName>
          <sentinel3aux:fileType>SR__ROE_AX</sentinel3aux:fileType>
          <sentinel3aux:timeliness>NR</sentinel3aux:timeliness>
          <sentinel3aux:baselineCollection>__</sentinel3aux:baselineCollection>
          <sentinel3aux:familyName>Sentinel-3</sentinel3aux:familyName>
          <sentinel3aux:number>A</sentinel3aux:number>
          <sentinel3aux:productSize>98389</sentinel3aux:productSize>
          <sentinel3aux:creationTime>20140206T140224</sentinel3aux:creationTime>
          <sentinel3aux:validityStartTime>2013-11-03T16:21:24.000000Z</sentinel3aux:validityStartTime>
          <sentinel3aux:validityStopTime>2013-11-03T18:04:03.000000Z</sentinel3aux:validityStopTime>
        </sentinel3aux:generalProductInformation>
        </xmlData>
      </metadataWrap>
    </metadataObject>
    <metadataObject ID="processing" category="PDI" classification="PROVENANCE">
      <metadataWrap mimeType="text/xml" textInfo="Processing" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel-safe:processing name="AdfProcessing">
            <sentinel-safe:facility country="Germany" name="Marine Processing and Archiving Centre (MAR)"
organisation="European Organisation for the Exploitation of Meteorological Satellites" site="Darmstadt">
              <sentinel-safe:hardware name="OPE"/>
              <sentinel-safe:software name="S3PODIPF" version="02.15"/>
            </sentinel-safe:facility>
            <sentinel-safe:resource name="S3IPF.PDS.007 - i1r12 - Auxiliary Data Format Specification"
role="Auxiliary Data Specification Document - SRAL Level 1 and 2"/>
            <sentinel-safe:resource
name="S3A_GN_0_GNS____20160602T082818_20160602T100911_20160602T103621_6052_005_007_____MAR_O_NR_001.SEN3"
role="GNSS L0 product"/>
            <sentinel-safe:resource
name="S3A_GN_0_GNS____20160602T100911_20160602T114926_20160602T121605_6014_005_008_____MAR_O_NR_001.SEN3"
role="GNSS L0 product"/>
          </sentinel-safe:processing>
        </xmlData>
      </metadataWrap>
    </metadataObject>
    <metadataObject ID="measurementQualityInformation" category="DMD" classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="Quality Information" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel-safe:qualityInformation>
            <sentinel-safe:extension>
              <sentinel3aux:adfQuality>
                <sentinel3aux:adfQualityCheck>PASSED</sentinel3aux:adfQualityCheck>
                <sentinel3aux:overallProductQuality>NOMINAL</sentinel3aux:overallProductQuality>
              </sentinel3aux:adfQuality>
            </sentinel-safe:extension>
          </sentinel-safe:qualityInformation>
        </xmlData>
      </metadataWrap>
    </metadataObject>
  </metadataSection>
</xfd>
```

```

    </sentinel-safe:extension>
  </sentinel-safe:qualityInformation>
</xmlData>
</metadataWrap>
</metadataObject>
</metadataSection>

<dataObjectSection>
  <dataObject ID="ADFData">
    <byteStream mimeType="application/octet-stream" size="96309">
      <fileLocation
href="S3A_SR__ROE_AX_20131103T162124_20131103T180403_20140206T140224_____MAR_O_NR____.EOF"
locatorType="URL"/>
      <checksum checksumName="CRC">52192</checksum>
    </byteStream>
  </dataObject>
</dataObjectSection>
</xfdu>

```

4. ORBIT FILES

4.1. PREDICTED ORBIT FILE (AUX_PREORB)

4.1.1. MISSION APPLICABILITY

S-1, S-2

4.1.2. DESCRIPTION

This file contains the Orbit State Vectors (OSVs) generated by the orbit determination process of the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite, and are expressed in the Earth-Centred, Earth-Fixed (ECEF) coordinate frame. In the case of Sentinel-2 satellites, the OSVs are only at epochs of Ascending Node Crossings (ANXs), which occur whenever the Spacecraft (S/C) crosses the ECEF equator with positive Z velocity.

4.1.3. DISSEMINATION

This product type is made available to the PDGS of Sentinel-1 and Sentinel-2 by the CPOD Service through the PODIP server.

4.1.4. DATA LATENCY/COVERAGE

For Sentinel-1, the file is generated within 30 minutes from the reception of GNSS data in the CPOD FTP server. One file is generated for every data dump. The file coverage is four orbits from the last ANX present in the GPS L0 input file. The OSVs frequency is 10 seconds.

For Sentinel-2, the file is made available at least 90 minutes before the ANX. The generation frequency is approximately equal to the Sentinel-2 orbital period as its delivery is related to the ANX. As 90 minutes is almost one orbital revolution, this means that the prediction of revolution N will be based on the orbit estimated with GPS data from revolution N-2. The trigger of the generation of the file is based on a prediction of the ANX crossing. Based on the predicted orbit, the time of the next ANXs is predicted and, from there, the deadline for submission of the product is known. Each file covers the next orbital revolution (start and end ANX) plus one orbital revolution of prediction and contains OSVs at the epochs of the ascending node crossings. The accuracy of the product is only ensured for the first orbital revolutions contained in the product. The rest are intended as an overlap with the next products.

4.1.5. ACCURACY

For Sentinel-1, the position accuracy threshold is 1 m 2D 1-sigma RMS (TBC). The 2D refers to the along-track and cross-track directions.

For Sentinel-2, the position accuracy threshold is 10 m 2D 3-sigma RMS. The 2D refers to the along-track and cross-track directions.

4.1.6. DATA VOLUME

S1: 1200 Kbytes

S2: 4 Kbytes

4.1.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2.

Below you can find an example of a Predicted Orbit file name for S-1A and for S-2A:

S1A_OPER_AUX_PREORB_OPOD_20100101T000000_V20100101T010000_20100101T020000.EOF

S2A_OPER_AUX_PREORB_OPOD_20100101T000000_V20100101T010000_20100101T020000.EOF

4.1.8. DATA STRUCTURE AND DEFINITION

The Predicted Orbit File is formatted using XML-tags. Each Predicted Orbit File consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.1.8.1. XML Fixed Header Section

Table 4-1: Predicted Orbit File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		NRT POD Predicted Orbit File	
Notes		Variable	Free Text
Mission		Sentinel-MU	11 characters string with the following form: Sentinel-MU where: • "Sentinel-" is a fixed string; • M = the second character of the Mission ID specified within the File Name (Section 2); • U = the third character of the Mission ID specified within the File Name (Section 2).
File_Class		Variable	Consistent with file class in Section 2.
File_Type		AUX_PREORB	Same as File Type in Section 2.
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. Format: • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. Format: • UTC=yyyy-mm-ddThh:mm:ss
File_Version		0001	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	OPOD	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	OPOD	Corresponds to the facility deployed on the Site Centre that generated the file
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	Date of creation. Format: • UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2)

4.1.8.2. Variable Header Section

Table 4-2: Predicted Orbit File – Variable Header

XML Tag (Level 1)	Name	XML Tag (Level 2)	Name	Value	Description
Ref_Frame				EARTH_FIXED	Coordinate Frame ID
Time_Reference				UTC	Time Reference ID

4.1.8.3. Data Block Section

One Data set consists of one list of OSVs in ASCII xml format.

Table 4-3: Predicted Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	list	See Table below for elements content.

Table 4-4: Predicted Orbit File – OSV

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter This counter is incremented by a single unit when crossing the earth-fixed ascending node.
X	float	m	%+012.3lf	X position in earth-fixed coordinate system.
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system.
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system.
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system.
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system.
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system.
Quality	String		%s	Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP See next section for a complete definition of each possible value

4.1.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned

during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product Predicted Orbit File:

- Default quality flag value: NOMINAL
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (Value: DEGRADED-OBSPERCENTAGE)
- Number of processed observations during the orbital revolution being processed (Value: DEGRADED-OBSNUMBER)
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (Value: DEGRADED-OBSRESIDUALS)
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (Value: DEGRADED-MANOEUVRE)
- Use of navigation solution from the GPS receiver due to the complete lack of GPS observables (code and phase) (Value: DEGRADED-NAVSOL)
- Size of potential gap around a given epoch (Value: DEGRADED-GAP)

4.1.8.5. Example of a File for Sentinel-1

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S1A_OPER_AUX_PREORB_OPOD_20190905T120728_V20190419T071019_20190419T152409</File_Name>
    <File_Description>NRT POD Predicted Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-1A</Mission>
    <File_Class>OPER</File_Class>
    <File_Type>AUX_PREORB</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2019-04-19T07:10:19</Validity_Start>
      <Validity_Stop>UTC=2019-04-19T15:24:09</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>OPOD</System>
      <Creator>OPOD</Creator>
      <Creator_Version>0.0</Creator_Version>
      <Creation_Date>UTC=2019-09-05T12:07:28</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    <Ref_Frame>EARTH_FIXED</Ref_Frame>
    <Time_Reference>UTC</Time_Reference>
  </Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="2964">
    <OSV>
      <TAI>TAI=2019-04-19T07:10:56.199682</TAI>
      <UTC>UTC=2019-04-19T07:10:19.199682</UTC>
      <UT1>UT1=2019-04-19T07:10:19.059813</UT1>
      <Absolute_Orbit>+26856</Absolute_Orbit>
      <X unit="m">-6755083.490307</X>
      <Y unit="m">2109174.384640</Y>
      <Z unit="m">-0.072348</Z>
```

```

    <VX unit="m/s">480.556559</VX>
    <VY unit="m/s">1509.240629</VY>
    <VZ unit="m/s">7430.554117</VZ>
    <Quality>NOMINAL</Quality>
  </OSV>
  <OSV>
    <TAI>TAI=2019-04-19T07:11:06.199682</TAI>
    <UTC>UTC=2019-04-19T07:10:29.199682</UTC>
    <UT1>UT1=2019-04-19T07:10:29.059813</UT1>
    <Absolute_Orbit>+26856</Absolute_Orbit>
    <X unit="m">-6749888.474623</X>
    <Y unit="m">2124144.609357</Y>
    <Z unit="m">74304.067104</Z>
    <VX unit="m/s">558.431402</VX>
    <VY unit="m/s">1484.757280</VY>
    <VZ unit="m/s">7430.133937</VZ>
    <Quality>NOMINAL</Quality>
  </OSV>
...
</List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.1.8.6. Example of a File for Sentinel-2

```

<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>
      <File_Name>
S2A_OPER_AUX_PREORB_OPOD_20071116T130432_V20160306T000000_20160313T010000</File_Name>
      <File_Description>Predicted Orbit File</File_Description>
      <Notes></Notes>
      <Mission>Sentinel-2A</Mission>
      <File_Class>OPER</File_Class>
      <File_Type>AUX_PREORB</File_Type>
      <Validity_Period>
        <Validity_Start>UTC=2016-03-06T00:00:00</Validity_Start>
        <Validity_Stop>UTC=2016-03-13T01:00:00</Validity_Stop>
      </Validity_Period>
      <File_Version>0001</File_Version>
      <Source>
        <System>OPOD</System>
        <Creator>OPOD</Creator>
        <Creator_Version>1.0</Creator_Version>
        <Creation_Date>UTC=2007-11-16T13:04:32</Creation_Date>
      </Source>
    </Fixed_Header>
    <Variable_Header>
      <Ref_Frame>EARTH-FIXED</Ref_Frame>
      <Time_Reference>UTC</Time_Reference>
    </Variable_Header>
  </Earth_Explorer_Header>
  <Data_Block type="xml">
    <List_of_OSVs count="110">
      <OSV>
        <TAI>TAI=2016-03-06T00:36:53.959000</TAI>

```



```

<UTC>UTC=2016-03-06T00:36:19.959000</UTC>
<UT1>UT1=2016-03-06T00:36:20.068000</UT1>
<Absolute_Orbit>+42244</Absolute_Orbit>
<X unit="m">-1069530.706</X>
<Y unit="m">-6689213.247</Y>
<Z unit="m">+0002623.994</Z>
<VX unit="m/s">-1410.364622</VX>
<VY unit="m/s">+0238.533479</VY>
<VZ unit="m/s">+7615.362798</VZ>
<Quality>NOMINAL</Quality>
</OSV>
<OSV>
<TAI>TAI=2016-03-06T02:09:22.659000</TAI>
<UTC>UTC=2016-03-06T02:08:48.659000</UTC>
<UT1>UT1=2016-03-06T02:08:48.768000</UT1>
<Absolute_Orbit>+42245</Absolute_Orbit>
<X unit="m">-3610035.328</X>
<Y unit="m">-5731945.800</Y>
<Z unit="m">+0002614.761</Z>
<VX unit="m/s">-1203.476302</VX>
<VY unit="m/s">+0773.248416</VY>
<VZ unit="m/s">+7615.498893</VZ>
<Quality>NOMINAL</Quality>
</OSV>
...
</List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.2. RESTITUTED ORBIT FILE (AUX_RESORB)

4.2.1. MISSION APPLICABILITY

S-1, S-2

4.2.2. DESCRIPTION

This file contains the Restituted Orbit State Vectors (OSVs) based on the orbit determination performed by the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite and are expressed in the Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

4.2.3. DISSEMINATION

The file is made available to the PDGS of Sentinel-1 and Sentinel-2 by the CPOD Service through the PODIP server and it is used for generating Sentinel-1 and Sentinel-2 Mission products.

Note: for Sentinel-3, a similar file is generated by the CPOD Service (see Section 4.5 for further information). For Sentinel-6, a similar file is generated by the CPOD Service (see Section 4.6 for further information).

4.2.4. DATA LATENCY/COVERAGE

For Sentinel-1, the file is generated within 3 hours from reception of GNSS data in the CPOD FTP server. One file is generated for every data dump. The file coverage is one satellite orbit, from the last Ascending Node Crossing (ANX) present in the GNSS L0 input file plus an overlap of 593 OSVs before the satellite orbit time span, which covers another satellite orbit. The OSVs frequency is 10 seconds. Consecutive GNSS L0 products have a large overlap and do not cover an integer number of satellite orbits. Only complete restituted orbit files not covered by the previous GNSS L0 product are generated and delivered on the pick-up point following each GNSS L0 reception.

For Sentinel-2, the file is generated within 30 minutes from the reception of GNSS data in the CPOD FTP server. One file is generated for every dump. The file coverage is equal to the latest Position, Velocity and Timing (PVT) contained within the received satellite ancillary data that triggers such generation with 2 orbits backwards. The OSVs frequency is 30 seconds. In addition, 5 OSVs are added after the period of the latest PVT.

4.2.5. ACCURACY

For Sentinel-1, the position accuracy threshold is 10 cm 2D 1-sigma RMS. The 2D refers to the along-track and cross-track directions.

For Sentinel-2, the position accuracy threshold is 3 m 3D 3-sigma RMS.

4.2.6. DATA VOLUME

S1: 552 Kbytes

S2: 196 Kbytes.

4.2.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2.

Below you can find an example of a Restituted Orbit File name for Sentinel-1 and Sentinel-2 missions:

S1A_OPER_AUX_RESORB_OPOD_20100101T000000_V20100101T010000_20100101T020000.EOF

S2A_OPER_AUX_RESORB_OPOD_20100101T000000_V20100101T010000_20100101T020000.EOF

4.2.8. DATA STRUCTURE AND DEFINITION

The Restituted Orbit File is formatted using XML-tags and has the same format as the Predicted Orbit File. Each Restituted Orbit File consists of a single file (*.EOF) containing both the Header and the Data Block Sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.2.8.1. XML Fixed Header Section

Table 4-5: Restituted Orbit File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		NRT POD Restituted Orbit File	
Notes		Variable	Free Text.
Mission		Sentinel-MU	11 characters string with the following form: Sentinel-MU where: • "Sentinel-" is a fixed string; • M = the second character of the Mission ID specified within the File Name (Section 2); • U = the third character of the Mission ID specified within the File Name (Section 2).
File_Class		Variable	Consistent with File Class in Section 2.
File_Type		AUX_RESORB	Same as File Type in Section 2.
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. Format: • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. . Format: • UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	OPOD	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	OPOD	Corresponds to the facility deployed on the Site Centre that generated the file (OPOD for the CPOD Service).
	Creator_Version	Variable	Version of the service software generating the product.
	Creation_Date	Variable	Date of creation. Format: • UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2).

4.2.8.2. Variable Header Section

Table 4-6: Restituted Orbit File – Variable Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Ref_Frame		EARTH_FIXED	Coordinate Frame ID
Time_Reference		UTC	Time Reference ID

4.2.8.3. Data Block Section

One Data set consists of one list of OSVs in ASCII XML format.

Table 4-7: Restituted Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	list	See Table below for the content of elements.

Table 4-8: Restituted Orbit File – OSV

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter This counter is incremented by a single unit when crossing the earth-fixed ascending node.
X	float	m	%+012.3lf	X position in earth-fixed coordinate system.
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system.
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system.
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system.
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system.
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system.
Quality	string		%s	Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP See next section for a complete definition of each possible value

4.2.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product Restituted Orbit File:

- Default quality flag value: NOMINAL.
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (value: DEGRADED-OBSPERCENTAGE).
- Number of processed observations during the orbital revolution being processed (value: DEGRADED-OBSNUMBER).
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (value: DEGRADED-OBSRESIDUALS).
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (value: DEGRADED-MANOEUVRE).
- Use of navigation solution from the GPS receiver due to the complete lack of GPS observables (code and phase) (value: DEGRADED-NAVSOL).
- Size of potential gap around a given epoch (value: DEGRADED-GAP).

4.2.8.5. Example of a File for Sentinel-1

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
<Earth_Explorer_Header>
  <Fixed_Header>
    <File_Name>S1A_OPER_AUX_RESORB_OPOD_20120101T030000_V20111231T215720_20120101T011440</File_Name>
    <File_Description>POD Restituted Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-1A</Mission>
    <File_Class>OPER</File_Class>
    <File_Type>AUX_RESORB</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2011-12-31T21:57:20</Validity_Start>
      <Validity_Stop>UTC=2012-01-01T01:14:40</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>OPOD</System>
      <Creator>OPOD</Creator>
      <Creator_Version>1.0</Creator_Version>
      <Creation_Date>UTC=2012-01-01T03:00:00</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    <Ref_Frame>EARTH_FIXED</Ref_Frame>
    <Time_Reference>UTC</Time_Reference>
  </Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="1185">
    <OSV>
      <TAI>TAI=2011-12-31T21:57:54.000000</TAI>
      <UTC>UTC=2011-12-31T21:57:20.000000</UTC>
      <UT1>UT1=2011-12-31T21:57:20.000002</UT1>
      <Absolute_Orbit>+01767</Absolute_Orbit>
      <X unit="m">+3647461.238</X>
      <Y unit="m">-6055786.165</Y>
      <Z unit="m">-0333545.604</Z>
      <VX unit="m/s">-1181.021623</VX>
      <VY unit="m/s">-1110.141649</VY>
```

```

    <VZ unit="m/s">+7421.878362</VZ>
    <Quality>NOMINAL</Quality>
  </OSV>
</OSV>
  <TAI>TAI=2011-12-31T21:58:04.000000</TAI>
  <UTC>UTC=2011-12-31T21:57:30.000000</UTC>
  <UT1>UT1=2011-12-31T21:57:30.000002</UT1>
  <Absolute_Orbit>+01767</Absolute_Orbit>
  <X unit="m">+3635438.930</X>
  <Y unit="m">-6066539.396</Y>
  <Z unit="m">-0259309.274</Z>
  <VX unit="m/s">-1223.397364</VX>
  <VY unit="m/s">-1040.464602</VY>
  <VZ unit="m/s">+7425.224765</VZ>
  <Quality>NOMINAL</Quality>
</OSV>
...
</List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.2.8.6. Example of a File for Sentinel-2

```

<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>
      <File_Name>
S2A_OPER_AUX_RESORB_OPOD_20100101T000000_V20160306T000000_20160313T010000</File_Name>
      <File_Description>POD Restituted Orbit File</File_Description>
      <Notes></Notes>
      <Mission> Sentinel-2A</Mission>
      <File_Class>OPER</File_Class>
      <File_Type>AUX_RESORB</File_Type>
      <Validity_Period>
        <Validity_Start>UTC=2016-03-06T00:00:00</Validity_Start>
        <Validity_Stop>UTC=2016-03-13T01:00:00</Validity_Stop>
      </Validity_Period>
      <File_Version>0001</File_Version>
      <Source>
        <System>OPOD</System>
        <Creator>OPOD</Creator>
        <Creator_Version>1.0</Creator_Version>
        <Creation_Date>UTC=2010-01-01T00:00:00</Creation_Date>
      </Source>
    </Fixed_Header>
    <Variable_Header>
      <Ref_Frame>EARTH-FIXED</Ref_Frame>
      <Time_Reference>UTC</Time_Reference>
    </Variable_Header>
  </Earth_Explorer_Header>
  <Data_Block type="xml">
    <List_of_OSVs count="10141">
      <OSV>
        <TAI>TAI=2016-03-06T00:00:34.000000</TAI>
        <UTC>UTC=2016-03-06T00:00:00.000000</UTC>
        <UT1>UT1=2016-03-06T00:00:00.109000</UT1>

```

```

<Absolute_Orbit>+42243</Absolute_Orbit>
<X unit="m">+0519641.779</X>
<Y unit="m">+5278659.929</Y>
<Z unit="m">-4220599.988</Z>
<VX unit="m/s">+1113.622468</VX>
<VY unit="m/s">-4842.338815</VY>
<VZ unit="m/s">-5925.935594</VZ>
<Quality>NOMINAL</Quality>
</OSV>
<OSV>
<TAI>TAI=2016-03-06T00:01:34.000000</TAI>
<UTC>UTC=2016-03-06T00:01:00.000000</UTC>
<UT1>UT1=2016-03-06T00:01:00.109000</UT1>
<Absolute_Orbit>+42243</Absolute_Orbit>
<X unit="m">+0583912.227</X>
<Y unit="m">+4975970.019</Y>
<Z unit="m">-4566150.959</Z>
<VX unit="m/s">+1027.326972</VX>
<VY unit="m/s">-5243.308832</VY>
<VZ unit="m/s">-5588.035384</VZ>
<Quality>NOMINAL</Quality>
</OSV>
...
</List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.3. MEDIUM ORBIT EPHEMERIDES (MOE) ORBIT FILE (AUX_MOEORB)

4.3.1. MISSION APPLICABILITY

S-3

4.3.2. DESCRIPTION

This file contains the Medium Orbit Ephemerides (MOE), corresponding to the Preliminary Restituted Orbit State Vectors (OSVs) based on the orbit determination performed by the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite and are expressed in the Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

4.3.3. DISSEMINATION

The file is made available to the Sentinel-3 PDGS by the CPOD Service through the PODIP server (for the S-3 Land centre) and the CPOD FTP server (for the S-3 Marine centre) and it is used for generating Level 2 SRAL STC Mission products.

4.3.4. DATA LATENCY/COVERAGE

One file is generated per day covering 26 hours with OSVs from d-2 at 22 h (GPS time) to d-1 at 24 h (GPS time) for the product delivered on day d. The product is made available before mid-day of day d, 36 hours/1.5 days with respect to the first epoch contained in the orbital product. The OSVs frequency is 10 seconds.

4.3.5. ACCURACY

The position accuracy threshold is 4 cm radial 1-sigma RMS (with a target accuracy threshold of 3cm).

4.3.6. DATA VOLUME

S3: 4.3 Mbytes.

4.3.7. NAMING CONVENTION

4.3.7.1. Naming Convention for the CPOD Service

The applicable file naming convention is defined in [AD.2] and detailed in Section 2. .

Below you can find an example of a MOE Orbit File name:

S3A_OPER_AUX_MOEORB_POD__20151215T031941_V20151212T215943_20151213T235943_DGNS.EOF

4.3.7.2. Naming Convention for the Sentinel-3 PDGS File

Upon arrival of the file described in Section 4.3.7.1, the ADC will move that file into a folder following the Sentinel-3 PDGS File Naming Convention [AD.1]. All naming elements have been detailed in Table 4-9.

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

Where:

Table 4-9: Naming element description for Medium Orbit Ephemerides file

Parameter	Value	Description
MMM	S3[A/B]	For Sentinel-3A or -3B.
SS	SR	Data consumer: SRAL.

Parameter	Value	Description
L	_	Processing Level not applicable.
TTTTTT	MGNPAX	Data Type ID; Medium Orbit Ephemerides (MOE) Orbit File.
yyyymmddThhmmss		Validity start time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Validity stop time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Creation date of the file, in CCSDS compact format.
<instance ID>	17 underscores "_"	N/A
GGG	POD	CPOD Service
<class ID>	P_XX_NNN	Where: • P = "O" for operational; "D" for development • XX = "ST" for STC • NNN = POD for Precise Orbit Determination (i.e. data usage)
<extension>	SEN3	Sentinel-3

Below you can find an example of a MOE Orbit File name for S-3 PDGS:

S3A_SR_MGNPAX_20151212T215943_20151213T235943_20151215T031941_POD_O_ST_POD.SEN3

4.3.8. DATA STRUCTURE AND DEFINITION

The MOE Orbit File is formatted using XML-tags and has the same format as the Predicted Orbit File. Each MOE Orbit File consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.3.8.1. XML Fixed Header Section

Table 4-10: MOE Orbit File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		Medium Orbit Ephemerides (MOE) Orbit File	
Notes		Variable	Free Text
Mission		Sentinel-MU	11 characters string with the following form: Sentinel-MU where: • "Sentinel-" is a fixed string; • M = the second character of the Mission ID specified within the File Name (Section 2); • U = the third character of the Mission ID specified within the File Name (Section 2).
File_Class		Variable	Consistent with File Class in Section 2.
File_Type		AUX_MOEORB	Same as File Type in Section 2.
Validity_Period			

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. Format: UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. Format: UTC=yyyy-mm-ddThh:mm:ss
File_Version		0001	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	POD_	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	POD_	Corresponds to the facility deployed on the Site Centre that generated the file.
	Creator_Version	Variable	Version of the service software generating the product.
	Creation_Date	Variable	Date of creation. Format: UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2).

4.3.8.2. Variable Header Section

Table 4-11: MOE Orbit File – Variable Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Source_Data		Variable	Same as Optional Suffix Data Source Section 2: - DGNS: GNSS only solution - DG_S: GNSS+SLR solution
Ref_Frame		EARTH_FIXED	Coordinate Frame ID
Time_Reference		UTC	Time Reference ID

4.3.8.3. Data Block Section

One Data set consists of one list of OSVs in ASCII XML format

Table 4-12: MOE Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	list	See Table below for the content of elements.

Table 4-13: MOE Orbit File – OSV

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss

XML Tag Name	Type	Unit	C Format	Description
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter This counter is incremented by a single unit when crossing the earth-fixed ascending node.
X	float	m	%+012.3lf	X position in earth-fixed coordinate system.
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system.
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system.
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system.
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system.
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system.
Quality	String		%s	Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP - DEGRADED-OVERLAP See next section for a complete definition of each possible value

4.3.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product MOE Orbit File:

- Default quality flag value: NOMINAL.
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (value: DEGRADED-OBSPERCENTAGE).
- Number of processed observations during the orbital revolution being processed (value: DEGRADED-OBSNUMBER).
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (value: DEGRADED-OBSRESIDUALS).
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (value: DEGRADED-MANOEUVRE).
- Use of navigation solution from the GPS receiver due to the complete lack of GPS observables (code and phase) (value: DEGRADED-NAVSOL).
- Size of potential gap around a given epoch (value: DEGRADED-GAP).
- Root-mean-square of the orbit position differences in the overlap with the previous solution (value: DEGRADED-OVERLAP).

4.3.8.5. Example of a File

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S3A_OPER_AUX_MOEORB_POD__20151215T031941_V20151212T215943_20151213T235943_DGNS</File_Name>
```

```

<File_Description>Medium Orbit Ephemerides (MOE) Orbit File</File_Description>
<Notes></Notes>
<Mission>Sentinel-3A</Mission>
<File_Class>OPER</File_Class>
<File_Type>AUX_MOEORB</File_Type>
<Validity_Period>
  <Validity_Start>UTC=2015-12-12T21:59:43</Validity_Start>
  <Validity_Stop>UTC=2015-12-13T23:59:43</Validity_Stop>
</Validity_Period>
<File_Version>0001</File_Version>
<Source>
  <System>POD_</System>
  <Creator>POD_</Creator>
  <Creator_Version>0.9.6</Creator_Version>
  <Creation_Date>UTC=2015-12-15T03:19:41</Creation_Date>
</Source>
</Fixed_Header>
<Variable_Header>
  <Source_Data>DGNS</Source_Data>
  <Ref_Frame>EARTH_FIXED</Ref_Frame>
  <Time_Reference>UTC</Time_Reference>
</Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="9361">
    <OSV>
      <TAI>TAI=2015-12-12T22:00:19.000000</TAI>
      <UTC>UTC=2015-12-12T21:59:43.000000</UTC>
      <UT1>UT1=2015-12-12T21:59:43.113504</UT1>
      <Absolute_Orbit>+00003</Absolute_Orbit>
      <X unit="m">2262094.562479</X>
      <Y unit="m">1025799.638601</Y>
      <Z unit="m">-6746083.550147</Z>
      <VX unit="m/s">7133.731453</VX>
      <VY unit="m/s">-509.001651</VY>
      <VZ unit="m/s">2315.382397</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
    <OSV>
      <TAI>TAI=2015-12-12T22:00:29.000000</TAI>
      <UTC>UTC=2015-12-12T21:59:53.000000</UTC>
      <UT1>UT1=2015-12-12T21:59:53.113504</UT1>
      <Absolute_Orbit>+00003</Absolute_Orbit>
      <X unit="m">2333306.625649</X>
      <Y unit="m">1020603.236375</Y>
      <Z unit="m">-6722568.882121</Z>
      <VX unit="m/s">7108.549655</VX>
      <VY unit="m/s">-530.263526</VY>
      <VZ unit="m/s">2387.509729</VZ>
      <Quality>DEGRADED-OBSRESIDUALS</Quality>
    </OSV>
    ...
  </List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.4. PRECISE ORBIT EPHEMERIDES (POE) ORBIT FILE (AUX_POEORB)

4.4.1. MISSION APPLICABILITY

S-1, S-3

4.4.2. DESCRIPTION

This file contains the Precise Orbit Ephemerides (POE) Orbit State Vectors (OSVs) based on the orbit determination performed by the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite and are expressed in Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

4.4.3. DISSEMINATION

The file is made available to the PDGSs of Sentinel-1 and Sentinel-3 by the CPOD Service through the PODIP server (for Sentinel-1 and Sentinel-3 Land centre) and the CPOD FTP server (for Sentinel-3 Marine centre) and it is used for supporting the generation of the following Mission Products: Sentinel-1 off-line SAR Mission Products and Sentinel-3 Level 2 SRAL NTC Mission Products.

4.4.4. DATA LATENCY/COVERAGE

For Sentinel-1, one file is generated per day covering 26 hours (one complete day in GPS time, plus 1 hour before the start and after the end of the day – overlap of two hours between consecutive files). The file is made available 20 days after data acquisition, which translates into a total timeliness threshold of 21 days with respect to the first epoch contained in the orbital product. The OSVs frequency is 10 seconds.

For Sentinel-3, one file is generated per day covering 26 hours (one complete day in GPS time, plus 2 hours before the start of the day – overlap of two hours between consecutive files). The file is made available 25 days after data acquisition, which translates into a total timeliness threshold of 26 days with respect to the first epoch contained in the orbital product. The OSVs frequency is 10 seconds.

4.4.5. ACCURACY

For Sentinel-1, the position accuracy threshold is 5 cm 3D 1-sigma RMS.

For Sentinel-3, the position accuracy threshold is 3 cm radial 1-sigma RMS (with a target accuracy threshold of 2 cm).

4.4.6. DATA VOLUME

S1, S3: 4.3 Mbytes.

4.4.7. NAMING CONVENTION

4.4.7.1. Naming Convention for the CPOD Service

The applicable file naming convention is defined in [AD.2] and detailed in Section 2. .

Below you can find an example of POE Orbit File names for Sentinel-1 and Sentinel-3 missions:

S1A_OPER_AUX_POEORB_OPOD_20151215T072731_V20151212T215943_20151213T235943.EOF

S3A_OPER_AUX_POEORB_POD__20151215T072731_V20151212T215943_20151213T235943_DGNS.EOF

4.4.7.2. Naming Convention for the Sentinel-3 PDGS File

Upon arrival of the file described in Section 4.4.7.1, the ADC will move that file into a folder following the Sentinel-3 PDGS File Naming Convention [AD.1]. All naming elements have been detailed in Table 4-14:

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

Where:

Table 4-14: Naming element description for Precise Orbit Ephemerides file

Parameter	Value	Description
MMM	S3[A/B]	For Sentinel-3A or -3B.
SS	SR	Data consumer: SRAL.
L	_	Processing Level not applicable.
TTTTTT	POEPAX	Data Type ID; Precise Orbit Ephemerides (POE) Orbit File.
yyymmddThhmmss		Validity start time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Validity stop time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Creation date of the file, in CCSDS compact format.
<instance ID>	17 underscores " _ "	N/A
GGG	POD	CPOD Service
<class ID>	P_XX_NNN	Where: - P = "O" for operational; "D" for development - XX = "NT" for NTC - NNN = POD for Precise Orbit Determination (i.e. data usage)
<extension>	SEN3	Sentinel-3

Below you can find an example of a POE Orbit File name for S-3 PDGS:

S3A_SR__POEPAX_20151212T215943_20151213T235943_20151215T072731_____
_____POD_O_NT_POD.SEN3

4.4.8. DATA STRUCTURE AND DEFINITION

The POE orbit File is formatted using XML-tags and has the same format as the Predicted Orbit File. Each POE Orbit File consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.4.8.1. XML Fixed Header Section

Table 4-15: POE Orbit File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		Precise Orbit Ephemerides (POE) Orbit File	
Notes		Variable	Free Text
Mission		Sentinel-MU	11 characters string with the following form: Sentinel-MU where: • "Sentinel-" is a fixed string;

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
			- M = the second character of the Mission ID specified within the File Name (Section 2); - U = the third character of the Mission ID specified within the File Name (Section 2).
File_Class		Variable	Consistent with File Class in Section 2.
File_Type		AUX_POEORB	Same as File Type in Section 2.
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. . Format: UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. . Format: UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	OPOD (for S-1) POD_ (for S-3)	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	OPOD (for S-1) POD_ (for S-3)	Corresponds to the facility deployed on the Site Centre that generated the file.
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	Date of creation. Format: UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2).

4.4.8.2. Variable Header Section

Table 4-16: POE Orbit File – Variable Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Source_Data1		Variable	Same as Optional Suffix Data Source Section 2. - DGNS: GNSS only solution - DG_S: GNSS+SLR solution
Ref_Frame		EARTH_FIXED	Coordinate Frame ID
Time_Reference		UTC	Time Reference ID

¹ Applicable only for Sentinel-3 POE Orbit Files

4.4.8.3. Data Block Section

One Data set consists of one list of OSVs in ASCII XML format.

Table 4-17: POE Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	list	See Table below for the content of elements.

Table 4-18: POE Orbit File – OSV

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter. This counter is incremented by a single unit when crossing the earth-fixed ascending node.
X	float	m	%+012.3lf	X position in earth-fixed coordinate system.
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system.
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system.
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system.
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system.
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system.
Quality	string		%s	Quality flag indicating the quality status of the product Possible values are: - NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP - DEGRADED-OVERLAP See next section for a complete definition of each possible value

4.4.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product POE Orbit File:

- Default quality flag value: NOMINAL.
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (value: DEGRADED-OBSPERCENTAGE).

- Number of processed observations during the orbital revolution being processed (value: DEGRADED-OBSNUMBER).
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (value: DEGRADED-OBSRESIDUALS).
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (value: DEGRADED-MANOEUVRE).
- Use of navigation solution from the GPS receiver due to the complete lack of GPS observables (code and phase) (value: DEGRADED-NAVSOL).
- Size of potential gap around a given epoch (value: DEGRADED-GAP).
- Root-mean-square of the orbit position differences in the overlap with the previous solution (value: DEGRADED-OVERLAP).

4.4.8.5. Example of a File for Sentinel-1

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S1A_OPER_AUX_POEORB_OPOD_20140516T121444_V20140424T225936_20140426T005939</File_Name>
    <File_Description>Precise Orbit Ephemerides (POE) Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-1A</Mission>
    <File_Class>OPER</File_Class>
    <File_Type>AUX_POEORB</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2014-04-24T22:59:36</Validity_Start>
      <Validity_Stop>UTC=2014-04-26T00:59:39</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>OPOD</System>
      <Creator>OPOD</Creator>
      <Creator_Version>0.7.9</Creator_Version>
      <Creation_Date>UTC=2014-05-16T12:14:44</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    <Ref_Frame>EARTH_FIXED</Ref_Frame>
    <Time_Reference>UTC</Time_Reference>
  </Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="3808">
    <OSV>
      <TAI>TAI=2014-04-24T23:00:11.181000</TAI>
      <UTC>UTC=2014-04-24T22:59:36.181000</UTC>
      <UT1>UT1=2014-04-24T22:59:35.943583</UT1>
      <Absolute_Orbit>+307</Absolute_Orbit>
      <X unit="m">2057221.260411</X>
      <Y unit="m">-5248334.960752</Y>
      <Z unit="m">-4270684.609420</Z>
      <VX unit="m/s">-1.414621</VX>
      <VY unit="m/s">-4786.161806</VY>
      <VZ unit="m/s">5888.124977</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
  </List_of_OSVs>
</Data_Block>
```

```

    <TAI>TAI=2014-04-24T23:00:35.854000</TAI>
    <UTC>UTC=2014-04-24T23:00:00.854000</UTC>
    <UT1>UT1=2014-04-24T23:00:00.616582</UT1>
    <Absolute_Orbit>+307</Absolute_Orbit>
    <X unit="m">2056274.539326</X>
    <Y unit="m">-5364619.609372</Y>
    <Z unit="m">-4123956.394256</Z>
    <VX unit="m/s">-75.236411</VX>
    <VY unit="m/s">-4639.317814</VY>
    <VZ unit="m/s">6005.026501</VZ>
    <Quality>NOMINAL</Quality>
  </OSV>
...
  </List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

4.4.8.6. Example of a File for Sentinel-3

```

<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S3A_OPER_AUX_POEORB_POD__20151215T072731_V20151212T215943_20151213T235943_DGNS</File_Name>

    <File_Description>Precise Orbit Ephemerides (POE) Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-3A</Mission>
    <File_Class>OPER</File_Class>
    <File_Type>AUX_POEORB</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2015-12-12T21:59:43</Validity_Start>
      <Validity_Stop>UTC=2015-12-13T23:59:43</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>POD</System>
      <Creator>POD</Creator>
      <Creator_Version>0.9.6</Creator_Version>
      <Creation_Date>UTC=2015-12-15T07:27:31</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    <Source_Data>DGNS</Source_Data>
    <Ref_Frame>EARTH_FIXED</Ref_Frame>
    <Time_Reference>UTC</Time_Reference>
  </Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="9361">
    <OSV>
      <TAI>TAI=2015-12-12T22:00:19.000000</TAI>
      <UTC>UTC=2015-12-12T21:59:43.000000</UTC>
      <UT1>UT1=2015-12-12T21:59:43.113504</UT1>
      <Absolute_Orbit>+00003</Absolute_Orbit>

```

```
<X unit="m">2262094.562358</X>
<Y unit="m">1025799.638557</Y>
<Z unit="m">-6746083.549787</Z>
<VX unit="m/s">7133.731453</VX>
<VY unit="m/s">-509.001651</VY>
<VZ unit="m/s">2315.382396</VZ>
<Quality>NOMINAL</Quality>
</OSV>
<OSV>
  <TAI>TAI=2015-12-12T22:00:29.000000</TAI>
  <UTC>UTC=2015-12-12T21:59:53.000000</UTC>
  <UT1>UT1=2015-12-12T21:59:53.113504</UT1>
  <Absolute_Orbit>+00003</Absolute_Orbit>
  <X unit="m">2333306.625531</X>
  <Y unit="m">1020603.236331</Y>
  <Z unit="m">-6722568.881763</Z>
  <VX unit="m/s">7108.549656</VX>
  <VY unit="m/s">-530.263526</VY>
  <VZ unit="m/s">2387.509729</VZ>
  <Quality>DEGRADED-OBSRESIDUALS</Quality>
</OSV>
...
</List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>
```

4.5. NRT RESTITUTED ORBIT FILE FOR SENTINEL-3 (SR__ROE_AX)

4.5.1. MISSION APPLICABILITY

S-3

4.5.2. DESCRIPTION

This file contains the NRT Restituted Orbit State Vectors (OSVs) based on the orbit determination performed by the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite and are expressed in Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

4.5.3. DISSEMINATION

The file is made available to the S-3 PDGS by the CPOD Service through the PODIP server (for the S-3 Land centre) and the CPOD FTP server (for the S-3 Marine centre²). The file is used for supporting the generation of Sentinel-3 NRT SRAL Level 1 and Level 2 Products.

4.5.4. DATA LATENCY/COVERAGE

One file is generated for each GNSS Level-0 data dump within 30 minutes from the reception of the GNSS input data. The coverage of each file is equal to the input file coverage (GNSS data) plus 5 OSVs before and after the coverage of the GNSS input data. The OSVs frequency is 10 seconds.

4.5.5. ACCURACY

The position accuracy threshold is 10 cm radial 1-sigma RMS (with a target accuracy threshold of 8 cm).

4.5.6. DATA VOLUME

S3: 410 Kbytes.

4.5.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.1] and detailed in Section 2. All naming elements have been detailed in Table 4-19:

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

Where:

Table 4-19: Naming element description for NRT Restituted Orbit File

Parameter	Value	Description
MMM	S3[A/B]	For Sentinel-3A or -3B.
SS	SR	Data consumer: SRAL
L	_	Processing Level not applicable.
TTTTTT	ROE_AX	Data Type ID; NRT Restituted Orbit File for S-3.
yyymmddThhmmss		Validity start time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Validity stop time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Creation date of the file, in CCSDS compact format.
<instance ID>	17 underscores "_"	N/A

² The dissemination to the Marine centre will be ready before the end of 2022; meanwhile, this product will be computed directly on the Marine centre by the S-3 NRT POD IPF Facility.

Parameter	Value	Description
GGG	MAR/LN3/POD	MAR = Marine Processing and Archiving Centre LN3 = Land Processing and Archiving Centre POD = CPOD Service
<class ID>	P_XX_NNN	Where: - P = "O" for operational; "D" for development - XX = "NR" for NRT - NNN = Not relevant
<extension>	SEN3	Sentinel-3

Below you can find an example of a NRT Restituted Orbit File name for S-3A:

S3A_SR__ROE_AX_20131103T162124_20131103T180354_20140414T093803_____MAR_O_NR____.SEN3

4.5.8. DATA STRUCTURE AND DEFINITION

The NRT Restituted Orbit File for Sentinel-3 is composed by:

- A manifest file, with a fix filename: **xfdumanifest.xml**;
- A measurement data file containing the NRT Restituted Orbit File for Sentinel-3, with a filename equal to the NRT Restituted Orbit File product (section 4.5.7) but changing the *extension* to **EOF**;

See example below:

S3A_SR__ROE_AX_20131103T162124_20131103T180354_20140414T093803_____MAR_O_NR____.EOF

These three files are included in a directory with a name described in section 4.5.7.

4.5.8.1. Manifest File

See section 3.3.

Table 4-20: NRT Restituted Orbit File for Sentinel-3 – Manifest File

Parameter	Description
Metadata Wrap Section	
fileName	Name of directory; described in section 4.5.7
fileType	SR__ROE_AX
Data Object Section	
href	Relative path to measurement data file.

4.5.8.2. Measurement Data File

The measurement data file is formatted using XML-tags (see table below). Each NRT Restituted Orbit File for Sentinel-3 consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.5.8.3. XML Fixed Header Section

Table 4-21: NRT Restituted Orbit File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 4.5.7 without the extension.
File_Description		NRT POD Restituted Orbit File	
Notes		Variable	Free Text
Mission		Sentinel-3#	# indicates the spacecraft ID; A, B
File_Class		Variable	Value: - Routine Operations - Re-Processing - Generated test files
File_Type		SR___ROE_AX	
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 4.5.7. Format: UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 4.5.7. Format: UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	Free Text
Source			
	System	MAR/LN3/POD	Value: - MAR: Marine Processing and Archiving Centre - LN3: Land Processing and Archiving Centre - POD_: CPOD Service
	Creator	Variable	Name of the tool: SPOD_SYSTEM_Vx.xx, where x.xx is the version number
	Creator_Version	Variable	Version of the tool
	Creation_Date	Variable	Date of creation. Format: UTC=yyyy-mm-ddThh:mm:ss

4.5.8.4. Variable Header Section

Table 4-22: NRT Restituted Orbit File – Variable Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Ref_Frame		EARTH_FIXED	Coordinate Frame ID
Time_Reference		UTC	Time Reference ID

4.5.8.5. Data Block Section

One Data set consisting of one list of OSVs in ASCII XML format.

Table 4-23: NRT Restituted Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	list	See Table below for the content of elements.

Table 4-24: NRT Restituted Orbit File – OSVs

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter. This counter is incremented by a single unit when crossing the earth-fixed ascending node.
X	float	m	%+012.3lf	X position in earth-fixed coordinate system.
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system.
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system.
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system.
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system.
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system.
Quality	string		%s	Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP See next section for a complete definition of each possible value

4.5.8.6. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product NRT Restituted Orbit File:

- Default quality flag value: NOMINAL.
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (value: DEGRADED-OBSPERCENTAGE).
- Number of processed observations during the orbital revolution being processed (value: DEGRADED-OBSNUMBER).
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (value: DEGRADED-OBSRESIDUALS).
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (value: DEGRADED-MANOEUVRE).
- Use of navigation solution from the GPS receiver due to the complete lack of GPS observables (code and phase) (value: DEGRADED-NAVSOL).
- Size of potential gap around a given epoch (value: DEGRADED-GAP).

4.5.8.7. Example of a File

4.5.8.7.1. Manifest File

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<xfdu version="http://www.esa.int/safe/sentinel/1.1/sentinel-3/adf" xmlns:sentinel-3="http://www.esa.int/safe/sentinel/1.1/sentinel-3" xmlns:sentinel-safe="http://www.esa.int/safe/sentinel/1.1" xmlns:sentinel3aux="http://www.esa.int/safe/sentinel/1.1/sentinel-3/adf" xmlns:xfdu="urn:ccsds:schema:xfdu:1">

  <informationPackageMap>
    <xfdu:contentUnit ID="packageUnit" dmdID="generalProductInformation measurementQualityInformation" pdiID="processing" textInfo="SENTINEL-3 ADF" unitType="Information Package">
      <xfdu:contentUnit ID="ADFUnit" textInfo="ADF processed automatically" unitType="Measurement Data Unit">
        <dataObjectPointer dataObjectID="ADFData"/>
      </xfdu:contentUnit>
      <xfdu:contentUnit ID="MetricsAnnotationUnit" textInfo="metrics annotation info" unitType="Annotation Data Unit">
        <dataObjectPointer dataObjectID="MetricsAnnotationData"/>
      </xfdu:contentUnit>
    </xfdu:contentUnit>
  </informationPackageMap>

  <metadataSection>
    <metadataObject ID="generalProductInformation" category="DMD" classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="General Product Information" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel3aux:generalProductInformation>

<sentinel3aux:fileName>S3A_SR__ROE_AX_20131103T162124_20131103T180354_20140414T093803_____.MAR_O_NR____.SEN3</sentinel3aux:fileName>
          <sentinel3aux:fileType>SR__ROE_AX</sentinel3aux:fileType>
          <sentinel3aux:timeliness>NR</sentinel3aux:timeliness>
          <sentinel3aux:baselineCollection>__</sentinel3aux:baselineCollection>
          <sentinel3aux:familyName>Sentinel-3</sentinel3aux:familyName>
          <sentinel3aux:number>A</sentinel3aux:number>
          <sentinel3aux:productSize>99603</sentinel3aux:productSize>
          <sentinel3aux:creationTime>20140414T093803</sentinel3aux:creationTime>
          <sentinel3aux:validityStartTime>2013-11-03T16:21:24.000000</sentinel3aux:validityStartTime>
          <sentinel3aux:validityStopTime>2013-11-03T18:03:54.000000</sentinel3aux:validityStopTime>
          </sentinel3aux:generalProductInformation>
        </xmlData>
      </metadataWrap>
    </metadataObject>
    <metadataObject ID="processing" category="PDI" classification="PROVENANCE">
      <metadataWrap mimeType="text/xml" textInfo="Processing" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel-safe:processing name="AdfProcessing">
            <sentinel-safe:facility country="Germany" name="Marine Processing and Archiving Centre (MAR)" organisation="European Organisation for the Exploitation of Meteorological Satellites" site="Darmstadt">
              <sentinel-safe:hardware name="OPE"/>
              <sentinel-safe:software name="S3PODIPF" version="01.00"/>
            </sentinel-safe:facility>
          </sentinel-safe:processing>
        </xmlData>
      </metadataWrap>
    </metadataObject>
  </metadataSection>
</xfdu:contentUnit>
</informationPackageMap>
</xfdu>
```



```

    <sentinel-safe:resource name="S3IPF.PDS.007 - ilr3 - Auxiliary Data Format
Specification" role="Auxiliary Data Specification Document - SRAL Level 1 and 2"/>
  </sentinel-safe:processing>
</xmlData>
</metadataWrap>
</metadataObject>
<metadataObject ID="measurementQualityInformation" category="DMD"
classification="DESCRIPTION">
  <metadataWrap mimeType="text/xml" textInfo="Quality Information" vocabularyName="Sentinel-
SAFE">
    <xmlData>
      <sentinel-safe:qualityInformation>
        <sentinel-safe:extension>
          <sentinel3aux:adfQuality>
            <sentinel3aux:adfQualityCheck>PASSED</sentinel3aux:adfQualityCheck>
            <sentinel3aux:overallProductQuality>NOMINAL</sentinel3aux:overallProductQuality>
          </sentinel3aux:adfQuality>
        </sentinel-safe:extension>
      </sentinel-safe:qualityInformation>
    </xmlData>
  </metadataWrap>
</metadataSection>

<dataObjectSection>
  <dataObject ID="ADFDData">
    <byteStream mimeType="application/octet-stream" size="97534">
      <fileLocation
href="S3A_SR__ROE_AX_20131103T162124_20131103T180354_20140414T093803_____MAR_O_NR_
____.EOF" locatorType="URL"/>
      <checksum checksumName="CRC">39657</checksum>
    </byteStream>
  </dataObject>
</dataObjectSection>

</xfdu>

```

4.5.8.7.2. Measurement Data File

```

<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S3A_SR__ROE_AX_20131103T162124_20131103T180354_20140414T113810_____MAR_
O_NR_____</File_Name>
    <File_Description>NRT POD Restituted Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-3A</Mission>
    <File_Class>Routine Operations</File_Class>
    <File_Type>SR__ROE_AX</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2013-11-03T16:21:24</Validity_Start>
      <Validity_Stop>UTC=2013-11-03T18:03:54</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>MAR</System>
      <Creator>S3A_PODIPF</Creator>
      <Creator_Version>01.00</Creator_Version>
    </Source>
  </Earth_Explorer_Header>
</Earth_Explorer_File>

```

```
<Creation_Date>UTC=2014-04-14T11:38:10</Creation_Date>
</Source>
</Fixed_Header>
<Variable_Header>
  <Ref_Frame>EARTH_FIXED</Ref_Frame>
  <Time_Reference>UTC</Time_Reference>
</Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="2">
    <OSV>
      <TAI>TAI=2013-11-03T16:21:49.000000</TAI>
      <UTC>UTC=2013-11-03T16:21:14.000000</UTC>
      <UT1>UT1=2013-11-03T16:21:13.971094</UT1>
      <Absolute_Orbit>+43</Absolute_Orbit>
      <X unit="m">1121430.472249</X>
      <Y unit="m">490897.154831</Y>
      <Z unit="m">7066909.913505</Z>
      <VX unit="m/s">-568.120345</VX>
      <VY unit="m/s">-7485.901796</VY>
      <VZ unit="m/s">605.754023</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
    <OSV>
      <TAI>TAI=2013-11-03T16:22:19.000000</TAI>
      <UTC>UTC=2013-11-03T16:21:44.000000</UTC>
      <UT1>UT1=2013-11-03T16:21:43.971093</UT1>
      <Absolute_Orbit>+43</Absolute_Orbit>
      <X unit="m">1103358.308737</X>
      <Y unit="m">266158.587736</Y>
      <Z unit="m">7081652.137316</Z>
      <VX unit="m/s">-636.600913</VX>
      <VY unit="m/s">-7495.417266</VY>
      <VZ unit="m/s">376.980391</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
  </List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>
```

4.6. NRT RESTITUTED ORBIT EPHEMERIDES FOR SENTINEL-6 (ROE__AX)

4.6.1. MISSION APLICABILITY

S-6

4.6.2. DESCRIPTION

This file contains the Restituted Orbit State Vectors (OSVs) based on the orbit determination performed by the CPOD Service. The OSVs are referred to the Centre of Gravity (CoG) of the satellite and are expressed in Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

4.6.3. DISSEMINATION

The file is made available to the Sentinel-6 PDAP by the CPOD Service through a FTP server placed at EUMETSAT premises.

4.6.4. DATA LATENCY/COVERAGE

The file is generated within 10 minutes from the reception of GNSS Level-0 data, which is made available on the FTP server placed at EUMETSAT. The file coverage is equal to the input file coverage (GNSS data) plus 5 OSVs before and after the period of the GNSS data in input (overlap). The OSVs frequency is 10 seconds.

4.6.5. ACCURACY

The position accuracy threshold is 5 cm radial 1-sigma RMS (with a target accuracy threshold of 3 cm).

4.6.6. DATA VOLUME

S6: 370 Kbytes.

4.6.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.14] and detailed in Section 2. All naming elements have been detailed in Table 4-25.

Table 4-25: NRT Restituted Orbit Ephemerides – Naming element description

Parameter	Value	Description
MMM	S6[A/B]	For Sentinel-6A or -6B.
SS	AX	Data consumer: for multi instrument auxiliary data.
LL	__	Processing Level not applicable.
TTTTTT	ROE__AX	Data Type ID; NRT Restituted Orbit Ephemerides.
<start_time>	yyyyMMddThhmmss	Validity start time of the data contained in the file, in CCSDS compact format.
<end_time>	yyyyMMddThhmmss	Validity end time of the data contained in the file, in CCSDS compact format.
<generation_time>	yyyyMMddThhmmss	Generation date of the file, in CCSDS compact format.
<instance_id>	16 underscores “_”	Instance ID for auxiliary data.
<source>	CPOD	CPOD Service.
<environment>	XXX	OPE: For operational environment VAL: For validation environment
<class_id>	XX_NNN	Where: - XX = “NR” for NRT - NNN = Not relevant. Set to underscores

Parameter	Value	Description
<extension>	SEN6	Sentinel-6
.tar		The file must be delivered compressed on a .tar file

Below you can find an example of a NRT ROE name for S-6A:

**S6A_AX____ROE_AX_20210101T011215_20210101T030645_20210101T033236____
____CPOD_OPE_NR____.SEN6.tar**

4.6.8. DATA STRUCTURE AND DEFINITION

The NRT ROE is composed by:

- A manifest file, with a fix filename: **xfdumanifest.xml**;
- A measurement data file containing the NRT ROE file, with a filename equal to the NRT ROE product (section 4.6.7) but changing the *extension* to **EOF** and non-compressed. See example below:

**S6A_AX____ROE_AX_20210101T011215_20210101T030645_20210101T033236____
____CPOD_OPE_NR____.EOF**

These two files are included in a package (tar) directory with a name described in section 4.6.7.

4.6.8.1. Manifest File

It is defined in [AD.15].

4.6.8.2. Measurement Data File

The measurement data file is formatted using XML-tags (see table below). Each NRT ROE consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ORB.xsd describes the format of this file. The schema is attached to this document in [RD.13].

4.6.8.2.1. XML Fixed Header Section

Table 4-26: NRT Restituted Orbit Ephemerides (ROE) – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 4.6.7 without the extension and without the .tar
File_Description		NRT POD Restituted Orbit File	
Notes		Variable	Free Text
Mission		Sentinel-6#	# indicates the spacecraft ID: A or B
File_Class		Variable	Value: • Routine Operations • Re-Processing • Generated test files
File_Type		AX____ROE_AX	
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 4.6.7. Format: • UTC=yyyy-MM-ddThh:mm:ss

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 4.6.7. Format: UTC=yyyy-MM-ddThh:mm:ss
File_Version		Variable	A counter, e.g. 0001
Source			
	System	POD_	CPOD Service
	Creator	POD_	CPOD Service
	Creator_Version	Variable	Version of the tool
	Creation_Date	Variable	Date of creation. Format: UTC=yyyy-MM-ddThh:mm:ss

4.6.8.2.2. Variable Header Section

Table 4-27: NRT Restituted Orbit Ephemerides (ROE) – Variable Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Ref_Frame		EARTH_FIXED	Coordinate Frame ID
Time_Reference		UTC	Time Reference ID

4.6.8.2.3. Data Block Section

One Data set consisting of one list of OSVs in ASCII XML format.

Table 4-28: NRT Restituted Orbit File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_OSVs	List	See Table below for the content of elements

Table 4-29: NRT Restituted Orbit File – OSVs

XML Tag Name	Type	Unit	C Format	Description
TAI	date	string		TAI date and time of OSV, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-MM-ddThh:mm:ss.ssssss
UTC	date	string		UTC date and time of OSV, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-MM-ddThh:mm:ss.ssssss
UT1	date	string		UT1 date and time of OSV, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-MM-ddThh:mm:ss.ssssss
Absolute_Orbit	int		%+05ld	Absolute orbit counter. This counter is incremented by a single unit when crossing the earth-fixed ascending node
X	float	m	%+012.3lf	X position in earth-fixed coordinate system
Y	float	m	%+012.3lf	Y position in earth-fixed coordinate system
Z	float	m	%+012.3lf	Z position in earth-fixed coordinate system
VX	float	m/s	%+012.6lf	X velocity in earth-fixed coordinate system
VY	float	m/s	%+012.6lf	Y velocity in earth-fixed coordinate system
VZ	float	m/s	%+012.6lf	Z velocity in earth-fixed coordinate system
Quality	string		%s	Quality flag indicating the quality status of the product. Possible values are:

XML Tag Name	Type	Unit	C Format	Description
				- NOMINAL - DEGRADED-OBSPERCENTAGE - DEGRADED-OBSNUMBER - DEGRADED-OBSRESIDUALS - DEGRADED-MANOEUVRE - DEGRADED-NAVSOL - DEGRADED-GAP See next section for a complete definition of each possible value

4.6.8.2.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product NRT ROE:

- Default quality flag value: NOMINAL.
- Percentage of accepted observations with respect to the overall number of observations during the orbital revolution being processed (value: DEGRADED-OBSPERCENTAGE).
- Number of processed observations during the orbital revolution being processed (value: DEGRADED-OBSNUMBER).
- Root-mean-square of the residuals of code and phase observations during the orbital revolution being processed (value: DEGRADED-OBSRESIDUALS).
- Time elapsed since last manoeuvre with respect to the orbital revolution being processed (value: DEGRADED-MANOEUVRE).
- Use of navigation solution from the GNSS receiver due to the complete lack of GNSS observables (code and phase) (value: DEGRADED-NAVSOL).
- Size of potential gap around a given epoch (value: DEGRADED-GAP).

As agreed with EUMETSAT, degraded products will not be disseminated to the PDAP. Therefore, those products that have been flagged with DEGRADED-OBSPERCENTAGE, DEGRADED-OBSNUMBER, DEGRADED-OBSRESIDUALS or DEGRADED-NAVSOL will not be disseminated. Products with state-vectors flagged as DEGRADED-MANOEUVRE and DEGRADED-GAP will be disseminated, as these flags does not apply to the whole product, but only part of it.

4.6.8.3. Example of a File

4.6.8.3.1. Manifest File

```
<?xml version='1.0' encoding='UTF-8' standalone='yes'?>
<xfd:XFdu xmlns:sentinel-safe="http://www.esa.int/safe/sentinel/1.1"
xmlns:sentinel6aux="http://www.esa.int/safe/sentinel/sentinel-6/adf/1.0"
xmlns:xfdu="urn:ccsds:schema:xfdu:1" version="esa/safe/sentinel/sentinel-6/adf/1.0">
  <informationPackageMap>
    <xfdu:contentUnit ID="packageUnit" dmdID="generalProductInformation
measurementQualityInformation" pdiID="processing" textInfo="SENTINEL-6 ADF" unitType="Information
Package">
      <xfdu:contentUnit ID="ADFUnit" textInfo="ADF processed automatically" unitType="Measurement
Data Unit">
        <dataObjectPointer dataObjectID="ADFData"/>
      </xfdu:contentUnit>
    </xfdu:contentUnit>
  </informationPackageMap>
  <metadataSection>
    <metadataObject ID="generalProductInformation" category="DMD" classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="General Product Information"
vocabularyName="Sentinel-SAFE">
```

```

<xmlData>
  <sentinel6aux:generalProductInformation>

<sentinel6aux:fileName>S6A_AX___ROE___AX_20210119T224005_20210120T003645_20210120T010356____
____CPOD_OPE_NR____.SEN6</sentinel6aux:fileName>

  <sentinel6aux:fileType>AX___ROE___AX</sentinel6aux:fileType>
  <sentinel6aux:timeliness>NR</sentinel6aux:timeliness>
  <sentinel6aux:fileVersion>__</sentinel6aux:fileVersion>
  <sentinel6aux:familyName>Sentinel-6</sentinel6aux:familyName>
  <sentinel6aux:number>A</sentinel6aux:number>
  <sentinel6aux:productSize>331373</sentinel6aux:productSize>
  <sentinel6aux:creationTime>20210120T010356</sentinel6aux:creationTime>
  <sentinel6aux:validityStartTime>2021-01-
19T22:40:05.000000Z</sentinel6aux:validityStartTime>
  <sentinel6aux:validityStopTime>2021-01-
20T00:36:45.000000Z</sentinel6aux:validityStopTime>
  </sentinel6aux:generalProductInformation>
</xmlData>
</metadataWrap>
</metadataObject>
<metadataObject ID="processing" category="PDI" classification="PROVENANCE">
  <metadataWrap mimeType="text/xml" textInfo="Processing" vocabularyName="Sentinel-SAFE">
    <xmlData>
      <sentinel-safe:processing name="AdfProcessing">
        <sentinel-safe:facility country="Spain" name="CPOD" organisation="Copernicus POD
Service" site="Tres Cantos">
          <sentinel-safe:hardware name="OPE"/>
          <sentinel-safe:software name="SPOD_SYSTEM" version="1.9.0"/>
        </sentinel-safe:facility>
        <sentinel-safe:resource
name="S6A_GN_0_GNS____20210118T221906_20210119T001326_20210119T001430_6860_007_071_036_EUM___OPE
__NR____.SEN6" role="GNSS L0 Input Files"/>
        <sentinel-safe:resource
name="S6A_GN_0_GNS____20210119T001326_20210119T002009_20210119T003608_0403_007_073_037_EUM___OPE
__ND____.SEN6" role="GNSS L0 Input Files"/>
        ...
name="S6A_GN_0_GNS____20210119T224055_20210120T003601_20210120T003707_6906_007_097_049_EUM___OPE
__NR____.SEN6" role="GNSS L0 Input Files"/>
        <sentinel-safe:resource name="brdc020a.21n.Z" role="GPS Nav. Message"/>
        ...
        <sentinel-safe:resource name="brdc018x.21n.Z" role="GPS Nav. Message"/>
        <sentinel-safe:resource name="gpn214130030.sp3.gzip" role="GNSS 15M Products"/>
        ...
        <sentinel-safe:resource name="gpn214120030.sp3.gzip" role="GNSS 15M Products"/>
        <sentinel-safe:resource name="gpu2141200.sp3.gzip" role="GNSS 24H Orbits"/>
        ...
        <sentinel-safe:resource name="gpu2141120.sp3.gzip" role="GNSS 24H Orbits"/>
        <sentinel-safe:resource name="gpu2141200.clk.gzip" role="GNSS 24H Clocks"/>
        ...
        <sentinel-safe:resource name="gpu2141120.clk.gzip" role="GNSS 24H Clocks"/>
        <sentinel-safe:resource name="gpn214130030.sp3.gz" role="Backup GNSS 15M Products"/>
        <sentinel-safe:resource name="EUM/LEO-JASCS/SPE/17/899450" role="Jason-CS/Sentinel-6
Generic Auxiliary Data Specification (GADS)"/>
        <sentinel-safe:resource name="EUM/LEO-JASCS/SPE/17/899011" role="Jason-CS/Sentinel-6
Generic File Naming Convention (GFNC)"/>
      </sentinel-safe:processing>
    </xmlData>
  </metadataWrap>
</metadataObject>

```

```
<metadataObject ID="measurementQualityInformation" category="DMD"
classification="DESCRIPTION">
  <metadataWrap mimeType="text/xml" textInfo="Quality Information" vocabularyName="Sentinel-
SAFE">
    <xmlData>
      <sentinel-safe:qualityInformation>
        <sentinel-safe:extension>
          <sentinel6aux:adfQuality>
            <sentinel6aux:adfQualityCheck>PASSED</sentinel6aux:adfQualityCheck>
          </sentinel6aux:adfQuality>
        </sentinel-safe:extension>
      </sentinel-safe:qualityInformation>
    </xmlData>
  </metadataWrap>
</metadataObject>
</metadataSection>
<dataObjectSection>
  <dataObject ID="ADFDData">
    <byteStream mimeType="application/octet-stream" size="331373">
      <fileLocation
href="S6A_AX____ROE_AX_20210119T224005_20210120T003645_20210120T010356_____CPOD_OPE
_NR____.EOF" locatorType="URL"/>
      <checksum checksumName="CRC">3599404144</checksum>
    </byteStream>
  </dataObject>
</dataObjectSection>
</xfdu:XFDU>
```

4.6.8.3.2. Measurement Data File

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S6A_AX____ROE_AX_20210119T224005_20210120T003645_20210120T010356_____CPO
D_OPE_NR____</File_Name>
    <File_Description>NRT POD Restituted Orbit File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-6A</Mission>
    <File_Class>Routine Operations</File_Class>
    <File_Type>AX____ROE_AX</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2021-01-19T22:40:05</Validity_Start>
      <Validity_Stop>UTC=2021-01-20T00:36:45</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>POD_</System>
      <Creator>POD_</Creator>
      <Creator_Version>1.9.0</Creator_Version>
      <Creation_Date>UTC=2021-01-20T01:03:56</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    <Ref_Frame>EARTH_FIXED</Ref_Frame>
    <Time_Reference>UTC</Time_Reference>
  </Variable_Header>
```



```

</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_OSVs count="701">
    <OSV>
      <TAI>TAI=2021-01-19T22:40:42.000000</TAI>
      <UTC>UTC=2021-01-19T22:40:05.000000</UTC>
      <UT1>UT1=2021-01-19T22:40:04.828672</UT1>
      <Absolute_Orbit>+00012</Absolute_Orbit>
      <X unit="m">-5930325.429383</X>
      <Y unit="m">-1661731.391200</Y>
      <Z unit="m">4648694.677741</Z>
      <VX unit="m/s">4456.836292</VX>
      <VY unit="m/s">-2081.691789</VY>
      <VZ unit="m/s">4936.799807</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
    ...
    <OSV>
      <TAI>TAI=2021-01-20T00:37:22.000000</TAI>
      <UTC>UTC=2021-01-20T00:36:45.000000</UTC>
      <UT1>UT1=2021-01-20T00:36:44.828688</UT1>
      <Absolute_Orbit>+00013</Absolute_Orbit>
      <X unit="m">-5121609.303620</X>
      <Y unit="m">305336.275330</Y>
      <Z unit="m">5762463.690678</Z>
      <VX unit="m/s">4004.909637</VX>
      <VY unit="m/s">-4260.536042</VY>
      <VZ unit="m/s">3781.850737</VZ>
      <Quality>NOMINAL</Quality>
    </OSV>
  </List_of_OSVs>
</Data_Block>
</Earth_Explorer_File>

```

5. AUXILIARY FILES FOR SENTINELS

5.1. ATTITUDE RESTITUTED DATA FILE FOR SENTINEL-1 (AUX_RESATT)

5.1.1. MISSION APPLICABILITY

S-1

5.1.2. DESCRIPTION

This file contains the Attitude Restituted Data File computed by the CPOD Service based on the attitude quaternions computed on-board by the Attitude and Orbit Control System (AOCS). This file is provided to the CPOD Service within the Sentinel-1 PDGS Synthetic Aperture Radar (SAR) Level-0 Annotations Products. The attitude is calculated in Earth-Centred, Earth-Fixed (ECEF) coordinate frame.

5.1.3. DISSEMINATION

The file is made available to the Sentinel-1 PDGS by the CPOD Service through the PODIP server and it is used for generating Sentinel-1 Mission products.

5.1.4. DATA LATENCY/COVERAGE

The Attitude Restituted Data File is generated by the CPOD Service during the precise orbit processing. The processing delay and timeliness are therefore related to the Sentinel-1 POE Files production (20 days after data acquisition, which translates into a total timeliness threshold of 21 days with respect to the first epoch contained in the orbital product). The coverage is the same as the Sentinel-1 POE File. Each file covers 26 hours (one complete day in GPS time, plus 1 hour before the start and after the end of the day – overlap of two hours between consecutive files). One Attitude Restituted Data File is generated per day. The attitude information is provided every 1 second.

5.1.5. ACCURACY

The attitude accuracy threshold is 0.005 deg in roll, pitch and yaw independently (see [RD.10]).

5.1.6. DATA VOLUME

Around 10 Mbytes.

5.1.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2. Below you can find an example of an Attitude Restituted Data File name for S-1A:

S1A_OPER_AUX_RESATT_OPOD_20151215T122337_V20151124T225943_20151126T005943.EOF

5.1.8. DATA STRUCTURE AND DEFINITION

The Attitude Restituted Data File follows the Earth Observation GS File Format Standard [AD.3] and the Tailoring of the Earth Observation GS File Format Standard of the PDGS of the Sentinel missions defined in [AD.2]. When no specific tailoring is described, the standard [AD.3] directly applies.

Each Attitude Restituted Data File consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ATT.xsd describes the format of this file. The schema is attached to this document in [RD.13].

5.1.8.1. XML Fixed Header Section

Table 5-1: Attitude Restituted Data File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		Attitude Restituted Data File	
Notes		Variable	Free Text
Mission		Sentinel-1 #	# indicates the spacecraft ID: A or B
File_Class		Variable	Consistent with File Class in Section 2.
File_Type		AUX_RESATT	Same as File Type in Section 2.
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. . Format: • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. . Format: • UTC=yyyy-mm-ddThh:mm:ss
File_Version		0001	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	OPOD	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	OPOD	Corresponds to the facility deployed on the Site Centre that generated the file.
	Creator_Version	Variable	Version of the service software generating the product.
	Creation_Date	Variable	Date of creation. Format: • UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2)

5.1.8.2. Variable Header Section

No variable header present.

5.1.8.3. Data Block Section

The data block format is ASCII XML.

Table 5-2: Attitude Restituted Data File – Data Block

XML Tag Name (Level 1)	Type	Description
Attitude_File_Type	string	The attitude file type: Sat_Attitude
Attitude_Data_Type	string	It defines the type of attitude data: Quaternions
Max_Gap	Unit="s"	Maximum gap detected in the file, i.e. maximum amount of seconds between two consecutive sets of quaternions, increased by a fixed amount of 0.5 s.
Quaternion_Data	Structures: see tables below	Structure for the list of quaternions

Table 5-3: Attitude Restituted Data File – Quaternions Data

XML Tag Name	Type	Unit	Description
Inertial_Ref_Frame	string		Reference frame: EARTH_FIXED. This reference frame is defined as EO CFI frame w.r.t. S1 satellite frame using the following convention: - X_CFI = - Y_S1 - Y_CFI = - X_S1 - Z_CFI = - Z_S1
List_of_Quaternions	count="n"		List of Quaternions

Table 5-4: Attitude Restituted Data File – List of Quaternions Data

XML Tag Name	Type	Unit	Description
Quaternions	Structure		Set of quaternions for a given time representing the transformation between Earth-Centred-Earth-Fixed and satellite attitude frame. It is recommended to write quaternions with 9 decimal digits. See table and note below.

Table 5-5: Attitude Restituted File – Quaternions

XML Tag Name	Type	Attribute	Description
Time	string	ref="UTC"	Date for the quaternions. The date format is CCSDS-A with reference and microseconds: UTC=yyyy-mm-ddThh:nn:ss.uuuuuu
Q1	real		Quaternion
Q2	real		Quaternion
Q3	real		Quaternion
Q4	real		Quaternion
Quality	String		Quality flag indicating the quality status of the product. Possible values: - NOMINAL - DEGRADED-MODELLED See next section for a complete definition of each possible value

Note: The following quaternions definition, consistent with EO CFI v4.4 conventions, has to be used:

$$Q1 = e_x \cdot \sin\left(\frac{\theta}{2}\right) \quad Q2 = e_y \cdot \sin\left(\frac{\theta}{2}\right) \quad Q3 = e_z \cdot \sin\left(\frac{\theta}{2}\right) \quad Q4 = \cos\left(\frac{\theta}{2}\right)$$

where (e_x, e_y, e_z) are the direction cosines of the rotation axis and θ is the rotation angle. Then (Q1, Q2, Q3) corresponds to the vector part of the quaternion and Q4 is the scalar part of the quaternion.

5.1.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product Attitude Restituted Data File:

- Default quality flag value (value: NOMINAL).
- Use of a model due to the lack of (value: DEGRADED-MODELLED).

5.1.8.5. Example of a File

```
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S1A_OPER_AUX_RESATT_OPOD_20151215T122337_V20151124T225943_20151126T005943</File_Name>
  <File_Description>Attitude Restituted data File</File_Description>
  <Notes></Notes>
  <Mission>Sentinel-1A</Mission>
  <File_Class>OPER</File_Class>
  <File_Type>AUX_RESATT</File_Type>
  <Validity_Period>
    <Validity_Start>UTC=2015-11-24T22:59:43</Validity_Start>
    <Validity_Stop>UTC=2015-11-26T00:59:43</Validity_Stop>
  </Validity_Period>
  <File_Version>0001</File_Version>
  <Source>
    <System>OPOD</System>
    <Creator>OPOD</Creator>
    <Creator_Version>0.9.6</Creator_Version>
    <Creation_Date>UTC=2015-12-15T12:23:37</Creation_Date>
  </Source>
</Fixed_Header>
  <Variable_Header>
</Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <Attitude_File_Type>Sat_Attitude</Attitude_File_Type>
  <Attitude_Data_Type>Quaternions</Attitude_Data_Type>
  <Max_Gap unit="s">1.5</Max_Gap>
  <Quaternion_Data>
    <Inertial_Ref_Frame>EARTH_FIXED</Inertial_Ref_Frame>
    <List_of_Quaternions count="93601">
      <Quaternions>
        <Time ref="UTC">UTC=2015-11-24T22:59:43.000000</Time>
        <Q1>-0.253047899698</Q1>
        <Q2>-0.436975295404</Q2>
        <Q3>0.861003275641</Q3>
        <Q4>-0.060767680550</Q4>
        <Quality>NOMINAL</Quality>
      </Quaternions>
      <Quaternions>
        <Time ref="UTC">UTC=2015-11-24T22:59:44.000000</Time>
        <Q1>-0.253170898025</Q1>
        <Q2>-0.436496641014</Q2>
        <Q3>0.861204656334</Q3>
        <Q4>-0.060841751171</Q4>
        <Quality>DEGRADED-MODELLED</Quality>
      </Quaternions>
    </List_of_Quaternions>
  </Quaternion_Data>
</Data_Block>
...

```

```
</List_of_Quaternions>  
</Quaternion_Data>  
</Data_Block>  
</Earth_Explorer_File>
```

5.2. PLATFORM DATA FILES FOR SENTINEL-3 (AUX_PRLPTF AND AUX_PRCPTF)

5.2.1. MISSION APPLICABILITY

S-3

5.2.2. DESCRIPTION

Two files are generated with different timeliness:

- The Preliminary Platform Data File (AUX_PRLPTF) following the same timeliness as the MOE Orbit File.
- The Precise Platform Data File (AUX_PRCPTF) following the same timeliness as the POE Orbit File.

Both files contain information on:

- The nadir projection of the distance between the altimeter antenna Centre of Phase and the satellite Centre of Gravity (CoG) [m].
- The platform derived off nadir angles pitch, roll and yaw [degrees].

The platform derived off nadir angles pitch, roll and yaw are computed as the rotation angles from nominal attitude to actual satellite attitude. The nominal attitude is understood as the attitude the satellite should have for a certain attitude mode, according to the corresponding attitude theoretical law (i.e. geodetic, geocentric, geodetic with yaw steering or geocentric with yaw steering).

The inertial to actual frame rotation matrix is obtained from the attitude file. Then the inertial to nominal frame rotation matrix is modelled using the orbit. Finally, the nominal to actual rotation is obtained. This is $[A]_{21} = [A]_{20} \cdot [A]_{01}$ where "2" is the actual, "1" is the nominal, and "0" is the inertial frame.

The off-nadir angle biases (roll, pitch and yaw) are obtained from the resulting rotation matrix. The convention used is the 123 Euler Angles rotation (pitch (Φ) - roll (θ) - yaw (φ)), with the following rotation matrix:

$$\begin{bmatrix} \cos(\varphi) * \cos(\theta) & -\sin(\varphi) * \cos(\theta) & \sin(\theta) \\ \cos(\varphi) * \sin(\theta) * \sin(\Phi) + \sin(\varphi) * \cos(\Phi) & -\sin(\varphi) * \sin(\theta) * \sin(\Phi) + \cos(\varphi) * \cos(\Phi) & -\cos(\theta) * \sin(\Phi) \\ -\cos(\varphi) * \sin(\theta) * \cos(\Phi) + \sin(\varphi) * \sin(\Phi) & \sin(\varphi) * \sin(\theta) * \cos(\Phi) + \cos(\varphi) * \sin(\Phi) & \cos(\theta) * \cos(\Phi) \end{bmatrix}$$

The nadir projection is obtained with the following steps:

- 1) The three components of the position vector of the altimeter antenna centre of phase with respect to the actual satellite CoG (variable in time), in body axis, are computed.
- 2) Using the inverse of the matrix obtained above, the vector is expressed in nominal axes.
- 3) The third component (Z, along true nadir) is the retrieved as the nadir projection.

5.2.3. DISSEMINATION

The files are made available to the Sentinel-3 PDGS by the CPOD Service through the PODIP server (for the S-3 Land centre) and the CPOD FTP server (for the S-3 Marine centre). These files are used for supporting the generation of the Level 2 SRAL Mission products as follows:

- The Preliminary Platform Data File is used for generating Sentinel-3 STC products;
- The Precise Platform Data File is used for generating Sentinel-3 NTC products;
- For NRT production, the latest NRT Platform file shall be used (see section 5.3).

5.2.4. DATA LATENCY/COVERAGE

The Preliminary and Precise Data Files are generated by the CPOD Service during the orbit processing. The processing delay and timeliness are therefore related to the generation of the MOE and POE Orbit Files. Similarly, the coverage, frequency of values and generation of each Platform File are also identical to the respective MOE and POE Orbit Files.

5.2.5. ACCURACY

The restitution of the roll, pitch and yaw axes biases shall have an accuracy of better than (see [RD.11], requirement S3-SC-TRD-REQ-2509 a):

- 0.05 degrees (3-sigma) on the pitch and roll axis;
- 0.5 degrees (3-sigma) on the yaw axis.

Such requirements are based on the absolute measurement error of the star-trackers on-board the satellite. In case the star-tracker measurements are not available, the accuracy with which the satellite platform follows the theoretical attitude law (equivalent to the accuracy of the modelled attitude) shall be better than (see [RD.11], requirement S3-SC-TRD-REQ-0343 d):

- 0.09 degrees (3-sigma) on the pitch and roll axes;
- 0.1 degrees (3-sigma) on the yaw axis.

5.2.6. DATA VOLUME

6.7 Mbytes.

5.2.7. NAMING CONVENTION

5.2.7.1. Naming Convention for the CPOD Service

The applicable file naming convention is defined in [AD.2] and detailed in Section 2. Below you can find an example of a Preliminary and a Precise Platform File name:

S3A_OPER_AUX_PRLPTF_POD__20151215T031942_V20151212T215943_20151213T235943.EOF

S3A_OPER_AUX_PRCPTF_POD__20151215T072732_V20151212T215943_20151213T235943.EOF

5.2.7.2. Naming Convention for the Sentinel-3 PDGS File

Upon arrival of the file described in Section 5.2.7.1, the ADC will move that file into a folder following the Sentinel-3 PDGS File Naming Convention [AD.1]. All naming elements have been detailed in Table 5-6:

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

Where:

Table 5-6: Naming element description for Platform Data file

Parameter	Value	Description
MMM	S3[A/B]	For Sentinel-3A or -3B
SS	SR	Data consumer: SRAL
L	2	Processing Level: 2
TTTTTT	PMPPAX PCPPAX	Data Type ID; Preliminary Platform Data file Precise Platform Data file.

Parameter	Value	Description
yyyymmddThhmmss		Validity start time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Validity stop time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Creation date of the file, in CCSDS compact format.
<instance ID>	17 underscores "_"	N/A
GGG	POD	CPOD Service
<class ID>	P_XX_NNN	Where: - P = "O" for operational; "D" for development - XX = "ST" for STC, "NT" for NTC - NNN = POD for Precise Orbit Determination (i.e. data usage)
<extension>	SEN3	Sentinel-3

Below you can find an example of a Preliminary and Precise Platform Data Files name for S-3 PDGS:

S3A_SR_2_PMPAX_20151212T215943_20151213T235943_20151215T031942_
POD_O_ST_POD.SEN3
S3A_SR_2_PCPPAX_20151212T215943_20151213T235943_20151215T072732_
POD_O_NT_POD.SEN3

5.2.8. DATA STRUCTURE AND DEFINITION

The Platform Data Files follow the Earth Observation GS File Format Standard [AD.3] and the Tailoring of the Earth Observation GS File Format Standard of the PDGS of the Sentinel missions defined in [AD.2]. When no specific tailoring is described, the standard [AD.3] directly applies.

Each Platform File consists of a single file (*.EOF) containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_ATT.xsd describes the format of this file. The schema is attached to this document in [RD.13].

5.2.8.1. XML Fixed Header Section

Table 5-7: Preliminary and Precise Platform File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 2 without the extension.
File_Description		Preliminary Platform File or Precise Platform File	
Notes		Variable	Free Text
Mission		Sentinel-3#	# indicates the spacecraft ID: A or B
File_Class		Variable	Consistent with File Class in Section 2.
File_Type		AUX_PRLPTF or AUX_PRCPTF	Same as File Type in Section 2.
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. . Format: • UTC=yyyy-mm-ddThh:mm:ss

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section 2. Format: UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value of the File_Version field starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	POD_	A string with 4 characters. The System field value must be equal to the File Name Site Centre field value as defined in section 2.
	Creator	POD_	Corresponds to the facility deployed on the Site Centre that generated the file.
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	Date of creation. Format: UTC=yyyy-mm-ddThh:mm:ss The value of this field must correspond to the File Name Creation Date field defined as part of the mandatory sub-fields of the File Instance ID (Section 2).

5.2.8.2. Variable Header Section

No variable header present.

5.2.8.3. Data Block Section

The data block format is ASCII XML.

Table 5-8: Preliminary and Precise Platform File – Data Block

XML Tag Name (Level 1)	Value	Description
List_of_PTFs	List	See Table below for the content of elements.

Table 5-9: Preliminary and Precise Platform File – PTF

XML Tag Name	Type	Unit	Description
TAI	date		TAI date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date		UTC date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date		UT1 date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Platform_Off_Nadir_Pitch_Angle	float	degree	Platform Mis-pointing Pitch Angle
Platform_Off_Nadir_Roll_Angle	float	degree	Platform Mis-pointing Roll Angle
Platform_Off_Nadir_Yaw_Angle	float	degree	Platform Mis-pointing Yaw Angle
SRAL_Off_Nadir_Pitch_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Pitch Angle
SRAL_Off_Nadir_Roll_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Roll Angle
SRAL_Off_Nadir_Yaw_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Yaw Angle
Dist_Ant_COG	float	meter	Distance between the antenna phase centre and the CoG of the satellite (nadir projection)

XML Tag Name	Type	Unit	Description
Quality	String		Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-MODELLED See next section for a complete definition of each possible value

5.2.8.4. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the products Preliminary and Precise Platform Data Files:

- Default quality flag value (value: NOMINAL)
- Use of a model due to the lack of (value: DEGRADED-MODELLED)

5.2.8.5. Example of a File

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S3A_OPER_AUX_PRLPTF_POD__20151215T031942_V20151212T215943_20151213T235943</File_Name>
    <File_Description>Preliminary Platform File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-3A</Mission>
    <File_Class>OPER</File_Class>
    <File_Type>AUX_PRLPTF</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2015-12-12T21:59:43</Validity_Start>
      <Validity_Stop>UTC=2015-12-13T23:59:43</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>POD_</System>
      <Creator>POD_</Creator>
      <Creator_Version>0.9.6</Creator_Version>
      <Creation_Date>UTC=2015-12-15T03:19:42</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
    </Variable_Header>
</Earth_Explorer_Header>
<Data_Block type="xml">
  <List_of_PTFs count="3121">
    <PTF>
      <TAI>TAI=2015-12-12T22:00:19.000000</TAI>
      <UTC>UTC=2015-12-12T21:59:43.000000</UTC>
      <UT1>UT1=2015-12-12T21:59:43.113504</UT1>
      <Platform_Off_Nadir_Pitch_Angle>0.000035</Platform_Off_Nadir_Pitch_Angle>
      <Platform_Off_Nadir_Roll_Angle>-0.000039</Platform_Off_Nadir_Roll_Angle>
      <Platform_Off_Nadir_Yaw_Angle>0.000031</Platform_Off_Nadir_Yaw_Angle>
```

```
<SRAL_Off_Nadir_Pitch_Angle>0.000035</SRAL_Off_Nadir_Pitch_Angle>
<SRAL_Off_Nadir_Roll_Angle>-0.000039</SRAL_Off_Nadir_Roll_Angle>
<SRAL_Off_Nadir_Yaw_Angle>0.000031</SRAL_Off_Nadir_Yaw_Angle>
<Dist_Ant_COG>-0.807601</Dist_Ant_COG>
<Quality>DEGRADED-MODELLED</Quality>
</PTF>
<PTF>
  <TAI>TAI=2015-12-12T22:00:49.000000</TAI>
  <UTC>UTC=2015-12-12T22:00:13.000000</UTC>
  <UT1>UT1=2015-12-12T22:00:13.113504</UT1>
  <Platform_Off_Nadir_Pitch_Angle>0.000029</Platform_Off_Nadir_Pitch_Angle>
  <Platform_Off_Nadir_Roll_Angle>0.000014</Platform_Off_Nadir_Roll_Angle>
  <Platform_Off_Nadir_Yaw_Angle>-0.000026</Platform_Off_Nadir_Yaw_Angle>
  <SRAL_Off_Nadir_Pitch_Angle>0.000029</SRAL_Off_Nadir_Pitch_Angle>
  <SRAL_Off_Nadir_Roll_Angle>0.000014</SRAL_Off_Nadir_Roll_Angle>
  <SRAL_Off_Nadir_Yaw_Angle>-0.000026</SRAL_Off_Nadir_Yaw_Angle>
  <Dist_Ant_COG>-0.807600</Dist_Ant_COG>
  <Quality>DEGRADED-MODELLED</Quality>
</PTF>
...
  </List_of_PTFs>
</Data_Block>
</Earth_Explorer_File>
```

5.3. NRT PLATFORM DATA FILES FOR SENTINEL-3 (SR_2_NRPPAX)

5.3.1. MISSION APPLICABILITY

S-3

5.3.2. DESCRIPTION

This file contains the NRT Platform Data file generated by the CPOD Service from the satellite attitude. It contains the following information:

- The nadir projection of the distance between the altimeter antenna centre of phase and the satellite centre of gravity [m];
- The platform derived off nadir angles pitch, roll and yaw [degrees].

The same convention used in section 5.2 is used for the NRT Platform Data File.

5.3.3. DISSEMINATION

The file is made available to the S-3 PDGS by the CPOD Service through the PODIP server (for the S-3 Land centre) and the CPOD FTP server (for the S-3 Marine centre³). The file is used for supporting the generation of the Level 2 SRAL Mission products.

5.3.4. DATA LATENCY/COVERAGE

One file is generated for each GNSS and NAVATT Level-0 data dump within 30 minutes from the reception of GNSS input data. The coverage of each file is equal to the input file coverage (NAVATT data) plus 5 values before and after the coverage of the GNSS input data. The values frequency is 10 seconds.

5.3.5. ACCURACY

The restitution of roll, pitch and yaw axis biases shall have an accuracy of better than (see [RD.11], requirement S3-SC-TRD-REQ-2509 a):

- 0.05 degrees (3 sigma) on the pitch and roll axes
- 0.5 degrees (3 sigma) on the yaw axis

Based on the absolute measurement error of the star-trackers on-board the satellite.

In case the star-tracker measurements are not available, the accuracy with which the satellite platform follows the theoretical attitude law (equivalent to the accuracy of the modelled attitude) is better than (see [RD.11], requirement S3-SC-TRD-REQ-0343 d):

- 0.09 degrees (3 sigma) on the pitch and roll axes
- 0.1 degrees (3 sigma) on the yaw axis.

5.3.6. DATA VOLUME

530 Kbytes.

5.3.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.1] and detailed in Section 2. All naming elements have been detailed in Table 5-10.

MMM_SS_L_TTTTTT_yyyymmddThhmmss_YYYYMMDDTHHMMSS_YYYYMMDDTHHMMSS_<instance ID>_GGG_<class ID>.<extension>

Where:

³ The dissemination to the Marine centre will be ready before the end of 2022; meanwhile, this product will be computed directly on the Marine centre by the S-3 NRT POD IPF Facility.

Table 5-10: Naming element description for NRT Platform Data File

Parameter	Value	Description
MMM	S3[A/B]	for Sentinel-3A or -3B
SS	SR	Data consumer: SRAL
L	2	Processing Level = Level-2
TTTTT	NRPPAX	Data Type ID; NRT Platform Data File for S-3
yyyymmddThhmmss		Validity start time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Validity stop time of the data contained in the file, in CCSDS compact format.
YYYYMMDDTHHMMSS		Creation date of the file, in CCSDS compact format.
<instance ID>	17 underscores "_"	N/A
GGG	MAR/LN3/POD	MAR = Marine Processing and Archiving Centre LN3 = Land Processing and Archiving Centre POD = CPOD Service
<class ID>	P_XX_NNN	Where: - P = "O" for operational; "D" for development - XX = "NR" for NRT - NNN = Not relevant
<extension>	SEN3	Sentinel-3

Below you can find an example of a NRT Platform Data File name for S-3:

S3A_SR_2_NRPPAX_20131103T162124_20131103T180354_20140429T063405_____MAR_O_NR____.SEN3

5.3.8. DATA STRUCTURE AND DEFINITION

The NRT Platform File for Sentinel-3 is composed by:

- A manifest file, with a fix filename: **xfdumanifest.xml**;
- A measurement data file containing the NRT Platform File for Sentinel-3, with a filename equal to the NRT Platform File product (section 5.3.7) but changing the extension to EOF. See Example below:

S3A_SR_2_NRPPAX_20131103T162124_20131103T180354_20140429T063405_____MAR_O_NR____.EOF

These two files are included in a directory with a name described in section 5.3.7.

5.3.8.1. Manifest file

See section 3.3.

Table 5-11: NRT Platform Data File for Sentinel-3 – Manifest File

Parameter	Description
Metadata Wrap Section	
fileName	Name of directory; described in section 5.3.7
fileType	SR_2_NRPPAX
Data Object Section	
href	Relative path to measurement data file.

5.3.8.2. Measurement data file

The measurement data file is formatted using XML-tags, see table below. Each NRT Restituted Orbit File for S-3 consists of a single file containing both the Header and the Data Block sections.

The Header is structured in two sections:

- Fixed Header
- Variable Header

The schema SCHEMA_PTF.xsd describes the format of this file. The schema is attached to this document in [RD.13].

5.3.8.3. XML Fixed Header Section

Table 5-12: NRT Platform File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			As defined in Section 5.3.7 without the extension.
File_Description		NRT Platform File	
Notes		Variable	Free Text
Mission		Sentinel-3#	# indicates the spacecraft ID: A or B.
File_Class		Variable	Value: • Routine Operations • Re-Processing • Generated test files
File_Type		SR_2_NRPPAX	Same as File Type in Section 5.3.7
Validity_Period			
	Validity_Start	Variable	UTC time consistent with Validity Start Date in Section 2. Format: • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC time consistent with Validity Stop Date in Section2. . Format: • UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	Free Text
Source			
	System	MAR/SVL/POD	Value: • MAR: Marine Processing and Archiving Centre • LN3: Land Processing and Archiving Centre • POD: CPOD Service
	Creator	Variable	Name of the tool: SPOD_SYSTEM_Vx.xx, where x.xx is the version number
	Creator_Version	Variable	Version of the tool
	Creation_Date	Variable	Date of creation. Format: • UTC=yyyy-mm-ddThh:mm:ss

5.3.8.4. Variable Header Section

No variable header present.

5.3.8.5. Data Block Section

The data block format is ASCII XML.

Table 5-13: NRT Platform File – Data Block

XML Tag Name Level 1	Value	Description
List_of_PTFs	List	See Table below for elements content.

Table 5-14: NRT Platform File – PTF

XML Tag Name	Type	Unit	Description
TAI	date		TAI date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. TAI=yyyy-mm-ddThh:mm:ss.ssssss
UTC	date		UTC date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. UTC=yyyy-mm-ddThh:mm:ss.ssssss
UT1	date		UT1 date and time of PTF Values, in ASCII standard time format, including time reference and microseconds. UT1=yyyy-mm-ddThh:mm:ss.ssssss
Platform_Off_Nadir_Pitch_Angle	float	degree	Platform Mis-pointing Pitch Angle.
Platform_Off_Nadir_Roll_Angle	float	degree	Platform Mis-pointing Roll Angle.
Platform_Off_Nadir_Yaw_Angle	float	degree	Platform Mis-pointing Yaw Angle.
SRAL_Off_Nadir_Pitch_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Pitch Angle.
SRAL_Off_Nadir_Roll_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Roll Angle.
SRAL_Off_Nadir_Yaw_Angle	float	degree	Altimeter (SRAL) Antenna Mis-pointing Yaw Angle.
Dist_Ant_COG	float	meter	Distance between the antenna phase centre and the centre of gravity of the satellite (nadir projection).
Quality	string		Quality flag indicating the quality status of the product. Possible values are: - NOMINAL - DEGRADED-MODELLED See next section for a complete definition of each possible value.

5.3.8.6. Quality flags

As part of the CPOD Service processing chains, each of the products needs to be quality flagged. The definition of these quality flags is based on the monitoring of specific metrics available at the time of generation of the corresponding product. The thresholds to define a product as degraded are fine-tuned during the commissioning phase as part of the Cal/Val activities. More metrics may be added because of these Cal/Val activities.

The metrics to be monitored together with the corresponding value of the quality flag are described next for the product NRT Platform Data File:

- Default quality flag value (value: NOMINAL)
- Use of a model due to the lack of (value: DEGRADED-MODELLED)

5.3.8.7. Example of a File

5.3.8.7.1. Manifest File

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<xfdu version="http://www.esa.int/safe/sentinel/1.1/sentinel-3/adf" xmlns:sentinel-3="http://www.esa.int/safe/sentinel/1.1/sentinel-3" xmlns:sentinel-safe="http://www.esa.int/safe/sentinel/1.1" xmlns:sentinel3aux="http://www.esa.int/safe/sentinel/1.1/sentinel-3/adf" xmlns:xfdu="urn:ccsds:schema:xfdu:1">

  <informationPackageMap>
```



```

    <xfd:contentUnit ID="packageUnit" dmdID="generalProductInformation
measurementQualityInformation" pdiID="processing" textInfo="SENTINEL-3 ADF" unitType="Information
Package">
      <xfd:contentUnit ID="ADFUnit" textInfo="ADF processed automatically" unitType="Measurement
Data Unit">
        <dataObjectPointer dataObjectID="ADFData"/>
      </xfd:contentUnit>
    </xfd:contentUnit>
  </informationPackageMap>

  <metadataSection>
    <metadataObject ID="generalProductInformation" category="DMD" classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="General Product Information"
vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel3aux:generalProductInformation>

<sentinel3aux:fileName>S3A_SR_2_NRPPAX_20131103T162124_20131103T180354_20140429T063405_____
MAR_O_NR____.SEN3</sentinel3aux:fileName>
          <sentinel3aux:fileType>SR_2_NRPPAX</sentinel3aux:fileType>
          <sentinel3aux:timeliness>NR</sentinel3aux:timeliness>
          <sentinel3aux:baselineCollection>__</sentinel3aux:baselineCollection>
          <sentinel3aux:familyName>Sentinel-3</sentinel3aux:familyName>
          <sentinel3aux:number>A</sentinel3aux:number>
          <sentinel3aux:productSize>153714</sentinel3aux:productSize>
          <sentinel3aux:creationTime>20140429T063405</sentinel3aux:creationTime>
          <sentinel3aux:validityStartTime>2013-11-
03T16:21:24.000000Z</sentinel3aux:validityStartTime>
          <sentinel3aux:validityStopTime>2013-11-
03T18:03:54.000000Z</sentinel3aux:validityStopTime>
          </sentinel3aux:generalProductInformation>
        </xmlData>
      </metadataWrap>
    </metadataObject>
    <metadataObject ID="processing" category="PDI" classification="PROVENANCE">
      <metadataWrap mimeType="text/xml" textInfo="Processing" vocabularyName="Sentinel-SAFE">
        <xmlData>
          <sentinel-safe:processing name="AdfProcessing">
            <sentinel-safe:facility country="Germany" name="Marine Processing and Archiving
Centre (MAR)" organisation="European Organisation for the Exploitation of Meteorological
Satellites" site="Darmstadt">
              <sentinel-safe:hardware name="OPE"/>
              <sentinel-safe:software name="S3PODIPF" version="01.00"/>
            </sentinel-safe:facility>
            <sentinel-safe:resource name="S3IPF.PDS.007 - ilr3 - Auxiliary Data Format
Specification" role="Auxiliary Data Specification Document - SRAL Level 1 and 2"/>
          </sentinel-safe:processing>
        </xmlData>
      </metadataWrap>
    </metadataObject>
    <metadataObject ID="measurementQualityInformation" category="DMD"
classification="DESCRIPTION">
      <metadataWrap mimeType="text/xml" textInfo="Quality Information" vocabularyName="Sentinel-
SAFE">
        <xmlData>
          <sentinel-safe:qualityInformation>
            <sentinel-safe:extension>
              <sentinel3aux:adfQuality>
                <sentinel3aux:adfQualityCheck>PASSED</sentinel3aux:adfQualityCheck>
              </sentinel3aux:adfQuality>
            </sentinel-safe:extension>
          </sentinel-safe:qualityInformation>
        </xmlData>
      </metadataWrap>
    </metadataObject>
  </metadataSection>

```

```
<sentinel3aux:overallProductQuality>NOT_AVAILABLE</sentinel3aux:overallProductQuality>
  </sentinel3aux:adfQuality>
</sentinel-safe:extension>
</sentinel-safe:qualityInformation>
</xmlData>
</metadataWrap>
</metadataObject>
</metadataSection>

<dataObjectSection>
  <dataObject ID="ADFDData">
    <byteStream mimeType="application/octet-stream" size="153714">
      <fileLocation
href="S3A_SR_2_NRPPAX_20131103T162124_20131103T180354_20140429T063405_____MAR_O_NR_
____.EOF" locatorType="URL"/>
      <checksum checksumName="CRC">2601</checksum>
    </byteStream>
  </dataObject>
</dataObjectSection>
</xfdu>
```

5.3.8.7.2. Measurement Data File

```
<?xml version="1.0" ?>
<Earth_Explorer_File>
  <Earth_Explorer_Header>
    <Fixed_Header>

<File_Name>S3A_SR_2_NRPPAX_20131103T162124_20131103T180354_20140414T113813_____MAR_
O_NR_____</File_Name>
    <File_Description>NRT Platform File</File_Description>
    <Notes></Notes>
    <Mission>Sentinel-3A</Mission>
    <File_Class>Routine Operations</File_Class>
    <File_Type>SR_2_NRPPAX</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2013-11-03T16:21:24</Validity_Start>
      <Validity_Stop>UTC=2013-11-03T18:03:54</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>MAR</System>
      <Creator>S3A_PODIPF</Creator>
      <Creator_Version>01.00</Creator_Version>
      <Creation_Date>UTC=2014-04-14T11:38:13</Creation_Date>
    </Source>
  </Fixed_Header>
  <Variable_Header>
</Variable_Header>
</Earth_Explorer_Header>
  <Data_Block type="xml">
    <List_of_PTFs count="2">
      <PTF>
        <TAI>TAI=2013-11-03T16:21:49.000000</TAI>
        <UTC>UTC=2013-11-03T16:21:14.000000</UTC>
        <UT1>UT1=2013-11-03T16:21:13.971094</UT1>
        <Platform_Off_Nadir_Pitch_Angle>-0.000008</Platform_Off_Nadir_Pitch_Angle>
```

```
<Platform_Off_Nadir_Roll_Angle>0.000014</Platform_Off_Nadir_Roll_Angle>
<Platform_Off_Nadir_Yaw_Angle>0.000016</Platform_Off_Nadir_Yaw_Angle>
<SRAL_Off_Nadir_Pitch_Angle>-0.000008</SRAL_Off_Nadir_Pitch_Angle>
<SRAL_Off_Nadir_Roll_Angle>0.000014</SRAL_Off_Nadir_Roll_Angle>
<SRAL_Off_Nadir_Yaw_Angle>0.000016</SRAL_Off_Nadir_Yaw_Angle>
<Dist_Ant_COG>0.453001</Dist_Ant_COG>
<Quality>NOMINAL</Quality>
</PTF>
<PTF>
  <TAI>TAI=2013-11-03T16:22:19.000000</TAI>
  <UTC>UTC=2013-11-03T16:21:44.000000</UTC>
  <UT1>UT1=2013-11-03T16:21:43.971093</UT1>
  <Platform_Off_Nadir_Pitch_Angle>0.000035</Platform_Off_Nadir_Pitch_Angle>
  <Platform_Off_Nadir_Roll_Angle>0.000005</Platform_Off_Nadir_Roll_Angle>
  <Platform_Off_Nadir_Yaw_Angle>-0.000034</Platform_Off_Nadir_Yaw_Angle>
  <SRAL_Off_Nadir_Pitch_Angle>0.000035</SRAL_Off_Nadir_Pitch_Angle>
  <SRAL_Off_Nadir_Roll_Angle>0.000005</SRAL_Off_Nadir_Roll_Angle>
  <SRAL_Off_Nadir_Yaw_Angle>-0.000034</SRAL_Off_Nadir_Yaw_Angle>
  <Dist_Ant_COG>0.452997</Dist_Ant_COG>
  <Quality>NOMINAL</Quality>
</PTF>
</List_of_PTFs>
</Data_Block>
</Earth_Explorer_File>
```

6. GNSS L1B FILES

6.1. HOURLY GNSS L1B RINEX FILE (AUX_GNSSRX)

6.1.1. MISSION APPLICABILITY

S-3

6.1.2. DESCRIPTION

Each GNSS Level-1 File consists of a single TGZ file containing two files: a XML Header file (HDR), and a Data Block file (DBL), which contains GNSS measurements, processed at Level-1 in RINEX format.

The GNSS measurements (code and phase) are not corrected with ground or space-calibrated biases to account for temperature effects, or azimuth/elevation dependance biases.

The GNSS code measurements are corrected with a constant bias of 23.5 metres, to align the estimated receiver clock with the GPS time scale. This bias is an instrumental bias of the receiver, which has been estimated empirically from POD processing. The estimated clock bias is therefore aligned to zero.

6.1.3. DISSEMINATION

The file is made available to CNES/SALP by the CPOD Service through the CPOD FTP server.

6.1.4. DATA LATENCY/COVERAGE

The file is generated within 5 hours from sensing time (i.e., the last epoch included in the RINEX file) of the GNSS Level-0 data dumps made available by the Sentinel-3 PDGS. The file coverage is one GPS hour, due to restrictions of the RINEX format. There are no overlaps between consecutive files. The Hourly GNSS L1b RINEX File contain measurements every second.

6.1.5. ACCURACY

The accuracy of the GNSS measurements (pseudo-range and phase) is given by the performance of the GNSS receiver. Typical orders of magnitude of the accuracy are between 0.1 and 1 m for pseudo-range and between 1 and 5 mm for phase measurements [RD.14].

6.1.6. DATA VOLUME

S3: 1 Mbyte.

6.1.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2. Below you can find an example of an Hourly GNSS L1b RINEX File name:

S3A_OPER_AUX_GNSSRX_POD__20100101T063019_V20100101T005942_20100101T015941.TGZ

6.1.8. DATA STRUCTURE AND DEFINITION

The data structure of the Hourly GNSS L1b RINEX File is described in section 3.1. In this particular case, the XML Header and the Data Block sections are separated in two independent files with same filename but different extension:

- the XML Header File has extension .HDR;
- and the Data Block File has extension .DBL.

These two files are packaged on a TGZ file comprising the final Hourly GNSS L1b RINEX File product to be delivered. The filename of the HDR and DBL files is equal to the TGZ file (see section 6.1.7), except for the extension. See an example below:

S3A_OPER_AUX_GNSSRX_POD__20100101T063019_V20100101T005942_20100101T015941.HDR

S3A_OPER_AUX_GNSSRX_POD__20100101T063019_V20100101T005942_20100101T015941.DBL

The XML Header File is an ASCII file containing data information that users can easily access to identify the product without the need to look inside the Data Block File.

The Data Block File is the RINEX Observation file, the format of which is defined in [AD.10].

6.1.8.1. XML Header File

The XML Header file contains general information identifying the product. It is composed by:

- A Fixed Header section;
- A Variable Header section.

6.1.8.1.1. Fixed Header Section

Table 6-1: Hourly GNSS L1b RINEX Files – Fixed Header

XML Tag Name Level 1	XML Tag Name Level 2	Value	Description
File_Name			As defined in 6.1.7 without the extension
File_Description		Rinex Hourly File	Description of the file.
Notes		Variable	Free Text
Mission		Sentinel-3#	# indicates the spacecraft ID: A or B
File_Class		OPER	This field is part of the File Name and indicates the type of processing (Section 6.1.7)
File_Type		AUX_GNSSRX	This field is part of the file name (Section 6.1.7)
Validity_Period			
	Validity_Start	Variable	UTC Validity Start Date • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC Validity Stop Date • UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	POD_	Name of the Ground Segment component creating the product
	Creator	POD_	Name of the tool creating the product
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	This field gives the UTC date of the generation of the file • UTC=yyyy-mm-ddThh:mm:ss

6.1.8.1.2. XML Specific Product Header

Table 6-2: Hourly GNSS L1b RINEX Files – Specific Header

XML Tag Name (Level 1)	Value	Description
SPH_Descriptor	GNSS L1b RINEX File	Name describing the Specific Product Header
Validity_Start	Variable	GPS=yyyy-mm-ddThh:mm:ss.uuuuuu GPS of the first record of the original file
Validity_Stop	Variable	GPS=yyyy-mm-ddThh:mm:ss.uuuuuu GPS of the last record of the original file
Rinex_Filename	Variable	Corresponding RINEX filename [AD.10] with name of receiver as s[1/2/3][a/b][n/r] where [n/r] correspond to the nominal or redundant receiver. e.g.: s3an1800.15o
Rinex_Version	3.03	x.xx. E.g. 3.03
Receiver_Name	Variable	Receiver name; e.g. - GPSR-N: for nominal receiver - GPSR-R: for redundant receiver
Receiver_Type	Variable	Type of receiver. e.g. SENTINEL-3 GPSR
Antenna_Name	Variable	Antenna name
Antenna_Type	Variable	Type of antenna. e.g. SEN-3A-GPSA

6.2. DAILY GNSS L1B RINEX FILES (AUX_GNSSRD)

6.2.1. MISSION APPLICABILITY

S-3 for SALP/CNES

S-1, S-2 and S-3 for ESA Copernicus Open Access Hub

6.2.2. DESCRIPTION

Each GNSS Level-1 file consists of a single TGZ file containing two files: a XML Header file (HDR), and a Data Block file (DBL) which contains GNSS measurements, processed at Level-1 in RINEX format.

The GNSS measurements (code and phase) are not corrected with ground or space-calibrated biases to account for temperature effects, or azimuth/elevation dependence biases.

The GNSS code measurements are corrected with a constant bias of 23.5 metres, to align the estimated receiver clock with the GPS time scale. This bias is an instrumental bias of the receiver, which has been estimated empirically from POD processing. The estimated clock bias is therefore aligned to zero.

The difference between the file delivered to SALP/CNES and the one generated to the ESA Copernicus Open Access Hub differ in the epochs at which the measurements are provided. On the first case, the measurements are aligned to the Instrument Measurement Time (IMT), as SALP/CNES requires the observations aligned to the local Ultra-Stable Oscillator (USO) that it is also used for DORIS and the SRAL altimeter instrument. On the second case, the measurements are aligned to GPS Time (GPST) for Sentinel-1 and Sentinel-2, and to a polynomial fit to GPST for Sentinel-3. This difference between Sentinels is due to the presence of a USO onboard Sentinel-3, which generate a more stable clock that allows the polynomial fit. With Sentinel-1 and Sentinel-2, the clock drifts faster, and it is noisier. The result of both methods is to align the epochs of the observations to integer seconds.

6.2.3. DISSEMINATION

For SALP/CNES, the file is made available by the CPOD Service through the CPOD FTP server.

For the ESA Copernicus Open Access Hub, the files are made available by the CPOD Service through the ESA Copernicus Open Access Hub FTP server.

6.2.4. DATA LATENCY/COVERAGE

The Daily GNSS L1b RINEX Files are generated from the GNSS Level-0 data dumps delivered by Sentinel-1, Sentinel-2 or Sentinel-3 PDGS, respectively. The file for SALP/CNES is made available within 5 hours from sensing time (i.e., the last epoch included in the RINEX file), whereas the files for the ESA Copernicus Open Access Hub are made available within 7 days from sensing time (i.e., the last epoch included in the RINEX file). The file coverage is one GPS day for both RINEX files due to restrictions of the RINEX format. There are no overlaps between consecutive files. The Daily GNSS L1b RINEX Files contain measurements every 10 seconds for Sentinel-1 and Sentinel-2, and every second for Sentinel-3.

6.2.5. ACCURACY

The accuracy of the GNSS measurements (pseudo-range and phase) is given by the performance of the GNSS receiver. Typical orders of magnitude of the accuracy are between 0.1 and 1 m for pseudo-range and between 1 and 5 mm for phase measurements [RD.14].

6.2.6. DATA VOLUME

S1, S2: 6 Mbytes.

S3: 24 Mbytes.

6.2.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2.

Below you can find an example of a Daily GNSS L1b RINEX File name for SALP/CNES and for the ESA Copernicus Open Access Hub, respectively:

S3A_OPER_AUX_GNSSRD_POD__20100103T043354_V20100101T235942_20100102T235941.TGZ

S3A_OPER_AUX_GNSSRD_POD__20100109T024316_V20100101T235942_20100102T235941.TGZ

6.2.8. DATA STRUCTURE AND DEFINITION

The data structure of the Daily GNSS L1b RINEX File is described in section 3.1. In this particular case, the XML Header and the Data Block sections are separated in two independent files with the same filename but different extension:

- The XML Header File has extension .HDR;
- The Data Block File has extension .DBL.

These two files are packaged on a TGZ file comprising the final Daily GNSS L1b RINEX File product to be delivered. The filename of the HDR and DBL files is equal to the TGZ file (see section 6.3.7), except for the extension. See an example below for SALP/CNES case:

S3A_OPER_AUX_GNSSRD_POD__20100103T043354_V20100101T235942_20100102T235941.HDR

S3A_OPER_AUX_GNSSRD_POD__20100103T043354_V20100101T235942_20100102T235941.DBL

The XML Header File is an ASCII file containing data information that users can easily access in order to identify the product without the need to look inside the Data Block File.

The Data Block File is the RINEX observation file, the format of which is defined in [AD.10].

6.2.8.1. XML Header File

The XML Header file contains general information identifying the product. It is composed by:

- a Fixed Header section;
- a Variable Header section.

6.2.8.1.1. Fixed Header Section

Table 6-3: Daily GNSS L1b RINEX Files – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			Product File Name as defined in 6.2.7 without extension
File_Description		GNSS L1B RINEX File	Description of the file
Notes		Variable	Free Text
Mission		Sentinel-N#	N indicates the spacecraft family: 1, 2, 3 # indicates the spacecraft model: A or B
File_Class		OPER	This field is part of the File Name and indicates the type of processing (Section 6.2.7)
File_Type		AUX_GNSSRD	This field is part of the file name (Section 6.2.7)
Validity_Period			
	Validity_Start	Variable	UTC Validity Start Date • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC Validity Stop Date • UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value starts from 0001 and increases by 1 every time a new version of the same file is generated.

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Source			
	System	POD_	Name of the Ground Segment component creating the product
	Creator	POD_	Name of the tool creating the product
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	This field gives the UTC date of the generation of the file UTC=yyyy-mm-ddThh:mm:ss

6.2.8.1.2. XML Specific Product Header

Table 6-4: Daily GNSS L1b RINEX Files – Specific Header

XML Tag Name Level 1	Value	Description
SPH_Descriptor	GNSS L1b RINEX File	Name describing the Specific Product Header
Validity_Start	Variable	GPS of the first record of the original file: GPS=yyyy-mm-ddThh:mm:ss.uuuuuu
Validity_Stop	Variable	GPS of the last record of the original file: GPS=yyyy-mm-ddThh:mm:ss.uuuuuu
Rinex_Filename	Variable	Corresponding RINEX filename ([AD.10]) with name of receiver as s[1/2/3][a/b][n/r] where [n/r] correspond to the nominal or redundant receiver. e.g.: s3an1800.15o
Rinex_Version	3.03	x.xx. E.g. 3.03
Receiver_Name	Variable	Receiver name; e.g. - GPSR-N: for nominal receiver - GPSR-R: for redundant receiver
Receiver_Type	Variable	Type of receiver. e.g. SENTINEL-3 GPSR
Antenna_Name	Variable	Antenna name
Antenna_Type	Variable	Type of antenna. e.g. SEN-3A-GPSA

6.3. GNSS L1B RINEX FILE FOR SENTINEL-6 (RNXH_AX/RNXD_AX)

6.3.1. MISSION APLICABILITY

S-6

6.3.2. DESCRIPTION

Each GNSS Level-1 File consists of a single folder compressed on a TAR file containing two files:

1. A manifest file
2. The RINEX file itself, compressed with gzip, containing GNSS measurements, decoded from the GNSS Level-0 into RINEX format.

The GNSS measurements (code and phase) are not corrected with ground or space-calibrated biases in order to account for temperature effects, or azimuth/elevation dependance biases.

The GNSS measurements are aligned to the Instrument Measurement Time (IMT).

6.3.3. DISSEMINATION

The file is made available to the Sentinel-6 PDAP by the CPOD Service through a FTP server placed at EUMETSAT premises.

6.3.4. DATA LATENCY/COVERAGE

There are two coverages:

1. A hourly file (RNXH_AX), generated within 10 minutes after the reception of the last GNSS L0 dump product covering the corresponding hour. The file coverage is one GPS hour.
2. A daily file (RNXD_AX), generated within 3 days from the last epoch of the processed day. The file coverage is one GPS day.

In both cases, there are no overlaps between consecutive files and the measurement rate is one second for the phase and 10 seconds for the code.

6.3.5. ACCURACY

The accuracy of the GNSS measurements (pseudo-range and phase) is given by the performance of the GNSS receiver. Typical orders of magnitude of the accuracy are between 0.1 and 1 m for pseudo-range and between 1 and 5 mm for phase measurements.

6.3.6. DATA VOLUME

For the hourly files, 1 Mbytes.

For the daily files, 22 Mbytes.

6.3.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.14]. All naming elements have been detailed in Table 6-5.

Table 6-5: GNSS L1b RINEX File – Naming element description

Parameter	Value	Description
MMM	S6[A/B]	For Sentinel-6A or -6B
SS	GN	Data consumer: GNSS-POD receiver
LL	1B	Processing Level "1B"
TTTTTT	RNXH_AX RNXD_AX	Data Type ID; GNSS L1b RINEX Hourly file Data Type ID; GNSS L1b RINEX Daily file

Parameter	Value	Description
<start_time>	yyyyMMddThhmmss	Validity start time of the data contained in the file, in CCSDS compact format
<end_time>	yyyyMMddThhmmss	Validity end time of the data contained in the file, in CCSDS compact format
<generation_time>	yyyyMMddThhmmss	Generation date of the file, in CCSDS compact format
<instance_id>	16 underscores "_"	Instance ID for auxiliary data
<source>	CPOD	CPOD Service
<environment>	XXX	OPE: For operational environment VAL: For validation environment
<class_id>	XX_NNN	Where: • XX = "NR" for NRT • NNN = Not relevant
<extension>	SEN6	Sentinel-6
.tar		The file must be delivered compressed on a .tar file

Below you can find an example of a GNSS L1b RINEX Hourly and Daily name for S-6A:

- Hourly:
S6A_GN_1B_RNXH_AX_20210212T005942_20210212T015941_20210212T063051_____
_____.CPOD_OPE_NR____.SEN6.tar
- Daily:
S6A_GN_1B_RNXD_AX_20210210T235943_20210211T235941_20210212T044200_____
_____.CPOD_OPE_NR____.SEN6.tar

6.3.8. DATA STRUCTURE AND DEFINITION

The GNSS L1b RINEX Hourly File is composed by:

- a manifest file, with a fix filename: **xfdumanifest.xml**;
- the RINEX file itself, compressed with gzip, with a filename that uses the new RINEX filename pattern [AD.10] (see Table 6-6 for naming elements)

Table 6-6: GNSS L1b RINEX File – Naming element description

Parameter	Value	Description
Name	S6AP00EUM	S6[AB]: Indicates the mission and spacecraft P: Indicates the RUAG PODRIX receiver 00: indicates the nominal receiver (GNSS-POD A) 01: indicates the redundant receiver (GNSS-POD B) EUM: Indicates the entity that disseminate them.
Data Source	R	Receiver data using vendor or other software
<start time>	yyyyDDDhhmm	Validity start time of the data contained in the file, with format: Year, Day of Year, Hour and Minutes in the same time system as specified in the header (GPS)
File coverage	01H / 01D	1 hour for hourly; 1 day for daily
Measurement frequency	01S	1 second
File Type	MO	For mixed RINEX (GPS+GAL)
<extension>	rnx	RINEX observation
.gz		The file must be delivered compressed on a .gz file

Below you can find an example of an Hourly and Daily RINEX name for S-6A:

- Hourly: S6AP00EUM_R_20210192300_01H_01S_MO.rnx.gz
- Daily : S6AP00EUM_R_20210190000_01D_01S_MO.rnx.gz

Both files (manifest and RINEX) are included into a folder, which is packaged with TAR into a file with a name described in section 6.3.7.

6.3.8.1.1. Manifest File

It is defined in [AD.15].

6.3.8.1.2. RINEX File

RINEX format [AD.10].

7. QUATERNIONS FILES

7.1. PROCESSED QUATERNIONS FILES FOR POD DATA HUB (AUX_PROQUA)

7.1.1. MISSION APPLICABILITY

S-1, S-2, S-3

7.1.2. DESCRIPTION

Every Sentinel provides its attitude in the RAW data packages (LO binary data). This information is decoded into a time tagged quaternions file (ASCII), containing the attitude of the satellites.

The quaternions can be raw (untouched), or processed. Processed quaternions can be interpolated, to align the quaternion to the closer integer epoch, or simulated, in case of data gaps. Each quaternion is flagged to indicate whether is raw, interpolated or simulated.

The data gaps within the real quaternions are filled with simulated attitude using the nominal attitude of each satellite. Available attitude modes are summarized in Table 7-1, relating them to their corresponding mission and identifier (mode ID).

Table 7-1: Attitude modes

Mission	Mode	Mode ID
Sentinel-1	No mode	10
	Normal Pointing Mode (NPM)	15
	Orbit Control Mode (OCM)	16
Sentinel-2	Initial Acquisition Mode (IAM)	21
	Normal Mode (NOM)	22
	Orbit Control Mode (OCM)	23
	Safe Mode (SFM)	24
Sentinel-3	Flight path pointing guidance (GDC_FLP)	0
	Geocentric pointing guidance (GDC_GEO)	1
	Geodetic pointing guidance (GDC_GED)	2
	Geocentric pointing with yaw-steering guidance (GDC_YEO)	3
	Geodetic pointing with yaw-steering guidance (GDC_YED)	4
	Heliocentric pointing guidance (GDC_SUN)	5

The 123 Euler Angles rotation (pitch (Φ) – roll (θ) – yaw (φ)) of a particular epoch is related to a quaternion of scalar part Q_0 and vectorial part (Q_1, Q_2, Q_3) as follows:

$$\theta = \text{atan2}(2 * (Q_2 * Q_3 + Q_0 * Q_1), (1 - 2 * (Q_1 * Q_1 + Q_2 * Q_2)))$$

$$\Phi = \text{asin}(-2 * (Q_1 * Q_3 - Q_0 * Q_2))$$

$$\varphi = \text{atan2}(2 * (Q_1 * Q_2 + Q_0 * Q_3), (1 - 2 * (Q_2 * Q_2 + Q_3 * Q_3)))$$

7.1.3. DISSEMINATION

The files are made available to the ESA Copernicus Open Access Hub by the CPOD Service through the ESA Copernicus Open Access Hub FTP server.

7.1.4. DATA LATENCY/COVERAGE

The Processed Quaternions Files are generated with a timeliness of 2 days with respect to the last epoch included into the file (they are aligned to the generation of the MOE Orbit Files). Each Processed

Quaternions File covers 24 hours of data, starting from the beginning of the day (00:00:00 GPST), with a temporal rate aligned to the RAW data (typically, 1 second).

7.1.5. ACCURACY

The accuracy of these products is in accordance with the operational attitude products, already addressed in sections 5.1.5 and 5.2.5 for Sentinel-1 and Sentinel-3, respectively. In the case of the Sentinel-2 mission, as there are not official attitude products, there is no an established requirement in this document. However, comparisons between the real attitude and the simulated attitude yield an agreement better than 20 mdeg for roll, 40 mdeg for pitch and 20 mdeg for yaw axes.

7.1.6. DATA VOLUME

1.5 Mbytes.

7.1.7. NAMING CONVENTION

The applicable file naming convention is defined in [AD.2] and detailed in Section 2.

Below you can find an example of a Processed Quaternions File name for S-1A:

S1A_OPER_AUX_PROQUA_POD__20100104T021150_V20100101T235942_20100102T235941.TGZ

7.1.8. DATA STRUCTURE AND DEFINITION

The data structure of the Processed Quaternions File is described in section 3.1. In this particular case, the XML Header and the Data Block sections are separated in two independent files with the same filename but different extension:

- the XML Header File has extension .HDR;
- and the Data Block File has extension .DBL.

These two files are packaged on a TGZ file comprising the final Processed Quaternions File product to be delivered. The filename of the HDR and DBL files is equal to the TGZ file (see section 7.1.7), except for the extension. See an example below for S-1A:

S1A_OPER_AUX_PROQUA_POD__20100104T021150_V20100101T235942_20100102T235941.HDR

S1A_OPER_AUX_PROQUA_POD__20100104T021150_V20100101T235942_20100102T235941.DBL

The XML Header File is an ASCII file containing data information that users can easily access to identify the product without the need to look inside the Data Block File.

The Data Block File is the Quaternions file, whose format is described in section 0.

7.1.8.1. XML Header File

The XML Header file contains general information identifying the product. It is composed by:

- a Fixed Header section;
- and a Variable Header section.

7.1.8.1.1. Fixed Header Section

Table 7-2: Processed Quaternions File – Fixed Header

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
File_Name			Product File Name as defined in section 7.1.7 without extension
File_Description		Quaternions Operational File	Description of the file

XML Tag Name (Level 1)	XML Tag Name (Level 2)	Value	Description
Notes		Variable	Free Text
Mission		Sentinel-N#	N indicates the spacecraft family: 1, 2, 3 # indicates the spacecraft model: A or B
File_Class		OPER	This field is part of the File Name and indicates the type of processing (section 7.1.7)
File_Type		AUX_PROQUA	This field is part of the file name (section 7.1.7)
Validity_Period			
	Validity_Start	Variable	UTC Validity Start Date • UTC=yyyy-mm-ddThh:mm:ss
	Validity_Stop	Variable	UTC Validity Stop Date • UTC=yyyy-mm-ddThh:mm:ss
File_Version		Variable	The value starts from 0001 and increases by 1 every time a new version of the same file is generated.
Source			
	System	POD_	Name of the Ground Segment component creating the product
	Creator	POD_	Name of the tool creating the product
	Creator_Version	Variable	Version of the service software generating the product
	Creation_Date	Variable	This field gives the UTC date of the generation of the file • UTC=yyyy-mm-ddThh:mm:ss

7.1.8.1.2. XML Specific Product Header

Table 7-3: Processed Quaternions File – Specific Product Header

XML Tag Name (Level 1)	Value	Description
SPH_Descriptor	Quaternions File	Name describing the Specific Product Header
Validity_Start	Variable	GPS of the first record of the original file • GPS=yyyy-mm-ddThh:mm:ss.uuuuuu
Validity_Stop	Variable	GPS of the last record of the original file • GPS=yyyy-mm-ddThh:mm:ss.uuuuuu
Attitude_Mode	Variable	Attitude mode as defined in Table 7-1
Attitude_ID	Variable	Attitude identifier as defined in Table 7-1

7.1.8.2. Data Block Section

The Data Block Section contains firstly five lines that represent a header. The entries of this header are described in Table 7-4 below.

Table 7-4: Header structure in Data Block File (Processed Quaternions File)

Header Entry	Value	Description
Parameter list	Variable	List of elements correlated to the body columns: - Q_COMP1: real part of the quaternion - Q_COMP2: first component of the vectorial part of the quaternion - Q_COMP3: second component of the vectorial part of the quaternion - Q_COMP4: third component of the vectorial part of the quaternion - ATT_MODE: attitude mode ID as defined in Table 7-1 represented by the quaternion - SOURCE: source of the data ("r"=real data, "i"=interpolated data or "s"=simulated data).

Header Entry	Value	Description
Satellite	Sentinel-N#	N: indicates the spacecraft family: 1, 2, 3 #: indicates the spacecraft model: A or B.
Start date (GPS)	Variable	GPS time of the first record of the body (format: yyyy/mm/dd hh:mm:ss)
End date (GPS)	Variable	GPS time of the last record of the body (format: yyyy/mm/dd hh:mm:ss)
Step (sec)	Variable	Temporal step between consecutive records of the body. This field is null if the step is variable
Nr. records	Variable	Number of records in the body

Then, the body is represented by a list of time tagged quaternions. For each line, the first column of the body corresponds to the GPS time of the quaternion (format: yyyy/mm/dd hh:mm:ss.uuu). The following columns map one-by-one and in the same order the Parameter List field of Table 7-4. An example of the quaternions data block is:

```
# Parameter list : Q_COMPR  Q_COMP1  Q_COMP2  Q_COMP3  ATT_MODE  SOURCE
# Satellite      : Sentinel-3A
# Start date (GPS): 2017/02/19 00:00:00
# End date (GPS): 2017/02/19 23:59:59
# Step (sec)     :
# Nr. records    : 86400
2017/02/19 00:00:00.000  0.255594  0.434377  0.829076  -0.242120  4 r
2017/02/19 00:00:01.000  0.255180  0.434519  0.829202  -0.241868  4 r
2017/02/19 00:00:02.000  0.254767  0.434661  0.829328  -0.241617  4 r
2017/02/19 00:00:03.000  0.254354  0.434802  0.829454  -0.241365  4 r
2017/02/19 00:00:04.000  0.253941  0.434944  0.829580  -0.241114  4 r
2017/02/19 00:00:05.000  0.253527  0.435085  0.829705  -0.240863  4 r
2017/02/19 00:00:06.000  0.253114  0.435227  0.829830  -0.240611  4 r
```


8. ILRS INTERFACES

8.1. CONSOLIDATED PREDICTION FORMAT (CPF) ORBIT FILE FOR SENTINEL-3 (AUX_STCCPF)

8.1.1. MISSION APPLICABILITY

S-3

8.1.2. DESCRIPTION

This file contains the orbital predictions of the Sentinel-3 satellites in Consolidated Prediction Format (CPF). It is considered different version formats for the generation of this file.

8.1.3. DISSEMINATION

This file is made available to the International Laser Ranging Service (ILRS) by the CPOD Service through a dedicated folder in the external FTP server of the CPOD Service.

8.1.4. DATA LATENCY/COVERAGE

The file is generated daily from the MOE Orbit File. It contains predictions of at least 5 days to the future from the time of generation. The step between consecutive predictions is of 1 minute.

8.1.5. ACCURACY

There is no a specific accuracy threshold for this file. The accuracy of the orbit predictions shall be below a few tens of metres in order to allow the ILRS stations to track the Sentinel-3 satellites.

8.1.6. DATA VOLUME

700 Kbytes.

8.1.7. NAMING CONVENTION

The applicable file naming convention is defined in [RD.7]. Below you can find an example of a CPF Orbit File name for each existing version format:

Filename of version 1.00: satellite_cpf_yymmdd_nnnv.src

Where:

- satellite: satellite name defined by the ILRS (sentinel3a and sentinel3b for S-3A and S-3B, respectively)
- yy: year (two digits)
- mm: month (two digits)
- dd: day of month (two digits)
- nnn: ephemeris version number. This is the day of year + 500
- v: version number within the day. This is one digit, starting with '1'
- src: prediction provider code, 3 characters long. This is 'esa'

Example: sentinel3a_cpf_150626_6771.esa

Filename version 2.00: satellite_cpf_yymmdd_nnnvv.src

Where:

- satellite: satellite name defined by the ILRS (sentinel3a and sentinel3b for S-3A and S-3B, respectively)
- yy: year (two digits)

- mm: month (two digits)
- dd: day of month (two digits)
- nnn: ephemeris version number. This is the day of year
- vv: version number within the day. This is two digits with zero leading fill, starting with '01' and increasing to '99'
- src: prediction provider code, 3 characters long. This is 'esa'

Example: sentinel3a_cpf_190326_08501.esa

8.1.8. DATA STRUCTURE AND DEFINITION

ILRS orbit prediction in CPF format [RD.7]

9. EXTERNAL AUXILIARY DATA FILES

This section presents the format specification of the External Auxiliary Data Files needed for the generation of products by the CPOD Service.

9.1. 15M NRT GNSS ORBIT AND CLOCK FILE (AUX_GSVMAX)

9.1.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.1.2. DESCRIPTION

This file contains ephemerides and clocks of the GNSS constellations in near real time in a 15-minutes batch for a Near-Real Time (NRT) processing.

9.1.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server. A backup EGP also provides this file through the CPOD FTP server in order to avoid possible gaps of data in case of punctual failures of the main EGP.

9.1.4. DATA LATENCY/COVERAGE

The file is generated every 15 minutes. It covers 15+15 minutes at a sampling rate of 30 seconds. The first 15 minutes are an overlap with the previous product. The second 15 minutes start in the reference epoch indicated in the filename.

9.1.5. ACCURACY

The 15M NRT GNSS orbits shall compare to the CODE rapid orbits with a 1D 1-sigma RMS of 10 cm or lower without allowing for a 7-parameter Helmert transformation.

The 15M NRT GNSS clocks shall compare to the CODE rapid clocks with a sigma of 0.2 ns or lower

9.1.6. DATA VOLUME

90 Kbytes.

9.1.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gpnwwwdHHMM.sp3.gzip, where:

- d: day of week of the GPS start time of the period covered by the file.
- www: GPS week of the GPS start time of the period covered by the file.
- HH: hour of the day of the GPS start time of the period covered by the file.
- MM: minute of the hour (00, 15, 30, 45) of the GPS start time of the period covered by the file.

9.1.8. DATA STRUCTURE AND DEFINITION

SP3 format including clocks (valid version "c" [AD.11] and "d" [AD.16]).

9.2. 24H NRT GNSS ORBITS (AUX_GSVHAX)

9.2.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.2.2. DESCRIPTION

This file contains ephemerides of the GNSS constellation in near real time with coverage of 24 hours

9.2.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.2.4. DATA LATENCY/COVERAGE

It is generated every hour and it covers 48 hours (24 hours + 24 hours of prediction) at a sampling rate of 15 minutes.

9.2.5. ACCURACY

The 24H NRT GNSS orbits shall compare to the CODE rapid orbits in with a 1D 1-sigma RMS better than the 15M NRT GNSS orbits without allowing for a 7-parameter Helmert transformation.

9.2.6. DATA VOLUME

230 Kbytes.

9.2.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gpuwwwdHH.sp3.gzip, where:

- d: day of week of the GPS start time of the period covered by the file.
- www: GPS week of the GPS start time of the period covered by the file.
- HH: hour of the day of the GPS start time of the period covered by the file.

9.2.8. DATA STRUCTURE AND DEFINITION

SP3 format (valid version "c" [AD.11] and "d" [AD.16])

9.3. 24H NRT GNSS CLOCKS (AUX_GCLHAX)

9.3.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.3.2. DESCRIPTION

This file contains clocks of the GNSS constellation in near real time with coverage of 24 hours. It must be consistent with the corresponding 24H NRT GPS orbits.

9.3.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.3.4. DATA LATENCY/COVERAGE

It is generated every hour and it covers 24 hours at a sampling rate of 30 seconds.

9.3.5. ACCURACY

The 24H NRT GNSS clocks shall compare to the CODE rapid clocks in sigma better than the 15M NRT GNSS clocks.

9.3.6. DATA VOLUME

1.5 Mbytes.

9.3.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gpuwwwdHH.clk.gz, where:

- d: day of week of the GPS start time of the period covered by the file
- www: GPS week of the GPS start time of the period covered by the file
- HH: hour of the day of the GPS start time of the period covered by the file

9.3.8. DATA STRUCTURE AND DEFINITION

Clock RINEX format (see [RD.4])

9.4. 24H NRT EARTH ORIENTATION PARAMETERS (EOPS) (AUX_EOPHAX)

9.4.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.4.2. DESCRIPTION

This file contains the Earth Orientation Parameters (EOP) estimated by the EGP together with the NRT GNSS orbit.

9.4.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.4.4. DATA LATENCY/COVERAGE

It is generated every hour and it covers a period of 7 days being the middle day the one of the related 24H NRT GNSS orbit.

9.4.5. ACCURACY

The accuracy of the 24H NRT GNSS EOPs is consistent with the accuracy of the 24H NRT GNSS orbits and clocks.

9.4.6. DATA VOLUME

4 Kbytes

9.4.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gpuwwwdHH.eop, where:

- d: day of week of the GPS start time of the middle 24 hours of the period covered by the file.
- www: GPS week of the GPS start time of the middle 24 hours of the period covered by the file.
- HH: hour of the day of the GPS start time of the middle 24 hours of the period covered by the file.

9.4.8. DATA STRUCTURE AND DEFINITION

The following table gives the record format:

Table 9-1: Description of NAPEOS EOP file

Key	Type	Description
Epoch	I4,1X,I2,1X,I2,1X,I2	Epoch of parameters in UTC as: YYYY MM DD HH
X-Pole	F12.7	X-component of pole position in arcsec
Y-Pole	F12.7	Y-component of pole position in arcsec
UT1-UTC	F12.7	UT1 - UTC in seconds
UTC-TAI	I5	UTC - TAI in integer seconds
Status	A8	Status of EOP values, FIN=final, QCK=rapidservice, PRE=90-day prediction, LTP=long-term prediction. Having the first character of this status is enough.
dX	F10.6	Nutation in longitude
dY	F10.6	Nutation in obliquity

9.5. STC GNSS ORBITS (AUX_GSVSTC)

9.5.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.5.2. DESCRIPTION

This file contains ephemerides of the GNSS constellation with the best possible accuracy generated after several hours.

9.5.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.5.4. DATA LATENCY/COVERAGE

It is generated daily with a timeliness of 36 hours and it covers from 00:00 to 24:00 of the day with a sampling rate of 15 minutes.

9.5.5. ACCURACY

The GNSS orbits shall compare to the CODE rapid orbits with a 1D 1-sigma RMS of 6 cm or lower without allowing for a 7-parameter Helmert transformation.

9.5.6. DATA VOLUME

124 Kbytes.

9.5.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gprwwwwd.sp3.gzip, where:

- d: day of week of the GPS start time of the day covered by the file.
- www: GPS week of the GPS start time of the day covered by the file.

9.5.8. DATA STRUCTURE AND DEFINITION

SP3 format (valid version c [AD.11] and "d" [AD.16])

9.6. STC GNSS CLOCKS (AUX_GCLSTC)

9.6.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.6.2. DESCRIPTION

This file contains clocks of the GNSS constellation with the best possible accuracy generated after several hours.

9.6.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.6.4. DATA LATENCY/COVERAGE

It is generated daily with a timeliness of 36 hours and it covers from 00:00 to 24:00 of one day with a sampling rate of 30 seconds.

9.6.5. ACCURACY

The STC GNSS clocks shall compare to the CODE rapid clocks with a sigma of 0.1 ns or lower

9.6.6. DATA VOLUME

1.5 Mbytes

9.6.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gprwwwwd.clk.gzip, where:

- d: day of week the GPS start time of of the day covered by the file
- www: GPS week the GPS start time of of the day covered by the file

9.6.8. DATA STRUCTURE AND DEFINITION

Clock RINEX format (see [RD.4])

9.7. STC EARTH ORIENTATION PARAMETERS (EOPS) (AUX_EOPSTC)

9.7.1. MISSION APPLICABILITY

S1, S2, S-3, S-6

9.7.2. DESCRIPTION

This file contains the Earth Orientation Parameters (EOP) estimated by the EGP together with the STC GNSS orbit.

9.7.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.7.4. DATA LATENCY/COVERAGE

It is generated daily with a timeliness of 36 hours and it covers a period of 5 days being the middle day the one of the related STC GNSS orbit.

9.7.5. ACCURACY

The accuracy of the STC EOPs is consistent with the accuracy of the STC GNSS orbits and clocks.

9.7.6. DATA VOLUME

4 Kbytes

9.7.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

gprwwwwd.eop, where:

- www: GPS week of the GPS start time of the middle day of the period covered by the file.
- d: day of week of the GPS start time of the middle day of the period covered by the file.

9.7.8. DATA STRUCTURE AND DEFINITION

The following table gives the record format:

Table 9-2: Description of NAPEOS EOP file

Key	Type	Description
Epoch	I4,1X,I2,1X,I2,1X,I2	Epoch of parameters in UTC as: YYYY MM DD HH
X-Pole	F12.7	X-component of pole position in arcsec
Y-Pole	F12.7	Y-component of pole position in arcsec
UT1-UTC	F12.7	UT1 - UTC in seconds
UTC-TAI	I5	UTC - TAI in integer seconds
Status	A8	Status of EOP values, FIN=final, QCK=rapidservice, PRE=90-day prediction, LTP=long-term prediction. Having the first character of this status is enough.
dX	F10.6	Nutation in longitude
dY	F10.6	Nutation in obliquity

9.8. GNSS NAVIGATION MESSAGE (AUX_NAV_AX)

9.8.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.8.2. DESCRIPTION

This file contains the navigation message of the GNSS constellations.

9.8.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.8.4. DATA LATENCY/COVERAGE

It is generated every hour and it contains the orbital navigation messages of the GNSS satellites from the current day until the current time.

9.8.5. ACCURACY

The GNSS navigation message shall be equal to the one transmitted by the GNSS constellation.

9.8.6. DATA VOLUME

50 Kbytes.

9.8.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

brdcdddf.yyn.Z, where

- ddd: day of year of the start time of the period covered by the file
- f: hour letter of the start time of the period covered by the file
- yy: 2-digit year of the start time of the period covered by the file

9.8.8. DATA STRUCTURE AND DEFINITION

RINEX format specification (see [AD.10])

9.9. GNSS CONSTELLATION ANTEX FILE (AUX_ATX_AX)

9.9.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.9.2. DESCRIPTION

This file is the latest ANTEX file as used by the EGP containing the Antenna Phase Centre Offsets (PCO) and Variations (PCV) of the antennas of the GNSS constellation.

9.9.3. DISSEMINATION

The file is made available from the External GNSS Provider (EGP) to the CPOD Service through the CPOD FTP server.

9.9.4. DATA LATENCY/COVERAGE

It is generated whenever it is changed (e.g. a new GNSS satellite is commissioned) and it contains historical data of the GNSS constellation.

9.9.5. ACCURACY

The GNSS ANTEX information shall have an accuracy consistent with the accuracy of the CPOD orbits and clocks.

9.9.6. DATA VOLUME

18 Mbytes.

9.9.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

igsnn_www.atx, where:

- nn: year of the ITRF realization with which the ANTEX is consistent
- www: GPS week of the GPS time when the file starts being applicable.

9.9.8. DATA STRUCTURE AND DEFINITION

Antenna exchange format (see [RD.5])

Addendum: The fields "START OF FREQUENCY" and "END OF FREQUENCY", should allow the satellite system flag "I" for IRNSS. The values are "I05" (L5 band) and "I09" (S band). This is explained in [RD.15]

9.10. CODE NTC GNSS ORBITS (AUX_GSVCOR)

9.10.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.10.2. DESCRIPTION

This file contains ephemerides of the GNSS constellations generated by CODE Rapid chain.

9.10.3. DISSEMINATION

The file is obtained from the CODE FTP.

9.10.4. DATA LATENCY/COVERAGE

It is generated daily with a delay of 16 hours for CODE rapid products. It covers the interval from 00:00 to 23:45 of one day with a sampling of rate 15 minutes.

9.10.5. ACCURACY

The accuracy of the CODE Rapid GNSS orbits is estimated to be in the order of 1cm 1D 1-sigma RMS.

9.10.6. DATA VOLUME

200 Kbytes.

9.10.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

CODwwwd.EPH_M.Z, where:

- www: GPS week of the day covered by the file
- d: day of week of the day covered by the file

9.10.8. DATA STRUCTURE AND DEFINITION

SP3 format (valid version "c" [AD.11] and "d" [AD.16])

9.11. CODE NTC GNSS CLOCKS (AUX_GCLCOR)

9.11.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.11.2. DESCRIPTION

This file contains clocks of the GNSS constellation generated by the CODE Rapid chain.

9.11.3. DISSEMINATION

The file is obtained from the CODE FTP.

9.11.4. DATA LATENCY/COVERAGE

It is generated daily with a delay of 16 hours for CODE rapid products. It covers the interval from 00:00 to 23:59:30 of one day with a sampling rate of 30 seconds.

9.11.5. ACCURACY

The accuracy of the CODE Rapid GNSS clocks is estimated to be in the order of 0.03ns 1D 1-sigma RMS.

9.11.6. DATA VOLUME

3.2 Mbytes.

9.11.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

CODwwwd.CLK_M.Z, where:

- www: GPS week of the day covered by the file
- d: day of week of the day covered by the file

9.11.8. DATA STRUCTURE AND DEFINITION

Clock RINEX format (see [RD.4])

9.12. CODE GNSS BIASES (AUX_GBICOR)

9.12.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.12.2. DESCRIPTION

This file contains code and phase biases of the GNSS constellation computed by CODE.

9.12.3. DISSEMINATION

The file is obtained from the CODE FTPs.

9.12.4. DATA LATENCY/COVERAGE

It is generated with a delay of 2 weeks from CODE rapid products, but in the chain of CODE final products. It contains single biases applicable to a single day.

9.12.5. ACCURACY

The accuracy is the required for the accuracy of the CODE rapid products.

9.12.6. DATA VOLUME

108 Kbytes.

9.12.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

CODwwwd.BIA_M.Z, where:

- d: day of week of the day covered by the file
- www: GPS week of the day covered by the file

9.12.8. DATA STRUCTURE AND DEFINITION

Clock SINEX format [AD.13].

9.13. REP GNSS ORBITS (AUX_GSVREP)

9.13.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.13.2. DESCRIPTION

This file contains ephemerides of the GNSS constellation with the best possible accuracy generated as part of CODE reprocessing campaigns

9.13.3. DISSEMINATION

This file is used in the orbit reprocessing of the Copernicus POD Service.

9.13.4. DATA LATENCY/COVERAGE

All files are published at once one available and each one of them covers one day from 00:00 to 23:45 of the GPS time scale with a sampling rate of 15 minutes.

9.13.5. ACCURACY

The accuracy is estimated to be in the order of 1cm 1D 1-sigma RMS.

9.13.6. DATA VOLUME

Around 400 Kbytes

9.13.7. NAMING CONVENTION

Filename format: (all time variables in GPS time scale)

CORyydoy.EPH.gz

where:

- yy: year
- doy: Day of Year

9.13.8. DATA STRUCTURE AND DEFINITION

SP3 format (valid version "c" [AD.11] and "d" [AD.16])

9.14. REP GNSS CLOCKS (AUX_GCLREP)

9.14.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.14.2. DESCRIPTION

This file contains clocks of the GNSS constellation with the best possible accuracy generated as part of CODE reprocessing campaigns

9.14.3. DISSEMINATION

This file is used in the orbit reprocessing of the Copernicus POD Service.

9.14.4. DATA LATENCY/COVERAGE

All files are published at once one available and each one of them covers one day from 00:00 to 23:45 of the GPS time scale with a sampling rate of 5 seconds.

9.14.5. ACCURACY

The accuracy of the REP GNSS clocks is estimated to be in the order of 0.03ns 1D 1-sigma RMS.

9.14.6. DATA VOLUME

Around 7.8 Mbytes

9.14.7. NAMING CONVENTION

Filename format: (all time variables in GPS time scale)

CORyydoy_5s.CLK.gz

where:

- yy: year
- doy: Day of Year

9.14.8. DATA STRUCTURE AND DEFINITION

Clock RINEX format (see [RD.4])

9.15. REP GNSS BIASES (AUX_GBIREP)

9.15.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.15.2. DESCRIPTION

This file contains code and phase biases of the GNSS constellation computed by CODE during a reprocessing campaign.

9.15.3. DISSEMINATION

The file is obtained from the CODE FTPs.

9.15.4. DATA LATENCY/COVERAGE

It is generated in a reprocessing campaign. Each file contains biases applicable to a single day.

9.15.5. ACCURACY

The accuracy is the required for the accuracy of the CODE reprocessed products.

9.15.6. DATA VOLUME

108 Kbytes.

9.15.7. NAMING CONVENTION

The filename format uses the following pattern (all time variables are in GPS time scale):

CORyydoy.BIA.gz, where:

- yy: Year
- doy: Day of Year

9.15.8. DATA STRUCTURE AND DEFINITION

Clock SINEX format [AD.13].

9.16. IERS EARTH ORIENTATION PARAMETERS (AUX_EOP_AX)

9.16.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.16.2. DESCRIPTION

This file contains the Earth Orientation Parameters (EOPs) including Earth pole, Earth axis nutation and Earth rotation synchronisation information. The EOPs can be used for transformations between various reference frames.

9.16.3. DISSEMINATION

This file is obtained from external entities, in particular IERS, CDDIS, or IGS.

9.16.4. DATA LATENCY/COVERAGE

The file `finals2000A.data` (updated weekly) contains historic data (from 1992), while the other file `finals2000A.daily` (updated daily at about 18:00 UTC) only contains data for the last three months and a prediction of another three months. Thus, the former file is needed for the reprocessing campaigns in the CPOD Service, whereas the latter is needed to have up-to-date values daily.

9.16.5. ACCURACY

The accuracy of the IERS EOPs is consistent with the accuracy of the NTC GNSS orbits and clocks.

9.16.6. DATA VOLUME

`finals2000A.data`: 2.1 Mbytes

`finals2000A.daily`: 40 Kbytes

9.16.7. NAMING CONVENTION

Filename format:

`finals2000A.data` (file generated weekly)

`finals2000A.daily` (file generated daily)

9.16.8. DATA STRUCTURE AND DEFINITION

IERS EOP format specification (see [RD.3])

9.17. IERS LEAP SECONDS (AUX_LSC_AX)

9.17.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.17.2. DESCRIPTION

This file contains the leap seconds introduced by the IERS in order to keep UTC and UT1 aligned (less than 1 second). This information is important for the CPOD Service for the handling of time scales (GPS, UTC, TAI)

9.17.3. DISSEMINATION

This file is obtained from external entities, in particular IERS, CDDIS, or IGS.

9.17.4. DATA LATENCY/COVERAGE

The file can be updated any day, but it is only updated very rarely, at most once every six months. It contains all historical leap seconds introduced in the UTC time scale. The file covers from 1961 until the current time plus six months. It is updated every time a Leap Second event is scheduled by the IERS.

9.17.5. ACCURACY

N/A

9.17.6. DATA VOLUME

4 Kbytes

9.17.7. NAMING CONVENTION

Original filename format:

tai-utc.dat

9.17.8. DATA STRUCTURE AND DEFINITION

IERS leap second format (see [RD.2] for the leap second file)

9.18. SOLAR FLUX ACTIVITY (AUX_SAC_AX)

9.18.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.18.2. DESCRIPTION

This file contains the solar flux and geomagnetic activity information, estimated and predicted. This file is needed for the estimation of the atmospheric density for the computation of the atmospheric drag acting on the Sentinel satellites.

9.18.3. DISSEMINATION

This file is obtained from NOAA.

9.18.4. DATA LATENCY/COVERAGE

It is generated once per day. The file covers a period of one day. It is available at about 03:00 UTC of day d. It will cover the period between day d-2 at 21:00 to day d-1 at 21:00. It also contains predictions for day d.

9.18.5. ACCURACY

Unknown.

9.18.6. DATA VOLUME

4 Kbytes.

9.18.7. NAMING CONVENTION

Filename format:

YYYYMMDDRSQA.txt, where:

YYYY: year of the contents (estimated solar flux) of the file

MM: month of the contents (estimated solar flux) of the file

DD: day of month of the contents (estimated solar flux) of the file

9.18.8. DATA STRUCTURE AND DEFINITION

Solar activity information specifications (see [RD.1])

9.19. ATMOSPHERE AND OCEAN DE-ALIASING LEVEL-1B (AOD1B) FILE (AOD1B)

9.19.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.19.2. DESCRIPTION

This file contains the spatio-temporal mass variations in the atmosphere and oceans deduced from an operational atmospheric model and corresponding ocean dynamics provided by an ocean model. The file is provided in Stokes coefficients up to degree and order 180..

9.19.3. DISSEMINATION

The file is made available by the GeoForschungsZentrum (GFZ) through its FTP server.

9.19.4. DATA LATENCY/COVERAGE

- The file is updated daily with a timeliness of 1 day. It covers one day from 00:00:00 to 21:00:00 hours in GPS time at a sampling rate of 3 hours.

9.19.5. ACCURACY

Unknown

9.19.6. DATA VOLUME

20 Mbytes.

9.19.7. NAMING CONVENTION

The filename format of the AOD1B File uses the following pattern (all time variables are in GPS time scale):

AOD1B_YYYY-MM-DD_X_NN.asc.gz, where

- YYYY = year of the day covered by the file;
- MM = month of the year of the day covered by the file;
- DD = day of the month covered by the file;
- NN = release number of the file.

9.19.8. DATA STRUCTURE AND DEFINITION

AOD1B format specification [RD.16]

9.20. SLR DATA (AUX_SLR___)

9.20.1. MISSION APPLICABILITY

S-3, S-6

9.20.2. DESCRIPTION

This file contains the SLR observations generated by the ILRS network. These observations are used for orbit quality control.

9.20.3. DISSEMINATION

This file is obtained from ILRS.

9.20.4. DATA LATENCY/COVERAGE

It is generated daily and it contains SLR measurements from the current day and an undefined number of days to the past (in the order of one week).

9.20.5. ACCURACY

The accuracy of the SLR measurements is of the order of 5-10 mm RMS.

9.20.6. DATA VOLUME

50 Kbytes

9.20.7. NAMING CONVENTION

Filename format:

satellitename_yyyymmdd.npt, where:

- satellitename: satellite name defined by the ILRS (sentinel3a and sentinel3b for S-3A and S-3B)
- yyyy: year of the day when the contained SLR measurements are received
- mm: month of year of the day when the contained SLR measurements are received
- dd: day of month of the day when the contained SLR measurements are received

9.20.8. DATA STRUCTURE AND DEFINITION

ILRS SLR data CRD format (see [RD.6])

9.21. DORIS RINEX (AUX_DORIS_)

9.21.1. MISSION APPLICABILITY

S-3

9.21.2. DESCRIPTION

Each Doris Level 1 file consists of a single file. This file contains Doris measurements processed at Level 1

9.21.3. DISSEMINATION

Doris level1 files are one of the main input allowing the SALP to produce Precise Orbit State Vectors based on Doris data. They may also be used at the CPOD Service for the NTC processing chain

9.21.4. DATA LATENCY/COVERAGE

It is generated daily with coverage of one full day

9.21.5. ACCURACY

Unknown

9.21.6. DATA VOLUME

1.3 Kbytes.

9.21.7. NAMING CONVENTION

Filename format:

DS3A/B_MEP_1P<a>D<StartMeasurementTime>, where:

- DS3A/B = Doris on board Sentinel3/A or B satellites
- <a> = version number
- D = Day (file covering a day of data)
- <StartMeasurementTime> using the following format: `yyyymmdd_hhmmss`

9.21.8. DATA STRUCTURE AND DEFINITION

RINEX DORIS 3.0 (see [RD.9])

9.22. SENTINEL ANTEX FILE (AUX_ATXSAX)

9.22.1. MISSION APPLICABILITY

S1, S2, S-3, S-6

9.22.2. DESCRIPTION

This file is the ANTEX file containing the Antenna Phase Centre Offsets (PCO) and Variations (PCV) of the antennas of the Sentinel satellites

9.22.3. DISSEMINATION

The file is generated by the CPOD Service for POD.

9.22.4. DATA LATENCY/COVERAGE

The file is generated whenever there is a change on a Sentinels satellite.

9.22.5. ACCURACY

The LEO ANTEX information shall have an accuracy consistent with the accuracy of the CPOD orbits and clocks.

9.22.6. DATA VOLUME

4.7 Mbyte

9.22.7. NAMING CONVENTION FOR THE SENTINELS POD SERVICE CENTRE

Filename: (all time variables are in GPS time scale)

sennn_www.atx, where:

- nn: year of the ITRF realization with which the ANTEX is consistent
- www: GPS week of the GPS time when the file is published.

9.22.8. DATA STRUCTURE AND DEFINITION

Antenna exchange format (see [RD.5])

9.23. EXTERNAL SENTINEL ORBITS (AUX_EXTORB)

9.23.1. MISSION APPLICABILITY

S-1, S-2, S-3, S-6

9.23.2. DESCRIPTION

This file contains the precise orbital solution provided by an external entity like DLR, TUM, ESOC, EUM, CODE, DEOS, GFZ This file is intended to compare the different orbital solutions computed by external expert centres against the precise orbits computed by the CPOD Service.

9.23.3. DISSEMINATION

This file is provided to the CPOD Service via the ftp server accessible via the Internet from each of the centres contributing with precise external orbits

9.23.4. DATA LATENCY/COVERAGE

The file is provided asynchronously. The external orbit file covers a period of one day with a margin of one hour at both ends. Hence, the interval covered by the file is 26 hours. This file may contain several satellites

9.23.5. ACCURACY

The orbits provided by the external centres shall have an accuracy better than 10 cm (ideally 2-3 cm radial 1-sigma RMS) in order to be useful for the CPOD Service

9.23.6. DATA VOLUME

160 Kbytes

9.23.7. NAMING CONVENTION

Filename format: (all time variables are in GPS time scale)

Sxycentwwwd.sp3.gz, where:

- x: Sentinel mission id (1, 2, 3,...)
- y: Sentinel satellite id (A, B, C, D)
- cent: is a 4 character id of the centre generating the file (e.g. ESOC)
- www: is the GPS week number of the day covered by the file
- d: GPS day of week of the day covered by the file

9.23.8. DATA STRUCTURE AND DEFINITION

SP3 format (see [AD.11])

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