



Ref: AED-SD-DoRIT-L1B-009
Issue/Rev 7/12
Date: 13-Dec-2021

Aeolus Level 1b Processor and End-to-End Simulator

ESA Contract No. 16312/03//NL/MM

ASTRIUM Order AE.CO.ASU.GS.00026

L1bP Issue 7/12 Software Release Note

AED-SD-DoRIT-L1B-009

(former ADM-RN-52-3330)

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CHANGE RECORD

ISSUE	DATE	PAGE(S)	DESCRIPTION
1/0	Sept. 26, 2005	All	First Issue Reason for Changes: To support initial L1bP release 1.0.
1/1	Sept. 30, 2005	All	First Issue, First Revision Reason for Changes: To support L1bP release 1.0.1.
1/2	Dec. 9, 2005	All	First Issue, Second Revision Reason for Changes: To support L1bP release 1.0.2.
1/3	Jul. 05, 2006	All	First Issue, Third Revision Reason for Changes: To support L1bP related SPRs (ADM-MDA-0014 to ADM-MDA-0041).
1/4	Nov. 08, 2006	All	First Issue, Fourth Revision Reason for Changes: To support the changes according to CCN4 and the SPRs.
1/5	Jan. 17, 2007	All	First Issue, Fifth Revision Reason for Changes: To support L1bP release 1.05.
1/6	Apr. 12, 2007	All	First Issue, Sixth Revision Reason for Changes: To support L1bP release 1.06.
1/7	Jun. 12, 2007	All	First Issue, Seventh Revision Reason for Changes: To support L1bP release 1.07.



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ISSUE	DATE	PAGE(S)	DESCRIPTION
1/8	Jan. 14, 2008	All	First Issue, Eighth Revision Reason for Changes: To support L1bP release 1.09.
1/9	Feb. 18, 2008	All	First Issue, Ninth Revision Reason for Changes: To support L1bP release 1.09.
1/10	Apr. 01, 2008	All	First Issue, Tenth Revision Reason for Changes: To support L1bP release 1.10.
1/11	Sept. 04, 2008	All	First Issue, Eleventh Revision Reason for Changes: To support L1bP release 1.11.
1/12	Oct. 30, 2008	All	First Issue, Twelfth Revision Reason for Changes: To support L1bP release 1.12.
5/03	Mar 23, 2009	All	First DLR Issue Support L1bP release 5.03
5/04	Jun. 19, 2009		Reason for Changes: To support L1bP release 5.04
5/05	Jan. 29, 2010		Reason for Changes: To support L1bP release 5.05 AE-IPF-24, AE-IPF-28, AE-IPF-40, AE-IPF-44, AE-IPF-52, AE-IPF-53, AE-IPF-54, AE-IPF-55, AE-IPF-56, AE-IPF-58, AE-IPF-59, AE-IPF-61, AE-IPF-62, AE-IPF-63, AE-IPF-65, AE-IPF-66, AE-IPF-67, AE-IPF-70, AE-IPF-73, AE-IPF-76, AE-IPF-77, AE-IPF-79



ISSUE	DATE	PAGE(S)	DESCRIPTION
5/06	Oct. 15, 2010	All	Reason for Changes: To support L1bP release 5.06 AE-IPF-80, AE-IPF-81, AE-IPF-82, AE-IPF-86. AE-IPF-90, AE-IPF-91, AE-IPF-92, AE-IPF-94 Processing of A2D data, update of DCO and ground detection algorithm, quality flagging of wind processing, and processing of NOP, UDM mode data
5/07	Dec. 20, 2010	All	Reason for Changes: To support L1bP release 5.07 AE-IPF-95, AE-IPF-96, AE-IPF-98, AE-IPF-100
6/00	Oct. 28, 2011		Sixth Issue Reason for Change: To support L1bP release 6.00; new system requirements; new make system; continuous mode operation; AE-IPF-103, AE-IPF-88
6/01	Jul. 01, 2012		Sixth Issue, First Revision Reason for Change: To support L1bP release 6/01;
6/02	Oct. 21, 2013		Sixth Issue, Second Revision Reason for Change: To support L1bP release 6/02
6/03	13-Jun-2014		Sixth Issue, Third Revision Reason for Change: To support L1bP release 6/03
6/03_CleanUp	08-Aug-2014		Sixth Issue, Third Revision, Clean up Reason for Change: To support L1bP release 6/03_CleanUp
6/04	26-Feb-2015		Sixth Issue, Fourth Revision Reason for Change: To support L1bP release 6/04
6/04_Patch_1	11-Mar-2015		Sixth Issue, Fourth Revision, Patch_1 Reason for Change: To support L1bP 6/04 Patch_1 release



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6/05	29-Jan-2016		Sixth Issue, Fifth Revision Reason for Change: To support L1bP 6/05 release
6/06	01-Jun-2016		Sixth Issue, Sixth Revision Reason for Change: To support L1bP 6/06 release
7/00	21-Jul-2017		Seventh Issue Reason for Change: To support L1bP 7/00 release
7/01			Seventh Issue, First Revision Reason for Change: To support L1bP 7/01 release
7/02	20-Jul-2018		Seventh Issue, Second Revision To support L1bP 7/02 release
7/02_DL R	25-Aug-2018		Seventh Issue, Second Revision, DLR Development Version To support L1bP 7/02_DLR
7/03	09-Sep-2018		Seventh Issue, Third Revision To support L1bP 7/03 release
7/04	17-Oct-2018		Seventh Issue, Fourth Revision To support L1bP 7/04 release
7/05	14-Dec-2018		Seventh Issue, Fifth Revision To support L1bP 7/05 release
7/06	30-Apr-2019		Seventh Issue, Sixth Revision To support L1bP 7/06 hot pixel patch release
7/07	08-Aug-2019		Seventh Issue, Seventh Revision To support L1bP 7/07 release
7/07_1	06-Oct-2019		Seventh Issue, Seventh Revision, First Sub-revision To support L1bP 7/07_1 release
7/08	10-Dec-2019		Seventh Issue, Eighth Revision To support L1bP 7/08 release



ISSUE	DATE	PAGE(S)	DESCRIPTION
7/08_1	07-Feb-2020		Seventh Issue, Eighth Revision, First Sub-revision To support L1bP 7/08_1 release
7/09	12-Jun-2020		Seventh Issue, Ninth Revision To support L1bP 7/09 release
7/09_1	19-Aug-2020		Seventh Issue, Ninth Revision, First Sub-revision To support L1bP 7/09_1 release
7/10	29-Jan-2021		Seventh Issue, Tenth Revision To support L1bP 7/10 release
7/10_1	17-Mar-2021		Seventh Issue, Tenth Revision, First Sub-revision To support L1bP 7/10_1 release
7/11_Pre	11-Jun-2021		Seventh Issue, Eleventh Revision To support L1bP 7/11 pre-release
7/11	30-Jul-2021		Seventh Issue, Eleventh Revision To support L1bP 7/11 release
7/11_1	06-Oct-2021		Seventh Issue, Eleventh Revision, First Sub-revision To support L1bP 7/11_1 release
7/11_2	22-Oct-2021		Seventh Issue, Eleventh Revision, Second Sub-revision To support L1bP 7/11_2 release
7/12	13-Dec-2021		Seventh Issue, Twelfth Revision To support L1bP 7/12 release



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ACRONYMS AND ABBREVIATIONS

Acronyms and Abbreviations used in this document but not found in this list will be listed in the latest release of Document A-12.

E2S	ADM-Aeolus End-To-End Simulator
FAT	Factory Acceptance Test
L1bP	ADM-Aeolus Level 1B Processor
MDA	MacDonald Dettwiler



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1 INTRODUCTION

1.1 Purpose of the Document

The purpose of this document is to provide information relevant to the release of the Aeolus Level 1B Processor (L1bP) software Issue 7/12, dated Dec 13, 2021.

This document is intended for individuals that will be installing and using this release of the Level 1B Processor software.

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2 DOCUMENTS

2.1 Applicable Documents

Applicable documents at the issue date or revision level shown provide information which either takes precedence over, or forms an intrinsic part of this document, to the extent specified herein.

A-1	AE.CO.ASU.GS.005	Level 1B processor and End to End Simulator Contract. Issue B.
A-2	AE-SW-ASU-GS-011	Statement of Work. Issue E2.
A-3	AE-RS-ASU-GS-022	Requirement Specification. Issue E2.
A-4	AE-SW-ASU-GS-023	Aeolus Master Algorithm Document. Issue 10
A-5	ESA-ID-ACS-GS-0001	PDS-IPF ICD Generic Interface Guidelines. Issue 2.2.
A-6	AE-RS-ASU-PA-001	Product Assurance Requirements for Subcontractors. Issue 3.
A-7	AE-RS-ASG-PA-002	Software Product Assurance Requirements. Issue 2A.
A-8	AE-SW-ASU-MA-001	Subcontractor Project Management. Issue H.
A-9	AE-RS-ASU-GS-023	Level 1B and End to End Simulator Document Contents Guidelines. Issue B.
A-10	ECSS-E-40B	Space Engineering Software – Part 1: Principles and Requirements. Draft, July 28, 2000.
A-11	ECSS-Q-80B	Space Product Assurance, Software Product Assurance. Issue B, October 10, 2004.
A-12	AE-LI-ASU-SY-001	Acronyms and Abbreviations. Issue 2.
A-13	AE-TN-ASU-SY-006	Background Document for Contractors. Issue B.

A-14	AE-ST-ASG-SY-001	Aeolus Packet Utilisation Standards. Issue 6, Dec. 17, 2004.
A-15	AE-IF-ASF-AL-00006	ALADIN Instrument FM TM/TC ICD. Issue 15,
A-16	AE-TN-ESA-SY-007	ADM-Aeolus Engineering Data Products Guidelines. Issue 1B.
A-17	PE-TN-ESA-GS-0001	Earth Explorer Ground Segment File Format Standard, Issue 1.4, June 13, 2003.
A-18	CS-NA-DMS-GS-001	Earth Explorer Mission Conventions Document. Issue 1.3, 15 July 2004.
A-19	AE-TN-ASF-AL-00044	ALADIN Instrument Operation Definition. Issue 3, 29 Oct. 2004.

2.2 Reference Documents

Reference documents provide background and/or supplementary information to the contents of this document. The reference documents are relevant to this document to the extent specified herein.

R-1	AED-SD-DoRIT-E2SL1B-011	Aeolus Level 1b Processor and End-to-End Simulator: Software Requirements Specification, Issue/Revision 1/09, May 15, 2020.
R-2	AED-SD-DoRIT-E2SL1B-015	Aeolus Verification Control Document, Issue 1/09, May 15, 2020.
R-3	AED-SD-DoRIT-E2SL1B-016	Aeolus Level 1b Processor and End-to-End Simulator Acceptance Test Plan, Issue 1/5, May 15, 2020.
R-4	AED-SD-DoRIT-L1B-014	Aeolus Level 1B Processor Acceptance Test Procedures, Issue 1/06, Jun. 12, 2020.
R-5	AED-SD-DoRIT-L1B-008	Aeolus Level 1B Processor Operator's Manual, Issue 2/11, Jun 12, 2020.
R-6	AED-SD-DoRIT-L1B-006	Input/Output Data Definitions Interface Control Document, Issue 4/15, Jun. 11, 2021.
R-7	AED-SD-DoRIT-L1B-007	Level 1b Processor Detailed Processing Model, Issue 3/15, Dec. 13, 2021
R-8	AE-TN-DLR-ACS-L1B	Additional Computational Steps ADM-Aeolus L1B, Issue 1.6, Jul. 25, 2014



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R-9 AED-SD-DoRIT-E2S-002

ADM-Aeolus End-To-End Simulator Operator's
Manual, 2/14, Nov 15, 2021

R-10 AED-TN-DoRIT-L1A-062

Investigation results dL1A_004: Beam propagation
with refractive index using EO-CFI, V1.1, 12/11/2021

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3 VERSION DESCRIPTION

3.1 Overview

This release contains the Level 1B Processor Issue 7/12 software and updated documents. It consists of a source code package

- L1bP_Source_7.12,

two modified documents

- AED-SD-DoRIT-L1B-007, Level 1b Processor Detailed Processing Model, 521800_DPM_v3_15
- AED-SD-DoRIT-L1B-009, L1bP Issue 7/12 Software Release Note

ten unmodified documents

- AED-SD-DoRIT-L1B-006, Input/Output Data Definitions Interface Control Document, 521666_IODD_4_15
- AED-SD-DoRIT-E2SL1BL2A-010, E2S & L1bP & L2aP-op Test Validation Plan, V1.3, dated Oct. 12, 2019
- AED-SD-DoRIT-L1B-008, L1B Software Users Manual, V 2/11 dated June 12, 2020
- AED-SD-DoRIT-L1B-012, Aeolus Level 1b Processor Architectural Design Document, V 3/6 dated June 12, 2020
- AED-SD-DoRIT-L1B-013, Aeolus Level 1b Processor External Interface Control Document, V 1/11 dated June 12, 2020
- AED-SD-DoRIT-L1B-014, Aeolus Level 1B Processor Acceptance Test Procedures,
- AED-SD-DoRIT-L1B-017, The E2S Satellite Characterisation and L1B AUX_CHAR input files, Issue 1.0 Rev 1,
- AED-SD-DoRIT-E2SL1B-015, Verification Control Document, Revision 1/09, dated May 15, 2020,
- AED-SD-DoRIT-E2SL1B-016, Acceptance Test Plan, Revision 1/05, dated May 15, 2020,
- AED-SD-DoRIT-E2SL1B-011, Software Requirements Specification, Revision 1/09, dated May 15, 2020,

1 modified special test document

- AED-SD-DoRIT-L1B-042, L1bP Runtime Performance Overview

1 special test data set for the updates listed in section 3.2,

- dL1A_004

and four extra test data sets for the additional regression tests:

- 19293
- PRB0044285
- OSVA_20190731T0556
- OSVA_20200423T1208

Note: The auxiliary files provided with the source code package and installed into the `./aux` directory of the runtime are applicable to FMA data, E2S simulated data, and special test cases. Auxiliary files that shall be used for data processing of data measured from L1bP V7.12 delivery onward, are grouped in a dedicated directory `Aux-Inputs`, that is delivered in addition to L1bP V7.12. This directory usually holds three sub-directories:

- **fromPDGS:** For convenience this directory holds copies of the most recent auxiliary inputs from the ADDS. These are only files that have not changed their format or content with L1bP V7.12.
- **newFormatAux:** This directory holds all auxiliaries that have either changed their format or their content.
- **forE2SSimulated:** This directory holds auxiliary files with special settings needed for E2S simulated data.

3.2 Updates

3.2.1 dL1A_004 Beam propagation with refractive index using EO-CFI

Two bugs have been identified providing input to `cfi` routines that calculate the geolocation parameters. Those bugs have been fixed. Further some minor code changes have been added to the retrieval of geolocation parameter to improve precision of retrieved parameters. A full description of the investigations and code modifications can be found in R-10.

Test case: dL1A_004

3.2.2 dL1B_028 Define a SNR related to the total signal for the Mie channel in the L1B (updated definition)

The definition of the parameter `Total_Mie_Signal_to_Noise_Ratio` has been changed corresponding to the latest insights as reported on Oct. 6, 2021 in discussion item dL1B_028. The total Mie SNR is now computed as described in equation 79.5.6 of R-7.

Test case: `install-test-L1bP-test00`, WVM mode

3.2.3 Improved installation test

The L1b file comparator tool used during the installation test has been extended to check consistency of header information from *.DBL and *.HDR files. File names and paths of *.HDR files can be passed to the tool using new command line arguments `--hdr1` and `--hdr2`, and then MPH and SPH entries of the *.HDR files are compared to the corresponding entries of the *.DBL files. These consistency checks are now incorporated to the installation test script.

Test case: `install-test-L1bP-test00`, WVM mode, OWV mode, slightly modified *.HDR files.

3.3 New File Formats

Compared to L1bP V7.11 all products generated by L1bP V7.12 have the same file format.

3.4 Test Cases

All extra test cases provided in the TDS can be run as soon as their whole directory is copied into the working directory of the runtime of L1bP V7.12.

3.4.1 dL1A_004

The test case dL1A_004 is based on a L0 product with data measured 03. Aug. 2019, `AE_OPER_ALD_U_N_0_20190803T093547033_005399990_005479_0001`, as it is available from the ESA Aeolus Online Dissemination System. The ground track of this data is close to the Pierre Auger observatory in Argentina. This observatory noticed, that the ADM products provide wrong latitude/longitude values in the GE data set.

An additional external tool has been provided by ESA. This external tool retrieves latitude and longitude values from the ADM telemetry products. This tool confirmed, that there is an error in the latitude/longitude values in the GE data set. The output of this external tool is provided within the test case directory dL1A_004: `ATT_AEOLUS_QUAT_wDEM_noREF.CSV`. This file holds the results for all AOCS samples of 15 BRCs close to the Pierre Auger observatory.

Data should be processed to L1A from L0. In a next step the GE data set should be dumped to ASCII with the `LAC_ReadLevelOneAFile` tool.



The test was successful, if the measurement level latitude/longitude of DEM intersection values are close to the ones for results found in the output of the external tool with for about the same UTC time.



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4 COMPATIBILITY INFORMATION

4.1 Processor Compatibility Matrix

E2S	L1bP
V4.01	V7.02
V4.01	V7.03
V4.01	V7.04
V4.02	V7.05
V4.02	V7.06
V4.03	V7.06
V4.03	V7.07
V4.04	V7.08
V4.05	V7.09
V4.05	V7.09.1
V4.05	V7.10
V4.06	V7.10
V4.06	V7.10.1
V4.06	V7.11
V4.07	V7.11



V4.07	V7.11.1
V4.07	V7.11.2
V4.07	V7.12
V4.08	V7.12

Table 4-1 L1bP Processor Compatibility Matrix

4.2 Auxiliary Files Compatibility Matrices

Note: The L1bP V7.12 is delivered with a set of updated auxiliary input files suited for processing FMA data. Input files for FMB data are provided in a separate directory.

The tables below list all static auxiliary input files used by the L1b operational processor, where

- **File Type** denotes the specific sub-string of the product name that identifies the product,
- **Origin** specifies the company providing the file,
- **Schema Version** defines the version as specified in the header of the file, and
- **Ref Doc** specifies the IODD that defines the product.
- **s/d** indicates if file is used as static or dynamic input.

Example:

AE_OPER_ AUX_PAR_1B 20180712T000000_99991231T235959_0001.EEF

↑

File Type

4.2.1 Auxiliary Input Files

The File Version has not been filled, as it is not clear to the contractor, how to fill the column. This needs to be discussed with DOS and ESA/ESRIN.

File Type	Origin	Schema Version	Ref Doc	s/d
AUX_CHAR	DoRIT	04.09	521666_IODD_4_09	s

AUX_PAR_0	DoRIT	04.09	521666_IODD_4_09	s
AUX_PAR_1A	DoRIT	04.13	SD-DoRIT-L1B-006 v4.13	s
AUX_PAR_1B	DoRIT	04.15	SD-DoRIT-L1B-006 v4.15	s
MPL_ORBSCT	ESA	1.5	Not known	s
AUX_HBE	DoRIT	04.09	521666_IODD_4_09	s
AUX_RDB	DoRIT	04.09	521666_IODD_4_09	s
AUX_DCMZ	EDAF ECS	04.15	SD-DoRIT-L1B-006 v4.15	d
AUX_MRC	EDAF ECS	04.14	SD-DoRIT-L1B-006 v4.14	s
AUX_RRC	EDAF ECS	04.14	SD-DoRIT-L1B-006 v4.14	s
AUX_ZWC	PDGS	04.09	521666_IODD_4_09	s

Table 4-2 Auxiliary Files Compatibility Matrix



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5 ENVIRONMENT NEEDED

This release of the Level 1B Processor software is intended for the following environment:

RedHat Linux Enterprise Server, Kernel 2.6.32-71.el6.x86-64 for 64bit

GNU Compiler Collection (GCC) 4.4.4

GNU Fortran (GCC) 4.4.4

libxml2 2.5.10

Matlab 7.0.4 for Linux, Service Pack 1 or higher

IBM Java Software Development Kit V1.6.0

Perl V5.10.1

cmake 2.8

Digital Elevation Model (DEM) data and flag files (compatible with the Earth Explorer CFI) need to be installed together in a dedicated directory.

pdflatex (necessary only for the test script)

perl packages Time::Piece, Time::Seconds, Getopt::Long, File::Copy, File::Spec, File::Path, Cwd (necessary only for the test script)

perl packages Date::Manip and Switch (only for performance script detJobDuration.pl)

5.1 Installation Instructions

Please refer to the Level 1B Processor Operator's Manual, Document R-5, for instruction on how to compile and install the software.



5.2 Tested Platforms

5.2.1 Platform 1 – yuma

#		
1	Hardware Configuration	DELL Latitude 5590 BTX Intel Core i5-8250U, 4 kernels, 1.6GHz 6 MB Cache
2	Linux Distribution	Ubuntu "bionic" 18.04.3 LTS gcc version Matlab R2019a Java Software Development Kit V1.0.4 Perl V5.26.1 cmake 3.10.2 libxml2 2.9.4

5.2.2 Platform 2 – adm1

#		
1	Hardware Configuration	PowerEdge M640 Blade Server 46 Intel(R) Xeon(R) Gold 6152 CPU @ 2.10GHz 128 GB RAM
2	Linux Distribution	openSUSE Leap 15.0, 4.12.14-lp150.12.45-default x86_64 gcc version 7.4.0 Matlab R2019a Java Software Development Kit V1.6.0 Perl V5.26.1 cmake 3.10.2 libxml2 2.5.10

5.2.3 Platform 3 – adm5

#		
1	Hardware Configuration	DELL PowerEdge R410 8 Intel(R) Xeon(R) CPU E5620 @ 2.40GHz 8 GB RAM
2	Linux Distribution	RedHat Linux Enterprise Server, Kernel 2.6.32-71.el6.x86-64 gcc version 4.4.4 20100726 (Red Hat 4.4.4-13) Matlab 7.0.4 Java Software Development Kit V1.6.0 Perl V5.10.1 cmake 2.8 libxml2 2.5.10



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5.2.4 Platform 4 – adm2

Due to a hardware problem on adm2 (broken hard disc drive) L1bP V7.12 could not be tested on this machine.

#		
1	Hardware Configuration	DELL PE 1950 4 Intel(R) Xeon(R) CPU 5160 @ 3.00GHz 8 GB RAM
2	Linux Distribution	openSUSE 12.3 (Dartmouth) (x86_64) gcc (SUSE Linux) 4.7.2 20130108 [gcc-4_7-branch revision 195012] MATLAB Version 7.13.0.564 (R2011b) java-1.6.0-openjdk-1.6.0.0.x86_64 perl 5, version 16, subversion 2 (v5.16.2) built for x86_64-linux-thread-multi cmake version 2.8.10.2 libxml2-2-2.9.0-2.29.1.x86_64

Ref: AED-SD-DoRIT-L1B-009
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