

# SMOS L1 Processor Prototype 5.5.0

## Software Release Note

**Code** : SO-SRN-DME-LIPP-0261  
**Issue** : 1.0  
**Date** : 29/11/11

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## 1. INTRODUCTION

### 1.1. Purpose and Scope

This document provides the Software Release Note for the SMOS L1 Processor Prototype v5.5.0 and associated tools. It also details the Installation and Compilation procedures.

### 1.2. Acronyms and Abbreviations

CAS	Calibration System
CFI	Customer Furnished Item
COTS	Commercial Off-The-Shelf
CRSD	Correlated Noise Injection Calibration File
EE	Earth Explorer
EEFH	Earth Explorer File Handling CFI (ASCII XML library)
GUI	Graphical User Interface
HTML	HyperText Markup Language
LICEF	Light-weight Cost-Effective
L1PP	Level 1 processor prototype
NS	Noise Source
SMOS	Soil Moisture and Ocean Salinity
SPAR	S-Parameters
SVP	Software Validation Plan
XML	Extended Markup Language
XSL	eXtensible Stylesheet Language

**Table 1: Table of Acronyms.**

For the complete list of acronyms, please refer to the document SO-LI-CASA-PLM-0094 “Directory of Acronyms and abbreviations”.

## 1.3. Applicable and Reference Documents

### 1.3.1. Applicable Documents

Ref.	Code	Title	Issue & Date
AD.1	SO-SOW-CASA-PLM-0855	Level 1 Processor Prototype Development Phase 3 and Support and Analysis Activities. Statement of Work	1.0
AD.2	EE-MA-DMS-GS-0008	EE XML/Binary CFI File Handling Library	3.7.3
AD.3	SO-DS-DME-L1PP-0007	SMOS L1 Processor L0 to L1a Data Processing Model	2.15 29/11/11
AD.4	SO-DS-DME-L1PP-0012	SMOS L1 Processor Prototype ADD (obsolete, integrated in DPMs)	1.3
AD.5	BinX	Editkt::BinX 1.2 Developer's Guide	1.3 2005
AD.6	SO-TR-DME-L1PP-0018	SMOS L1 Processor Software Verification and Validation Plan (SVVP)	2.11 29/11/11
AD.7	SO-TN-IDR-GS-0005	SMOS L1 DPGS Product Specification	5.22 29/11/11
AD.8	SO-DS-DME-L1PP-0008	SMOS L1 Processor L1a to L1b Data Processing Model	2.15 29/11/11
AD.9	SO-DS-DME-L1PP-0009	SMOS L1 Processor L1c Data Processing Model	2.10 29/11/11
AD.10	SO-DS-DME-L1PP-0011	SMOS L1 Processor Algorithm Theoretical Baseline Definition	2.10 29/10/10
AD.11	SO-UM-DME-L1PP-0016	SMOS L1 Processor Prototype User Manual	2.17 29/11/11
AD.13	SO-SOW-ESA-GS-6647	SMOS Expert Support Laboratories for the period 2010-2014 - ESL Level 1 Calibration and Reconstruction	1.2 07/05/10

**Table 2: Applicable Documents.**

### 1.3.2. Reference Documents

Ref.	Code	Title	Issue
<b>RD 1</b>	EE-MA-DMS-GS-0001	Earth Explorer Mission CFI Software MISSION CONVENTIONS DOCUMENT	<b>1.5</b>
<b>RD 2</b>	PE-TN-ESA-GS-0001	Earth Explorer Ground Segment File Format Standard	<b>1.4</b> 13/06/03
<b>RD 3</b>	EE-MA-DMS-GS-0002	Earth Explorer Mission CFI Software GENERAL SOFTWARE USER MANUAL	<b>3.7.3</b> 07/05/10
<b>RD 4</b>	SO-LI-CASA-PLM-0094	Directory of Acronyms and abbreviations	

**Table 3: Reference Documents**

## 2. Version Description

### 2.1. Baseline Processing

This is version 5.5.0 of the SMOS L1 Processor Prototype, implementing the baseline defined at QWG#6 and detailed in the documentation delivered with this release, with the exceptions described in Section 2.3. The L1PP has been system and scientifically tested. No unit tests were performed, since all functionality is tested with the full L0 to L1c scientific tests.

### 2.2. Changes Implemented

This is the third release of the SMOS L1 Processor Prototype Phase 6, corresponding to the build version 5.5.0. The following changes with respect to the previous release (L1PP Build 5.0.0) are included in this release.

**L1PP Version: 5.5.0**

**CVS Tag: SMOS-P6-REL-V5\_5\_0-FINAL-20111110**

**Creation Date: 2011-11-10**

Corrected the following SPRs with respect to the previous release (v 5.0.0):

- SPR 565 - L1PP is not able to use VTEC\_C or VTEC\_R ADF
- SPR 564 - CMN\_NIR\_Status flag is not propagated from the TLM\_MIRA1A to the MIR\_SC\_F1B
- SPR 563 - MIR\_SC\_F1B product headers do not contain references to AUX\_DGG\_\_ and AUX\_LSMASK\_\_
- SPR 561 - The product header reports that the correlator layer is nominal when it should be redundant
- SPR 562 - Mismatch in leakage equation used during NIR calibration wrt leakage used in Science processing
- SPR 559 - The Correlator Layer field is wrongly filled
- SPR 558 - The Header size information in the MIR\_CRSD1A product header sometimes is incorrect
- SPR 560 - CMN\_NIR\_Status is always on in the TLM\_MIRA1A files
- SPR 557 - Improve leakage and cross-coupling computation by using new antenna model in LICEF-LA
- SPR 556 - Inversion of copolar HV part produces one zero singular value before inversion

- SPR 555 - L1PP crashes when detecting more than 1 lock/unlock event

In addition to the SPR correction, the following updates were made:

- Major updates

- Implemented separation between Long and Short Calibration
- Implemented configurable generation and usage of an hexagonally expanded G-matrix for extended sources removal
- Correction of the Gibbs 2 algorithm.
- Implemented the correction for the T4 baseline, fixing a large part of the bias observed in the descending orbits

- Minor updates

- This L1PP Installer includes the latest XML RW API and DPGS schemas available at the time of creation (v05.00.35, Release for L1PP only)
- Implementation of a configurable option to compute the Sun BT through an interpolation of the four closest grid points to the Sun position

## 2.3. Differences wrt Baseline

This version of the L1 Prototype (5.5.0) has been delivered together with the latest documentation baseline of L1 Processing (see Section 2.4). The latest instrument and processing baseline is fully implemented with some exceptions:

- On all DPGS products, the quality information (in both headers and datablocks) is set to zero as L1PP v5.5.0 is not computing any quality indicators (except for those already present in the L0 headers which are simply transmitted onwards)
- The following changes are to be understood as L1PP “evolutions”, which are implemented and tested using L1PP framework before issuing formally a recommendation for DPGS implementation (or not). Some of them are already known not to be needed in DPGS, but are reported here for completeness:
  - Configurable option to use new PMS external calibration baseline or the nominal PMS internal calibration (external PMS calibration is not recommended for DPGS)
  - Configurable option to activate Unoise correction for baselines covered only by a common Noise Source (no recommendation has yet been issued)

- Configurable option to decimate Local Oscillator sequences by configuration (not recommended for DPGS)
- Configurable option to generate and use a Hexagonally expanded G-matrix in extended sources removal (no recommendation has yet been issued)
- Configurable option to use a four point interpolation to compute the Sun BT during the Direct Sun correction.

## 2.4. Documents Delivered and Changes

The following table provides a list of the documents that are delivered in this release and that define the L1 5.5.0 baseline:

Code	Changes	Issue
SO-DS-DME-L1PP-0007	Updated Leakage and Cross-coupling equations in section 3.8.2.3	<b>2.15</b>
SO-DS-DME-L1PP-0008	Added description for new Sun Interpolation method Added description for hexagonal G-Matrix computation and its implications at L1c Updated outputs of RFI Histogram in RFI Detection module	<b>2.15</b>
SO-DS-DME-L1PP-0009	Added Open Issue regarding apodisation windows used in L1	<b>2.10</b>
SO-UM-DME-L1PP-0016	Updated for L1PP V5.5.0	<b>2.16</b>
SO-TDD-DME-L1PP-0023	Added new configuration for Sun Removal and update Baseline Weights file.	<b>2.11</b>
SO-TR-DME-L1PP-0018	Updated for L1PP V5.5.0 test campaign.	<b>2.10</b>
SO-TDD-DME-L1PP-0257	Test Data Set for v5.5.0.	<b>1.0</b>
SO-TR-DME-L1PP-0263	Software Validation Report for v5.5.0 delivery	<b>1.0</b>
SO-DS-DME-L1PP-0011	No updates	<b>2.10</b>
SO-TN-IDR-GS-0005	Updated with Long/Short Term Calibration separation.	<b>5.22</b>

## 2.5. Implementation of Mandatory Fields

A table reporting the mandatory fields for Level 1c products can be found in Annex. This table only reports the status of the L1C product headers. All datablock values are set according to the L1 Product Specification.

## 2.6. Known limitations and bugs

As of Phase 5 (L1PP v3.1.0), only the 64bit version of the SW is supported.

There are no remaining Software Problem Reports to be investigated in L1PP v5.5.0, meaning that are no open SPRs.

For reporting additional SPRs, please use the Problem report form available at the L1PP project's webpage:

[http://www.smos.com.pt/problem\\_report.html](http://www.smos.com.pt/problem_report.html).

## 2.7. Future Implementations

For the next delivery of L1PP (v600), the following activities are planned:

- SPR fixes
- Possible RFI Full-Pol mitigation (impacts DPM L1b)

## 3. INSTALLATION PROCEDURE

### 3.1. Hardware Requirements

L1PP may be run on any x86 architecture (PentiumIV, Xenon, AMD Opteron, ...) 64 bits with LINUX installed. The memory and disk resources needed for executing the prototype depend on the type of algorithms being used. For full functionality, the user needs the following resources:

- ❑ 18,5 GiB of Disk Space – from these 18,5GB, 16GiB are needed for generating the G-Matrix ADF<sup>1</sup>. After the generation of the ADF, the L1PP needs around 10GiB of disk space for all the ADFs, libraries and some available space for products generation;
- ❑ Minimum 4GiB RAM - the RAM memory available will be critical when handling the G-Matrix ADF (Level 1B). If the user wants to use the G-Matrix ADF for performing the Foreign Sources Correction in Full Polarisation, a minimum of 10GiB is advisable (16 GiB recommended). If the user has less than 8 GiB of RAM, a swap partition of at least 8 GiB is also recommended as the total amount of memory needed in L1b processing may reach 10GiB for a full pol product half-orbit.
- ❑ From L1PP v5.5.0 onwards there is the possibility to generate and use an expanded G-Matrix. This implies that the user must have 41 GiB of disk space, since the generation of this expanded matrix requires ~38 GiB. The expanded matrix needs a minimum of 19 GiB of RAM memory.

As mentioned before, only the 64bit version of L1PP is maintained, which requires a 64bit HW platform to execute.

### 3.2. Dependencies

In order to run the SMOS L1PP, it is recommended to have the following software already installed in the target platform:

- ❑ GCC 4.3 (<http://gcc.gnu.org>)
- ❑ glibc 2.3.4 (<http://gcc.gnu.org>)
- ❑ gfortran (version included in gcc 4.3)
- ❑ BinaryXML File Handler 3.7 (already includes BinX 1.2.6) (<http://www.smos.esa.int/>)
- ❑ xerces 2.8.0 (<http://xml.apache.org/xerces/>)

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<sup>1</sup> The ADF occupies around 8GB of disk space. However, since it is not provided with the Install Kit, it must be generated by the prototype (refer to [AD.11] for further details on generating the G-Matrix ADF). For generating it a minimum of 2X8GB of disk space available is needed. After the generation of the ADF, only the 8GB occupied by the ADF are needed.

- XML RW API ([ftp://131.176.251.166/smos/software/XML\\_RW\\_API/](ftp://131.176.251.166/smos/software/XML_RW_API/))
- xerces 2.7.0 (<http://xml.apache.org/xerces/>) (needed by XML RW API)
- DOM4J 1.5.2 (<http://www.dom4j.org>)
- Jaxen 1.1 (<http://jaxen.codehaus.org>)
- Swing 1.0
- Log4c 1.2.0 (<http://log4c.sourceforge.net>)
- Java J2SE SDK 1.5.0 (<http://java.sun.com/j2se/1.5.0/download.html>)
- Lapack 3.0 (<http://www.netlib.org/lapack/>)
- Blas 3.0 (version included in Lapack 3.0)
- FFTW 3.1.2 (<http://www.fftw.org/>)

Each product referred above should be installed according to its own instructions in the target platform.

Nevertheless, the LIPP Install Kit already contains some of the above dynamic libraries in case the user has not installed them locally. The included libraries are:

- BinaryXML 3.7
- xerces 2.8.0 (<http://xml.apache.org/xerces2-j/>)
- XML RW API ([ftp://131.176.251.166/smos/software/XML\\_RW\\_API/](ftp://131.176.251.166/smos/software/XML_RW_API/))
- xerces 2.7.0 (<http://xml.apache.org/xerces/>) (needed by XML RW API)
- Libxml2 2.6.16
- Log4c 1.2.0
- DOM4J 1.5.2
- Jaxen 1.1
- Swing 1.0
- Lapack 3.0
- Blas 3.0 (version included in Lapack 3.0)
- FFTW 3.1.2
- gfortran (version included in gcc 4.3)

Libraries *dom4j.jar*, *jaxen-1.1-beta-8.jar* and *swing-layout-1.0.jar* are provided in *l1pp/lib* directory (no extraction or installation required).

The rest of the libraries may need to be compiled as appropriate, so it may be possible that they need to be installed as root. Please check each installation instructions for this purpose, although for GNU packages it can be done simply by executing *./configure* and then *make*.

### 3.3. Installation Kit Description

The L1 Processor Prototype is provided as an InstallKit composed of a single *tgz* file. This binary distribution is delivered as *L1PP-5.5.0\_Installer.tgz* which after decompressing contains:

- ❑ *InstallKitL1PP\_5\_5\_0.readme*
- ❑ *InstallKitL1PP\_5\_5\_0.tgz*: which contains the libraries and configuration files of the L1 prototype. The package contains inside a pre-configured structure of the L1PP working directory with the Linux 64 bits version and Mac OS X of the L1PP. All required configuration files, product schemas and header templates are also included;
- ❑ *InstallKitL1PP.sh*

In order to run the prototype the user will also need the Auxiliary Data Files and the test data scenarios, which are provided separately:

- ❑ *ADFPackage\_5\_5\_0.tgz*: contains all the Auxiliary Data Files needed by the prototype as well as the corresponding xml schemas and documentation;
- ❑ *TestDataPackage\_5\_5\_0*: contains several test data scenarios (L0 products), each packed independently, corresponding configuration files in order to be used directly by the prototype. In addition, documents with the test scenarios description and with the product format specification are also provided in the same webpage<sup>2</sup>.

### 3.4. L1PP Installation Steps

In order to install the L1PP, the user shall extract the *tgz* file and execute the install script in the command line:

```
$ tar xzvf L1PP_Installer.tgz
```

```
$ sh InstallKitL1PP.sh $INSTALL_PATH
```

Where *\$INSTALL\_PATH* is the directory where the user wants to install the prototype. For example, if we want to create it in */home/smos/tools/*, the command to execute shall be:

```
$ sh InstallKitL1PP.sh /home/smos/tools/
```

---

<sup>2</sup> [http://www.smos.com.pt/project\\_data\\_products.html](http://www.smos.com.pt/project_data_products.html)

and the script will extract and create a new directory inside *tools* called *l1pp-<version>* with all the L1 Prototype contents (Libraries, configuration files, xml schemas, product headers, etc.). The script will also perform an md5 checksum for all the files contained in the distribution. For a complete list of these files and their checksum, please refer to “InstallKit.md5”, provided in the home directory of the distribution.

The installation script shall also update the configuration files being extracted so that the paths referred inside are correctly referenced to the installation directory. This is done automatically by using the script named *scripts/update-config-path.sh*. If at any time there is the need to reuse it with a default configuration file, it can be invoked on its own.

When installing a new test scenario from the provided Test Data Set (found on the L1PP SMOS webpage), the script *scripts/update-config-path.sh* will have to be re-executed for the *configurationFile.xml* and *log4crc* files inside the scenario directory.

After the installation is complete, the directories structure shown in Section 5 has been created automatically by the installation script. Nevertheless, the user must later populate manually the ADF and L0/L1 products that he intends to process into the appropriate directories.

After installing the prototype, the user will need the Auxiliary Data Files contained in *ADFPackage\_5\_0.tgz*. After extracting the package, a soft link pointing from *<l1pp home>/data/adf* directory to *ADF-Package-5\_0/adf* has to be created by the user.

Finally the user will need to fetch the directories *<l1pp home>/data/l1a-in* , *<l1pp home>/data/l1b-in*, *<l1pp home>/data/l1c-in* with the products provided as examples on the test data webpage.

As part of the 5.5.0 delivery, the *dpgs\_interface* directory is provided inside the Install Kit. This directory contains the latest status of the DPGS-V3 products and schemas (v05.00.35) at the time of the release.

### 3.4.1. Environment Variables

For execution of the prototype, a new environment variable named *L1PP\_ROOT* must be created by the user, pointing to the *l1pp* directory. For instance, if the *\$INSTALL\_PATH* is */home/smos/tools/* , the L1PP will be installed in */home/smos/tools/l1pp-v5.5.0*. Therefore *L1PP\_ROOT* variable must be set by the user as */home/smos/tools/l1pp-v5.5.0/* :

```
$ export L1PP_ROOT=/home/smos/tools/l1pp-v5.5.0/
```

**Remark:** It is important to highlight that the environment variable *\$L1PP\_ROOT* shall be always terminated with a slash (“/”) character. For instance if the L1PP is installed in */home/smos/tools/l1pp-v5.5.0* the *L1PP\_ROOT* shall be */home/smos/tools/l1pp-v5.5.0/*.

It is also necessary to update the *LD\_LIBRARY\_PATH* environment variable with the location of the shared libraries, as follows:

```
$ export LD_LIBRARY_PATH=$L1PP_ROOT/lib64: $L1PP_ROOT/external_libs/lib64:$LD_LIBRARY_PATH
```

LD\_LIBRARY\_PATH shall include the directories where the different libraries are installed. Some of the external libraries are provided with the Installation Kit in the directory *L1PP\_ROOT/external\_libs/lib64*, while others shall be installed by the user (See Section 3.2). The path for the L1PP internal libraries (*L1PP\_ROOT/lib64* – for the 64-bit version) shall also be included in LD\_LIBRARY\_PATH variable.

**Note:** If the user changes the location of the libraries, the LD\_LIBRARY\_PATH shall be updated accordingly. However, the files *dom4j.jar*, *jaxen-1.1-beta-8.jar* and *swing-layout-1.0.jar*, provided in *\$L1PP\_ROOT/lib* shall always be kept in this directory.

These two variables are updated if the prototype is executed with the scripts provided in the installation package. If the user wants to use a different execution method, these variables must be defined. In order to avoid overriding the user's local libraries, the L1PP will only use the provided additional libraries in case it cannot find them in the user-defined path.

### 3.5. Launching L1PP

The prototype may be started in 64bits by running the script *run-l1pp64.sh*, as follows:

```
$ sh ./run-l1pp64.sh
```

This script is provided as part of the installation package and is configured also during installation time. If the user moves the L1PP directory to another location, it shall be required to verify the correctness of the scripts.

The following type of output should be displayed upon execution:

```
Set L1PP_ROOT= /home/smolestest/l1pp/  
Set LD_LIBRARY_PATH=/home/smolestest/l1pp/lib:/usr/local/lib:/home/smolestest/l1pp/external_libs/lib  
Set XML_RW_API_HOME= /home/smolestest/l1pp/dpgs_interface/  
#####  
Starting the L1PP GUI  
#####  
SMOS Level 1 Processor Prototype v5.5.0  
Developed by Deimos Engenharia & Critical Software S.A.  
Under contract of EADS CASA Espacio and ESA
```

The output above confirms that the L1PP is correctly installed and the binary is running.

In order to run in text mode, in which L1PP runs directly from the terminal without any HMI, the following command shall be executed:

```
$ sh ./run-l1pp64.sh -text
```

## 4. Compilation Procedure

The following sub-sections describe a set of procedures required to compile the L1 Processor Prototype and BinaryXML from the Release Kit (Appendix B lists the full contents).

### 4.1. Dependencies

In order to compile the BinaryXML library from the Release Kit, the following software must already be installed in the target platform:

- gcc 4.3 (<http://gcc.gnu.org>)
- Earth Explorer CFI 3.7.3 (<http://eop-cfi.esa.int/>)
- Libxml2 2.6.16 or higher
- BinX 1.2.6 (<http://www.edikt.org/binx>)
- xerces 2.8.0 (<http://xml.apache.org/xerces2-j/>) - required by BinX

In order to compile the SMOS L1PP, the following software must already be installed in the target platform:

- GCC 4.3 (<http://gcc.gnu.org>)
- glibc 2.3.4 (<http://gcc.gnu.org>)
- Earth Explorer CFI 3.7.3 (which already includes libxml2 2.6.16) (<http://eop-cfi.esa.int/>)
- BinaryXML File Handler 3.7 (<http://www.smos.esa.int/>)
- FFTW 3.1.2 (<http://www.fftw.org/>)
- BLAS v3.0 (<http://www.netlib.org/blas/>) (included in LAPACK distribution)
- LAPACK v3.0 (<http://www.netlib.org/lapack/>)
- DOM4J 1.5.2 (<http://www.dom4j.org>)
- Jaxen 1.1 (<http://jaxen.codehaus.org>)
- Log4c 1.2.0 (<http://log4c.sourceforge.net>)
- j2sdk1.5.0 (<http://java.sun.com/j2se/1.4.2/download.html>)
- XML RW API ([ftp://131.176.251.166/smos/software/XML RW API/](ftp://131.176.251.166/smos/software/XML_RW_API/))

- xerces 2.7.0 (<http://xml.apache.org/xerces/>) (needed by XML RW API)

Each product should be installed according to its own instructions in the target platform.

When all external libraries are installed, it is necessary to create some soft links to the installed libraries:

- create a link from the Explorer CFI home directory to "/opt/cfi"
- create a link from the BinX home directory to "/opt/binx"
- create a link from the xerces-c home directory to "/opt/xerces-c"
- create a link from the binxml-fh home directory to "/opt/binxml-fh"
- create a link from the XML RW API home directory to "/opt/xml\_rw"

e.g.: An example for creating a link for the BinX library installed in the user's home directory would be:

```
$ ln -s ~/binx1.2 /opt/binx
```

If these links cannot be created, then the Makefile inside the l1pp directory should be updated with the paths to the different libraries by editing the first lines in the file. It should also be verified that the paths to the include and lib files are correct within the Makefile. It should also be verified that it has the permissions to access the libraries.

These instructions for compilation are valid for any OS (Linux, MacOS), as they are the paths where the Makefile expects to find the libraries.

For execution of the prototype, it is also necessary to update the LD\_LIBRARY\_PATH environment variable with the location of the shared libraries, as follows:

```
$ export LD_LIBRARY_PATH=/opt/xerces-c/lib:/opt/binxml-fh/lib:  
/opt/cfi/aux_tools/libxml/LINUX/lib:$LD_LIBRARY_PATH
```

## 4.2. Compilation

The command “make clean all” shall initiate the compilation of all libraries and executables. Compilation on 32 or 64bits can be toggled by commenting out the variable ARCH64 inside the Makefile.

## 5. ANNEX A: L1PP INSTALL KIT CONTENTS

In the figure below, the directory structure is shown. For a full listing of the L1PP files, please consult “Installkit.md5”, provided in the binary distribution home directory (*l1pp-5.5.0*).

```
l1pp-5.5.0
├── bin
├── breakpoint
├── config
│   ├── iono_models
│   │   ├── IGRF
│   │   └── IRI
│   ├── product_headers
│   └── xml_schemas
├── data
│   ├── adf-dpgs
│   ├── adf-eef
│   ├── lla-in
│   ├── llb-in
│   ├── llc-in
│   ├── llc-out
│   ├── processed-data
│   └── unprocessed-data
├── dpgs_interface
│   ├── lib64
│   │   └── LINUX
│   ├── projects
│   ├── smos
│   │   ├── config
│   │   ├── schemas
│   │   └── tmp
│   └── xml_rw_api
│       └── headers
├── external_libs
│   └── lib64
│       └── LINUX
├── lib
├── lib64
│   └── LINUX
├── logs
└── scripts
```

## 6. ANNEX B: L1PP RELEASE KIT CONTENTS

This is the directory structure for the release Kit for the L1PP source release kit. Please note that source code is provided “as is”, as per the Software License Agreement and that no support is available for the usage of its contents (refer to LICENSE and README files inside *l1pp-src-5.5.0* directory).

```
l1pp-src-5.5.0
├── bin
├── breakpoint
├── config
│   ├── iono_models
│   │   ├── IGRF
│   │   └── IRI
│   ├── product_headers
│   └── xml_schemas
├── data
│   ├── adf-dpgs
│   ├── adf-eef
│   ├── l1a-in
│   ├── l1b-in
│   ├── l1c-in
│   ├── l1c-out
│   ├── processed-data
│   └── unprocessed-data
├── dpgs_interface
│   ├── lib
│   ├── lib64
│   ├── smos
│   │   ├── config
│   │   ├── schemas
│   │   └── tmp
│   ├── VEGA
│   │   ├── include
│   │   ├── lib
│   │   ├── lib64
│   │   └── src
│   └── xml_rw_api
│       └── headers
├── include
│   ├── core_components
│   ├── error_correction
│   ├── geolocation
│   ├── image_reconstruction
│   ├── ionospheric_correction
│   └── l1p_orchestrator
├── lib
├── lib64
├── logs
├── scripts
└── src
    ├── core_components
    ├── error_correction
    ├── geolocation
    ├── image_reconstruction
    ├── ionospheric_correction
    └── l1p_orchestrator
```

## 7. ANNEX C: L1PP 5.5.0 USAGE OF DPGS ADF FILES

Product	Header	Datablock
APDL /APDS	Not used	Read
BFP		
BWGHT		
BSCAT		
DGG		
FAIL		
GALAXY		
GALNIR		
LCF		
LSMASK		
MASK		
MISP		
MOONT		
NIR		
PATT		
PLM		
PMS		
RFI		
RFILST		
SPAR		
SUNT		
VTEC		

## 8. ANNEX D: IMPLEMENTATION OF MANDATORY FIELDS IN L1C SCIENCE HEADERS

Item	L2 Usage	Value	Notes
<b>Earth_Explorer_Header</b>	L2 uses this value		Our headers are in line with the specification. The value defined by the schema is the one we use.
<b>File_Name</b>	L2 uses this value		This value is copied from the internal data-structure that holds the actual product name. The Site Instance value is always set to 0 in L1PP.
<b>File_Description</b>			This value is hard-coded as specified in the documentation.
<b>Notes</b>		x	No value is being written, but the schemas' default is 'x'.
<b>Mission</b>	L2 uses this value	SMOS	It is always set to ' <i>SMOS</i> '
<b>File_Class</b>	L2 uses this value		This value is copied from the product filename.
<b>File_Type</b>	L2 uses this value		This value is copied from the product filename.
<b>Validity_Start</b>	L2 uses this value		The value that is used to generate the product name is also used to calculate this value.
<b>Validity_Stop</b>	L2 uses this value		The value that is used to generate the product name is also used to calculate this value.

Item	L2 Usage	Value	Notes
<b>File_Version</b>	L2 uses this value		This value is copied from the product filename.
<b>System</b>		L1PP	Value obtained from L1PP configuration file.
<b>Creator</b>		L1PP	Always set to ' <i>L1PP</i> '
<b>Creator_Version</b>			This value is set to the version of the L1PP. This same version is used to generate the product name.
<b>Creation_Date</b>			This value is generated when writing the header.
<b>Ref_Doc</b>		SO-TN-IDR-GS-0005	Always set to ' <i>SO-TN-IDR-GS-0005</i> '
<b>Acquisition_Station</b>	L2 uses this value		L1PP propagates the values read from the previous levels.
<b>Processing_Centre</b>		DMEP	Value obtained from L1PP configuration file.
<b>Logical_Proc_Centre</b>		DME	Value obtained from L1PP configuration file.
<b>Orbit_Information</b>	L2 uses this value		All <i>Orbit_Information</i> values are copied from previous levels products
<b>Phase</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.

Item	L2 Usage	Value	Notes
<b>Cycle</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>Rel_Orbit</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>Abs_Orbit</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>OSV_TAI/UTC/UT1</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>Leap_Second</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>X_/Y_/Z_Position</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>X_/Y_/Z_Velocity</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>Vector_Source</b>	L2 uses this value		This value is read from previous level products (L0) and propagated.
<b>Product_Confidence</b>			This value is set according to the specification, however the error counters are not updated during the processing, so unless previous levels have a value different than 0, the Product_Confidence field will always be set to 'NOMINAL'.
<b>SPH_Descriptor</b>			Value hard-coded according to specification.
<b>Time_Info</b>			
<b>Precise_Validity_Start</b>	L2 uses this value		It is computed for each header.

Item	L2 Usage	Value	Notes
Precise_Validity_Stop	L2 uses this value		It is computed for each header.
Abs_Orbit_Start	L2 uses this value		It is computed for each header.
Start_Time_ANX_T	L2 uses this value		It is computed for each header.
Abs_Orbit_Stop	L2 uses this value		It is computed for each header.
Stop_Time_ANX_T	L2 uses this value		It is computed for each header.
UTC_at_ANX	L2 uses this value		It is computed for each header.
Long_at_ANX	L2 uses this value		It is computed for each header.
Ascending_Flag	L2 uses this value		This value is copied from previous levels. If this value is not available the value is set to 'A'
Semiorbit_Start_Time			This value is copied from previous levels. If this value is not available the value is set to 'UTC=2007-01-01T00:00:00.000000'
Semiorbit_Stop_Time			This value is copied from previous levels. If this value is not available the value is set to 'UTC=2007-01-01T00:00:00.000000'
Correlator_Layer			This value is copied from previous levels. If this value is not available the value is set to 'N'
Checksum			The value is correctly computed using the XMLRW methods.
Header_Schema	L2 uses this value		This value is correctly computed using the XMLRW methods.
Datablock_Schema	L2 uses this value		This value is correctly computed using the XMLRW methods.
Header_Size			The value is correctly computed.
Datablock_Size			The value is correctly computed.
HW_Identifier		L1PP	The value is always set to 'L1PP'

Item	L2 Usage	Value	Notes
<i>Quality Information</i>			
<b>Software_Error_Counter</b>		0 (schema default)	Currently not available
<b>Instrument_Error_Counter</b>		0 (schema default)	Currently not available
<b>ADF_Error_Counter</b>		0 (schema default)	Currently not available
<b>N_Discarded_Scenes</b>		0	This value is not correctly computed, an internal <b>SPR</b> has been opened.
<b>Error_Counter</b>		0	Currently not available
<b>N_Invalid_Blocks</b>		0 (schema default)	Currently not available
<b>N_Missing_Packets</b>		0 (schema default)	Currently not available
<b>N_Missing_Blocks</b>		0 (schema default)	Currently not available
<b>Reference Datasets</b> <b>(ALGORITHM_CONFIG_FILE)</b>			This value is always set to blanks in L1PP, since this file does not exist in L1PP.
<b>Product Location</b>			
<b>Start_Lat</b>	L2 uses this value		This value is correctly computed.
<b>Start_Lon</b>	L2 uses this value		This value is correctly computed.
<b>Stop_Lat</b>	L2 uses this value		This value is correctly computed.
<b>Stop_Lon</b>	L2 uses this value		This value is correctly computed.
<b>Mid_Lat</b>	L2 uses this value		This value is correctly computed.

Item	L2 Usage	Value	Notes
Mid_Lon	L2 uses this value		This value is correctly computed.
Radiometric_Accuracy_Scale	L2 uses this value	50	We use the reference value presented by the reference document. This value is taken from L1PP configuration file.
Pixel_Footprint_Scale	L2 uses this value	100	We use the reference value presented by the reference document. This value is taken from L1PP configuration file.
Percentage_of_Mixed_Pixels			This value is correctly computed.
Apodisation_Window		001	The value is not computed in L1PP, and it is always set to '001' - Blackman Window.
Total_Num_Grid_Points			This value is correctly computed.