RPW Operation Centre

ROC Project Management Plan

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Acronym List

Acronym	Definition
AR	Acceptance Review
CCSDS	Consultative Committee for Space Data Systems
CDF	Common Data Format
CNES	Centre National d'Etudes Spatiales
CP	Cruise Phase
CUC	CCSDS Unsegmented time Code
DA	Data Archive
DAL	Data Access Layer
DAS	DPU Application Software
DIO	Direction Informatique de l'Observatoire
DPM	Ground Segment Deputy Project Manager
DPS	Data Processing System
DPU	Digital Processing Unit
EPD	Energetic Particle Detector
ESA	European Space Agency
ESAC	European Space Astronomy Centre
ESOC	European Space Operation Centre
GIGL	Groupe Informatique Générale du LESIA
GSE	Ground Support Equipment
GUI	Graphical User Interface
HF	High Frequency
HFR	High Frequency Receiver
ICD	Interface Control Document
ID	Identifier
IT	Information Technology / Instrument Team
LEOP	Launch and Early Operation Phase
LESIA	Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique
LF	Low Frequency
LFR	Low Frequency Receiver
LL	Low Latency
MCS	Monitoring and Control System

MEB	Main Electronic Box
MIP	Mission Implementation Plan
MOC	Mission Operation Centre
NECP	Near Earth Commissioning Phase
NEOP	Near Earth Operation Phase
NMP	Nominal Mission Phase
PA	Pre-Amplifier
PDR	Preliminary Design Review
PM	Ground Segment Project Manager
PMP	Project Management Plan
QA/PA	Quality Assurance / Product Assurance
RCS	RPW Calibration Software
RGS	RPW Ground Segment
RGTS	ROC Ground Test SGSE
RLLP	RPW Low Latency Pipeline
RMU	RPW Monitoring Unit
ROC	RPW Operation Centre
RODS	ROC Operation and Data System
ROI	ROC Operation Interface
ROT	RPW Operation Toolkit
RPW	Radio and Plasma Waves instrument
RSS	ROC Software System
SBM	Selected Burst Mode
SCM	Search Coil Magnetometer
SDD	Software Design Document
SGS	Science Ground Segment
SGSE	Software Ground Support Equipment
SOC	Science Operation Centre
SolO	Solar Orbiter
SRS	Software Requirement Specification
SSS	Software System Specification
TDS	Time Domain Sampler
TNR	Thermal Noise Receiver
TV	TM/TC Viewier

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1 GENERAL

1.1 Scope of the Document

This document is the project management plan (PMP) of the RPW Operation Centre (ROC), which drives the RPW Ground Segment (RGS) activities.

The PMP presents the main objectives and constraints of the project, and covers the following aspects [RD2]:

- Project organization
- Project breakdown structures
- Configuration, information and documentation management
- Cost and schedule management
- Integrated logistic support
- Risk management
- Product assurance management
- Engineering management

The PMP shall address a project management in agreement with the requirements defined in the ROC Concept and Implementation Requirements Document (CIRD) [AD1].

The ROC is located at the Laboratoire d'Etudes Spatiales et d'Instrumentation en Astrophysique (LESIA) in Meudon, France.

1.2 Applicable Documents

This document responds to the requirements of the documents listed in the following table:

Mark	Reference/Iss/Rev	Title of the document	Authors	Date
AD1	ROC-GEN-SYS-PLN-00002-LES/1/4	ROC Concept and Implementation Requirements Document (CIRD)	Y. de Conchy X. Bonnin	17/11/2017
AD2	ROC-GEN-OTH-NTT-00045-LES/1/0	ROC Project Glossary of terms	X.Bonnin	24/01/2017
AD3				

1.3 Reference Documents

This document is based on the documents listed in the following table:

Mark	Reference/Iss/Rev	Title of the document	Authors	Date
RD1	RPW-GEN-PLN-00130-LES/1/0	RPW Operation Concept	M.Maksimovic	08/03/2012
RD2	ECSS-M-ST-10C/3/1	Project planning and implementation	ECSS consoritium	06/03/2009

RD3	ROC-GEN-SYS-PLN-00015-LES/2/1	ROC Software Development Plan (SDP)	X.Bonnin	17/11/2017
RD4	ROC-GEN-OTH-BDG-00010-LES/2/0	Proposition Technique et Financière pour le ROC – Phase D et E1	Y. de Conchy	18/10/2017
RD5	ROC-GEN-SYS-NTT-00008-LES/1/3	ROC Engineering Guidelines	X.Bonnin	17/11/2017
RD6	ROC-GEN-SYS-NTT-00019-LES/2/0	ROC Engineering Guidelines for External Users	X.Bonnin	17/11/2017
RD7	SOL-ESC-PL-00001/1/1	Solar Orbiter Mission Implementation Plan (MIP)	I.Tanco	31/01/2013
RD8	ROC-GEN-MGT-QAD-00033/1/1	ROC Software Product Assurance Plan (SPAP)	S.Papais	07/11/2017
RD9	2A- SOL-ESC-HO-05014/1/1	Instrument Command Workshop, ESOC : Commanding Interface and Testing	I.Tanco	05/09/2016
RD10	SOL-SGS-0006-TS/1/0	Solar Orbiter Instrument Teams – SOC Test Specification	Nana Bach, Chris Watson	30/08/2017
RD11	LL-pipelines at SOC schedule.pptx	LL-Pipelines@SOC Proposed schedule	Chris Watson	06/07/2015
RD12	ROC-TST-GSE-SUM-00035-LES/1/1	POPPy framework User Manual	Manuel Duarte	24/06/2016
RD13	ROC-PRO-DAT-NTT-00006-LES/01/01	RPW Data Products	Xavier Bonnin	17/11/2017
RD14	SOL-ESC-IF-05010/1/2	Planning Interface Control Document	L. Michienzi	07/2015
RD15	SOL-SGS-ICD-0009/1/0	Solar Orbiter File-Transfer SOC<-> Instrument Teams ICD	E Salazar, C.Watson	24/03/2017
RD16	SOL-SGS-PL-0009/2/0	Solar Orbiter Archive Plan	Pedro Osuna	01/09/2017

1.4 About this document

1.4.1 Access policy

This document is public and can be accessible without any restriction.

Any modification of the present document requires formal approval of the RPW Ground Segment Project Manager (PM) before publication.

This latter shall ensure that the present document is always up-to-date and in accordance with the current project requirements and status.

1.4.2 Terminology

Except the terms listed in the table below, the definitions provided in [AD2] are applicable in the present document.

Name	Definition
Post-launch phases	Phases of the Solar Orbiter planned after the launch (i.e., LEOP, NECP, CP, NMP)

Table 1. Terminology.

2 OBJECTIVES AND CONSTRAINTS OF THE PROJECT

2.1 The RPW ground segment objectives overview

The RPW ground segment expected activities are already detailed in the CIRD [AD1], nevertheless for convenience the main objectives are summarized below:

- Support the definition of the science operations.
- Provide to the Solar Orbiter Science Operations Centre (SOC), inputs for the definition and implementation of the science operation planning, data handling and archiving concepts.
- Supervise the preparation of the instrument operation timelines
- Support the definition and implementation of the Solar Orbiter scientific data archive, as part of the pre-launch tasks.
- Agree on a long-term science activity plan and define the scientific priorities of scientific goals.
- Monitor and analyze instrument state in support to the Solar Orbiter Mission Operation Centre (MOC). Especially, the MOC does not plan to analyze instrument science telemetry (TM).
- Optimize instrument performances
- Perform the selection of the Selected Burst Mode (SBM) event data to be downlinked
- Make available the necessary resources during Near Earth Commissioning Phase (NECP) for the installation of equipment at the MOC, to monitor the operations execution in near-real time and to support GO/NOGO decisions at predefined steps in the procedures
- Deliver calibrated and high level data, including relevant calibration products, to the Solar Orbiter scientific archive at the European Space Astronomy Centre (ESAC)
- Provide to ESA unlimited access to all processed and analyzed data for public relation purposes during the 3-months proprietary period
- Provide summaries of the main scientific results at regular intervals
- Maintain the instrument flight software

All of the activities that support these objectives are under the supervision of the ROC, which has the two-tier function of a data processing centre and an operations centre for the RPW instrument. However, most of the ROC tasks are carried out in close collaboration with the other parties who have delegated responsibilities for the ground segment and operations.

In the framework of the ground calibration campaigns at RPW system level, it has been decided that the ROC shall also develop, deliver and maintain a SGSE dedicated to post-mortem analysis of data. The so-called ROC SGSE shall support calibration validation, but also be a milestone in the development of ROC infrastructure for in-flight RPW data processing as well as monitoring.

2.2 Constraints of the project

2.2.1 During the phase “D” of the Solar Orbiter mission

The phase “D” of the Solar Orbiter mission corresponds to the so-called “Qualification and Production” step, prior to the launch. The following sections present the main milestones at both mission and RPW levels, which involve the ROC during this period.

2.2.1.1 ROC involvement in the RPW instrument engineering activities: main milestones

The table below gives the milestones before the launch, relative to the ROC involvement to the RPW engineering activities.

RPW engineering activity description	ROC involvement	Schedule / deadline
RPW DPU flight software SBM1/SBM2 detection algorithms ground validation campaign		
RPW DPU SBM1 detection algorithm validation campaign	Develop, run and maintain software to support the validation of the SBM1 detection algorithm by the RPW Flight Software team. Especially, this software must be able to simulate the detection and produce input files for the RPW DPU software.	Sept. 2015-June 2016
RPW DPU SBM2 detection algorithm validation campaign	Develop, run and maintain software to support the validation of the SBM2 detection algorithm by the RPW Flight Software team. Especially, this software must be able to simulate the detection and produce input files for the RPW DPU software.	Sept., 2015-June 2016
RPW system ground calibration campaigns		
RPW EM2 blank calibration campaign at CNES (Toulouse, France)	Develop, run and maintain a SGSE to support RPW teams in the analysis of the data produced during the EM2 calibration campaign. This SGSE will have to be deployed at the CNES site in Toulouse, as part of the RPW CNES GSE.	April-Sept. 2016
RPW PFM thermal calibration campaign at LESIA (Meudon, France)	Run and maintain the SGSE to support RPW teams in the analysis of the data produced during the PFM calibration campaign.	Nov. 2016 to Jan. 2017
RPW PFM delta-calibration campaign at CNES (Toulouse, France)	Run and maintain the SGSE to support RPW teams in the analysis of the data produced during the PFM delta-calibration campaign.	May-June 2017

Table 2. ROC involvement in the RPW engineering activities before the launch: main milestones.

2.2.1.2 ROC involvement in the Solar Orbiter mission engineering activities: main milestones

The table below gives the milestones prior to the launch, relative to the ROC involvement to the Solar Orbiter mission engineering activities. It concerns mainly testing activities driven by the Solar Orbiter SOC and/or MOC, namely:

- The Low Latency (LL) engineering activities [RD11]
- The SOC - Instrument Team (IT) interface tests [RD10]
- The MOC - IT interface tests [RD??]
- The System Operations Validation (SOV) [RD7, RD9]
- The System Validation Test (SVT) [RD7, RD9]

It must be noticed that the ROC has no visibility on the MOC – IT interface tests organization, specification and schedule at this stage of the project, as well as concerning the organization and validation of the infrastructure for the NECP RPW-related operations at ESOC.

Solar Orbiter MOC/SOC	ROC involvement	Schedule / deadline

engineering activity description		
Low Latency Virtual Machine (LLVM) delivery schedule		
"Hello World" LLVM version delivery	To provide to the SOC a first "Hello world" version of the LLVM for RPW, that processes fake RPW LL packet data.	January, 31 2016
LL Data Description Document (DDD) delivery	To provide to the SOC the LL Data Description Document (DDD) for RPW.	February 29, 2016
LL Testcard delivery	To provide to the SOC the LL Testcard files for RPW.	March 31, 2016
LLVM processing version delivery	To provide to the SOC a second version of the LLVM that includes real RPW LL packet data processing.	June 30, 2016
LLVM processing + tests version delivery	To provide to the SOC a full version of the LLVM that includes real RPW LL packet data processing and self-testing processes.	August 31, 2016
SOC – IT interface tests		
Compatibility tests	The Compatibility Tests will consist of data exchange and manual check of the formats of the data products.	April – Oct. 2016
Integration tests	Integration Tests will consist on data exchange and running specific Sub-System(s) in order to read and execute some involved parts of the Sub-Systems and in order to be able to evaluate the output.	March – July 2017
Validation tests	The Validation Test Cases will be part of particular System Tests which will involve running the entire System or relevant part of it involving all the data product exchange needed for given Interface Test.	April 2018
System Operation Validation engineering activities		
SOV-0: Data Distribution interface Test	Test the data distribution interfaces between the MOC and the ROC.	Launch – 10 months
SOV-1: MOC/SOC interface Test	Will involve instrument inputs.	Launch – 9 months
SOV-2: Cruise Operations End-to-end Test	Will involve In Situ (IS) instruments, and some limited Remote Sensing (RS) participation	Launch – 6 months
SOV-3: OBSM End-to-End Test	Will involve all instruments	Launch – 6 months
System Validation Test engineering activities		
SVT-0: devoted to unit-level commanding	First set of flight procedures for RPW to be run during the SVT-0	Launch – 18 months
SVT-1: to validate closed loop behaviour	RPW User Manual complete. All the inputs required for Near Earth Commissioning Phase and Cruise Phase (timeline and procedures). Instrument Teams to provide inputs and	Launch – 9 months

	support iterations as necessary. All inputs required to test on the PFM to validate as far as possible instrument database and procedures. Instrument Teams to provide all test inputs. These inputs are expected to be delivered 3 months before the SVT-1. Instrument Team with decision authority to support test at test site. Up to two instruments tested in parallel.	
SVT-2: at the launch site, to perform last minute validation	Retest of any problems found with Instruments during SVT-1	Launch – 4 months

Table 3. ROC involvement in the ESA engineering activities before the launch: main milestones.

2.2.1.3 ROC key points and formal reviews

The table below lists the ROC key points and formal reviews planned prior to the launch. The details about the organization and the expected data packages are reported into the "ROC Software Product Assurance Plan" (SPAP) [RD8].

It must be noticed that no formal acceptance review of the instrument ground segments will be conducted by ESA before the launch.

Key points / Reviews	Purpose	Scheduled date/time
Preliminary Design Key point (PDKP)	Preliminary design key point of the ROC organization and design organized by CNES	2017/01/16
End of Design Key point (EDKP)	End of design key point of the ROC organized by CNES	Fall 2017
Validation Reviews	Internal review in preparation to the ROC validation campaign. This campaign will have to start with a Test Readiness Review (TRR) and to finish with an Test internal Review Board (TRB)	Launch – 12 months (TBC)
Acceptance Review (AR)	RPW ground segment acceptance review.	Launch – 3 months (TBC)

Table 4. ROC main key points and reviews.

2.2.2 During the phase "E" of the Solar Orbiter mission

2.2.2.1 Solar Orbiter mission phases

The "E", also called "utilisation", phase starts at the launch. Figure 1 indicates the timeline of the different phases of the Solar Orbiter mission and the corresponding operations planned during the "E" phase.

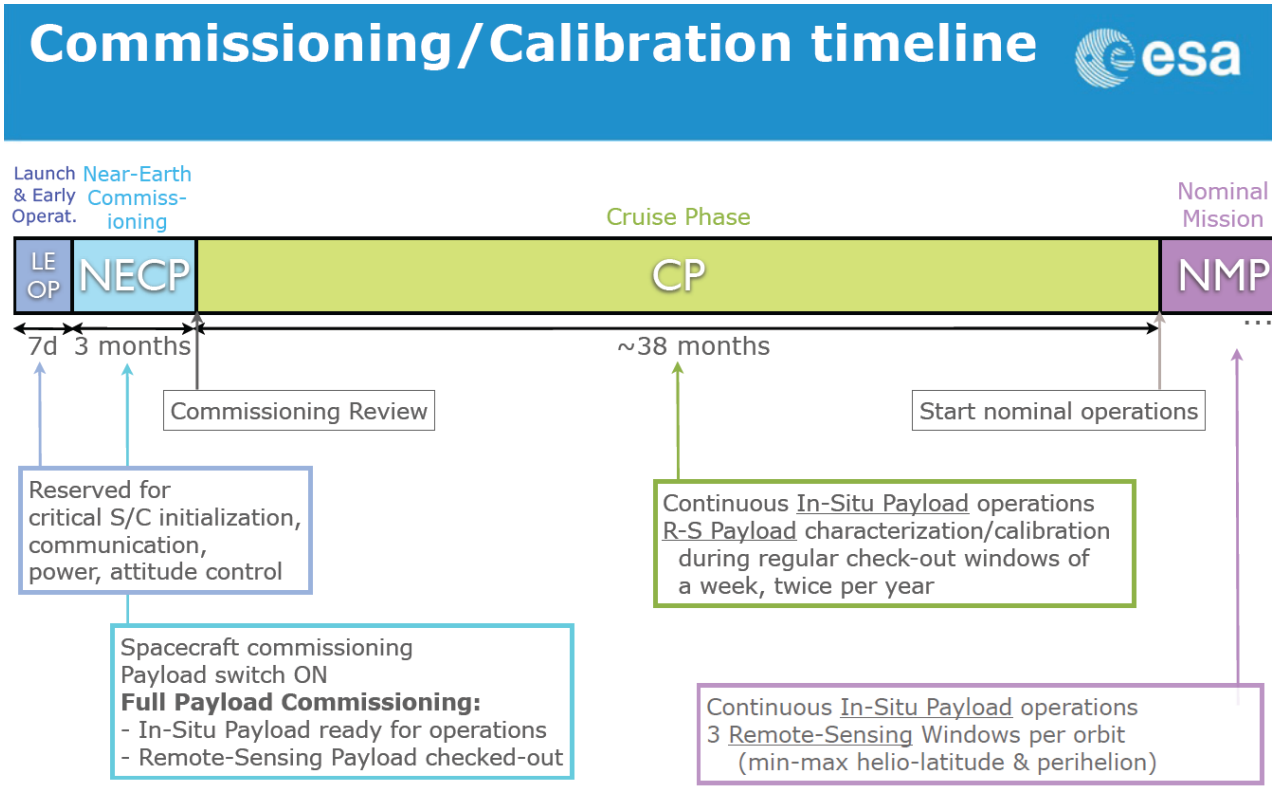

Figure 1. Solar Orbiter mission phases.

The "E" phase can be divided into two periods:

- The "E1" phase, which only covers the Launch & Early Operations Phase (LEOP) and the Near Earth Commissioning Phase (NECP).
- The "E2" phase, which begins with the Cruise Phase (CP) and continue with the Nominal Mission Phase (NMP)

The Extended Mission Phase (EMP) may prolong the NMP.

2.2.2.2 Key flight operations involving RPW

The key operations, involving RPW during the Solar Orbiter mission, are detailed in the "RPW Operation Concept" document [RD1].

Figure 2 gives an overview of the RPW operations timeline over the main phases of the mission.

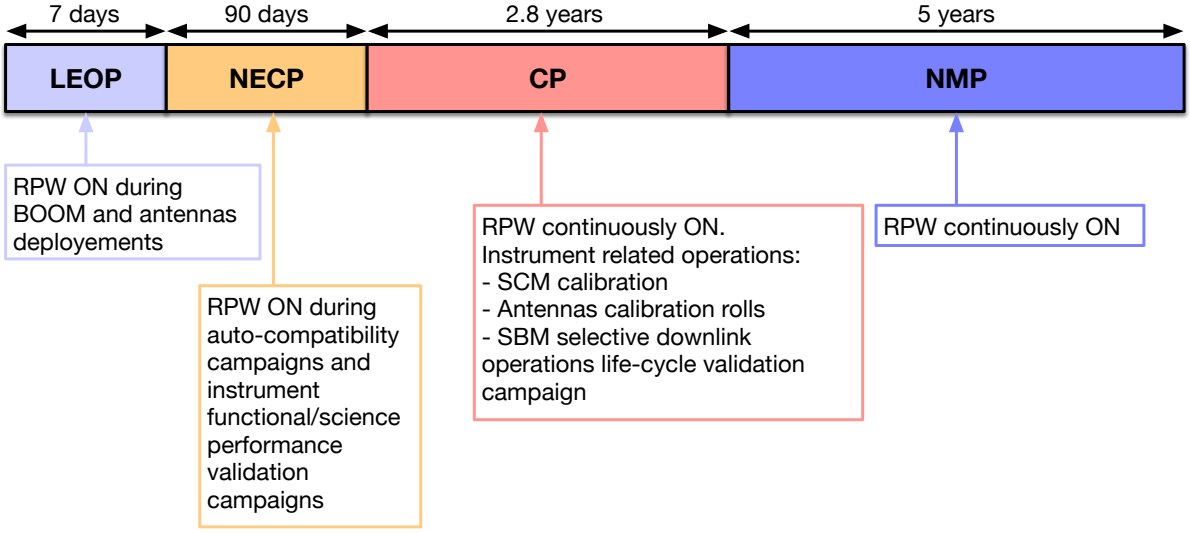

Figure 2. RPW operations timeline.

During the LEOP:

- SCM boom & ANT (x3) deployments

During the NECP:

- Inter-Instruments auto-compatibility interference campaign
- RPW-PAS filtering tune campaign
- RPW-SPICE heat shield door (HSD) Z antenna (ANT) bending effect characterization (TBC). This effect might be analysed after the NECP to follow possible changes with the distance to the Sun.
- TDS/LFR software algorithms validation campaign
- SBM1/SBM2 detection algorithms validation campaign
- Bias current setting operations life-cycle validation campaign

During CP:

- Near Earth ANT calibration rolls
- SCM noise characterization (when the S/C trajectory crosses the Earth magnetic lobes)
- SBM1/SBM2 selective downlink operations life-cycle validation campaign

During NMP and EMP:

- The SURVEY "NORMAL" mode
- The SURVEY "BURST" mode
- The detection mode for recording both SBM1 (shock crossings) and SBM2 (in-situ Type III) events
- The Bias current setting
- The on-board sub-system calibrations

The preparation and organization of the RPW flight operations shall be described in the "ROC Operations Management Plan" (OMP) document.

2.2.2.3 ROC key points and formal reviews

Exact schedule and organization about ROC key points or reviews planned after the launch are not defined in details yet. Nevertheless, the commissioning phase will end with a dedicated review, which involves instrument ground segments.

2.2.3 Main phases of the ROC project

The following table summarizes the main phases and tasks of the ROC project related to the activities at Solar Orbiter and RPW projects levels. The list of documents referenced in the table can be found in the section 5.3.

Solo project phase	ROC project phase	ROC main tasks	RPW SolO main related activities/phases	
Phase D	**Phase 0**	- ROC concept and engineering requirement specification. It shall lead to the release of a first version of the ROC CIRD, PMP, SDP and SSS documents.	N/A	N/A /
Phase D	**Phase 1**	- First release of the PTF document for the phases D and E1. - Release of a preliminary version of the RPW packet parsing library for the ROC	EM	N/A
Phase D	**Phase 2**	- Release of the SBM validation software and products in support to the validation of the SBM algorithms at the RPW DPU Application Software (DAS) level. - Releases of the ROC SGSE versions for the RPW ground calibration activities (EM and PFM) - Releases of the preliminary RPW Low Latency Virtual Machine (LLVM) - ROC PDR - Release of the RPW Operations and Data Pipeline (RODP) preliminary version for the test bench activities at SolO level - Release of the "ready-for-flight" version of the ROC Software System - ROC AR	- EM2 (receiver/sensor stand alone calibrations and blank test calibrations at system level) - PFM (thermal calibrations)	- EM - FM (SolO payload test bench activities)
Phase E1	**Phase 3**	- RPW commissioning operations (instrument switch-on and antenna deployment critical operations) - Validation of the ROC infrastructure and release of the "fully operational" ROC Software System	RPW commissioning	LEOP
Phase E2	**Phase 4**	- RPW Cruise Phase operations (instrument performance analysis and optimization) - RPW Nominal and Extended Phases operations (instrument monitoring and commanding activities, science data processing, dissemination and archiving activities)	Instrument exploitation phase	CP NMP, EMP

Table 5. ROC project main phases.

2.3 The Solar Orbiter mission operations implementation plan

The implementation plan for the Solar Orbiter mission operations is described in the "Solar Orbiter Mission Implementation Plan" (MIP) [RD7].

3 ROC PROJECT PRESENTATION

3.1 ROC function tree

Figure 3 presents the ROC function tree. The tree is divided into 6 main branches of activities, which must meet the requirements defined in the CIRD:

- **Data processing**, which regroups functions related to the RPW data processing, including Low Latency data production, and the assessment of the science data products quality.
- **In-flight Performance optimization and Calibration**, which gathers functions related to the instrument performance optimization and calibration after the launch.
- **Operations**, which concerns all of the science and engineering activities to be coordinated by the ROC to perform the instrument operations.
- **Ground support**, which focus on the ROC functions related to the ground support activities; mainly GSE facilities for system calibrations, anomalies investigation and SBM detection algorithms validations).
- **Project management**, which gathers the functions concerning the management of the ROC as a project, including the documentation management and the ROC logistics.
- **Data dissemination and archiving**, which regroups functions related to the RPW data distribution and archiving.

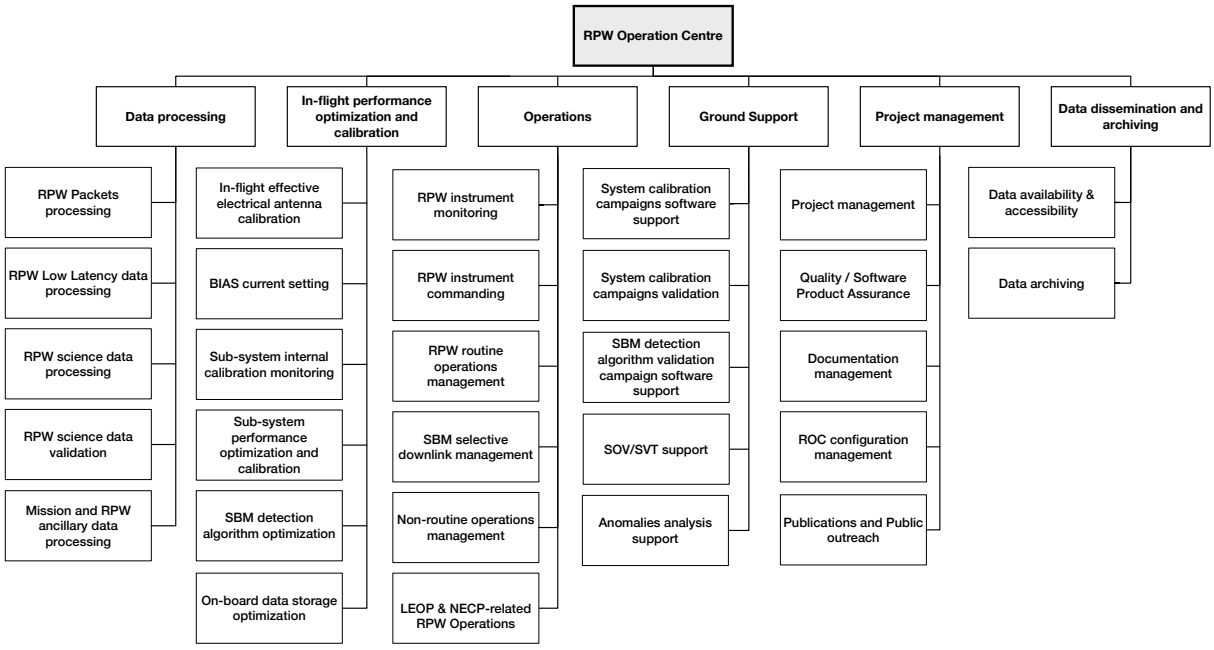

Figure 3. RPW Ground Segment function tree.

The following table gives more details about the functions of each branch.

Functional branch	Function	Description

Data Processing	**RPW Packets processing**	Retrieve from the SOC/MOC, identify and parse correctly the RPW TM packets. Retrieve and analyse the TC history catalogue.
Data Processing	**RPW Low Latency data processing**	Process RPW Low Latency data as required by the SOC.
Data Processing	**RPW science and HK data processing**	Process RPW science and HK data products, including calibrated science data.
Data Processing	**RPW science data validation**	Ensure that the RPW calibrated science data quality is as close as possible from the instrument science requirements
Data processing	**Mission and RPW ancillary data processing**	Ensure the retrieval, processing of the ancillary data (i.e., orbit/attitude/frame/time SPICE kernels)
In-flight performance optimization and calibration	**In-flight effective antenna calibration**	Perform the RPW effective electric antenna calibration after the launch.
In-flight performance optimization and calibration	**BIAS current setting**	Optimize the BIAS current values during the whole mission
In-flight performance optimization and calibration	**Sub-system internal calibration monitoring**	Monitor the sub-system internal calibrations
In-flight performance optimization and calibration	**Sub-system performance optimization and calibration**	Optimize the sub-system performance and calibration
In-flight performance optimization and calibration	**SBM detection algorithm optimization**	Optimize the SBM1/SBM2 algorithm detections
In-flight performance optimization and calibration	**On-board data storage optimization**	Optimize the on-board data storage
Operations	**RPW data monitoring**	Monitor the instrument data: TM/TC, HK and science data, the sub-systems status, event reporting, actual TM data rate, on-board memory storage, power consumption
Operations	**RPW instrument commanding**	Prepare and submit instrument operation requests in agreement with the mission operation planning and constraints (e.g., data rate, power consumption, events, etc.) Plan the GSE in support to this activity
Operations	**RPW routine operations management**	Plan and coordinate the RPW routine operations management in terms of procedures, team responsibilities, software and logistics
Operations	**SBM selective downlink management**	Plan and perform the SBM data selection life cycle
Operations	**Non-routine operations management**	Plan and coordinate the RPW non-routine operations (e.g., FDIR) management in terms of procedures, team responsibilities, software and logistics
Operations	**Commissioning**	Prepare and support the RPW specific operations planned during the commissioning phase
Ground support	**System calibration software support**	Provide software support during on-ground calibration tests at system level
Ground support	**System calibration validation**	Participate to the system calibration validation during ground calibration campaigns.
Ground support	**SBM algorithm validation**	Support RPW flight software team in the SBM detection algorithm test and validation on-ground.
Ground support	**SOV/SVT support**	Participate to the SOV/SVT campaigns
Ground support	**Anomalies analysis support**	Participate to the analysis of anomalies using RPW GSE facilities.
Project management	**Project management**	Manage the ROC project
Project management	**Quality Software Product Assurance**	Ensure the Quality Assurance / Produce Assurance of the ROC project

Project management	**Documentation management**	Ensure that documentation management
Project management	**ROC logistics**	Ensure that ROC logistics (hardware/software support equipment, logistics for meetings, collaboration tools, etc.)
Project management	**Publication and public outreach**	Manage the publication and public outreach activities around RPW
Data Dissemination and Archiving	**Data availability & accessibility**	Ensure that availability and the accessibility of RPW data in terms of products, documentation, user interfaces and software
Data Dissemination and Archiving	**Data archiving**	RPW data archiving activities with ESA and CDPP. Primary data storage at the LESIA.

Table 6. ROC functions.

3.2 ROC product tree

3.2.1 ROC Software System (RSS)

The ROC Software System (RSS) is the top-level system of the ROC. It gathers all of the software systems required to ensure the ROC functions listed above. It is divided into two systems:

- The ROC Ground Equipment Support (ROC GSE), which regroups software equipment in support to the instrument system and sub-system tests performed on-ground, before the launch and during the operations in-flight.
- The ROC Operations And Data System (ROADS), which concerns software equipment to perform the on-board instrument data processing and operations.

Figure 4 shows the RSS product tree. The sub-systems of the ROC GSE and ROADS are briefly presented in the next sections. More details can be found in the "ROC Software Development Plan" (SDP) document [RD3]. The RSS specification and design will have to be defined in dedicated "ROC Software System Specification" (RSSS) document and "ROC Software System Design Document" (RSSD).

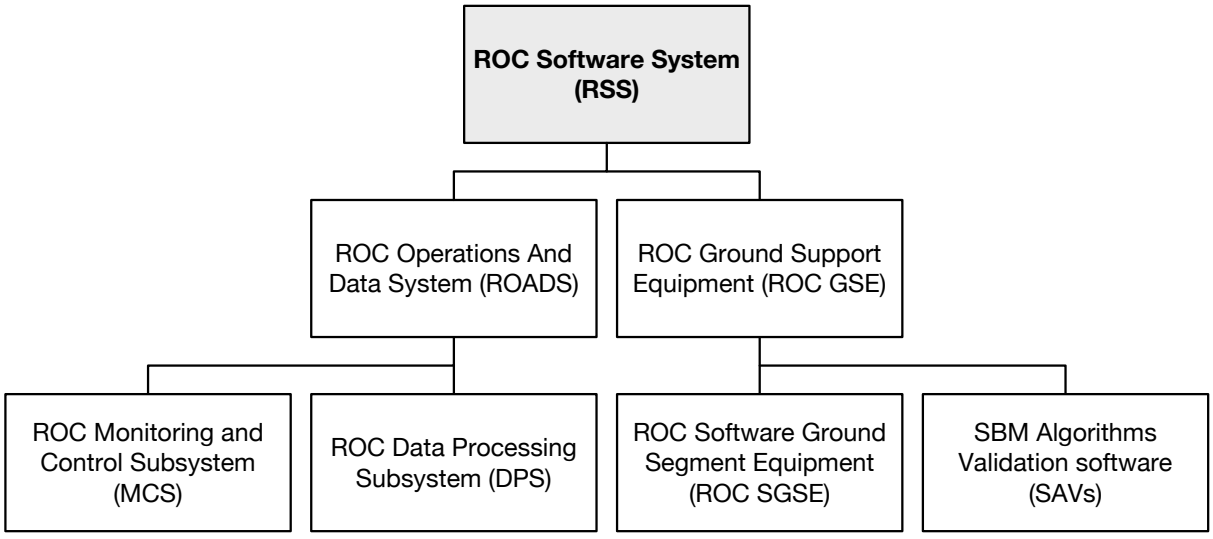

Figure 4. ROC Software System product tree.

3.2.1.1 ROC Operations And Data System (ROADS)

The ROC Operations And Data System (ROADS) contains the software tools in support to the RGS activities during the Solar Orbiter mission.

Figure 5 shows the overall software product tree of the ROADS. The description and functionalities of the MCS and DPS software units, including the data products and databases, are more detailed in the SDP.

The ROADS is composed of the two sub-systems:

- The ROC Monitoring and Control Subsystem (MCS), which gathers at least the following software units:
  - The "MCS User Interfaces" (MUSIC); a Web interface allowing the ROC operations team to prepare, submit and control the RPW operations (FAUST tool), view the mission planning (OPERA tool) and monitor RPW data (TV tool). Besides, MUSIC includes dedicated tools to generate the flight procedures (FIGARO tool) and view/select the SBM1/SBM2 event data to downlink (SISSI tool).
  - The RPW "TM data Rate Calculator" (TRAC); a software tool capable of computing the TM data rate as a function of the instrument operating modes.
  - The RPW "Power Consumption Analyser" (POCA); a software to monitor the instrument power consumption
  - The RPW "Instrument Commanding Automaton" (INCA); a software that includes a instrument state model, in order to link sequences of TC w.r.t operating modes, power and data rate in an automated way.
- The ROC Data Processing Subsystem (DPS) contains at least the following software units:
  - The ROC Operations and Data Pipeline (RODP); the main RPW data processing pipeline, which must also support some automated tasks relative to the operations. The list of RPW data sets to be produced by the RODP is available in [RD13].
  - The RPW Calibration Software (RCS); a set of software dedicated to the RPW science data calibration and L2 science data files production. The RCS will be delivered by the RPW analyser/sensor teams (i.e., TDS, LFR, THR, Bias, SCM) and run as components of the RODP. The list of RCS can be found in the section 4.3.4.
  - The RPW Low Latency Virtual Machine (LLVM); the virtual appliance hosting the RPW Low Latency Data Pipeline (RLLP), in charge of processing the RPW Low Latency data. The primary instance of the LLVM shall be delivered to the SOC to be run at ESAC.
  - The RPW Data Archive (DArc); the infrastructure and tools use for RPW data archiving tasks
  - The RPW Data Access Layer (DAL); the interfaces and services that allow RPW data users to retrieve the instrument data at the ROC site.

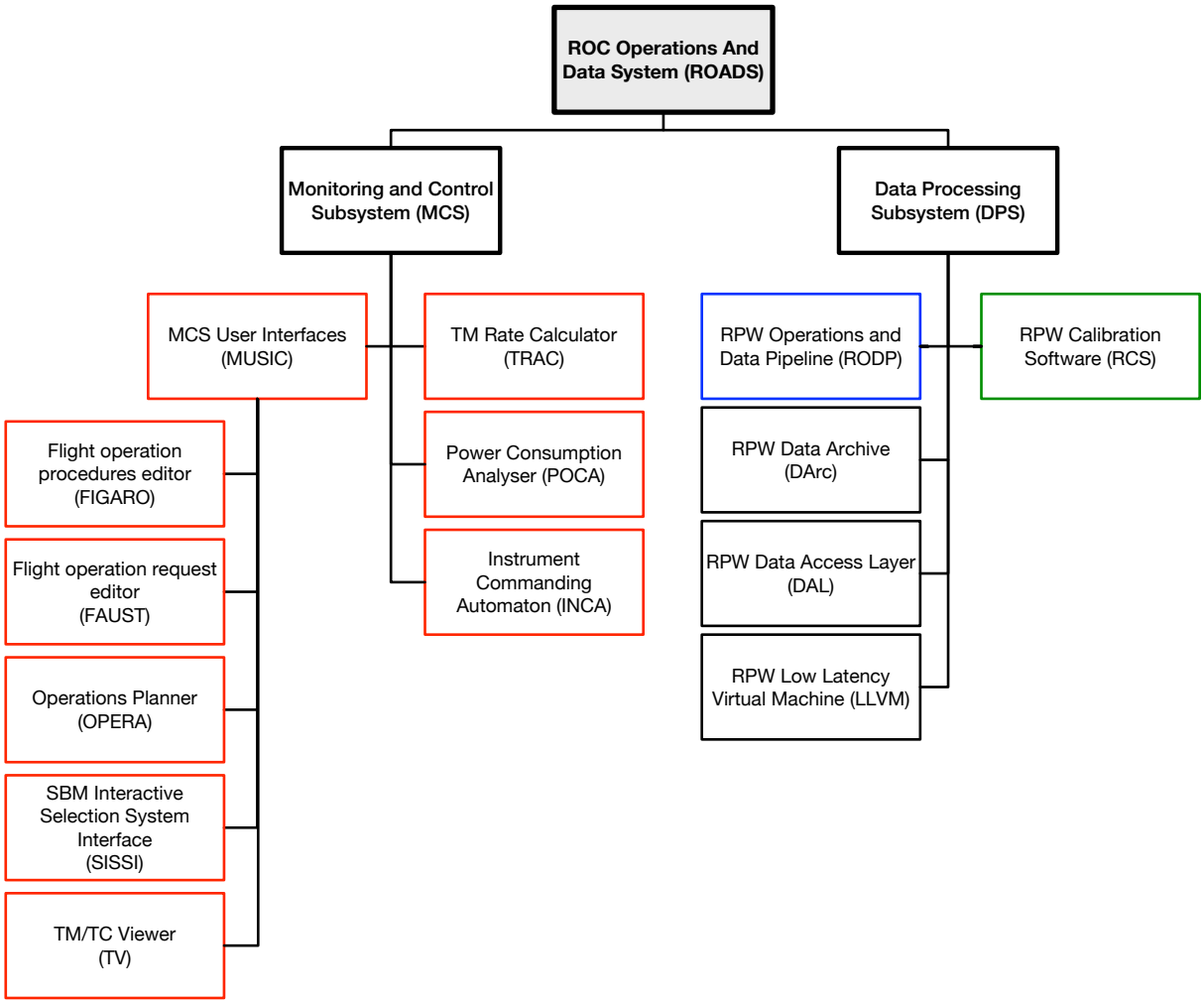

Figure 5. ROADS software product tree.

3.2.2 ROC Ground Support Equipment (ROC GSE)

Figure 6 shows the product tree concerning the ROC Ground Support Equipment (GSE). The ROC GSE application firstly concerns RPW instrument tests performed on-ground before launch, namely: EM2/PFM instrument calibrations at system level and RPW DPU SBM1/SBM2 detection algorithm validation campaigns. Nevertheless, dedicated instances of this software equipment will be used during the Solar Orbiter mission, in order to support possible GSE activities on the instrument.

Two main components are supplied:

- The ROC Software Ground Support Equipment (ROC SGSE), which provides SGSE to analyse RPW packet data during the EM2/PFM ground calibration tests at system level. An instance of the ROC-SGSE will also be deployed at LESIA and used to support the ground test activities during the mission (e.g., TCs sequences validation and anomalies investigation on a RPW "spare" model).
- The SBM Algorithm Validation software (SAVS), supplying software to support the validation of the Selected Burst Modes (SBM) algorithms of the RPW DPU. Tailored instances of the SAVS will be used to optimize the detection rate of the on-board SBM algorithms during the Cruise Phase (CP).

The functionalities of the GSE units are presented in the SDP.

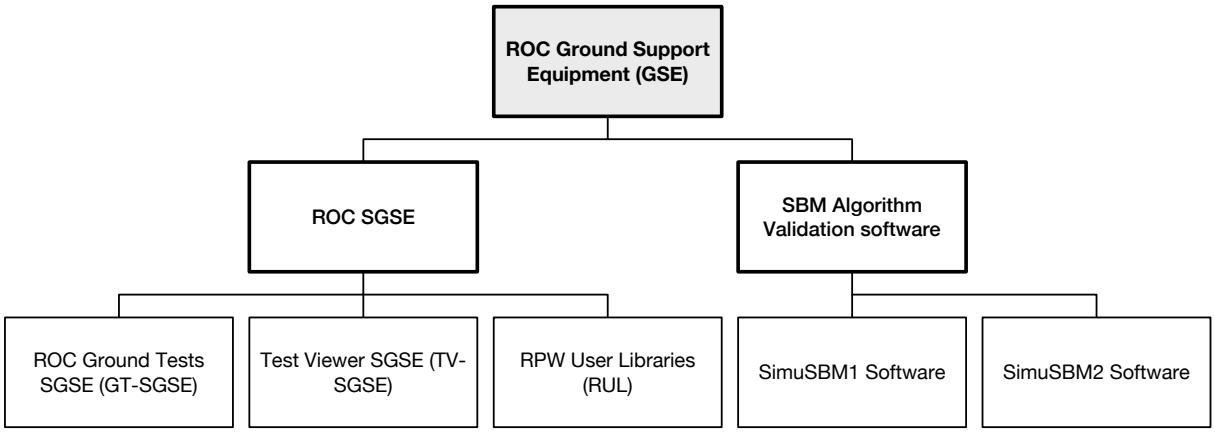

Figure 6. ROC Ground Support Equipment (ROC GSE) related software products.

4 ROC PROJECT ORGANIZATION AND RESPONSIBILITIES

4.1 Solar Orbiter ground segment organization

The organization of the ground segment at the Solar Orbiter level is presented in the CIRD.

4.2 RPW ground segment organization

Figure 7 shows the institutes and teams involved in the RPW ground segment, as well as the main points of contact. The main role played by each team is presented in the CIRD, however a summary description is given by convenience.

The ground segment includes:

- The ROC team at LESIA, which is detailed in the next section.
- The *sub-systems ground segment teams*, namely: TDS, LFR, TNR-HFR, BIAS and SCM teams, in charge of calibrating their sub-systems, delivering the RPW Calibration Software (RCS) to the ROC, supporting the validation of the science data products and providing expertise during the operations. Moreover, the BIAS team will have to support the ROC in the setting of the Bias currents to apply on-board during the mission. In the same time, the TNR-HFR team shall ensure the calibration of the effective antenna direction and length in-flight.
- The *instrument support teams* at LESIA, namely: System, MEB, flight software, MEB GSE, E-GSE, AIT-AIV teams located at the LESIA. These teams will mainly ensure expertise and support in case of flight software upgrading and anomaly investigation during the mission.
- The *instrument and ground segments support teams* at CNES. The participation of the CNES RPW instrument team in the project will be effective until the end of the commissioning phase. During the CP, NMP and EMP, only CNES support to the instrument exploitation is planned. Nevertheless, the instrument staff may be temporary re-activated on the LESIA demand, in case of anomalies. In addition, the CNES assists the ROC during the D phase in terms of development, quality assurance and command/control support.

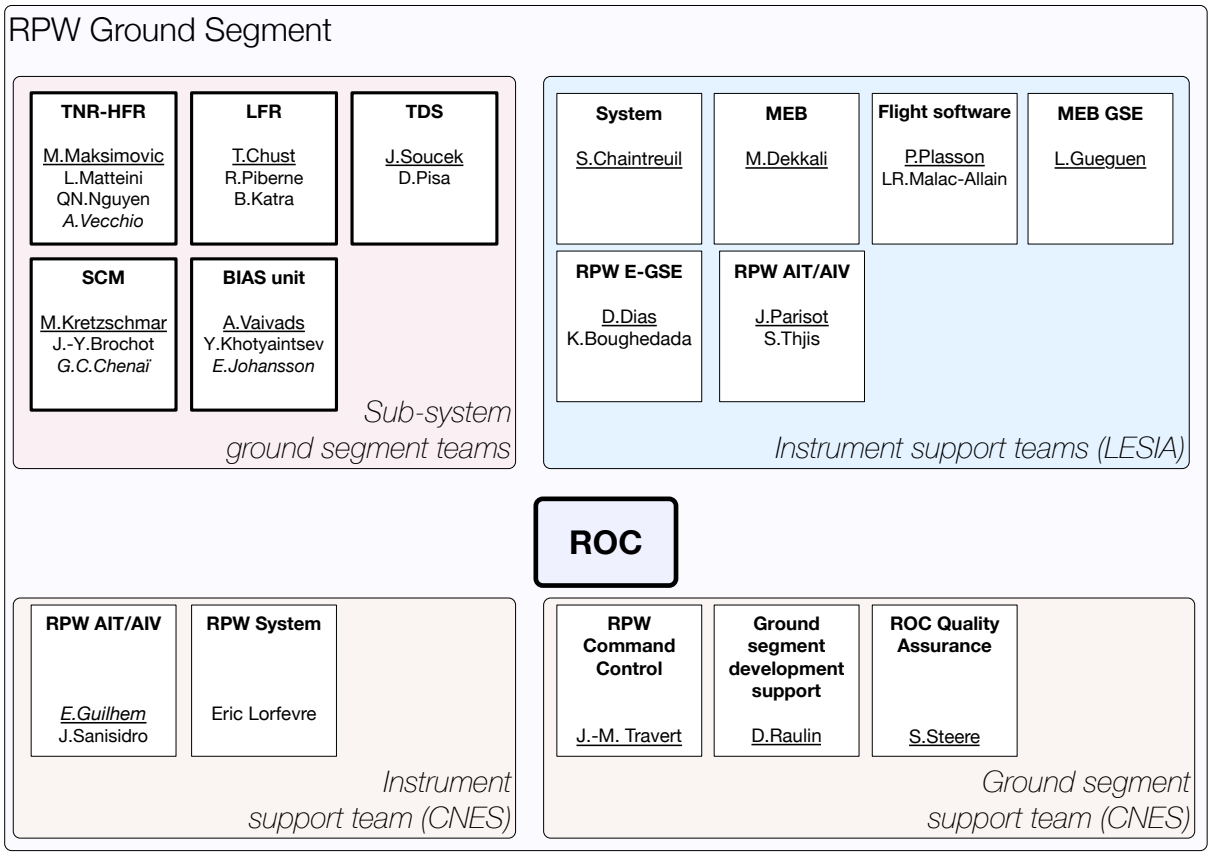

Figure 7. ROC support teams.

The detailed responsibilities of the ground segment personnel are listed in the Table 11.

4.2.1 ROC staff

Figure 8 shows the structure tree of the ROC science and engineering personnel at the LESIA.

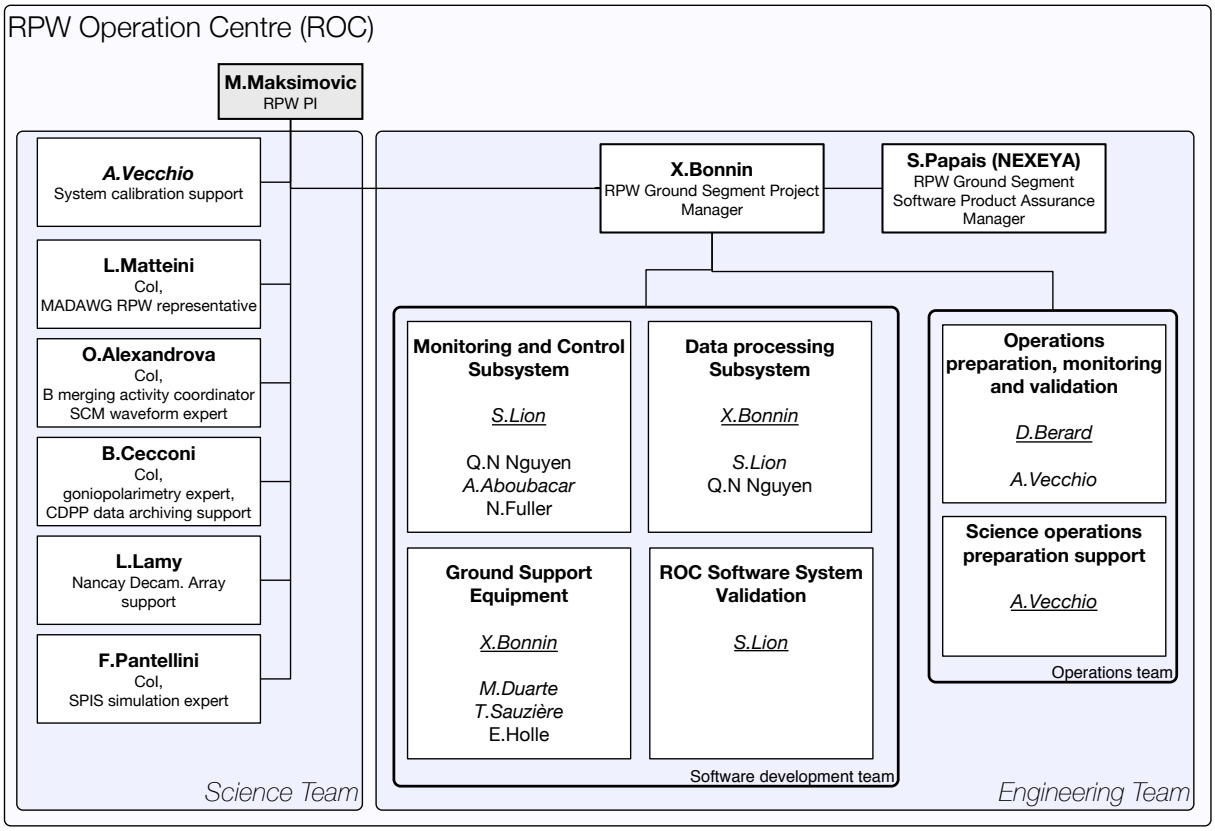

Figure 8. ROC staff at the LESIA.

The detailed responsibilities of the ROC personnel at LESIA are listed in the Table 11.

Moreover, the personnel workload can change over the project and shall be maintained up-to-date into the *ROC workload management schedule file* (see section 5.1.1.1).

4.3 Responsibilities

4.3.1 Key personnel responsibilities

The definitions and responsibilities of the key personnel involved in the ROC are established in the CIRD.

4.3.2 Institutes responsibilities

The responsibilities of the institutes relative to the ROC activities can be found in the CIRD.

4.3.3 ROC software and data validation responsibilities

This section presents in more details the responsibilities relative to the ROC software and data.

4.3.3.1 Customer versus supplier roles

The following table resumes the customer versus supplier roles concerning the systems, software and database units required to run the RSS.

Software units	Customer	Supplier
RODP	ROC	ROC
ROC SGSE tools	ROC, CNES	ROC

and databases	AIT/AIV team (for ground calibration campaigns)	
SAVs	ROC (but SAVs data products serve as inputs to the RPW DPU flight software team during the ground DPU SBM1/SBM2 detection algorithms validation campaign)	ROC
LLVM	SOC (primary instance run at ESAC) / ROC (backup instance run at LESIA)	ROC
RCS	ROC	RPW analyser/sensor teams (BIAS team for BICAS, SCM team for SCMCAL, THR team for THR_CALBAR, TDS team for TDS_CALBA and LFR team for LFR_CALBUT)
MEB GSE tools and databases	ROC	MEB GSE team
ROC MDB	ROC	ROC
RPW IDB	ROC	Flight software team (for PALISADE version) / MOC (for MiB version)
SolO Mission Information Database (MiB)	ROC	MOC

Table 7. ROC software customers versus suppliers.

4.3.4 RPW Calibration Software (RCS) specific responsibilities

The RCS will have to be delivered to the ROC by the teams in charge. The ROC is in charge of the S/W execution only, however it is the responsibility of the teams to ensure the maintenance of the RCS during the mission.

The following table summarizes the list of RCS to be developed by which team and for which data products.

RCS name	Entity in charge of the RCS development, test, validation, maintenance	Entity in charge of the RCS execution	Data products generated by the RCS	RCS programming language

	and delivery			
BICAS	BIAS team (IRF-U)	ROC team (LESIA)	- TDS (LFM) / LFR L2/L2S electrical WF data	Matlab©
LFR_CALBUT	LFR team (LPP)	ROC team (LESIA)	- LFR L2/L2S LFR data products, except WF data - LFR L1R electrical/magnetic WF data	Python
SCMCAL	SCM team (LPC2E)	ROC team (LESIA)	- TDS/LFR L2/L2S magnetic WF data	IDL©
TDS_CALBA	TDS team (IAP)	ROC team (LESIA)	- TDS L2/L2S data products, except WF data - TDS L1R electrical/magnetic WF data	IDL©
THR_CALBAR	THR team (LESIA)	ROC team (LESIA)	- THR L2 data products	IDL©

Table 8. RCS responsibilities.

The detailed list of people involved is given in the section 4.3.8.

Note that IDL© and Matlab© software licence will have to be reported into the ROC Software Re-Use File (RSF).

4.3.5 RPW science data production, validation and archiving responsibilities during the Solar Orbiter mission

4.3.5.1 Science data production

The ROC will be in charge to produce the RPW science data at the LZ, L0, L1R, L1 and L2 processing levels during the mission. This hence includes also the calibrated science data, using the RCS delivered by the sub-system teams.

4.3.5.2 Science data quality validation responsibilities

Several steps of validation will have to be realized between the RPW TM data retrieval at the LESIA and the delivery of definitive science calibrated data to the ESA archive centre.

The ROC science team will be in charge of the final validation of the science data. Nevertheless, the expertise of the sub-systems teams will be required to refine calibration process, at least of the beginning of the mission.

Table 9 presents the person in charge of the calibrated science data validation (i.e. data validation leader) at the LESIA, given by science data products category. The contributors from each sub-system team are also indicated; they are supposed to support the ROC for producing good quality science data. Technically speaking, it should mainly consist of delivering to the ROC, refined version of the RCS calibration tables.

Science data products category	Data validation leader at LESIA	Data validation contributor(s)
LFR spectral products – electric component	M.Maksimovic (TBC)	T.Chust (LPP)
LFR WF products – electric component	F.Pantellini (TBC)	A.Vaivads (IRF-U), T.Chust (LPP)
LFR spectral products – magnetic component	O.Alexandrova	M.Kretzschmar (LPC2E), T.Chust (LPP)
LFR WF products – magnetic component	O.Alexandrova	M.Kretzschmar (LPC2E), T.Chust (LPP)
LFR BP1/BP2 products	TBD	T.Chust (LPP)
THR products - electric component	L.Matteini	M.Maksimovic
THR products - magnetic component	L.Matteini	M.Kretzschmar (LPC2E), M.Maksimovic
TDS histogram, stats, MAMP and SM-PDS products	M.Maksimovic (TBC)	J.Soucek (IAP)
TDS WF products – electric component	M.Maksimovic (TBC)	J.Soucek (IAP)
TDS WF products – magnetic component	M.Maksimovic (TBC)	M.Kretzschmar (LPC2E), J.Soucek (IAP)

Table 9. Science calibrated data validation leader.

4.3.5.3 Science data distribution and archiving responsibilities

All of the processed science data files will be stored at LESIA. Preliminary LZ/L1/HK/ANC data will have to be distributed by the ROC within a short time - less than 24 hours after the downloading through the MOC DDS - to the RPW consortium and other instrument teams.

The definitive data will have to be delivered to the SOC within 3-months, in order to be archived at the ESAC data archive centre. The way the science data will be archived at the SOC is described in the Solar Orbiter Archive Plan (SOAP) [RD16].

RPW science data archiving at the CDPP (Toulouse) is also foreseen, but the details are not known at this stage of the project.

4.3.6 RPW science data production, validation and archiving responsibilities during the ground calibrations at system level

4.3.6.1 Science data production and distribution responsibilities

During the EM blank calibrations in CNES (Toulouse), the AIT/AIV CNES team will be in charge to ensure the production of L1 uncalibrated science data files, using the local instance of the ROC-SGSE. Resulting CDF format files will have to be then sent to the LESIA using the dedicated exchange file interface (SEF).

During the thermal calibration on PFM in LESIA (Meudon), the ROC team will produce it-self the L1 uncalibrated science data from its ROC-SGSE instance. This instance will be deployed on its production server at LESIA. Moreover it shall have a direct access to the CNES MEB GSE database in order to be able to retrieve test log data produced during calibrations.

The L1R/L2S science calibrated data production will be ensured by the sub-system teams them-selves, from the L1 data files provided by the ROC. Data will have to be available within a short time - less than 72h - to the RPW consortium for analysis.

At the end all of the processed science data files will be archived at the LESIA.

4.3.6.2 Science data quality validation responsibilities

The ROC team does not plan to validate the science data quality during the ground calibrations. The primary validation of these data will have to be performed directly by the sub-system teams involved.

4.3.6.3 Science data archiving responsibilities

All of the relevant data produced during the ground calibration campaigns, including stand-alone, must be archived at the ROC. It includes the following data products:

- LZ, L0, L1 and HK data files produced by the ROC-SGSE
- L1R and L2S data files produced by the RCS
- CDF skeleton tables and calibration tables used to produce the data, as well as the associated documentation

4.3.7 ROC software logistics support responsibilities

4.3.7.1 At LESIA and Paris Observatory

It has been decided that the computer services of the LESIA (GIGL) and of the Observatoire de Paris (DIO), will have in charge to supply facilities to the ROC for the following needs:

- Hosting, maintaining and ensuring the system administration of the ROC hardware equipment, i.e., servers and disks. In practice, ROC servers and disks will be integrated into the LESIA computer infrastructure.
- Ensuring the availability of the network and accesses, which permit data exchange between the ROC equipment and with the external servers (i.e., intranet/internet accesses, NFS-like mounting systems, SFTP/HTTPS servers).
- Maintaining up-and-running collaboration tools (Web page, Git/SVN servers, Wiki page, mailing lists, etc.)
- Supporting ROC team in the use of logistics (e.g., telecon/visiocon system usage).
- Providing a helpdesk to the ROC team in case of assistance or problems. Especially, the GIGL and DIO shall be able to promptly recover these facilities in case of failure.

The following table summarizes the list of equipment and the computer service in charge of the maintenance/assistance. Details about the concerned ROC device can be found in the section. Obsolete equipment is written in grey.

ROC facilities	Service in charge of the maintenance
Servers	GIGL
Data disks	GIGL
Communications (intranet/internet)	GIGL (at LESIA level) and DIO (at the Observatory level)
RPW Web portal	GIGL
ROC Confluence/JIRA site	GIGL
ROC SVN repository	GIGL
ROC Gitlab server	DIO
ROC mailing lists	DIO
Telecon system	GIGL
Visiocon	GIGL

Table 10. Logistics support to the ROC at LESIA and Paris Observatory.

4.3.8 Personnel responsibilities: summary list

The table 11 gives the list of people involved in or that interact with the ROC.

People in bold font are directly involved in the ROC project, people in italic font are contract employees, and people that don't work anymore in the project are indicated in grey. The list is given in alphabetical order and by team.

Since people can belong to several teams, they can appear several times in the table.

Name	Function(s)	Institut	Contact
ROC			
A.Aboubacar Amadou	**MUSIC Front-end (FIGARO, FAUST, OPERA, SISSI) software**	**LESIA**	**aichatour.aboubacar@obspm.fr**

	developer		
O.Alexandrova	**Co-I, B merging activity coordinator, SCM waveform expert**	**LESIA**	**olga.alexandrova@obspm.fr**
Diane Berard	**Instrument operations preparation and validation, including LEOP/NECP operations.**	**LESIA**	**diane.berard@obspm.fr**
X.Bonnin	RPW ground segment project manager (since Sept. 2017). ROC Software design manager (before Sept. 2017). ROC GSE and RODP design and development manager.	LESIA	xavier.bonnin@obspm.fr
B.Cecconi	MADAWG RPW member, CDDP data archiving support, Virtual Observatory (OV) expert	LESIA	baptiste.cecconi@obspm.fr
Y.de Conchy	**RPW ground segment project manager / ROC budget / operation preparation engineering coordinator (until Aug. 2017)**	**LESIA**	**yvonne.deconchy@obspm.fr**
M.Duarte	ROC SGSE and TV SGSE software developer	LESIA (VIVERIS)	manuel.duarte@obspm.fr
E.Holle	RPL V0.2.0 developer	LESIA	eleonore.holle@obspm.fr
L.Lamy	Nançay Decametric Array (NDA) PI	LESIA	laurent.lamy@obspm.fr
S.Lion	RSS validation manager	LESIA	sonny.lion@obspm.fr

	MUSIC and LLVM software design and development manager MUSIC backend and LLVM software developer		
L.Matteini	CoI, MADAWG RPW representative member TNR-HFR calibration leader	LESIA	lorenzo.matteini@obspm.fr
M.Maksimovic	**RPW PI**	**LESIA**	**milan.maksimovic@obspm.fr**
QN.Nguyen	ROC RODP and MUSIC-TV software developer / RPW user library developer	LESIA	quynh-nhu.nguyen@obspm.fr
F.Pantellini	CoI, spacecraft potential simulation with SPIS tool	LESIA	filippo.pantellini@obspm.fr
S.Papais	ROC software product assurance manager	*LESIA (Nexeya)*	Stephane.PAPAIS@nexeya.com
T.Sauziere	RPW Packet parsing library software engineer	LESIA (AVISTO)	thierry.sauziere@obspm.fr
A.Vecchio	System calibration / operation preparation science support TNR-HFR calibration support	*LESIA*	antonio.vecchio@obspm.fr
TNR-HFR team			
B.Cecconi	TNR-HFR CoI, goniopolarimetry expert	LESIA	baptiste.cecconi@obspm.fr
M.Maksimovic	TNR-HFR Lead Co-I	LESIA (ROC)	milan.maksimovic@obspm.fr
L.Matteini	TNR-HFR data calibration software co-responsible (after April, 2017)	LESIA	lorenzo.matteini@obspm.fr
QN.Nguyen	TNR-HFR data	LESIA	quynh-nhu.nguyen@obspm.fr

	calibration software engineer		
K.Boughedada	TNR-HFR flight software engineer	LESIA	kamal.boughedada@obspm.fr
A.Vecchio	TNR-HFR data calibration software co-responsible (until April 2017)	LESIA	antonio.vecchio@obspm.fr
LFR team			
T.Chust	LFR Lead Co-I	LPP	thomas.chust@lpp.polytechnique.fr
B.Katra	LFR flight et data calibration software engineer	LPP	bruno.katra@lpp.polytechnique.fr
R.Piberne	LFR calibration software support engineer	LPP	rodrigue.piberne@ lpp.polytechnique.fr
TDS team			
V.Krupar	TDS data definition and software support scientist	IAP	vk@ufa.cas.cz
D.Pisa	TDS data calibration software engineer	IAP	dp@ufa.cas.cz
J.Soucek	TDS Lead Co-I	IAP	soucek@ufa.cas.cz
BIAS team			
E.Johansson	BIAS data calibration software engineer	IRF Uppsala	erik.johansson@irfu.se
Y.Khotyaintsev	BIAS CoI / RPW data definition support	IRF Uppsala	yuri@irfu.se
A.Vaivads	BIAS Lead Co-I	IRF Uppsala	andris@irfu.se
SCM team			
J.Y.Brochot	SCM data calibration software engineer	LPC2E	Jean-Yves.Brochot@cnrs-orleans.fr
G.C.Chenaï	SCM data calibration software support engineer	LPC2E	Gamil.Cassam-Chenai@cnrs-orleans.fr
M.Kretzschmar	SCM CoI / SCM data calibration and ground segment manager	LPC2E	matthieu.kretzschmar@cnrs-orleans.fr

CNES AIT/AIV engineer Team			
E.Guilhem	RPW CNES AIT/AIV manager (until Jan. 2018) EMC & Performance Support (until Jan. 2018)	CNES (ALTRAN Technology)	emmanuel.guilhem@cnes.fr
J.Sanisidro	RPW CNES AIT/AIV Manager	CNES	julien.sanisidro@cnes.fr
J.Segur	EMC & Performance Support	CNES (Sogeti)	jerome.segur@sogeti.com
LESIA AIT/AIV engineer Team			
G.Barbary	MEB AIT Manager	LESIA	gaele.barbary@obspm.fr
A.Habet	*MEB AIT engineer*	*LESIA*	*abderrahmane.habet@obspm.fr*
S.This	MEB AIT/AIV Manager	LESIA	simone.this@obspm.fr
LESIA Flight software / Command control Team			
L.R. Malac-Allain	Command and Control Architect / Flight Software manager support	LESIA	leeroy.malac-allain@obspm.fr
P.Plasson	Command and Control Architect / Flight Software Manager	LESIA	philippe.plasson@obspm.fr
CNES Command control / ground segment engineering support			
J.M. Travert	Command control / ground segment engineering support	CNES	jean-michel.travert@cnes.fr
CNES RPW User Manual leader team			
E.Guilhem	RPW CNES AIT/AIV manager (until Jan. 2018) EMC & Performance Support (until Jan. 2018)	CNES (ALTRAN Technology)	emmanuel.guilhem@cnes.fr
Eric Lorfevre	RPW System engineer (after Jan. 2018)	CNES	eric.lorfevre@cnes.fr
J.M. Travert	Command control / ground segment engineering support	CNES	jean-michel.travert@cnes.fr
System			

S.Chaintreuil	RPW System Manager	LESIA	sylviane.chaintreuil@obspm.fr
E.Guilhem	RPW CNES AIT/AIV manager (until Jan. 2018) EMC & Performance Support (until Jan. 2018)	CNES (ALTRAN Technology)	emmanuel.guilhem@cnes.fr
Eric Lorfevre	RPW System engineer	CNES	eric.lorfevre@cnes.fr
Yann le Huédé	RPW EMC support	CNES	yann.lehuede@cnes.fr
Bernard Pontet	RPW System engineer	CNES	bernard.pontet@cnes.fr
MEB			
M.Dekkali	MEB/PA Project Manager	LESIA	moustapha.dekkali@obspm.fr
MEB GSE (LESIA)			
L.Gueguen	MEB GSE Software Manager	LESIA	loic.gueguen@obspm.fr
MEB EGSE (LESIA)			
K.Boughedada	RPW E-GSE software support	LESIA	kamal.boughedada@obspm.fr
D.Dias	RPW E-GSE manager	LESIA	daniel.dias@obspm.fr
Project management (CNES)			
E.Bellouard	RPW Project Manager	CNES	elise.bellouard@cnes.fr
I.Fratter	Solar Orbiter Project Manager (French contribution)	CNES	isabelle.fratter@cnes.fr
C.Laffaye	RPW Project Manager	CNES	catherine.laffaye@cnes.fr
M.Rouze	RPW Project exploitation Manager	CNES	michel.rouze@cnes.fr
Ground segment software development support (CNES)			
D.Raulin	RPW and SPICE ground segment development support	CNES	desi.raulin@cnes.fr
FIELDS / Solar Probe Plus (NASA)			
S.Bale	FIELDS PI / RPW Lead Co-I	SSL	bale@ssl.berkeley.edu
K.Goetz	FIELDS system	University of Minnesota	goetz@umn.edu
M.Pulupa	FIELDS ground segment lead	SSL	pulupa@berkeley.edu
STIX team (LESIA)			
N.Vilmer	STIX CoI,	LESIA	nicole.vilmer@obspm.fr

	STIX-RPW joined science exploitation main interlocutor at LESIA		

Table 11. Key personnel involved in the RPW Ground Segment activities.

5 CONFIGURATION, INFORMATION AND DOCUMENTATION MANAGEMENT

5.1 Configuration management plan

5.1.1 Project management files and tools

5.1.1.1 ROC workload management schedule file

The workload management schedule of the ROC shall be written in a dedicated file in the Excel© 2007 format. It shall provide the workload for each ROC agent at LESIA, its:

- Name,
- Agent category (e.g., “engineer”, “scientist”)
- Function (e.g., “developer”, “Project Manager”, etc.)
- Position type (e.g., “permanent position”, “temporary contract”)
- Eventually its arrival/departure dates in the project
- Percentage of workload over the timeline of the project.

The PM shall ensure that this document is always up-to-date.

5.1.1.2 ROC project planning file

The ROC project planning shall be written in a dedicated file in the Microsoft Project© file format. This file shall contain the detailed planning of the project, including the main milestones, the phases of software development, validation campaigns and delivery deadlines. It shall also permit to identify the origin and contribution of the person in charge.

Two separated files can be used to distinguish between the preparation/validation phase (i.e., the phases 1, 2 and 3, including the commissioning in-flight) and the exploitation phase (i.e., the phase 4).

The PM shall ensure that this document is always up-to-date.

5.1.1.3 ROC mailing lists

In addition to the RPW mailing lists, the ROC team shall maintain the following lists:

- **roc.cal** – List of people involved in the instrument calibration activities
- **roc.rcs** – List for the discussions related to the RCS engineering activities (i.e., development, integration, data production, etc.)
- **roc.ops** – List for discussions concerning the RPW operations (only engineering part).
- **roc.sci-ops** – List for discussions concerning the RPW science operations.

- **roc**.**rpw-um** – List for discussions concerning the RPW User Manual.
- **roc.sgse** – List of people involved in the ROC-SGSE development, interface and data product definition
- **roc.lesia** – Internal list used by the ROC science and engineering teams at LESIA.
- **roc**.**tech** – Mailing list of the ROC engineering team at LESIA
- **roc.teams** – List of all of the personnel directly concerned by the ROC activities.
- **rpw-roc.recrut** – Internal mailing-list dedicated to the ROC personnel hiring.
- **roc**.**support** – Mailing list to be used by the ROC data and software users for assistance.

The PM shall be a moderator of these lists.

5.1.1.4 ROC project issue tracker tool

The ATLASSIAN JIRA© software shall be used as the main issue tracker tool by the ROC team. Especially the following JIRA projects shall be implemented:

- **ROC-ADMIN** – administrative management of the ROC project
- **ROC-DATAPROD** – issues about the RPW science data production. Especially, the RCS teams shall use it in order to report issues related to their software and data.
- **ROC-OPERATIONS** – issues relative to the instrument operations
- **ROC-PIPELINE** – ROC pipelines (RODP) issues project
- **ROC-GITLAB** – project used to archive Gitlab issues.
- **ROC-RPWLIB** – issues relative to the instrument packet analysis
- **RPW-TESTS-SOL** – issues relative to the ROC GSE
- **RPW-REVIEWS** – issues relative to the ROC key points and reviews

In addition to JIRA, the ROC developer team at LESIA shall also use the Gitlab tool as an internal issue tracker, in order to monitor the software development, as explained in the SDP.

In all cases, all the ROC project-related issues (i.e., action-items, anomalies, bugs, new software feature, etc.) will have to be centralized in the JIRA tool.

5.1.1.5 ROC Project Wiki page

The ROC team shall maintain a Wiki page for the project, in order to give a centralized access to the people involved in the project. Especially this Wiki shall permit to:

- Centralize and view the list of action-items and anomalies of the project (including the JIRA issues)
- Archive the meeting notes and associated items (documents or presentations)
- Share information, documentation and resources with people involved in the project.

The ROC Wiki page relies on an ATLASSIAN Confluence© server to work.

5.1.2 Software development specific files and tools

The specific files and tools in support to the software development shall be listed in the SDP.

5.1.1 Requirements traceability management

The following scheme shall be applied to support the traceability of the requirements:

The top-level requirements (e.g., EID-A) shall be translated in terms of implementation requirements in the "ROC Concept and Implementation Requirements Plan" (CIRD).

In parallel, the PM shall write a "Top-level requirements traceability matrix", in order to ensure the verification of the ROC implementation to the higher-level requirements.

The technical specification requirements of the RSS shall be reported into the dedicated "ROC Software System Specification" (RSSS) document.

A CIRD-RSSS requirements traceability matrix shall be generated to verify the compliance of the RSSS w.r.t. the CIRD requirements.

The traceability between the RSSS and the implemented design should be also reported in a dedicated document, in order to ensure the validation of the full system.

5.2 Information management plan

5.2.1 Regular meetings involving the ROC

The following table gives the list of regular meetings planned during the project. The latest column on the right gives the approximate cadence of the meetings. This cadence is likely to change depending of the phases of the project.

Meeting name	Purpose	Participants	Approx. Cadence
Solar Orbiter-related meetings			
Science Working Team (SWT) Meeting	Discussions and decision about the scientific objectives to reach during the Solar Orbiter mission	SOC + MOC + IT	Every 6 months
Science Operation Working Group (SOWG) Meeting	Preparation of the mission operations according to the science objectives and operational constraints	SOC + MOC + IT	Every 6 months
Modelling and Data Analysis Working Group (MADAWG) Meeting	Discussion concerning data format, science data analysis tools and models for Solar Orbiter	SOC + MOC + IT	Every 6 months
RPW-related meetings			
RPW Consortium Meeting	Discussions inside the RPW consortium about the instrument manufacturing, performance, calibration and ground segment activities	RPW consortium	Every 6 months

ROC management-related meetings			
ROC project management telecon	Discussions between the ROC and CNES RPW management team in order to take stock of the progress of the ROC project	ROC + CNES RPW management team	Every month (after the end of the NECP, the frequency might decrease)
ROC development-related meetings			
ROC design development telecon	Discussions between the ROC and CNES ground segment development support team in order to take stock of the progress of the ROC software development	ROC + CNES ground segment development support team	Every week (until the end of the NECP and the in-flight validation of the RSS)
ROC development "sprint" meeting	Internal meeting of the ROC developer team at LESIA, in order to discuss the development "sprints".	ROC developer team	Every 2 weeks (at least until the end of the NECP and the in-flight validation of the RSS.)
Low latency working group telecon	Discussion concerning the low latency data processing implementation	ROC + SOC + other IT	Every month. After the delivery of the full functional LLVM version the frequency might decrease.
RPW calibration telecon	Discussions about RPW calibrations	ROC + AIT CNES + RPW consortium	Every month. After the CP, the frequency may decrease.
ROC SGSE telecon	Technical discussions about the ROC SGSE implementation	ROC + RCS teams	Every month , until the instrument delivery to ESA.
ROC RCS telecon	Technical discussions concerning the RCS development and integration (including data products)	ROC + RCS teams	Every month (until the end of the NECP. After this phase, the frequency may decrease)
ROC operations-related meetings			
RPW science operations telecon	Discussions about the RPW science operations with RPW teams involved	ROC team + RPW PI and Lead CoI teams	Every month
RPW instrument operations telecon	Discussion to discuss about the instrument (engineering) operations between the RPW teams involved.	ROC + CNES	Every month, until the end of the commissioning. Then in case of special operations (e.g., calibration rolls, anomalies or flight software upgrades)
RPW SBM telecon	Discussion to	ROC + RPW PI + In-situ	Every week (as soon as the SBM

	decide the SBM event data to downlink	instrument PIs + FIELDS/PSP PI (TBC)	selective downlink is operational)

Table 12. ROC regular meetings.

5.2.2 RPW Web portal

The ROC team shall maintain up-to-date a Web portal at LESIA to provide public information concerning the RPW instrument and project. In particular, this portal shall provide access to:

- Overview of the instrument description, its objectives, the Solar Orbiter mission and teams involved in the RPW and ROC projects
- Servers, data centre and services, where RPW data can be downloaded as well as the associated documentation
- Information about software and services that allow the science community to retrieve and use the RPW science data.

5.3 Documentation management plan

5.3.1 ROC documentation organization

The following table gives the list of allowed Object ("Objet") and Type of document for the ROC project, with the corresponding node trees and acronyms.

Rubriques Arbre OT pour le projet ROC					
Objet			Type		
1	GEN	General	1.1	MGT	Management
1	GEN	General	1.2	SYS	System
1	GEN	General	1.3	SCI	Science
1	GEN	General	1.4	QAP	Quality Assurance Produit
1	GEN	General	1.5	DPK	Datapackage
1	GEN	General	1.6	OTH	Other
2	PRO	Processing	2.1	CAL	Calibration
2	PRO	Processing	2.2	DAT	Data all levels
2	PRO	Processing	2.3	SFT	Software all levels
2	PRO	Processing	2.4	PIP	Pipeline
2	PRO	Processing	2.5	OTH	Other
3	OPS	Operations	3.1	SBM	Selected Burst Mode
3	OPS	Operations	3.2	SYS	System
3	OPS	Operations	3.3	ANA	Analysis
3	OPS	Operations	3.4	COM	Commissionning
3	OPS	Operations	3.5	LLD	Low Latency Data
3	OPS	Operations	3.6	OTH	Other
4	TST	Tests	4.1	GSE	Ground Support Equip.
4	TST	Tests	4.2	SBM	Selected Burst Mode
4	TST	Tests	4.3	OTH	Other

Table 13. ROC documentation objects and types.

5.3.2 ROC document file naming convention

The ROC documentation management inherits the RPW project convention in terms of reference and file naming convention.

Each ROC document shall be referenced with a unique ID number. The naming convention shall be as followed:

ROC-*Object*-*Type*-*DocType*-*XXXXX*-*Provider*_Iss*YY*_Rev*ZZ*(*Title_of_the_doc*).*ext*

, where *Object*, *Type* and *DocType* fields are the Object, Type and Type of document (see next section for the list of possible Object and Type). *XXXXX* is the ID number, *YY* and *XX* are respectively the issue and revision numbers. *Title_of_the_doc* corresponds to the title of the document and *ext* is the extension of the file.

5.3.3 ROC project management main documentation tree

Figure 10 shows the current management main documentation tree of the ROC project. It provides the main deliverable documents that shall ensure the project activities are fully covered.

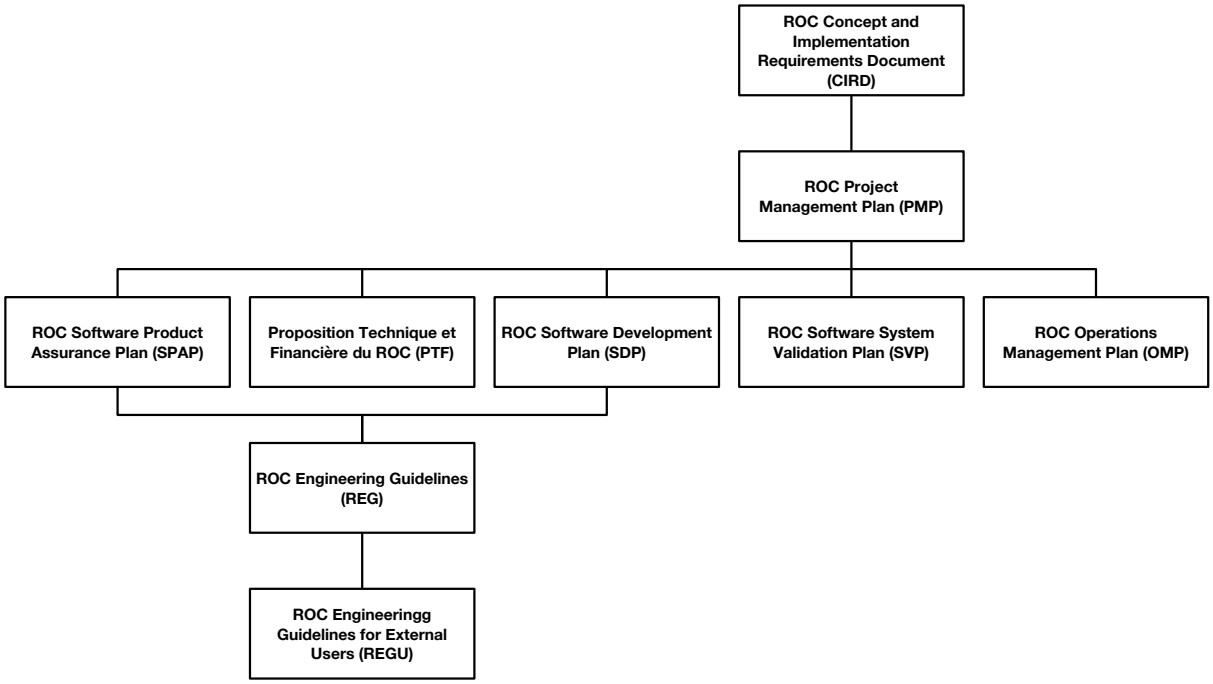

Figure 9. ROC project management main documentation tree.

Table below gives the reference and a short description of the ROC project management documentation.

Document	Reference	Description
ROC Concept and Implementation Requirements Document (CIRD)	ROC-GEN-SYS-PLN-00002-LES	- Presents the concept of the ROC design. - Lists the responsibilities as well as the centre implementation requirements, in agreement with higher-level requirements defined at RPW and Solar Orbiter system levels. - Gives traceability matrix with higher-level requirements (can be delivered in separated file)

ROC Project Management Plan (PMP)	ROC-GEN-MGT-PLN-00013-LES	- Presents the project management plan of the ROC to be followed for implementing, coordinating, and maintaining a full operational centre.
ROC Software Development Plan (SDP)	ROC-GEN-SYS-PLN-00015-LES	- Describes the software development plan of the ROC
ROC Software System Validation Plan (SVP)	ROC-GEN-SYS-PLN-00040-LES	Plan to test and validate the ROC concept and engineering infrastructure. Especially it shall provide the list of tests to be performed, the reason, the procedure and the expected results and the reports to be written.
Proposition Technique et Financière du ROC (PTF) – Phases D et E1	ROC-GEN-OTH-BDG-00010-LES	ROC technical and financial proposal to be addressed to the CNES for the phases D and E1 (in French)
Proposition Technique et Financière du ROC (PTF) – Phase E2	ROC-GEN-OTH-BDG-00048-LES	ROC technical and financial proposal to be addressed to the CNES for the phase E2 (in French)
ROC Software Products Assurance Plan (SPAP)	ROC-GEN-MGT-QAD-00033-LES	ROC Quality Assurance / Product Assurance Plan
ROC Operations Management Plan (OMP)	ROC-GEN-MGT-PLN-00041-LES	Lists and details the organization, tools, procedures and responsibilities required to perform the instrument operations during the mission
ROC Engineering Guidelines (REG)	ROC-GEN-SYS-NTT-00008-LES	Lists the guidelines to be applied by the ROC engineering team at LESIA.
ROC Engineering Guidelines for external users (REGU)	ROC-GEN-SYS-NTT-00019-LES	Extension of the REG for the teams external to the LESIA, but involved in the RPW Ground Segment engineering activities

Table 14. ROC project management documentation.

5.3.4 ROC engineering main documentation tree

5.3.4.1 ROADS main documentation tree

Figure 10 shows the current main documentation tree of the ROADS. It provides the main deliverable documents relative to the instrument operations and data processing activities, supported by the ROC during the mission. This set of documents shall ensure that the concept and the technical approaches fully satisfy the functional requirements defined at both RPW and Solar Orbiter levels.

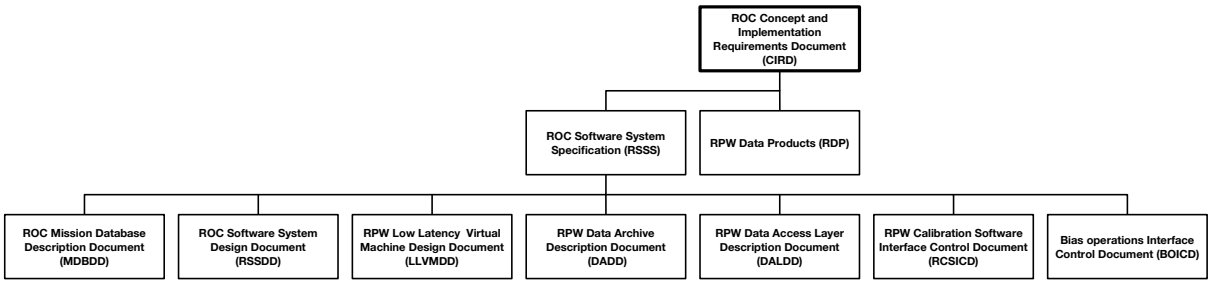

Figure 10. ROC Operations And Data System main documentation tree.

Table below gives the reference and a short description of the ROADS main documentation. The documents in italic are not showed on the figure above. The items in grey has been removed from the project, or the content has been merged into another document.

Document	Reference	Description
ROC Concept and Implementation Requirements Document (CIRD)	ROC-GEN-SYS-PLN-00002-LES	- Presents the concept of the ROC. - Lists the science and operational activities as well as the engineering capabilities implementation requirements, in agreement with requirements defined at RPW and Solar Orbiter system levels. - Lists the responsibilities of the key personnel
RPW Data Products (RDP)	ROC-GEN-DAT-NTT-00006-LES	List and description of all of the RPW data products to be generated by the ROC during the Solar Orbiter mission.
ROC Software System Specification (RSSS)	ROC-GEN-SYS-SPC-00026-LES	It is the Software System Specification (SSS) of the ROC. It covers mainly the specification requirements concerning the ROADS.
ROC Human-Machine Interfaces User Requirements	ROC-OPS-SFT-SWU-00039-LES	The content of this file has been inserted into the RSSS.
ROC Software System Design Document (RSSDD)	ROC-PRO-PIP-SPC-00036-LES	RSSDD gathers the Software Design Documents (SDD) for the RSS
RPW Calibration Software Interface Control Document	ROC-PRO-SFT-ICD-00037-LES	Interface Control Document for the RPW Calibration Software implementation into the RODP.
ROC Software System User Manual (RSSUM)	*ROC-GEN-SYS-SUM-XXXXX-LES*	*Software user manual of the RSS*
ROC Software System Reference Manual (RSSRUM)	*ROC-GEN-SYS-SUM-XXXXX-LES*	*Technical reference manual of the RSS*
RPW Low Latency Virtual Machine Design Document (LLVMDD)	ROC-OPS-LLD-SPC-00018-LES	Software Design Document of the RPW Low Latency Virtual Machine (LLVM)
RPW Low Latency Virtual Machine User Manual (RLLP SUM)	*ROC-OPS-LLD-SUM-00032-LES*	*Software User Manuel of the LLVM*
Dataset Description Document for RPW Low Latency CDF files (DDD RPW LL)	*ROC-OPS-LLD-NTT-00028-LES*	*Description of the RPW Low Latency Dataset to be produced by the RLLP*
ROC Mission Database Description Document (MDBDD)	ROC-OPS-SYS-SPC-00038-LES	Description of the ROC Mission Database (MDB) architecture and content
RPW Data Access Layer Description Document (DALD)	TBD	Description of the ROC DAL facilities concerning RPW data.
RPW Data Archive Description Document (DAD)	TBD	Description of the ROC DArc facilities concerning RPW data.
Bias Operations Interface Control Document	ROC-OPS-OTH-ICD-00022-LES	Description of the interface to be implemented between the Bias and ROC teams in order to perform Bias-related operations.

Table 15. ROC Operations And Data System main documentation tree.

5.3.4.2 ROC GSE main documentation tree

Figure 11 shows the main documentation tree of the ROC GSE.

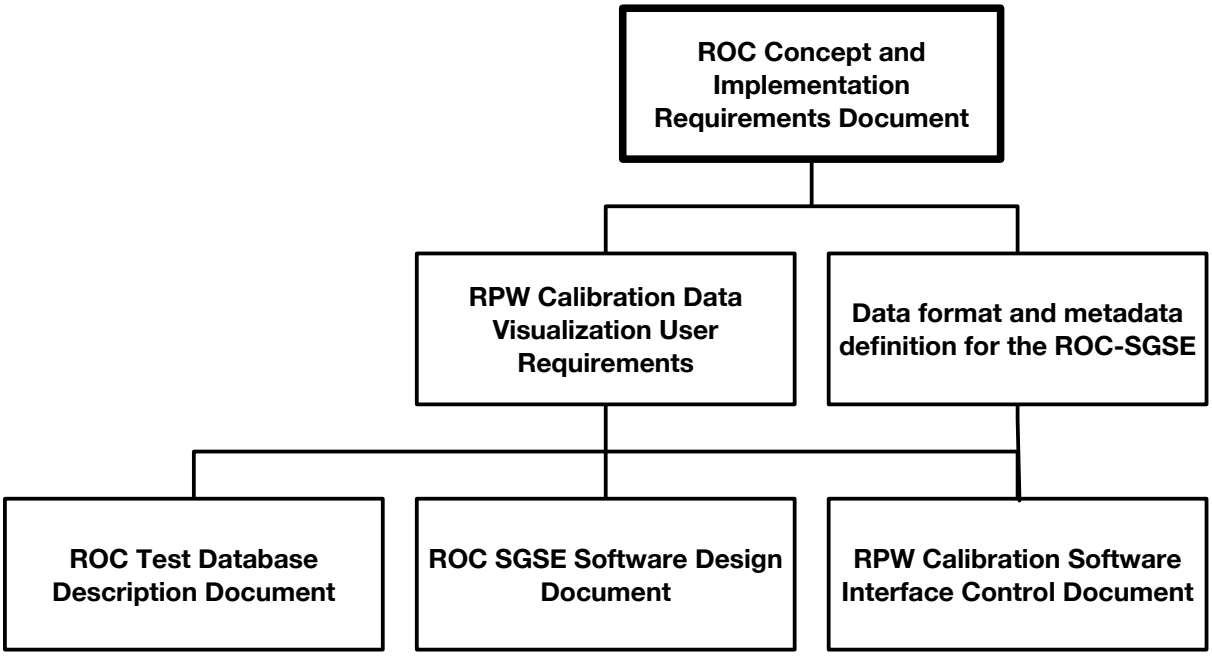

Figure 11. ROC GSE main documentation tree.

Table below gives the reference and a short description of the ROC GSE main documentation. The documents in italic are not showed on the figure above.

Document	Reference	Description
ROC Concept and Implementation Requirements Document (CIRD)	ROC-GEN-SYS-PLN-00002-LES	- Presents the concept of the ROC. - Lists the science and operational activities as well as the engineering capabilities implementation requirements, in agreement with requirements defined at RPW and Solar Orbiter system levels. - Lists the responsibilities of the key personnel
RPW Calibration Data Visualization User Requirements	ROC-TST-GSE-SWU-00003-LES	List the user requirements in terms of RPW ground calibration data visualization functionalities.
Data format and metadata for the ROC-SGSE	ROC-TST-GSE-NTT-00017-LES	Data format and metadata definition for the ROC-SGSE
ROC SGSE Software Design Document (ROC SGSE SDD)	ROC-TST-GSE-SPC-00004-LES	Software Design Document of the ROC-SGSE.
ROC-SGSE Test Database Description	ROC-TST-GSE-NTT-00021-LES	Description of the ROC-SGSE test database
RPW Calibration Software Interface Control Document	ROC-PRO-SFT-ICD-00037-LES	Interface control document (ICD) of the RPW Calibration Software to be implemented into the ROC-SGSE (the ROC-PRO-SFT-ICD-00037-LES document has superseded ROC-TST-GSE-ICD-00023-LES, which has become obsolete.)

SimuSBM1 Software Design Document	*ROC-TST-SBM-NTT-00005-LES*	*Software Design Document of the SimuSBM1 software, dedicated to simulate SBM1 event detections*
SimuSBM2 Software Design Document	*ROC-TST-SBM-NTT-00016-LES*	*Software Design Document of the SimuSBM2 software, dedicated to simulate SBM2 event detections*
Test Viewer SGSE specification	*ROC-TST-GSE-SPC-00012-LES*	*Technical specification of the Test Viewer (TV)*
Plugin Oriented Pipeline for Python (POPPy) framework User Manual	*ROC-TST-GSE-SUM-00035-LES*	*Software User Manual of the POPPy framework used to design the ROC-SGSE and RODP pipelines.*
ROC-SGSE Calibration Software Validation Tool User Manual	*ROC-TST-SFT-SUM-00027-LES*	*Software User Manual of the ROC-SGSE versus RCS interface validation tool.*

Table 16. ROC GSE main documentations

5.3.5 ROC requirement identification

The ROC requirements shall be clearly identified in the project documentation. The following conventions shall be applied over the entire project documentation.

Except if it is explicitly mentioned, the ROC requirements are valid during the entire life of the project. They can be cited from a document to another using the requirement identifier keyword.

Every requirement definition shall be assigned a unique identifier (ID). This requirement ID shall have the following structure:

REQ-ROC-ZZZ-XXXX

, where "REQ" refers to requirement, "ROC" indicates the name of the project, "ZZZ" is a 3-characters name which permits to identify the origin of the requirement, and "XXXX" is a 4-digits number starting at 0001, and that must be incremented by 1 each time a new requirement is provided for a given requirement origin "ZZZ".

5.3.6 ROC requirement structure

The structure of a requirement is the following:

Requirement ID	*Requirement Title*	Dependencies
Requirement Body		

The dependencies indicate the IDs of the possible upper level requirements. Only the 3-characters name and the 4-digits number separated by the "-" of the IDs can be displayed for the dependencies (e.g., "REG-0001).

5.3.7 ROC documentation management system

The ROC will rely on the COTRANET documentation management system (DMS) of the LESIA, to book reference and archive its documents.

COTRANET will be also used to build and archive the data packages for the ROC reviews and key points.

6 COST AND SCHEDULE MANAGEMENT

6.1 Cost management

The estimation of the cost of the ROC project shall be reported into the "Proposition Technique et Financière" document [RD4]. Two documents, one for the 1-2-3 phases (D-E1 mission phases) and one for the 4 phases (E2-EMP mission phases), can be written. The real cost will be monitored using the "Geslab" application (https://**geslab**.dsi.cnrs.fr) used by the LESIA.

6.2 Schedule management

The schedule is maintained with the ROC project-planning file (see section 5.1.1.2).

7 INTEGRATED LOGISTIC SUPPORT

7.1 Hardware and software logistic supports

The Groupe Informatique Générale du LESIA (GIGL), the computer service of the LESIA, will be the main interlocutor concerning both the hardware and software logistic supports.

Especially, the GIGL will:

- Host and keep available the ROC servers, data disks and network interfaces (hereafter called ROC device).
- Ensure that the ROC device is rapidly replaced in case of failure.
- Provide assistance to the ROC team in order to maintain, recover or upgrade software environment installed on the ROC device.
- Ensure that the LESIA collaboration tools, services and software, which are used by the ROC, are always operational.

It must be noticed that in the case of the mailing lists and Gitlab tools, the ROC team shall directly request support from the Direction Informatique de l'Observatoire (DIO), which is in charge of the computer service management at the Paris Observatory level.

7.2 Project logistic supports

In support to its operations activities, the ROC shall have a dedicated operations room at LESIA. Especially, this room will have to supply visioncon system with presentations sharing and to allow ROC team to promptly view via dedicated monitors the latest RPW science and HK data as well as instrument status.

8 RISK MANAGEMENT

8.1 Risk management at the project level

The following table attempts to identify the types of risk that could potentially become points of potential failures for the ROC project activities.

Type of risk	Cause(s)	Consequence(s)	Severity	Occurrence probability	Proposed solution(s)	Solution(s) to mitigate the

						risk
Personnel reduction in the project	Transfer, voluntary redundancy, contract end, disease, pregnancy, ...	Under-sized team, loss of expertise, delays in the project, ground segment human or/and system deficiency	High	Low	- Partially assign an available resource at LESIA - Prompt hiring of non permanent post	- Be sure that the LESIA has potentially another person available - Be sure that funds can be promptly invested for hiring - Sharing information inside the project - Maximizing the redundancy of competences
Lack of experience	Lake of experience of the ROC personnel relative to the necessary expertise required to operate a ground segment	Delay in deliveries, deficient ground segment to perform operations and data processing activites	High	Medium	The ROC shall offer the possibility to its personnel team to get professional training. The ROC shall ask for the support for experimented teams (at CNES, at LESIA, at other laboratories)	The ROC team shall include or be reviewed by high-skilled people relative to ground segment
Exceeding budget	Budget is not controlled	Exceeding budget	High	Medium	The ROC shall ensure that the needs have been well defined and sized	The ROC shall verify that the initial budget has been prepared

						and verified with the other people involved. The budget shall be regularly monitored over the project.

Table 17. Types of risk at the ROC project level.

8.2 Risk management at the engineering level

The following table attempts to identify the types of risk that could potentially become points of potential failures for the ROC engineering activities.

Type of risk	Cause(s)	Consequence(s)	Severity	Probability	Solution(s) to mitigate the risk
Hardware/Operating System (OS) failure at LESIA	Obsolescence, overvoltage	Loss of instrument operation and monitoring capabilities, science data delivery delay	High	Medium	Plan backup systems to be rapidly deployed. To mitigate the risk at OS level, the ROC uses virtual machines as primary servers for the RSS. (Hardware/OS recovery is the responsibility of the GIGL)
ROC Software System failure at LESIA	Bugs, regression, retro-compatibility not supported	Loss of instrument operation and monitoring capabilities, science data delivery delay	High	Low	A stable version of the RSS shall be ready to be deployed quickly (use of Git repos + Python installation package capabilities). Use of continuous integraton strategy with non-regression tests during the

					development and validation can also mitigate the risk.
Hardware/OS/RSS failure at the MOC site during the RPW related NECP operations	See previous risks	NECP operations related to RPW cannot be performed correctly by the ROC team	Critical	Low	Plan to have at least two backup software systems ready to be used at the MOC. Perform a validation of the MOC systems. This solution might impact the hardware/software facilities to be deployed at the MOC site.
Obsolete software/hardware	Software updates are not retro-compatible, unavailable hardware devices	Risk of software facilities failures, loss of ROC facilities	Low	Low	Use as much as possible stable, portable and time-honoured software technology
Unexpected personnel reduction in the developer team	Transfer, voluntary redundancy, contract end, disease, pregnancy, ...	Under-sized team, loss of expertise	High	Low	Prompt Non permanent post hiring or internal replacement by the LESIA
Lack of experience	Developer not familiar with a software technology	Software quality loss, required specification not reached, software delivery delay	Mediu m	Medium	The ROC shall offer the possibility to its developer team to get professional training.

Table 18. Identified types of risk at the ROC engineering level.

The identification and the management of the risks related to the ROC software system development shall be described in the SDP document.

9 QUALITY/PRODUCT ASSURANCE MANAGEMENT

The ROC project plans to include QA/PA management in order to:

- Assist the ROC team to define the QA/PA requirements.
- Write the ROC QA/PA plan document

- Ensure that the ROC software and interface products to be delivered are compliant with the requirements defined at RPW and Solar Orbiter levels, including RPW calibration software from analyzer/sensor teams.
- Participate to the preparation of the risk management plan of the ROC
- Support ROC team in the preparation of the preliminary design and acceptance reviews
- Support teams involved in the RPW ground segment activities in the delivery of software product for the ROC.

The requirements, tasks and actors concerning the QA/PA are presented in the SPAP.

10 ENGINEERING MANAGEMENT

The ROC engineering management mainly concerns software system and data of the ROC.

10.1 ROC software development approach

The ROC development approach in terms of software infrastructures, logistics, resources and schedules shall be detailed in the SDP document; however the main concept is given in the next section.

10.1.1 ROC software development Agile Scrum approach

10.1.1.1 Concept

The development, testing and validation of the main RSS units at LESIA, namely: RODP, MUSIC, ROC-SGSE and LLVM shall rely on the Agile Scrum approach. It must be noticed that this scheme is not applied for the development of the RCS, which must be done by the Lead CoI teams in charge (see section 10.1.2 for more details about the development approach for the RCS).

As illustrated on the Figure 12, the development timeline shall be composed of several main RSS releases (“R1” and “R2” for instance on the figure), for which the required functionalities shall be listed (see section 10.1.1.2.4). The releases date and functionalities will have to be driven by the constraints of the project; especially it is expected that releases are done prior to the SOV end-to-end tests, launch and commissioning validation report review.

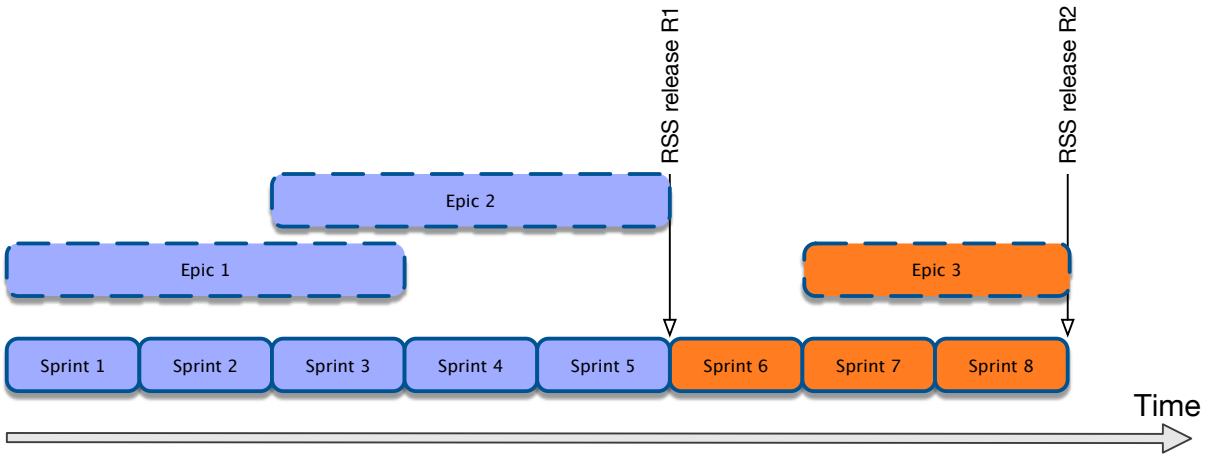

Figure 12. ROC software development sprint concept.

For each release, the software development timeline will have to be split into 2-weeks named "sprints", where the design of the priority functionalities will be developed and/or tested. The priority will have to establish during the sprint kick-off meeting (see next section).

10.1.1.2 ROC sprint implementation

10.1.1.2.1 Sprint planning convention

Here are some general rules concerning the sprint planning:

- A typical sprint duration shall be 15 days (11 working days). This duration can be occasionally changed if required.
- Every sprint shall end/start with a sprint meeting, where progresses are reviewed for the ending sprint in one hand, and the developer team agrees on the tasks to be done and things to improve for the next starting sprint in another hand. Note that depending of the project planning the development priorities can be changed from a sprint to another.
- A sprint meeting takes place on Friday at 10:00. This day can be occasionally changed, if members of the team cannot attend the meeting.

The GM shall ensure that these rules are strictly respected, and the ROC developers are available to attend the sprint meetings.

10.1.1.2.2 Sprint planning dashboard

In addition, the GM shall report the sprint planning for each release as tables in the ROC Wiki. These tables shall have the following columns:

- **Sprint #** - The sequence number of the sprint (must be a integer starting at 0)
- **Sprint name** - Name of the sprint
- **Working days** - Duration of the sprint in working days (i.e., without week-ends and public holidays)
- **Start date** - Date when the sprint starts
- **End date** - Date when the sprint ends
- **Tasks** – List of tasks for the current sprint. In practice, this list will be managed using the Issue tracker of the ROC Gitlab server.
- **Sprint meeting notes** - It should contain meeting notes concerning the current sprint.
- **Comments** - column to report any comment concerning the sprint.

These tables will have to be accessible by the ROC developers at LESIA.

10.1.1.2.3 Sprint tasks management

The sprint tasks will have to be monitored using Gitlab issue mechanism; one issue shall be created for each task. Especially, an issue shall be only closed: (i) in agreements with the PM and other developers during the sprint meetings. (ii) If the corresponding task has been fully tested and validated.

Moreover, the sprint tasks will have to be classified by software (e.g., "RODP" or "MUSIC") and be labelled according to the priority (e.g., "low", "normal", "high" and "critical"), the type of tasks (e.g., "spec", "feature", "bug", "hotfix") and the status (e.g., "backlog", "to do", "in progress", "testing", "terminated").

It shall be possible to create sub-tasks in such a way design-related tasks, i.e., "feature", can be associated with their corresponding higher level specification-task i.e., "spec". The "spec" tasks will have to match the specification requirements defined in the ROC SSS document.

10.1.1.2.4 RSS release functionalities management

The expected functionalities for each RSS release will have to be detailed in the SDP.

In same time, the GM shall also report into the dedicated dashboard on the ROC Wiki, the list of expected functionalities for each RSS release, w.r.t. to the specification requirements defined in the RSSS. The the specifications shall be labelled as “low”, “medium”, “high” and “critical” for each of the releases. The GM shall ensure that the dashboard is accessible to the ROC developers and that it is consistent with the priority of development decided during the sprints.

Besides, all of the RSSS specification requirements will have to be fulfilled in the latest release.

The main functionalities for each release will have also to be visible in the ROC planning file, in order to monitor the progress and possible delays w.r.t. to the project planning.

10.1.2 RPW Calibration Software (RCS) development approach

The RCS will have to be delivered to the ROC by the RPW Lead CoI teams in charge. The organization, schedule and expected interfaces and environments are presented in the SDP.

However, the GM will have to ensure the current status of the RCS development and delivery, including the data products definition, is reported into the ROC planning file.

Additionally, the GM shall provide a dedicated dashboard in the ROC Wiki, which allow the RCS teams to have user-friendly interface to follow the RCS development activities.

Especially, the GM will use this dashboard during the dedicated RCS telecons to monitor the status, the actions-items and possible anomalies.

10.2 ROC software validation approach

The ROC validation strategy shall be presented into the “ROC Software System Validation Plan” (SVP) document.

The SVP shall at least provide:

- The list of compatibility, integration and validation tests to be performed to ensure the validation of the ROC software system
- A description of the validation environment and configuration
- For each test, the reason, the procedures, the person in charge, the people involved, and the expected results and reports
- A schedule of the tests during the validation campaign

10.3 ROC engineering conventions and rules

In addition to the ROC SPAP, the engineering conventions concerning the ROC project shall be listed into a dedicated REG [RD5]. The REG shall help the ROC team to ensure the quality and homogeneity of the software development and application, providing standard rules and procedures.

Any additional rules and procedures that could concern external users should be reported into an extra “ROC Engineering Guidelines for External Users” (REGU) document [RD6].

11 LIST OF TBC/TBD/TBWS

TBC/TBD/TBW			
Reference/Page/Location	Description	Type	Status

12 DISTRIBUTION LIST

LISTS See Contents lists in "Baghera Web": Project's informations / Project's actors / RPW_actors.xls and tab with the name of the list or NAMES below		Tech_LESIA
		Tech_MEB
		Tech_RPW
		[Lead-]CoIs
		Science-CoIs

INTERNAL

LESIA CNRS		

LESIA CNRS		

EXTERNAL (To modify if necessary)

CNES		C. FIACHETTI
		C. LAFFAYE
		R.LLORCA-CEJUDO
		E.LOURME
		M-O. MARCHE
		E.GUILHEM
		J.PANH
		B.PONTET
IRFU		L. BYLANDER
		C.CULLY
		A.ERIKSSON
		SE.JANSSON
		A.VAIVADS
LPC2E		P. FERGEAU
		G. JANNET
		T.DUDOK de WIT
		M. KRETZSCHMAR
		V. KRASNOSSELSKIKH
SSL		S.BALE

AsI/CSRC		J.BRINEK
		P.HELLINGER
		D.HERCIK
		P.TRAVNICEK
IAP		J.BASE
		J. CHUM
		I. KOLMASOVA
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