



ROC Commissioning Report

Ref: ROC-GEN-OTH-RPT-00120-LES
Issue: 01
Revision: 00
Date: 08/06/2020

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SOLAR ORBITER



RPW Operations Centre

ROC Commissioning Report

ROC-GEN-OTH-RPT-00120-LES
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CLASSIFICATION

PUBLIC



RESTRICTED



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Change Record

Issue	Rev.	Date	Authors	Modifications
1	0	08/06/2020	X.Bonnin and ROC team members	First issue



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Acronym List

Acronym	Definition
AIT	Assembly Integration Test
AIV	Assembly Integration Validation
ANT	(Electrical) antennas
APID	Application Process ID
CDPP	Centre de Données de Physique des Plasmas
CIRD	Concept and Implementation Requirements Document
CNES	Centre National d'Etudes Spatiales
CoI	Co Investigator
CP	Cruise Phase
DDS	Data Dissemination System
DPU	Digital Processing Unit
EDDS	EGOS Data Dissemination System
EID-A	Experiment Interface Document - Part A
EMP	Extended Mission Phase
EPD	Energetic Particles Detector
ESA	European Space Agency
ESAC	European Space Astronomy Centre
ESOC	European Space Operation Centre
FDIR	Failure Detection Isolation and Recovery
FOP	Flight Operation Plan
GFTS	Generic File Transfer System
HFR	High Frequency Receiver
HK	Housekeeping parameters
IAP	Institute of Atmospheric Physics
ID	Identifier
IOR	Instrument Operation Request
IT	Instrument Team
ISM	Instrument State Model
IOP	Instrument Operation Planner
IOR	Instrument Operation Request
LEOP	Launch & Early Operations Phase
LESIA	Laboratoire d'Etudes Spatiales et d'Instrumentations en Astrophysiques
LFR	Low Frequency Receiver
LLVM	Low Latency Virtual Machine
LPC2E	Laboratoire de Physique et Chime de l'Environnement et de l'Espace
LPP	Laboratoire de Physique des Plasma
LVPS-PDU	Low Voltage Power Supply - Power Distribution Unit
MDOR	Memory Direct Operation Request
MOC	Solar Orbiter Mission Operation Centre



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MUSIC	Monitoring and control subsystem user interfaces
NECP	Near Earth Commissioning Phase
NMP	Nominal Mission Phase
OGS	Operations Ground Segment
OS	Operating System
PDOR	Payload Direct Operation Request
PI	Principal Investigator
PM	Ground Segment Project Manager
PS	Packet Store
POR	Payload Operations Request
ROC	RPW Operation Centre
RODP	RPW Operations and Data Pipeline
RPW	Radio and Plasma Waves
RSS	ROC Software System
RSW	Remote-sensing Window
S/C	Spacecraft
SBM	Selective Burst Mode
SCM	Search Coil Magnetometer
SGS	Science Ground Segment
SGSE	Software Ground Support Equipment
SOC	Solar Orbiter Science Operation Centre
SOOP	Solar Orbiter Observing Plan
SOWG	Science Operations Working Group
SSL	Space Science Laboratory
SSMM	Solid State Mass Memory
SVT	System Validation Tests
SWT	Science Working Team
TC	Telecommand
TDS	Time Domain Sampler
TM	Telemetry
TNR	Thermal Noise Receiver
URD	User Requirements Document
VM	Virtual Machine



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1 GENERAL

1.1 Scope of the Document

This document reports the activities performed on-ground by the RPW Operations Centre (ROC) during the Solar Orbiter commissioning phase.

The on-board activities related to the RPW instrument are not covered by the present document, but can be found in [RD1].

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				
AD2				
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 Commissioning Report	E.Lorfèvre	
RD2	NECP_timeline_v5_10.zip/5/10	NECP timeline	Ana Mestre	26/05/2020
RD3	https://confluence-lesia.obspm.fr/pages/viewpage.action?pageId=44532564	NECP Planning and Reports	RPW Teams	
RD4	https://gitlab.obspm.fr/groups/ROC/-/milestones	ROC sprint milestones	ROC Teams	

1.4 About this document

1.4.1 Access policy

This document is accessible without any restriction.

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

2 SUMMARY OF ACTIVITES

2.1 Mission level planning

The latest NECP planning can be found in [RD2].



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2.2 Ground activity planning

RPW operation activities - scheduling, first data analysis - were discussed every Friday during the dedicated RPW Operation Board (ROB) telecons.

Especially, RPW NECP weekly reports were presented (see full list available in [RD3]).

Activities related to the ROC infrastructure and services - development, test, maintenance, upgrades, debugging - were discussed every Monday during the dedicated "ROC sprint" telecons (see sprints 52 to 60 in the ROC Gitlab Milestones [RD4]).

3 ROC STATUS

The first sub-section (3.1) presents the overall status of the ROC facilities at LESIA (Meudon, France), used to performed RPW ground segment activities during the commissioning phase.

Following sub-sections (3.2, 3.3 and 3.4) report the status of the ROC main fonctions.

3.1 ROC facilities

3.1.1 Hardware, device and interfaces

Table below gives an overview of the ROC main hardware equipment status.

Hardware	Status	Location	Comment
Data processing server	OK	roc.obspm.fr	
SFTP server	OK	sftp-lesia.obspm.fr	Used for MOC and SOC GFTS Used for EDDS response file-delivery Used for RPW team file delivery
HTTPS private server	OK	https://rpw.lesia.obspm.fr/roc/data/private	Used to share RPW data to RPW teams
HTTPS public server	OK	https://rpw.lesia.obspm.fr/roc/data/pub	Used to share RPW public data and collaborators
Gitlab server	OK	https://gitlab.obspm.fr	Stores ROC software source files Stores RPW sequences and operation request files



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			(PDOR, MDOR, IOR) Used for issue/anomaly tracking
Test server	OK	roc-test.obspm.fr	
Dev. server	OK	roc-dev2.obspm.fr	

3.1.2 Software

Table below gives an overview of the ROC main software equipment status and version.

Software	Status	Version	Comment
RODP	OK	TBD	Up and running in roc.obspm.fr server
RGTS	OK	3.8.3	Up and running in roc.obspm.fr server
RIVP	OK	2.4.3	Up and running in roc.obspm.fr server
LLDP	OK	00.04.02	Prime instance delivered to SOC on January 2020 Backup instance deployed at LESIA
MUSIC-FIGARO	OK		Minor upgrades required
MUSIC-FAUST	OK	0.3.0	Nominal – minor bugs to fix
MUSIC-TV	NOK	N/A	Not implemented.
MUSIC-SISSI	NOK	N/A	Planned to be fully operational for NMP
MUSIC-OPERA	NOK	N/A	Not implemented.
TRAC	OK	1.0.0	
LOBOTM	OK	1.0.0	

3.2 Instrument commanding

3.2.1 Operation requesting

The operation requesting has been performed nominally.

Ajouter issues

3.2.2 Command tracking

The command tracking has been performed nominally.

Ajouter issues

3.3 Instrument monitoring

The monitoring of the instrument has been performed by the RPW team at CNES (Toulouse, France) during commissioning.



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3.4 Instrument data processing

3.4.1 Data retrieval

The data retrieval process for RPW is nominal:

- New RPW TmRaw data are queried from MOC EDDS by “STORAGE TIME” every 6 hours ;
- New RPW TcReport data are queried from MOC EDDS by “EXECUTION TIME” every 24 hours ;
- New Solar Orbiter HK parameters relevant to RPW are queried from MOC EDDS by “STORAGE TIME” every 24 hours ;
- New SOC-provided SPICE kernels ZIP files are processed every 24 hours.

Resulting products of the data retrieval process are distributed to the RPW teams via the ROC Web site at LESIA. Table below gives the location of the products.

Product	Location
RPW TmRaw	https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/TM/
RPW TcReport	https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/TC/
Solo HK parameters	https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/SOLO_HK/
SPICE kernels	https://rpw.lesia.obspm.fr/roc/data/private/solo/soc/spice/kernels/

3.4.2 RPW L0 data production

The production of RPW L0 data files is nominal.

It is triggered in an autonomous way every 24 hours.

Resulting L0 files are distributed to the RPW teams via the ROC Web site at LESIA in <https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/L0/> (restricted access).

3.4.1 RPW L1 data production

The production of RPW L1 data files is close to be nominal.

Generating L1 survey data files is triggered in an autonomous way every 24 hours.

Resulting L1 files are distributed to the RPW teams via the ROC Web site at LESIA in <https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/L0/> (restricted access).

Some L1 production still need to be triggered on demand: SOLO_L1_RPW-BIA-SWEEP, SOLO_L1_RPW-BIA-CURRENT and SBM mode L1 data. Automatization of these tasks is in progress.

Table below gives a snapshot of the main new features and upgrades still to be implemented at the end of the commissioning.

Implementation	type	Location	Status
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Setting QUALITY_BITMASK in L1 CDF	New feature	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/42	In progress
Setting SOOP_TYPE g. attribute in L1 CDF	New feature	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/44	Open
Setting OBS_ID g. attribute in L1 CDF	New feature	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/45	Open
Process HFR LIST mode data	New feature	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/15	Open
Add a flag for HK_BIA_MODE_BYPASS_PROBE1-3 state in SOLO_L1_RPW-BIA-SWEEP data	Upgrade	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/32	In progress
Change content of SNAPSHOT_SEQ_NR in SOLO_L1_RPW-TDS-XXX-TSWF	Upgrade	https://gitlab.obspm.fr/ROC/RCS/TDS_CALBA/-/issues/39	Open
Update file naming for SOLO_L1_RPW-BIA-CURRENT	Upgrade	https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/43	Open
Update SOLO_L1_RPW_CURRENT content	Upgrade	https://gitlab.obspm.fr/ROC/RCS/BICAS/-/issues/23	Open

Several issues have also been raised during the commissioning phase. The summary list can be found in the section 5.2.

3.4.2 RPW L2 data production

The production of RPW L2 data files is close to be nominal.

L2 data file production is triggered in an automatic way every 24 hours.

Resulting L2 files are distributed to the RPW teams via the ROC Web site at LESIA in <https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/L0/> (restricted access).

Table below gives a snapshot of the main new features and upgrades still to be implemented at the end of the commissioning.

Implementation	type	Location	Status
Improve the way to handle empty output CDF	Upgrade	https://gitlab.obspm.fr/ROC/RCS/TDS_CALBA/-/issues/38	Open



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Improve the processing time of LFR-SURV-SWF-E dataset by BICAS	Upgrade	https://gitlab.obspm.fr/ROC/RCS/BICAS/-/issues/25	Open
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Several issues have also been raised during the commissioning phase. The summary list can be found in the section 5.2.

3.4.3 RPW L3 data production

Production of the RPW L3 is not nominal. It is expected to be fully implemented during the cruise phase.

Nevertheless, RPW science data summary plots have started to be shared by the ROC through its Web site (https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/Summary_plots/). These first files have been provided by the RPW Lead CoI teams.

Generation of RPW summary plots is expected to be performed by the ROC at LESIA. Implementation is in progress.

3.4.4 RPW data sharing at LESIA

Distribution of the RPW L1/L2 science data to the RPW teams and collaborators via the ROC Web site at LESIA (<https://rpw.lesia.obspm.fr/roc/data/private/solo/rpw/data/>) is nominal.

During cruise phase RPW L1/L2 science data will be available within 48 hours in the ROC Web site after the reception at LESIA.

3.4.5 RPW data delivery to SOC

First set of RPW “CDAG” L2 data files were successfully delivered to the Solar Orbiter Archive (SOAR) at ESAC on April 2020, using the ROC-SOC GFTS local node at LESIA.

RPW “CDAG” data files is expected to be regularly delivered to ESAC during the cruise phase.

Delivery of public RPW science data files to ESAC will start on Sept. 2020.

4 SPECIAL EVENTS

Engineering activities operated by the CNES during the commissioning phase are progressively transferred to the RPW ground segment team at LESIA.

The LESIA will be fully in charge of the instrument exploitation during the CP and NMP.

5 ANOMALIES

5.1 Operations

Table below gives the list of main anomalies related to the operation activities still open at the end of the commissioning.

Full list of operation-related anomalies can be found in <https://gitlab.obspm.fr/ROC/OpsLib/-/issues?scope=all&utf8=%E2%9C%93&state=all&search=%5BERROR%5D>.



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Anomaly ID	Comment
https://gitlab.obspm.fr/ROC/OpsLib/-/issues/12	Medium level
https://gitlab.obspm.fr/ROC/OpsLib/-/issues/11	Critical level

5.2 Data processing

Table below gives the list of main anomalies related to the data processing still open at the end of the commissioning.

Full list of issues can be found in:

[https://gitlab.obspm.fr/groups/ROC/-/issues?scope=all&utf8=%E2%9C%93&state=opened&label_name\[\]=Bug](https://gitlab.obspm.fr/groups/ROC/-/issues?scope=all&utf8=%E2%9C%93&state=opened&label_name[]=Bug)

Anomaly ID	Comment
https://gitlab.obspm.fr/ROC/RCS/LFR_CALBUT/-/issues/32	Anomaly understood (low priority). Does not require any fix.
https://gitlab.obspm.fr/ROC/RCS/TDS_CALBA/-/issues/26	Anomaly understood (low priority). Fixing postponed
https://gitlab.obspm.fr/ROC/Pipelines/RODP/-/issues/41	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/THR_CALBAR/-/issues/45	Investigation in progress (medium priority)
https://gitlab.obspm.fr/ROC/RCS/BICAS/-/issues/26	Open (low priority)
https://gitlab.obspm.fr/ROC/RCS/THR_CALBAR/-/issues/53	Investigation in progress (low priority).
https://gitlab.obspm.fr/ROC/RCS/THR_CALBAR/-/issues/52	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/SCMCAL/-/issues/29	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/SCMCAL/-/issues/28	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/LFR_CALBUT/-/issues/42	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/LFR_CALBUT/-/issues/41	Anomaly understood (low priority). Fixing in progress
https://gitlab.obspm.fr/ROC/RCS/LFR_CALBUT/-/issues/39	Anomaly understood (low priority). Fixing in progress



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6 FUTURE MILESTONES

Milestone	Date	Comment
CNES-LESIA activity transfer meeting	10/06/2020	
Cruise Phase first STP (100)	15/06/2020	
Commissioning Review Board	25/06/2020	
ROC V5 release (RSS5)	30/06/2020	
RPW EM swap		
RPW science data delivery to Solar Orbiter Archive	Sept. 2020	

7 CONCLUSION

The ROC is up-and-running and has ensured the critical functions to support the RPW activities during the commissioning phase.

Transfer of the activities from CNES to LESIA is on-going and shall be achieved before the CNES team withdrawal from project.

Several implementations are still in progress and will have to be completed during the cruise phase. Especially, the selective downlink life-cycle shall be fully operational before NMP. It includes: the full understanding of the on-board SBM algorithms behaviour, the mapping of the SBM PS, the procedures and tools to select and retrieve SBM event data stored on-board.

8 LIST OF TBC/TBD/TBWs

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



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9 DISTRIBUTION LIST

<p style="text-align: center;">LISTS</p> <p>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</p>	Tech_LESIA
	Tech_MEB
	Tech_RPW
	[Lead-]Cols
	Science-Cols

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. KRASNOSELSKIKH
SSL	S.BALE

Asi/CSRC	J.BRINEK
	P.HELLINGER
	D.HERCIK
	P.TRAVNICEK
IAP	J.BASE
	J. CHUM
	I. KOLMASOVA
	O.SANTOLIK
	J. SOUCEK
IWF	L.UHLIR
	G.LAKY
	T.OSWALD
	H. OTTACHER
	H. RUCKER
	M.SAMPL
LPP	M. STELLER
	T.CHUST
	A. JEANDET
	P.LEROY
	M.MORLOT