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Solar Orbiter Mission Operations Report #23

Period [14 September 20 - 27 September 20]

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APPROVAL

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1 SUMMARY OF ACTIVITIES

This report covers two weeks of cruise in LTP 2 (STPs 113 to 114).

Post CSW 3.1.1 loading activities are complete with relevant instruments switched back on in STP 113.

On MOC end, work now focuses on the VGAM on 27/12 as well as the next CSW version 3.1.2 loading.

DoY	Date	Activity
258	14/09/2020	STP 113 WOL
259	15/09/2020	CEB pass PM EEPROM A/B images 0 update to 3.1.1
260	16/09/2020	
261	17/09/2020	CEB pass METIS OBCP update
262	18/09/2020	CEB pass NNO pass
263	19/09/2020	WOL
264	20/09/2020	
265	21/09/2020	STP 114 CEB pass WOL
266	22/09/2020	CEB pass
267	23/09/2020	CEB pass
268	24/09/2020	CEB pass, eclipse files update on board
269	25/09/2020	CEB pass
270	26/09/2020	WOL
271	27/09/2020	Test DDOR

At the end of the reporting period (DoY 271, 27/09) Solar Orbiter was at:

- 267.7 million km from the Earth (1.79 AU); the one-way signal travel time was 14 min 53 sec (893 sec).
- 146.5 million km from the Sun (0.98 AU).



2 SATELLITE STATUS

2.1 Platform

2.1.1 AOCS / propulsion

The AOCS configuration at the end of the reporting period is:

- AOCS in NCM mode
 - with attitude control based on Wheels (all 4 Wheels)
 - using the gyro stellar estimator (GSE) on STEADY gains
 - with inertial reference attitude guidance
- AOCS Sensors
 - IMU A (all 4 Channels) ON and IN-USE
 - IMU B (all 4 Channels) OFF and all 4 Channels PRESELECTED
 - ACC (all 4 Channels) OFF
 - FSS A (XP and ZM) ON and IN-USE, with FSS A XP having SUN Presence
 - FSS B (XP and ZM) OFF
 - STR A OFF since 05/06 (DoY 157), health set to 2
 - STR B ON (NEAT mode) and IN-USE since 05/06 (DoY 157), health set to 3

AOCS Actuators

- RW 1-4 ON and IN-USE used for Attitude Control since DoY 042 and LEOP day 1
- RW Momentum Target Levels @ 18/-18/-18/18 Nms
- CPS B OFF and PRESELECTED, CPS A OFF
- AOCS Flags
 - Sun Distance flag set to FAR since 13/09/2020 (DoY 257)
 - Flyby flag set to NO FLYBY since launch
- AOCS HK and TM mode configuration: Default since DoY 052 (21/02/2020)

- Propulsion system
 - Valves in default configuration (all TLVs + LFLV closed, except for LFLV 3+4)
 - The propulsion system is configured in regulated mode since launch
 - The pressure relief function is activated when needed
 - Pressure levels
 - HE tank pressure @ 149.1 bar (PT1)
 - PT2 (between pressure regulator and latch valves 1/2) @ 16.9 bar
 - NTO tank pressure @ 16.4 bar (PT3)
 - MMH tank pressure @ 16.4 bar (PT4)
 - PT5 (before latch valves 3/4 for MON) @ 16.4 bar
 - PT6 (before latch valves 3/4 for MMH) @ 16.4 bar
 - PT7 (between pressure regulator and latch valves 1/2) @ 16.8 bar
 - Pressure relief function period to be updated back to 40 days (as per 17/04, DoY 108 in RAM only, pending completion of on-going iteration with ADS); duration unchanged and at 8 cycles. SGM RAM values unchanged (18 days/8 cycles). The new RAM period applies following the pressure relief from 27/04.

2.1.2 Mechanisms

- SADE
 - SADE A ON and IN-USE
 - SADE B OFF
 - SA @ 0 degrees since 243.04.19. The next scheduled rotation is on 329.19.25 (24/11) to 30 degrees.
- HGA APME
 - HGA Deployment Status = TRUE
 - HGA selected as PRIME Antenna (PM and SGM RAM)
 - APME A OFF and PRESELECTED
 - APME B OFF
- MGA APME
 - MGA Deployment Status = TRUE
 - MGA is selected as PRIME Antenna (SGM RAM) since DoY 058
 - APME A OFF and PRESELECTED
 - APME B OFF

2.1.3 *TT&C*

The performance of the subsystem is nominal

- TRSP-1 X-band up and down via HGA, 4 kbps uplink, downlink bit rate is selected according to the used ground station
- TWTA-1 is in use, RF power nominal (from Helix Current telemetry reading)
- TRSP-2 back-up uplink is configured for X-band reception at 7.8 bps via LGA-1 since DoY 178 26/06/2020. LGA-1 is the better antenna till at least end of LTP 3.
- TWTA-2 is OFF and in cold redundancy
- MGA is selected as safe mode antenna since DoY 058.
- PN ranging is fully validated and used by default since DoY 057 (26/02). This allows to currently be on the max TM bit rate.

DST 1 and 2 output power was reduced on 19/06 as the TWTA was in overdrive.

The change was also applied in SGM.

2.1.4 *Thermal*

The thermal configuration has been updated with CSW 3.1.1 loading which takes into account most changes since launch. The following changes (which will be included in CSW 3.1.2 under preparation) were applied during the safe mode recovery on 10/09:

TL044 (METIS Ebox)	updated to: -16.5°C / -16°C
TL045 (PHI Ebox)	updated to: : -16.5°C / -16°C
TL048 (MY RS zone)	updated to: : -15.5°C / -15°C
TL093 (EPD SIS)	updated to: : -24°C / -20°C
TL098 (MAG OBS)	updated to: : -90°C / -88°C

2.1.5 *Power*

The subsystem is in its nominal configuration and performing nominally.

- PCDU A OFF
- PCDU B ON and in use

PCDU A and B EEPROM table updates took place in flight on 05/06.

PCDU-B SGM & PM RAM health is set to 3 since 03/07 (to make B the preferred choice and avoid changing the SCV config in SGM EEPROM).

2.1.6 *Data handling*

The subsystem is in its nominal hardware and software configuration.

The SSMM is ON and fully configured in 3 MM Configuration.

The TC Link Monitor is configured to a time-out of 7 days since 04/06 (DoY 157).

This is the configuration for cruise which is now set as follows (TC link TH1/TC link TH1 increase/TC link TH2):

PM RAM: 7d/24h/7d + 70h

SGM RAM: 7d/12h/7d + 34h

The TM generation mode is configured to NOMINAL.

OBCPs: an issue with timing in the METIS OBCP was identified and is being addressed. [During the CEB#222 pass on 18/09/2020, the correct version of the METIS OBCP was uplinked to the S/C.](#)

The current DMS configuration is:

Item	A	B
OBC PM	Active	Off
OBC CSW Image Select	1	1
OBC CSW Version	3.1.1	3.1.1
OBC CSW RAM version	3.1.1	3.1.1
OBC EEPROM Segs	1 : Code 2: Data	1 : Code 2: Data
RM PAP Prog. Set	1 (PM-A Nominal)	1 (PM-A Nominal)
RM	Enabled	Enabled
SSMM SV	Active	Off
SSMM ASW Image	1	1
SSMM ASW Version	02.07.00	02.07.00
RIU	Active	Off
OMM	On and in use (slave)	On and in use (Master)

[PM A/B EEPROM images 0 were patched with CSW 3.1.1 on DoY 259.](#)

[Updated eclipse files for SGM EEPROM A and B \(unique eclipse in the mission is during the EGAM in Nov 2021\) were commanded to the SC on 22/11.](#)

2.2 Instruments

EPD

Nothing to report.

EUI

Nothing to report.

MAG

Warm-up of the MAG OBS sensor in anticipation of the MAG switch on activity on 18/09/2020 took place on 17/09. MAG booted in high power mode on 18/09.

4 new reboots were commanded on 25/09 without success. The MAG team decided not to do any more reboot attempts and remain in high power mode as an increase in the outboard sensor "offset" in previous days has been observed.

METIS

Nothing to report.

PHI

Nothing to report.

RPW

Nothing to report.

SWA

Nothing to report.

SoloHi

Nothing to report.

SPICE

Nothing to report.

STIX

Nothing to report.

Decontamination heater status

Current status:

- SPICE OU = ON
- SPICE CE = ON
- METIS = OFF
- EUI OU = OFF

3 GROUND FACILITIES

3.1 Ground Stations

During the reporting period mission operations have been conducted with the CEB and NNO ESA stations.

The reason why the DOR tones were not on during the DDOR on 02/09 is [fully understood](#). [Ranging should not have been left on](#). The updated DDOR configuration was successfully tested before CEB BoT on 23/09.

3.2 Control Centre

Solo MCS SW version D3.15.17 is used on all operational machines since 20/08/2020. This version uses:

- GFTS SW version 3.1.6
- EDDS SW version 2.4.0 on 07/07 (with latest stream client now available)
- NIS SW version 5.2.0
- FARC SW version 3.2.1

Version [3.19](#) is installed on most devlan servers and clients for testing since 23/07.



4 SPECIAL EVENTS

None



5 ANOMALIES

The following Anomaly Reports were raised in the reporting period:

Spacecraft

SOL_SC-66 EUI: ME temperatures during De-icing and OCM Type-1

Ground Segment

None

Non Conformance Reports

None



6 FUTURE MILESTONES

This is the timeline of future milestones:

Milestone	Date	Comment
LTP2	DoY 181, 29/06/20	LTP 2 runs till 28/12/2020 00:00
	27/12/2020	VGAM
LTP3	DoY 363, 28/12/20	LTP 2 runs till 28/06/2021 00:00
	30/01/20 to 11/02/20	Conjunction, limited access to the SC (TM and TC) With the Sun Earth SC angle < 5 deg
	Dates TBD; in Jan or Feb 2021	CSW 3.1.2 upload to the SC This will be a full SW load, requiring all instruments off. The new SW will address the AOCS pointing stability issues.