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Solar Orbiter Mission Operations Report #9

Period [20 April 20 - 26 April 20]

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1 SUMMARY OF ACTIVITIES

DoY	Date	Activity
111	20/04/2020	STP 9 start (PL NECP week 8) WOL @ 22:00 IP-5 ID-54
112	21/04/2020	IC-SOU-60_1-7 IH-11 IM-5
113	22/04/2020	WOL @ 22:00 IA-6 ID-54
114	23/04/2020	ID-54 IT-4_12
115	24/04/2020	WOL @ 22:00 ID-54 IA-6
116	25/04/2020	
117	26/04/2020	

The table above only reports interactive activities. Many non-interactive activities run throughout the week for multiple instruments.

At the end of the reporting period (DoY 117, 26/04) Solar Orbiter was at:

- 36.1 million km from the Earth (0.24 AU); the one-way signal travel time was 2 min 01 sec (121 sec).
- 114.8 million km from the Sun (0.767 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 ON (NEAT mode) and IN-USE
 - STR B OFF

STR defective pixels check [will be executed as part of the remaining platform NECP activities.](#)

Lost in space acquisition tests open behaviors are further being investigated with ADS. [Feedback is imminent!](#)

The STR triangular shaped object (artefact) is further being discussed with ADS. [A new FOTO dump will take place on 20/05.](#)

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 set to NEAR since 16/03/2020 (DoY 76)
 - Flyby 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
 - NTO tank pressure @ 16.5 bar
 - MMH tank pressure @ 16.45 bar
 - HE tank pressure @ 150 bar
 - Pressure relief function period updated to 40 days on 17/04 (DoY 108) in RAM only; duration unchanged and at 8 cycles. SGM RAM values unchanged (18 days/8 cycles). The new RAM period will apply as of after the next pressure relief planned on 27/04.

2.1.2 Mechanisms

- SADE
 - SADE A ON and IN-USE
 - SADE B OFF
 - SA @ 30 deg since 091.11.17.17 (31/03). The next scheduled rotation is on 120.00.47.14 to 56 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

The Fdyn attitude colleagues calibrated the MGA and the HGA. The MGA is fine, but for the HGA a 3dB half cone angle of 0.64 deg was estimated. [The HGA pattern calibration will be repeated in flight on 01/06. The activity is being defined with ADS and project.](#)

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-2 since DoY 044 13/02/2020
- 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.

2.1.4 *Thermal*

TL97 (MAG OBS) latest setting is a regulation (in RAM only) of -90 to -88 degC.

Thermal configuration is configured for the op range for some instruments (decontamination heaters were not touched).

In orbit thermal characterisation data acquired on 15/03 is being analysed offline.

2.1.5 *Power*

The subsystem is in its nominal configuration and performing nominally.

- PCPU A OFF
- PCPU B ON and in use

PCPU A and B EEPROM table updates have been tested and reviewed on ground and are pending upload to the spacecraft (wrong reporting in previous MOR, both A and B tables need updating). The update in flight is scheduled for 28/05

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 back to a time-out of 3 days since 31/03 (DoY 091). Configuration for cruise is now set as follows (TC link TH1/TC link TH1 increase/TC link TH2):

PM RAM: 72h/24h/142h

SGM RAM: 72h/12h/106h

The TM generation mode is configured to NOMINAL.

SSMM ASW 02.07.00 was uploaded on DoY 052 in both ASW images and both supervisors.

The ADS patch (3.0.3p5) for SOL_SC-06 ([LEOP] OMM packet stores cannot be dumped) has been applied on board on DoY 098 (07/04).

OBCPs: an issue with timing in the METIS OBCP was identified and is being addressed.

The current DMS configuration is:

Item	A	B
OBC PM	Active	Off
OBC CSW Image Select	0	0
OBC CSW Version	3.0.3p1	3.0.3p1
OBC CSW RAM version	3.0.3p5	
OBC EEPROM Segs	1 : Code 2 : Data 3-8 : Profiles	1 : Code 2 : Data 3-8 : Profiles
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)

2.2 Instruments

EPD

EPD/SIS is now fully operational. All the planned activities for the HV powering have run smoothly and the unit is now providing its first scientific data.

EUI

Nothing to report.

MAG

Nothing to report.

METIS

On 23/04, the commissioning of the Metis UV detector was completed, taking the first UV image with door open and a clear Lya emission in the equatorial corona. The position of the internal occulter will be optimized in the upcoming commissioning activities.

An issue with timing in the METIS OBCP has been identified and is being addressed.

PHI

PHI's high-resolution telescope (HRT) was successfully commissioned. The scientists are very happy with the results they see. Two effects that were not anticipated were observed. The focus calculation did not work as expected. This will be fixed via commissioning activity IP-9. A new "feature" of the image stabilization system (ISS) was discovered. This will be handled operationally.

RPW

Two DPU Timecode anomaly events were received early in the week. Explanation for these events is pending RPW team feedback.

Many [Error during compression process] events were received. These are generated when the compression (of TDS data) is inefficient.

The RPW commands for STP 10 had to be re-uplinked over the weekend due to too tight timing in the original PDOR which would have led to an unsuccessful RPW power cycle. RPW is to take more margin in sequence timing and revisit the management of sequence durations.

SWA

Following the SWA-HIS issues on 24/04 (excessive current in the EIAS-HVPS and consequently in the LVPS +12V current, triggering SWA FDIR leading to HIS off, SOL_SC-AR 46 was raised. The issue was understood and a workaround was successfully tested on 24/04. EAS 1&2 LV & MCP HV commission is completed. HIS is commissioned to 22.5kV.

SoloHi

SOL_SC-AR 45 was raised. This is a re-occurrence of SOL_SC-AR 38 which affected STIX and SPICE this time. The consequences of the SoloHI test was totally overlooked and with hindsight the test should never have taken place in the first place.



SPICE

The SPICE IC-SOU-60 activity was executed successfully. The activity consisted on the taking the first light measurements. At the start of the activity SPICE was switched OFF unexpectedly due to SOL_SC-AR 45. SPICE was promptly recovered.

STIX

STIX was unexpectedly switched off due to SOL_SC-AR 45 and bridged back in on DoY 112.

Decontamination heater status

Current status:

- SPICE OU = ON
- SPICE CE = ON
- METIS = OFF since DoY 113 (22/04)
- EUI OU = OFF since DoY 106 (15/04)

Heat shield door status

Current status:

- Door 1 (SPICE) = CLOSED (since 21/04 DoY 112)
- Door 2 (EUI-FSI) = CLOSED (since 31/03, DoY 091), movement allowed = false
- Door 3 (EUI-HRI) = CLOSED (since 31/03, DoY 091), movement allowed = false
- Door 4 (METIS) = CLOSED
- Door 5 (PHI-FDT) = OPEN
- Door 6 (PHI-HRT) = OPEN (since 07/04, DoY 098)

3 GROUND FACILITIES

3.1 Ground Stations

During the reporting period mission operations have been conducted with the CEB ESA station.

3.2 Control Centre

Solo MCS SW version D3.15.10 is used on all operational machines since week 16/2020. This version uses:

- GFTS SW version 3.1.6
- EDDS SW version 2.3.0
- NIS SW version 5.2.0
- FARC SW version 3.2.1

[Version 3.15.11 of the MCS has been installed on devlan for testing.](#)
[Version 3.18 is under preparation.](#)

MATIS (our automation tool) is used since 14/02 (DoY 045) to manage all links to the ground stations. [Since 20/04 \(DoY 111\) MATIS is also used for some start of pass commanding. MATIS should take over full start of pass commanding activities in the coming weeks. This will need MCS version 3.18 to address all open MATIS issues.](#)

MCS issues related to SC file transfer, OOL management of the offline datastream and data gap issues (including EDDS) are further being investigated.

DSMs are investigating issues with the verifier and TC history not updating despite S1 being down on ground and OK. This happened multiple times [in the previous reporting period.](#)



4 SPECIAL EVENTS

None.



5 ANOMALIES

The following Anomaly Reports were raised in the reporting period:

Spacecraft

SOL_SC-46	[NECP] Unexpected SWA HIS events on DOY115
SOL_SC-45	[NECP] SpW Errors following SOLOHI commanding

Ground Segment

None

Non Conformance Reports

None



6 FUTURE MILESTONES

This is the timeline of future milestones:

Milestone	Date	Comment
Start of PL NECP week 9 (STP 10)		For PL, only interactive activities are reported
	DoY 118, 27/04/20	WOL @ 22:00 IX-2
	DoY 119, 28/04/20	IX-2 SWA
	DoY 120, 29/04/20	WOL @ 22:00 ID-T IU-5 SWA MAG power cycle (see AR Sol-SC 39)
	DoY 121, 30/04/20	IU-8_2-7 SWA
	DoY 122, 01/04/20	WOL @ 22:00 Public holiday, no activities
	DoY 123, 02/04/20	
	DoY 124, 03/04/20	
Beyond		
NECP plan available till LTP1 start		
LTP1 start on 15/06	DoY 167, 15/06/20	
LTP2 start on 29/06	DoY 181, 29/06/20	