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Solar Orbiter Mission Operations Report #8

Period [13 April 20 - 19 April 20]

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1 SUMMARY OF ACTIVITIES

Commissioning has now been re-planned with a full plan available and going till mid-June. On time for LTP 1 start on 15 June. LTP 1 has been shortened by two weeks.

DoY	Date	Activity
		<i>STP 8 start (PL NECP week 7)</i>
104	13/04/2020	WOL from 22:00 to 14/04/2020 01:00
105	14/04/2020	STIX IX-1 SWA IA-5
		WOL from 22:00 to 16/04/2020 01:00
106	15/04/2020	STIX IX-1 SWA IA-5
107	16/04/2020	STIX IX-1 SWA IA-5
		WOL from 22:00 to 18/04/2020 01:00
		Pressure relief function period update
108	17/04/2020	EPD ID-53 PHI IP-5 SPICE -> replan of activities from previous week
109	18/04/2020	
110	19/04/2020	

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 110, 19/04) Solar Orbiter was at:

- 30.9 million km from the Earth (0.206 AU); the one-way signal travel time was 1 min 43 sec (103 sec).
- 120.9 million km from the Sun (0.808 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 discussion is on-going.

Lost in space acquisition tests open behaviors are further being investigated with ADS.

The STR triangular shaped object (artefact) is further being discussed with ADS.

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 is estimated, while the nominal value in the FDDDB is 1.0 deg. This finding is still to be further analysed, validated and confirmed internally. However, for the next 8 weeks (commands already on board) HGA re-positioning commands are based on a 3 dB half cone angle of 0.60 deg to be on the safe side. Ground station signal strength data is being analysed too.

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.

- PCDU A OFF
- PCDU B ON and in use

PCDU A EEPROM tables [are up to date](#). PCDU B EEPROM table updates [have been tested and reviewed on ground](#) are pending upload to the spacecraft.

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

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 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 is in operational mode, with STEP ON, SIS ON in science mode, IRIS A and B open, EPT-HET 1 and 2 on. SIS A HV increased to 1.77, SIS B to 1.55.

EUI

FDIR limits for the EUI survival heaters were updated to the OP values and the EUI S/C controlled decontamination heaters had been switched off.

MAG

Nothing to report.

METIS

Nothing to report.

PHI

IP-5 interactive activities with HRT commissioning is on-going.

RPW

Nothing to report.

SWA

PAS HV commissioning operations were exercised according to plan. Unfortunately at the end of the first commanding period an internal FDIR tripped and switched off PAS unexpectedly. FDIR behaviour was understood on the next day.

EAS MCP commission continued.

FSW is now on the prime and redundant side, with DPU, PAS and EAS 1&2 LV & MCP HV fully commissioned.

SoloHi

Nothing to report.

SPICE

The SPICE IC-SOU-50 activity was executed successfully. This consisted on testing the Focus and Scan mechanisms.

STIX

STIX commissioning finally started and STIX been switched on successfully! On the first day, a Commissioning Functional Test (CFT) was performed as well as loading ASW v174 to flash location A2 followed by a boot on this new SW. Overnight data accumulation was then performed using old ASW v167.

STIX-1 part2 on the next day as well as activities on day 3 ran successfully. With some deviations to the plan.



Decontamination heater status

Current status:

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

Heat shield door status

Current status:

- Door 1 (SPICE) = OPEN (since 08/04, DoY 099)
- 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

MATIS (our automation tool) is used since 14/02 (DoY 045) to manage all links to the ground stations.

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

DARC has been updated to run consolidation based on reception time. A patch on EDDS, **ARES** and **WebMUST** has been applied in order to address the data gap issues observed via these tools.

Server **mmaasares02** was unavailable as of 18/04 causing unavailability of service for most of the weekend. This was caused by an incident in the ESA cloud (*unexpected reboot of the ESOC VNX Service processor*). The service is available again.

DSMs are investigating issues with the verifier and TC history not updating despite S1 being down on ground and OK. This happened multiple times last week.



4 SPECIAL EVENTS

None.



5 ANOMALIES

The following Anomaly Reports were raised in the reporting period:

Spacecraft

SOL_SC-44	[NECP] SPICE REC_SpW2_PL_OFF execution error
SOL_SC-43	[NECP] METIS: HVU MCP current OOL seen during HV ramp down in
IT-4 part #2	

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 8 (STP 9)		For PL, only interactive activities are reported
	DoY 111, 20/04/20	WOL from 22:00 to 21/04/2020 @ 01:00 IP-5 ID-54
	DoY 112, 21/04/20	IC-SOU-60_1-7 IH-11 IM-5
	DoY 113, 22/04/20	WOL from 22:00 to 16/04/2020 @ 01:00 IA-6 ID-54
	DoY 114, 23/04/20	ID-54 IT-4_12
	DoY 115, 24/04/20	WOL from 22:00 to 18/04/2020 @ 01:00 ID-54 IA-6
	DoY 116, 25/04/20	
	DoY 117, 26/04/20	
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	