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Solar Orbiter Mission Operations Report #12

Period [11 May 20 - 17 May 20]

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1 SUMMARY OF ACTIVITIES

Preparation for the 4 NECP campaigns is well under way with the stacks sent for review to all teams and deadline to respond set to 19/05.

DoY	Date	Activity
132	11/05/2020	<i>STP 12 start (PL NECP week 11)</i> IU-9_1-3 IU_9_4 SWA PHI (installation of new compression module) IT-6A WOL @ 15:07
133	12/05/2020	ID-T IU_9-5-14 IC-SOU-60_8 IP-6
134	13/05/2020	IU_9-5-14 IP-7 WOL @ 15:00
135	14/05/2020	gyro calibration update in SGM IP-8 IC-SOU-70
136	15/05/2020	IT-6B1 IC-SOU-70 Close SPICE Door WOL @ 15:22
137	16/05/2020	IU-10_1-2
138	17/05/2020	Linear CEL buffer full with EUI events

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 138, 17/05) Solar Orbiter was at:

- 63.1 million km from the Earth (0.42 AU); the one-way signal travel time was 3 min 31 sec (211 sec).
- 94.6 million km from the Sun (0.63 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 iterated after initial feedback from ADS.

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

[The gyro bias and null space calibration was updated in SGM on DoY 135.](#)

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 applies following the pressure relief from 27/04.

2.1.2 Mechanisms

- SADE
 - SADE A ON and IN-USE
 - SADE B OFF
 - SA @ 60 degrees since 127.19.52. The next scheduled rotation is on 152.20.30 to 70 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. ADS reports that with the latest ground station processed data, the 3dB beamwidth looks ok at +-1deg, but that there is a boresight misalignment. The test on 01/06 will allow to get more data points to get a more accurate plot but the antenna looks fine in general.

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. 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).

[A patch for the SpW instrument cascade effect is imminent \(delivery from ADS to MOC\).](#)

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

The team is investigating the reason for the generation of the events [TM 5,2 SIS aliveness] from time to time. The instrument is working correctly, so this is probably some kind of hiccup from time to time with no action needed for now.

EUI

First light images were acquired.

EUI Heat Shield doors 2 & 3 (EUI FSI and EUI HRI) were opened on DoY 133.

EUI filled the CEL linear buffer on DoY 138.

The S5 TM(5,3) event error message comes from the building of the SID 2 HK packet. The SID 2 HK packet generation was reduced to every 65535 seconds as a temporary work around to avoid filling the CEL.

The error is due to the 2 byte Lya program number of 0x3fd (1021) which does not fit in 1 byte and hence gives a packet build error.

The issue is already fixed for next software in IU-11 planned in a few days.

The new software will also have some error throttling on by default.

MAG

Nothing to report.

METIS

Activity IT 6B1 aimed at repositioning the IOM and was executed successfully.

PHI

The on board compression module was replaced by an updated version to fix existing issues. Out of pass activities failed on two occasions requiring plan re-definitions and the power cycling of PHI.

RPW

Nothing to report.

SWA

SWA NECP interactive activities are complete.

SoloHi

Nothing to report.

SPICE

The SPICE LUT was updated.

SPICE activities were all successful.

STIX

Nothing to report.



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) = OPEN (since 12/05, DoY 133)
- Door 3 (EUI-HRI) = OPEN (since 12/05, DoY 133)
- 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 was installed on opslan on 05/05.

[Version 3.15.12 will be installed on devlan on 18/05 for FCT 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 needs 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.

Issues with the verifier and TC history should be fixed in D3.15.11.

[A strange behavior was observed on 15/05 with many OOLs due to a toggling bit rate, MCS teams are investigating the issue.](#)



4 SPECIAL EVENTS

None.



5 ANOMALIES

The following Anomaly Reports were raised in the reporting period:

Spacecraft

None

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 12 (STP 13)		This is the second week with FDyn re-planned products
	DoY 139, 18/05/20	IX-4 STR-B alignment update in RAM WOL
	DoY 140, 19/05/20	IX-4 IP-FDT EUI/PHI flatfield (SOL-SGS-TN-0019 0.4)
	DoY 141, 20/05/20	IU-10_4 IU-10_5-10 STR B Foto Dump WOL
	DoY 142, 21/05/20	IU-10_5-10 IP-HRT
	DoY 143, 22/05/20	IU-10_5-10 CPS Purging WOL
	DoY 144, 23/05/20	IX-Crab Nebula
	DoY 145, 24/05/20	IU-10_5-10 IM-IIC_MAG_RPW_EPD_SWA (first NECP campaign)
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	