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Solar Orbiter Mission Operations Report #10

Period [27 April 20 - 03 May 20]

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APPROVAL

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Sylvain Lodiot, SolO SOM	

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Date: 2020.05.04 18:00:38 +02'00'

CHANGE LOG

Reason for change	Issue Nr.	Revision Number	Date
Updated with reporting for new time period	10	0	**04/05/2020**

CHANGE RECORD

Issue Number 10	**Revision Number 0**		
Reason for change	**Date**	**Pages**	**Paragraph(s)**
New issue	04/05/2020	All	all

Note: no change record is kept for this document since every new issue corresponds to a new reporting period.

Distribution list

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- SolO MOR
- SolO MOR cc

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1SUMMARY OF ACTIVITIES

DoY	Date	Activity
118	27/04/2020	***STP 10 start (PL NECP week 9)*** WOL @ 22:00 IX-2
119	28/04/2020	IX-2 SWA
120	29/04/2020	WOL @ 22:00 ID-T IU-5 SWA MAG power cycle
121	30/04/2020	IU-8_2-7 SWA
122	01/05/2020	WOL @ 22:00 MAG switch off upon PI request
123	02/05/2020	
124	03/05/2020	

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 124, 03/04) Solar Orbiter was at:

- 42.9 million km from the Earth (0.28 AU); the one-way signal travel time was 2 min 23 sec (143 sec).
- 108.2 million km from the Sun (0.723 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.

  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 @ 56 degrees since 120.00.47.14. The next scheduled rotation is on 127.19.52 to 60 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.

- PCDU A OFF
- PCDU B ON and in use

PCDU 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).

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
Nothing to report.

EUI
The SW patch was successfully installed.
Unexpected behaviour of the instrument was observed during the High Voltage Unit testing, with a bug in the EUI SW discovered.

MAG
A MAG reboot on 29/04 in an effort to return the instrument to its nominal state was not successful. MAG was still in a higher power state (as documented in AR SOL-SC-39). It is believed both front end electronics boards were actually in high power state after the reboot. MAG emergency switch OFF was therefore requested by the MAG PI on 01/05.
MAG is back on since 04/05 and is no longer in a high power state.
The MAG team is further investigating the issue.

METIS
Nothing to report.

PHI
Nothing to report.

RPW
A further DPU Timecode anomaly event was received on 03/04. This is believed to be an RPW issue.
Due to a timing issue, a BIAS weeping failure event was generated with no impact on other activities.

SWA
HIS experienced a reoccurrence of the SOL_SC-46 anomaly on 29/04 leading to FDIR trigger and HIS power off. This in turn lead to the decontamination heaters being left unpowered as the FDIR function doesn't take into account the previous LCL state.
It was decided to cancel the planned HIS activities for the day and bring forward some EAS & PAS activities from DOY 120.
PAS activities proceeded without incident. During EAS activities a number of failed TCs were observed.
HIS power-on using modified procedure was successful on the following day. HV ramp up activities proceeded as expected, and without incident.

SoloHi
Nothing to report.

SPICE
Nothing to report.

STIX
STIX NECP activities continued nominally during the reporting period.

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 versionD3.15.10 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 will be installed on opslan on 05/05.
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.

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

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 10 (STP 11)		For PL, only interactive activities are reported
	DoY 125, 04/05/20	WOL @ 22:00 MAG switch on
	DoY 126, 05/05/20	IH-11 SWA ID-T IH-31_20-29
	DoY 127, 06/05/20	WOL @ 22:00 SA Steering @ 19:52 -> 60deg SWA
	DoY 128, 07/05/20	IX-3 IW-7 SWA
	DoY 129, 08/05/20	WOL @ 22:00 SWA IX-3
	DoY 130, 09/05/20	
	DoY 131, 10/05/20	
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	