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Solar Orbiter Mission Operations Report #17

Period [15 June 20 - 21 June 20]

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Reference	SOL-ESC-RP-10100
Issue/Revision	17.0
Date of Issue	22/06/2020
Status	Issued



APPROVAL

Title Solar Orbiter Mission Operations Report #17	
Issue Number 17	Revision Number 0
Author Sylvain Lodiot	Date 22/06/2020
Approved By	Date of Approval
Sylvain Lodiot, Solo SOM	

CHANGE LOG

Reason for change	Issue Nr.	Revision Number	Date
Updated with reporting for new time period	17	0	22/06/2020

CHANGE RECORD

Issue Number 17	Revision Number 0		
Reason for change	Date	Pages	Paragraph(s)
New issue	22/06/2020	All	all

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



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1 SUMMARY OF ACTIVITIES

The first cruise week is complete.

The first payload checkout took place.

First perihelion was crossed on 15/06 (0.515 AU).

DoY	Date	Activity
		<i>STP 100 continuation</i>
167	15/06/2020	OCM WOL CEB pass
168	16/06/2020	WOL CALIB_OFFPOINTING_STAR
169	17/06/2020	WOL
170	18/06/2020	WOL CALIB_OFFPOINTING_FLATFIELD CEB pass
171	19/06/2020	WOL CEB pass
172	20/06/2020	WOL CALIB_OFFPOINTING_ALIGNMENT
173	21/06/2020	WOL CALIB_OFFPOINTING_STRAYLIGHT

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 153, 01/06) Solar Orbiter was at:

- 150.7 million km from the Earth (1 AU); the one-way signal travel time was 8 min 23 sec (503 sec).
- 78.1 million km from the Sun (0.52 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

STR-A EEPROM dump was attempted on 05/06. Only 2 out of 4 memory bank dumps were successful. The other 2 failed. This is further being investigated and may lead to an AR.

STR A FOTO dump took place on DoY 160 to complete the STR defective pixel activities.

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)

As part of the AR SOL_SC-49 investigations (pointing), the gyroscopic torque compensation was disabled on 15/06.

A new TM packet was also defined to gain more visibility. This packet is generated at 8 Hz and will remain enabled for a few more STPs. This new packet makes an increase of 6 kbps.

- 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 @ 16.4 bar
 - HE tank pressure @ 149.5 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.

A Very preliminary assessment of the OCM on 15/06 indicates a ~2% over-performance of the 14.5 cm/s that were targeted.

2.1.2 Mechanisms

- SADE
 - SADE A ON and IN-USE
 - SADE B OFF
 - SA @ 70 degrees since 152.20.30. The next scheduled rotation is on 181.18.55 (29/06) 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 HGA pattern calibration confirms a 3 dB half cone of 1.027 deg for APME A and 1.022 for APME B (nominal value of 1 deg). And a boresight (nominally at centre of the 3 dB half cone) of 0.18 deg for APME A and 0.21 deg for APME B.

No specific action is required as the link budget contains sufficient margin.

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.

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*

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.

Significant work has been done on SOL_SC-49 [NECP] Pointing Stability Disturbance.

To address the STIX Aspect System disturbances, the IMU200 set-points (TL 3) were updated to [-8; -7], with an immediate effect on the heater. This should solve the STIX issue. The set points may need further tuning (including FDIR update in the future), as a final solution.

Thermal line 48 (MY panel heater) set points were updated to [0.5; 1 deg] on 15/06 as part of the AR SOL_SC-49 investigations (pointing). The frequency of several thermal packets was increased around the PL checkout as well.



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.

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.

SSMM ASW 02.07.00 was uploaded on DoY 052 in both ASW images and both supervisors. SSMM issues following the SpW overload are further being investigated.

SSMM rerouting activities took place as follows:

- (a) SOC request: all of the EPD "selective" APIDs currently routed to store #7 (namely 844, 860, 908, 1612) re-routed to store #6, EPD bulk science
- (b) reroute APID 924 from the EUI SSMM science packet store (PS12) to the low latency packet store (PS5) following EUI request at the end of the NECP

The TC Link Monitor is configured back 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.

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).

Patch CSW V3.0.3p6 for the instrument "cascade switch-off effect" was applied on 26/05 .

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	3.0.3p6	
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

Wrong science tables on board had to be updated via PDOR on 15/06.

MAG

Nothing to report.

METIS

Many BSW_ERRORS generated on DoY 169 are being looked into.

PHI

Nothing to report.

RPW

Nothing to report.

SWA

Commanding issues in STP 100 (blocking all commanding to EAS and PAS) had to be corrected via PDOR on 15/06.

There was a problem with HIS while ramping down for a WOL on the 15th June and FDIR switched off HIS. It is likely HIS has to be powered down before every WOL and powered ON after every WOL.

SoloHi

Nothing to report.

SPICE

Nothing to report.

STIX

Nothing to report.



Decontamination heater status

Current status:

- SPICE OU = ON
- SPICE CE = ON since DoY 155 (06/06)
- METIS = OFF since DoY 113 (22/04)
- EUI OU = OFF since DoY 106 (15/04)

Due to an SWA/HIS FDIR triggering, onboard autonomy switched OFF the relay box LCL which powers both HIS and the decontamination heaters. The RelayBox LCL was switched back on so the heaters are powered again.

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 [3.15.15](#) is used on all operational machines since [16/06/2020](#). 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 [3.15.16](#) is under preparation for devlan installation.
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.



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
LTP2 start	DoY 181, 29/06/20	
	week 37 07/09 to 11/09	CSW upload on the SC This implies a SC safe mode hence all instruments off that week
	27/12/2020	VGAM