



Operations Notes

FOS Team @ ESAC

Reported by:

J. Fauste/J.M. Castro Cerón

Topic:

Date:

Issue:

FOS Report for week 47, year 2020

from 16 NOV 2020 to 23 NOV 2020

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1 General Comments

Activities scheduled for this week are those planned for the 47th calendar week of 2020:

16 NOV 2020 to 23 NOV 2020 (DOYs 321 to 328).

The following routine activities were planned this week (see Gantt chart on next page and CRF 928).

- One PMS Offset on 19 NOV 2020 (DOY 324), including three Short Calibrations at 06:40:30.0z, 06:41:04.8z, and 06:41:39.6z (orbit 58063).
- Local Oscillator Calibrations every 10 minutes.
- X band Passes over ESAC and Svalbard.

2 Mission Planning Deviations

Because of the CCU reset that happened on the 18th of November, the following X-Band passes were not acquired on ground:

Xband_ESAC	2020-11-18T20:02:32	2020-11-18T20:05:49	196
Xband_SVAL	2020-11-18T21:28:16	2020-11-18T21:38:36	619
Xband_SVAL	2020-11-18T23:06:59	2020-11-18T23:17:15	615
Xband_SVAL	2020-11-19T00:45:40	2020-11-19T00:56:02	622
Xband_SVAL	2020-11-19T02:24:36	2020-11-19T02:35:03	627
Xband_SVAL	2020-11-19T04:04:24	2020-11-19T04:14:20	596
Xband_SVAL	2020-11-19T07:26:17	2020-11-19T07:33:33	436
Xband_SVAL	2020-11-19T09:08:40	2020-11-19T09:13:35	295

Also the PMS offset calibrations initially scheduled on the 19th of November were not executed due to the same CCU reset event.



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3 TC Failures

None.

4 On Board Anomalies

- The MIRAS instrument CCU reset on 2020-11-18T18:11:45.450z (DOY 323). KSAT phoned the FOS hotline on 18 AUG 2019, at 21:40z, reporting the no acquisition of the first evening Svalbard X band pass, (AOS: 21:28:16z). Following that, FOS engineer checked that the first evening pass over ESAC with AOS at 18:21:52z only acquired 25242 TM packets while the second one in that evening, AOS 20:02:32z, was not received at all. Since no S-Band passes were already received at that time, there was no way to confirm the real possibility of a CCU reset. Nevertheless FOS engineer alerted to the CNES SOM on the possibility for this CCU reset. The reset was finally confirmed by the CNES on call operations manager on a telephone call and SMS to FOS hotline on 19 NOV at 02:35z and upon reception of S-Band pass KER-23 with AOS 01:46:26z

The reset took place in between the Svalbard X band pass with AOS 16:30:38z and the one at ESAC with AOS 18:21:52z. Last TM packet received before the reset was time stamped at 2020-11-18T18:11:45.450z. This reset was triggered by the standard Task Overrun error (Boot Report).

The recovery took place on the 19 of NOV by execution of dedicated replanning CRF number 930 uploaded by CNES during S-Band pass IVK-6 with AOS at 2020-11-19T09:06:11z

As per this re-planning, nominal MIRAS X band GS dumps resumed on 2020-11-19T10:50:58z (Svalbard).

Because of this particular reset happening in the middle of two X-band passes all the instrument data acquired from the beginning of the last pass until the reset event has been lost i.e from 2020-11-18T16:31:17z to 2020-11-18T18:12:17z, 6060 seconds in total.

The values of the READ and WRITE pointers at the time of the reset were:

Read = 2038160, *MM Partition P4*

Write = 2293403, *MM Partition P4*

The anomaly was geolocated off the coast Komsomolets island Artic region:



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Latitude = 81.59°

Longitude = 90.05°

5 On Board Events Telemetry

The following RAM Single Bit errors befell this week:

Event Description	Packet ID	Severity	Event Time	Parameters
RAM single Bit Error	730	WARN	2020-11-18T11:18	36864892
RAM single Bit Error	730	WARN	2020-11-18T18:12	36864892
RAM single Bit Error	730	WARN	2020-11-20T21:56	36250576
RAM single Bit Error	730	WARN	2020-11-22T21:23	33891848

6 FOS Systems Status

- On the 16th of November a new SW patch, PLPC patch 27, was installed on PLPCPRM fixing the problem of too many messages on the FTPtool log. After a first test on the 16 of November and after sending the replanning files for the day, the SW did not behave as expected since it was immediately expecting the ACK file from CNES and this normally happened days later. As consequence of this error, the replanning files were archived on PLPC under failed directory and were not transferred to the PLPCEXT. The patch was immediately reverted and the replanning files generated again.

7 Data Reception from CNES

All S band passes were correctly received from CNES and successfully processed by the FOS PLPC system, with the following exceptions:

- Because of an issue with the receiving station, S-Band pass STC-16 with AOS 2020-11-21T19:40:39z was not received on ground and all data, PUS and EHKTm got lost. The outage generated the following gap on MIRAS PUS TM:

from 2020-11-21T11:49:21z to 2020-11-21T19:42:30z

and in EHKTm:

from 2020-11-21T11:48:50z to 2020-11-21T19:42:59z

PUS TM was filled from the X-Band telemetry passes.



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- Because of an issue with the receiving station, S-Band pass STC-15 with AOS 2020-11-21T04:16:27z was not received on ground and all data, PUS and EHKTM got lost. The outage generated the following gap on MIRAS PUS TM:

from 2020-11-21T00:31:41z to 2020-11-21T04:18:10z

and in EHKTM:

from 2020-11-21T00:31:30z to 2020-11-21T04:18:10z

PUS TM was filled from the X-Band telemetry passes.

8 X Band Data Reception in PXMF

Because of the problems S-Band reception problems reported in previous section, FOX PXMF system was used to fill the PUS TM gaps.

9 Exceptional Activities

None.

10 AOB

MIRAS Mass Memory corruption:

As it was noticed by DPGS and CEC teams, X-band data acquired after last CCU reset, 18 of November, included some chunks of corrupted TM data. First important thing to take into account is that no anomaly was seen by just looking at the S-Band telemetry data; in particular neither out of limit nor single/double bit memory errors did happen after the CCU reset and its recovery the day after, in other words, from S-Band point of view everything was nominal. Nevertheless the problem was clearly seen when housekeeping telemetry from the X-band channel was processed on FOS PXMF system.

For this particular case we also need to distinguish between the TM gap due to the faulty chip 6 of partition P3 and the corrupted data above mentioned. The first one can be considered nominal and expected since the CCU recovery was executed more than 11 hours after the reset which is the approximate time that the MM write pointer takes to reach that faulty chip. This known anomaly generated a foreseen TM gap of 1304 seconds between 05:32:35z to 05:55:19z on the 19 of November.

The estrange MM corruption in this case was unexpectedly generated during the execution of the CCU recovery on the 19 of November at 09:10:20z. Few seconds before that, at 09:10:14z, and as part of the CCU recovery procedure, the MM scrubbing process was nominally



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stopped by TC and restarted again also by TC at 09:10:39z, therefore the MM corruption appeared while the MM scrubbing was not active. It is important to bear in mind that when the scrubbing process is again started, it starts from the beginning of the MM and the whole correction process for the nine MM active partitions after the recovery takes around 53 minutes to be executed. In other words, if a MM corruption appears while the scrubbing is not active will not be detected during the first scrubbing cycle and that is the reason why we did not see any error on S-Band telemetry in fact FOS saw from telemetry that the first MM scrubbing cycle finished at 10:02:15z (no single bit errors were detected in this first cycle)

From pure X-Band housekeeping data, the corrupted telemetry seems to go from 09:10:20z to approximately 09:28:14z but FOS cannot really say how much of the science data may be affected by this corruption. One important thing also to bear in mind is the fact that this CCU reset was a non-nominal CCU reset since it happened between two consecutive X-Bands passes (so far four cases like these have been recorded) although I personally believe this is not fully related with the anomaly.

Regarding X-band passes acquired after the CCU reset, the overall summary for each of them is as follows:

- ESAC pass on 2020-11-18T18:21:52z: Pass acquired immediately after the reset. No gaps, instrument not recovered yet.
- ESAC pass on 2020-11-19T05:53:12z: No data gaps, chip 6 not reached yet but just for few seconds. Instrument not recovered yet.
- Svalbard pass on 2020-11-19T10:54:27z, First short pass, saturated pass, after instrument recovery not all the stored data was downloaded. Data gap for chip 6 is seen for the first time in this pass
- Svalbard pass on 2020-11-19T12:36:48z, Second pass where both. TM gap due to chip 6 and MM corruption is seen for the first time.
- Svalbard pass on 2020-11-19T14:19:05z, Third pass after the recovery, same as previous one, both data anomalies are seen in X-band telemetry.

One important thing to take into account is that the MM data corrupted was nominally overwritten after 26 hours and everything went back to nominal after that.



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In conclusion, on the 19 of November and as part of the instrument recovery process and while the MM scrubbing process was stopped, there was a MIRAS Mass Memory corruption that created several data gaps at L0 level. There is no clear reason for this anomaly and it could be related with a SEU caused by radiation or because of a possible aging overcurrent on the main MM FPGA unit or even because an OBSW problem.



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APPENDIX A: OOLs

The following expected out of limit was received at the time of the CCU recovery procedure.

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2020-11-19T10:43:02	2020-11-19T09:08:33	NTLHK022	ITL Ena State	Disabled	Enabled

The following out of limits were received at the time of the CCU reset on the 18th of November 2020.

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM22167	C3 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM21167	C2 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM20167	C1 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM19167	B3 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM18167	B2 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM17167	B1 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM16167	A3 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM15167	A2 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM14167	A1 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM13167	H3 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM12172	H2 LO_locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPM11167	H1 LO_Locking	UNLOCK	LOCK
2020-11-19T02:16:54	2020-11-18T18:12:19	SPC02106	Instrument_Mode	Inst Init	Any
2020-11-19T02:16:54	2020-11-18T18:12:19	XNIRABST	NIR AB VALID ST	NOT-OK	OK



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2020-11-19T02:16:54	2020-11-18T18:12:19	XNIRBCST	NIR BC VALID ST	NOT-OK	OK
2020-11-19T02:16:54	2020-11-18T18:12:19	XNIRCAST	NIR CA VALID ST	NOT-OK	OK