1 General Comments

Activities scheduled for this week are those planned for the 41st calendar week of 2018:

08 OCT 2018 to 15 OCT 2018 (DOYs 281 to 288).

The following routine activities were planned this week (see Gantt chart on next page and CRF 770).

- One PMS Offset on 11 OCT 2018 (DOY 284), including three Short Calibrations at 06:13:30.0z, 06:14:04.8z, and 06:14:39.6z (orbit 46983).
- Local Oscillator Calibrations every 10 minutes.
- *X* band Passes over ESAC and Svalbard.

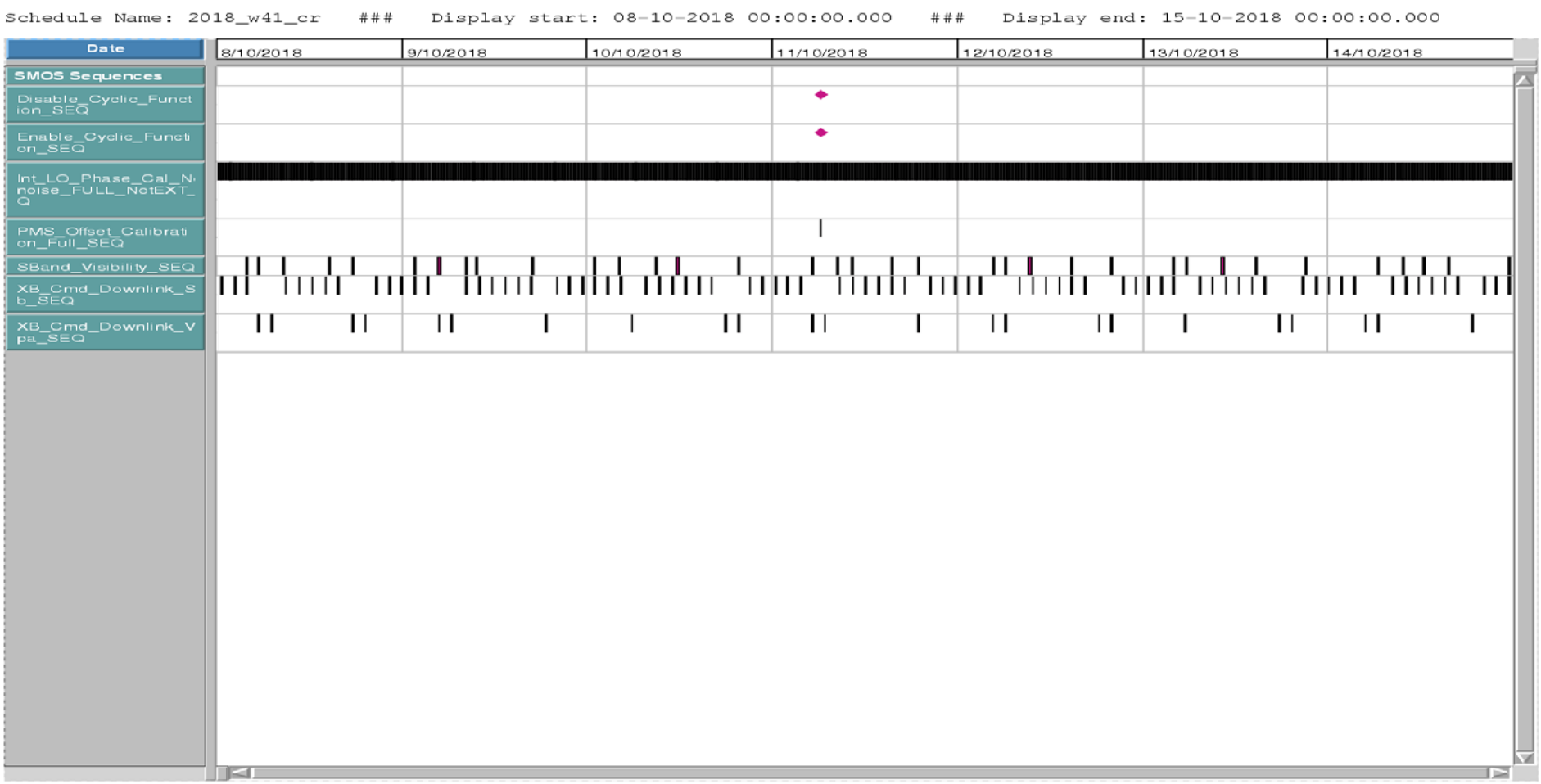
2 Mission Planning Deviations

Due to the CCU reset that took place on the 11th of October (see section 4) the following X-Band passes were not acquired on ground.

Station	AOS	LOS	Duration
Xband_SVAL	2018-10-11T17:04:39	2018-10-11T17:14:29	589
Xband_SVAL	2018-10-11T20:23:10	2018-10-11T20:33:35	625
Xband_SVAL	2018-10-11T22:02:02	2018-10-11T22:12:19	617
Xband_SVAL	2018-10-11T23:40:43	2018-10-11T23:51:00	617
Xband_SVAL	2018-10-12T01:19:26	2018-10-12T01:29:51	624
Xband_SVAL	2018-10-12T02:58:34	2018-10-12T03:08:58	624
Xband_SVAL	2018-10-12T08:01:13	2018-10-12T08:07:42	388
Xband_SVAL	2018-10-12T09:43:43	2018-10-12T09:47:56	253
Xband_SVAL	2018-10-12T11:25:40	2018-10-12T11:29:16	215
Xband_SVAL	2018-10-12T13:06:18	2018-10-12T13:11:42	324
Xband_SVAL	2018-10-12T14:46:15	2018-10-12T14:53:58	462

Also due to the failure of the Auto-downlink function that followed the CCU reset (see section 4) the following X-Band passes over ESAC station were not received on ground:

Station	AOS	LOS	Duration
Xband_ESAC	2018-10-11T18:55:38	2018-10-11T19:03:49	491
Xband_ESAC	2018-10-12T04:32:24	2018-10-12T04:36:50	266
Xband_ESAC	2018-10-12T06:08:54	2018-10-12T06:16:55	480


Schedule Name: 2018_w41_cr ### Display start: 08-10-2018 00:00:00.000 ### Display end: 15-10-2018 00:00:00.000
Date
8/10/2018
9/10/2018
10/10/2018
11/10/2018
12/10/2018
13/10/2018
14/10/2018
SMOS Sequences
Disable_Cyclic_Function_SEQ
Enable_Cyclic_Function_SEQ
Int_LO_Phase_Cal_Noise_FULL_NotEXT_Q
PMS_Offset_Calibration_Full_SEQ
SBand_Visibility_SEQ
XB_Cmd_Downlink_Sb_SEQ
XB_Cmd_Downlink_Vpa_SEQ

3 TC Failures

None.

4 On Board Anomalies

- The MIRAS instrument CMN, unit H1, unlocked on 2018-10-12T20:15:56.990z (DOY 285). This anomaly was geolocated over the south west of the Atlantic Ocean (Salvador de Bahia, Brazil coast)

  Latitude = -12.63°
  Longitude = 324.44°

  Both parameters, output power SPM11162 and locking status SPM11167, went out of limits in the FOS PLPC system. The anomaly recovered in 15 epochs.

- The MIRAS autodownlink function did not work properly after the CCU reset that happened on the 11 of October 2018. This function gets automatically activated after a CCU reset and allows the instrument to autonomously download XBand data over ESAC every time that the spacecraft is flying long enough over the station.

  Between the reset at 15:28z on the 11 of October, and the final recover of the instrument during the morning of the 12 of October and the first nominal scheduled pass over Svalbard on the 12 of October at 16:25z, there were three potential opportunities where the spacecraft was flying over ESAC, in particular:

Station	AOS	LOS	Duration
Xband_ESAC	2018-10-11T18:55:38	2018-10-11T19:03:49	491
Xband_ESAC	2018-10-12T04:32:24	2018-10-12T04:36:50	266
Xband_ESAC	2018-10-12T06:08:54	2018-10-12T06:16:55	480

  In nominal conditions the instrument should have been able to detect and download data at least during the two longer slots, but unfortunately for any of them the pass was detected. As consequence of that, no science data was downloaded to ground from the reset itself until the first scheduled pass, in total 23 hours. In the meantime TM data was acquired for the SBand passes indicating that the instrument was working nominally. Looking in detail MIRAS telemetry data, the list of parameter that detail the computation of the autodownlink algorithm were frozen all the time and always with value equal to -1, those parameters are:

  SPC00156 Cur Arcr Trak Dist
  SPC00158 Curr Elv GS-SC
  SPC00160 XBd Boresight EL

Nevertheless the parameter that shows that the instrument was in autodownlink mode, DPC00154 GS Detect Ena Sta, was correctly reading value "Enabled".
Looking backwards and checking TM data from previous CCU resets, we also saw that the previous reset on the 16 of May was having exactly the same problem, i.e. the autodownlink parameters were all frozen and with value -1. In this particular case the anomaly was not noticed because we did not have any potential pass over ESAC between the CCU reset and its recovery. All the rest of CCU resets during the mission had nominal behaviour and the autodownlink parameters were all computed and having values different than -1.

In order to discard potential problems FOS verified that the PVT and AVT information coming from the platform were all time nominal. FOS also checked the EEPROM boot report and compared with previous resets and again the report was nominal and perfectly in line with previous ones. Therefore FOS discard both GPS and possible EEPROM corruptions.

Later on FOS has succeed to reproduce the problem by forcing resets on the MIRASIM simulator for the 16th of May 2018, 11th of October and 15th of October. In all these three cases FOS got the same wrong result (all parameters with value -1). FOS went further and then forced resets before the 16th of May, and in all cases except on the 13th of May FOS got good results after the reset i.e. the autodownlink algorithm was working fine. FOS finally managed to narrow the "start" point of the error between the 10th of May 2018 and the 13th of May 2018. Therefore it seems that there is something wrong in the onboard algorithm which depends on the time and triggers the error on the autodownlink function. FOS believe that the onboard code and the C module download_algo.c could be the responsible for the anomaly but of course this has to be checked carefully. In fact a dedicated ARB will be organised soon by PLSO in order to discuss the anomaly and its way forward.

- MIRAS Correlator and Control Unit (CCU) suffered a reset on 2018-10-11T15:28:55.207z. It was first noticed by the DPGS operator around 2018-10-11T19:10z who notified the issue to the FOS on call engineer. At that time the following two X-Band passes were not acquired:

Station	AOS	LOS	Duration
Xband_SVAL	2018-10-11T17:04:39	2018-10-11T17:14:29	589
Xband_ESAC	2018-10-11T18:55:38	2018-10-11T19:03:49	491

The CCU reset was finally confirmed upon reception of the following S-Band pass (STC-11) with AOS at 18:51z on the 11 of October. One hour later after the reception of that pass, FOS on call Engineer contacted the CNES on call support to verify the reset itself and the correct instrument recovery. Around the same time FOS oncall Engineer contacted KSAT operator to inform on the issue and the fact that no X-Band passes will be received during the whole upcoming night and until the final instrument recovery performed the following day, 12 of October. The reception of the first X-Band pass was performed at Svalbard on 2018-10-12T16:25:55z.

The reset happened at the end of the Svalbard X Band GS pass commencing on 2018-10-11T15:25:04z. Said pass was scheduled for a duration of 507 seconds. The reset occurred 192 s after the AOS and before the switch off of the X Band antenna, scheduled on 2018-10-11T15:33:32z. The last TM packet before the reset was received on 2018-10-11T15:28:55.207z. The FOS team had produced, in advance, a suitable re-planning for this contingency included in CRF No. 770 and it was uploaded by CNES during GS pass KUX-13 with AOS on 2018-10-12T09:16z. It is worth to notice that this recovery was performed using the new procedure put in in place in May 2018 which simplifies a lot the number of TCs to upload the OBOPs. The execution of this procedure can be considered successful. MIRAS nominal activities were finally resumed on 2018-10-12T16:25:55z.

Due to the fact that the instrument recovery took place more than 11.6 hours after the reset, wrong chip 6 of MM partition P3 was overwritten, generating a data gap from 2018-10-12T02:49:43z to 2018-10-12T03:12:38z. The sequence of events including alarm and event packets leading to the CCU reset was as follows:

2018-10-11T15:25:19z XBand powered On
2018-10-11T15:25:43z Mass Memory Full Dump Start
2018-10-12T15:28:55 The reset takes places

No alarm packets were received before the reset. During the reset and while the instrument was synchronizing with the PROTEUS Milbus the following two alarm packets were received:

Time Correlator Unexpected UTC (Packet id 652)
Time Correlator Unexpected PPS (Packet id 653)

This is considered nominal since those alarm packets have also been seen in previous resets and those alarms are not linked with the failure of the autodownlink function above reported.

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

Read = 1928588 MM Partition P4
Write = 1666495 MM Partition P3

- The MIRAS instrument CMN, unit H1, unlocked on 2018-10-10T23:17:08.990z (DOY 283). This anomaly was geolocated over the south east side of the Pacific Ocean:

  Latitude = -24.11°
  Longitude = 277.24°

  Both parameters, output power SPM11162 and locking status SPM11167, went out of limits in the FOS PLPC system. The anomaly recovered in 6 epochs.

5 On Board Events Telemetry

Immediately after the CCU reset and while the instrument was resynchronizing with the platform the following error packets were generated on-board:

Event Description	Packet ID	Severity	Event Time	Parameters
Time_Correlator_Unexpected_UTC	652	ERROR	2018-10-11T19:22:00	PPS
Time_Correlator_Unexpected_PPS	653	ERROR	2018-10-11T19:22:00	Idle

The following RAM Single Bit errors befell this week:

Event Description	Packet ID	Severity	Event Time	Parameters
RAM single Bit Error	730	WARN	2018-10-08T10:10:13	20CC1C8
RAM single Bit Error	730	WARN	2018-10-09T11:49:10	21A2044
RAM single Bit Error	730	WARN	2018-10-11T19:22:00	21A2044

6 FOS Systems Status

All FOS systems nominal.

7 Data Reception from CNES

All *S* band passes were correctly received from CNES and successfully processed by the FOS PLPC system.

8 *X* Band Data Reception in PXMF

None, all *S* band passes successfully received and processed.

9 Exceptional Activities

The ones related with the execution of the CCU recovery procedure, PRO-CRP-100, during the morning of the 12th October.

10 AOB

None.

APPENDIX A: OOLs

At the time of the CMN unlock of H1 unit on the 12th of October the following TM parameters went temporary out of limits:

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2018-10-13T04:18:48	2018-10-12T20:15:56	SPM11162	H1 LO_Out_Power	NOT-OK	OK
2018-10-13T04:18:48	2018-10-12T20:16:04	SPM11167	H1 LO_Locking	UNLOCK	LOCK

During the recovery of the CCU reset, the following parameter went nominally out of limit due to the fact that the ITL was temporary made disabled as part of the recovery procedure:

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2018-10-12T15:04:23	2018-10-12T09:18:28	NTLHK022	ITL Ena State	Disabled	Enabled

The MIRAS CCU reset on the 11th of October generated the following list of parameters going temporary out of limits:

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2018-10-11T19:22:01	2018-10-11T15:29:29	TCO_FLAG	TCO Restart flag	NOT-OK	OK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM22167	C3 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM21167	C2 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM20167	C1 LO_Locking	UNLOCK	LOCK

2018-10-11T19:22:00	2018-10-11T19:22:00	SPM19167	B3 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM18167	B2 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM17167	B1 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM16167	A3 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM15167	A2 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM14167	A1 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM13167	H3 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM12172	H2 LO_locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPM11167	H1 LO_Locking	UNLOCK	LOCK
2018-10-11T19:22:00	2018-10-11T19:22:00	SPC10107	PPS_ERROR_FLAG	Unexp PPS	valid
2018-10-11T19:22:00	2018-10-11T19:22:00	SPC02106	Instrument_Mode	Inst Init	Any Mode
2018-10-11T19:22:00	2018-10-11T19:22:00	XNIRABST	NIR AB VALID ST	NOT-OK	OK
2018-10-11T19:22:00	2018-10-11T19:22:00	XNIRBCST	NIR BC VALID ST	NOT-OK	OK
2018-10-11T19:22:00	2018-10-11T19:22:00	XNIRCAST	NIR CA VALID ST	NOT-OK	OK

At the time of the CMN unlock of H1 unit on the 11th of October the following TM parameters went temporary out of limit:

GS_TIME	OB_TIME	PARAMETER	DESCRIPTION	OOL Value	Check Value
2018-10-11T05:47:51	2018-10-10T23:17:08	SPM11162	H1 LO_Out_Power	NOT-OK	OK
2018-10-11T05:47:51	2018-10-10T23:17:10	SPM11167	H1 LO_Locking	UNLOCK	LOCK