
EUROPEAN SPACE AGENCY
DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT
MISSION OPERATIONS DEPARTMENT

INTEGRAL
Mission report

INT-MOC-SYS-RP-1001-OPS-OAI

No. 402
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Routine Phase

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1 General

The Flight Control Team at MOC has compiled this report with some input provided by the Flight Dynamics Team, ISOC and ISDC. Nominal science operations were performed according to the planning inputs from ISOC combined with some manual commanding by MOC.

This report addresses the activities from October and covers the revolutions 1094 until 1105 (included). The targets of these revolutions can be found on the ISOC web: <http://integral.esac.esa.int/isocweb/schedule.html?action=intro> .

Summary of the main activities during the reporting period

- Nominal science operations. During the reporting period, 744 of the 747 planned science pointings were executed nominally. 2 pointings were lost due to an FD problem and 1 pointing was lost due to a problem with the AOCS. Two Flat-field calibrations were performed this month.
- E3.5 Testing

Summary of the overall status and performance of S/C

- Nominal for platform and payload
- Fuel consumption seems to have decreased after the relaxation of the constraints on the INTEGRAL perigee attitude; increased fuel consumption since January under investigation
- IREM Anomaly: Reset of IREM_CSCI S/W #116 (25/10/2011)

Summary of the overall status and performance of the ground segment

- Ongoing occasional RFI at Redu, source unknown
- Ongoing occasional error sending data to ISDS

The previous weekly and monthly reports are available at the XMM-INTTEGRAL website: <http://xmm.esoc.esa.int/documentation/documentation.php> .

2 Satellite status

2.1 Platform

2.1.1 AOCS

The AOCS operations were performed from the timeline during this period.

5 slews were missed from the Timeline.

The fuel consumption over the reporting period was 0.4733 Kg. The remaining propellant is in the order of 117.0355 Kg.

Note: Some more information concerning the AOCS operations and the fuel budget is provided in the Appendix 6.1.

2.1.2 Power

All units of the EPS are working nominally.

2.1.3 Thermal

The thermal control of the satellite is working well. The temperatures are currently all within the specified operational limits.

2.1.4 OBDH

The OBDH subsystem is working flawlessly. No on-board communications problem has been identified.

The PST was over-subscribed by 3 packets, which were allocated to SPI during the Instrument window for the entire reporting period.

2.1.5 RFS

The RF subsystem is working properly. The link margin is sufficient to ensure proper TM reception and execution of commands with the ranging channel enabled.

2.2 Payload

2.2.1 SPI

Following the 17th SPI annealing, which ended on 16/04/2010, the overall status of the gamma-ray spectrometer is nominal, except for detector #2 (failed since 06/12/2003), detector #17 (failed since 17/07/2004), detector #5 (failed since 19/02/2009) and detector #1 (failed since 27/05/2010).

The Germanium detectors' temperature was kept in the range 80K $\pm$ 1K.

SPI was operated in photon-by-photon mode with spectra TM enabled during science observations. The assigned TM bandwidth in the science observation windows was 99 packets/cycle, except from 2011-10-06T00:03:36Z to 2011-10-06T05:03:00Z and from 2011-10-22T02:30:26Z to 2011-10-22T06:59:42Z (OMC Flat Field Calibrations), when it was 88 packets/cycle. The average telemetry occupation when the allocation was 99 packets/cycle was 73.6 packets/cycle.

The following plot shows the TM bandwidth allocation and occupation during the reporting period.

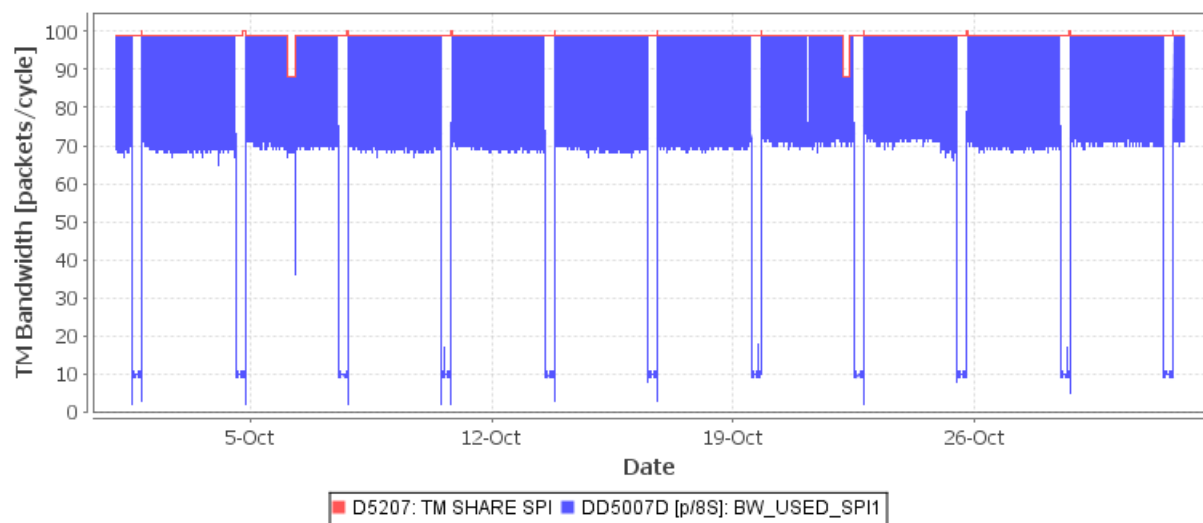


Figure 1: SPI TM bandwidth utilisation

The following plot illustrates the DPE CPU load during the reporting period.

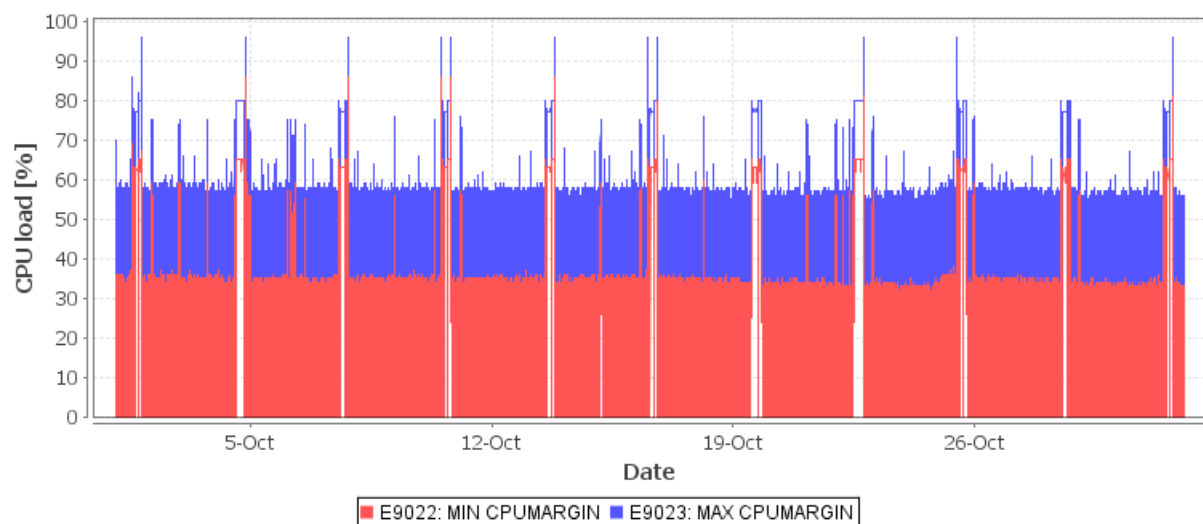


Figure 2: SPI IASW Performance

The following plot shows the evolution of the assigned and the average occupation of the SPI TM bandwidth since May 2005.

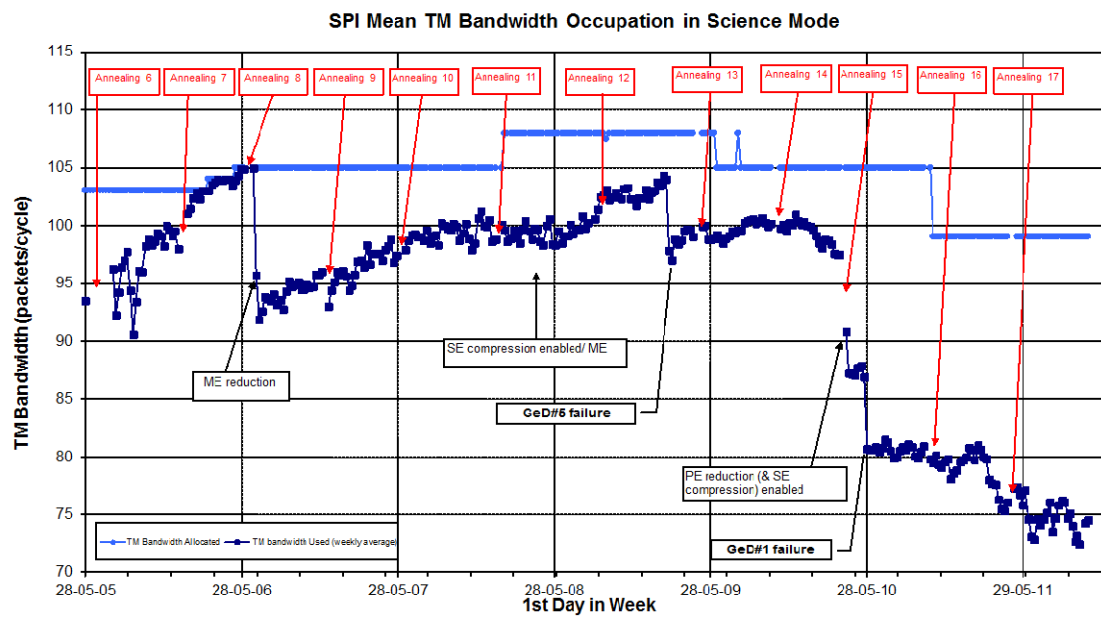


Figure 3: SPI TM bandwidth usage evolution since May 2005

Note: More information concerning the SPI operations is provided in Appendix 0.

2.2.2 IBIS

The overall status of IBIS is nominal.

During the reporting period, IBIS was operated in Science Standard mode during science observations. The TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 129 packets/cycle, except from 2011-10-06T00:03:36Z to 2011-10-06T05:03:00Z and from 2011-10-22T02:30:26Z to 2011-10-22T06:59:42Z (OMC Flat Field Calibrations), when it was 90 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 104.3 packets/cycle

The plot below shows the IBIS TM utilisation during the reporting period.



Figure 4: IBIS TM bandwidth utilisation

A plot of the IBIS weekly bandwidth utilisation since May 2005 is shown below.

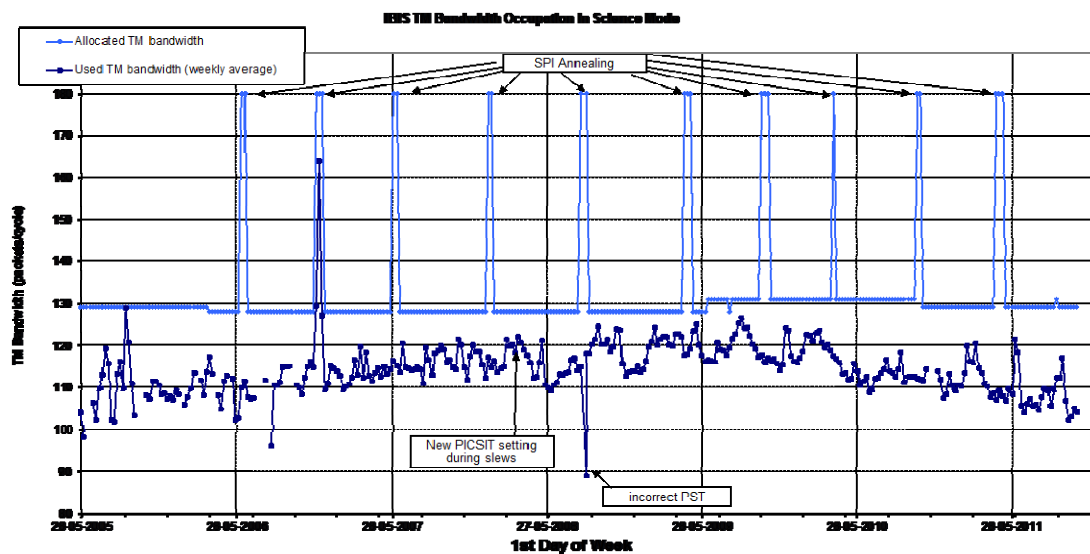


Figure 5: IBIS TM bandwidth usage evolution since May 2005

Note: More information concerning the IBIS operations is provided in Appendix 6.3.

2.2.3 JEM-X

The status of both JEM-X units is nominal:

- JEM-X1 & 2 were operated in Data Taking mode with a TM allocation of 8 packets/cycle each, except from 2011-10-06T00:03:36Z to 2011-10-06T05:03:00Z and from 2011-10-22T02:30:26Z to 2011-10-22T06:59:42Z during the OMC Flat-field calibrations, when it was 4 packets/cycle each.

Note: Some more information concerning the JEM-X operations is provided in Appendix 0.

2.2.4 OMC

The status of OMC is nominal.

OMC was operated in Science Normal mode during science observations, with a TM allocation of 5 packets/cycle, except from 2011-10-06T00:03:36Z to 2011-10-06T05:03:00Z and from 2011-10-22T02:30:26Z to 2011-10-22T06:59:42Z during the Flat-field calibrations, when it was 63 packets/cycle.

During this reporting period, 744 of the 747 planned science pointings were executed nominally. 2 pointings were lost to an FD problem and 1 pointing was lost to a problem with the AOCS. Two Flat-field calibrations were performed this month.

Note: Some more information concerning the OMC operations is provided in Appendix 6.5.

2.2.5 IREM

The status of IREM is nominal.

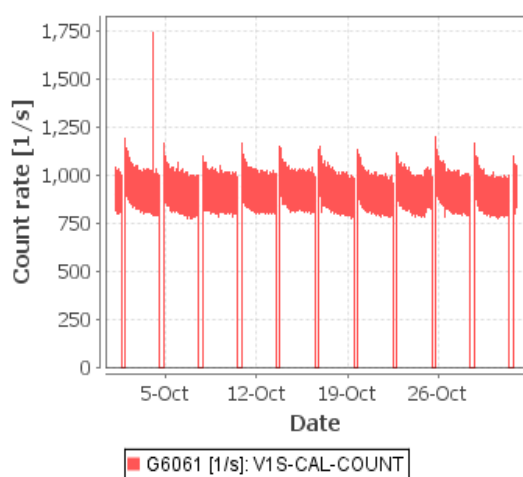
On DoY 298 (25/10/2011), the 116th IREM SEU occurred

Note: Some more information concerning the IREM operations is provided in Appendix 6.6.

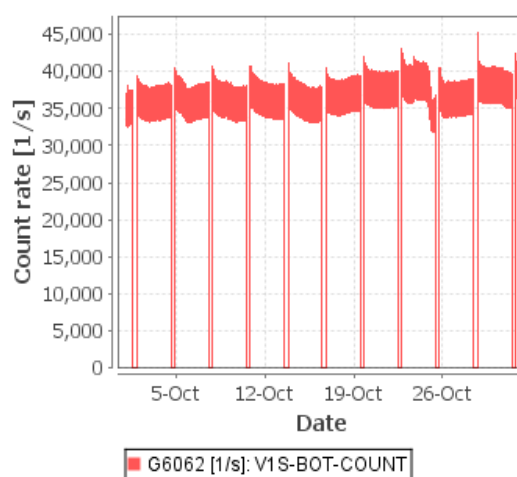
Radiation background

The background radiation level as measured by the instrument counters was low during the reporting period. The following plots show the SPI ACS, IBIS VETO, JEM-X Triggers and IREM count rates over the reporting period:

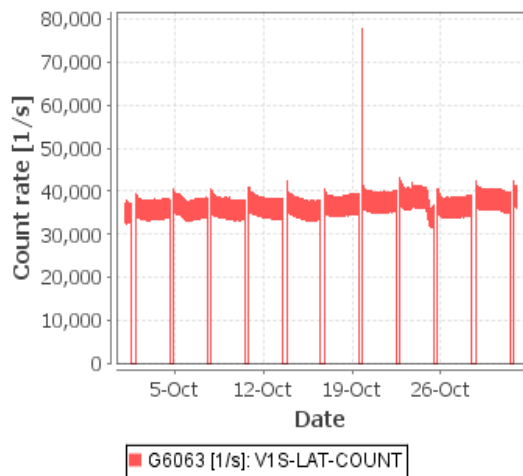
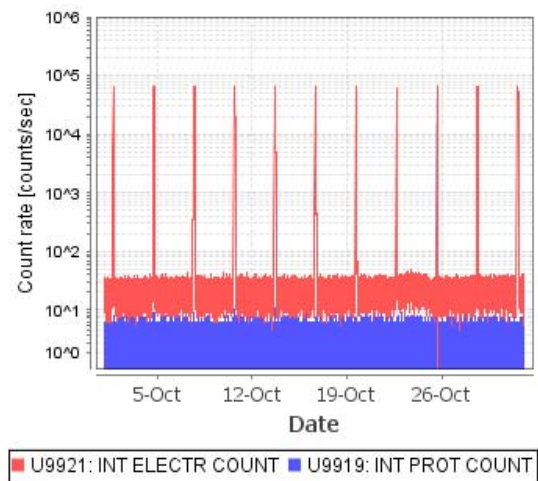
VETO Calibration Source Count Rate



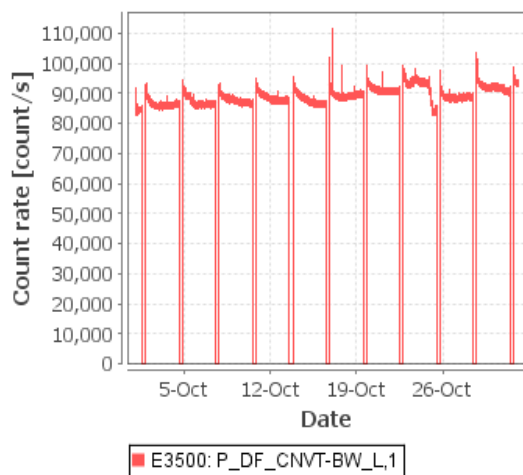
VETO Bottom Count Rate



VETO Lateral Count Rate

IREM Proton & Electron Counters¹

ACS Below 100MeV



ACS Above 100MeV

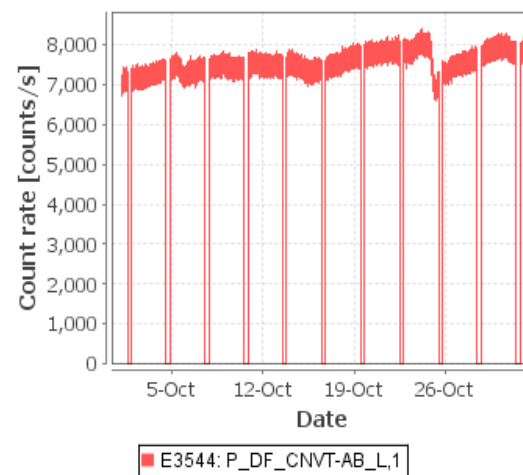


Figure 6: Instrument Count Rates

The JEM-X count rates are only plotted for the active JEM-X unit, the data is sampled every 8th packet (64sec).

¹ Note that the scale used in this plot is logarithmic.

K5119/L5119 - JEM-X1/2 Software trigger, K5449/L5449 - JEM-X1/2 Hardware trigger

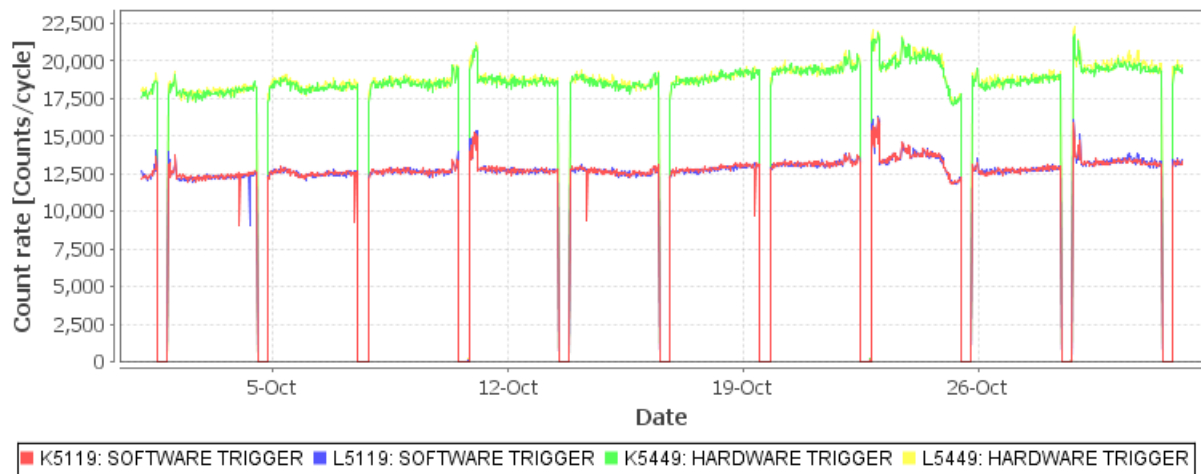


Figure 7: JEM-X Count rates. The smaller downward spikes in the figure are due to the slews of the spacecraft

Radiation Belts

Figure 8 gives a prediction of the trapped radiation environment sensed by the S/C when descending into perigee; the different areas crossed, the Radiation Belt entry/exit points, the shape of the Radiation Belt passage and a rough estimation of the trapped proton and electron fluxes.

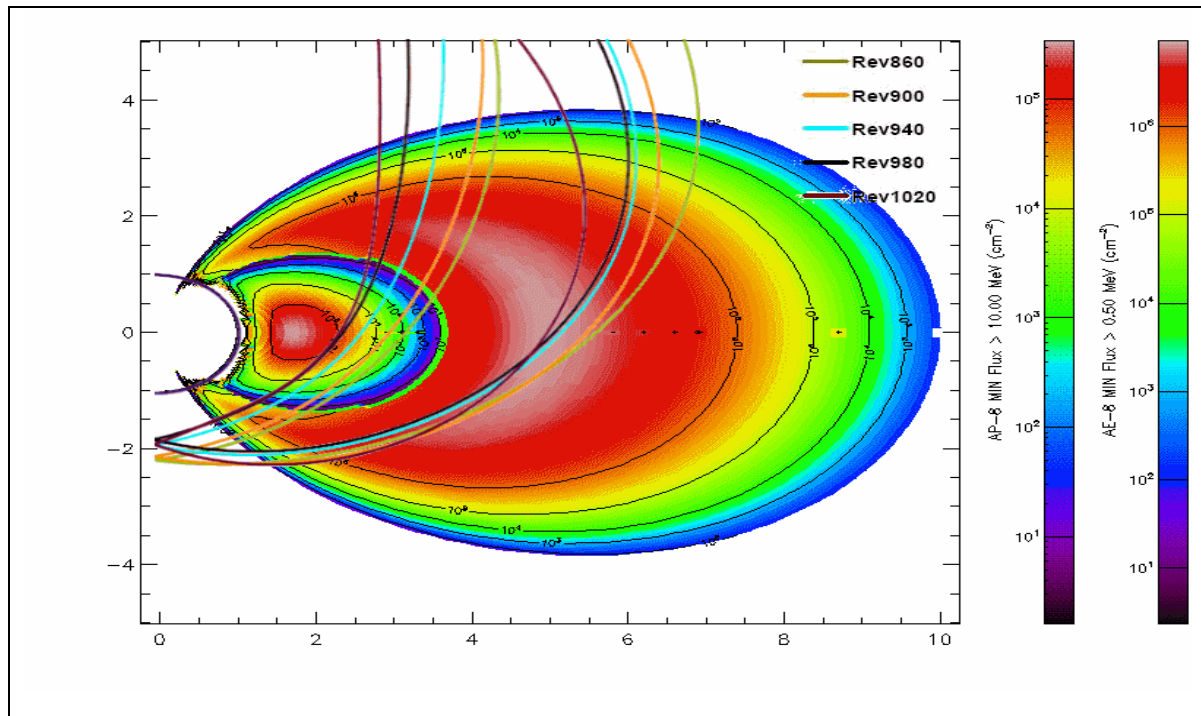


Figure 8: The predicted evolution of the orbit of Integral through the radiation belts

3 Ground Facilities

The Operational ground facilities performance was good this month. The overall performance was over the 95% requirement.

The following figure shows the number of slews executed and the number of slews missed per revolution. These numbers give a very good indication of the performance of the operational ground facilities, because it involves all the different elements of the ground facilities to complete all slews scheduled.

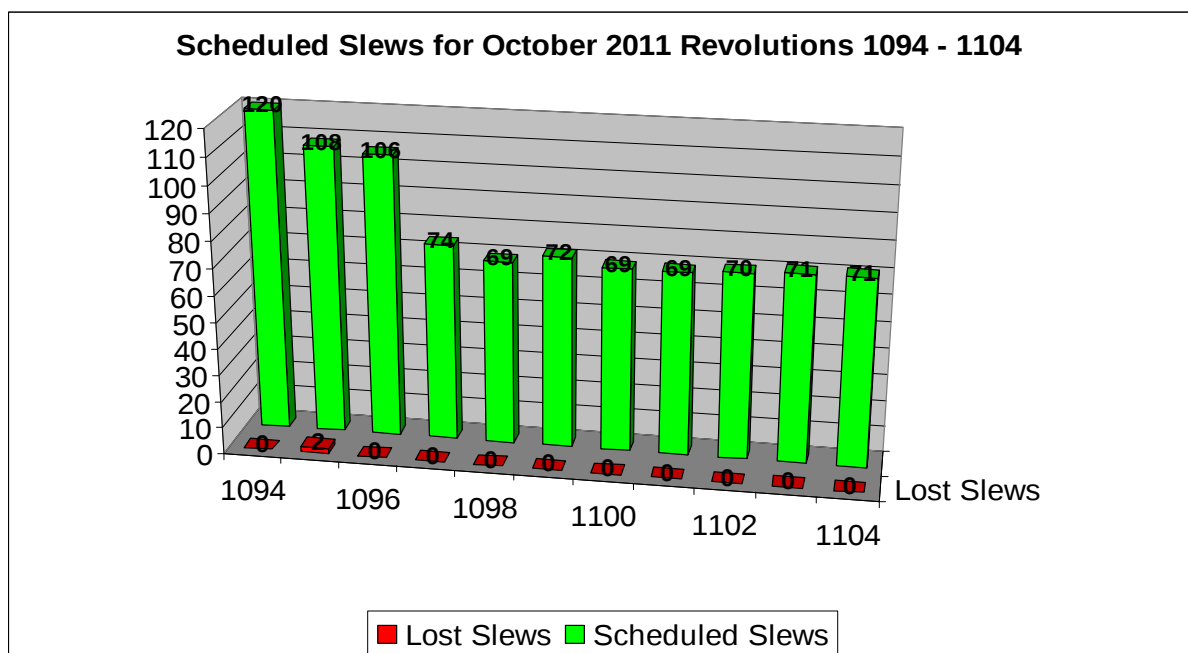


Figure 9: The number of slews scheduled compared to the number of slews lost

3.1 Mission Control System

On DOY 271 the IFTS partially stopped working and TPFs were no longer applied to the autostack. The IFTS nodes were restarted on IMCA and on the FDS.

On DOY 272 it was noticed that the IFTS on IDDA was not working properly since the previous restart on IMCA and AUX files were no longer received. The IFTS nodes on IDDA were restarted.

On DOY 274 the OBQM crashed on IMCA and had to be restarted.

On DOY 283 the IFTS stopped forwarding files to ISDC. The IFTS nodes on IDDA and ISDSA were restarted.

On DOY 283 the autostack on sun122 crashed at AOS and was restarted.

On DOY 292 the Multiplexer on IMCA and the autostack on sun122 crashed at AOS. Both were restarted.

On DOY 298 the Multiplexer on IMCA crashed at AOS and was restarted.

On DOY 298 the the IFTS partially stopped working and TPFs were no longer applied to the autostack. The IFTS nodes were restarted on IMCA and on the FDS.

The connection to ISDC dropped 19 times and the ISDS and IFRD tasks needed to be restarted on 9

occasions.

3.2 Ground Stations and Network

The performance of the ground stations and Network was good this month.

4 TM drops were identified from REDU and 1 TM drop from VIL2. Bad frames were received from REDU on 13 occasions mostly due to RFI.

Figure 10 shows the quality of the ground station performance. The data received from the ground stations is compared to the data that is expected to be received.

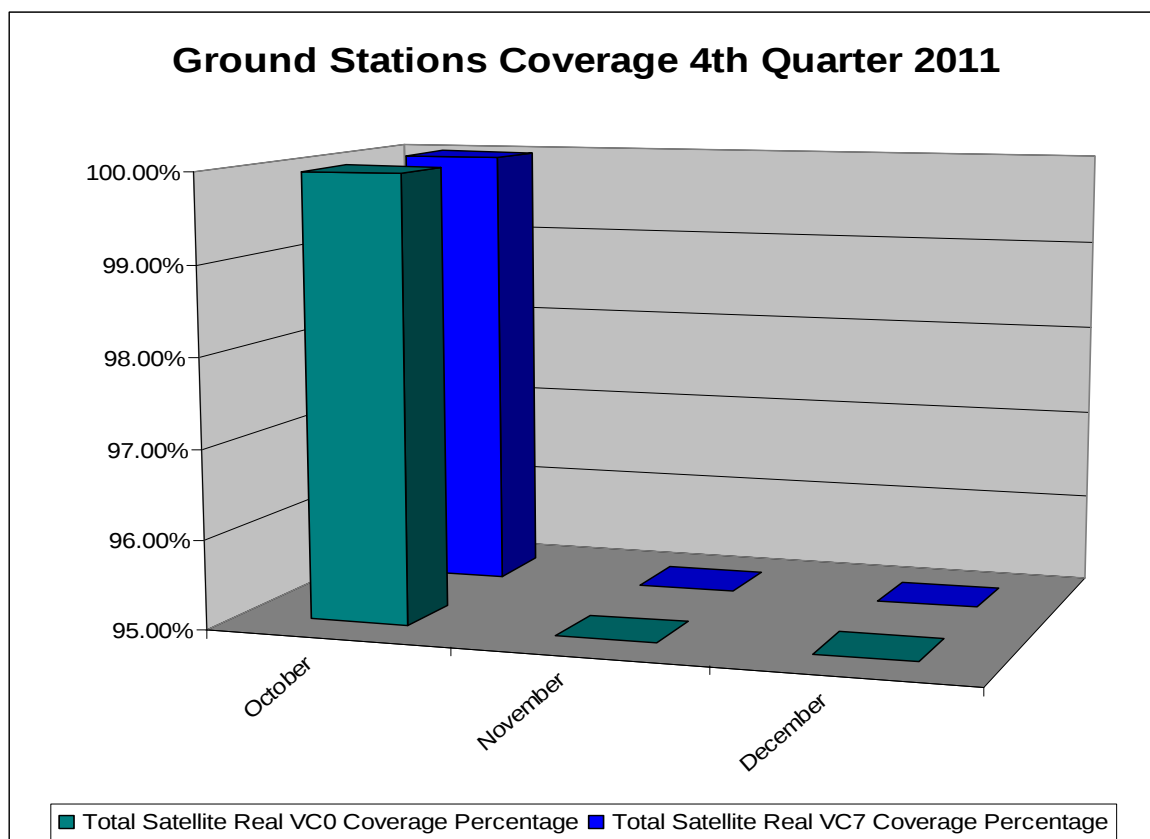


Figure 10: Comparison of VC0 to VC7 coverage

3.3 ISOC

3.3.1 Mission Planning

New or updated PSFs have been received for revolutions 1102 to 1111, corresponding to the time range 22 October to 21 November.

New observations have been planned for revolutions 1101 (19-21 September) to 1111 (18-21 November). Most of these are for continuing TOO observations of the nearby supernova SN2011fe. Revolution 1101 was re-planned to accommodate an additional OMC Flat-field calibration to make up for the one affected by a planning error in revolution 1096.

TSFs have been received for revolutions 1098 to 1106.

3.3.2 Observation Status

New ECS files have been received for revolutions 1085 to 1095 (covering observations up to 1 October).

3.3.3 ISOC Science Data Archive

Syncing of rev_3 data has been done up to revolution 1051, no change since last report.

Raw telemetry copied from MOC is available up to 17 October.

An ICD for the new ISDA is being developed with the ESAC archive team and the fundamentals have been discussed in a dedicated meeting.

3.3.4 ISOC System

ISOC software V31 was released on 5 October. The next release is in preparation.

3.3.5 Problems

No new problems.

4 Anomalies

Table 1 contains the anomalies that occurred in the reporting period:

Table 1: Anomalies reported

AR id	Date of occurrence	Subject	Segment	Status
INT-3198	2011-10-06	Time set back to 1917 on IDDB	IMCS	Closed
INT-3199	2011-10-04	JS1019, JS1018, JS1008: STATUS OOL	ESA Stations	Pending
INT-3200	2011-10-09	Bad Frames from REDU	ESA Stations	Closed
INT-3201	2011-10-06	1st command of sequence MEFFCA01 failed acceptance but executed successfully	ISOC	Pending
INT-3202	2011-10-04	Generic telemetry processors froze	FDS	Pending
INT-3203	2011-10-06	Failed to connect to Weilheim (B-chain)		Pending
INT-3204	2011-10-13	Error when starting IDDB after patching	IMCS	Testing

AR id	Date of occurrence	Subject	Segment	Status
INT-3205	2011-10-13	Shutdown IDDB not possible via SPACON shutdown server menu	IMCS	Testing
INT-3206	2011-10-18	IFRD_SPI_A: problems with the power supply		Closed
INT-3207	2011-10-25	Autostack left in BD mode after multiplexer crash	IMCS	Closed
INT-3208	2011-10-06	OMC Flat-Field Calibration Command Rejected.	MPS	Closed
INT_SC-347	2011-10-25	IREM Anomaly: Reset of IREM_CSCI S/W #116, 25/10/2011	Payload	Testing

5 Special Events & Future Milestones

Thruster Torque Calibration planned for 07.11.2011.

18th SPI annealing is currently scheduled for late November 2011.

Next S/C database update scheduled for early December 2011.

Eclipse season starts on 24th December, with a double eclipse expected on 23rd January 2012.

IMU calibration planned for 14th December 2011.

6 Appendix

The appendix contains some detailed information concerning the AOCS subsystem and the instruments.

6.1 AOCS operations

During this period, 358 Open Loop Slews, 446 Closed Loop Slews and 25 Momentum Biases were executed (as reported by ACC OEM).

5 slews were missed from the Timeline.

6.1.1 Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 31/10/2011 is reported in the following plot:

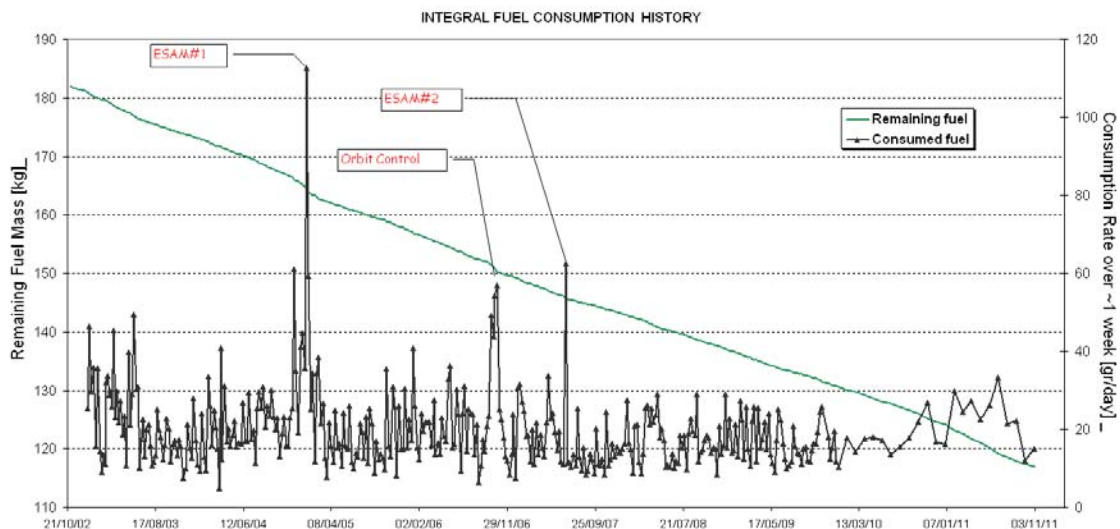


Figure 11: Fuel consumption. Note: ESAM fuel consumption is spread over period of ~1 week.

6.1.2 The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the last month are reported in the plot below. The evolution of the drift on yaw channel is under constant monitoring but the values are still well within the specs.

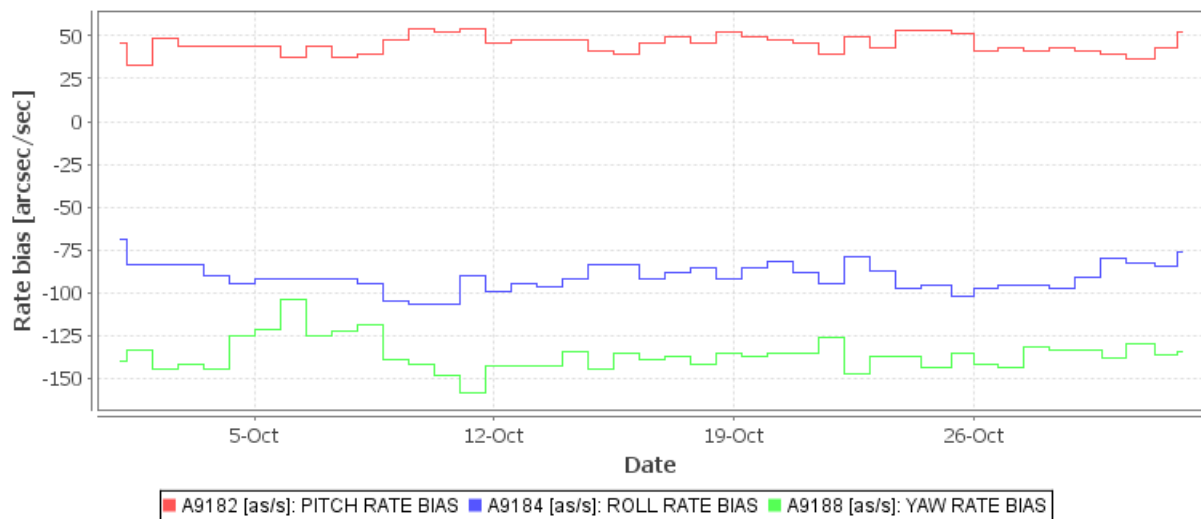


Figure 12: RMU pitch, roll and yaw. Historic data is available on request

6.1.3 Event log

04/10/2011 (Day of Year 277, Revolution 1096)

FDS TPF update failed for slew 10960006 (19:03:00Z) due to FDS problems. The AOCS was suspended in the timeline, then a manual mapping was commanded and a slew was manually generated from attitude 10960005 to attitude 10960008.

After the manual slew was completed, the parameters for slew 10960009 were manually updated (spacontool).

Slaws 10960006 ,10960007 and 10960008 were missed from the timeline. The OTF was not reached for PIDs 10960006, 10960007 and 10960008.

06/10/2011 (Day of Year 279, Revolution 1096)

Autostack commanding for slew 10960067 (11:23:52Z) failed release (TC A3189 "START GUIDE STAR"). The AOCS was suspended in the timeline, then a manual mapping was commanded and a slew was manually generated from attitude 10960066 to attitude 10960067.

After the manual slew was completed, the parameters for slew 10960068 were manually updated (spacontool).

Slew 10960067 was missed from the timeline. The OTF was not reached for its PID.

06/10/2011 (Day of Year 279, Revolution 1096)

FDS TPF update failed for slew 10960069 (12:09:00Z).The AOCS was suspended in the timeline, then a manual mapping was commanded and a slew was manually generated from attitude 10960068 to attitude 10960069.

After the manual slew was completed, the parameters for slew 10960070 were manually updated (spacontool).

Slew 10960069 was missed from the timeline. The OTF was not reached for its PID.

07/10/2011 (Day of Year 280, Revolution 1097)

IMU1 switched ON during perigee passage (13:39:00Z). After the AOS at Redu, a manual mapping was performed to generate a new CGS prior to the RWB. FDS reported that current guide star is good for upcoming RWB.

No impact on the timeline

13/10/2011 (Day of Year 286, Revolution 1099)

FDS TPF update failed for slew 10990007 (21:35:00Z).The AOCS was suspended in the Timeline, then a manual mapping was commanded but update failed. On-site FD-Support decided to let next slew go from Timeline without update.

No impact in the Timeline

21/10/2011 (Day of Year 294, Revolution 1101)

FDS TPF update failed for slew 11010051 (16:51:00Z).The AOCS was suspended in the Timeline, the parameters for 11010051 manually updated by FD-Support on-site.

No impact in the Timeline

25/10/2011 (Day of Year 298, Revolution 1103)

FDS TPF update failed for slew 11030001 (14:54:00Z) due to a IFTS-Problem. The AOCS was suspended in the Timeline, then IFTS service instance were restarted by the analyst and the parameters for 11030001 manually updated by resending the TPF via spacontool.

No impact in the Timeline

6.2 SPI

6.2.1 Operations

Stirling Compressors and Cryostat

The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K +/-1K.

The following plot shows the evolution of the cold plate and H bus temperature during the reporting period. The stroke of all four compressors was increased to 42 on 21-10-2011 leading to a decrease of the temperature of the cold plate as well to an increase of the SPI CDE LCL currents.

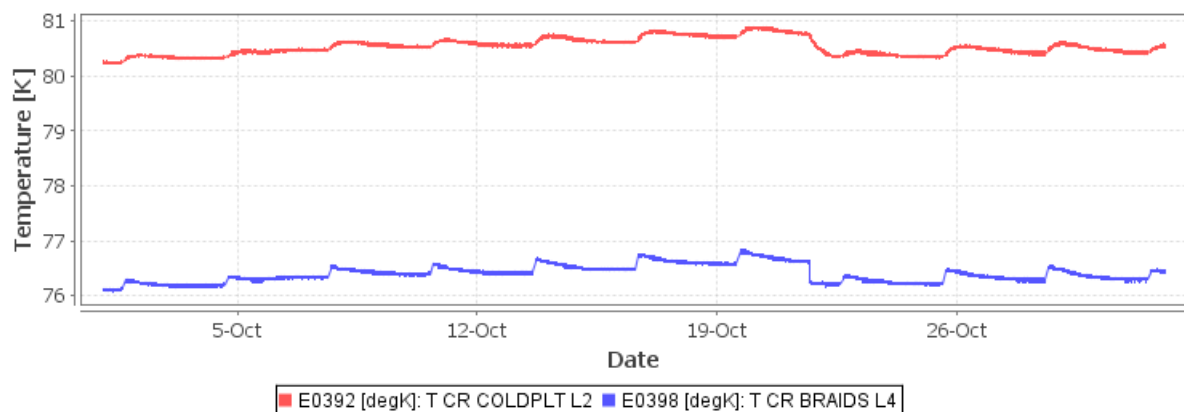


Figure 13: SPI Cold plate and H-bus temperature

The following plot shows the evolution of the CDE LCL currents during the reporting period.

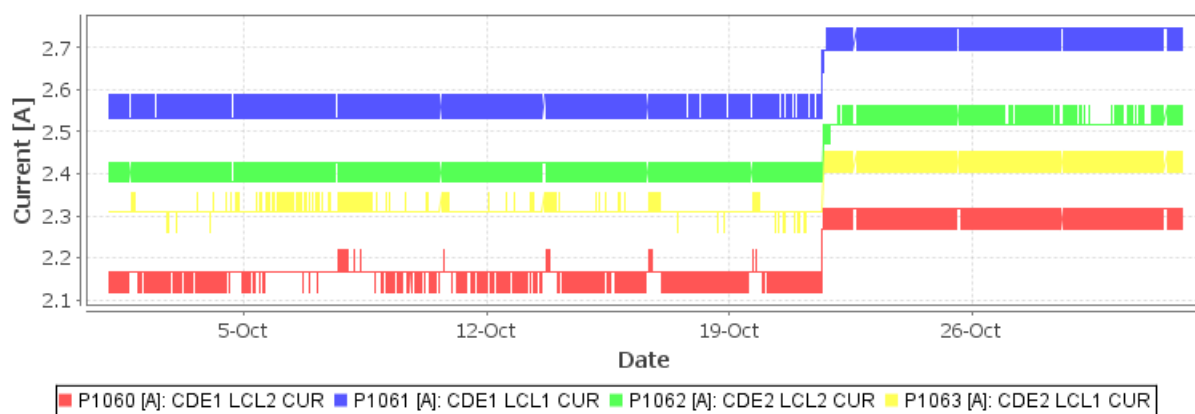


Figure 14: SPI CDE LCL current

DPE & IASW

The DPE health and IASW performance are nominal. The IASW version installed is v4.3.5 with both SE compression and PE reduction enabled and the spectra scaling factor set to 7/19 SE. The DPE CPU usage was nominal during the reporting period (see Figure 2).

ACS

The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61). A plot of the ACS counts is given in Figure 6: Instrument Count Rates.

AFEE

The health of the AFEE is nominal. Detector #2 is failed since 06/12/2003, detector #17 is failed since 17/07/2004, detector #5 is failed since 19/02/2009 and detector #1 is failed since 27/05/2010. The HV of the failed detectors are nominally set to 0.5kV and events from these GeDs are disabled in the DFEE and PSD. The following plot shows the AFEE DC output voltages over the reporting period.

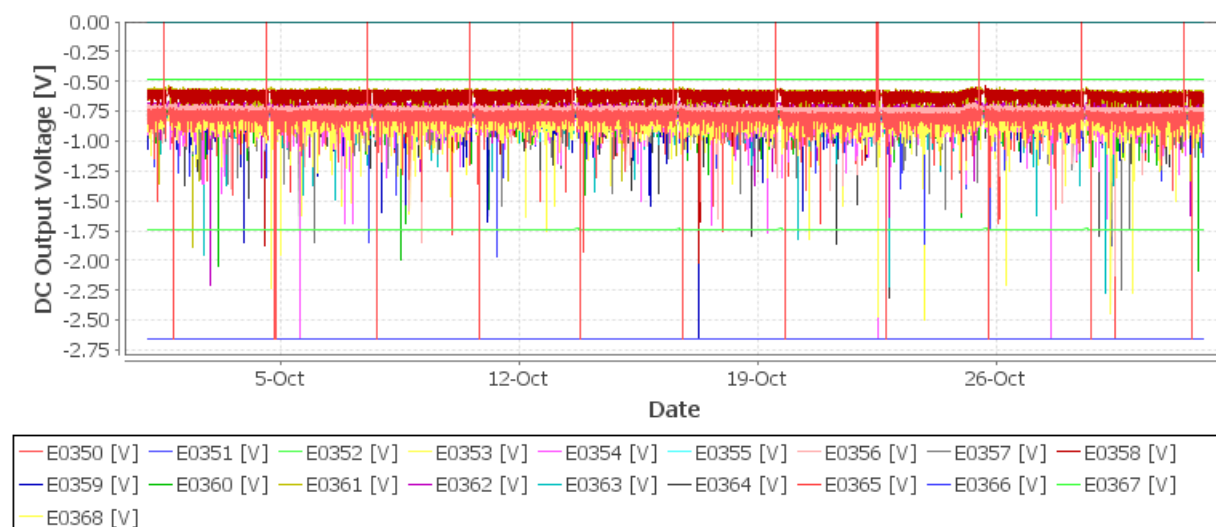


Figure 15: AFEE DC Output Voltages. Note that the data is sampled every 8th packet (64sec)

DFEE

The health of the unit is nominal. The following plots show the Non Vetoed, Time Tagged and Time Tagged Saturated Event count rates during the reporting period.

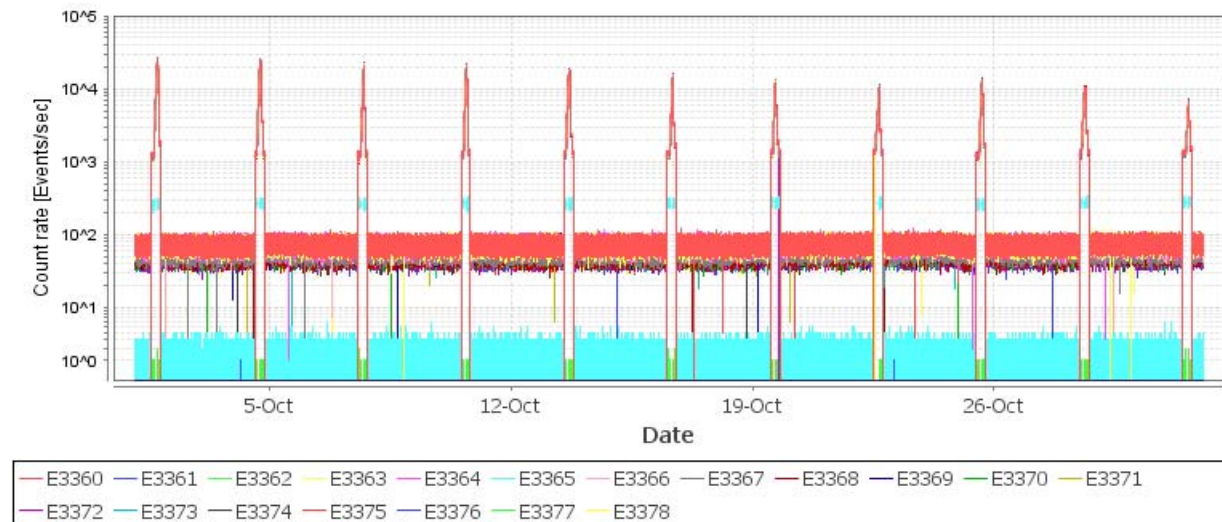


Figure 16: SPI GeD Non-Vetoed count rates. Note that the scale used for plotting is logarithmic.

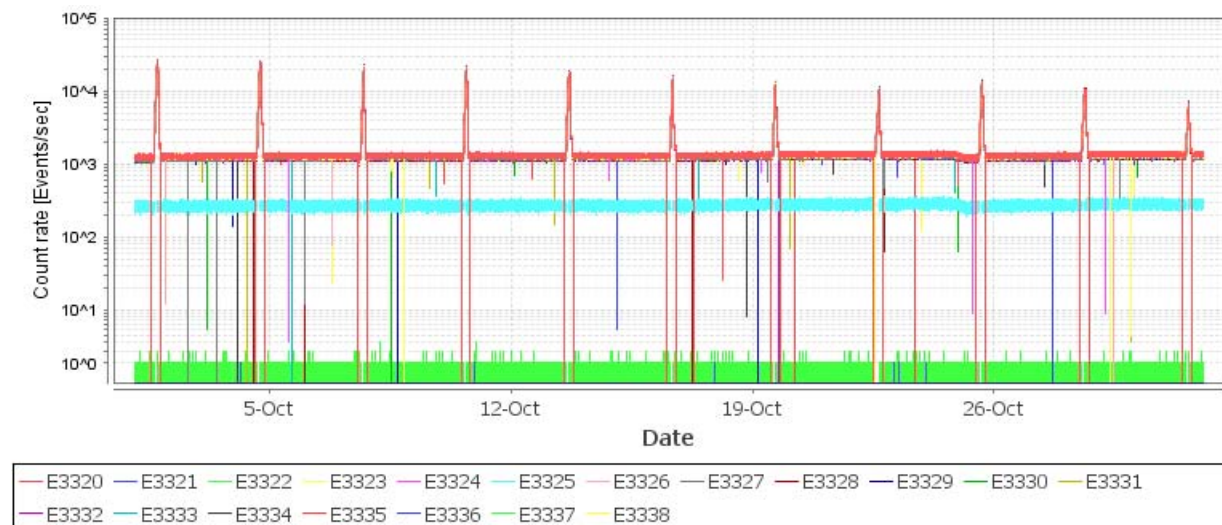


Figure 17: SPI GeD Time Tagged count rates. Note that the scale used for plotting is logarithmic.



Figure 18: SPI GeD Time Tagged Saturated count rates

PSD

The health of the PSD is nominal. The following plot shows the PSD channel rates over the reporting period.

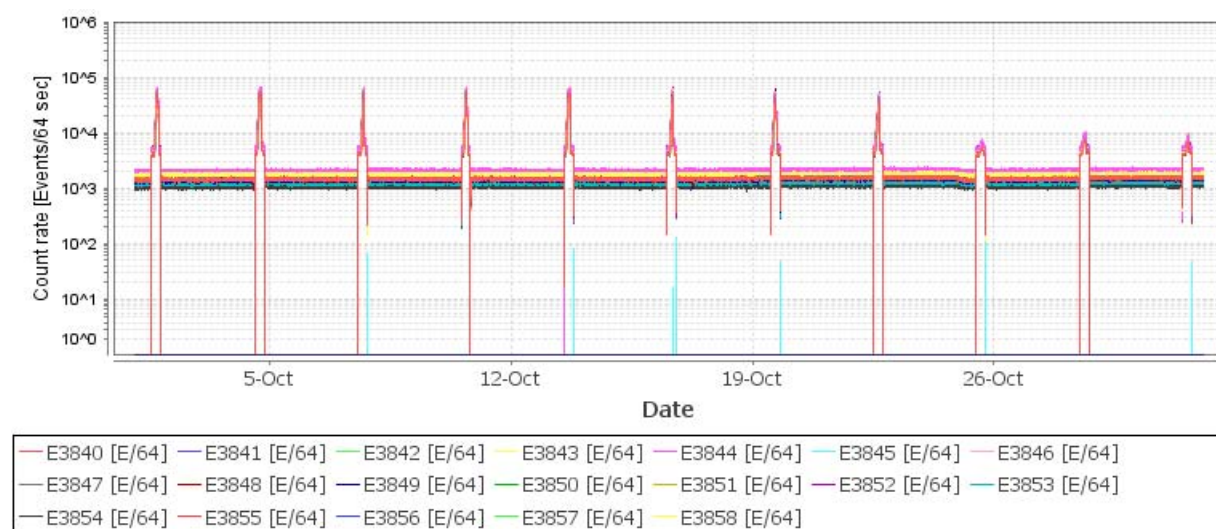


Figure 19: SPI PSD GeD Channel rates

6.2.2 Event Log

01-10-2011 (Day of Year 274, Revolution 1094)

At 12.50Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. As it was a single occurrence, no action was required. SPI operations continued nominally.

16-10-2011 (Day of Year 289, Revolution 1099)

At 11.44Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. As it was a single occurrence, no action was required. SPI operations continued nominally.

21-10-2011 (Day of Year 294, Revolution 1101)

At 14:40Z FCP_SPI1_2504 was executed to increase the stroke of all four compressors from 41 to 42 at a coldplate temperature of 80.75K. SPI operations continued nominally.

31-10-2011 (Day of Year 304, Revolution 1104)

At 10.42Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. As it was a single occurrence, no action was required. SPI operations continued nominally.

6.3 IBIS

6.3.1 Operations

ISGRI

The health and performance of ISGRI was nominal during the reporting period. The following plot shows the ISGRI MCE counters during the reporting period:

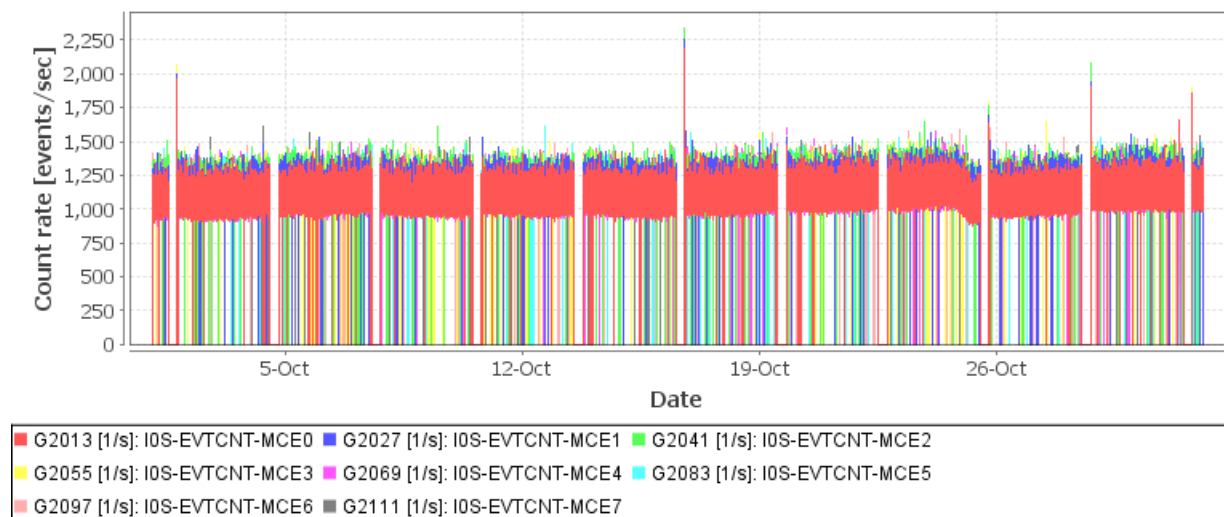


Figure 20: ISGRI MCE Counters

PICsIT

The health and performance of PICsIT was nominal during the reporting period. The following plot shows the PICsIT semi-module counters during the reporting period.

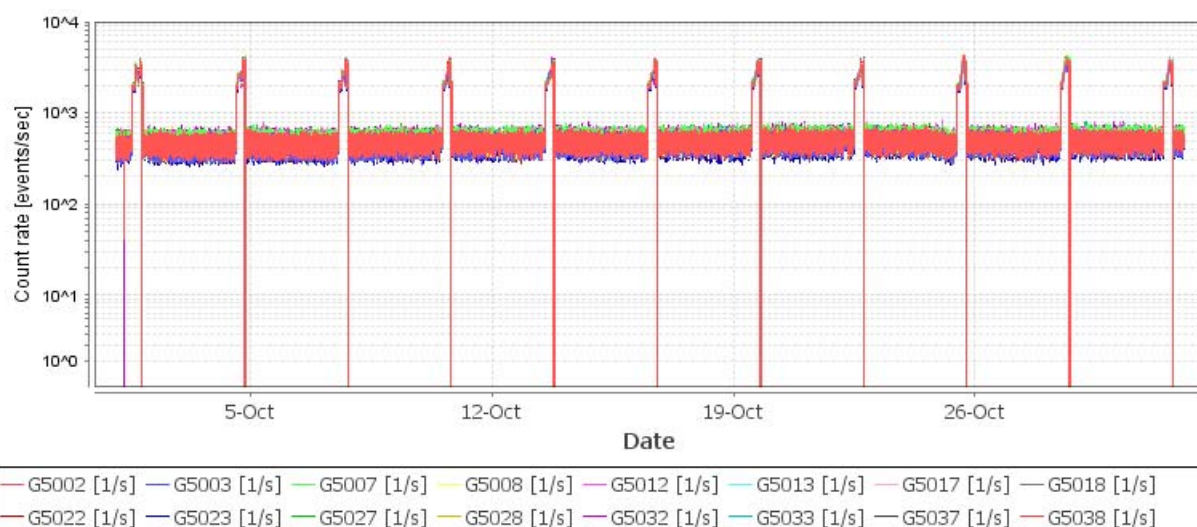


Figure 21: PICsIT semi-module counters. Note that the scale used for plotting is logarithmic.

VETO

The health and performance of VETO was nominal during the reporting period. Plots of the VETO counters are given in Figure 6: Instrument Count Rates.

6.3.2 Event Log

01-10-2011 (Day of Year 274, Revolution 1094)

At 06:05Z there was a SCC fail of TM G5072 family for about one minute indicating a PDMi semi-module #2 FIFO error. No action was required since they disappeared automatically. IBIS operations continued nominally.

01-10-2011 until 31-10-2011 (Day of Year 274-304, Revolution 1095-1105)

OEM: "IBIS1 PICSIT NOISY SEMIMODULE ..." occurred during the following periods:

2011.274.16.41.20.416	until	2011.274.16.53.20.416
2011.277.16.34.24.576	until	2011.277.16.42.48.576
2011.283.15.38.00.925	until	2011.283.15.47.28.926
2011.298.13.51.44.404	until	2011.298.13.56.01.720
2011.298.14.01.37.720	until	2011.298.14.01.53.720
2011.298.14.13.45.721	until	2011.298.14.44.09.722
2011.301.14.05.21.880	until	2011.301.14.42.41.882
2011.304.13.58.50.038	until	2011.304.14.06.42.039

Since IASW was in stand by and the S/C inside the radiation belts, no action was required. IBIS operations continued nominally.

21-10-2011 (Day of Year 294, Revolution 1101)

At 22:11Z G2000 failed status consistency check for 8 seconds indicating an overflow of the noisy pixel address register in MCEi. IBIS operations continued nominally.

22-10-2011 (Day of Year 295, Revolution 1101)

At 01:27 G2098 failed status consistency for 6 seconds indicating an overflow of the noisy pixel address register in MCEi. IBIS operations continued nominally.

6.4 JEM-X**6.4.1 Operations**

The Status of JEMX-1 & 2 is nominal. The following plot shows the JEMX DFEE and detector temperatures over the reporting period.

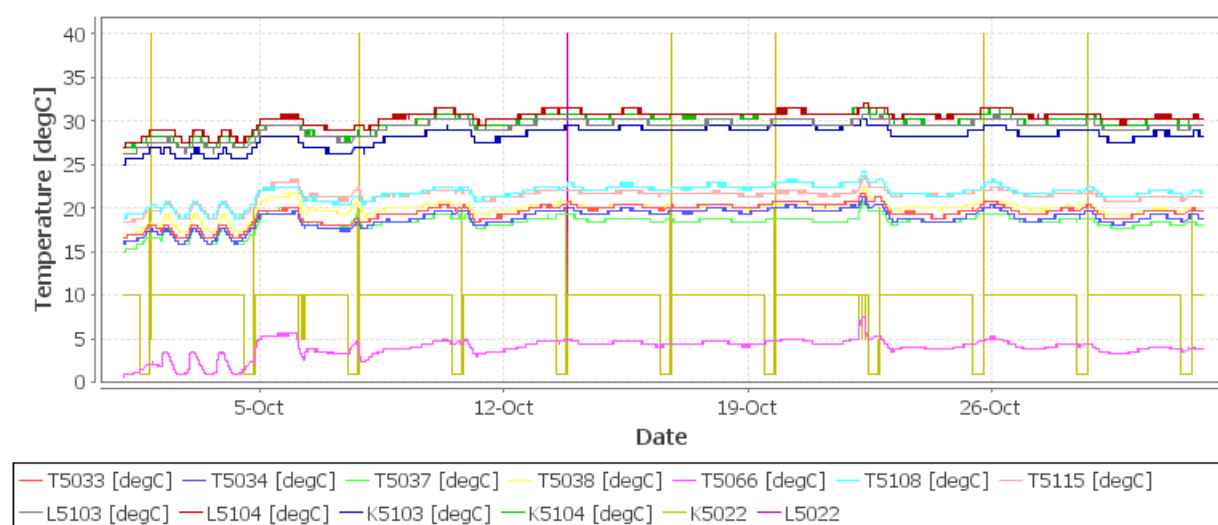


Figure 22: JEMX Detector and DFEE Temperatures

6.4.2 Event Log

Nothing to report.

6.5 OMC**6.5.1 Operations**

The status and performance of OMC is nominal.

6.5.2 Event Log**04-10-2011 (Day of Year 277, Revolution 1096)**

At 18:59, a Flight Dynamics problem forced an interruption to the timeline. At 20:50, after a recovery, operations were resumed. The impact was the loss of pointings 10960006 & 10960007. It was at this time that the following pairs of commands were rejected:

2011.277.19.34.47.786	2011.277.19.34.53.317	1792	RealTime	131	TC REJECT	REJECTED
TC1		0	0	65535 PR	N E E	
2011.277.19.34.53.786	2011.277.19.35.05.159	1792	RealTime	131	TC REJECT	REJECTED
TC1		0	0	65535 PR	N E E	

2011.277.20.10.46.537	2011.277.20.10.57.980	1792	RealTime	131	TC	REJECT	REJECTED
TC1		0	0	65535	PR	N	E

2011.277.20.10.53.037	2011.277.20.11.05.096	1792	RealTime	131	TC	REJECT	REJECTED
TC1		0	0	65535	PR	N	E

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for those pointings.

06-10-2011 (Day of Year 279, Revolution 1096)

At 02:16:17, the following OEM was received:

2011.279.02.16.17.368	2011.279.02.16.22.581	1792	RealTime	131	TC	REJECT	REJECTED
TC1							

This corresponds to a M1540 (FFCALIBRATE) command. The cause of this was a missing MESTBY01 ED from the timeline. There was no impact as OMC was already in flat-field calibration mode. The calibration continued nominally.

At 11:23:52, an AOCS command failed, which forced an interruption. A recovery was performed, and the timeline rejoined at 11:48. The impact was the loss of pointing 10960067.

6.6 IREM

6.6.1 Operations

Radiation belts entry and exit

The following plots show the Radiation Belt Entry (Figure 23, red line) and Exit times (Figure 24, blue line) obtained from the ISDC website, defined where the IREM TC3 (soft electrons) rate reads 600 counts. The blue line in Figure 23 and the magenta line in Figure 24 are the altitudes used by the MOC for planning purposes.

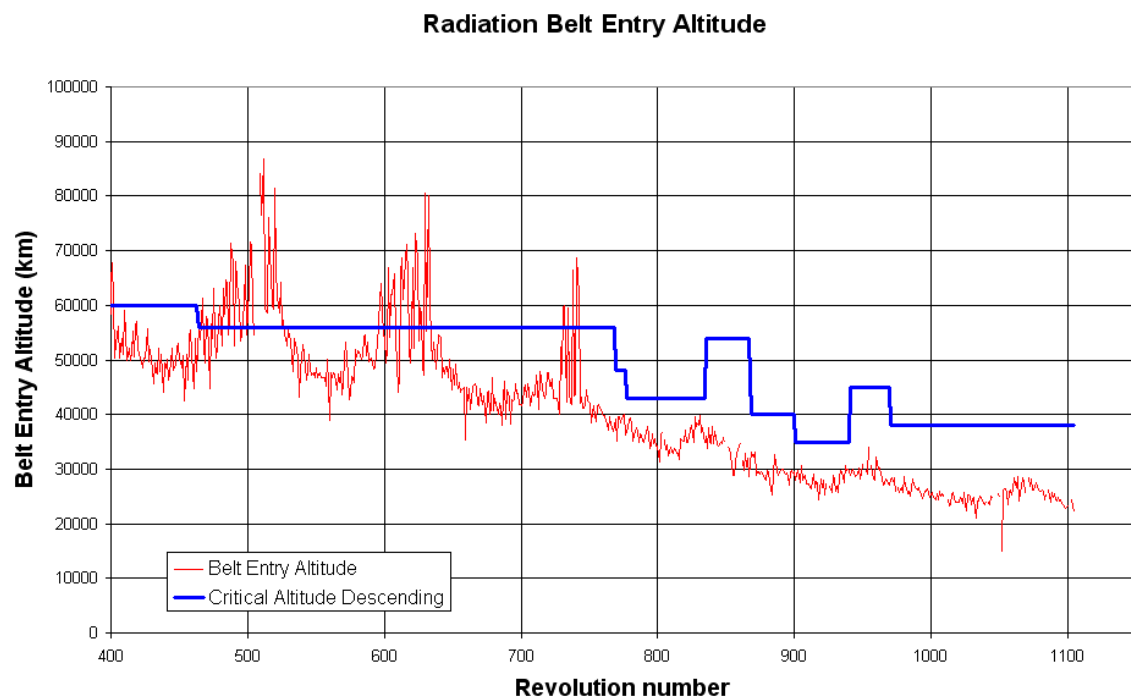


Figure 23: Radiation belt entry

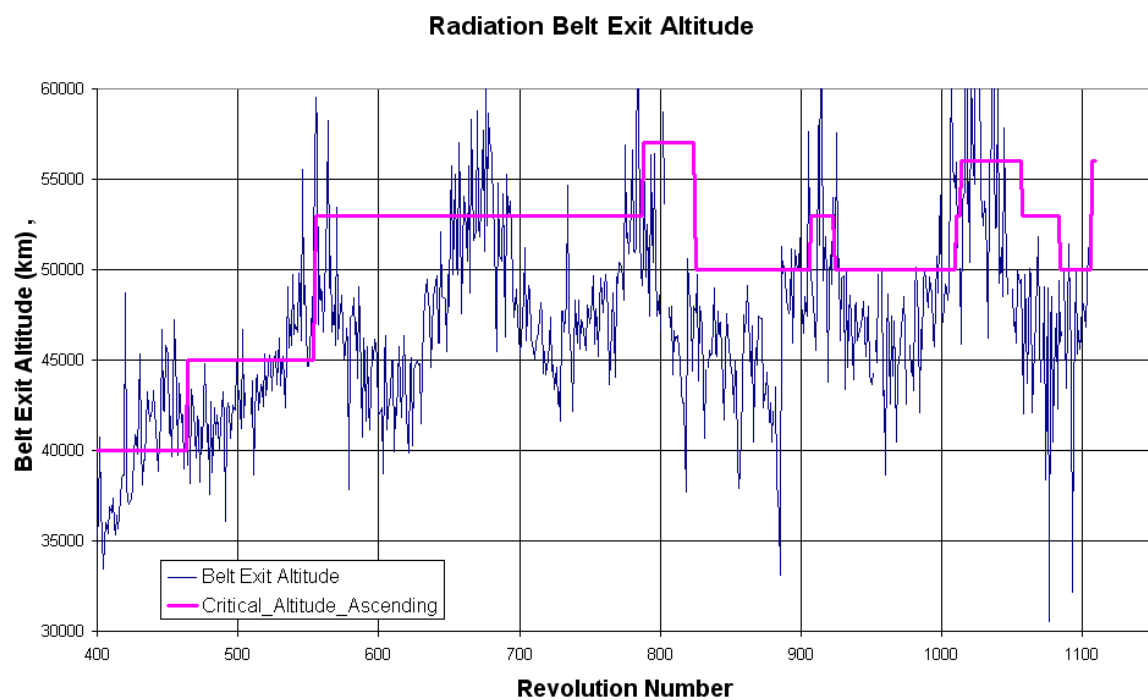


Figure 24: Radiation belt exit

Table 2: Radiation belts. Radiation belt entry crossings are ignored if there is a subsequent gap of at least 30 minutes of low radiation.

Revo number	Spacecraft BCPKT (electron)	Observed entry/exit time by Electron CUT-OFF	Observed entry/exit altitude [km] by Electron CUT-OFF	Predicted entry/exit time by Electron CUT-OFF	Predicted entry/exit altitude [km] by Electron CUT-OFF	Predicted entry/exit time by Proton CUT-OFF	Predicted entry/exit altitude [km] by Proton CUT-OFF
1094	RAD_ENTR R 2011-10-01T11:40:46Z	01/10/2011 13:12:44	19107.7	01-Oct-2011 13:14:52	17604.57	01-Oct-2011 13:54:52	7521.805
1095	RAD_EXIT R 2011-10-01T18:18:11Z	01/10/2011 17:42:52	>>29130.9	01-Oct-2011 18:04:52	47977.74	01-Oct-2011 14:24:52	2890.867
1095	RAD_ENTR R 2011-10-04T11:28:00Z	04/10/2011 12:59:17	19479.3	04-Oct-2011 13:05:32	16920.59	04-Oct-2011 13:35:32	9360.34
1096	RAD_EXIT R 2011-10-04T18:05:52Z	04/10/2011 17:00:29	38541.2	04-Oct-2011 17:55:32	48367.94	04-Oct-2011 14:15:32	3057.325
1096	RAD_ENTR R 2011-10-07T11:13:59Z	07/10/2011 12:49:33	19099.3	07-Oct-2011 12:46:40	18212.74	07-Oct-2011 13:26:40	8175.962
1097	RAD_EXIT R 2011-10-07T17:51:52Z	07/10/2011 16:53:49	39812.4	07-Oct-2011 17:46:40	49161.81	07-Oct-2011 13:56:40	2974.842
1097	RAD_ENTR R 2011-10-10T11:00:34Z	N/A	N/A	10-Oct-2011 12:32:39	18262.09	10-Oct-2011 13:12:39	8172.536
1098	RAD_EXIT R 2011-10-10T17:37:57Z	10/10/2011 16:36:45	>>29132.3	10-Oct-2011 17:32:39	49222.21	10-Oct-2011 13:42:39	2880.579
1098	RAD_ENTR R 2011-10-13T10:48:08Z	13/10/2011 12:26:29	16744.9	13-Oct-2011 12:18:50	18300.36	13-Oct-2011 12:58:50	8197.841
1099	RAD_EXIT R 2011-10-13T17:25:15Z	13/10/2011 16:29:09	>>29151.9	13-Oct-2011 17:08:50	47553.87	13-Oct-2011 13:28:50	2858.172
1099	RAD_ENTR R 2011-10-16T10:35:01Z	16/10/2011 12:12:53	17300.8	16-Oct-2011 12:12:40	16806.29	16-Oct-2011 12:42:40	9215.713
1100	RAD_EXIT R 2011-10-16T17:12:24Z	16/10/2011 16:32:13	>>29132.6	16-Oct-2011 17:02:40	48506.13	16-Oct-2011 13:22:40	3023.474
1100	RAD_ENTR R	N/A	N/A	19-Oct-2011	18623.68	19-Oct-2011	8574.12

Revo number	Spacecraft BCPKT (electron)	Observed entry/exit time by Electron CUT-OFF	Observed entry/exit altitude [km] by Electron CUT-OFF	Predicted entry/exit time by Electron CUT-OFF	Predicted entry/exit altitude [km] by Electron CUT-OFF	Predicted entry/exit time by Proton CUT-OFF	Predicted entry/exit altitude [km] by Proton CUT-OFF
	2011-10-19T10:21:02Z			11:51:10		12:31:10	
1101	RAD_EXIT R 2011-10-19T16:58:31Z	19/10/2011 16:10:21	>>29125.6	19-Oct-2011 16:51:10	48926.6	19-Oct-2011 13:11:10	3219.91
1101	RAD_ENTR R 2011-10-22T10:08:13Z	N/A	N/A	22-Oct-2011 11:38:56	18742.67	22-Oct-2011 12:18:56	8642.9
1102	RAD_EXIT R 2011-10-22T16:45:11Z	22/10/2011 15:53:02	>>29161.7	22-Oct-2011 16:38:56	48948.61	22-Oct-2011 12:58:56	3091.988
1102	RAD_ENTR R 2011-10-25T09:57:40Z	N/A	N/A	25-Oct-2011 11:30:53	17784.03	25-Oct-2011 12:10:53	7611.869
1103	RAD_EXIT R 2011-10-25T16:34:04Z	25/10/2011 15:55:50	44254.9	25-Oct-2011 16:20:53	48005.37	25-Oct-2011 12:40:53	2731.194
1103	RAD_ENTR R 2011-10-28T09:47:48Z	28/10/2011 11:17:50	19463.5	28-Oct-2011 11:18:39	17999.85	28-Oct-2011 11:58:39	7869.369
1104	RAD_EXIT R 2011-10-28T16:24:24Z	28/10/2011 16:00:46	52580.4	28-Oct-2011 16:08:39	47792.88	28-Oct-2011 12:28:39	2797.505
1104	RAD_ENTR R 2011-10-31T09:35:33Z	N/A	N/A	31-Oct-2011 11:03:11	18993.03	31-Oct-2011 11:43:11	8964.07
1105	RAD_EXIT R 2011-10-31T16:12:51Z	31/10/2011 15:40:06	29138.0	31-Oct-2011 16:03:11	48663.54	31-Oct-2011 12:23:11	3096.896

Reference:

- High radiation
- Very small error vs reference (less than 10 minutes)
- Small error vs reference (between 10 and 30 minutes)
- Large error vs reference (more than 30 minutes)

6.6.2 Event Log

25-10-2011 (Day of Year 298, Revolution 1103)

At 13:51:42Z, at AOS, a local reset of the IREM CSCI S/W (SEU #116) was observed. The status of the unit, before the local reset of the IREM CSCI S/W, was nominal, here is a summary:

- 1) The temperatures were nominal;
- 2) The LCL current was nominal;
- 3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits;
- 4) The anomaly occurred before AOS at 2011.298.13:51:42Z (17828.0 km). The unit had performed an automatic transition to Standard Mode (ie. no block counter increasing, all the TM words= FFFF hex);
- 5) The recovery of the unit started immediately using procedure CRP_SYS_2570. The first dump of the status word after the anomaly reported a value of 3CC0 HEX = 15552 DEC = 0011110011000000, i.e the Checksum Failure Flag ON. The unit was still reporting the status as if it was in Integral mode with counting ON and accumulation ON, and ground link OFF. This value of the status word is assumed to be an old one written by the S/W at the moment of the anomaly.
- 6) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 16:20:00Z.

There was no impact on the other instruments as the anomaly occurred during the perigee passage, when the instruments are anyway in SAFE mode.