EUROPEAN SPACE AGENCY

DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT

MISSION OPERATIONS DEPARTMENT

INTEGRAL

Mission report

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

No. 414

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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 perfomed 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 1217 untill 1227 (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 this reporting period, 954 of the 1000 planned science pointings and a Flat Field calibration were executed nominally. 42 pointings were lost to a planning error, 2 were lost to AOCS problems and 2 to FD problems.
- Raise of belts exit altitude from rev. 1226 to 53000km
- Rev. 1222: all slews as OSLs

Summary of the overall status and performance of S/C

- Nominal for platform and payload
- Nominal for platform and payload
- SPI DFEE HSL error OOL toggle in and out
- IBIS: VETO VDM06 high voltage break down

Summary of the overall status and performance of the ground segment

- Ongoing occasional RFI at Redu and VIL2, some sources identified, filter installed for testing at Redu
- Ongoing occasional interruptions to ISDS-ISDC link
- Verification of command TC L0021 several hours delayed
- Three DEBPG200 per pointing in rev. 1222
- REDU Antenna Stopped Tracking

The previous weekly and monthly reports are available at the XMM-INTEGRAL 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.

4 slews were missed from the Timeline due to ground segment issues. For slews interrupted due to other issues (guide star problems, etc) please see the INTEGRAL weekly reports: http://10.33.199.49/documentation/wops.php

The fuel consumption over the reporting period was 0.3942 Kg. The remaining propellant is in the order of 109.5544 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 18th SPI annealing, which ended on 09/12/2011, 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+/-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 89 packets/cycle, except from 2012-10-25T22:28:54Z to 2012-10-26T03:26:26Z (OMC Flat Field Calibration), when it was 88

packets/cycle. The average telemetry occupation when the allocation was 89 packets/cycle was 71.3 packets/cycle.

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

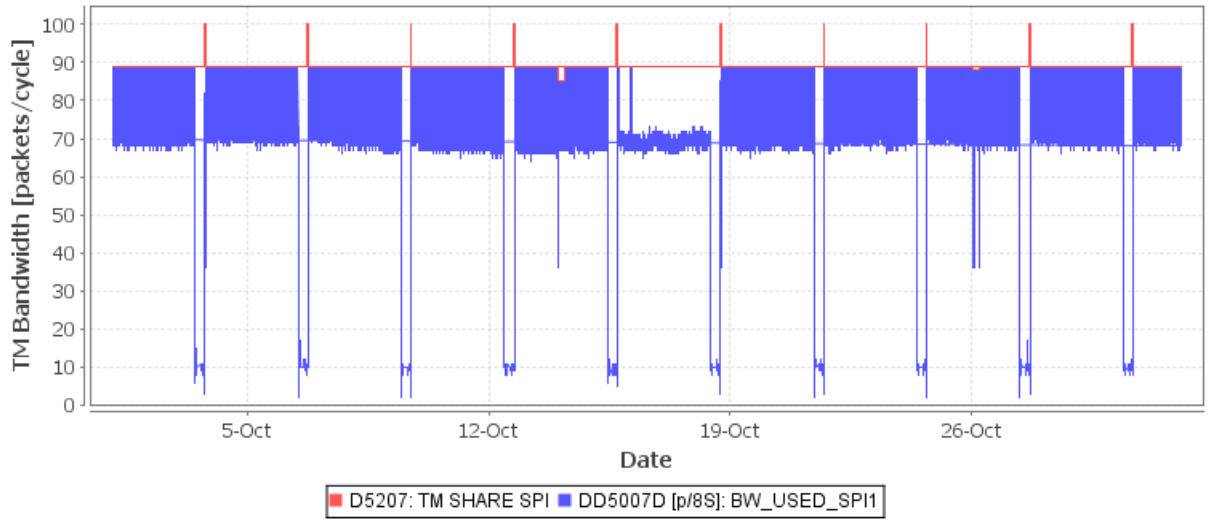


Figure 1: SPI TM bandwidth utilisation

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

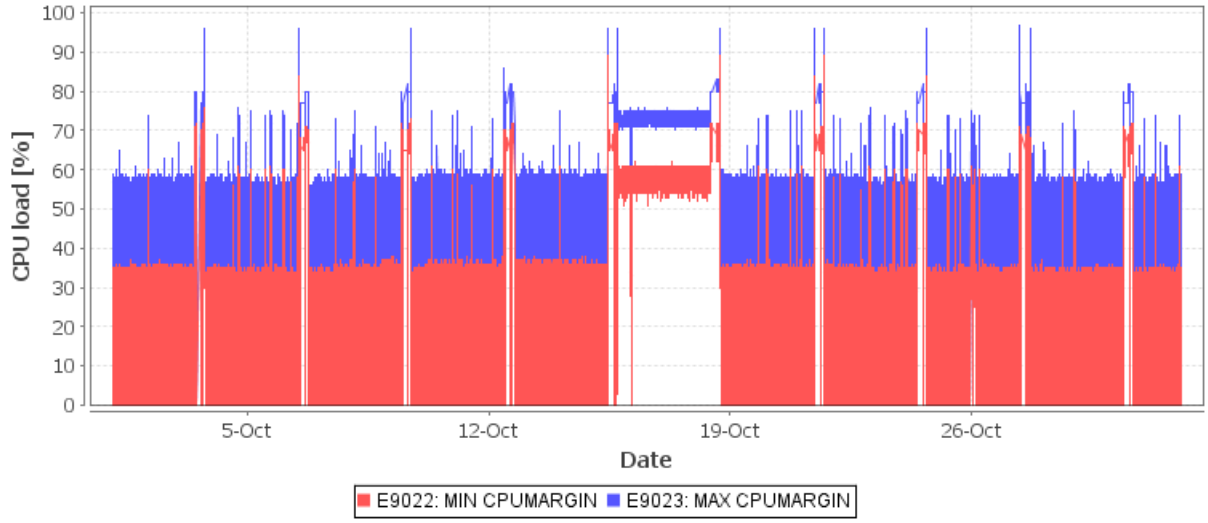


Figure 2: SPI IASW Performance

The following plot shows the evolution of the assigned and the average occupation of the SPI TM bandwidth since May 2010.

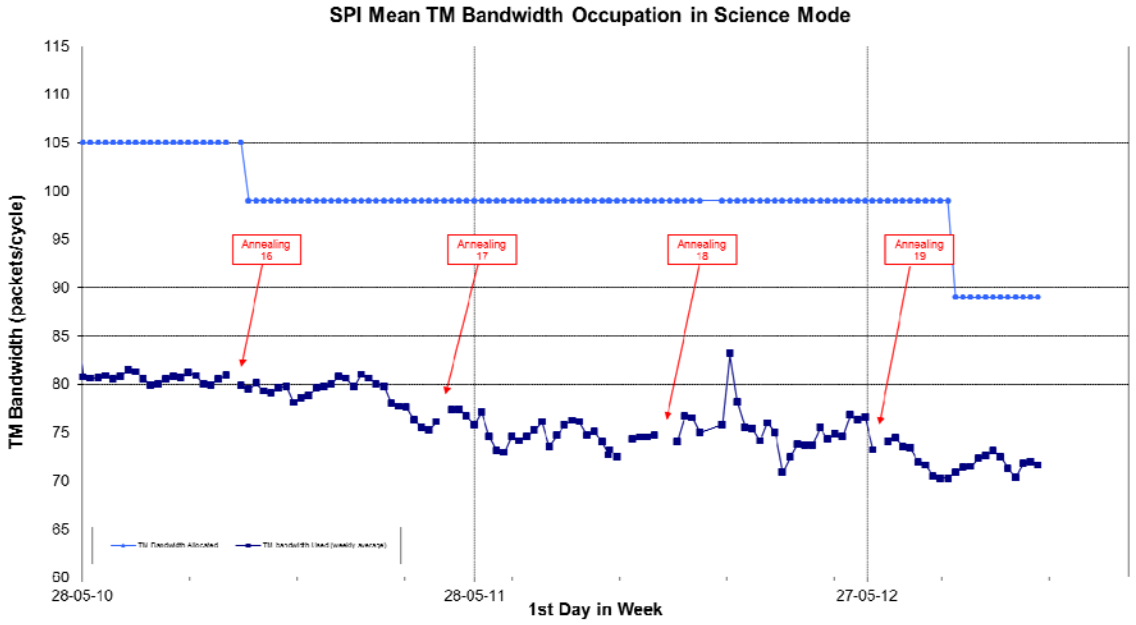


Figure 3: SPI TM bandwidth usage evolution since May 2010

Note: More information concerning the SPI operations is provided in Appendix 6.2.

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 2012-10-25T22:28:54Z to 2012-10-26T03:26:26Z (OMC Flat Field Calibration), when it was 90 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 101.17 packets/cycle

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

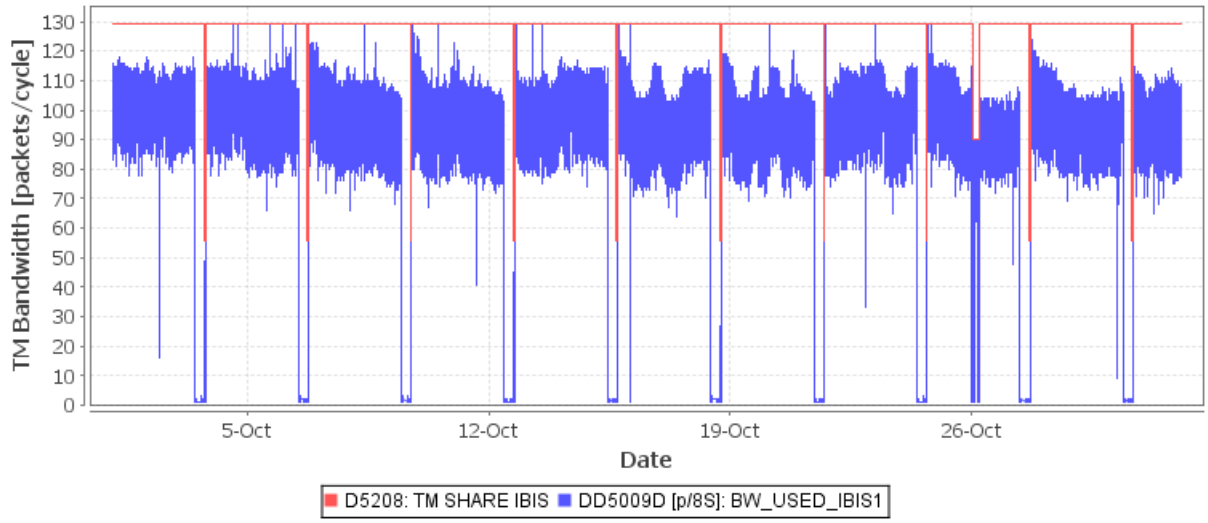


Figure 4: IBIS TM bandwidth utilisation

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

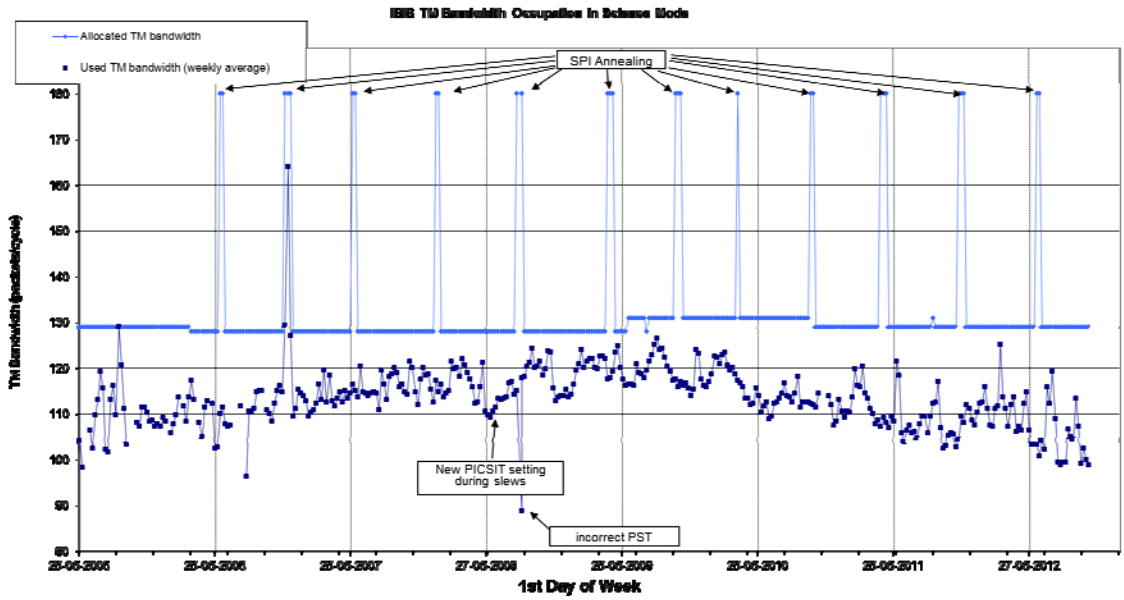


Figure 5: IBIS TM bandwidth usage evolution since May 2005

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

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 13 packets/cycle, except from 2012-10-25T22:28:54Z to 2012-10-26T03:26:26Z during the OMC Flat-Field calibration, when it was 4 packets/cycle each.

Note: Some more information concerning the JEM-X operations is provided in Appendix 6.4.

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 2012-10-25T22:28:54Z to 2012-10-26T03:26:26Z during the Flat-Field calibration, when it was 63 packets/cycle.

During this reporting period, 954 of the 1000 planned science pointings and a Flat Field calibration were executed nominally. 42 pointings were lost to a planning error, 2 were lost to AOCS problems and 2 to FD problems.

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

2.2.5 IREM

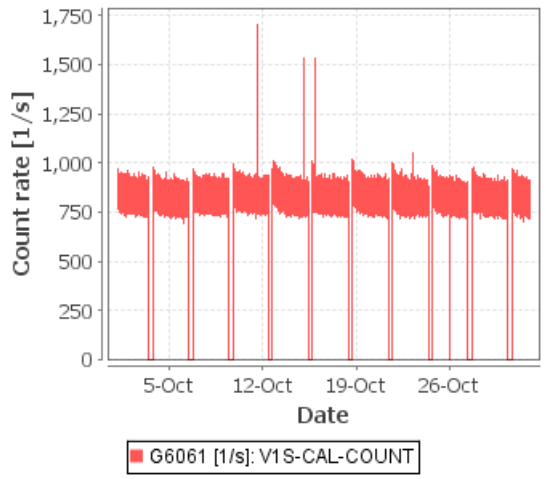
The status of IREM is nominal.

Note: Some more information concerning the IREM operations is provided in Appendix 0.

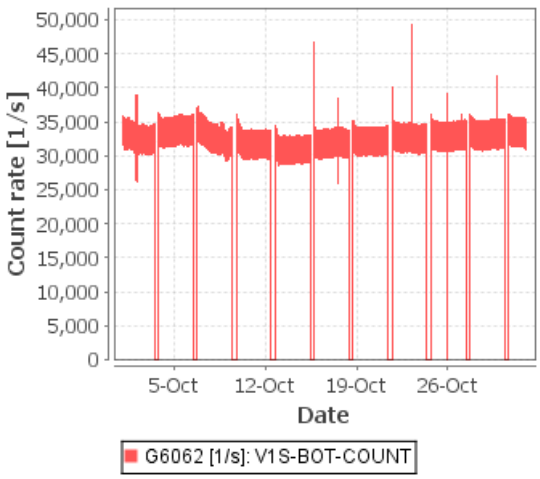
Radiation background

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:

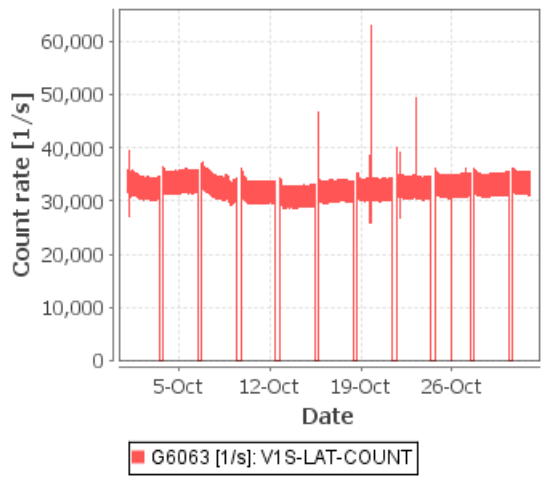
VETO Calibration Source Count Rate



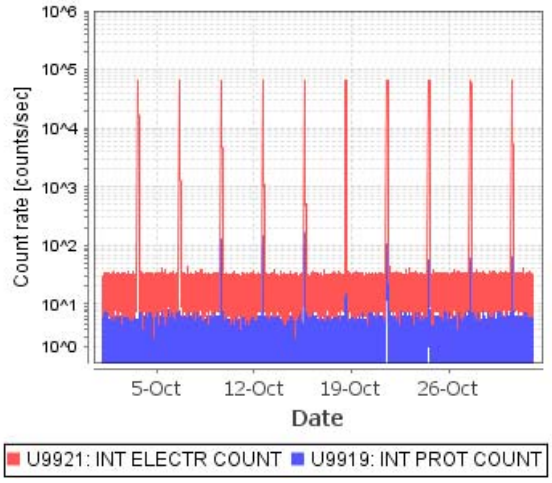
VETO Bottom Count Rate



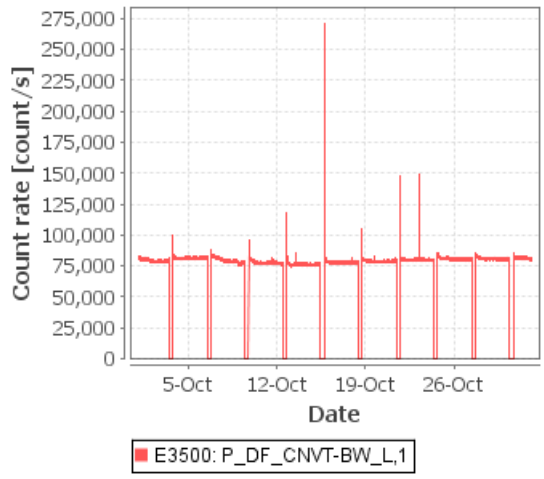
VETO Lateral Count Rate



IREM Proton & Electron Counters[1]



ACS Below 100MeV



ACS Above 100MeV

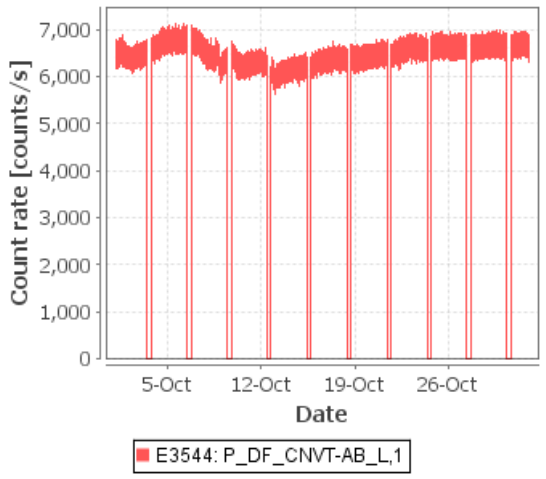


Figure 6: Instrument Count Rates

The JEM-X count rates are plotted for both JEM-X units, 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

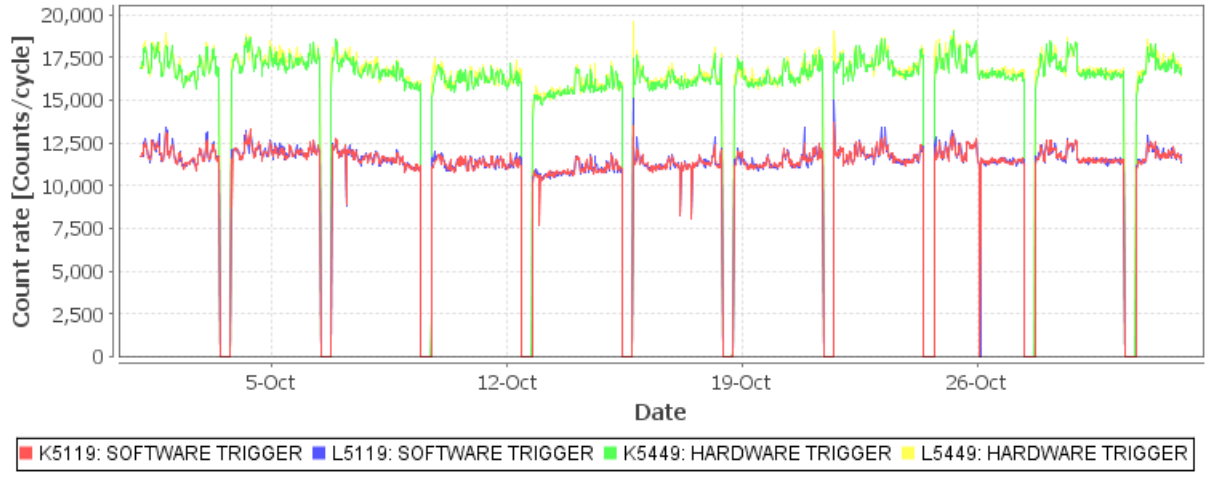


Figure 7: JEM-X Count rates. The smaller downward spikes in the figure are due to the slews of the spacecraft

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.

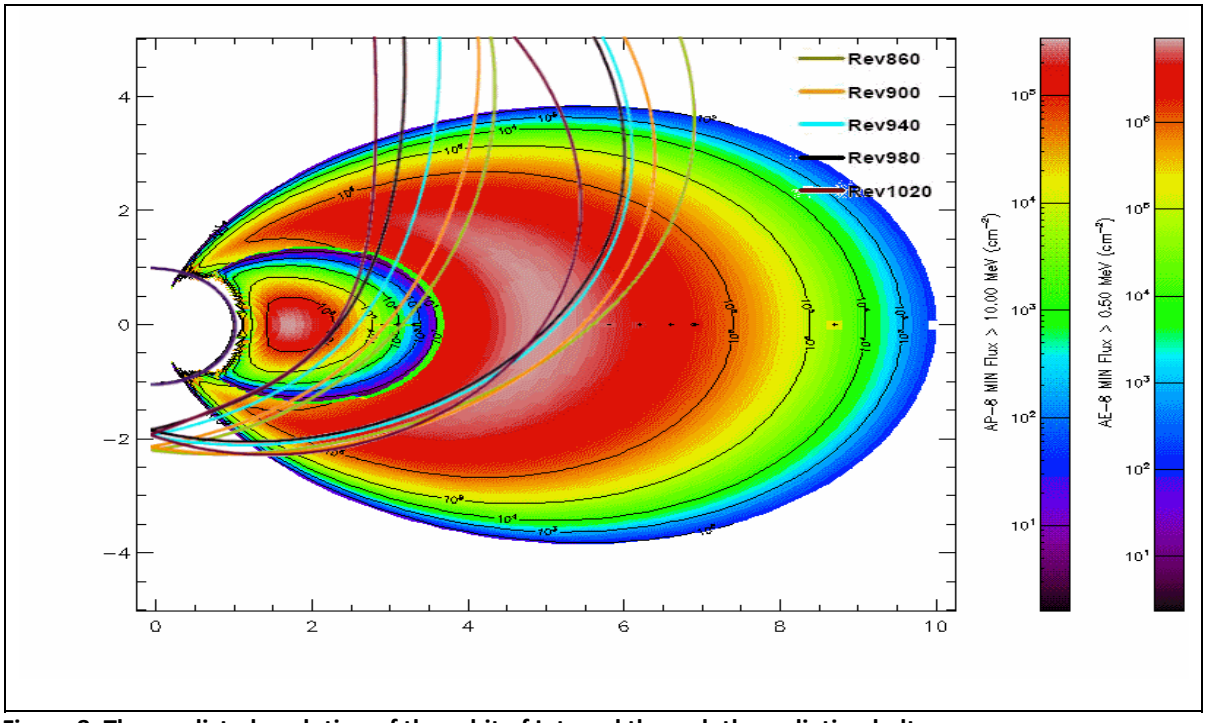


Figure 8: The predicted evolution of the orbit of Integral through the radiation belts

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.

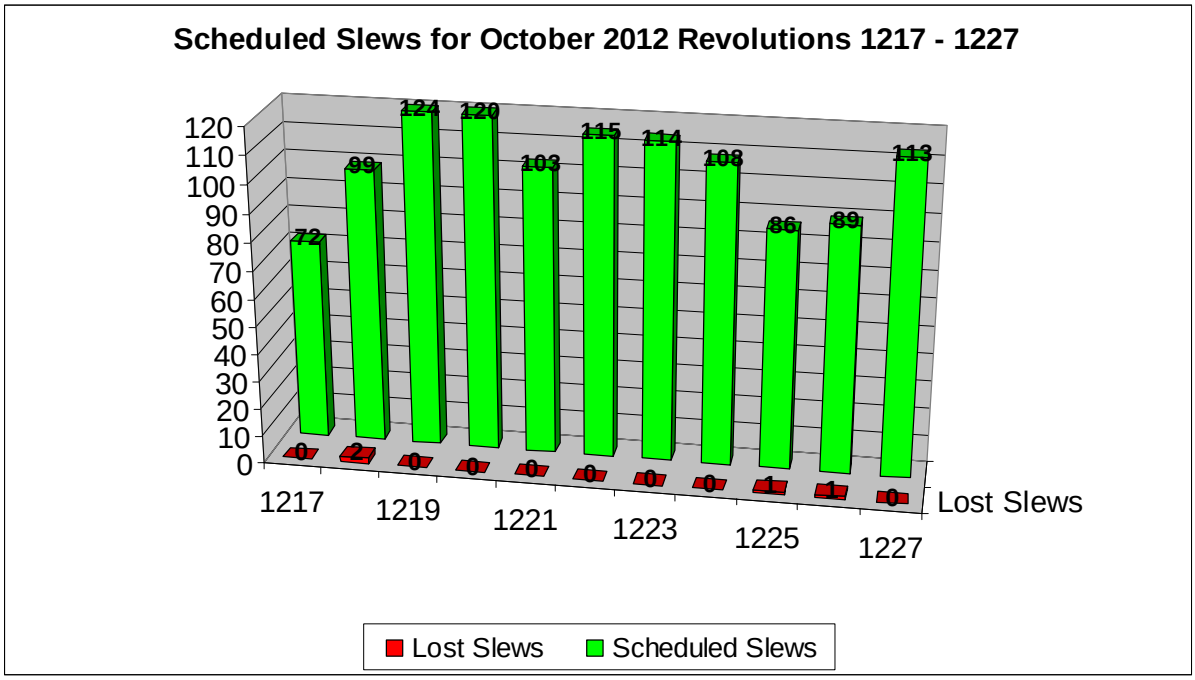


Figure 9: The number of slews scheduled compared to the number of slews lost

3.1 Mission Control System

MCS version E3.5.5 was delivered on the C-Chain this month.
There was also SRB for MCS version E3.6.0

3.2 Ground Stations and Network

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

- On DOY 287 at 12:07, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 290 at 10:16, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 290 at 10:38, during Redu-1 support, data gaps occurred due to RFI. Only D/L chain 1 was affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 290 at 12:00, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 299 at 13:39, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 300 at 07:06, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 302 at 07:02, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 302 at 10:18, during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 302 at 11:08 during Redu-1 support, data gaps occurred due to RFI. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

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.

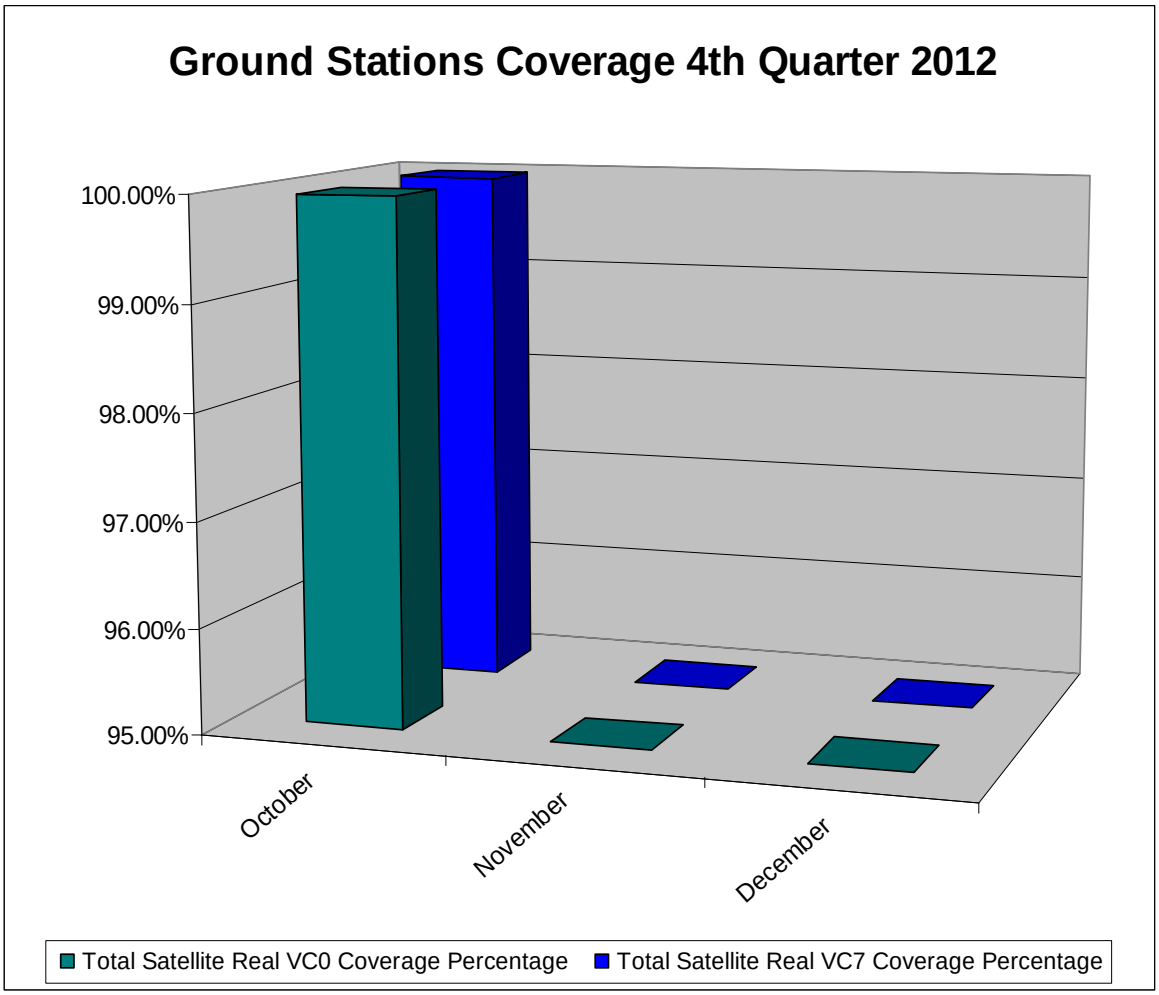


Figure 10: Comparison of VC0 to VC7 coverage

3.3 ISOC

3.3.1 Mission Planning

New or updated PSFs have been received for revolutions 1224 to 1235, corresponding to the time range 21 October to 26 November.

New observations have been planned for revolutions 1219 (6-9 October) to 1235 (23-26 November).

TSFs have been received for revolutions 1218 to 1228.

3.3.2 Observation Status

New ECS files have been for revolutions 1199 to 1211, covering observations up to 15 September.

3.3.3 ISOC Science Data Archive

Main archive content moved to disks maintained by Science Archive Team.

3.3.4 ISOC System

ISOC system V33.1 was released on 1 October including the flagging of planning gaps in the POS and allowing for open-loop slews only.

3.3.5 Problems

The first test run of a revolution with only open loop slews led to problems for OMC because of a software bug introduced with ISOC system V33.1.

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-3305	2012-10-11	MADDSB.OLFmain task crashed	IMCS	Pending
INT-3306	2012-10-11	sun129 frozen - xsun process using 20% CPU	IMCS	Pending
INT-3307	2012-10-15	Three DEBPG200 per pointing in rev. 1222	ISOC	Pending
INT-3308	2012-10-12	Verification of command TC L0021 several hours delayed	IMCS	Pending
INT-3309	2012-10-31	REDU Antenna Stopped Tracking	ESA Stations	Pending
INT_SC-409	2012-10-15	SPI DFEE HSL error OOL toggle in and out	Payload	Pending
INT_SC-410	2012-10-25	IBIS: VETO VDM06 high voltage break down	Payload	Pending

5 Special Events & Future Milestones

Virtualised Solaris environments
MCS development
Earth observation 2.5 20-21/11/2012
Raising of radiation belt exit to 56000km on rev. 1233
Set up and validation of Kiruna
Battery 2 Reconditioning 6/11/2012
Eclipse season starts 29/11/2012

6 Appendix

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

6.1 AOCS operations

During this period, 623 Open Loop Slews, 455 Closed Loop Slews and 21 Momentum Biases were executed (as reported by ACC OEM).

4 slews were missed from the Timeline due to ground segment issues. For slews interrupted due to other issues (guide star problems, etc) please see the INTEGRAL weekly reports: http://10.33.199.49/documentation/wops.php

6.1.1 Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 01/11/2012 is reported in the following plot:

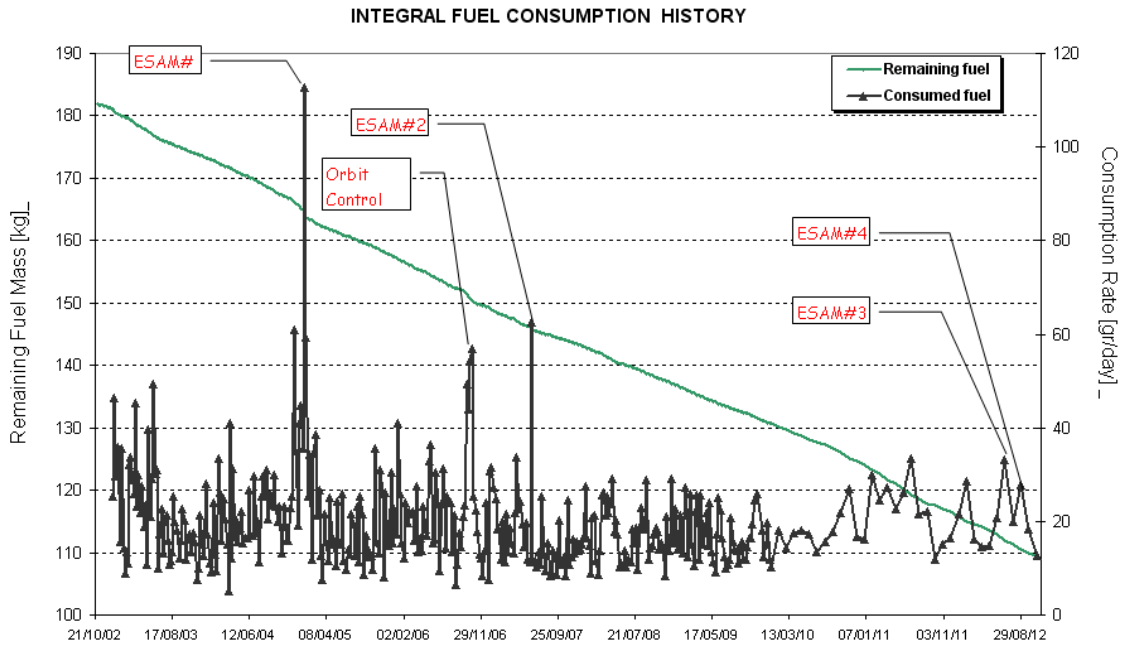


Figure 11: Fuel consumption. Note: ESAM fuel consumption is spread over period of ~1 week.

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.

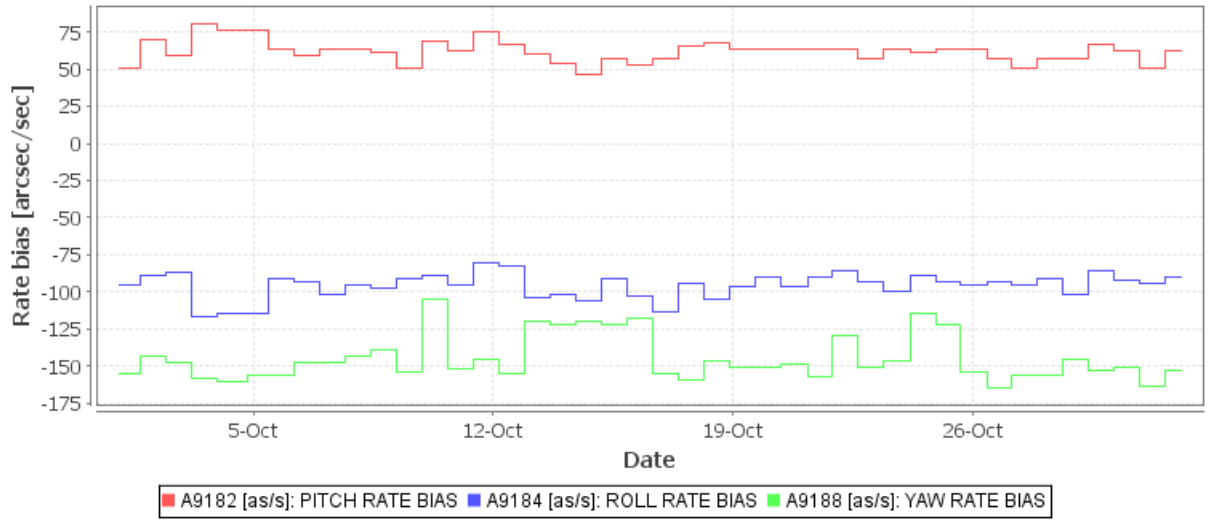


Figure 12: RMU pitch, roll and yaw. Historic data is available on request

6.1.3 Event log

Please refer to the INTEGRAL weekly reports for all AOCS issues not considered as anomaly (e.g., TPF update failures that forced an interruption to the timeline and have led to a loss of a slew , TC Start Sun Steer Law failed at CEV level completion, events where the IMU came on due to the loss of a guide star,..).

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 40 on 01-10-2012 leading to a decrease of the temperature of the cold plate as well to an increase of the SPI CDE LCL currents.

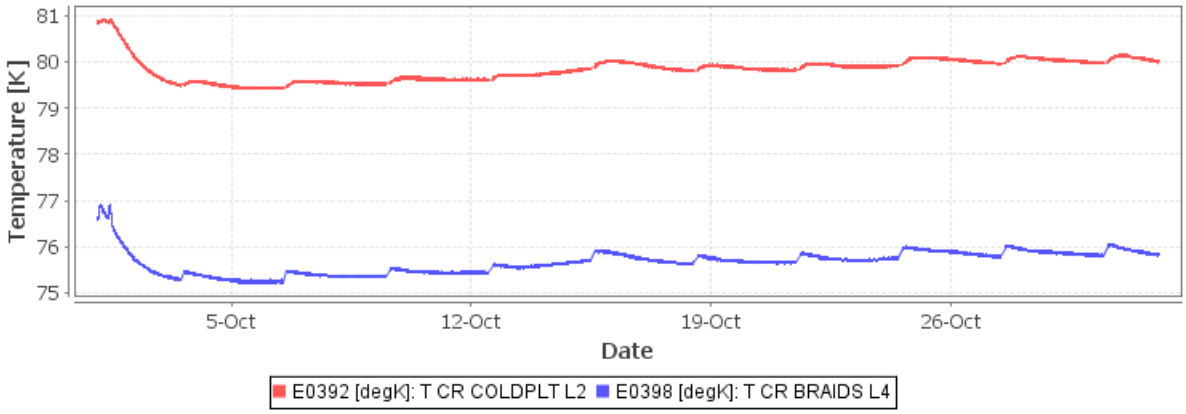


Figure 13: SPI Cold plate and H-bus temperature

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

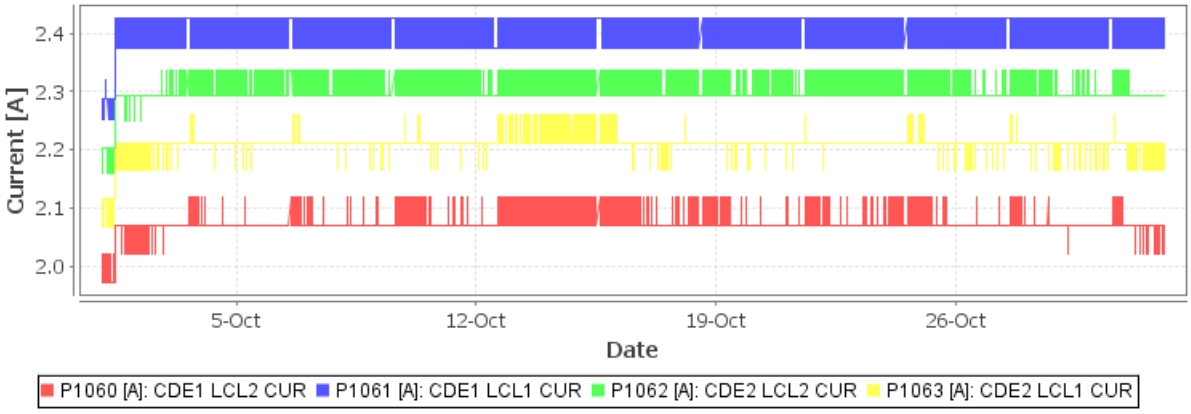


Figure 14: SPI CDE LCL current

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.

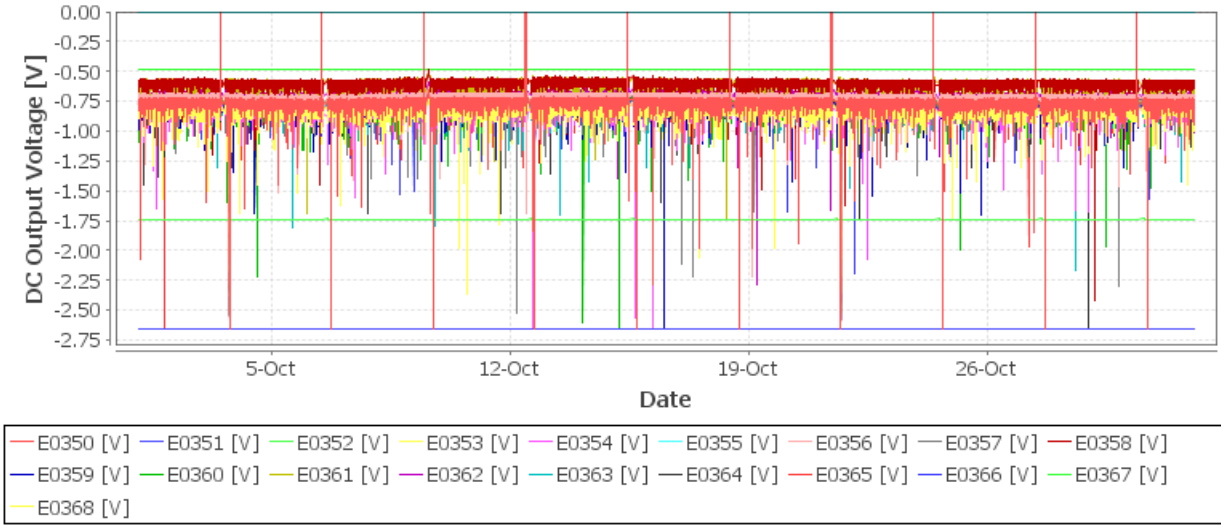


Figure 15: AFEE DC Output Voltages. Note that the data is sampled every 8th packet (64sec)

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.

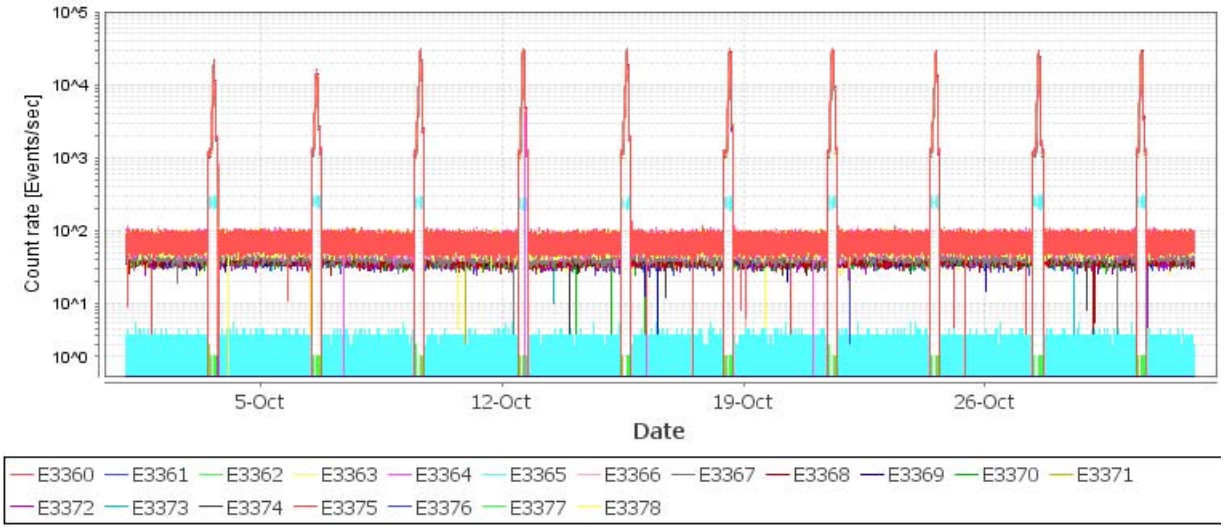


Figure 16: SPI GeD Non-Vetoed count rates. Note that the scale used for plotting is logarithmic.

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

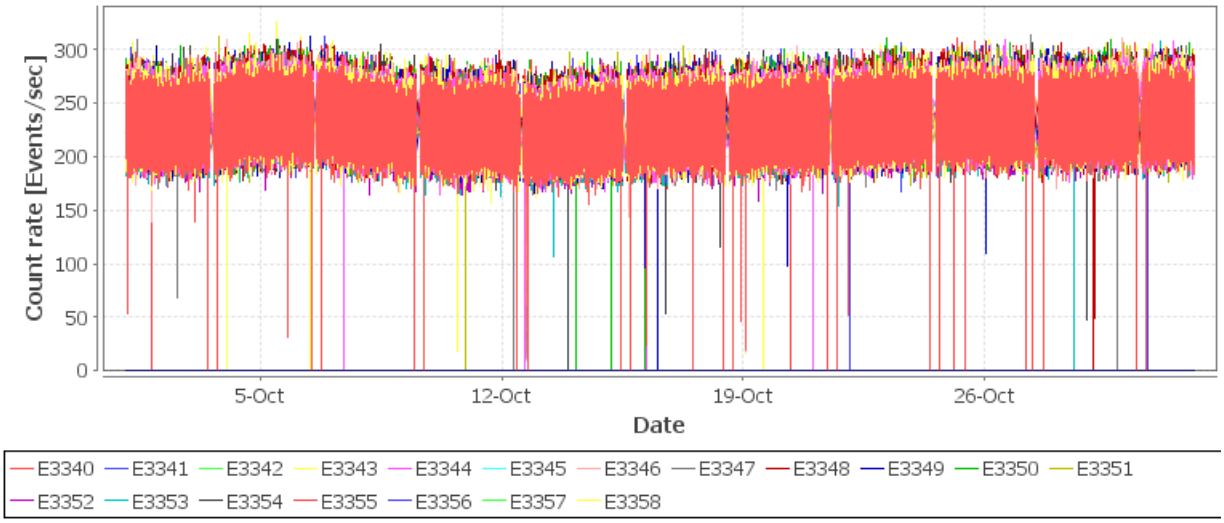


Figure 18: SPI GeD Time Tagged Saturated count rates

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

15-10-2012 (Day of Year 289, Revolution 1222)

SPI DFEE HSL error OOL toggle in and out right after AOS after perigee. The alarm was not continuous. The performance of SPI and DFEE were nominal. Around 13:25Z, while preparing the DFEE reset, the problem fixed itself: the OOL disappeared and did not appear again. Therefore, the DFEE reset was not performed. For further information, please see INT_SC-409.

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:

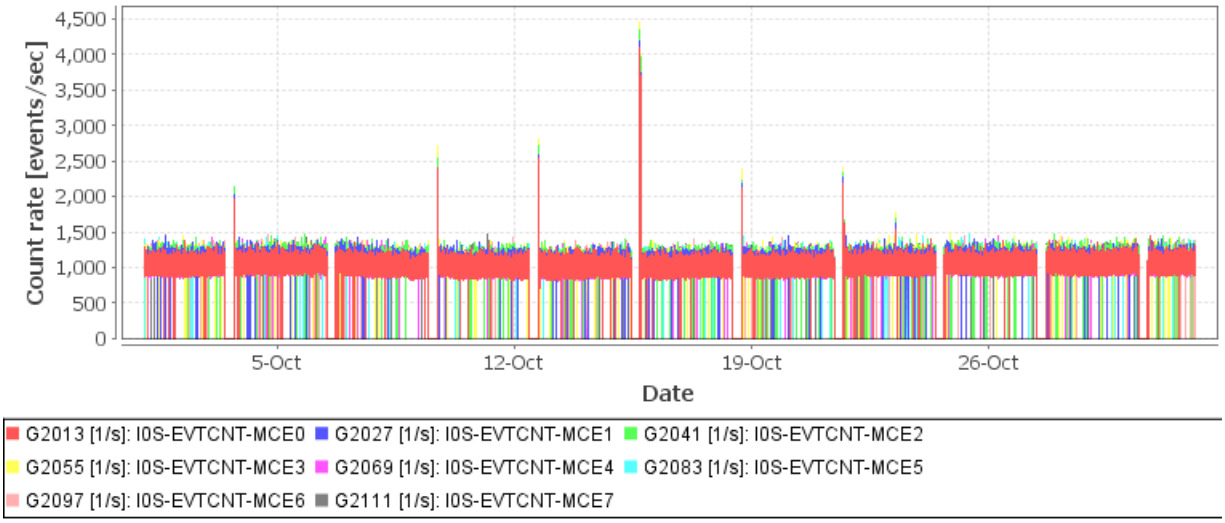


Figure 20: ISGRI MCE Counters

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.

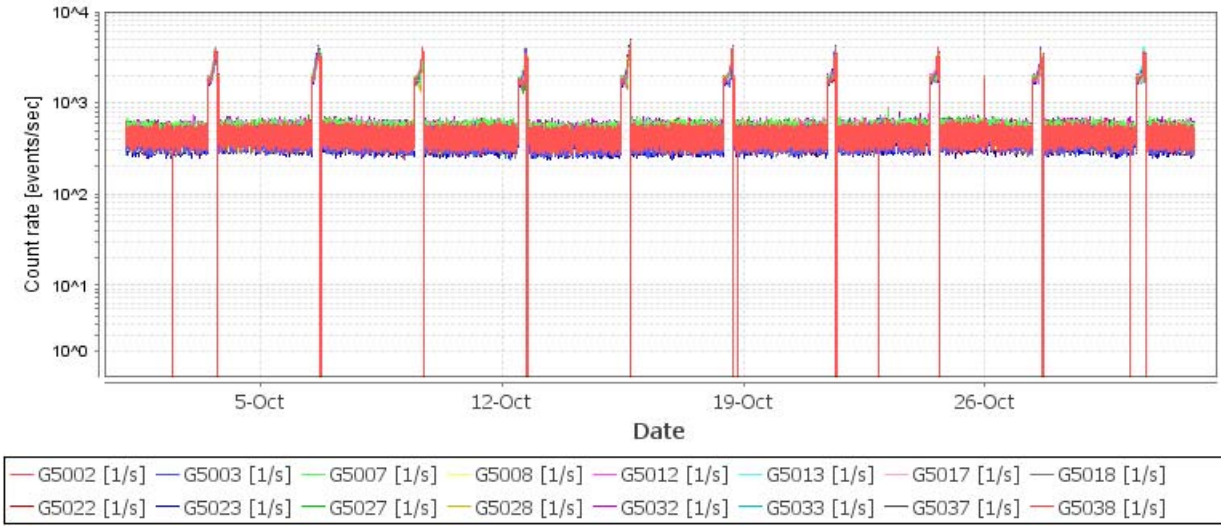


Figure 21: PICsIT semi-module counters. Note that the scale used for plotting is logarithmic.

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

25-10-2012 (Day of Year 299, Revolution 1225)

IBIS VETO VDM06 high voltage breakdown: see INT_SC-410

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.

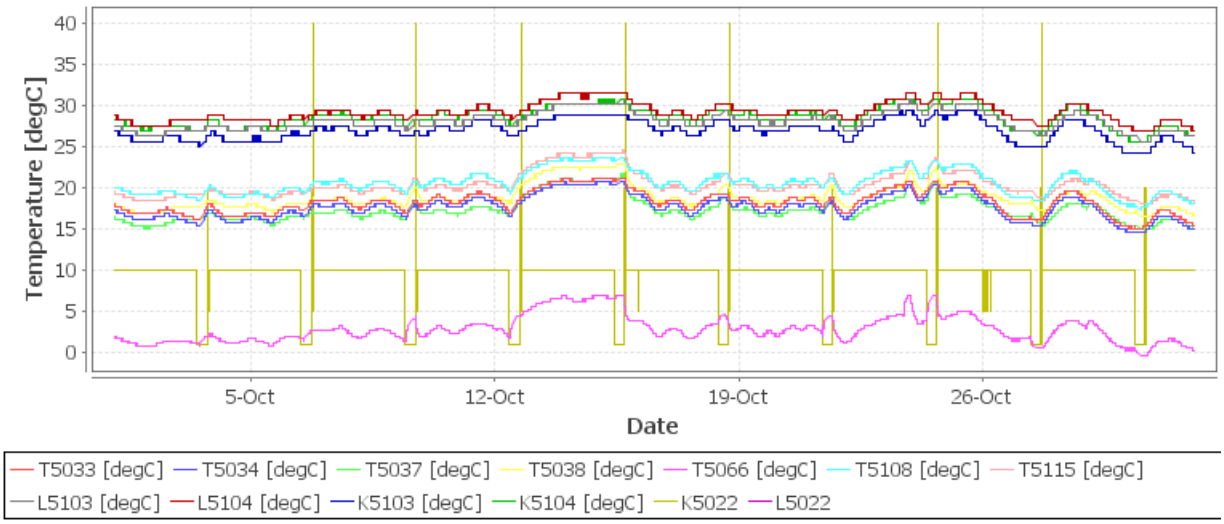


Figure 22: JEMX Detector and DFEE Temperatures

6.4.2 Event Log

06-10-2012 (Day of Year 280, Revolution 1219)

At 06:14, there was a command verifier crash, which interrupted the timeline and stopped the High Voltage activation of both JEMX-1 & JEMX-2. At 16:52, after a recovery, the instruments were manually reactivated. The impact was the loss of 23 minutes science time on both units.

25-10-2012 (Day of Year 299, Revolution 1225)

At 23:19:30, another command verifier crash again halted the JEMX EDs. At 23:59, after a recovery, the KEDATA02 & LEDATA02 EDs were resent. There was no impact, as JEMX was in Data-Taking throughout.

6.5 OMC

6.5.1 Operations

The status and performance of OMC is nominal.

6.5.2 Event Log

04-10-2012 (Day of Year 279, Revolution 1218)

At 13:59, a FD problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 14:55. The impact was the loss of pointing 12180025. It was at this time the following OEMs were received:

```
2012.278.14.51.30.968   2012.278.14.51.38.318   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E

2012.278.14.51.37.093   2012.278.14.51.45.270   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E
```

These correspond to the rejected M1130 (RESET IM) and MU1310 (IMAGING-A) commands sent from the auto-stack for that pointing.

05-10-2012 (Day of Year 279, Revolution 1218)

At 12:59, an AOCS problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 13:42. The impact was the loss of pointing 12180061. It was at this time the following OEMs were received:

```
2012.279.13.02.20.892   2012.279.13.02.25.987   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E

2012.279.13.02.27.017   2012.279.13.02.37.863   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E
```

These correspond to the rejected M1130 (RESET IM) and MU1310 (IMAGING-A) commands sent from the auto-stack for that pointing.

At 22:05, an AOCS problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 22:53. The impact was the loss of pointing 12180078. It was at this time the following OEMs were received:

```
2012.279.22.08.34.787   2012.279.22.08.41.729   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E

2012.279.22.08.40.912   2012.279.22.08.52.894   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E
```

These correspond to the rejected M1130 (RESET IM) and MU1310 (IMAGING-A) commands sent from the auto-stack for that pointing.

15-10-2012 to 18-10-2012 (Day of Year 289-292, Revolution 1222)

At 16:08, due to a planning software error, 3 DEBPG200 EDs were placed in the timeline instead of the required 2. This caused every second pointing to be rejected. The operator manually re-uplinked the pointing commands for a while. The impact was 42 pointings were lost and others cut short. There were 75 pairs of commands rejected causing the reception of OEMs like:

```
2012.289.16.08.03.495   2012.289.16.08.11.889   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E

2012.289.16.08.09.745   2012.289.16.08.17.801   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0     65535   PR    N      E   E
```

These correspond to the rejected M1130 (RESET IM) and MU1310 (IMAGING-A) commands sent from the auto-stack for those pointings.

25-10-2012 (Day of Year 299, Revolution 1225)

At 05:28, a FD problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 05:39. The impact was the loss of pointing 12250027.

At 23:19, the first command in the Flat-field sequence was rejected. This was because OMC was already in Flat-field calibration mode. Subsequently, the next parameter set was loaded and executed as normal. There was no impact.

```
2012.299.23.19.28.299   2012.299.23.19.30.587   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0    65535   PR    N     E   E
```

This corresponds to the rejected M1540 (FFCALIBRATE) command sent from the auto-stack for that calibration.

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.

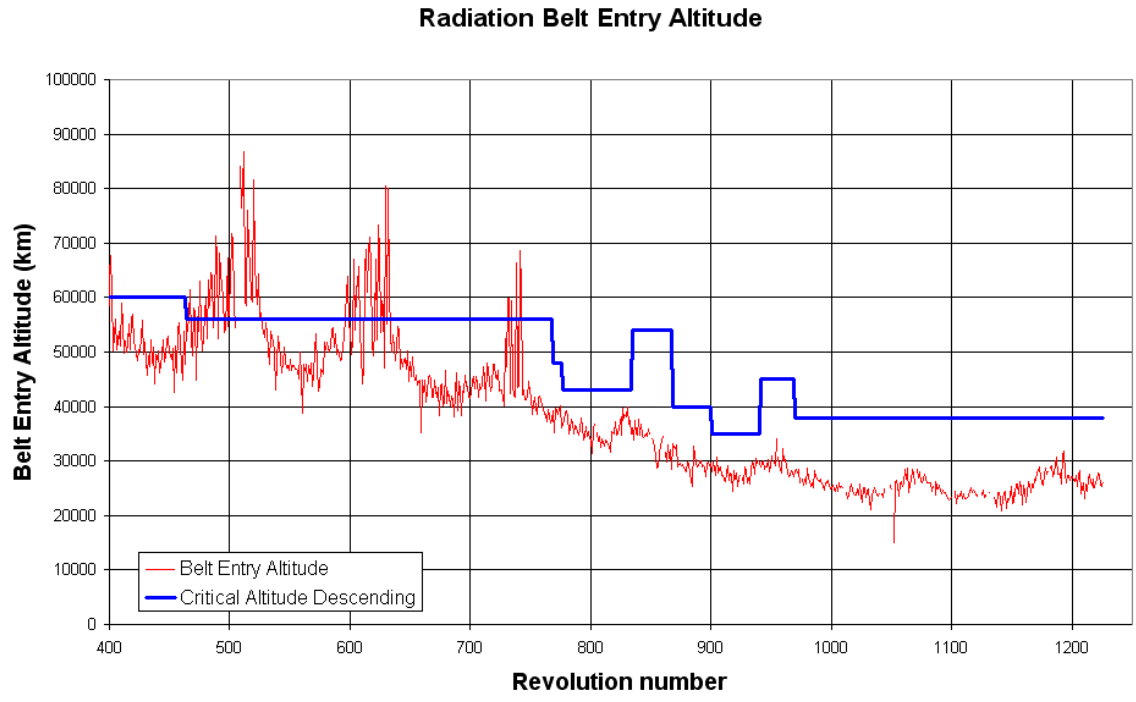


Figure 23: Radiation belt entry

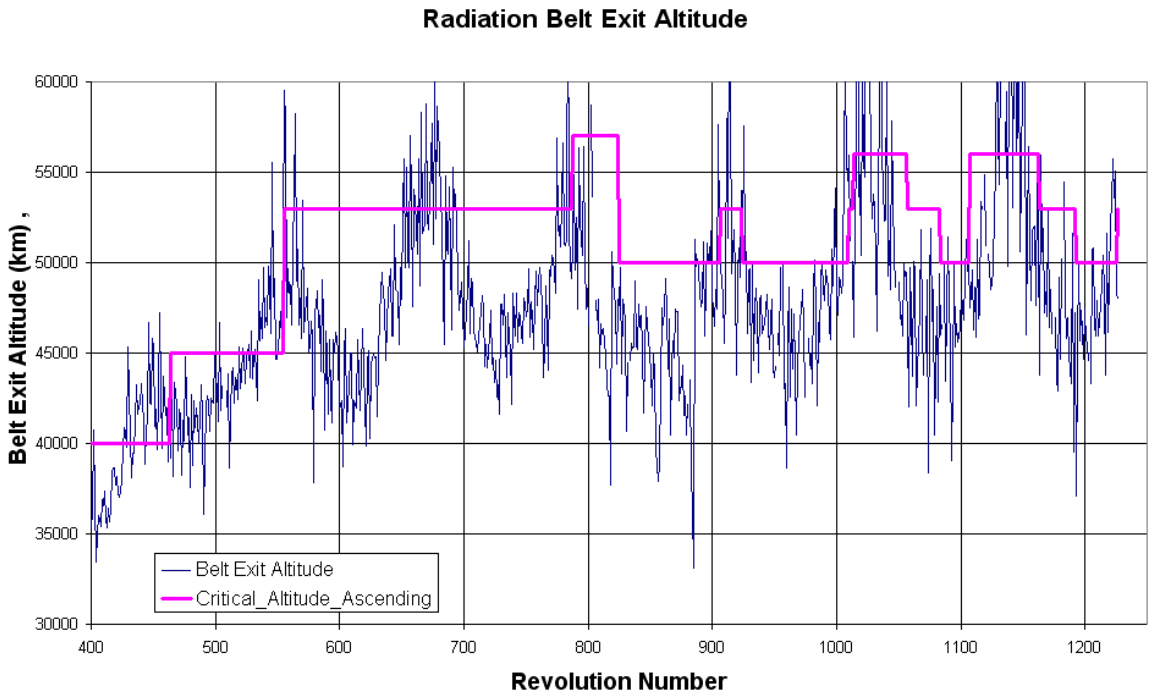


Figure 24: Radiation belt exit

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
1217	RAD_ENTR R 2012-10-03T09:27:22Z	N/A	N/A	03-Oct-2012 10:51:15	20302.63	03-Oct-2012 11:41:15	8301.266
1218	RAD_EXIT R 2012-10-03T16:10:31Z	03/10/2012 15:49:20	52863	03-Oct-2012 16:01:15	48699.98	03-Oct-2012 12:11:15	3625.066
1218	RAD_ENTR R 2012-10-06T09:13:20Z	N/A	N/A	06-Oct-2012 10:32:38	21558.53	06-Oct-2012 11:22:38	9611.008
1219	RAD_EXIT R 2012-10-06T15:56:46Z	06/10/2012 15:04:16	47445	06-Oct-2012 15:52:38	49414.52	06-Oct-2012 12:02:38	3691.47
1219	RAD_ENTR R 2012-10-	N/A	N/A	09-Oct-2012	19525.13	09-Oct-2012	9856.718

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
	09T08:59:49Z			10:28:30		11:08:30	
1220	RAD_EXIT R 2012-10-09T15:43:02Z	09/10/2012 15:25:44	53512	09-Oct-2012 15:38:30	49290.62	09-Oct-2012 11:48:30	3591.077
1220	RAD_ENTR R 2012-10-12T08:48:08Z	N/A	N/A	12-Oct-2012 10:12:27	20339.5	12-Oct-2012 11:02:27	8273.971
1221	RAD_EXIT R 2012-10-12T15:30:57Z	12/10/2012 15:16:25	53990	12-Oct-2012 15:22:27	48770.81	12-Oct-2012 11:32:27	3526.62
1221	RAD_ENTR R 2012-10-15T08:37:30Z	N/A	N/A	15-Oct-2012 10:02:49	20107.19	15-Oct-2012 10:42:49	10461.04
1222	RAD_EXIT R 2012-10-15T15:20:28Z	15/10/2012 15:34:17	58570	15-Oct-2012 15:12:49	48885.87	15-Oct-2012 11:22:49	3563.307
1222	RAD_ENTR R 2012-10-18T08:25:43Z	18/10/2012 09:44:09	28300	18-Oct-2012 09:46:56	20718.66	18-Oct-2012 10:36:56	8783.774
1223	RAD_EXIT R 2012-10-18T15:09:31Z	18/10/2012 15:00:57	54978	18-Oct-2012 15:06:56	49935.41	18-Oct-2012 11:06:56	3780.43
1223	RAD_ENTR R 2012-10-21T08:11:27Z	N/A	N/A	21-Oct-2012 09:36:49	20155.25	21-Oct-2012 10:16:49	10619.19
1224	RAD_EXIT R 2012-10-21T14:55:57Z	21/10/2012 15:09:45	58572	21-Oct-2012 14:56:49	50252.43	21-Oct-2012 10:56:49	3797.471
1224	RAD_ENTR R 2012-10-24T07:56:53Z	N/A	N/A	24-Oct-2012 09:18:57	20934.67	24-Oct-2012 10:08:57	9031.462
1225	RAD_EXIT R 2012-10-24T14:41:23Z	24/10/2012 13:59:21	49326	24-Oct-2012 14:38:57	49743.46	24-Oct-2012 10:48:57	3934.429
1225	RAD_ENTR R 2012-10-	N/A	N/A	27-Oct-2012 09:03:52	21276.29	27-Oct-2012 09:53:52	9386.239

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
	27T07:43:26Z						
1226	RAD_EXIT R 2012-10-27T14:46:57Z	27/10/2012 13:40:42	48403	27-Oct-2012 14:23:52	49496.09	27-Oct-2012 10:33:52	3851.503
1226	RAD_ENTR R 2012-10-30T07:29:52Z	N/A	N/A	30-Oct-2012 08:46:15	22046.08	30-Oct-2012 09:36:15	10262.03
1227	RAD_EXIT R 2012-10-30T14:34:01Z	30/10/2012 13:38:02	50222	30-Oct-2012 14:06:15	48822.37	30-Oct-2012 10:16:15	3873.674

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

Nothing to report.