EUROPEAN SPACE AGENCY

DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT

MISSION OPERATIONS DEPARTMENT

INTEGRAL

Mission report

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

No. 415

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Routine Phase

Prepared by: M. Walker (HSO-OAI) and INTEGRAL FCT

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	L. Paito	P. Ubertini (IBIS)	J. P. Roques (SPI)
	A. Mantineo	C. Brysbaert (SPI)	M. M. Hesse (OMC)
INTEGRAL/XMM Flight Dynamics team			
INTEGRAL/XMM Flight Control team			

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 November and covers the revolutions 1227 untill 1237 (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, 697 of the 704 planned science pointings. 3 pointings were lost and 1 interrupted due to AOCS problems, 2 pointings were lost and 1 interrupted due to FD problems.

- Earth Observations 2.5 (20-21/11/2012)
- Set up and validation of Kiruna G/S; Regular Kiruna passes start 12/12/2012
- Battery 2 Reconditioning 6/11/2012
- Raise of belts exit altitude from rev. 1233 to 56000km
- Eclipse season #22 from 29/11/2012 to 01/01/2013

Summary of the overall status and performance of S/C

- Nominal for platform and payload
- IBIS Veto off after LCL flip

Summary of the overall status and performance of the ground segment

- Ongoing occasional RFI at Redu, some sources identified, filter installed for testing
- Ongoing occasional interruptions to ISDS-ISDC link
- MCCM reported sw discrepancy on imcb
- AOCS deviations during EO2.5

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 0.5664 Kg. The remaining propellant is in the order of 108.9880 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 2012-11-20T13:39:59Z to 2012-11-21T03:16:29Z during the Earth observation when it was 85. The average telemetry occupation when the allocation was 89 packets/cycle was 71.2 packets/cycle.

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

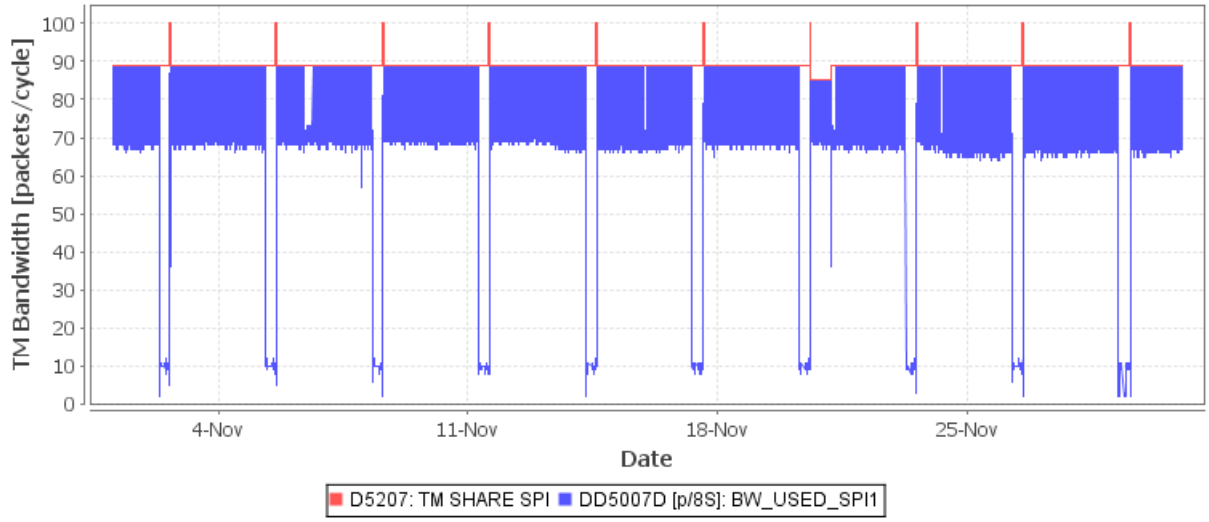


Figure 1: SPI TM bandwidth utilisation

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

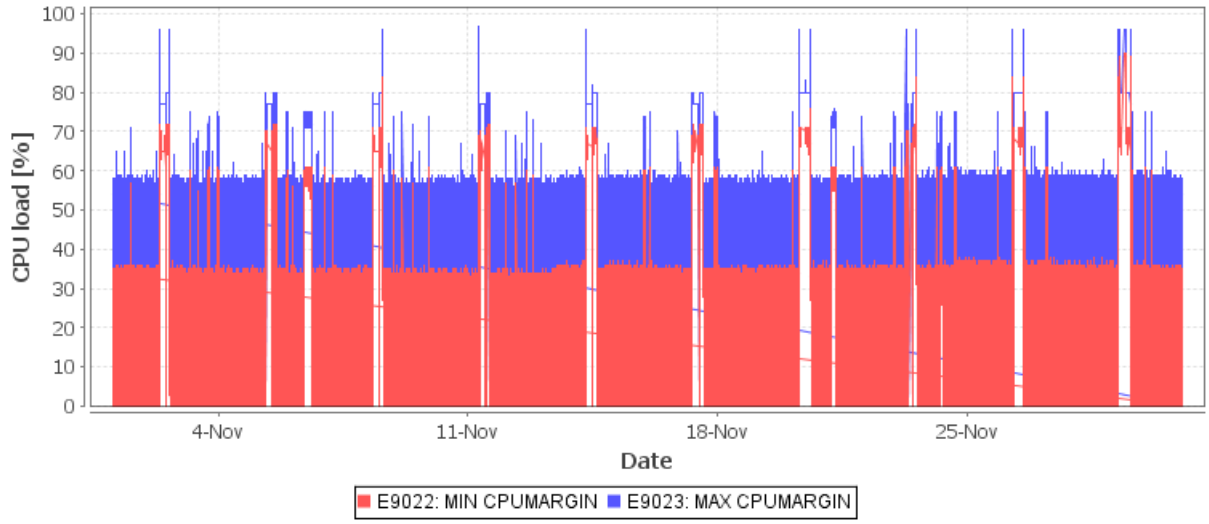


Figure 2: SPI IASW Performance

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

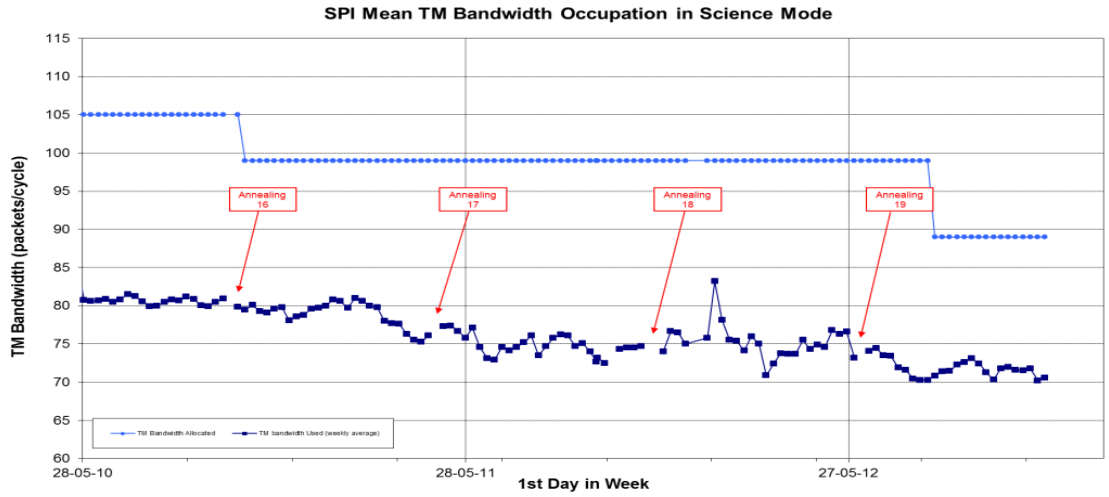


Figure 3: SPI TM bandwidth usage evolution since May 2010

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.
- IBIS mean bandwidth utilisation in science mode: 97.5 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.

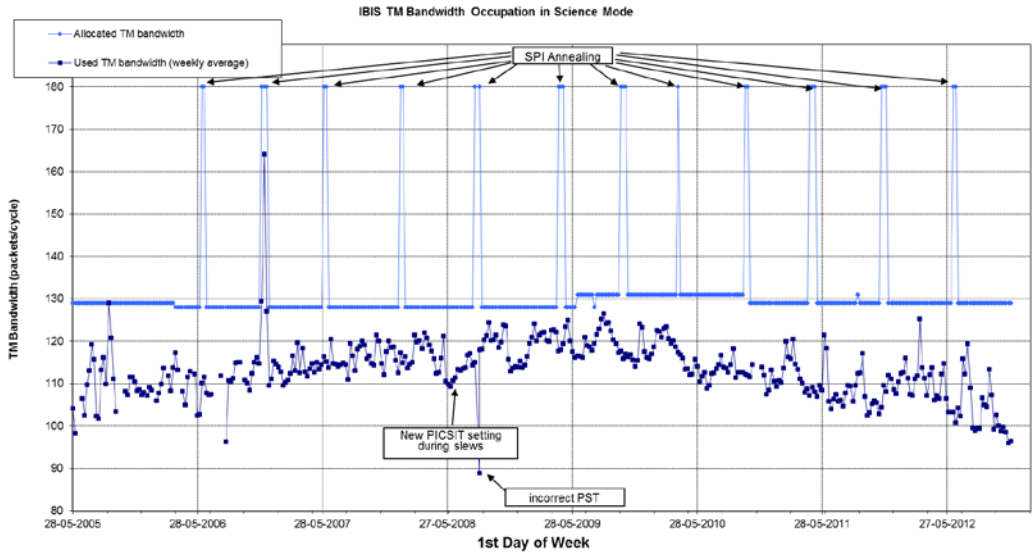


Figure 5: IBIS TM bandwidth usage evolution since May 2005

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 13 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 2012-11-20T13:39:59Z to 2012-11-21T03:16:29Z during the Earth Observation, when it was 9 packets/cycle.

During this reporting period, 697 of the 704 planned science pointings. 3 pointings were lost and 1 interrupted due to AOCS problems, 2 pointings were lost and 1 interrupted due to FD problems.

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

2.2.5 IREM

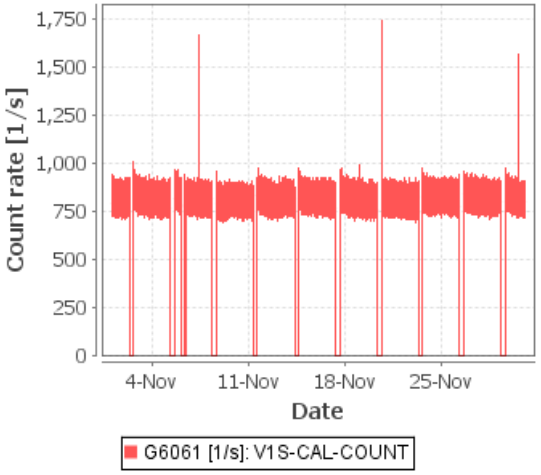
The status of IREM is nominal.

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

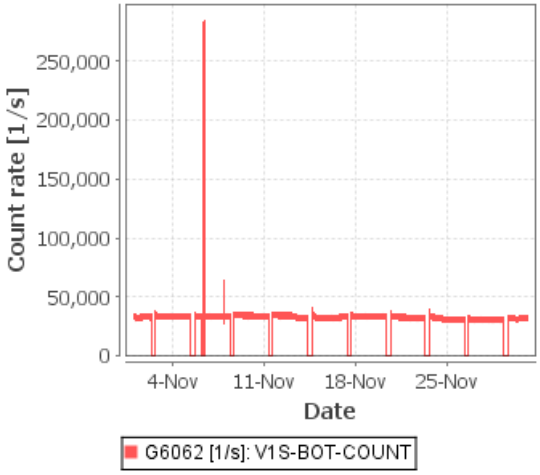
Radiation background

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:

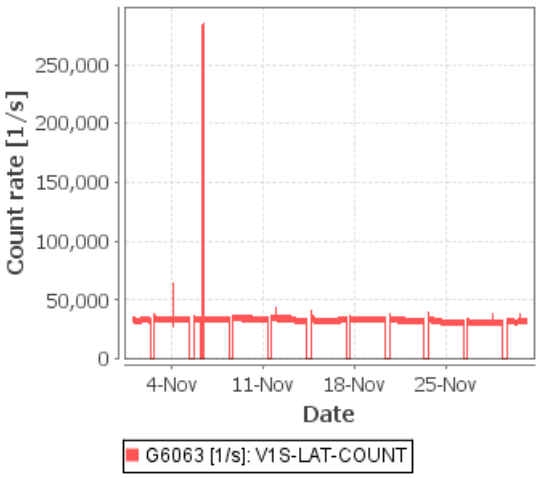
VETO Calibration Source Count Rate



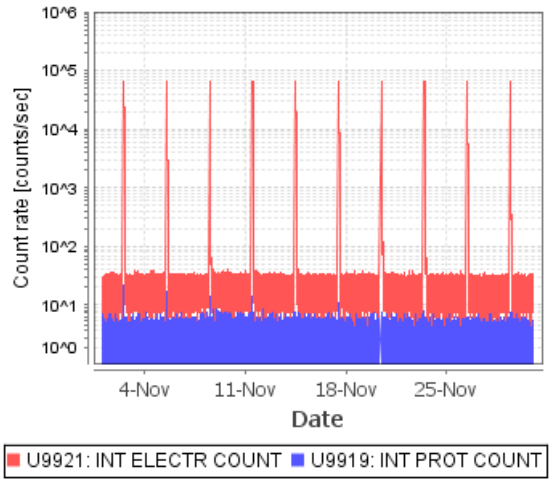
VETO Bottom Count Rate



VETO Lateral Count Rate



IREM Proton & Electron Counters[1]



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

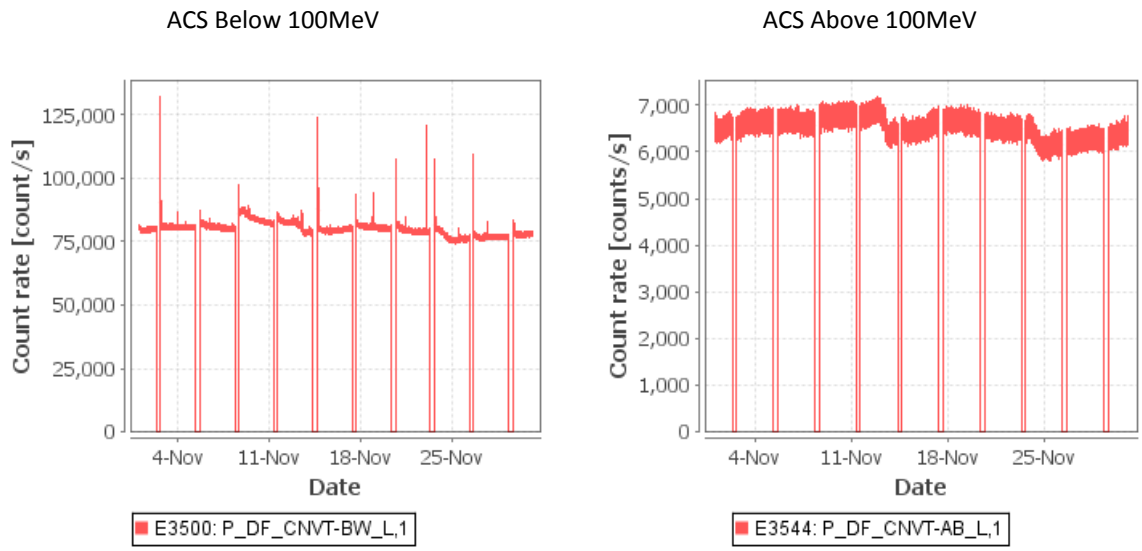


Figure 6: Instrument Count Rates

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

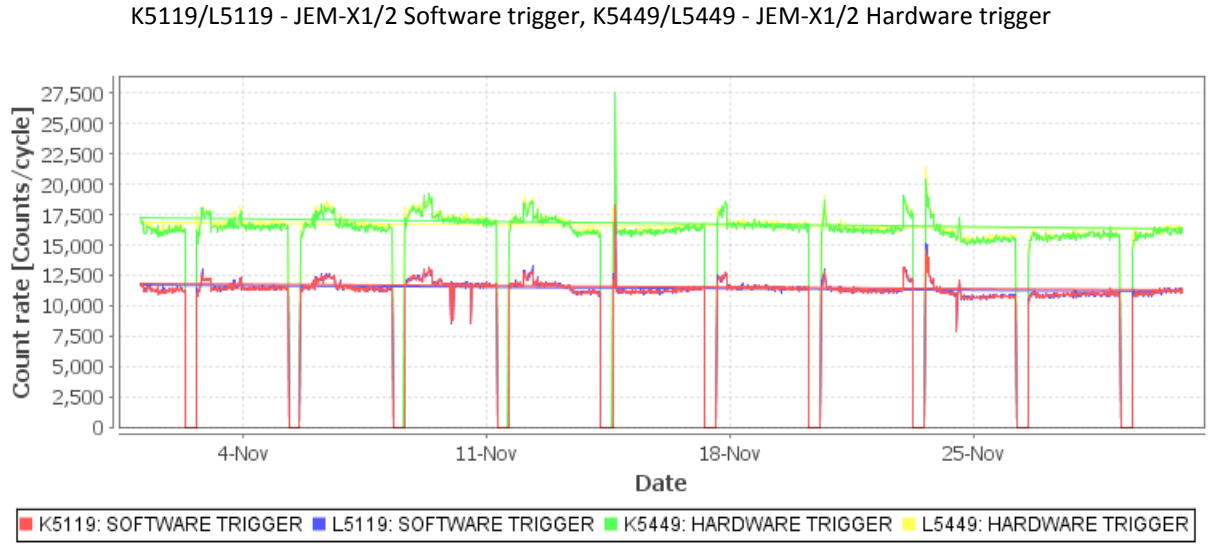


Figure 7: JEM-X Count rates. The smaller downward spikes in the figure are due to the slews of the spacecraft

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.

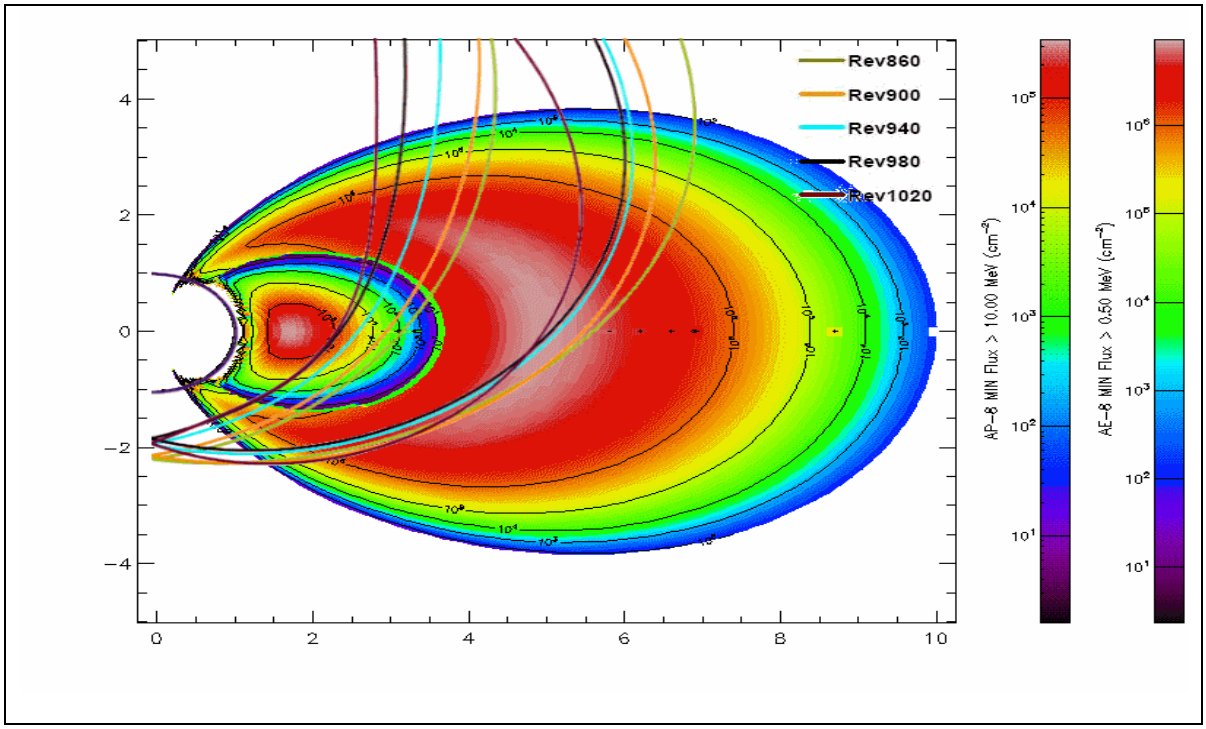


Figure 8: The predicted evolution of the orbit of Integral through the radiation belts

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.

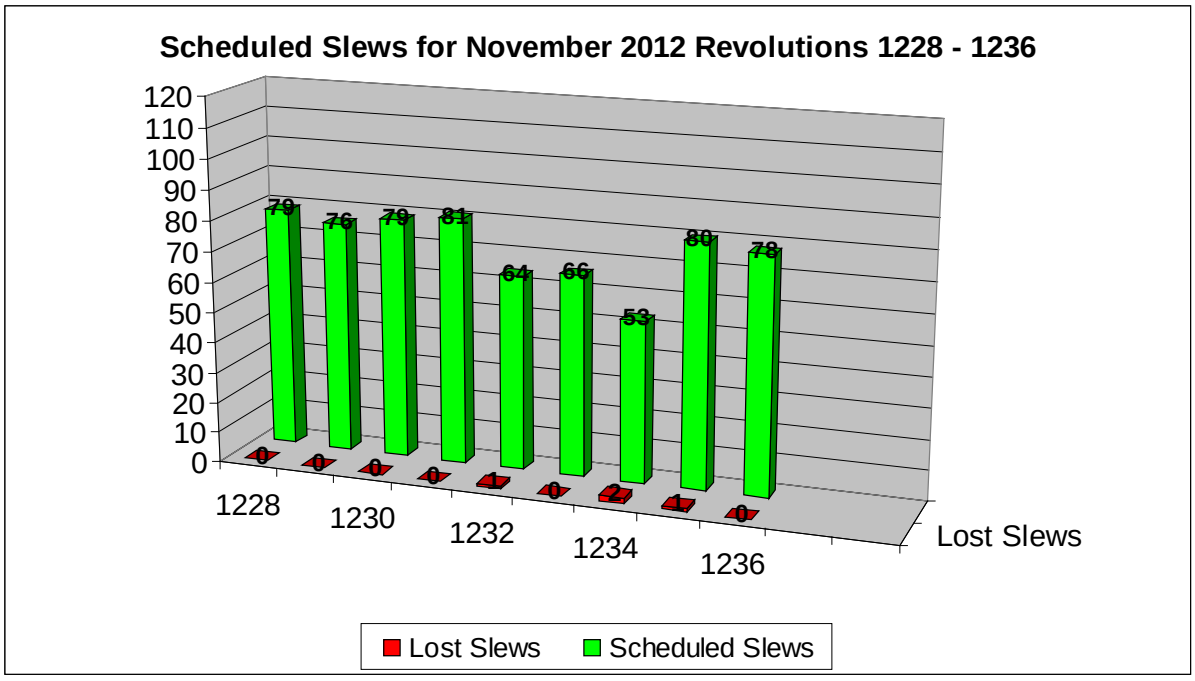


Figure 9: The number of slews scheduled compared to the number of slews lost

3.1 Mission Control System

IFTS had to be restarted 2 times for sending data to ISDC again. The MCS raised many times the message 'Error sending data to ISDS' on A-Chain. ISDS and IFRD got restarted several times. According to digilog those problems happened at least 7 times in this month.

OMCH crashed on the 5th and 12th and was restarted by the Spacon. Same once to the stacks directly after AOS. Once the stacks showed no G/S link: the MCS TC link was recycled on inctra, afterwards the TC chain restarted to cure the wrong information.

The AUX and ARCH tasks have been restarted on idda twice to resume the CD production. No OLF files were received for some hours at the end of the month. Analyst informed and problem cured by restarting IFTS.

3.2 Ground Stations and Network

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

- On DOY 306 at 17:06, during Redu-1 support, data gaps occurred due to RFI, ca. 4 minutes duration. Both D/L chains were affected. This RFI did not correspond to any incident predicted by Flight Dynamics.

- On DOY 309 at 02:51, during Redu-1 support, data gaps occurred due to RFI from JASON-1. Both D/L chains were affected.

- On DOY 309 at 04:42, 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, but is possibly linked to
the RFI from JASON-1 at 04:48.

- On DOY 309 at 04:48, during Redu-1 support, data gaps occurred due to RFI from JASON-1. Both D/L chains were affected.

- On DOY 310 at 05:29, during Redu-1 support, data gaps occurred due to RFI from SMOS. Both D/L chains were affected.

- On DOY 312, during pre-pass configuration for VIL-2 support, IFMS-1 could not be controlled by the STC. ECC configured for IFMS-2 as prime, but at low elevation the signal level was marginal,
so that some TM frames were lost. ECC swapped support back to Redu-1, which was only possible because the station staff gave up part of their scheduled maintenance slot.
At ca. 12:10, once Maspalomas had visibility of Integral and was above 5 degrees elevation, support was swapped from Redu-1 to Maspalomas.
VIL-2 station staff identified the problem with IFMS-1 as a hard disk problem, which was solved by them executing a file system recovery, after which VIL-2 STC could connect to IFMS-1 again as normal.

- On DOY 312 at 17:28, during Maspalomas 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 313 starting at ca. 11:07 during Redu-1 support, VC 7 telemetry intermittently went to drop. CCC reported that the leased line to Redu was down, and that the ISDN had been brought up. CCC brought the ISDN down again at 15:21, after the leased line had been stable for four hours.

- On DOY 314 at 06:12, 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 314 at 16:20, during VIL-2 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 315 at 00:54, during Redu-1 support, data gaps occurred due to RFI from JASON-1. Both D/L chains were affected.

- On DOY 317 at 10:06, 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 320 at 10:00, 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 324 at 01:20, 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 326 at 04:06, 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 327 at 17:22, 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 330 at 04:36, 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 332 at 01:10, 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 332 at 09:04, during VIL-2 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 335 at 08:53, during VIL-2 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 336 at 07:11, during VIL-2 support, the track was stopped by an STC schedule step executing early. This issue is under investigation by STC s/w support, but likely to be a recurrence of a known problem, for which a patch is already available. To be checked whether this STC database version already includes the patch.

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.

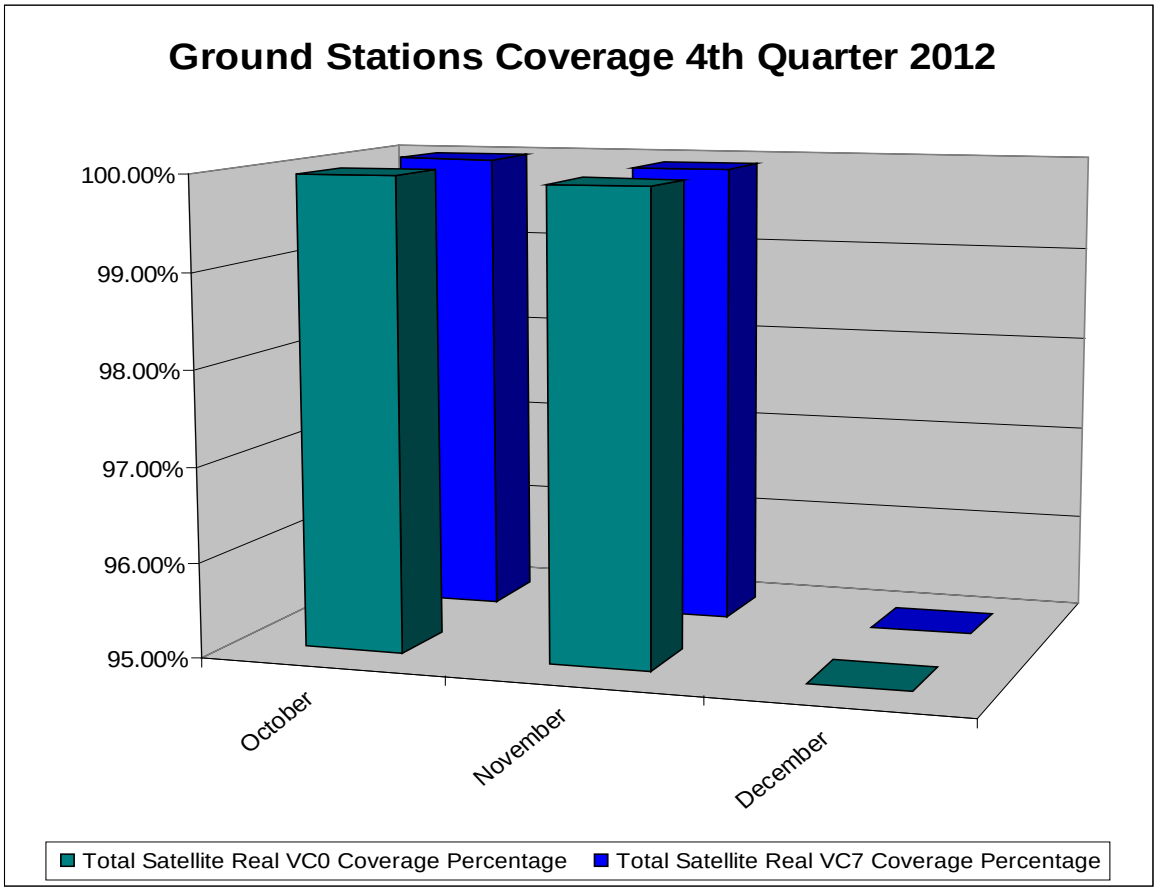


Figure 10: Comparison of VC0 to VC7 coverage

3.3 ISOC

3.3.1 Mission Planning

New or updated PSFs have been received for revolutions 1236 to 1246, corresponding to the time range 26 November to 29 December. The PSFs received before 21 November had to be redone, due to an error in the generating software and all subsequent work repeated.

New observations have been planned for revolutions 1236 (26-29 November) to 1242 (14-17 December) with 1236 to 1241 being repeated due to the PSF changes.

TSFs have been received for revolutions 1229 to 1241.

3.3.2 Observation Status

New ECS files have been for revolutions 1212 to 1224, covering observations up to 24 October.

3.3.3 ISOC Science Data Archive

Miguel Arregui took over the work previously done by Silvia de Castro. The raw telemetry data is mostly complete up to 27 October.

3.3.4 ISOC System

ISOC system V33.2 was released on 13 November, fixing a memory bug in the scheduling software among smaller issues.

3.3.5 Problems

On first try, no bias could be found at MOC for revolutions 1236-1238. This was resolved by making sure a RWB was implemented after the first pointing of each GPS.

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-3310	2012-11-09	YTIM threshold discrepancy found in FD input	FDS	Testing
INT-3311	2012-11-15	Killing a task via MCCM does not work	IMCS	Pending
INT-3312	2012-11-15	MCCM reported sw discrepancy on imcb	IMCS	Pending
INT-3313	2012-11-16	Extra lines inserted into 1236_02.PSF	FDS	Open
INT-3314	2012-11-19	AOCS deviations during EO2.5	FDS	Pending
INT_SC-411	2012-11-06	IBIS Veto off after LCL flip	Payload	Pending

5 Special Events & Future Milestones

Virtualised Solaris environments
MCS development
Set up and validation of Kiruna
Eclipse season ends 04/01/2013
SPI annealing starts 03/01/2013
Testing IMCS on Solaris 10
IMCS E3.6.0 - Validated on DEV LAN and installed on C-Chain for testing (timeline regression test ongoing)

6 Appendix

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

6.1 AOCS operations

During this period, 455 Open Loop Slews, 308 Closed Loop Slews and 26 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 01/12/2012 is reported in the following plot:

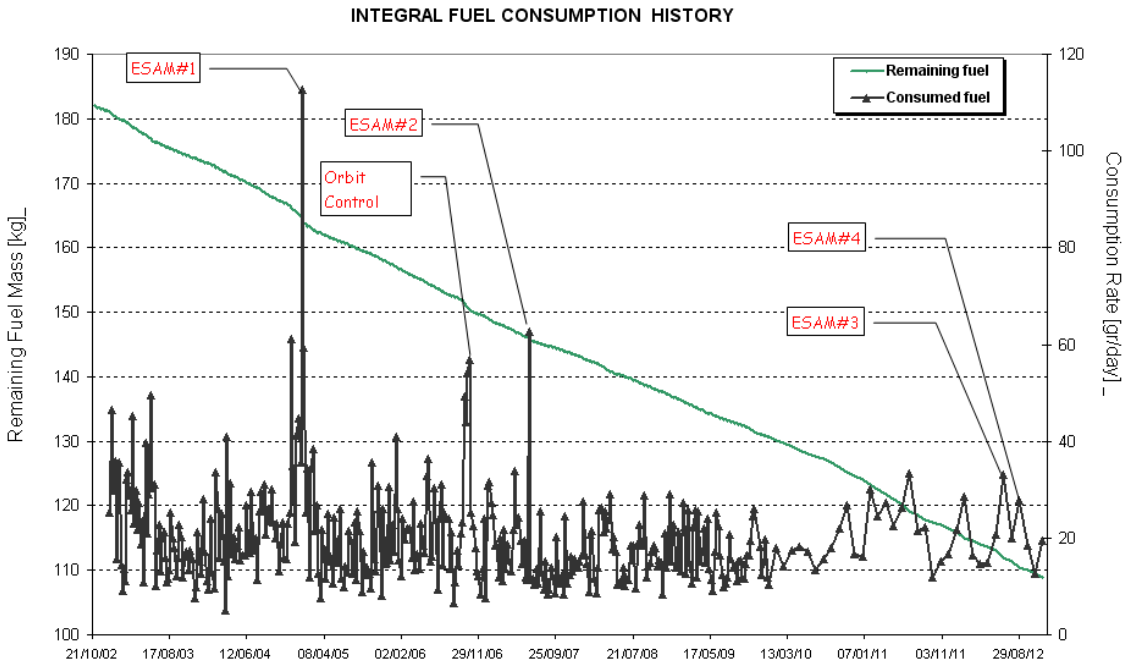


Figure 11: Fuel consumption. Note: ESAM fuel consumption is spread over period of ~1 week.

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.

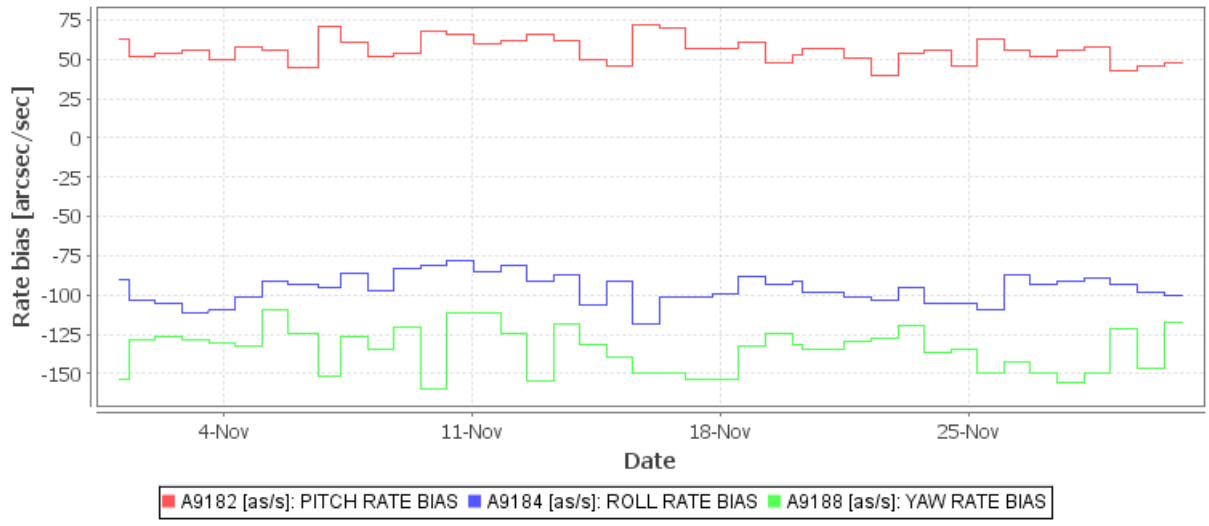


Figure 12: RMU pitch, roll and yaw. Historic data is available on request

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,..). In the following, only the AOCS anomalies are listed which occurred during the reporting period.

19-11-2012 (Day of Year 324-325, Revolution 1233-1234)

AOCS deviations during EO2.5: see INT-3314

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 vertical line correspond to the first eclipse of this eclipse season.

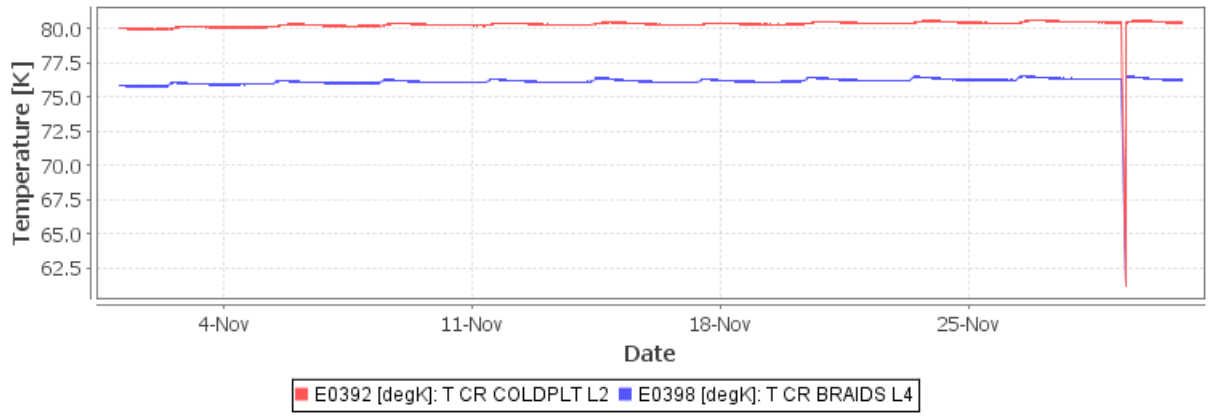


Figure 13: SPI Cold plate and H-bus temperature

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

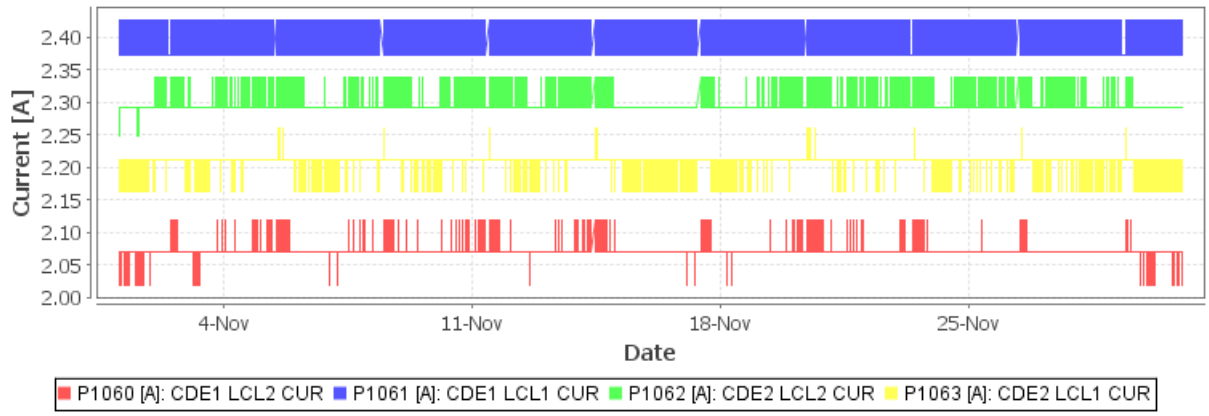


Figure 14: SPI CDE LCL current

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.

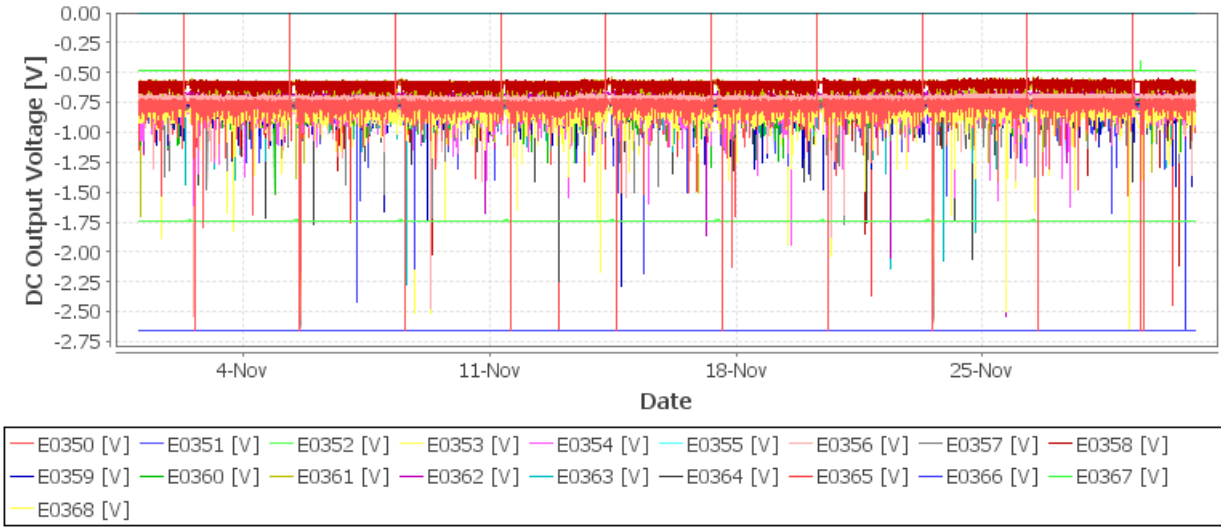


Figure 15: AFEE DC Output Voltages. Note that the data is sampled every 8th packet (64sec)

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.

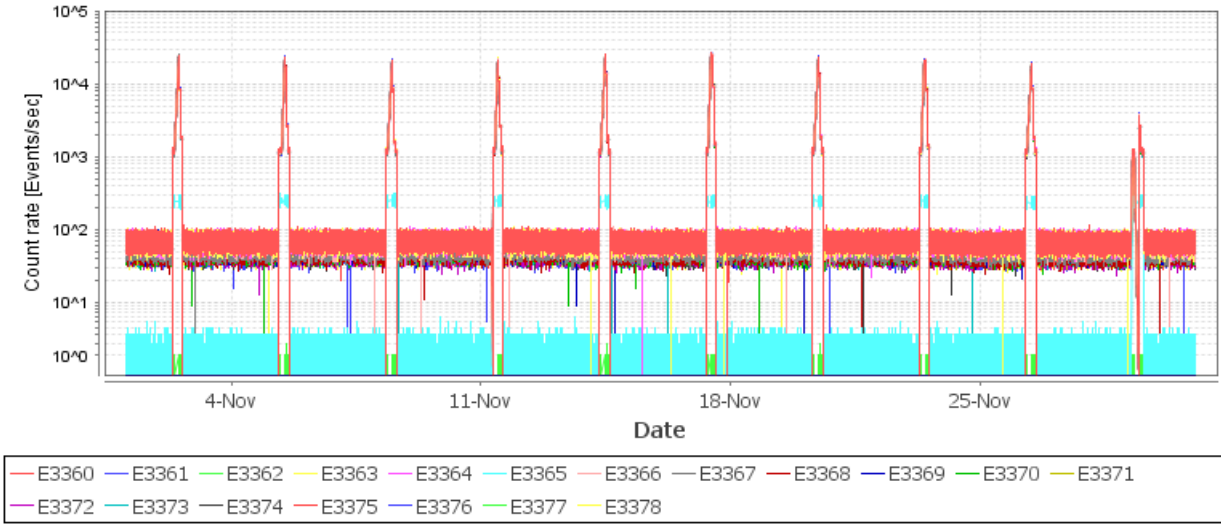


Figure 16: SPI GeD Non-Vetoed count rates. Note that the scale used for plotting is logarithmic.

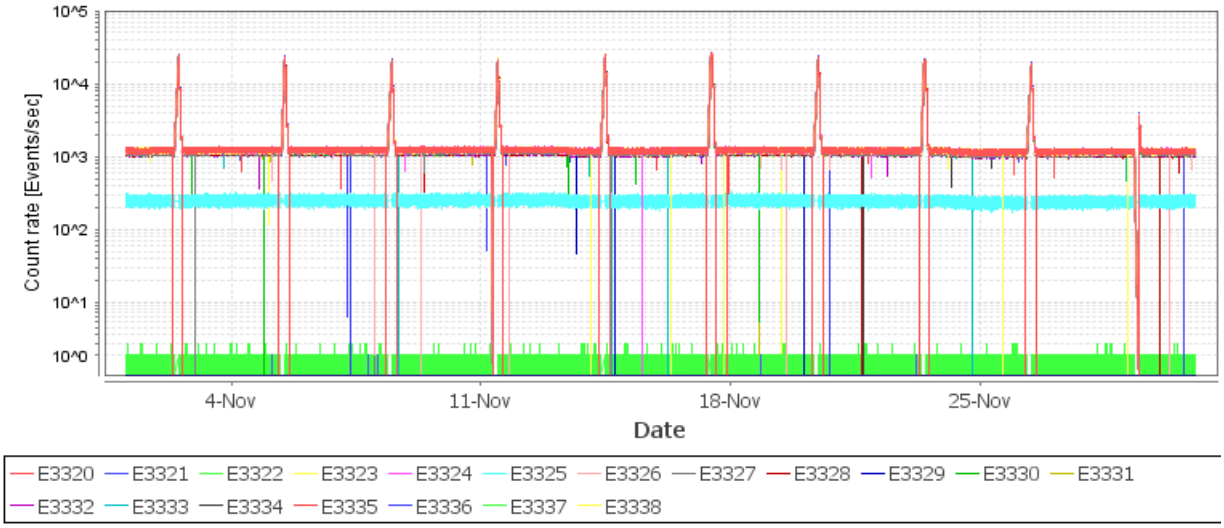


Figure 17: SPI GeD Time Tagged count rates. Note that the scale used for plotting is logarithmic.

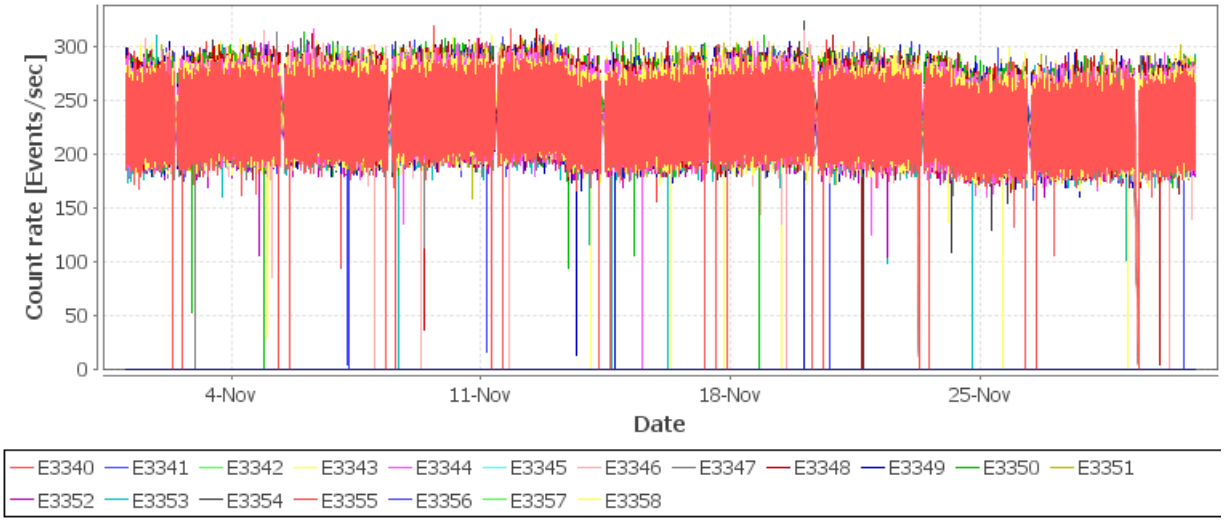


Figure 18: SPI GeD Time Tagged Saturated count rates

PSD

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

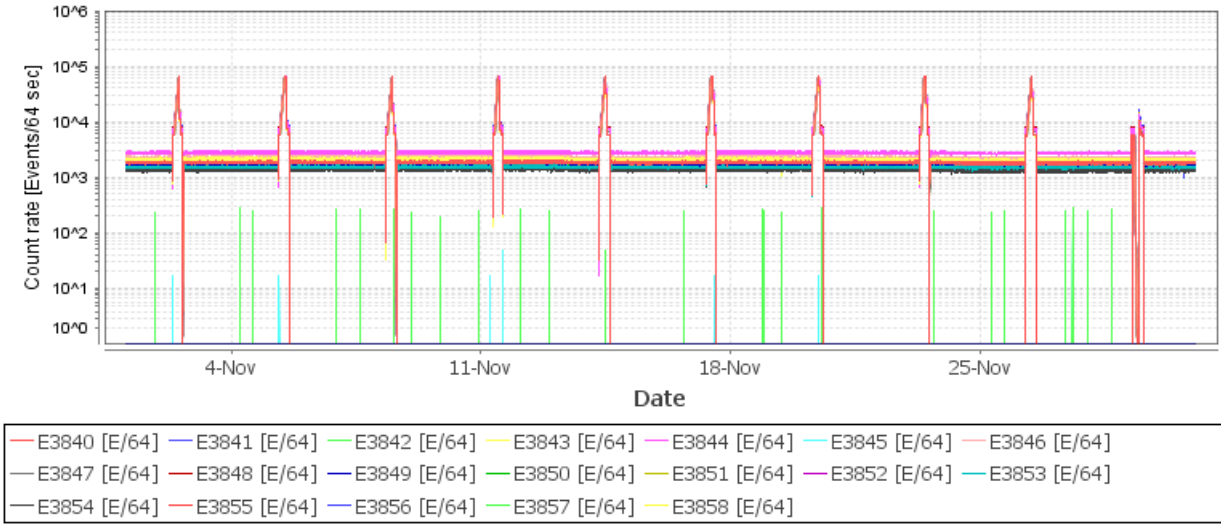


Figure 19: SPI PSD GeD Channel rates

6.2.2 Event Log

No SPI anomalies occurred in the reporting period.

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:

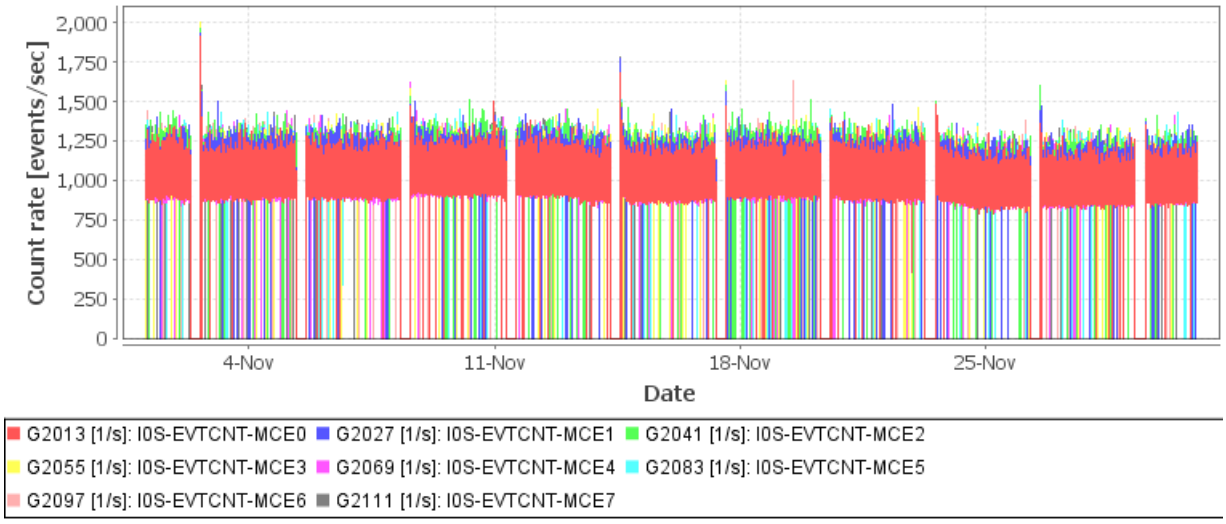


Figure 20: ISGRI MCE Counters

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.

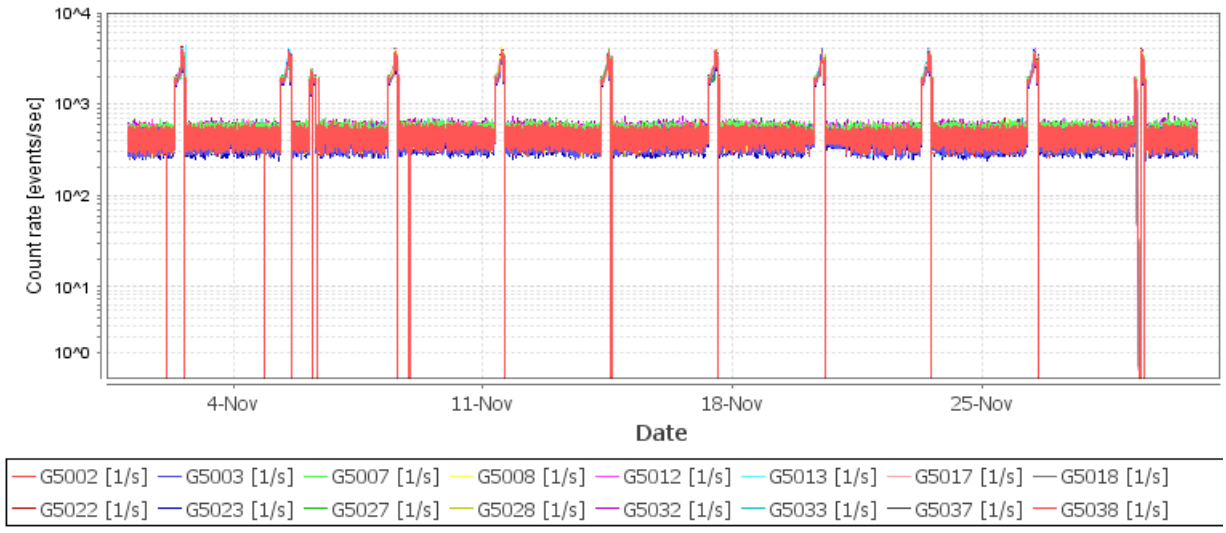


Figure 21: PICsIT semi-module counters. Note that the scale used for plotting is logarithmic.

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

06-11-2012 (Day of Year 311, Revolution 1229)

SEU on IBIS VETO Electronic Box LCL switched off VETO: see INT_SC-411

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.

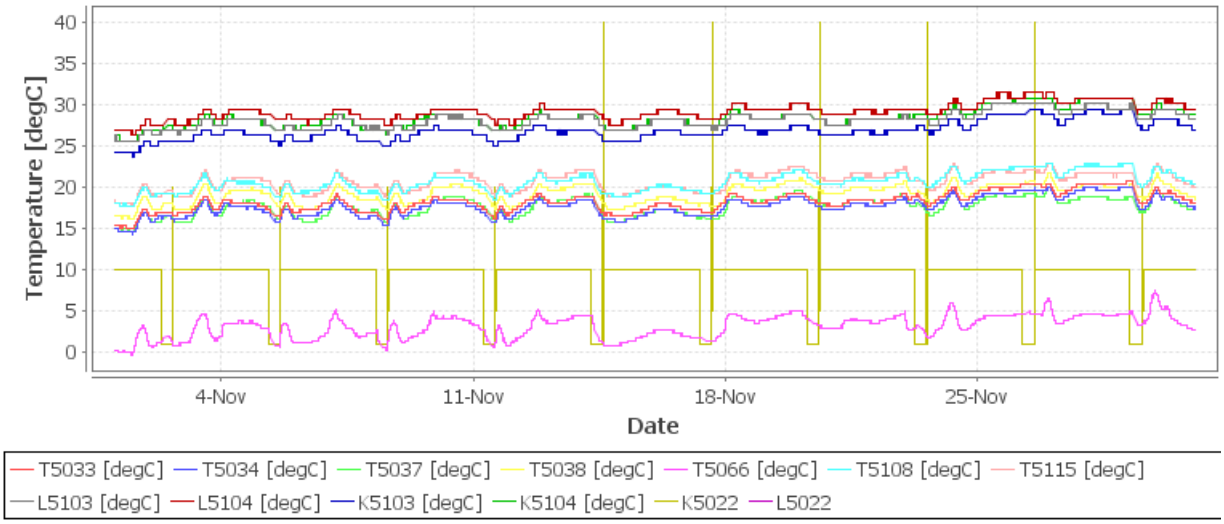


Figure 22: JEMX Detector and DFEE Temperatures

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

15-11-2012 (Day of Year 320, Revolution 1232)

At 21:47, an FD problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 22:35. The impact was pointing 12320033 was cut short from a planned 3556 to 2784 seconds.

16-11-2012 (Day of Year 321, Revolution 1232)

At 00:06, an FD problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 01:38. The impact was the loss of pointing 12320036. It was at this time the following OEMs were received:

```
2012.321.01.01.35.839   2012.321.01.01.43.625   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0    65535   PR    N     E   E

2012.321.01.01.42.089   2012.321.01.01.51.291   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.

21-11-2012 (Day of Year 326, Revolution 1234)

At 04:42:27, an AOCS problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 06:49. The impact was pointing 12340002 was executed late and at the wrong attitude, pointing 12340004 was missed, and pointing 12340005 was cut short from a planned 3479 to 961 seconds.

24-11-2012 (Day of Year 329, Revolution 1235)

At 05:09, a lost guide star forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 05:39. The impact was the loss of pointing 12350023.

25-11-2012 (Day of Year 329, Revolution 1235)

At 18:54, a FD problem forced an interruption to the timeline. A recovery was performed, and the timeline rejoined at 20:05. The impact was the loss of pointing 12350069. It was at this time the following OEMs were received:

```
2012.330.19.42.14.781   2012.330.19.42.20.045   1792   RealTime   131     TC REJECT   REJECTED
TC1                                             0       0    65535   PR    N     E   E

2012.330.19.42.20.781   2012.330.19.42.31.708   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.

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.

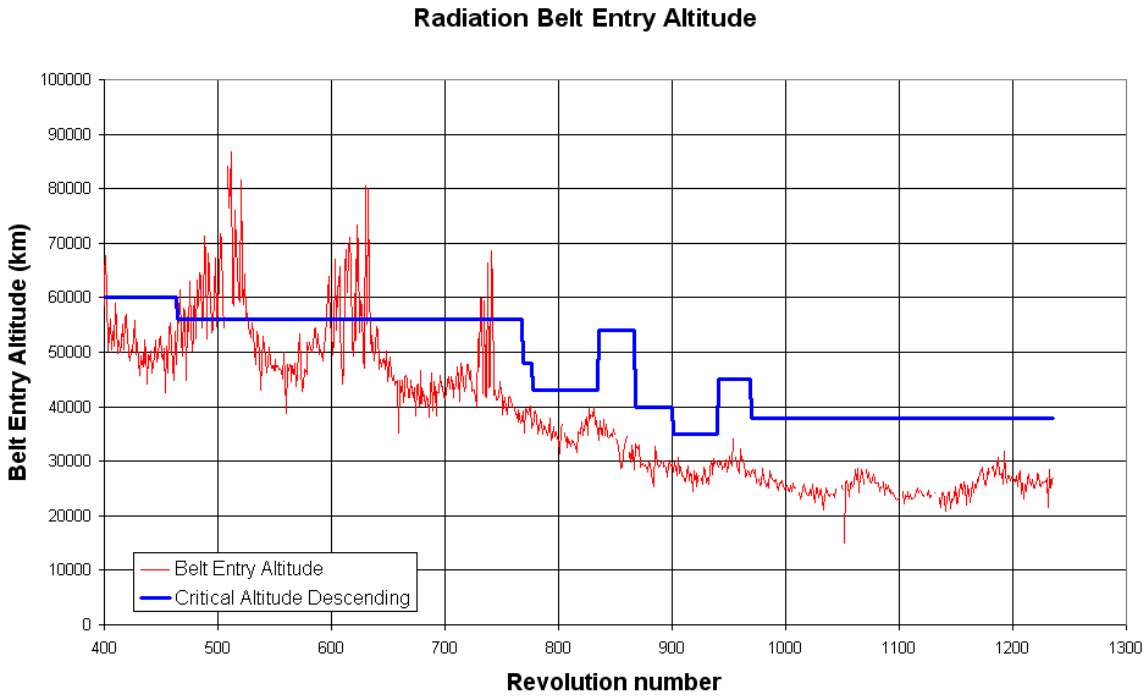


Figure 23: Radiation belt entry

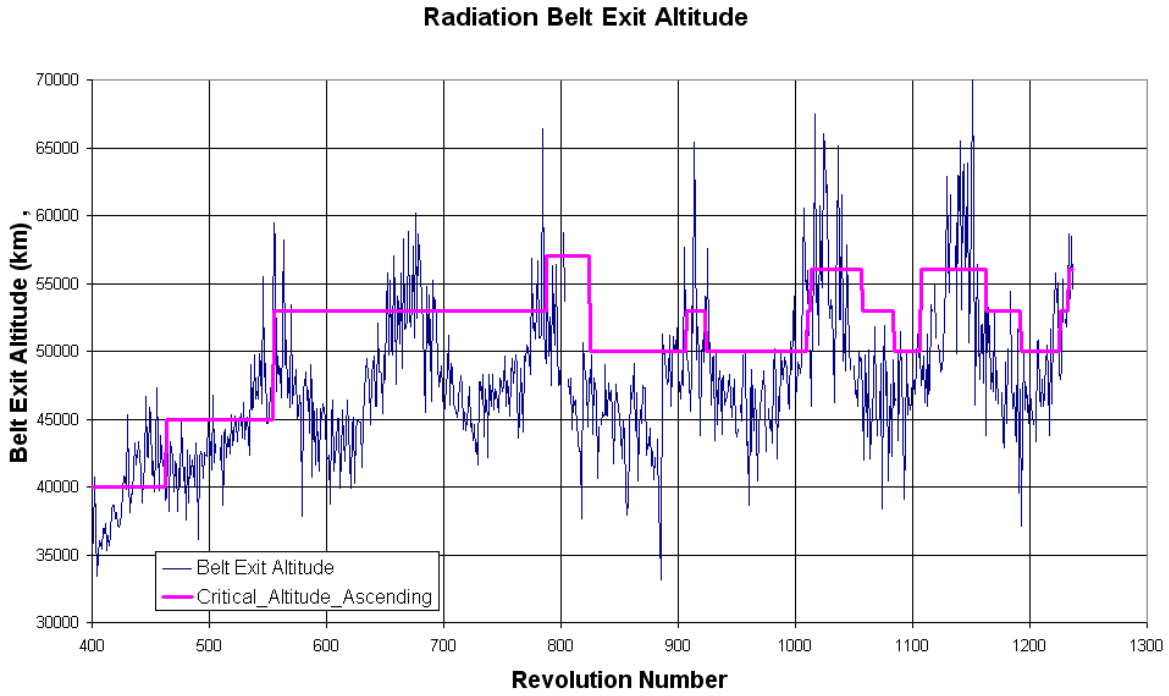


Figure 24: Radiation belt exit

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
1227	RAD_ENTR R 2012-11-02T07:15:43Z	N/A	N/A	02-Nov-2012 08:38:10	20866.61	02-Nov-2012 09:28:10	9072.859
1228	RAD_EXIT R 2012-11-02T14:20:22Z	02/11/2012 14:20:02	59354	02-Nov-2012 13:58:10	49616.62	02-Nov-2012 10:08:10	4108.818
1228	RAD_ENTR R 2012-11-05T07:01:50Z	N/A	N/A	05-Nov-2012 08:18:28	22207.74	05-Nov-2012 09:08:28	10441.05
1229	RAD_EXIT R 2012-11-05T14:06:27Z	05/11/2012 13:44:18	55858	05-Nov-2012 13:48:28	50308.99	05-Nov-2012 09:48:28	3888.144
1229	RAD_ENTR R 2012-11-	N/A	N/A	08-Nov-2012	21661.42	08-Nov-2012	9841.064

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
	08T06:49:39Z			08:09:00		08:59:00	
1230	RAD_EXIT R 2012-11-08T13:54:03Z	08/11/2012 13:20:34	53989	08-Nov-2012 13:29:00	49129.97	08-Nov-2012 09:39:00	3871.902
1230	RAD_ENTR R 2012-11-11T06:38:42Z	N/A	N/A	11-Nov-2012 07:55:40	21922.69	11-Nov-2012 08:45:40	10144.36
1231	RAD_EXIT R 2012-11-11T13:43:18Z	11/11/2012 13:09:30	53919	11-Nov-2012 13:15:40	48887.98	11-Nov-2012 09:25:40	3898.405
1231	RAD_ENTR R 2012-11-14T06:27:03Z	N/A	N/A	14-Nov-2012 07:48:57	21346.56	14-Nov-2012 08:38:57	9634.308
1232	RAD_EXIT R 2012-11-14T13:32:35Z	14/11/2012 13:19:15	57220	14-Nov-2012 13:08:57	49159.07	14-Nov-2012 09:18:57	4108.239
1232	RAD_ENTR R 2012-11-17T06:12:44Z	17/11/2012 07:27:39	29373	17-Nov-2012 07:37:35	20784.43	17-Nov-2012 08:27:35	9135.396
1233	RAD_EXIT R 2012-11-17T13:38:53Z	17/11/2012 13:16:51	58937	17-Nov-2012 12:57:35	49452.17	17-Nov-2012 08:57:35	4272.616
1233	RAD_ENTR R 2012-11-20T05:57:46Z	N/A	N/A	20-Nov-2012 07:21:34	20861.05	20-Nov-2012 08:11:34	9195.059
1234	RAD_EXIT R 2012-11-20T13:24:02Z	20/11/2012 12:49:39	56982	20-Nov-2012 12:41:34	49421.43	20-Nov-2012 08:51:34	4291.53
1234	RAD_ENTR R 2012-11-23T05:44:05Z	N/A	N/A	23-Nov-2012 07:06:35	21098.48	23-Nov-2012 07:56:35	9432.897
1235	RAD_EXIT R 2012-11-23T13:10:26Z	23/11/2012 14:23:15	72577	23-Nov-2012 12:26:35	49252.8	23-Nov-2012 08:36:35	4233.18
1235	RAD_ENTR R 2012-11-	N/A	N/A	26-Nov-2012 06:51:42	21220.19	26-Nov-2012 07:41:42	9627.465

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
	26T05:30:51Z						
1236	RAD_EXIT R 2012-11-26T12:57:50Z	26/11/2012 12:55:15	61938	26-Nov-2012 12:11:42	49050.65	26-Nov-2012 08:21:42	4318.532
1236	RAD_ENTR R 2012-11-29T05:17:05Z	N/A	N/A	29-Nov-2012 06:34:56	22093.5	29-Nov-2012 07:24:56	10561.28
1237	RAD_EXIT R 2012-11-29T12:44:37Z	29/11/2012 11:55:39	54741	29-Nov-2012 12:04:56	49966.37	29-Nov-2012 08:04:56	4319.369

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.