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

INTEGRAL
Mission report

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

No. 390

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Routine Phase

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Distribution List

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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 November and covers the revolutions 983 until 992 (included). The targets of these revolutions can be found on the ISOC web: <http://integral.esac.esa.int/isocweb/schedule.html?action=intro> .

The previous weekly and monthly reports are available at the XMM-INTEGRAL website: <http://xmm.esoc.esa.int/documentation/documentation.php3> .

2 Satellite status

2.1 Platform

2.1.1 AOCS

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

No statistics are given this month due to absence of the AOCS engineer.

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; available power from the arrays is of the order of 2100W.

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 16th SPI annealing, which ended on 28/10/2010, 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 2010-11-24T05:55:12Z to 2010-11-24T09:29:00Z (OMC Flat Field Calibration), when it was 88 packets/cycle. The average telemetry occupation when the allocation was 99 packets/cycle was 79.5 packets/cycle (average over entire month).

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

Plot not available

Figure 1: SPI TM bandwidth utilisation

The following plot shows the DPE CPU load during the reporting period:

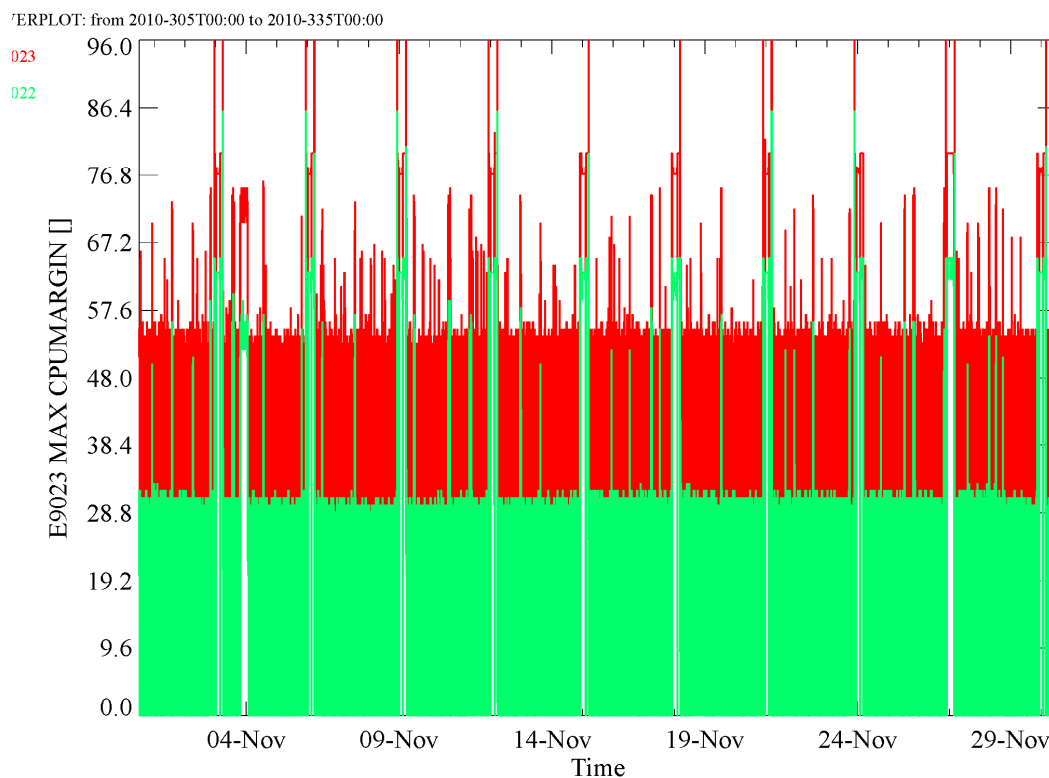


Figure 2: SPI IASW Performance. Red = E9023 – CPU MAX, Green = 9022 – CPU MIN

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

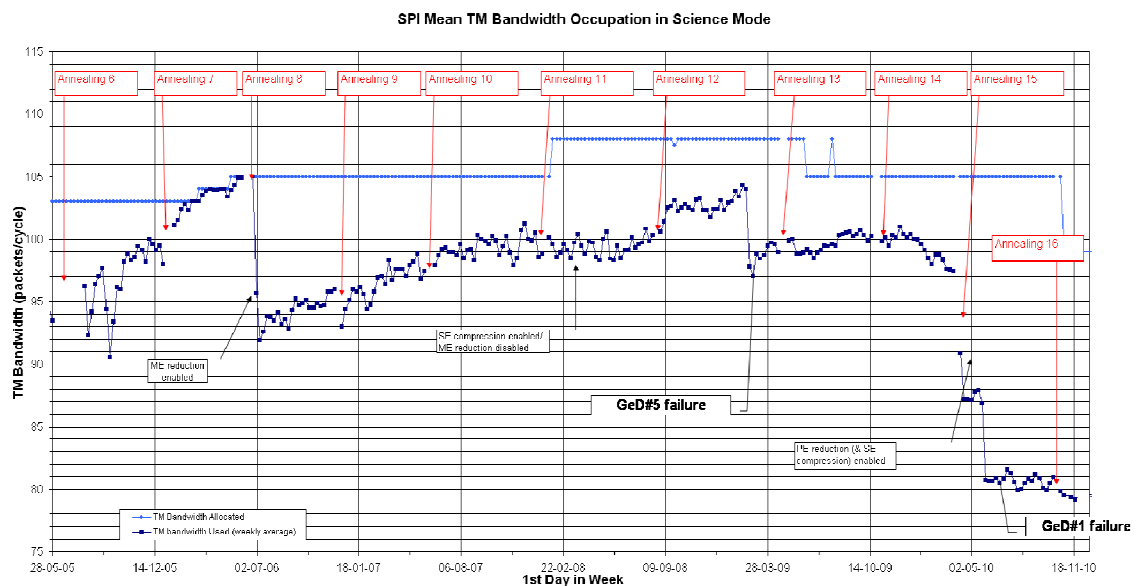


Figure 3: SPI TM bandwidth usage evolution since May 2005

Note: Some 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: 131 packets/cycle, except from 2010-02-08T15:55:27Z to 2010-02-08T19:41:27Z (OMC Flat Field Calibration), when it was 90 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 114.08 packets/cycle

Note: Some 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.

JEMX-1 & 2 were operated in Data Taking mode with a TM allocation of 8 packets/cycle each, except from 2010-11-24T05:55:12Z to the end of the revolution 990, during the OMC Flat-field calibration, when they were allocated 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 2010-11-24T05:55:12Z to the end of the revolution 990, during the Flat-field calibration, when it was 63 packets/cycle.

During this reporting period, 752 of the 762 planned science pointings were executed nominally. Two pointings were lost and another executed late and at the wrong attitude due to guide star problems. A pointing was lost and three more interrupted by IREM SEUs. Two pointings were shortened, when the CCCFs caused OMC to switch prematurely back to Standby mode. A TM drop at Redu caused the loss of a further pointing. In addition 1 Flat-field calibration was performed this month (nominally).

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 326 (22/11/2010), the 99th IREM SEU occurred

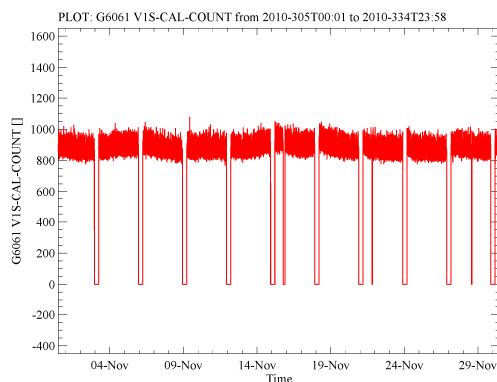
On DoY 333 (29/11/2010), the 100th IREM SEU occurred

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

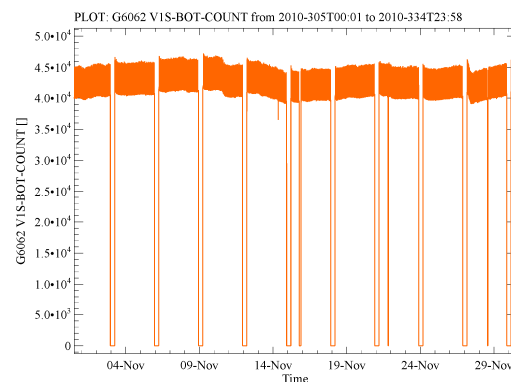
Radiation background

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:

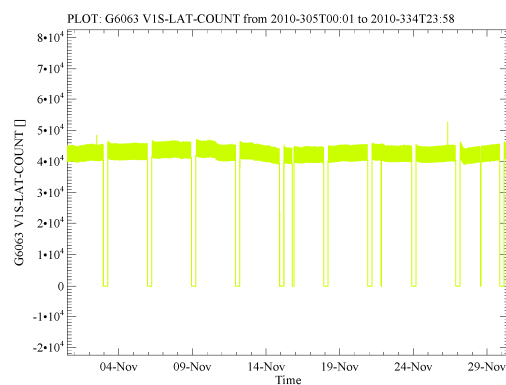
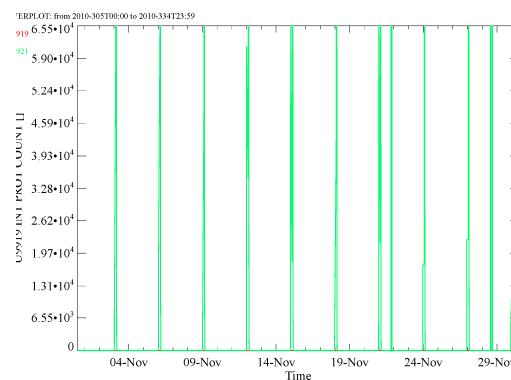
VETO Calibration Source Count Rate



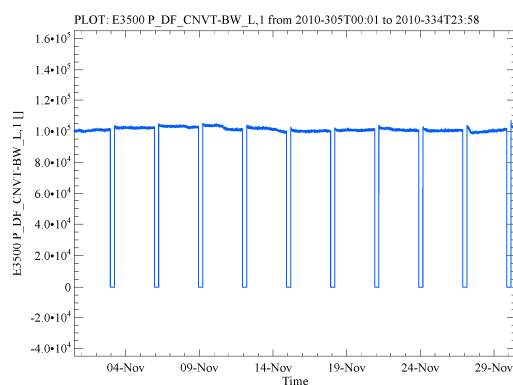
VETO Bottom Count Rate



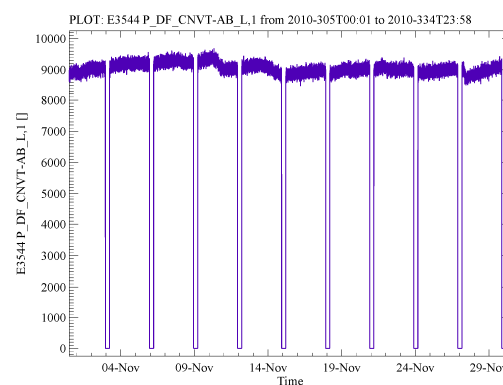
VETO Lateral Count Rate

IREM Proton & Electron Counters¹

ACS Below 100MeV



ACS Above 100MeV

**Figure 4: 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

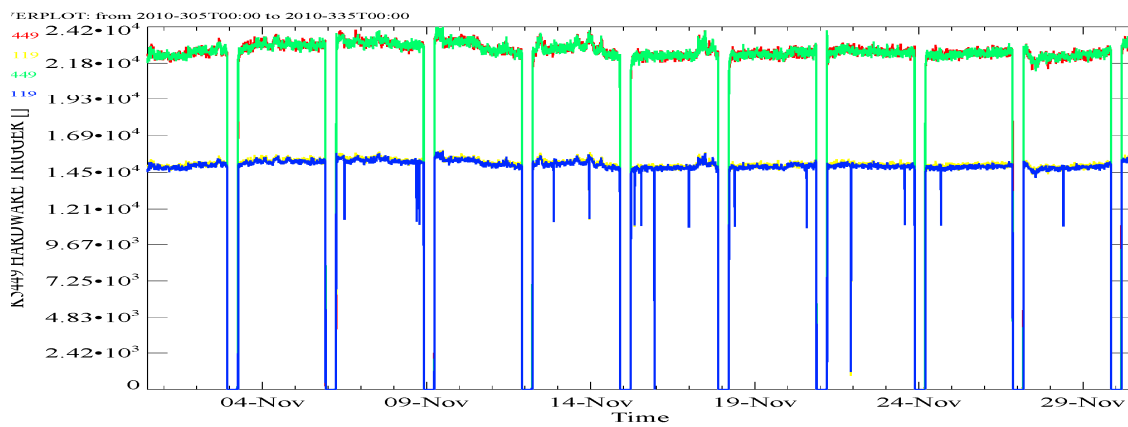


Figure 5: JEM-X Count rates. The smaller downward spikes in the figure are due to the slews of the spacecraft

Radiation Belts

Figure 6 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.

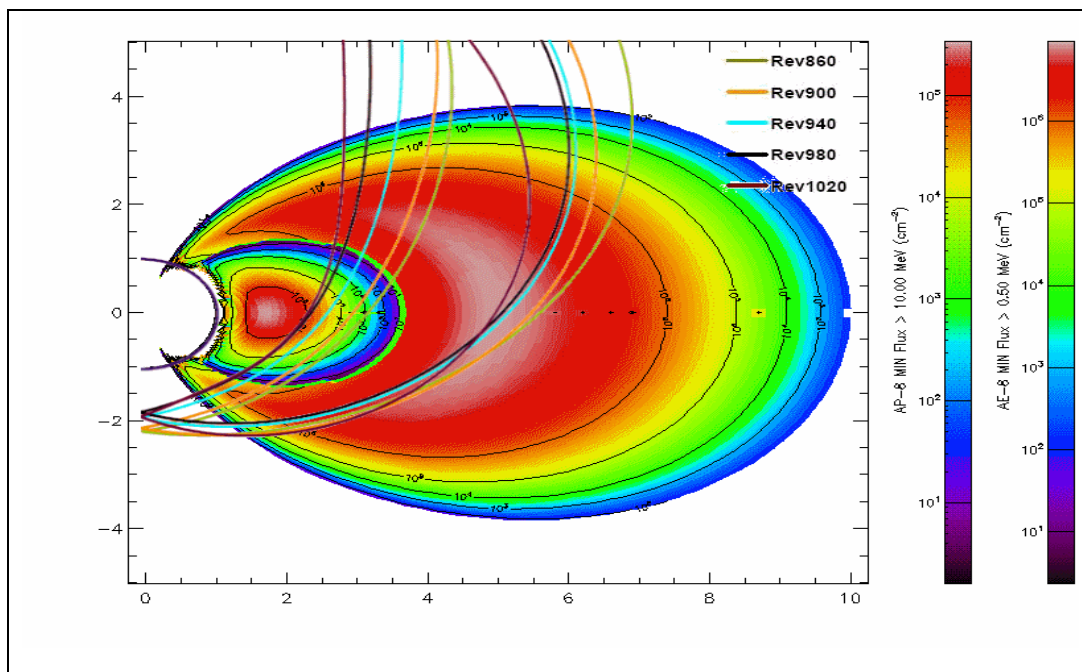


Figure 6: The predicted evolution of the orbit of Integral through the radiation belts

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.

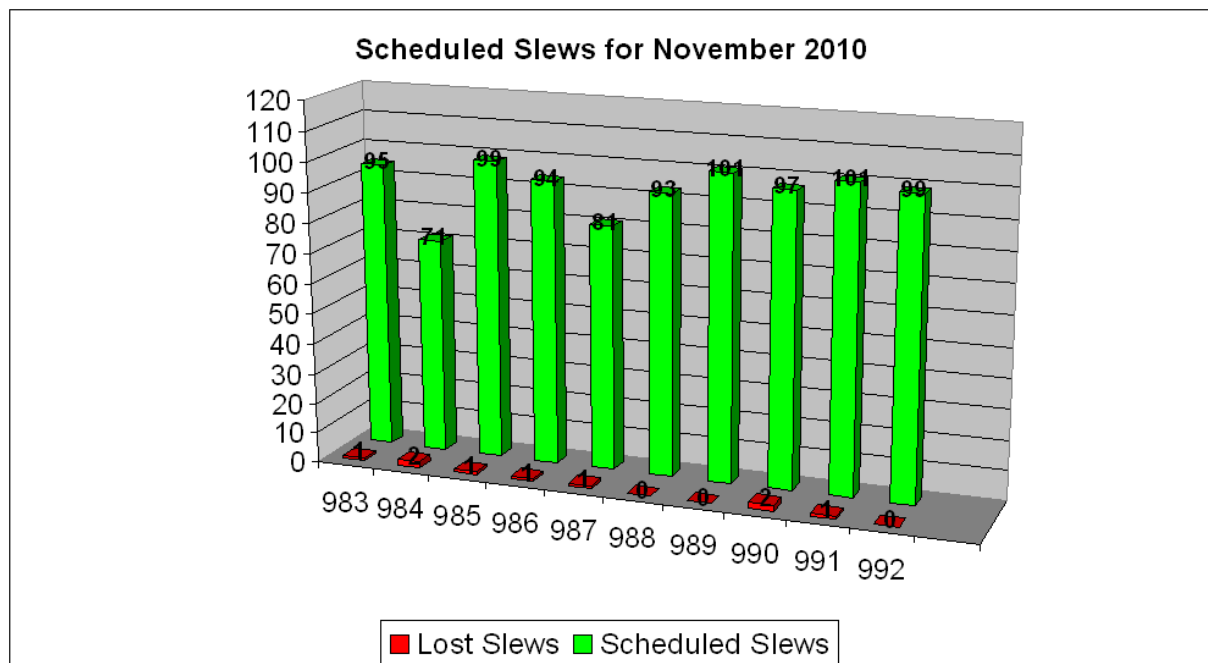


Figure 7: The number of slews scheduled compared to the number of slews lost

3.1 Mission Control System

On DOY312, DOY321 and DOY322 there were problems with OLF file transfer. The OMCH task stopped and was restarted in DOY319. The ISDS and IFRD tasks were restarted five times on isdsa this month and one on isdsb.

On DOY307 the HFA_TM and DDSS tasks on IDDB were restarted to resume MUST retrievals. Due to a hard disk error, MUSTI is offline since 322, 04:30Z.

On DOY319 the command verifier crashed, but there were problems bringing it up again. A swap was made from imca to imcb, to restart imca. After the restart the SPACON swapped back from imcb to imca, see INT-3124 for more details. Two hours later the multiplexer task stopped soon after the autostack started running. The Multiplexer task, manual and autostacks were restarted. On DOY320 the Command verifier task lost connection to TM CPD (on imca), the verifier was stopped and restarted to restore the connection. On DOY329 the NCTRSA had to be restarted, because the MMI

had to be moved to a newer server.

The ROSETTA MCS was successfully installed on Integral and XMM clients. Accounts are obtained to install the INTEGRAL MCS on Rosetta clients.

3.2 Ground Stations and Network

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

REDU

There were several occasions of RFI from an unknown source reported. On DOY312 at 06:00:00Z there was a sudden LOS of TM. Network reported a scheduled end of track, but gave no warning. The SPACON had not been informed and requested to stay with REDU. The FEC1 had to be restarted on DOY315. This cause a short interruption of telemetry and telecommanding.

DSS27

On DOY327 there was a drop in VC-0 and VC-7, a frame was out of sequence. TM stayed Green and commanding was unaffected.

Figure 8 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.

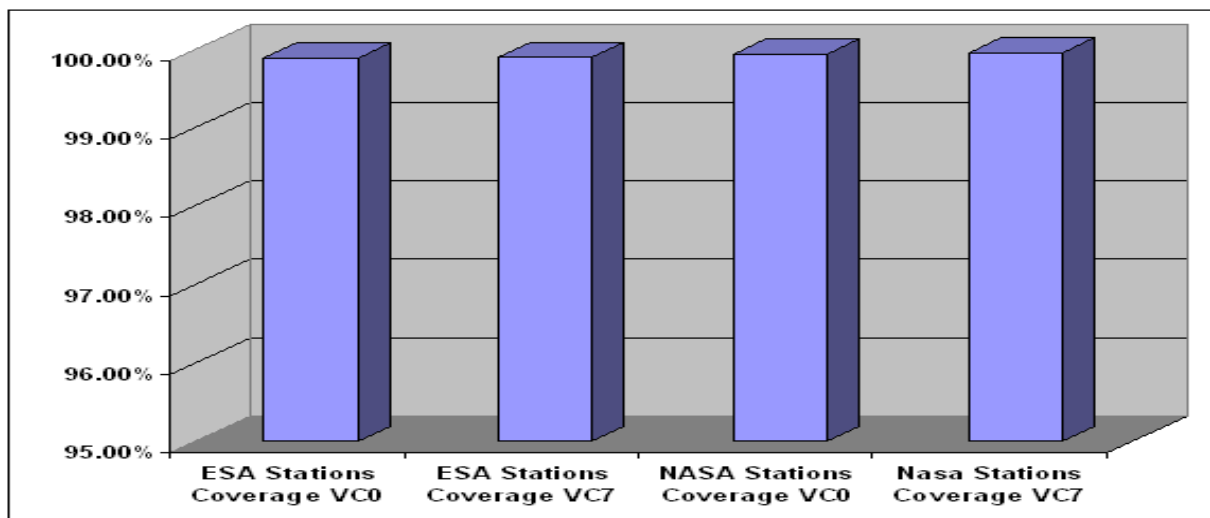


Figure 8: The usage of ESA ground stations compared to the usage of DSN ground stations

3.3 ISOC

3.3.1 Mission Planning

New or updated PSFs have been received for revolutions 991 to 1002, corresponding to the time range 25 November to 30 December.

New observations have been planned for revolutions 989 (18-21 November) to 995 (6-9 December).

Two related TOO observations of the flaring gamma-ray blazar 3C454.3 have been scheduled in revolutions 990 and 991.

TSFs have been received for revolutions 984 to 994.

3.3.2 Observation Status

New ECS files have been received for revolutions 968 to 981 (up to 28 October), including the previously missing 964.

3.3.3 ISOC Science Data Archive

Scw data has been ingested up to revolution 981.

Raw telemetry copied from MOC is available up to 21 November with some gaps. Work is ongoing to close the gaps.

3.3.4 ISOC System

ISOC software release V27.1 has been released on 8 November.

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-3123	11.11.2010	REDU - Problems with Front End Controller (FEC) - DOY 315	ESA Stations	Pending
INT-3124	15.11.2010	Verifier Task Crashes forcing restart of imca	IMCS	Pending
INT-3125	16.11.2010	L0021 Status Changed to Uncertain Fail	IMCS	Open
INT_SC-309	22.11.2010	IREM Anomaly: Reset of IREM_CSCI S/W #99, 22/11/2010	Payload	Pending
INT_SC-310	29.11.2010	IREM Anomaly: Reset of IREM_CSCI S/W #100, 29/11/2010	Payload	Pending

5 Special Events & Future Milestones

- FSS/STR Misalignment Calibration to be planned
- Star tracker blemish pixel survey to be planned

- The transfer of NCTRS operations to the SPACONS to be planned
- DSN routine support will be discontinued after 16.12.2010
- A new perigee passage strategy for SPI has been implemented from revolution 993 onwards (OCR-298).
- Analysis ongoing for possible Earth observations in 2011
- New FOP release to be issued on 06.12.2010
- Installation of the INTEGRAL MCS on ROSSETTA clients will be done after E3.4 validation.
- ISDC communications upgrade ongoing

6 Appendix

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

6.1 AOCS operations

No statistics are given this month due to absence of the AOCS engineer.

6.1.1 Fuel consumption

The plot for the fuel consumption (total, grams per day) is not included in this months report.

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.

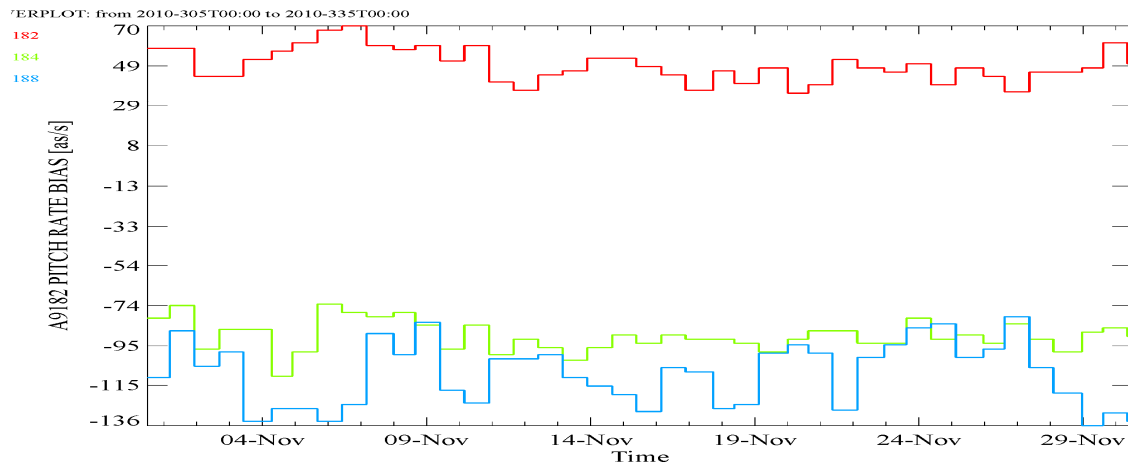


Figure 9: RMU pitch, roll and yaw. Historic data is available on request

6.1.3 Event log

The events are given as stated in the spacon log book. No further investigation or corrections to the logs were made due to absence of the AOCS SOE.

03/11/2010 (Day of Year 307, Revolution 983)

IMU1 switched ON (07:40:00Z). Command 'A3089 Start Sun Steer Ini' failed release. After the IMU switched back OFF the recovery tool was started, 0983_0500_M.CSL was generated, but not uplinked as the uplink time was missed. Again the recovery tool was started and a manual slew was performed to go to attitude #09830090. Then a mapping was commanded and the parameters for slew #09830091 were manually updated (spacontool).

PID #09830090 was lost. CSL #09830090 was missed from timeline.

04/11/2010 (Day of Year 308, Revolution 984)

At 00:40:00Z CSL #09840010 failed, the start guide star (A3189) failed PTV. PID # 0010 was lost and the AOCS was disabled in timeline. Again at 01:00:00Z the start guide star (A3189) failed PTV. The recovery tool was started and the parameters for slew #0012 were manually updated (spacontool).

At 17:58:00Z the RMU Calibration task terminated unsuccessfully; Invalid Return status from routine FIPOUT. FD was informed.

IMU1 switched ON (21:06:45Z). After the IMU switched back OFF, a mapping was commanded and the parameters for slew #0027 were manually updated (spacontool).

06/11/2010 (Day of Year 310, Revolution 984)

IMU1 switched ON (06:58:00Z). After the IMU switched back OFF, a manual slew was performed from PID #09840063 to PID #09840064. Then a mapping was commanded and the parameters for slew 09780065 were manually updated (spacontool).

PID # 09840064 was lost. Slew 09840064 was missed from the Timeline.

07/11/2010 (Day of Year 311, Revolution 985)

IMU1 switched ON (23:04:00Z). After the IMU switched back OFF, a mapping was commanded and the parameters for slew #09850043 were manually updated (spacontool).

PID #09850042 was lost.

11/11/2010 (Day of Year 315, Revolution 986)

The following updates were applied on board:

- 08:45:00Z Update of FDE TIM Thresholds on board, following calibration
- 09:03:00Z Update reciprocal torques on board, following calibration
- 09:22:00Z Update S/C inertias on board, following calibration
- 09:39:00Z Update on board AMD on times on board, following calibration

IMU1 switched ON (18:48:18Z). After the IMU switched back OFF, a mapping was commanded and the parameters for slew #09860075 were manually updated (spacontool).

PID #0072 was lost.

14/11/2010 (Day of Year 318, Revolution 987)

IMU1 switched ON (15:25:00Z). A mapping was commanded and the parameters for slew OSL 09870060 were manually updated (spacontool).

PID #09870059 was lost.

15/11/2010 (Day of Year 319, Revolution 987)

Due to a swap from imca to imcb, AOCS was disabled on the timeline and OSL #09870081 was missed from the timeline.

17/11/2010 (Day of Year 321, Revolution 988)

IMU1 switched ON (16:06:00Z). The guide star that was selected after the IMU switched OFF is same star that would be selected after the next change of guide star. AOCS remains disabled in timeline until CGS failed release.

20/11/2010 (Day of Year 325, Revolution 989)

IMU1 switched ON (19:26:33Z). After the IMU switched back OFF, a mapping was commanded and the parameters for the next slew were manually updated (spacontool).

PID #007 lost.

24/11/2010 (Day of Year 328, Revolution 990)

IMU1 switched ON (02:03:39Z). After the IMU switched back OFF, a mapping was commanded and the parameters for the next slew were manually updated (spacontool).

PID #0074 lost.

25/11/2010 (Day of Year 329, Revolution 991)

IMU1 switched ON (15:34:12Z). After the IMU switched back OFF, a mapping was commanded and the parameters for slew #09910032 were manually updated (spacontool).

OTF was not reached for PID #09910031.

26/11/2010 (Day of Year 330, Revolution 991)

IMU1 switched ON (07:09:58Z). After the IMU switched back OFF, a mapping was commanded and a manual slew was performed to go to attitude #09910050. The parameters for slew #09910051 were manually updated (spacontool).

PID #09910049 was missed from the Timeline.

27/11/2010 (Day of Year 332, Revolution 991-992)

IMU1 switched ON (18:48:59Z). After the IMU switched back OFF, a mapping was commanded and a manual slew was performed to go to attitude 09920043. The parameters for slew #09920044 were manually updated (spacontool).

Slew #09920042 failed release from Timeline.

28/11/2010 (Day of Year 333, Revolution 992)

IMU1 switched ON (03:49:36Z). After the IMU switched back OFF, a mapping was commanded and the parameters for slew #09920053 were manually updated (spacontool).

OTF was not reached for PID #09920052.

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 stroke of all four compressors was set to:

- 38 on 03/11/2011 at 16:36z
- 39 on 10/11/2011 at 08:22z
- 40 on 18/11/2011 at 14:50z

After the annealing the stroke of all four compressors was set to 37. It was noticed that a significant jump in the SPI cold plate temperature over perigee was seen, which is believed to be due in part to the lower altitude and therefore the greater albedo from the Earth. Therefore new constraints on the perigee passage attitude were made, such that the SPI radiator (S/C -Z side) is as far as possible in shadow. This is done by selecting a perigee passage attitude for which the angle between S/C -Z and the S/C to Earth direction is maximum when the S/C is at perigee. A test was performed over the perigee passage of rev 991-992 with such an attitude and this test proved successful. The SPI Cold

Plate temperature did not show the $\sim 0.2\text{K}$ jump over perigee that had been observed over the previous perigee passages. Instead, the temperature only increased by a negligible amount and then recovered, such that the temperature was the same in rev 992 as in rev 991. From revolution 993 onwards the new perigee passage attitude will be chosen to reduce the temperature jump of the SPI cold plate temperature during the perigee passage and to delay the next stroke increase of all four compressors.

The following plot shows the evolution of the cold plate and H bus temperature during the reporting period:

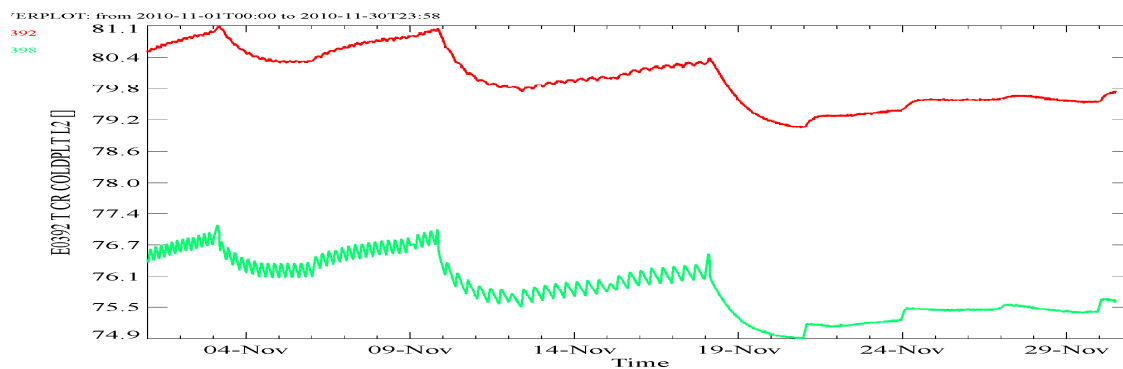


Figure 10: SPI Cold plate and H-bus temperature

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

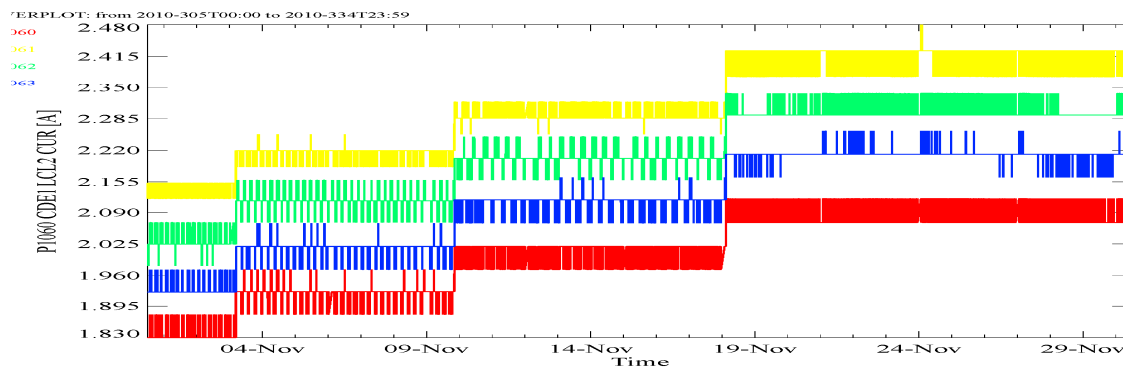


Figure 11: SPI CDE LCL current

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 4: 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.

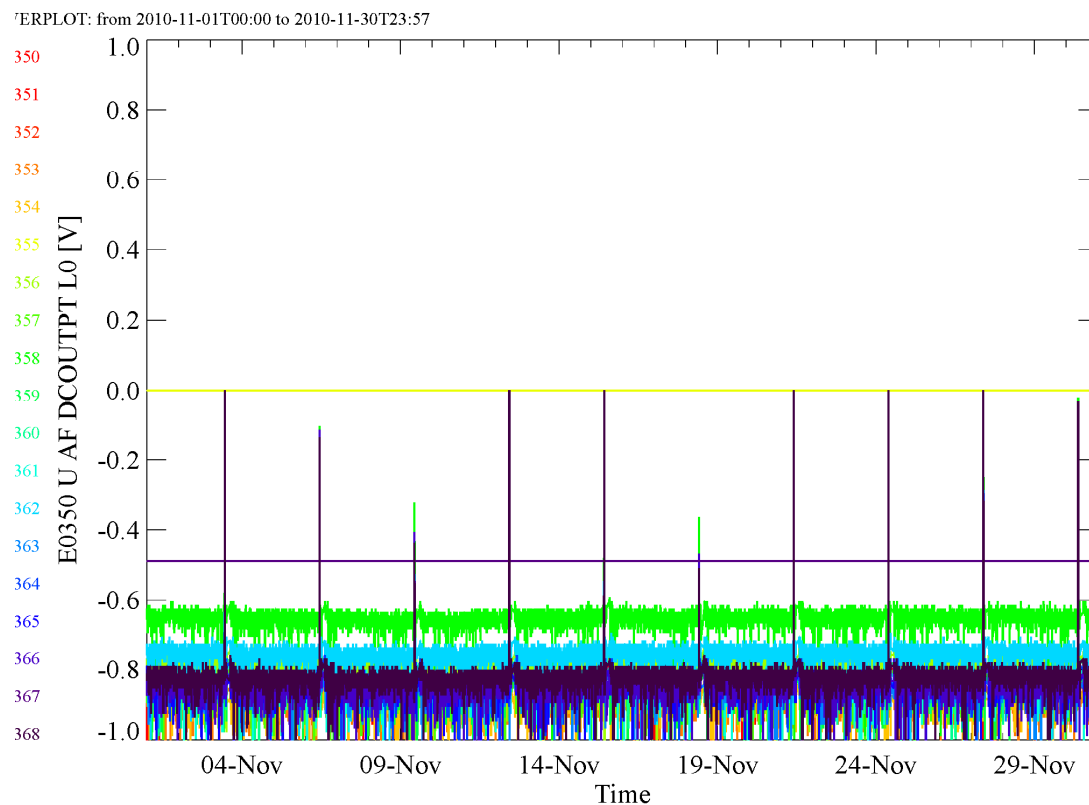


Figure 12: AFEE DC Output Voltages. Note that the data is sampled every 8th packet (64sec)

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.

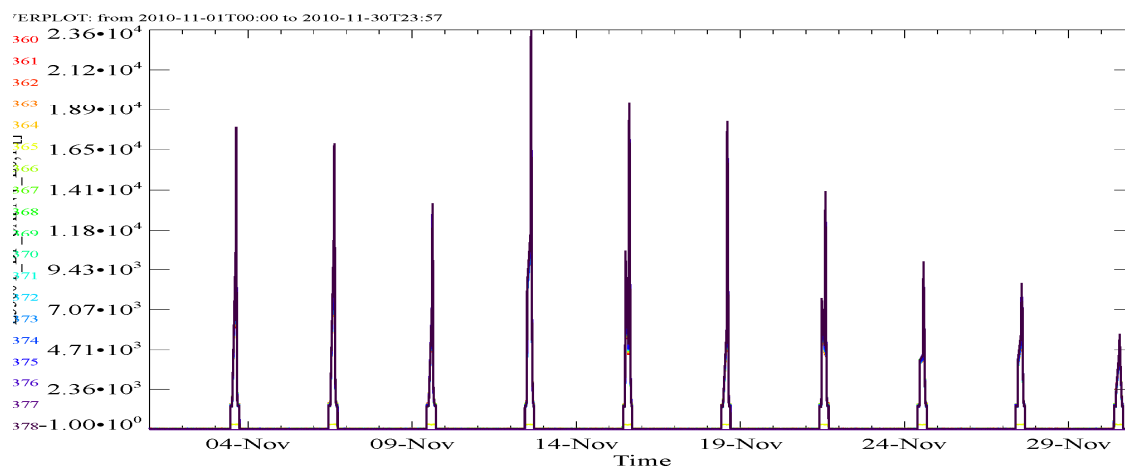


Figure 13: SPI GeD Non-Vetoed count rates. Note that the scale normally used for plotting is logarithmic

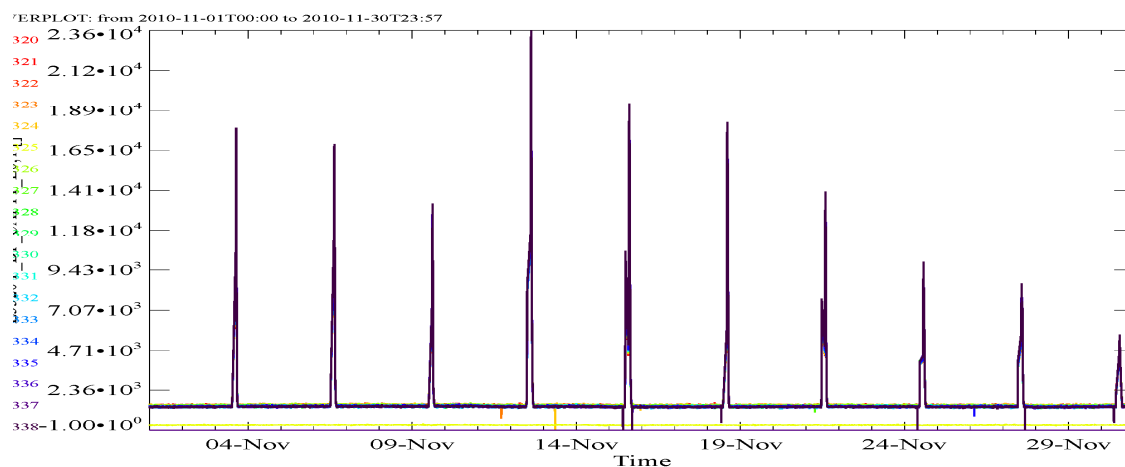


Figure 14: SPI GeD Time Tagged count rates. Note that the scale normally used for plotting is logarithmic

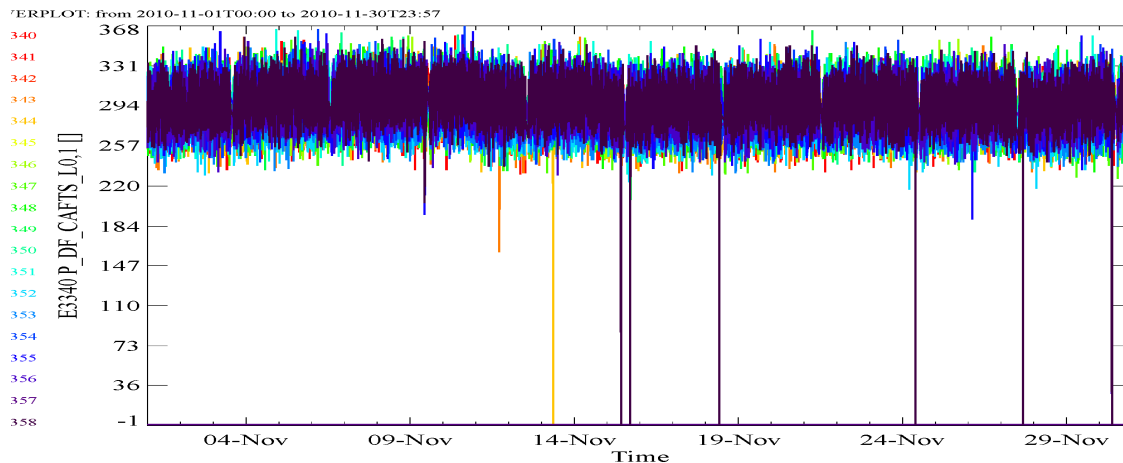


Figure 15: SPI GeD Time Tagged Saturated count rates

PSD

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

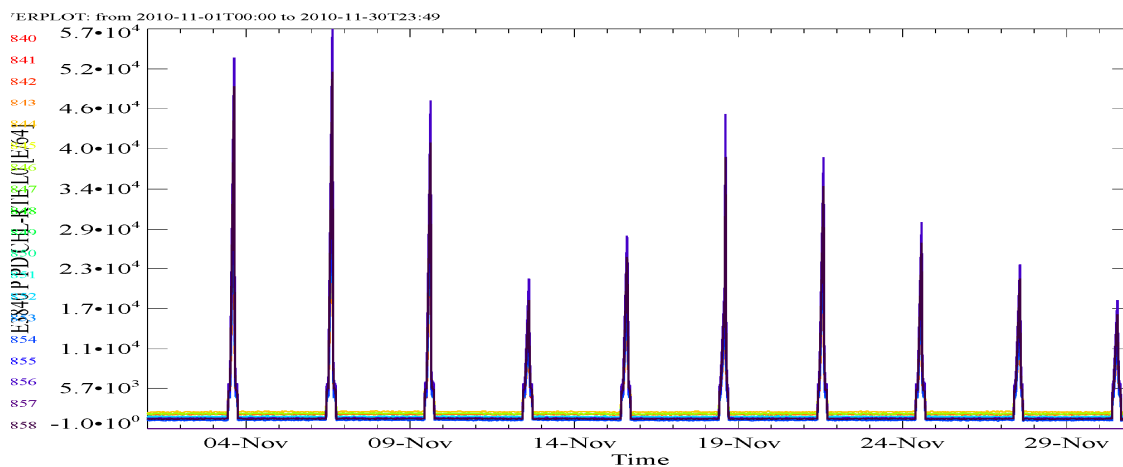


Figure 16: SPI PSD GeD Channel rates

6.2.2 Event Log

Two occurrences (at 2010.307.15.19.30Z and 2010.322.14.20.35Z) of OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW were received. As in each case it was a single occurrence, no action was required.

30-11-2010 (Day of Year 334, Revolution 993)

At 13.07.27Z TM parameter E0227 T AF PA2 L17 which is representing the temperature of the Pre-Amplifier of detector #17 of the AFEE subassembly, went soft high out of limit with the value 215.02363 K. E0227 returned back within limits at 13:25:59Z after the next TM packet was received on ground.

At 15:48:44Z 27Z TM parameter E1293 S AS OBT ST L which is representing On board time synchronisation of the ACS sub-assembly, went out of limit with the value 1 during the belt transition. E1293 returned back within limits at 15:50:12Z. No action was taken.

30-11-2010 (Day of Year 333, Revolution 992)

At 20:56:30Z TM parameter E2066 S AS HVST L25 FEE HV, which is representing the ACS FEE high voltage status of the Front End Electronic #25, went OOL with value = PARAM < SPEC. It returned within limits of its own accord at 21.07.12Z and no action was taken.

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:

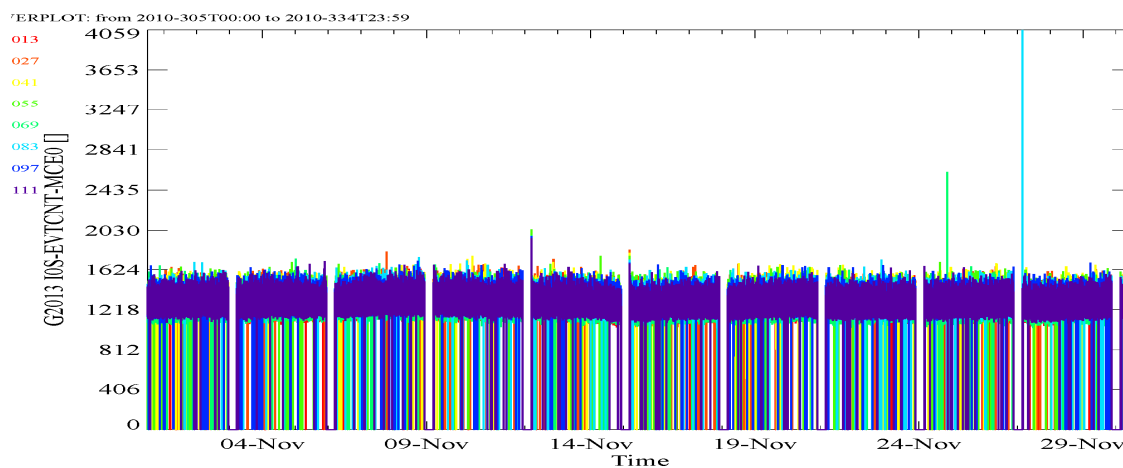


Figure 17: ISGRI MCE Counters

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:

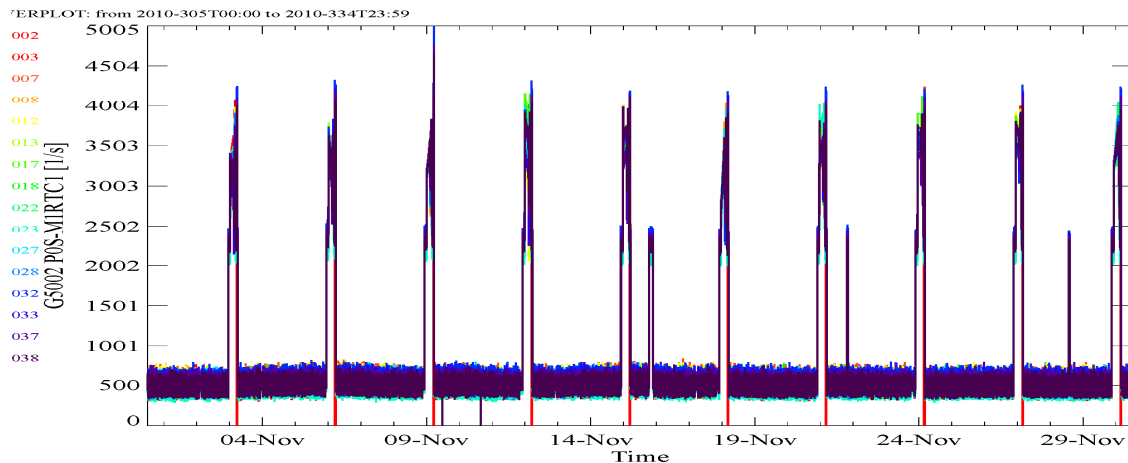


Figure 18: PICsIT semi-module counters. Note that the scale used for plotting is logarithmic

VETO

The health and performance of VETO was nominal during the reporting period. Plots of the VETO counters are given in Figure 4: Instrument Count Rates.

6.3.2 Event Log

09-11-2010 (Day of Year 313, Revolution 985-986)

At 2010.313.23.26Z the TM parameter families G5002 and G5003 for the PDM semi-module counters went OOL Low. As these were followed at 2010.313.23.30.19Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

11-11-2010 (Day of Year 315, Revolution 986)

At 2010.315.03.36.06Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. At 2010.315.03.36.33Z the TM parameter families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As these were followed at 2010.315.03.39.55Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

16-11-2010 (Day of Year 320, Revolution 988)

At 2010.320.06.43.21Z TM parameter G6030 V1S-CDM02STAT went OOL (failed SCC) with value = ON, indicating a VETO reset had occurred. The following recovery actions were then performed:

- 2010.320.06.58.39Z FCP_IBIS1_0313 (IASW in Stand-By);
- 2010.320.07.07.09Z FCP_IBIS1_0203 (VETO Stand-By);
- 2010.320.07.27.56Z FCP_IBIS1_0332 IBIS VEB-A Deactivation;
- 2010.320.08.52.39Z FCP_IBIS1_0111 VETO VEB Activation;
- 2010.320.09.05.26Z FCP_IBIS1_0199 IBIS: VETO Restore CTX;

- 2010.320.09.17.32Z ED GEVESPO1 ED re-uplinked;
- 2010.320.09.27.04Z FCP_IBIS1_0201 VETO Nominal Mode;
- 2010.320.10.10.51Z ED GESTAN02 re-uplinked to return IBIS to Science Standard mode with the planned observation parameters.

IBIS operations continued nominally.

18-11-2010 (Day of Year 322, Revolution 988-989)

At 06:17Z TM parameter X7500 went OOL indicating a problem with the histogram process. The following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 2010.322.06.31.09Z FCP_IBIS1_0312
- 2010.322.06.35.35Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

20-11-2010 (Day of Year 324, Revolution 989)

Following a ground station handover, at 02:39Z TM parameter X7500 went OOL indicating a problem with the histogram process. The following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 2010.324.03.46.09Z FCP_IBIS1_0312
- 2010.324.03.56.25Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

22-11-2010 (Day of Year 326, Revolution 990)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 2010.326.07.34.47Z. It was recovered as follows:

- o At 2010.326.08.04.10Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
- o At 2010.326.08.17.40Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.

TM parameter X7500 was still OOL following the recovery (it had been OOL since 07:44Z), indicating a problem with the histogram process. Therefore the following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 2010.326.09.18.34Z FCP_IBIS1_0312
- 2010.326.09.19.50Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

29-11-2010 (Day of Year 333, Revolution 992)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 2010.333.01.36.37.40Z. It was recovered as follows:

- o At 2010.333.02.01.40Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
- o At 2010.333.02.15.06Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.

Following the recovery, at 02:30Z TM parameter X7500 went OOL indicating a problem with the histogram process. The following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 2010.333.02.33.10Z FCP_IBIS1_0312
- 2010.333.02.34.36Z TC G0129 uplinked to return IBIS to Science Standard mode.

As X7500 went OOL again at 02:42Z, the recovery was repeated as follows:

- 2010.333.02.52.03Z FCP_IBIS1_0312
- 2010.333.02.54.06Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

6.4 JEM-X

6.4.1 Operations

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

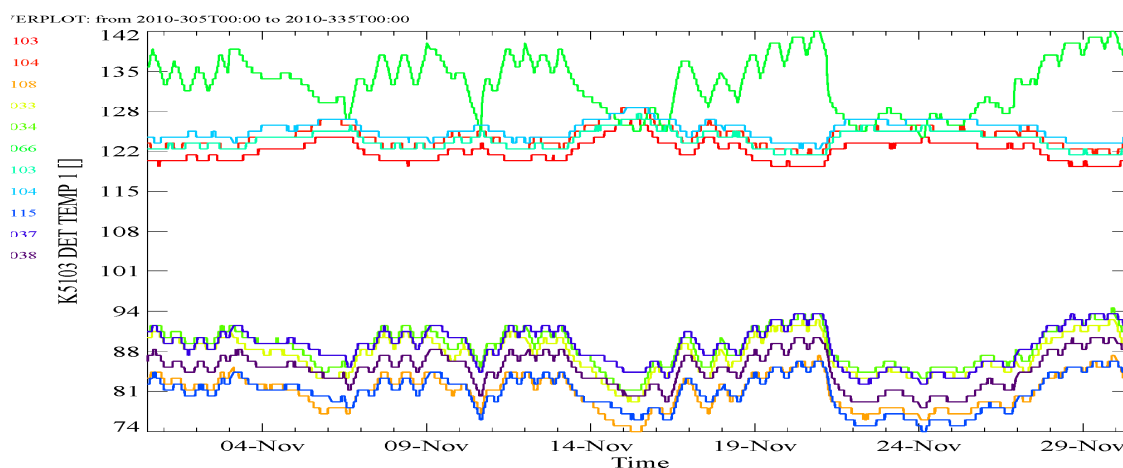


Figure 19: JEMX Detector and DFEE Temperatures

6.4.2 Event Log

22-11-2010 (Day of Year 326, Revolution 990)

At 07:35:20 JEMX-1 & 2 parameters K5315, K5316, K5317, L5315, L5316 & L5317 went Out-of-Limits due to an IREM SEU (#99). There was no impact as the reaction has been disabled.

29-11-2010 (Day of Year 333, Revolution 992)

At 01:37:10 JEMX-1 & 2 parameters K5315, K5316, K5317, L5315, L5316 & L5317 went Out-of-Limits due to an IREM SEU (#100). There was no impact as the reaction has been disabled.

6.5 OMC

6.5.1 Operations

The status and performance of OMC is nominal.

6.5.2 Event Log

04-11-2010 (Day of Year 308, Revolution 984)

At 00:40, the loss of a guide star forced the suspension of operations. A recovery was performed, and the timeline rejoined at 01:44. The impact was the loss of pointing 09840010. It was at this time that the following pair of commands were rejected:

2010.308.00.43.27.702	2010.308.00.43.34.596	1792	RealTime	131	TC	REJECT	REJECTED
TC1		0	0	65535	PR	N	E
2010.308.00.43.33.952	2010.308.00.43.42.286	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 that pointing.

11-11-2010 (Day of Year 315, Revolution 986)

At 20:30, a TM drop from Redu caused the OMC commands to fail uplink. After the TM was restored, a recovery was performed, but the OMC commands were not uplinked. The impact was the loss of pointing 09860074.

16-11-2010 (Day of Year 320, Revolution 988)

At 10:39, as part of an on-going IBIS recovery, the CCCFs were enabled. When these were sent, OMC switched back to Standby mode prematurely. At 10:49:39, OMC was put back into science mode, after the pointing commands were manually resent. The impact was pointing 09880028 was cut short from a planned 2315 to 1376 seconds.

22-11-2010 (Day of Year 326, Revolution 990)

At 07:34:36, an IREM SEU (#99) forced OMC to SAFE mode, a recovery was performed, and the unit returned to standby at 07:58:13. The impact was pointing 09900089 was cut short from a planned 2667 to 1553 seconds, and pointing 09900023 was lost. It was at this time that the following pair of commands were rejected:

2010.326.07.53.31.958	2010.326.07.53.43.743	1792	RealTime	131	TC	REJECT	REJECTED
TC1		0	0	65535	PR	N	E
2010.326.07.53.37.958	2010.326.07.53.43.907	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 that pointing.

At 10:19:39, as part of the IREM recovery, the CCCFs were enabled. When these were sent, OMC switched back to Standby mode prematurely. At 10:26:43, OMC was put back into science mode, after the pointing commands were manually resent. The impact was pointing 09900026 was cut short from a planned 2667 to 1936 seconds.

26-11-2010 (Day of Year 330, Revolution 991)

At 07:09:58, the loss of a guide star forced the suspension of operations. A recovery was performed, and the attitude recovered at 07:54. The impact was that pointing 09910049 started 20 minutes late, and at the wrong attitude, and pointing 09910050 was lost. It was at this time that the following pair of commands were rejected:

2010.330.08.07.24.222	2010.330.08.07.33.532	1792	RealTime	131	TC	REJECT	REJECTED
TC1		0	0	65535	PR	N	E
2010.330.08.07.30.222	2010.330.08.07.33.574	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 pointing 09910050.

29-11-2010 (Day of Year 333, Revolution 992)

At 01:36:28, an IREM SEU (#100) forced OMC to SAFE mode, a recovery was performed, and the unit returned to standby at 01:55:31. The pointing commands for pointing ID 09920050 were then manually uplinked. The impact was pointing 09920049 was cut short from a planned 3600 to 2936 seconds, and pointing 09900050 was uplinked manually a little late such that that pointing was also cut short from a planned 2000 to 1712 seconds.

6.6 IREM**6.6.1 Operations****Radiation belts entry and exit**

The following plots show the Radiation Belt Entry (Figure 20, red line) and Exit times (Figure 21, blue line) obtained from the ISDC website, defined where the IREM TC3 (soft electrons) rate reads 600 counts. The blue line in Figure 20 and the magenta line in Figure 21 are the altitudes used by the MOC for planning purposes.

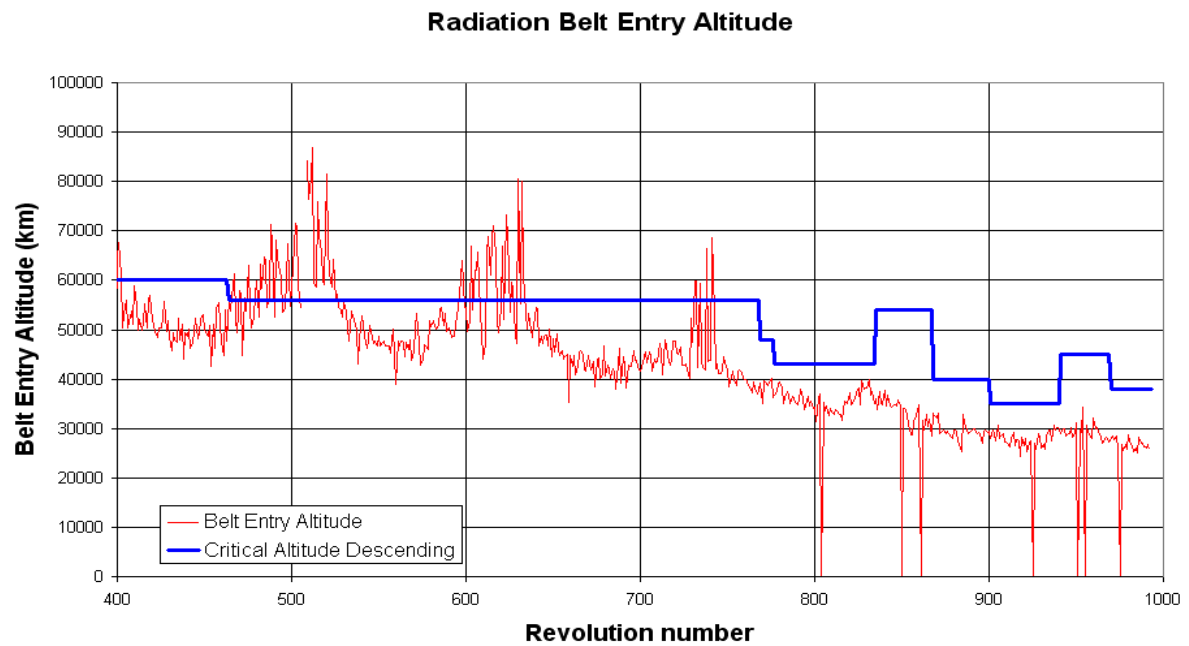


Figure 20: Radiation belt entry

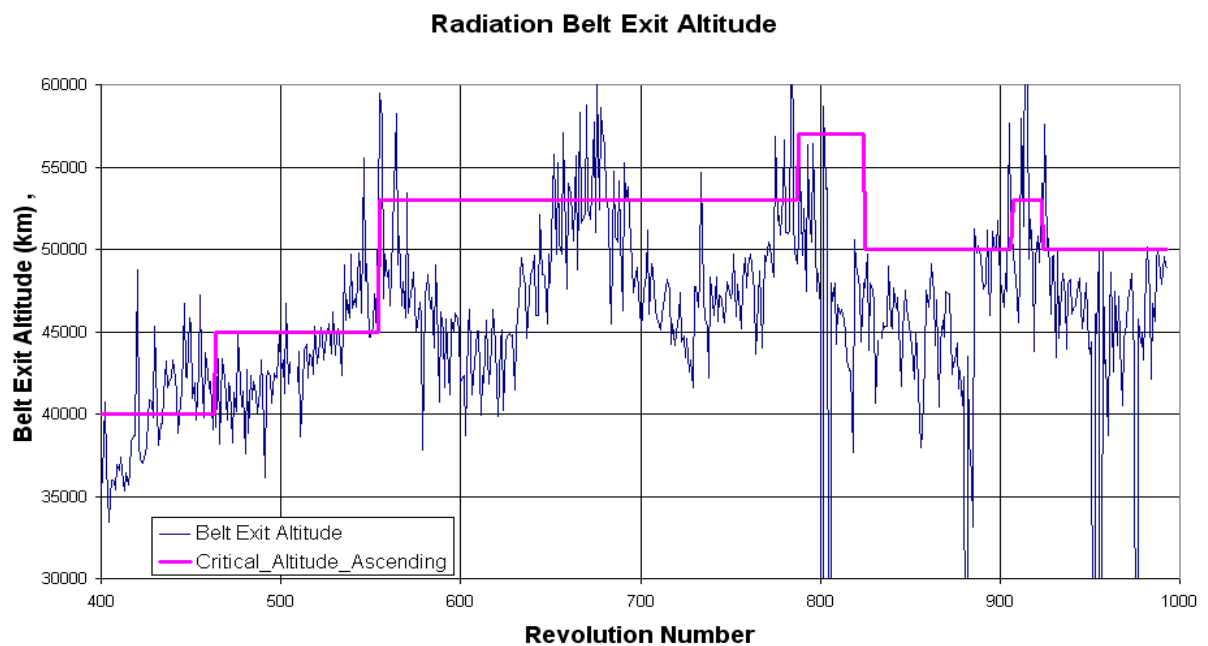


Figure 21: Radiation belt exit

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
983	RAD_ENTR R 2010-11- 03T10:55:55Z	03/11/2010 12:23:38	20097.7	03-Nov-2010 12:26:15	19312.91	03-Nov-2010 13:06:15	9743.504
984	RAD_EXIT R 2010-11- 03T17:41:27Z	03/11/2010 16:25:30	>>28598.5	03-Nov-2010 17:26:15	47593.12	03-Nov-2010 13:46:15	3819.27
984	RAD_ENTR R 2010-11- 06T10:45:11Z	06/11/2010 12:10:26	20651.8	06-Nov-2010 12:13:35	19634	06-Nov-2010 12:53:35	10066.57
985	RAD_EXIT R 2010-11- 06T17:30:07Z	06/11/2010 16:36:02	>>28635.8	06-Nov-2010 17:13:35	47378.33	06-Nov-2010 13:33:35	3776.861
985	RAD_ENTR R 2010-11- 09T10:34:28Z	09/11/2010 12:04:18	18630.9	09-Nov-2010 12:05:00	19300.94	09-Nov-2010 12:45:00	9755.434
986	RAD_EXIT R 2010-11- 09T17:19:34Z	09/11/2010 16:17:14	>>28625.8	09-Nov-2010 17:05:00	47561.27	09-Nov-2010 13:25:00	3868.015
986	RAD_ENTR R 2010-11- 12T10:21:52Z	12/11/2010 11:31:54	23450.3	12-Nov-2010 11:54:37	18956.92	12-Nov-2010 12:34:37	9447.192
987	RAD_EXIT R 2010-11- 12T17:07:24Z	12/11/2010 16:36:18	>>28601.0	12-Nov-2010 16:54:37	47736.67	12-Nov-2010 13:04:37	4126.331
987	RAD_ENTR R 2010-11- 15T10:08:13Z	15/11/2010 11:29:38	21499.4	15-Nov-2010 11:40:43	19119.55	15-Nov-2010 12:20:43	9606.78
988	RAD_EXIT R 2010-11- 15T16:53:48Z	15/11/2010 16:22:26	44697.2	15-Nov-2010 16:40:43	47629.2	15-Nov-2010 12:50:43	4170.492
988	RAD_ENTR R 2010-11- 18T09:55:20Z	18/11/2010 11:13:55	21710.8	18-Nov-2010 11:27:44	19057.38	18-Nov-2010 12:07:44	9496.224
989	RAD_EXIT R 2010-11- 18T16:40:28Z	18/11/2010 15:58:27	>> 28626.1	18-Nov-2010 16:27:44	47758.32	18-Nov-2010 12:37:44	4053.497
989	RAD_ENTR R 2010-11-	21/11/2010 11:05:55	22024.7	21-Nov-2010 11:14:27	18990.9	21-Nov-2010 11:54:27	9412.048

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
	21T09:43:00Z						
990	RAD_EXIT R 2010-11- 21T16:27:50Z	21/11/2010 15:45:07	42822.4	21-Nov-2010 16:14:27	47832.97	21-Nov-2010 12:24:27	3997.617
990	RAD_ENTR R 2010-11- 24T09:29:31Z	24/11/2010 10:55:07	19579.7	24-Nov-2010 11:00:18	19295.58	24-Nov-2010 11:40:18	9767.77
991	RAD_EXIT R 2010-11- 24T16:14:44Z	24/11/2010 15:37:55	>>28619.8	24-Nov-2010 16:00:18	47532.82	24-Nov-2010 12:20:18	3902.419
991	RAD_ENTR R 2010-11- 27T09:15:17Z	27/11/2010 10:38:43	21622.6	27-Nov-2010 10:45:47	19052.64	27-Nov-2010 11:25:47	9515.058
992	RAD_EXIT R 2010-11- 27T16:00:32Z	27/11/2010 15:22:19	43683.0	27-Nov-2010 15:45:47	47718.67	27-Nov-2010 11:55:47	4099.258
992	RAD_ENTR R 2010-11- 30T09:03:11Z	30/11/2010 10:29:55	19528.3	30-Nov-2010 10:33:50	18817.06	30-Nov-2010 11:13:50	9219.065
993	RAD_EXIT R 2010-11- 30T15:47:51Z	30/11/2010 15:04:43	>> 28652.1	30-Nov-2010 15:33:50	47986.83	30-Nov-2010 11:43:50	3911.796

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

22-11-2010 (Day of Year 326, Revolution 990)

At 07:34:35Z, a local reset of the IREM CSCI S/W (SEU #99) 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 at 2010.326.07:34:35Z (134229.5 km). The unit had performed an automatic transition to Standard Mode (i.e. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit;
- 5) The recovery of the unit started immediately using procedure CRP_SYS_2570. 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 BCC0 HEX = 48320 DEC = 1011110011000000, 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. 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 09:36:00Z.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the Pls request. OMC was recovered at 07:58:00Z and IBIS at 08:18:00Z.

29-11-2010 (Day of Year 333, Revolution 992)

At 01:36:27Z, a local reset of the IREM CSCI S/W (SEU #100) 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 at 2010.333.01:36:27Z (158670.4 km). The unit had performed an automatic transition to Standard Mode (i.e. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit;
- 5) The recovery of the unit started immediately using procedure CRP_SYS_2570. 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 BCC0 HEX = 48320 DEC = 1011110011000000, 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. 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 05:06:00Z.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the Pls request. OMC was recovered at 01:55:31Z and IBIS at 02:16:00Z.