EUROPEAN SPACE AGENCY

DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT

MISSION OPERATIONS DEPARTMENT

INTEGRAL

Mission report

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

No. 381

01.01.2010

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.

It addresses the activities from January and covers the revolutions 882 untill 891. The targets of these revolutions can be found on the ISOC web.

This is the first report in a new format and covering a longer time span. The major change is the way the figures are created and are still being improved. Suggestions and comments are most welcome. The previous weekly and monthly reports are available at the XMM-INTEGRAL website.

2 Satellite status

2.1 Platform

2.1.1 AOCS

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

Three slews were missed from the Timeline.

The fuel consumption over the reporting period was 0.5368 Kg. The remaining propellant is in the order of 130.1252 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; 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 14th SPI annealing, which ended on 06/11/2009, 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) and detector #5 (failed since 19/02/2009).

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 105 packets/cycle and the average telemetry occupation was 99.7 packets/cycle.

The following plot shows the TM bandwidth allocation, occupation and DPE CPU load during the reporting period:

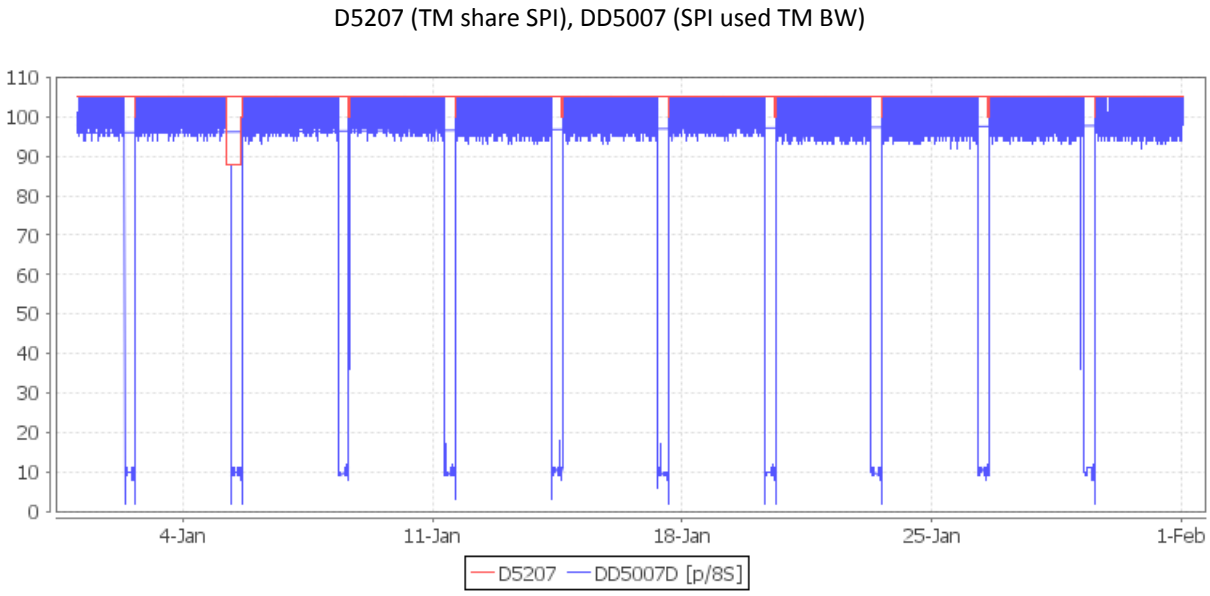


Figure 1: SPI TM bandwidth utilisation

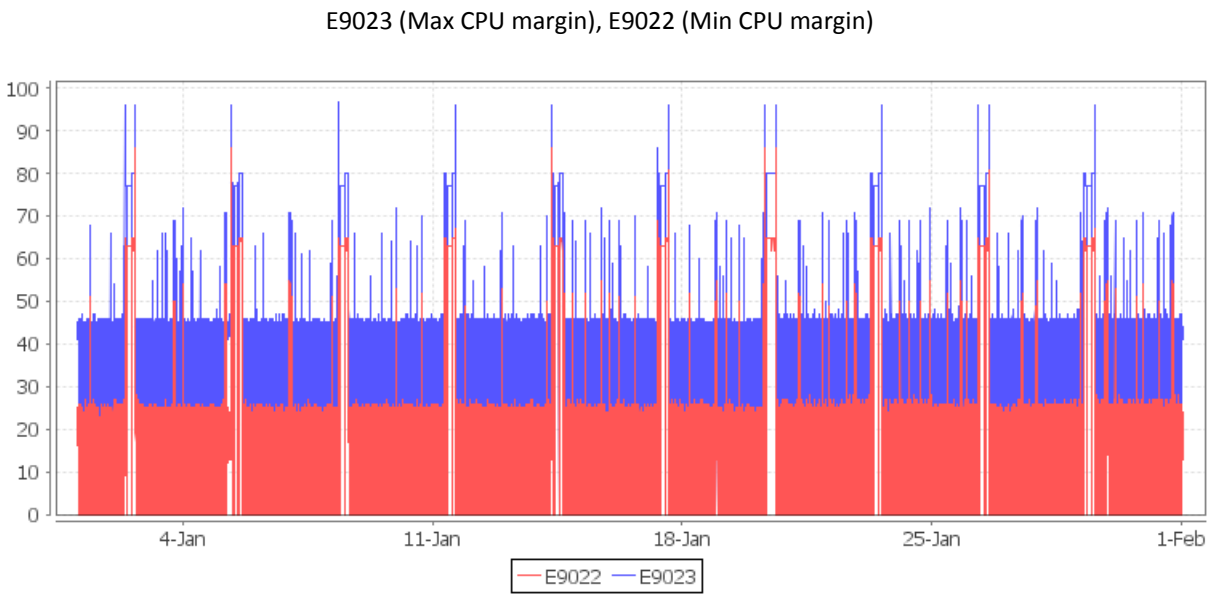


Figure 2: SPI IASW Performance

The following plot shows the evolution of the assigned and the average occupation of the SPI TM bandwidth since May 2005 along with the mean ACS count rate evolution (since July 2006). As can be seen, there is a strong correlation between the evolution of the background as measured by the ACS and the overall TM bandwidth usage.

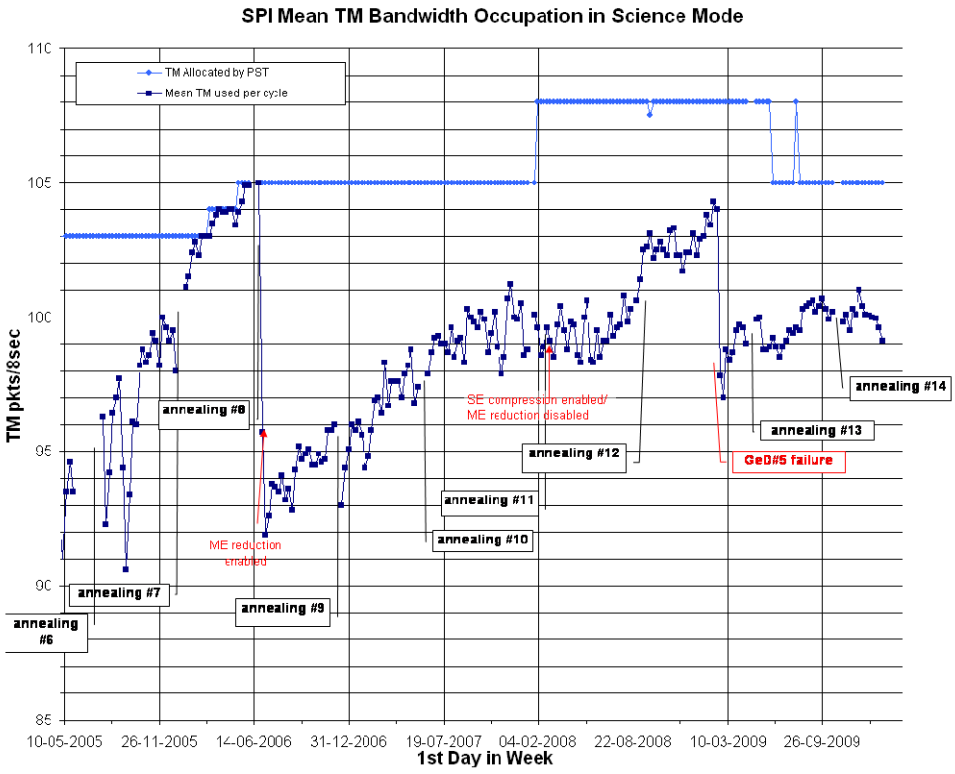


Figure 3: SPI TM bandwidth usage evolution since May 2005

Note: Some 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: 131 packets/cycle.
- IBIS mean bandwidth utilisation in science mode: 116.8 packets/cycle

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

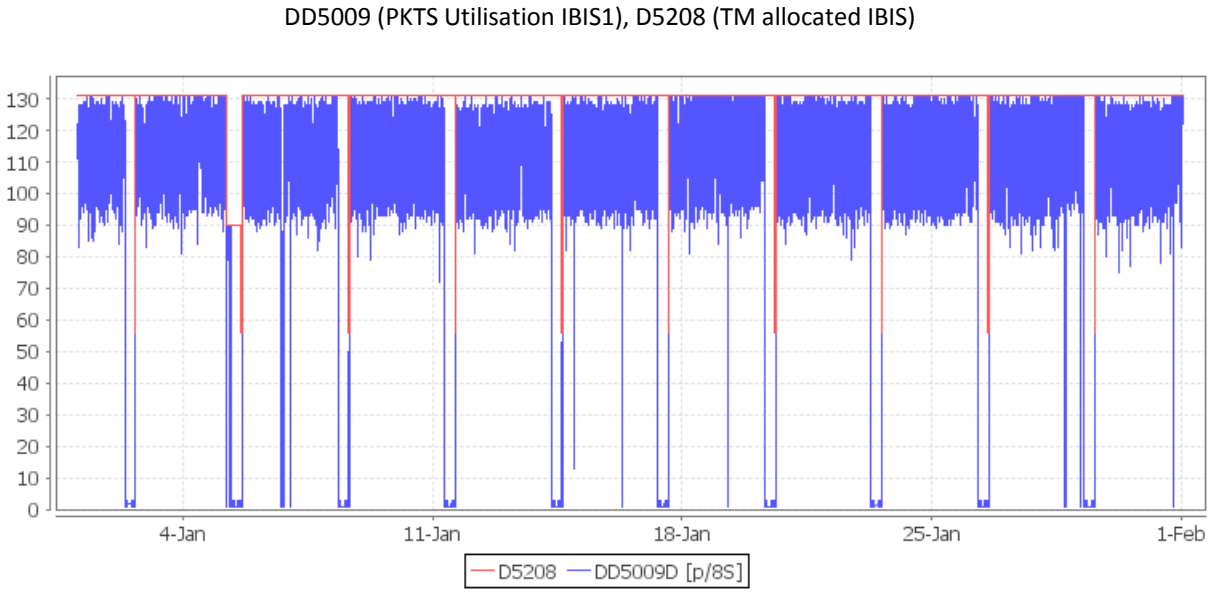


Figure 4: IBIS TM bandwidth utilisation

A plot of the IBIS weekly bandwidth utilisation since May 2005 is shown on the next page.

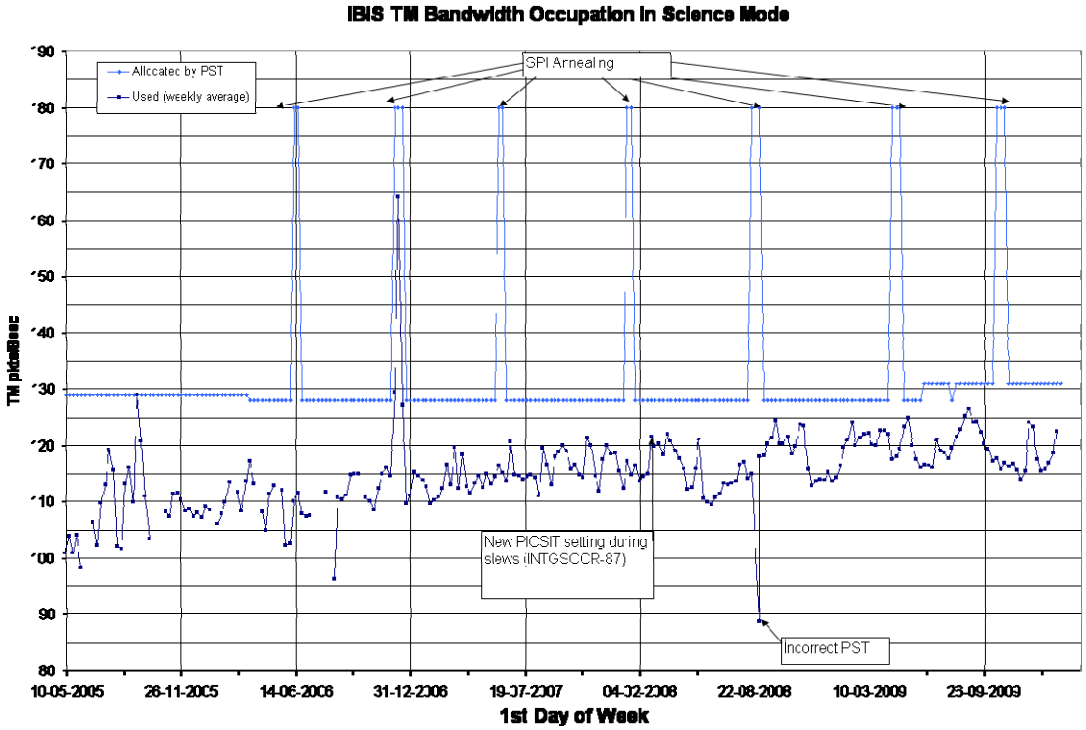


Figure 5: IBIS TM bandwidth usage evolution since May 2005

Note: Some 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-X2 was operated in Data Taking mode with a TM allocation of 8 packets/cycle.
- JEM-X1 was dormant (DPE OFF) with no TM slots allocated.

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 2010-01-05T03:47:59Z to 2010-01-05T07:10:36Z during the Flat-Field calibration, when it was 63 packets/cycle.

During this reporting period, 733 of the 738 planned science pointings were executed nominally, 3 pointings were lost, one pointing was interrupted by an IREM SEU, and another by an AOCS problem. There was also a Flat-field calibration performed, which was nominal.

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

2.2.5 IREM

The status of IREM is nominal.

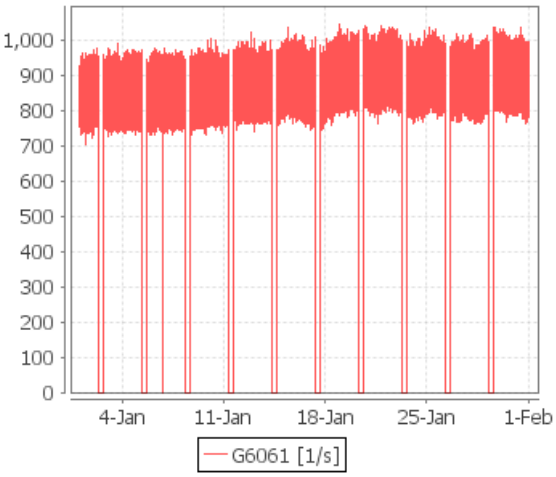
On DoY 006 (06/01/2009), the 86th IREM SEU occurred; details can be found in Appendix 6.6.

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

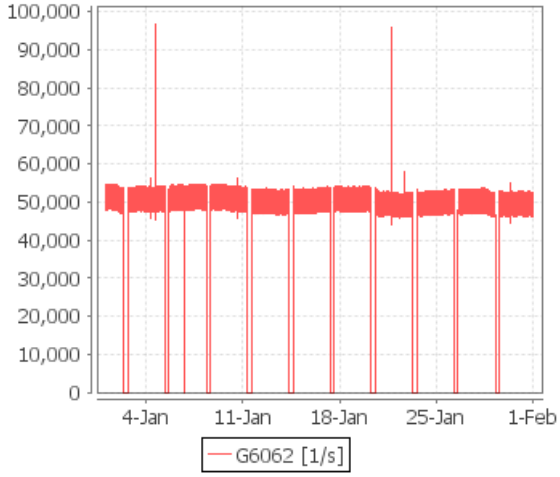
Radiation background

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:

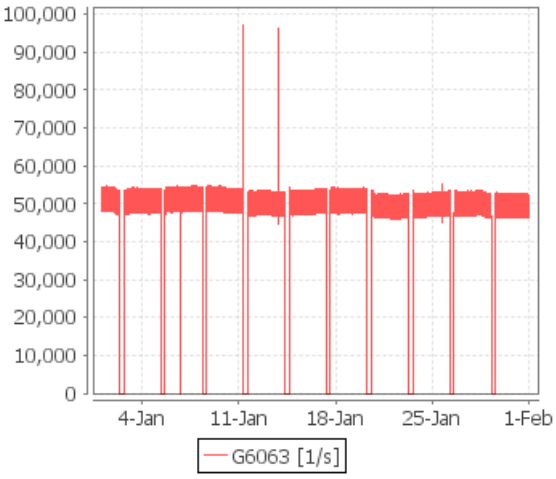
G606 (1V1S-CAL-COUNT)



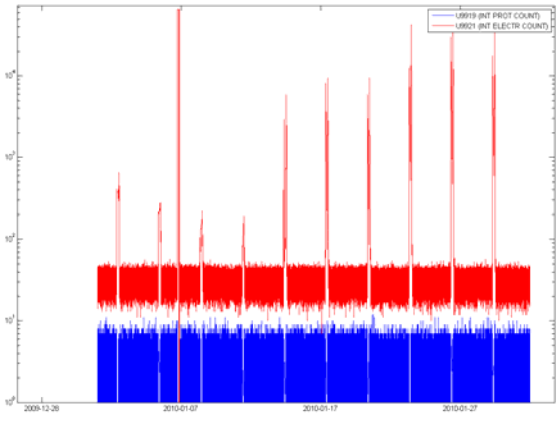
G6062 (V1S-BOT-COUNT)



G6063 (V1S-LAT-COUNT)



U9919/U9921 (IREM proton & electron counters)[1]



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

E3500 (ACS below 100MeV) E3544 (ACS above 100MeV)

Figure 6: Instrument Count Rates

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

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

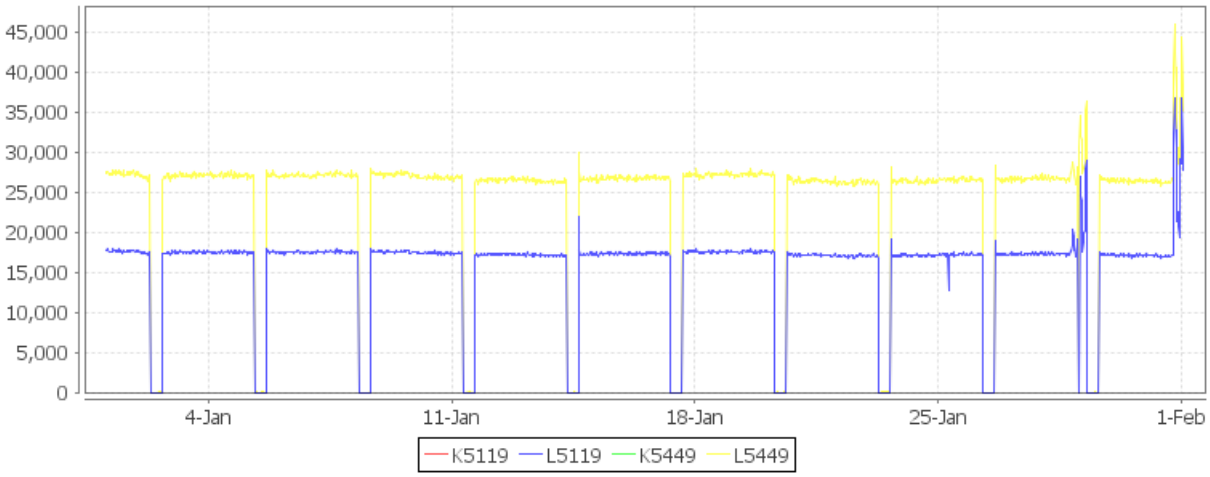


Figure 7: JEM-X Count rates. The smaller downward spikes in the figure are due to the slews of the spacecraft

Radiation Belts

Figure 8 gives a prediction on 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 protons and electrons fluxes.

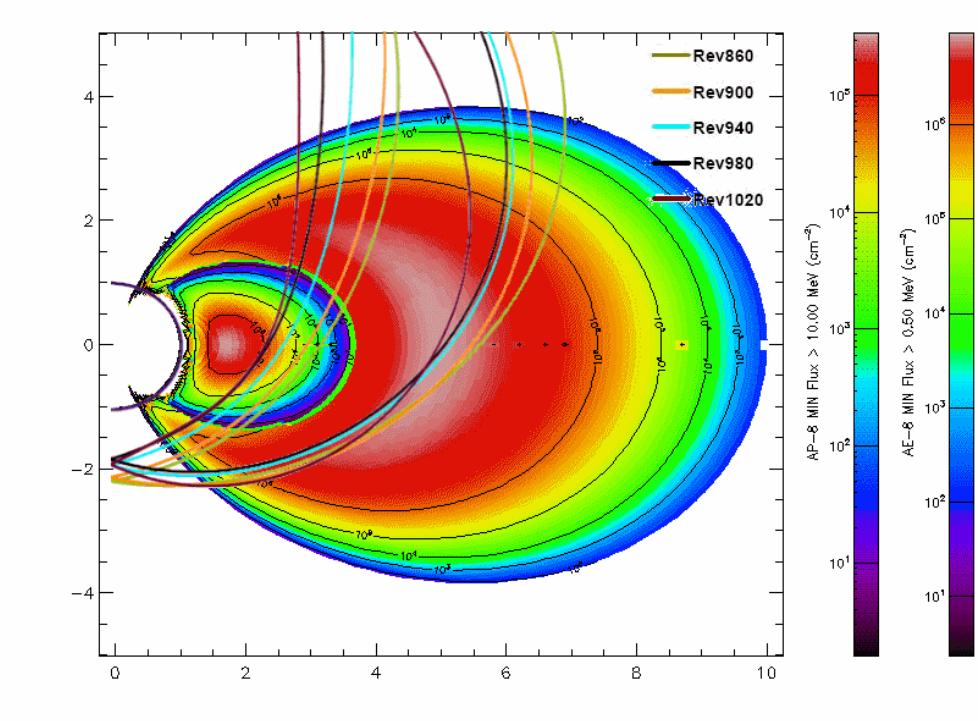


Figure 8: The predicted evolution of the orbit of Integral through the radiation belts

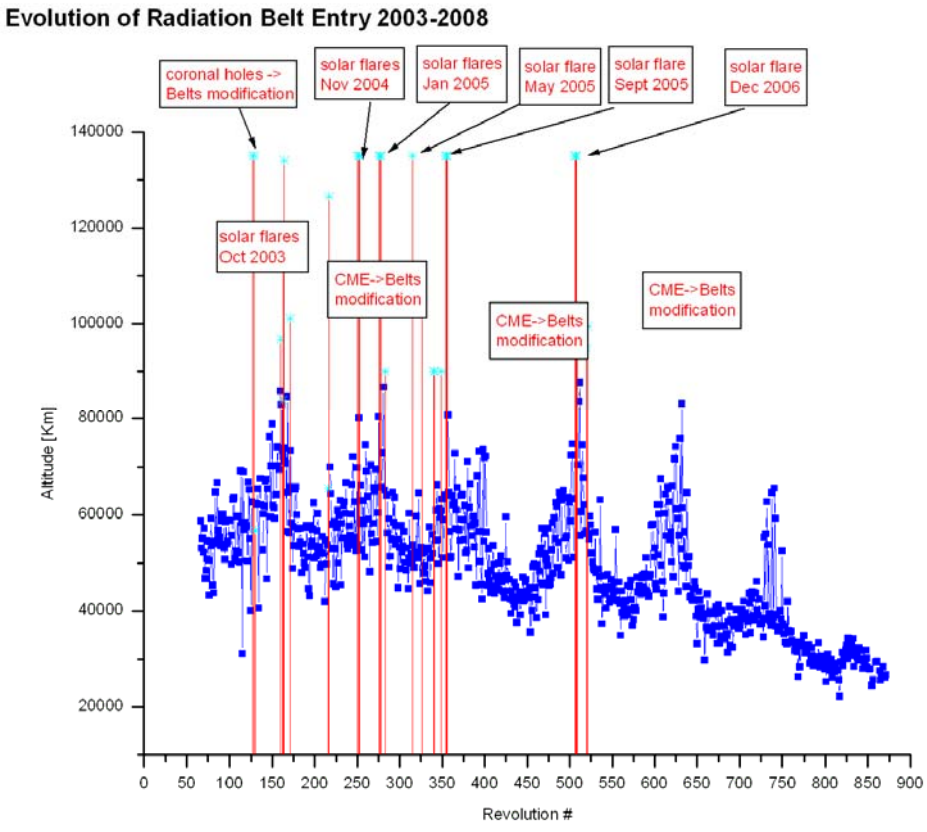


Figure 9: Predicted radiation belt passages

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 segments of the ground facilities to complete all slews scheduled.

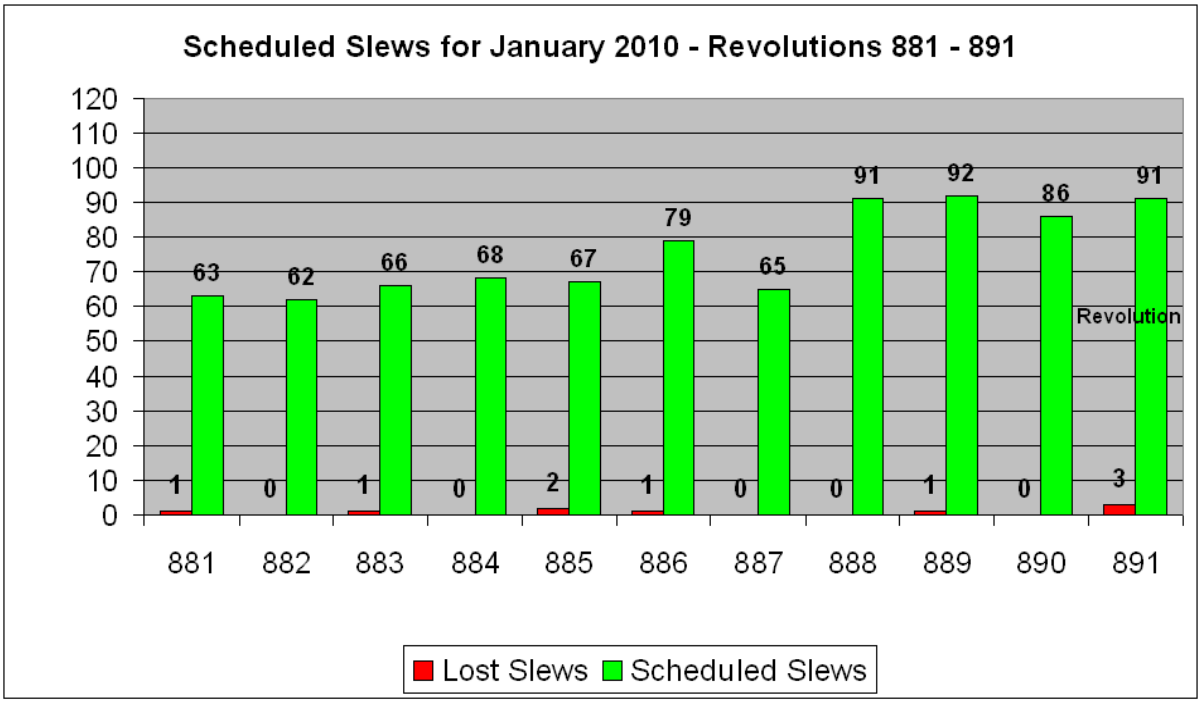


Figure 10: The amount of slews scheduled compared to the amount of slews lost

3.1 Mission Control System

The following restarts were necessary this month:
The IFRD and ISDS tasks on isdsa: one time
The IFRD and ISDS tasks on isdsb: three times
The HFA_TM task on idda: eight times
The HFA_TM task on iddb: none

There was one occasion neccesatating a restart of TCONmainRT on idda and iddb, after restart it was ok again on both idda and iddb. The reason for crash was that the TCON task was not restarted after sws generated new consolidated archive files, the old files expired at midnight on on doy 010.

On DOY020 a restart of imca was done and on DOY021 the analyst moved NCTRS-B TM to IMCC to test SLE1 testing in playback mode.

On DOY023 the SPACON informed by CCC of attack on isdsb server. ON DOY025 we were informed that the SEIS machines had a security breach over the weekend. The machines on the Relay and PISA will be hardened, to prevent future security breaches.

3.2 Ground Stations and Network

The performance of the ground stations and Network was very good this week. There were four occasions of Bad frames and one occasion of data gaps on VC-0 & VC-7 from REDU. There was a drop in VC-0 and VC-7 from REDU twice and from VIL2 once.

On DOY014 TC and TM were disconnected for a SLE swap to use new SLE software at JPL. On DOY021 an early ground station handover was made from DSS27 to REDU, due to very strong winds at Goldstone. On DOY022 DSS27 was affected by high winds again, all links were lost. A handover was made back to REDU. After two attempts the following hours the handover to DSS27 could be done properly.

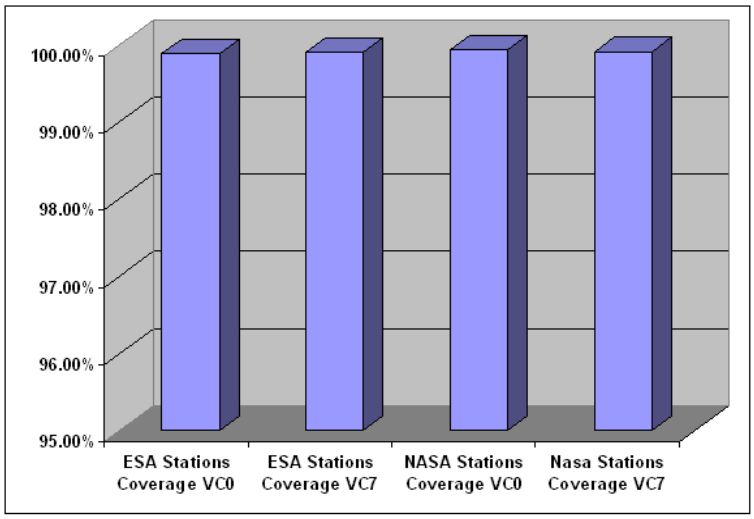


Figure 11: The usage of ESA ground stations compared to the usage of DSN ground stations

3.3 ISOC

3.3.1 Mission Planning

PSFs have been received for revolutions 889 to 898, corresponding to the time range 23 Jan to 21 Feb.

Observations have been planned up to revolution 893, a relatively short stretch ahead, due to the uncertainty on the SPI annealing date.

A TOO on the flaring blazar PKS 1510-089 led to replanning of revolutions 887-890.

TSFs have been received for revolutions 886 to 892.

3.3.2 Observation Status

New ECS files have been received for revolutions 867 to 878, i.e. up to 24 Dec 2009.

3.3.3 ISOC Science Data Archive

Work is ongoing to allow full ingestion of OSA 7 and new PAD data. A tentative release schedule has been agreed with the SAT for ISDA updates in 2010. Raw TM data are routinely transferred from MOC, but several gaps still need to be filled by the MOC side.

3.3.4 ISOC System

ISOC system v23.5 which mainly includes a change to Java 6 has been released.

3.3.5 Problems

No new problems.

4 Anomalies

Table 1 contains the anomalies that occurred last month:

Table 1: Anomalies reported

AR id	Date of occurrence	Subject	Segment	Status
INT-3089	11/01/2010	IMCS: TCON_RT crashed on both IDDA and IDDB	IMCS	Pending
INT-3090	14/01/2010	IMCS: Frame Archive rejecting 90% of frames due to same timestamp	I/F to JPL	Pending
INT-3092	22/01/2010	High Winds Cause Loss of DSS-27 pass	NASA Station	Pending
INT_SC-278	06/01/2010	IREM Anomaly: Reset of IREM_CSCI S/W #86	Payload	Pending
INT_SC-277	03/01/2010	Spurious Switch Off of HLCL 4B1	Spacecraft	Open

5 Special Events & Future Milestones

Start of the eclipse season: 14.02.2010.
SPI Annealing will be planned after the end of the eclipse season, date tbd.

6 Appendix

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

6.1 AOCS operations

During this period, 409 Open Loop Slews, 381 Closed Loop Slews and 22 Momentum Biases were executed (as reported by ACC OEM).

Slews 08910012, 08910013 and 08910014 were missed from the Timeline.

6.1.1 Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 31/01/2010 is reported in the following plot:

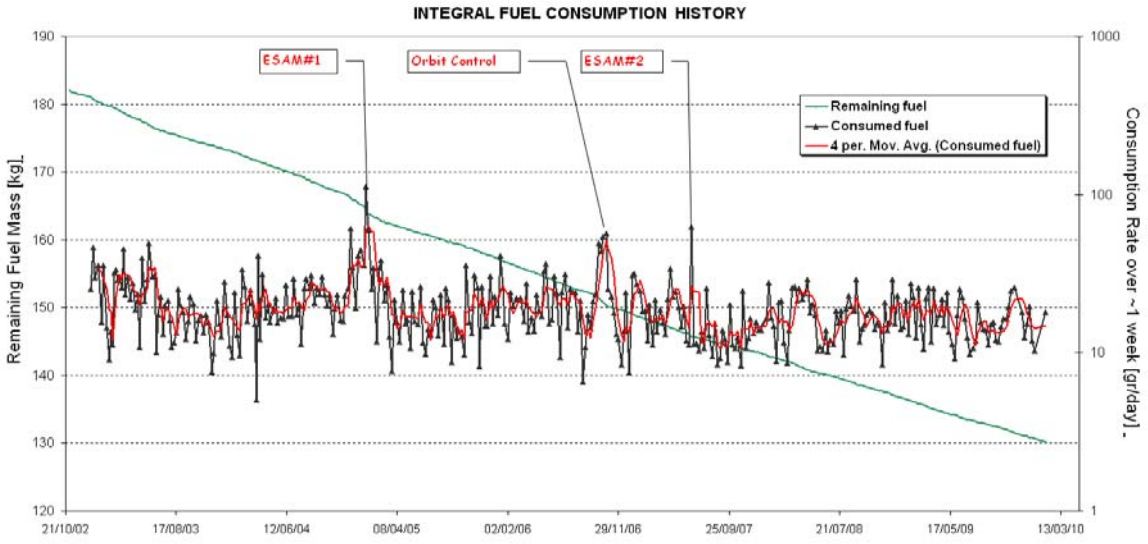


Figure 12: Fuel consumption. Note: ESAM fuel consumption is spread over period of ~1 week.

6.1.2 The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel as from January 2010 up to date are reported in the plot below. Historic data is not available at the moment, but present in the archives. The evolution of the drift on yaw channel is under constant monitoring but the values are still well within the specs.

A9182 – Pitch rate bias, A9184 – Roll rate bias, A9188 – Yaw rate bias

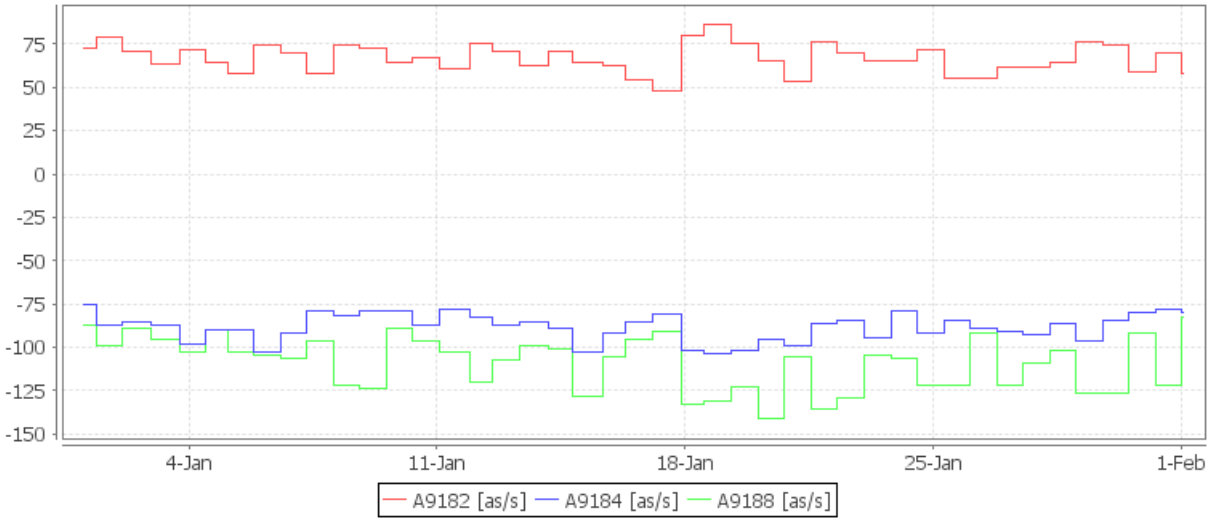


Figure 13: RMU pitch, roll and yaw. Historic data is not available yet

6.1.3 Event log

- **03-01-2010 (Day of Year 003, Revolution 882)**
  IMU1 switched ON during the stable pointing of PID 08820020 (10:44:55Z). A manual mapping was commanded and the parameters for slew 08820021 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08820020.

- **04-01-2010 (Day of Year 004, Revolution 882)**
  IMU1 switched ON during the stable pointing of PID 08820041 (09:14:00Z). A manual mapping was commanded and the parameters for slew 08820042 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08820042.

- **08-01-2010 (Day of Year 008, Revolution 883 to 884)**
  IMU1 switched ON during the stable pointing of PID 08830061 (02:46:00Z). A manual mapping was commanded and the parameters for slew 08830062 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08830061.

- **12-01-2010 (Day of Year 012, Revolution 885)**
  IMU1 switched ON during the stable pointing of PID 08850028 (02:46:00Z). A manual mapping was commanded and the parameters for slew 08850029 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08850028.

- **13-01-2010 (Day of Year 013, Revolution 885)**

IMU1 switched ON during the stable pointing of PID 08850045 (10:02:00Z). A manual mapping was commanded and the parameters for slew 08850046 were afterwards manually updated (spacontool).

OTF was not reached for PID 08850045.

- **14-01-2010 (Day of Year 014, Revolution 885 to 886)**
  IMU1 switched ON during the stable pointing of PID 08860011 (20:51:00Z). A manual mapping was commanded and the parameters for slew 08860012 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08860011.

- **25-01-2010 (Day of Year 025, Revolution 889)**
  IMU1 switched ON during the stable pointing of PID 08890054 (01:02:49Z). A manual mapping was commanded and the parameters for slew 08890055 were afterwards manually updated (spacontool).

  OTF was not reached for PID 08890054.

- **29-01-2010 (Day of Year 029, Revolution 890 to 891)**
  FDS TPF update failed for slew 08910012 (19:37:00Z). A manual 0891_0500_M.OSL TPF was generated with Spacontool from PID 08910011 to 08910012.

  After completion of 0891_0500_M.OSL, a new manual mapping was commanded in order to update the parameter for slew 08910013, but attitude determination based in this mapping failed, so FD was called in.

  FD generated a manual 0891_0501_M.OSL TPF from PID 08910012 to 08910014 and the parameters for slew 08910015 were successfully updated afterwards.

  Slews 08910012, 08910013 and 08910014 were missed from the Timeline. OTF was not reached for their corresponding PIDs.

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 as well as the CDE LCL currents during the reporting period:

E0392 (T CR COLDPLT L2), E0398 (T CR BRAIDS L4)

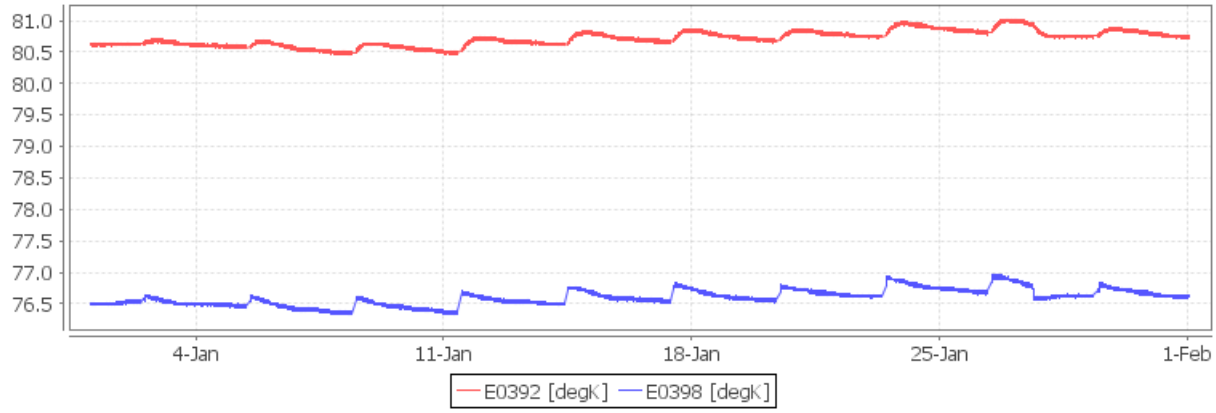


Figure 14: SPI Cold plate and H-bus temperature

P1061 (CDE1 LCL1 CUR), P1063 (CDE2 LCL1 CUR)

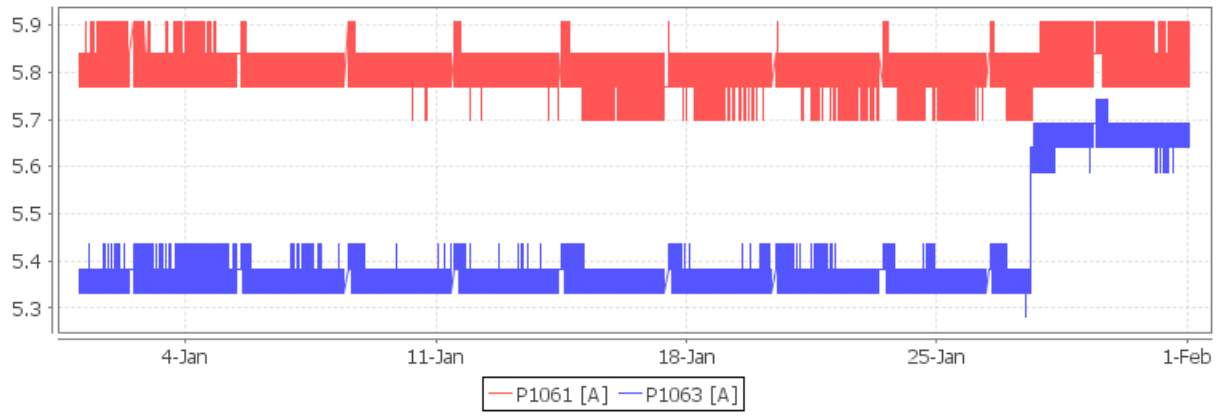


Figure 15: SPI CDE LCL curent

DPE & IASW

The DPE health and IASW performance are nominal. The IASW version installed is v4.3.5 with SE compression only enabled and the spectra scaling factor set to 7/19 SE. The DPE CPU usage was nominal during the reporting period (see Figure 1).

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 and detector #5 is failed since 19/02/2009. The HV of the failed detectors are nominally set to 0.5kV. The following plot shows the AFEE DC output voltages over the reporting period.

Figure 16: 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 Tag and Time Tag Saturated Event count rates during the reporting period.

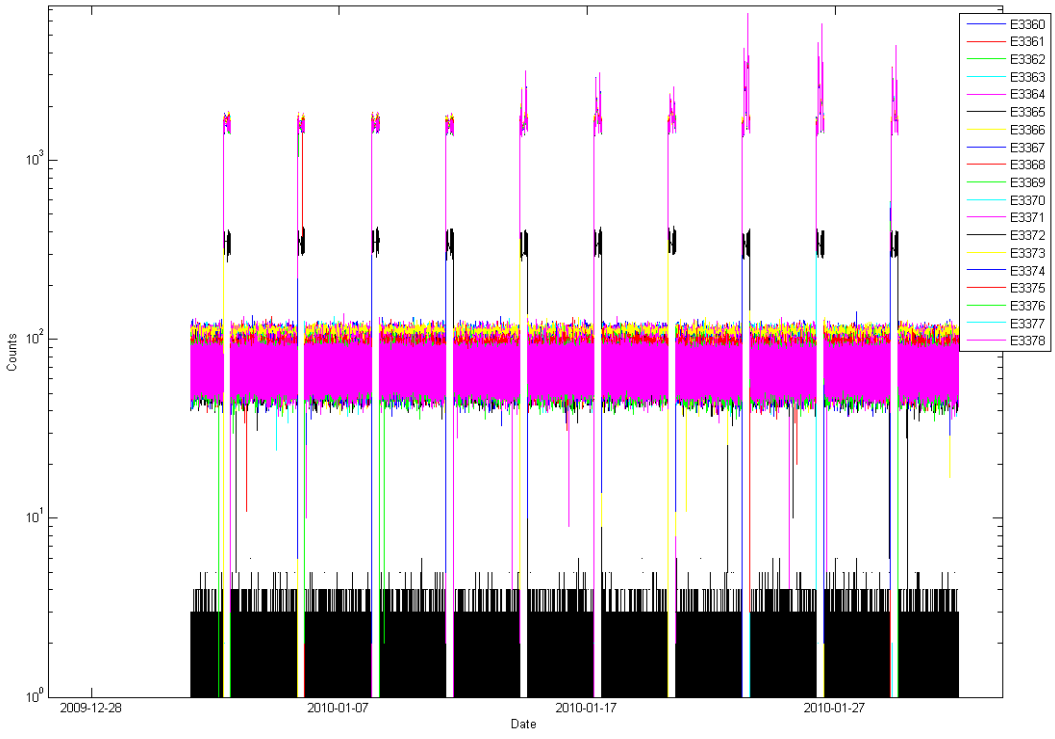


Figure 17: SPI GeD Non-Vetoed count rates. Note that the scale used for plotting is logarithmic

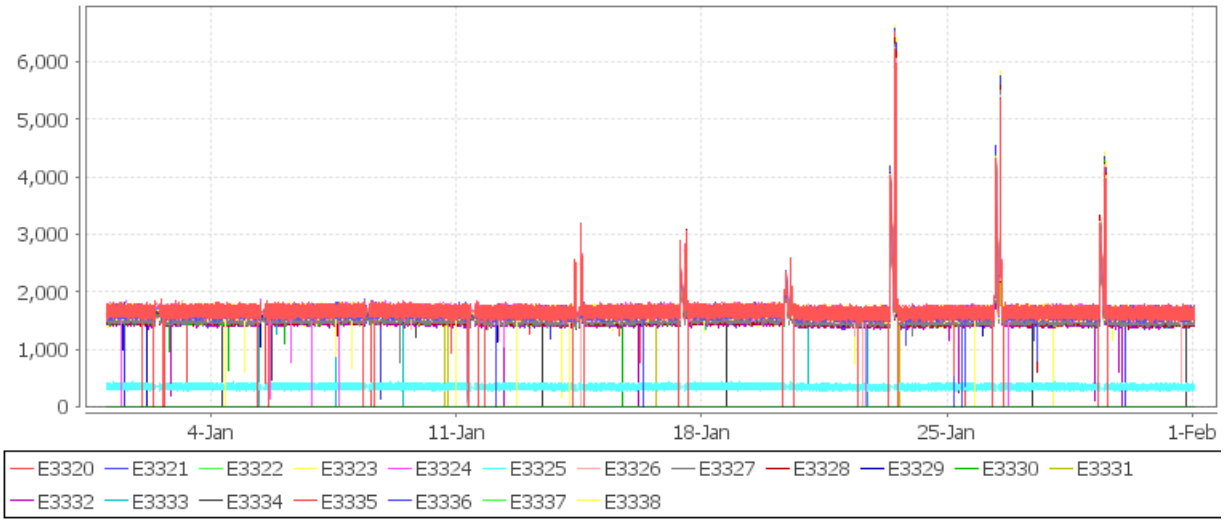


Figure 18: SPI GeD Time tag count rates

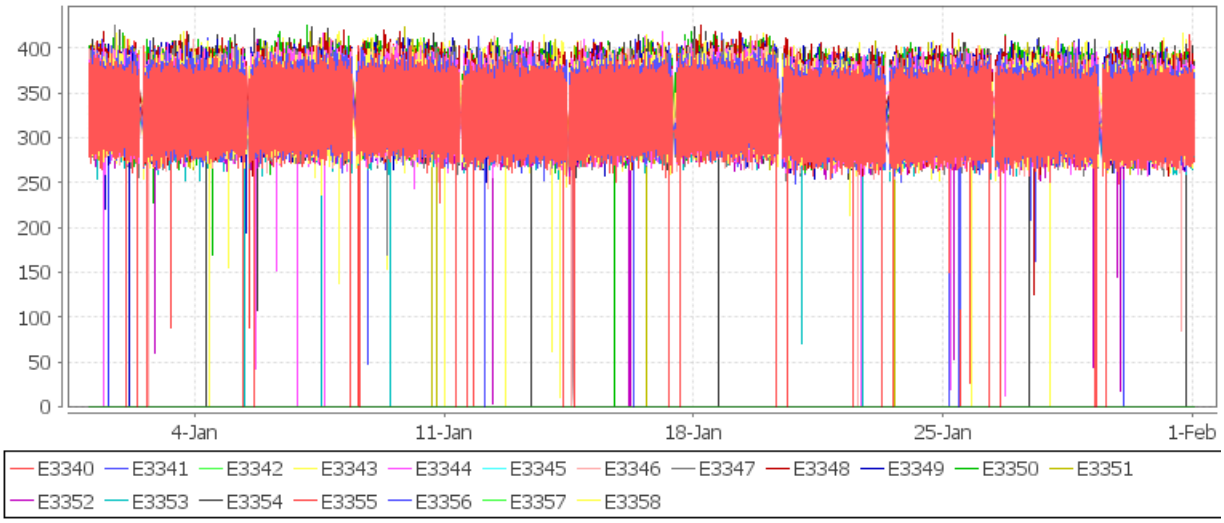


Figure 19: SPI GeD Time tag saturated count rates

PSD

The overall health of the unit is nominal. The Figure 20: SPI PSD GeD Channel rates Figure 20 shows the PSD channel rates over the reporting period:

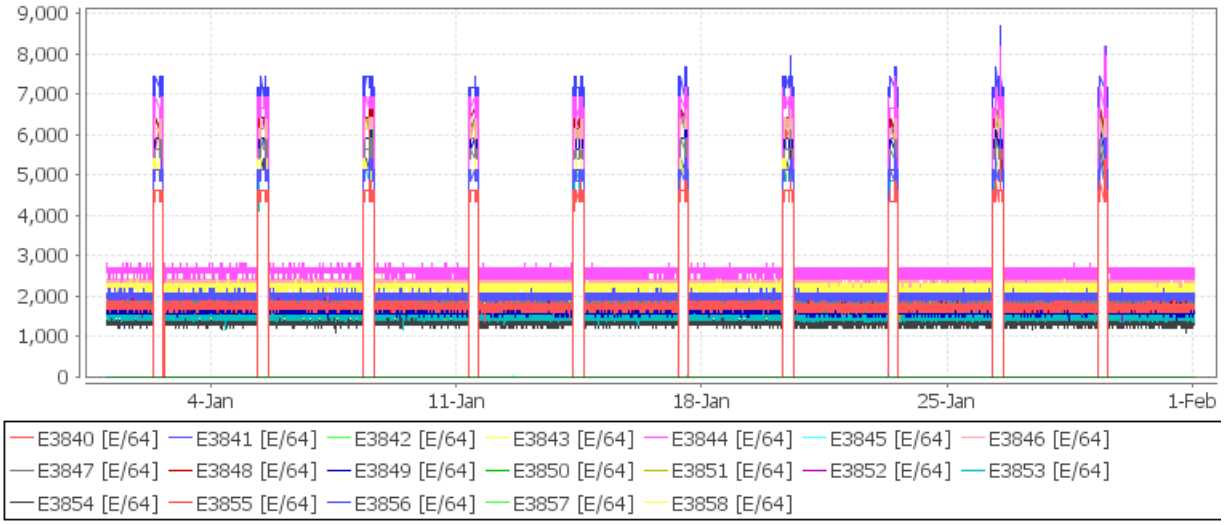


Figure 20: SPI PSD GeD Channel rates

6.2.2 Event Log

The event log will be updated the coming weeks.

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:

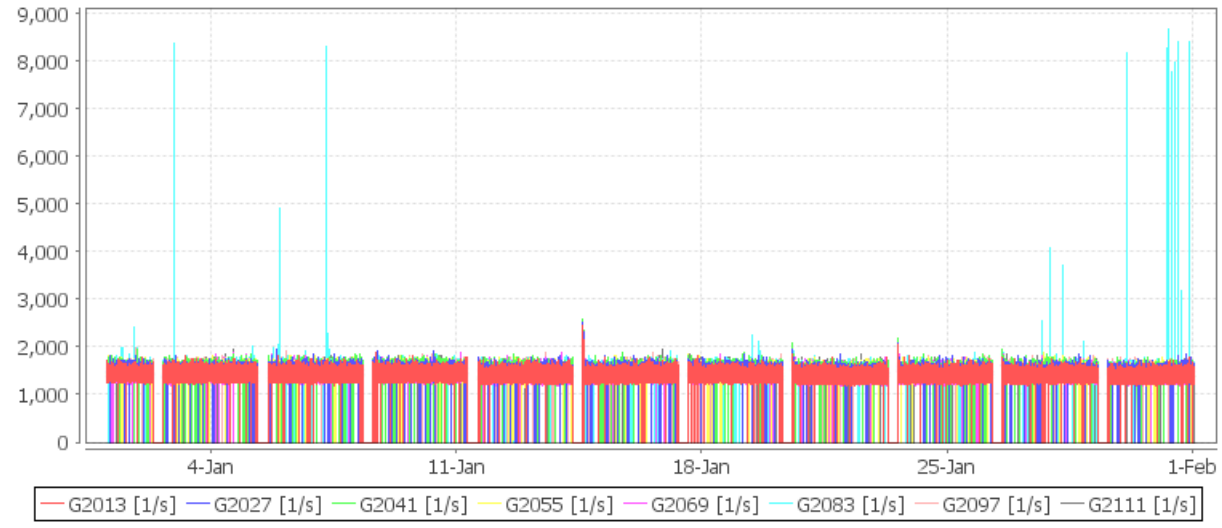


Figure 21: ISGRI MCE Counters

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:

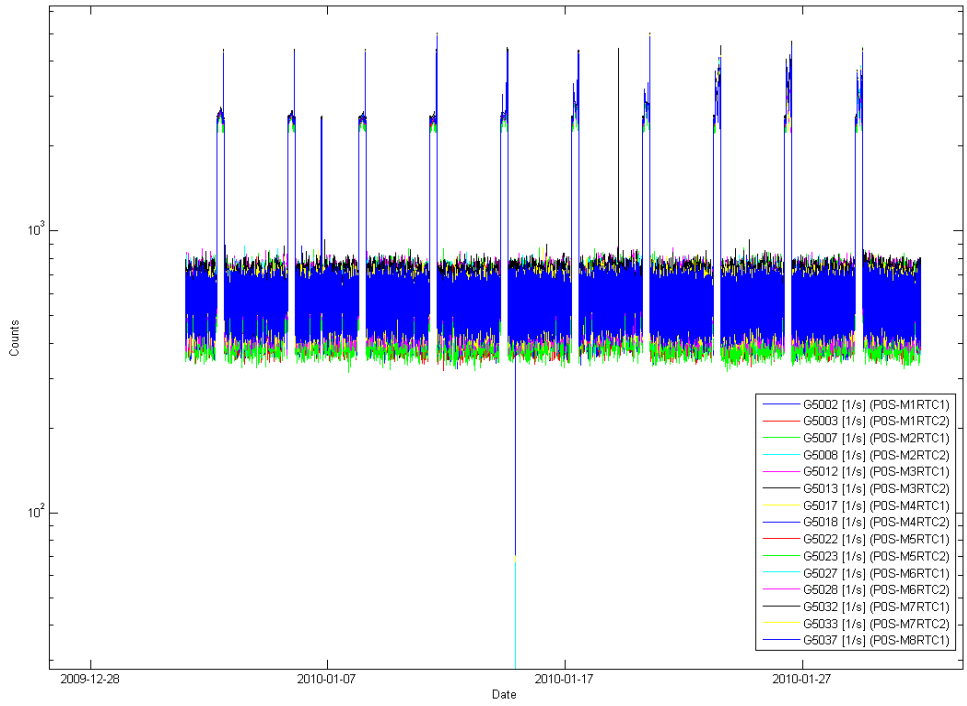


Figure 22: PICsIT semi-module counters. Note that the scale used for plotting is logarithmic

VETO

The health and performance of VETO was nominal during the reporting period.

6.3.2 Event Log

The event log will be updated the coming weeks.

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 and DFEE detector temperatures over the reporting period.

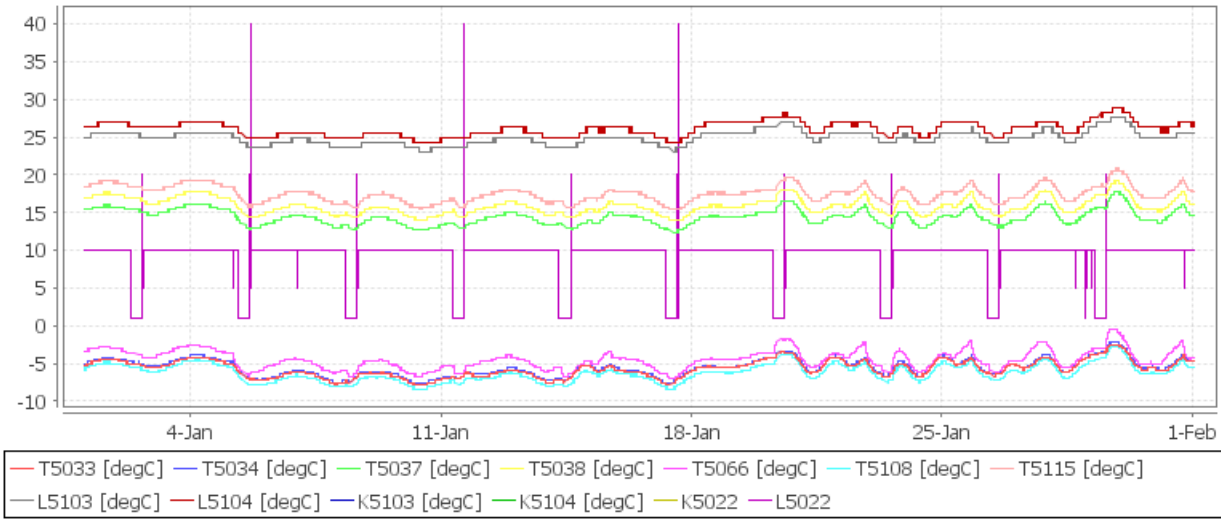


Figure 23: JEMX Detector and DFEE Temperatures

6.4.2 Event Log

- **06-01-2010 (Day of Year 006, Revolution 883)**

  At 17:08:59 JEMX-2 parameters L5315, L5316 & L5317 went Out-of-Limits due to an IREM SEU (#86). There was no impact as the reaction has been disabled.

- **14-01-2010 (Day of Year 014, Revolution 855-866)**

  From 14:30:11 to 15:01:46, JEMX-2 parameter L5449 repeatedly exceeded soft limits, no action was taken, and there was no impact.

- **24-01-2010 (Day of Year 024, Revolution 889)**

  From 15:01:59, during the slew from the attitude of pointing 08890039 to 08890040, parameter L5449, and shortly after L5136 exceeded soft limits, they returned within limits inside 3 minutes. No action was taken, and there was no impact.

- **26-01-2010 (Day of Year 026, Revolution 889-890)**

  At 13:53:41, TCs L0021 & LU0014 terminated with status unknown. At 15:02:23, TC L0021 terminated again, this time with status uncertain-failed. No action was taken, and there was no impact.

- **28-01-2010 (Day of Year 028, Revolution 890)**

  At 16:59:48, TC LU0014 terminated with status affected, which then changed to unverified, and then to unknown. No action was taken, and there was no impact.

  At 23:06:36, TM parameter L5449 exceeded soft limits, this was followed at 23:07:35 by parameter L5136. At this point the operator as a precaution manually sent the SAFE command. After consultation with the engineer, the unit was returned to science by executing procedures FCP_JEM2_0041 (transition to setup), and the FCP_JEM2_1010

configuration for science ops. At 00:08, the following day, JEMX-2 was back in data-taking. Unfortunately, the ops instruction to go to the new Voltage setting of 73 was over-looked, and the instrument remained with a value of 74 until the end of the revolution

- **29-01-2010 (Day of Year 029, Revolution 890-891)**

  At 00:07:07, TM parameter L5449 exceeded soft limits, with L5136 following at 00:08:19.

  At 01:09:23 & 01:10:21 TM parameter L5136 exceeded soft limits.

  At 03:16:19, TC LU0014 terminated with status affected, which then changed to unverified, and then to unknown. No action was taken, and there was no impact.

  At 04:10:20 TM parameter L5449 exceeded soft limits and at 04:11:39 parameter L5136 briefly did the same.

  At 05:13:46, TC LU0014 terminated with status affected, which then changed to unverified, and then to unknown. No action was taken, and there was no impact.

  At 13:40:38, TC LU0014 terminated with status affected, which then changed to unverified. No action was taken, and there was no impact.

- **31-01-2010 (Day of Year 31, Revolution 891)**

  From 17:17:43, until the end of the day, parameters L5119, L5449 & L5136 repeatedly exceeded soft limits, and on occasions L5119 & L5449 exceeded hard limits. No action was taken, and there was no impact.

  To try and reduce the incidences of TeleCommands not terminating properly, the timeout for the CEV has been extended from 16 to 20 seconds, and will be included in the next database release due shortly.

6.5 OMC

6.5.1 Operations

The status and performance of OMC is nominal.

6.5.2 Event Log

- **06-01-2010 (Day of Year 006, Revolution 883)**

  At 17:08:17 an IREM SEU (#86) forced OMC to SAFE mode, a recovery was performed, and the unit returned to standby at 17:42:05. The impact was an interruption of pointing 08830028 after 1897 from a planned 3334 seconds

- **08-01-2010 (Day of Year 008, Revolution 883)**

  Insert you text concerning the event here

- **29-01-2010 (Day of Year 029, Revolution 890-891)**

At 02:46, an AOCS problem forced a suspension of the timeline. At 03:25, after a recovery, the timeline was rejoined. The impact was pointing 08830061 was cut short to 2501 from a planned 3334 seconds.

6.6 IREM

6.6.1 Operations

Radiation belts entry and exit

The following plots show the Radiation Belt Entry (Figure 24, red line) and Exit times (Figure 25, blue line) obtained from the ISDC website, defined where the IREM TC3 (soft electrons) rate reads 600 counts. The blue line in Figure 24 and the magenta line in Figure 25 are the altitudes used by the MOC for planning purposes.

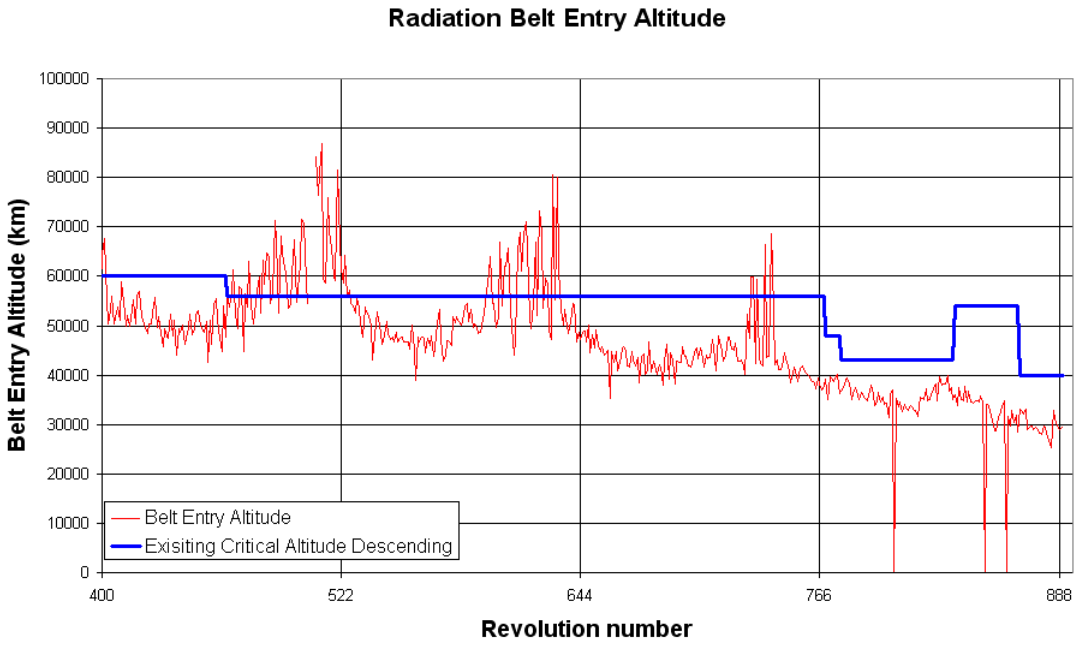


Figure 24: Radiation belt entry

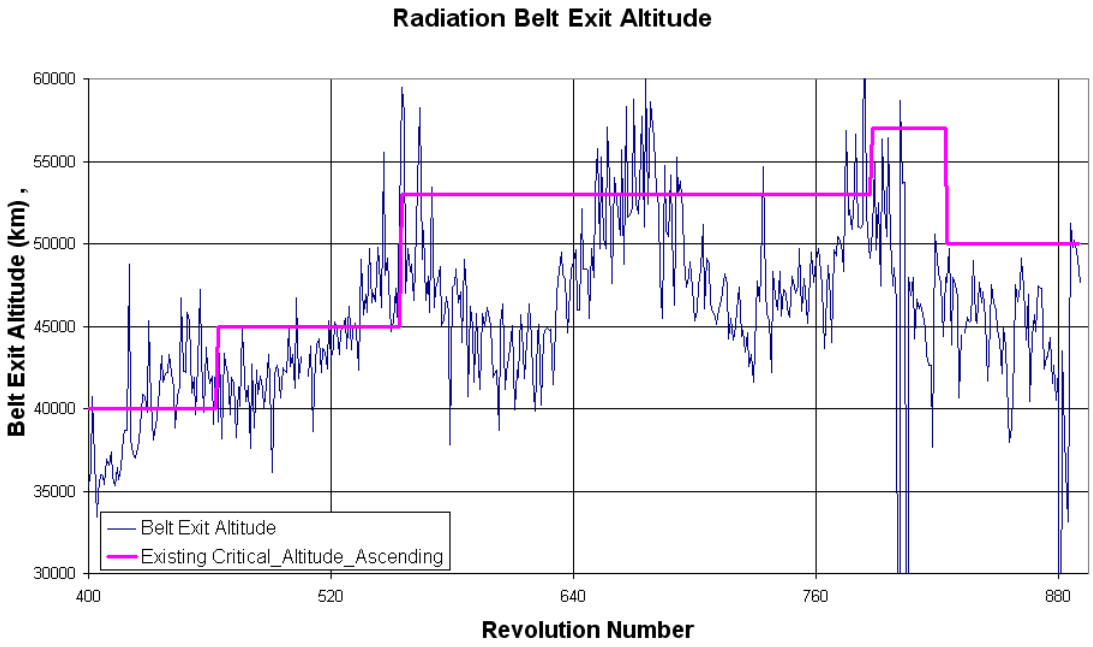


Figure 25: Radiation belt exit

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
881	RAD_ENTR R 2010-01-02T07:32:58Z	02/01/2010 08:56:49	24219.7	02-Jan-2010 08:48:34	25860.27	02-Jan-2010 09:48:34	13287.2
882	RAD_EXIT R 2010-01-02T14:47:23Z	02/01/2010 13:38:41	>>29576.7	02-Jan-2010 14:28:34	46980.14	02-Jan-2010 10:28:34	6626.811
882	RAD_ENTR R 2010-01-05T07:21:27Z	05/01/2010 08:54:17	23327.2	05-Jan-2010 08:35:50	26150.77	05-Jan-2010 09:45:50	11507.61
883	RAD_EXIT R 2010-01-05T14:35:46Z	05/01/2010 13:07:05	>>29585.2	05-Jan-2010 14:15:50	46790.08	05-Jan-2010 10:15:50	6709.566
883	RAD_ENTR R 2010-01-08T07:11:44Z	08/01/2010 08:43:05	23287.7	08-Jan-2010 08:28:59	25117.28	08-Jan-2010 09:28:59	12442.89

884	RAD_EXIT R 2010-01-08T14:25:31Z	08/01/2010 13:02:33	>>29613.4	08-Jan-2010 13:58:59	46088.12	08-Jan-2010 10:08:59	6212.546
884	RAD_ENTR R 2010-01-11T07:03:07Z	11/01/2010 08:43:05	21602.9	11-Jan-2010 08:20:47	25090.79	11-Jan-2010 09:20:47	12410.86
885	RAD_EXIT R 2010-01-11T14:16:43Z	11/01/2010 12:26:17	31551.0	11-Jan-2010 13:50:47	46117.26	11-Jan-2010 10:00:47	6195.989
885	RAD_ENTR R 2010-01-14T06:53:33Z	14/01/2010 08:07:37	25883.3	14-Jan-2010 08:10:47	25204.57	14-Jan-2010 09:10:47	12556.74
886	RAD_EXIT R 2010-01-14T14:07:32Z	14/01/2010 13:46:33	46664.1	14-Jan-2010 13:40:47	45980.03	14-Jan-2010 09:50:47	6283.892
886	RAD_ENTR R 2010-01-17T06:42:54Z	17/01/2010 07:58:57	26320.9	17-Jan-2010 08:01:38	24896.53	17-Jan-2010 09:01:38	12329.39
887	RAD_EXIT R 2010-01-17T13:57:31Z	17/01/2010 13:26:33	>>29569.8	17-Jan-2010 13:31:38	46096.53	17-Jan-2010 09:31:38	7193.385
887	RAD_ENTR R 2010-01-20T06:30:48Z	20/01/2010 07:52:34	24051.8	20-Jan-2010 07:43:57	26324.38	20-Jan-2010 08:53:57	11762.52
888	RAD_EXIT R 2010-01-20T13:45:45Z	20/01/2010 13:26:02	46875.3	20-Jan-2010 13:23:57	46538.64	20-Jan-2010 09:23:57	6919.774
888	RAD_ENTR R 2010-01-23T06:19:15Z	23/01/2010 07:49:06	22266.9	23-Jan-2010 07:32:42	26070.85	23-Jan-2010 08:42:42	11459.71
889	RAD_EXIT R 2010-01-23T13:33:58Z	23/01/2010 13:20:02	47840.1	23-Jan-2010 13:12:42	46808.75	23-Jan-2010 09:12:42	6721.27
889	RAD_ENTR R 2010-01-26T06:08:01Z	26/01/2010 07:35:06	23816.8	26-Jan-2010 07:28:01	24731.01	26-Jan-2010 08:28:01	12117.95
890	RAD_EXIT R 2010-01-26T13:22:29Z	26/01/2010 12:44:34	>>29578.5	26-Jan-2010 12:58:01	46297	26-Jan-2010 08:58:01	7022.788
890	RAD_ENTR R 2010-01-29T05:55:01Z	29/01/2010 07:18:26	23867.7	29-Jan-2010 07:15:27	24867.89	29-Jan-2010 08:15:27	12320.14
891	RAD_EXIT R 2010-01-29T13:09:59Z	29/01/2010 12:28:02	>>29550.7	29-Jan-2010 12:45:27	46092.56	29-Jan-2010 08:45:27	7211.359

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

- **06-01-2010 (Day of Year 006, Revolution 883)**

At 17:08:17Z, a local reset of the IREM CSCI S/W (SEU #86) occurred. 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 2010.006.17:08:17Z (154370.2 km). The unit had performed an automatic transition to Standard Mode (ie. 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.
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 21:18:00Z.

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 PIs request. OMC was recovered at 17.42.05Z and IBIS at 18:50:00Z