

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 209
Week 38
25.09.06
Routine Phase

Prepared by: M. Walker (OPS-OFO)

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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.

It addresses the activities from 16.09.06 until 22.09.06 (both dates inclusive) and covers the revolutions 480 and 481.

2 Summary of Activities

The operations were performed according to the planning inputs from ISOC combined with some manual commanding by MOC.

The targets of these revolutions consisted of 2 hexagonal dithers of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), 2 hexagonal dithers of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), 3 raster dithers of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5) and 4 raster dithers of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6)

Note: Some further information concerning the activities is provided in the Appendix.

3 Satellite Status

3.1 Platform

The performance of the platform was good. No new unexpected behaviour / malfunction was identified.

3.1.1 AOCS

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

Four slews were missed during the observation period due to problems on the TC/TM links to REDU station and IMCS-FDS connection.

The fuel consumption over the period between 14/09/2006 and 20/09/2006 was 0.1581 Kg. The remaining propellant is in the order of 151.9616 Kg.

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

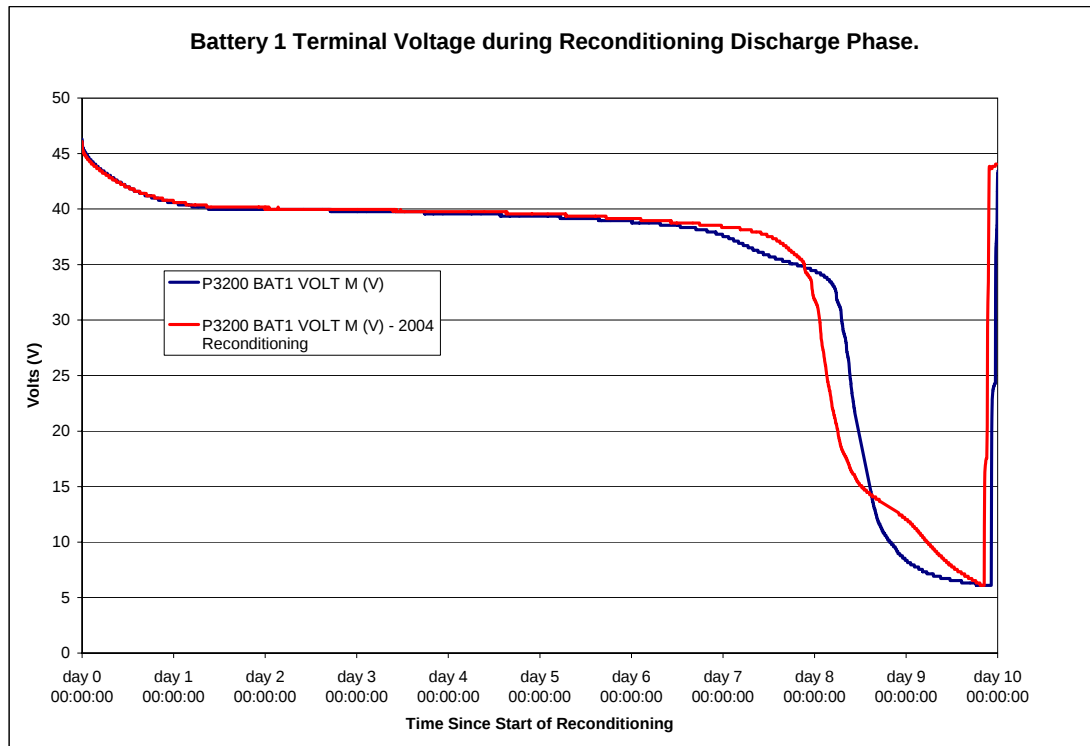
3.1.2 Power

The EPS is working nominally, available power from the arrays is of the order of 2100W.

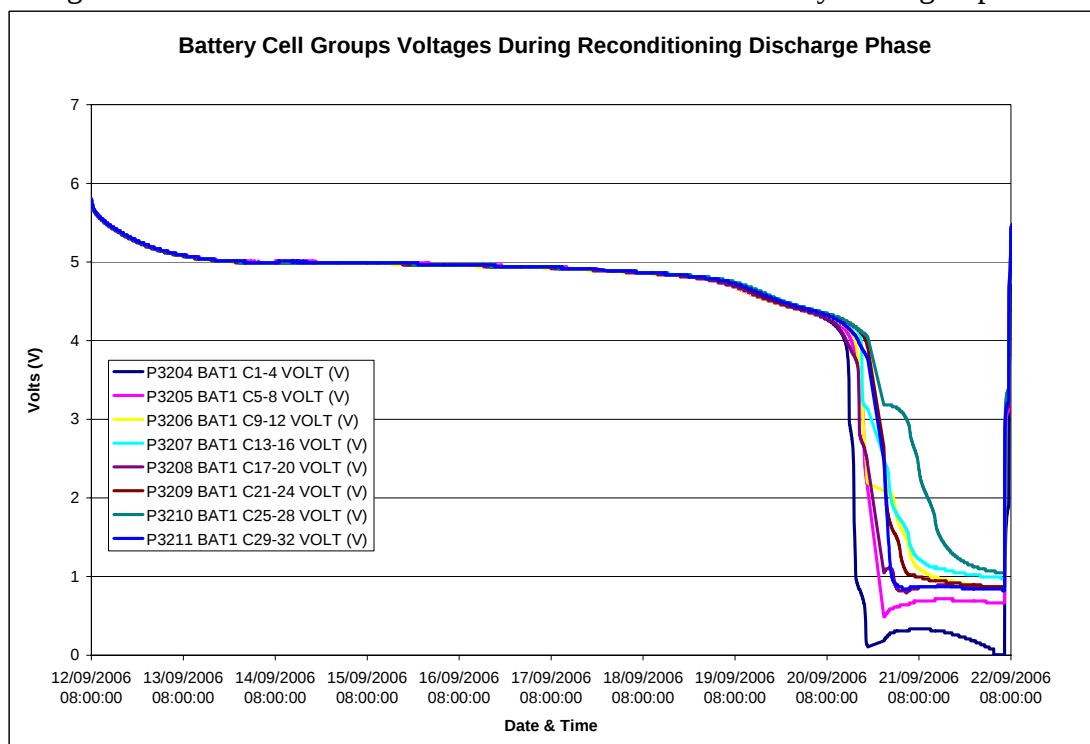
Battery 2 reconditioning discharge phase terminated nominally on 22/9/2006 at 06.04z.

The following plot illustrates the battery terminal voltage, during the discharge phase and the start of the recharge phase, both for the current reconditioning and the last reconditioning in Spring 2004. As can be seen the discharge profiles are very similar for the first 7.5 days, after this some divergence can be seen, possibly an indication

that the battery reconditioning was necessary. However in both cases the discharged capacity was very similar (2006: 36Ah, 2004: 35.75Ah)



The battery cells groups voltages during the discharge phase are plotted below, as in the previous reconditioning, the groups voltages remained equal down to a very deep depth of discharge (>8 days), indicating that there is little imbalance in the capacities of the cells groups. As in 2004, cell group 1-4 was the only cell group which discharged to 0V, once the trickle charge current was applied (0.1A) the cell group voltage soon recovered to be in line with that of the other battery 1 cell groups.



The recharge of battery 1 is expected to take about 22 hours, the recharge capacity will be set at about 38.6Ah.

3.1.3 Thermal

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

3.1.4 OBDH

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

3.1.5 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.

3.2 Payload

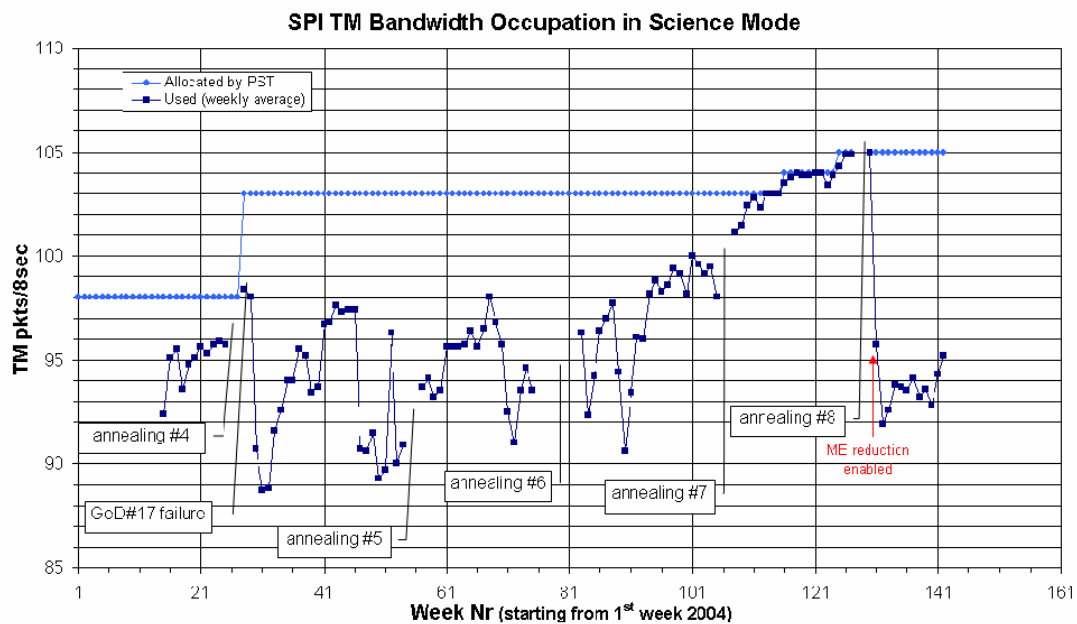
3.2.1 SPI

Following the 8th annealing, which ended on 26th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with this annealing. Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

The Stirling compressors are working nominally, maintaining the Germanium detectors at 82 +/-1K.

During science operations, the instrument was kept in photon-by-photon mode with spectra TM enabled. The assigned TM bandwidth in the science observation windows was 105 packets/cycle. The average telemetry occupation when the TM allocation was 105 packets/cycle was 95.2 packets/cycle.

The following plot shows the assigned and the average occupation of the SPI TM bandwidth.



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

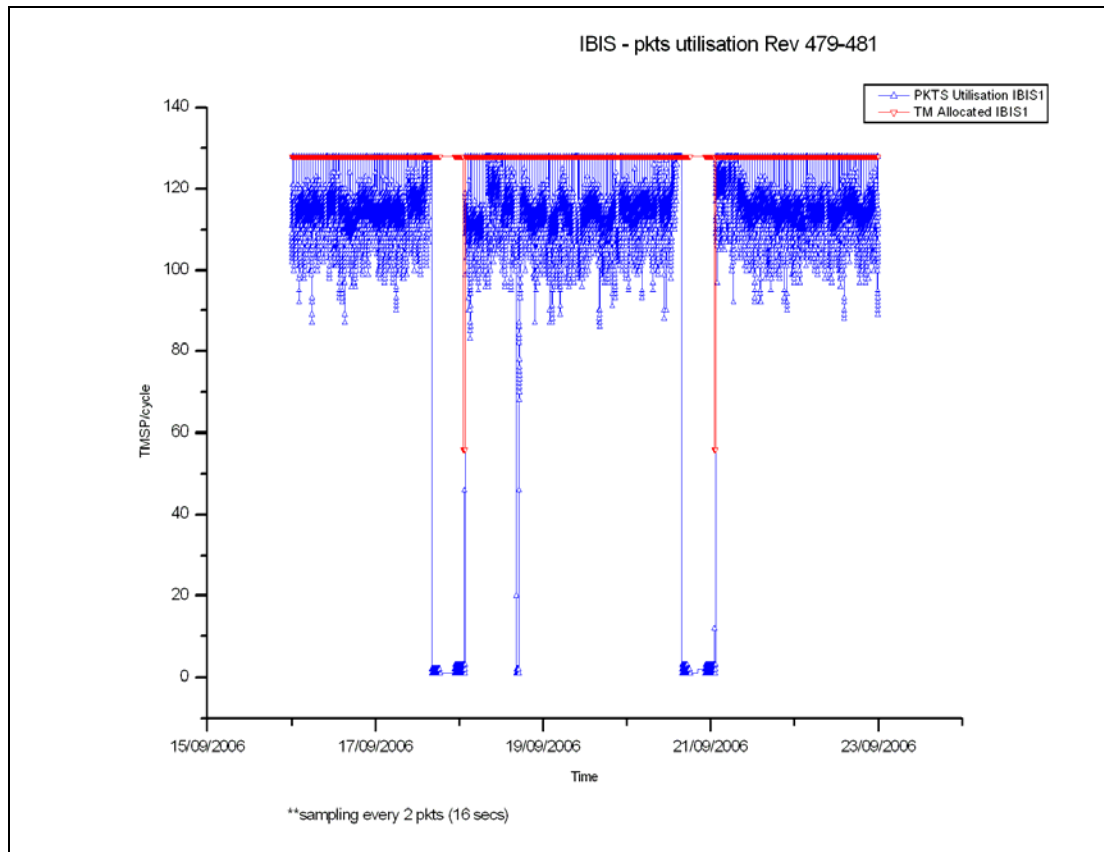
3.2.2 IBIS

The overall status of the unit is nominal.

On 2006-09-18 at 16:23Z, a local reset of the IREM CSCI S/W (SEU #35) occurred. This triggered the IBIS radiation automatism that sent the unit into safe mode. IBIS was manually recovered at 17:27Z.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 114.93 TMPS/cycle, up 3.71 on last week.

A plot of the IBIS TM utilisation during the observation period is shown below:



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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

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

Further information on the JEM-X operations can be found in the Appendix Section 8.3.4.

3.2.4 OMC

The status of OMC is nominal.

OMC operations were performed by the automatic Timeline. OMC was operated in Science Normal mode during science observations, with a TM allocation of 5 packets/cycle.

During this reporting period, 184 of the 188 planned science pointings for OMC were executed nominally, 2 were delayed and 2 were lost.

Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.

3.2.5 IREM

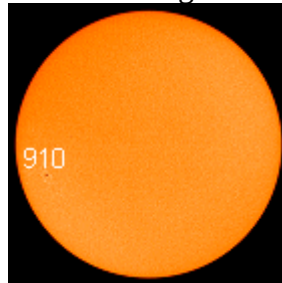
The overall status of the unit is nominal.

On 18/09/2006, the IREM CSCI SW reset #35 occurred during the science observations of revolution 480, which were interrupted as a result for IBIS and OMC (see INT_SC-158).

Solar Activity

The observation period was characterised by low solar activity.

On 17/09/2006, sunspot 904 disappeared and a new sunspot, 910, emerged on the sun. This later remained small during the whole observation period (see picture of the sun on 19/09/2006). There was no threat for strong solar flares.



Reference: www.spaceweather.com

Note: Some more information concerning the IREM operations is provided in the Appendix Section 8.3.6.

4 Ground Facilities

The Operational ground facilities performance was good this week. A couple of slews were lost/delayed when problems with the TM links with Redu led to commands failing release. The overall performance, however, was well above the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was again good this week. The main problems reported was the GTP server within the FD system crashed twice, which led to the loss of two pointings. The overall performance was well above the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was again good this week. There were, however, repeated instances of Reed-Solomon errors, bad frames, hits on the line and data drops from Redu, one of which led to the loss of a pointing. There was also one occurrence reported of the isds-ISDC link dropping. The overall performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs have been received for revolutions 487 and 488. Up to revolution 485 has been planned and sent to MOC. 3 ToO requests were received. Two were on the same source. They could be satisfied by optimising the planning in future revolutions. The third request is still pending. It might be included in revolution 486 at the earliest if approved. TSF's up to revolution 482 was received.

2. Observation status

ECS's for revolutions 470 and 472 have been received. They have been processed including the ones left over from last week. No extra time has been credited.

3. ISOC science Data Archive

The ingestion of products in the ISDA is now in sync with ISDC. The work to integrate the visualisation tool to allow it to be launched from the ISDA has started

4. ISOC system

ISOC version 13.0 has been used without problems

5. AO-4

Nothing to report.

7. Problems

none

4.3.2 ISDC

Status of ISDC observation processing on 25/09/2006:

- Latest Standard Analysis completed: observation 03201080014 (Field_14, Revolution 453, 455 & 459) on 29/08/2006.
- Latest products archived: observation 03201080014 (Field_14, Revolution 453, 455 & 459) on 04/09/2006.
- Latest observation products sent to the observer: observation 03201080014 (Field_14, Revolution 453, 455 & 459) on 06/09/2006.

5 Special Events

6 Anomalies

The following problem that impacted operations was reported:

- On DoY 261, at 16:23, a local reset of the IREM CSCI S/W (SEU #35) occurred. A recovery was performed, and completed at 17:27, the impact was OMC & IBIS science data for pointing 04800023 was lost.

- On DoY 262, at 09:26, the FD system failed to update the parameters for the next slew. The problem was later traced to the GTP server having crashed. A recovery was performed, and completed at 10:16. The impact was a 23 minute delay in the start of pointing 04800045.
- At 21:29, the TM links with Redu dropped. During the recovery, an insufficient number of stars found during the mapping, delaying the corrective slew. The Timeline was rejoined at 22:43. The impact was the loss of pointing 04800060, and a 13 minute delay in the start of pointing 04800061.
- On DoY 263, at 14:58, the application HFATM died, the cause was traced to the FD GTP server having crashed. The GTP and HFATM processes were restarted, there was no impact on the timeline.
- On DoY 263, at 17:10, TC/TM links from REDU dropped out. An application restart of the INCTRA at 17:19z didn't cure the problem. Still no Bitlock available after a swap to INCTRB at 17:26z. Swap back to INCTRA at 17:37z. DSS-27 was asked to support INTEGRAL at that time. The station experienced problems with maintaining solid lock on receiver and telemetry from 17:34z to 17:49:27z. DR# G107054, the impact was the slew to attitude 04800083 (the perigee attitude) was lost, the science data was not affected.

The following anomaly reports were entered into the ARTS system this week:

AR id	Date Created	Subject	Segment	Status
INT-2880	21/09/2006	HFA TM task on IMCA died	IMCS	Pending
INT-2881	25/09/2006	OBSM FARC empty.	OBSM	Open
INT-2882	25/09/2006	OBSM crashes when importing a file.	OBSM	Open

:

7 Future Milestones

Battery 1 re-conditioning started on the 12th September 2006, battery 2 reconditioning is planned for late September 2006.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 480

The observations in revolution 480 began with a hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.6 hours. It continued with a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6), lasting ~12.6 hours. After this, a raster dither of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), lasting ~18.5 hours, was executed. Finally, another raster dither of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6), lasting ~16.3 hours, was performed, until the end of the revolution.

Revolution 481

The observations in revolution 481 began with a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6), lasting ~2.2 hours. After this, raster dithers of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), and AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6), both lasting ~18.5 hours, were executed. Next, another raster dither of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), this time lasting ~8.9 hours, was performed. Finally a hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.6 hours was performed, until the end of the revolution.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-09-01T10:49:31.000Z	152.3113	F	Automatic TM processing.
2006-09-03T00:40:15.000Z	152.2875	F	Automatic TM processing.
2006-09-04T10:44:11.000Z	152.2472	F	Automatic TM processing.
2006-09-06T08:56:08.000Z	152.2273	F	Automatic TM processing.
2006-09-07T10:49:23.000Z	152.2060	F	Automatic TM processing.
2006-09-09T19:25:05.000Z	152.1945	F	Automatic TM processing.
2006-09-10T10:02:18.000Z	152.1805	F	Automatic TM processing.
2006-09-11T17:13:17.000Z	152.1468	F	Automatic TM processing.
2006-09-12T08:12:55.000Z	152.1360	F	Automatic TM processing.
2006-09-13T10:08:58.000Z	152.1197	F	Automatic TM processing.
2006-09-16T10:03:30.000Z	152.0733	F	Automatic TM processing.
2006-09-17T17:56:22.000Z	152.0453	F	Automatic TM processing.
2006-09-18T07:39:43.000Z	152.0262	F	Automatic TM processing.
2006-09-19T09:16:10.000Z	152.0057	F	Automatic TM processing.
2006-09-20T23:13:42.000Z	151.9616	F	Automatic TM processing.

This report was generated Fri Sep 22 08:00:35 GMT 2006

8.3 Detailed Satellite Information

This section contains some detailed information concerning the various subsystems of the satellite and instruments.

8.3.1 AOCS SUMMARY OPERATIONS REPORT, 16/09/2006 – 22/09/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 113 Open Loop Slews, 87 Closed Loop Slews and 6 Momentum Biases were executed.

4 slews (3 OSL, 1 CSL) were missed during the observation period due to a problem on the link to REDU station, on IMCS HFA TM task and on FDS GTPs processors.

This is equivalent to a ~2 % of the total number of slews planned (202).

Orbit Control

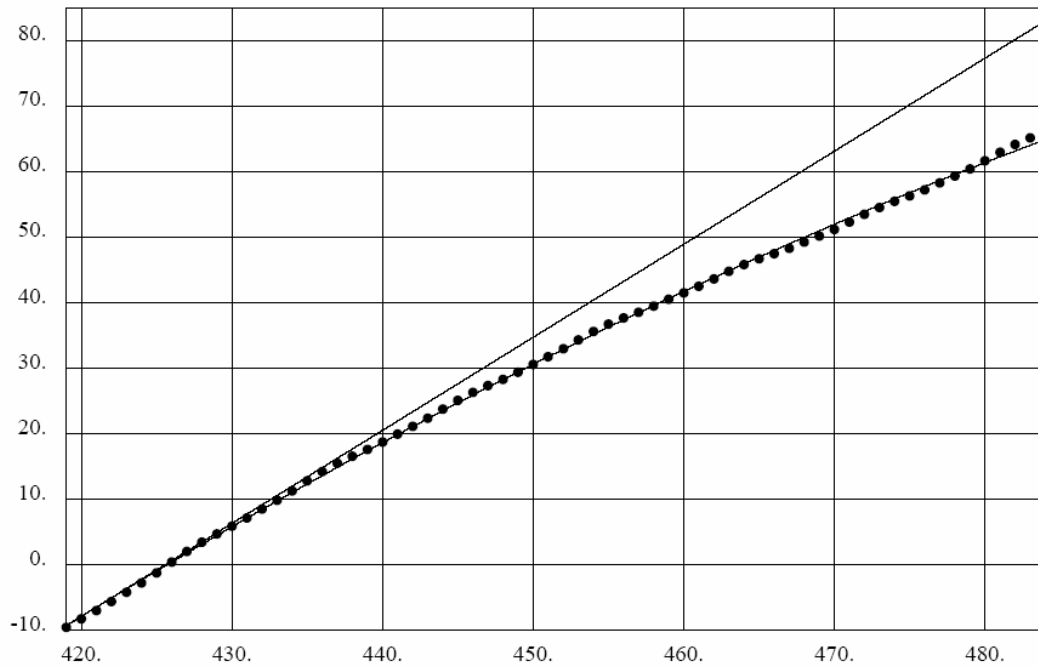
It has been noticed that the orbit is evolving in an unfavourable manner since May 2006 and it might be necessary to use Goldstone again to close the Apogee gap. This situation should be avoided as it will impact science activities. It has been decided to force the orbit in a more favourable direction.

The margins of Redu coverage relative to the period with sufficient altitude to operate the instrument:

Orbit	AOS REDU - 45000 km altitude (Crit.Instr.Alt.Asc.)	56000 km altitude(Crit.Instr.Alt.Des.) - LOS REDU
463	174 minutes	119 minutes
474	165 minutes	141 minutes
484	155 minutes	157 minutes

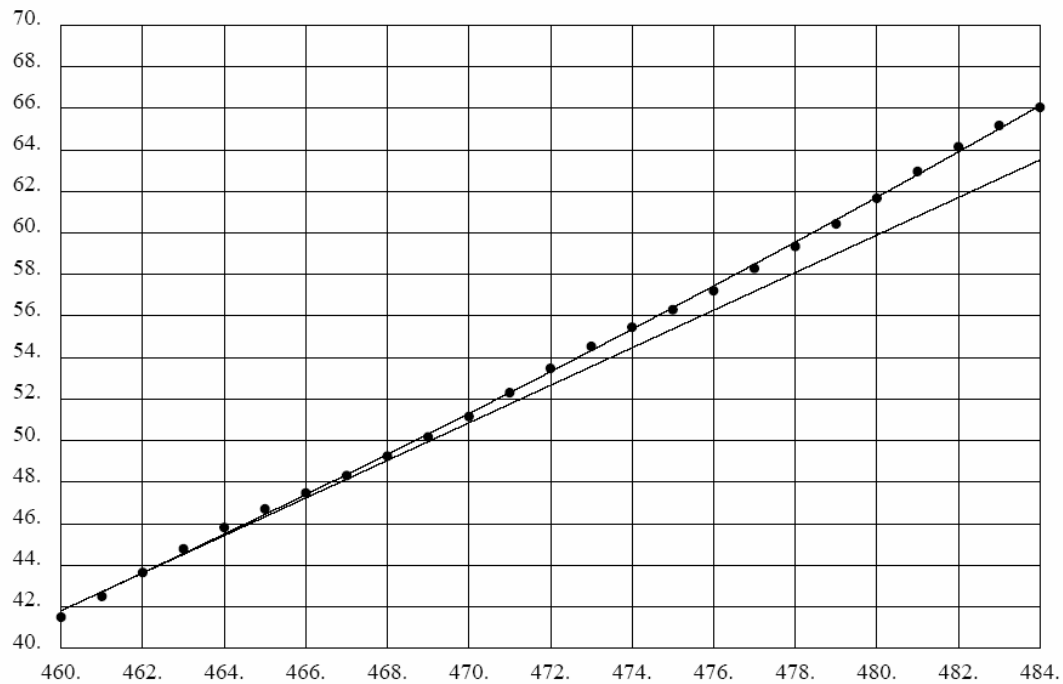
The attached plot shows the apogee longitude of Integral as a function of the orbit number. Using a parabolic approximation, the average semi-major axis increase due to momentum dumping manoeuvres is estimated to have been 464 m per orbital revolution.

APOGEE LONGITUDES OF INTEGRAL 21.03.2006 - 01.10.2006
 LEAST SQUARES APPROXIMATION WITH PARABOLA



Making the same analysis for the last 2.5 month:

APOGEE LONGITUDES OF INTEGRAL 21.07.2006 - 01.10.2006
 LEAST SQUARES APPROXIMATION WITH PARABOLA



It can be seen that in this period the drift rate has increased slightly instead of decreasing. The reason for this is that the pointing in this period has been towards the

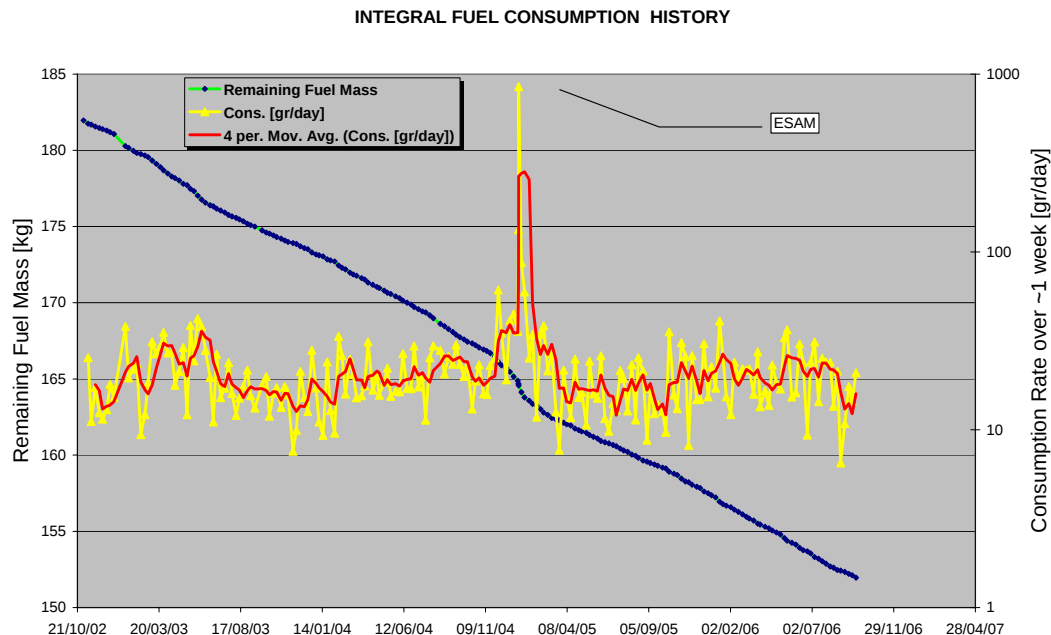
galactic centre and this attitude is unsuitable for momentum dumping activities close to perigee. In future this situation will be corrected by:

1. avoiding making momentum dumping manoeuvres close to perigee when pointing towards the "galactic centre";
2. performing artificial large momentum dump manoeuvres when the pointing is suitable for orbit control

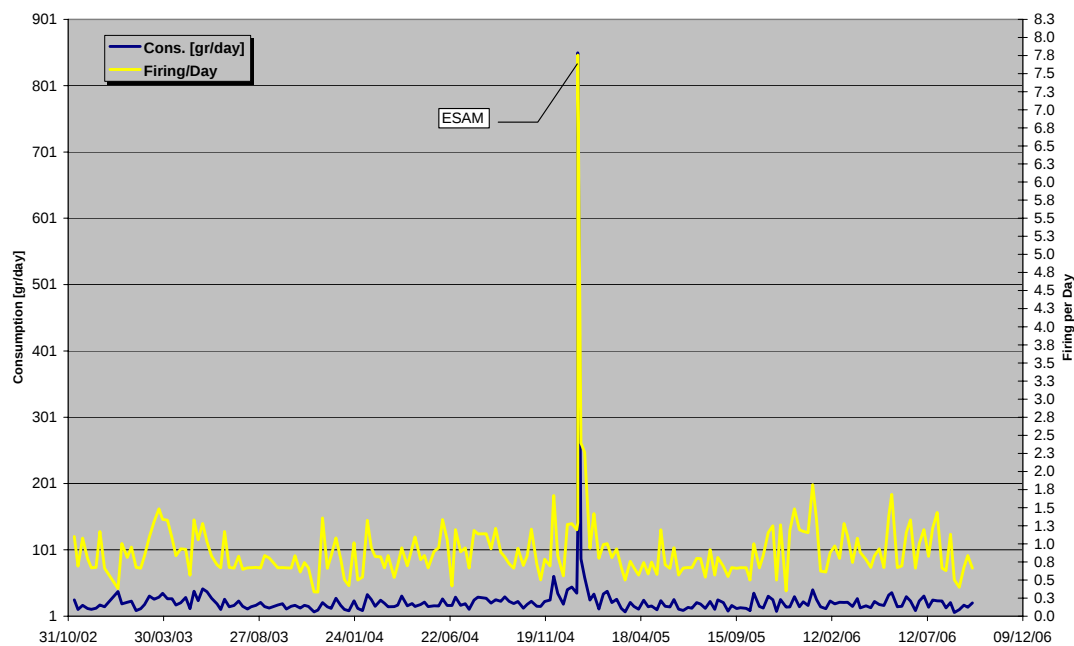
In this way it should be possible to compensate for the lack of drift rate decrease during the last two months and achieve a REDU only situation in the future.

Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 20/09/2006 is reported in the plot below.

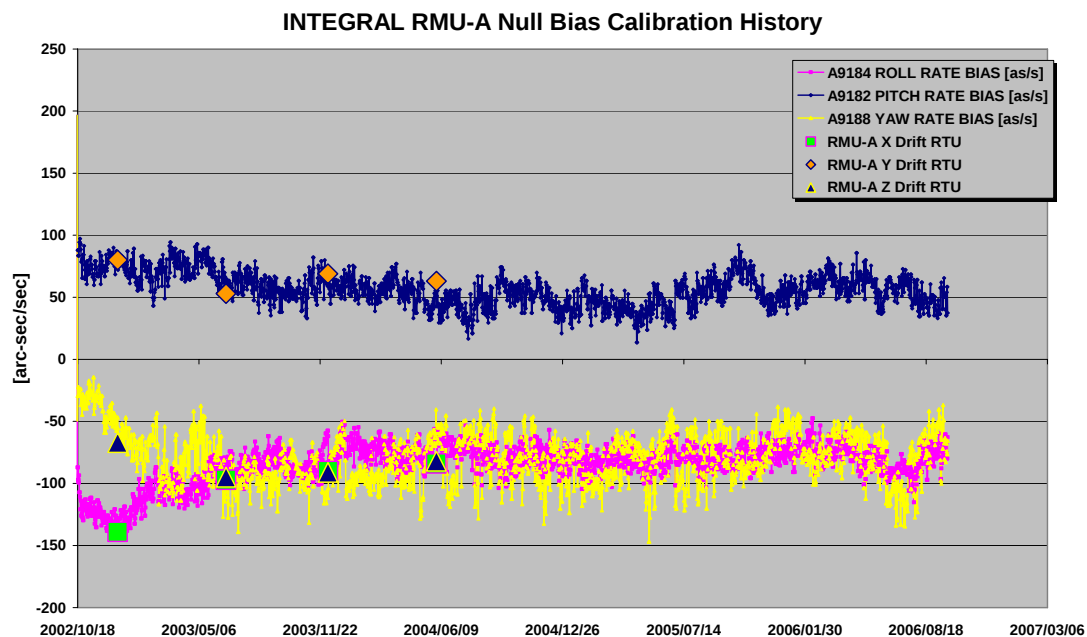


The firing\day over the period between 01/11/2002 and 20/09/2006 is reported in the plot below.

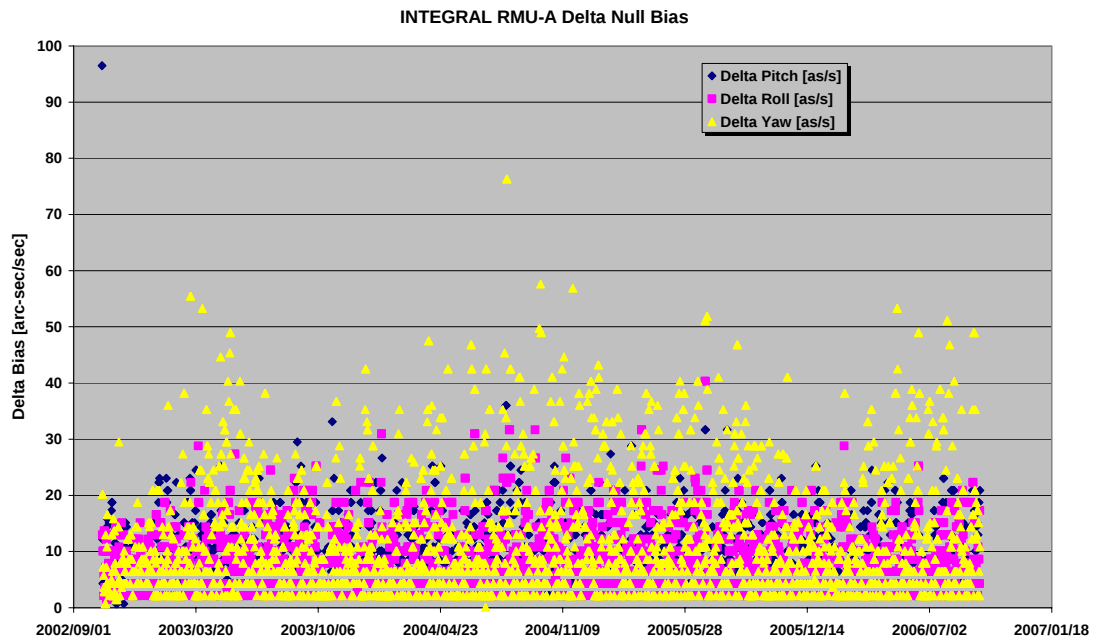


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 22/09/2006 is reported in the plot below.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 22/09/2006 is reported in the plot below.



16/09/06 (Day of Year 259, Revolution 479)

Problem on TM link to REDU station: on DoY 2006.258 at 23:48z due to a problem on TM link to REDU station the slew SID 04790032 (OSL) failed release.

A manual recovery was then started on DoY 2006.259 at 00:10z from attitude PID 04790031 to the attitude of PID 04790032. The next slew in TL (04790033) was manually updated at 00:25z.

The following slew was missed: 04790032(OSL).

17/09/06 (Day of Year 260, Revolution 479)

Nothing to report.

18/09/06 (Day of Year 261, Revolution 479-480)

Nothing to report.

19/09/06 (Day of Year 262, Revolution 480)

Problem on FDS processors (Instability of the Generic TM Processing Tasks, GTPs): at 09:26z due to a problem on the FDS GTPs processors caused likely by a restart of the HFA TM task on the IMCS-A server, the update for the SID 04800045 failed and the AOCS s/s was disabled in TL.

The GTPs crashed, causing the TM of the mapping after the previous AOCS operation (RWB) not received on the FDS. The attitude determination failed because it could not relate the latest mapping (after slew 04800044) to the current configuration.

A manual recovery was then started at 09:54z, from attitude of PID 04800044 to the attitude of PID 04800045. The next slew in TL (04800046) was manually updated at 10:16z.

The following slew was not executed from TL: ID 04800045 (OSL).

Problem on TM link to REDU station: at 21:29z, a problem on the TM link to REDU, caused the commands for slew SID 04800060 (OSL) to fail release.

A manual recovery was started at 21:34z, but the FDS recovery tool reported a fatal error when recovering due to the paucity of matched stars (STR vs catalogue, required minimum of 3 for attitude determination).

The operator attempted a manual mapping 7 times before succeeding. The Repeated STR mappings were lacking sufficient stars for a successful attitude determination.

Then a manual from attitude PID 04800059 to the attitude of PID 04800061 was performed. The next slew in TL (04800062) was manually updated at 22:42z.

The AOCS s/s was enabled at 22:43z.

The following slew was missed: 04800060(OSL).

20/09/06 (Day of Year 263, Revolution 480)

Problem on FDS processors (Instability of the Generic TM Processing Tasks, GTPs): at 14:58z due to a problem on the HFA TM task on the IMCS-A server, the FDS GTPs processors stopped.

FD support was called in, and the processors restarted.

No impact on TL.

Problem on TC/TM links to REDU station: at 17:10z due to a problem on TC/TM links to REDU station, the slew SID 04800083 (CSL) failing release.

FD support was called in at 18:06z to assess the situation and both the attitude and the guide star were considered correct for the next coming perigee passage, therefore no action was requested at the beginning of rev 481.

The following slew was missed: 04800083(CSL).

STR SEU filter exceeded during RWB: at 23:12:35z during the planned RWB at the beginning of rev 481, the STR SEU filter was exceeded and the guide star lost: as consequence the IMU was switched ON. An automatic mapping was commanded by ACC immediately after and a new guide star picked.

Following the TCM mode logic, ref INT-RP-MMB-0013 page 7-32, the controller did not abort the momentum dump because, the lost of guide star occurred when already

at stage 5 <<ON MODULATION THRUSTER CONTROL WITH TRANQUILLISATION>>, phase used to minimize the S/C rates.

The IMU was automatically commanded OFF at 23:22:35z.

No impact on TL.

21/09/06 (Day of Year 264, Revolution 480-481)

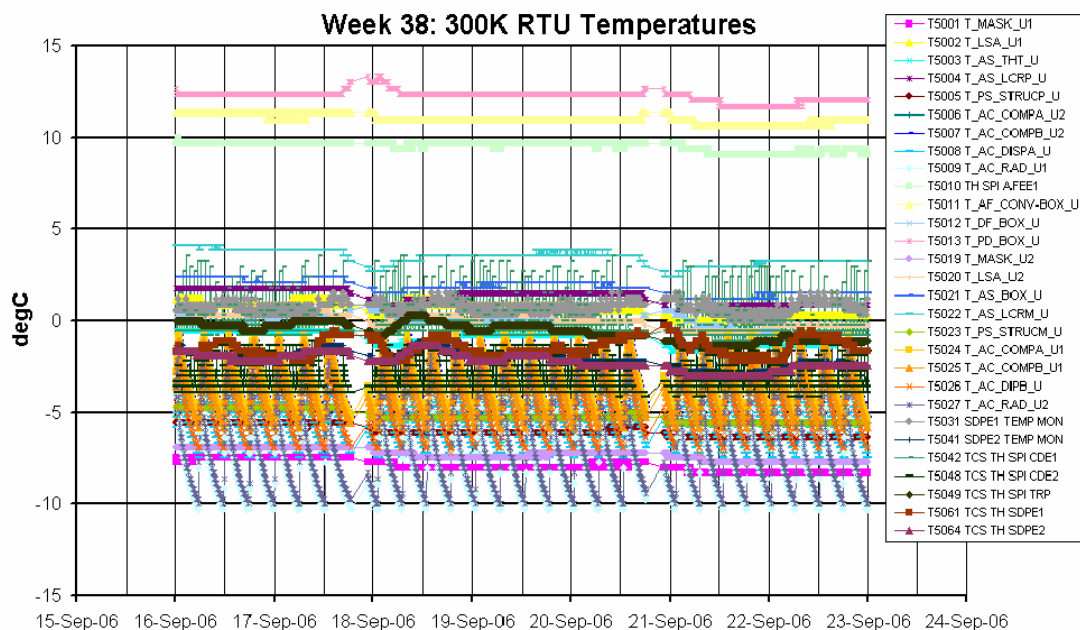
Nothing to report.

22/09/06 (Day of Year 265, Revolution 481)

Nothing to report.

8.3.2 SPI Operations

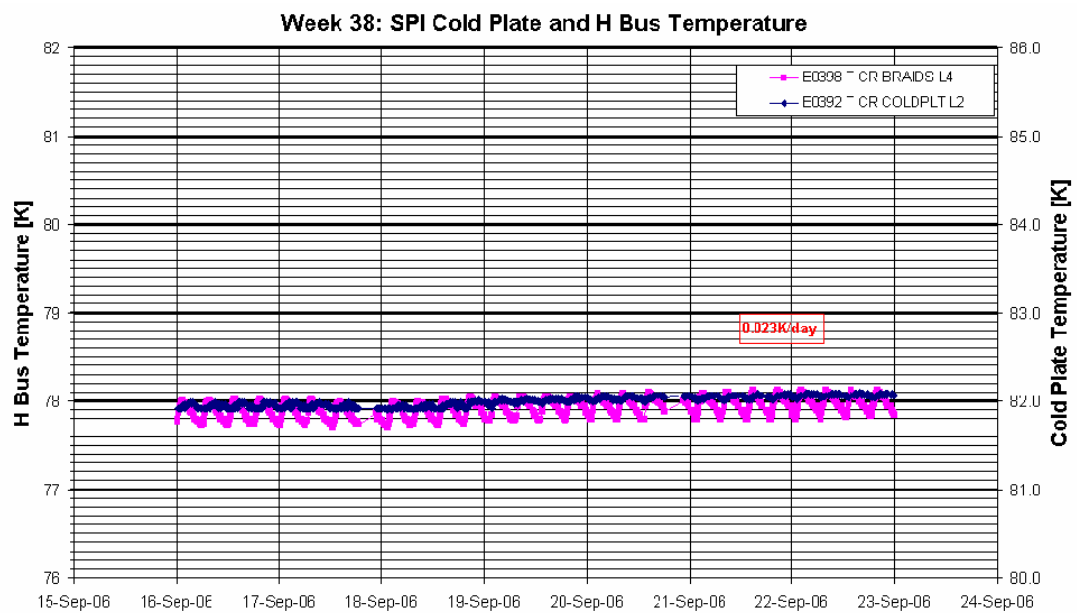
Unit Temperatures: All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period:



Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range to 82K +/-1K with a positive drift of 0.023deg/day. The stroke of all four compressors is currently set to 39. The average LCL currents of the CDEs over the week were:

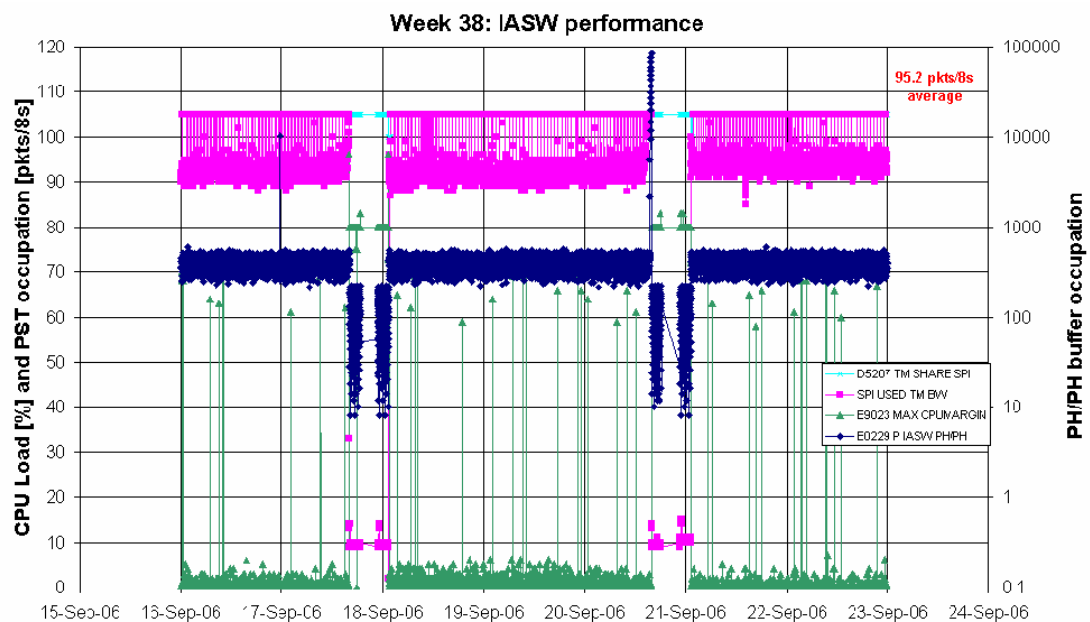
- Average CDE1 LCL Current = 4.57A
- Average CDE2 LCL Current = 4.35A

The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



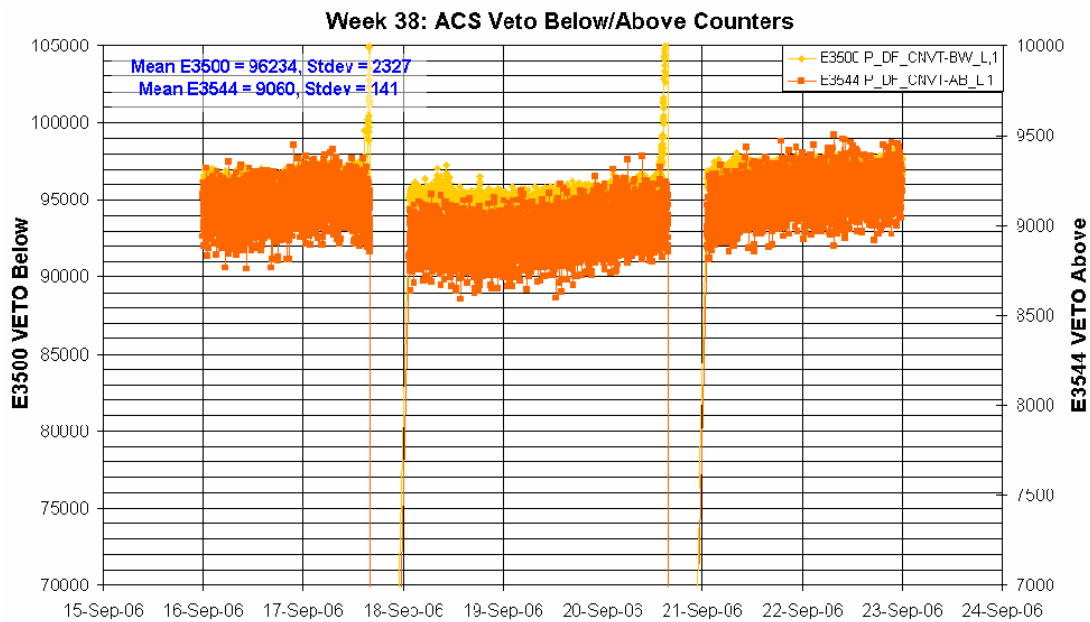
DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432.

The average TM bandwidth occupation of SPI was 95.2 packets/cycle over the science window when the TM allocation was 105 packets/cycle. The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



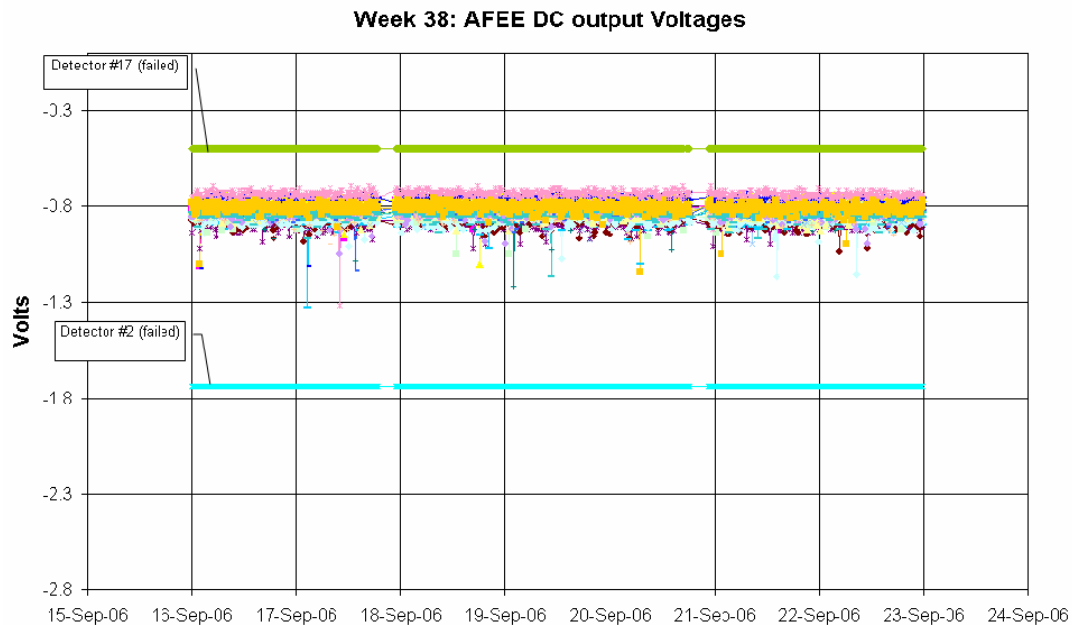
ACS: The performance of the ACS is nominal.

The following plot shows the ACS overall count rate evolution during the reporting period:

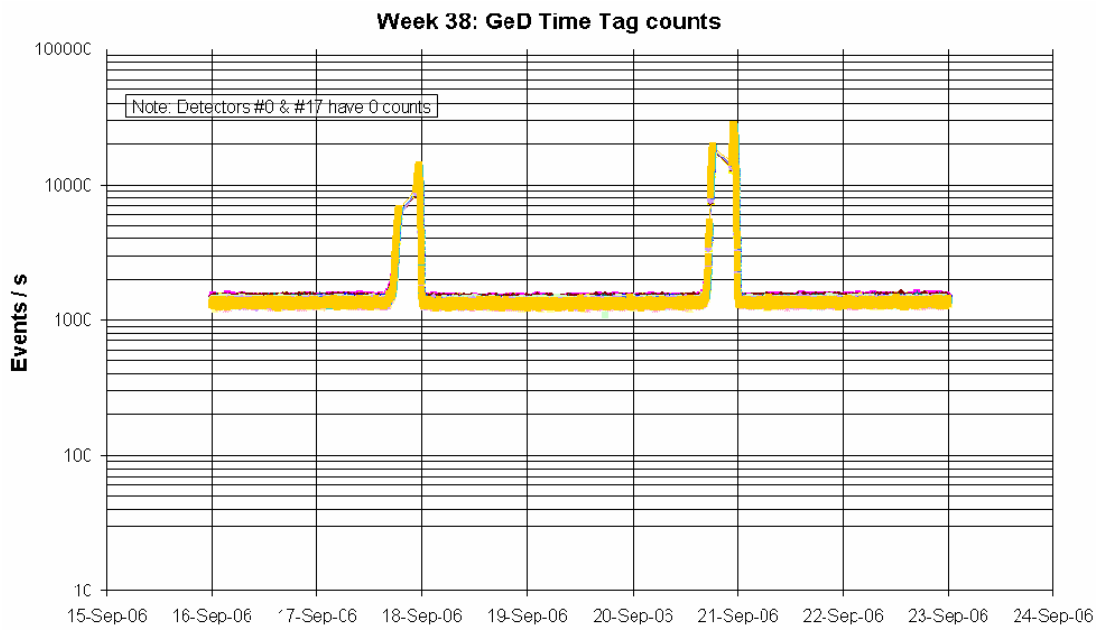
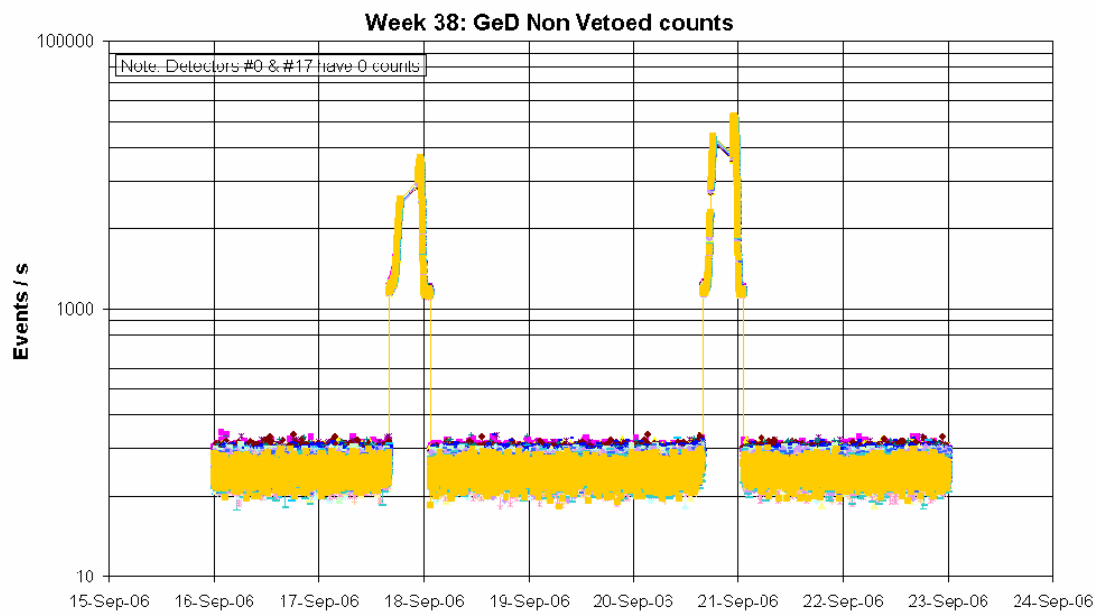


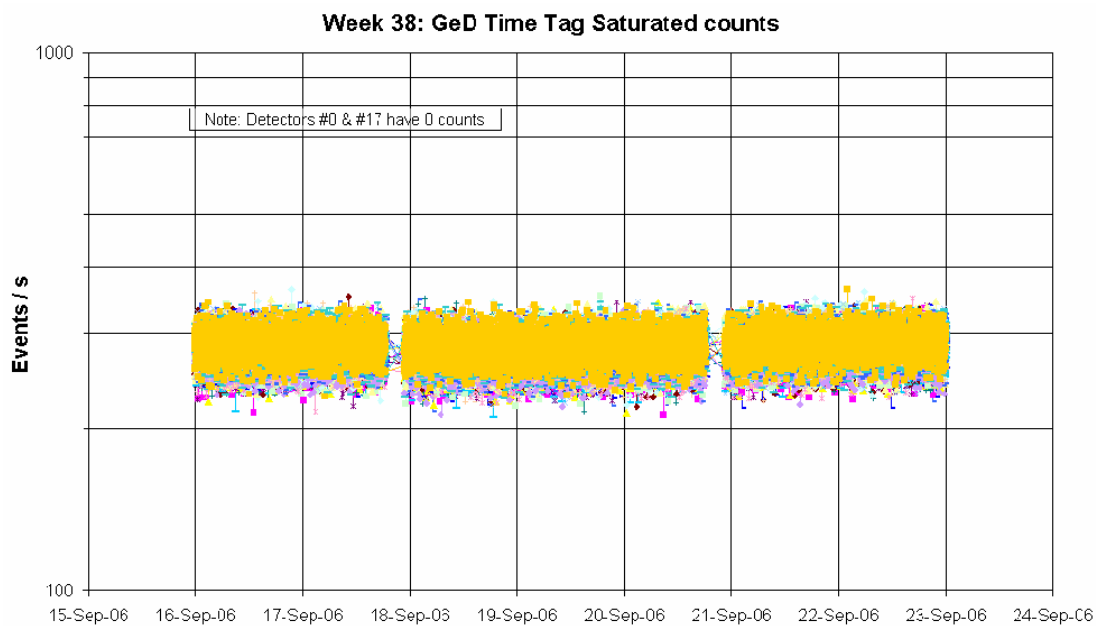
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with the last annealing.

The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004

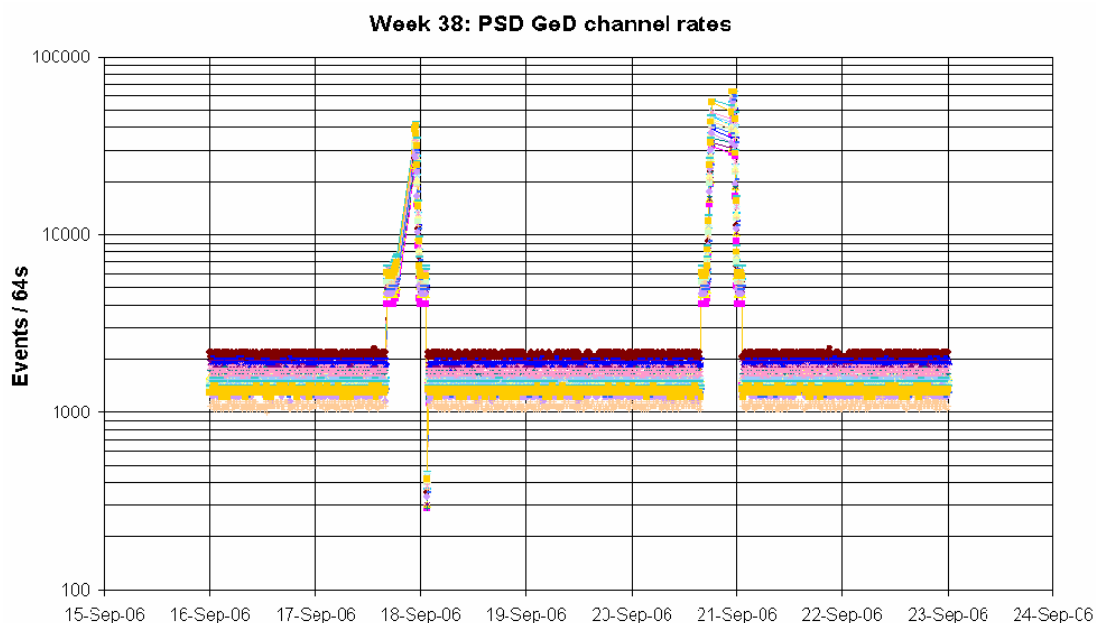


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD: The health of the unit is nominal. On 2006-09-21 at 14:13:04Z a PSD channel rates anomaly occurred, with all parameters E3840-E3858 going to zero (OOL Low), returning to nominal values at 14:21:36Z. The following plot shows the PSD channel rates during the reporting period.



Event Log:

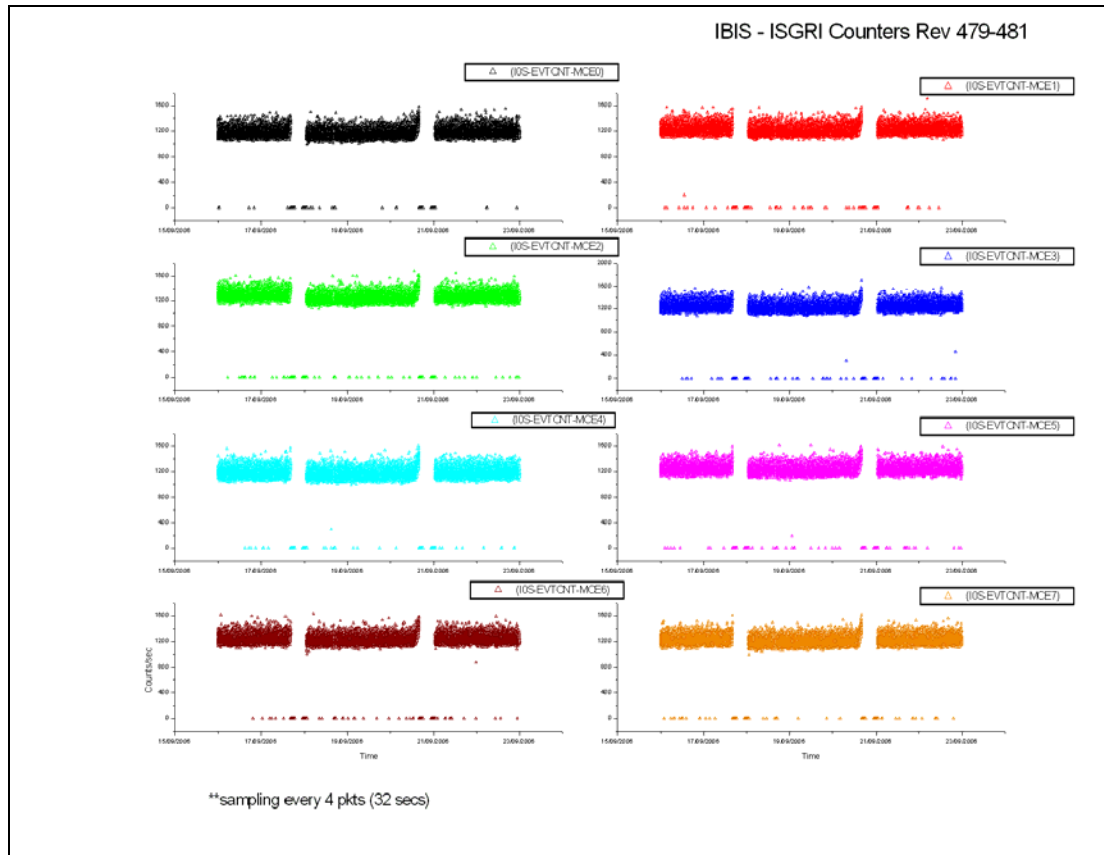
The following non-nominal OEMs were received from SPI during the reporting period:

- On 2006-09-16 from 23:42:59Z to 23:42:55Z, 11 occurrences of OEM APID 1024 ID 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW were received, indicating that the DFEE was not able to send all its data within the 125ms cycle. This was during PID 04790062.

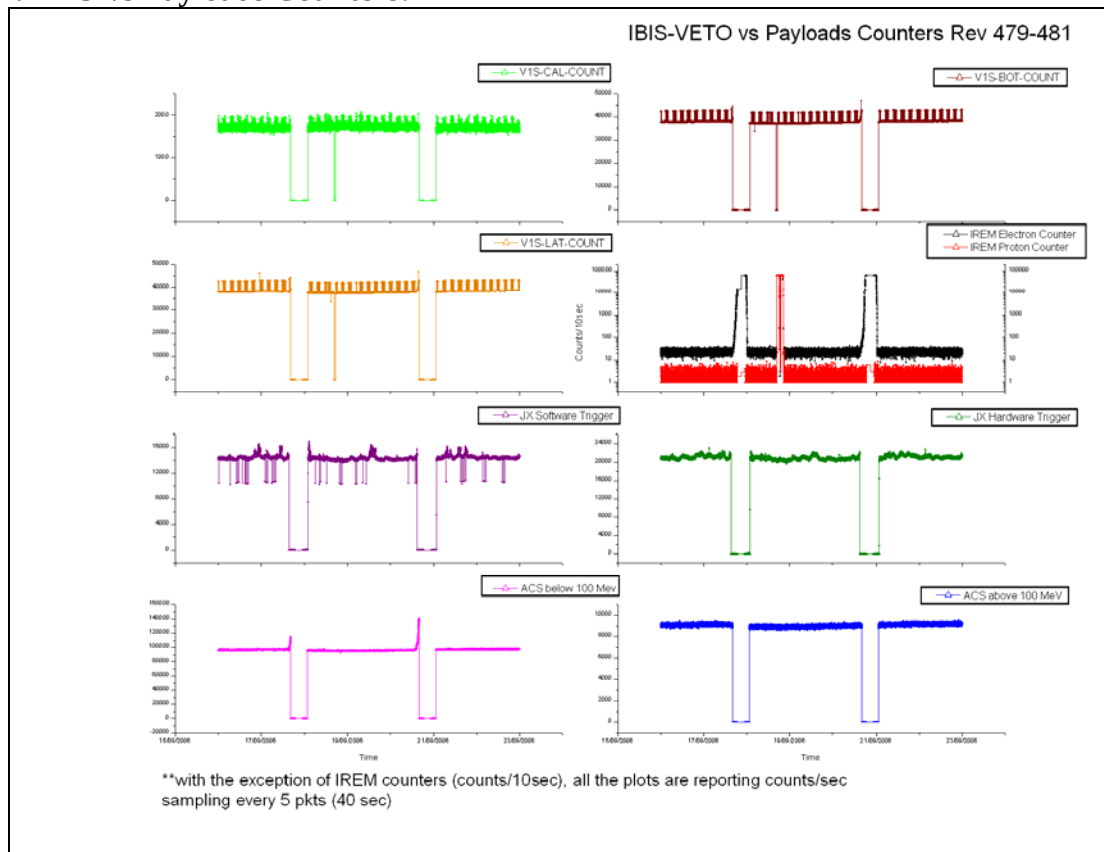
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

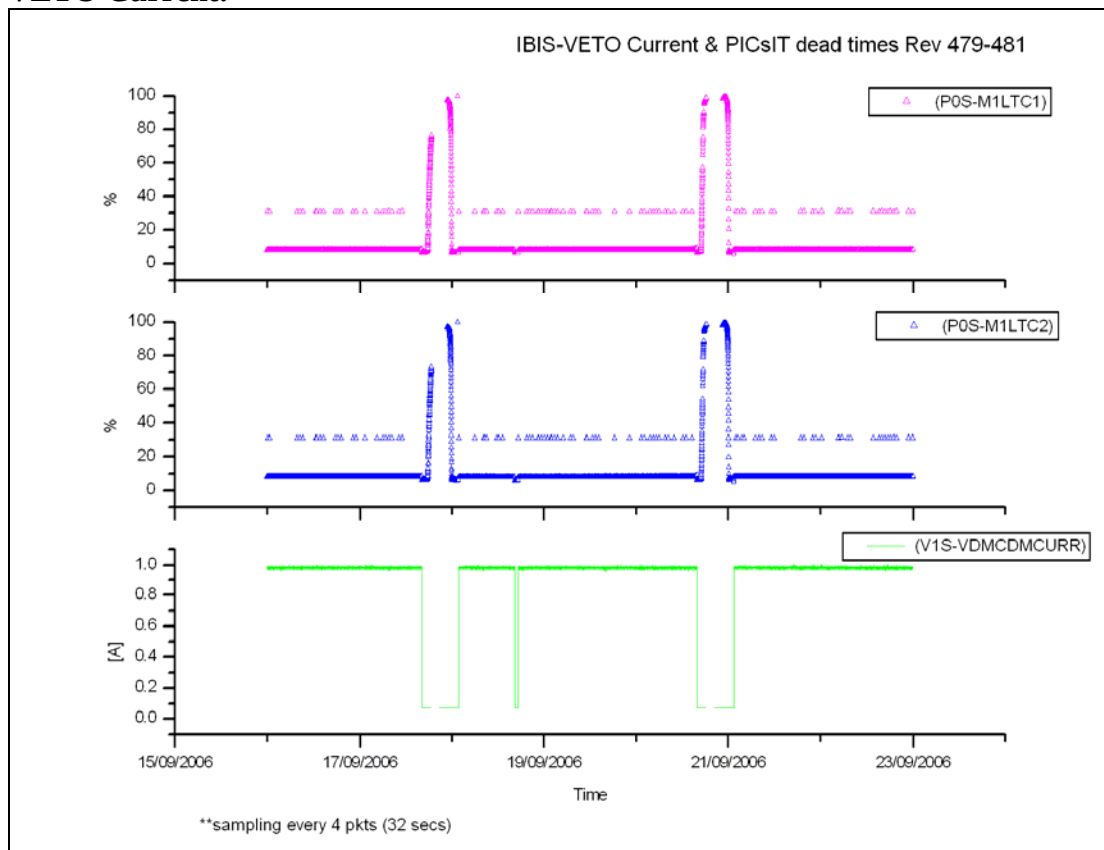


VETO vs Payloads Counters:

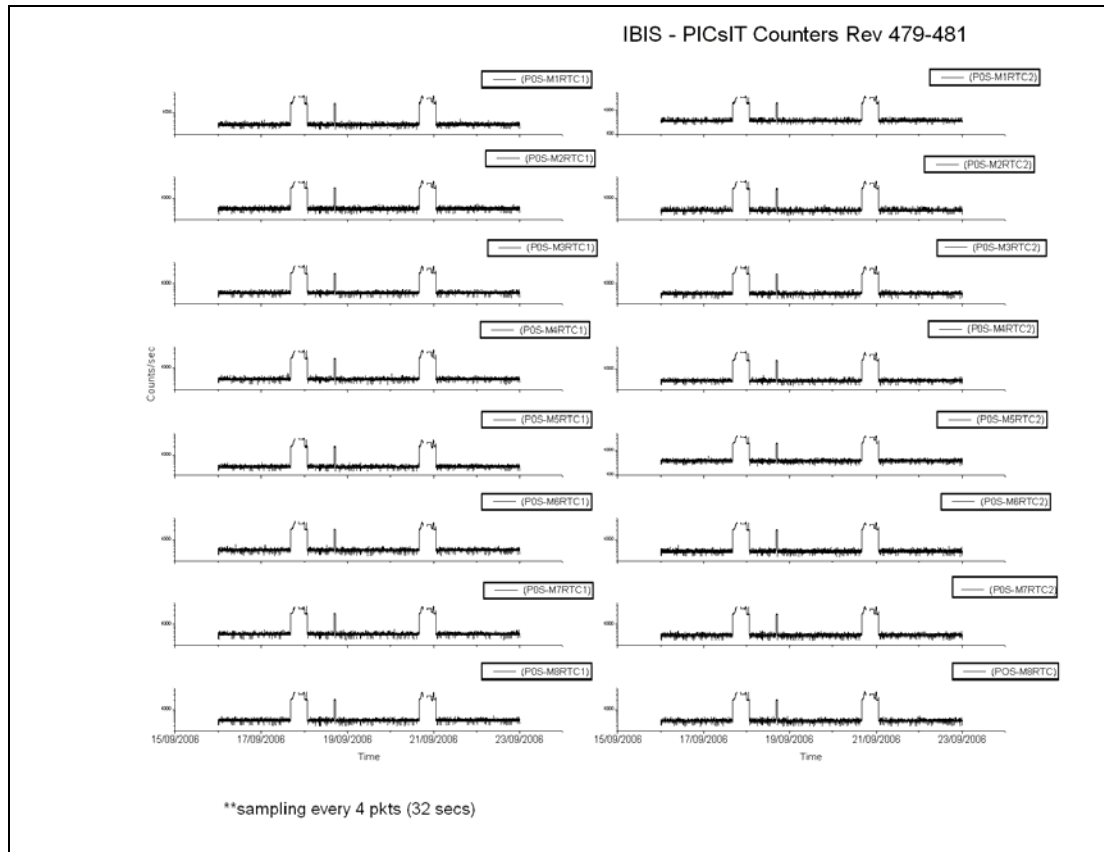


The week was characterised by low radiation.

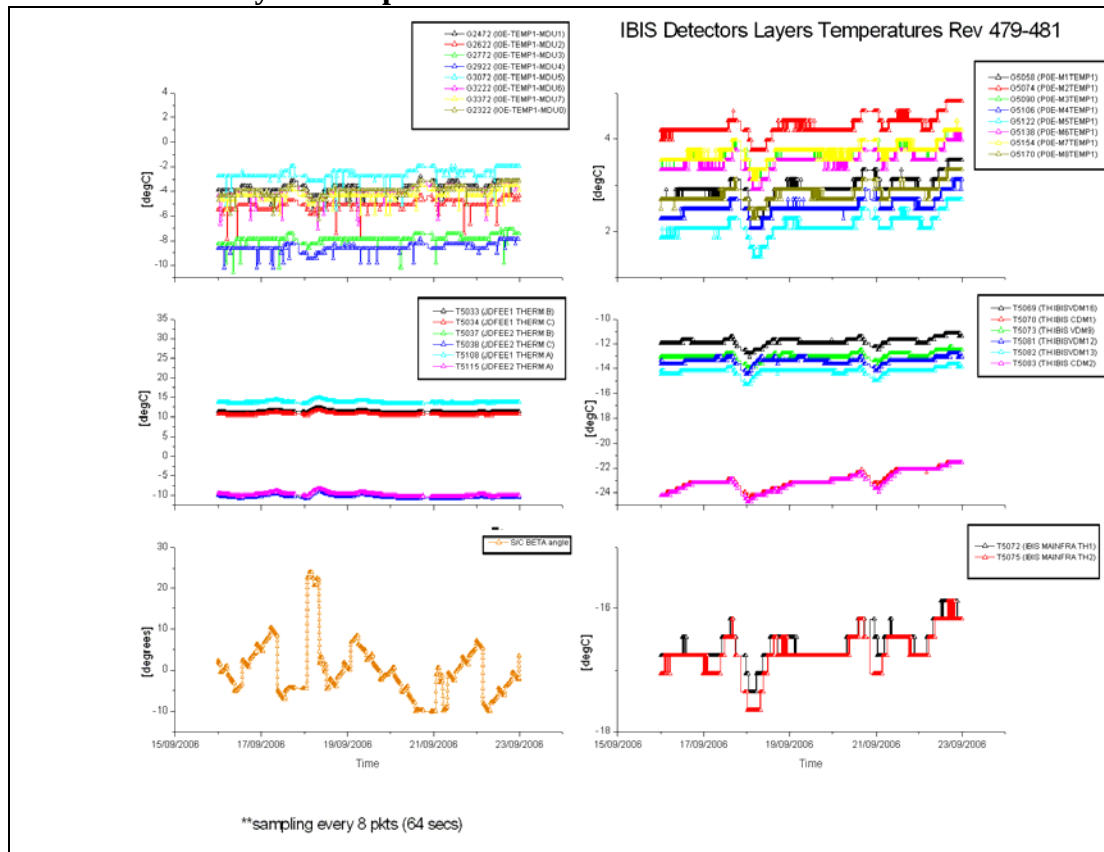
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

No significant problems occurred this week. However, due to technical difficulties, the report is delayed to next week.

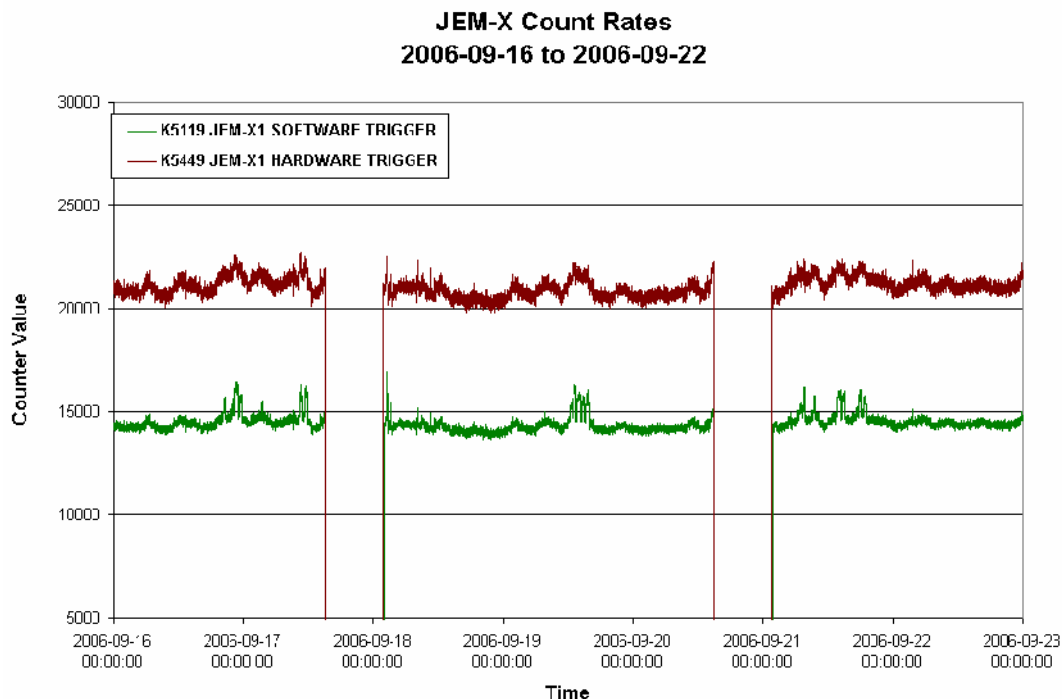
DoY 261 (18/09/2006): IREM SEU #35

At 16:23Z, due to IREM SEU #35, IBIS automatically went into Stand-by mode with ISGRI and VETO in Stand-by. The recovery was performed as per procedure CRP-SYS-2570 using the EXIT SAFE procedure (FCP_IBIS1_0803) and the GESTAN02 sequence. IBIS was back into Scientific Standard mode at 17:27Z.

8.3.4 JEM-X Operations

JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph¹.

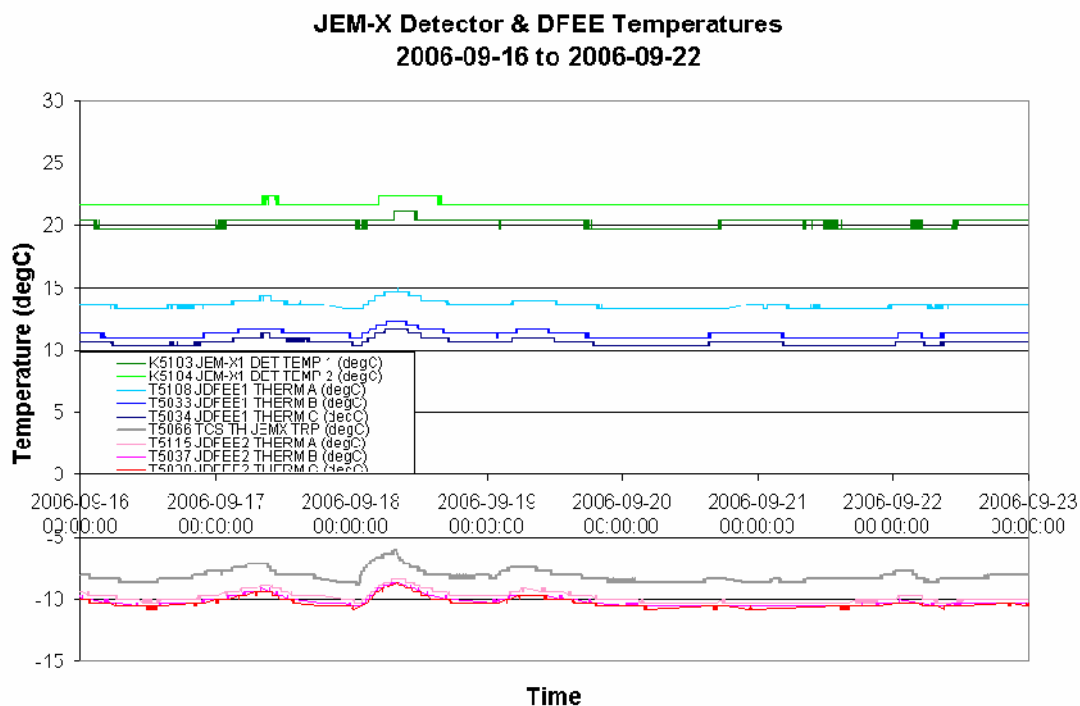


JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph².

¹ Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.

² Data sampled (1 frame in 8)



JEM-X Daily Report

2006-09-16 (DOY 259, Rev 479) to 2006-09-17 (DOY 260, Rev 479-480)

Nothing to report

2006-09-18 (DOY 261, Rev 480)

At 16:23:43Z an IREM SEU occurred, causing the RMC parameters K5315-K5317 to all go OOL High (value = 65535), however this had no effect on JEM-X1 as the JEM-X1 reaction to the RMC parameters is disabled.

2006-09-19 (DOY 262, Rev 480) to 2006-09-22 (DOY 265, Rev 481)

Nothing to report.

8.3.5 OMC Operations

2006-09-16 (DOY 259, Rev 479) to 2006-09-17 (DOY 260, Rev 480)

Nothing to report.

2006-09-18 (DOY 261, Rev 480)

At 16.23.38, an IREM SEU (#35) forced the instrument to SAFE mode. A recovery was immediately executed, returning OMC to Standby at 17:05:52. The impact was the interruption of pointing 04800023 after 25 from a scheduled 2667 seconds

2006-09-19 (DOY 262, Rev 480)

At 09:26, a problem on in the FDS caused the update for the slew 04800045 to fail. A manual recovery was started at 09:54, and a manually slew performed to the attitude for pointing 04800045. The impact was a delay of 23 minutes in the start of that pointing.

At 21:29z, a problem on the TM link to REDU, caused the AOCS commands for slew 04800060 to fail release. A manual recovery was started at 21:34, and completed at 22:42. The impact was the loss of pointing 04800060, and a 13 minute delay in the start of pointing 04800061.

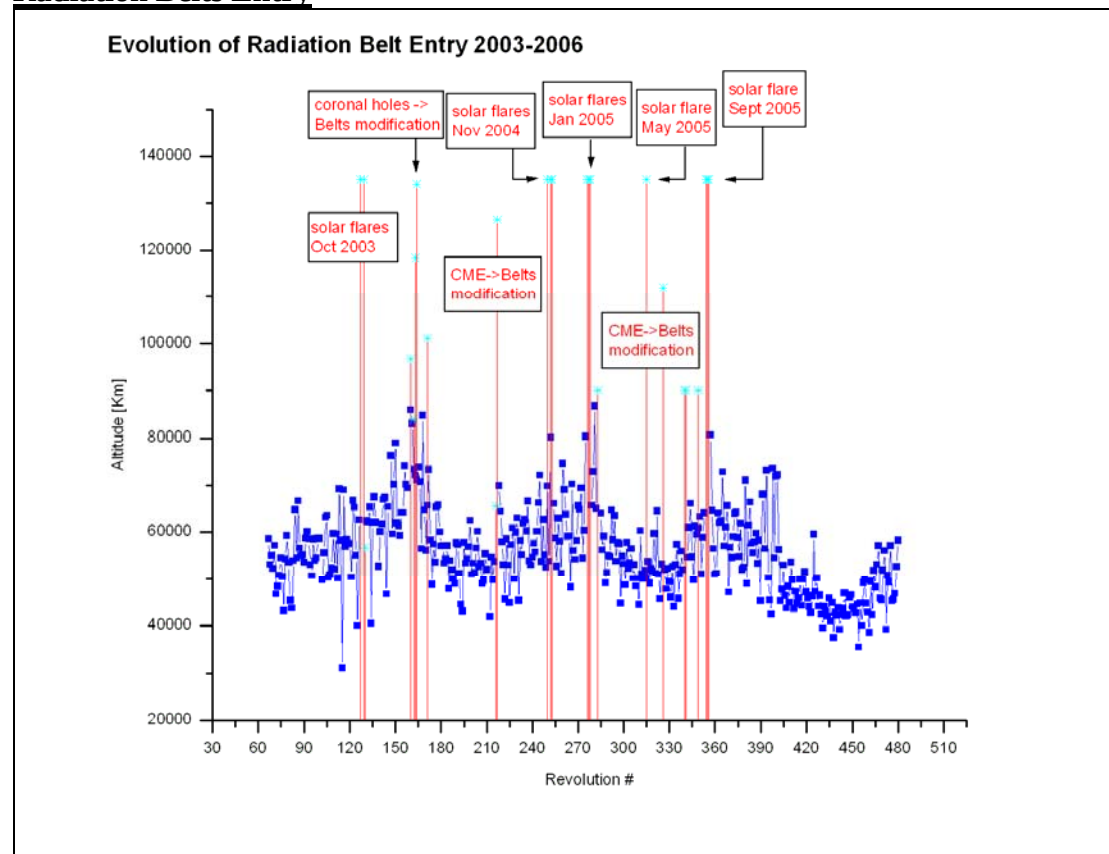
2006-09-20 (DOY 263, Rev 480) to 2006-09-22 (DOY 265, Rev 481)

Nothing to report.

On DoY 260 at 16:09:38 and DoY 263 at 15:53:06 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

On 2006-09-18 at 16:23Z, a local reset of the IREM CSCI S/W (SEU #35) occurred: as previously (see anomalies on 16/12/02, 01/01/03, 03/06/03, 11/07/03, 19/07/03, 05/08/03, 24/08/03, 26/12/03, 13/05/04, 16/05/04, 09/06/04, 12/06/04, 10/09/04, 14/09/04, 28/10/04, 06/11/04, 01/12/04, 11/12/04, 30/01/05, 11/02/05, 04/03/05,

11/05/05, 17/05/05, 15/06/05, 30/07/05, 07/09/2005, 20/09/2005, 21/11/2005, 09/04/2006, 30/04/2006, 10/06/2006, 16/08/2006, 08/09/2006, 10/09/2006) the status of the unit, before the anomaly, 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 2006.261.16.23Z at 124749.1km. 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 at 16:43Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly showed a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure flag shows YES. The unit was still reporting the status as if it was in Integral mode with counting ON, accumulation ON and checksum failure flag 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) A dump of all the registers gave a status word BC80 HEX = 48256 DEC = 1011110010000000, ie. the unit was still reporting the status as if it was in Integral mode but the Checksum Failure flag was this time OFF and the checksum counter in the register number 3 incremented by 1 unit.
- 7) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 22:40Z.

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.

The recovery of the payload was performed with IBIS at 17:27Z and OMC re-enabled at 17:09Z.

The cause of this S/W reset is still under investigation, but it is apparently due to the unit's memory device that is sensitive to ionising radiation.

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
479	RAD_ENTR R 2006-09-17T16:09:37Z	2006-09-17 16:30:17	>52708.2	2006-09-17 16:59:08	49611
480	RAD_EXIT R 2006-09-18T01:29:05Z	2006-09-18 00:02:25	>>28140.9	2006-09-18 00:59:08	40286
480	RAD_ENTR R 2006-09-20T15:52:58Z	2006-09-20 15:32:41	>58321.5	2006-09-20 16:50:28	48683
481	RAD_EXIT R 2006-09-21T01:12:44Z	2006-09-21 00:13:53	>>28142.5	2006-09-21 00:40:28	39725

Reference

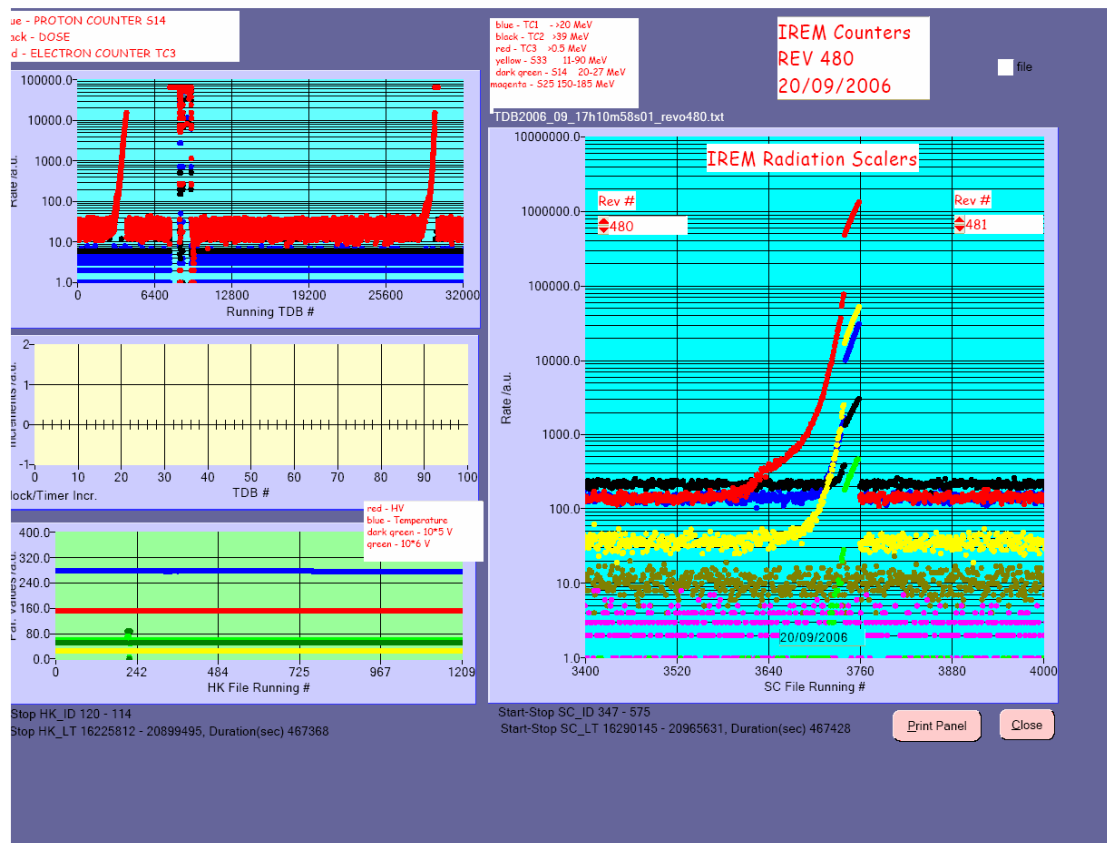
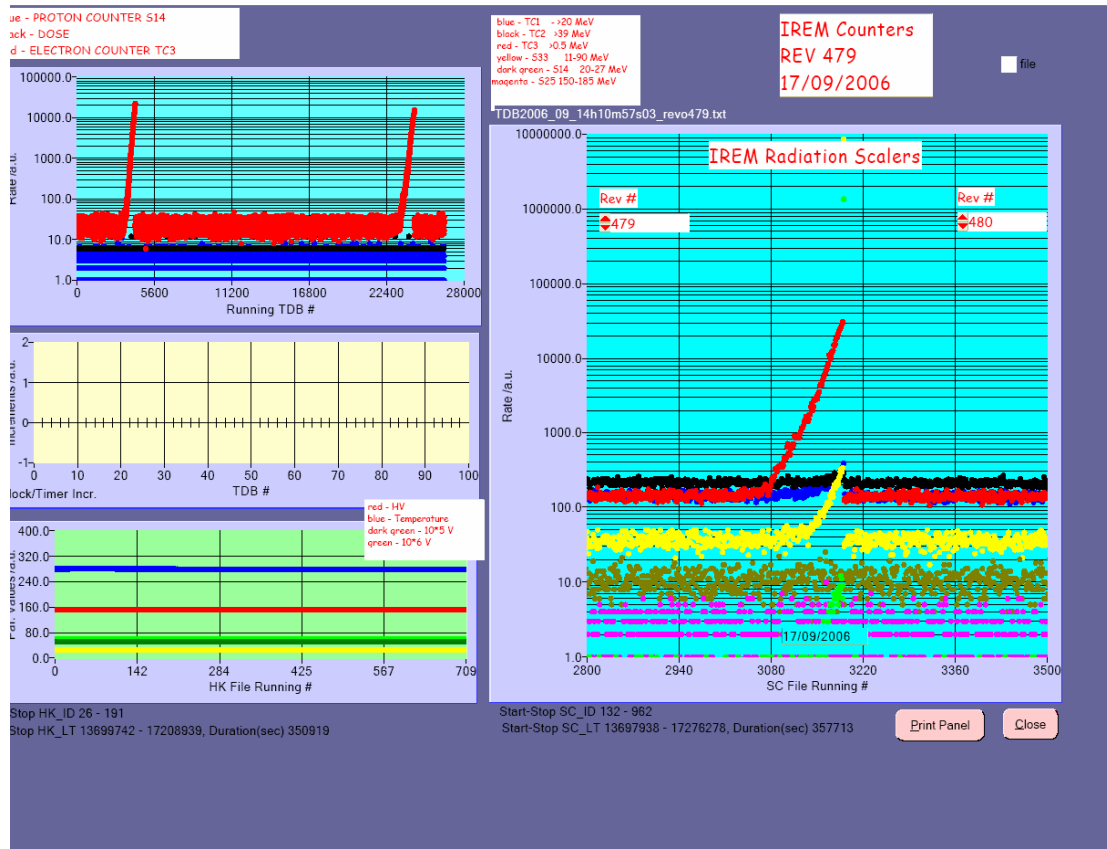
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

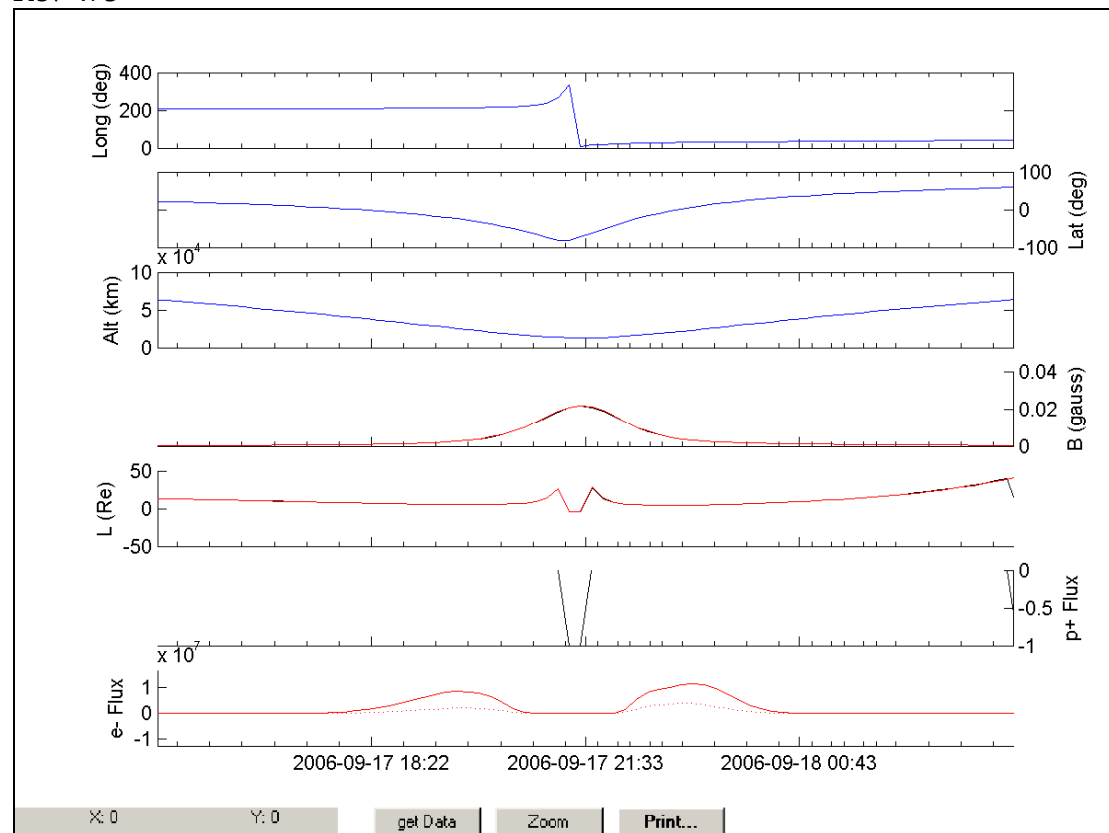
Radiation Spike

IREM radiation counters:

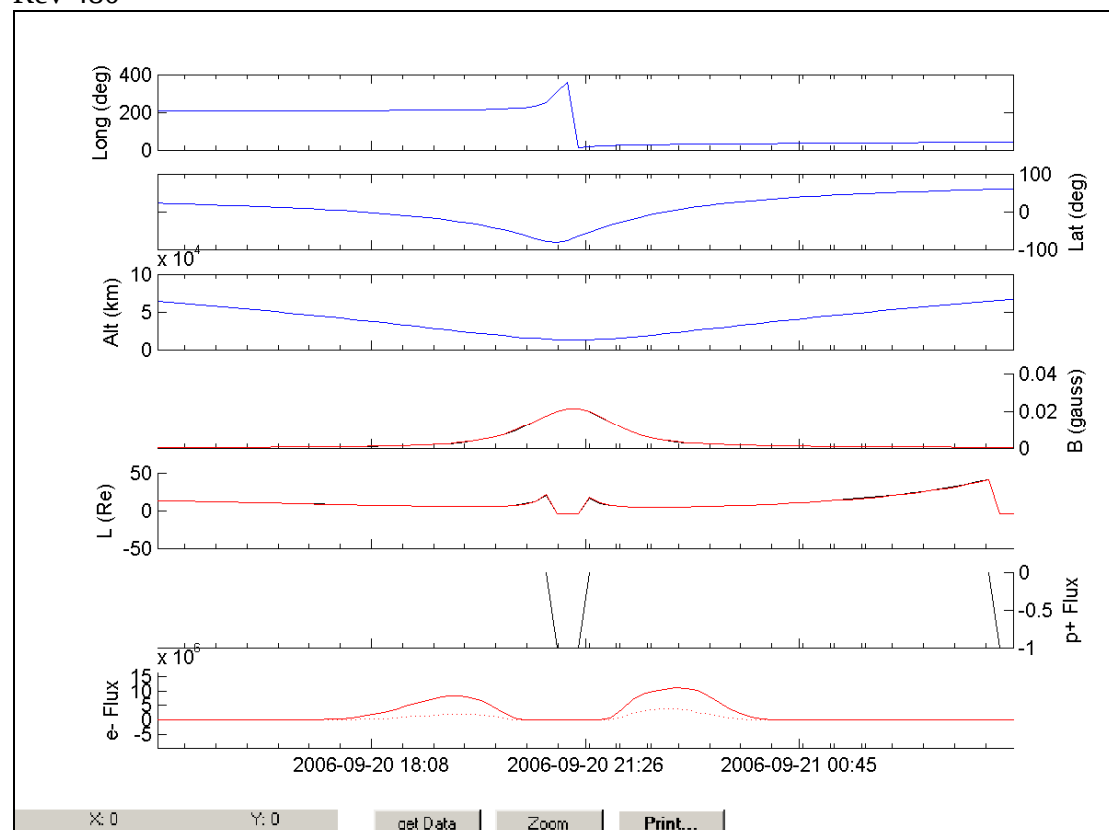


IREM Predicted Radiation Belt Passages:

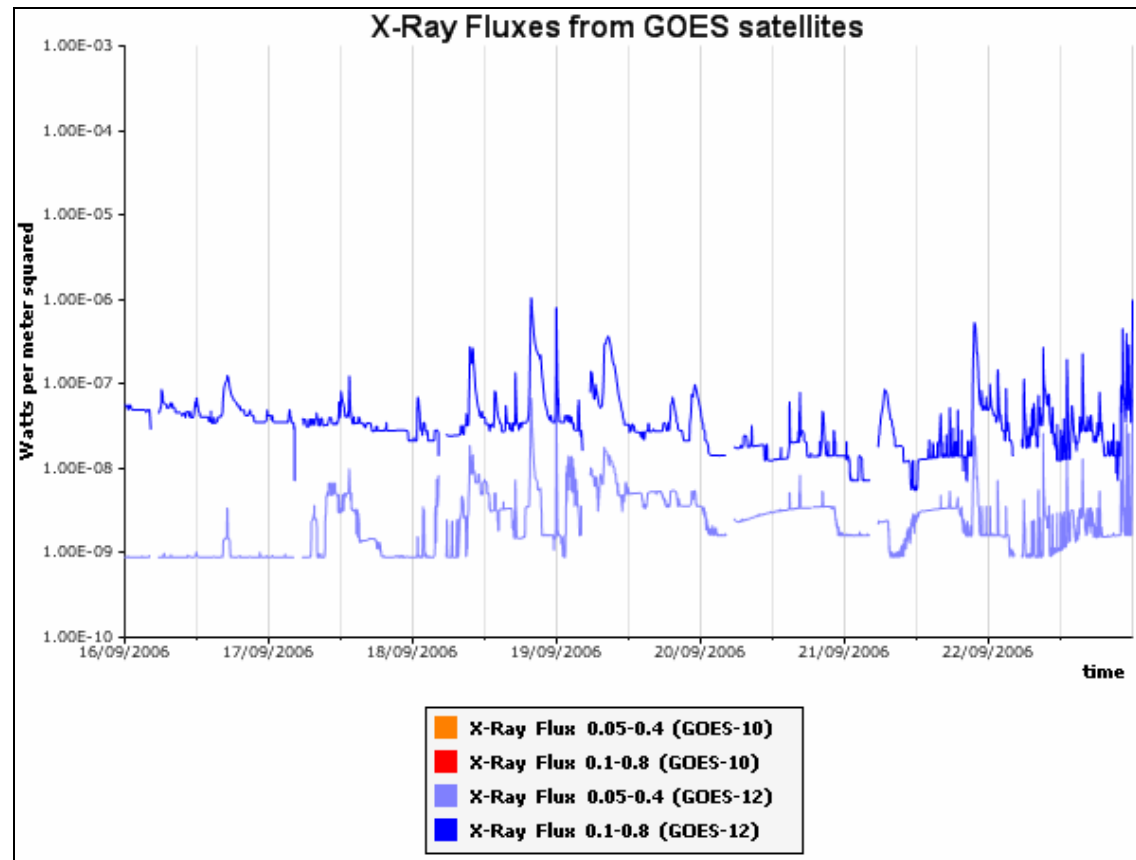
Rev 479



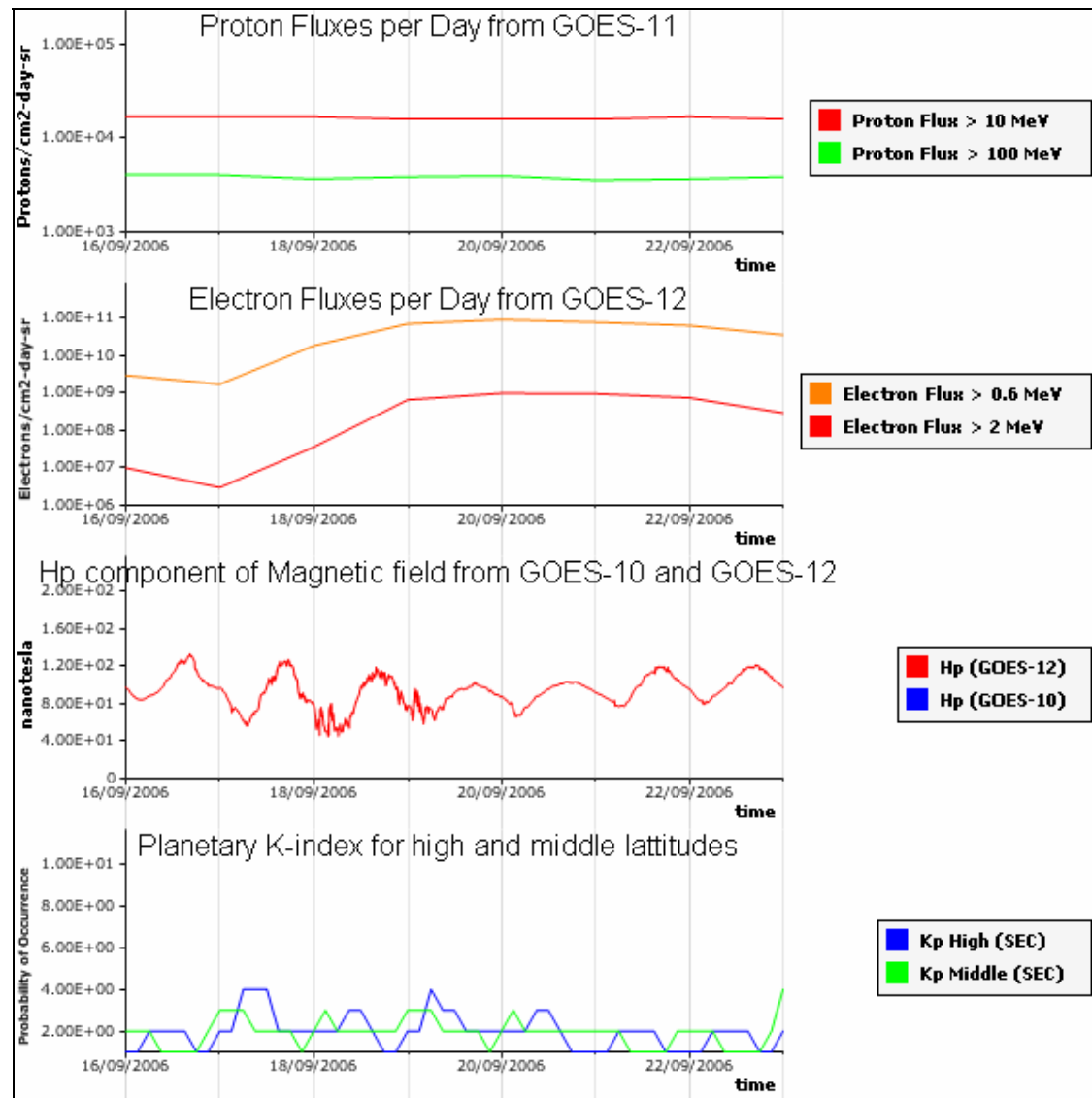
Rev 480



SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):



X-Ray fluxes start to be significant over 10^{-5}W/m^2 (corresponding to M-class flares). Above 10^{-4}W/m^2 , they correspond to strong X-class flares.



Proton and electron flux report low radiation background.

Hp component of the Geomagnetic Field is essentially parallel to the Earth's rotation axis. A drop near 0 nT is associated with a significant variation in the magnetic field.

Kp index is based on ground magnetometers. Kp ≥ 5 features storm-level geomagnetic activity.