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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 204
Week 33
21.08.06
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.

It addresses the activities from 12.08.06 until 18.08.06 (both dates inclusive) and covers the revolutions 468 and 469.

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 a Galactic Plane Survey, raster dithers of IGR J16318-4848 (RA 16:31:48.60, DEC -48:48:36.0) and Mid-latitude North region (RA 16:18:13.65, DEC -14:13:46.6), and a Hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0).

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.

No slews were missed during the observation period.

The fuel consumption over the period between 10/08/2006 and 17/08/2006 was 0.1506 Kg. The remaining propellant is in the order of 152.4560 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.

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

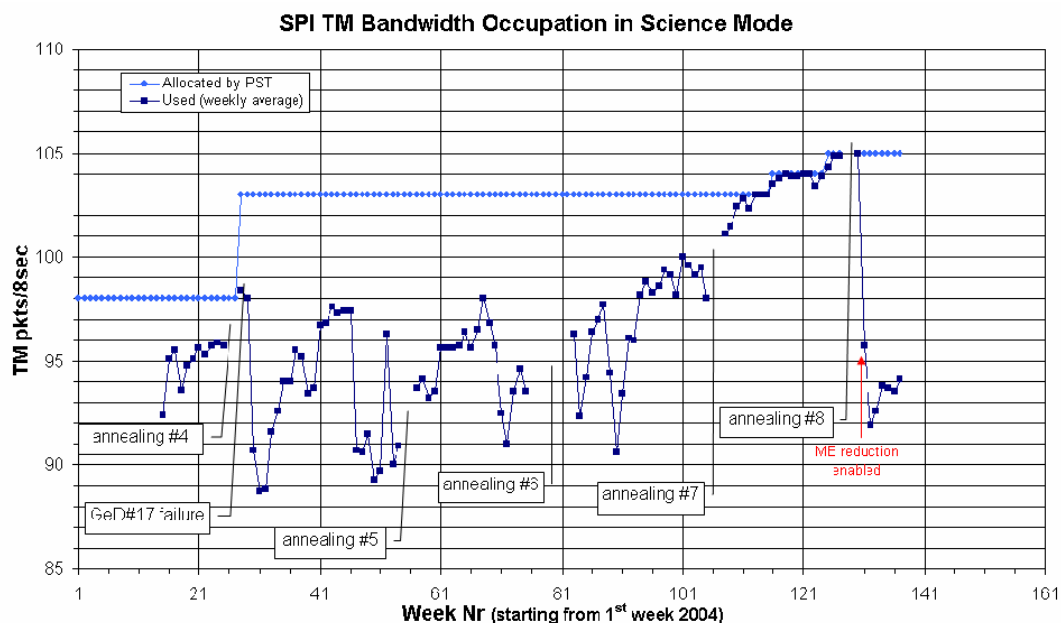
3.2.1 SPI

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 pkts/cycle and the average telemetry occupation was 94.1 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.

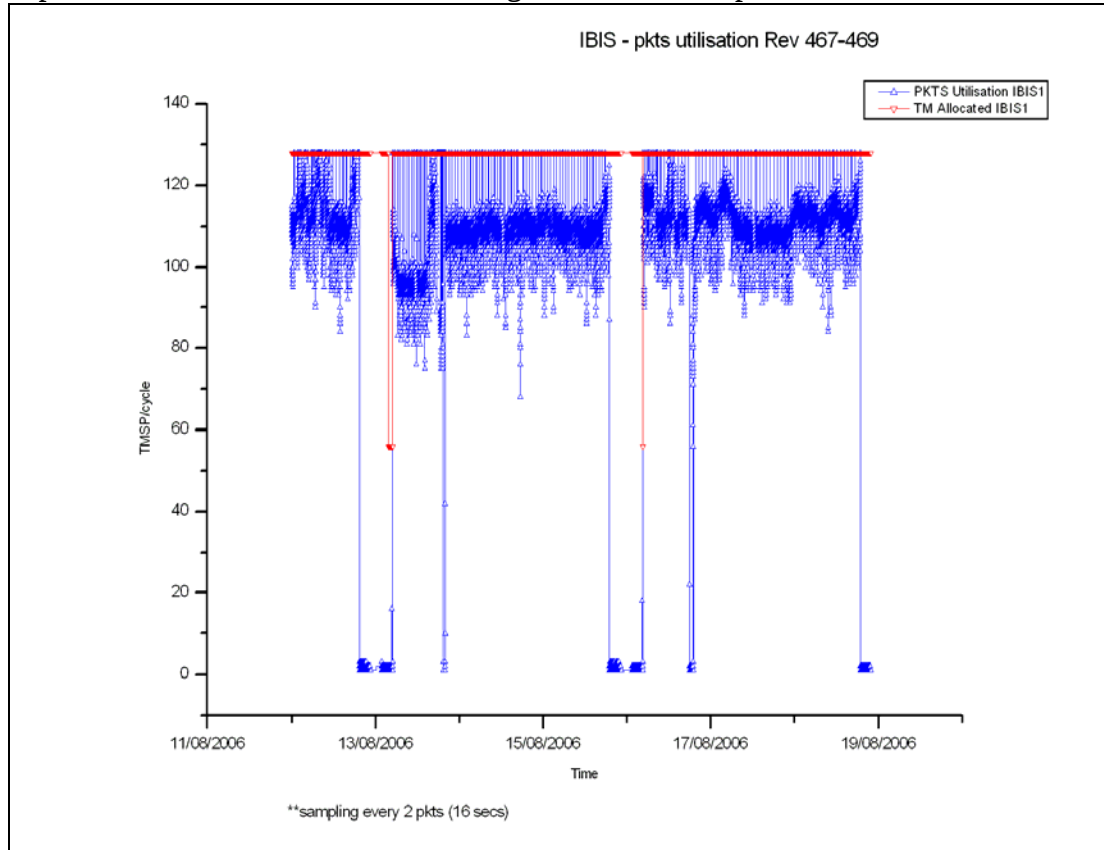
3.2.2 IBIS

The overall status of the unit is nominal.

On DoY 228 (16/08/2006) at 18:08Z, IBIS went into Safe configuration due to IREM reset #32. The unit was recovered by the operator at 19:10Z.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 110.54 TMPS/cycle, down 1.24 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 and JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

Due to high count rates during the galactic Mid-latitude North observation, several OOLs were received on the TM parameters K5136 BUFFER LOSS; K5449 HARDWARE TRIGGER and K5119 SOFTWARE TRIGGER during the week.

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, 151 of the 154 planned science pointings for OMC were executed nominally, 1 was interrupted and two were lost.

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

3.2.5 IREM

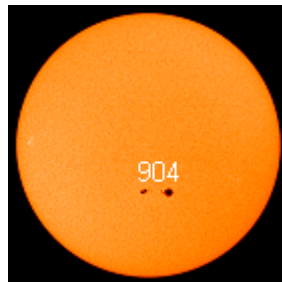
The overall status of the unit is nominal.

On DoY 228 (16/08/2006) at 18:07Z, IREM SEU #32 occurred. The unit was recovered by the operator at 22:00Z.

Solar Activity

The observation period was characterised by low solar activity.

During the whole observation period only one sunspot was present on the surface of the sun. This was sunspot 904 that appeared last week. It kept posing threat of strong solar flare but unleashed just one C3-flare on 16/08/2006 (cf Picture of Sun on 16/08/2006, which had no impact on INTEGRAL).



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 excellent this week, with 1 pointing lost to ground problems. The overall performance though, was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was very good this week, 1 OMC pointing was lost when the Command Verifier and TC History crashed. A problem was also reported with the connection to the MISCdynamic server, but this had no impact. The overall performance though, was well over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. With no pointings lost to ground station or network problems. There were, however, a few occasions of bad frames and brief link drops with Redu, but these had no impact. There were also several occasions when the link to ISDC dropped. The overall performance though was nearly 100%.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

Due to a TOO on EXO 2030+375, revolutions 470 to 472 were replanned. While PSFs have been received up to revolution 476, updated PSFs have been announced for revolutions 473 and 474 by Flight Dynamics and further planning is waiting for these to be available.

2. Observation status

ECS have been received up to revolution 460 and processed up to 458. Waiting for ISDC Archive Scientist to return from leave for processing the latest.

3. ISOC science data archive

The Ingest is now running with only occasional manual intervention, all ScW data from ISDC have been ingested and for higher level products ingestion is nearing completion. A prototype ISDA Visualisation Tool was demonstrated to the ISOC scientists.

4. ISOC system

Continuing to work on version 13, which is to support the Key Programme Extra AO.

5. AO-4

The first observations of AO-4 have been executed. Inputs have been received very recently for the complex "latitude scan" observations (PI: Sunayev) and will be used to correctly set up these observations.

6 Extra AO for AO-5 Key programme

No news.

7. Problems

For several revolutions recently the PSF's received contained an overlap between RWB and GSHO windows, impeding the import by the ISOC software and requiring redelivery of PSFs.

4.3.2 ISDC

Status of ISDC observation processing on 21/08/2006:

- Latest Standard Analysis completed: observation 03201100004 (XMM LSS, Revolution 456-457) on 11/08/2006.
- Latest products archived: observation 03201100004 (XMM LSS, Revolution 456-457) on 15/08/2006.
- Latest observation products sent to the observer: observation 03201090063 (Galactic Bulge, Revolution 426) on 01/06/2006.

5 Special Events

6 Anomalies

The following problems that impacted operations were reported:

- On DoY 225, at 19:25, the Command Verifier and TC History both crashed. This caused the OMC commands to fail. The impact was the loss of OMC pointing 04680025.
- On DoY 228, at 18:07, there was an IREM SEU. This caused OMC and IBIS to switch to SAFE mode. The units were recovered at 19:17 and 19:10 respectively, see the appendix for details.

The following anomaly report was entered into the ARTS system this week:

AR id	Date Created	Subject	Segment	Status
INT_SC-157	17/08/2006	IREM Anomaly: Reset of IREM_CSCI S/W #32, 16/08/2006	Payload	Open

7 Future Milestones

There are battery re-conditioning activities currently planned for mid-September, more details later.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 468

The observations in revolution 468 began with a Galactic Plane Survey lasting ~11 hours. This was followed by a raster dither of IGR J16318-4848 (RA 16:31:48.60, DEC -48:48:36.0), lasting ~45 hours, until the end of the revolution.

Revolution 469

The observations in revolution 469 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 the Mid-latitude North region (RA 16:18:13.65, DEC -14:13:46.6), lasting ~55.1 hours, 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

2006-08-02T13:30:04.000Z	152.7278	F	Automatic TM processing.
2006-08-03T03:47:18.000Z	152.7045	F	Automatic TM processing.
2006-08-04T03:09:44.000Z	152.6926	F	Automatic TM processing.
2006-08-05T13:52:36.000Z	152.6617	F	Automatic TM processing.
2006-08-07T02:55:36.000Z	152.6367	F	Automatic TM processing.
2006-08-09T20:01:12.000Z	152.6180	F	Automatic TM processing.
2006-08-10T11:24:18.000Z	152.6066	F	Automatic TM processing.
2006-08-11T13:25:32.000Z	152.5836	F	Automatic TM processing.
2006-08-12T21:56:56.000Z	152.5752	F	Automatic TM processing.
2006-08-13T02:28:32.000Z	152.5484	F	Automatic TM processing.
2006-08-13T11:50:25.000Z	152.5307	F	Automatic TM processing.
2006-08-13T17:41:30.000Z	152.5093	F	Automatic TM processing.
2006-08-14T12:53:00.000Z	152.4909	F	Automatic TM processing.
2006-08-16T02:12:08.000Z	152.4724	F	Automatic TM processing.
2006-08-17T12:55:00.000Z	152.4560	F	Automatic TM processing.

This report was generated Fri Aug 18 08:00:39 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, 12/08/2006 – 18/08/2006

AOCS operations were executed from the Automatic Timeline.

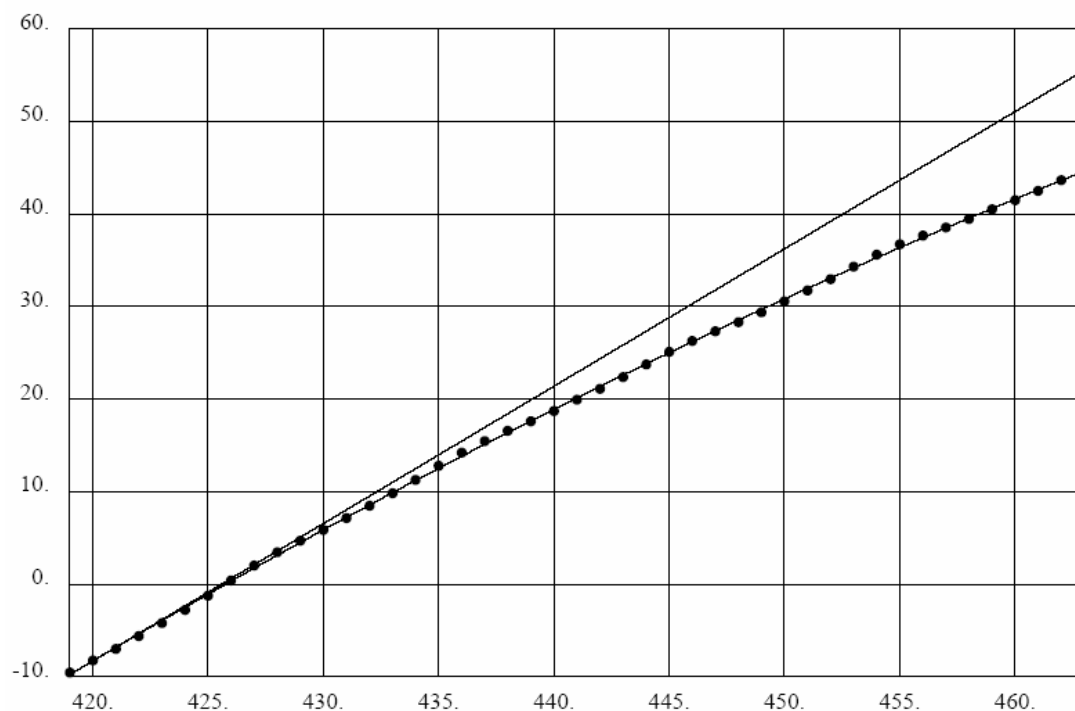
During this period, 81 Open Loop Slews, 86 Closed Loop Slews and 7 Momentum Biases were executed.

No slews were missed during the observation period.

Orbit Control

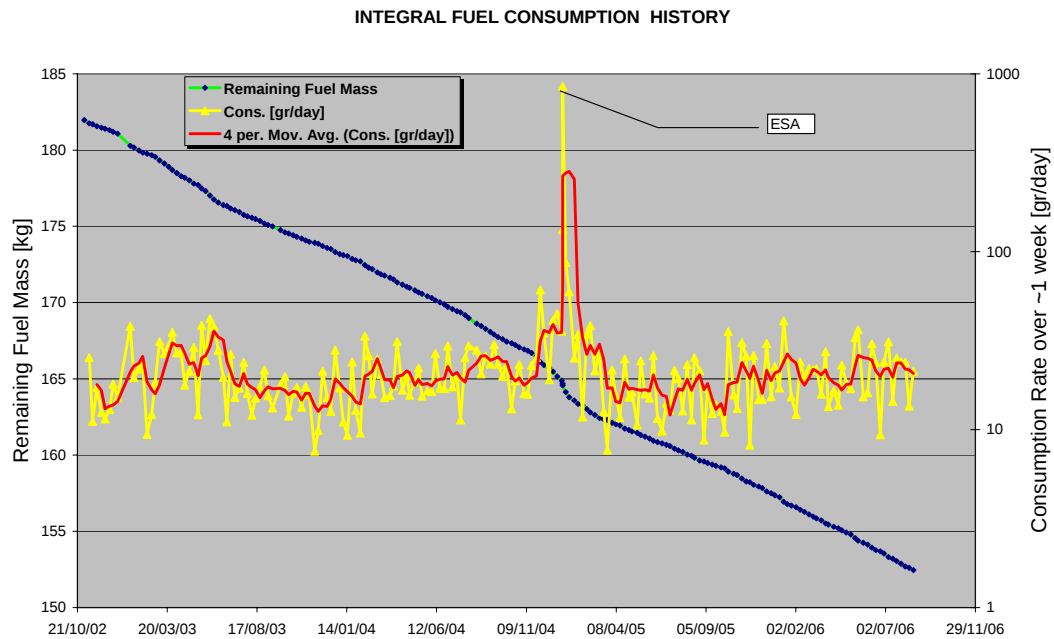
The attached plot shows the apogee longitude of Integral as a function of the orbit number. From the approximation of the apogee longitudes with a parable, the average semi-major axis increase, due to momentum dumping manoeuvres, is estimated to have been 596 m per orbital revolution.

APOGEE LONGITUDES OF INTEGRAL 21.03.2006 - 01.08.2006
LEAST SQUARES APPROXIMATION WITH PARABLE

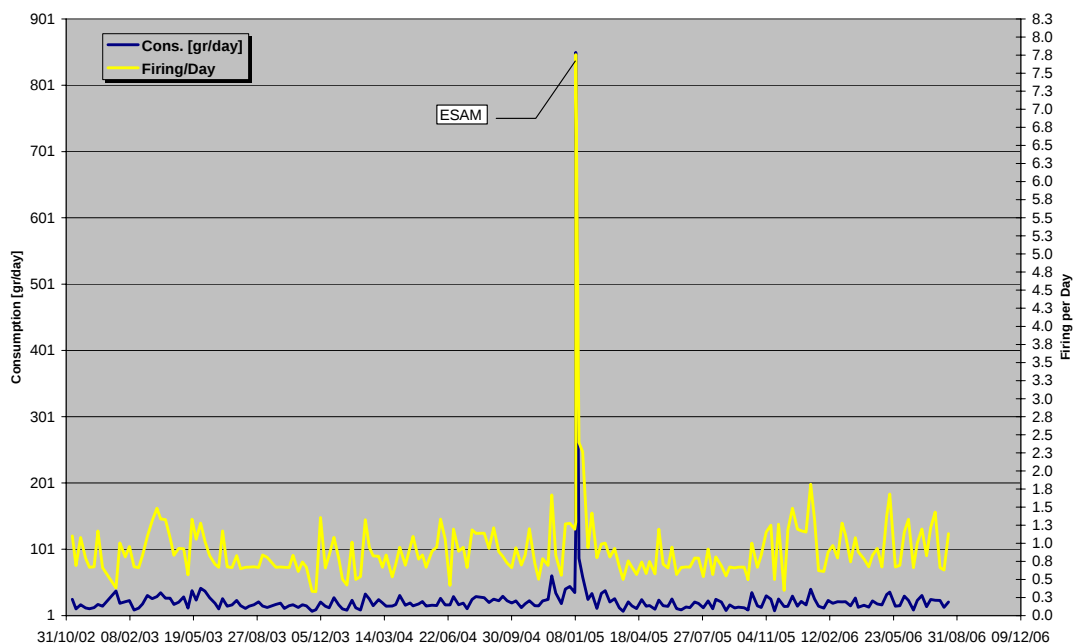


Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 17/08/2006 is reported in the plot below.

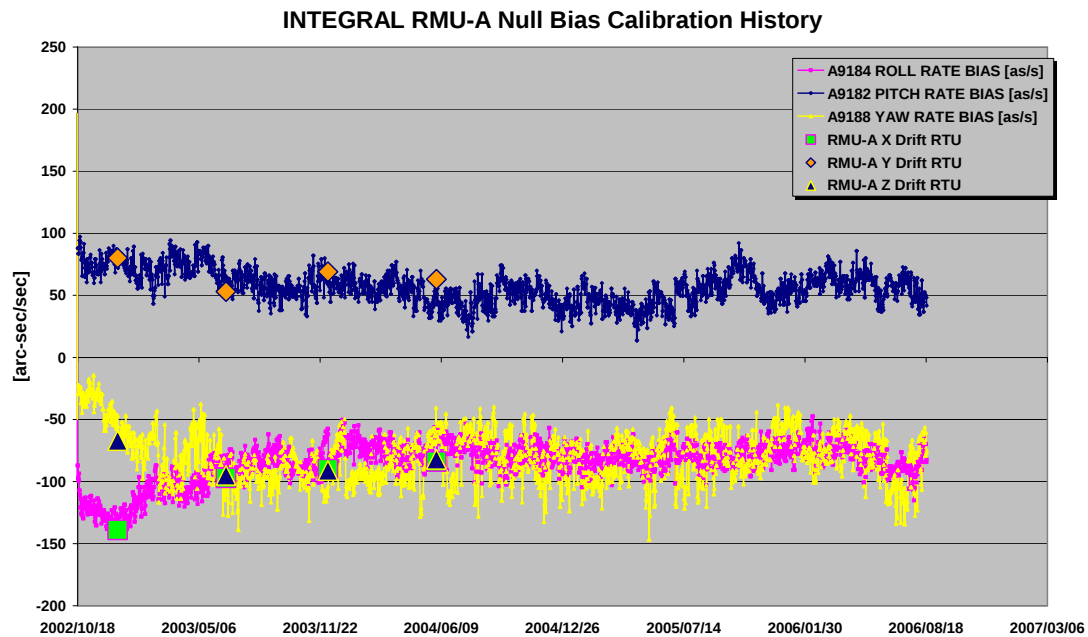


The firing\day over the period between 01/11/2002 and 17/08/2006 is reported in the plot below.

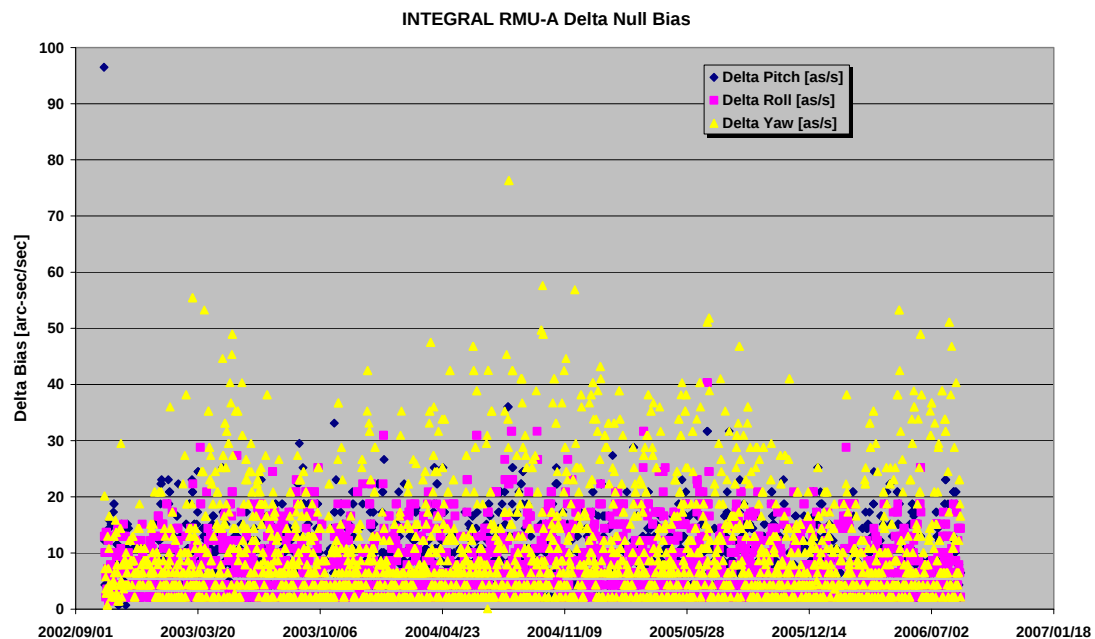


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 18/08/2006 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 18/08/2006 is reported in the plot below.



12/08/06 (Day of Year 224, Revolution 467)

Nothing to report.

13/08/06 (Day of Year 225, Revolution 467-468)

Nothing to report.

14/08/06 (Day of Year 226, Revolution 468)

Nothing to report.

15/08/06 (Day of Year 227, Revolution 468)

Nothing to report.

16/08/06 (Day of Year 228, Revolution 468-469)

Nothing to report.

17/08/06 (Day of Year 229, Revolution 469)

Limited divergence for Wheel 2 speed value: at 10:50z was reported for short time a limited divergence (~80 rpm) on measured wheel 2 speed (-368 rpm) wrt the prediction (-450 rpm), that caused the exceeding of the relevant soft limit while in pointing until 11:48z.

No impact on TL.

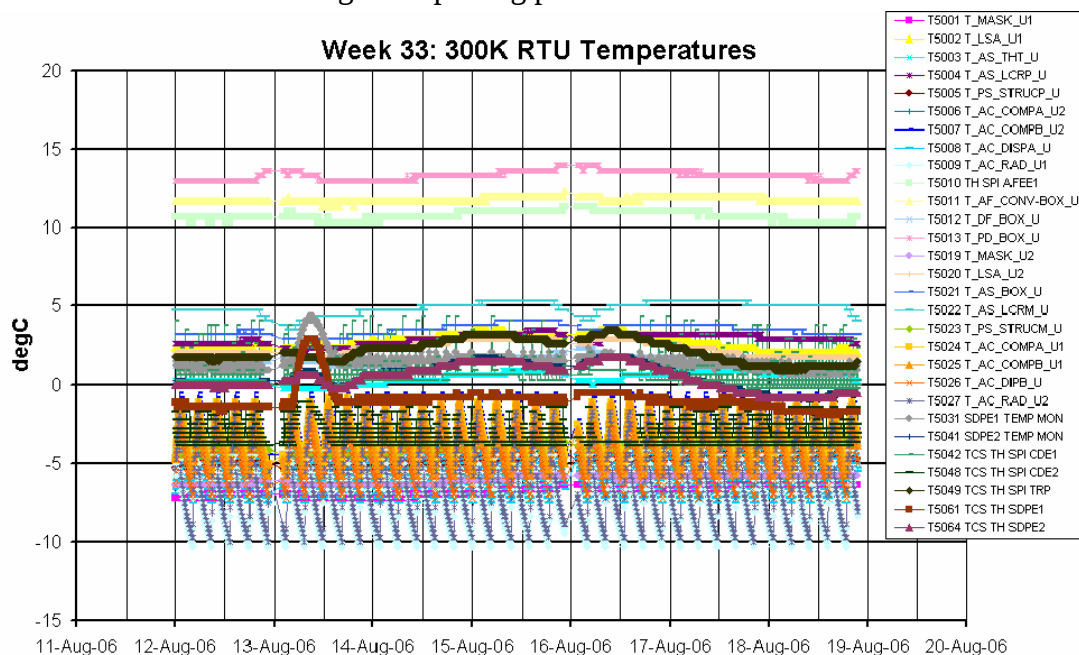
18/08/06 (Day of Year 230, Revolution 469)

Nothing to report.

8.3.2 SPI Operations

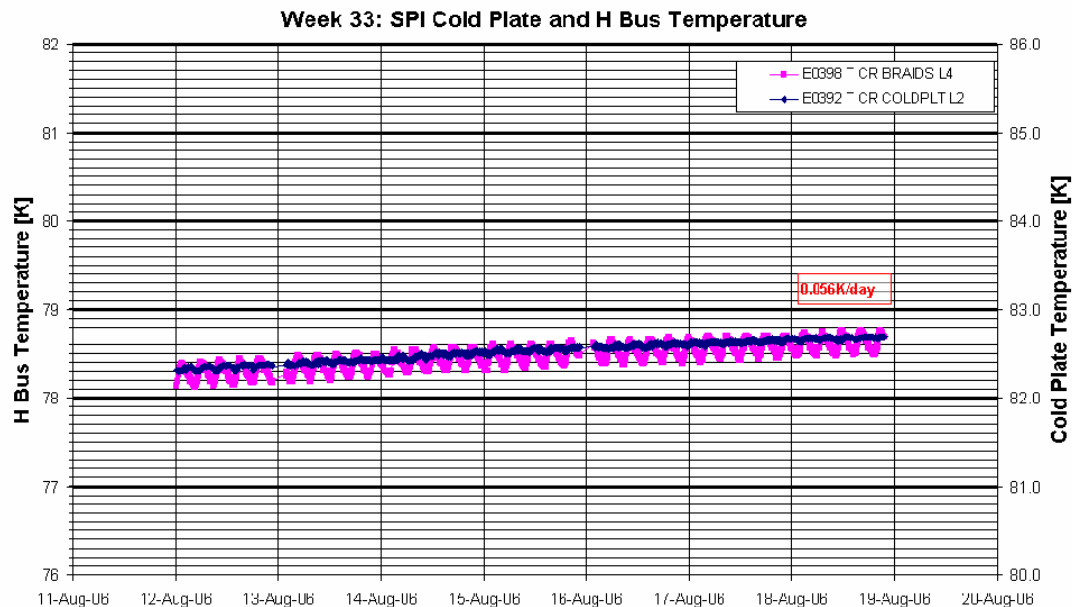
Unit Temperatures:

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 of 0.056deg/day. 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 94.1 packets/cycle over the science window, when the TM allocation was 105 pkts/cycle.

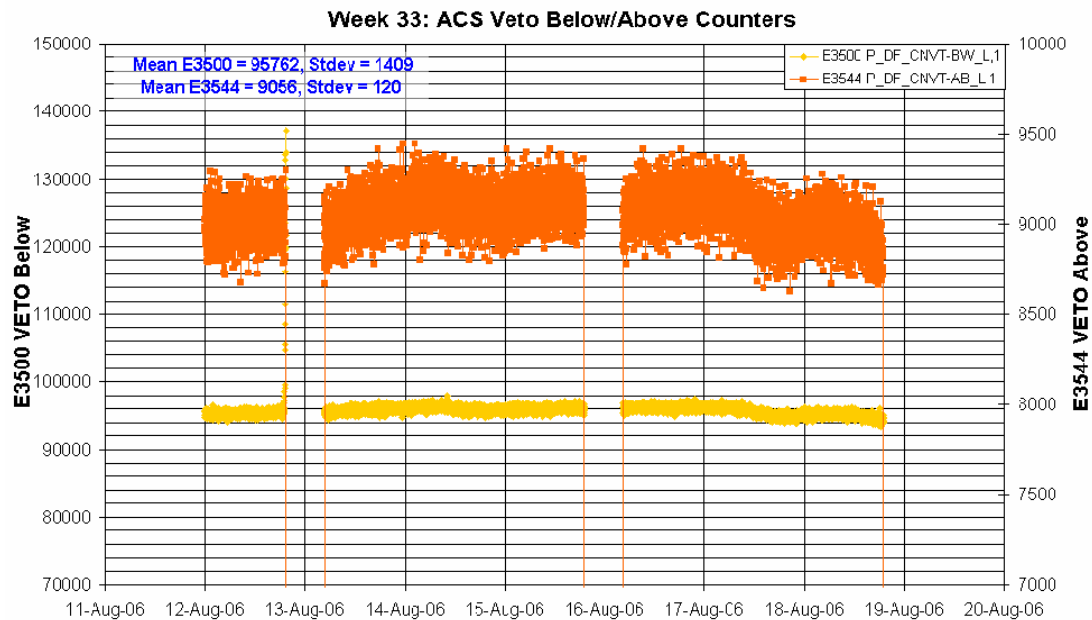
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

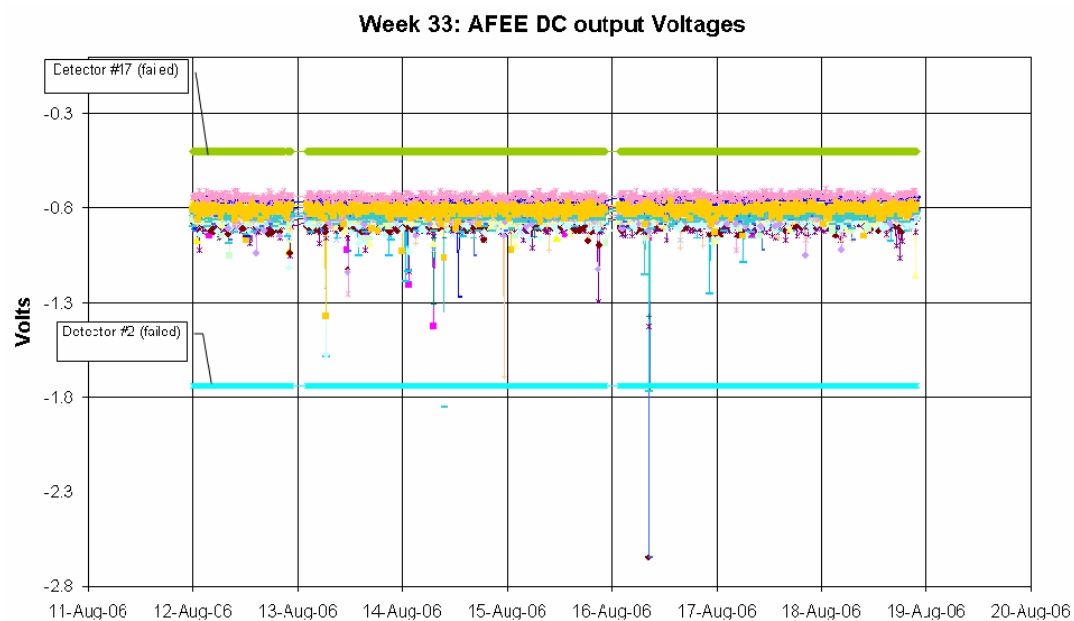
The following plot shows the ACS overall count rate evolution during the reporting period:



AFEE:

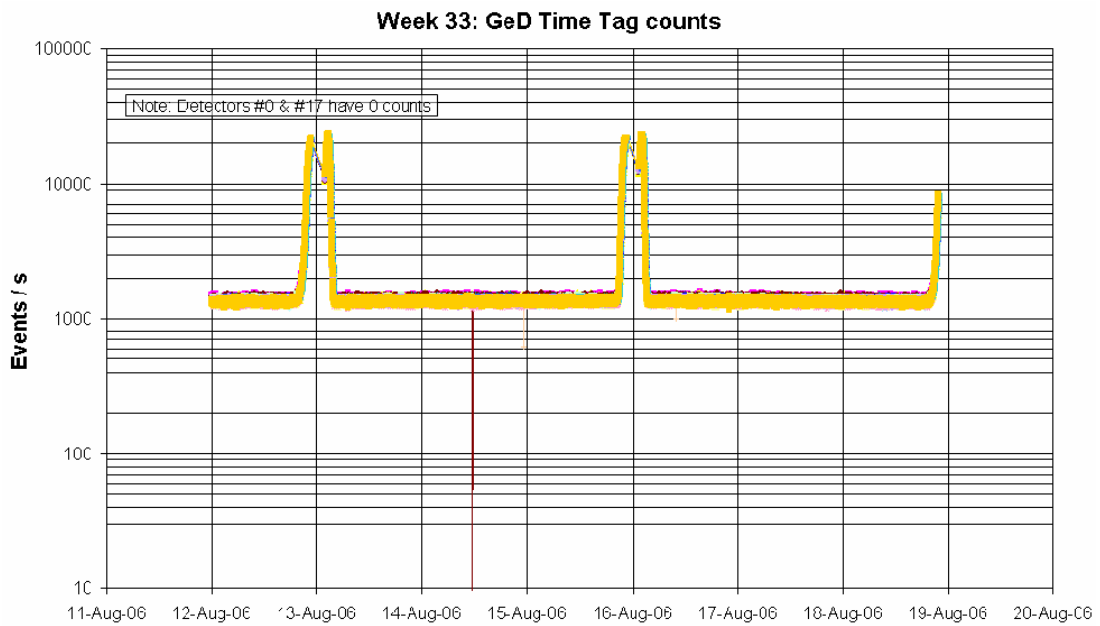
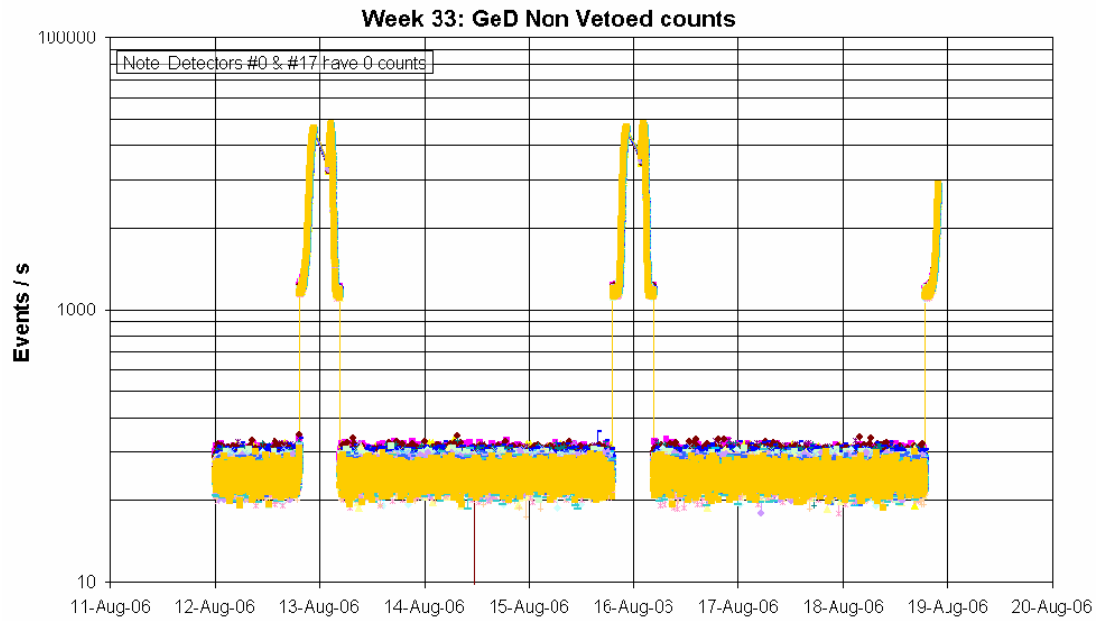
The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with the last annealing.

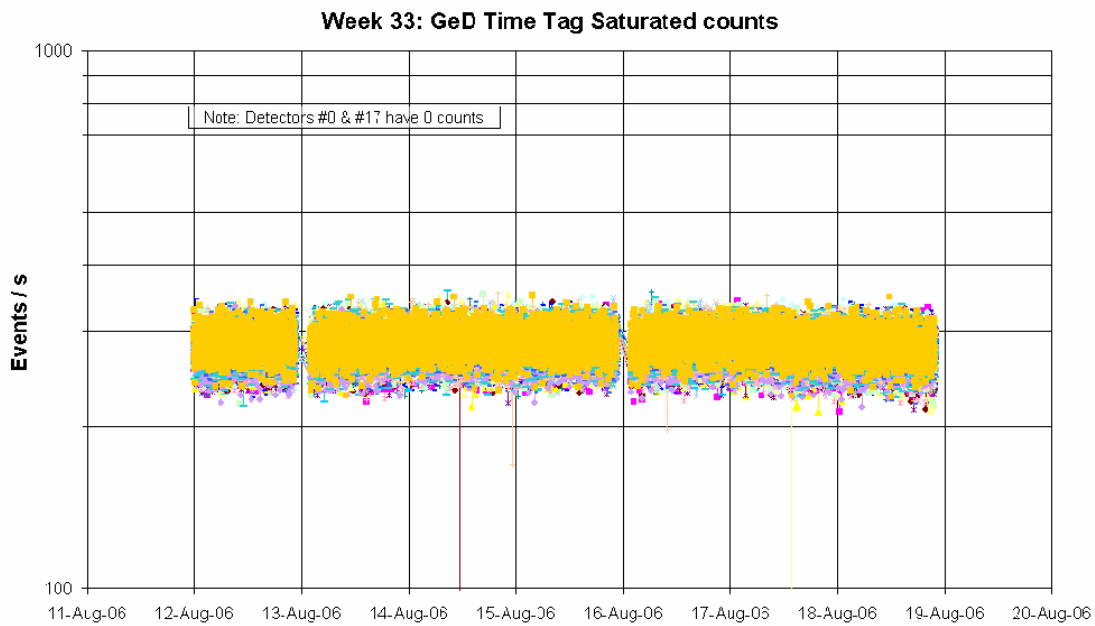
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004



DFEE:

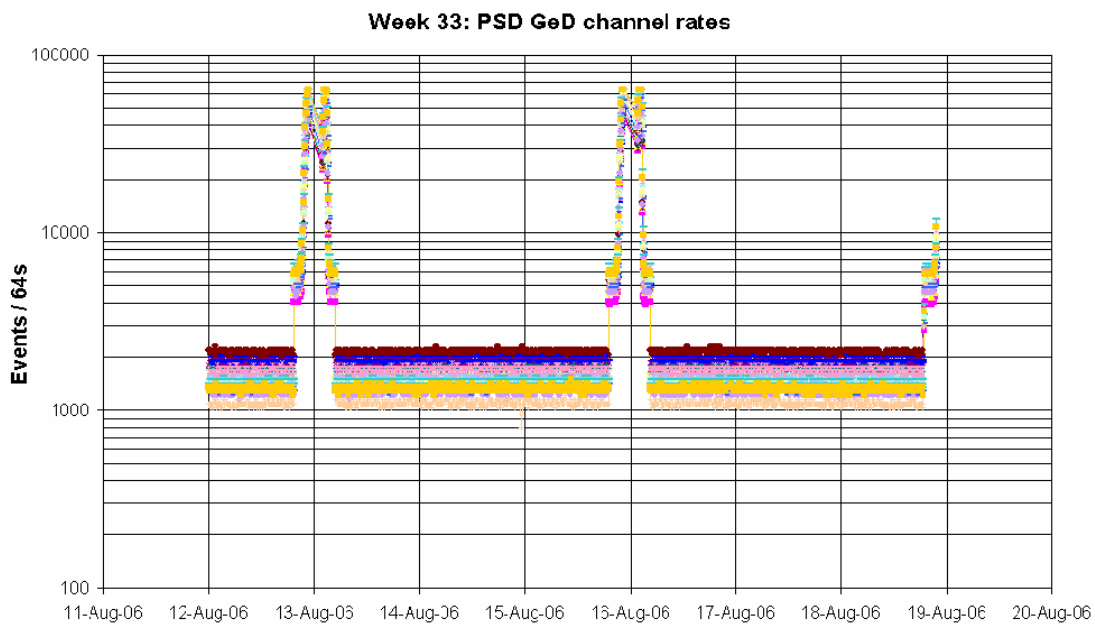
The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD:

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



Event Log:

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

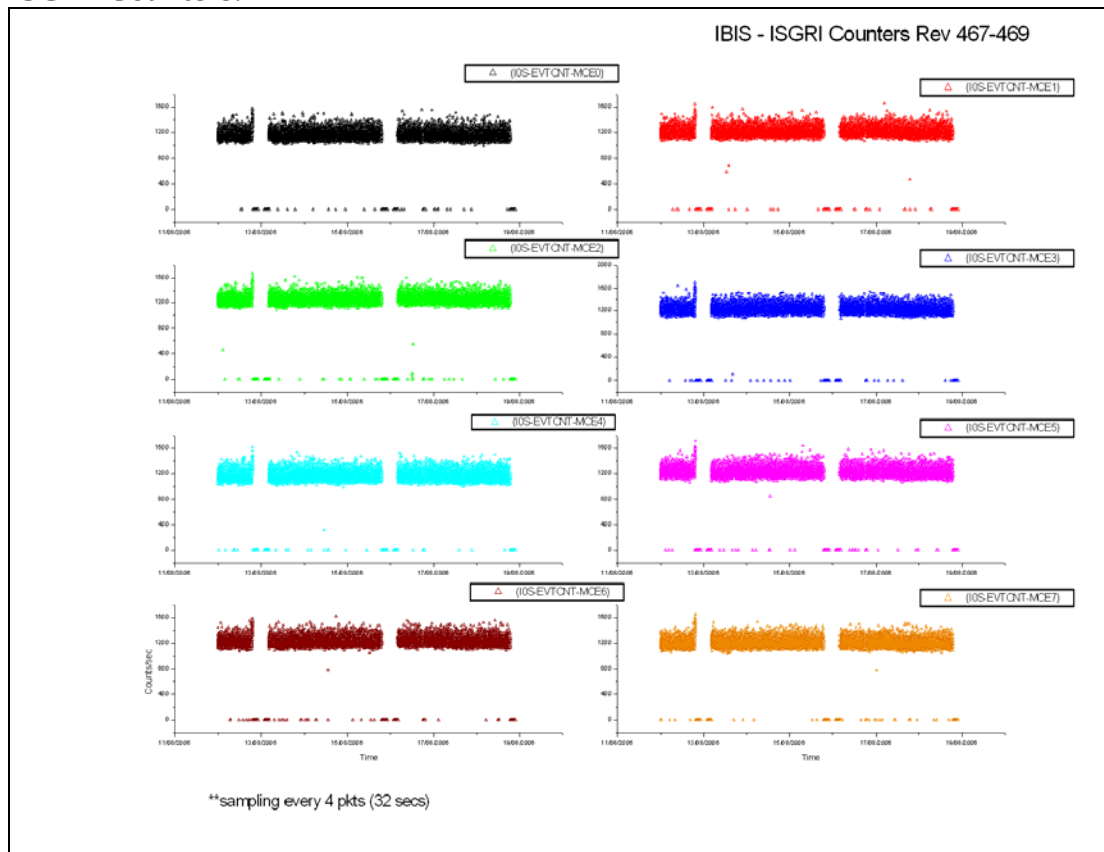
- On 2006-08-12 at 19:15:17Z TM parameter E3500 went OOL High (value = 134570). This is the ACS Veto Below Counter. As this was ~10 minutes before radiation belt entry of revolution 467 no action was taken.
- On 2006-08-15 at 21:38:54Z TM parameter E3824 U PD 5V+DIG L went OOL Low (value = 5.1156V). This is the + 5V digital voltage of the PSD. It returned within limits when the next packet was received at 21:39:58Z.

- On 2006-08-16 at 08:34:59Z TM parameters E0354 and E0365 went OOL Low (value = -2.652V). These are the digital Converter output voltage for Detectors #4 and #15. They returned within limits when the next packet was received at 08:45:39Z.

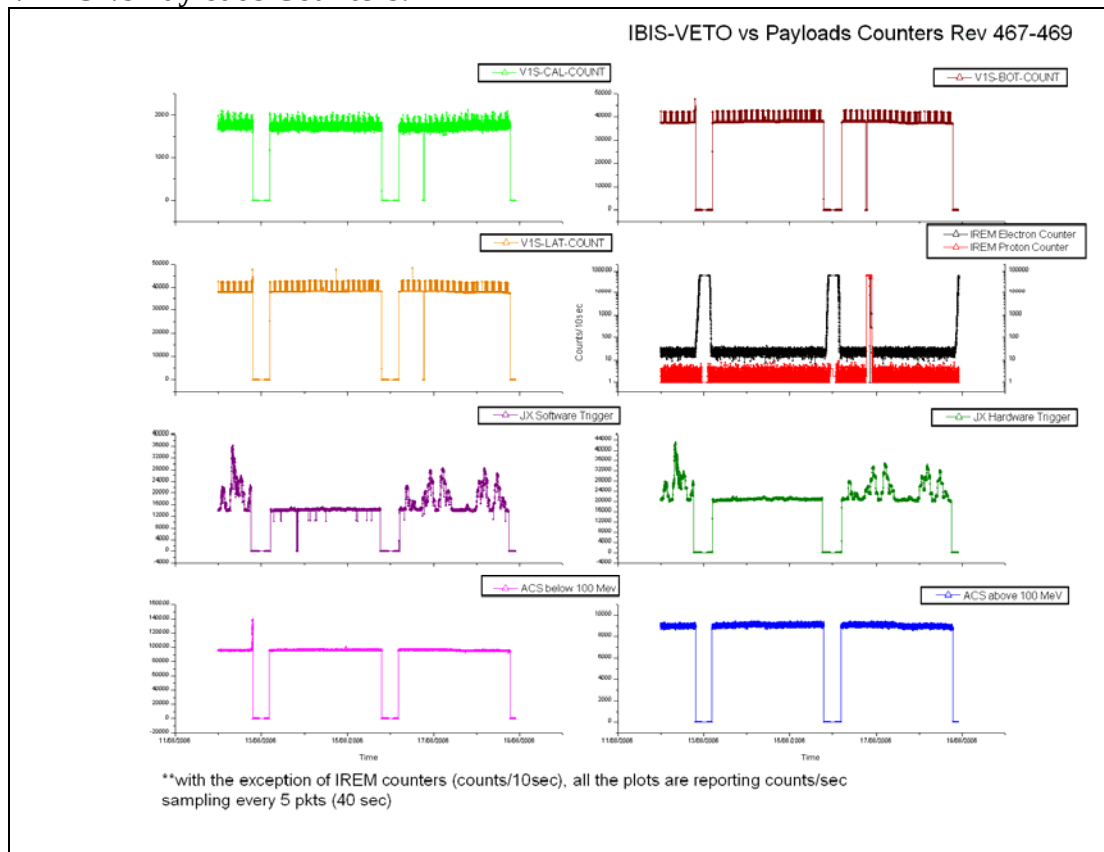
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

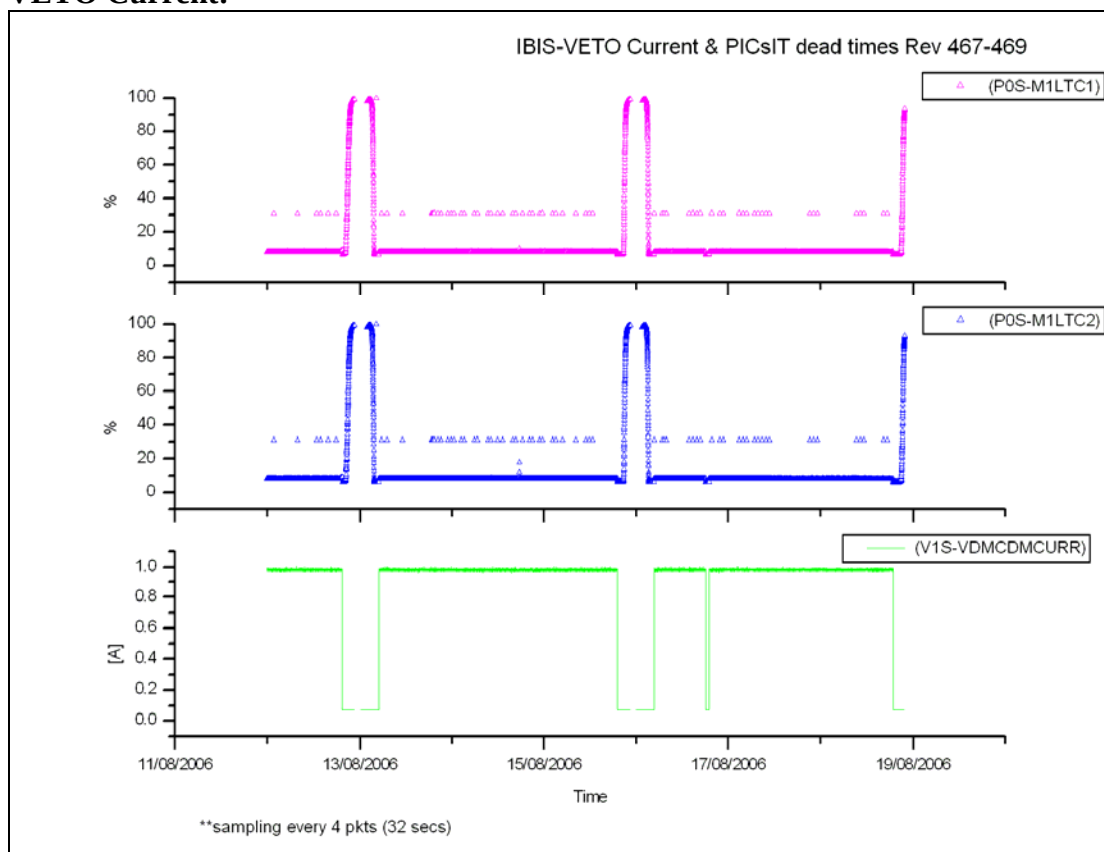


VETO vs Payloads Counters:

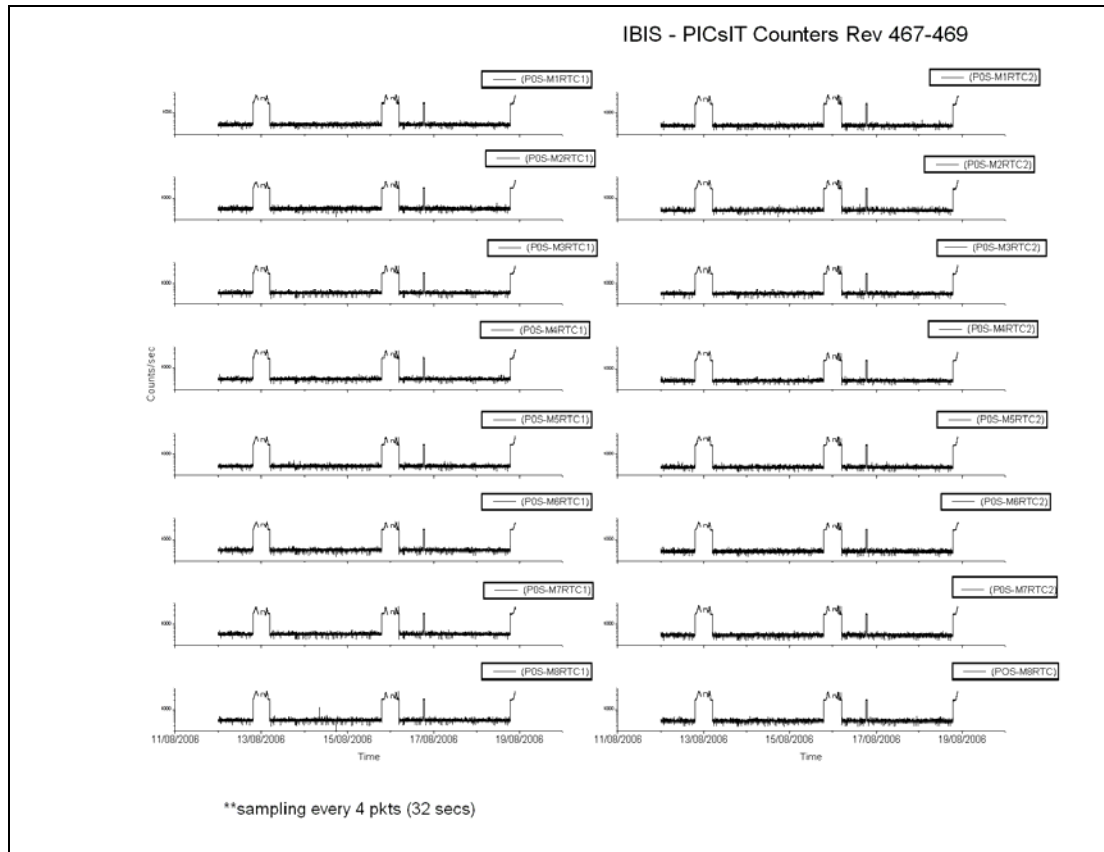


The week was characterised by low radiation.

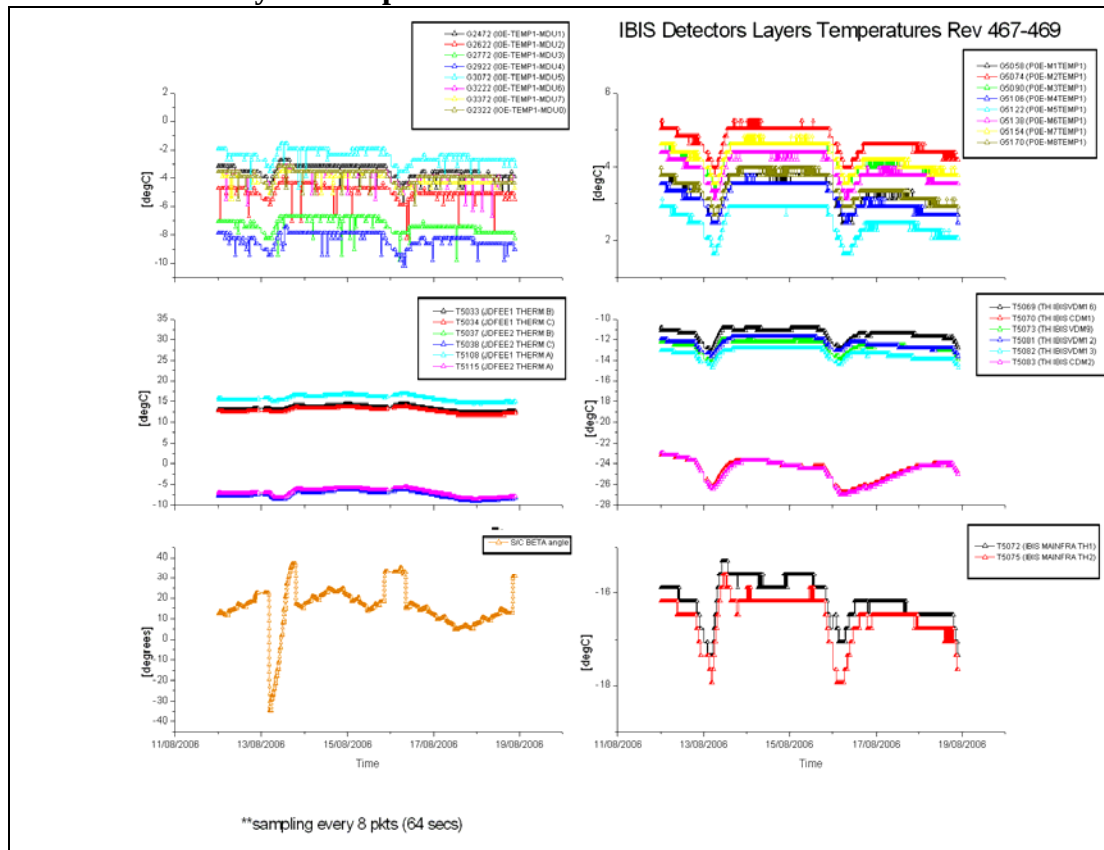
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 224 (12/08/2006):

At 19:26Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 225 at 04:57Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

DoY 225 (13/08/2006):

At 04:29Z TM parameter G2042 (I0E-OVFWPXADD-M3) failed SCC and back. According to I-OVF-1, no action was taken.

At 04:50Z, TM parameter G2027 (I0S-EVTCNT-MCE1) was reported OOL Low-Low (value = 0). It went back inside limits at the next TM cycle. According to I-CNT-1, no action was taken.

At 19:26Z, the Command Verifier Task crashed. This implied ED GESTAN02 to fail. The event Designator was manually recovered at 20:01Z. The impact is Pointing 04680025 was delayed.

DoY 226 (14/08/2006):

At 17:33Z, TM families G5068 and G5072 (POS-MiF 1 & 2 ERRF) reported failed SCC and back. According to P-FIF-1, no action was taken.

DoY 227 (15/08/2006):

At 19:09Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 228 at 04:41Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

DoY 228 (16/08/2006):

At 18:07Z, IBIS went into Safe configuration due to IREM SEU #32. The unit was manually recovered and re-enabled in the timeline at 19:10Z. The impact is Pointing 04690018 partially missed, and Pointing 04690019 delayed.

At 18:08Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit at 19:00Z. As this happened after IBIS went automatically in Safe mode (due to IREM reset #32), according to V-VLT-1 no action was taken.

DoY 230 (18/08/2006):

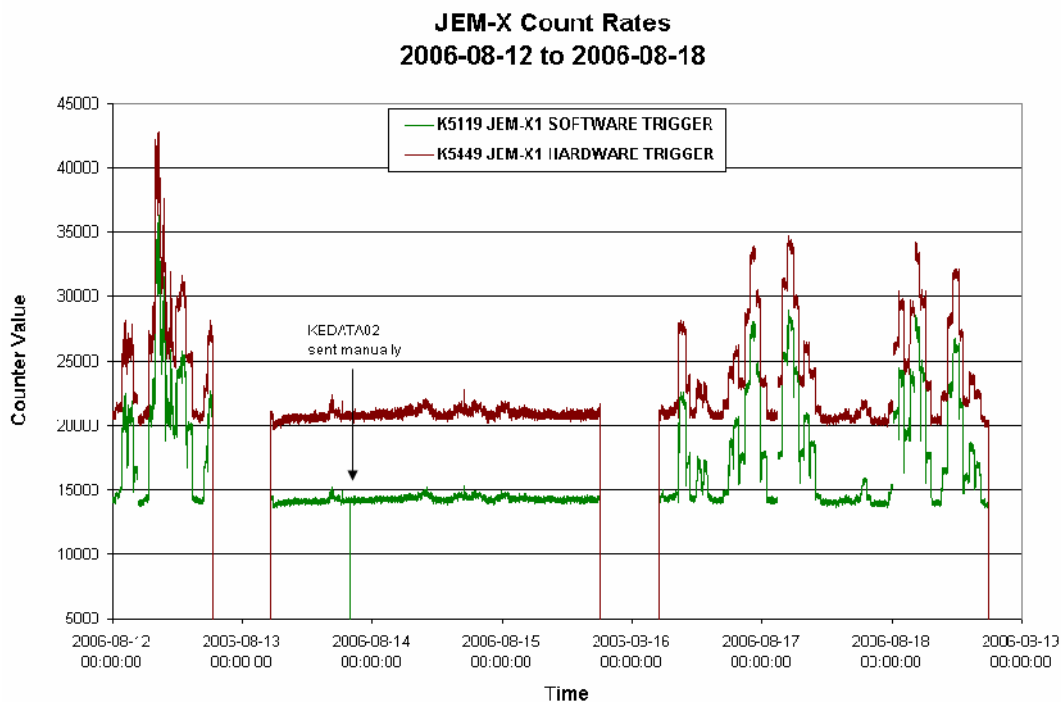
At 18:52Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 231. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph¹. Note that a smaller scale than normal has been used for this plot in order to display the very high count rates which were obtained during some of the pointings.

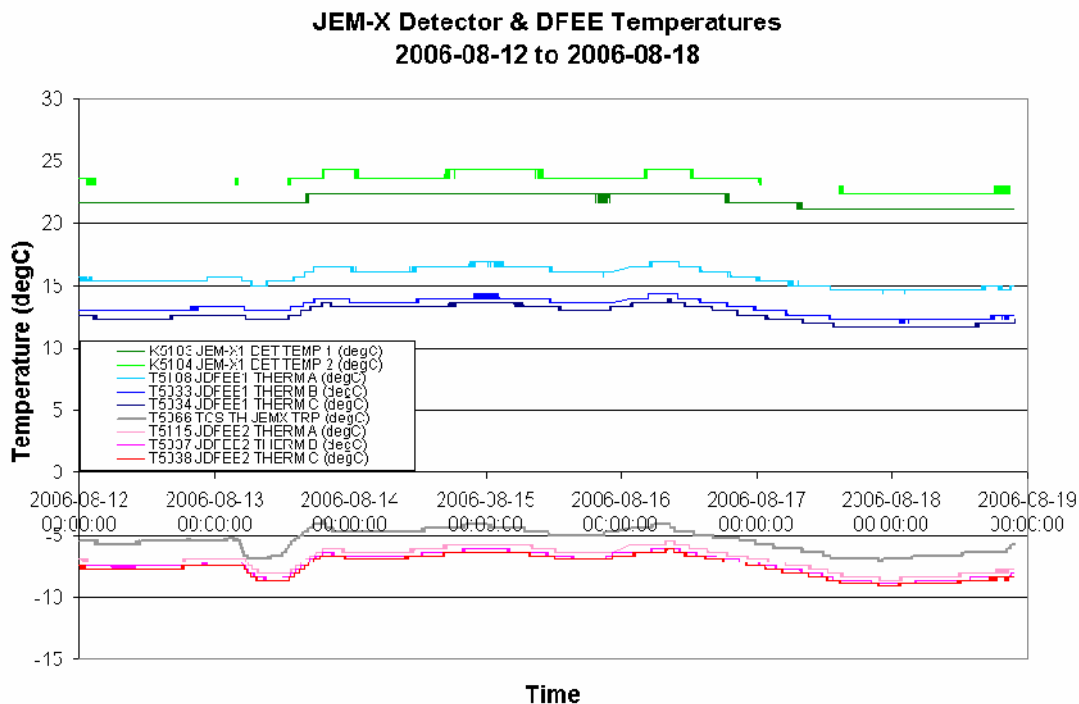


JEM-X Temperatures

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

2006-08-12 (DOY 224, Rev 467)

From 06:46:30 Z to 13:26:30Z the TM parameters K5136 BUFFER LOSS; K5449 HARDWARE TRIGGER and K5119 SOFTWARE TRIGGER frequently toggled between being OOL High and within limits. At 17:47:34Z K5136 BUFFER LOSS went OOL High again (value = 218), returning within limits at 17:48:54Z.

2006-08-13 (DOY 225, Rev 467-468)

Due to a crash of the command verifier, the TCs of an ED KEDATA02 starting with TC KU0014 at 19:25:54Z had acceptance unverified (although they were in fact executed on board). Once the verifier was restarted, as part of the recovery, the ED KEDATA02 was re-uplinked at 20:03:18Z. JEM-X1 operations continued nominally.

2006-08-14 (DOY 226, Rev 468) to 2006-08-15 (DOY 227, Rev 468)

Nothing to report

2006-08-16 (DOY 228, Rev 468-469)

From 08:35:18Z to 08:50:06Z TM parameter K5136 BUFFER LOSS toggled between OOL High and within limits. Again, from 20:49:50Z until the end of the day the TM parameters K5136 BUFFER LOSS and K5449 HARDWARE TRIGGER frequently toggled between being OOL High and back within limits.

At 18:07:57Z 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.

2006-08-17 (DOY 229, Rev 469)

From 03:49:42Z to 07:52:22Z the TM parameters K5136 BUFFER LOSS and K5449 HARDWARE TRIGGER frequently toggled between being OOL High and within limits.

2006-08-18 (DOY 230, Rev 469)

From 00:16:54Z to 12:19:02Z the TM parameters K5136 BUFFER LOSS and K5449 HARDWARE TRIGGER frequently toggled between being OOL High and within limits.

8.3.5 OMC Operations

2006-08-12 (DOY 224, Rev 467)

Nothing to report

2006-08-13 (DOY 225, Rev 468)

At 19:25, the Command Verifier and TC History both crashed. This caused the OMC commands to fail. The impact was the loss of pointing 04680025.

2006-08-14 (DOY 226, Rev 468) to 2006-08-15 (DOY 227, Rev 468)

Nothing to report

2006-08-16 (DOY 228, Rev 469)

At 18:07:52 an IREM SEU triggered a transition of the unit to SAFE mode. A recovery was initiated, and the unit was returned manually to standby at 19:17:00. The impact was pointing 04690018 was interrupted after 1076 from a planned 3479 seconds, with pointing 04690019 lost.

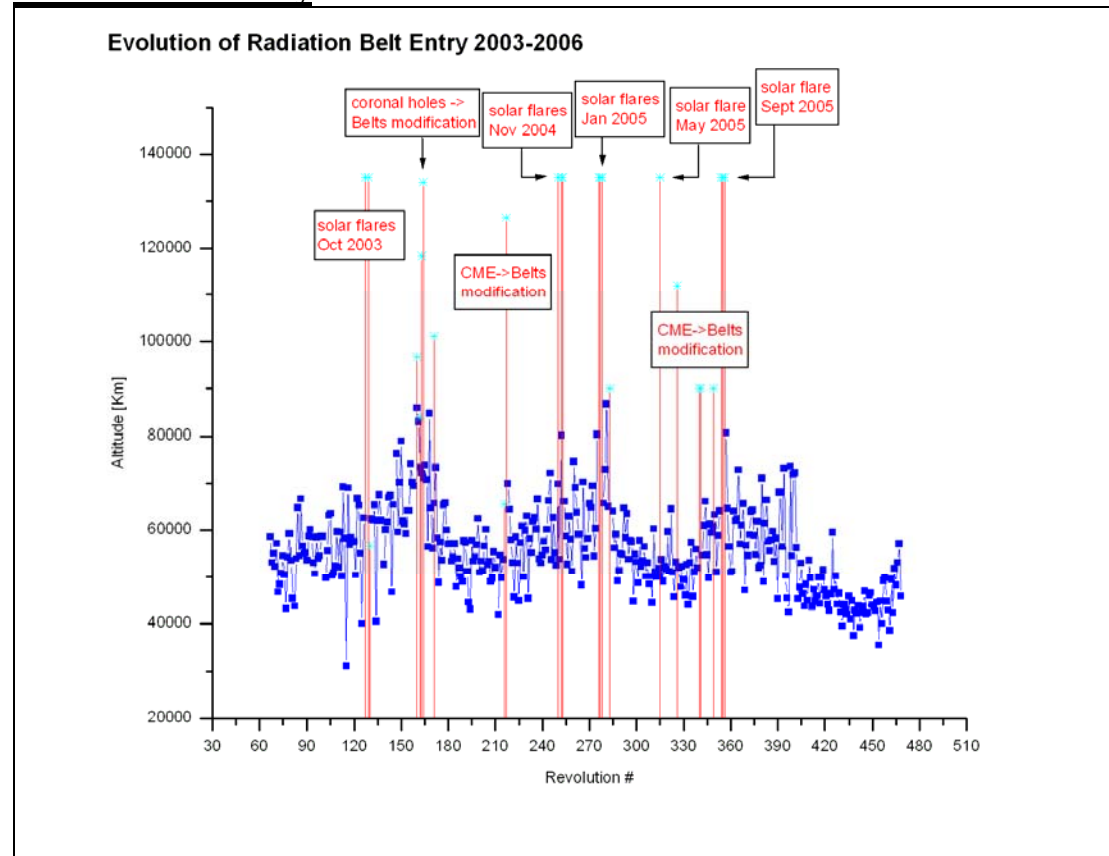
2006-08-17 (DOY 229, Rev 469) to 2006-08-18 (DOY 230, Rev 469)

Nothing to report

On DoY 224 at 19:26:16, DoY 227 at 19:08:56 and DoY 230 at 18:51:52 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

DoY 2006.228 (16/08/2006):

On 2006-08-16 at 18:07Z, a local reset of the IREM CSCI S/W (SEU #32) 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) 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 2006.228.18.07Z at 120940.3km. 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 18:13Z 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 = 1011110011000000, 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 22:00Z.

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.

The recovery of the payload was performed with OMC re-enabled at 19:16Z, and IBIS at 19:10Z.

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]
467	RAD_ENTR R 2006-08-12T19:26:09Z	2006-08-12 19:17:50	57160.0	2006-08-12 20:19:16	48495
468	RAD_EXIT R 2006-08-13T04:44:18Z	2006-08-13 03:51:34	37140.2	2006-08-13 03:59:16	38588
468	RAD_ENTR R 2006-08-15T19:08:51Z	2006-08-15 20:17:42	>45878.5	2006-08-15 20:08:29	47877
469	RAD_EXIT R 2006-08-16T04:27:36Z	2006-08-16 03:26:22	>>26538.4	2006-08-16 03:48:29	39171
469	RAD_ENTR R 2006-08-18T18:51:45Z	2006-08-18 20:08:47	45473.7	2006-08-18 19:48:29	48569

Reference

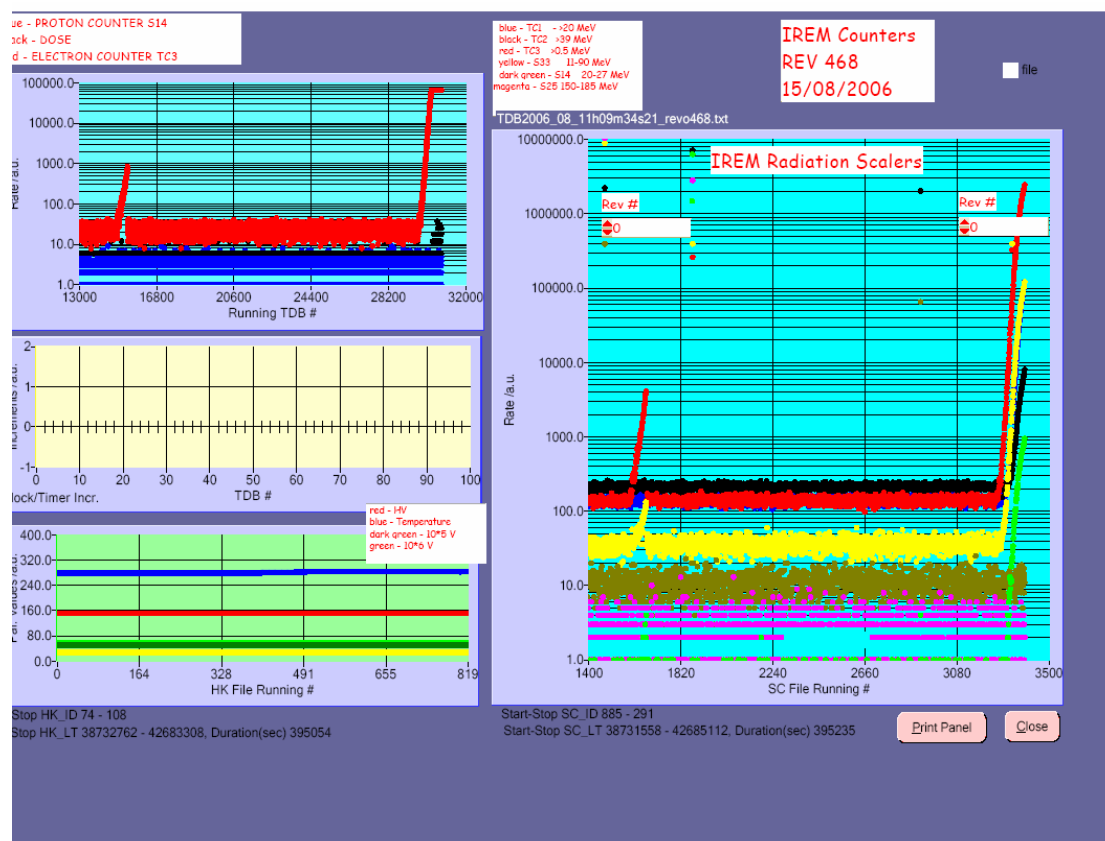
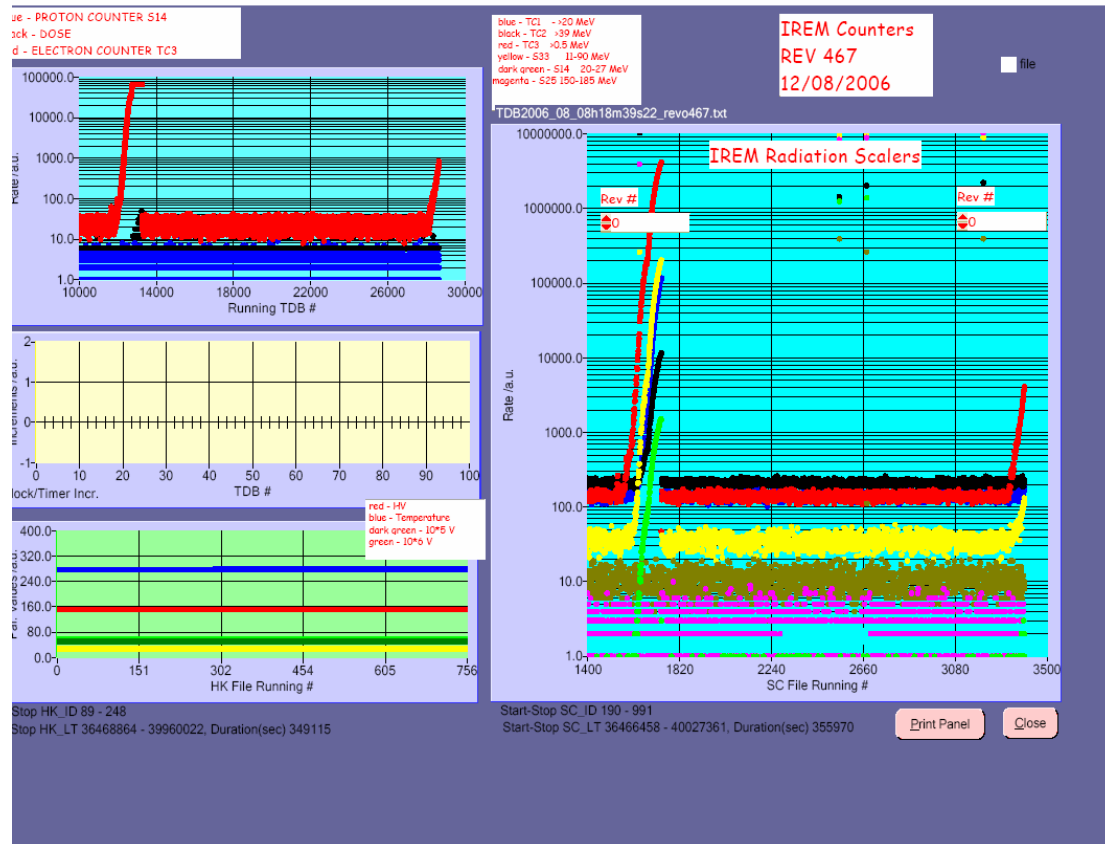
Very small error vs reference (less than 10 minutes)

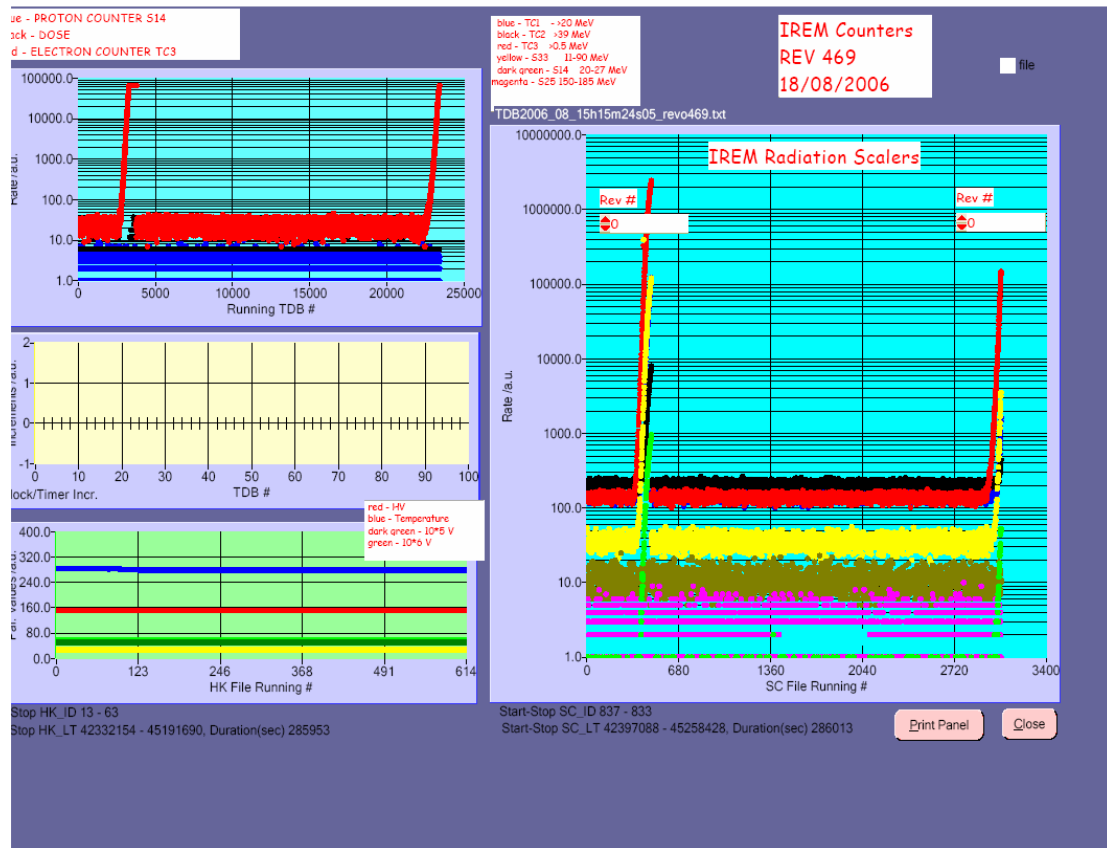
Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

Radiation Spike

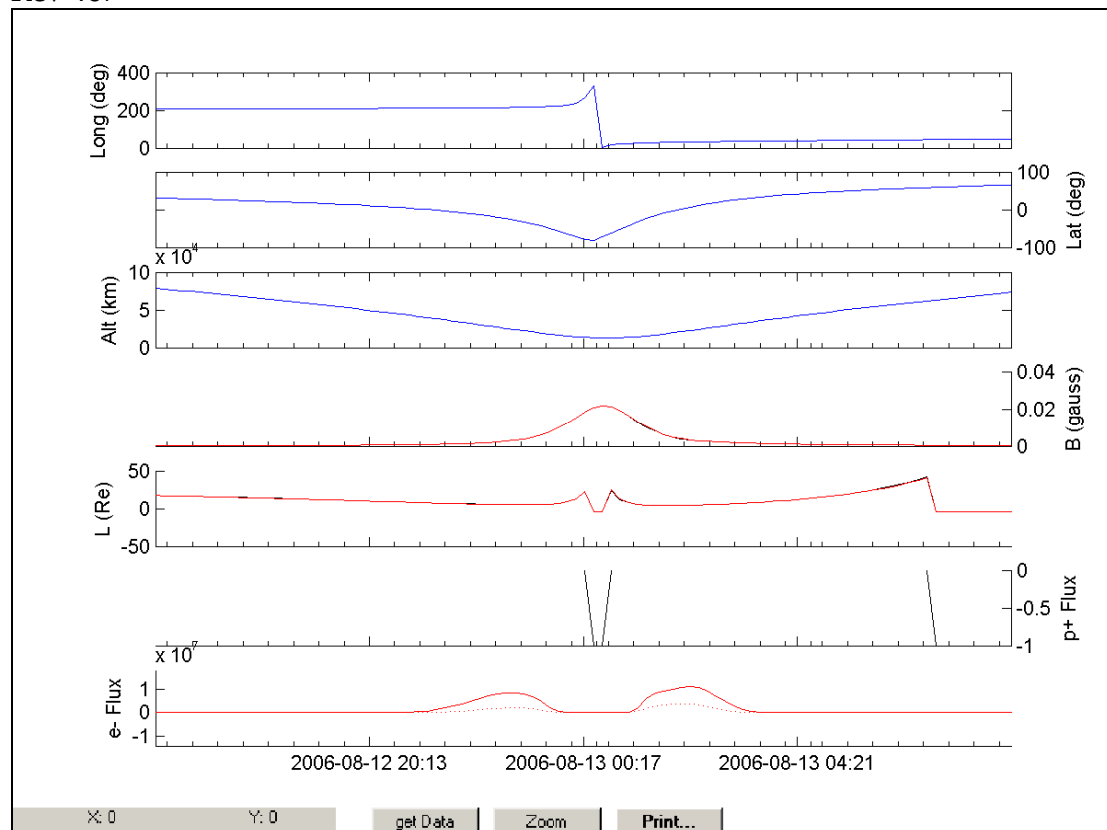
IREM radiation counters:



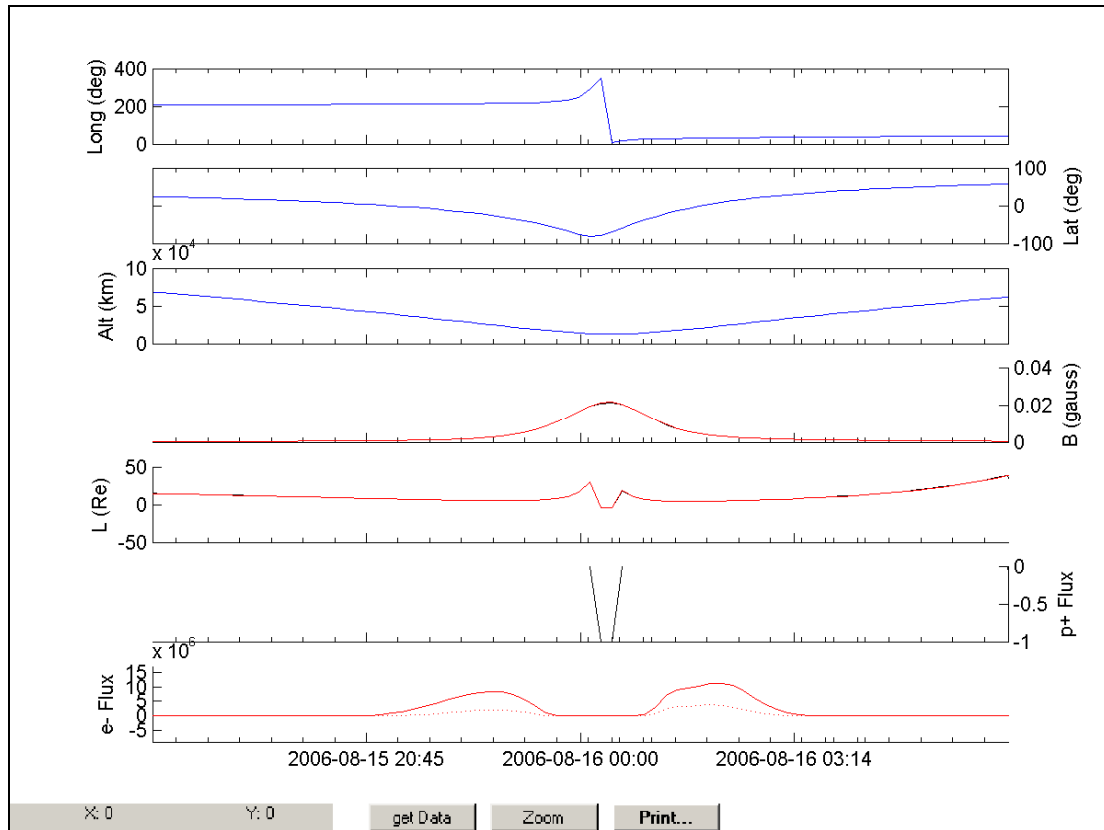


IREM Predicted Radiation Belt Passages:

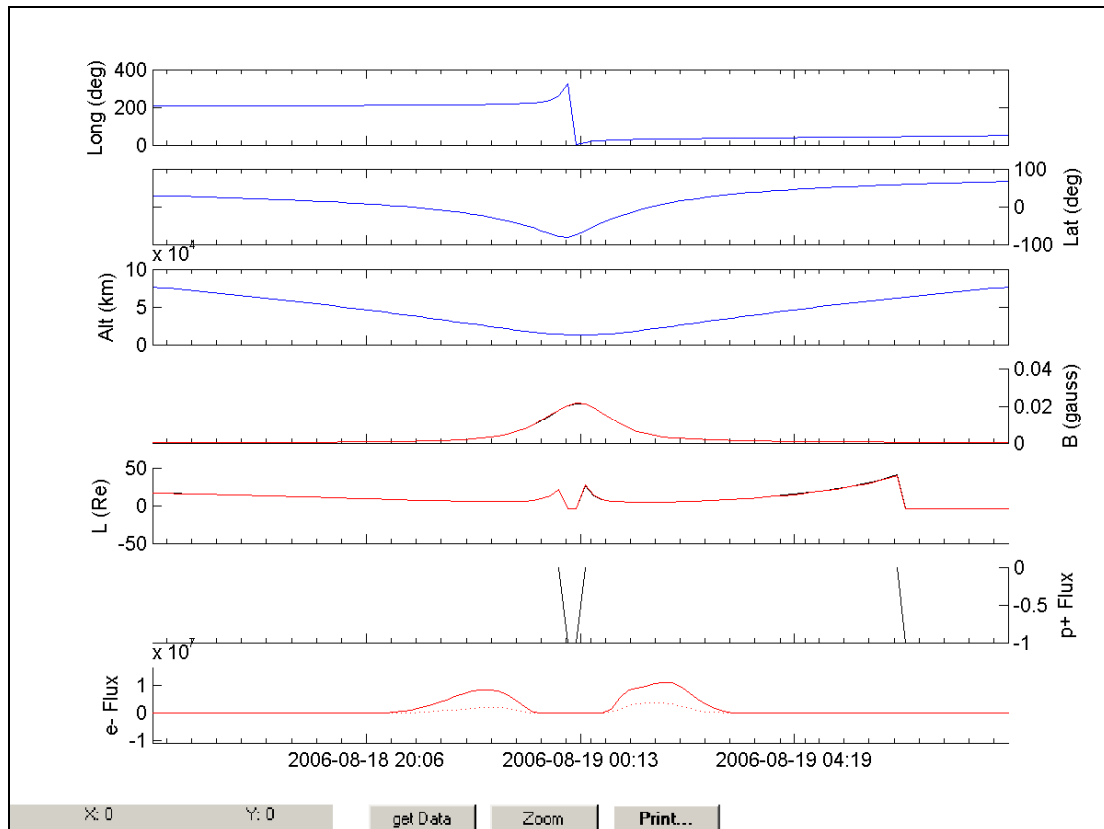
Rev 467



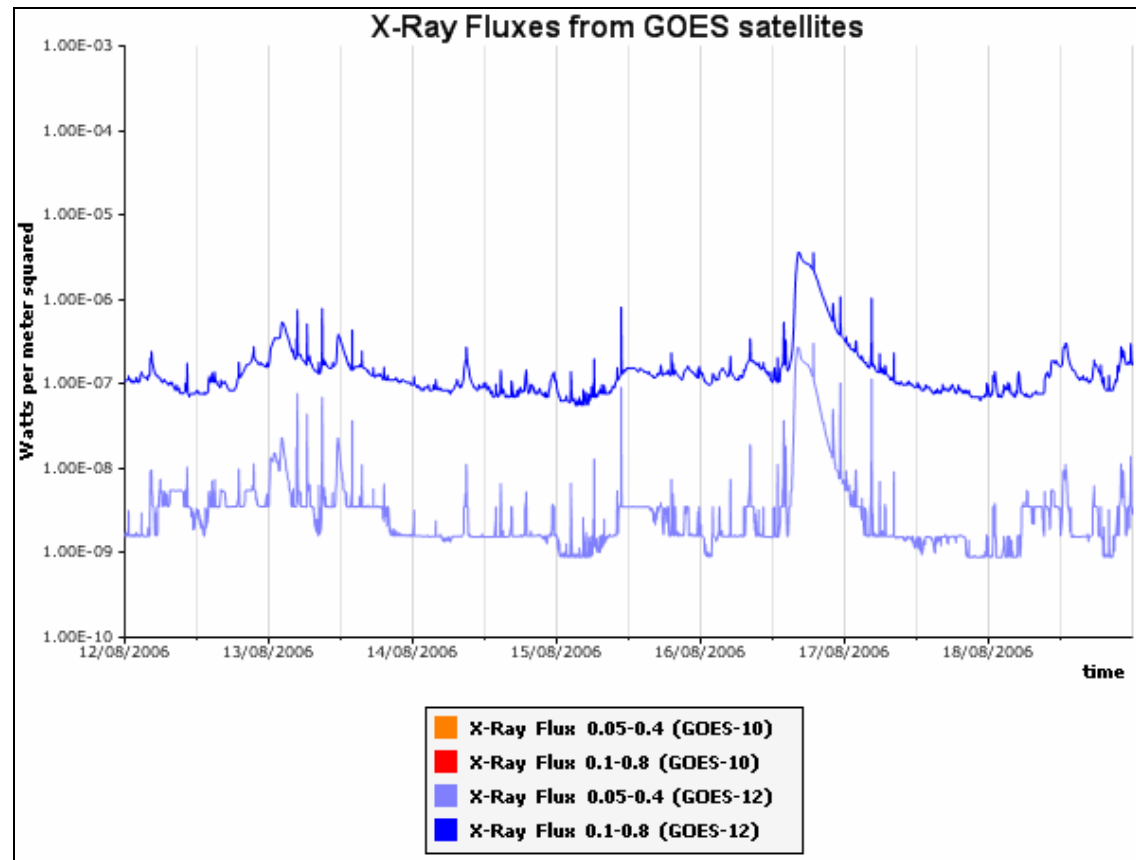
Rev 468



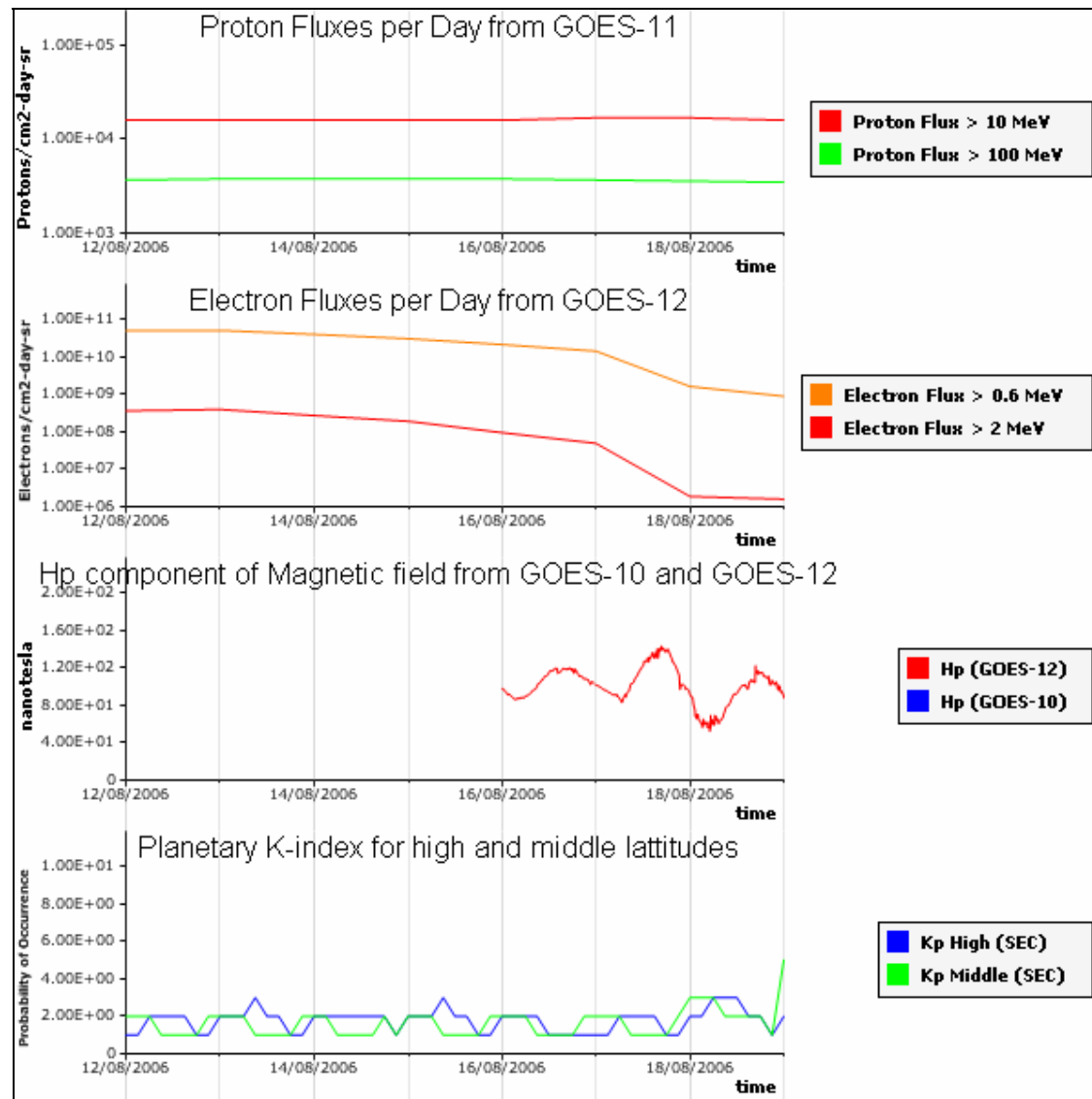
Rev 469



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.