

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 199
Week 28
17.07.06
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 08.07.06 until 14.07.06 (both dates inclusive) and covers the revolutions 456, 457 and 458.

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 raster dithers of XMM LSS (RA 02:18:00.00, DEC -07:00:00.0), LEDA170194 (RA 12:39:06.30, DEC -16:10:47.8), and Field_10 (RA 04:05:42.00, DEC -23:36:23.0), plus two short Galactic Plane Surveys.

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.

On 9/07/2006, the S/C experienced an anomalous execution of the automatic pyro sequence for the Launcher Separation (for the second time). The cause is likely due to an SEU or some discharge effect not yet clear. The recovery of the S/C required ~4 hours and no further problems were reported.

3 slews were lost during the observation period due an anomalous execution of the automatic pyro sequence for the Launcher Separation, as described above.

The fuel consumption over the period between 06/07/2006 and 14/07/2006 was 0.1046 kg. The remaining propellant is in the order of 153.2069 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.

On DoY 190, the following sequence of OOLs was observed:

At 190.15.41.15

P5102 PRU A AUX STAT = SECV PRSENT (CO)

P3004 BCR1 ON/OFF STAT = OFF (FX)

P3005 BCR2 ON/OFF STAT = OFF (FX)

P1112 LCL STA IMU1 = CLOSE (CO)

P1151 LCL STA IMU3 = CLOSE (CO)

P1101 LCL STA LV A = CLOSE (CO)

P1174 LCL STANOM CBH B = CLOSE (CO)

P1051 LCL CUR IMU3 = 0.94A (HH) remained OOL for about 3m.

P3012 BUS PRU A STAT = ON (FX)

At 190.15.41.31

P1012 LCL CUR IMU1 = 0.95A (HH) remained OOL for about 3m.

At 190.15.41.31

P1105 LCL STA FCV A = CLOSE (CO)

At 190.15.51.39

P5031 ATHN STAT 1A = CLOSE (CO)

P3104 BAT1 DICHA CUR M = 0.71A

P3105 BAT1 DICHA CUR R = 0.71A

These 3 remained OOL for about 1m.

At 190.15.52.51

P5030 ATHN STAT 2A = CLOSE (CO)

P3104 BAT1 DICHA CUR M = 0.71A

P3105 BAT1 DICHA CUR R = 0.71A

These 3 remained OOL for about 1m.

The above pattern of 3 OOL was repeated with the same relative timing for parameters P5029, P5028, P5027, P5026, P5025 & P5024. Following this no new OOLs occurred.

As the SPACON and on-call support were unsure of the AOCS configuration (some AOCS HW statuses had changed) AOCS timeline operations were suspended. Similarly the PLM instruments were placed in a safe mode. SOM / SOE and Flight Dynamics support were also requested.

Investigation suggested that a SEU or similar had caused both BCRs to switch-off and

the PRU to switch-on (the PRU is the unit which configures the satellite autonomously following separation from the launcher). Following switch on of the PRU the separation sequence would immediately start to execute again, this would explain all subsequent OOLs, the relative timing of OOLs was also in agreement.

Following a check that the sequence had executed correctly and that apart from this the Satellite status was as expected, the following steps were taken to return to a nominal configuration:

- Switch on BCR1 (FCP_EPS_1231)
- Switch on BCR2 (FCP_EPS_1232)
- Switch off PRU-A (FCP_EPS_1630)
- Switch-off IMU-1 (FCP_AOC_1601)
- Switch-off IMU-3 (FCP_AOC_1604)
- Switch-off Nominal Cat Bed Heater B (FCP_AOC_1537)
- Switch-off FCV-A (FCP_AOC_0004 step 5)
- Switch-off LV-A (FCP_AOC_1512)

Following this, a reaction wheel biasing was executed as part of the attitude recovery operations. This was also a confirmation that the reconfiguration of the RCS components (LV, FCV, Cat. Bed Heater) had executed correctly. In parallel with the attitude recovery the payload instruments were brought back into use. The recovery was completed at 19.20z.

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

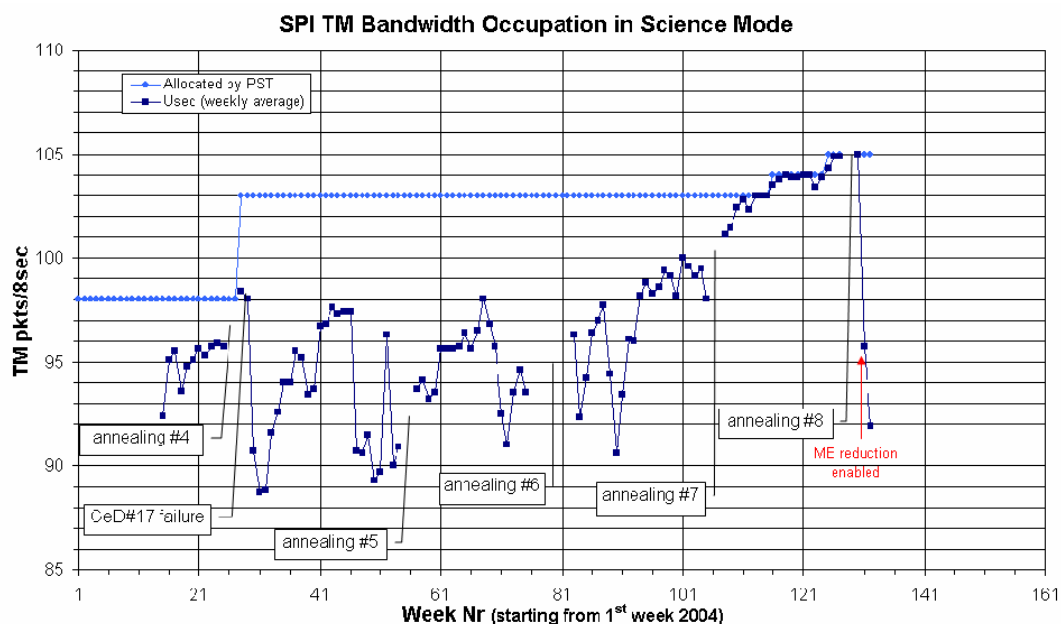
3.2.1 SPI

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 has been 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. The average telemetry occupation was 91.9 packets/cycle.

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



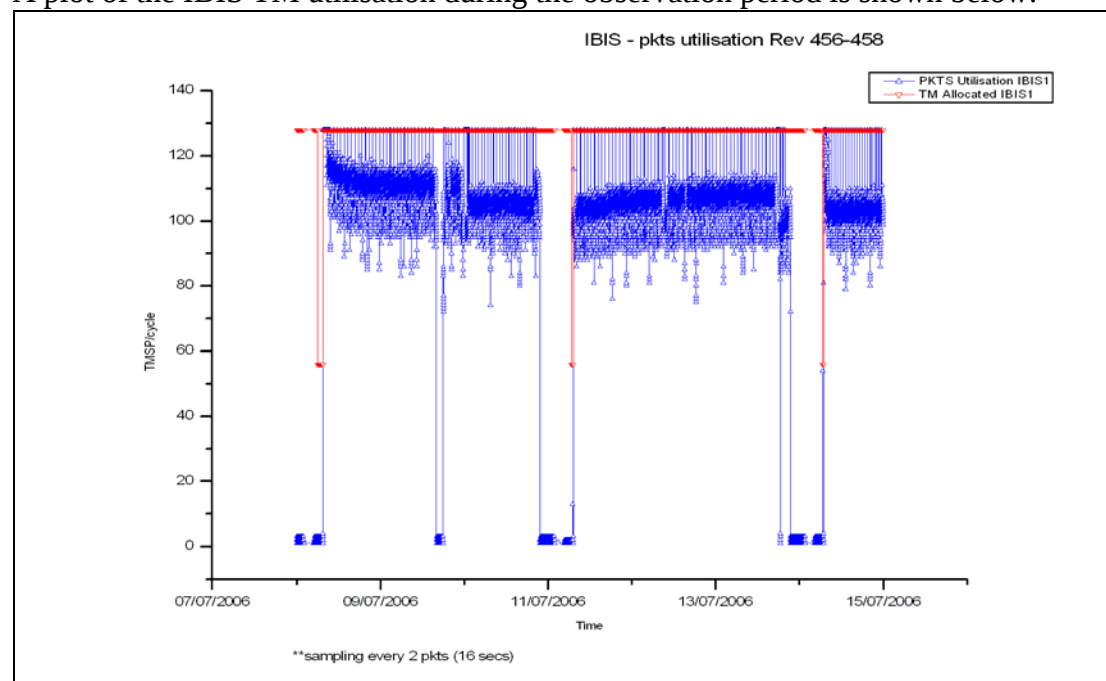
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 107.51 TMPS/cycle, up 0.12 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.

On 2006-07-09, due to the anomaly on the PRU and BCR (see INT_SC-154), JEM-X1 was commanded to Safe mode at 16:20Z and returned to Data Taking at 19:20Z.

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, 142 of the 144 planned science pointings for OMC were executed nominally, 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.

Solar Activity

The observation period was characterised by low solar activity.

On 08/07/2006 sunspot 898 had started to disappear but still posed threat of M-class flare. During the rest of the observation period, sunspots 898 and 899 both dissolved, and the sun became blank. No threat of solar flare was reported.

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 no pointings lost to ground problems. The overall performance was nearly 100% requirement.

4.1 Mission Operations Centre

The performance of the MOC was much better this week with no problems reported. The overall performance was nearly 100%.

4.2 Ground Stations & Network

The performance of the ground stations and Network was excellent this week. With no pointings lost to ground problems. There were, however, a few occasions of bad frames and brief link drops with Redu, but these had no impact. There was also one occasion 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

PSF for revolution 464 and 465 was delivered. Planning up to revolution 465 has been performed and the corresponding output has been sent to MOC and ISDC. No ToO request was received and no other re-planning was needed. The unusual eclipse in revolution 461 was also this week subject of extensive contacts between ISOC and MOC. The planning performed with the relaxed constraints as mentioned last week seems to have worked fine. However MOC detected a slew constraint violation that was not detected at ISOC. This was solved by MOC manually modifying the relevant slew with no impact on science. The reason for this discrepancy is being investigated by MOC. TSF for revolutions 458 to 460 were received from MOC.

2. Observation status

No new ECS's were received. ISOC has processed the ones received last week. No extra time was credited. All revolutions up to 449 are now processed.

3. ISOC science data archive

The implementation of the version 2.6 is ongoing. No other activity due to holidays.

4. ISOC system

The ISOC system 12.5 was installed this week. It has been successfully used for mission planning later in the week. The main improvements in this version relate to the handling of ground station handovers.

5. AO 4

Attempt to find candidates for amalgamation was performed this week. But only one pair of candidates was found. Work on the long term plan for AO 4 is started.

6 Extra AO for AO 5 Key programme

During this autumn there will be an extra call for proposals for key programmes for the next normal AO, AO 5. A schedule for the preparation is agreed and the documentation updates for this extra AO is well under way. Also the changes to the proposal generation software (PGT) to be used for this AO are now defined.

7. Problems

No new problems encountered except the discrepancy in the constraint checking detected when processing revolution 461.

4.3.2 ISDC

Status of ISDC observation processing on 17/07/2006:

- Latest Standard Analysis completed: observation 03200760002 (Mrk 421, Revolution 449) on 14/07/2006.
- Latest products archived: observation 03201080013 (Field_13, Revolution 446-447) on 15/07/2006.
- 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 impacted operations this week:

- On DoY 190, at 15:41, an on-board SEU caused the initiation of the post-launch separation sequence, see section 3.1.4 for details. After the successful ‘deployments’, a recovery was performed, and the Timeline rejoined at 19:20. The impact was the loss of pointings 04560036 & 04560037.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-154	10/07/2006	PRU and BCRs Unexpected switching	Spacecraft	Pending

7 Future Milestones

A new imcs release will be installed in June. This release will be based on SCOS 2000 3.1 patch M04, to bring the system in-line with that used by XMM.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 456

The observations in revolution 456 consisted of a raster dither of XMM LSS (RA 02:18:00.00, DEC -07:00:00.0), lasting ~38.2 hours, followed by a raster dither of LEDA170194 (RA 12:39:06.30, DEC -16:10:47.8), lasting ~19.2 hours until the end of the revolution.

Revolution 457

The observations in revolution 457 began with a Galactic Plane Survey lasting ~1.8 hours, and continued with a raster dither of XMM LSS (RA 02:18:00.00, DEC -07:00:00.0), lasting ~55.9 hours until the end of the revolution.

Revolution 458

The observations in revolution 458 began with a raster dither of Field_10 (RA 04:05:42.00, DEC -23:36:23.0), lasting ~54.8 hours and continued with a Galactic Plane Survey lasting ~2.4 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

2006-07-01T13:01:31.000Z	153.5288	F	Automatic TM processing.
2006-07-01T14:35:15.000Z	153.5126	F	Automatic TM processing.
2006-07-02T01:58:04.000Z	153.4859	F	Automatic TM processing.
2006-07-02T06:03:41.000Z	153.4459	F	Automatic TM processing.
2006-07-03T16:12:33.000Z	153.4109	F	Automatic TM processing.
2006-07-05T01:47:25.000Z	153.3953	F	Automatic TM processing.
2006-07-05T05:47:25.000Z	153.3736	F	Automatic TM processing.
2006-07-06T16:18:41.000Z	153.3626	F	Automatic TM processing.
2006-07-06T18:44:49.000Z	153.3115	F	Automatic TM processing.
2006-07-08T05:33:16.000Z	153.3006	F	Automatic TM processing.
2006-07-09T18:19:20.000Z	153.2536	F	Automatic TM processing.
2006-07-11T01:11:55.000Z	153.2456	F	Automatic TM processing.
2006-07-12T15:52:39.000Z	153.2369	F	Automatic TM processing.
2006-07-13T17:41:06.000Z	153.2281	F	Automatic TM processing.
2006-07-14T01:00:27.000Z	153.2069	F	Automatic TM processing.

This report was generated Fri Jul 14 08:00:43 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, 08/07/2006 – 14/07/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 85 Open Loop Slews, 72 Closed Loop Slews and 6 Momentum Biases were executed.

3 slews (2 OSL, 1 CSL) were lost during the observation period due to an anomalous execution of the automatic pyro sequence for the Launcher Separation.

This is equivalent to a ~2 % of the total number of slews planned (159).

Orbit Control

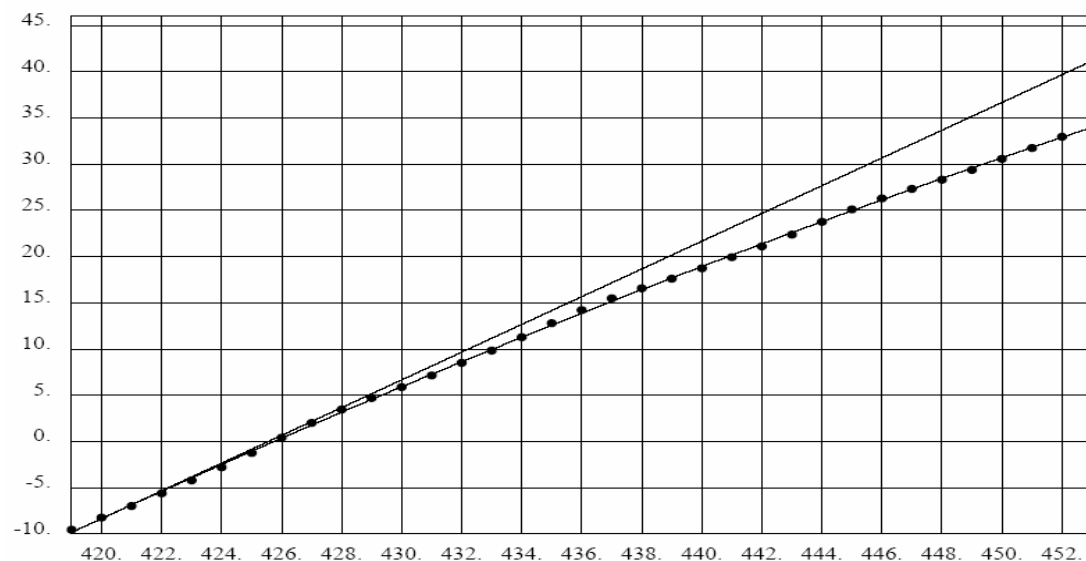
The following table shows the shortening of the necessary Goldstone pass:

Orbit number	Apogee passage date	Time from LOS Redu to 40000 km altitude
362	2005/10/01	284 min
372	2005/10/31	268 min
382	2005/11/30	244 min
393	2006/01/02	213 min
402	2006/01/29	188 min
412	2006/02/28	159 min
422	2006/03/30	122 min
433	2006/05/01	80 min
443	2006/05/31	46 min
453	2006/06/30	16 min

From orbit 461 and onwards Redu will give coverage down to 40000 km altitude.

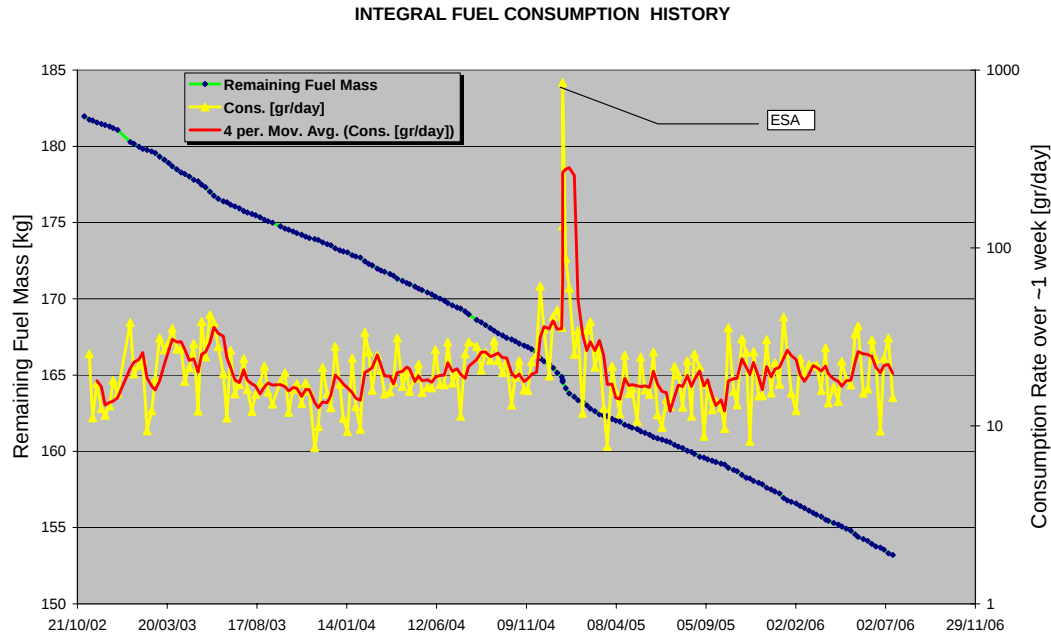
The attached plot shows the apogee longitude of Integral as a function of the orbit number. From the approximation of the apogee longitudes with a parable the average semi-major axis increase due to momentum dumping manoeuvres is estimated to be 670 m per orbital revolution

APOGEE LONGITUDES OF INTEGRAL 21.03.2006 - 01.07.2006
 LEAST SQUARES APPROXIMATION WITH PARABLE

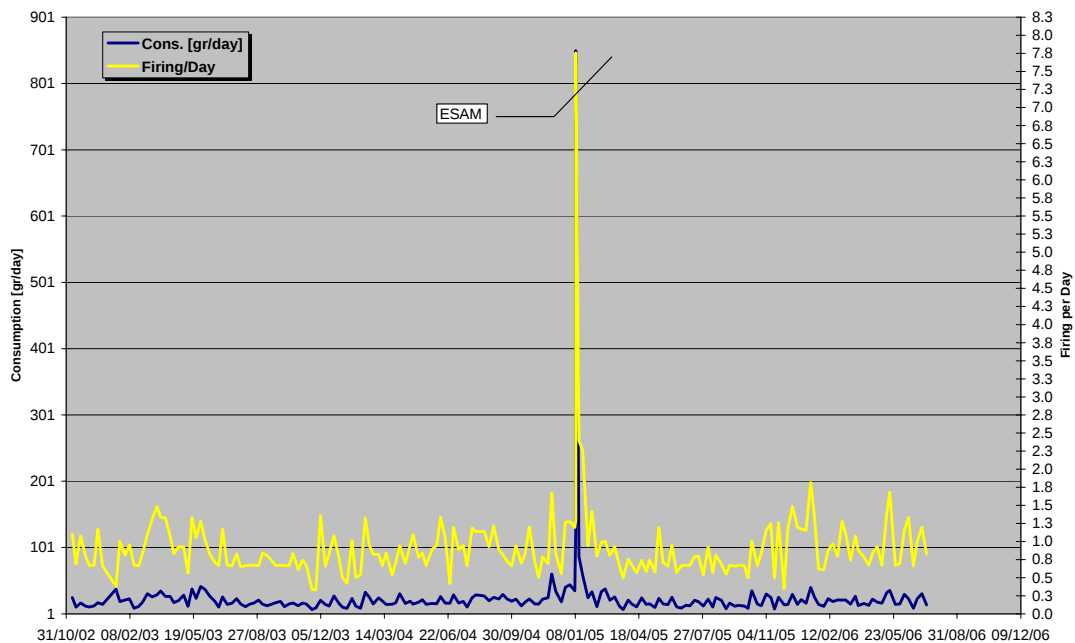


Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 14/07/2006 is reported in the plot below.

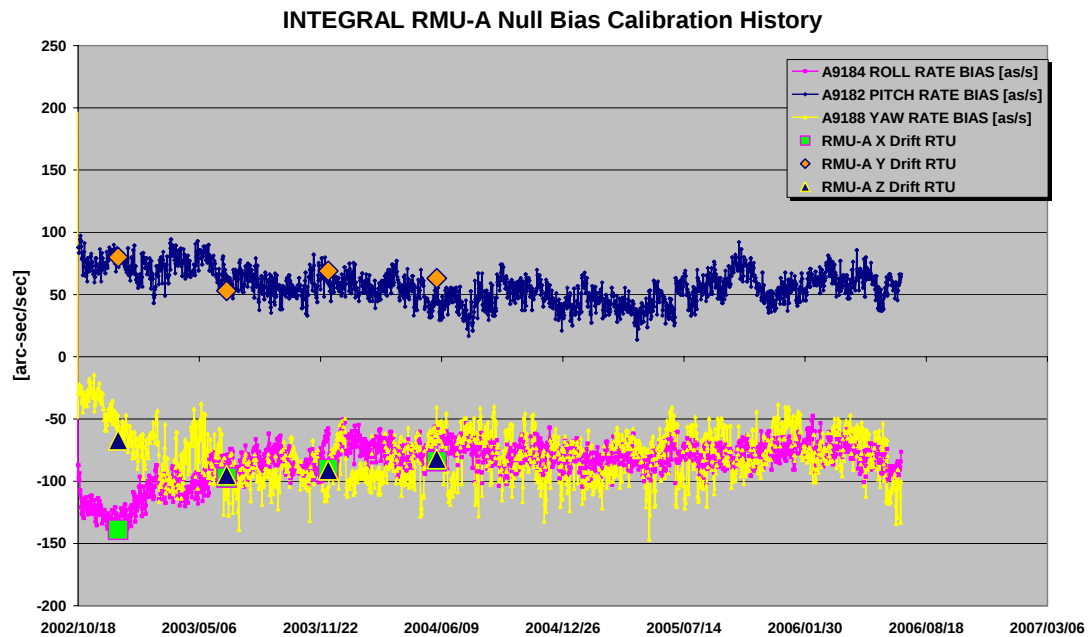


The firing\day over the period between 01/11/2002 and 14/07/2006 is reported in the plot below.

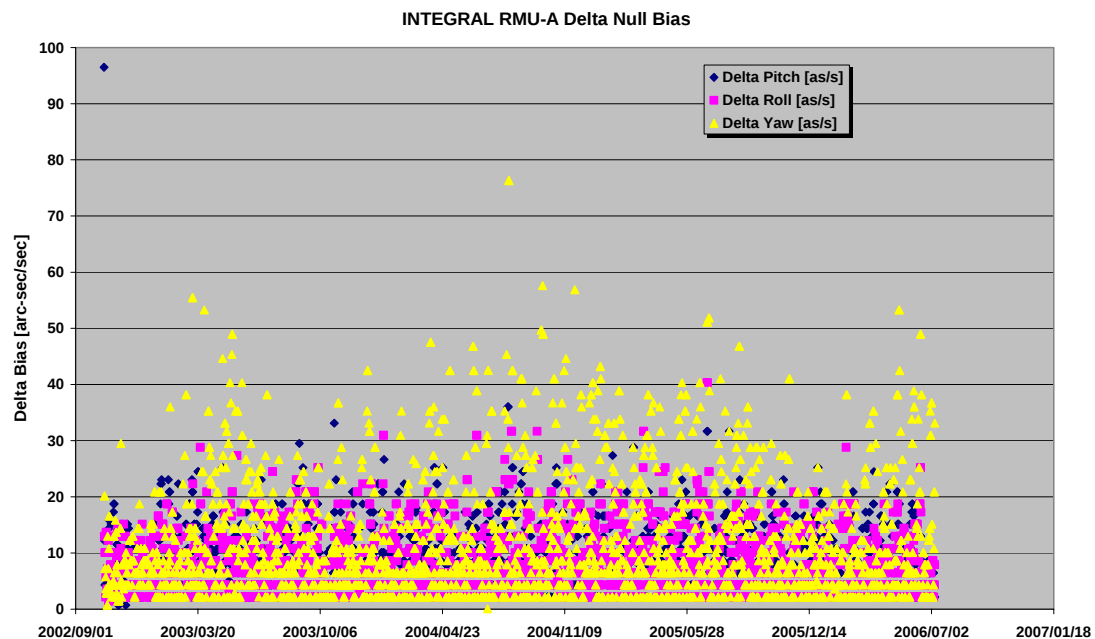


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 07/07/2006 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 07/07/2006 is reported in the plot below.



08/07/06 (Day of Year 189, Revolution 455-456)

Nothing to report.

09/07/06 (Day of Year 190, Revolution 456)

PRU and BCRs unexpected switching: an anomalous activation of the launch separation sequence was observed at 15:41:15z.

The following sequence of OOLs (here reported only the part relevant to AOCS s/s) was observed:

P5102 PRU A AUX STAT = SECV PRSENT
P1112 LCL STA IMU1 = CLOSE
P1151 LCL STA IMU3 = CLOSE
P1101 LCL STA LV A = CLOSE
P1174 LCL STANOM CBH B = CLOSE
P1051 LCL CUR IMU3 = 0.94A remained OOL for about 3min.
P3012 BUS PRU A STAT = ON

At 15.41.31z

P1012 LCL CUR IMU1 = 0.95A remained OOL for about 3m.

At 15.41.31z

P1105 LCL STA FCV A = CLOSE remained OOL for about 1m.

As the Spacecraft Operator and on-call support were not sure of the AOCS configuration (some AOCS HW statuses had changed) AOCS timeline operations were suspended at 15:42z. Similarly the PLM instruments were placed in a safe mode. SOM / SOE and Flight Dynamics support were also requested.

Investigation suggested that a SEU or similar had caused both BCRs to switch-off and the PRU to switch-on (the PRU is the unit which configures the satellite autonomously following separation from the launcher).

Following a check that the sequence had executed correctly and that apart from this the Satellite status was as expected, the following steps were taken to return AOCS s/s to a nominal configuration:

- Switch off PRU-A (FCP_EPS_1630)
- Switch-off IMU-1 (FCP_AOC_1601)
- Switch-off IMU-3 (FCP_AOC_1604)
- Switch-off Nominal Cat Bed Heater B (FCP_AOC_1537)
- Switch-off FCV-A (FCP_AOC_0004 step 5)
- Switch-off LV-A (FCP_AOC_1512)

A recovery was started at 18:11z. As part of the recovery a manual wheel biasing was executed, this was also a confirmation that the reconfiguration of the RCS components (LV, FCV, Cat. Bed Heater) had executed correctly. In parallel with the attitude recovery the payload instruments were brought back into scientific operations. A recovery from attitude of PID 04560035 to the attitude of PID 04560038 was executed at 18:32z. The next slew ID 04560039 was manually updated in TL at 18:45z and the AOCS s/s re-enabled in TL.

The S/C recovery was completed at 19.20z.(for more details, refers to AR INT_SC-154).

The following slews were not executed from TL: ID 04560036(OSL)-37(CSL)-38(OSL).

10/07/06 (Day of Year 191, Revolution 456)

Nothing to report.

11/07/06 (Day of Year 192, Revolution 456-457)

Guide Star not found during CGS: during the execution of the last Change of Guide Star before the end of the revolution 456, the expected guide star in slot # 2 was not found during the Search/Track process, causing the stop of the AOCS command sequence. The selected guide star for the S/T was ID 7599-942 , Mi 7.2 at CCD location [-7496 , -710]. The reason is likely due to two dim companions present in the STR FOV , as resulted from the analysis of the STR FOV, at that moment: the first located at [-7406 , -644] and the second at [-7567 , -644].

A recovery was performed at the beginning of the revolution 457, by executing a mapping and manually updating the parameters for the slew ID 04570001.

No impact reported on TL.

12/07/06 (Day of Year 193, Revolution 457)

ACC STR threshold exceeded: at 09:07:36z the STR SEU threshold was exceeded, when the guide star was ID 5282-2107, with Mi 8.3 at CCD location [19322, 7319]. The OTF went low during PID 04570027. The reason could be likely due to the presence of the comet Schwassmann-Wachmann around the guide star at that moment.

A new guide star ID 5282-2089 was found after the automatic mapping commanded by ACC, at CCD location [-1582 , 4561].

A recovery was performed by executing a mapping and manually updating the parameters for the next slew 04570028.

No impact reported on TL.

13/07/06 (Day of Year 194, Revolution 457)

Nothing to report.

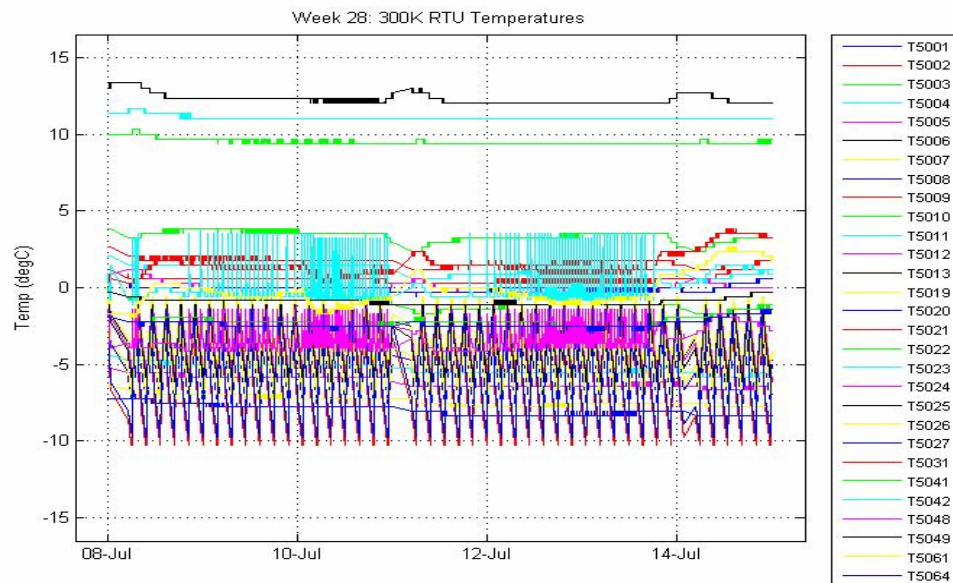
14/07/06 (Day of Year 195, Revolution 456-457)

Nothing to report.

8.3.2 SPI Operations

Unit Temperatures:

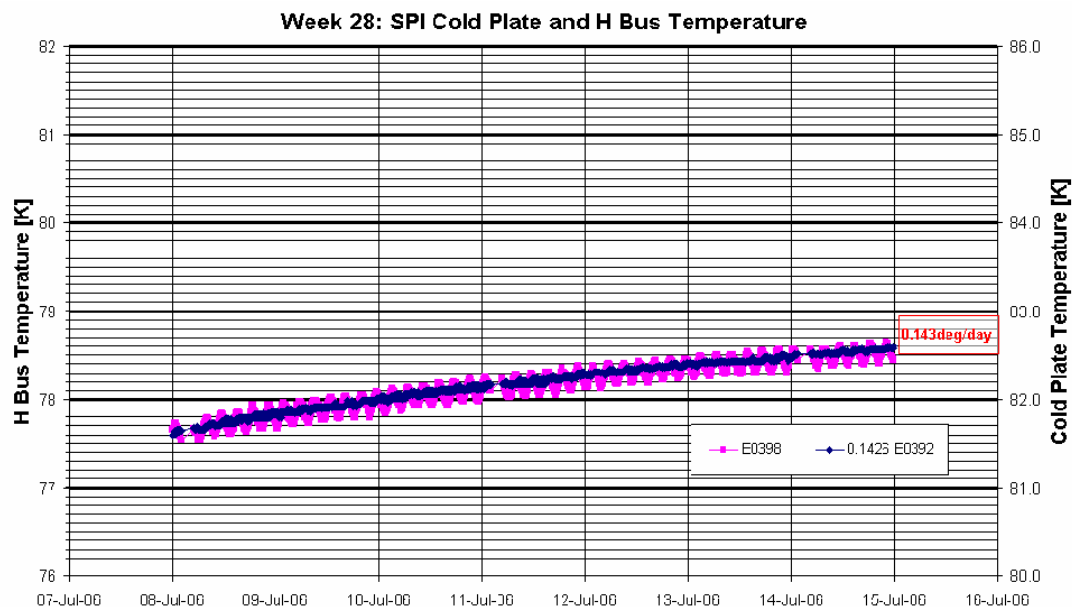
All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period:



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 0.143deg/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 is 91.9 packets/cycle over the science window.

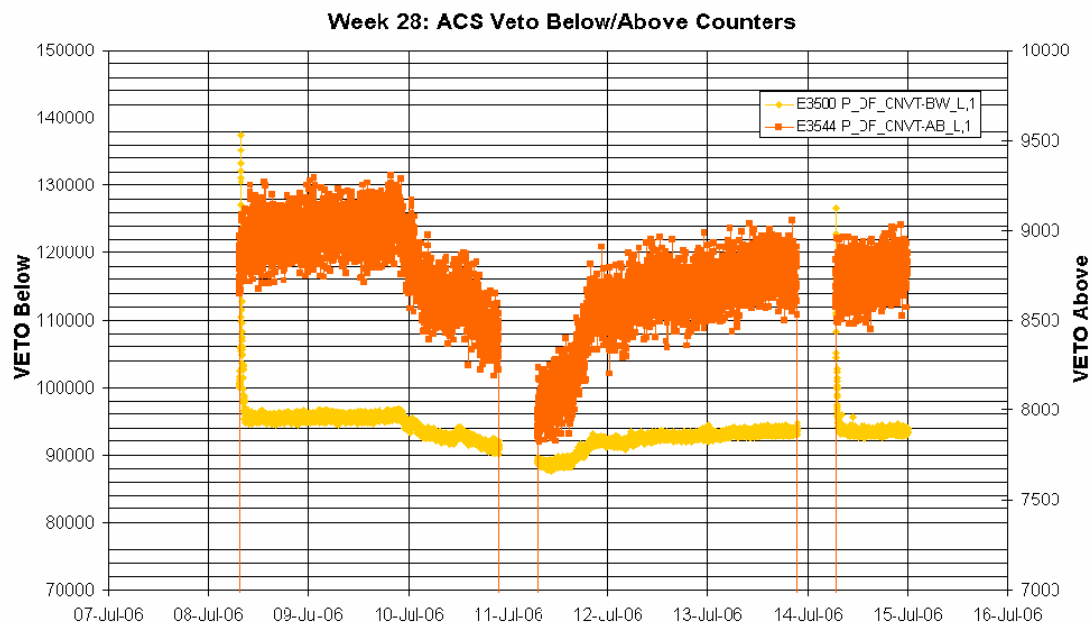
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

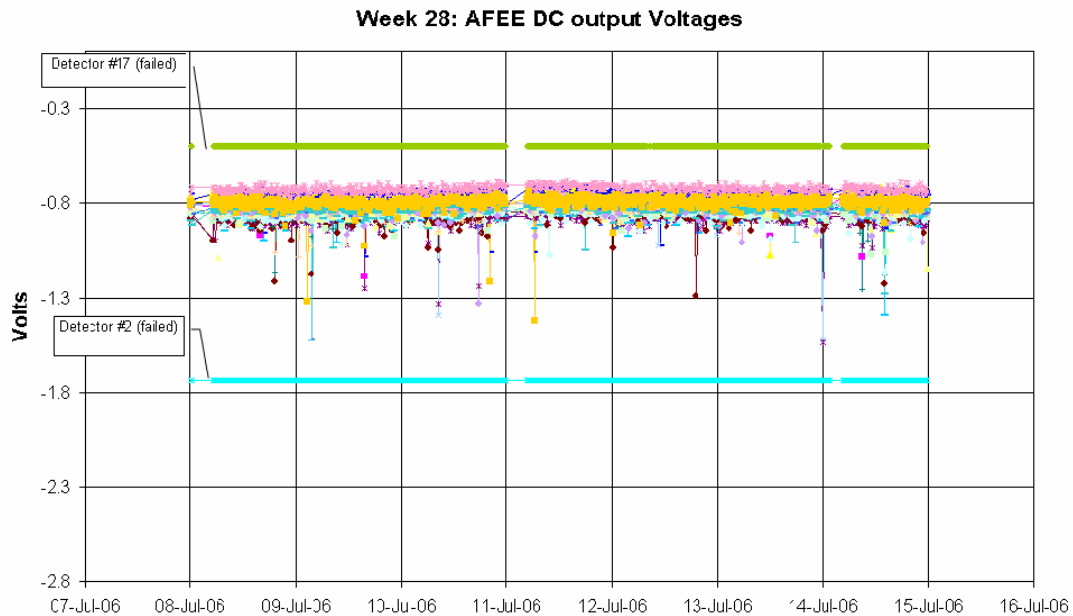
The following plot shows the ACS overall count rate evolution during the reporting period:



AFEE:

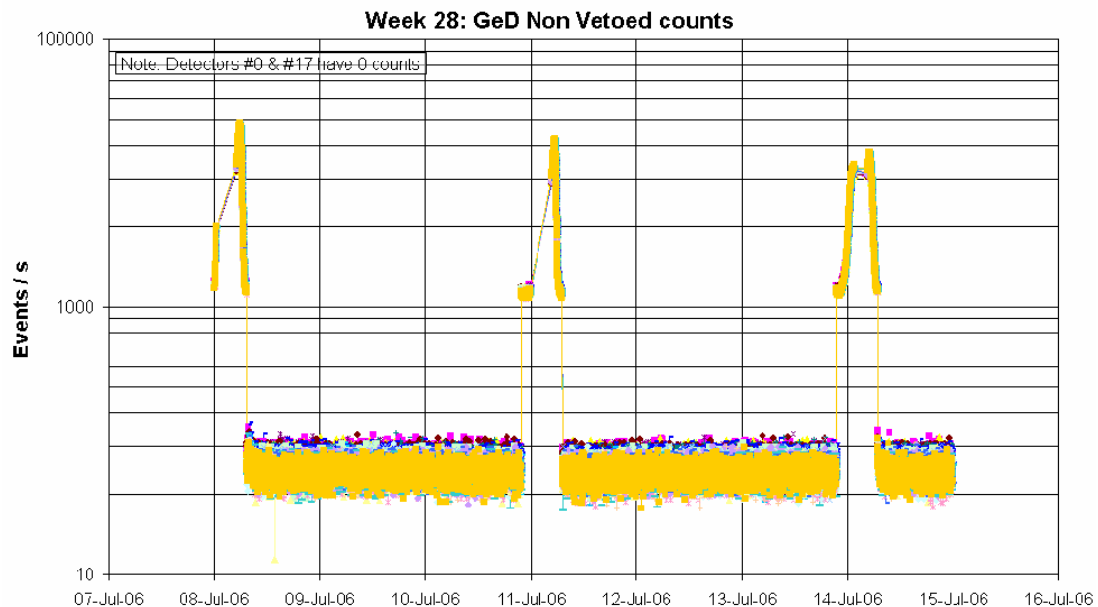
The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with this annealing.

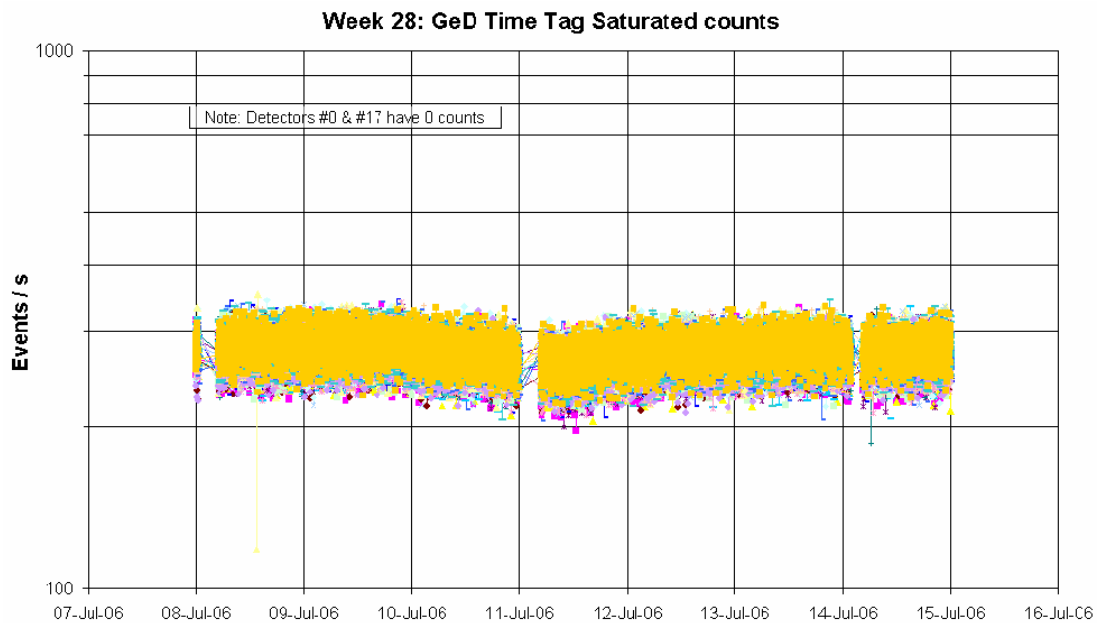
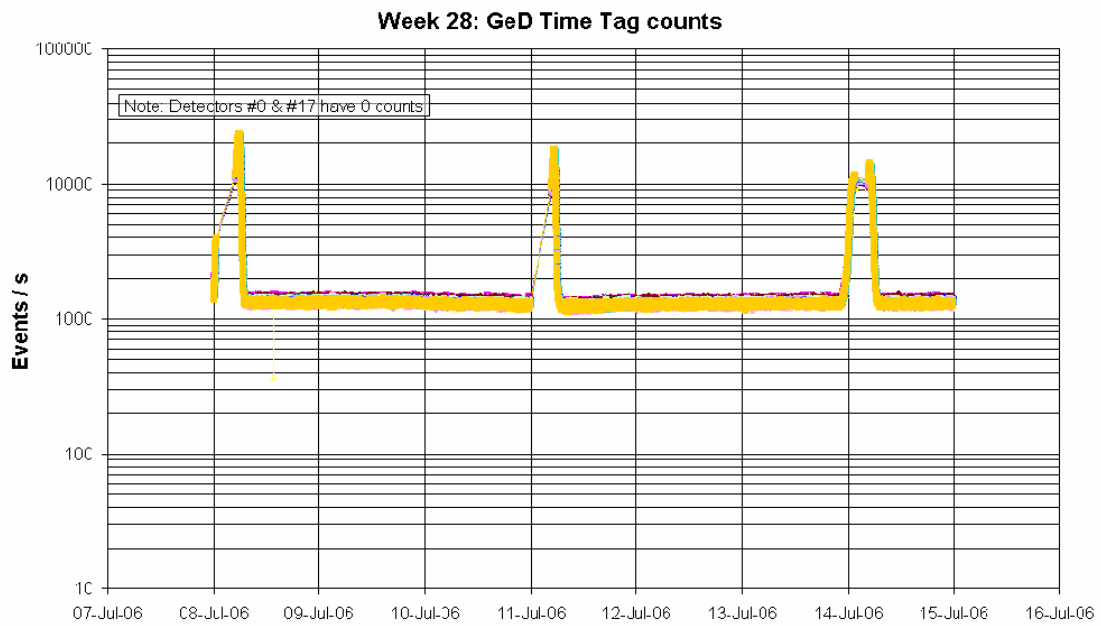
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004



DFEE:

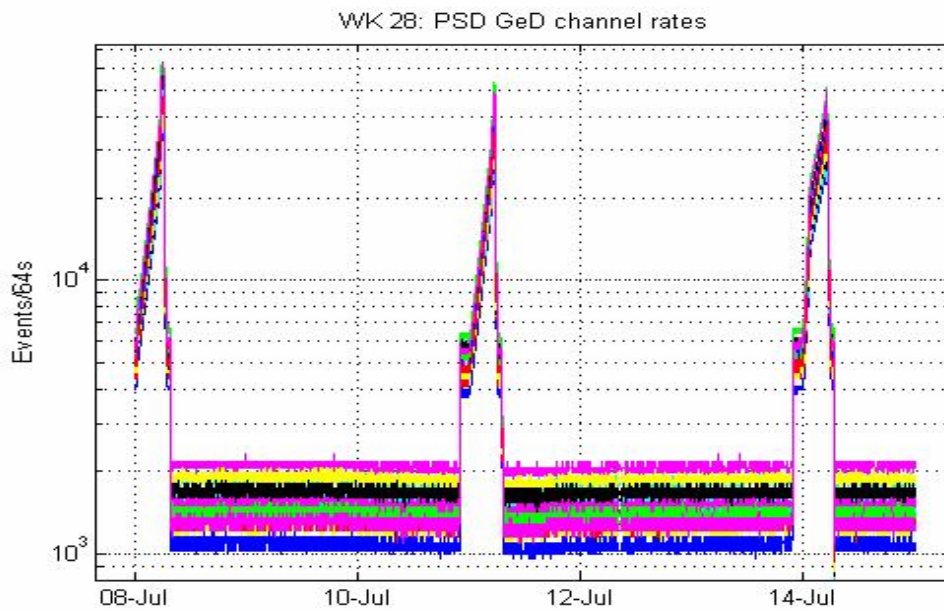
The performance of the unit is nominal. The following plots show the Non Vetoes, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD:

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



Event Log

The following OEM EXCEPTION was received from SPI during the reporting period:

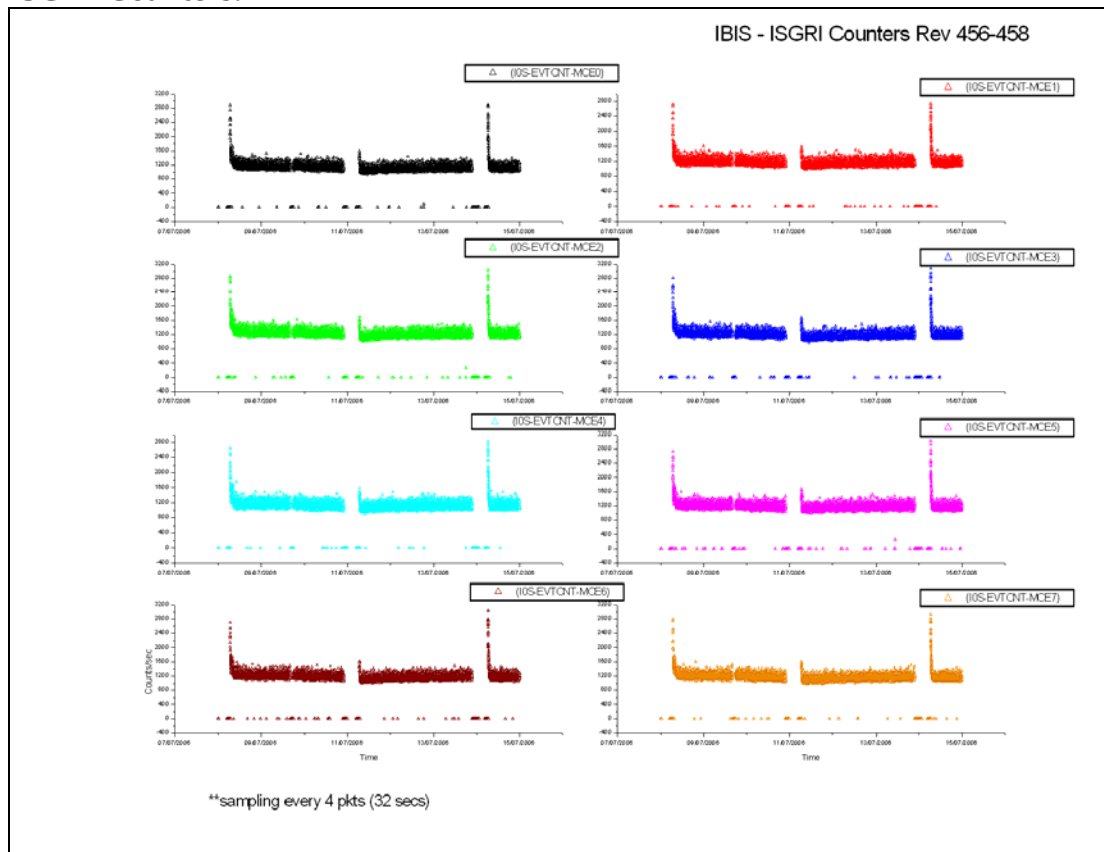
```
2006-07-08 at 01:49:51Z OEM 1 SPI1 FIXED POINT OVERFLOW
E9083             INTERRUPTED TASK             22
E9079             MESS CLASS                     1
E9080             MESS ID                       1
E9081             STATUS WORD INT               4096
E9082             INSTR COUNT INT              419
```

This was during the LOS_CHK window of revolution 455, when the SPI1 DPE time verification TC was sent. This OEM is sometimes received when this TC is sent and no action was taken.

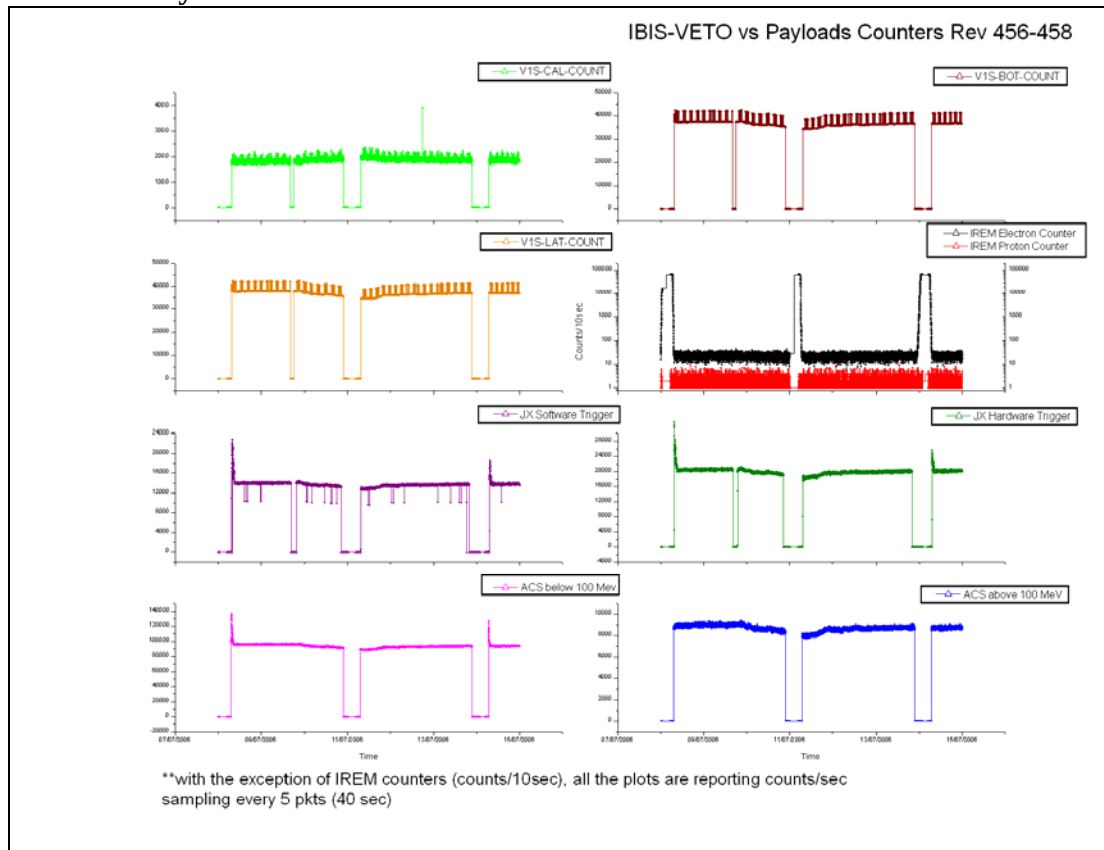
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

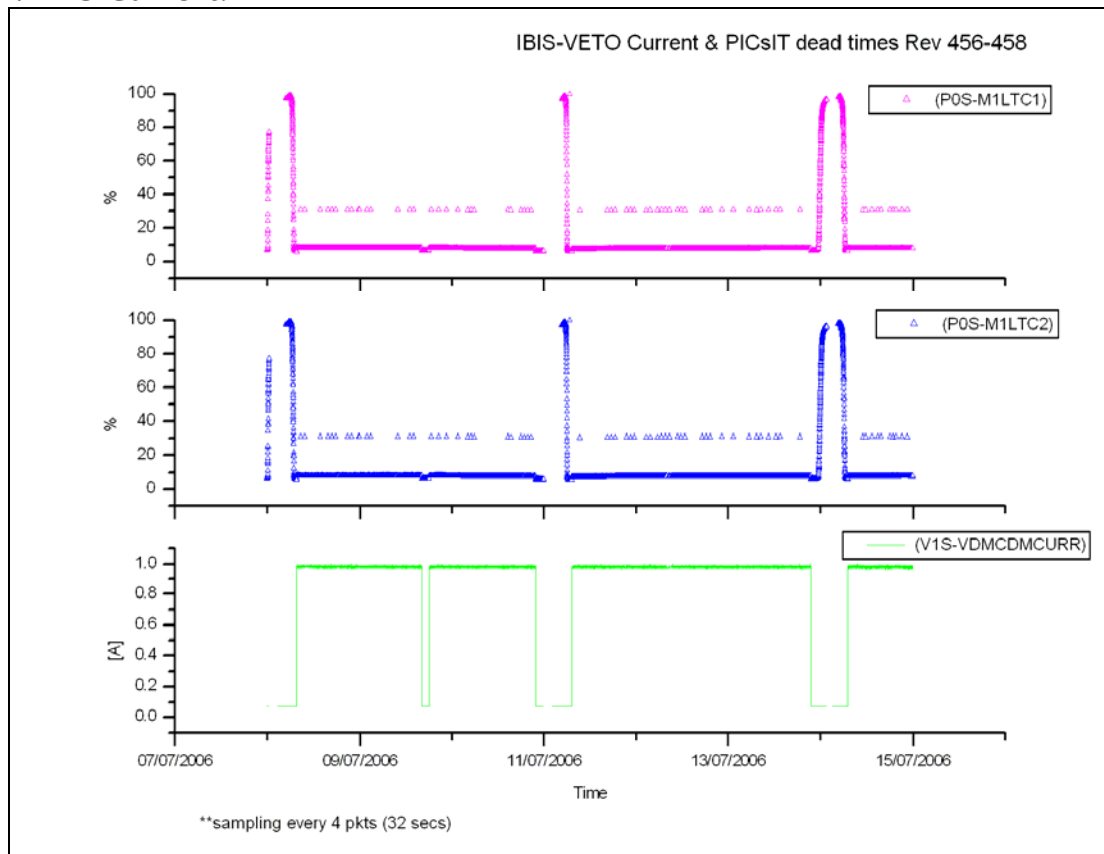


VETO vs Payloads Counters:

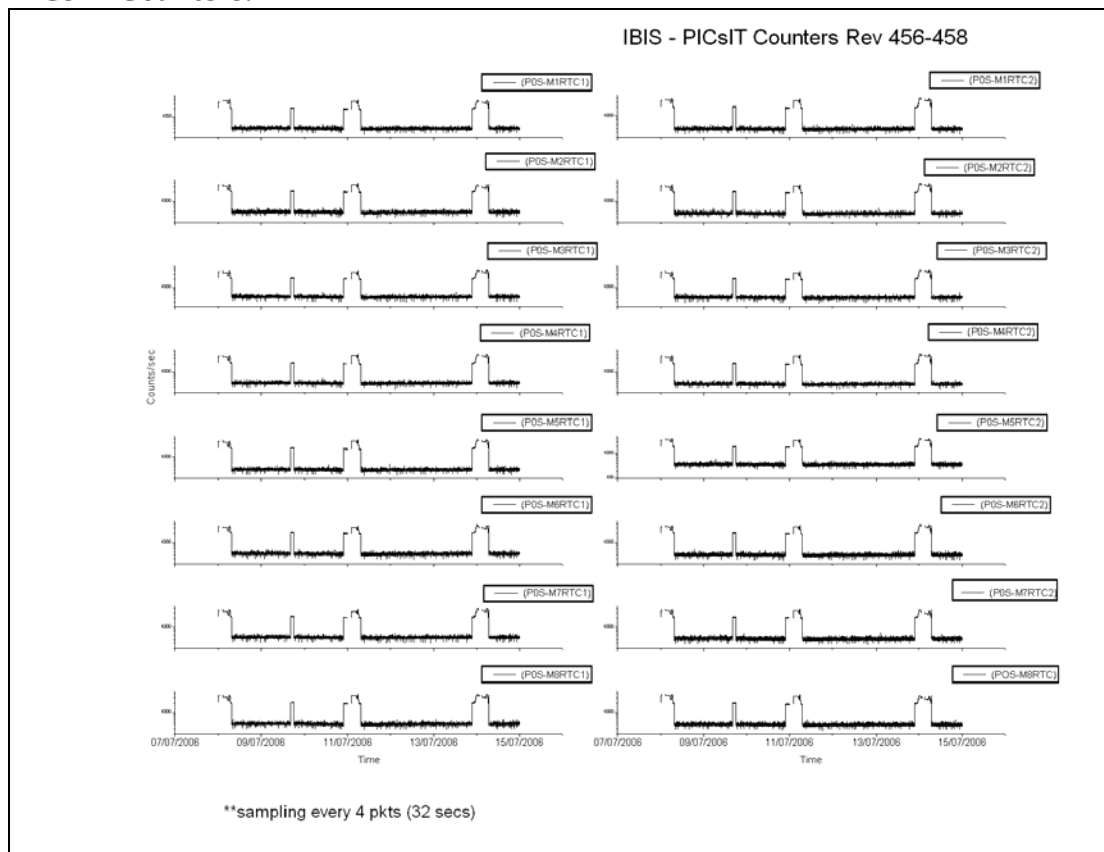


The week was characterised by low radiation.

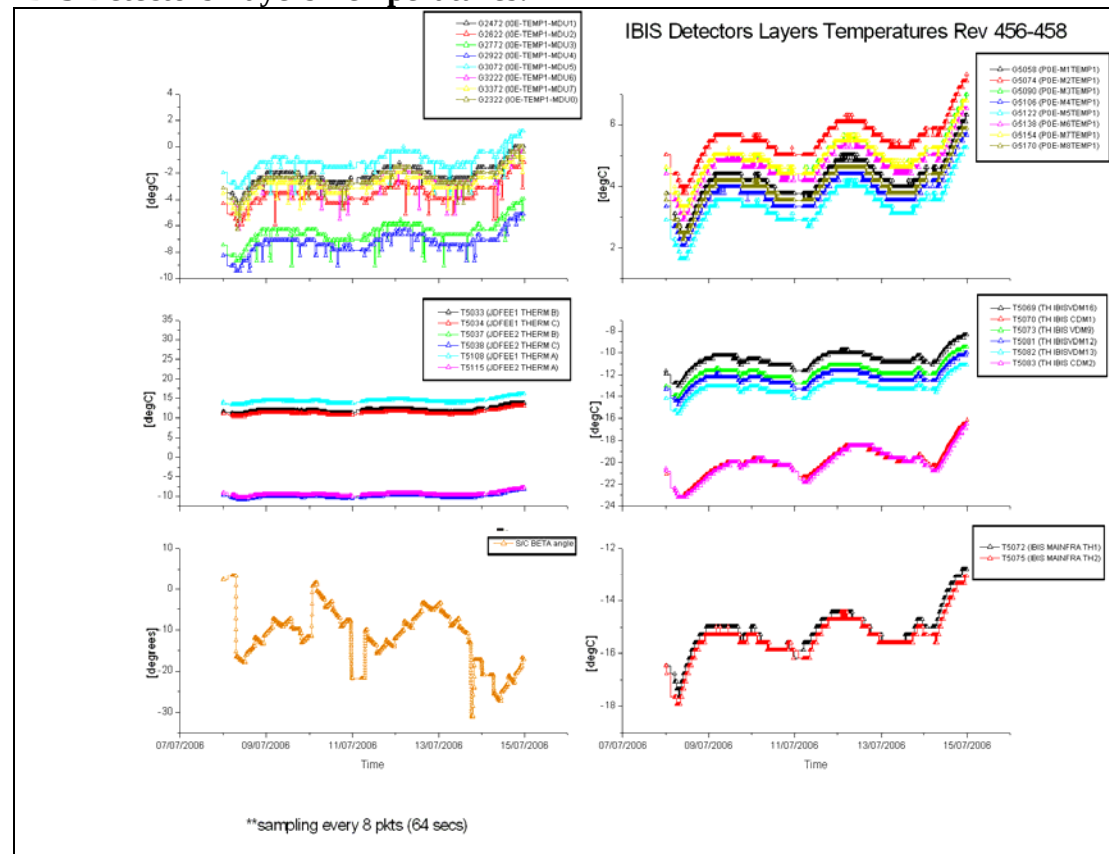
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2006.189 (08/07/2006):

On DoY 188 (07/07/2006) at 22:02Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 189 (08/07/2006) at 07:31Z. 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.

At 06:55Z TM parameter G2028 (I0E-OVFWPXADD-M2) failed SCC and back. According to I-OVF-1, no action was taken.

At 06:59Z, TM family G2013 (I0S-EVTCNT-MCEi) was reported OOL High and back. According to I-CNT-1, no action was taken.

At 07:18 TM parameter G2056 (I0E-OVFWPXADD-M4) failed SCC and back. According to I-OVF-1, no action was taken.

DoY 2006.190 (09/07/2006):

At 16:08Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit at 18:01Z. This was due to IBIS being in a Safe configuration following the PRU and BCR anomaly (INT-SC-154).

More precisely, at 16:07Z IBIS went to Stand-By mode with ISGRI and VETO in safe configuration (FCP_IBIS1_0801). At 17:53Z, IBIS was reconfigured via FCP_IBIS1_0803. At 18:06Z, ED GESTAN02 was uplinked and put IBIS in Scientific Standard.

DoY 2006.191 (10/07/2006):

On DoY 191 (10/07/2006) at 21:47Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 192 (11/07/2006) at 07:17Z. 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 (P0S-Mi RTC1) and G5003 (P0S-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

DoY 2006.194 (13/07/2006):

On DoY 194 (13/07/2006) at 21:33Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 195 (14/07/2006) at 07:02Z. 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 (P0S-Mi RTC1) and G5003 (P0S-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

At 06:31Z, TM family G2013 (I0S-EVTCNT-MCEi) was reported OOL High and back. According to I-CNT-1, no action was taken.

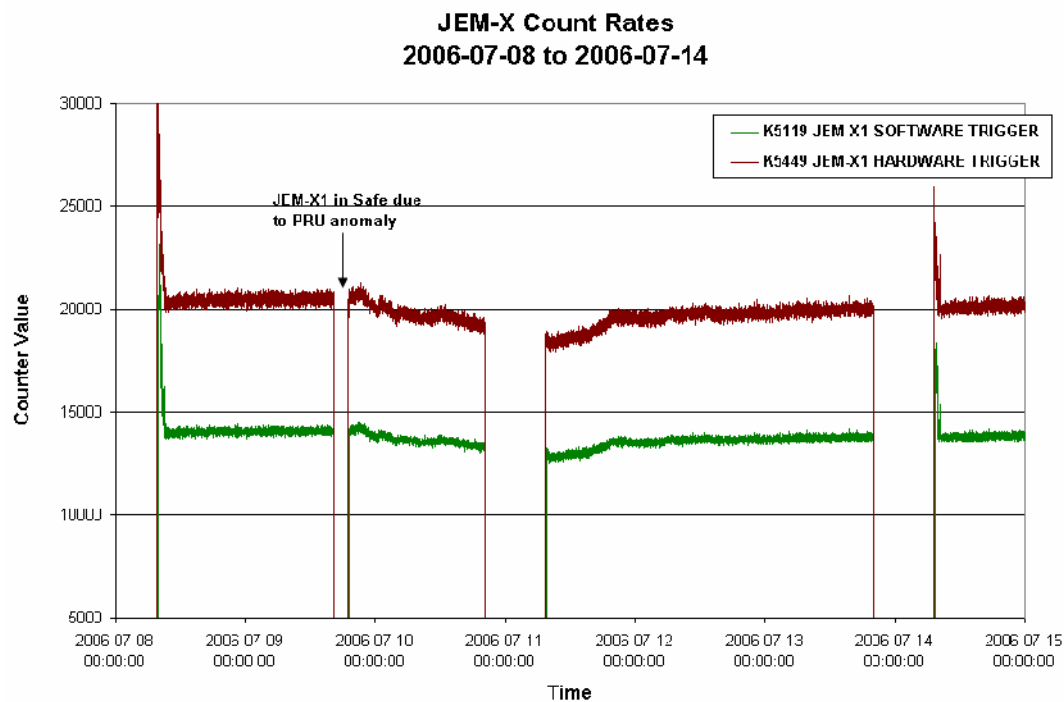
At 06:34 TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. At 06:47 TM parameter G2084 (I0E-OVFWPXADD-M6) failed SCC and back. According to I-OVF-1, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

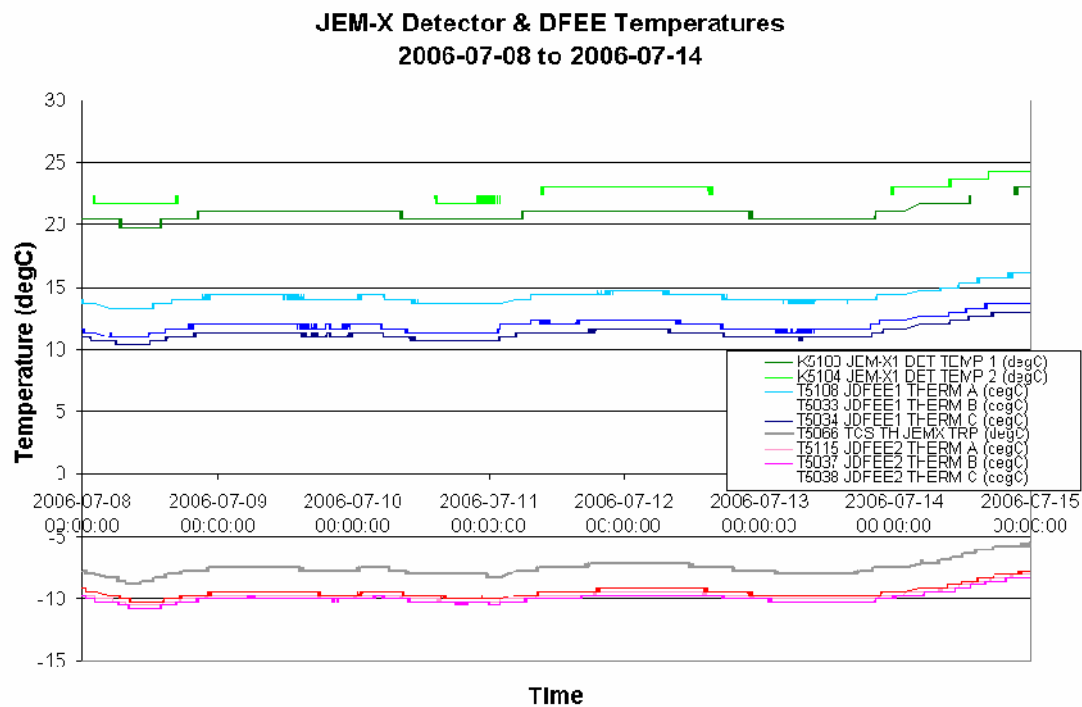
JEM-X count rates over the reporting period are displayed in the following graph¹.

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



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.



² Data sampled (1 frame in 8)

JEM-X Daily Report

2006-07-08 (DOY 189, Rev 455-456)

Due to continuing high background radiation conditions at radiation belt exit of revolution 456, at 07:41:24Z the TM parameter K5449 HARDWARE TRIGGER went OOL Warning High, returning within limits at 07:45:00Z.

In addition, during the execution of the JEM-X1 activation ED KEHVAC01 from the Timeline, after the TC K0013 STATE DIAGNOSTIC was uplinked at 07:43:31Z, the following OEM was received:

07:43:51Z 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in HK)

as the TM parameter K5462 DFEE STATE IASW was DATA DUMP while K5022 DFEE STATUS was SETUP. This was because the DFEE output FIFO buffer was over half full at the time of termination of the diagnostic data collection (K5135 FIFO FULL LOSS = 3162 at 07:43:31 Z) and thus the IASW did not recognise the autonomous transition of the DFEE back to SETUP. The situation rectified itself when the next TC of the ED, TC K0009 STATE SETUP, was sent at 07:48:31Z, after which both TM parameters K5462 and K5022 reported SETUP and the following OEM was received:

07:48:39Z OEM 254 ERROR OFF.

2006-07-09 (DOY 190, Rev 456)

Due to an anomaly on the PRU and BCR (see INT_SC-154 and Power section of this report), the Timeline was stopped at 16:02Z and JEM-X1 was commanded to Safe mode at 16:20Z via FCP_JEM1_0040. Once the anomaly was recovered and the Timeline rejoined, JEM-X1 was reconfigured back to Data Taking as follows:

- 18:46Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP
- 18:51Z FCP_JEM1_1010 JEMX1 CONFIGURATION SETTING FOR SCIENCE OPS
- 19:20Z ED KEDATA02 uplinked with the planned observation parameters.

Commanding to JEM-X1 from the Timeline was then re-enabled and JEM-X1 operations continued nominally.

2006-07-10 (DOY 191, Rev 456) to 2006-07-14 (DOY 195, Rev 457-458)

Nothing to report

8.3.5 OMC Operations

2006-07-08 (DOY 189, Rev 456)

Nothing to report

2006-07-09 (DOY 190, Rev 456)

Doc. Title : INTEGRAL Mission Report #199
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 17/07/06

Issue : 1
Rev. : 0
Page : 27

At 15:41:15, an on-board SEU, caused a sequence of events necessitating the interruption of operations. See section 3.1.4 for details. After a recovery, the Timeline was rejoined at 19:20. The impact was the loss of pointings 04560036 & 04560037.

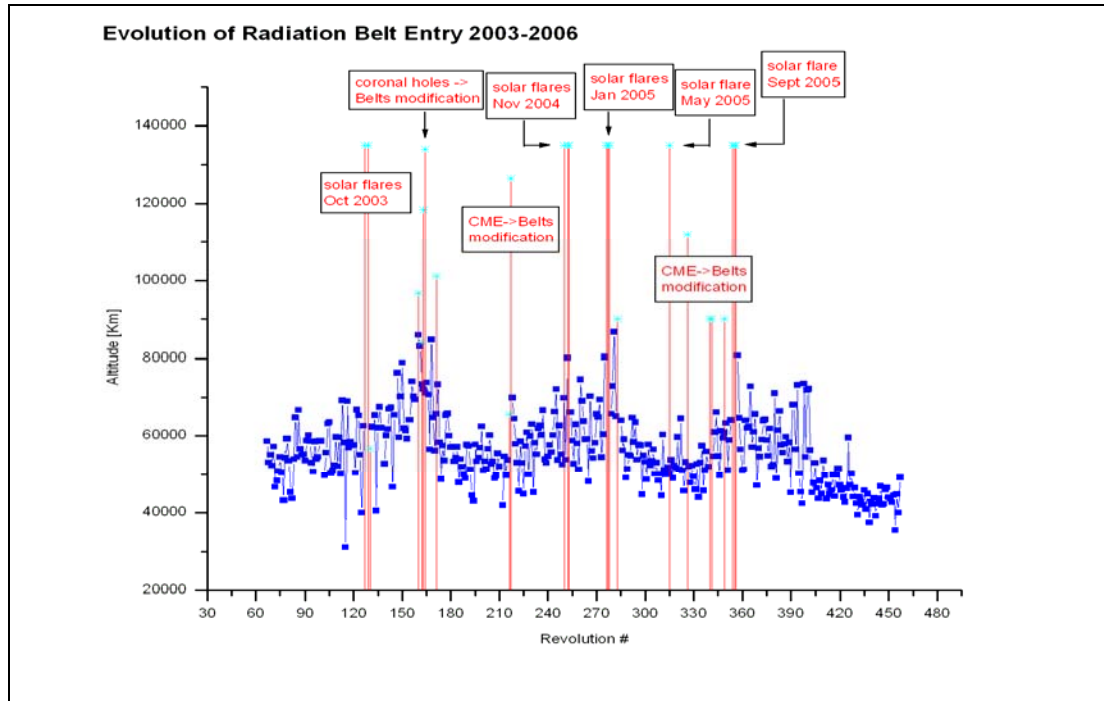
2006-07-10 (DOY 191, Rev 456) to 2006-07-14 (DOY 195, Rev 458)

Nothing to report

On DoY 191 at 21:47:34, DoY 194 at 21:33:26 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 DoY 195 (14/07/2006) at 01:18Z, TC U4921 (GND link off) failed completion. As the TM check was reporting Ground link Off, no action was taken.

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]
456	RAD_EXIT R 2006-07-08T07:20:21Z	2006-07-08 07:01:32	36782.4	2006-07-08 07:07:21	38182
456	RAD_ENTR R 2006-07-10T21:47:33Z	2006-07-11 00:09:53	40013.8	2006-07-10 23:14:31	48505
457	RAD_EXIT R 2006-07-11T07:04:09Z	2006-07-11 06:21:56	<<37526.3	2006-07-11 06:54:31	38524
457	RAD_ENTR R 2006-07-13T21:33:19Z	2006-07-13 22:57:17	<49208.3	2006-07-13 23:04:31	48183
458	RAD_EXIT R 2006-07-14T06:49:33Z	2006-07-14 06:40:05	38746.3	2206-07-14 06:44:31	38915

Reference

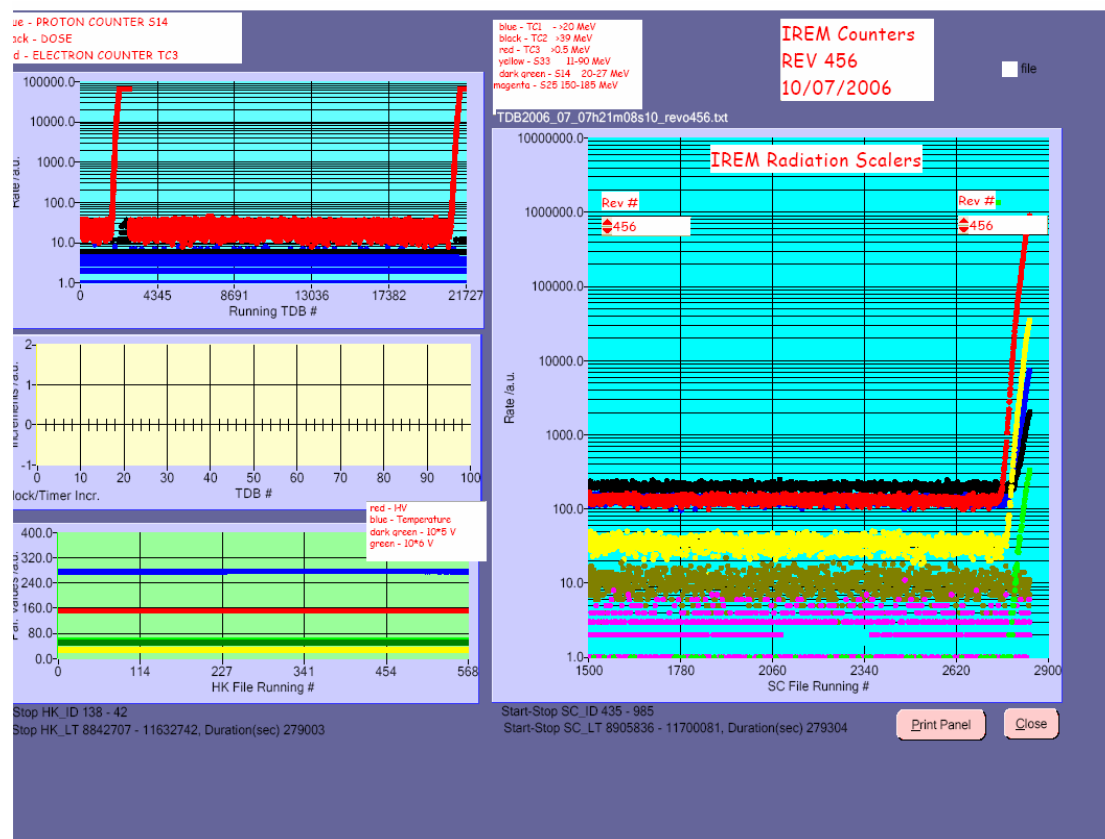
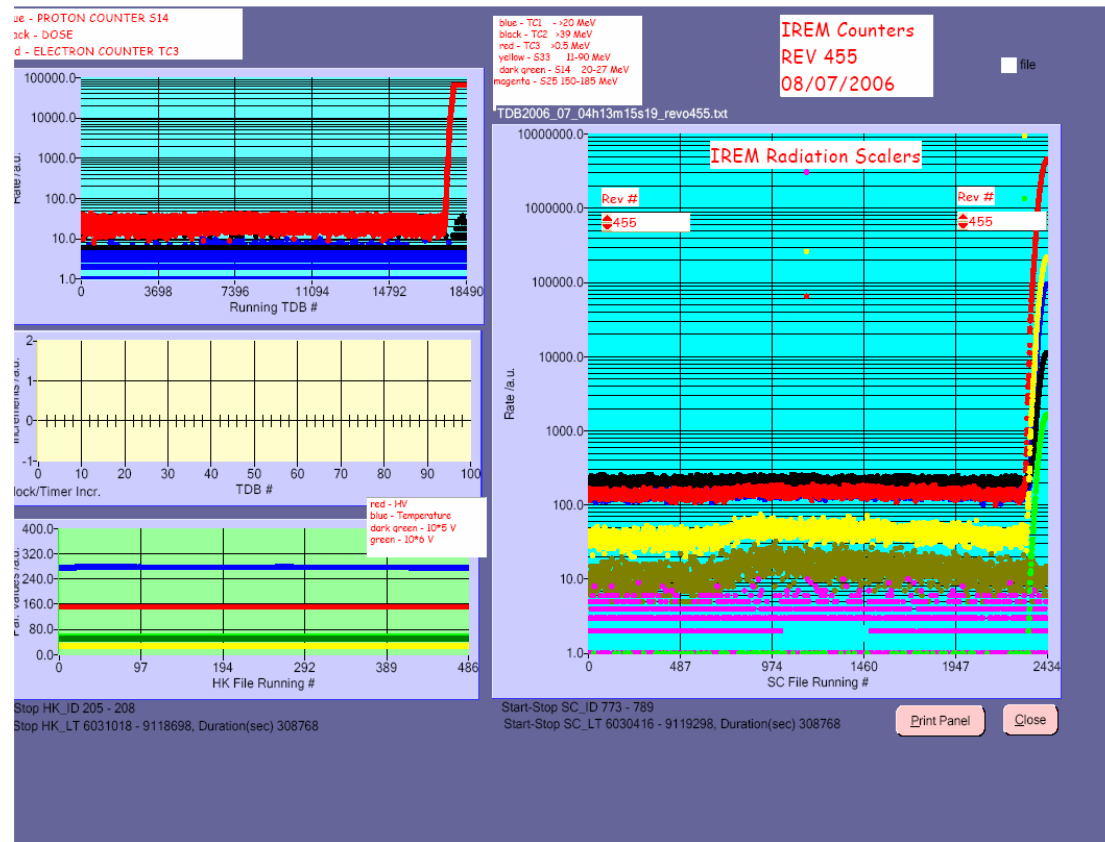
Very small error vs reference (less than 10 minutes)

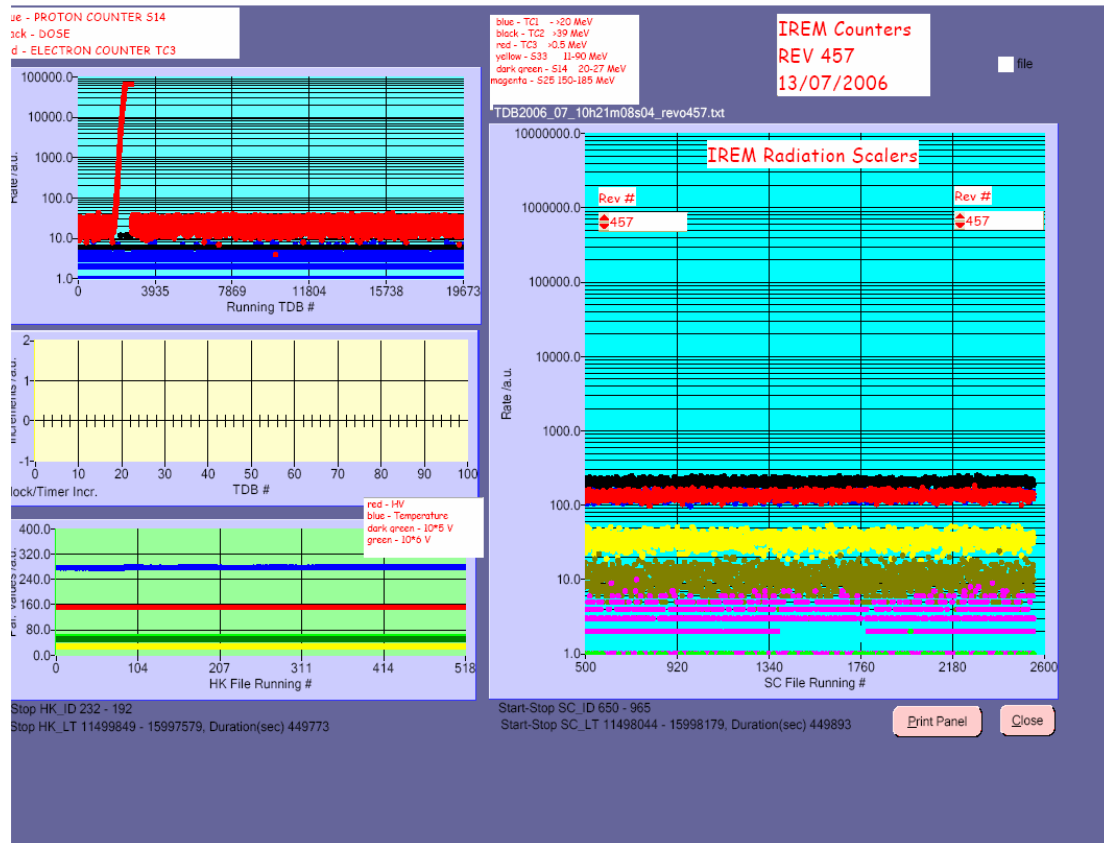
Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

Radiation Spike

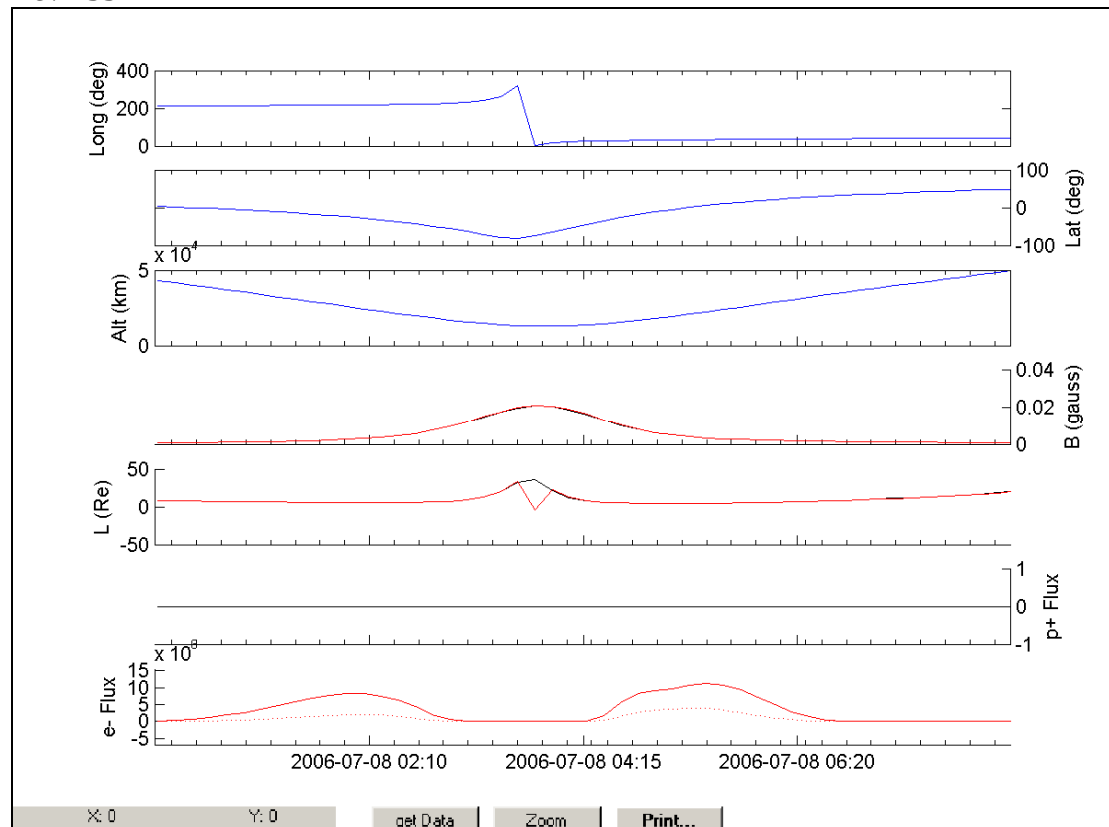
IREM radiation counters:



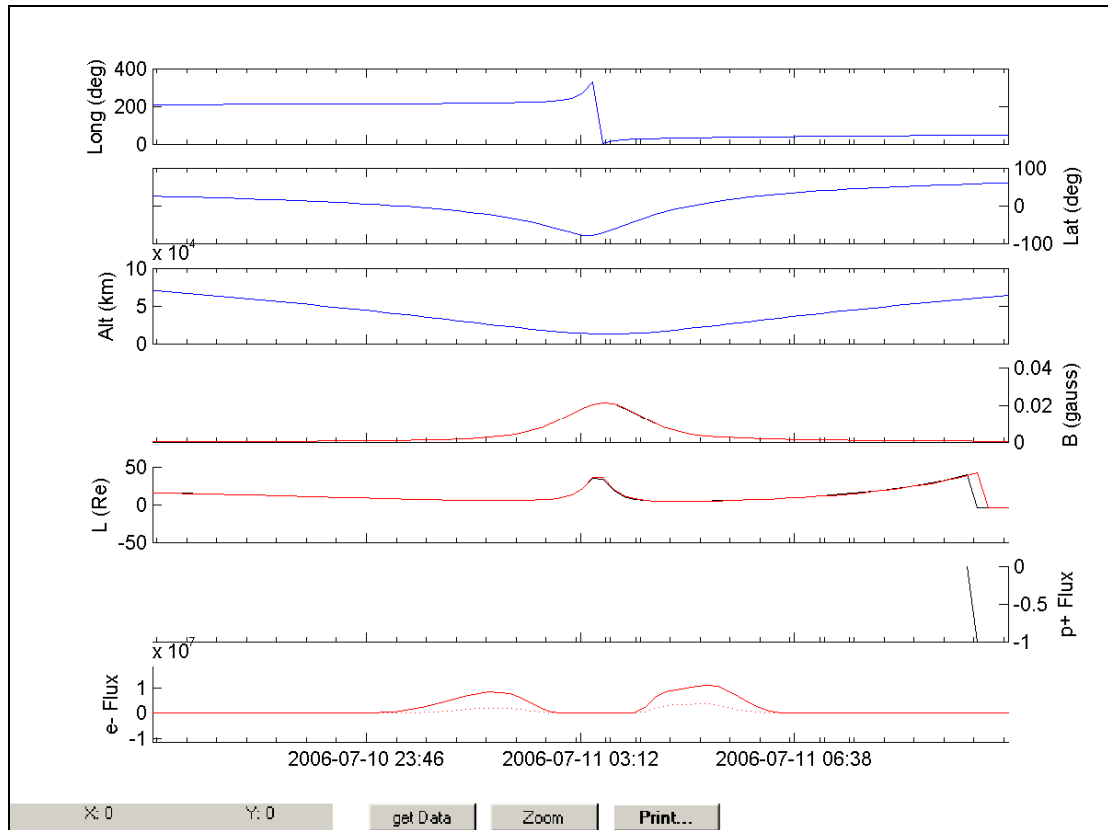


IREM Predicted Radiation Belt Passages:

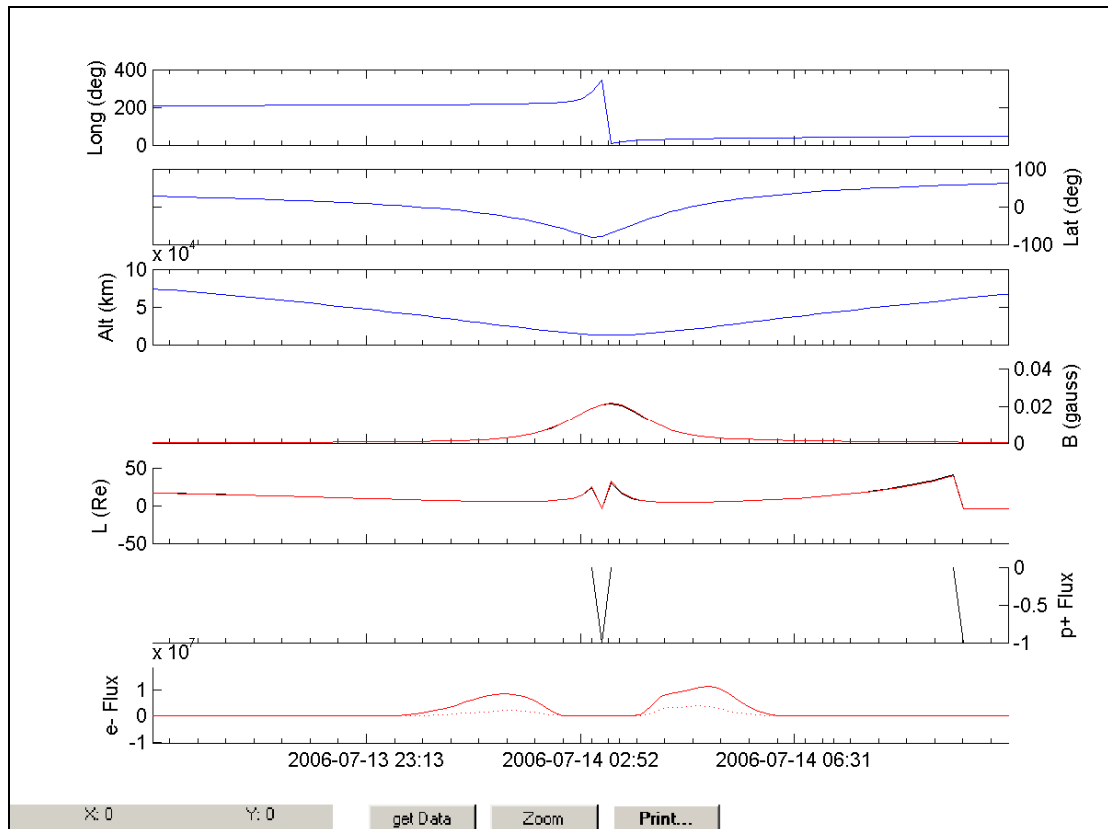
Rev 455



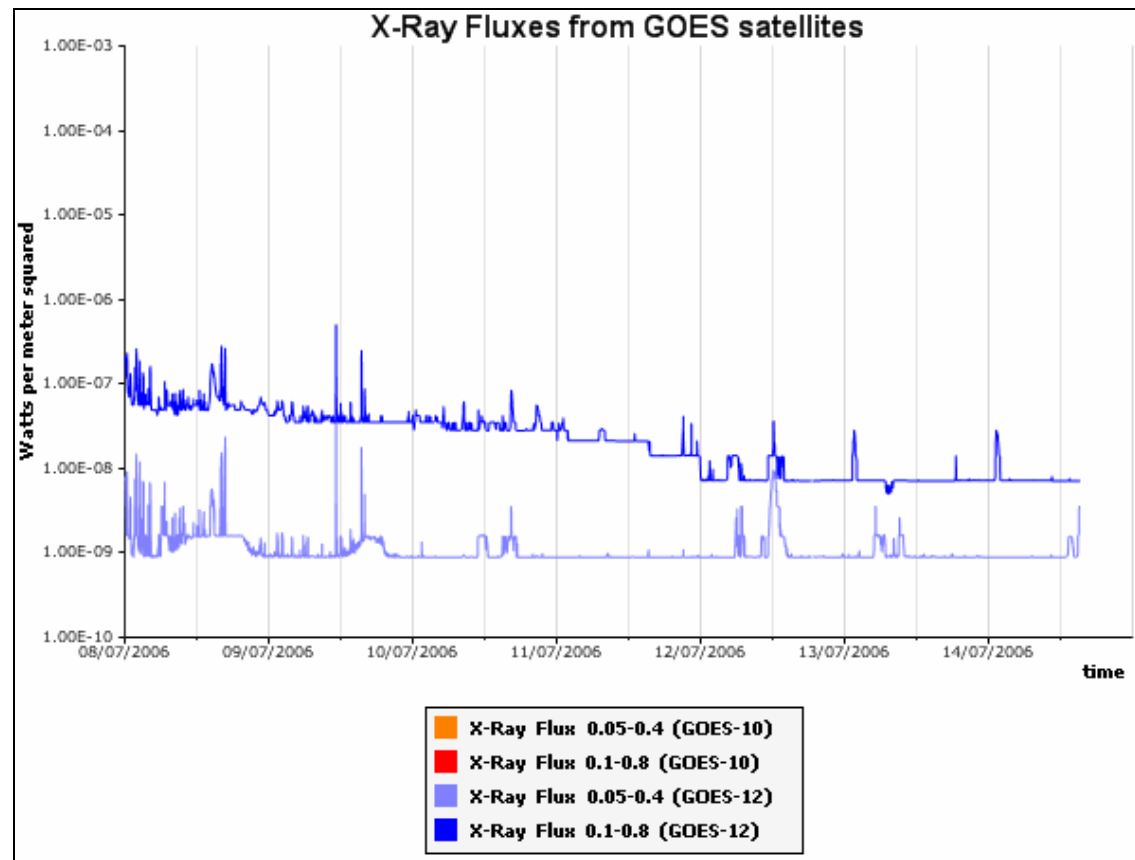
Rev 456



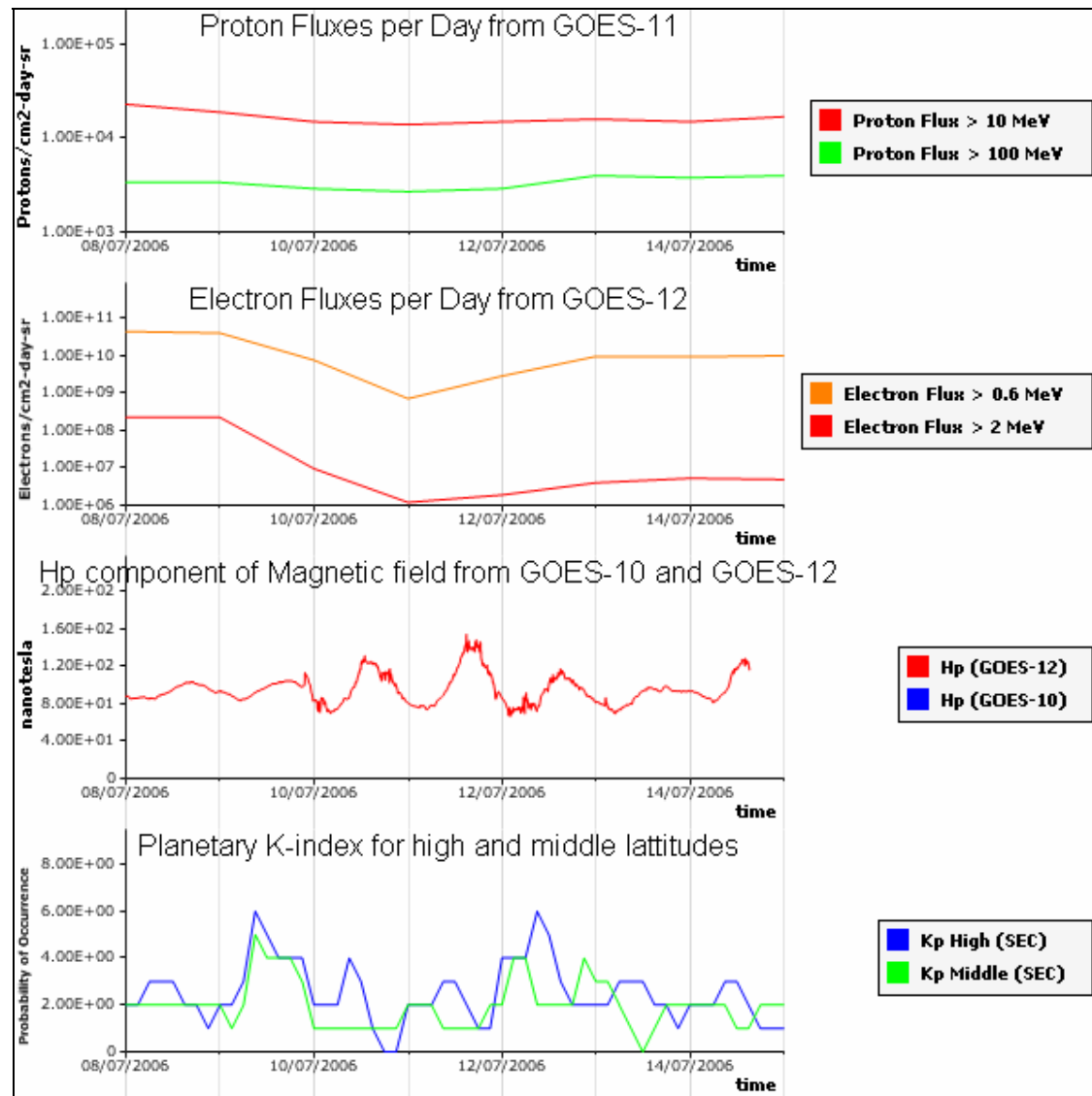
Rev 457



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.



The 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.

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