

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 208
Week 37
18.09.06
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 09.09.06 until 15.09.06 (both dates inclusive) and covers the revolutions 477, 478 and 479.

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 3 hexagonal dithers of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), a raster dither of the Galactic Centre (RA 17:45:40.00, DEC -29:00:28.0), a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6), a hexagonal dither of Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), an OMC Flat Field calibration with a target attitude of (RA 19:57:12.00, DEC -22:36:00.0), 4 raster dithers of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5) and 3 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.

Two slews were missed during the observation period due to a problem on the link to REDU station and IMCS-A chain reconfiguration.

The fuel consumption over the period between 08/09/2006 and 13/09/2006 was 0.0863 Kg. The remaining propellant is in the order of 152.1197 Kg.

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

3.1.2 Power

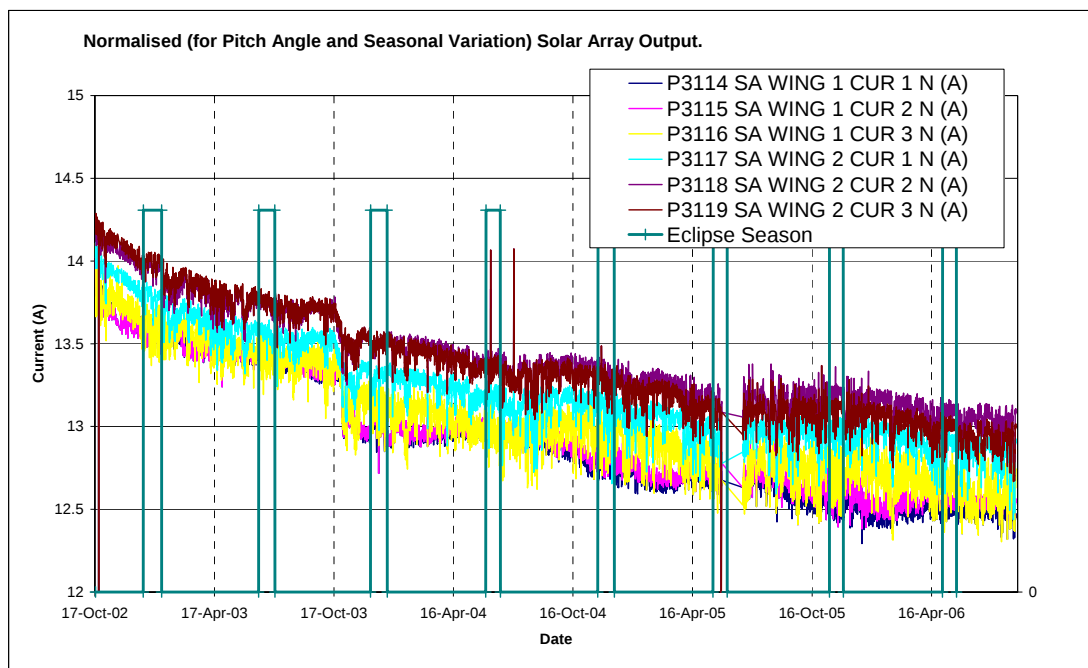
The EPS is working nominally, available power from the arrays is of the order of 2100W.

Battery Reconditioning operations started on 12/9/2006. Battery discharge started at 07.50z, the expected discharge duration is about 10 days.

The following plot illustrates the Solar array Degradation since launch, changes in pitch angle and seasonal variation are compensated, smaller effects such as temperature are not.

It can be seen that the rate of degradation is slowing, this, combined with the nominal PLM and SVM power consumption means that the power budget remains very healthy, there should be no need to restrict the pitch angle within the foreseeable future.

Note that Wing 1 sections 1 to 3 and wing 2 section 1 are the sections normally connected to the main Bus, this is why the output current of these sections is somewhat lower than that of the 2 sections which are generally not connected, hence for a true picture of the available power the lower curves should be taken as reference.



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

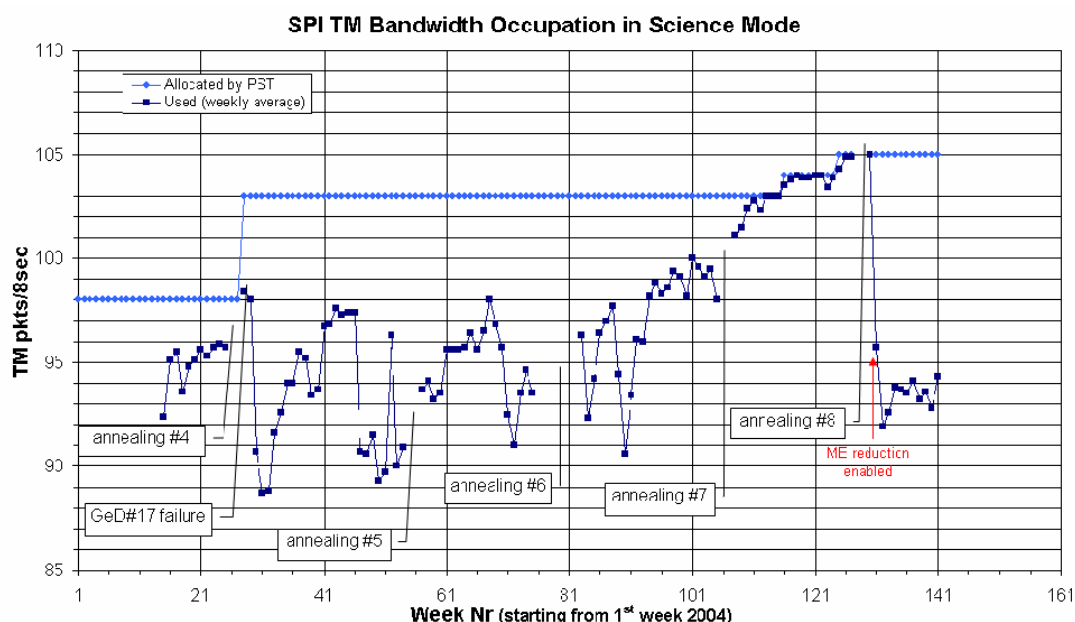
Following the 8th annealing, which ended on 26th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detectors #4 and #12 which are

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, except during the OMC Flat Field calibration (on 14/09/2006 from 04:45:36Z to 08:33:52Z), when the assigned TM bandwidth was 85 packets/cycle. The average telemetry occupation when the TM allocation was 105 packets/cycle in the science window was 94.3 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.

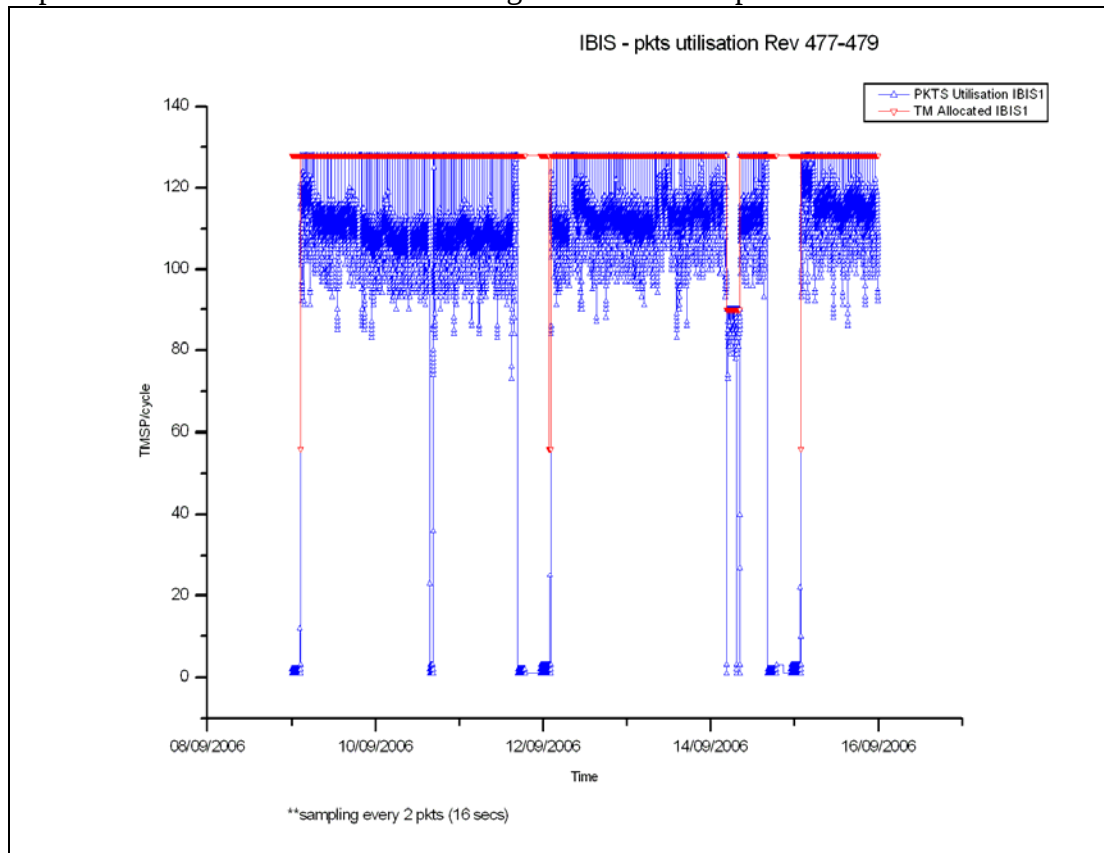
3.2.2 IBIS

The overall status of the unit is nominal.

On 2006-09-10 at 15:41Z, a local reset of the IREM CSCI S/W (SEU #34) occurred. This triggered the IBIS radiation automatism that sent the unit into safe mode. IBIS was manually recovered at 16:40Z.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. However it was 90 TMPS/cycle on 14/09/2006 between 04:45:04Z and 08:33:20Z due to an OMC Flat Field Calibration. The IBIS mean bandwidth utilisation during the observation period was 111.22 TMPS/cycle, up 0.79 on last week (*erratum*: in previous weekly report: the mean bandwidth was 110.43 TMPS/cycle and not 99.5).

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, 179 of the 186 planned science pointings for OMC were executed nominally, 1 was performed at an incorrect attitude, 1 was delayed, 1 was interrupted and 4 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.

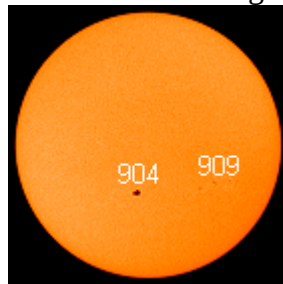
Last week, on 08/09/2006, the IREM CSCI SW reset #33 occurred during the belt passage inbound between revolutions 476 and 477, which led to interruptions in the science data for OMC.

This week, on 10/09/2006, the IREM CSCI SW reset #34 occurred during the science observations of revolution 477, 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.

During the whole observation period, sunspots 904 and 909 were present (see picture of sun on 11/09/2006) but posed 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. There were only minor problems reported, such as the TC History crashing, and the connection to the MISCdynamic server dropping, neither of which had any impact. 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, two of which led to the loss/delay of pointings. There were also several problems reported with the isds-ISDC links. 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 up to revolution 486. Up to revolution 483 has been planned and sent to MOC. Revolution 482 includes special JEM-X setting in preparation for the CRAB calibration in revolution 483. TSF up to revolution 480 was received.

2. Observation status

ECS's for revolutions 465 to 469 have been received. Due to the communication problems reported last week the ECS's have not been processed this week. They will be processed early next week.

3. ISOC science Data Archive

The following activities have been completed this week:

- INTEGRAL Visualisation Tool (IVT) prototype now complete except for the ISDA interface
- ISDA statistics tool tested, but needs revision
- New file format for ISGRI light-curves in ISDA (to support transfer of data to IVT)
- Script for automatic clean-up of ISDA index files released

4. ISOC system

ISOC version 13.0 has been used without problems

5. AO-4

The "latitude scan" observations (PI: Sunayev) still needs to be set up. Support by use of scripts is investigated.

7. Problems

none

4.3.2 ISDC

Status of ISDC observation processing on 18/09/2006:

- 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 251, at 19:59, a local reset of the IREM CSCI S/W (SEU #33) occurred. A recovery was performed, and completed at 07:20, the impact was OMC science data for pointings 04770001 & 04770002 were lost.
- On DoY 253, at 15:41, a local reset of the IREM CSCI S/W (SEU #34) occurred. A recovery was performed, and completed at 18:29, the impact was IBIS and OMC science data for pointing 04770048 were interrupted and lost altogether for pointing 04770049.
- On DoY 258, at 07:30, problems with the TM link from Redu led to some AOCS commands failing release. The timeline was stopped, and a recovery performed. The impact was a delay in the start of pointing 04790011 from 07:30 to 07:52.
- At 23:48, the TM link from Redu dropped, which caused the commanding to fail. The links were restored at 23:54, and a recovery started. At 00:18, the recovery was completed and the Timeline rejoined. The impact was the loss of pointing 04790032.

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

AR id	Date Created	Subject	Segment	Status
INT-2874	13/09/2006	AutoStk crashed after S/W update	IMCS	Closed
INT-2875	13/09/2006	Verifier application on IMCA crashed	IMCS	Pending
INT-2876	14/09/2006	Power outage at REDU	ESA Stations	Pending
INT-2877	14/09/2006	Unable to remove TC link from INCTRA	NCTRS	Pending
INT-2878	14/09/2006	Unable to connect TC to DSS-27	NASA Station	Pending
INT-2879	14/09/2006	TC History crashed	IMCS	Pending
INT_SC-158	19/09/2006	IREM Anomaly: Reset of IREM_CSCI S/W #33, #34, #35	Payload	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 477

The observations in revolution 477 began with a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. It continued with a raster dither of the Galactic Centre (RA 17:45:40.00, DEC -29:00:28.0), lasting ~12.6 hours. Finally, a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6), lasting ~41.7 hours, was performed, until the end of the revolution.

Revolution 478

The observations in revolution 478 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. 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 OMC Flat Field & Dark Current Calibration #33, a staring pointing with attitude (RA 19:57:12.00, DEC -22:36:00.0), lasting ~2.9 hours, was executed. Finally, a raster dither of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), lasting ~7.4 hours, was performed, until the end of the revolution.

Revolution 479

The observations in revolution 479 began with a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. It continued with a raster dither of AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), lasting ~11.1 hours. This was followed by raster dithers of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6) and AO-4 KP: l=+6.9 (RA 18:01:12.94, DEC -22:59:28.5), both lasting ~18.5 hours. Finally, a raster dither of AO-4 KP: l=-6.9 (RA 17:28:08.54, DEC -34:45:18.6), lasting ~5.9 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, except during the OMC Flat Field & Dark Current Calibrations from 2006-09-14T04:44:44 to 2006-09-14T08:33:11 when the allocation was IBIS 90; SPI 85; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-08-22T02:38:55.000Z	152.4350	F	Automatic TM processing.
2006-08-23T12:21:39.000Z	152.4171	F	Automatic TM processing.
2006-08-26T11:20:10.000Z	152.4032	F	Automatic TM processing.
2006-08-28T01:10:00.000Z	152.3791	F	Automatic TM processing.
2006-08-31T00:54:07.000Z	152.3357	F	Automatic TM processing.
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.

This report was generated Fri Sep 15 08:00:37 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, 09/09/2006 – 15/09/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 101 Open Loop Slews, 97 Closed Loop Slews and 5 Momentum Biases were executed.

Two slews (OSL, CSL) were missed during the observation period due to a problem on the link to REDU station and IMCS-A chain reconfiguration.

PID 04780063 shall be considered not reached, even OTF in target, due to the large attitude error accumulated (> 1 deg in pitch and yaw).

This is equivalent to a ~1 % of the total number of slews planned (198).

Orbit Control

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. Since it should be avoided this situation and to implement a delta V manoeuvre, that will have a bigger impact on the science activities, the orbit will be forced into a more favourable direction since rev 482 by using the following counter-measures:

1. Use of FD suggested Perigee Passage attitude

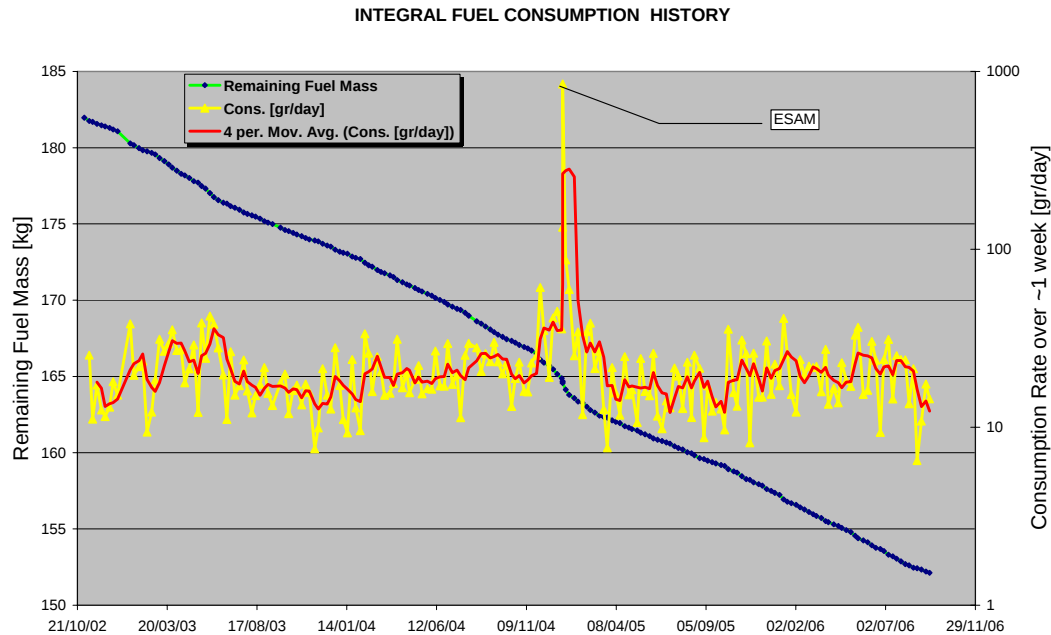
ISOC will use for the time being (few months) the attitude for the Perigee Passage that has been selected by Flight Dynamics. This should be taken into account from Revolution 482. This will require the RWB at the beginning of the revolution to be performed using the Perigee Passage attitude.

2. Use of calibration activities

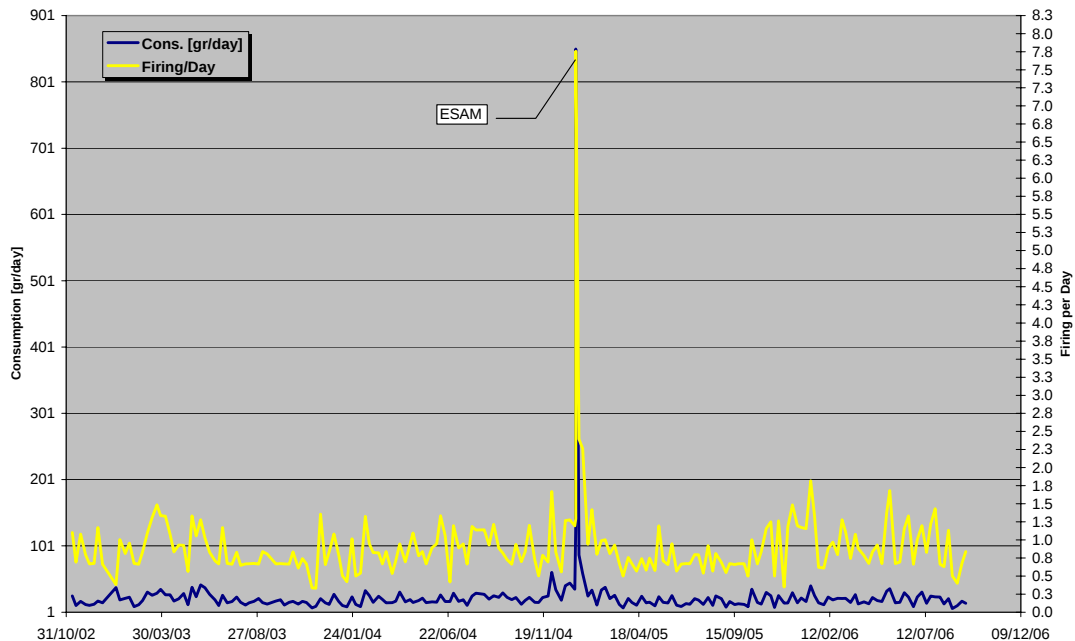
The Planning of the upcoming activities, in particular, the thruster torque calibration, should be done in such a way as to have a positive effect on the orbit control.

Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 13/09/2006 is reported in the plot below.

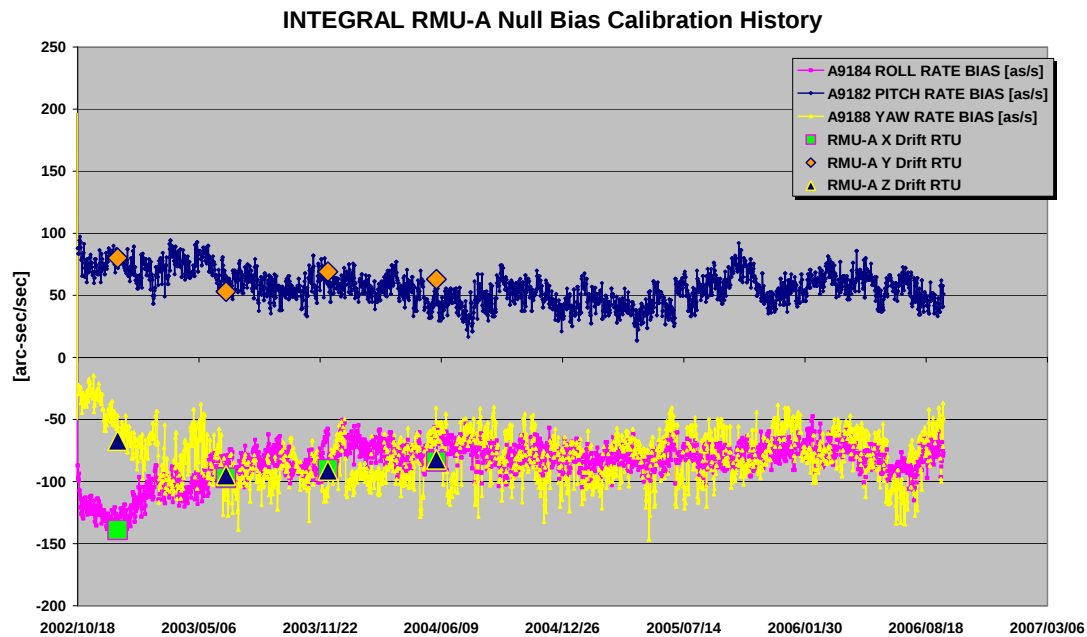


The firing\day over the period between 01/11/2002 and 13/09/2006 is reported in the plot below.

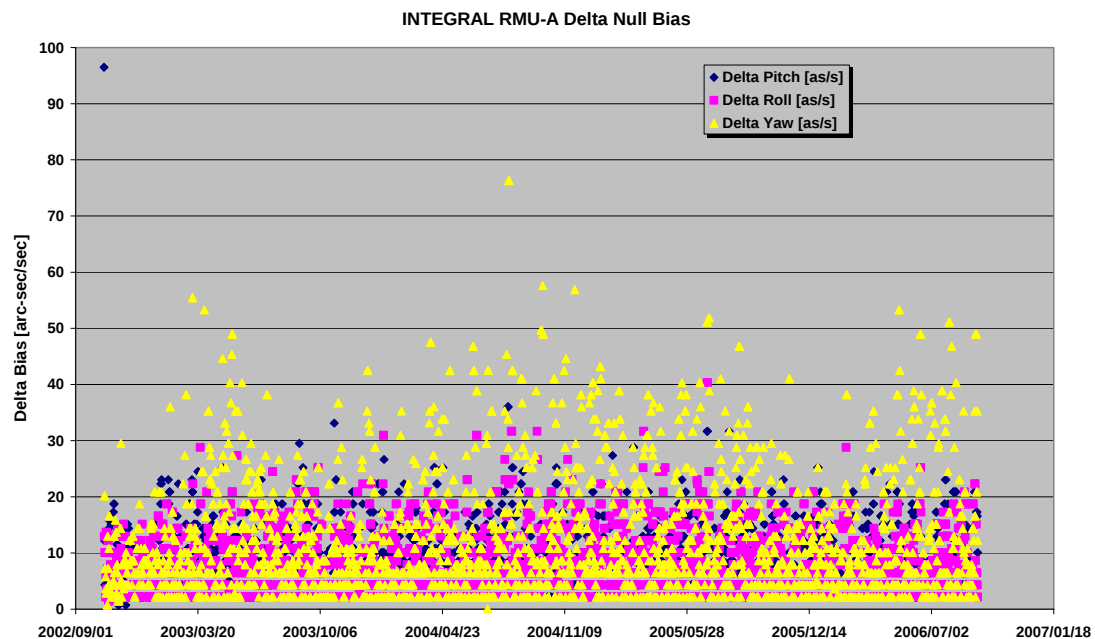


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 15/09/2006 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 15/09/2006 is reported in the plot below.



09/09/06 (Day of Year 252, Revolution 477)

Nothing to report.

10/09/06 (Day of Year 253, Revolution 477)

Planning problem, no CGS planned before the first RWB of rev 477: during the planned RWB for rev 477 at 19:19:34z, the selected guide star (picked after the previous OSL) reported the Yccd coordinate out of the expected star position constraints defined for bias activity.

The guide star was Mi 8.15 at CCD location [-28919 , -8226].

The operational Bias constraint on Yccd requires that the star coordinate is inside the interval $-26272 < Y_{ccd} < 26272$.

During the Bias execution the guide star was lost, being at the edge of the STR FOV, the IMU was switched ON at 19:22:30z and an automatic mapping performed by ACC.

Following the TCM mode logic , ref INT-RP-MMB-0013 page 7-32, the controller did not abort the momentum dump because, by chance , the lost of guide star occurred when already at stage 4 <<ON MODULATION THRUSTER CONTROL PHASE>>.

If the problem occurred during the stage 2 <<MOMENTUM DUMPING>> this would have caused the immediate abort of the dump with the wheels speed settle at the value reached at the time of the abortion.

The origin of the problem is due to the absence of the expected CGS before the execution of the RWB. Therefore the guide star picked was that one after the previous OSL and not suitable for RWB activity.

The operator spotted the problem on the guide star and communicate it to the on-call SOE but no action was taken based on the consideration that the dump was already running and an on-board protection (Autonomous Momentum Dump) is designed to keep safe the S/C at the occurrence such problem. The IMU was automatically switched OFF at 19:32:30z.

The problem, was mainly due to a difficulty in finding suitable guide star for the Bias at the end of rev 476. At the attitude specified by the SOC no stars were found. In order to maintain the attitude request by SOC, a manual manipulation of the rev 477 was required causing modification on POS not completely mirrored in the EPOS and the incorrect deletion of the CGS before the mentioned RWB.

For similar reason (i.e. POS manipulation) the ESM file for rev 477 did not report any wheels speeds predictions for the first 20 slews of the revolution, i.e. until the bias mentioned above.

No impact on TL.

11/09/06 (Day of Year 254, Revolution 477)

Nothing to report.

12/09/06 (Day of Year 255, Revolution 477-478)

Nothing to report.

13/09/06 (Day of Year 256, Revolution 478)

FDS failed update, due to not suitable stars in the STR FOV: at 19:08z the TPF generation for SID 04780057 was aborted due to the lack of a suitable guide star. The overlap of the initial and the target field of view only had two suitable guide stars. One of them was affected by a blemish pixel and the other one was too close to the edge of the initial field of view to be useful for slewing.

This problem is related to guide star selection criteria and evaluation of blemish pixels on slew path. The guide star used during the SST was Mi 7.45 at CCD location [-23790 , -17017].

The SST was performed correctly and the CSL executed based on the original TL parameters.

FD on-call was informed and decision was taken to run the CSL from the TL without update.

The attitude reconstructed at the end of the slew was:

RA 17:25:05
DEC -30:27:46
POS 273:14:13

consistent with the PREQ in the TL. The accumulated attitude errors were in the average. No impact on TL.

FDS failed update, due to not suitable stars in the STR FOV: at 23:58z the TPF generation for SID 04780063 was aborted due to the lack of a suitable guide star. The overlap of the initial and the target field of view only had two suitable guide stars. One of them was affected by a blemish pixel and the other one was too close to the edge of the initial field of view to be useful for slewing.

This problem is related to guide star selection criteria and evaluation of blemish pixels on slew path. The guide star to be used during the SST, Mi 7.45 at CCD location [4590, 2181], was already selected as guide star in slot#1. The SST execution reported an error on-board, flagged by TM para A5108= ERROR, and the process was not performed. Unfortunately the PTV for the CSL sequence checks only the validity of the star in slot #2 but not the coordinates of the star. This caused the slew to be uplinked nominally and the S/C to slew to a not planned star, still inside the overlapping of the initial STR FOV and the final FOV.

The attitude reconstructed at the end of the slew was:

RA 17:44:53
DEC -36:54:38
POS 270:06:56

Not consistent with the PREQ in the TL. The accumulated errors were:

Roll error ~500 arcsec

Pitch error ~ 5998 arcsec
Yaw error ~ -4810 arcsec

Impact on TL: the PID 04780063 shall be considered not reached.

14/09/06 (Day of Year 257, Revolution 478)

Nothing to report.

15/09/06 (Day of Year 258, Revolution 478-479)

Problem on IMCS-A chain: at 07:30z due to several problems affecting the IMCS-A chain, during the following reconfiguration of the ground system to the A-chain the starting TC (A2541 STR SRCH/TRCK) of the SID 04790011 (CSL) was missed. This cause the generation on-board of the OEM APID 640 <<ACC BAD TC SEQ>> and the failing of the slew sequence.

The AOCS s/s was disabled in TL at 07:31z and a manual recovery started at 07:33z from attitude of PID 04790010 to the attitude of PID 04790011. The next slew in TL (04790012) was manually updated and the AOCS enabled at 08:04z.

The following slew was missed: 04790011(CSL).

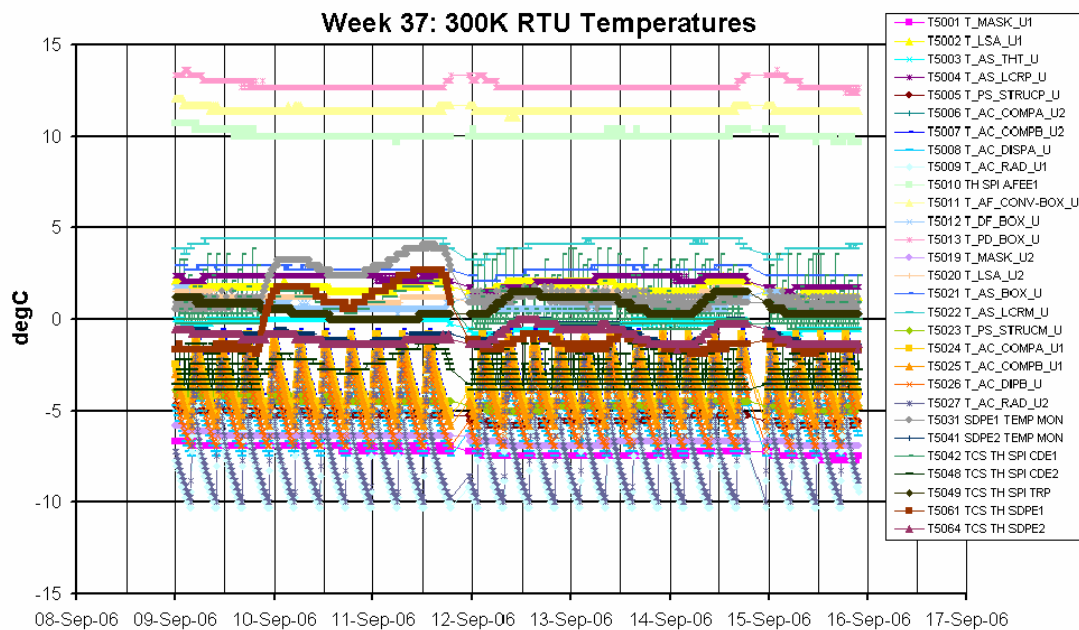
Problem on TM link to REDU station: at 23:48z due to a problem on TM link to REDU station the slew SID 04790032 (OSL) failed release.

A manual recovery was then started on DoY 2006.259 (16/09) 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.

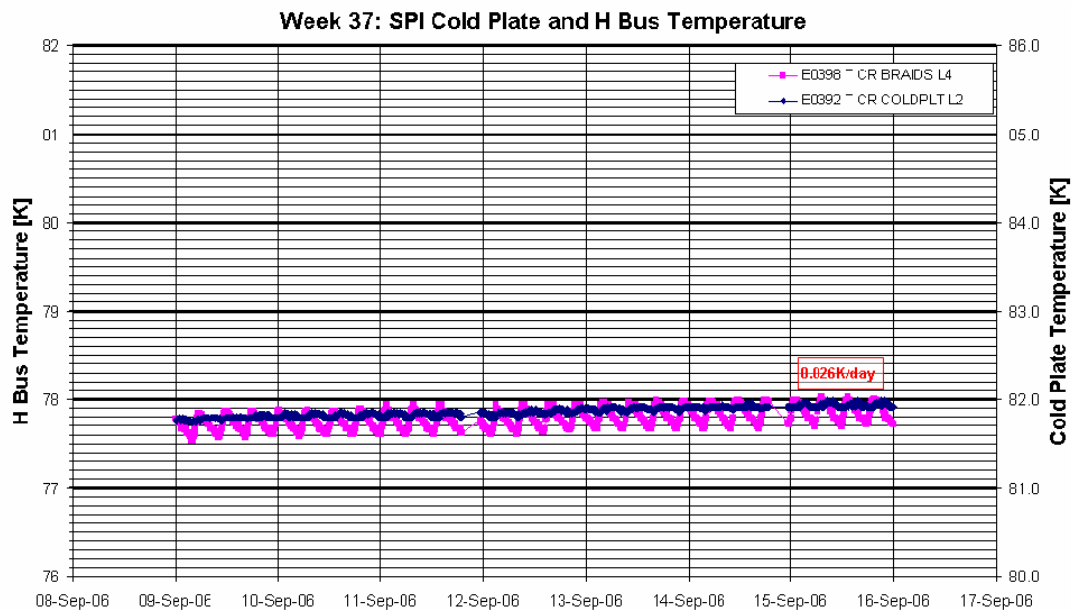
The following slew was missed: 04790032(OSL).

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:



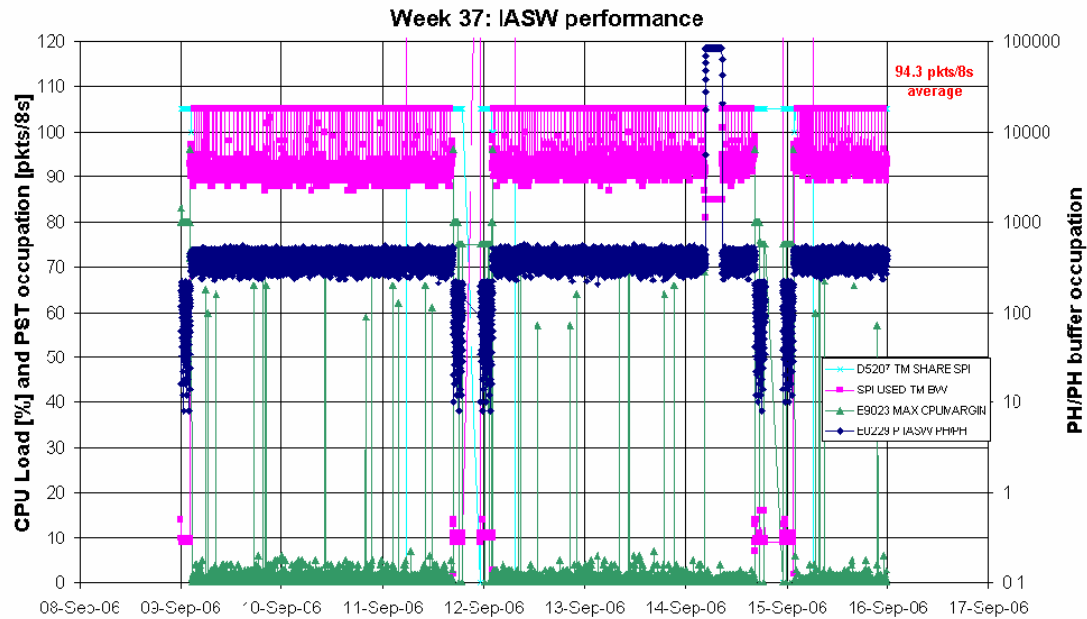
Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range to 82K $\pm$ 1K with a positive drift of 0.026deg/day. The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



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

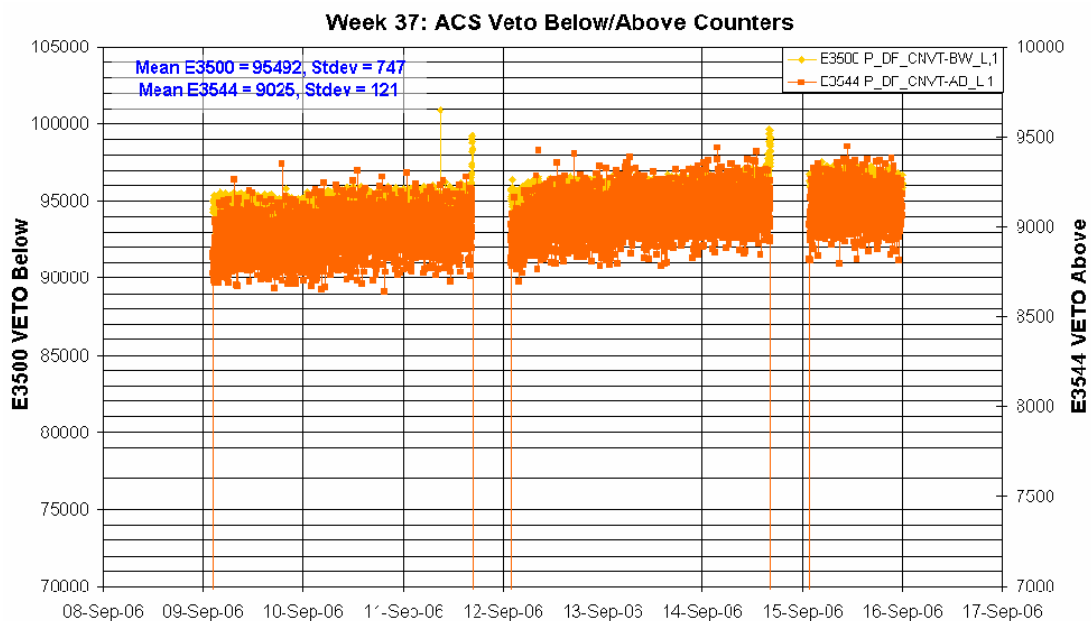
The average TM bandwidth occupation of SPI was 94.3 packets/cycle over the science window when the TM allocation was 105 packets/cycle. On 14/09/2006 from 04:45:36Z to 08:33:52Z the assigned bandwidth was 85 packets/cycle due to an OMC Flat Field Calibration.

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.

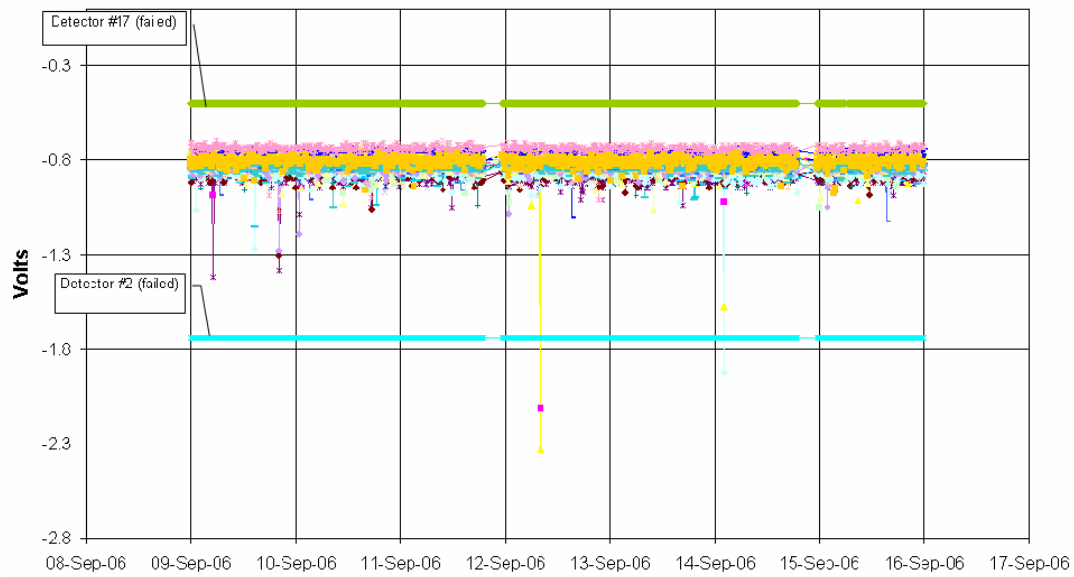
The following plot shows the ACS overall count rate evolution during the reporting period:



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.

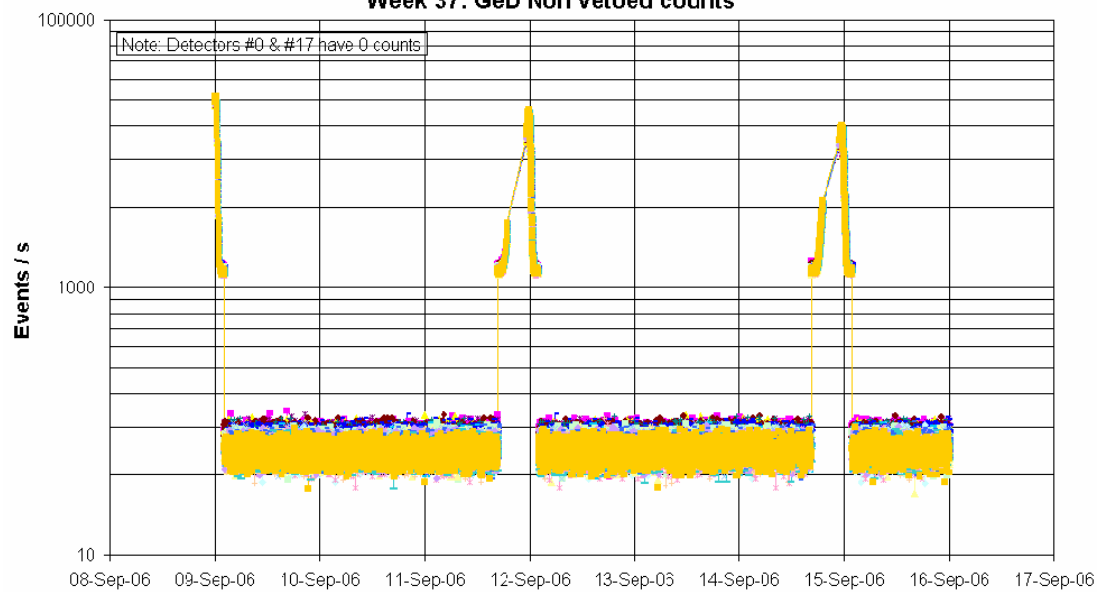
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004

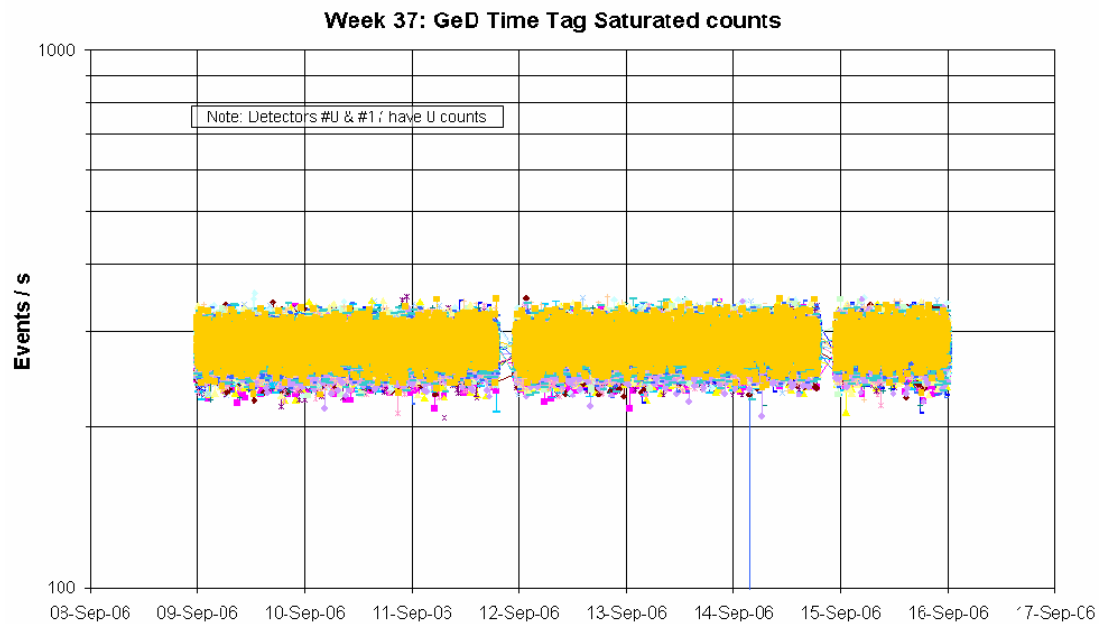
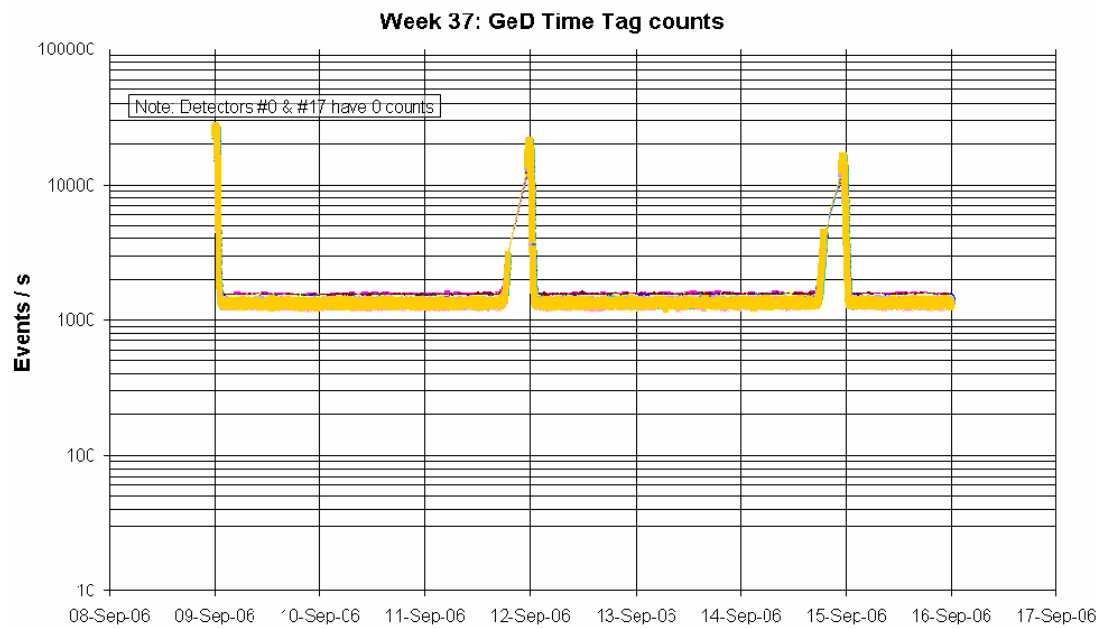
Week 37: AFEE DC output Voltages



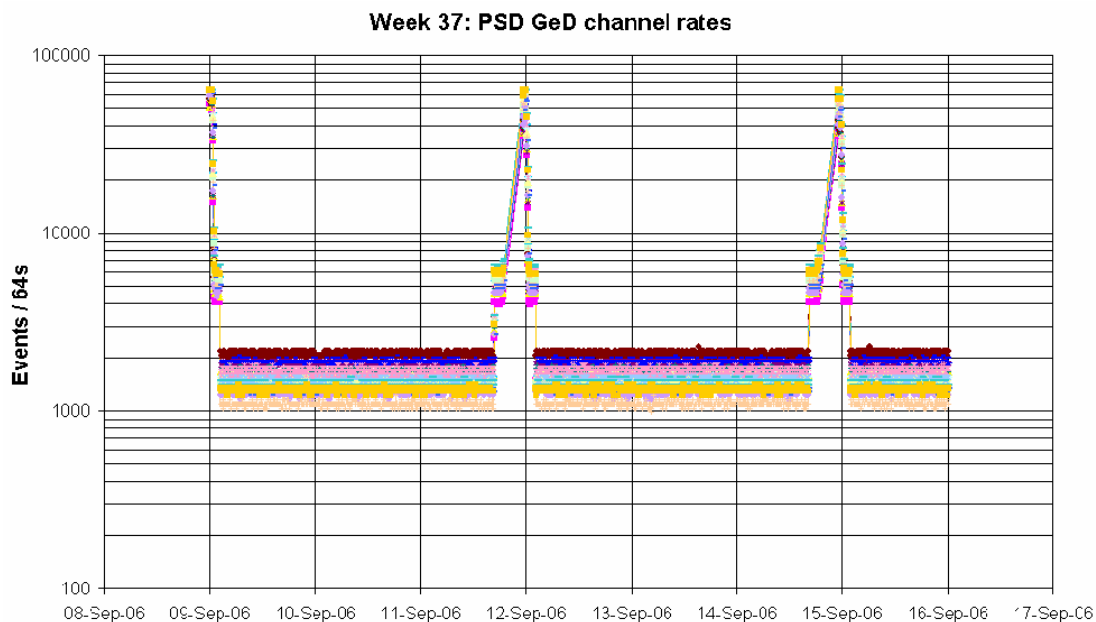
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.

Week 37: GeD Non Vetoed counts





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 and OEMs were received from SPI during the reporting period:

- On 2006-09-09 at 00:15:03Z TM parameter E4009 S DF HSLERR L went OOL High (value = 1), indicating that the number of erroneous HSL transfers in the previous second exceeded the threshold. It returned within limits at 00:15:19Z. This was just after AOS of revolution 477.
- On 2006-09-14 between 08:44:26Z and 08:45:31Z, 17 occurrences of the following pair of OEMs were received:

APID 1024	ID 224	EXCEPTION	SPI1 SW ERROR
FIX6	0		
E9079	MESS CLASS		1
E9080	MESS ID		224
E9777	FAULTY TASK ID		3
FIX16	0		
APID 1024	ID 7	EXCEPTION	SPI1 CONSTRAINT DPE CULPR
E9073	TASK ID 6		IASW TASK 3
E9079	MESS CLASS		1
E9080	MESS ID		7
E9076	OUT RANGE VALUE		4097
E9067	LOGICAL ADDRESS		11637

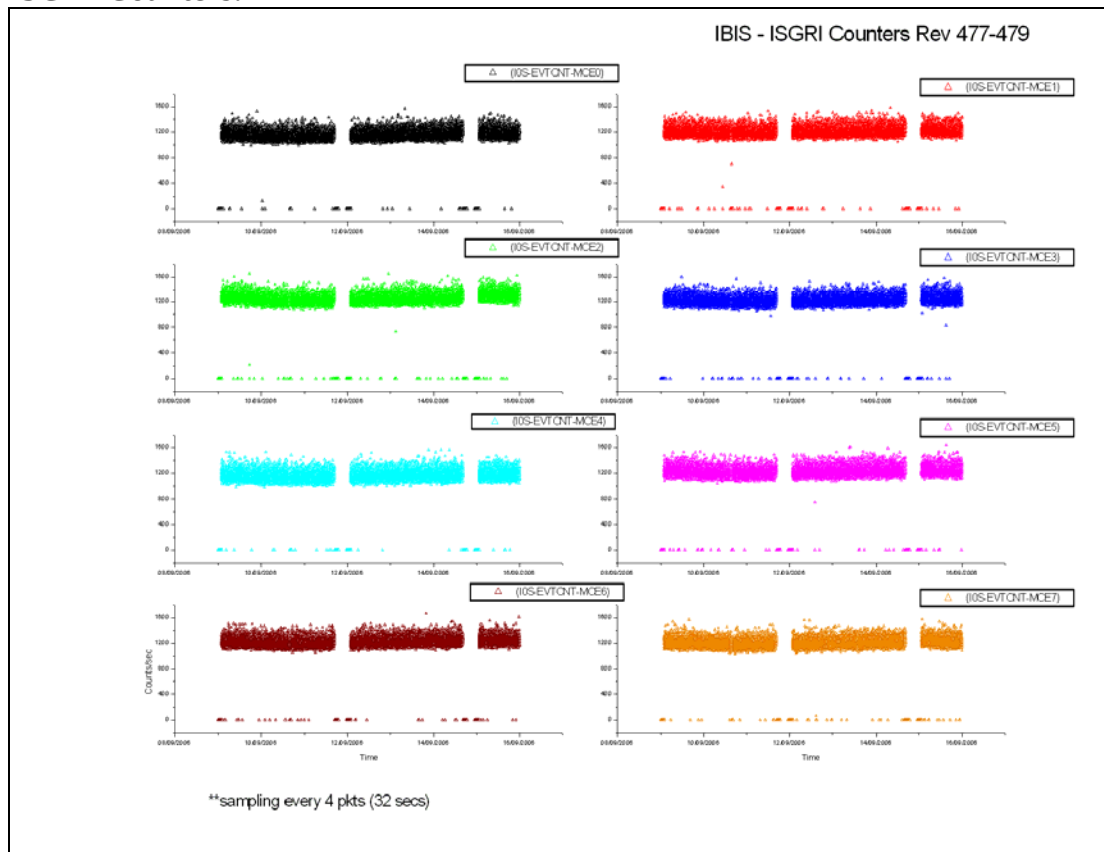
indicating a problem with the Spectra Transmitter task. This was in the first pointing after the OMC Flat Field Calibration, ~10 minutes after the TM allocation had been changed from 85 packets/cycle back to 105 packets/cycle. It is usual to get these OEMs in this situation and they stopped of their own accord.

- On 2006-09-15 at 09:43:12Z TM parameter E3825 (PSD + 5V analogue) exceeded the Soft OOL High (value= 5.2038V) but returned within limits when the next packet was received at 09:44:16Z.

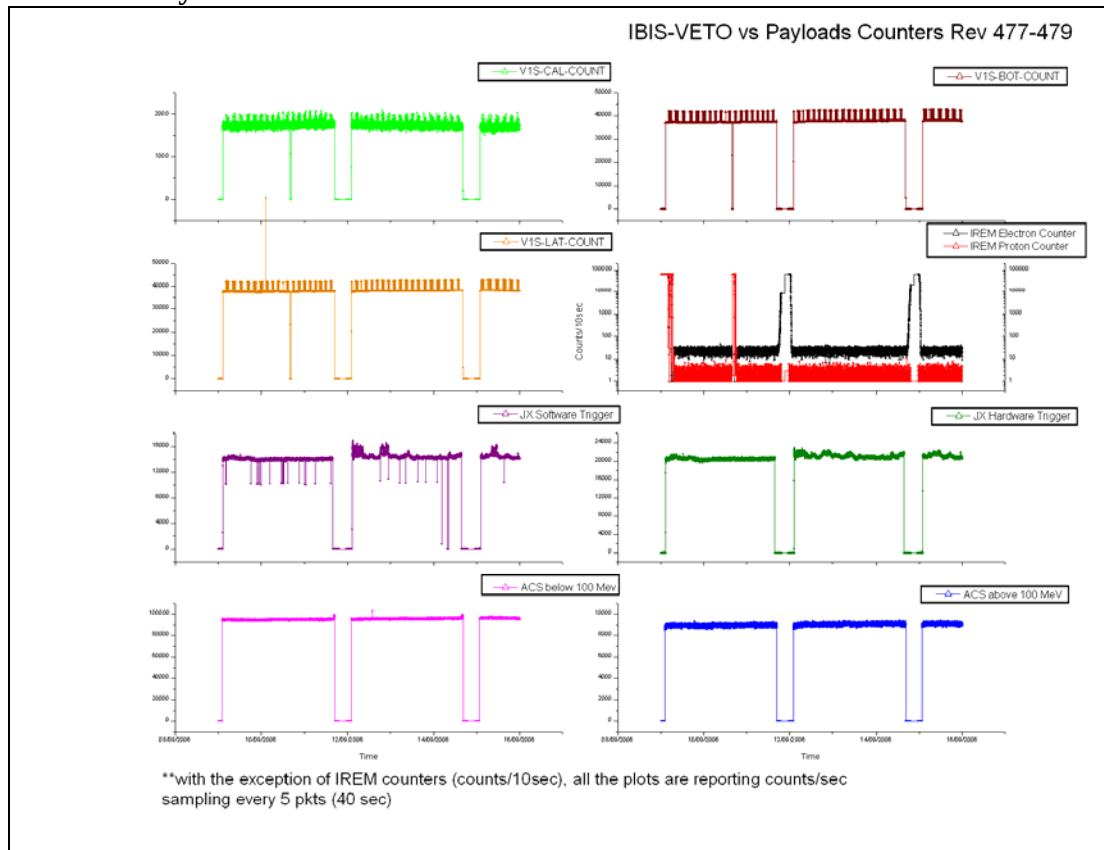
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

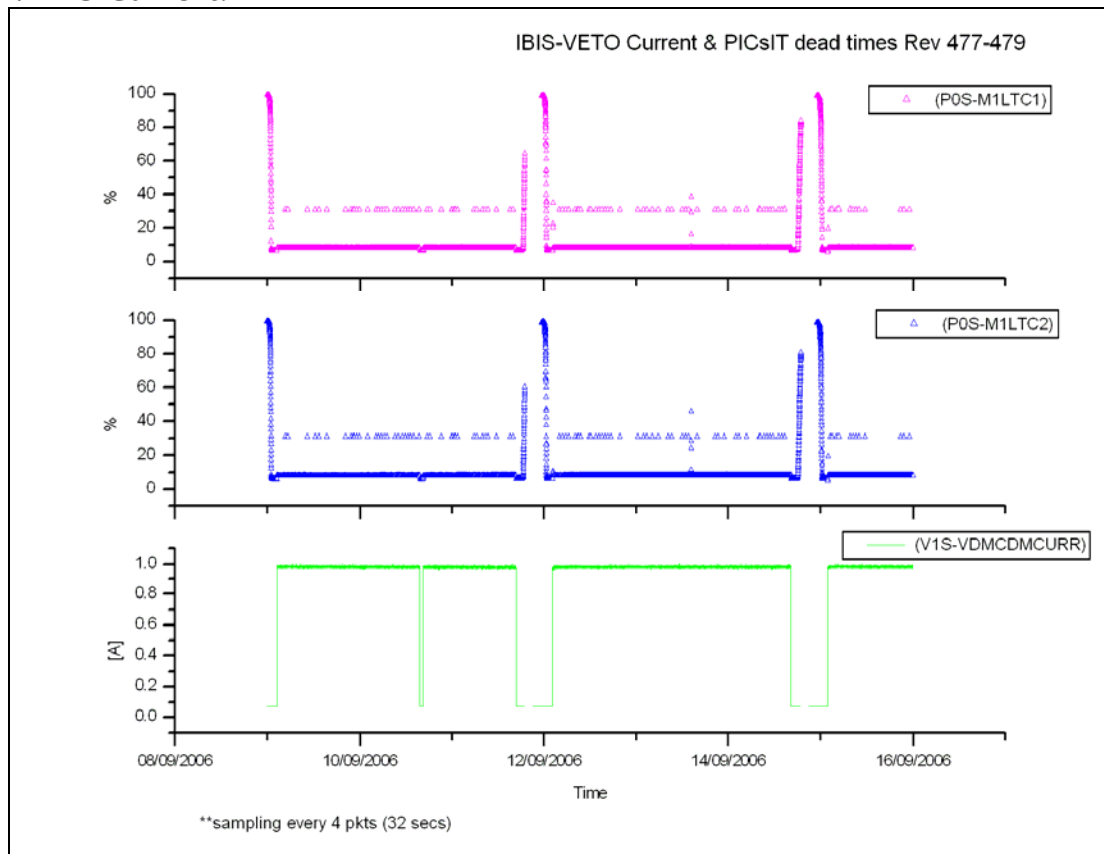


VETO vs Payloads Counters:

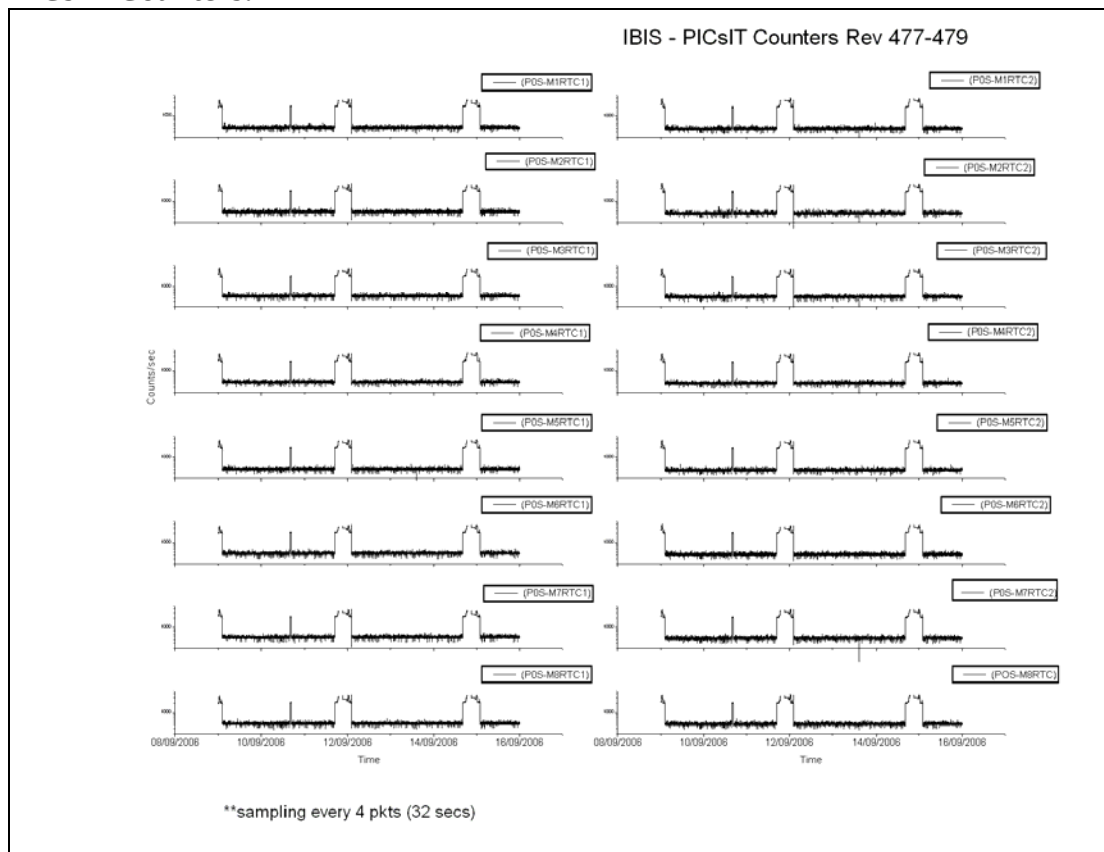


The week was characterised by low radiation.

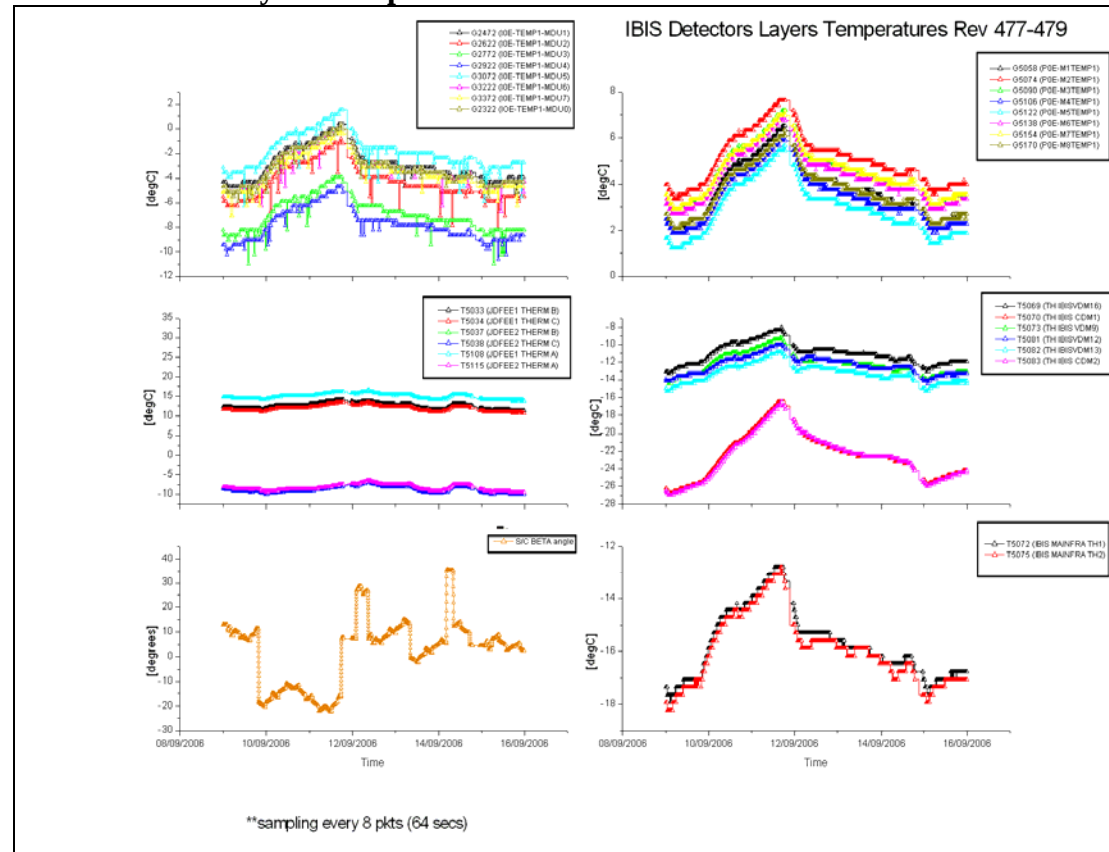
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 252 (09/09/2006):

On DoY 251 at 17:02Z, TM parameter G8015 (S1E-A2_PMT_V) was reported Out Of Limit High. It went back inside limits at 02:33Z on DoY 252. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 in FDIR, no action was taken.

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

At 02:05Z, TM parameter G2084 (I0E-OVFWPXADD-M6) failed Status Consistency Check. According to I-OVF-1 in FDIR, no action was taken.

At 02:26Z, TM parameter G2097 (I0S-EVTCNT-MCE6) was reported Out of limit Low-Low for one cycle. According to I-CNT-1 in FDIR, no action was taken.

DoY 253 (10/09/2006): IREM SEU #34

At 15:41Z, due to IREM SEU #34, 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 16:40Z.

At 15:41Z, TM parameter G8015 (S1E-A2_PMT_V) was reported Out Of Limit High. It went back inside limits at 16:33Z. As this happened following VETO Stand-By mode due to IREM SEU #34, according to V-VLT-1 in FDIR, no action was taken.

DoY 254 (11/09/2006):

At 16:44Z, TM parameter G8015 (S1E-A2_PMT_V) was reported Out Of Limit High. It went back inside limits at 02:17Z on DoY 255 (12/09/2006). As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 in FDIR, no action was taken.

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

At 01:50Z and at 02:02Z, TM parameter G2014 (I0E-OVFWPXADD-M1) failed Status Consistency Check. At 02:01Z, TM parameter G2056 (I0E-OVFWPXADD-M4) failed Status Consistency Check. According to I-OVF-1 in FDIR, no action was taken.

At 02:21Z, after Belts exit, TM families G5068 (POS-MiF1ERRF) and G5072 (POS-MiF2ERRF) failed the Status Consistency Checks. According to P-FIF-1 in FDIR, no action was taken.

DoY 256 (13/09/2006):

At 14:23Z, after Belts exit, TM families G5068 (POS-MiF1ERRF) and G5072 (POS-MiF2ERRF) failed the Status Consistency Checks. According to P-FIF-1 in FDIR, no action was taken.

DoY 257 (14/09/2006):

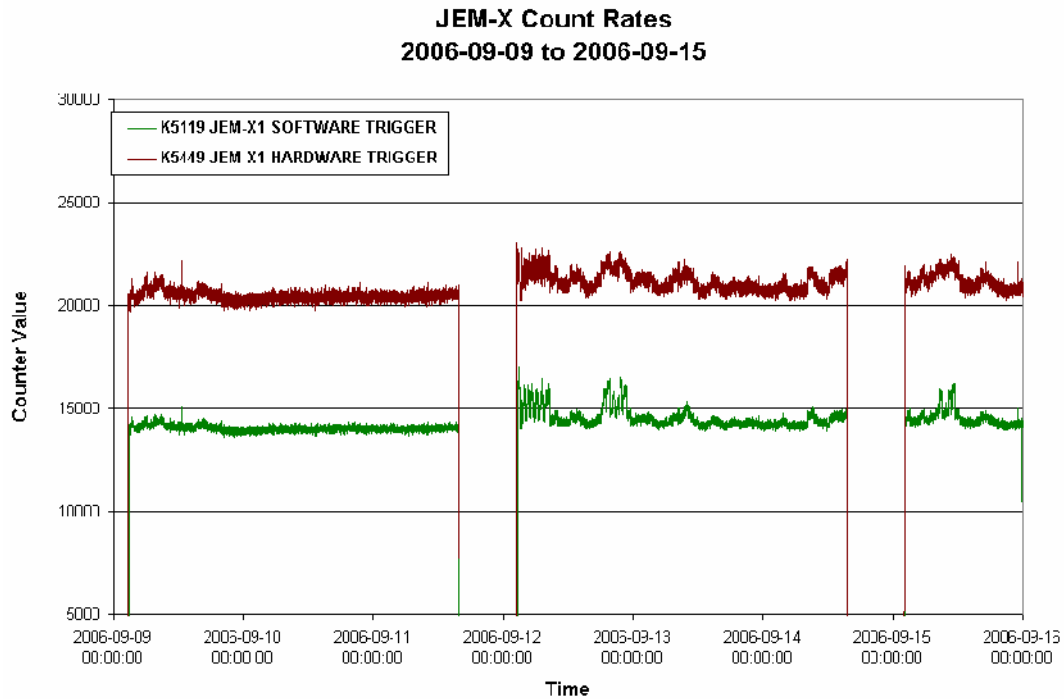
At 16:26Z, TM parameter G8015 (S1E-A2_PMT_V) was reported Out Of Limit High. It went back inside limits at 02:00Z on DoY 258 (15/09/2006). As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 in FDIR, no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went Out Of Limit High and back. According to P-CNT-1 in FDIR, 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.

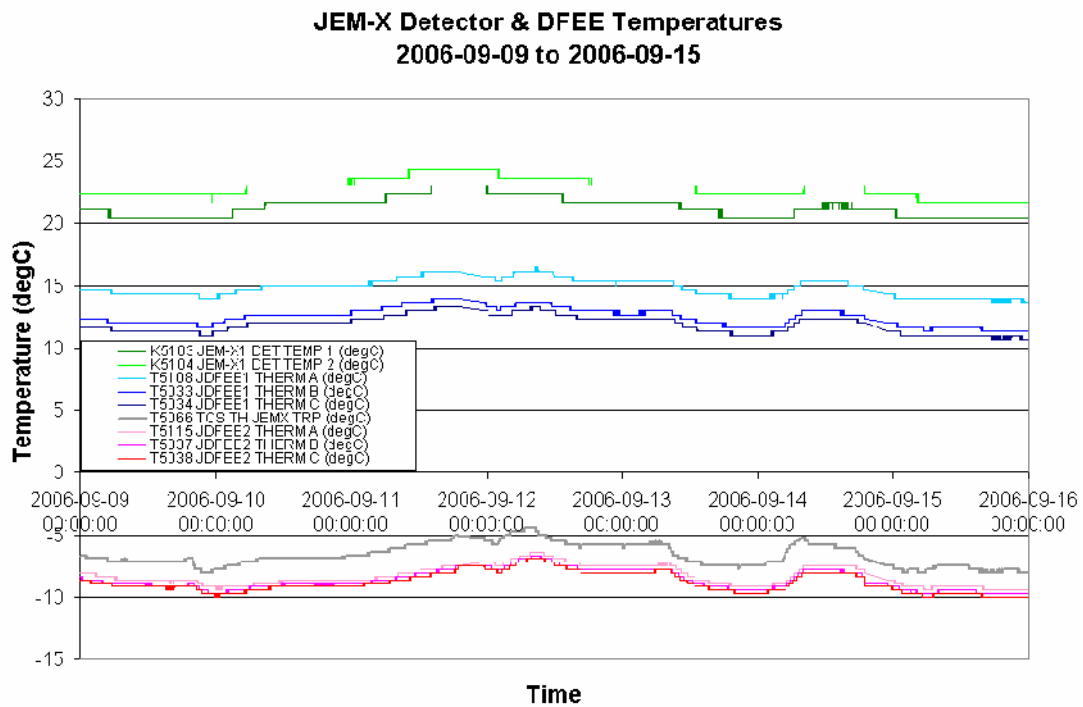


JEM-X Temperatures

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

2006-09-09 (DOY 252, Rev 477)

When JEM-X1 was activated at the start of revolution 477, the RMC parameters K5315-K5317 were all OOL High (value = 65535) due to an IREM SEU which had occurred during the radiation belt passage. However this had no effect on JEM-X1 as the JEM-X1 reaction to the RMC parameters is disabled.

2006-09-10 (DOY 253, Rev 477)

At 15:41:03Z 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.

2006-09-11 (DOY 254, Rev 477-478) to 2006-09-15 (DOY 258, Rev 479)

Nothing to report

8.3.5 OMC Operations

2006-09-09 (DOY 252, Rev 477)

Due to the ongoing recovery of the IREM SEU (#33), which occurred at 19:59 on the previous day, the OMC remained in SAFE mode until 03:34:58. OMC was returned manually to stand-by at 03:34:58. The impact was the loss of pointing 04770001 & 04770002. It was at this time the following commands were rejected:

2006.252.02.36.16.667	2006.252.02.36.26.785	1792	RealTime	131	TC	REJECT	
REJECTED TC1			0	0	65535	PR	N
E E							
2006.252.02.36.22.229	2006.252.02.36.26.813	1792	RealTime	131	TC	REJECT	
REJECTED TC1			0	0	65535	PR	N
E E							
2006.252.03.08.20.730	2006.252.03.08.26.962	1792	RealTime	131	TC	REJECT	
REJECTED TC1			0	0	65535	PR	N
E E							
2006.252.03.08.26.855	2006.252.03.08.34.711	1792	RealTime	131	TC	REJECT	
REJECTED TC1			0	0	65535	PR	N
E E							

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for those pointings.

2006-09-10 (DOY 253, Rev 477)

At 15:41:05, an IREM SEU (#34) forced the instrument to SAFE mode. A recovery was immediately executed, returning OMC to Standby at 16:43:20. The impact was the interruption of pointing 04770048 after 809 from a scheduled 2462 seconds and the loss of pointing 04770049.

2006-09-11 (DOY 254, Rev 477) to 2006-09-13 (DOY 256, Rev 478)

Nothing to report.

2006-09-14 (DOY 256, Rev 478)

At 00:25:05, the exposure taken for pointing 04780063 may show a significant attitude offset. For details see the AOCS section above.

2006-09-15 (DOY 257, Rev 478)

Nothing to report.

2006-09-15 (DOY 258, Rev 479)

At 07:30, an AOCS command failed release, leading to a delay in the start of pointing 04790011. A recovery was performed, and the OMC commands manually uplinked at 07:54:41. It was at this time the following commands were rejected:

2006.258.07.34.19.917	2006.258.07.34.27.387	1792	RealTime	131	TC	REJECT	
REJECTED TC1			0	0	65535	PR	N
E E							

Doc. Title : INTEGRAL Mission Report #208
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 18/09/06

Issue : 1
Rev. : 0
Page : 29

```
2006.258.07.34.25.917 2006.258.07.34.35.395 1792 RealTime 131 TC REJECT  
REJECTED TC1 0 0 65535 PR N  
E E
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for that pointing.

At 23:48, due to the TM links from Redu dropping, the commanding failed. A recovery was performed and completed by 00:25 the following day. The impact was the loss of pointing 04790032. It was at this time the following commands were rejected:

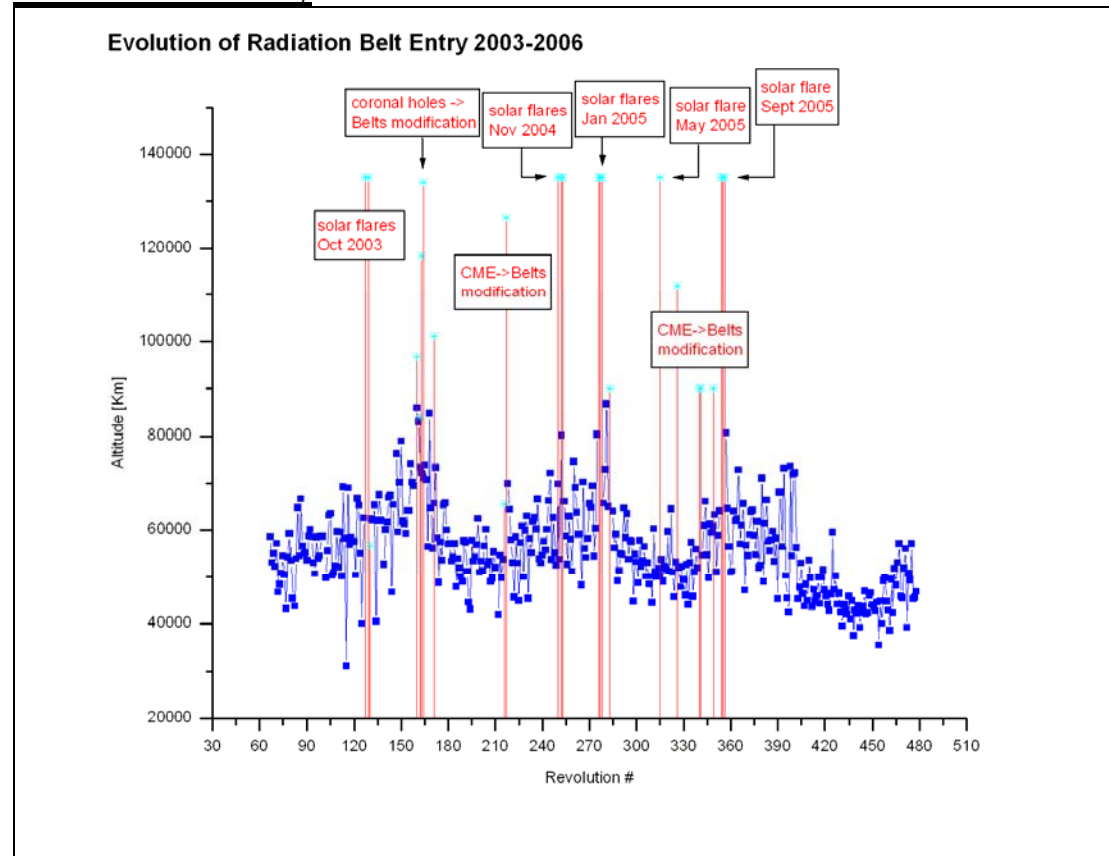
```
2006.258.23.50.31.201 2006.258.23.50.36.203 1792 RealTime 131 TC REJECT  
REJECTED TC1 0 0 65535 PR N  
E E  
2006.258.23.50.37.076 2006.258.23.50.43.406 1792 RealTime 131 TC REJECT  
REJECTED TC1 0 0 65535 PR N  
E E
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for that pointing.

On DoY 254 at 16:44:09 and DoY 257 at 16:26:26 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 2006-09-10 at 15:41Z, a local reset of the IREM CSCI S/W (SEU #34) 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) 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 2006.253.15.41Z at 147300km. 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 15:48Z 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 22:26Z.

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 16:40Z and OMC re-enabled at 16:44Z.

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

Corrections and complements to previous weekly report are presented in this table.

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]
474	RAD_ENTR R 2006-09-02T17:30:52Z	2006-09-02 18:21:35	49386.4	2006-09-02 18:29:32	47949
475	RAD_EXIT R 2006-09-03T02:49:15Z	2006-09-03 01:52:31	<<44133.8	2006-09-03 02:09:32	39183
475	RAD_ENTR R 2006-09-05T17:16:42Z	2006-09-05 17:05:36	57163.9	2006-09-05 18:05:57	49256
476	RAD_EXIT R 2006-09-06T02:34:50Z	2006-09-06 02:14:25	<44227.0	2006-09-06 01:55:57	39323
476	RAD_ENTR R 2006-09-08T17:01:56Z	2006-09-08 18:15:37	45292.3	2006-09-08 17:53:42	49094
477	RAD_EXIT R 2006-09-09T02:20:40Z	NA (SEU #33)	NA	2006-09-09 01:43:42	39384
477	RAD_ENTR R 2006-09-11T16:44:05Z	2006-09-11 17:57:12	45646.5	2006-09-11 17:39:43	48639
478	RAD_EXIT R 2006-09-12T02:03:40Z	2006-09-12 00:54:24	>>26542.9	2006-09-12 01:29:43	39753
478	RAD_ENTR R 2006-09-14T16:26:18Z	2006-09-14 17:33:04	46878.2	2006-09-14 17:17:25	49490
479	RAD_EXIT R 2006-09-15T01:45:58Z	2006-09-15 00:39:36	>>28141.9	2006-09-15 01:17:25	40361

Reference

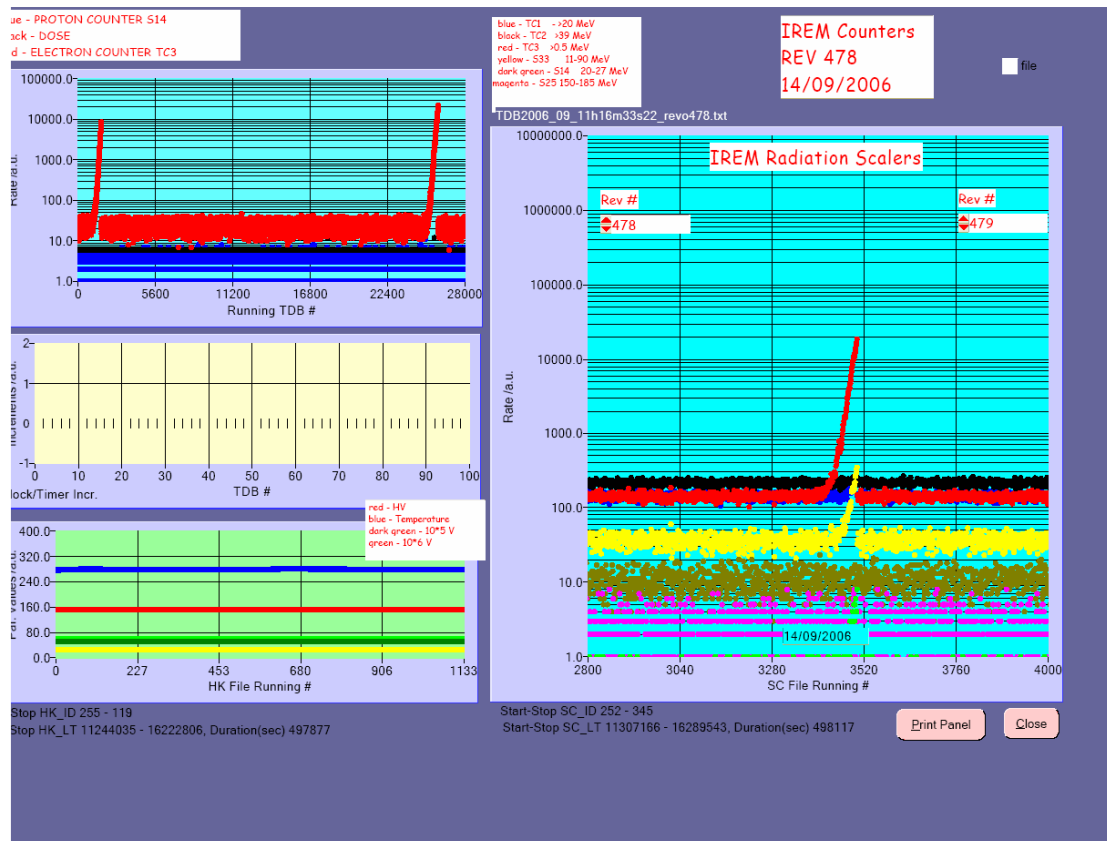
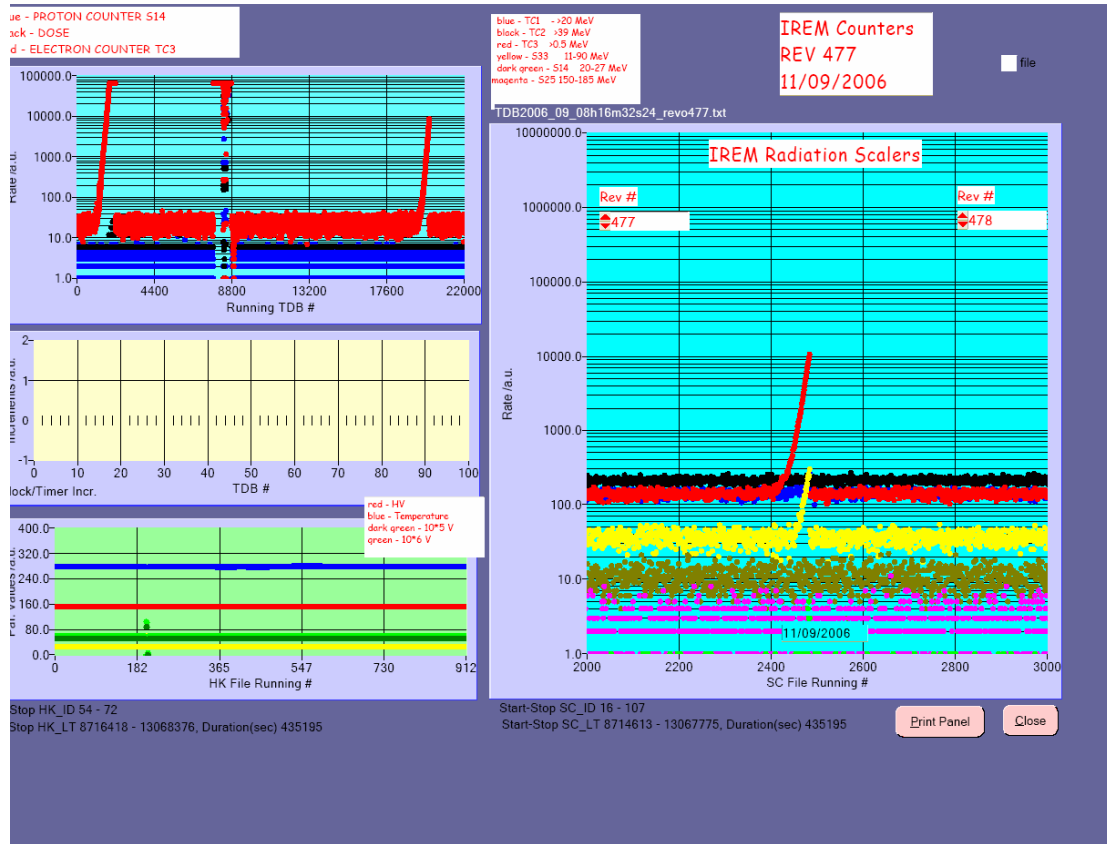
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

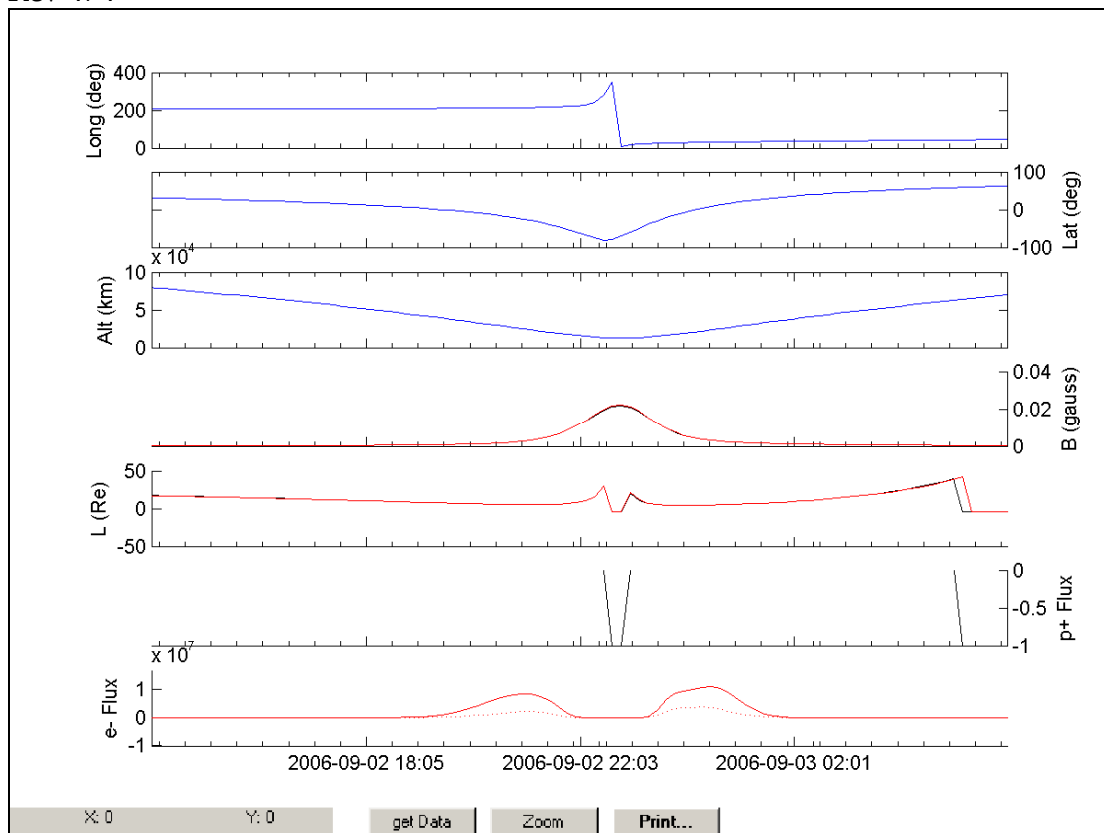
Radiation Spike

IREM radiation counters:

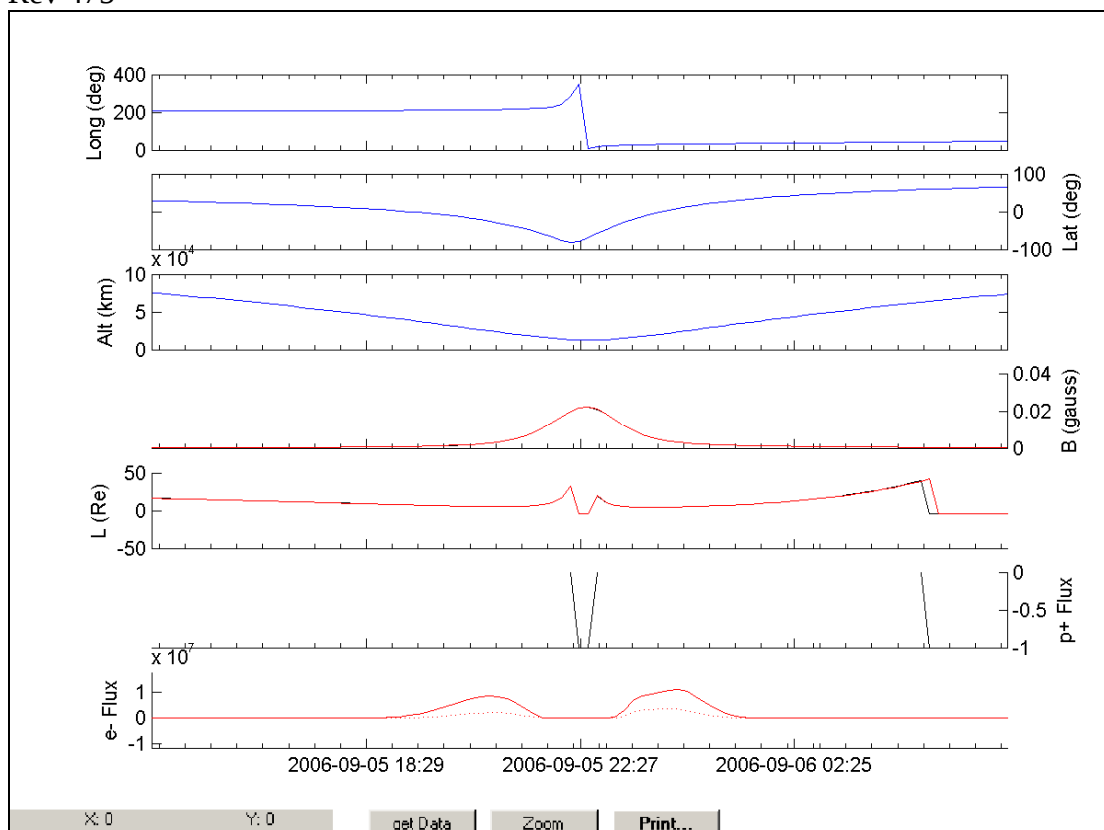


IREM Predicted Radiation Belt Passages:

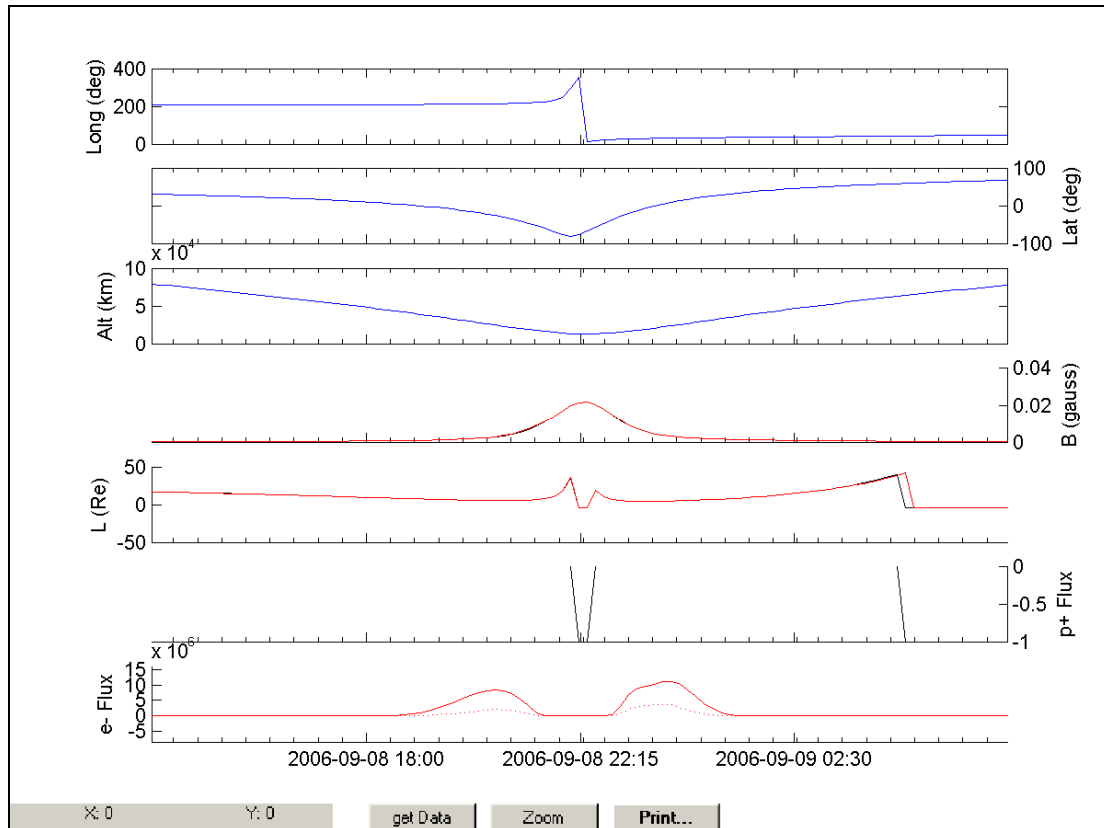
Rev 474



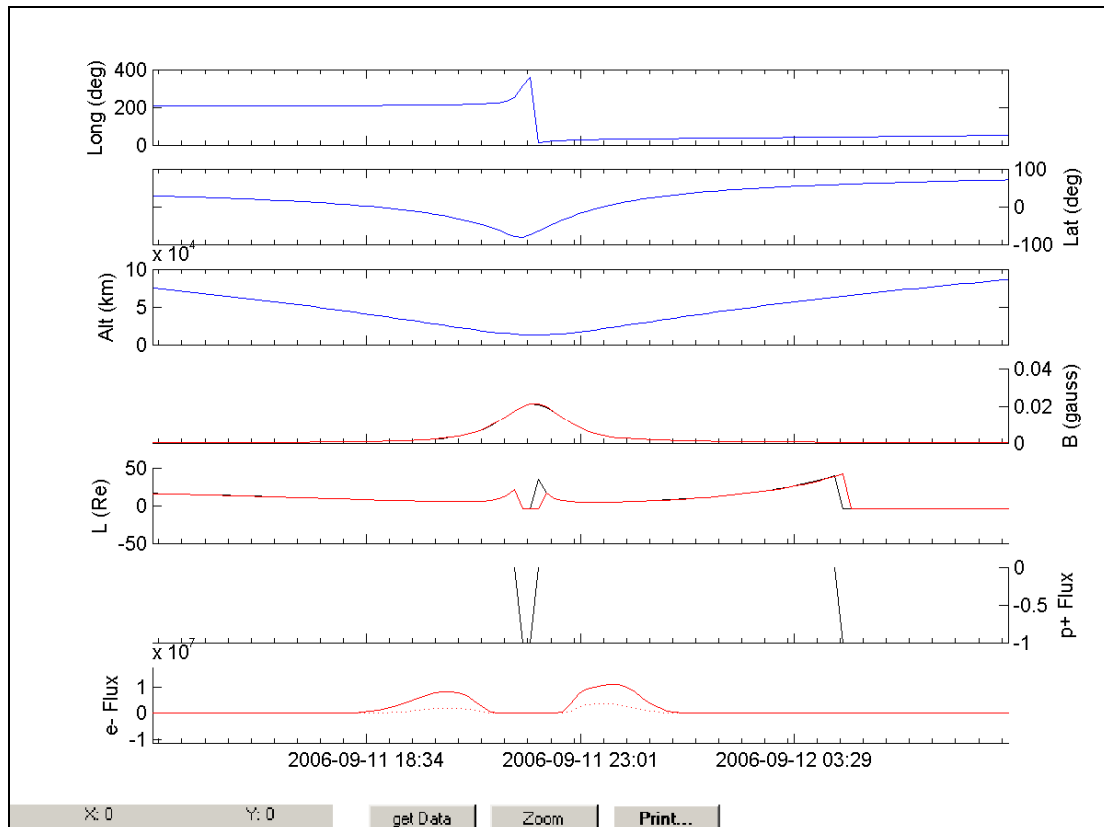
Rev 475



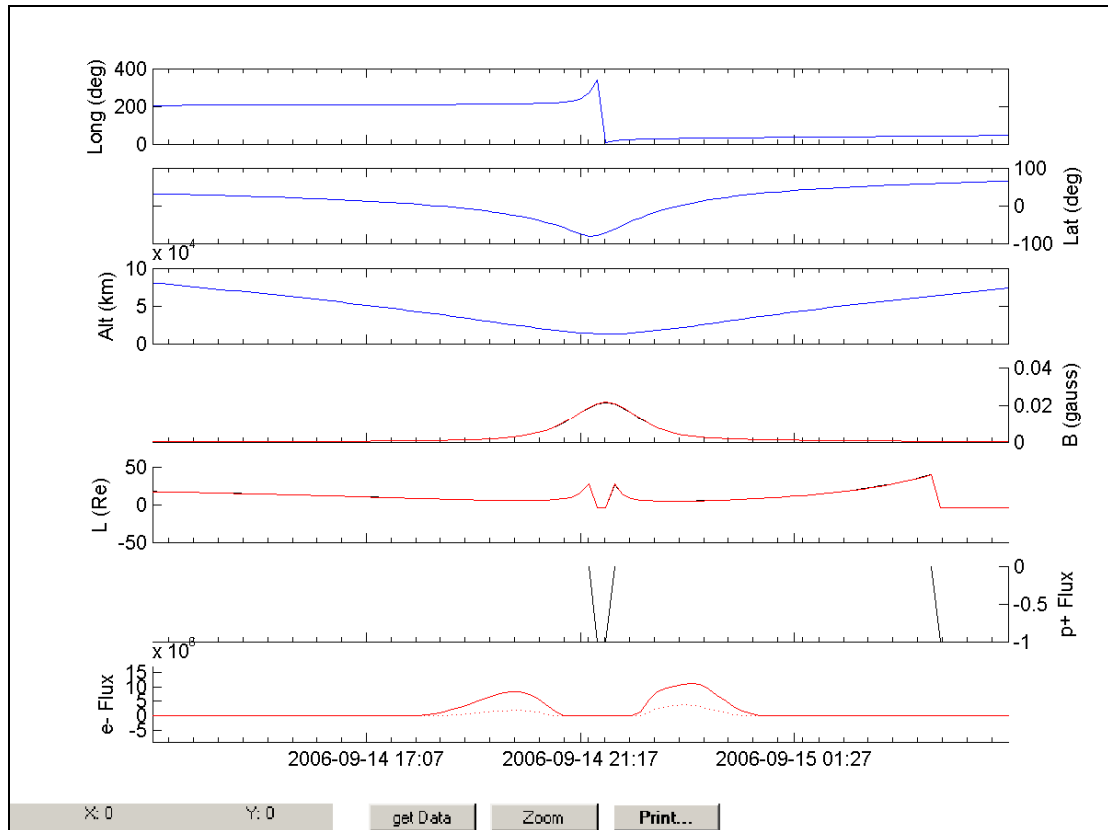
Rev 476



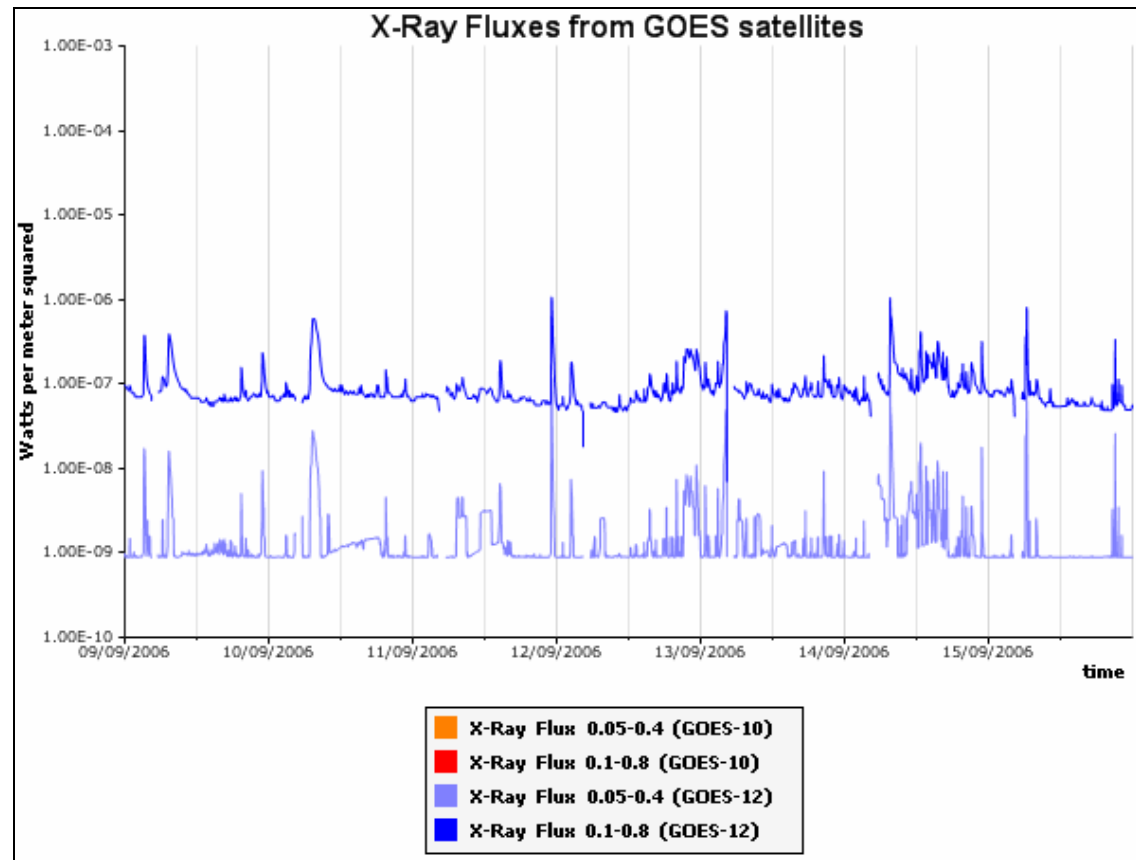
Rev 477



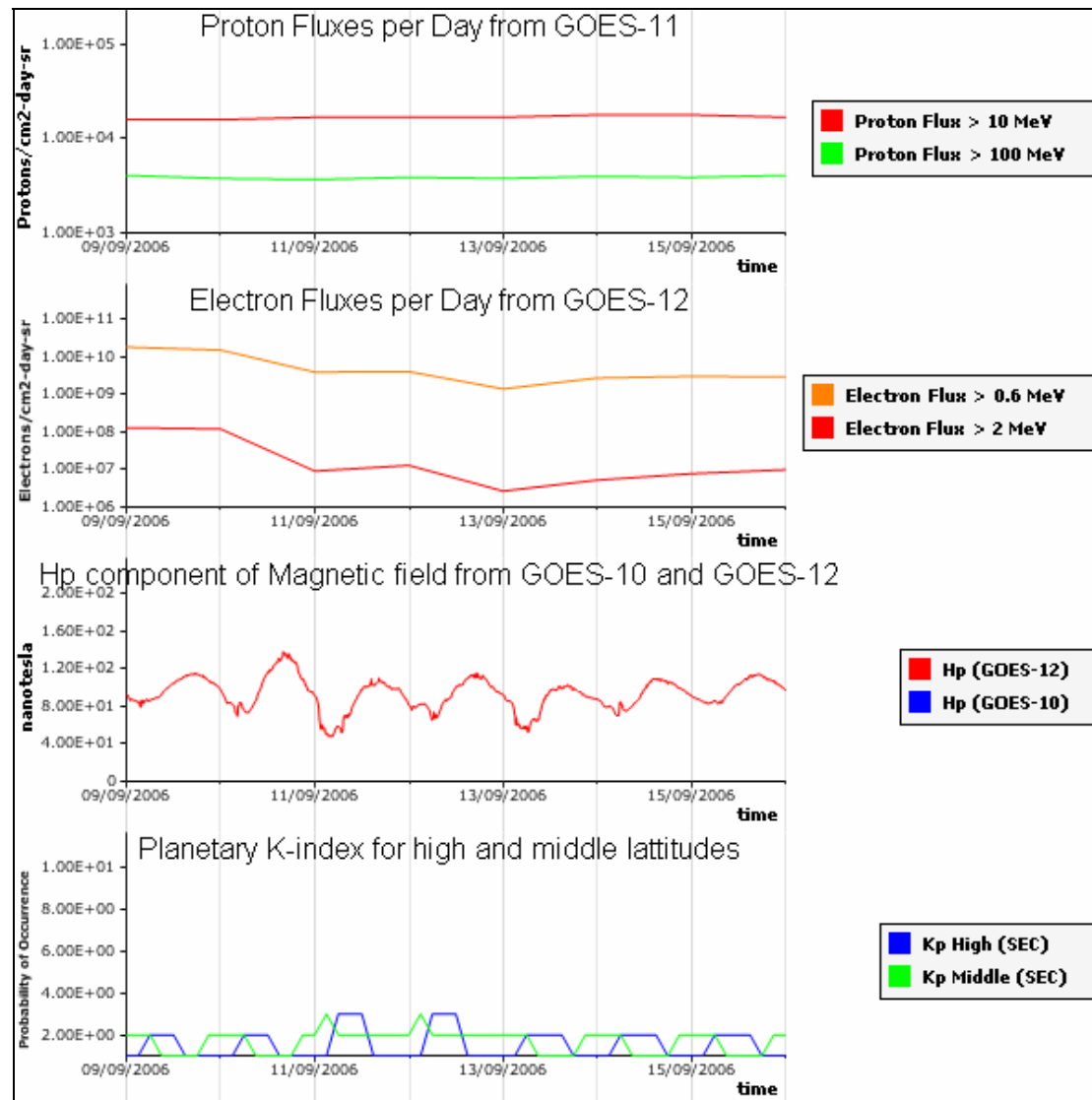
Rev 478



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.