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

INTEGRAL
Mission Report

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

No. 314
Week 39

29.09.08

Routine Phase

Prepared by: M.J.H. Walker (OPS-OAI) and INTEGRAL FCT

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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 20.09.08 until 26.09.08 (both dates inclusive) and covers the revolutions 726 and 727.

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 hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), an OMC Flat-Field calibration, at attitude (RA 19:57:12.00, DEC -22:36:00.0), a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), and a raster dither at attitude (RA 05:34:31.90, DEC +22:00:52.0) part of the Crab calibration dedicated to SPI.

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.

The Eclipse season started with the first eclipse passage on 22/09/2008. The first and second eclipse passages were nominal from an AOCS point of view.

As part of the AOCS preparation for the winter eclipse season, the onboard AMD thresholds were set to their eclipse season values at the end of rev 724. In the same time frame were verified the AMD dead band value, the IMU timers, the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

Four slews were missed from TL, during the observation period due to problem on IMCS.

The fuel consumption over the period between 20/09/2008 and 26/09/2008 was 0.0894 Kg. The remaining propellant is in the order of 138.3898 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.

The PST was over-subscribed by 3 packets, which were allocated to SPI during the Instrument window for the entire reporting period.

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

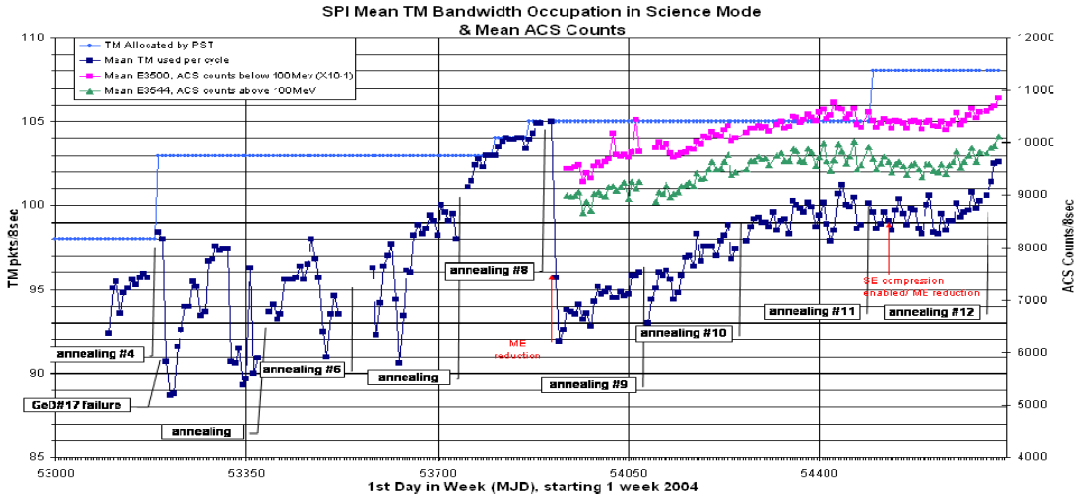
Following the 12th annealing, ended on 04/09/2008 at 23:50Z, the overall status of the gamma-ray spectrometer is nominal, except for detector #2 (failed since 06/12/2003) and detector #17 (failed since 17/07/2004). The energy resolution of the previously degraded GeD#12 has improved following this annealing and the bias of this detector is now set to 4kV as for the other detectors.

The first eclipse of the season occurred on 22-09-2008, at the start of revolution 726. Eclipse operations for SPI were executed nominally.

The Stirling compressors are working nominally. Due to a ground segment anomaly (AR INT-3031) resulting in the stroke of the cryocooler not being increased as required, the Germanium detectors temperature drifted to 82K during the week.

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 108 packets/cycle in revolutions 725 and 726, except from 2008-09-23T05:00:01Z to 2008-09-23T08:50:25Z when it was 88 packets/cycle due to an OMC FFC, and 107 packets/cycle in revolution 727. The average telemetry occupation when the allocation was above 107 packets/cycle was 102.6 packets/cycle.

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



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

3.2.2 IBIS

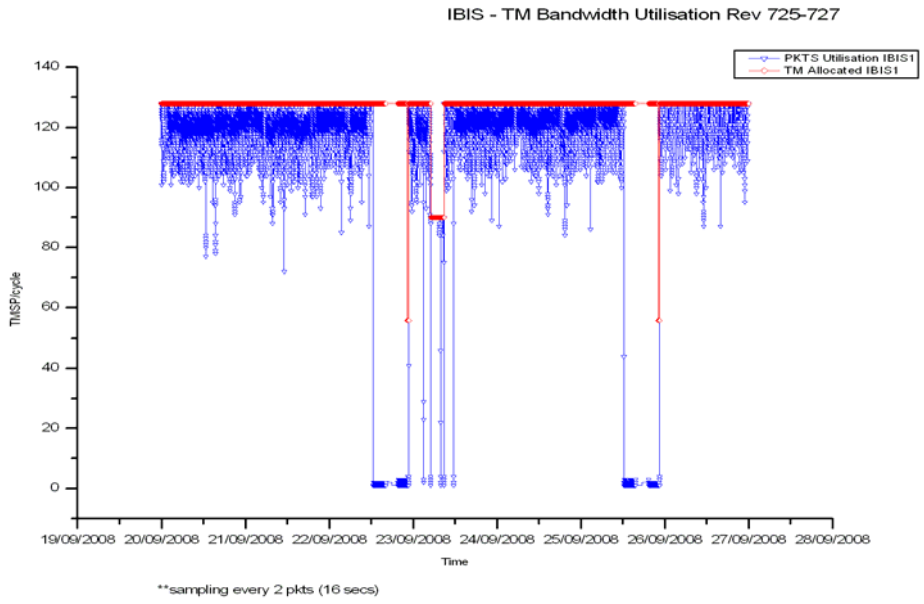
The overall status of the unit is nominal.

The first eclipse of the season occurred on 22-09-2008, at the start of revolution 726. Eclipse operations for IBIS were executed nominally.

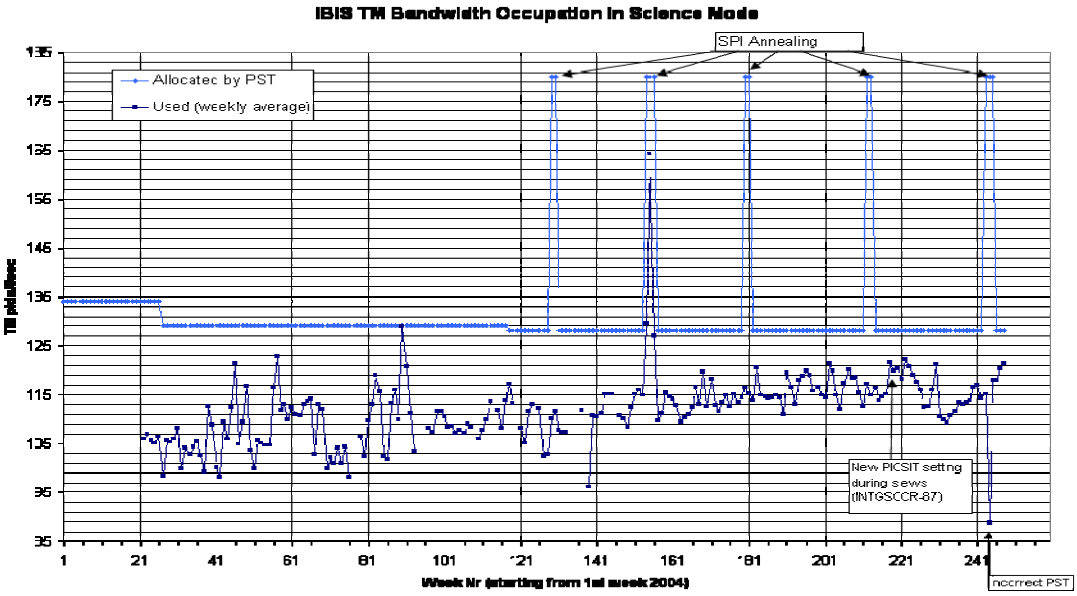
During the reporting period, the TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 128 packets/cycle, except from 2008-09-23T05:00:01Z to 2008-09-23T08:50:25Z when it was 90 packets/cycle due to an OMC FFC.
- IBIS mean bandwidth utilisation in science mode:121.34 packets/cycle (up 0.98 on previous week)
- Percentage of TM cycles in which full bandwidth was used: 26.11%

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



A plot of the IBIS weekly bandwidth utilisation since 2004 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.

During revolutions 725 & 726, JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle. In revolution 727, JEM-X2 was activated in addition, and the allocation was then JEM-X1: 6 packets/cycle and JEM-X2: 4 packets/cycle.

Note: Some more information concerning the JEM-X operations is provided in the Appendix.

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, except from 2008-09-23T05:00:44Z to 2008-09-23T08:51:08Z during the Flat-field calibration, when it was 63 packets/cycle, and during the crab calibration in revolution 727, when only 4 packets/cycle were allocated.

During this reporting period, 160 of the 164 planned science pointings were executed nominally, 1 was executed at the wrong attitude and 3 were lost.

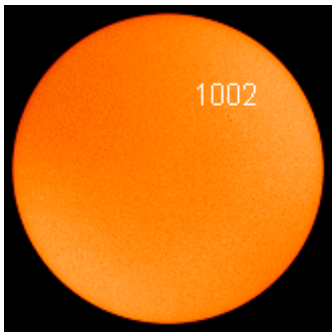
Note: Some more information concerning the OMC operations is provided in the Appendix.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. A small new sun-spot emerged on the 22nd September, but had disappeared by the 24th, the threat of solar flares was very low.



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. Four pointings were lost to ground problems. The overall performance was well above the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. A problem with the Command Verifier and Releaser caused the loss of 4 pointings.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were two short link drops reported from Redu, without impact.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 732 & 733.

Replan of rev 726, because of wrong IBIS GESTAN parameter values during OMC FF observations (proposal was copied from the one during previous SPI annealing).

Revolutions 729 & 730 planned and sent.

New TSFs have been received for revolutions 726-728.

2. Observation status

No new ECS files received.

3. ISOC Science Data Archive

OSA 7 products are only partly available (archive products still are OSA 5). Ingesting will have to wait when rev 3 data is available. Rev 3 processing at ISDC is in progress.

Light curves (to be ingested in the Archive at ESAC) from ISDC processing for certain energy bands can contain zero counts with no errors. The way processing is done at ISDC is thus not flawless. The processing of light curves at Southampton seems more robust. Investigation whether to use these is ongoing.

Install of new ingest software is pending.

ISOC will have a new "KP" numbering scheme from AO-7. Investigations are under way what the impact is on ISDC and on the Archive at ESAC.

MOC will not keep the raw TM after about 6 months. Toulouse seems to have all raw TM. ISOC may want to get raw TM from Toulouse for Archive at ESAC.

4. ISOC system

ISOC system v19.4.1 was released on Sep 22, including fix for amalgamation and 2 other SPRs.

5. Problems

Some problems with receiving (TOO) messages on the duty scientist phone. Under investigation.

4.3.2 ISDC

Status of ISDC observation processing on 29/09/2008:

- Latest Standard Analysis completed: observation 05200320003 (X Per, Revolutions 715-716) on 29/09/2008.

- Latest products archived: observation 05200320003 (X Per, Revolutions 715-716) on 29/09/2008.

- Latest observation products sent to the observer: observation 05297000004 (Perseus OB2 Cloud, Revolutions 706-710) on 13/09/2008.

5 Special Events

6 Anomalies

The following problems were reported this week that impacted operations.

- On DoY 266, at 20:27:56, there was a JEM-X1 DFEE CRC anomaly. Due to other on-going activities, this was not noticed immediately. The unit was recovered at 07:01 the following morning by power cycling the DFEE.
- At 22:35:00, the Command Verifier and Releaser died. This was restarted at 22:40. Problems encountered during the recovery delayed things. The Timeline was eventually rejoined at 02:00 the following morning. The impact was the loss of pointings 07260002, 07260003, 07260004 & 07260005.
- On DoY 269, at 15:31, the IMU health check failed on IMCA, the check was though successfully performed using IMCB. The problem was traced to a missed step in the JEMX-2 activation, when the Time correlation was inadvertently set to system time. There was no impact.

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

AR id	Date Created	Subject	Segment	Status
INT-3027	2008-09-17	Loss of Connectivity to PI WS on PISA LAN	Comms	Pending
INT-3026	2008-09-25	IMU Health Check Could not Execute	IMCS	Pending
INT_SC-236	2008-09-23	JEM-X1 DFEE CRC Anomaly following eclipse on 2008-09-22	Payload	Pending

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 726

The observations in revolution 726 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, They continued with an OMC Flat-Field calibration, which was a staring observation at attitude (RA 19:57:12.00, DEC -22:36:00.0), lasting ~3.4hours. This was followed by a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. Finally, a raster dither of the Galactic Center (RA 17:45:40.03, DEC -29:00:28.1), lasting ~44.5 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 108; JEM-X1 8; JEM-X2 0; OMC 5, except from 2008-09-23T05:00:44Z to 2008-09-23T08:51:08Z during the OMC Flat-field calibration, when it was IBIS 90; SPI 88; JEM-X1 8; JEM-X2 0; OMC 63.

Revolution 727

The observations in revolution 727 were devoted entirely to the Crab calibration for SPI, which was a raster dither at attitude (RA 05:34:31.90, DEC +22:00:52.0), lasting ~56.6 hours.

Throughout these observations, all instruments were in their nominal science modes. The TM allocation was IBIS 128; SPI 107; JEM-X1 6; JEM-X2 4; OMC 4.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2008-09-07T21:18:31.000Z     138.6576    F   Automatic TM processing.
2008-09-09T06:51:31.000Z     138.6108    F   Automatic TM processing.
2008-09-10T21:08:31.000Z     138.6016    F   Automatic TM processing.
2008-09-12T06:38:11.000Z     138.5874    F   Automatic TM processing.
2008-09-13T20:52:39.000Z     138.5780    F   Automatic TM processing.
2008-09-15T06:09:55.000Z     138.5450    F   Automatic TM processing.
2008-09-16T20:41:12.000Z     138.5320    F   Automatic TM processing.
2008-09-18T05:54:03.000Z     138.5122    F   Automatic TM processing.
2008-09-19T14:23:35.000Z     138.4947    F   Automatic TM processing.
2008-09-19T20:43:52.000Z     138.4792    F   Automatic TM processing.
2008-09-21T05:48:19.000Z     138.4475    F   Automatic TM processing.
2008-09-22T21:00:31.000Z     138.4370    F   Automatic TM processing.
2008-09-24T05:38:59.000Z     138.4261    F   Automatic TM processing.
2008-09-25T12:40:34.000Z     138.3998    F   Automatic TM processing.
2008-09-25T20:46:07.000Z     138.3898    F   Automatic TM processing.

This report was generated  Fri Sep 26 08:00:27 GMT 2008
```

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, 20/09/2008 – 26/09/2008

The AOCS operations were executed from the Automatic Timeline.

During this period, 120 Open Loop Slews, 54 Closed Loop Slews and 5 Momentum Biases were executed (as reported by ACC).

4 slews (3 CSL, 1 OSL) were missed from TL, during the observation period due to problem on IMCS (Command Verifier and Releaser Tasks crash).

The OTF was not reached during PID 07260065 due to loss of guide star.

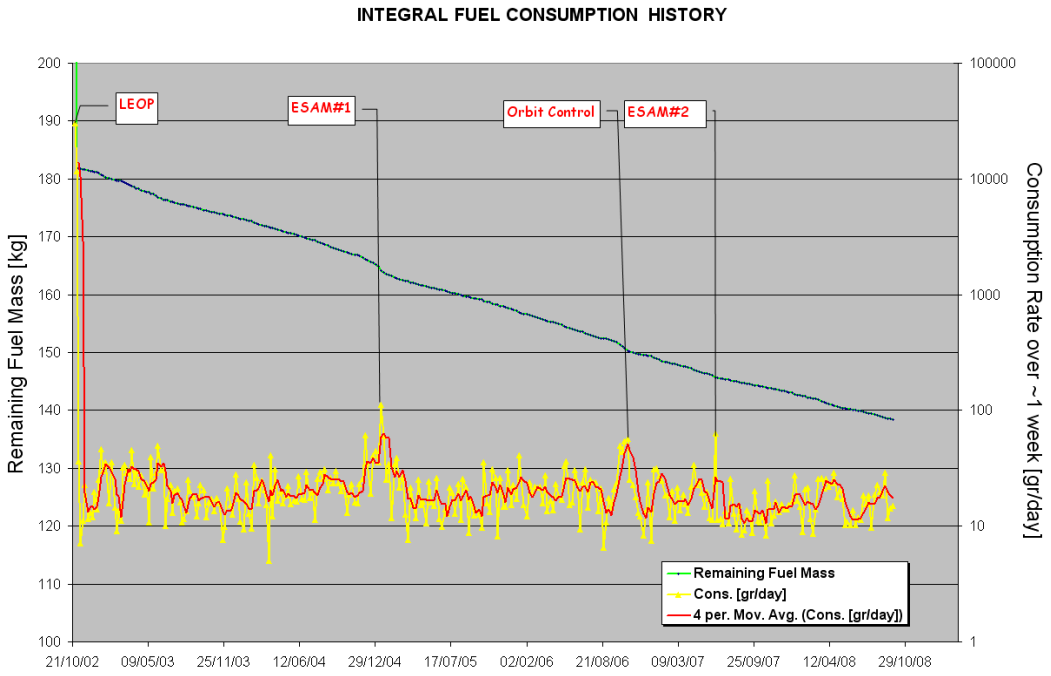
This is equivalent to ~ 2.3 % of the total number of slews planned (174).

Orbit Control

No update

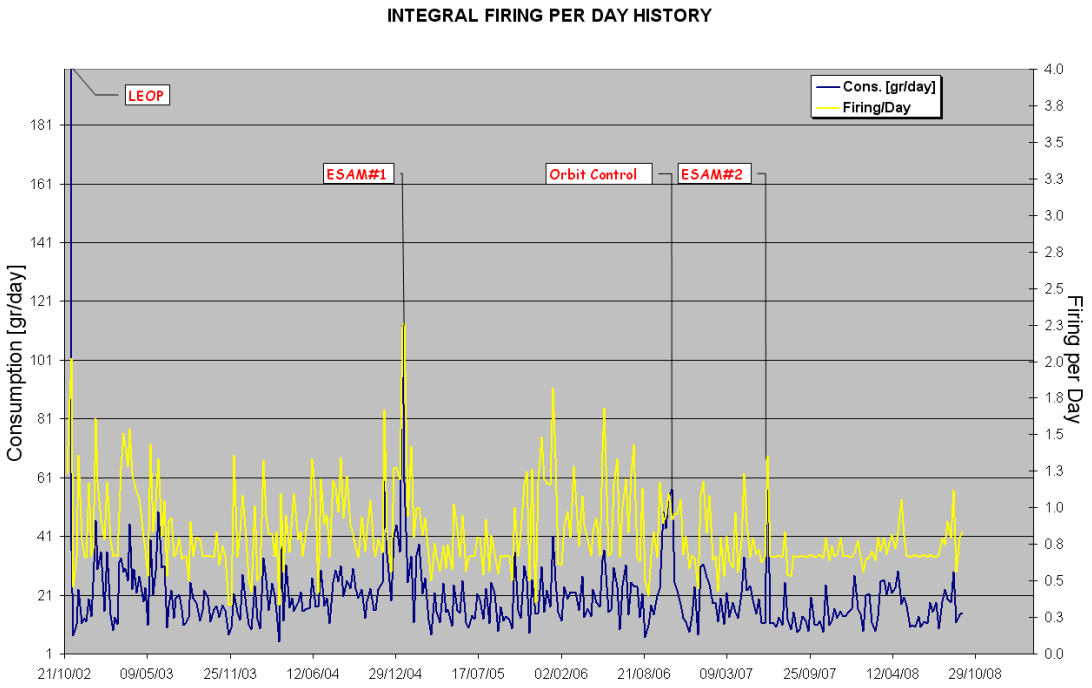
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 26/09/2008 is reported in the plot below.



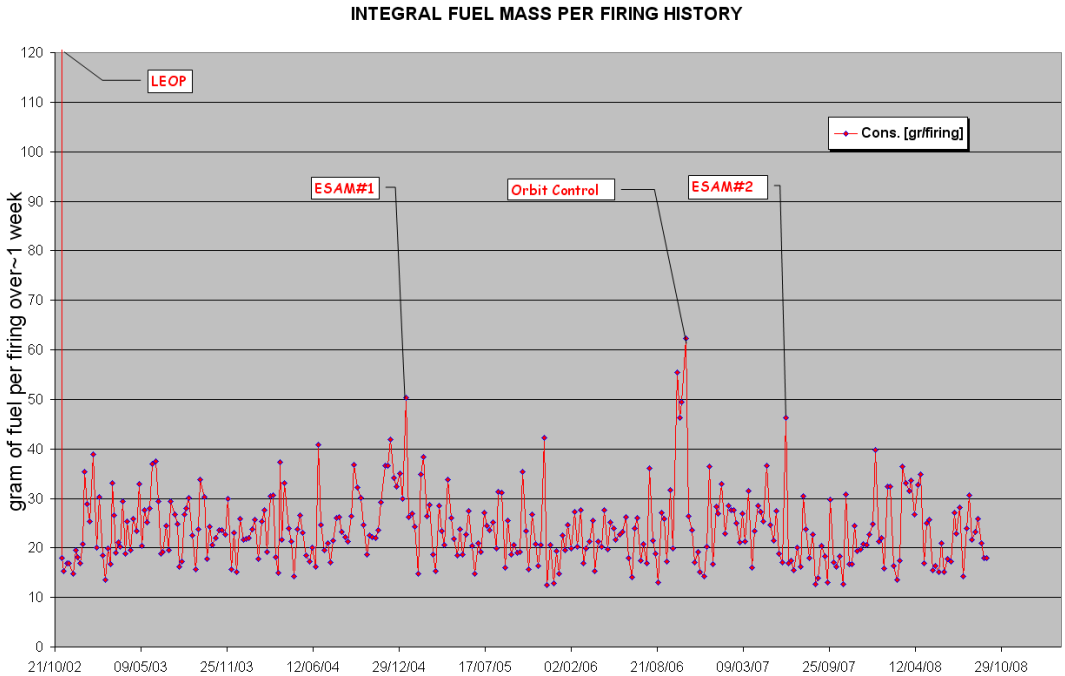
The above plot considers the ESAM fuel consumption spread over period of ~1 week.

The firing per day over the period between 01/11/2002 and 26/09/2008 is reported in the plot below.



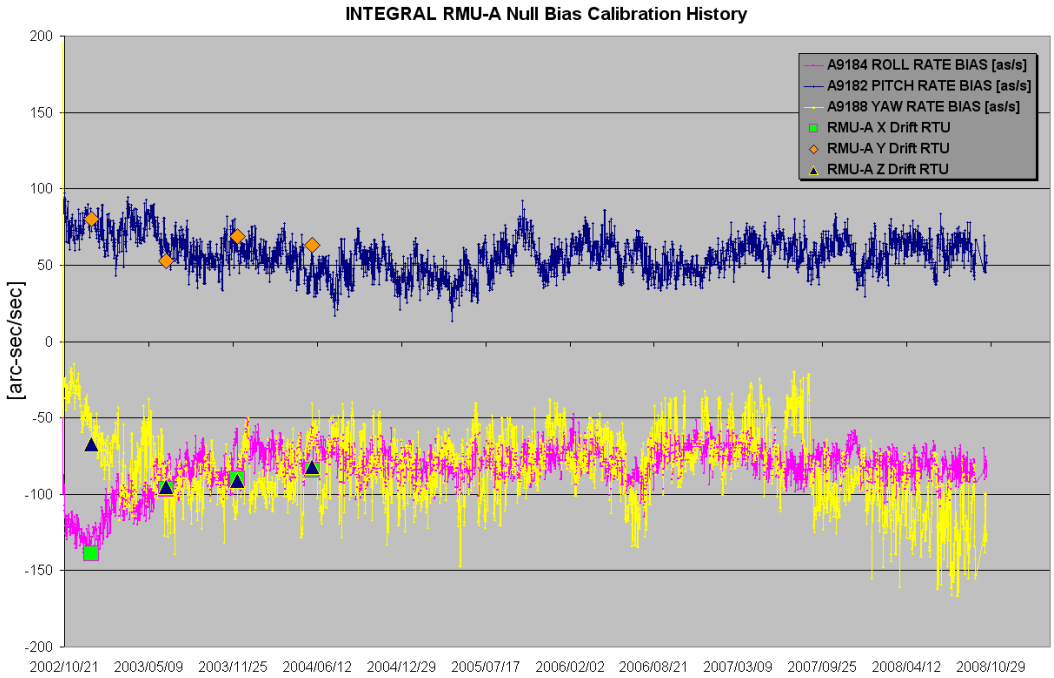
The above plot considers the ESAM fuel consumption spread over period of ~1 week.

The fuel per firing over the period between 01/11/2002 and 26/09/2008 is shown in the plot below.

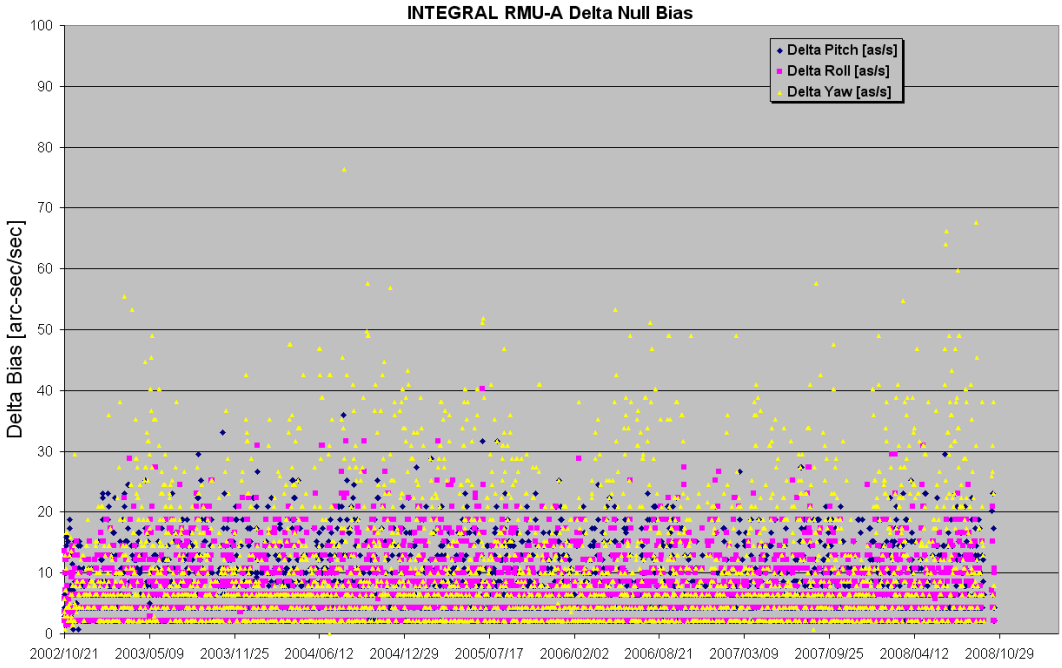


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 17/10/2008 is reported in the plot below.
The evolution of the drift on yaw channel is under constant monitoring but the values are still well within the specs. At moment the current constraints (for drift update generation) on the FDS have been relaxed to cope with the current situation.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over period between 01/11/2002 and 17/10/2008 is reported in the plot below.



20/09/2008 (Day of Year 264, Revolution 725)

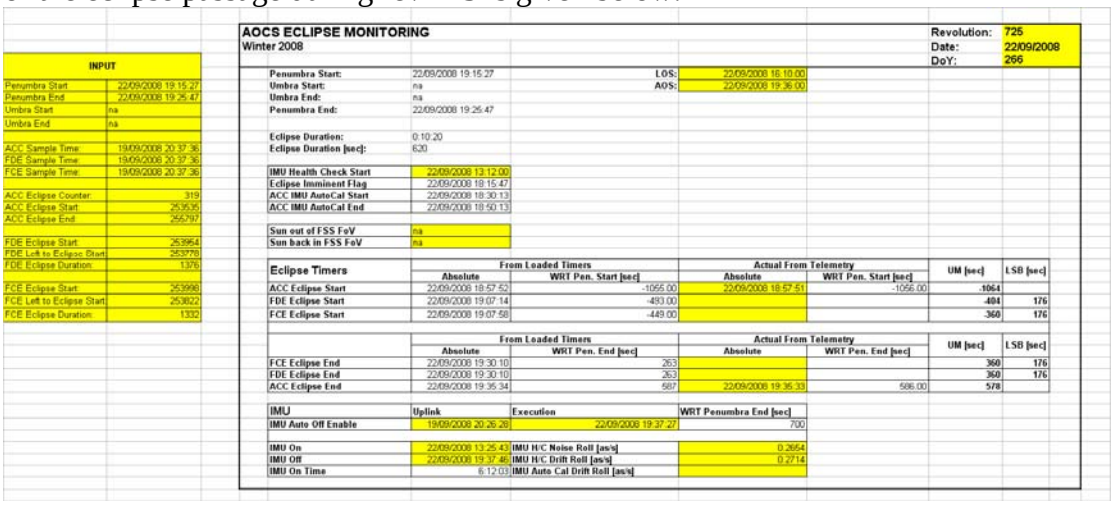
Nothing to report.

21/09/2008 (Day of Year 265, Revolution 725)

Nothing to report.

22/09/2008 (Day of Year 266, Revolution 725-726)

The first eclipse operations were nominal from the AOCS point of view. A summary of the eclipse passage during rev 725 is given below:



AOCS ECLIPSE MONITORING
Winter 2008

Revolution: 725
Date: 22/09/2008
DoY: 266

INPUT

Penumbra Start	22/09/2008 19:15:27
Penumbra End	22/09/2008 19:25:47
Umbra Start	na
Umbra End	na
ACC Sample Time	19/09/2008 20:37:36
FDE Sample Time	19/09/2008 20:37:36
FCE Sample Time	19/09/2008 20:37:36
ACC Eclipse Counter	319
ACC Eclipse Start	263535
ACC Eclipse End	264797
FDE Eclipse Start	263954
FDE Left to Eclipse Start	263778
FDE Eclipse Duration	1376
FCE Eclipse Start	263998
FCE Left to Eclipse Start	263822
FCE Eclipse Duration	1332

Penumbra Start:	22/09/2008 19:15:27	LOS:	22/09/2008 16:10:00
Umbra Start:	na	AOS:	22/09/2008 19:36:00
Umbra End:	na		
Penumbra End:	22/09/2008 19:25:47		
Eclipse Duration:	0:10:20		
Eclipse Duration [sec]:	620		

IMU Health Check Start	22/09/2008 13:12:00
Eclipse Imminent Flag	22/09/2008 18:15:47
ACC IMU AutoCal Start	22/09/2008 18:30:13
ACC IMU AutoCal End	22/09/2008 18:50:13
Sun out of FSS FoV	na
Sun back in FSS FoV	na

Eclipse Timers	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]		
ACC Eclipse Start	22/09/2008 18:57:52	-1055.00	22/09/2008 18:57:51	-1056.00	1064	
FDE Eclipse Start	22/09/2008 19:07:14	-493.00			404	176
FCE Eclipse Start	22/09/2008 19:07:58	-449.00			360	176

	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]		
FCE Eclipse End	22/09/2008 19:30:10	263			360	176
FDE Eclipse End	22/09/2008 19:30:10	263			360	176
ACC Eclipse End	22/09/2008 19:35:34	587	22/09/2008 19:35:33	586.00	578	

IMU	Uplink	Execution	WRT Penumbra End [sec]
IMU Auto Off Enable	19/09/2008 20:26:26	22/09/2008 19:37:27	700

IMU On	22/09/2008 13:25:43	IMU H/C Noise Roll [as/s]	0.2654
IMU Off	22/09/2008 19:37:46	IMU H/C Drift Roll [as/s]	0.2714
IMU On Time	6:12:03	IMU Auto Cal Drift Roll [as/s]	

IMCS problem at Command Verifier and Releaser Tasks: at 22:35z a problem on IMCS Command Verifier and Releaser Tasks caused the slew ID 07250002 to fail release. The AOCS s/s was disabled in TL.

The operator performed a manual mapping and a manual recovery of the failed slew without success. The manually generated slew failed because the TC A3189 Start guide star failed release. FD reported that the command generator selected a star that was already tracked to perform the mentioned CSL.
Several attempts were performed before recovering successfully the schedule, from attitude of PID 07260001 to the attitude of PID 07260005.

The following slews were not executed from TL: 07260002(CSL)-03(CSL)-04(CSL)-05(OSL).

23/09/2008 (Day of Year 267, Revolution 726)

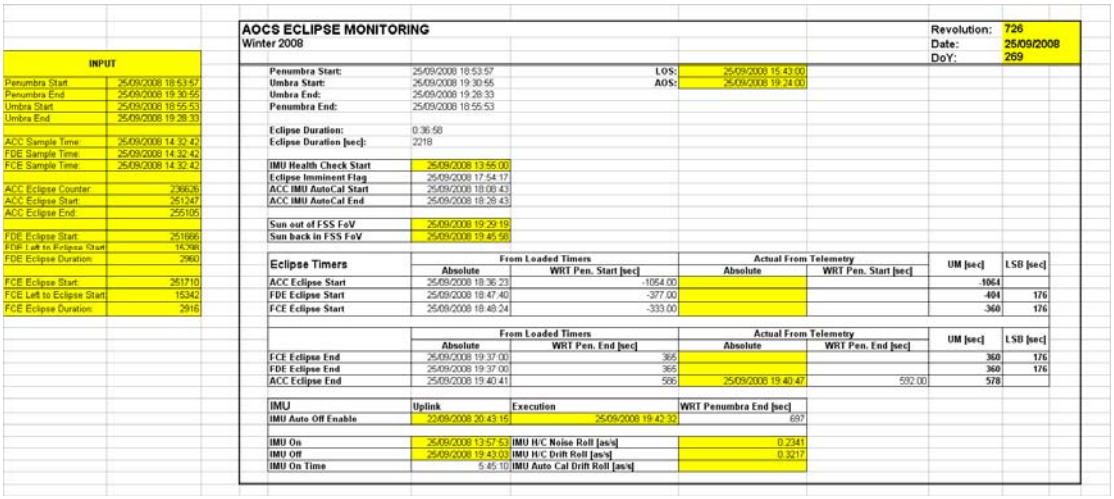
Nothing to report.

24/09/2008 (Day of Year 268, Revolution 726)

Nothing to report.

25/09/2008 (Day of Year 269, Revolution 726-727)

The second eclipse operations were nominal from the AOCS point of view. A summary of the eclipse passage during rev 726 is given below:



INPUT	
Penumbra Start	25/09/2008 18:53:57
Penumbra End	25/09/2008 19:30:55
Umbra Start	25/09/2008 18:55:53
Umbra End	25/09/2008 19:28:33
ACC Sample Time	25/09/2008 14:32:42
FDE Sample Time	25/09/2008 14:32:42
FCE Sample Time	25/09/2008 14:32:42
ACC Eclipse Counter	236626
ACC Eclipse Start	251247
ACC Eclipse End	255105
FDE Eclipse Start	251666
FDE Left to Eclipse Start	14398
FDE Eclipse Duration	2960
FCE Eclipse Start	251710
FCE Left to Eclipse Start	15342
FCE Eclipse Duration	2916

AOCS ECLIPSE MONITORING
Winter 2008

Revolution: 726
Date: 25/09/2008
DoY: 269

Penumbra Start:	25/09/2008 18:53:57	LOS:	25/09/2008 15:43:00
Umbra Start:	25/09/2008 19:30:55	AOS:	25/09/2008 19:24:00
Umbra End:	25/09/2008 19:28:33		
Penumbra End:	25/09/2008 18:55:53		
Eclipse Duration:	0:36:58		
Eclipse Duration [sec]:	2218		

IMU Health Check Start	25/09/2008 13:55:00
Eclipse Imminent Flag	25/09/2008 17:54:17
ACC IMU AutoCal Start	25/09/2008 18:00:43
ACC IMU AutoCal End	25/09/2008 18:28:43
Sun out of FSS FoV	25/09/2008 19:29:19
Sun back in FSS FoV	25/09/2008 19:45:58

Eclipse Timers	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]		
ACC Eclipse Start	25/09/2008 18:36:23	-1054.00			-1064	
FDE Eclipse Start	25/09/2008 18:47:40	-377.00			-404	176
FCE Eclipse Start	25/09/2008 18:48:24	-333.00			-360	176

	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]		
FCE Eclipse End	25/09/2008 19:37:00	365			360	176
FDE Eclipse End	25/09/2008 19:37:00	365			360	176
ACC Eclipse End	25/09/2008 19:40:41	586	25/09/2008 19:40:47	592.00	578	

IMU	Uplink	Execution	WRT Penumbra End [sec]
IMU Auto Off Enable	25/09/2008 20:43:15	25/09/2008 19:42:32	697

IMU On	25/09/2008 13:57:53	IMU H/C Noise Roll [as/s]	0.2341
IMU Off	25/09/2008 19:43:03	IMU H/C Drift Roll [as/s]	0.3217
IMU On Time	5:45:10	IMU Auto Cal Drift Roll [as/s]	

Loss of guide star: at 11:40z a loss of the current guide star occurred. As foreseen by the IPS logic, the IMU1 went on until a new guide star picked.

The operator performed a manual mapping and the next slew was manually updated in TL.

The OTF was not reached during PID 07260065.

No impact on TL.

26/09/2008 (Day of Year 270, Revolution 727)

FDS problem during slew update: at 10:00z a problem on FDS caused the slew update to fail for slew ID 07270022. The AOCS s/s was disabled in TL and FD engineer called in.

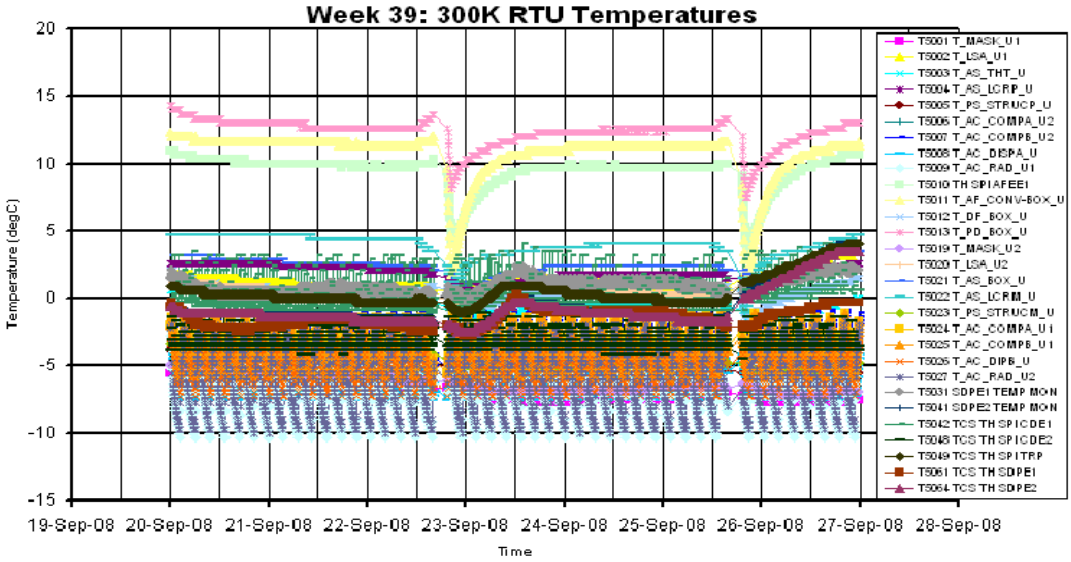
FD system reported not enough stars matched between the star catalogue and the STR TM. The FD engineer on-call assessed the status of wheels speeds profiles and authorized the execution of the next slew (OSL) without performing the update of the slew parameters.

The same problem re-occurred at 16:35z with the same resolution.

No impact on TL.

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.

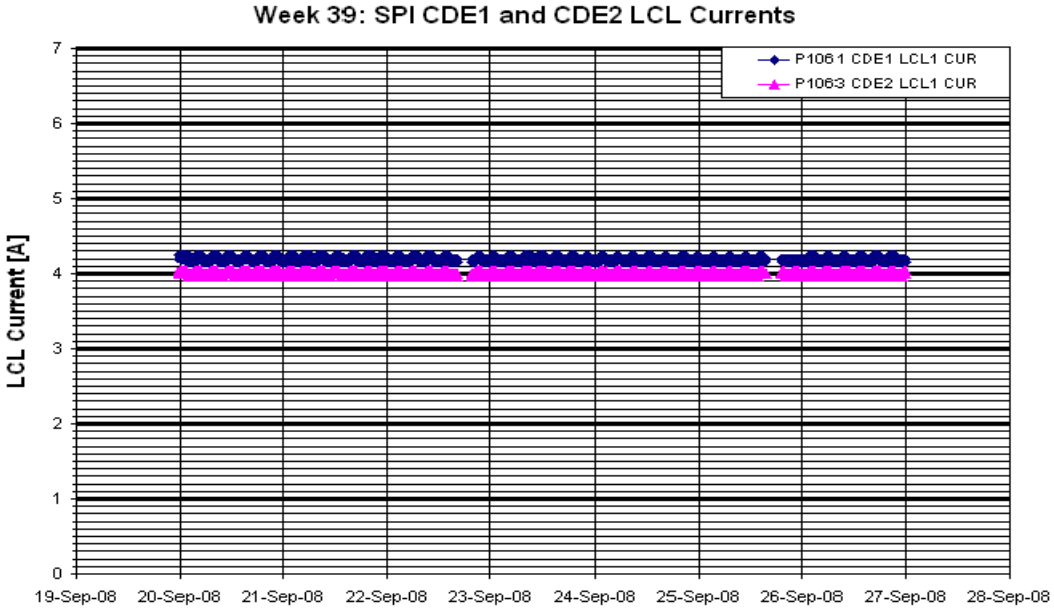


Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature exceeded the range 80K +/-1K during the week, reaching 81.9K at the end of the week. This was due to an incorrect setting on the Mission Control System, resulting in a lack of Out of Limit alarms which would normally have triggered an increase of the cryocooler strokes. This is detailed in Anomaly Report INT-3031.

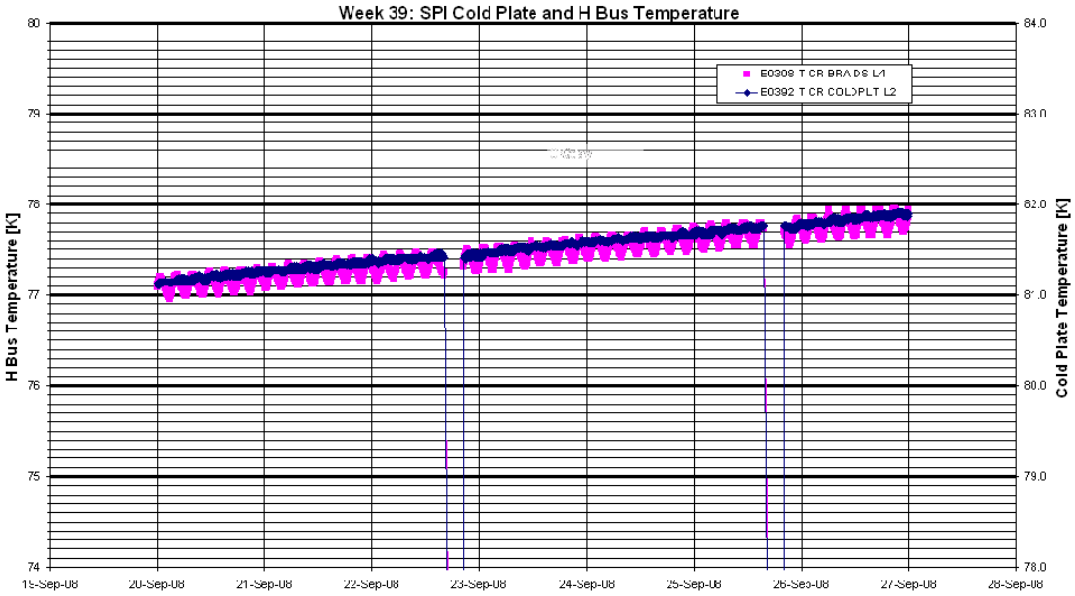
The stroke of all four compressors was set to 37 throughout the week. The average CDE LCL currents were as follows:

- CDE1 LCL Current = 4.19A
- CDE2 LCL Current = 3.99A

The following plot shows the evolution of the CDE LCL currents during the reporting period.



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 are nominal.

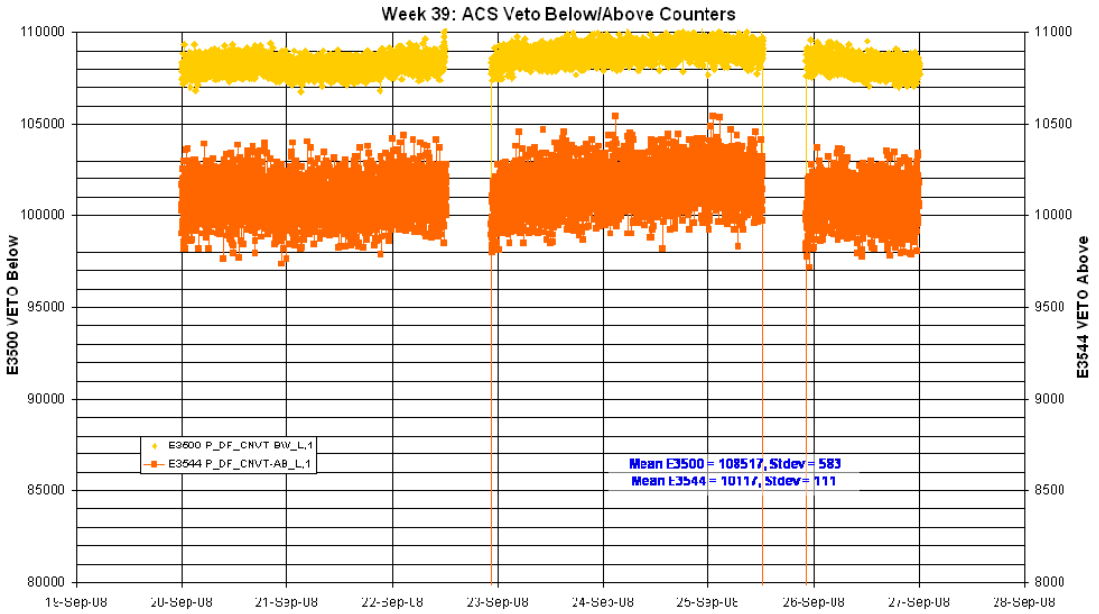
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE.

The average TM bandwidth occupation of SPI was 102.6 packets/cycle over the science window when the TM allocation was above 107 packets/cycle.

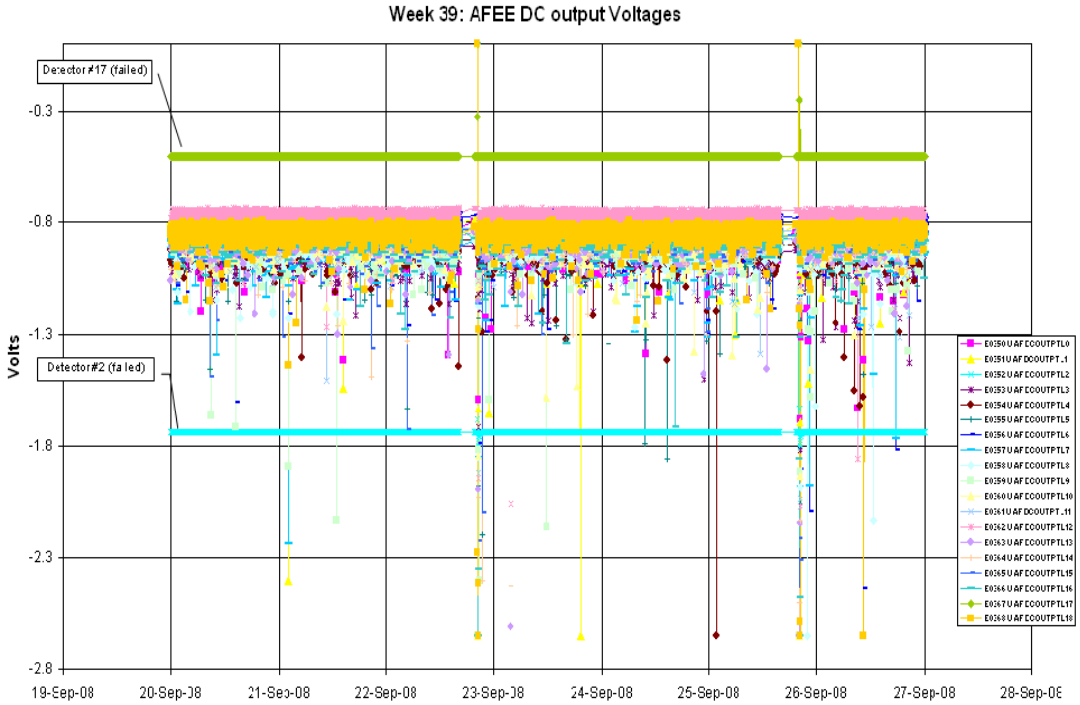
The following plot shows the IASW performance in terms of TM bandwidth occupation and DPE CPU load during the reporting period.

ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

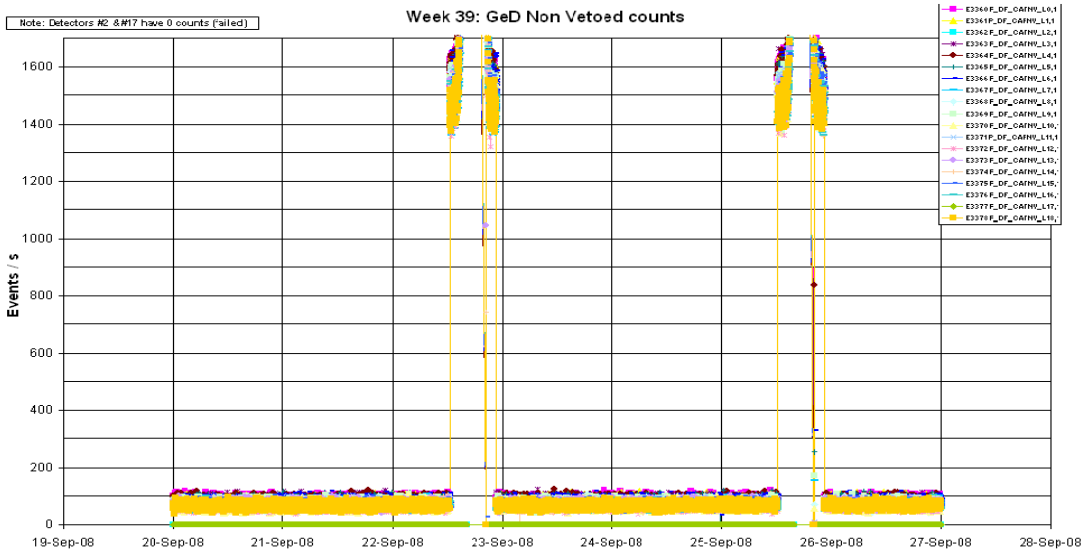
The following plot shows the ACS overall count rate evolution during the reporting period:

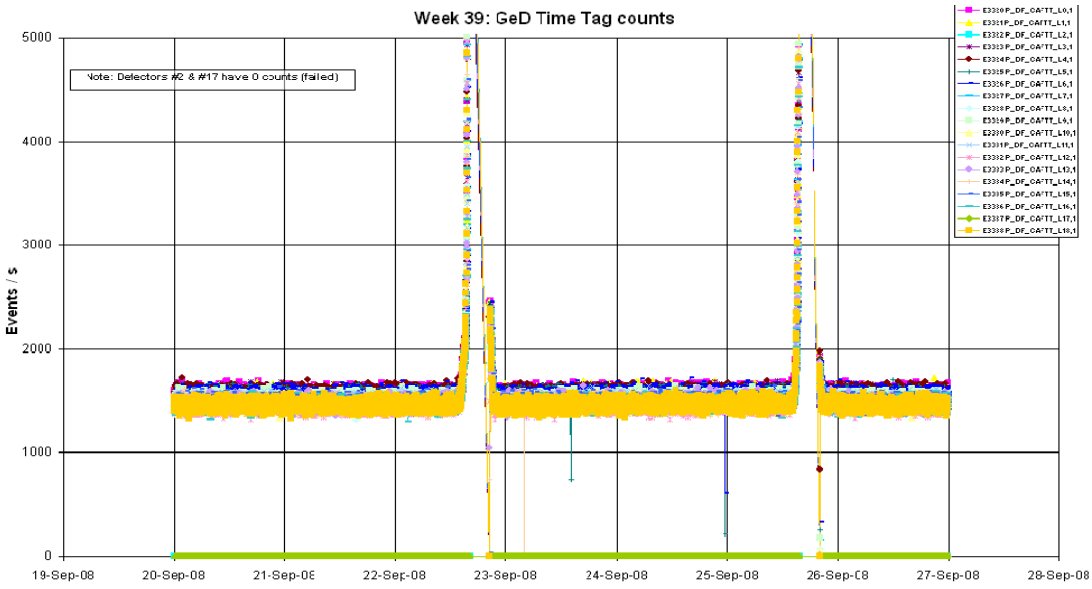


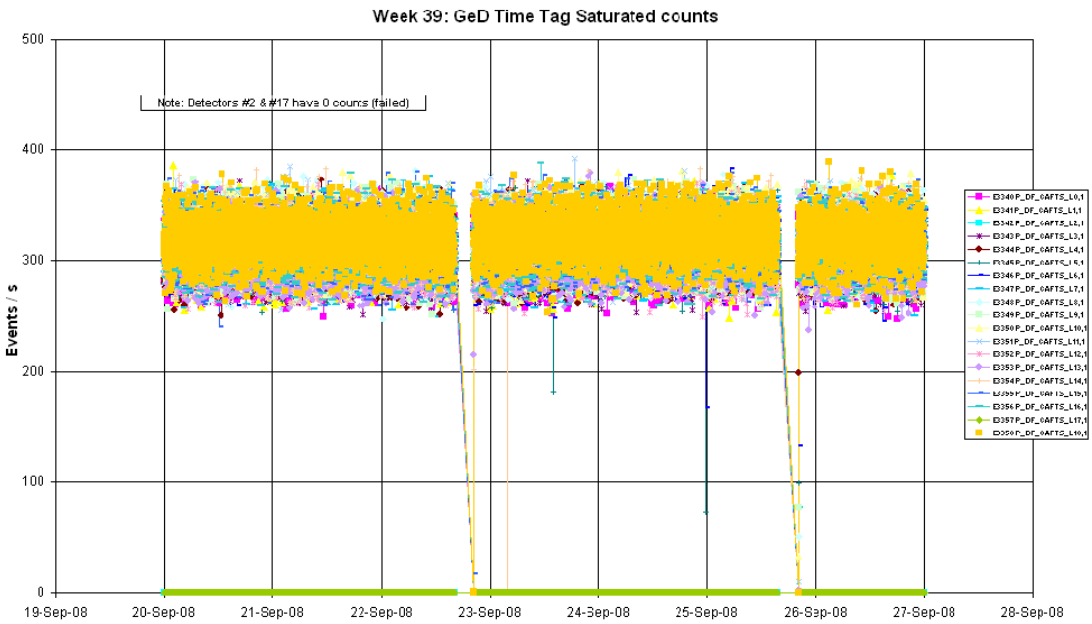
AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003 and detector #17 is failed since 17/07/2004.



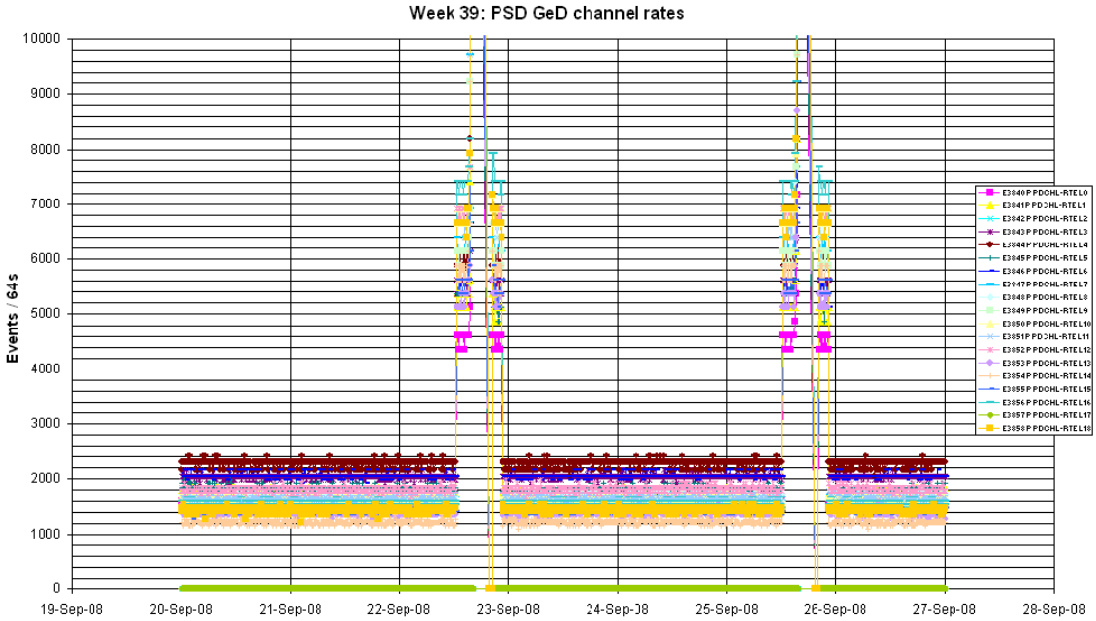
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period.


Week 39: GeD Non Vetoed counts
Note: Detectors #2 &#17 have 0 counts (failed)
Events / s
0
200
400
600
800
1000
1200
1400
1600
19-Sep-08
20-Sep-08
21-Sep-08
22-Sep-08
23-Sep-08
24-Sep-08
25-Sep-08
26-Sep-08
27-Sep-08
28-Sep-08


Week 39: GeD Time Tag counts
Note: Detectors #2 & #17 have 0 counts (failed)
Events / s
0
1000
2000
3000
4000
5000
19-Sep-08
20-Sep-08
21-Sep-08
22-Sep-08
23-Sep-08
24-Sep-08
25-Sep-08
26-Sep-08
27-Sep-08
28-Sep-08


Week 39: GeD Time Tag Saturated counts
Note: Detectors #2 & #17 have 0 counts (failed)
Events / s
0
100
200
300
400
500
19-Sep-08
20-Sep-08
21-Sep-08
22-Sep-08
23-Sep-08
24-Sep-08
25-Sep-08
26-Sep-08
27-Sep-08
28-Sep-08

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



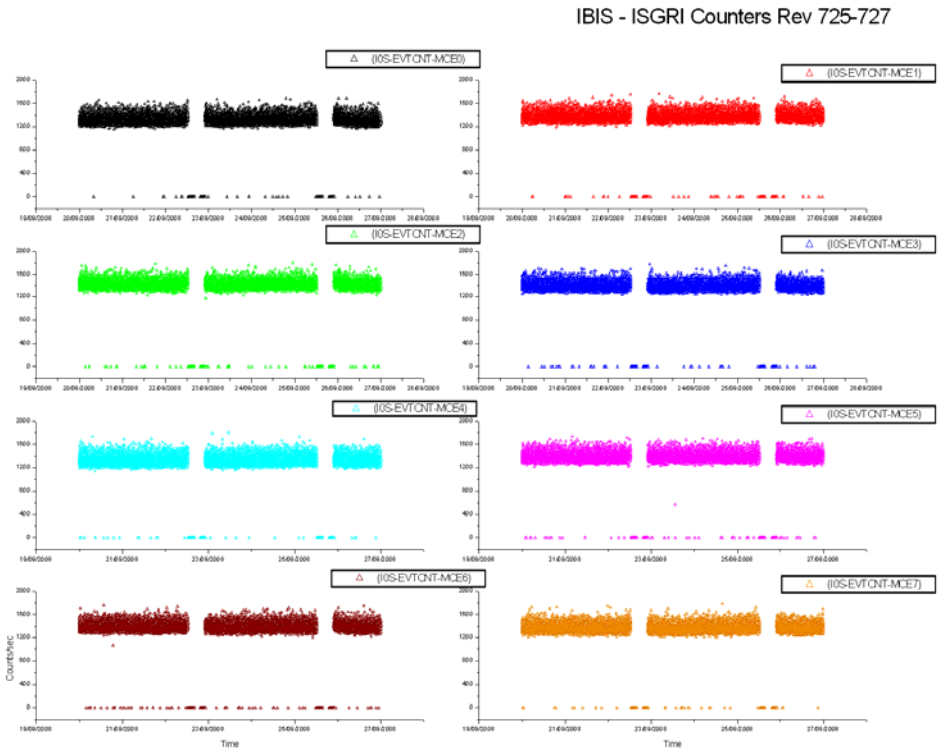
Event Log:

Other than Anomaly INT-3031 reported above, no non-nominal events occurred on SPI over the reporting period.

8.3.3 IBIS Operations

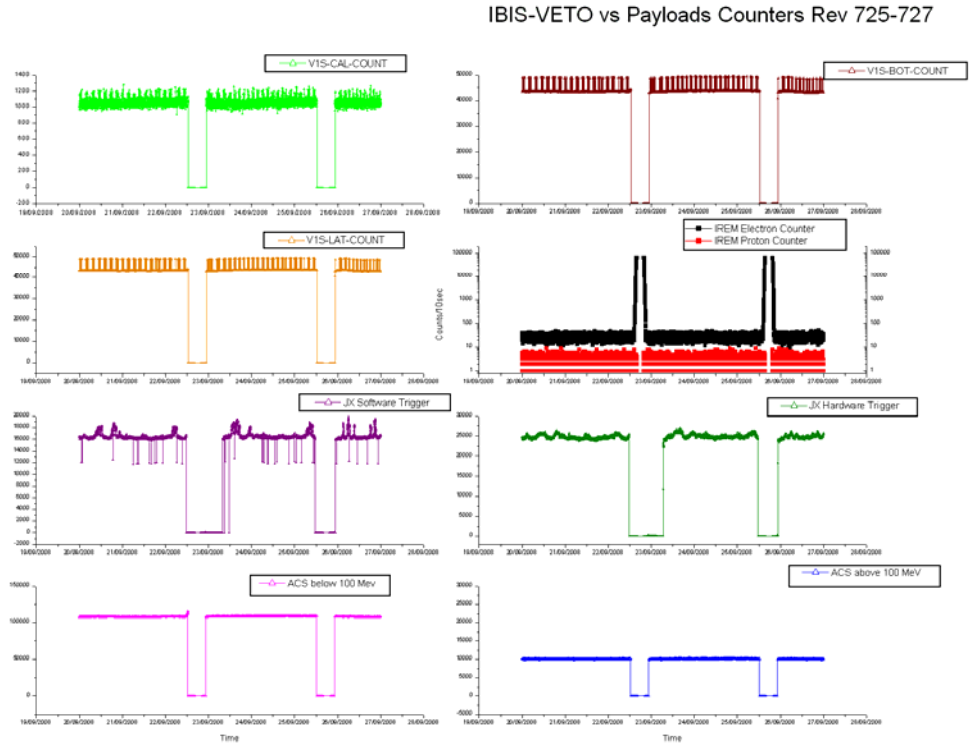
IBIS Event Counters Plots

ISGRI Counters:



**sampling every 4 pkts (32 secs)

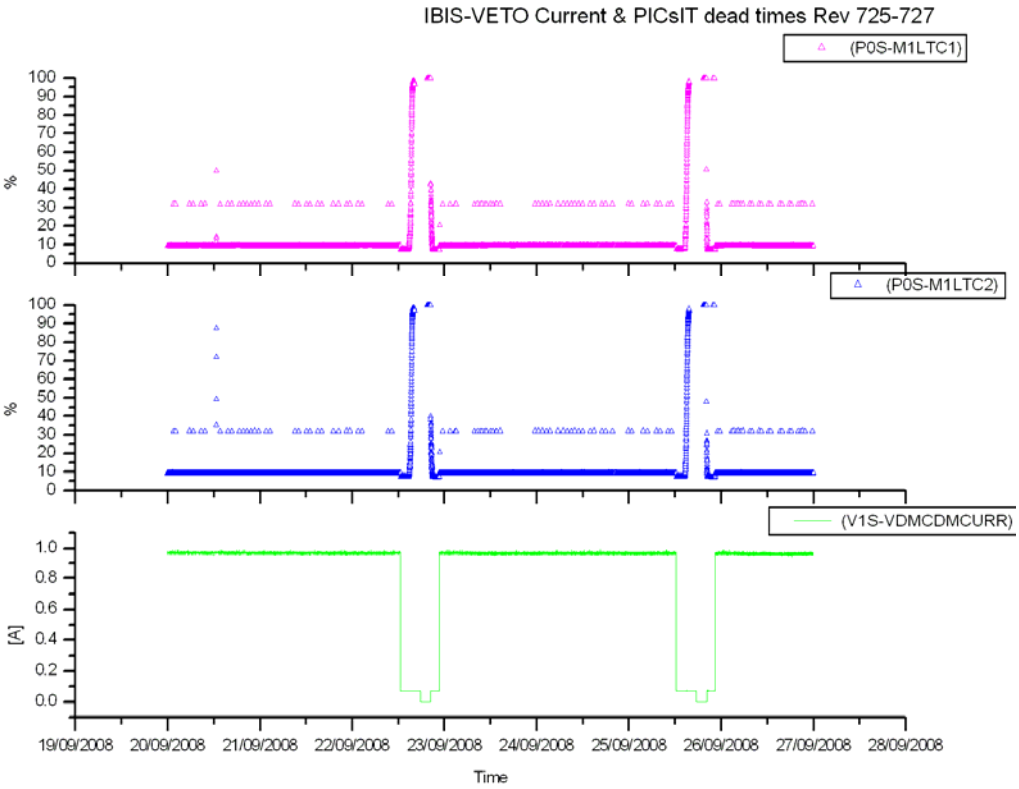
VETO vs Payload Counters:



**with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec sampling every 5 pkts (40 sec)

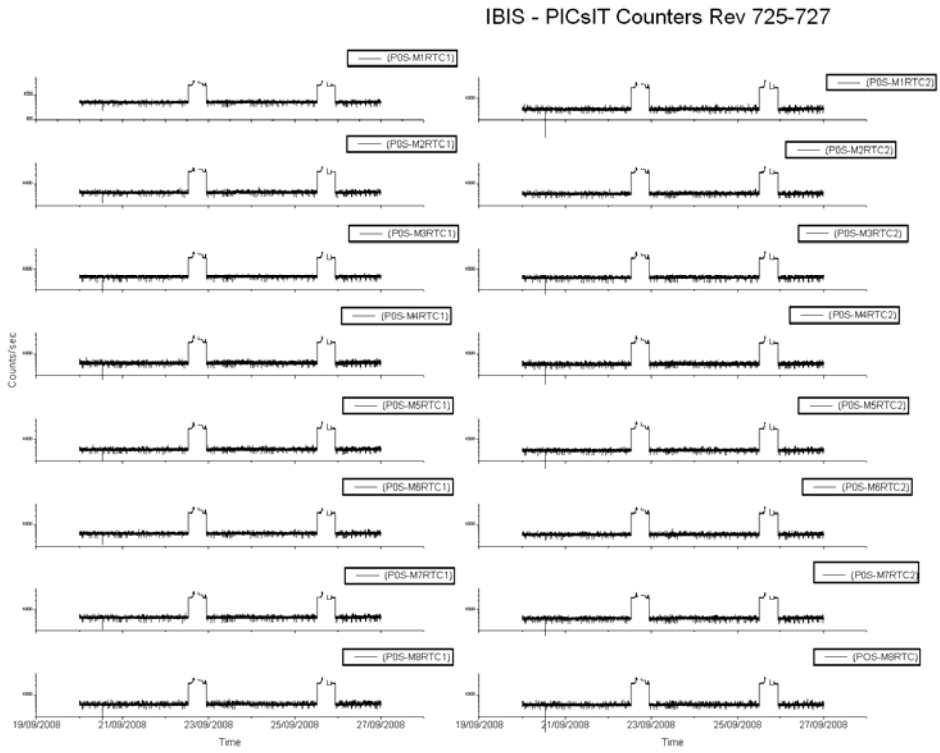
The week was characterised by low radiation as reported by the payload.

VETO Current:



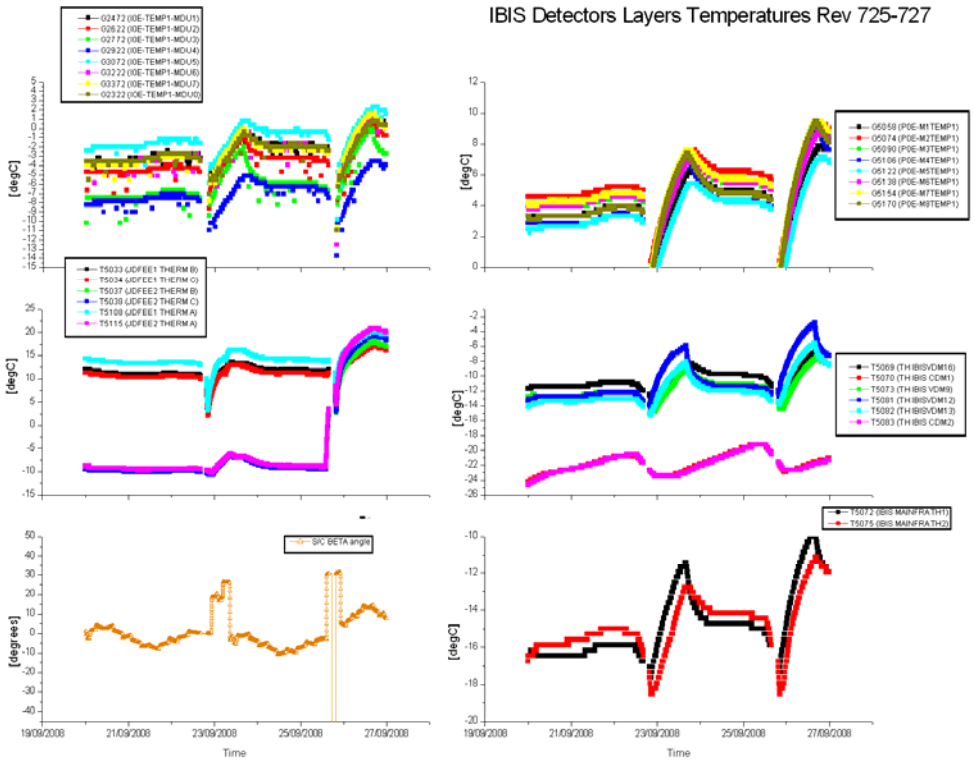
**sampling every 4 pkts (32 secs)

PICsIT Counters:



**sampling every 4 pkts (32 secs)

IBIS Detectors Layers Temperatures:



**sampling every 8 pkts (64 secs)

IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2) families and G2000 family (I0E-OVFWPXADD-Mi) were received during the radiation belt passages.

2008-09-20 (DOY 264, Rev 725)

At 12:42:36Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. As they had all returned within limits by 12:44:11Z, no action was taken.

2008-09-21 (DOY 265, Rev 725)

IBIS operations executed nominally.

2008-09-22 (DOY 266, Rev 725-726)

Due to a crash of the command verifier task of the IMCS, the ED GESTAN02 scheduled at 22:47:17Z partially failed verification, although the commands were all released and actually executed onboard. When the system was recovered, CCCFs were enabled to ensure the correct configuration of the instruments and therefore the CCCF_ED GESTAN02 was uplinked from the Timeline on 2008-09-23 at 03:01:59Z.

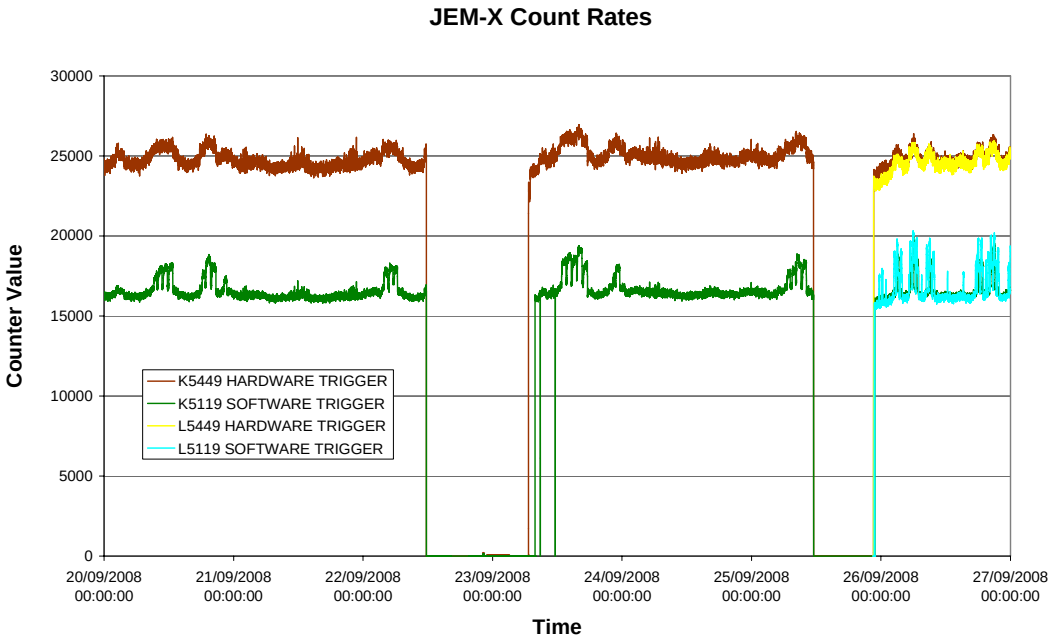
2008-09-23 (DOY 267, Rev 726) to 2008-09-26 (DOY 270, Rev 727)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

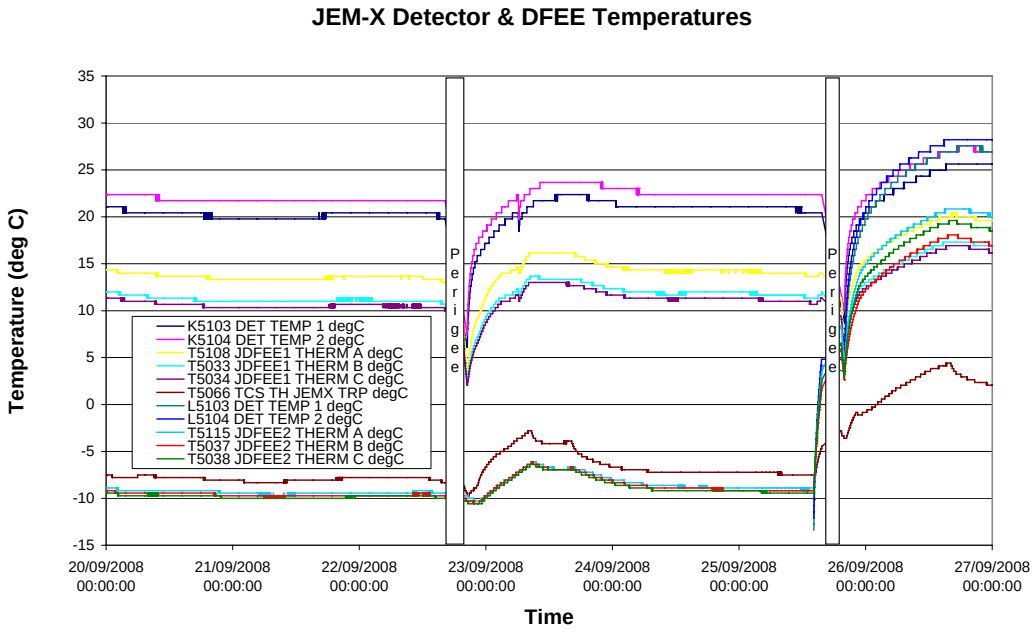
JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph[1].



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 graph[2].



[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

2008-09-20 (DoY 264, Rev 725) to 2008-09-21 (DoY 265, Rev 725)

JEM-X 1 operations executed nominally.

2008-09-22 (DoY 266, Rev 725-726)

At 20:27:56, during the post-eclipse reconfiguration of JEM-X1 following the 1st eclipse of this season, another DFEE anomaly occurred like those observed on 2004-06-20, 2004-06-23, 2004-12-08; 2005-05-18; 2005-11-14; 2006-10-26; 2007-04-30 and 2007-11-01 (ref: Anomaly Reports INT_SC-84; INT_SC-104; INT_SC-119; INT_SC-131; INT_SC-161; INT_SC-187 and INT_SC-209).

The symptoms were as follows:
1) The following OEMs were received after the JEM-X1 DFEE was switched on by the ED KECLEX01 in the Timeline (up-linked at 2008-09-22T20:27:15Z):

```
2008.266.20.27.56.330   2008.266.20.28.02.815   1536   RealTime   191    EVENT     JEM-X1
PROB       DFEE       11         0          0  65535        PR  N         E         E
  FIX6                     11
  K9079     MESS                          CLASS                                    0
  K9080     MESS                                                 ID              191
  FIX16                                                                          8
  FIX16                                                                          0
```

>> Indicating that the operation “Load DFEE context” was unsuccessful due to CRC failure of the area B000 (hex) to CFFF (hex).

```
2008.266.20.27.56.330   2008.266.20.28.02.831   1536   RealTime   234    EVENT     JEM-X1
AUTO       EVENT      4         0          0  65535        PR  N         E         E
  FIX6                     4
  K9079     MESS                           CLASS                                   0
  K9080     MESS                                                 ID              234
  K5419     ACTUAL                       LEVEL                                ECLIPSE
  K5420     TARGET                        LEVEL                                  RAD.
```

>>> Indicating failure of the automatic recovery from shutdown level ECLIPSE to shutdown level RAD. BELTS

2) Following the KECLEX01 ED, the JEM-X1 DFEE state (TM parameter K5022) remained MEMORY, instead of SAFE, and the Active Shutdown Level (TM parameter K5381) remained ECLIPSE instead of RAD. BELTS.

3) The DFEE CPU speed, TM parameter K5583 CPU MODE, remained at a value of 8 MHz WAIT (as at start-up) rather than the nominal value of 16MHz.

This event was not seen immediately, and the Timeline continued to run. A crash of the Command Verifier and subsequent recovery halted the Timeline.

The first attempt to recover the situation was at 02:09Z, to resend the KEHVAC01 ED, which failed. The unit was then SAFEd at 03:03Z.

2008-09-23 (DoY 267, Rev 726)

To recover the JEM-X1, a DFEE power cycle was then performed the following day according to CRP_JEM1_5010 JEMX1 DFEE POWER CYCLE, consisting of:
- 06:06Z FCP_JEM1_5010 JEMX1 DFEE power cycle
- 06:33Z As part of this procedure the HV was switched on at this time.
- 07:01Z JEMX re-enabled in T/L, and CCCFs activated.
- 07:52Z KEDATA02 up-linked from the Timeline.

2008-09-24 (DoY 268, Rev 726)

On this day, the following two anomalous OEMs were received:

```
2008.268.20.13.02.059   2008.268.20.13.06.201   1536   RealTime   5        EXCEPTION
JEM-X1 EXC IACS INTERF EXID                              0       0    65535   PR    N
E   E
    FIX6                                          0
    K9079          MESS CLASS                     1
    K9080          MESS ID                        5
    K9065          CSSW OPERAT ID                 START
    K9066          TASK ID 8                      IASW
    K9067          LOGICAL ADDRESS                4989
2008.268.20.13.02.059   2008.268.20.13.06.219   1536   RealTime   6        EXCEPTION
JEM-X1 EXC IACS INTERF CULP                              0       0    65535   PR    N
E   E
    FIX6                                          0
    K9079          MESS CLASS                     1
    K9080          MESS ID                        6
    K9065          CSSW OPERAT ID                 START
    K9066          TASK ID 8                      IASW
    K9067          LOGICAL ADDRESS                19726
```

No action was taken and there was no impact.

2008-09-25 (DoY 269, Rev 726-727)

At 12:30 operations to re-activate JEMX-2 began. First, the ED DEBWHI00 to assign bandwidth to JEM-X2 was up-linked. This was followed by FCP_JEM2_0010 to activate the DPE & CSSW. The other procedures followed were FCP_JEM2_0015 JEMX2 IASW Activation, FCP_JEM2_0016 JEMX2 Enable BCP Distribution, FCP_JEM2_0017 JEMX IASW Extended TM Check, FCP_JEM2_0020 JEMX2 DFEE 1st Activation After DPE Switch, FCP_JEM2_0120 JEMX2 Set BCP Overrides, FCP_JEM2_0040 JEMX2 Transition To Safe, The activity was completed at 15:30, and the unit left in SAFE mode until the next revolution.

At 20:10, parameter L5102 was showing outside lower soft limit. From 20:13 to 00:21 the following day, parameter L5101 was showing intermittently outside lower soft limit. This is a known ‘warm-up’ effect and no action was taken

2008-09-26 (DoY 270, Rev 727)

From 01:27 to 01:59, parameter L5102 was showing intermittently outside lower soft limit. No action was taken.

8.3.5 OMC Operations

2008-09-20 (DoY 264, Rev 725) to 2008-09-21 (DoY 265, Rev 725)

Nothing to report.

2008-09-22 (DoY 266, Rev 725)

At 22:35, and Command Verifier & Releaser died. During the recovery further problems were encountered with the AOCS. The timeline was eventually rejoined at 02:00. The impact was pointing 07260002 was executed at the wrong attitude, and pointings 07260003, 07260004 & 07260005 were lost.

2008-09-23 (DoY 267, Rev 726)

From 05:00:17 to 07:52:13, a Flat-field calibration was performed nominally. This was followed from 07:52:43 to 08:24:23 by a Dark current calibration, also performed nominally.

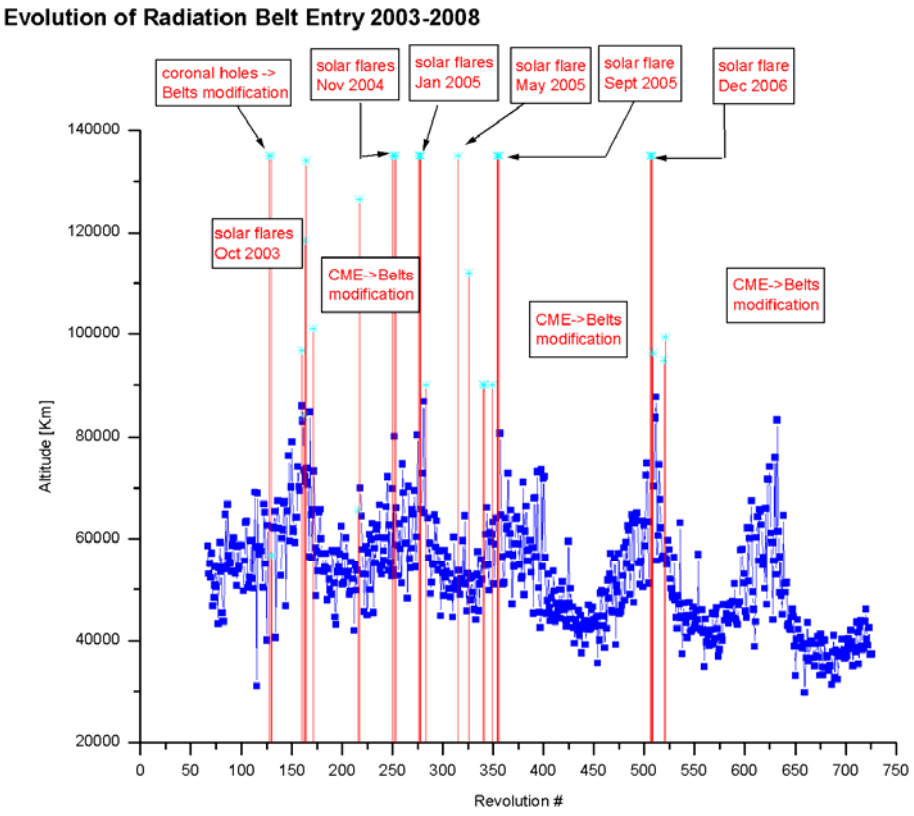
2008-09-24 (DoY 268, Rev 726) to 2008-09-26 (DoY 270, Rev 727)

Nothing to report.

On DoY 266 at 12:37:53 and DoY 269 at 12:23:53 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

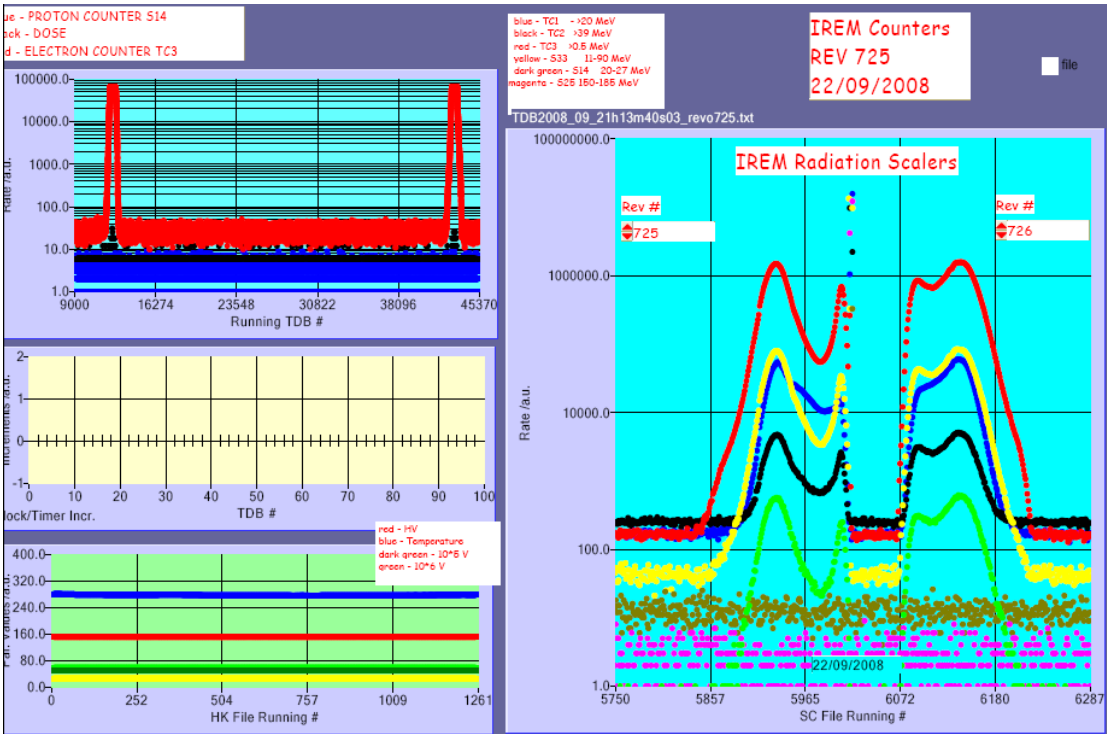
Nothing to report.

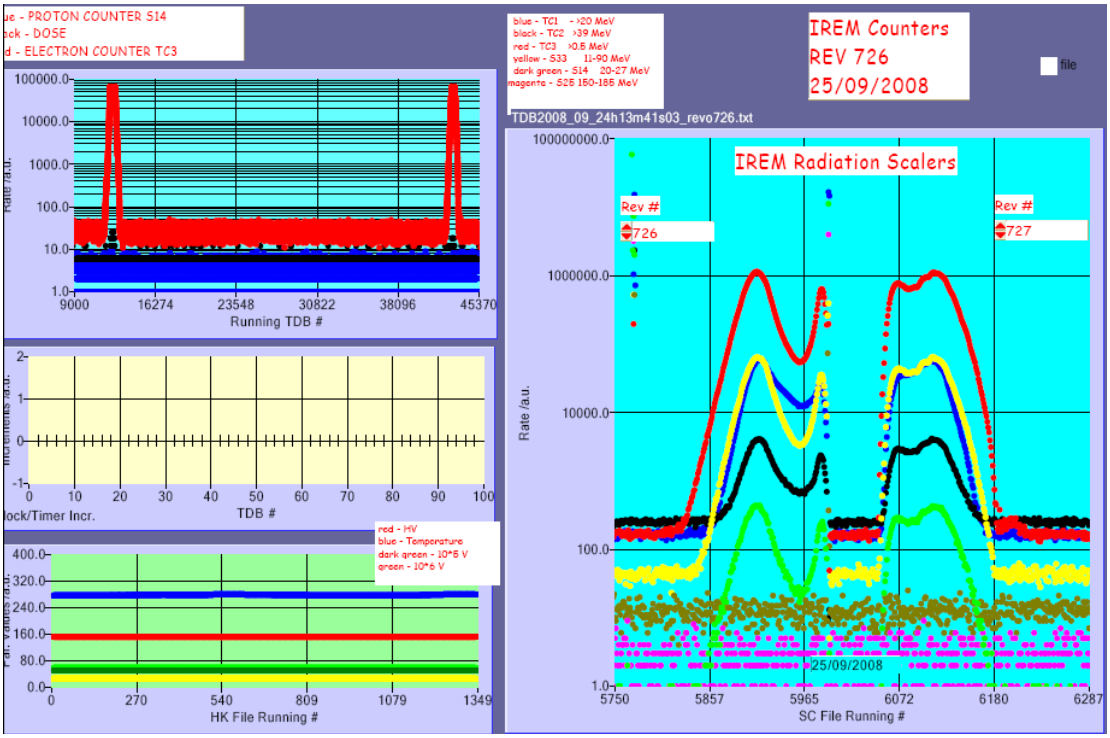
Electron Belts

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]
725	RAD_ENTR R 2008-09-22T12:37:51Z	22/09/2008 14:40:48	37287.6	22-Sep-2008 14:42:11	38599.53
726	RAD_EXIT R 2008-09-22T22:30:56Z	22/09/2008 20:57:44	38529.0	22-Sep-2008 21:52:11	46327.47
726	RAD_ENTR R 2008-09-25T12:23:52Z	25/09/2008 14:28:17	37402.2	25-Sep-2008 14:39:31	37490.46
727	RAD_EXIT R 2008-09-25T22:17:14Z	25/09/2008 20:33:28	36884.1	25-Sep-2008 21:39:31	45741.52

Reference
High radiation
Very small error vs reference (less than 10 minutes)
Small error vs reference (between 10 and 30 minutes)
Large error vs reference (more than 30 minutes)
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

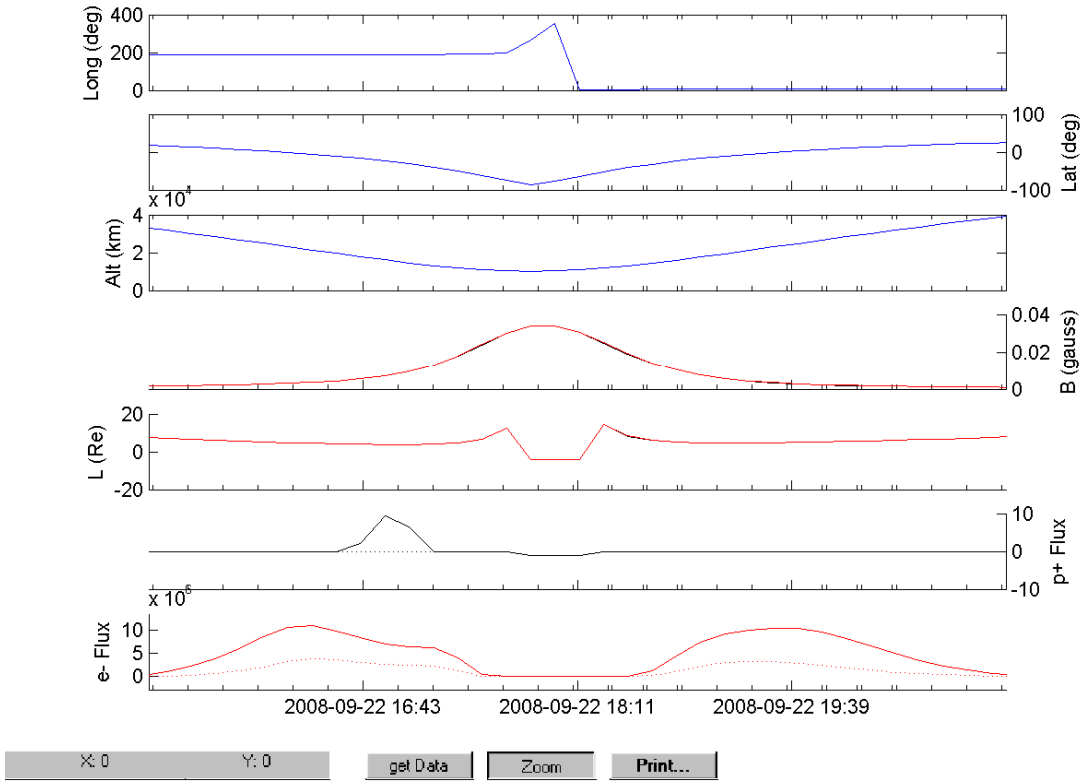
IREM radiation counters:



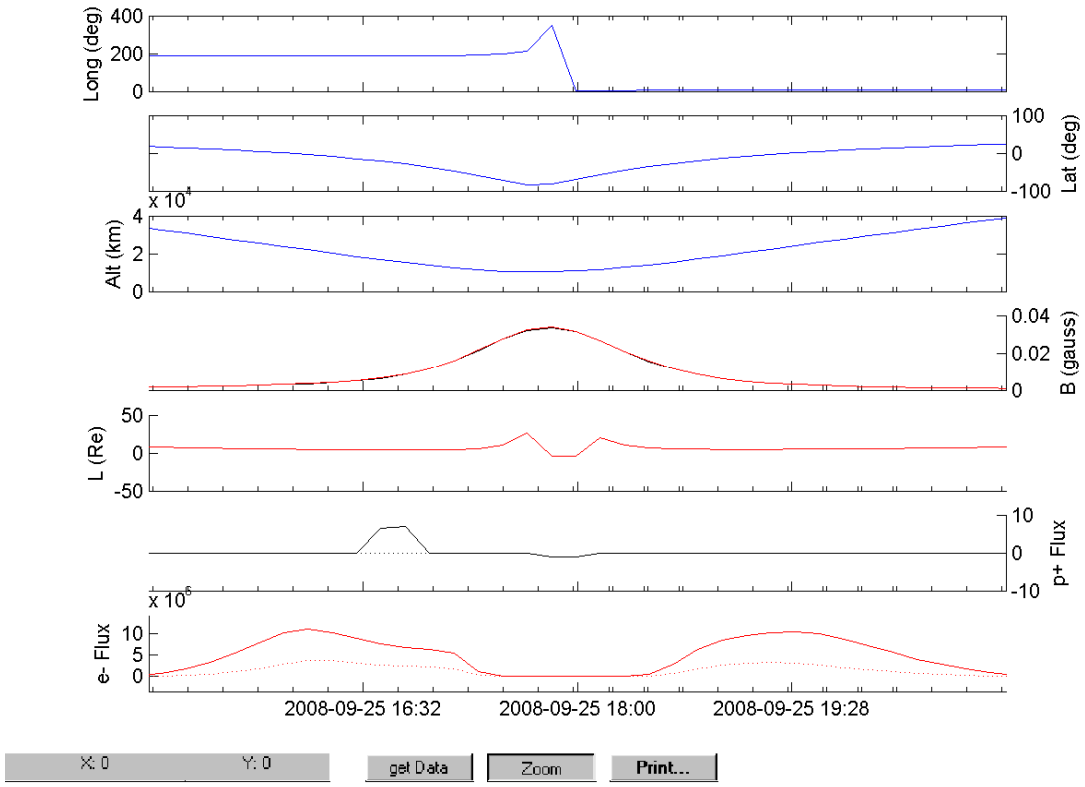


IREM Predicted Radiation Belt Passages

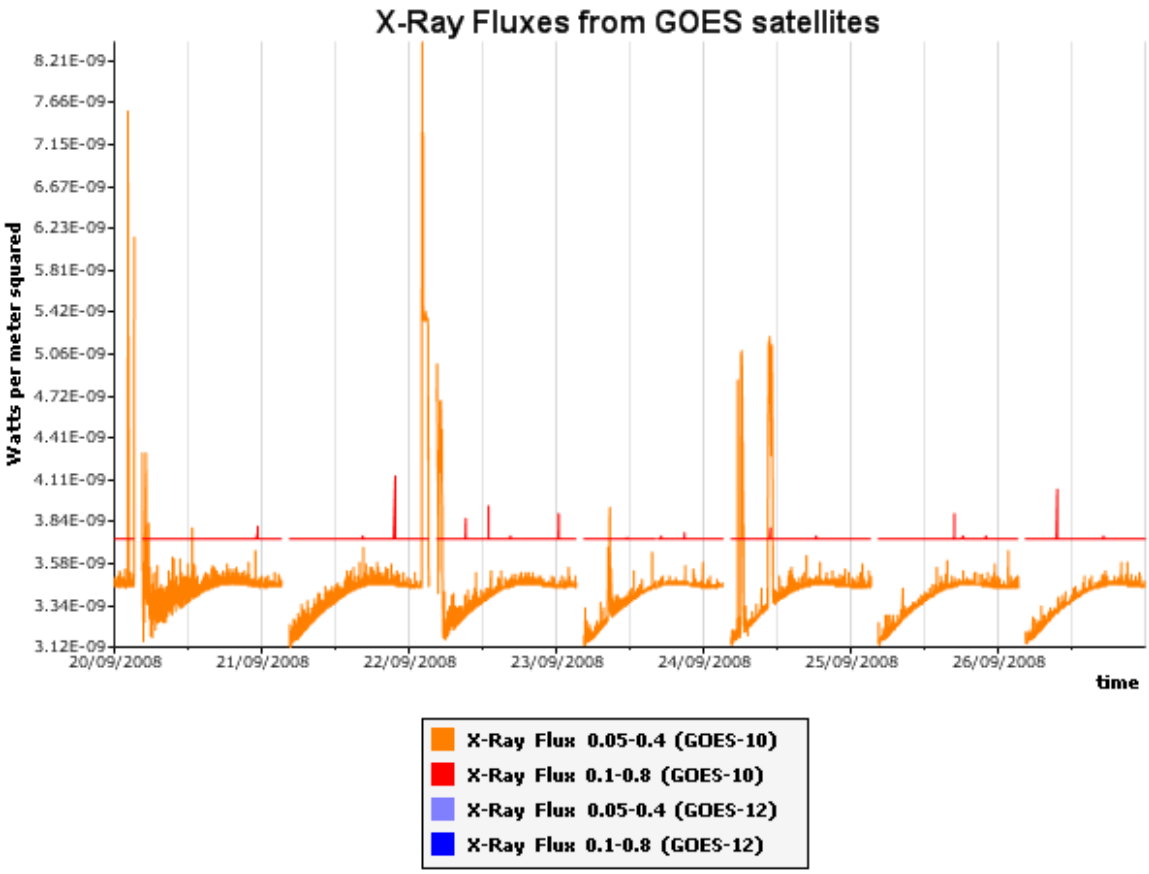
Rev 725



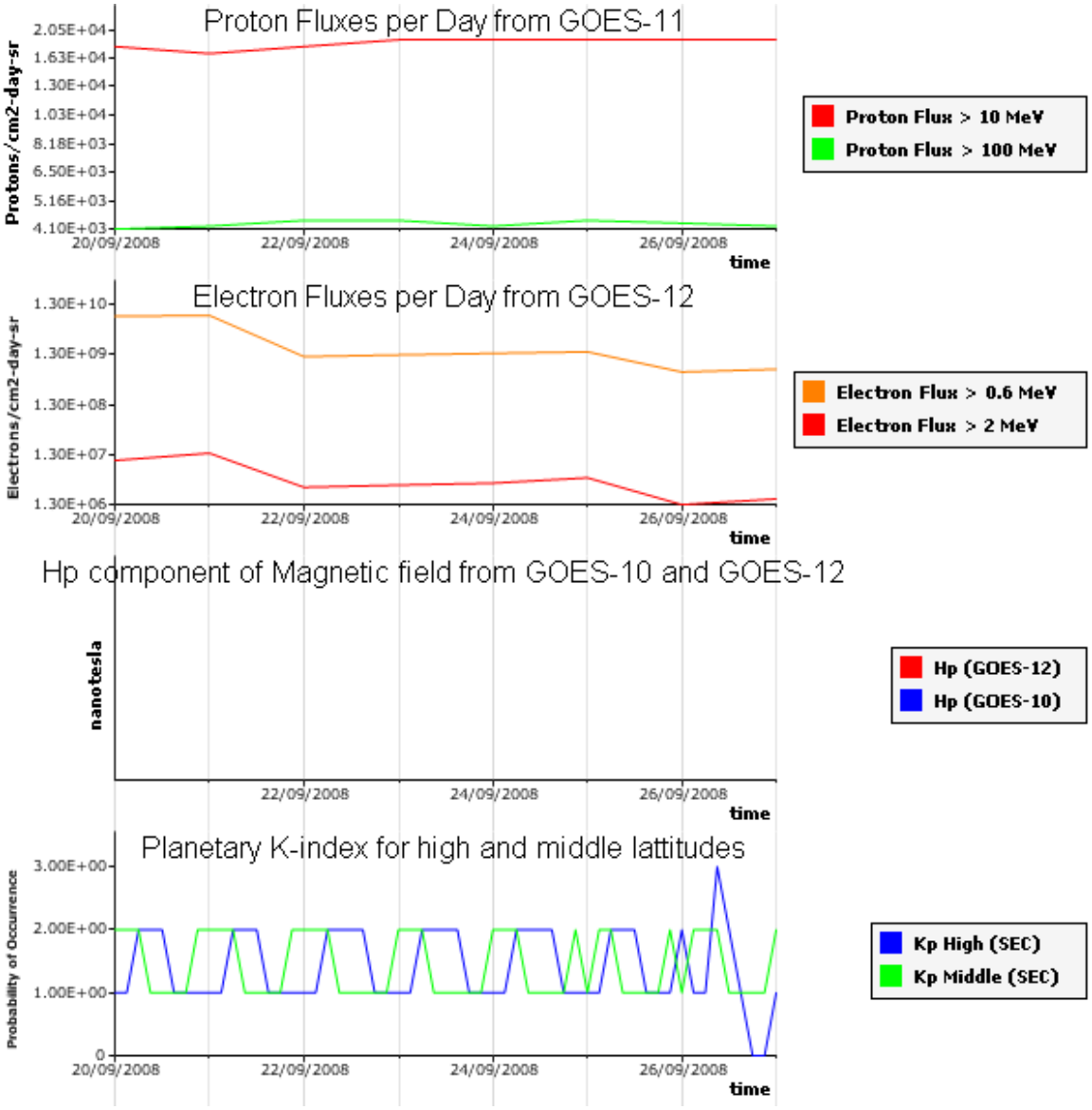
Rev 726



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.