

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 301
Week 26
30.06.08
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 21.06.08 until 27.06.08 (both dates inclusive) and covers the revolutions 694, 695 and 696.

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 were the Loop I-Loop IV Superbubble (RA 13:57:10.00, DEC +07:34:37.0); XMM-LSS (RA 02:18:00.00, DEC -07:00:00.0) and the Galactic Plane Region 3 (RA 13:09:32.98; DEC -62:47:56.4).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

No slew was missed from the Timeline during the observation period.

The fuel consumption over the period between 20/06/2008 and 26/06/2008 was 0.0885 Kg. The remaining propellant is in the order of 139.9435 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

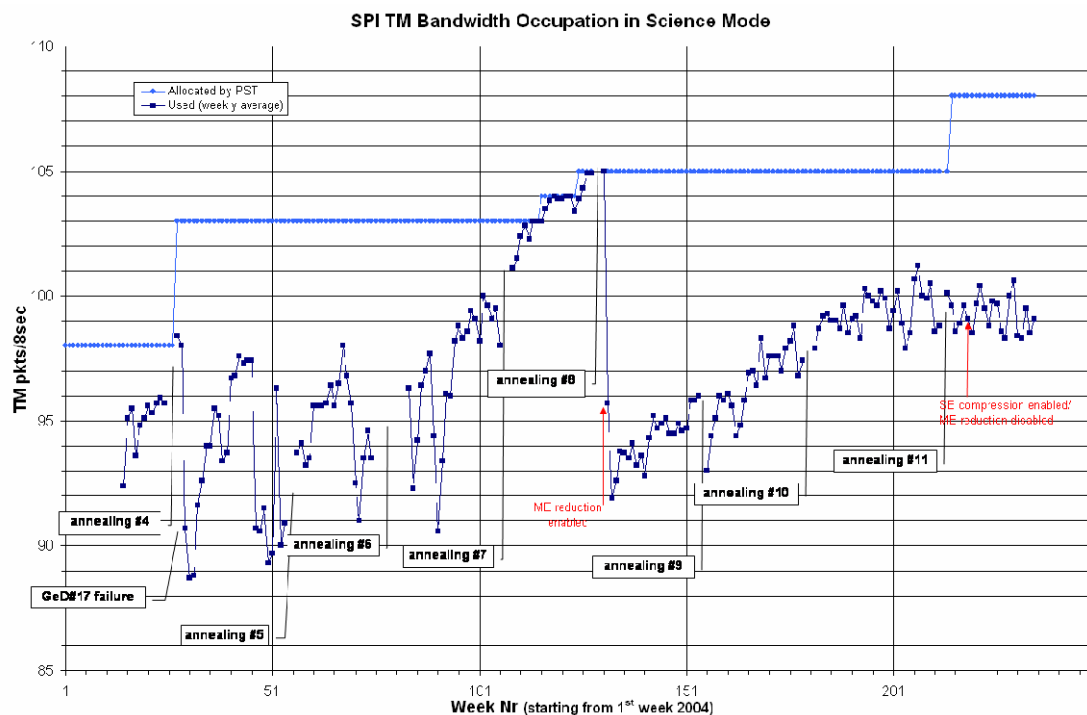
3.2.1 SPI

Following the 11th annealing, which ended on 30th January, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which, although its energy resolution improved since the previous annealing, is still showing a slightly degraded energy resolution compared to the other detectors and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). 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 80 +/-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 108 packets/cycle and the average telemetry occupation in the science window was 99.1 packets/cycle.

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



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

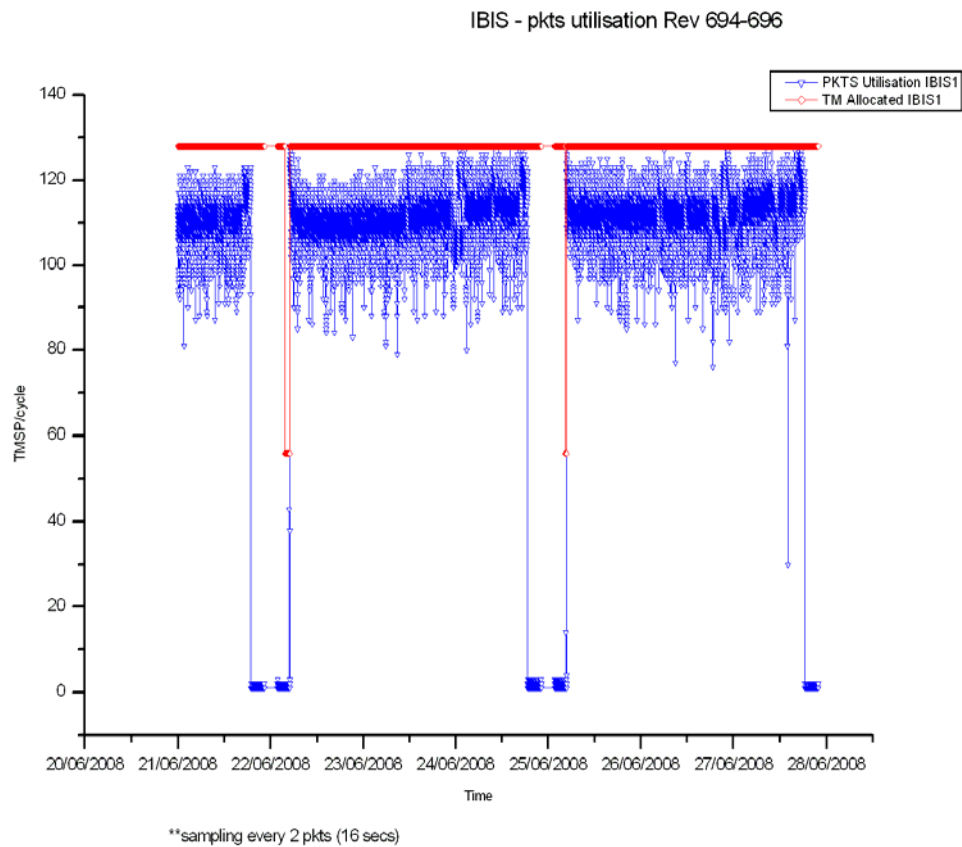
3.2.2 IBIS

The overall status of the unit is nominal.

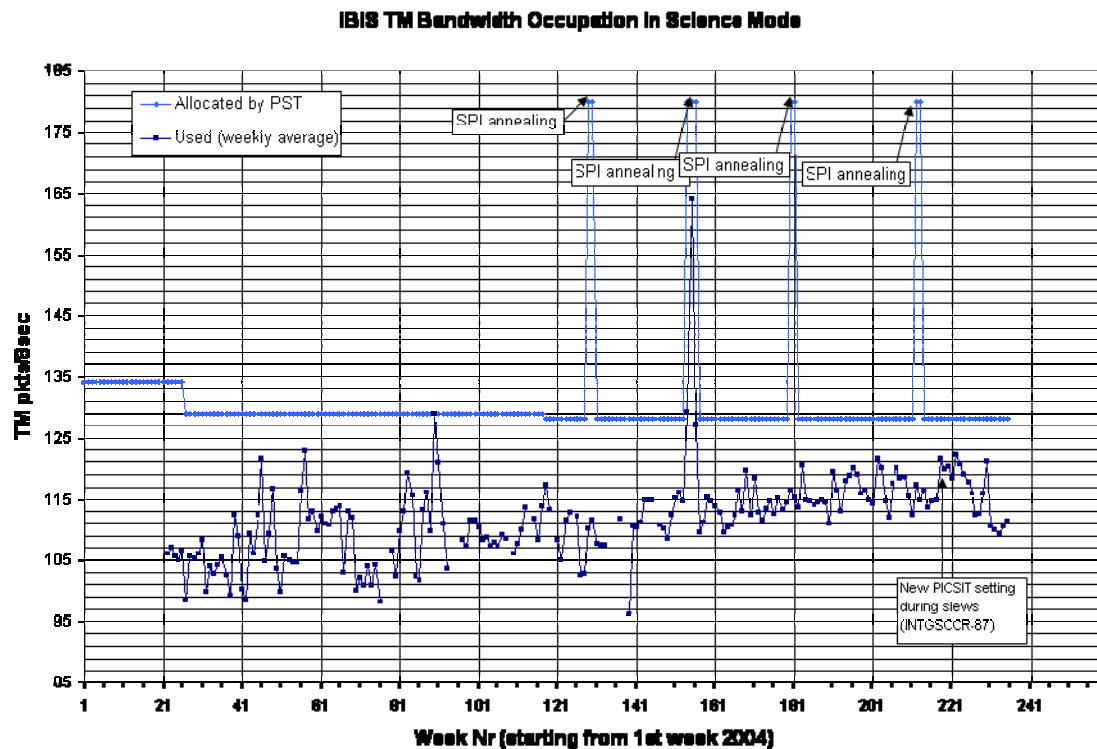
During the reporting period, the TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 128 packets/cycle.
- IBIS mean bandwidth utilisation in science mode: 111.43 packets/cycle (up 0.79 on last week)
- Percentage of TM cycles in which full bandwidth was used: 0.28%

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.

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

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.

During this reporting period, all 133 planned science pointings were executed nominally.

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.

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 very good this week. No pointings were lost to ground problems. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was very good this week.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were a few instances of bad frames from Redu but with no impact. There was also a problem with the VC0 playback from Redu, logged as AR INT-3006. The TM link to ISDC experienced occasional problems requiring a restart of the ISDS task

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

No new PSFs have been received this week.

No new observations have been planned.

No new TSFs have been received.

An update to the long-term plan up to the end of AO-5 has been released, as well as a first version of the AO-6 long-term plan.

SPI annealing is foreseen from revolution 714-719 (6 revolutions), where appropriate targets have been chosen.

2. Observation status

No new ECS files have been received.

3. ISOC Science Data Archive

Ingestion has been continued again. Currently ingesting revolutions 665 to 687 (inclusive).

4. ISOC system

Currently still on ISOC system V19.2. Release for testing of ISOC system V19.3 is expected next week.

5. Problems

None.

4.3.2 ISDC

Update not available this week. Status of ISDC observation processing on 16/06/2008:

- Latest Standard Analysis completed: observation 05200260004 (mid-latitude 2, Revolutions 680 & 681) on 16/06/2008.
- Latest products archived: observation 05200510008 (Mrk 421, Revolutions 679) on 14/06/2008.
- Latest observation products sent to the observer: observation 05200510009 (Mrk 421, Revolutions 679) on 16/06/2008.

5 Special Events

6 Anomalies

The following anomalies occurred this week.

AR id	Date Created	Subject	Segment	Status
INT-3007	2008-07-07	Antenna swap TT cmds not shown as deleted on 2 occasions	IMCS	Pending
INT-3006	2008-07-02	VC-0 playbacks not working from Redu	NCTRS	Pending

7 Future Milestones

Nothing to report.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 694

The observation in this revolution consisted entirely of a raster dither of Loop I-Loop IV Superbubble (RA 13:57:10.00, DEC +07:34:37.0), lasting ~61 hours.

Throughout this observation, 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.

Revolution 695

The observations in this revolution consisted of a raster dither of XMM-LSS (RA 02:18:00.00, DEC -07:00:00.0) lasting ~43 hours followed by a raster dither of the Galactic Plane Region 3 (RA 13:09:32.98; DEC -62:47:56.4) for the remaining ~15 hours of observation time.

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.

Revolution 696

The observations in this revolution consisted of a raster dither of XMM-LSS (RA 02:18:00.00, DEC -07:00:00.0) lasting ~40 hours followed by a raster dither of the Galactic Plane Region 3 (RA 13:09:32.98; DEC -62:47:56.4) for the remaining ~19 hours of observation time.

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.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2008-06-05T13:17:55.000Z	140.1970	F	Automatic TM processing.
2008-06-07T03:29:11.000Z	140.1850	F	Automatic TM processing.
2008-06-08T04:13:45.000Z	140.1610	F	Automatic TM processing.
2008-06-10T03:15:19.000Z	140.1206	F	Automatic TM processing.
2008-06-11T12:24:18.000Z	140.1081	F	Automatic TM processing.
2008-06-13T03:03:10.000Z	140.0926	F	Automatic TM processing.
2008-06-14T12:39:22.000Z	140.0722	F	Automatic TM processing.
2008-06-16T02:52:15.000Z	140.0621	F	Automatic TM processing.
2008-06-17T12:26:27.000Z	140.0394	F	Automatic TM processing.
2008-06-19T02:41:35.000Z	140.0320	F	Automatic TM processing.
2008-06-20T12:16:11.000Z	140.0171	F	Automatic TM processing.
2008-06-22T02:30:55.000Z	140.0110	F	Automatic TM processing.
2008-06-23T11:52:02.000Z	139.9857	F	Automatic TM processing.
2008-06-25T02:18:38.000Z	139.9678	F	Automatic TM processing.
2008-06-26T11:59:22.000Z	139.9435	F	Automatic TM processing.

This report was generated Fri Jun 27 08:00:32 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, 21/06/2008 – 27/06/2008

The AOCS operations were executed from the Automatic Timeline.

During this period, 95 Open Loop Slews, 58 Closed Loop Slews and 5 Momentum Biases were executed (as reported by ACC).

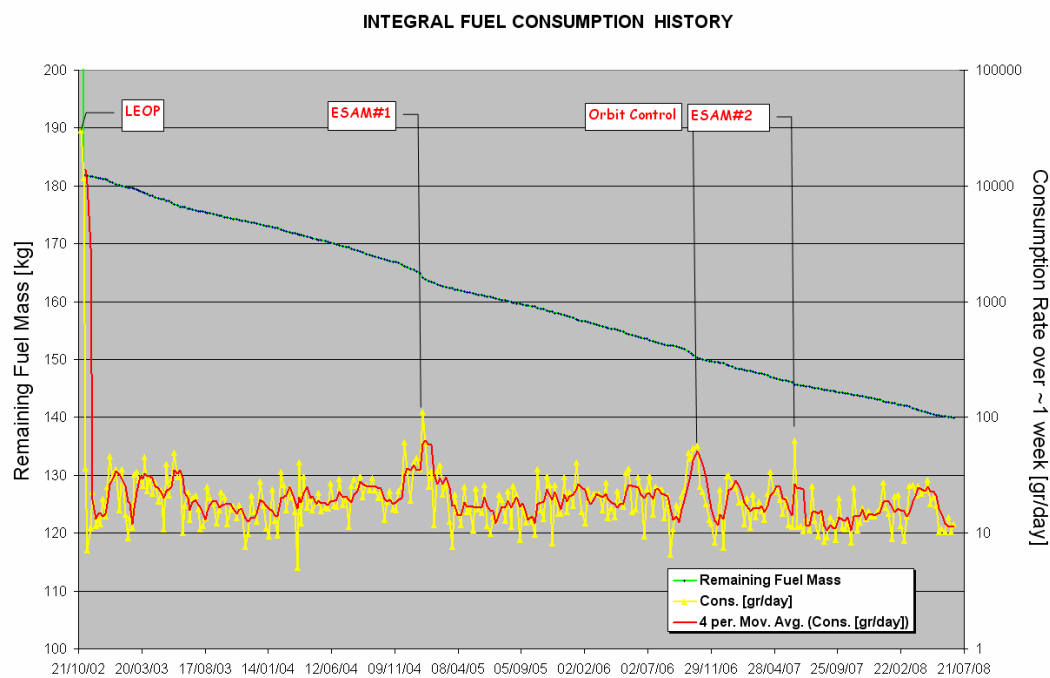
No slews were missed from TL, during the observation period.

Orbit Control

No update

Fuel consumption

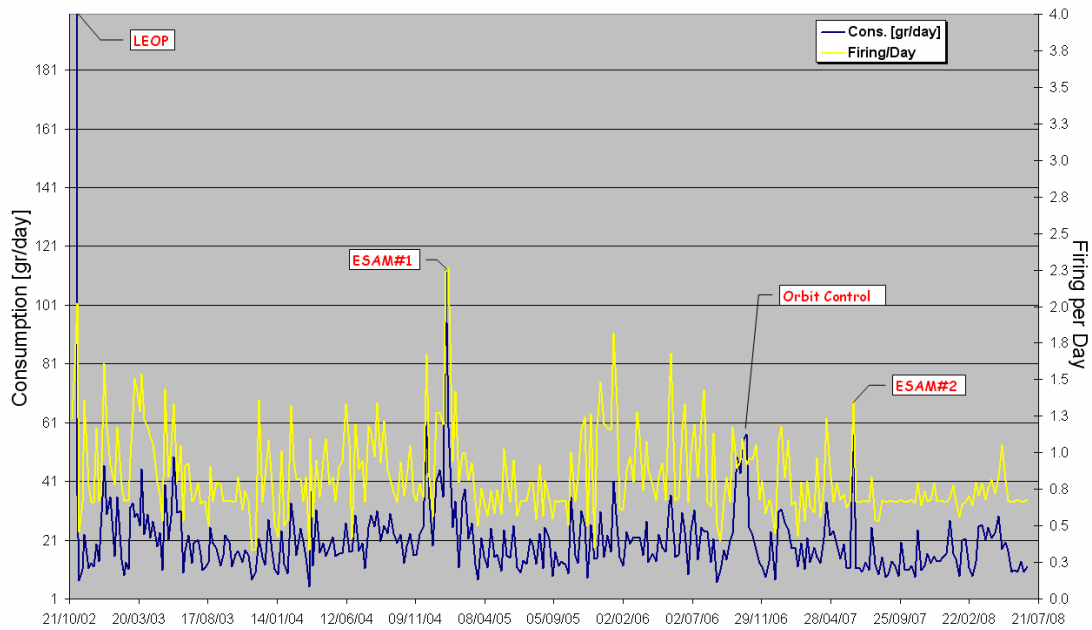
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 26/06/2008 is reported in the plot below.



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 26/06/2008 is reported in the plot below.

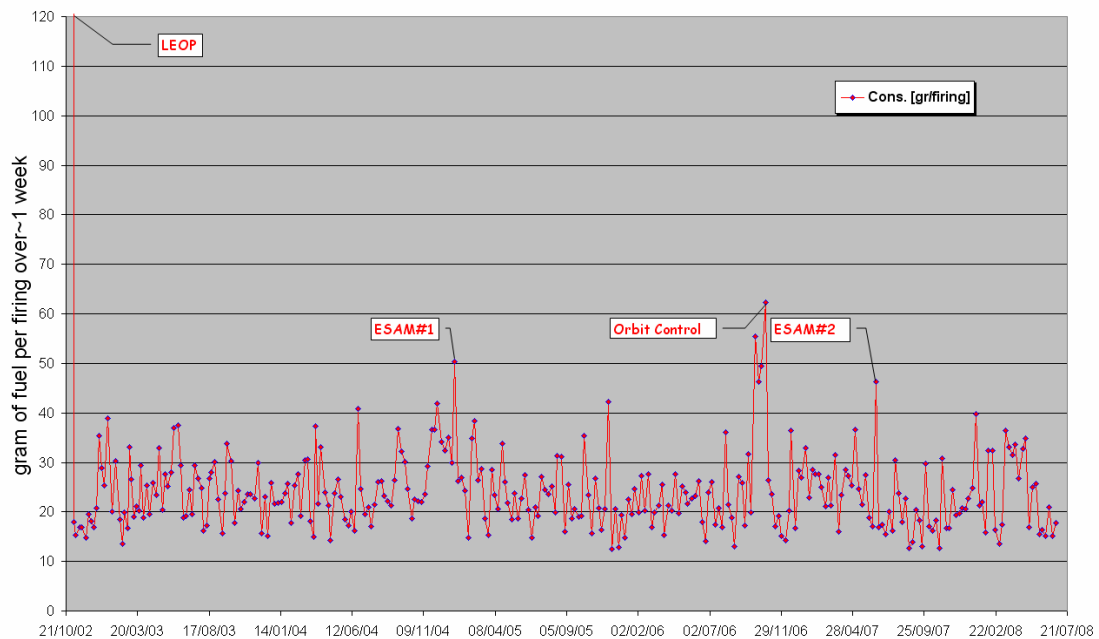
INTEGRAL FIRING PER DAY HISTORY



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 26/06/2008 is shown in the plot below.

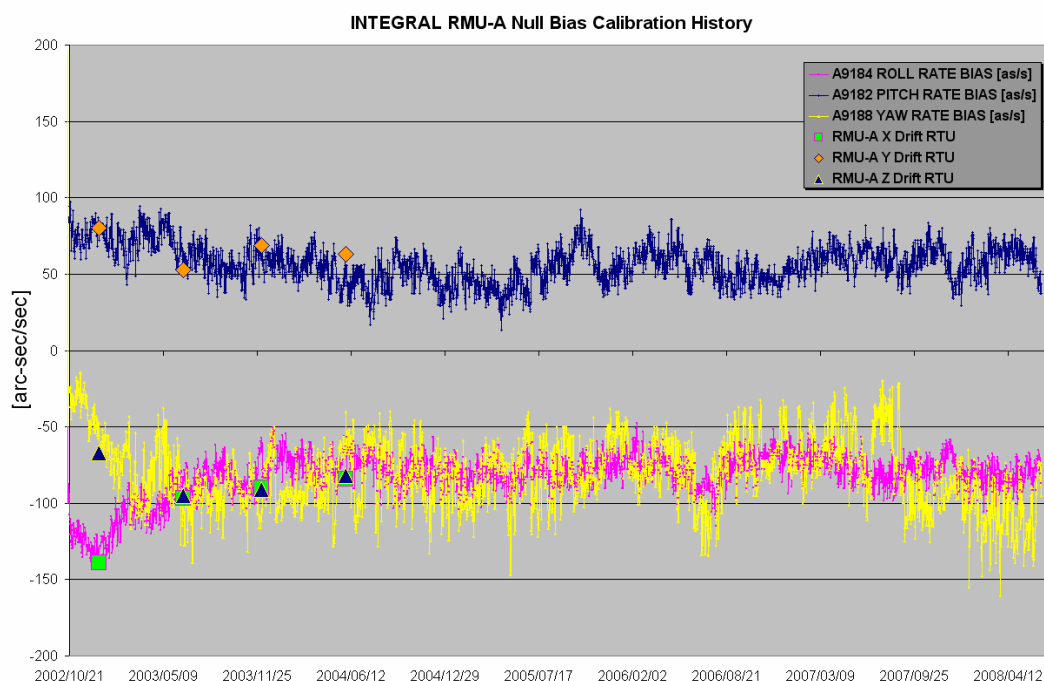
INTEGRAL FUEL MASS PER FIRING HISTORY



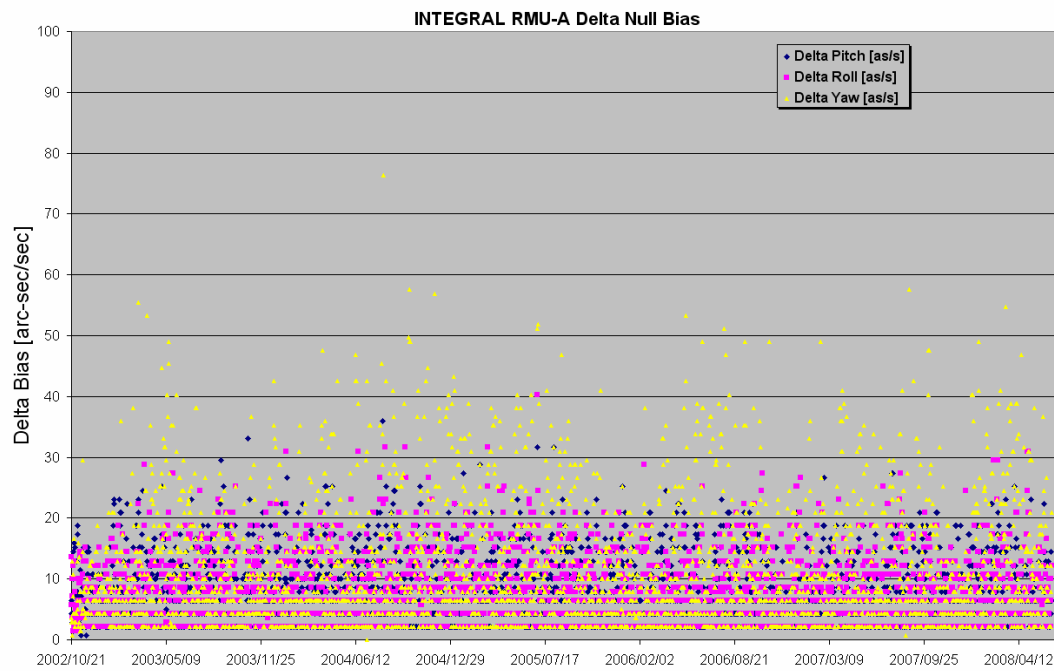
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 27/06/2008 is reported in the plot below.

Problems have been reported during the last period on FDS when generating the drift update for the RMU-A Yaw channel: the limits set on FDS have been violated few times. 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 27/06/2008 is reported in the plot below.



21/06/2008 (Day of Year 173, Revolution 694)

Nothing to report.

22/06/2008 (Day of Year 174, Revolution 694-695)

Nothing to report.

23/06/2008 (Day of Year 175, Revolution 695)

Nothing to report.

24/06/2008 (Day of Year 176, Revolution 695)

Nothing to report.

25/06/2008 (Day of Year 177, Revolution 695-696)

Nothing to report.

26/06/2008 (Day of Year 178, Revolution 696)

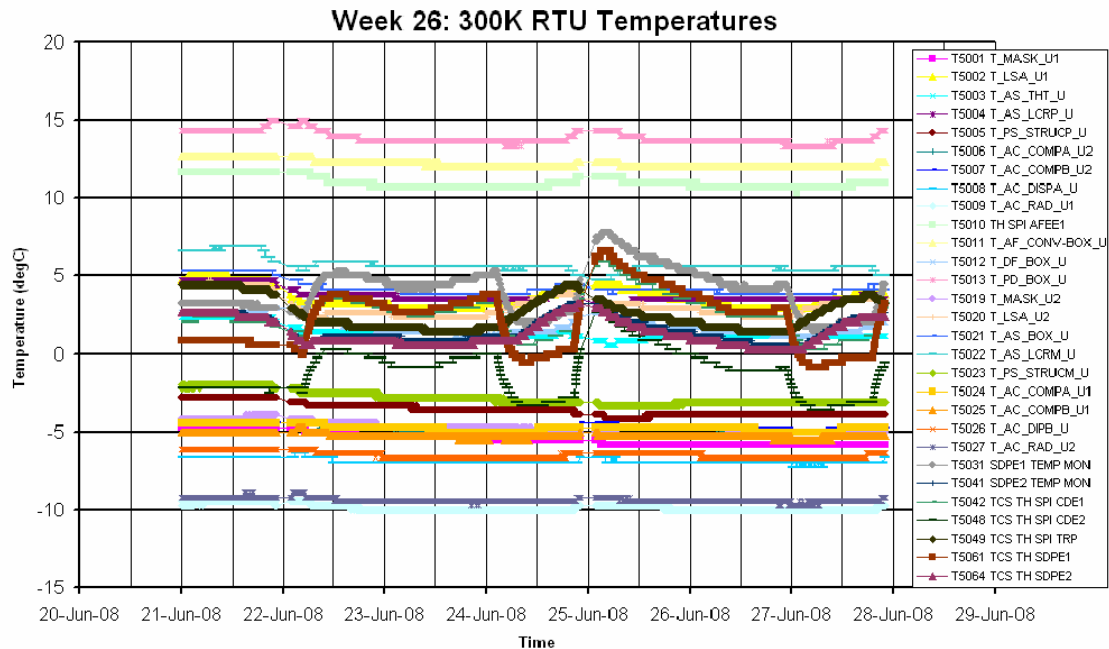
Nothing to report.

27/06/2008 (Day of Year 179, Revolution 696)

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.

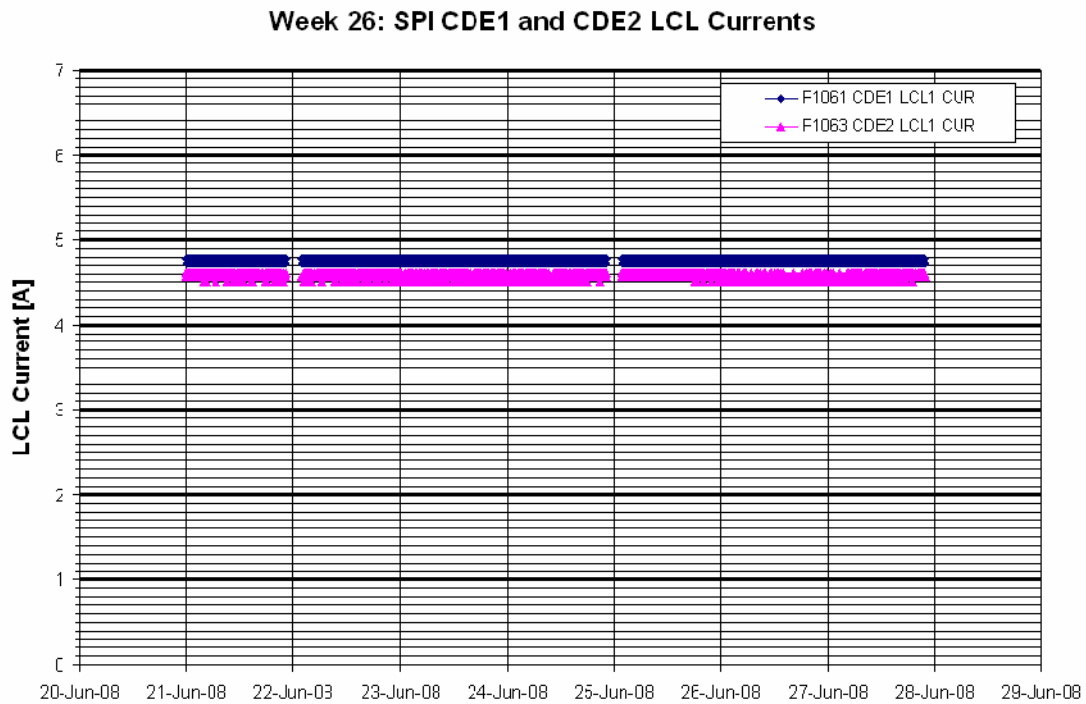


Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K +/-1K.

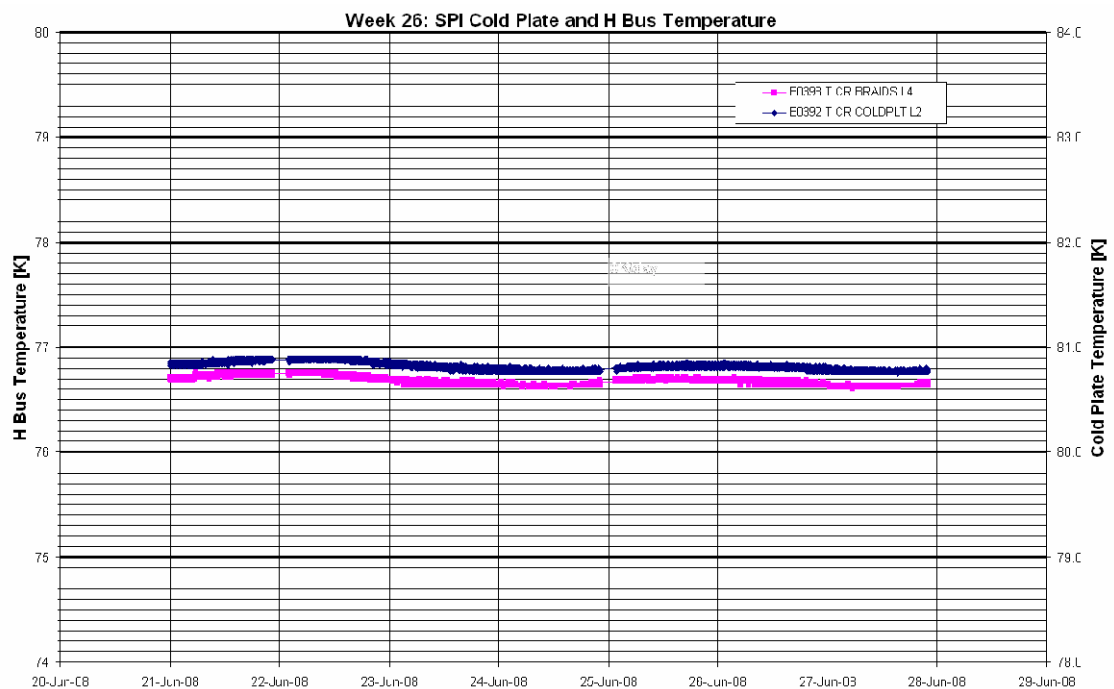
The stroke of all four compressors was set to 40 throughout the week. The average CDE LCL currents were as follows:

- CDE1 LCL Current = 4.76A
- CDE2 LCL Current = 4.56A

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 is nominal.

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

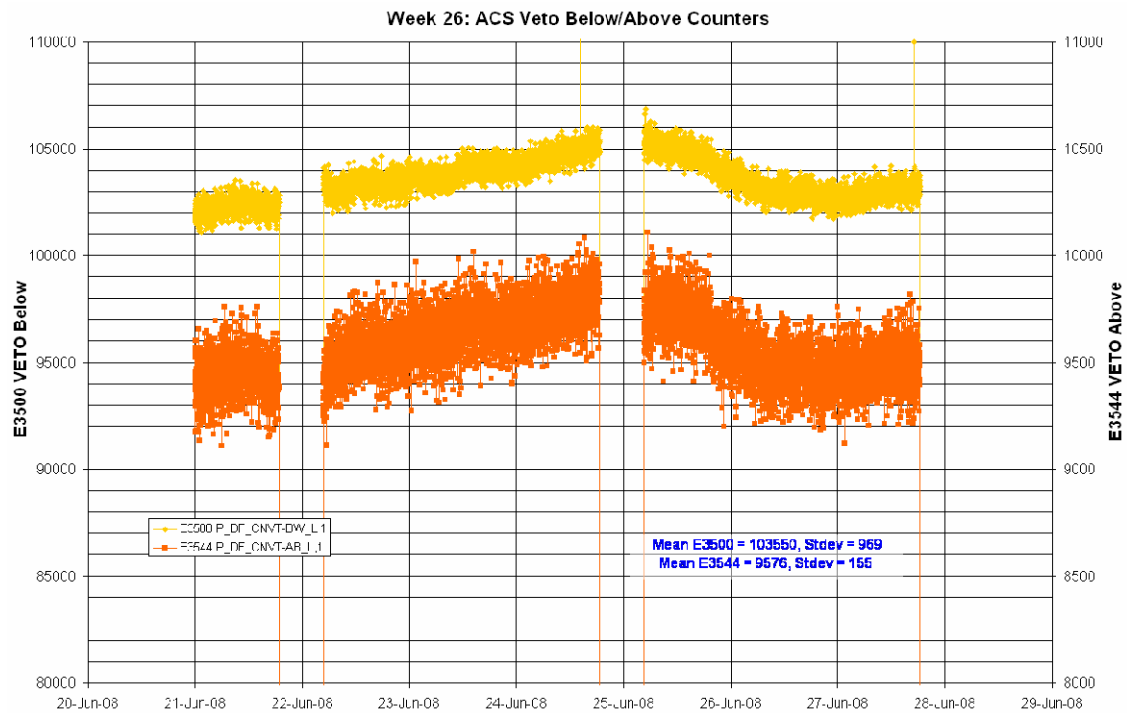
The average TM bandwidth occupation of SPI was 99.1 packets/cycle over the science window. The TM allocation in the science window was 108 packets/cycle.

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

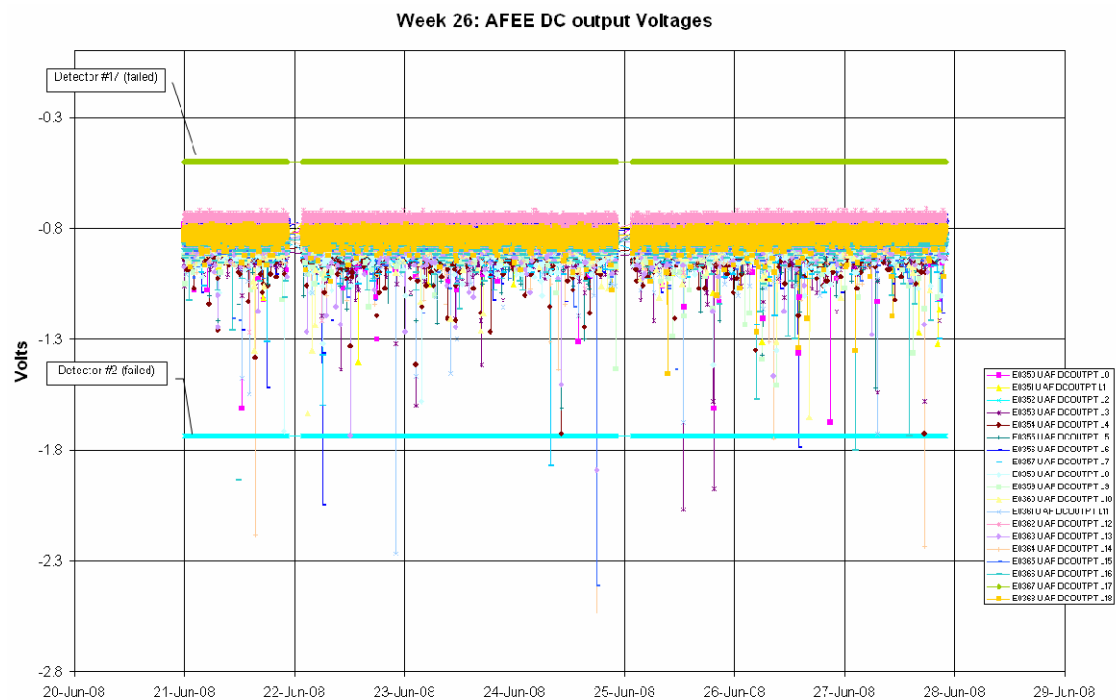


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

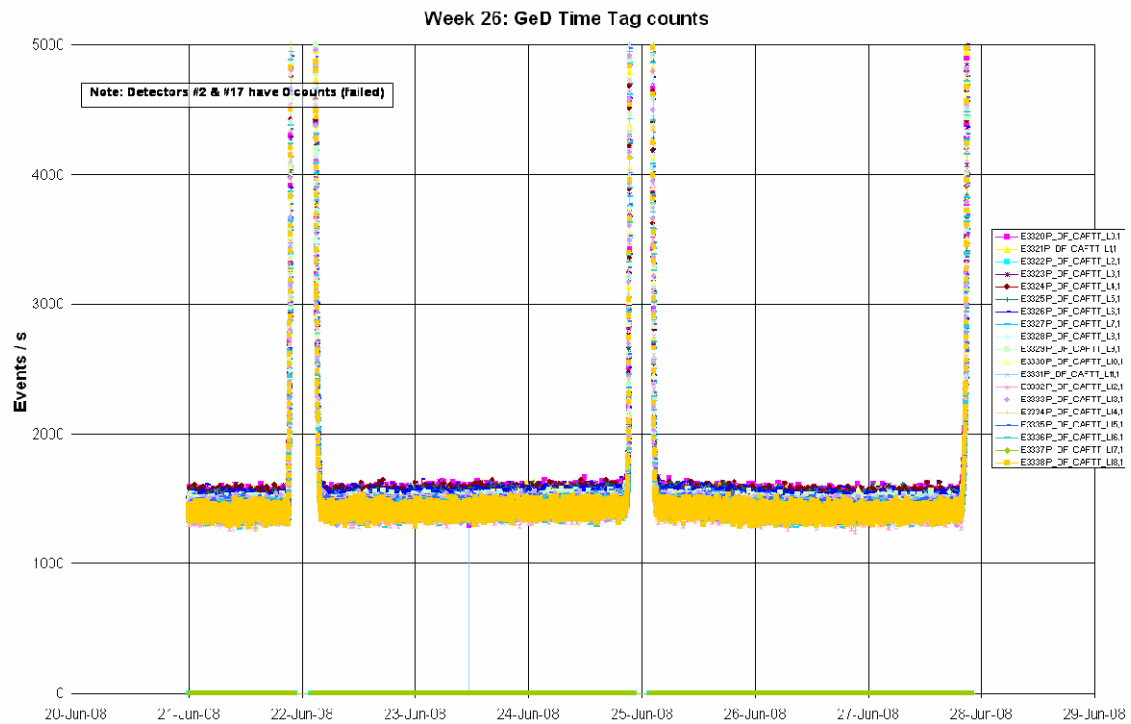
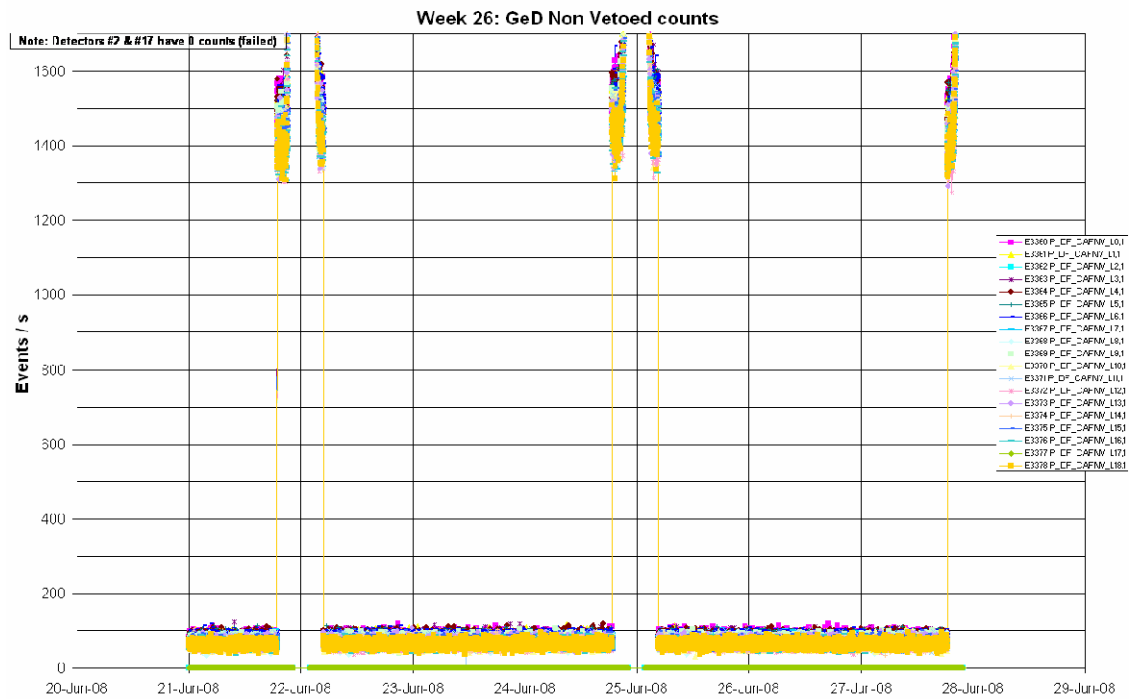
The following plot shows the ACS overall count rate evolution during the reporting period:

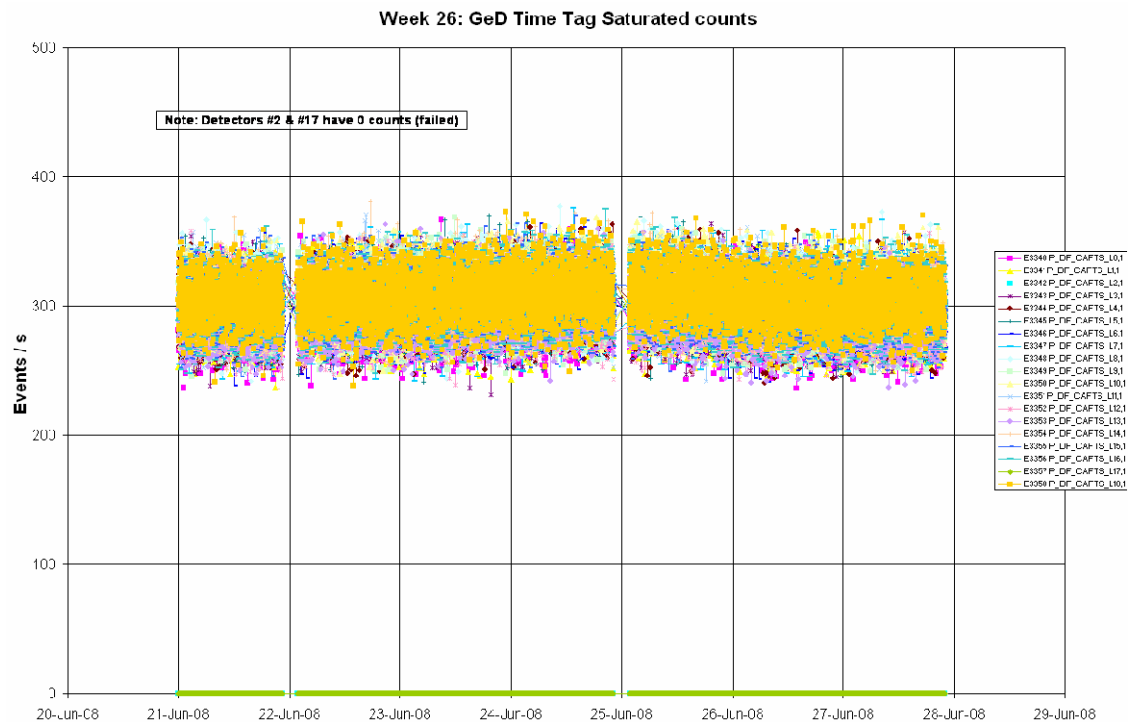


AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003 and detector #17 is failed since 17/07/2004.

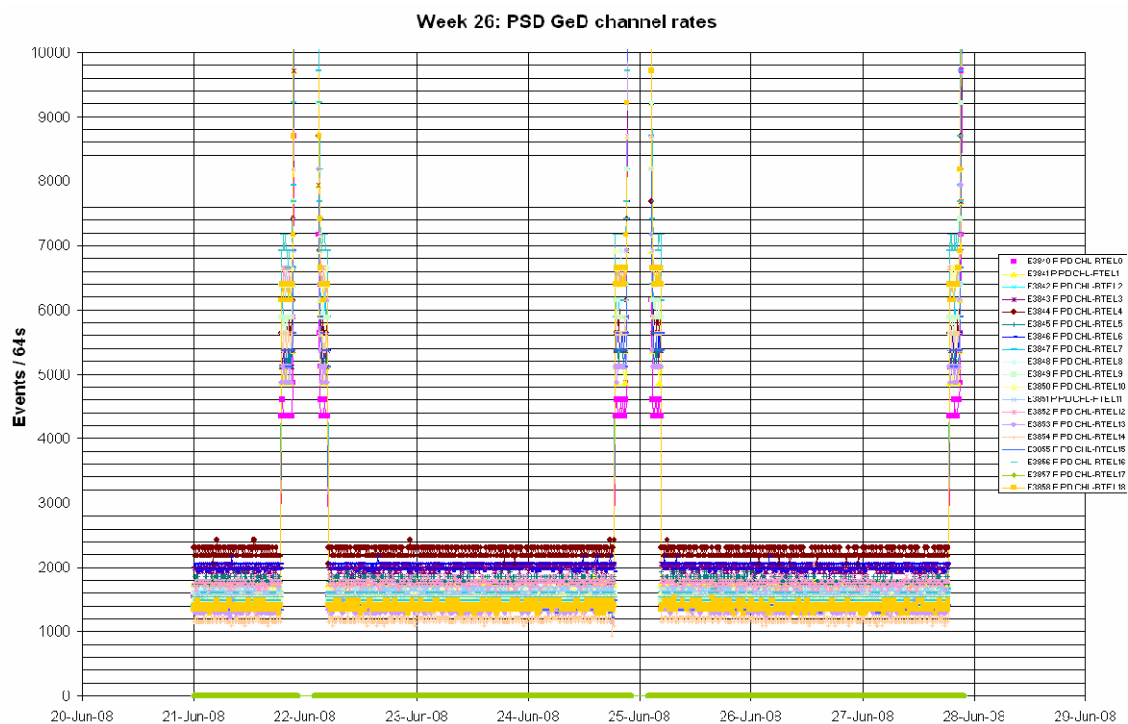


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period.





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 events occurred on SPI over the reporting period:

- On 2008-06-26 at 03:39:52Z TM parameter E2296 went OOL (value = NO EXIST VAL). This is the ACS FEE analogue status 5 V #46. It returned

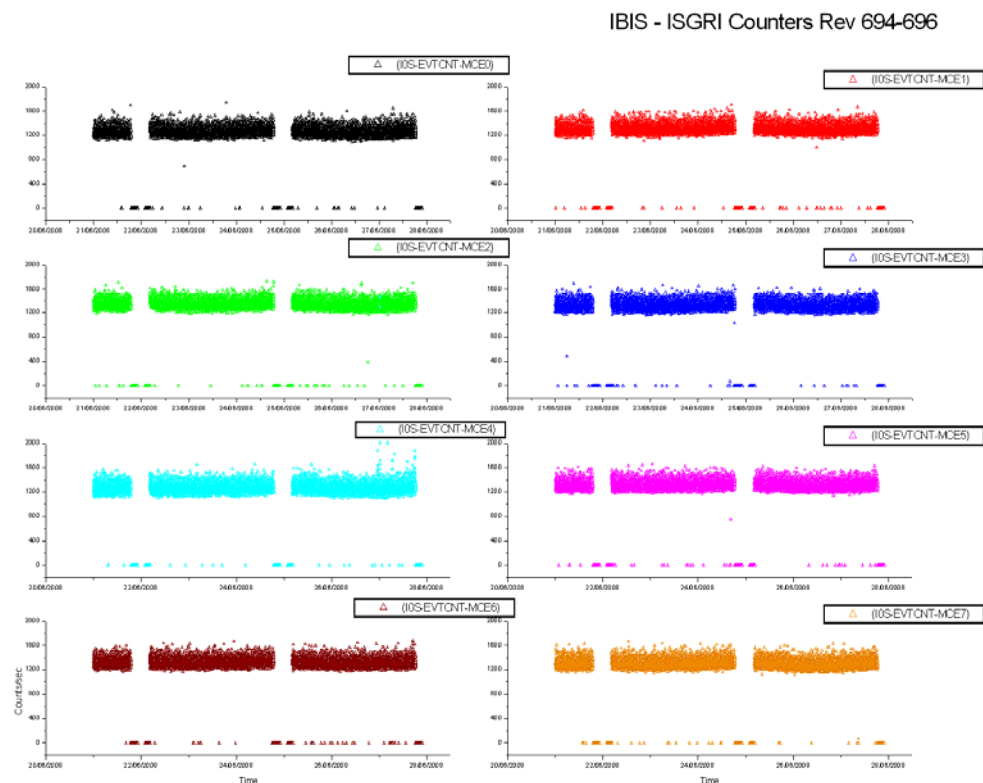
within limits when the next packet was received at 03:50:32Z and no action was taken.

- On 2008-06-27 at 00:06:32Z TM parameter E2309 went OOL (value = NO EXIST VAL). This is the ACS FEE analogue status 5 V #59. TCs E0282-E0287 (FCP_SPI1_1831) were then sent to report the ACS FEE analogue status parameters, after which it returned within limits at 00:18:21Z.

8.3.3 IBIS Operations

IBIS Event Counters Plots

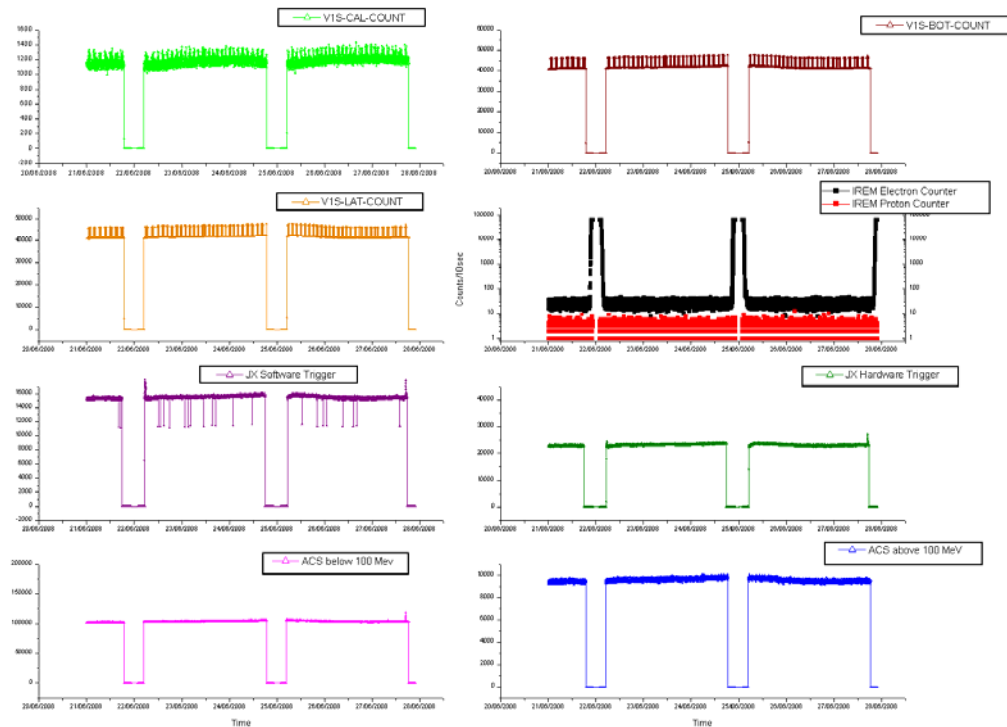
ISGRI Counters:



**sampling every 4 pkts (32 secs)

VETO vs Payload Counters:

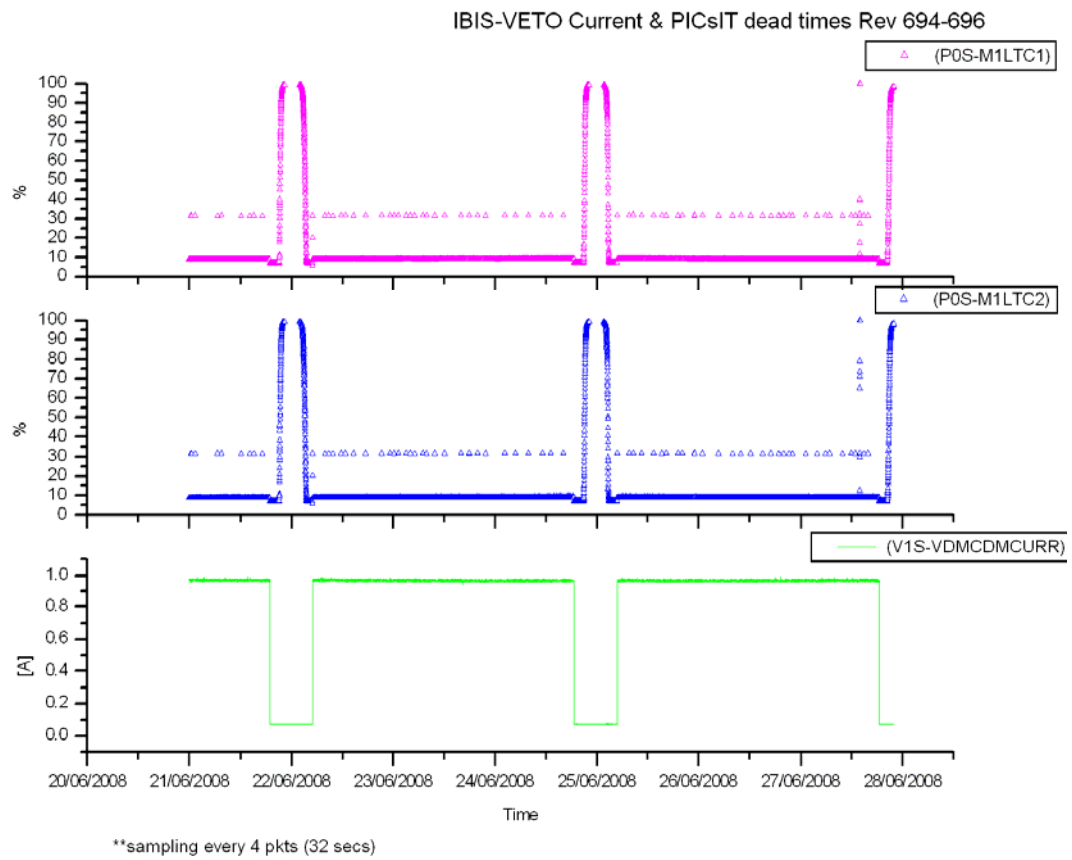
IBIS-VETO vs Payloads Counters Rev 694-696



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

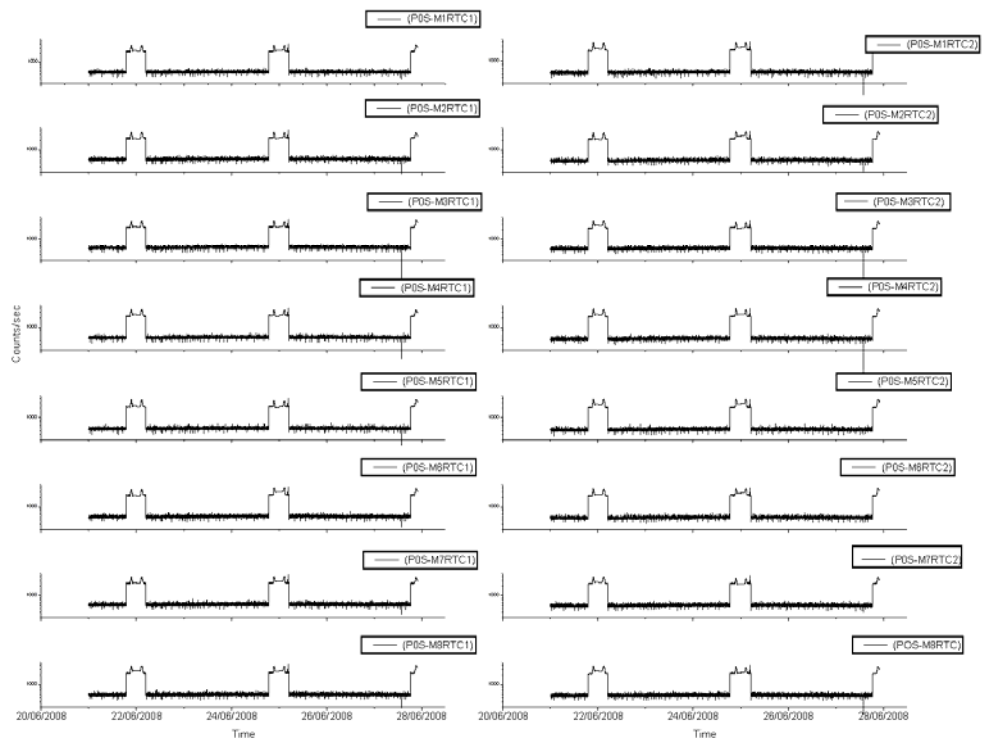
The week was characterised by low radiation as reported by the payload.

VETO Current:



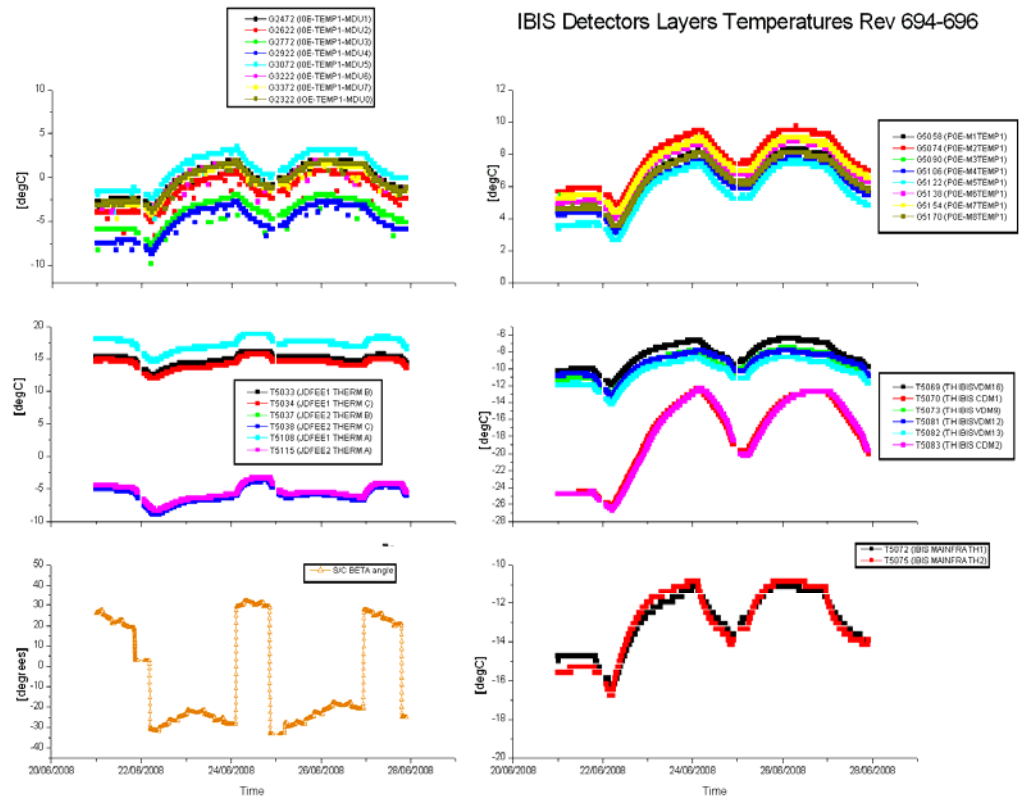
PICsIT Counters:

IBIS - PICsIT Counters Rev 694-696



**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 (POS-Mi_RTC1) and G5003 (POS-Mi_RTC2) families and G2000 family (IOE-OVFWPXADD-Mi) were received during the radiation belt passages.

2008-06-21 (DOY 173, Rev 694)

IBIS operations executed nominally.

2008-06-22 (DOY 174, Rev 694-695)

At 03:22:30Z TM parameter G5079 went OOL High (value = 2.605V). This is the PDM2: +2.5 V. It returned within limits of its own accord at 03:23:02Z and no action was taken.

2008-06-23 (DOY 175, Rev 695) to 2008-06-26 (DOY 178, Rev 696)

IBIS operations executed nominally.

2008-06-27 (DOY 179, Rev 696-697)

At 00:31:06Z TM parameter G2056 went OOL, indicating an overflow of the noisy pixel address buffer in MCE4. It returned within limits of its own accord at 00:31:14Z and no action was taken.

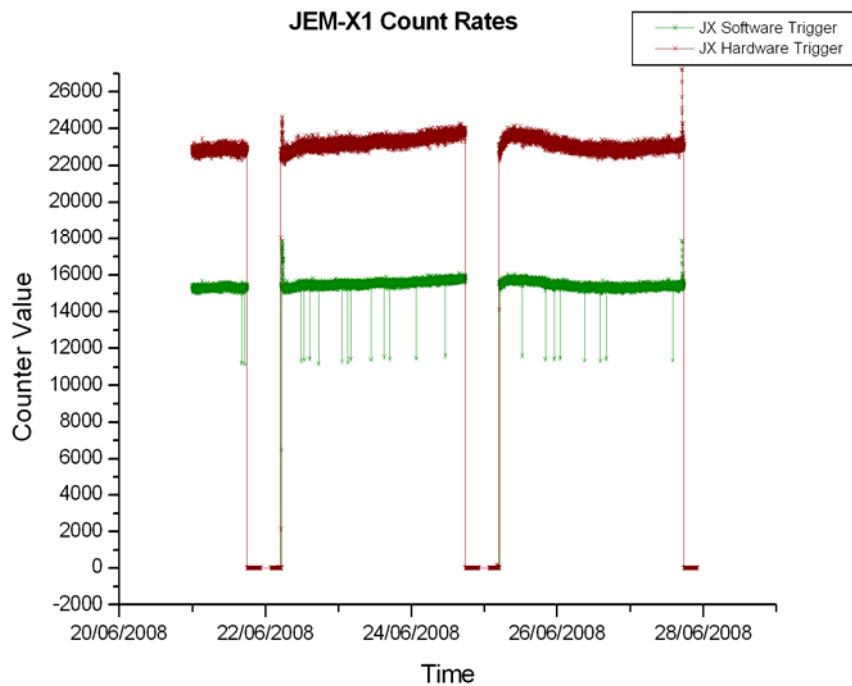
At 13:55:03Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. At 13:57:38Z the TM parameter families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As these were followed at 14:00:54Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

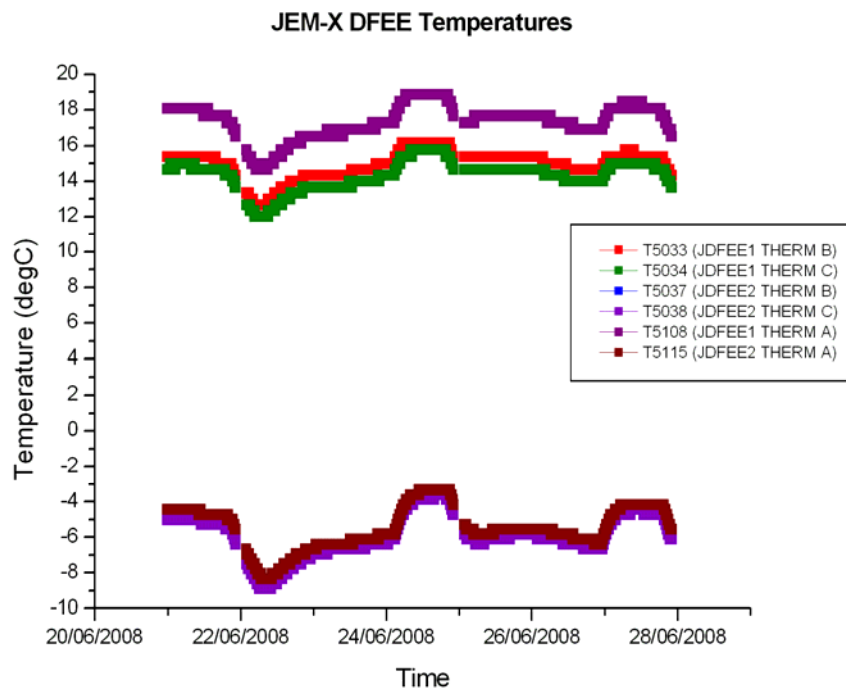
JEM-X count rates over the reporting period are displayed in the following graph¹.

¹ Data sampled.



JEM-X Temperatures

JEM-X DFEE temperatures over the reporting period are displayed in the following graph¹.



JEM-X Daily Report

2008-06-21 (DOY 173, Rev 694) to 2008-06-27 (DOY 179, Rev 696-697)

JEM-X1 operations executed nominally.

8.3.5 OMC Operations

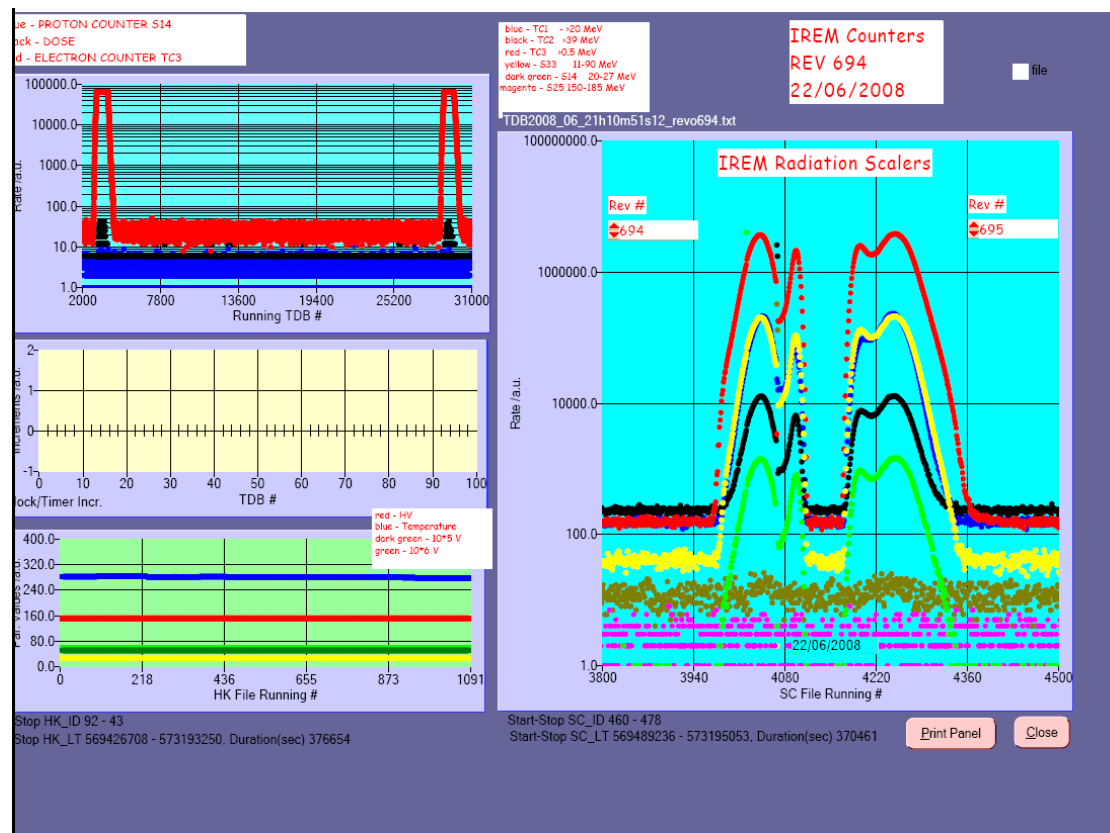
2008-06-21 (DOY 173, Rev 694) to 2008-06-27 (DOY 179, Rev 696-697)

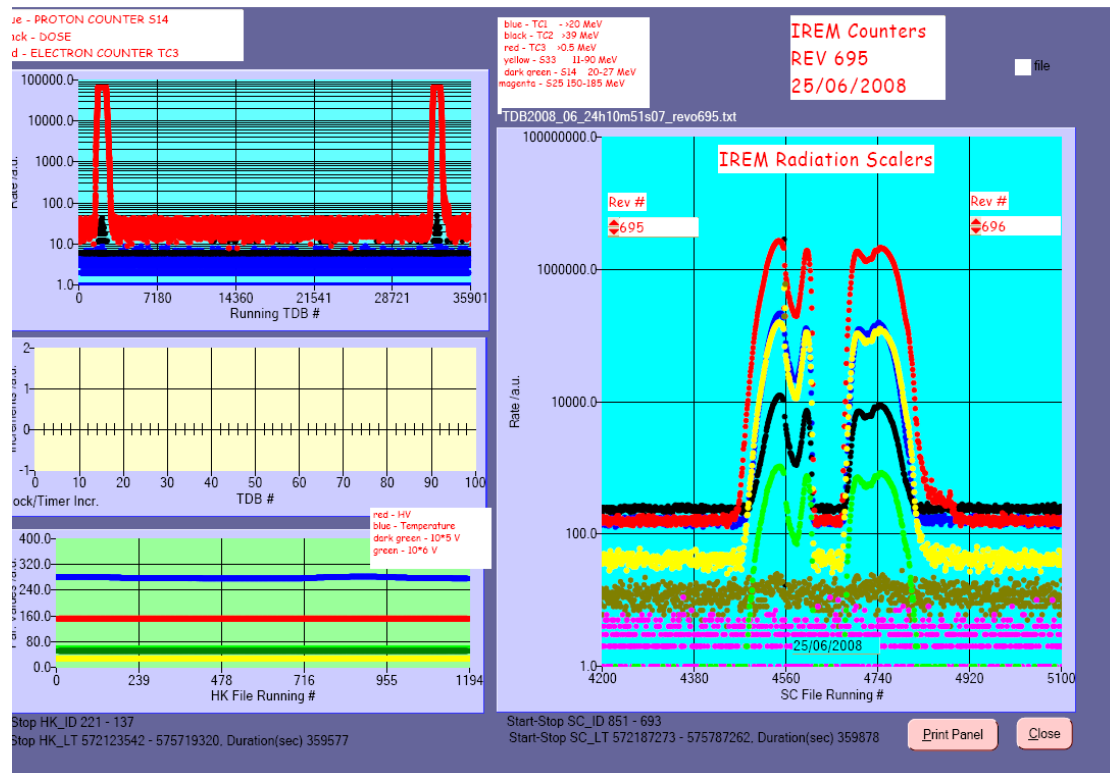
OMC operations executed nominally.

8.3.6 IREM Operations

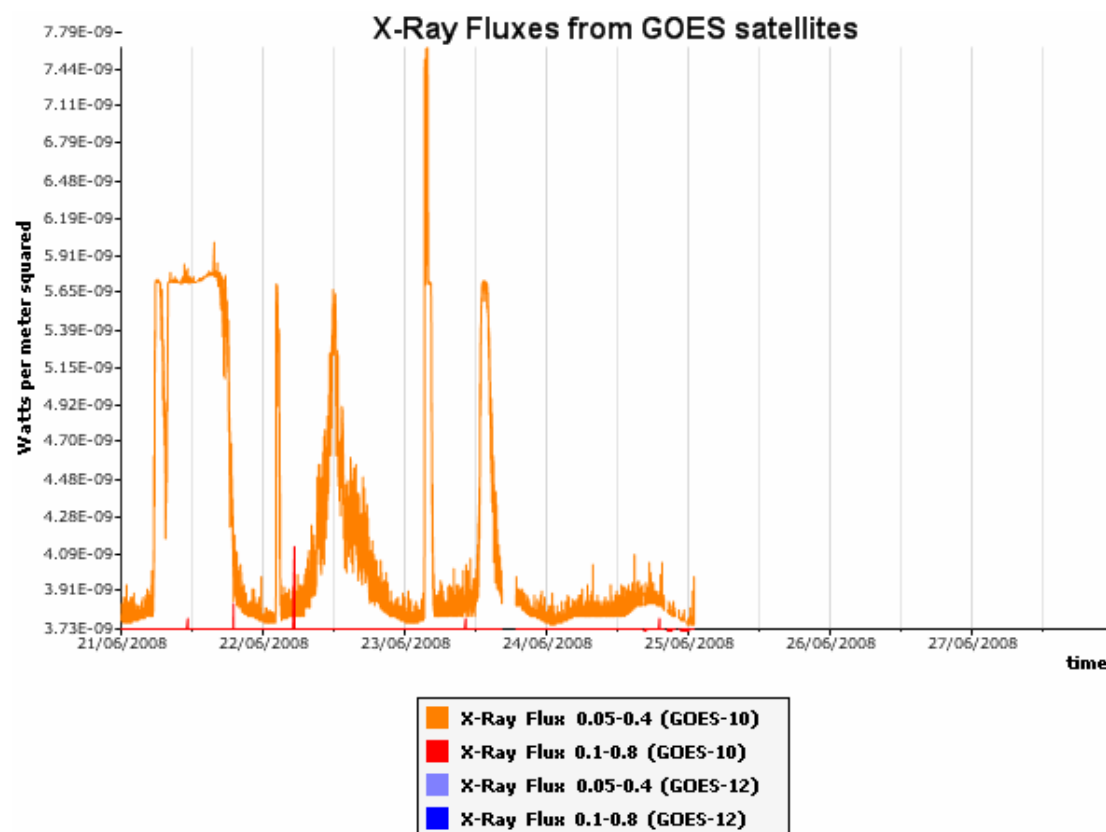
IREM operations during the reporting period were nominal.

IREM radiation counters:

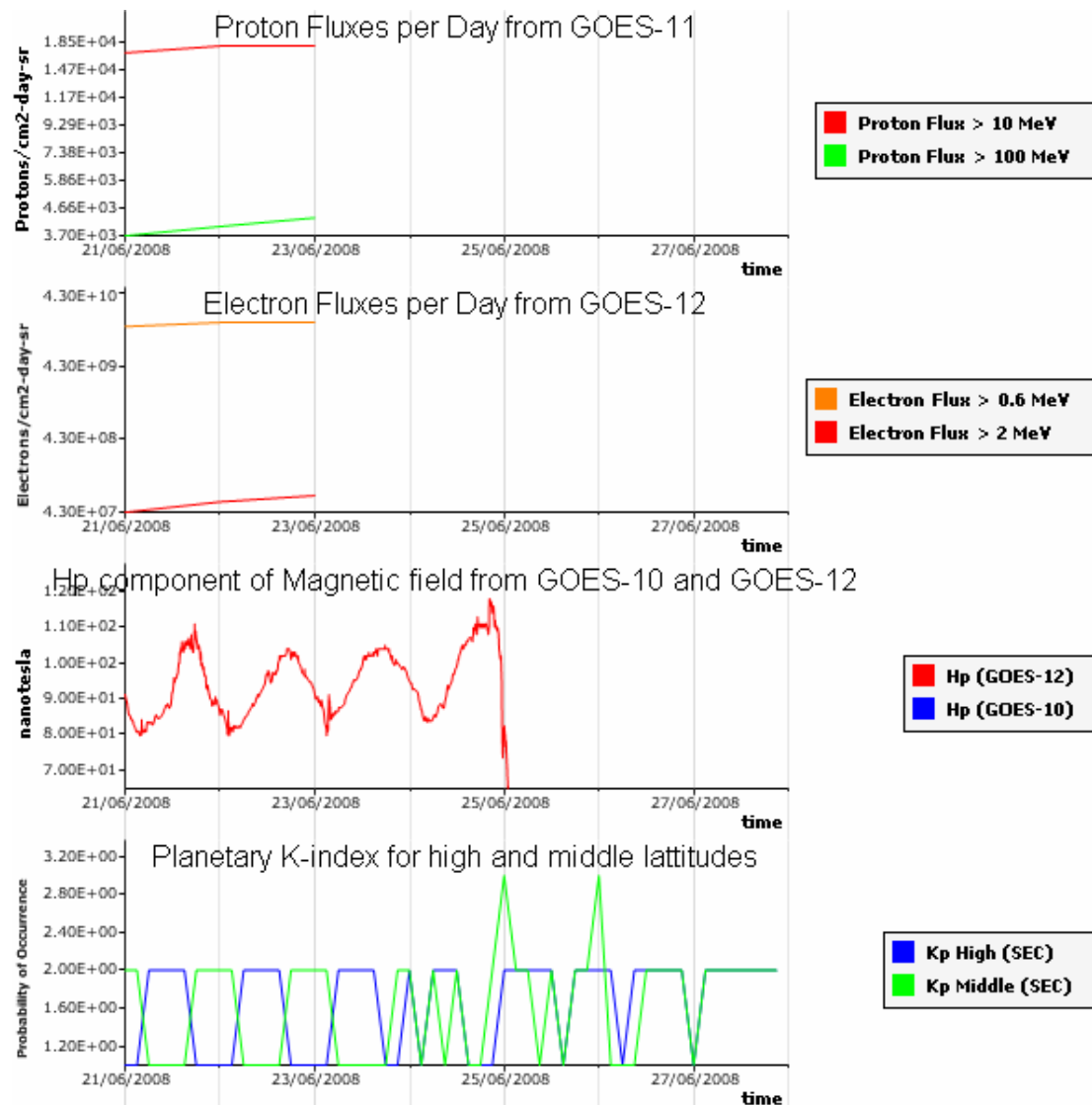




SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):



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 indicates storm-level geomagnetic activity.