

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 337
Week 10
09.03.09
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 28.02.09 until 06.03.09 (both dates inclusive) and covers the revolutions 778, 779 and 780.

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 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 of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3).

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 TL, during the observation period.

The fuel consumption over the period between 28/02/2009 and 06/03/2009 was 0.0795 Kg. The remaining propellant is in the order of 135.6057 Kg.

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

3.1.2 Power

All the other units of EPS are 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

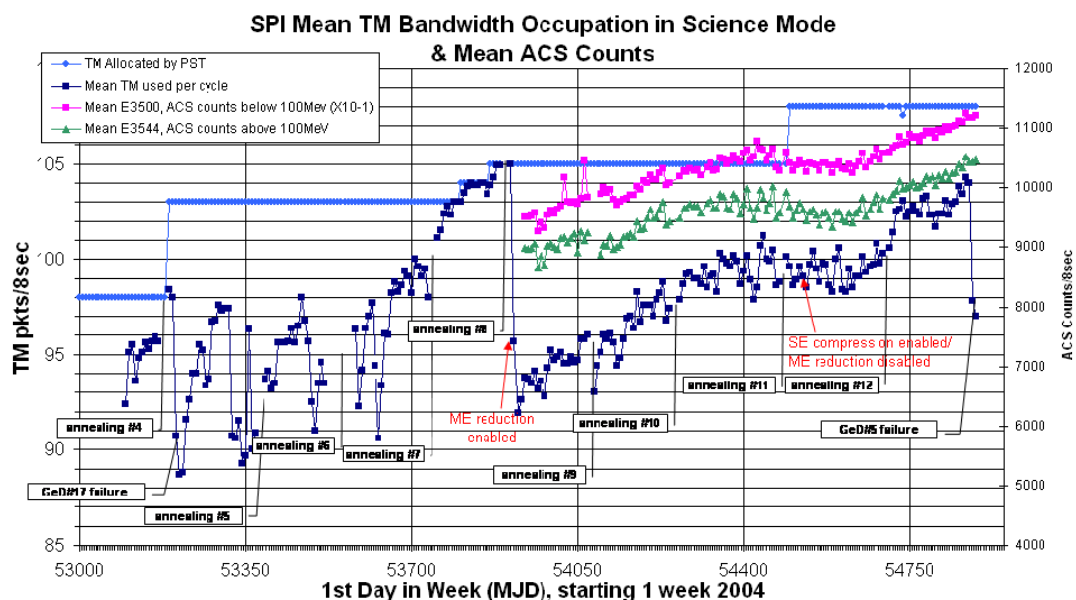
3.2.1 SPI

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); detector #17 (failed since 17/07/2004) and detector #5 (failed since 19/02/2009). 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 Stirling compressors are working nominally. The Germanium detectors temperature was kept in the range 80K $\pm$ 1K throughout 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 and the average telemetry occupation was 97 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 8.3.2.

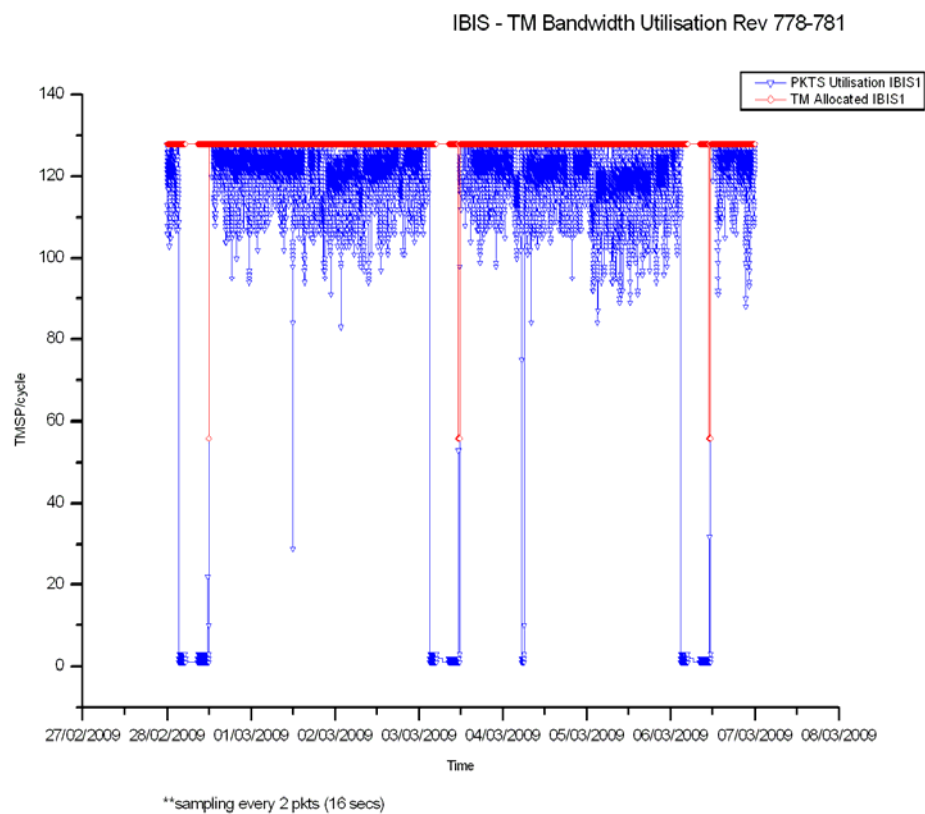
3.2.2 IBIS

The overall status of the unit is nominal.

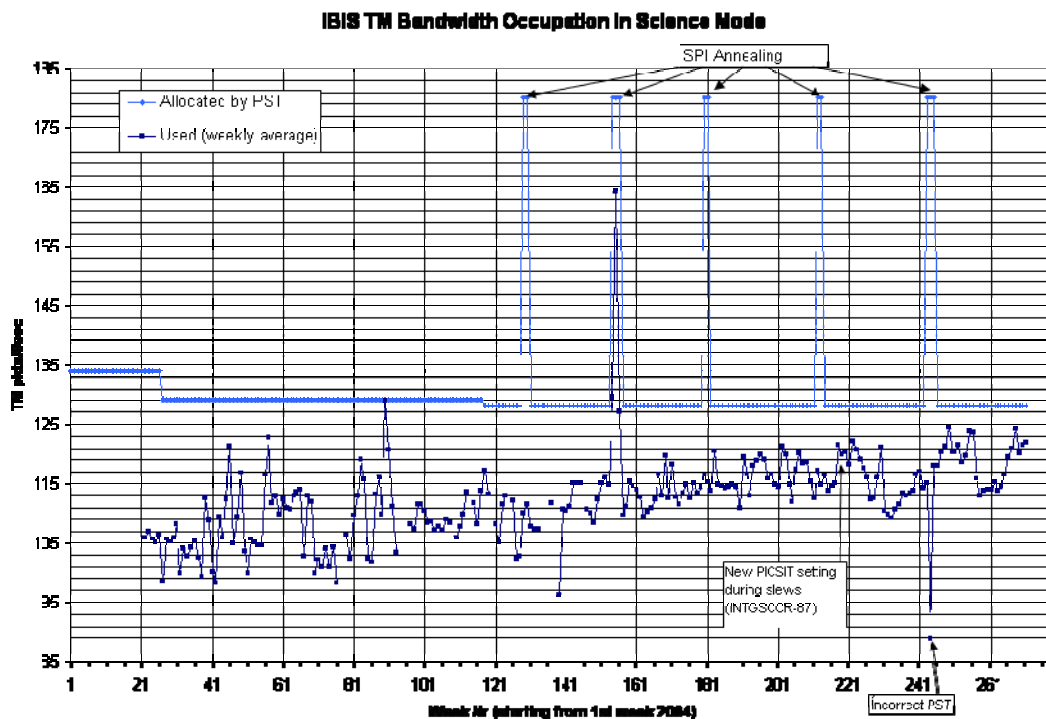
During the reporting period, the TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 128 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 121.98 packets/cycle (up 0.54 on previous week)
- Percentage of TM cycles in which full bandwidth (128 packets/cycle) was used: 19.43%

The plot below shows the IBIS TM utilisation during the reporting 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 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 per cycle.

During this reporting period, all of the 138 planned science pointings were executed nominally.

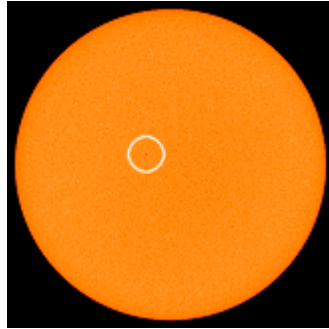
Note: Some more information concerning the OMC operations is provided in the Appendix.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. The Sun was blank for most of the week, however sun-spot #1014 emerged on the Friday 6th March. The risk 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. No pointings were lost due to ground problems. The overall performance was over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. The FD slew update failed to arrive on 3 occasions, there was no impact. The OTF was not reached for 2 occasions.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. On DoY 059 at 17:37Z and DoY 061 at 15:29Z there was a drop in TM for a few seconds from Redu and Goldstone. Also the TC dropped out for about one minute on DoY 061 at 14:47Z from Goldstone, with no impact.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

No new PSF has been received.

The POS for revolution 782 was updated to correct the JEM-X settings. New observations were planned for revolutions 785 and 786.

New TSFs have been received for revolutions 781 to 783.

2. Observation status

New ECS files have been received for revolution 769 to 771.

3. ISOC Science Data Archive

Installation of the new INGEST software is progressing. The 3rd ISGRI catalogue data has been provided to the SAT, but one catalogue table must be updated with a missing field. A draft document on nomenclature has been produced for internal use. Use of archived data from the Grid has encountered some issues with permissions which are being investigated.

4. ISOC system

Work is continuing on V22 (post TAC s/w).

5. Problems

No new problems.

4.3.2 ISDC

Status of ISDC observation processing on 06/03/2009:

- Latest Standard Analysis completed: observation 06200600001 (3C 279, Revolution 0766) on 05/03/2009.
- Latest products archived: observation 06200600001 (3C 279, Revolution 0766) on 05/03/2009.
- Latest observation products sent to the observer: observation 06200600001 (3C 279, Revolution 0766) on 06/03/2009.

5 Special Events

- Eclipse Season starts 12/3/2009

6 Anomalies

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

AR id	Date Created	Subject	Segment	Status
INT_SC-248	2009-03-06	Missing OMC pointing.	Payload	Testing

7 Future Milestones

- DPE LOBT Wraparound on 4/3/2009
- New PST ED in use from 6/3/2009 (revolution 781)
- Completion of VIL2 MPLS Validation

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 778

The observations in revolution 778 began with a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), lasting ~25.1 hours. They continued with a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3), lasting ~27.8 hours, until the end of the revolution.

Revolution 779

The observations in revolution 779 began with a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), lasting ~30.9 hours. They continued with a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3), lasting ~25.9 hours, until the end of the revolution.

Revolution 780

The observations in revolution 780 began with a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), lasting ~30.9 hours. They continued with a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3), lasting ~22.2 hours, until the end of the revolution.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 108; JEM-X1 8; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2009-02-19T22:39:22.000Z	135.7881	F	Automatic TM processing.
2009-02-22T10:05:21.000Z	135.7735	F	Automatic TM processing.
2009-02-23T19:25:16.000Z	135.7596	F	Automatic TM processing.
2009-02-25T11:42:41.000Z	135.7449	F	Automatic TM processing.
2009-02-26T19:25:24.000Z	135.6852	F	Automatic TM processing.
2009-02-28T09:24:00.000Z	135.6680	F	Automatic TM processing.
2009-03-01T18:59:48.000Z	135.6480	F	Automatic TM processing.
2009-03-03T09:08:57.000Z	135.6327	F	Automatic TM processing.
2009-03-04T19:14:13.000Z	135.6148	F	Automatic TM processing.

This report was generated Fri Mar 6 08:00:39 GMT 2009

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, 28/02/2009 – 06/03/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 121 Open Loop Slews, 34 Closed Loop Slews and 5 Momentum Biases were executed (as reported by ACC OEM).

No slew was missed from TL, during the observation period.

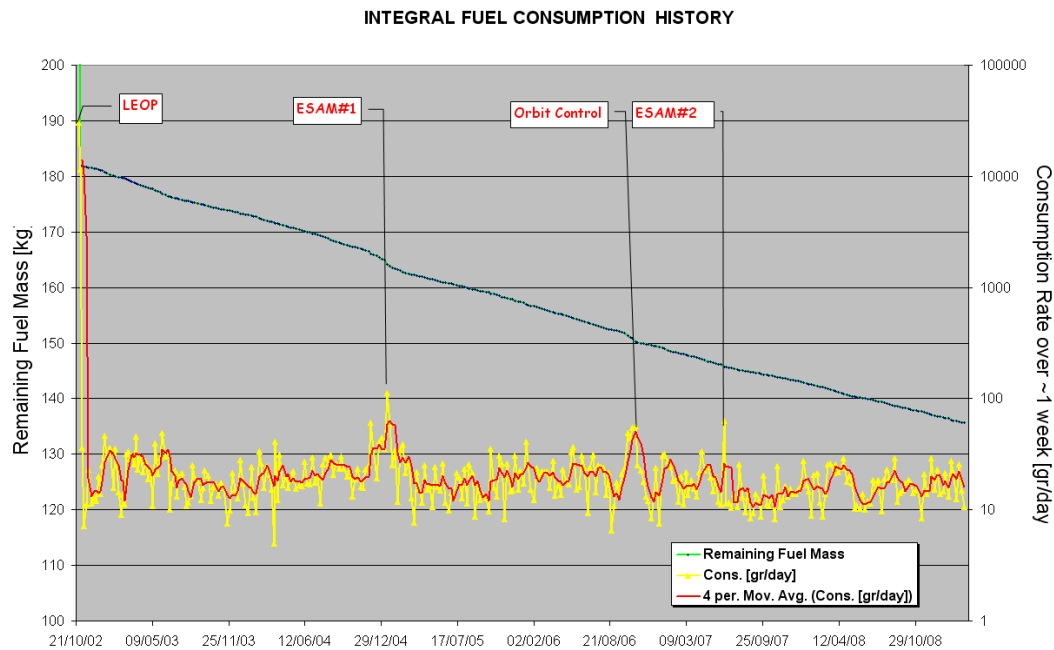
The OTF was not reached during part of PIDs 07790029 - 07800036, due to loss of guide star.

Orbit Control

No update.

Fuel consumption

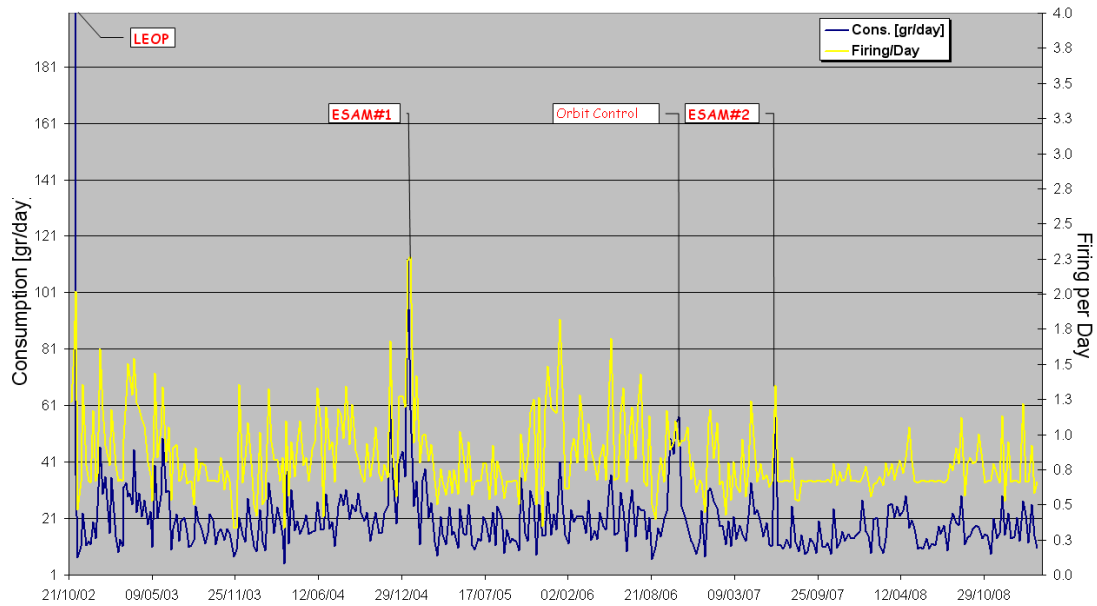
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 06/03/2009 is reported in the plot below.



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 06/03/2009 is reported in the plot below.

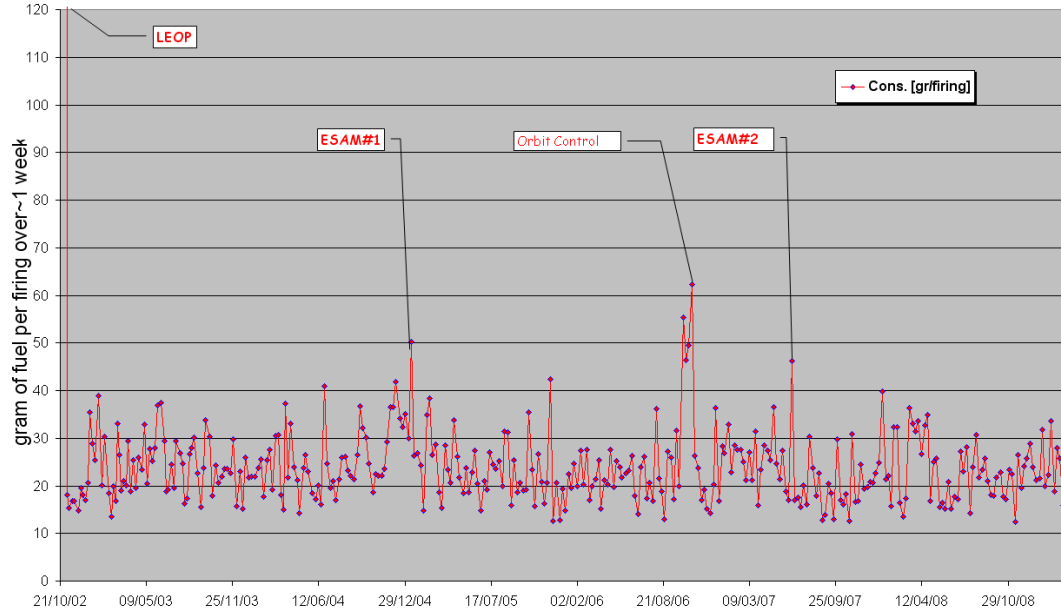
INTEGRAL FIRING PER DAY HISTORY



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 06/03/2009 is shown in the plot below.

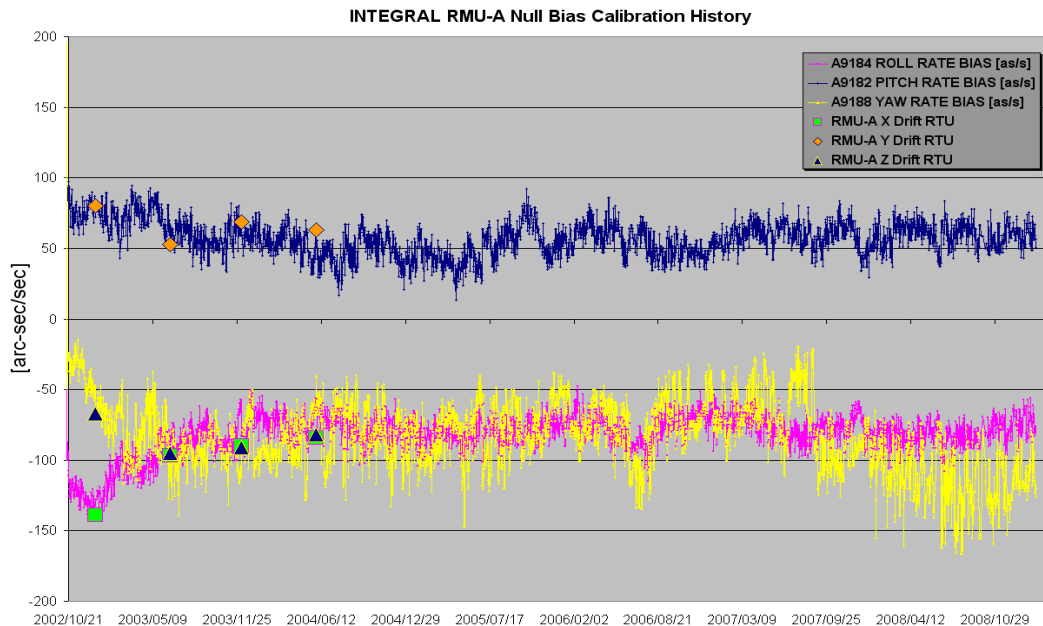
INTEGRAL FUEL MASS PER FIRING HISTORY



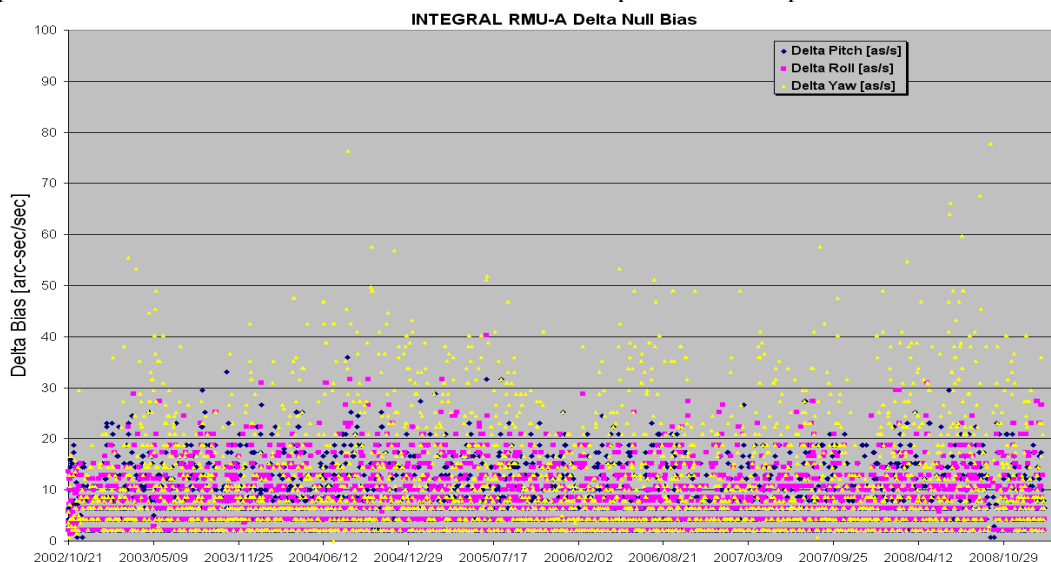
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 06/03/2009 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 06/03/2009 is reported in the plot below.



28/02/2009 (Day of Year 059, Revolution 778-779)

FDS problem on job scheduler task: at 09:49z the FDS did not perform the update of the slew ID 07790001. Likely an overload on the machine where running the job scheduler; caused the task to die. A manual recovery was performed and the slew updated in TL.

At 12:00z, the FDS reported again a problem when updating the slew ID 07790002 and 0003.

The slews were all manually updated in TL.

No slew was missed in TL

01/03/2009 (Day of Year 060, Revolution 779)

Loss of guide star: at 15:57:11z a loss of the selected guide star occurred during PID 07790029. The origin of the event is likely due to false event affecting the STR.

As foreseen by the IPS logic, the ACC did switch ON the IMU 1, a new automatic mapping was commanded and a new guide star picked. The next slew 07790030 was manually updated in TL.

No slew was missed in TL

The OTF was not reached during part of PID 07790029.

02/03/2009 (Day of Year 061, Revolution 779)

Nothing to report.

03/03/2009 (Day of Year 062, Revolution 779-780)

Nothing to report.

04/03/2009 (Day of Year 063, Revolution 780)

Loss of guide star: at 19:55:58z a loss of the selected guide star occurred during PID 07800036. The origin of the event is likely due to false event affecting the STR.

As foreseen by the IPS logic, the ACC did switch ON the IMU 1, a new automatic mapping was commanded and a new guide star picked. The next slew 07800037 was manually updated in TL.

No slew was missed in TL

The OTF was not reached during part of PID 07800036.

05/03/2009 (Day of Year 064, Revolution 780)

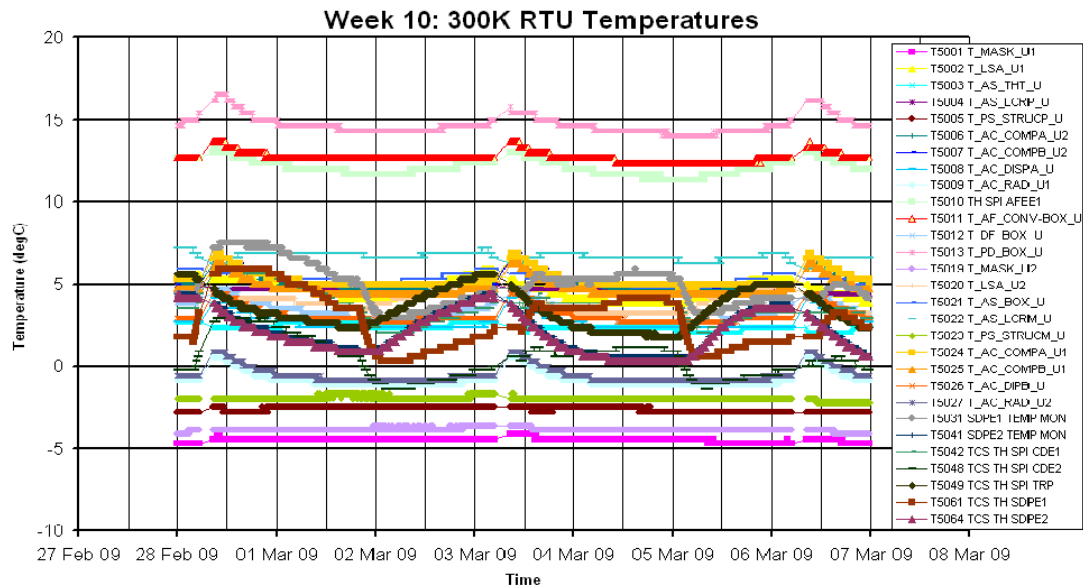
Nothing to report.

06/03/2009 (Day of Year 065, Revolution 780-781)

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.



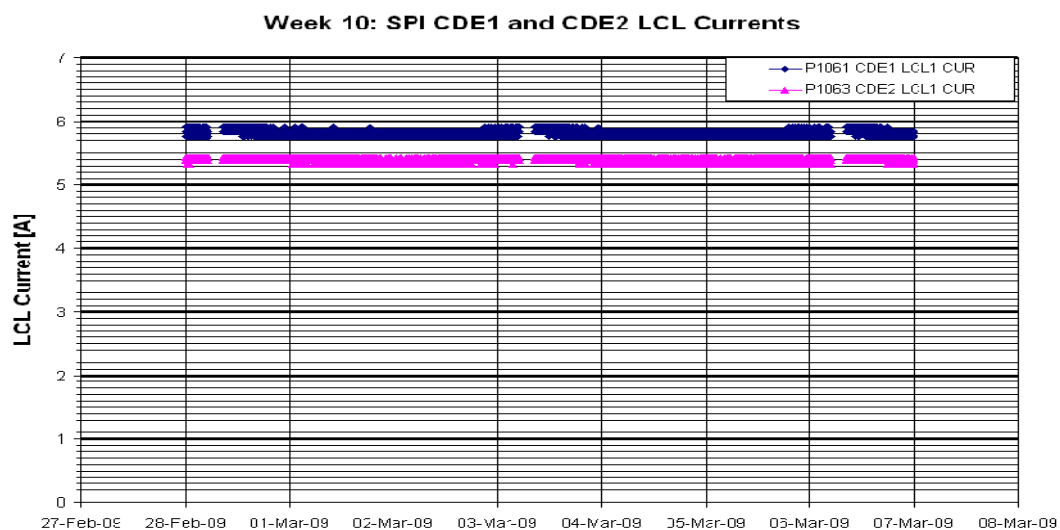
Stirling Compressors and Cryostat: The performance of the compressors is nominal.

The cold plate temperature was maintained in the range 80K +/-1K.

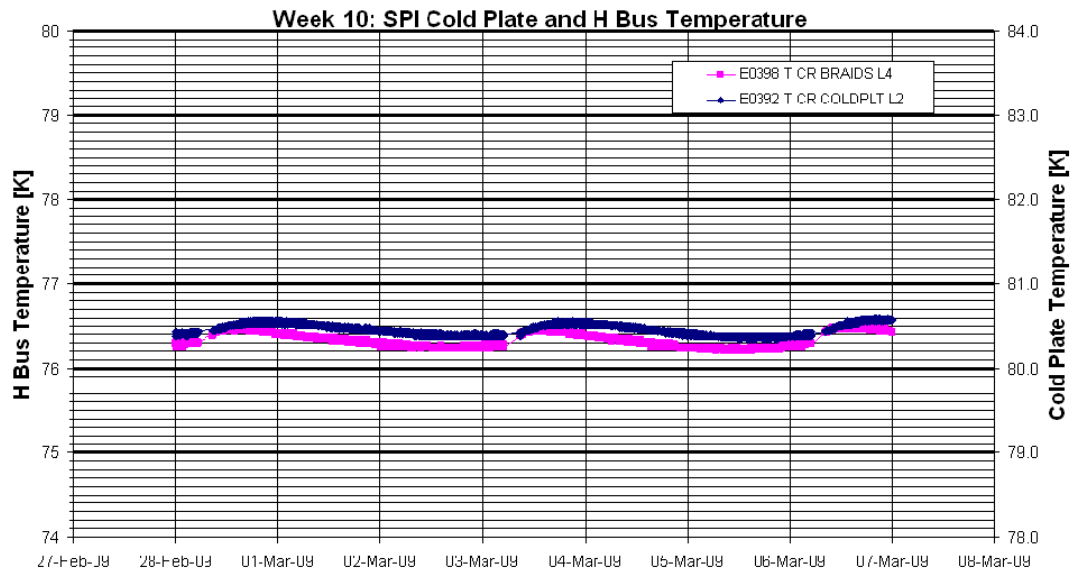
The stroke of all four compressors was set to 43 throughout the week and the average CDE LCL currents were as follows:

- CDE1 LCL Current = 5.82A
- CDE2 LCL Current = 5.39A

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.

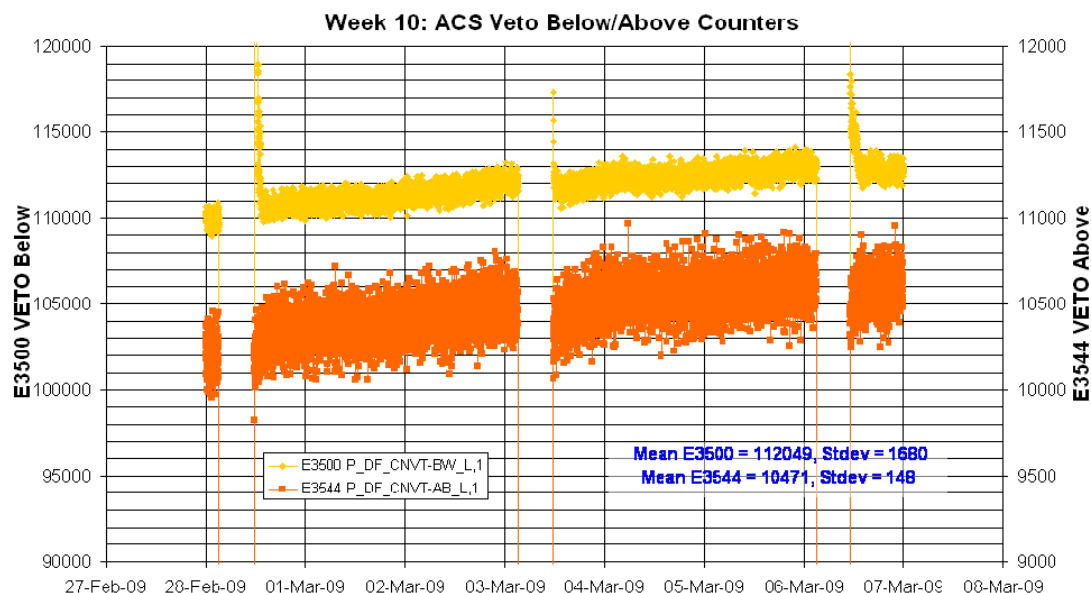
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 97 packets/cycle over the science window when the TM allocation was 108 packets/cycle.

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

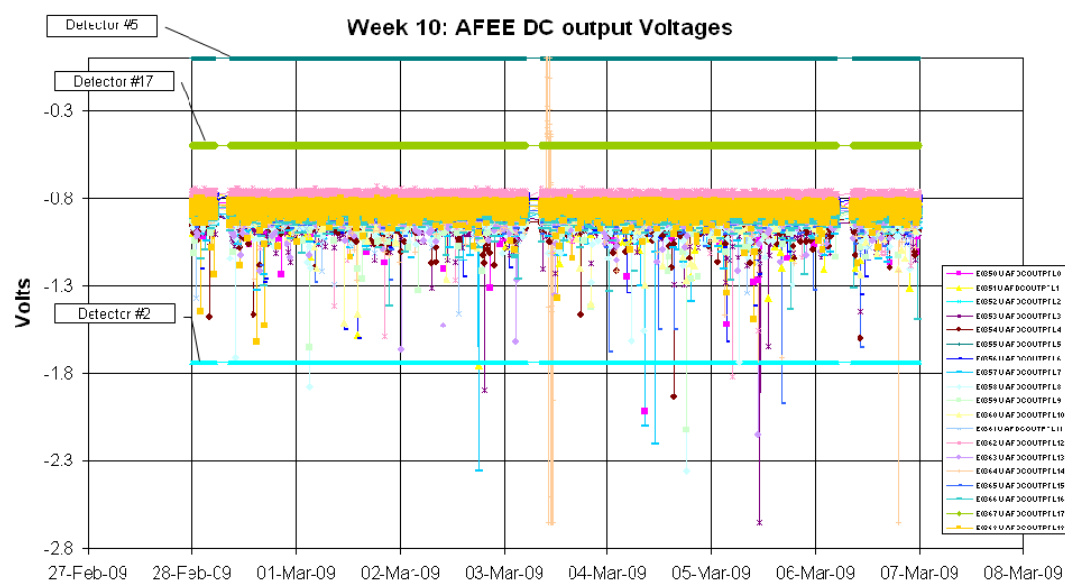


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

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

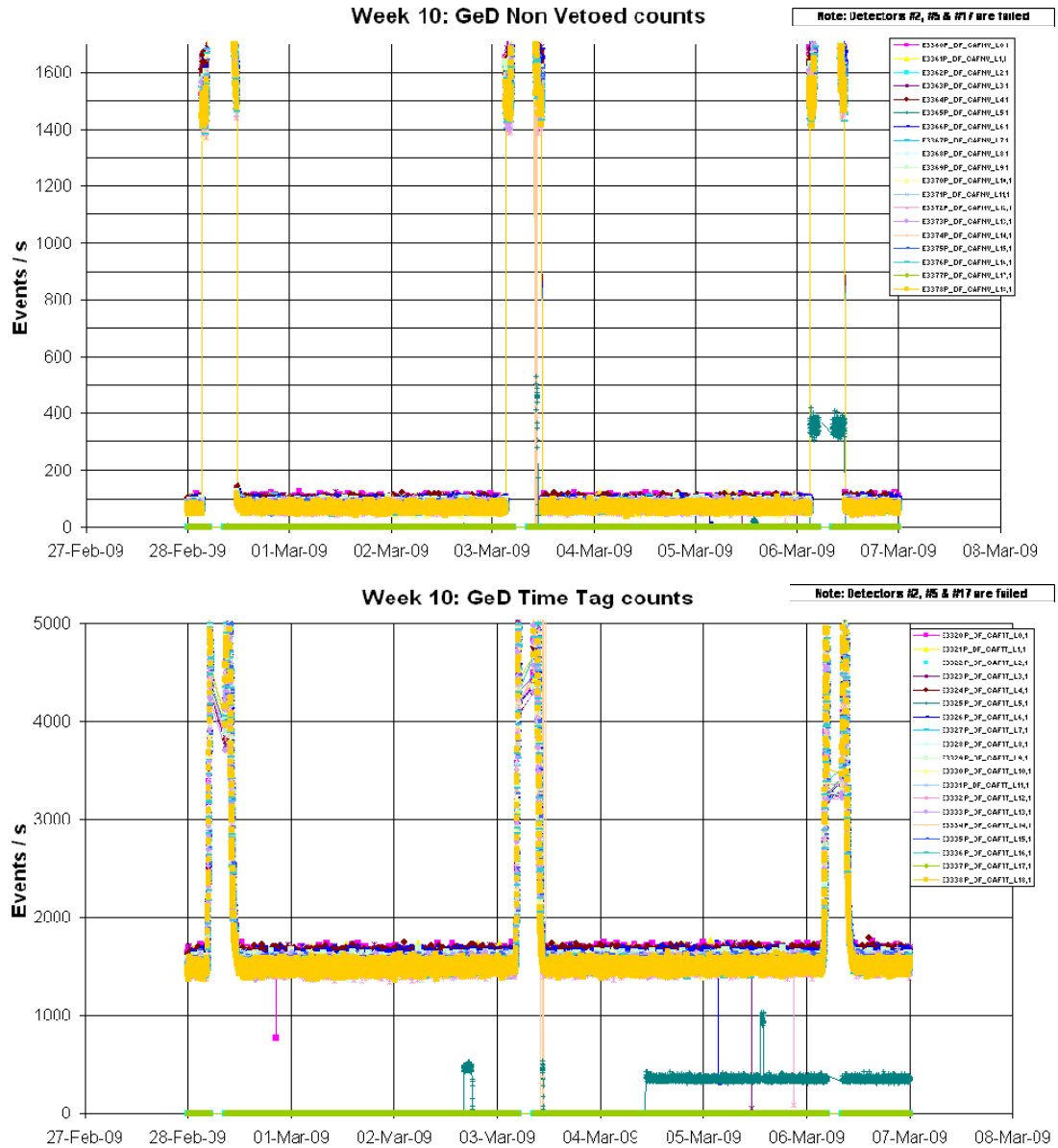


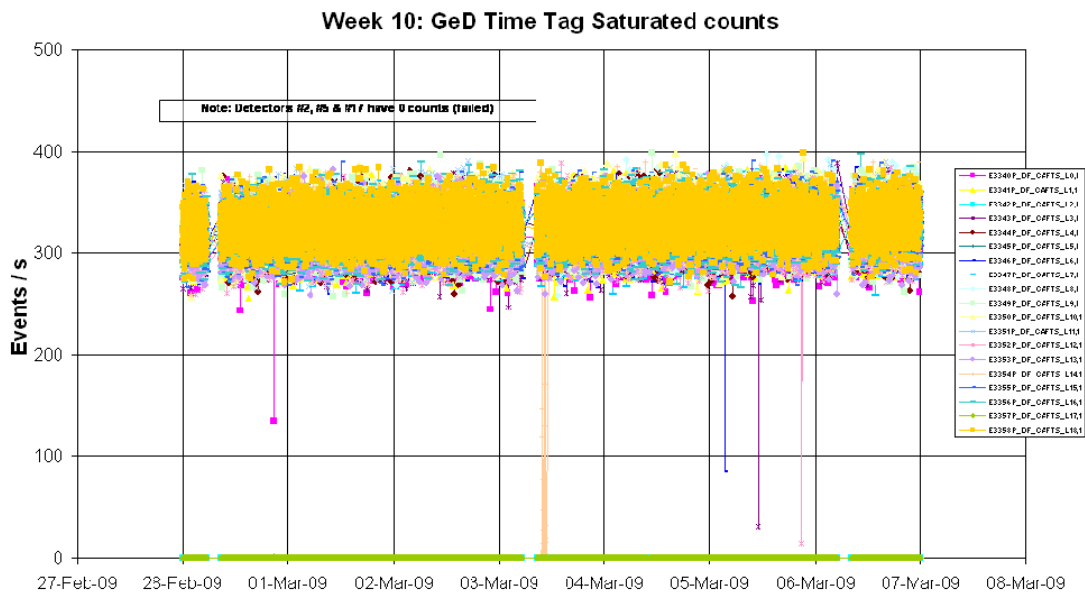
AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003; detector #17 is failed since 17/07/2004 and detector #5 is failed since 19/02/2009.



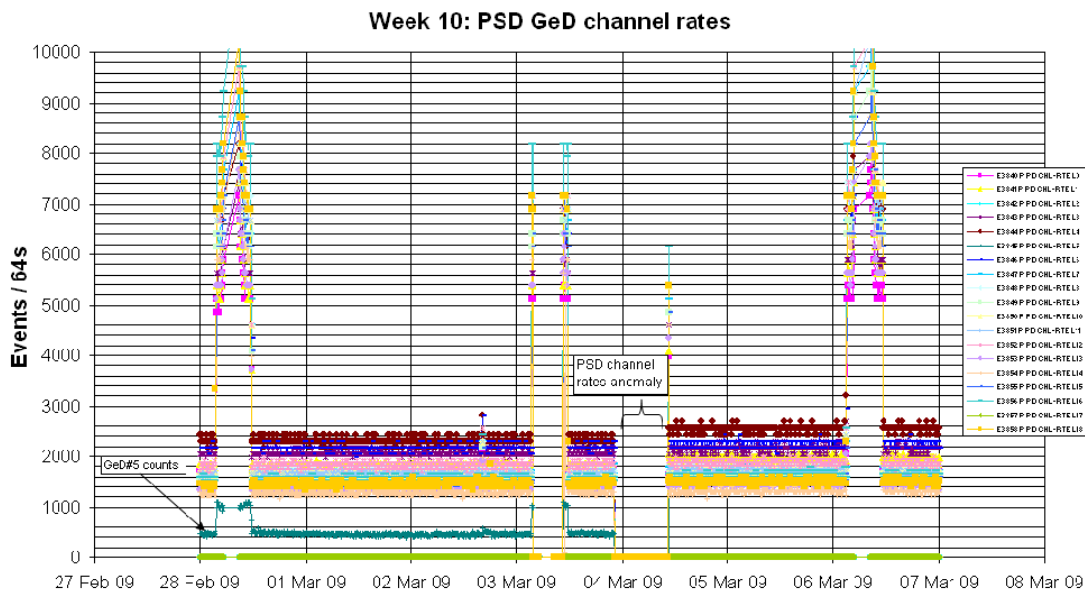
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period. The High Voltage of GeD#5 had been set to 0kV until the PSD channel rates

anomaly recovery on 04/03/2009 (ending at 10:40:05Z), after which the GeD#5 HV was set to 0.5kV as for the other failed detectors. Consequently the GeD#5 Non-Vetoed and Time Tagged counts are non-zero after this time.





PSD: The health of the unit is nominal. The following plot shows the PSD channel rates during the reporting period. A channel rate malfunction, in which all PSD channel rates went to zero, occurred on 03/03/2009. Full details are given in the Event Log section of this report. Following this anomaly, the GeD#5 is disabled in the PSD, as for the other failed detectors.



Event Log:

1) GeD#5 Anomaly: Further Investigation and Recovery Attempts

The following three tests were executed during the week for the purpose of investigating the GeD#5 anomaly:

Test 1: High energy clamping, performed on 02-03-2009

- The aim was to produce a transistor reset of the Preamplifier (which would occur in case of a high energy event).
- As this was enabled for GeD#5 in isolation, it did not affect the other detectors.

- The only impact to science was due to the transition from Photon to Conf mode and back, which was performed in synchronisation with slews in order not to interrupt the science data collection during the pointing.

Procedure:

- 16:07:57Z Go to Conf (FCP_SPI1_0160).
- 16:08:19Z Uplink fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para of GeD#5 to 2kV to restore HV of GeD#5.
- 16:10:05Z Go to Photon (FCP_SPI1_0130) and stay in photon for a while, monitoring count rates and DC output voltage. No change was observed in the DC output voltage and the count rates were observed to be the same as they were following the anomaly (before the GeD#5 HV was set to 0V), i.e. GeD#5 TT counts = ~500/cycle and GeD#5 NV counts = a few/cycle.
- 17:05:25Z Go to Conf (FCP_SPI1_0160).
- 17:05:36Z Uplink TPF fmconfig/ES1712_AF-CHPAR_fmconfig_0002.TPF (FCP_SPI1_1712), before uplink set TC para E5055 = ON to enable high energy clamping for GeD#5.
- 17:05:51Z Go to Photon (FCP_SPI1_0130) stay in photon for a while, monitoring count rates. No change was observed in the count rates or DC output voltage of GeD#5.
- 18:02:57Z Go to Conf (FCP_SPI1_0160).
- 18:03:12Z Uplink TPF fmconfig/ES1712_AF-CHPAR_fmconfig_0002.TPF (FCP_SPI1_1712) to restore nominal configuration.
- 18:03:27Z Restore nominal HV setting by uplinking TPF fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para E5015 to requested HV for GeD#5 (0V).
- 18:04:37Z Return to Photon (FCP_SPI1_0130)

Test 1 Outcome: No change to GeD#5 behaviour observed.

Test 2: Step change of GeD#5 High Voltage in Diagnostic Mode, performed on 03-03-2009

- The purpose of this was to monitor the evolution of the High Voltage and the transients in the DC output voltage during a High Voltage change (to determine the time constant of the HVPS circuit) and to compare this to the behaviour of a healthy detector. It was also thought useful to observe the behaviour of the other failed GeDs (#2 and #17) in this situation.
- The step change was performed from 0kV to 2kV and then back.
- This test was performed during radiation belts and therefore did not affect science operations.

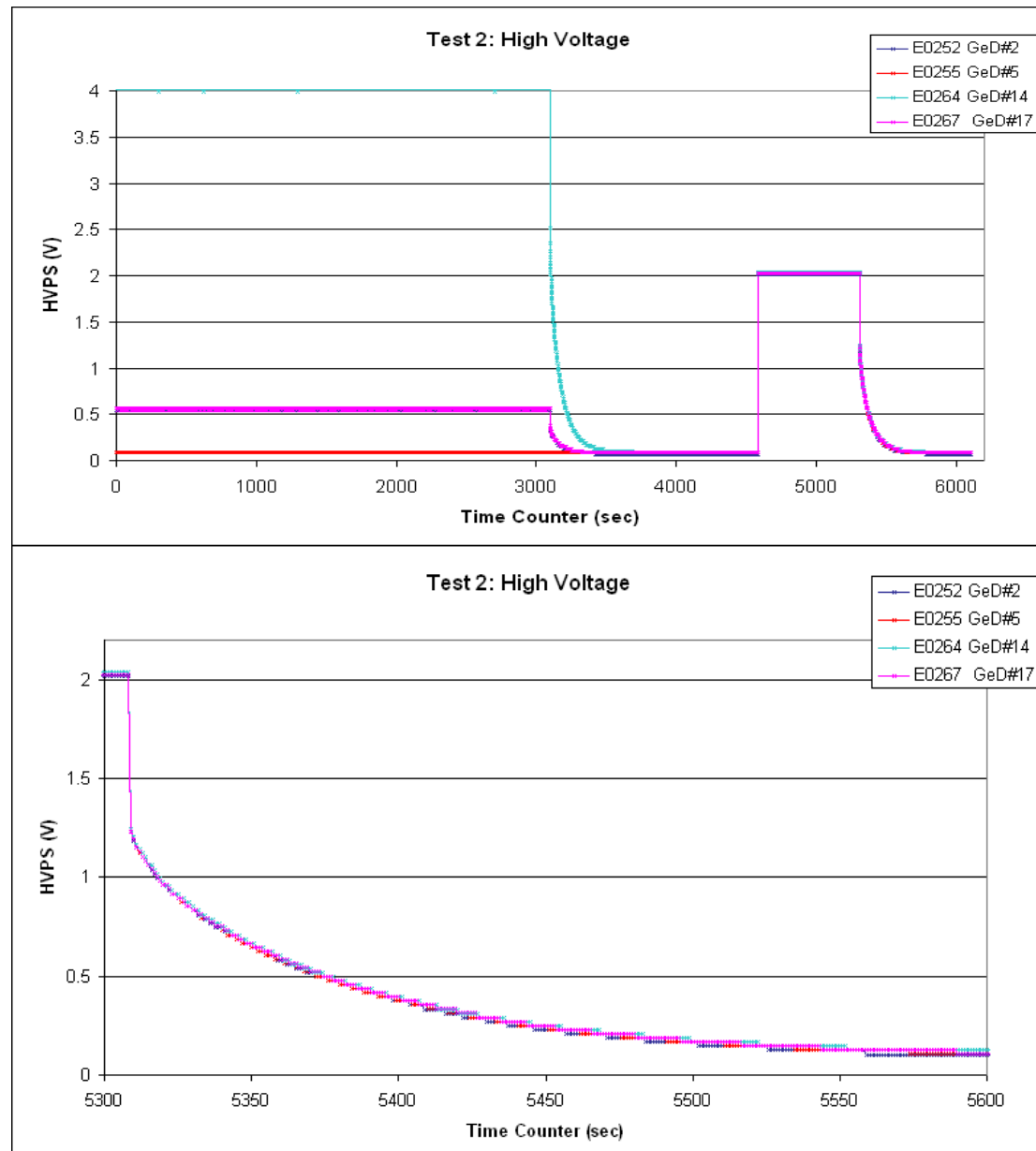
Procedure:

- 08:57:15Z Disable belts reaction and automatic reconfiguration by sending TPF ES1700_IASW-PAR_disbelts_0012.TPF to go out of PROTÉGÉ state.
- 08:57:52Z Go to Conf (FCP_SPI1_0160).
- 09:00:43Z Execute FCP_SPI1_0150 to go to Diagnostic Mode, uplinking TPF diag_SA/ ES1750_DIAG-PAR_diagafee_0001.TPF. It

was confirmed that Diagnostic mode was working, with the packets being received (though not processed at MOC).

- 09:54:02Z Go to Conf (FCP_SPI1_0160).
- 09:54:46Z Uplink fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para of GeD#2, GeD#17, GeD#5 and reference GeD (#14) to 0kV.
- 09:54:47Z Resume FCP_SPI1_0150 from step 4 to go to Diagnostic Mode and wait for the stabilisation of the HV and DC output voltages of the detectors.
- 10:19:34Z Go to Conf (FCP_SPI1_0160).
- 10:20:50Z Uplink fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para for GeD#5, #2, #17 and reference GeD (#14) to 2kV.
- 10:20:51Z Resume FCP_SPI1_0150 from step 4 to go to Diagnostic Mode and wait for the stabilisation of the HV and DC output voltages.
- 10:32:58Z Go to Conf (FCP_SPI1_0160).
- 10:34:18Z Uplink fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), setting 0kV for GeD#5, #2, #17 and #14 (reference).
- 10:34:19Z Resume FCP_SPI1_0150 from step 4 to go to Diagnostic Mode and wait for the stabilisation of the HV and DC output voltages.
- 10:47:44Z Go to Conf (FCP_SPI1_0160).
- 10:49:07Z Restore nominal HV setting for GeD #2 and #17 (0.5kV); set HV of GeD#5 to 0V and restore nominal HV of GeD#14 in steps of 1kV.
- 11:23:35Z Return to Photon (FCP_SPI1_0130).
- 11:26:02Z Restore radiation belts reaction and return to protégé by sending TPF ES1700_IASW-PAR_fmconfig_0015.TPF.
- 11:35:38Z Uplink ED EEACON02 to reconfigure SPI for science observations.

In analysing the data from this test, no change was observed in the Low Voltage Power Supply or DC output voltage or of the failed detectors. The High Voltage power supply showed the same behaviour as for the healthy detectors. In particular, the time constant of the decay of the HV when stepping down from 2kV to 0kV for all three failed detectors was identical to that of a healthy detector (~35s). As the response of the High Voltage circuits of the three failed detectors is nominal, this supports the theory that the failures are in the Pre-amplifiers:



Test 2 Outcome: Response of HV circuit for GeD#5, and other failed detectors, is nominal.

Test 3: Set detection threshold to 0keV, performed on 05-03-2009

- The primary purpose of this test was to check the status of the AFEE signal detection electronics.
 - As a secondary purpose it was considered that decreasing the detection threshold, thereby enabling more events to be detected, may be important for characterising the events produced by GeD#5.
 - It was expected that a high number of counts would be generated in this configuration. This would not have been dangerous however the acquisition of events (SE, ME, PE) was initially disabled for this reason (set globally for all detectors). To minimise the impact on science data, this was only performed for a short time and during an observation in which SPI was not the primary instrument.
- Procedure:

- 13:23:04Z Go to Conf (FCP_SPI1_0160).
- 13:24:05Z Uplink fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para of GeD#5 to 2kV to set HV of GeD#5.
- 13:24:51Z Disable acquisition of events by uplinking fmconfig/ES1721_DF-CLPAR_fmconfig_0007.TPF (FCP_SPI1_1721), before uplink set TC parameters E7777-E7779=NO.
- 13:25:17Z Uplink TPF fmconfig/ ES1711_AF-LW-DT_fmconfig_0001.TPF (FCP_SPI1_1711), before uplink set TC para E5035 = 0 to set detection threshold for GeD#5 to minimum (0 raw, 3.23keV engineering).
- 13:25:45Z Go to Photon (FCP_SPI1_0130). TT count rate was observed to be ~1000 counts/cycle and the NV count rate ~20 counts/cycle. This is greater than that observed on GeD#5 with a low threshold of 20keV (TT counts = ~400/cycle, NV counts = few/cycle) and also the percentage of non-vetoed counts was greater (~2% versus ~1%). However the GeD#5 count rates in this configuration were still a fraction of those for a healthy detector (TT counts of ~1600/cycle; NV counts of ~80/cycle) and far less than what was expected based on the outcome of the same test performed during the GeD#17 failure analysis (>20000 counts/cycle).
- 13:28:00Z Go to Conf (FCP_SPI1_0160).
- 13:28:41Z Uplink fmconfig/ES1721_DF-CLPAR_fmconfig_0007.TPF (FCP_SPI1_1721) to restore nominal configuration of DFEE (acquisition of events).
- 13:29:01Z Return to Photon (FCP_SPI1_0130) and stay in Photon for the rest of the pointing.
- 14:06:53Z Go to Conf (FCP_SPI1_0160).
- 14:07:17Z Restore nominal HV setting by uplinking TPF fmconfig/ ES1713_AF-HVSET_fmconfig_0007.TPF (FCP_SPI1_1713), before uplink set TC para E5015 to final desired HV for GeD#5 (0.5kV).
- 14:07:58Z Uplink TPF fmconfig/ ES1711_AF-LW-DT_fmconfig_0001.TPF (FCP_SPI1_1711) to restore nominal configuration of low thresholds.
- 14:09:14Z Return to Photon (FCP_SPI1_0130).

Test 3 Outcome: GeD#5 count rates with minimum low detection threshold much lower than expected. This indicates a different type of PA failure to that for e.g. GeD#17. In addition, spectra obtained in this configuration contained lots of noise and no lines were identifiable.

2) PSD Channel Rates Malfunction

On 2009-03-03 at 03:45:19Z TM parameters E3840 - E3858 (except E3842; E3845 and E3857) went OOL Low with value = 0. These are the PSD channel rates for all detectors except GeD#2, GeD#5 and GeD#17. This was just shortly before the perigee passage outage of revolution 779. At AOS of revolution 780 (at 08:33:19Z), the OOLs were still present. As operations for the GeD#5 anomaly investigation had been planned at this time, these were carried out and during these recovery operations, the PSD channel rates returned within limits. However later on the same day, at 22:18:55Z these parameters went OOL again with value = 0. As this anomaly had occurred in the past following GeD#2 and

GeD#17 failures, resulting in GeD#2 and #17 being disabled in the PSD, a first recovery attempt was made by disabling GeD#5 in the PSD as follows:

- 23:21:16Z FCP_SPI1_0160 SPI BACK TO CONF
- 23:22:47Z Disable GeD#5 in PSD by uplinking TPF ES1740_PD-DETED_fmconfig_0005.TPF with TC parameters E8655 and E8615 = DISABLE
- 23:23:31Z FCP_SPI1_0130 SPI TRANSITION TO PHOTON MODE

As this did not solve the problem, following consultation with the PI the following day, a full restoration of the PSD configuration was attempted on 2009-03-04:

- 09:46:38Z FCP_SPI1_0160 SPI BACK TO CONF
- 09:48:38Z FCP_SPI1_0171 SPI LOAD PSD NOMINAL FLIGHT CONFIGURATION
- 10:13:27Z FCP_SPI1_0130 SPI TRANSITION TO PHOTON MODE

This also did not resolve the anomaly. Further investigation of the occurrence on 2009-03-03 at 03:45:19Z revealed that the PSD channel rates had returned to nominal at the time when the GeD#5 had been set to 2kV as part of the ongoing tests. Therefore it was decided to first re-enable GeD#5 in the PSD, restore the GeD#5 HV to 2kV, and then disable GeD#5 in the PSD again before setting the HV to 0.5kV. This would also put GeD#5 in the same configuration as the other failed detectors. The operations were performed as follows on 2009-03-04:

- 10:31:13Z FCP_SPI1_0160 SPI BACK TO CONF
- 10:32:17Z Re-enable GeD#5 in PSD by uplinking TPF ES1740_PD-DETED_fmconfig_0005.TPF
- 10:32:57Z FCP_SPI1_1713 SPI LOAD/REPORT AFEE HIGH VOLTAGE SETTINGS to set GeD#5 HV to 2kV.
- 10:35:05Z FCP_SPI1_0130 SPI TRANSITION TO PHOTON MODE
- 10:36:03Z FCP_SPI1_0160 SPI BACK TO CONF
- 10:36:47Z Disable GeD#5 in PSD by uplinking TPF ES1740_PD-DETED_fmconfig_0005.TPF with TC parameters E8655 and E8615 = DISABLE
- 10:37:34Z FCP_SPI1_1713 SPI LOAD/REPORT AFEE HIGH VOLTAGE SETTINGS to set GeD#5 HV to 0.5kV.
- 10:40:05Z FCP_SPI1_0130 SPI TRANSITION TO PHOTON MODE

Following this, the PSD channel rates returned within limits and SPI operations continued nominally. Anomaly report INT_SC-194 has been updated accordingly.

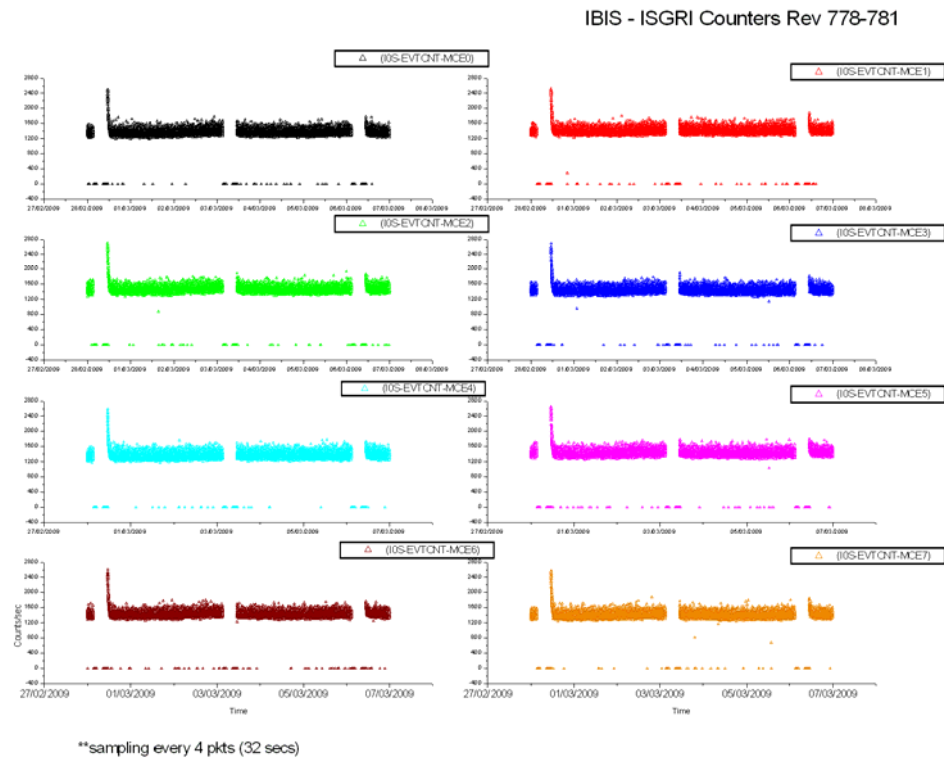
3) High radiation after radiation belt exit

- Due to continuing high radiation after the expected radiation belt exit of revolution 779, TM parameter E3500 (ACS CntVetoBelow) went OOL High on 2009-02-28 at 11:48:19Z. As it returned within limits of its own accord at 12:35:31Z, no action was taken.
- Due to continuing high radiation after the expected radiation belt exit of revolution 781, TM parameter E3500 (ACS CntVetoBelow) started toggling OOL High on 2009-03-06 at 11:21:15Z. As it returned within limits of its own accord at 11:49:31Z, no action was taken.

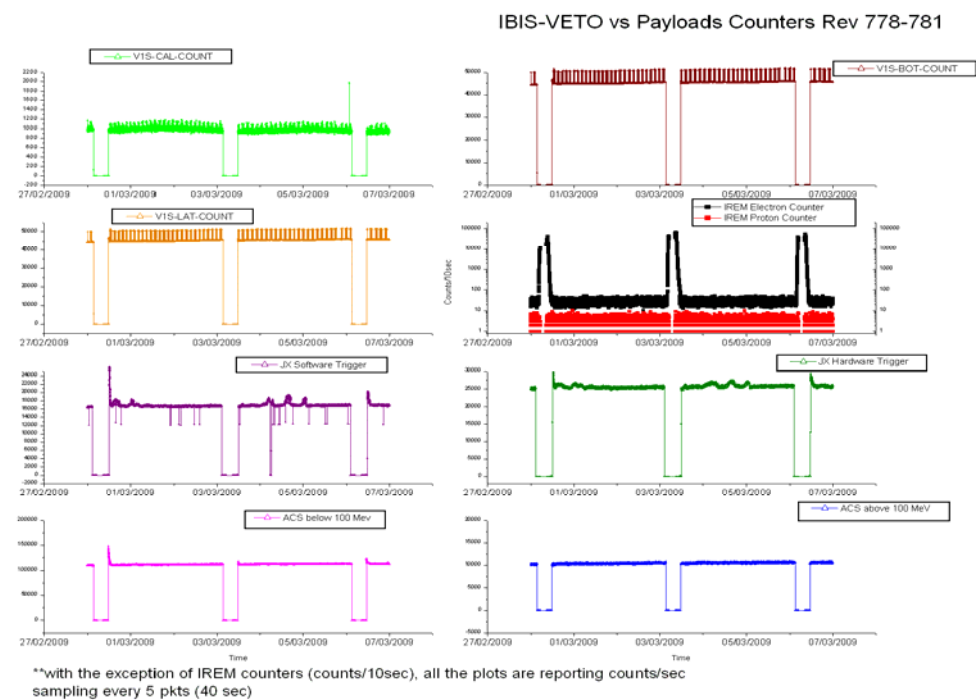
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:

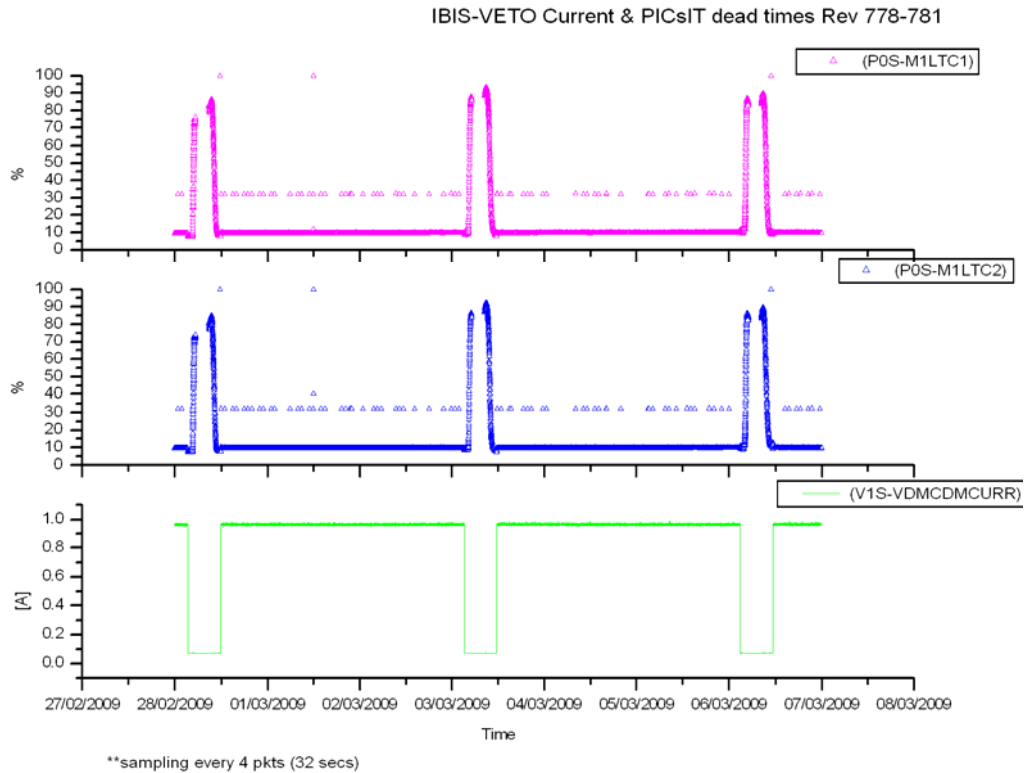


VETO vs Payload Counters:

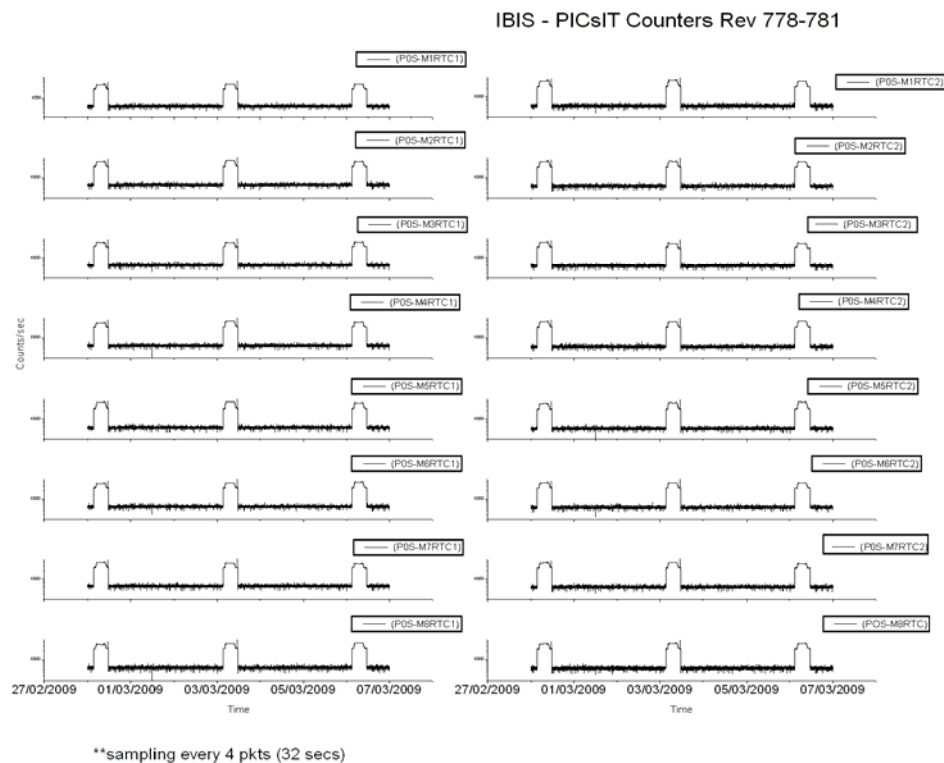


The background radiation level was low during the week, although a short period of high radiation was experienced by the instruments after the expected radiation belt exit of revolution 779.

VETO Current:



PICsIT Counters:



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.

2009-02-28 (DOY 059, Rev 778-779)

TM parameter G2070 went OOL several times during the day, indicating an overflow of the noisy pixel address buffer in MCE5. As in each case it returned within limits of its own accord after a few TM cycles, no action was taken.

2009-03-01 (DOY 060, Rev 779)

At 11:56:51Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. At 11:56:54Z the TM parameter families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As these were followed at 11:59:49Z 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.

2009-03-02 (DOY 061, Rev 779) to 2009-03-03 (DOY 062, Rev 779-780)

IBIS operations executed nominally.

2009-03-04 (DOY 063, Rev 780)

Due to the upcoming wraparound of the DPE LOBT, IBIS was commanded to Standby Mode at 05:26:02Z via FCP_IBIS1_0313. It was commanded back to Science Standard Mode via the CCCF_ED GESTAN02 in the Timeline at 06:09:29Z.

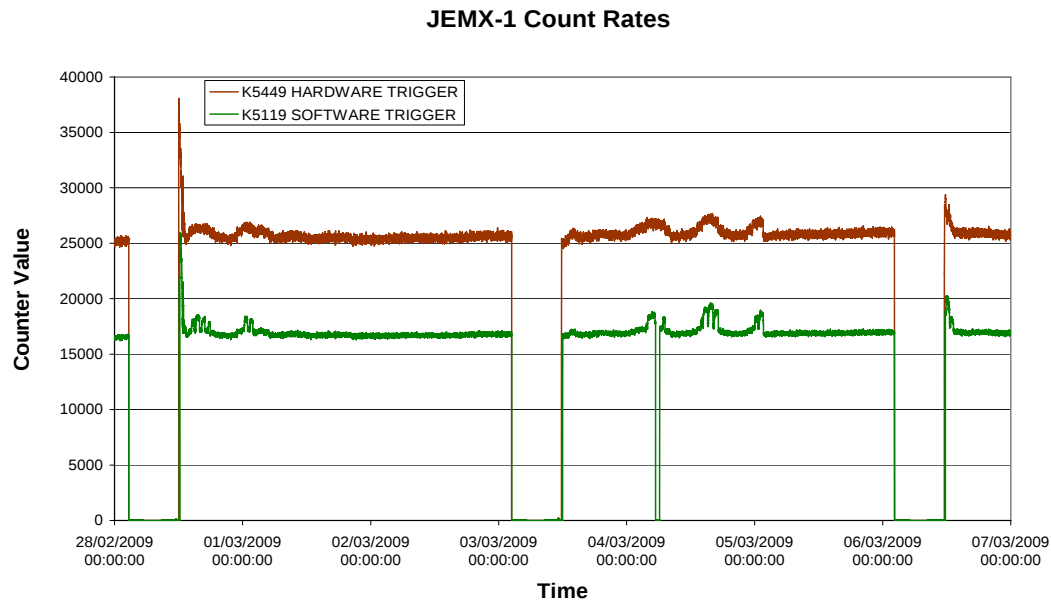
2009-03-05 (DOY 064, Rev 780) to 2009-03-06 (DOY 065, Rev 780-781)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

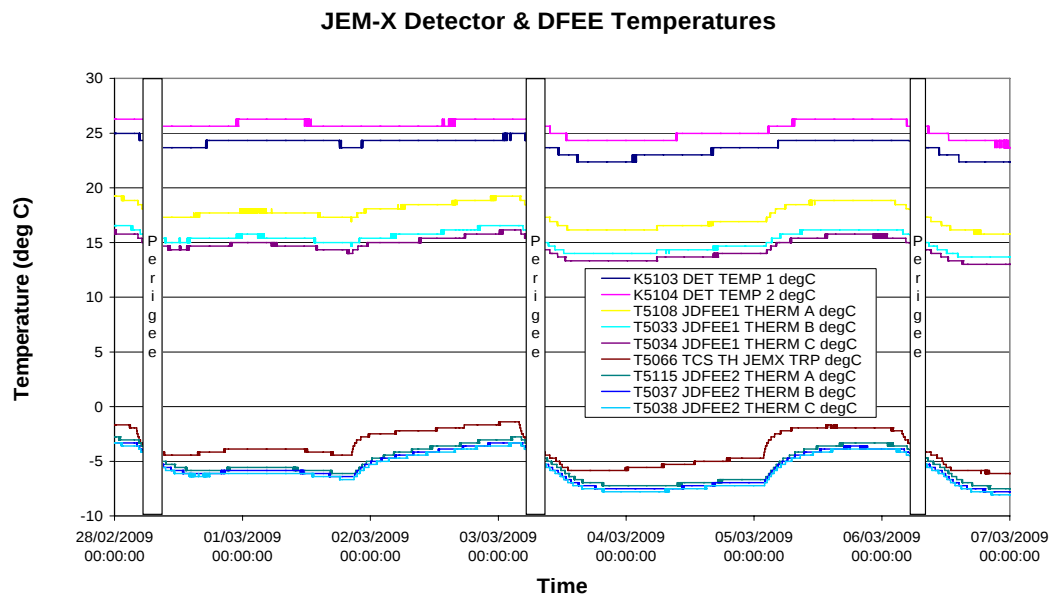
JEM-X Count Rates

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

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Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
Date : 09/03/09

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JEM-X Daily Report

2009-02-28 (DoY 059, Rev 778-779)

The following Out of Limits were received:

At 12:02:00, parameter K5449 exceeded soft limits.

At 12:04:26, parameter K9104 exceeded soft limits.

At 12:06:11, parameter KD5020D exceeded hard limits for 3 minutes 4 seconds.

At 12:09:54 & 12:11:52, parameter K5136 exceeded soft limits.

At 12:31:38, 12:49:45 & 12:51:29, parameter K5449 exceeded soft limits.

No action was taken and there was no impact.

The following OEMs were received at the indicated times:

```
2009.059.20.09.49.419 2009.059.20.09.56.010 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
2009.059.20.09.49.419 2009.059.20.09.56.040 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.

2009-03-01 (DoY 060, Rev 779) to 2009-03-03 (DoY 062, Rev 780)

JEM-X 1 operations executed nominally.

2009-03-04 (DoY 063, Rev 780)

From 05:25:58 to 06:10:46, the Software Trigger (K5119) went to zero, this was due to the instrument being manually commanded to Set-up during this period for the on-board clock wrap-around, and is nominal behaviour.

2009-03-05 (DoY 064, Rev 780) to 2009-03-06 (DoY 065, Rev 781)

JEM-X 1 operations executed nominally.

8.3.5 OMC Operations

2009-02-28 (DoY 059, Rev 778) to 2009-03-06 (DoY 065, Rev 781)

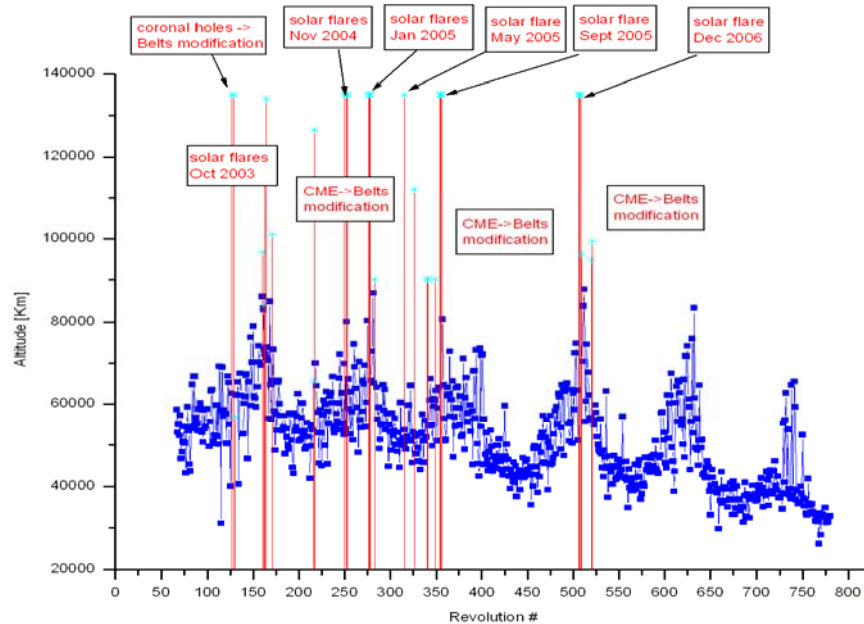
Nothing to report.

On DoY 059 at 03:24:56, DoY 062 at 03:11:29 and DoY 065 at 02:58:33 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

Evolution of Radiation Belt Entry 2003-2008



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]
778	RAD_ENTR R 2009-02-28T03:24:50Z	28/02/2009 04:36:47	31401.8	28-Feb-2009 04:20:30	34580.98
779	RAD_EXIT R 2009-02-28T11:39:39Z	28/02/2009 11:13:59	>>33963.8	28-Feb-2009 11:00:30	46456.56
779	RAD_ENTR R 2009-03-03T03:11:24Z	03/03/2009 04:16:08	32795.5	03-Mar-2009 04:12:40	33899.93
780	RAD_EXIT R 2009-03-03T11:25:42Z	03/03/2009 11:32:56	53519.4	03-Mar-2009 10:52:40	47127.2
780	RAD_ENTR R 2009-03-06T02:58:29Z	06/03/2009 03:59:04	32830.1	06-Mar-2009 04:02:40	33924.17
781	RAD_EXIT R 2009-03-06T11:12:34Z	06/03/2009 10:38:32	>>33998.7	06-Mar-2009 10:42:40	47124.59

Reference

High radiation

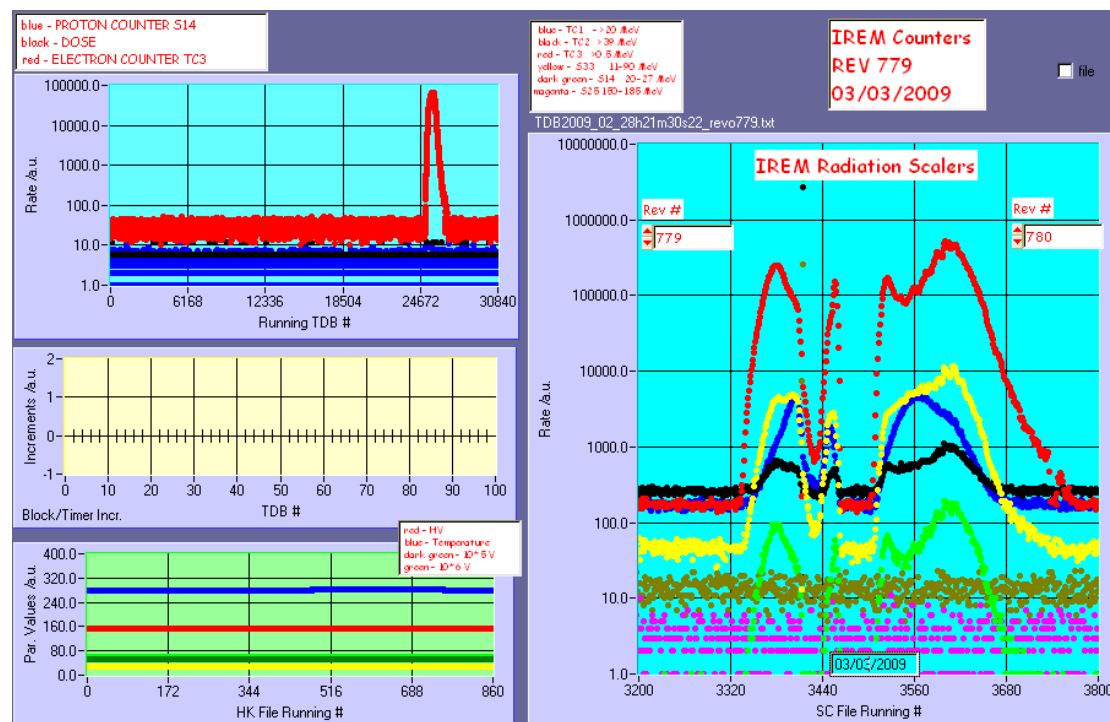
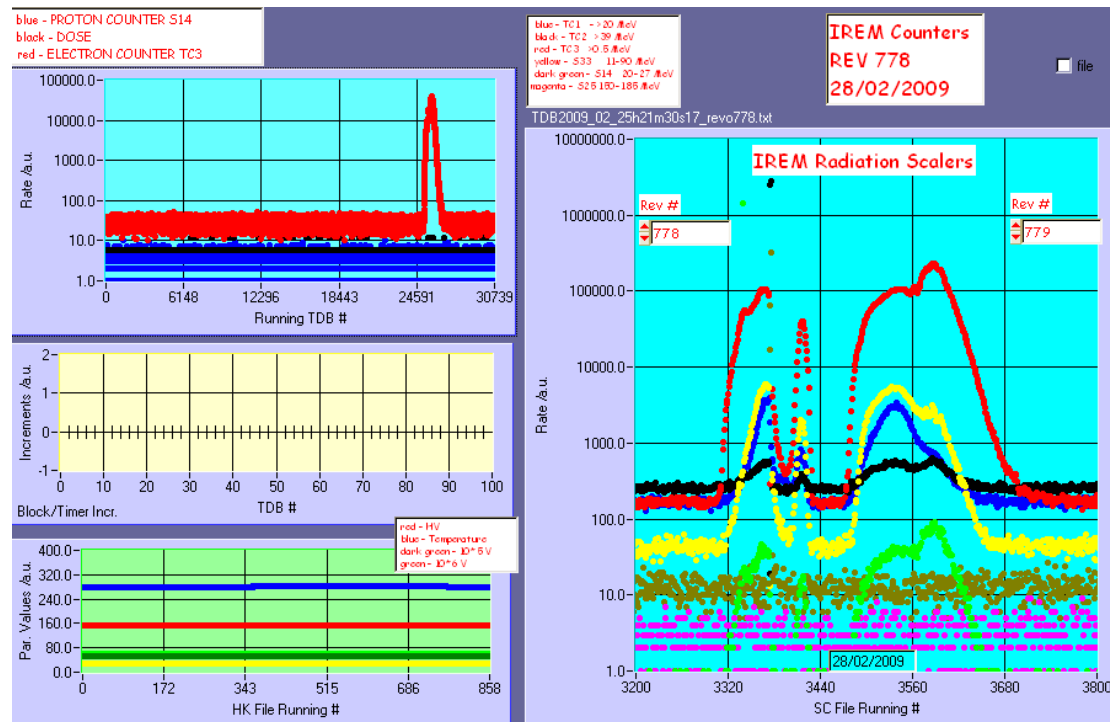
Very small error vs reference (less than 10 minutes)

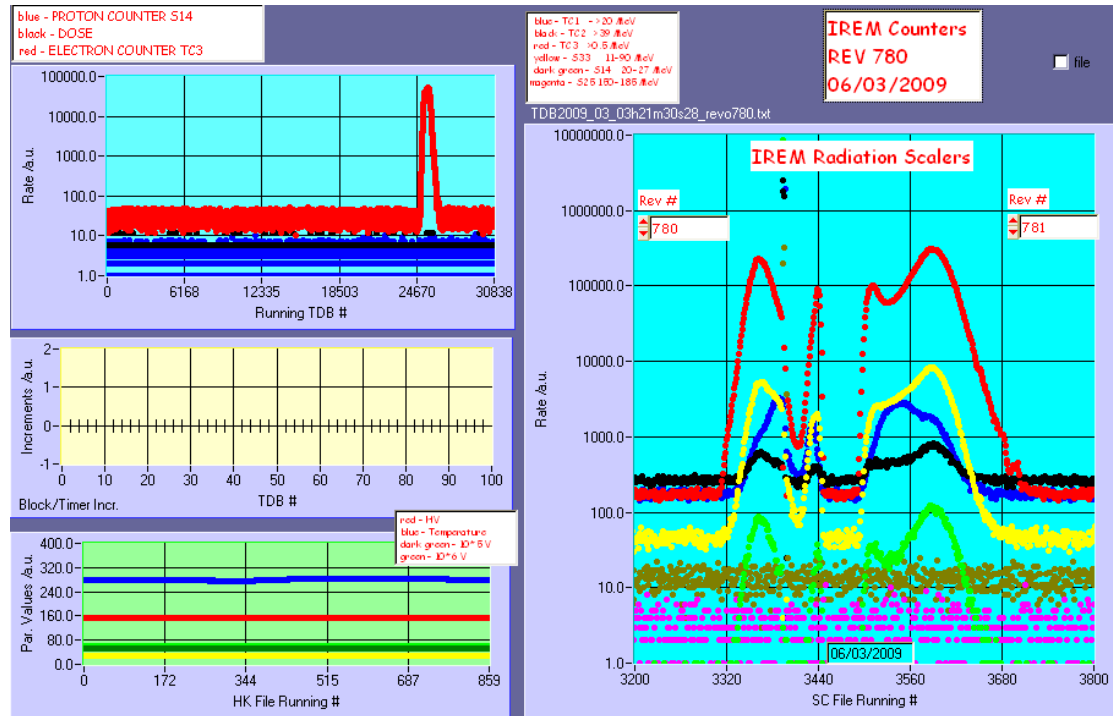
Small error vs reference (between 10 and 30 minutes)

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.

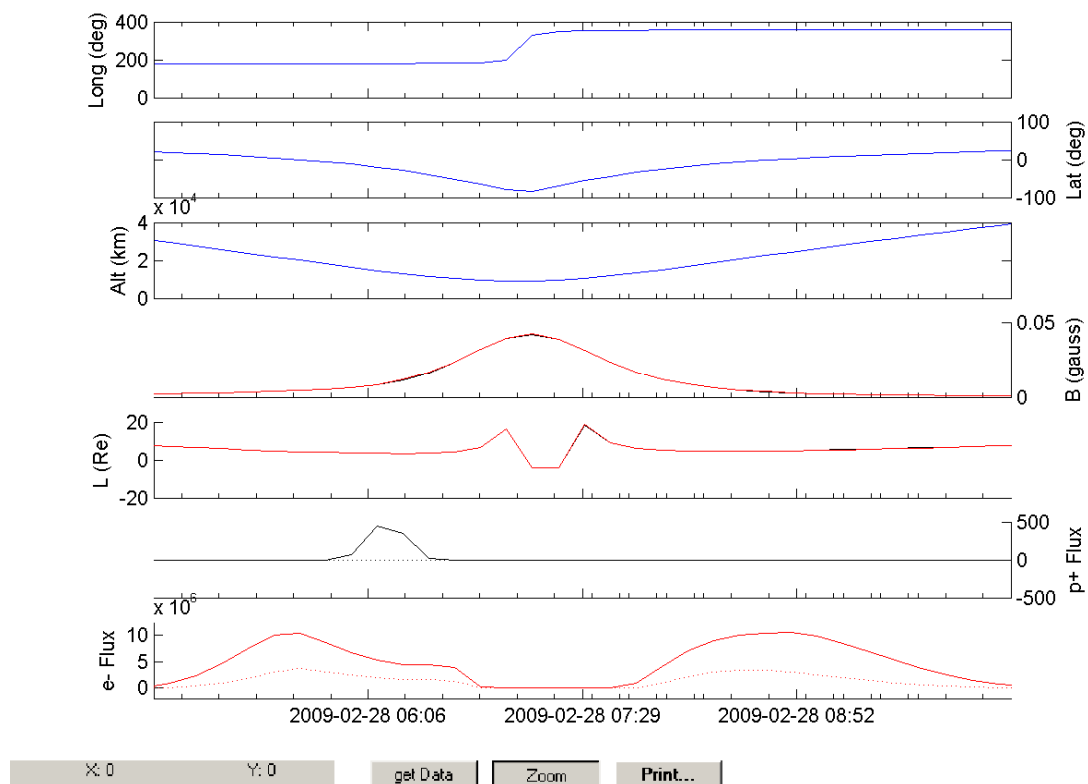
IREM radiation counters:





IREM Predicted Radiation Belt Passages

Rev 778



X: 0

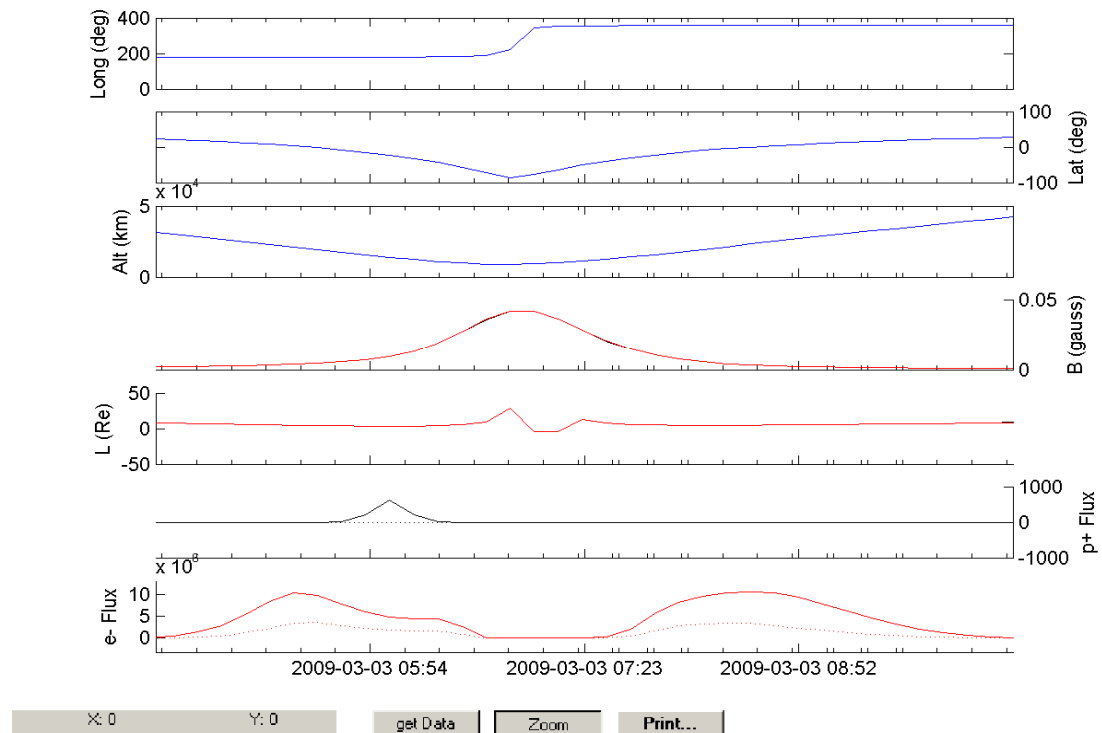
Y: 0

get Data

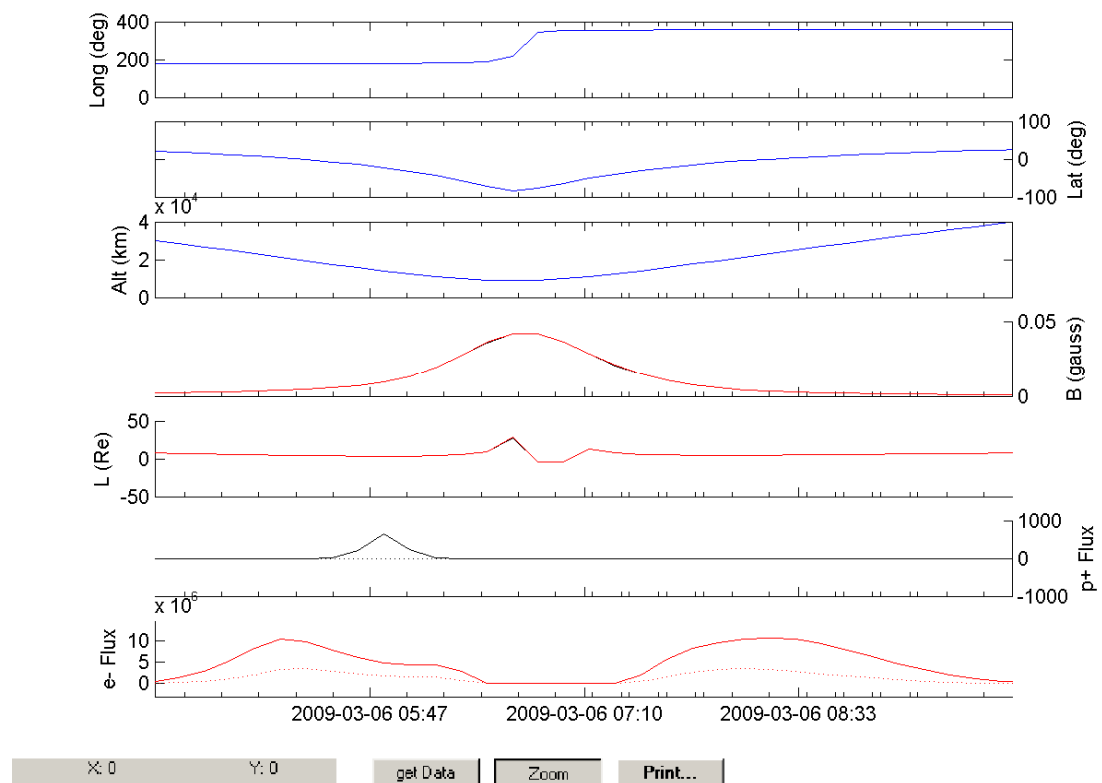
Zoom

Print...

Rev 779



Rev 780



Radiation Assessment

Generated with SEIS Report and Analysis tool.

INTRODUCTION

This note summarises the space weather status over the observation period

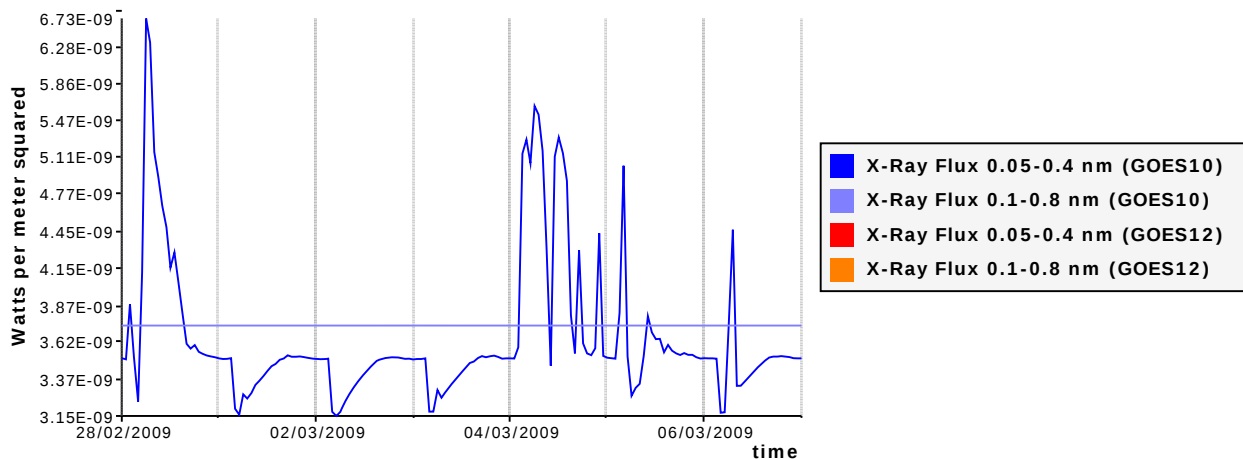
DAILY SUN

see in WR section 3.2.5

RADIATION FLUXES

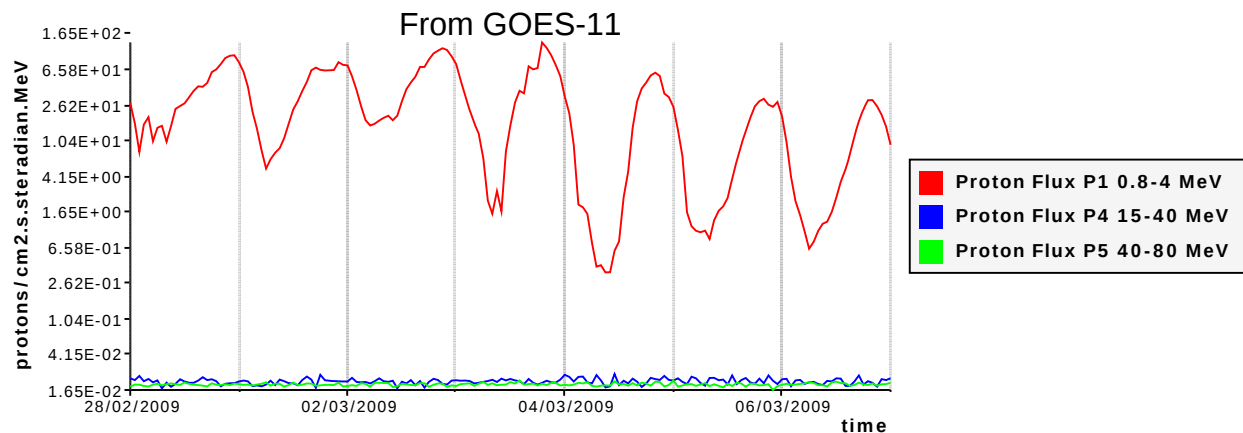
X-ray fluxes

X-ray fluxes for different energies are presented below as reported by GOES satellites. From $1\text{E-}5$ W/m², they start featuring significant radiation activity corresponding to M-class solar flares from $1\text{E-}5$ to $1\text{E-}4$ W/m², and to X-class solar flares from $1\text{E-}4$ and onwards.



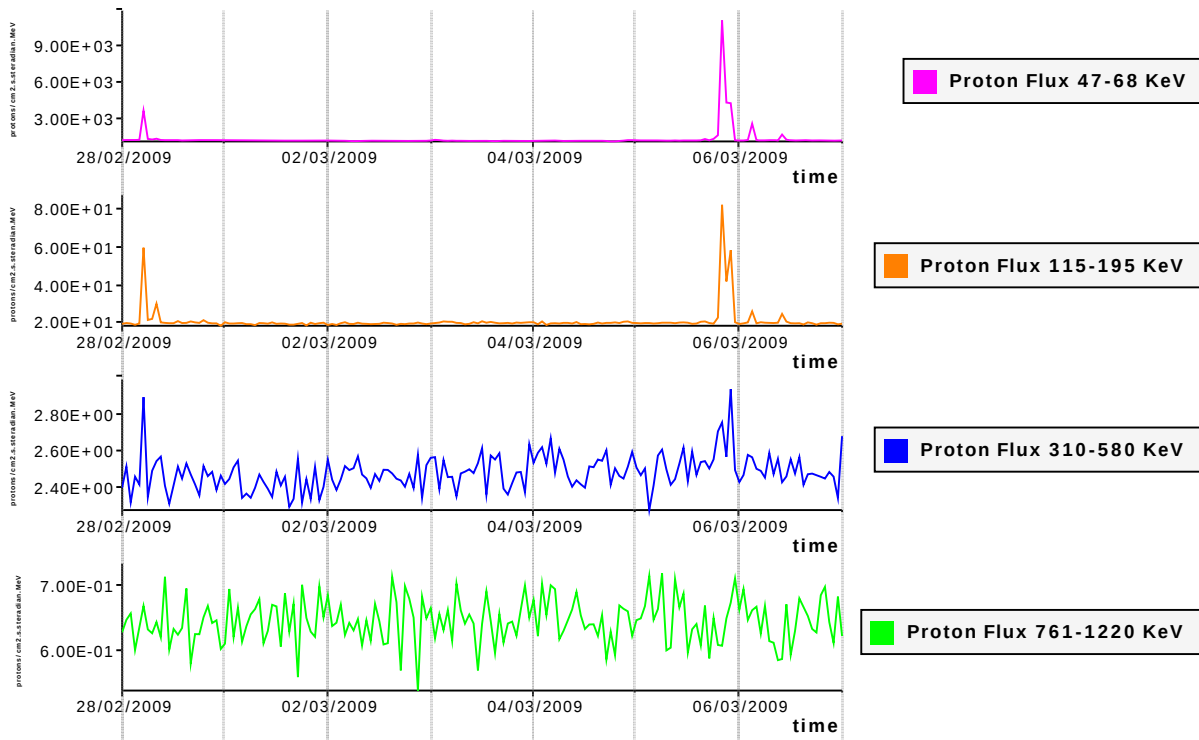
Proton fluxes (GOES-11)

Proton fluxes as measured by GOES satellites are presented in the following plot. Usually P1 oscillates between $1\text{E}+1$ and $1\text{E}+2$, while P2 and P3 evolve around $1\text{E-}2$.



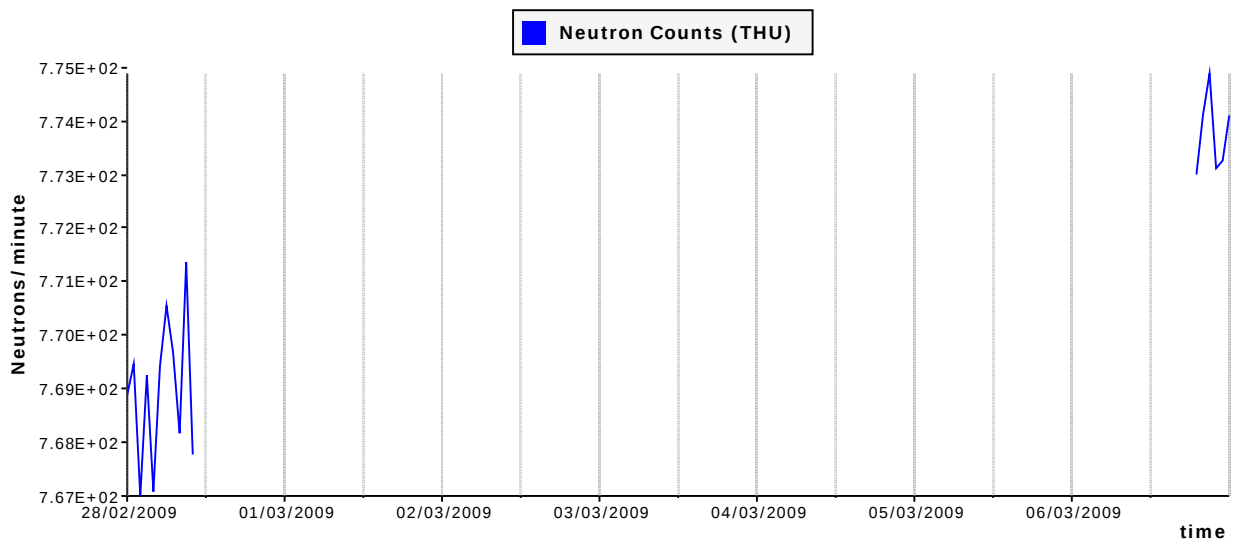
Proton fluxes (ACE)

Proton fluxes as measured by ACE satellite are presented in the following plot.



Neutron counts

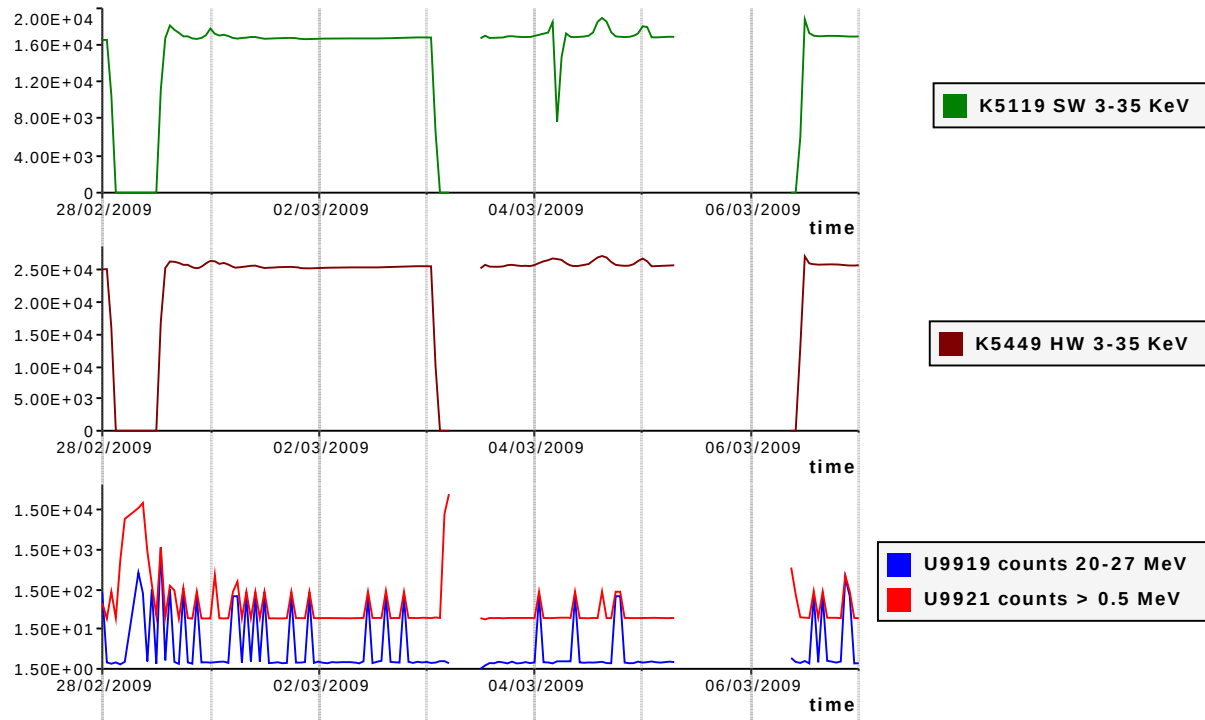
The neutron counts for the last 3 days are presented in the following plot. Nominally they remain stable around 7.2E+2.



IREM and JEM-X (INTEGRAL)

IREM proton and electron fluxes as well as JEM-X1 software and hardware triggers are presented in the following plots.

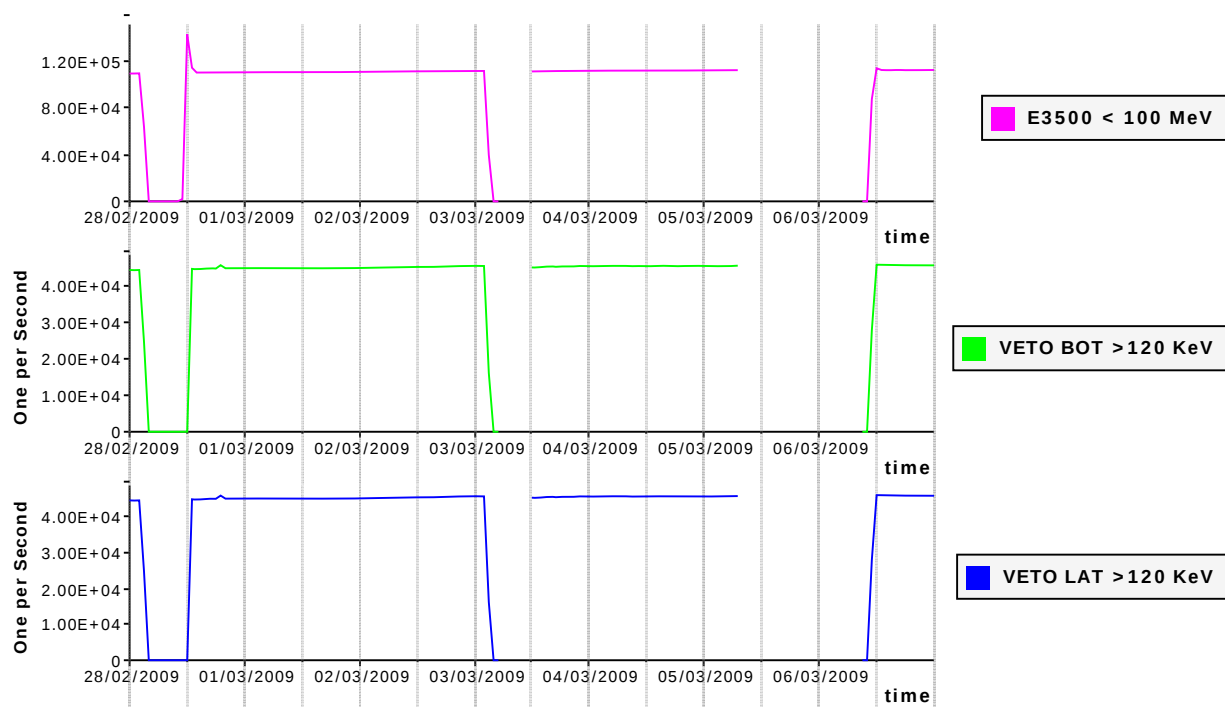
Nominal values are respectively about 1 and 18 for IREM counts, and, 13000 and 19000 for JEM-X ones.



SPI and IBIS (INTEGRAL)

SPI-ACS counters below 100MeV as well as IBIS-VETO bottom and lateral counters are presented in the following plots.

Nominal values are respectively about 90000 for SPI counts, and 36000 for IBIS ones.



SOLAR FLARES FORECAST

The probabilities of M and X-class solar flares during the last month are presented below. Chances of solar flare start to be meaningful from 15%.

