

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 237
Week 14
10.04.07
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 31.03.07 until 06.04.07 (both dates inclusive) and covers the revolutions 545, 546 and 547.

2 Summary of Activities

The operations were performed according to the planning inputs from ISOC combined with some manual commanding by MOC.

The targets of these revolutions consisted of 3 hexagonal dithers of the Galactic Bulge Region (RA 17:45:36.00, DEC -28:56:00.0), 3 raster dithers of the Galactic Plane Region 3 (RA 19:43:54.33, DEC +23:53:25.4), 2 raster dithers of Sgr A* (RA 17:45:40.00, DEC -29:00:28.1), 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), and a raster dither of Orion OB1 (RA 05:17:00.30, DEC +01:47:17.7).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

Two slews were missed from TL during the observation period due to problem REDU station and not suitable star (for slew update) found after STR mapping.

The fuel consumption over the period between 29/03/2007 and 04/04/2007 was 0.0936 Kg. The remaining propellant is in the order of 147.4331 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.

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

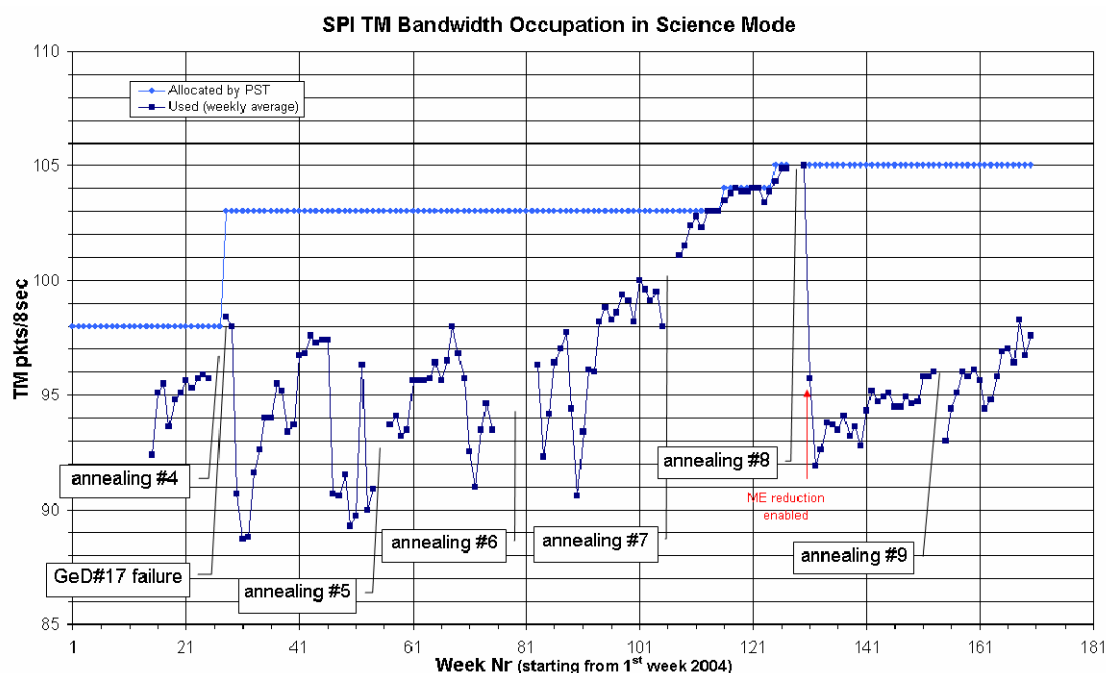
3.2.1 SPI

Following the 9th annealing, which ended on 22nd December, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). The energy resolution of GeD#4 was recovered with this annealing. Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

The Stirling compressors are working nominally, maintaining the Germanium detectors at 80 +/-1K. The stroke of all four compressors has been set to 40 since 03.02.2007 at 13:16Z.

During science operations, the instrument was kept in photon-by-photon mode with spectra TM enabled. The assigned TM bandwidth in the science observation windows was 105 packets/cycle, except from 2007-04-05T17:35:43Z to 2007-04-05T21:26:13Z when the TM allocation was 85 packets/cycle due to an OMC Flat Field Calibration. The average telemetry occupation when the TM allocation was 105 packets/cycle was 97.6 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

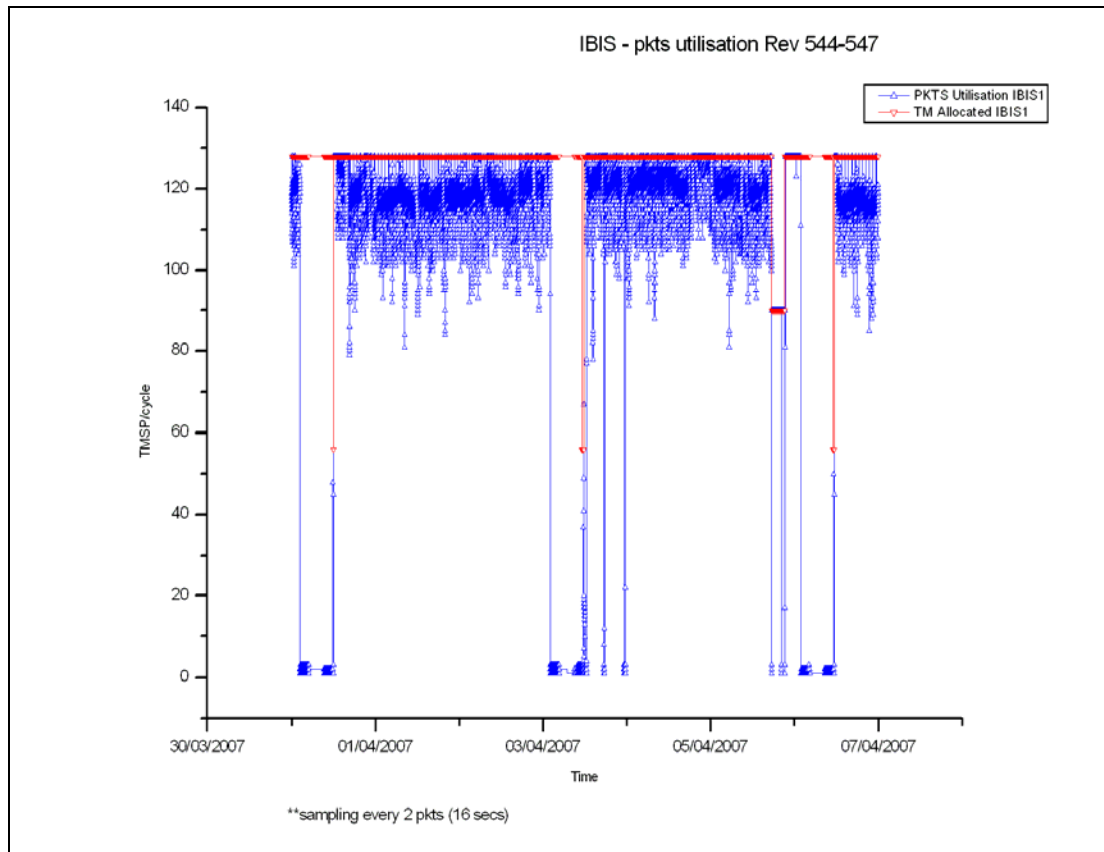
The overall status of the unit is nominal.

Four anomalies occurred during revolution 546:

1. Just after Radiation Belts exit of revolution 546 (on 03/04/2007), at 11:36Z, ISGRI switched to Stand-By mode due to IREM automatism as the radiation background was detected higher than IBIS thresholds. The recovery was performed by the operator and IBIS was back into Scientific Standard mode with both ISGRI and PICsIT in Nominal configuration at 12:39Z for the start of Pointing 05460003.
2. On 03/04/2007, at 17:20Z, VETO CDM01 High Voltage reported a breakdown. The operator performed the recovery as indicated in the FDIR. IBIS was back into Scientific Standard mode at 17:43Z.
3. On 03/04/2007, at 22:52Z, PICsIT PDM08 reported a Latch-Up. The operator performed the recovery as indicated in the FDIR. IBIS was back into Scientific Standard mode at 23:44Z.
4. On 05/04/2007 at 17:39Z, VETO Calibration, Bottom and Lateral counters (TM parameters G6061, G6062 and G6063) reported a drop in count-rates. They remained into a low range of values until Radiation Belts entry of revolution 546 on 06/04/2007 at 01:56Z. The unit recovered itself with the VETO mode cycle commanded by the timeline during Belts passage.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. However on 05/04/2007 between 17:37Z and 21:27Z, it was 90 TMPS/cycle due to an OMC Flat Field Calibration. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 118.33 TMPS/cycle, up 5.81 on last week.

A plot of the IBIS TM utilisation during the observation period is shown below:



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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

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

On 2007-04-03 the high voltage activation of JEM-X1 at the start of revolution 546 failed completion due to high values of the Hardware Trigger causing an autonomous switch-off of the High Voltage. JEM-X1 was then activated manually and reached Data Taking mode ~1 hour later than planned.

Further information on the JEM-X operations can be found in the Appendix Section 8.3.4.

3.2.4 OMC

The status of OMC is nominal.

OMC operations were performed by the automatic Timeline. OMC was operated in Science Normal mode during science observations, with a TM allocation of 5

packets/cycle, except from 2007-04-05T17:35:43 to 2007-04-05T21:26:13 during the Flat Field Calibration, when the TM allocation was 63 packets/cycle.

During this reporting period, 146 of the 149 planned science pointings for OMC were executed nominally, 2 started late and 1 was lost.

Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity.

Small sunspot 949 disappeared from the surface of the sun at the beginning of this week. The sun was then blank. No threat of strong solar flare was reported.

Reference: www.spaceweather.com

Note: Some more information concerning the IREM operations is provided in the Appendix Section 8.3.6.

4 Ground Facilities

The Operational ground facilities performance was good this week. One science pointing was lost, and two slightly delayed. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. The overall performance was nearly 100%.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were, however, 2 occasions of data drops from Redu, and 2 from DSS-24. The impact was a loss and a shortening of a pointing due to Redu, and a slight shortening in an OMC pointing due to DSS-24. The overall performance was well over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs are available up to revolution 554 and observations have been planned up to revolution 553.

Revolution 547 was re-planned for a TOO observation of SGR 1806-20.

TSF's up to revolution 548 have been received.

2. Observation status

ECS files have been received and processed up to revolution 539.

3. ISOC Science Data Archive

No news.

4. ISOC system

Version 14.5 installed succesfully.

5. Problems

None.

4.3.2 ISDC

Status of ISDC observation processing on 10/04/2007:

- Latest Standard Analysis completed: observation 04200560171 (GX 339-4, Revolution 536) on 02/04/2007.
- Latest products archived: observation 04200560171 (GX 339-4, Revolution 536) on 02/04/2007.
- Latest observation products sent to the observer: observation 04200340013 (GRS 1915+105, Revolution 535) on 01/04/2007.

5 Special Events

6 Anomalies

The following problems were reported that impacted operations:

- On DoY 092, at 15:04, there was a short TM data gap from DSS-24. The impact was that the OMC commands for pointing 05450059 failed. The commands were subsequently manually re-sent. This resulted a shortening in the duration of the pointing to 2720 from a scheduled 2934 seconds.
- On DoY 094, at 18:18, a lost line to Redu necessitated the suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 19:09. The impact was the loss of pointing 05460038, and a shortening of the duration of pointing 05460039 to 2672 from a scheduled 2934 seconds.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-182	04/04/2007	BCR1 and 2 switch-off	Payload	Open
INT_SC-183	04/04/2007	IBIS: VETO CDM1 High Voltage break down	Payload	Open
INT_SC-184	04/04/2007	IBIS: PICSIT PDM8 Latch-up Mode	Payload	Open

AR id	Date Created	Subject	Segment	Status
INT-2910	05/04/2007	MCA failed to connect after INCTRA restart	IMCS	Pending
INT_SC-185	11/04/2007	IBIS-VETO Calibration, Bottom and Lateral Counters reported reduced count-rates	Payload	Open

7 Future Milestones

The following activities are foreseen in the next few weeks.

- IMU Calibration and Health Check 11/04/2007 Rev. 548
- RMU-B Health Check 11/04/2007 Rev. 548
- Summer eclipse season starts 18/04/2007 Rev. 550
- Periodic Thruster Torque rescaling 24/07/2007 Rev. 583
- Planned altitude change for instrument activation.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 545

The observations in revolution 545 began with a hexagonal dither of the Galactic Bulge Region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. It continued with a raster dither of the Galactic Plane Region 3 (RA 19:43:54.33, DEC +23:53:25.4), lasting ~18.6 hours. This was followed by a raster dither of Sgr A* (RA 17:45:40.00, DEC -29:00:28.1), lasting ~30.2 hours. Finally another raster dither of the Galactic Plane Region 3 (RA 19:43:54.33, DEC +23:53:25.4), lasting ~2.9 hours was performed up to the end of the revolution.

Revolution 546

The observations in revolution 546 began with a raster dither of Sgr A* (RA 17:45:40.00, DEC -29:00:28.1), lasting ~30.2 hours. It continued with a hexagonal dither of the Galactic Bulge Region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of the Galactic Plane Region 3 (RA 19:43:54.33, DEC +23:53:25.4), lasting ~8.8 hours. After that, a hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.6 hours was performed. This was followed by an OMC Flat Field Calibration #33, a staring observation at attitude (RA 19:57:12.00, DEC -22:36:00.0), lasting ~3.4 hours. Finally another hexagonal dither of the Galactic Bulge Region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours was performed up to the end of the revolution.

Revolution 547

The observations in revolution 547 consisted entirely of a raster dither of Orion OB1 (RA 05:17:00.30, DEC +01:47:17.7), lasting ~58.4 hours.

Throughout these observations, all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5, except during the OMC Flat Field Calibration from 2007-04-05 17:36:26Z to 2007-04-05 21:26:56Z when the allocation was: IBIS 90; SPI 85; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2007-03-16T10:54:00.000Z	147.7652	F	Automatic TM processing.
2007-03-17T21:08:44.000Z	147.7164	F	Automatic TM processing.
2007-03-19T10:42:16.000Z	147.6978	F	Automatic TM processing.
2007-03-20T20:20:19.000Z	147.6410	F	Automatic TM processing.
2007-03-22T10:30:15.000Z	147.6223	F	Automatic TM processing.
2007-03-22T16:28:00.000Z	147.5993	F	Automatic TM processing.
2007-03-25T10:17:03.000Z	147.5925	F	Automatic TM processing.
2007-03-25T16:50:08.000Z	147.5701	F	Automatic TM processing.
2007-03-26T20:29:08.000Z	147.5498	F	Automatic TM processing.
2007-03-28T10:04:56.000Z	147.5418	F	Automatic TM processing.
2007-03-28T15:59:52.000Z	147.5267	F	Automatic TM processing.

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2007-03-31T09:53:19.000Z	147.5133	F	Automatic TM processing.
2007-03-31T15:48:24.000Z	147.4916	F	Automatic TM processing.
2007-04-03T09:40:39.000Z	147.4792	F	Automatic TM processing.
2007-04-04T19:19:31.000Z	147.4331	F	Automatic TM processing.

This report was generated Fri Apr 6 08:00:16 GMT 2007

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, 31/03/2007 –06/04/2007

AOCS operations were executed from the Automatic Timeline.

During this period, 90 Open Loop Slews, 75 Closed Loop Slews and 5 Momentum Biases were executed.

2 slews (2 CSL) were missed from TL during the observation period due to problem on the TM links on REDU station and on FDS failing slew update in TL because not suitable star found after mapping.

The OTF was toggling during PID 05450013-05450014 (pitch and yaw OTF thresholds exceeded) and not reached during PID 05450015, due to loss of guide star.

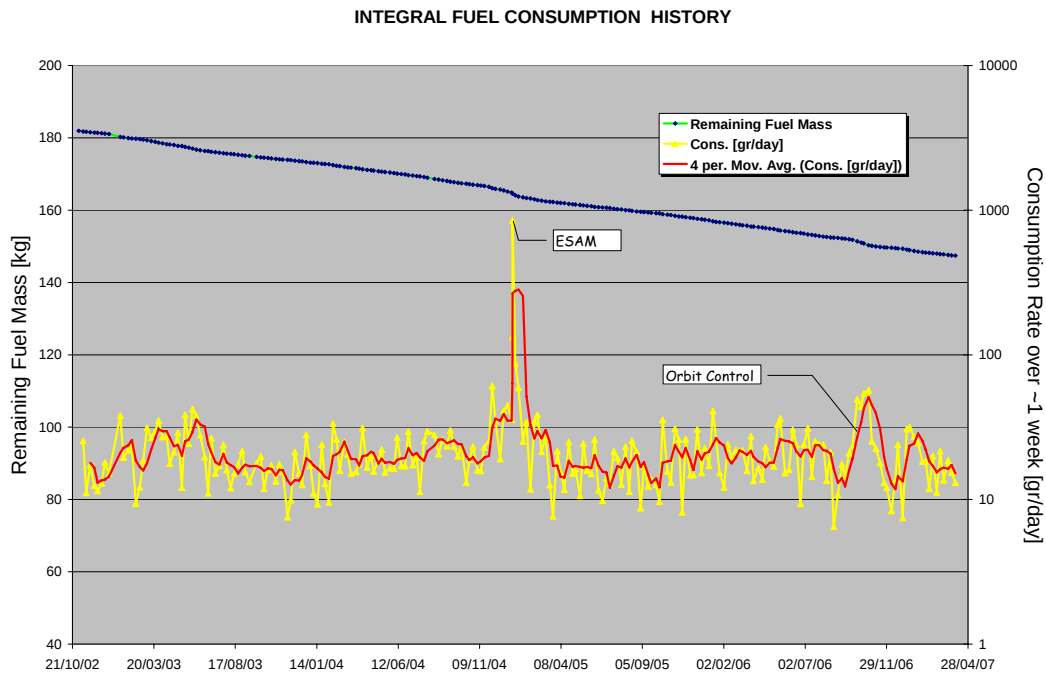
This is equivalent to $\sim 1.2\%$ of the total number of slews planned (165).

Orbit Control

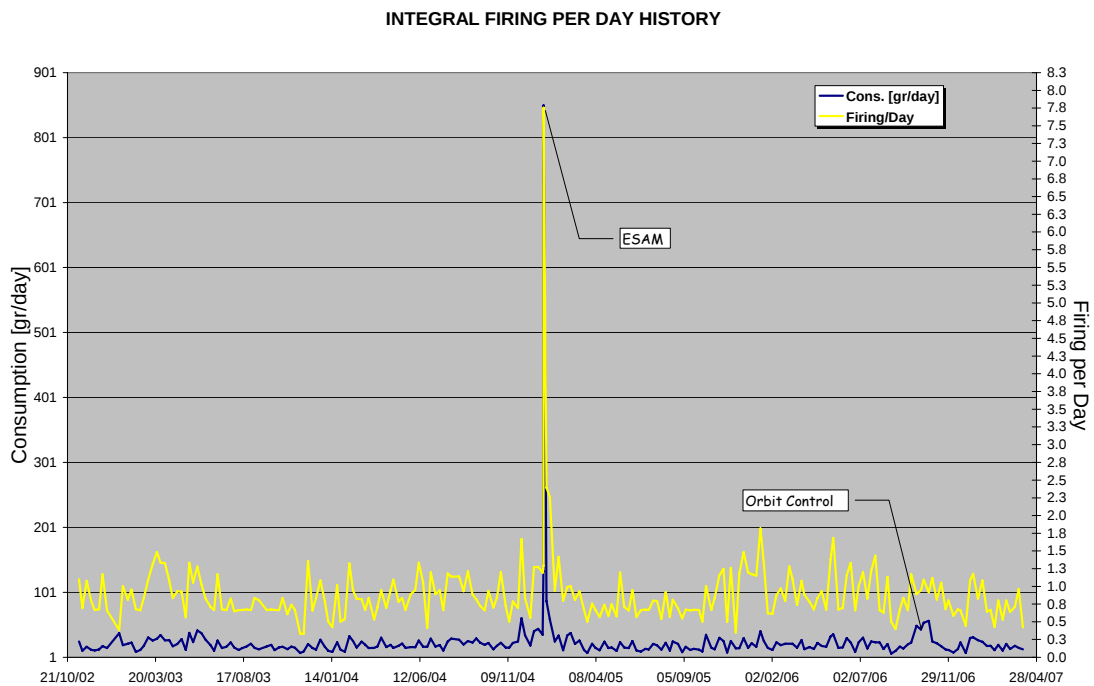
No update.

Fuel consumption

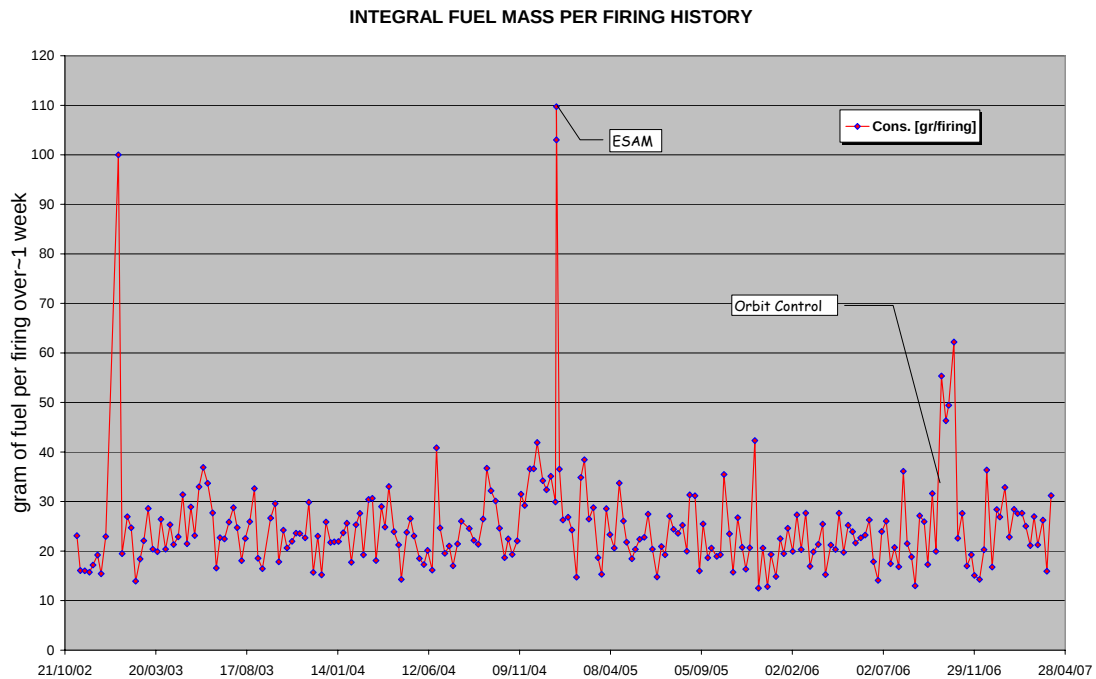
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 04/04/2007 is reported in the plot below.



The firing per day over the period between 01/11/2002 and 04/04/2007 is reported in the plot below.

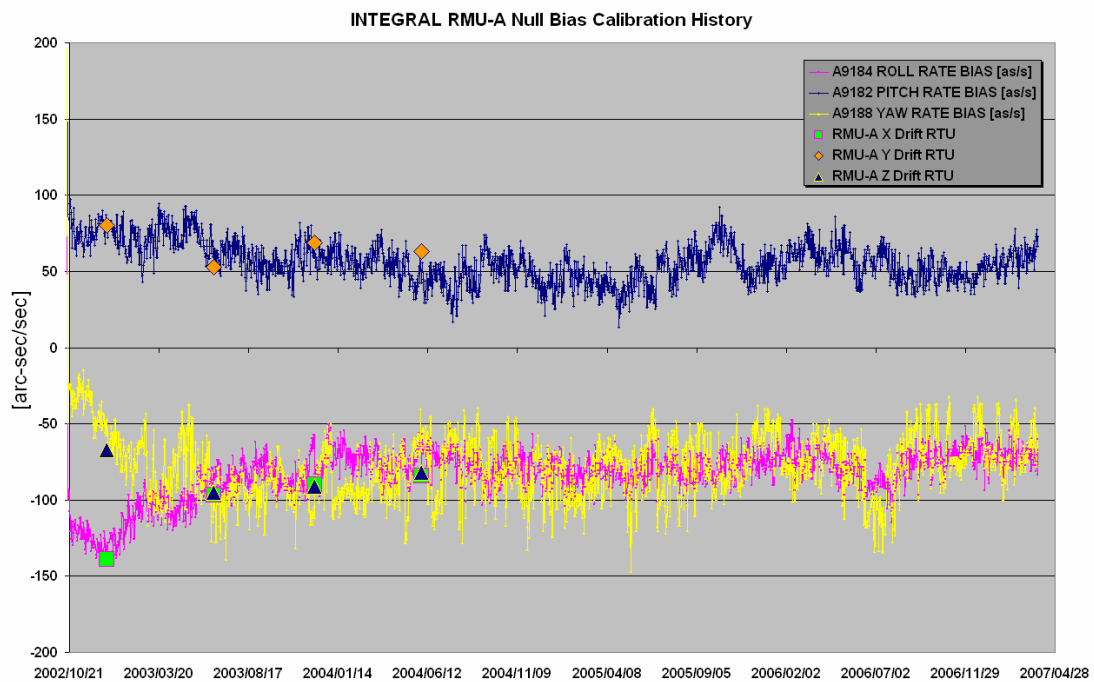


The fuel per firing over the period between 01/11/2002 and 04/04/2007 is reported in the plot below.

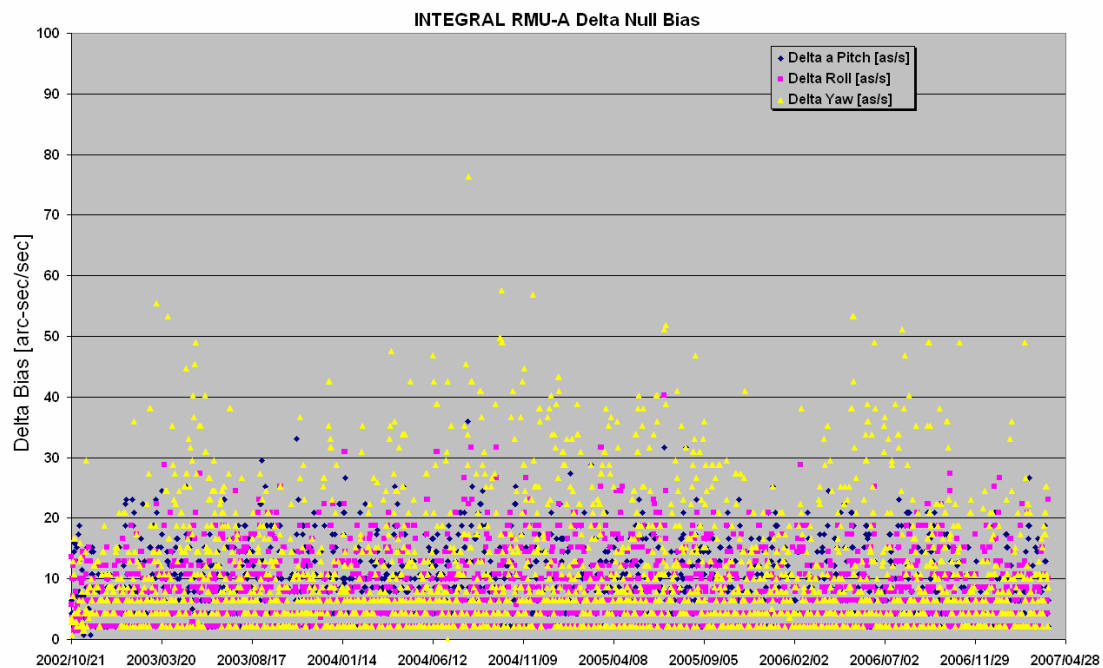


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 06/04/2007 is reported in the plot below.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 06/04/2007 is reported in the plot below



31/03/2007 (Day of Year 090, Revolution 544-545)

Change of Guide Star not updated: at 04:11z the FDS did not perform the update of the planned CGS at the end of the revolution 544 because only one suitable guide star was found in the STR field of view. Since this star was already tracked by the STR, the FDS could not find another suitable star to change to for the CGS. This caused the TPF production to be aborted.

No impact on TL.

Several ACC Pitch and Yaw errors: at 20:46z after the open loop slew for PID 05450013, were reported several occurrences of OEM << ACC PITCH ERROR>> (APID 640 ID 49) and <<ACC ROLL ERROR>> (APID 640 ID 50).

The guide star (ID 2144-31) at the occurrence of the event, was Mi 7.85 @ CCD location [1335, -20109].

The tracked guide star resulted having a dim companion (ID 2144-783), of Mi 8.0 @ CCD location [896, -19918]. The STR could not determine the barycentre of the system and this caused controller instability about the star position (observed also as actuations on the reaction wheels) with violation of the OTF pitch and yaw thresholds.

The attitude determination during the instability period, shown a systematic error (all stars in TM shifted w.r.t. the catalogue positions). The error was exceeding the defined threshold in the attitude determination algorithm and therefore the attitude determination process was aborted.

The same problem was observed after the execution of the following Open Loop Slew 05450014, because the same guide star, (ID 2144-31) of Mi 7.9 @ CCD location [-29236, -13442], was picked after the commanded mapping.

Being the guide star at the edge of the FOV in Y CCD coordinate and being the effect of the dim companion, (ID 2144-783) @ CCD location [-29716, -13231], still present, this caused the OTF pitch threshold to be exceeded several times during the PID 05450014.

At 22:33:30z, during PID 05450015, the STR SEU threshold was exceeded due to repeated false events, the guide star lost and the IMU1 was switched ON by the ACC.

A new mapping was automatic initiated by the ACC and a new guide star Mi 7.8 @ CCD location [7805 , -5298] , found.

No impact on TL except the OTF toggling during PID 05450013-14 and OTF not reached during PID 05450015.

01/04/2007 (Day of Year 091, Revolution 545)

Nothing to report.

02/04/2007 (Day of Year 092, Revolution 545)

Nothing to report.

03/04/2007 (Day of Year 093, Revolution 545-546)

FDS failed update: at 09:13z due to a maintenance on the NCTRS-A/B machines the operations were moved to the IMCS-B chain. At 10:00z the operations were moved back to the A-chain. During the reconfiguration the FDS did not receive TM continuously (due to the chain swap on the MCS). The first mapping of the revolution 546 , after the RWB, was lost and no attitude determination for the first slew in the revolution could be processed. As consequence the TPF update process failed.

A recovery was then performed by manually updating the first slew of the revolution PID 05460001.

No impact on TL.

04/04/2007 (Day of Year 094, Revolution 546)

Problem at Redu station: at 18:18z due to a problem on REDU station, both TM links dropped. This caused the slew sequence 05460038 to fail release.

A manual recovery was then performed from attitude of PID 05460037 to the attitude of PID 05460038. The subsequent CGS update job was not suspended in TL but left in execution and afterwards a manual RWB manually generated and executed.

At 19:26z the FDS failed to update the following slew ID 05460039. The only suitable star for slewing in the overlap of the initial and target STR field of view was

already taken as guide star before the slew. The CSL update could not find an appropriate slew star and hence was aborted.

A manual recovery was then performed from attitude of PID 05460038 to the attitude of PID 05460039. The next slew ID 05460040 was manually updated and the AOCS s/s enabled in TL.

The following slews were not executed from TL: 05460038(CSL)-39(CSL)

05/04/2007 (Day of Year 095, Revolution 546)

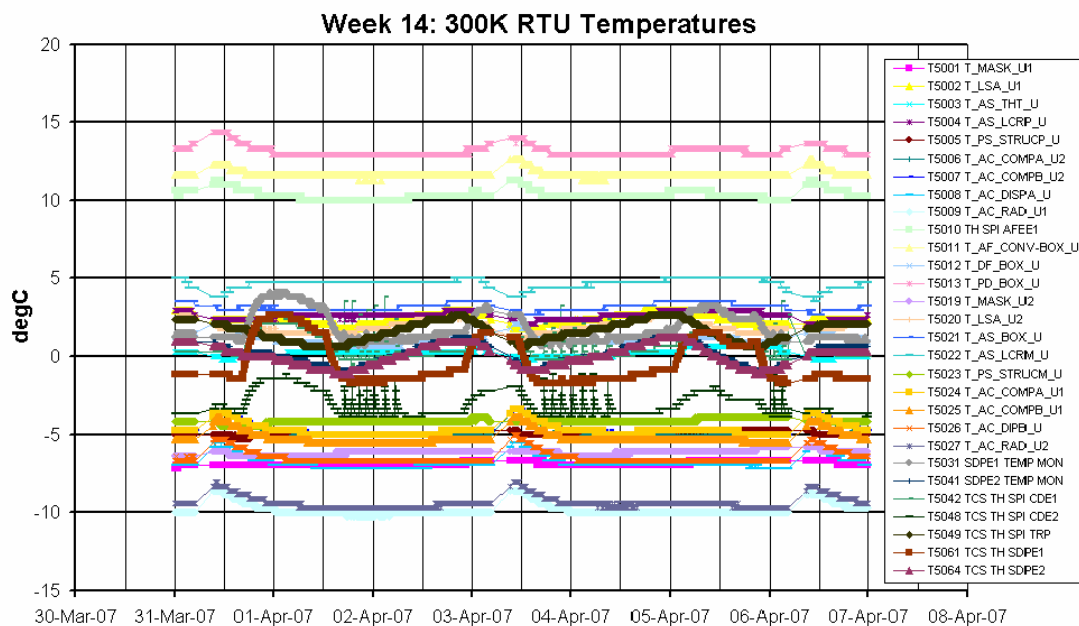
Nothing to report.

06/04/2007 (Day of Year 096, Revolution 546-547)

Nothing to report.

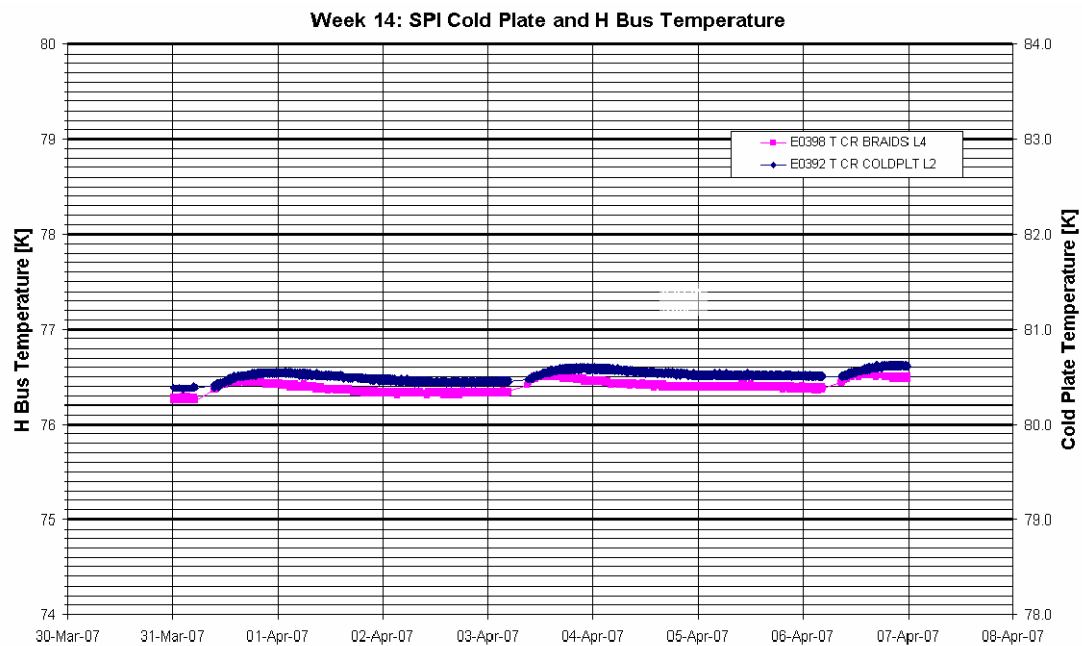
8.3.2 SPI Operations

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 following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.

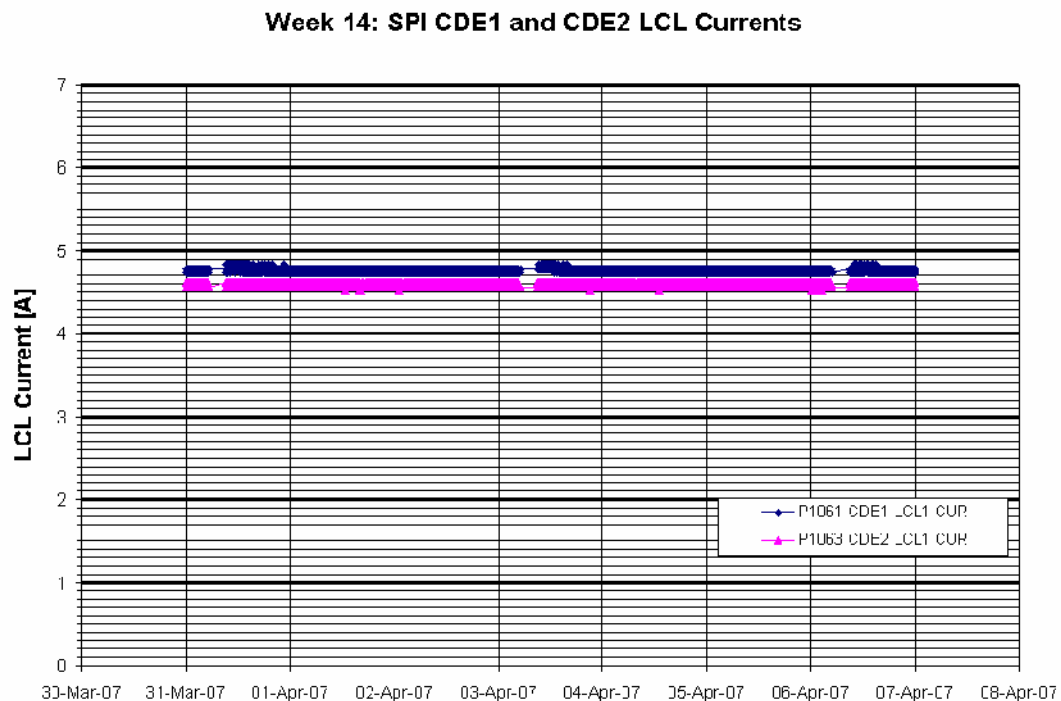


The stroke of all four compressors has been 40 since 03-02-2007 at 13:16Z.

The average LCL currents of the CDEs over the week were:

- Average CDE1 LCL Current = 4.77A
- Average CDE2 LCL Current = 4.57A

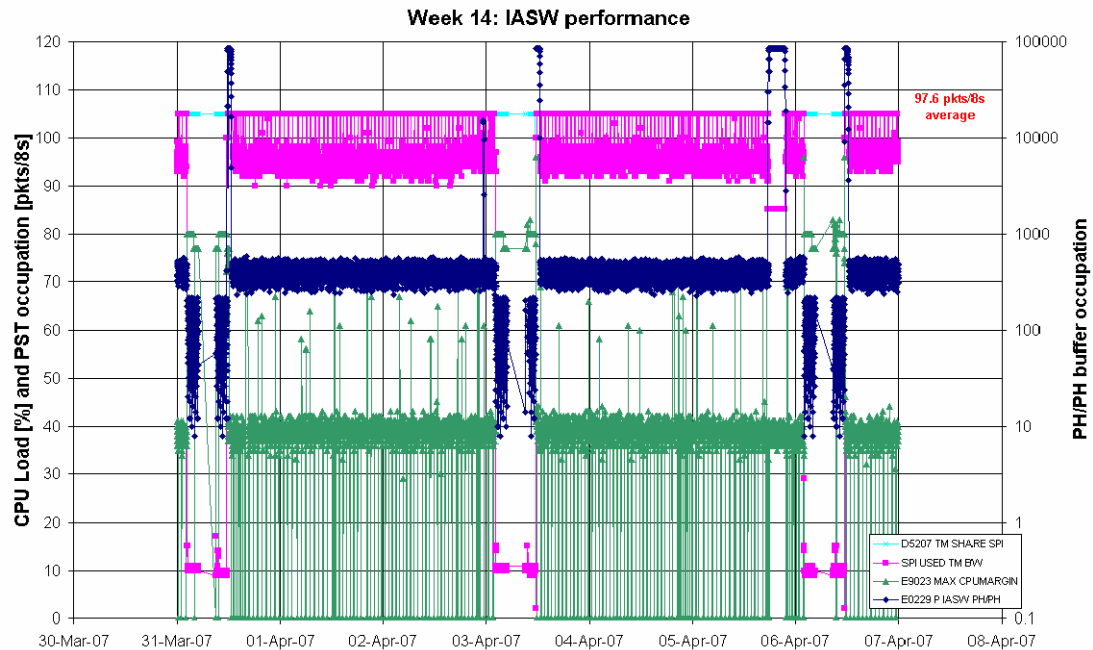
The following plot shows the evolution of the CDE currents during the reporting period.



DPE & IASW: The DPE health and IASW performance is nominal. The IASW version installed is 433. The spectra scaling parameter was set to 9/19 SE.

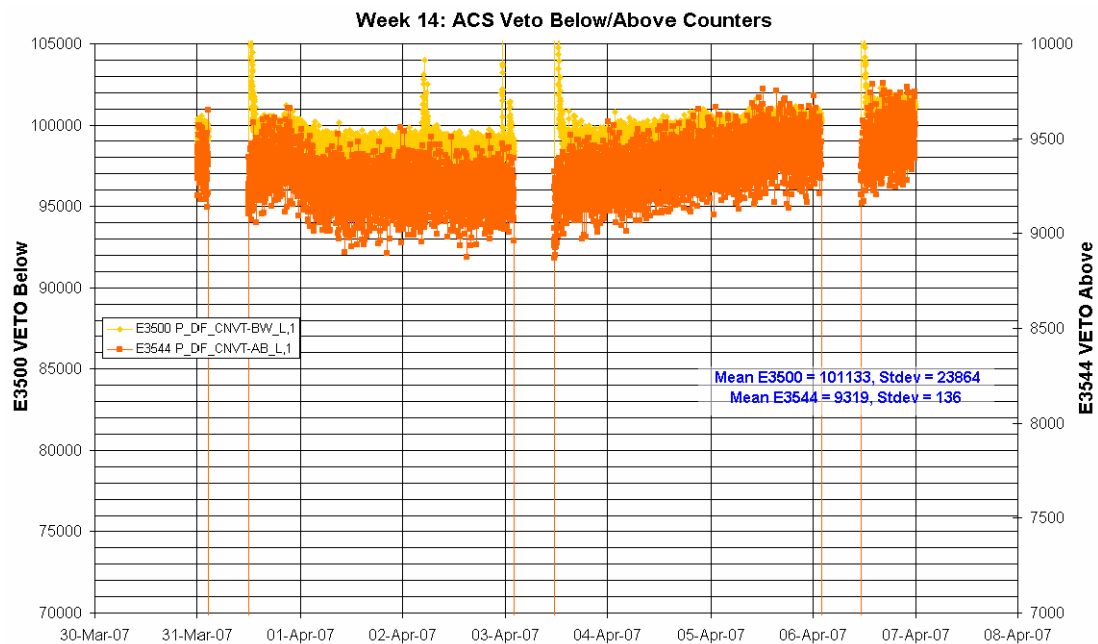
The average TM bandwidth occupation of SPI was 97.6 packets/cycle over the science window, when the TM allocation was 105 packets/cycle. The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.

Note that between 2007-04-05T17:35:43Z and 2007-04-05T21:26:13Z the TM allocation to SPI was 85 packets/cycle due to an OMC Flat Field Calibration.



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

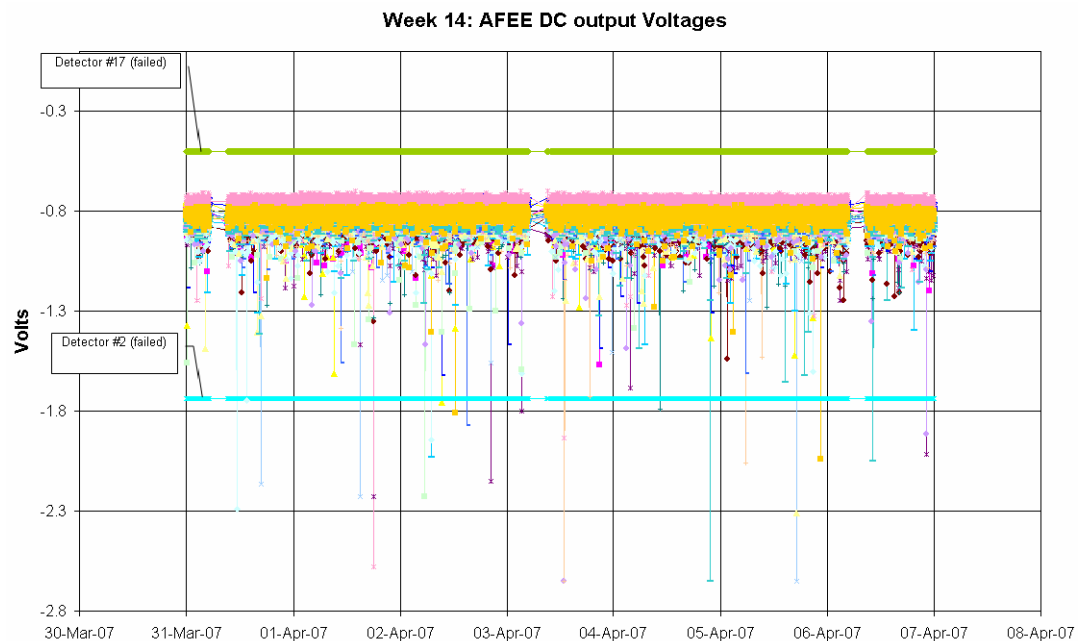
The following plot shows the ACS overall count rate evolution during the reporting period:



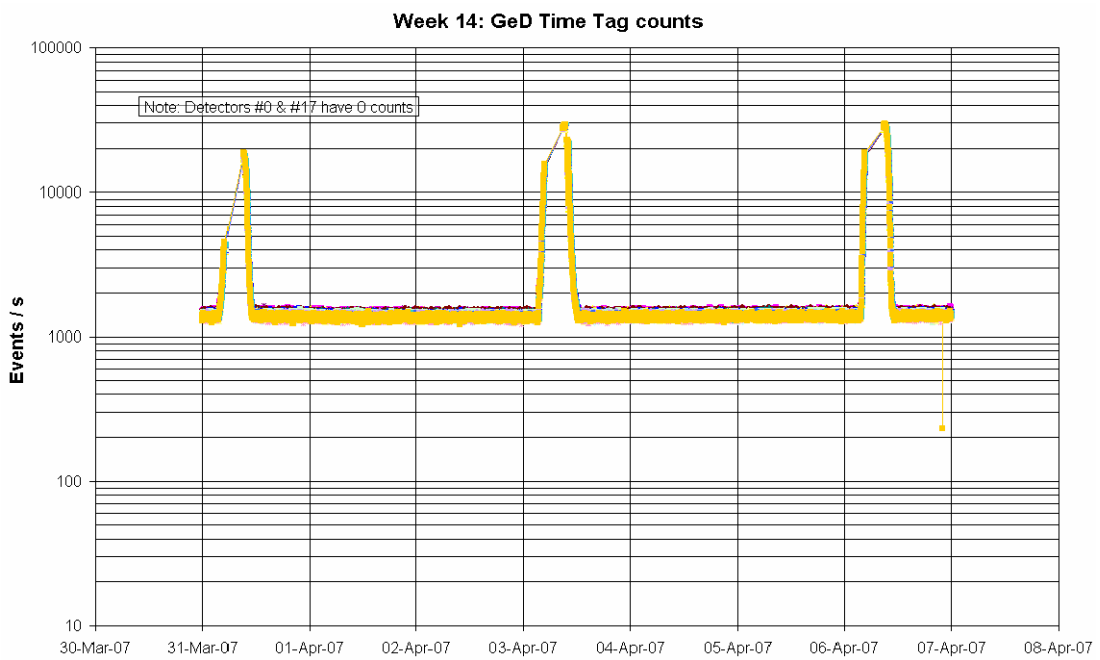
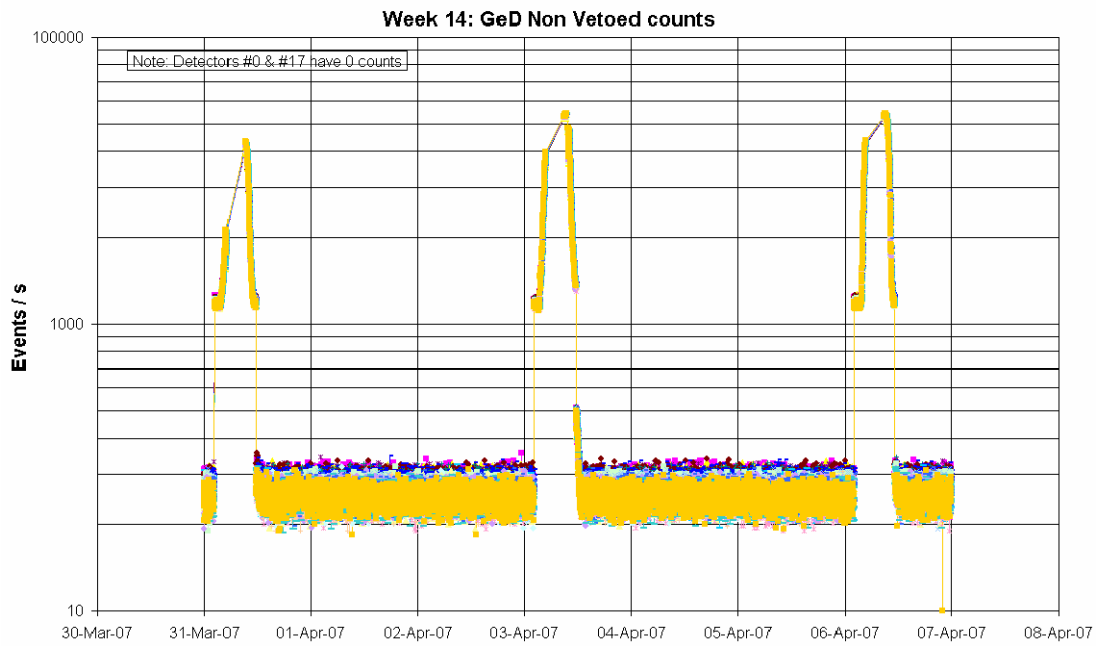
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution. The energy resolution of GeD#4 was recovered with the last annealing.

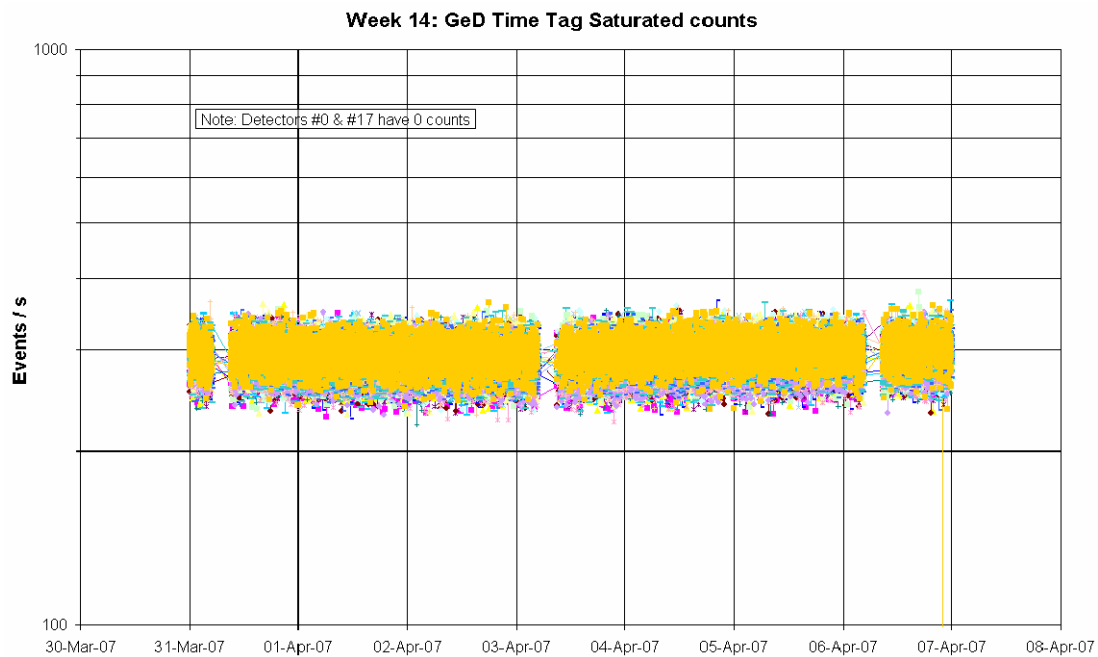
The GeD#12 HV remained at 3.5kV throughout the reporting period.

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.

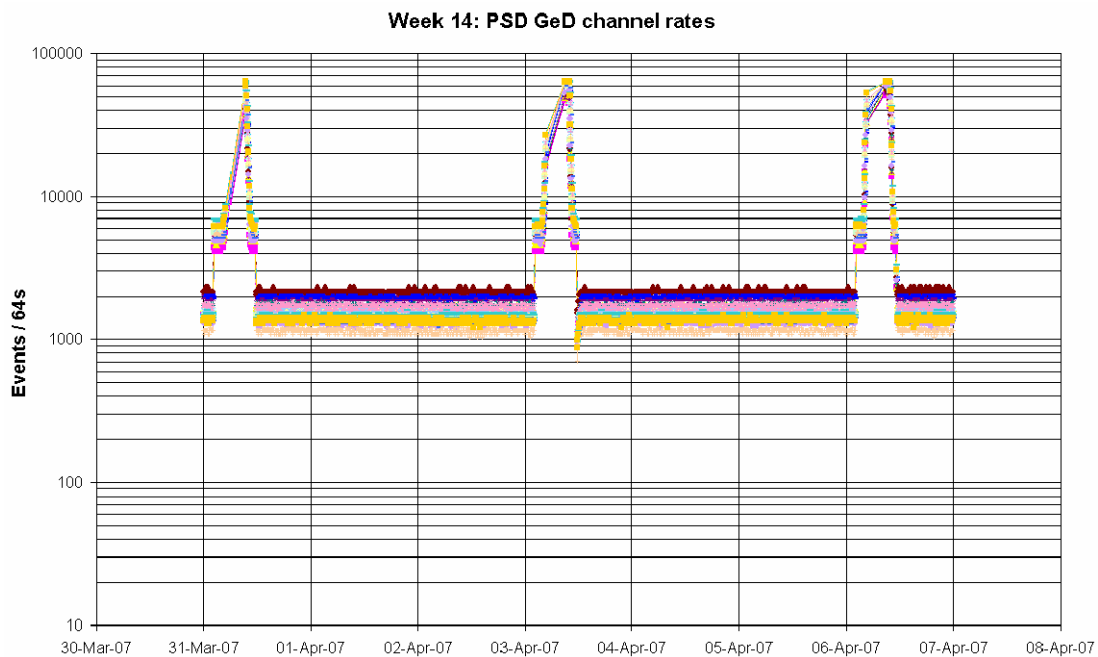


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





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 during the reporting period:

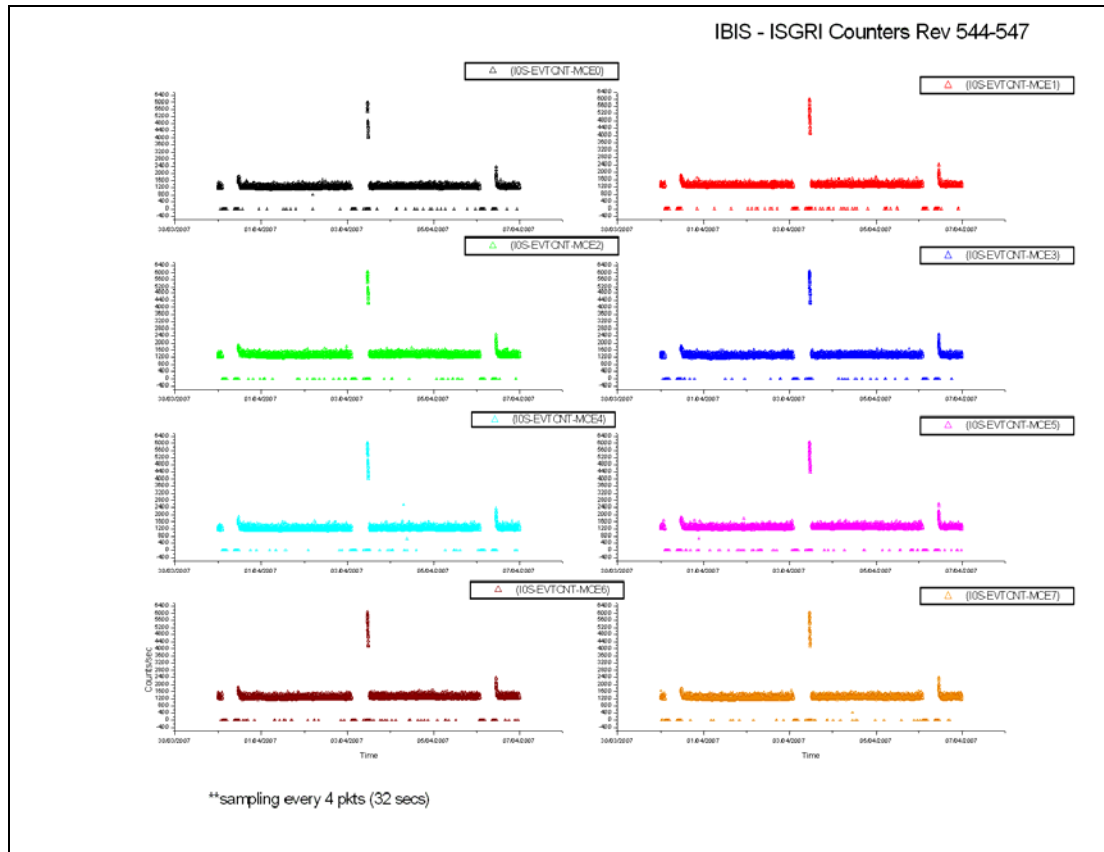
- On 2007-03-31 at 11:49:42Z the TM parameter E3500 P_DF_CNVLT-BW_L went OOL High. This was just after radiation belt exit of revolution 545. It returned within limits at 12:20:30Z.
- On 2007-04-03 at 09:10:27Z the TM parameter E4009 S DF HSLERR L started toggling OOL, indicating errors on the High Speed Line. This was after AOS of revolution 546. It returned stably within limits at 09:27:53Z and therefore no action was taken.

- On 2007-04-03 at 09:26:13Z one occurrence of OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. This was during the AOS_CHK window of revolution 546, when the time verification TC was sent. This OEM is sometimes received when this TC is sent and no action was taken.
- On 2007-04-03 at 10:14:50Z the TM parameter E3826 U PD 5V-ANL L went OOL Low (value = -5.3018V). It returned within limits when the next packet was received at 10:15:54Z.
- On 2007-04-03 at 11:36:22Z the TM parameter E3500 P_DF_CNVT-BW_L went OOL High. This was just after radiation belt exit of revolution 546. It returned within limits at 12:23:02Z.
- On 2007-04-03 at 13:37:30Z the TM parameter E3825 U PD 5V+ANL L went OOL High (value = 5.243V). It returned within limits when the next packet was received at 13:38:34Z.
- On 2007-04-05, between 21:47:05Z and 21:47:10Z, 17 occurrences of OEM APID 1024 ID 245 EXCEPTION SPI1 SPECTRA COMPRESSION OVERFLOW were received, one for each of the operational Ge detectors. At 21:47:10Z OEM APID 1024 ID 244 EXCEPTION SPI1 SPECTRA COMPRESSION NOT COMPLETED was then received for GeD#18. This was during pointing ID 05460070, which was the first pointing after the OMC Flat Field Calibration, once the TM allocation had been changed back to 105 packets/cycle, and indicated problems with the spectra compression for this pointing. This is different from the usual OEMs which are received following an OMC Flat Field Calibration (APID 1024 ID 224 EXCEPTION SPI1 SW ERROR and APID 1024 ID 7 EXCEPTION SPI1 CONSTRAINT DPE). However, as these OEMs stopped of their own accord and did not re-occur, no action was taken.
- On 2007-04-06 at 08:54:58Z the TM parameter E4009 S DF HSLERR L started toggling OOL, indicating errors on the High Speed Line. This was after AOS of revolution 547. It returned stably within limits at 09:21:14Z and therefore no action was taken.
- On 2007-04-06 at 11:23:19Z the TM parameter E3500 P_DF_CNVT-BW_L started toggling OOL High. This was just after radiation belt exit of revolution 547. It returned within limits at 12:07:51Z.

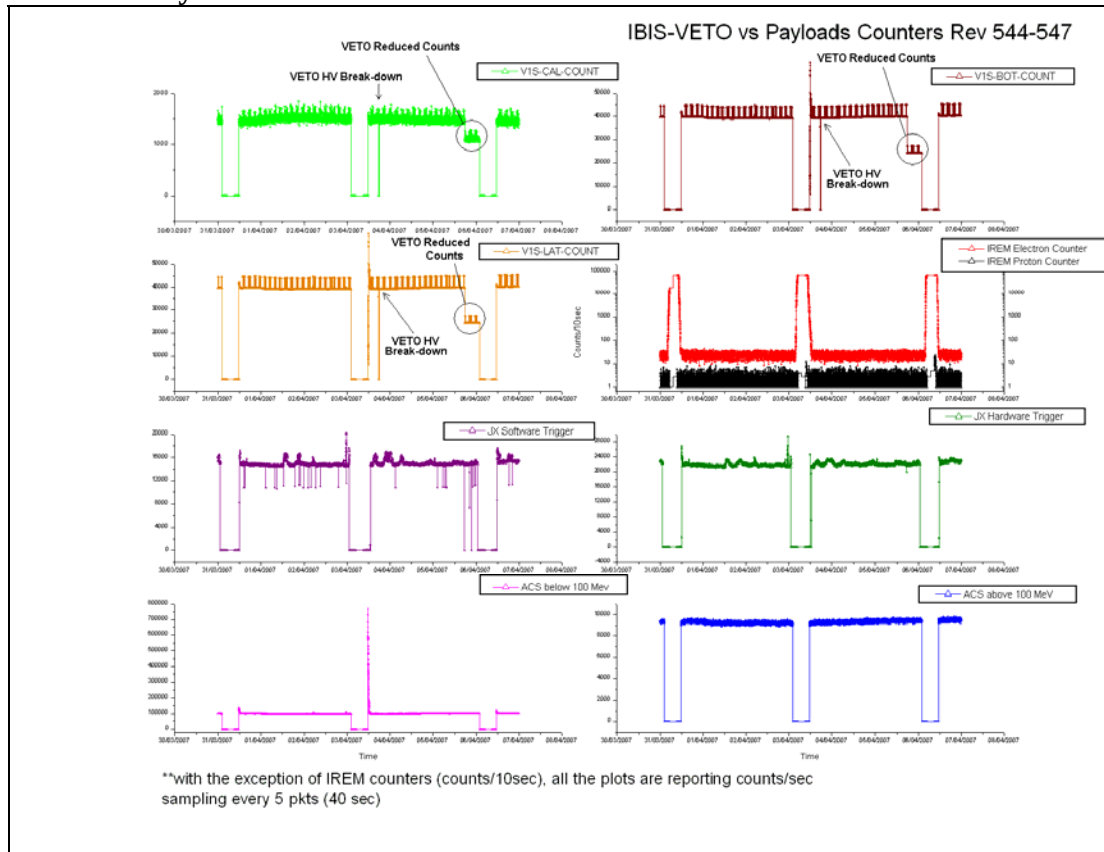
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

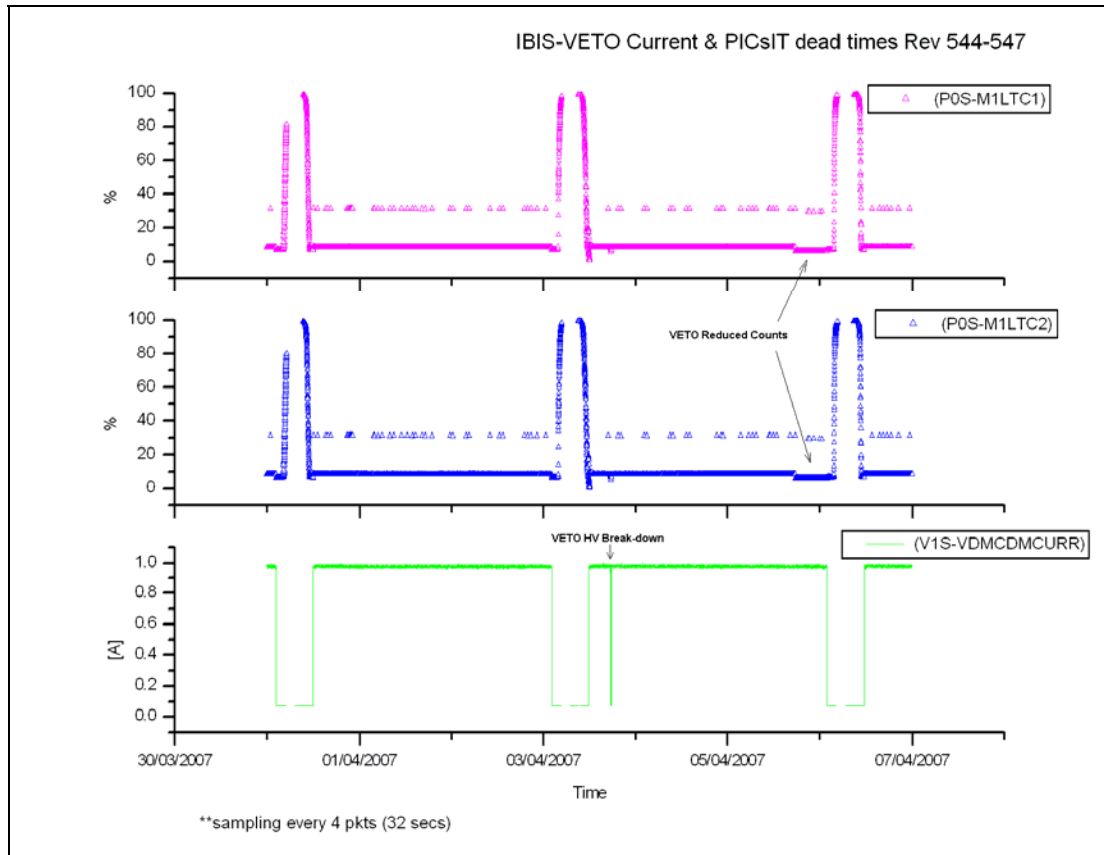


VETO vs Payloads Counters:

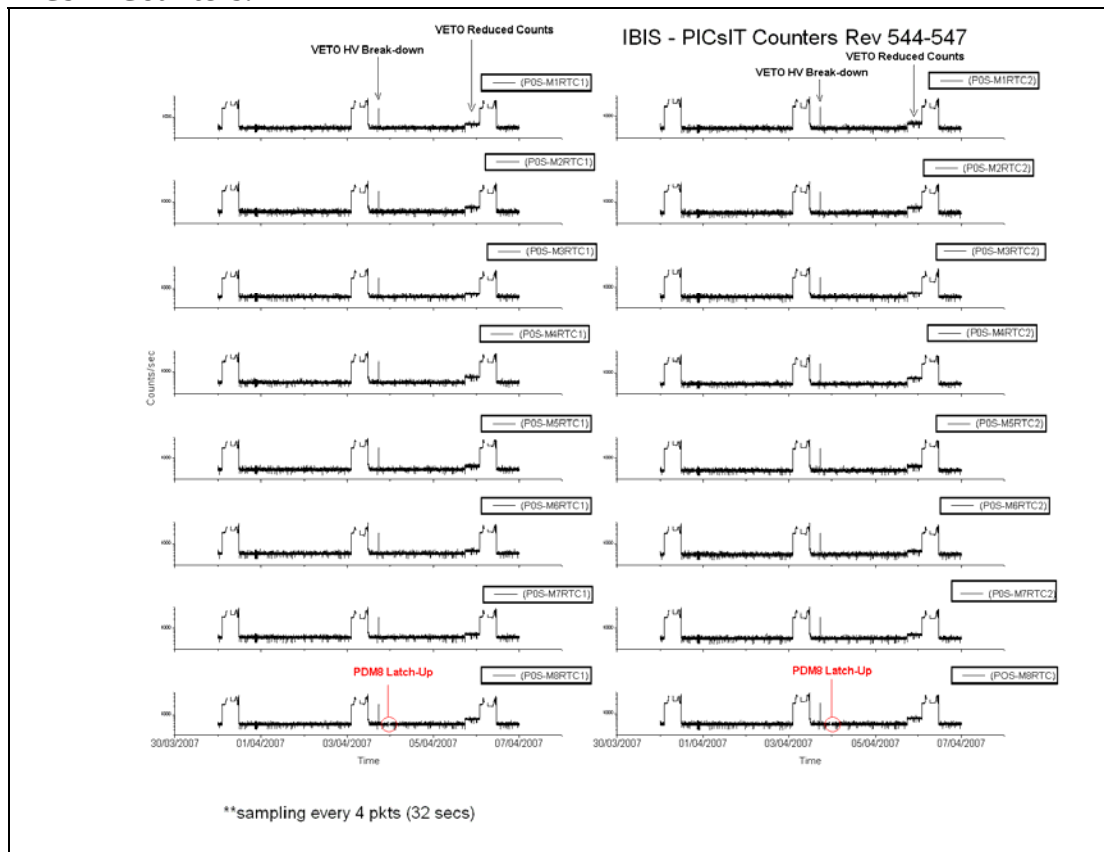


The week was characterised by low radiation.

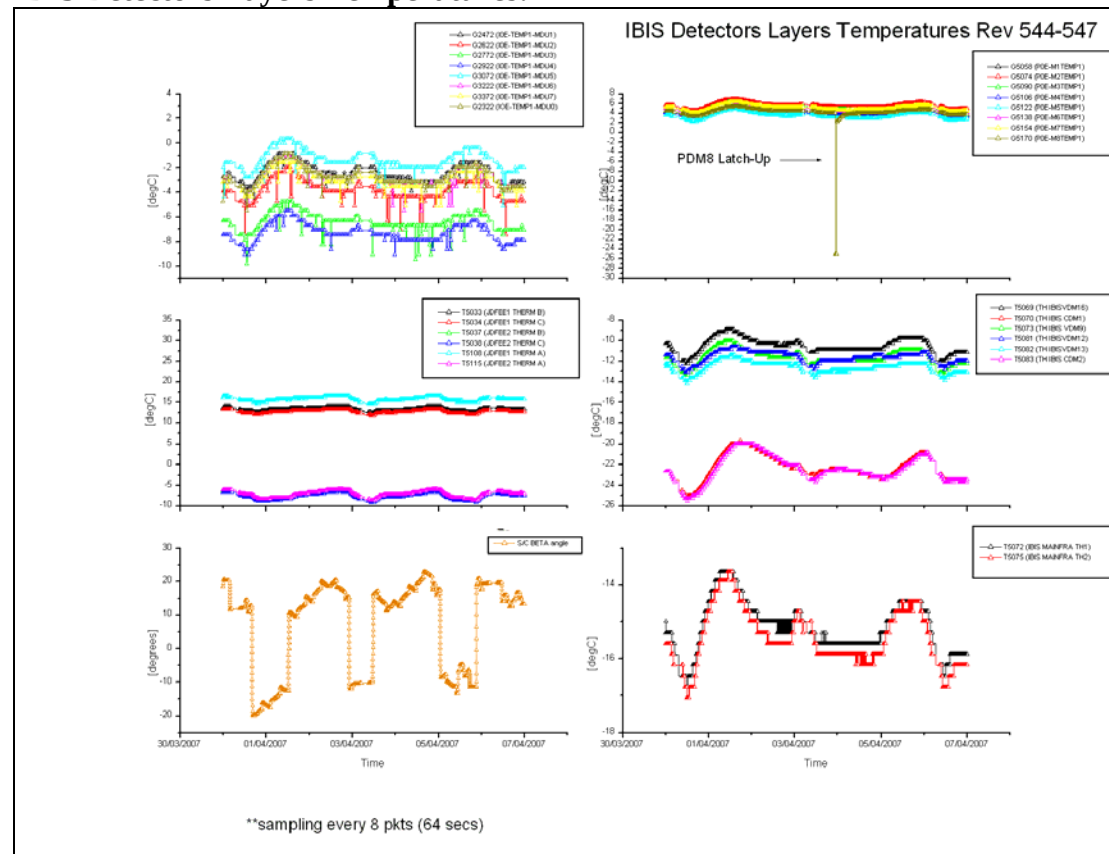
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), families G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2), families G2014 (I0E-OVFWPXADD-Mi) were reported at Radiation Belts passage.

DoY 2007.093 (03/04/2007): High radiation at belts exit

At the beginning of revolution 546, after execution of ED GEISCL03 per timeline, all 8 MCEs (ISGRI modules) were in "NOM+NP\LTH mode" (nominal mode for operations).

From 11:17Z, TM family G2013 (I0S-EVTCNT_MCEi) was reported toggling OOL High due to the high radiation environment.

At 11:36Z ISGRI switched automatically into Safe mode due to IREM automatism (IREM counters crossing IBIS thresholds) during the post-belts reconfiguration. TM family G2013 went consequently back into limit.

In fact the belts exit was planned in the timeline at 11:30Z. VETO activation (ED GEBEXT01) was executed at 11:42Z as per timeline, and the Scientific Standard mode change (ED GESTAN02) at 11:45Z.

After 11:45Z IBIS was hence running with only one detector layer PICsIT, ISGRI being in Stand-By since 11:36Z.

This anomaly was detected by the operator since the OEM APID 1280, id 132, class 0, "IBIS1 IASW HEPI RESYNCHRONISED" was being reported every packet.

The recovery was performed with s/s SOE as follows:

- 1/ IBIS to Stand-by
- 2/ ISGRI to Nominal (NOM + NP\LTH)
- 3/ IBIS to Scientific Standard.

The instrument was back into science configuration for the start of Pointing #05460003 at 12:39Z.

DoY 2007.093 (03/04/2007): VETO CDM01 High Voltage Break-Down (INT_SC-183)

At 17:20Z, the following OEM (class 2, ID 186) was reported:
<<IBIS1 VETO PMTXX IS ON AND CORRESPONDING HV MONITORING IS ABOUT ZERO>>;
at the same time, TM parameter G6051 (V1S-CDM01HV) was reported Out Of Limit Low-Low with a value of ~0 (-31.5V).

Before the anomaly the main VETO parameters reported nominal values:

G6012 (VETO current) = 1.63 A
G6013 (VETO VDM/CDM current) = 0.98 A
G6061 (VETO CAL counter) = 1440 /s
G6062 (VETO BOT counter) = 39384 /s
G6063 (VETO LAT counter) = 39384 /s
G6051 (VETO CDM01 HV) = 1052.26 V.

During the anomaly, the currents dropped down due to the HV break-down of CDM #01, as well as the count-rates (due to missing contribution of Calibration Module #01):

G6012 (VETO current) = 1.59 A
G6013 (VETO VDM/CDM current) = 0.94 A
G6061 (VETO CAL counter) = 0 /s
G6062 (VETO BOT counter) = 37544 /s
G6063 (VETO LAT counter) = 37528 /s
G6051 (VETO CDM01 HV) = -31.5 V.

No special radiation was reported at the time of the anomaly, according to the SEIS tool.

The anomaly was recovered by the operator following the recovery action V-HV-1:

- 1- Set IBIS-IASW in Stand-By
- 2- Set IBIS-VETO in Stand-By
- 3- Set IBIS-VETO in Maintenance and monitor for ~10mins
- 4- Set IBIS-VETO in Stand-By
- 5- Set IBIS-VETO in Nominal
- 6- Set IBIS-IASW in Science Standard.

At 17:43Z IBIS was back in Science Standard and VETO in Nominal.

The main VETO parameters were nominal:

G6012 (VETO current) = 1.63 A

G6013 (VETO VDM/CDM current) = 0.98 A
G6061 (VETO CAL counter) = 1560 /s
G6062 (VETO BOT counter) = 39304 /s
G6063 (VETO LAT counter) = 39296 /s
G6051 (VETO CDM01 HV) = 1052.26 V.

DoY 2007.093 (03/04/2007): PICsIT PDM08 Latch-Up (INT_SC-184)

At 22:52Z, TM parameter G5040 (P0E-PDM8STB) was reported OOL with the value OFF. All other PDMs were working nominally, and PICsIT was in Nominal mode. At the same time, the OEM <<APID 1280, class 1, id 170, IBIS1 PICSIT LATCHED UP MODULE NOTIFICATION>> was reported.

These 2 events reported a Latch-Up notification of PDM#8. The reason for this change of status remains unknown at the time being.

The radiation background was low according to the SEIS tool. However several anomalies occurred at this time (BCR SEU & IBIS VETO HV break-down).

Following the action in FDIR, under s/s SOE guidance, the recovery was performed as follows:

- 1- At 23:47Z IBIS was set in Stand-By mode with TC G0125 (FCP_IBIS1_0313).
- 2- At 23:30Z, PDM #8 was switched OFF with FCP_IBIS1_0329.
- 3- At 23:30Z, PDM #8 was switched ON with FCP_IBIS1_0110.
- 4- At 23:42Z, PDM #8 was enabled with FCP_IBIS1_0083 using the dynamic TC GU0512. PDM #8, like all the others, showed nominal TM (temperatures, voltages and counters).
- 5- As the recovery was successful, IBIS was set back in Scientific Standard mode at 23:44Z.

The impact on the science was: Pointing #05460015 and Pointing #05460016 were partially performed without PDM#8.

DoY 2007.095 (05/04/2007): VETO Calibration, Bottom and Lateral reduced counts (INT_SC-185)

At 17:39Z, TM parameters G6061 (V1S-CAL-COUNT), G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) reported a drop. This triggered the OOL "warning low" for TM G6061.

Before anomaly (17:39:38Z):

G6061 (V1S-CAL-COUNT) = 1448 cnt/s
G6062 (V1S-BOT-COUNT) = 39848 cnt/s
G6063 (V1S-LAT-COUNT) = 39848 cnt/s
G6012 (V1S-VETOCURR) = 1.63 A
G6013 (V1S-VDMCDMCURR) = 0.98 A

At anomaly (17:40:02Z):

G6061 (V1S-CAL-COUNT) = 1100 cnt/s

G6062 (V1S-BOT-COUNT) = 24296 cnt/s
G6063 (V1S-LAT-COUNT) = 24320 cnt/s
G6012 (V1S-VETOCURR) = 1.64 A
G6013 (V1S-VDMCDMCURR) = 0.98 A

The radiation background was quiet according to the SEIS-tool and to IREM counters.

The VETO counters remained in these low ranges of values until Radiation Belts entry on 06/04/2007 at 01:56Z, impacting the science observation for:

- Pointings 05460067 to 05460069: OMC Flat Field Calibration (=> IBIS TM allocation to 90 TMPS/cycle)
- Pointings 05460070 to 05460076 (IBIS TM allocation 128 TMPS/cycle).

During Radiation Belts passage, following the timeline commanding, VETO went to Stand-By mode and then back to Nominal. This fixed the anomaly.

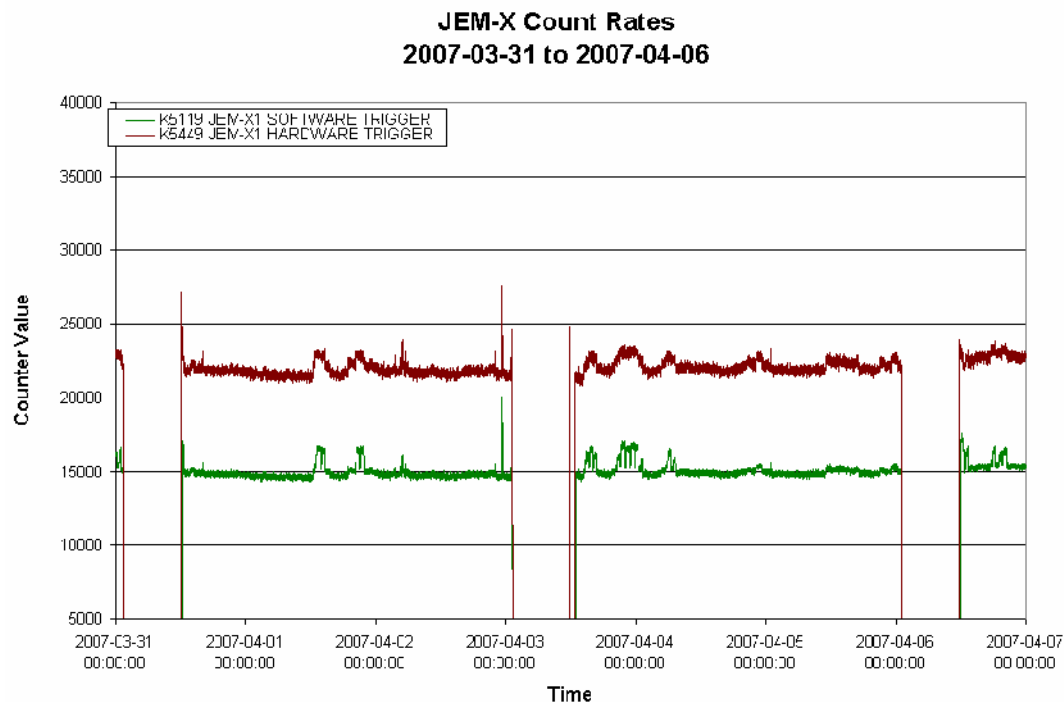
DoY 2007.095 (05/04/2007):

From 20:27Z TM parameter G8080 (S1E-VS_HBRA-RT) was reported toggling OOL High until Radiation Belts entry on 06/04/2007 at 01:57Z. This was likely due to high radiation as the spacecraft was approaching the Belts. No action was taken, as per FDIR.

8.3.4 JEM-X Operations

JEM-X Count Rates:

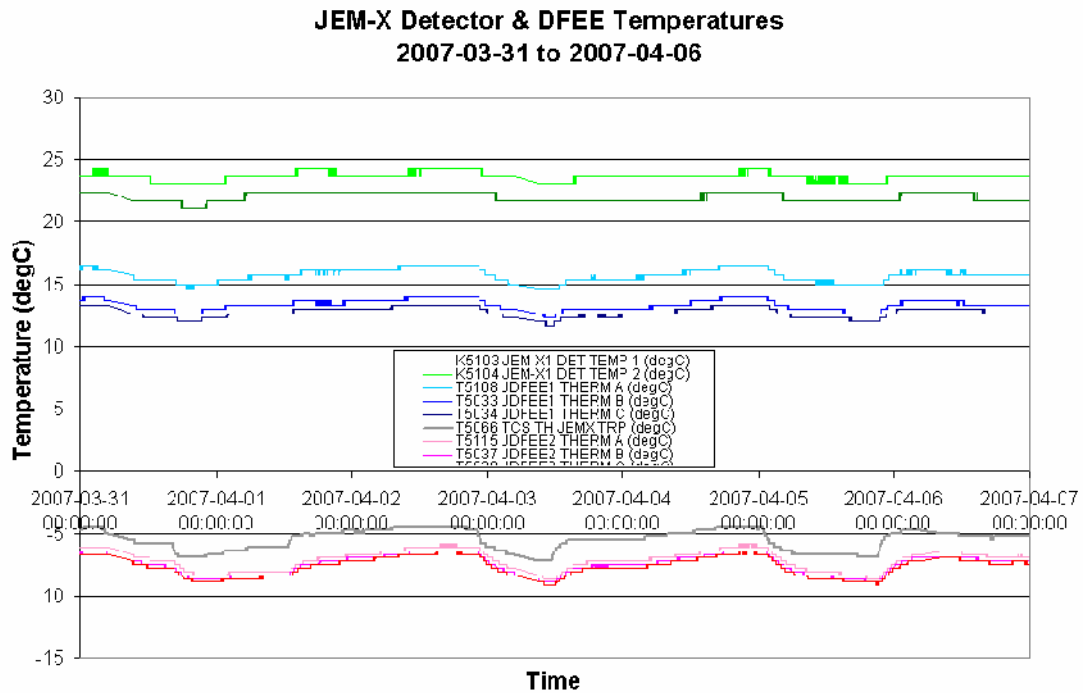
JEM-X count rates over the reporting period are displayed in the following graph¹.



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

JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph².



² Data sampled (1 frame in 8)

JEM-X Daily Report

2007-03-31 (DOY 090, Rev 544-545) to 2007-04-02 (DOY 092, Rev 545)

JEM-X1 operations executed nominally.

2007-04-03 (DOY 093, Rev 545-546)

Due to high count rates just after the expected radiation belt exit of revolution 546, the TM parameter K5317 RAD MONITOR 3went OOL High following radiation belt exit at 11:29:05Z. The TM parameter K5449 HARDWARE TRIGGER then also went OOL High at 11:51:30Z. This was during the execution of the JEM-X1 activation ED KEHVAC01 from the Timeline. The Hardware Trigger exceeded the Safe threshold for JEM-X1 within the next couple of TM cycles, causing the high voltage to be switched off autonomously. This was during the execution of the TC K0003 SET HVDELTA sent at 11:51:00Z. Therefore this TC failed completion and the other TCs of the sequence KEHVAC01 failed release. Commanding to JEM-X1 from the Timeline was then disabled and JEM-X1 was commanded to Safe mode via FCP_JEM1_0040 at 11:58:28Z.

After observing that the background radiation as measured by IREM had decreased to within the safe threshold for JEM-X1, JEM-X1 was recovered as follows:

- 12:39:27Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP
- 12:40:17Z Sequence KEHVAC01 re-uplinked, with the planned observation parameters.

JEM-X1 operations continued nominally.

2007-04-04 (DOY 094, Rev 546) to 2007-04-06 (DOY 096, Rev 546-547)

JEM-X1 operations executed nominally.

8.3.5 OMC Operations

2007-03-31 (DOY 090, Rev 544) to 2007-04-01 (DOY 091, Rev 545)

Nothing to report.

2007-04-02 (DOY 092, Rev 545)

At 15:04 a data gap from DSS-24, caused the OMC commands to fail release. They were sent manually 15:08, with the unit switching to Normal mode at 15:09. The impact was 05450059 was shortened to 2720 from a scheduled 2934 seconds. It was at this time the following command was rejected:

2007.092.15.04.32.493	2007.092.15.04.38.804	1792	RealTime	133	TC REJECT
REJECTED TC3			0	0	65535 PR N
E	E				

which corresponded to the MU1323 (IMAGING B3) command for that pointing.

2007-04-03 (DOY 093, Rev 545 to 546)

Nothing to report.

2007-04-04 (DOY 094, Rev 546)

At 18:18, the links to Redu dropped. They were recovered at 18:19. The impact was the loss of pointing 05460038, and the shortening of pointing 05460039 to 2672 from a scheduled 2934 seconds.

2007-04-05 (DOY 095, Rev 546)

From 17:36:00 to 21:00:00 a series of Flat Field, and Dark Current calibrations were performed, all nominally.

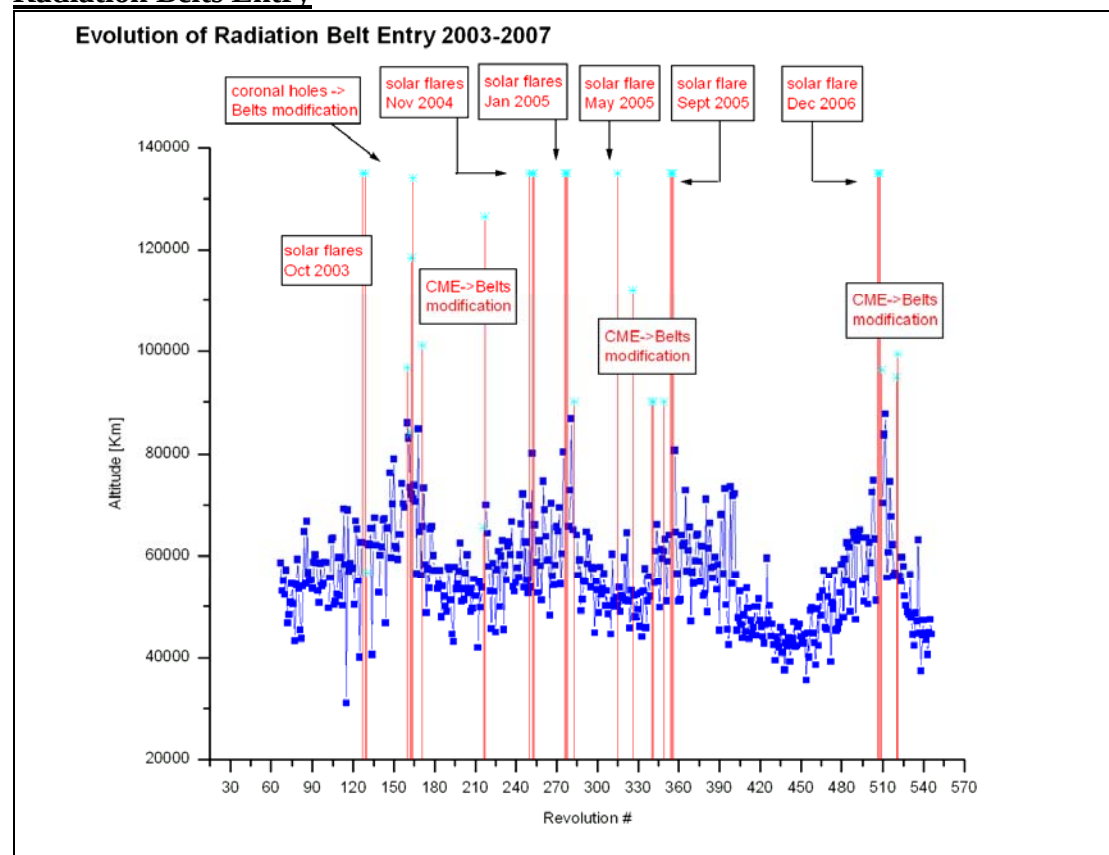
2007-04-06 (DOY 096, Rev 547)

Nothing to report.

On DoY 090 at 02:23:24, DoY 093 at 02:09:40 and DoY 096 at 01:56:44 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

DoY 2007.096 (06/04/2007):

At 09:21Z, TC U4920 "INT GND LINK ON" was uplinked from the timeline but failed CEV due to a late update of the TM desktop. The execution of the command was nevertheless checked by the operator in AND U001, and no further action was required.

Electron Belts

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]
544	RAD_ENTR R 2007-03-31T02:23:19Z	2007-03-31 03:44:25	44897.1	2007-03-31 03:24:17	47669
545	RAD_EXIT R 2007-03-31T11:42:25Z	2007-03-31 10:53:37	>>29746.1	2007-03-31 11:24:17	42379
545	RAD_ENTR R 2007-04-03T02:09:35Z	2007-04-03 03:16:17	47454.7	2007-04-03 03:17:25	46876
546	RAD_EXIT R 2007-04-03T11:29:01Z	2007-04-03 12:24:41	53105.6	2007-04-03 11:17:25	43131
546	RAD_ENTR R 2007-04-06T01:56:36Z	2007-04-06 03:18:42	44572.7	2007-04-06 03:07:25	46773
547	RAD_EXIT R 2007-04-06T11:15:51Z	2007-04-06 10:40:26	<<44779.0	2007-04-06 10:57:25	41794

Reference

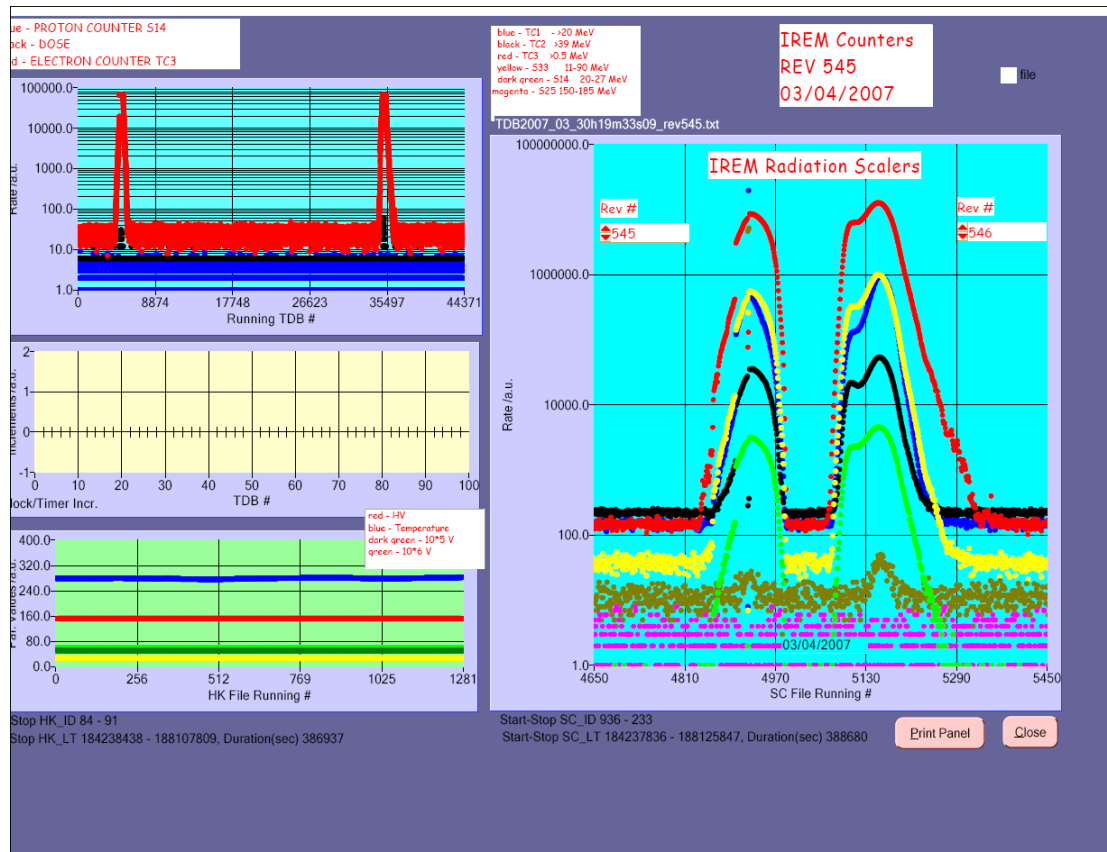
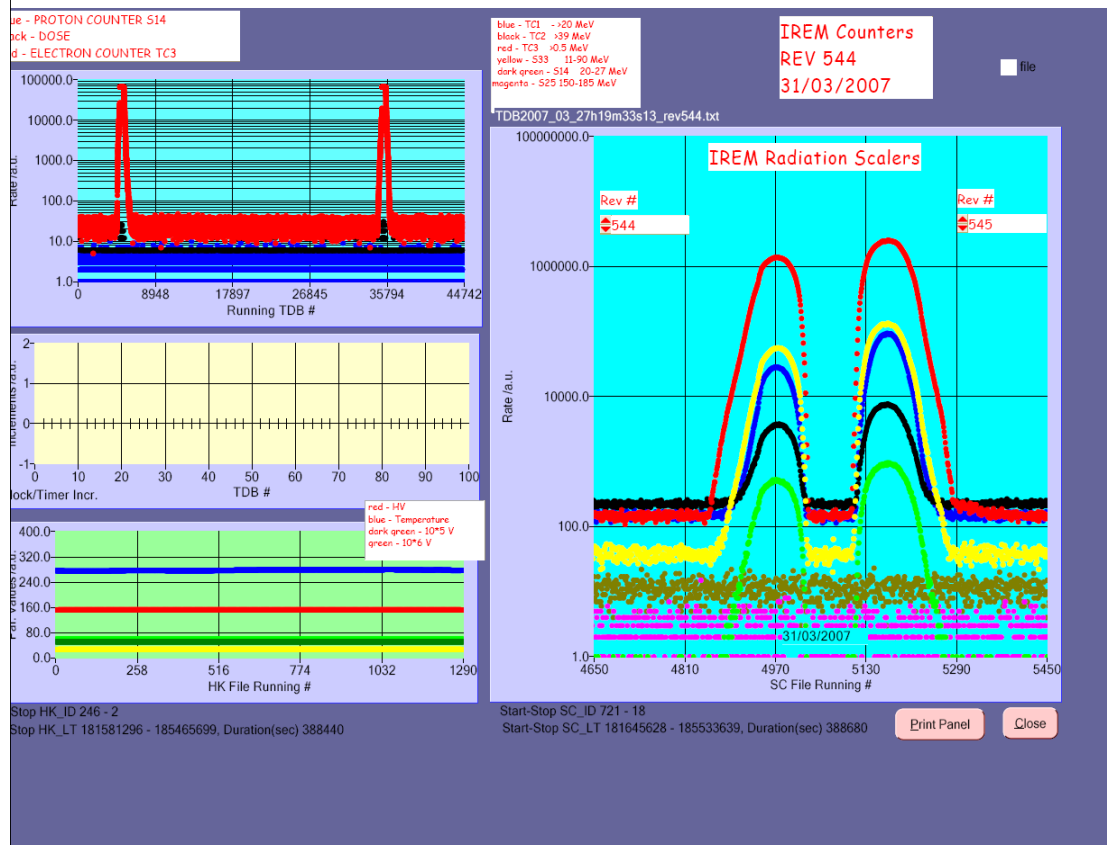
High radiation

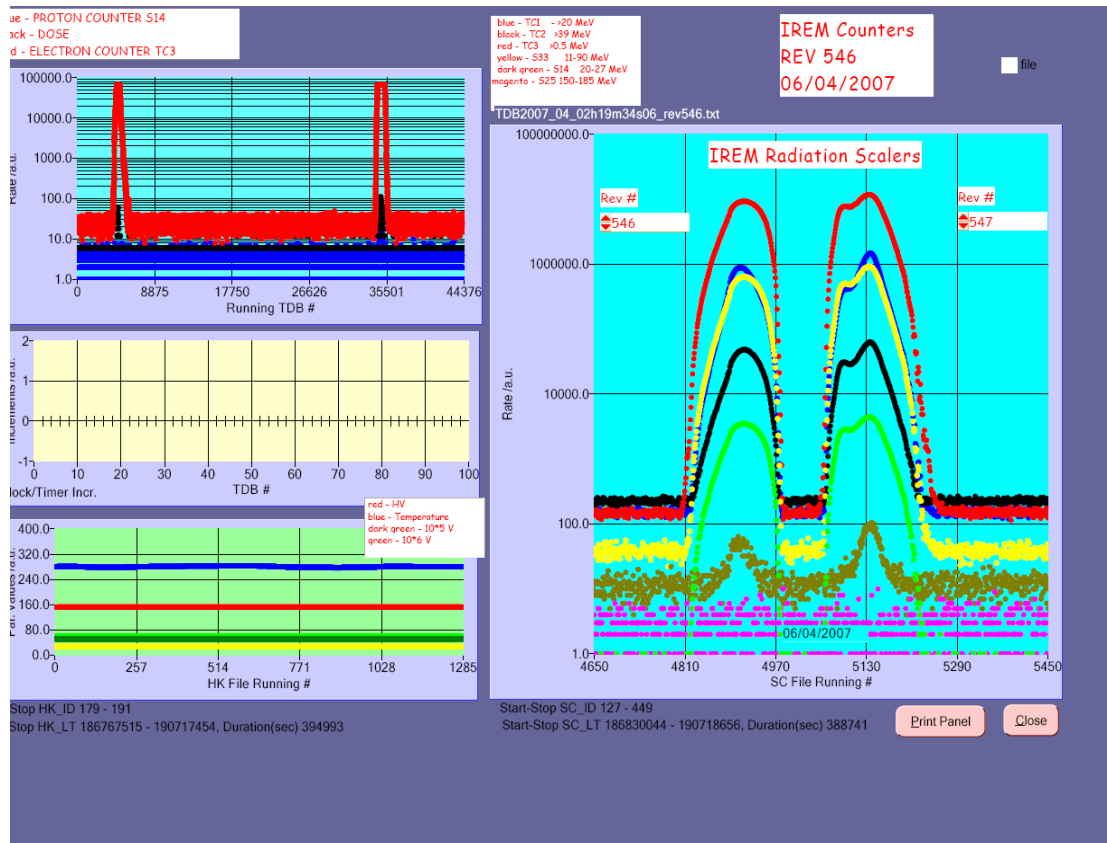
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

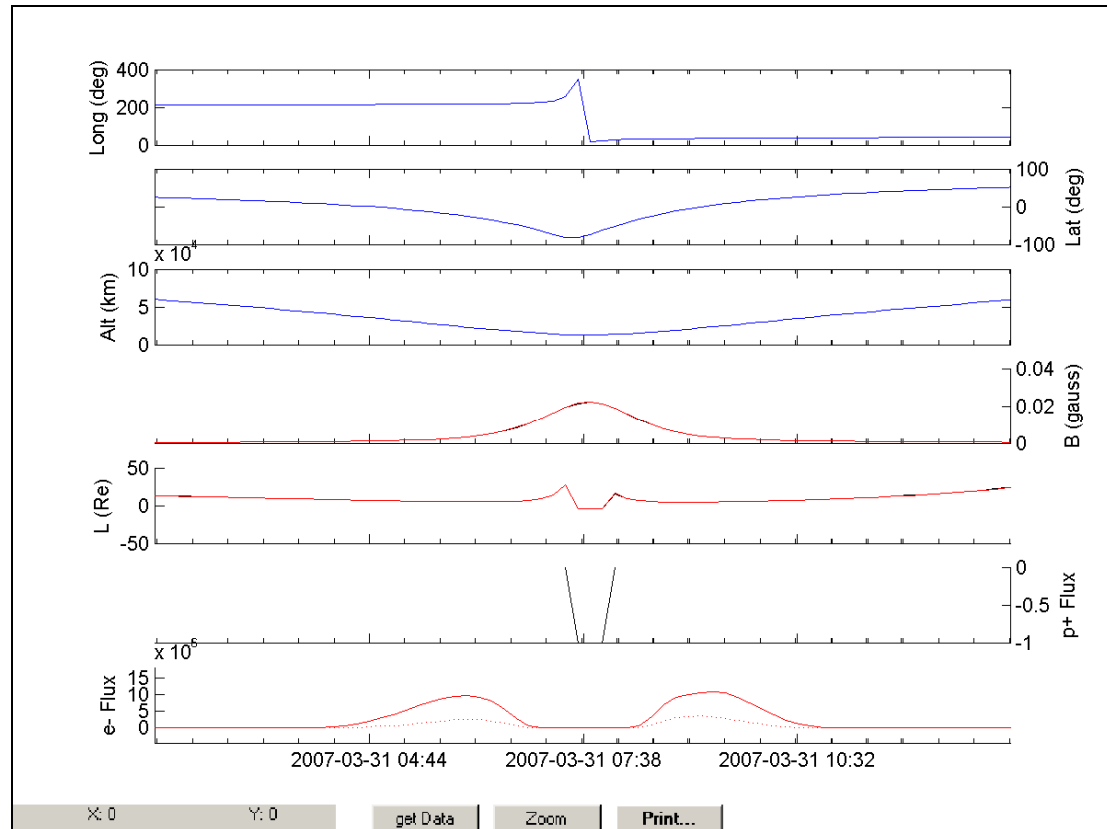
IREM radiation counters:



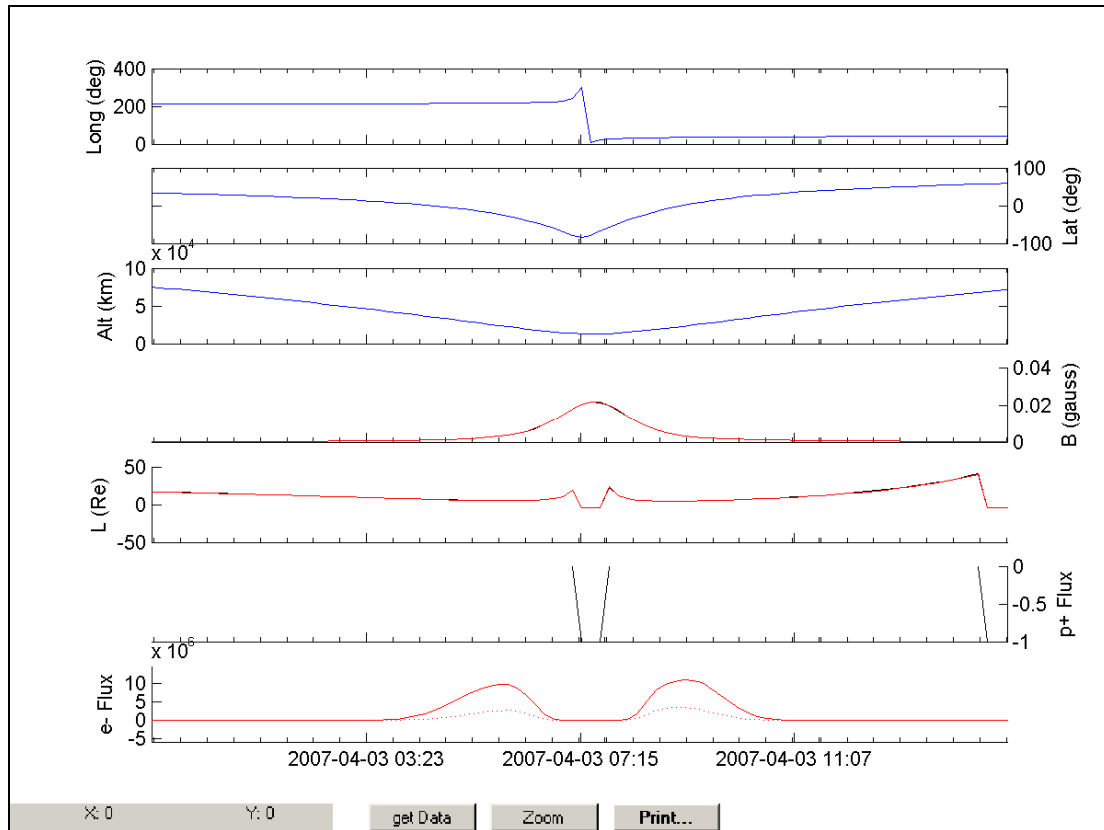


IREM Predicted Radiation Belt Passages

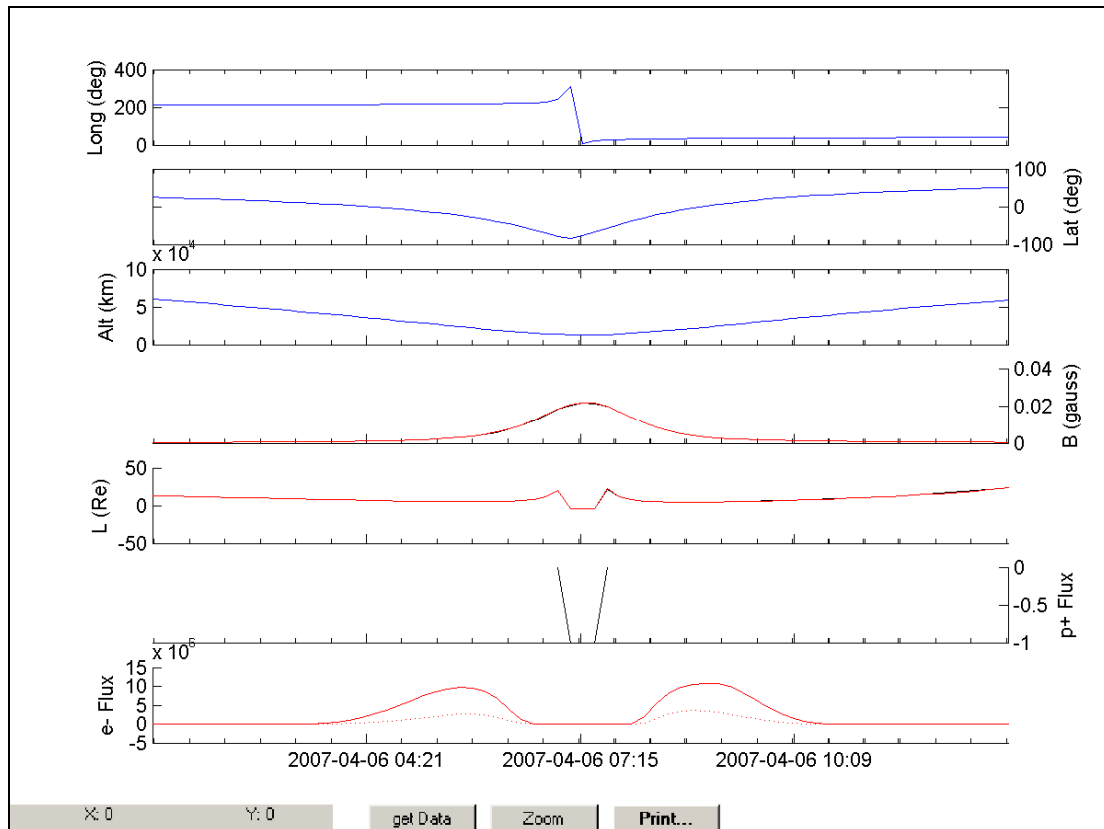
Rev 544



Rev 545



Rev 546



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Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 10/04/07

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Rev. : 0
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SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):

Note: no plots are available from the SEIS. However the radiation environment (X-Ray and particles flux) was quiet this week