

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 223
Week 52
02.01.07
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 23.12.06 until 29.12.06 (both dates inclusive) and covers the revolutions 513 and 514.

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 raster dithers of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), an OMC Flat-Field and Dark-Current calibration, at attitude (RA 02:27:36.00, DEC +16:18:00.0), and 2 Galactic disk scans, at attitudes (RA 15:07:15.00, DEC -58:17:51.0), and (RA 14:52:33.60, DEC -61:33:36.0).

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.

Five slews were missed during the observation period, due to problems on the link with REDU station and on the IMCS.

The fuel consumption over the period between 20/12/2006 and 28/12/2006 was 0.0670 Kg. The remaining propellant is in the order of 149.3455 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

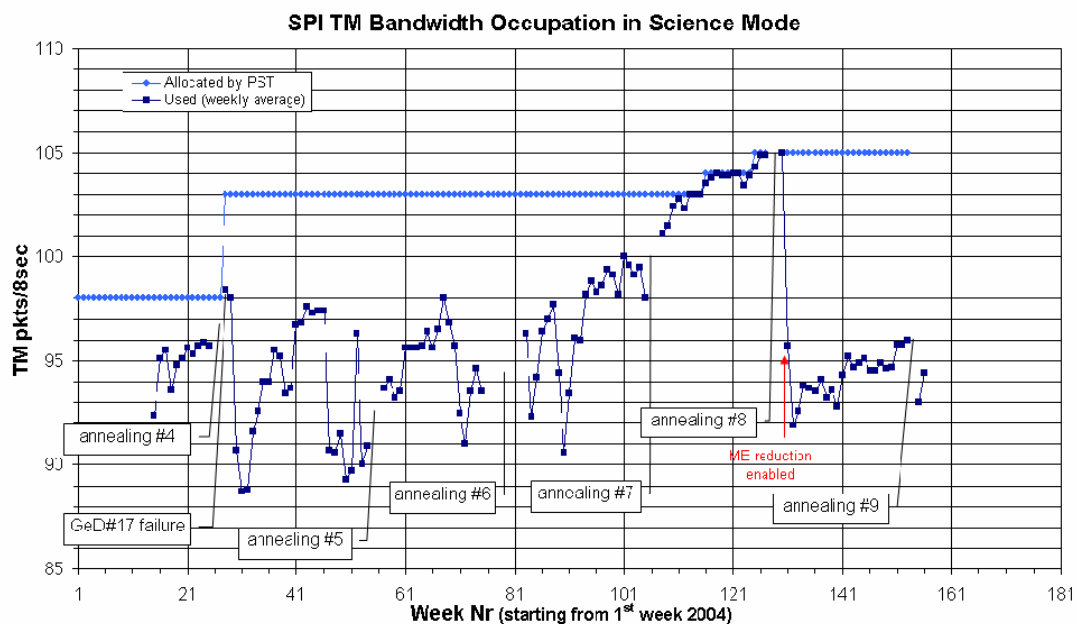
3.2.1 SPI

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. 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.

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 2006-12-26T04:38:37Z to 2006-12-26T09:40:40Z (OMC Flat Field Calibration) when the TM allocation was 85 packets/cycle. The average telemetry occupation when the allocation was 105 packets/cycle was 94.4 packets/cycle.

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



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

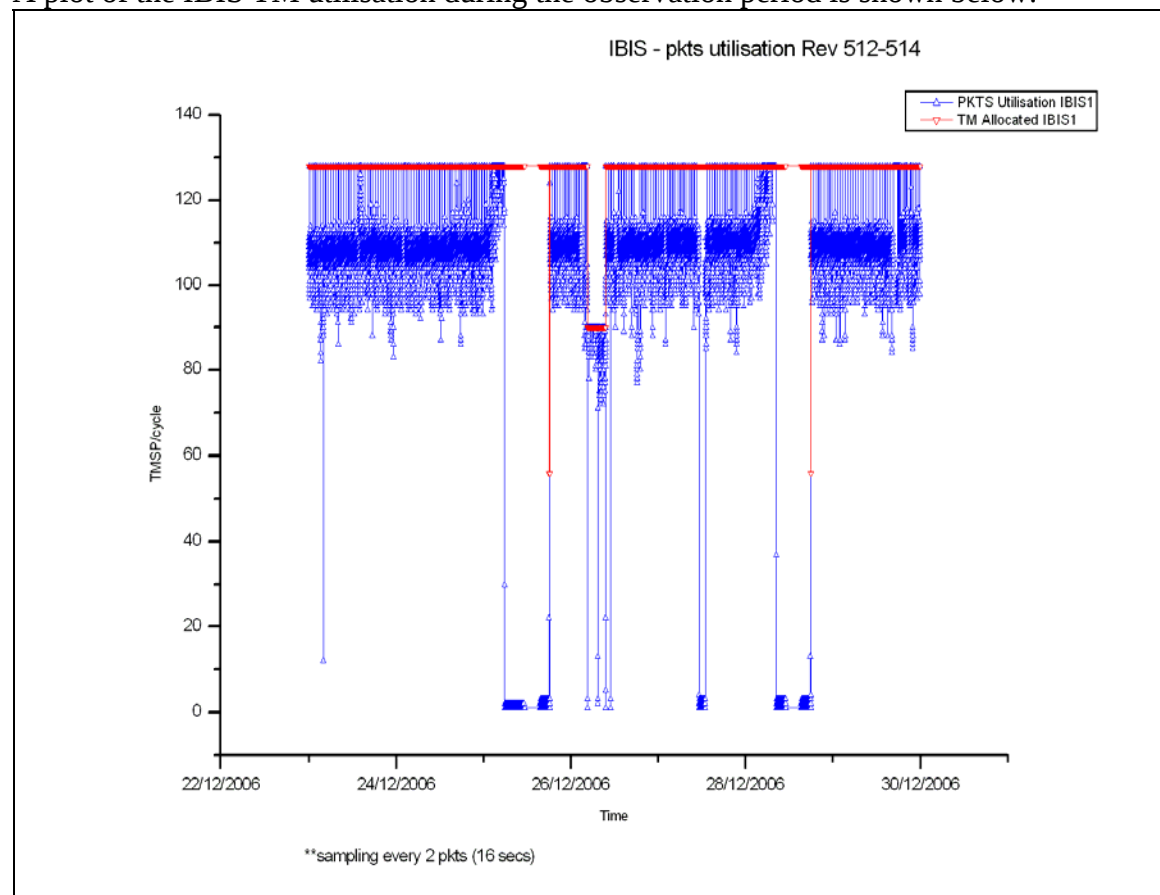
3.2.2 IBIS

The overall status of the unit is nominal.

On 27/12/2006, PICSIT PDM#4 reported a Latch-up notification. The recovery was performed successfully following the FDIR action.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. However on 26/12/2006 between 04:39:20Z and 09:41:23Z, 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 109.62 TMPS/cycle, down 17.47 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.

Due to high background radiation conditions, JEM-X1 made an autonomous transition to Safe mode on 2006-12-25 at 04:51:21Z, ~3 hours earlier than planned before radiation belt entry of revolution 512.

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 2006-12-26T04:39:20 to 2006-12-26T09:41:23, during the OMC Flat Field calibration, when it was 63 packets/cycle.

During this reporting period, 191 of the 194 planned science pointings for OMC were executed nominally, 3 were lost.

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

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity.

The sun was blank most of the observation period. On 26/12/2006 and 27/12/2006, 2 small sunspots, 931 and 932, appeared on the surface of the sun but faded nearly immediately.

No threat for 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 excellent this week. 1 slew was lost due to ground problems. The overall performance thought was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. There were, however, a couple of incidents: On one occasion, the Command Verifier task crashed delaying JEMX and IBIS commanding, but no slews were lost. The overall performance was well above the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. A slew, however, was lost due to a small TM drops from Redu. The overall performance though was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

The ISOC input for this week will be included in next week's report.

4.3.2 ISDC

Status of ISDC observation processing on 02/01/2007:

- Latest Standard Analysis completed: observation 04200340011 (Gamma Ray Source 1915+105, Revolution 499) on 20/12/2006.
- Latest products archived: observation 04200340010 (Gamma Ray Source 1915+105, Revolution 497) on 20/12/2006.
- Latest observation products sent to the observer: observation 04200240001 (Gamma Ray Source 1915+105, Revolution 497) on 20/12/2006.

5 Special Events

6 Anomalies

The following problems that impacted operations were reported:

- On DoY 360, at 09:41, the Command Verifier crashed. Successive attempts to restart it failed, forcing the operator to switch to the b-chain. Time was lost, as the b-chain had been incorrectly configured (the time was wrong and TCspacon parameters were incorrect). At 10:51, KEDATA02, and at 10:58 GESTAN02 were manually uplinked. There was no impact, apart from the delay in uplinking the above 2 EDs. Operations were switched back to the a-chain at 12:01, after successful recovery.
- At 12:29, a problem commanding the slew to the attitude for pointing 05130026, led to the timeline being suspended. A recovery was performed, and the timeline re-enabled at 13:30, the impact was the loss of that pointing.
- On DoY 361, at 20:00, command A3161 failed release due to the dynamic PTV. A recovery was executed, and the timeline recovered at 20:35. The impact was the loss of pointing 05130069.
- On DoY 363, at 20:51, a TM drop from Redu led to the Timeline being suspended. A recovery was executed, and completed at 21:42. The impact was the loss of pointing 05140039.

The following anomaly report was entered into the ARTS system this week:

AR id	Date Created	Subject	Segment	Status
INT_SC-171	09/01/2007	IBIS: PICsIT PDM4 Latch-up Mode	Payload	Open

Doc. Title : INTEGRAL Mission Report #223
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 02/01/07

Issue : 1
Rev. : 0
Page : 8

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 513

The observations in revolution 513 commenced with a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), lasting ~8.3 hours. This was followed by an OMC Flat Field and Dark Current calibration, a staring observation with attitude (RA 02:27:36.00, DEC +16:18:00.0), lasting ~3.4 hours. Finally another raster dither of the Galactic Plane Region 4 was performed, lasting ~44.0 hours until the end of the revolution.

Revolution 514

The observations in revolution 514 began with a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), lasting ~21.3 hours. It continued with a Galactic disk latitude scan, at attitude (RA 15:07:15.00, DEC -58:17:51.0), lasting 17.1 hours. Finally another Galactic disk latitude scan, this time at attitude (RA 14:52:33.60, DEC -61:33:36.0) lasting ~17.1 hours, was performed, until the end of the revolution.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was: IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5, except from 2006-12-26T04:39:20Z to 2006-12-26T09:41:23Z, during the OMC Flat Field calibration, when it was: IBIS 90; SPI 85; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-12-04T17:38:39.000Z	149.6562	F	Automatic TM processing.
2006-12-06T03:21:39.000Z	149.6335	F	Automatic TM processing.
2006-12-07T17:32:31.000Z	149.6229	F	Automatic TM processing.
2006-12-09T03:09:54.000Z	149.5839	F	Automatic TM processing.
2006-12-10T17:13:34.000Z	149.5556	F	Automatic TM processing.
2006-12-12T03:34:18.000Z	149.5392	F	Automatic TM processing.
2006-12-13T16:59:34.000Z	149.5307	F	Automatic TM processing.
2006-12-15T03:16:49.000Z	149.5216	F	Automatic TM processing.
2006-12-16T16:50:37.000Z	149.4933	F	Automatic TM processing.
2006-12-18T02:48:25.000Z	149.4719	F	Automatic TM processing.
2006-12-19T16:39:49.000Z	149.4125	F	Automatic TM processing.
2006-12-22T16:30:06.000Z	149.3975	F	Automatic TM processing.
2006-12-24T02:22:33.000Z	149.3808	F	Automatic TM processing.
2006-12-26T03:07:35.000Z	149.3628	F	Automatic TM processing.
2006-12-28T16:02:21.000Z	149.3455	F	Automatic TM processing.

This report was generated Fri Dec 29 08:00:31 GMT 2006

8.3 Detailed Satellite Information

This section contains some detailed information concerning the various subsystems of the satellite and instruments.

8.3.1 AOCS SUMMARY OPERATIONS REPORT, 23/12/2006 –29/12/2006

AOCS operations were executed from the Automatic Timeline.

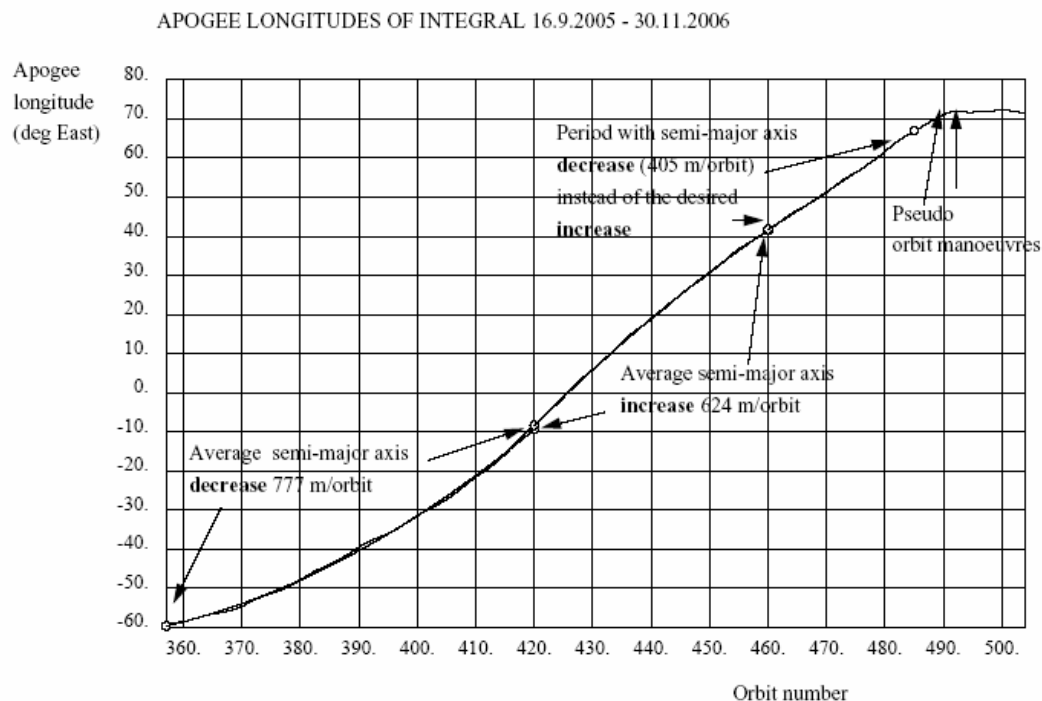
During this period, 105 Open Loop Slews, 102 Closed Loop Slews and 4 Momentum Biases were executed.

5 slews (2 OSL, 3 CSL) were missed from the TL during the observation period due to problem on the link with REDU station and with the CMD Verifier task on IMCS. The OTF was not reached during PID 05120087 due to lost of guide star.

This is equivalent to a $\sim 2.4\%$ of the total number of slews (209)

Orbit Control

The attached plot shows the apogee longitude of Integral (in deg East) as a function of the orbit number for the period September 2005 - October 2006.

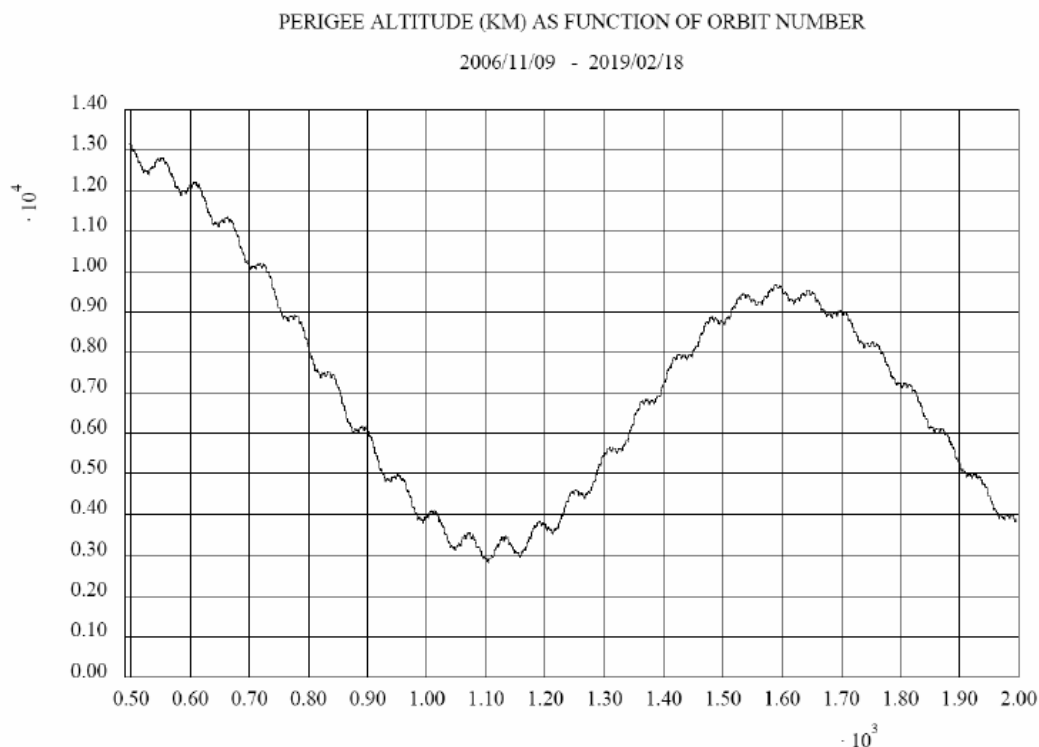


From September 2005 to March 2006 the momentum dumping manoeuvres were systematically executed in attitudes/at epochs to lower the orbit in order to initiate an eastward drift. The average semi-major axis decrease in this period was 777 m/orbit.

From March 2006 and onwards the momentum dumping manoeuvres should have been systematically executed in attitudes/at epochs to raise the orbit in order to decrease the eastward drift. Up to July this was successful, the average semi-major

axis increase in this period was 624 m/orbit. After July this was no more the case, the average effect of the momentum dumping was an orbit lowering with on the average 404 m/orbit instead of the desired raising. Because of this, several "pseudo orbit manoeuvres" were executed in October 2006. These "pseudo orbit manoeuvres" were momentum dumping manoeuvres artificially made large, by aiming for large reaction wheel rate changes rather than small ones, when in attitudes/epochs for which corresponding orbital effects were advantageous for the orbit control.

A recent analysis on the evolution of the perigee altitude evidenced a lowering of the perigee altitude when considering the over-extended phase of the mission. A plot of the perigee altitude for the period 2006/11/09 - 2019/02/18 is shown below.



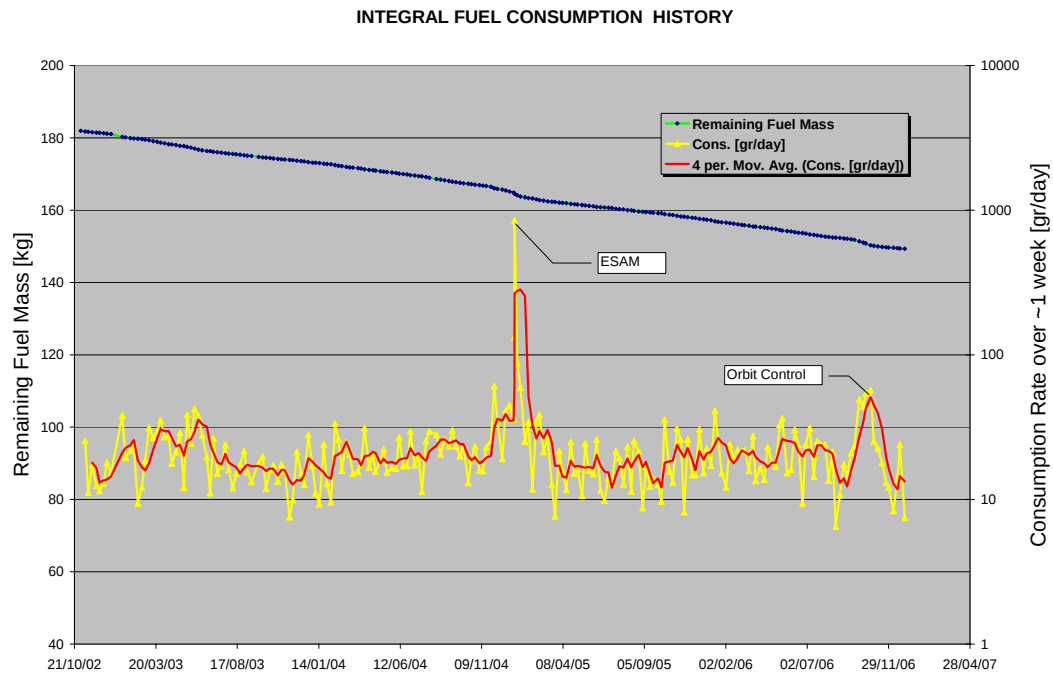
Perigee Height history; abscissa orbit number; ordinate perigee altitude in 10E+4 Km

The perigee altitude apparently only decreases to a minimal value of about 3000 km in 2012 and will then increase to reach a maximal value of about 9500 km in 2016.

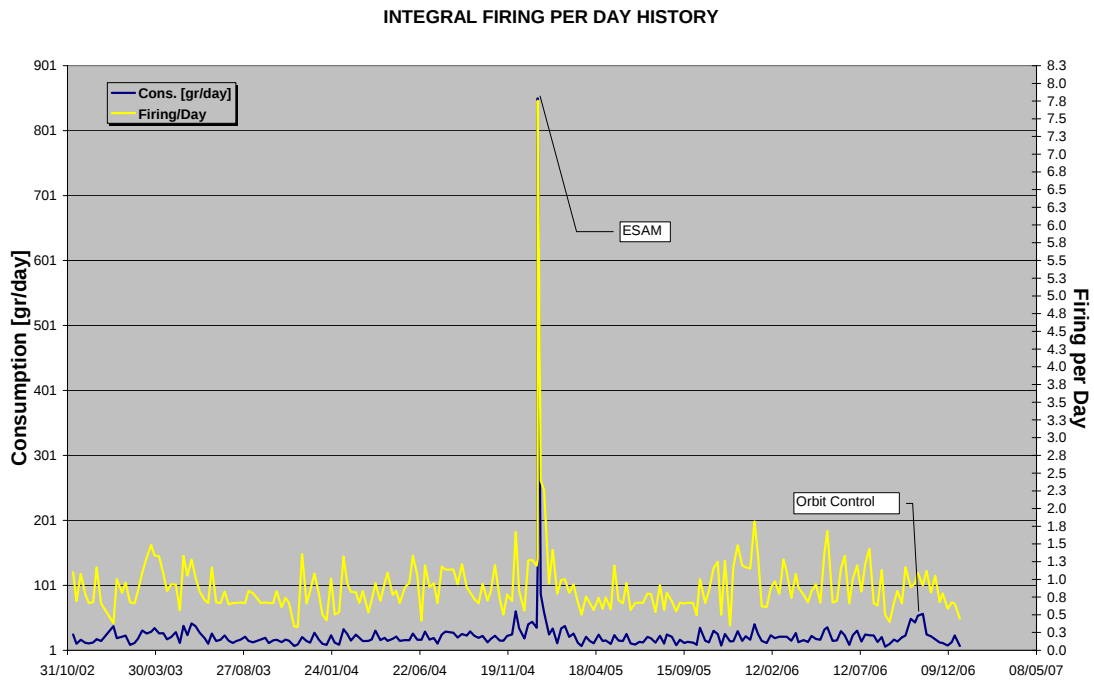
Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 28/12/2006 is reported in the plot below.

The large consumption rate observed in the end of 2006 was due to the combination of the strategy to perform artificial large momentum dump manoeuvres when the pointing is suitable for orbit control and the winter eclipse season.

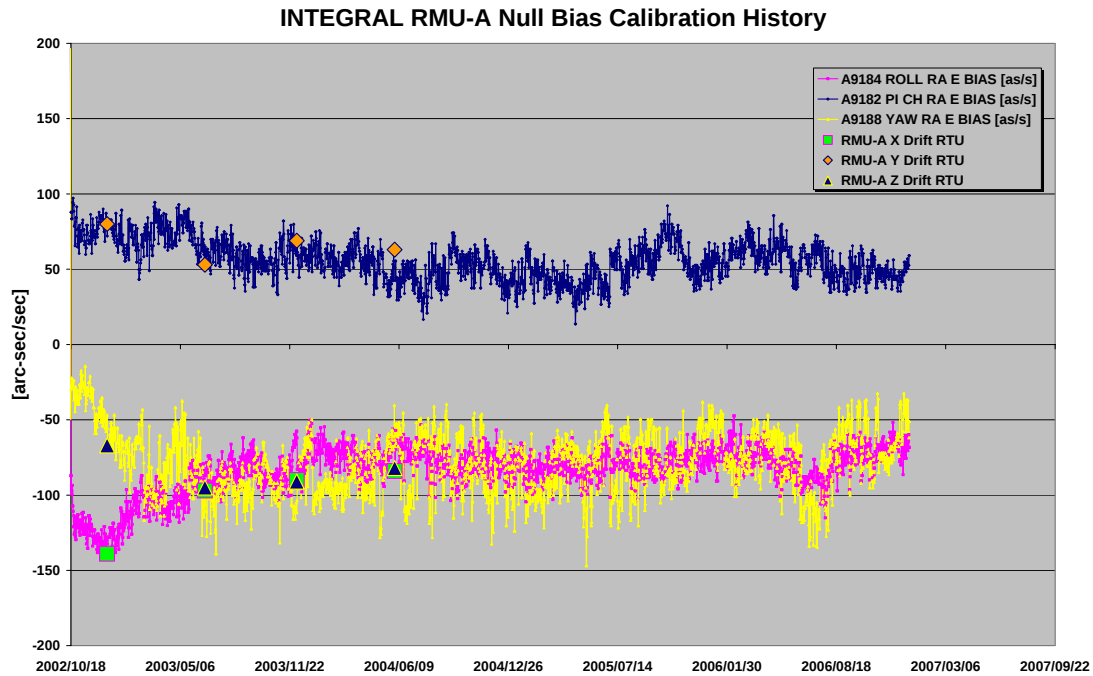


The firing\day over the period between 01/11/2002 and 28/12/2006 is reported in the plot below.

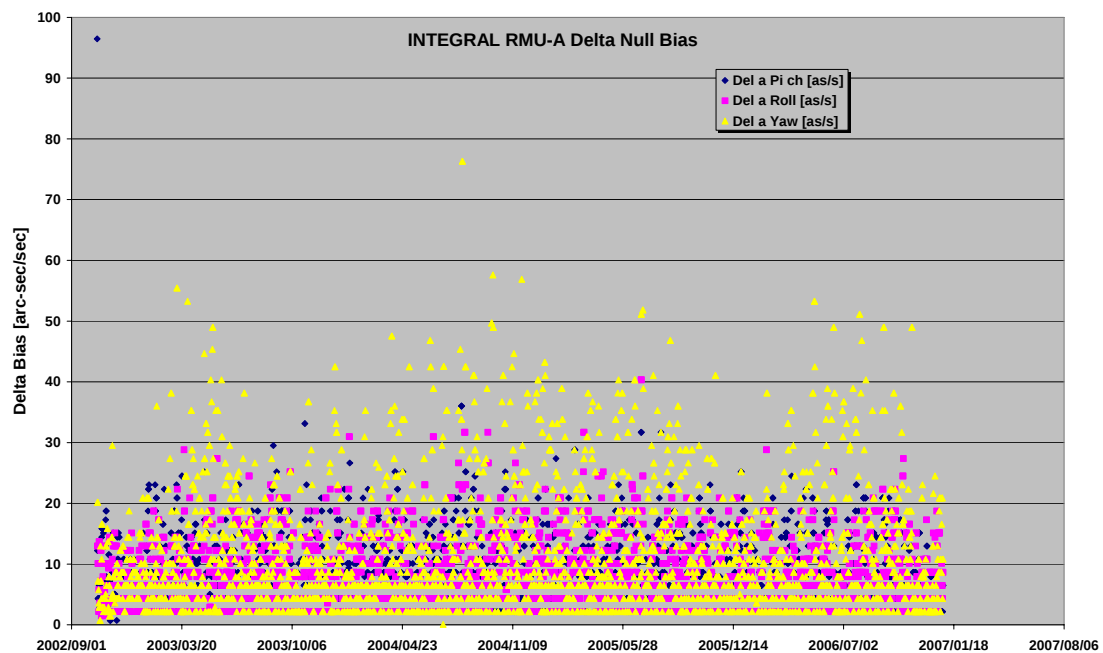


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 29/12/2006 is reported in the plot below.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 29/12/2006 is reported in the plot below



23/12/06 (Day of Year 357, Revolution 512)

Nothing to report.

24/12/06 (Day of Year 358, Revolution 512)

Nothing to report.

25/12/06 (Day of Year 359, Revolution 512-513)

STR ACC Threshold exceeded: at perigee passage of rev 513, the STR SEU threshold was exceeded several time due false events generated by the high radiation environment.

During the event occurred at 15:57:38z, the IMU 1 was switched ON and an automatic mapping commanded by the ACC.

The guide star was Mi 6.2 at CCD location [-6212, 6336]. The new guide star picked after automatic mapping was Mi 8.25 at CCD location [2707, 983].

A manual recovery was performed (under request of FD Team) and a new guide star, Mi 6.15 at CCD location [6982, 2262], was selected, such to have a brighter star during the following RWB activity.

No impact on TL reported except that the OTF was not reached during PID 05120087.

26/12/06 (Day of Year 360, Revolution 513)

Problem on IMCS: at 09:41z due to a problem on the CMD Verifier task on the IMCS-A chain, after several attempts to restart it, the commanding capability was moved to the IMCS-B chain.

A manual recovery was then performed and the next slew ID 05130023 was manually updated in the TL.

At 12:01z the operations were moved back from IMCS B-chain to A-chain. Due to a coordination problem, the slew ID 05130026 failed release. A manual recovery was then performed from attitude PID 05130025 to the attitude of PID 05130027; the next slew ID 05130028 was manually updated in the TL.

The following slew was lost: 05130026(OSL)-27(OSL)

27/12/06 (Day of Year 361, Revolution 513)

Slew failed release due to Dynamic PTV failure: at 20:00z, the slew ID 05130069 failed release due to Dynamic PTV failure caused by

The guide star was Mi 6.8 at CCD location [-15271, -17263].

A manual recovery was then performed from attitude PID 05130068 to the attitude of PID 05130069; the next slew ID 05130070 was manually updated in the TL.

The following slew was lost: 05130069(CSL)

28/12/06 (Day of Year 362, Revolution 513-514)

STR ACC Threshold exceeded: at perigee passage of rev 514, the STR SEU threshold was exceeded twice due false events generated by the high radiation environment.

During the first event occurred at 14:57:00z, the IMU 1 was switched ON and an automatic mapping commanded by the ACC. The second event occurred 15:15:38z and forced again the automatic IMU 1 switch ON, followed by the automatic mapping commanded by the ACC.

The guide star was Mi 6.45 at CCD location [18442, 4804]. The new guide star picked after automatic mapping (during the second event) was Mi 8.5 at CCD location [8360, -9563].

A manual recovery was performed (under request of FD Team) and a new guide star, Mi 4.5 at CCD location [-13346, 13777], was selected, such to have a brighter star during the following RWB activity.

No impact on TL reported being the event occurred during the ascending part of the orbit, inside radiation belts.

29/12/06 (Day of Year 363, Revolution 514)

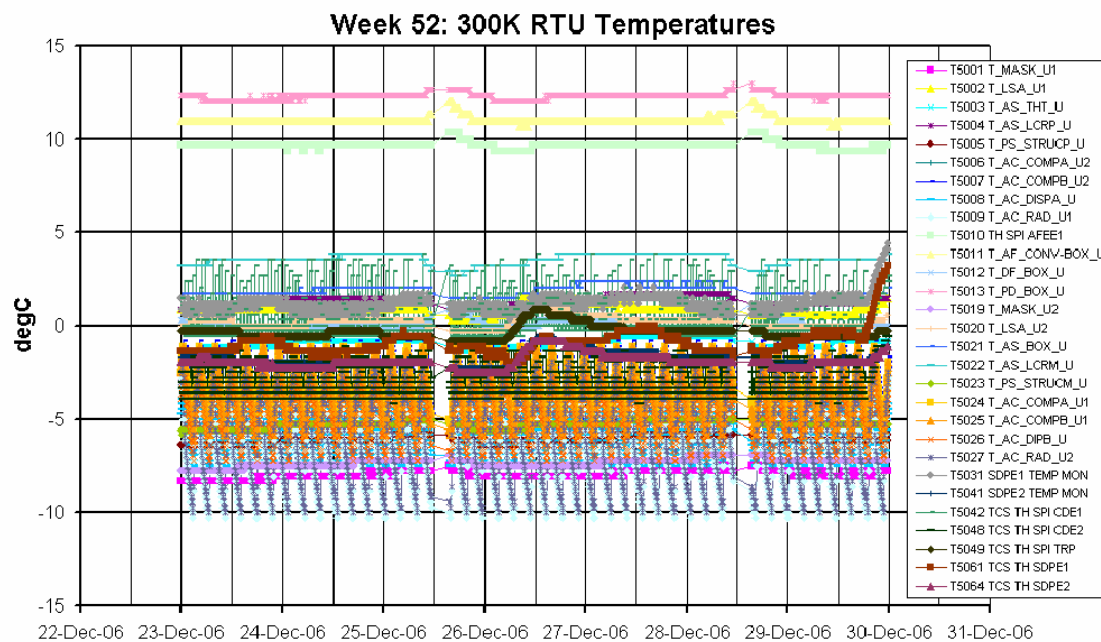
Problem on the link with REDU station: at 20:51z due to a problem on the link with REDU station, the slew ID 05140039 failed release.

A manual recovery was then performed from attitude of PID 05140038 to the attitude of PID 05140040. The next slew ID 05140041 was manually updated in the TL.

The following slew was not executed form TL: 05140039(CSL)-40(CSL).

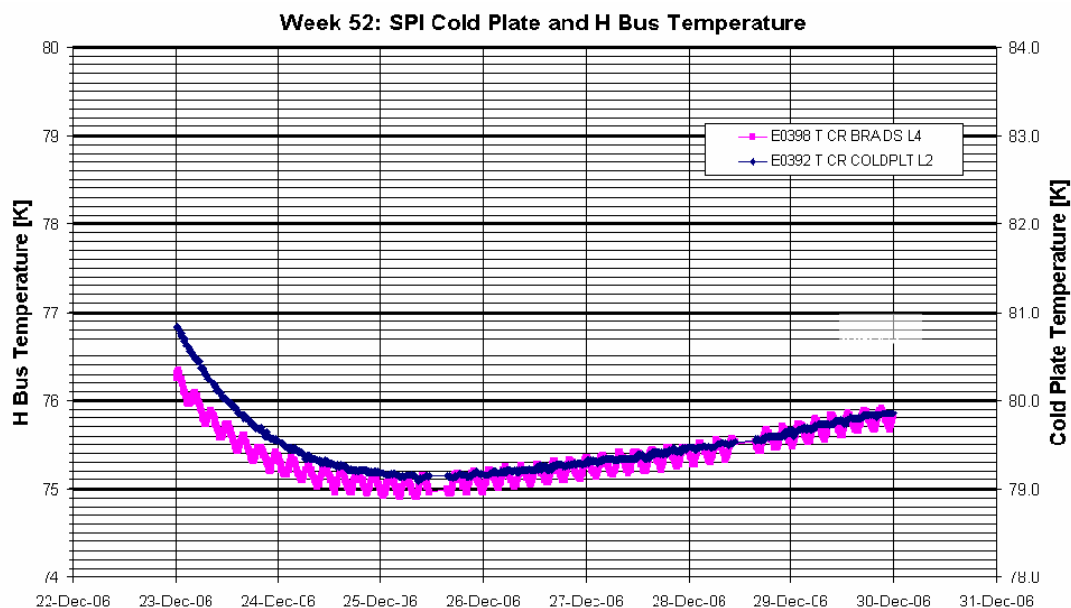
8.3.2 SPI Operations

Unit Temperatures: All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period:



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

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

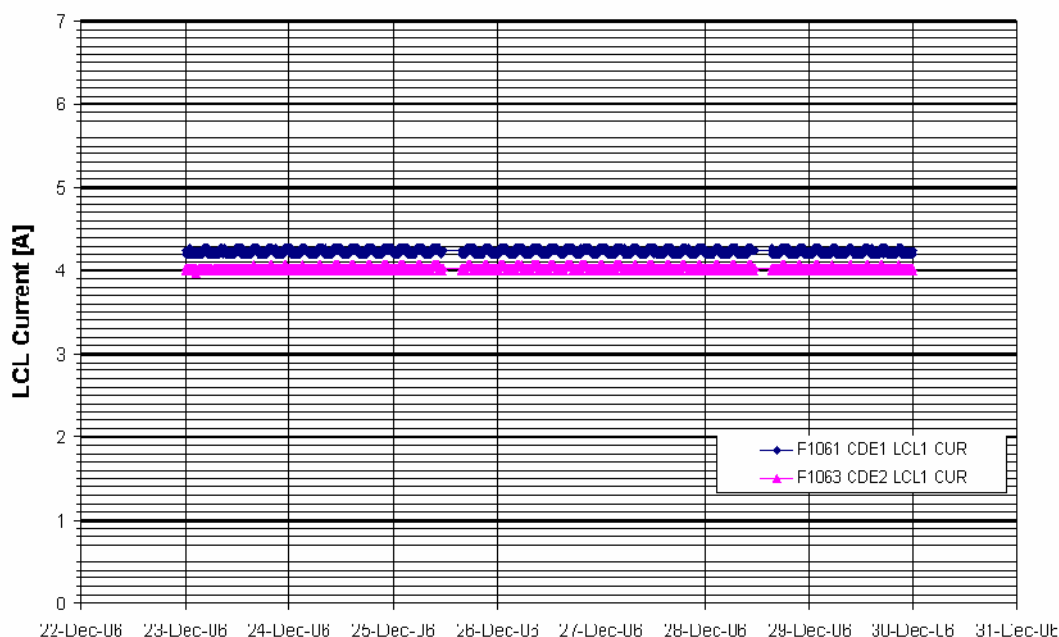


The stroke of all four compressors is currently set to 37. The average LCL currents of the CDEs over the week were:

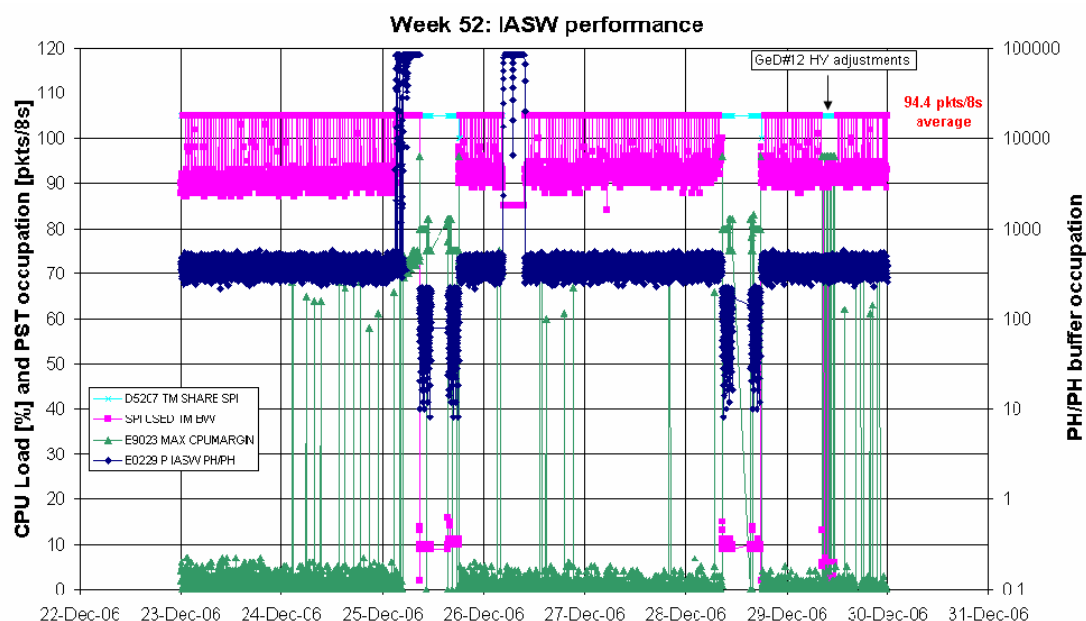
- Average CDE1 LCL Current = 4.24A
- Average CDE2 LCL Current = 4.03A

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

Week 52: SPI CDE1 and CDE2 LCL Currents

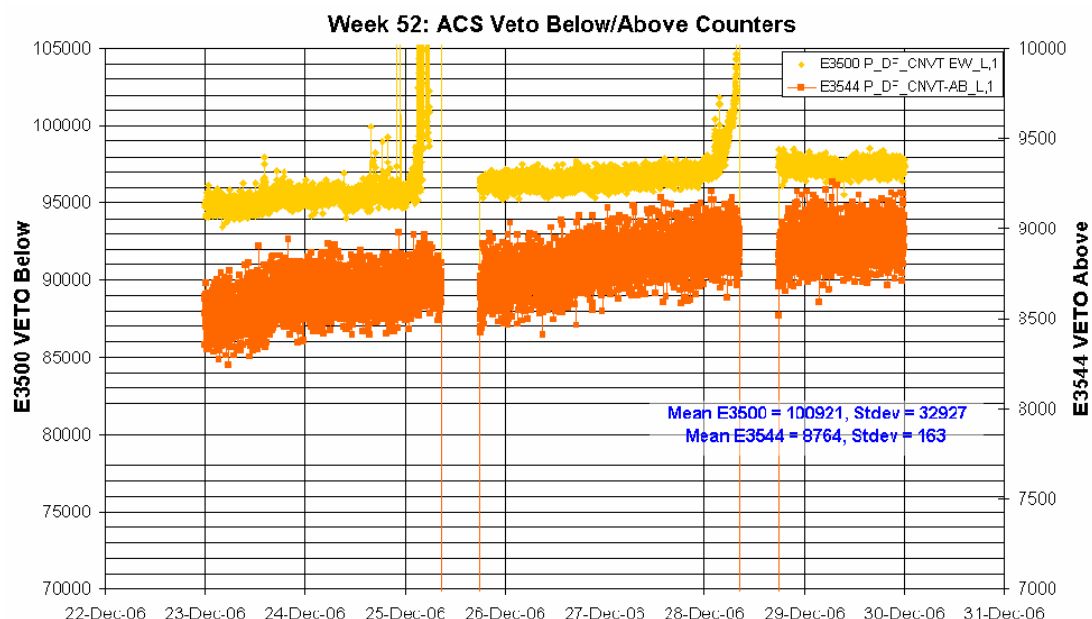


DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432. The average TM bandwidth occupation of SPI was 94.4 packets/cycle over the science window, when the TM allocation was 105 packets/cycle (note that from 2006-12-26T04:38:37Z to 2006-12-26T09:40:40Z the TM allocation was 85 packets/cycle due to an OMC Flat Field Calibration). The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS: The performance of the ACS is nominal, 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.

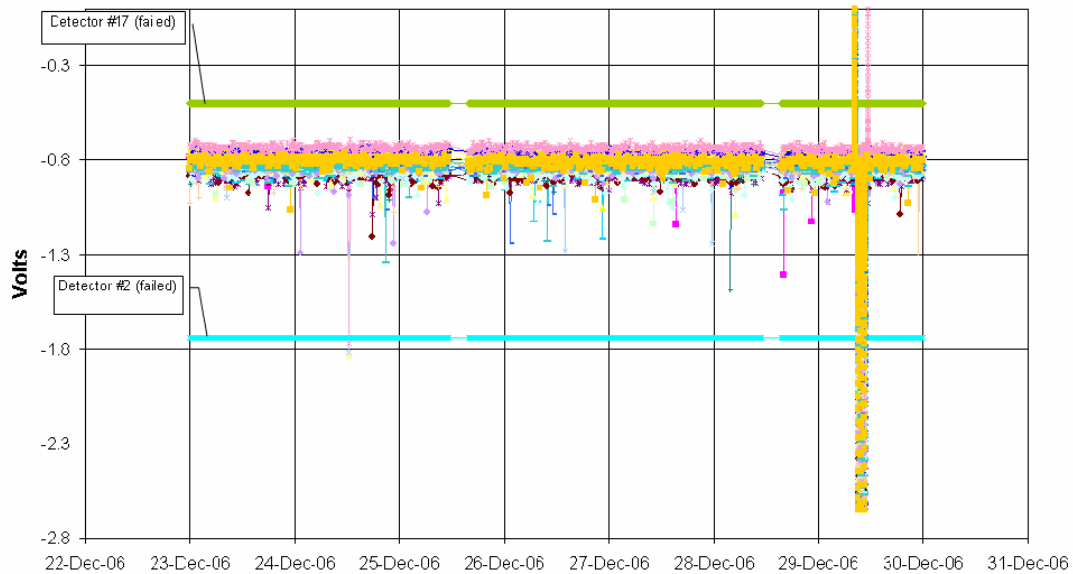
In order to re-evaluate the performance of GeD#12 following the stabilisation of the cold plate temperature in the range 80K+/-1K, a test was performed on 2006-12-29 with the detector HVs set to different values as follows:

- 2006-12-29T08:20:05Z SPI to CONF, all GeD HVs set to 2.5kV (TPF ES1713_AF-HVSET_2500volt_0001.TPF) and back to PHOTON
- 2006-12-29T09:00:04Z SPI to CONF, all GeD HVs set to 3kV (TPF ES1713_AF-HVSET_3000volt_0001.TPF) and back to PHOTON
- 2006-12-29T09:45:35Z SPI to CONF, all GeD HVs set to 3.5kV (TPF ES1713_AF-HVSET_3500volt_0001.TPF) and back to PHOTON
- 2006-12-29T10:30:20Z SPI to CONF all GeD HVs set to 4kV except GeD#2 and GeD#17 (TPF ES1713_AF-HVSET_fmconfig_0005.TPF) and back to PHOTON

A significant degradation of the GeD#12 energy resolution was observed at 4kV and therefore the PI decided to continue operation of the GeD#12 at 3.5 kV. At 2006-12-29T11:15:15Z SPI was commanded back to CONF, the GeD#12 HV was set to 3.5kV and SPI was commanded back to PHOTON. The GeD#12 HV remained at 3.5kV for the rest of the reporting period.

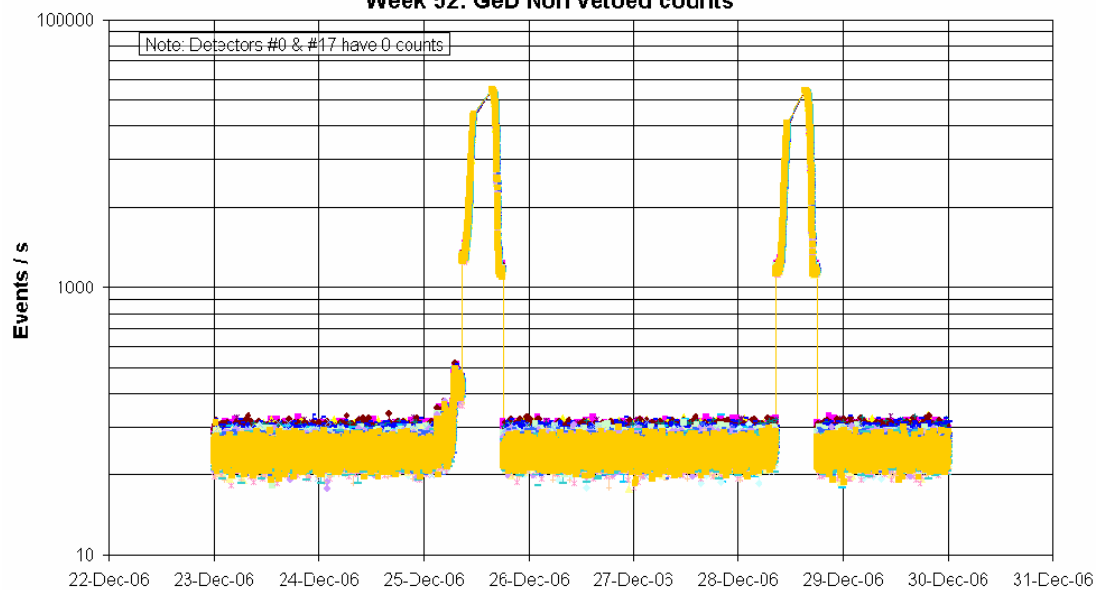
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004

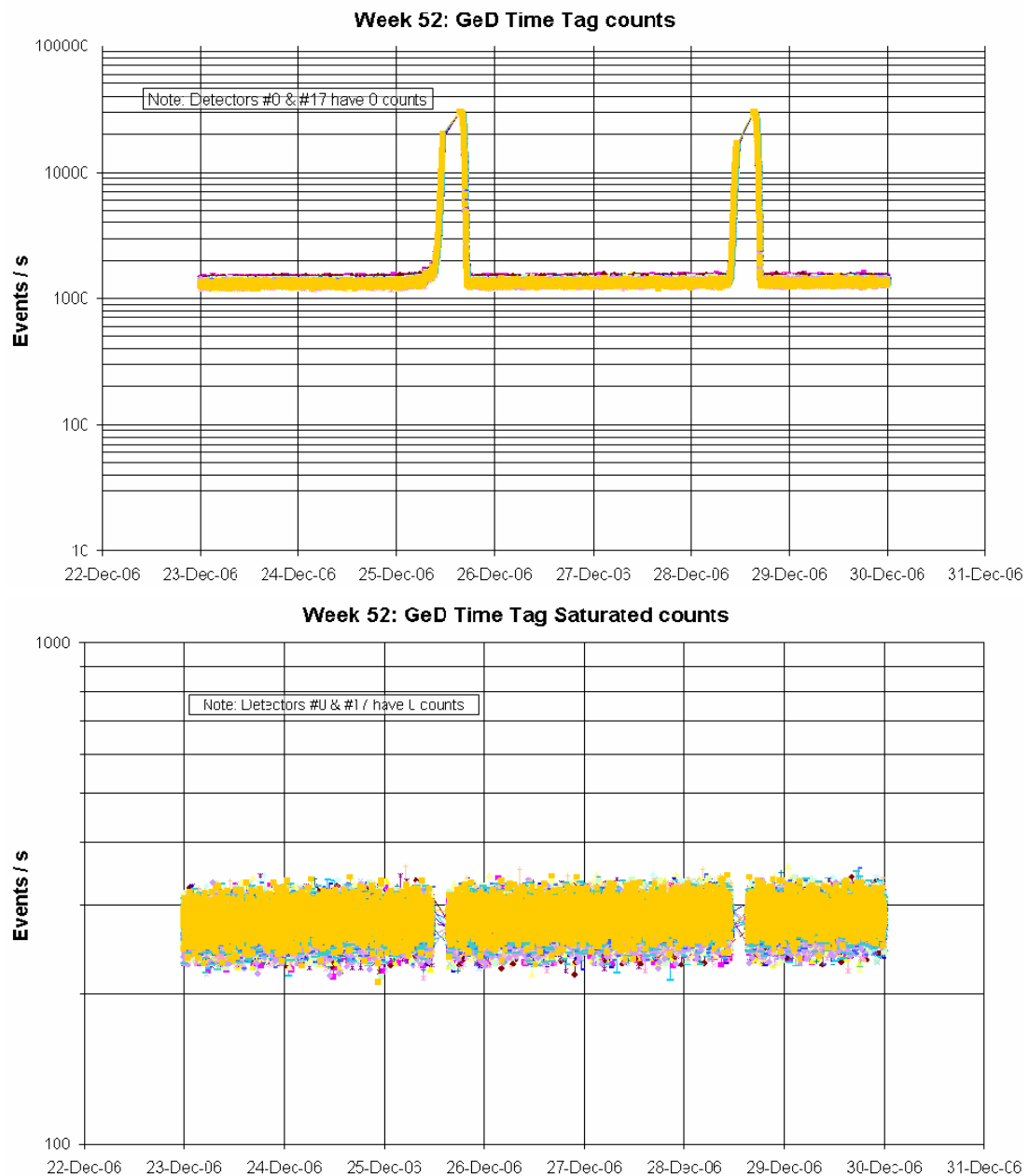
Week 52: AFEE DC output Voltages



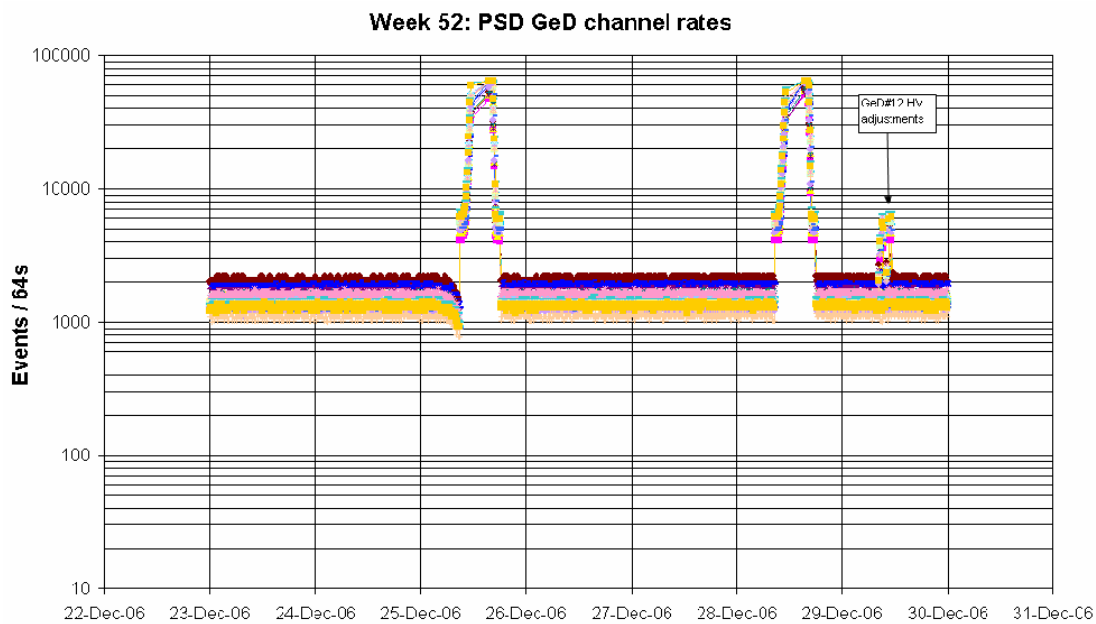
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.

Week 52: GeD Non Vetoed counts





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



Event Log:

The following non-nominal events occurred on SPI during the reporting period:

- On 2006-12-24 at 04:18:31Z OEM APID 1024 ID 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW was received. This was during pointing ID 05120047.
- On 2006-12-25 at 03:12:33Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~5.5 hours before radiation belt entry of revolution 512. No action was taken.
- On 2006-12-25 from 15:34Z to 16:19Z TM parameter E4009 S DF HSLERR L fluctuated OOL, indicating errors on the HSL. This was just after AOS of revolution 513.
- From 2006-12-26T09:51:36Z to 2006-12-26T09:52:32Z 17 occurrences of the following OEMs were received:
 APID 1024 ID 224 EXCEPTION SPI1 SW ERROR
 APID 1024 ID 7 EXCEPTION SPI1 CONSTRAINT DPE CULPR

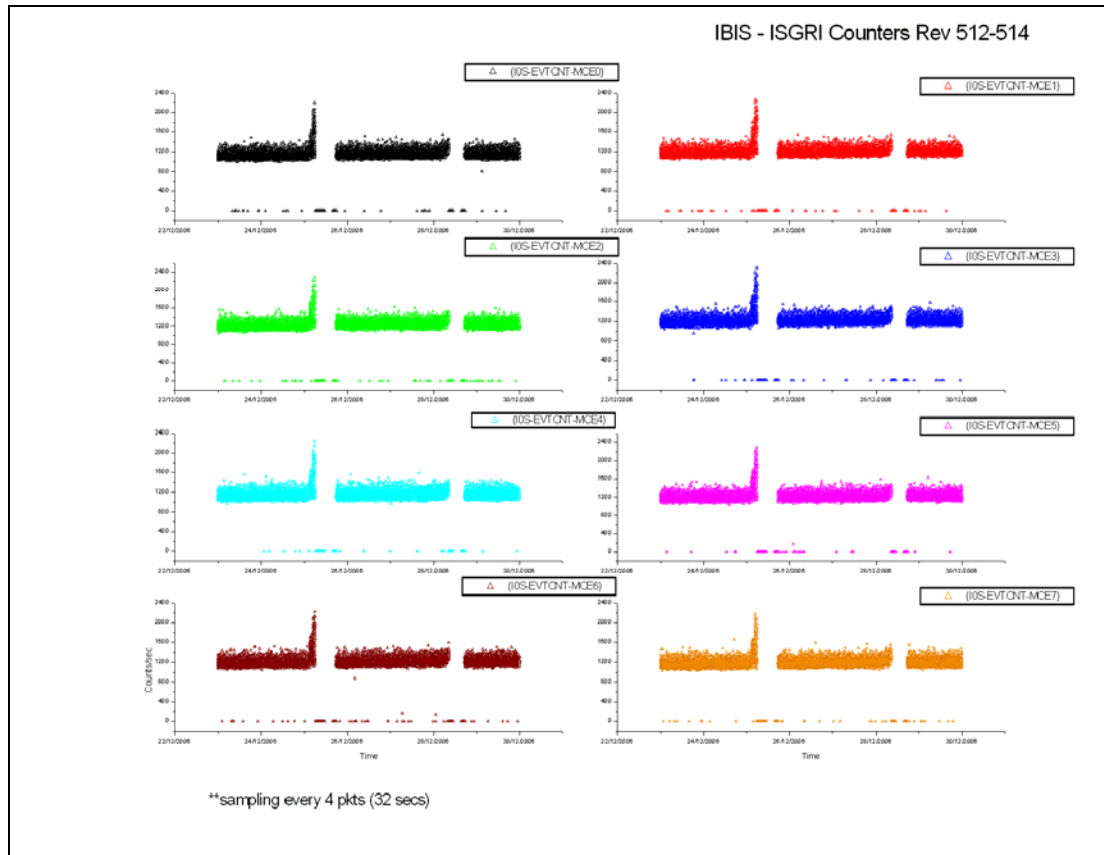
This was in the first pointing after the OMC Flat Field Calibration, ~10 minutes after the TM allocation had been changed from 85 packets/cycle back to 105 packets/cycle. It is usual to get these OEMs in this situation and they stopped of their own accord.

- On 2006-12-28 at 07:51:29Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~45 minutes before radiation belt entry of revolution 513 and therefore no action was taken.
- On 2006-12-28 from 15:24Z to 16:14Z TM parameter E4009 S DF HSLERR L fluctuated OOL, indicating errors on the HSL. This was just after AOS of revolution 514.
- TM parameter E2116 T AS PSAC L2 (Plastic Scintillator temperature) went OOL Low several times during the week. No action was taken as this is a known and recurring problem due to this thermistor being unreliable. The limit conditions for this parameter will be updated in the next IODB release.

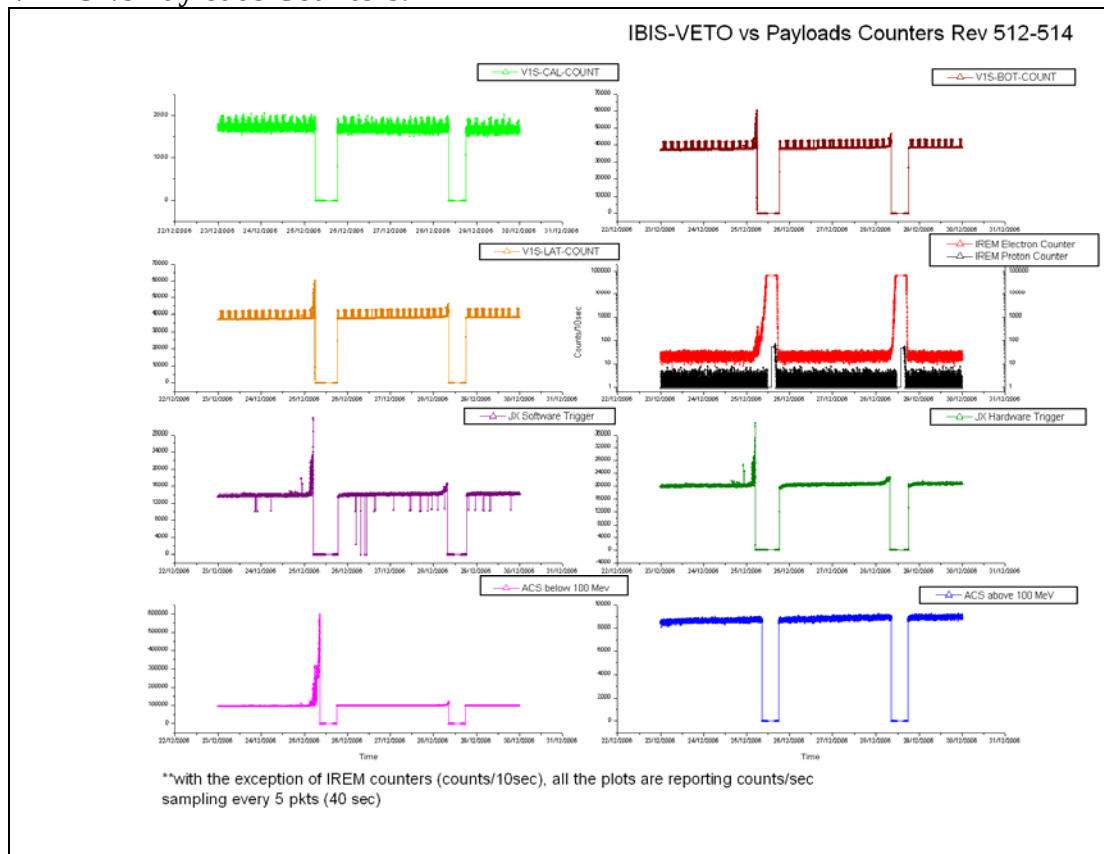
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

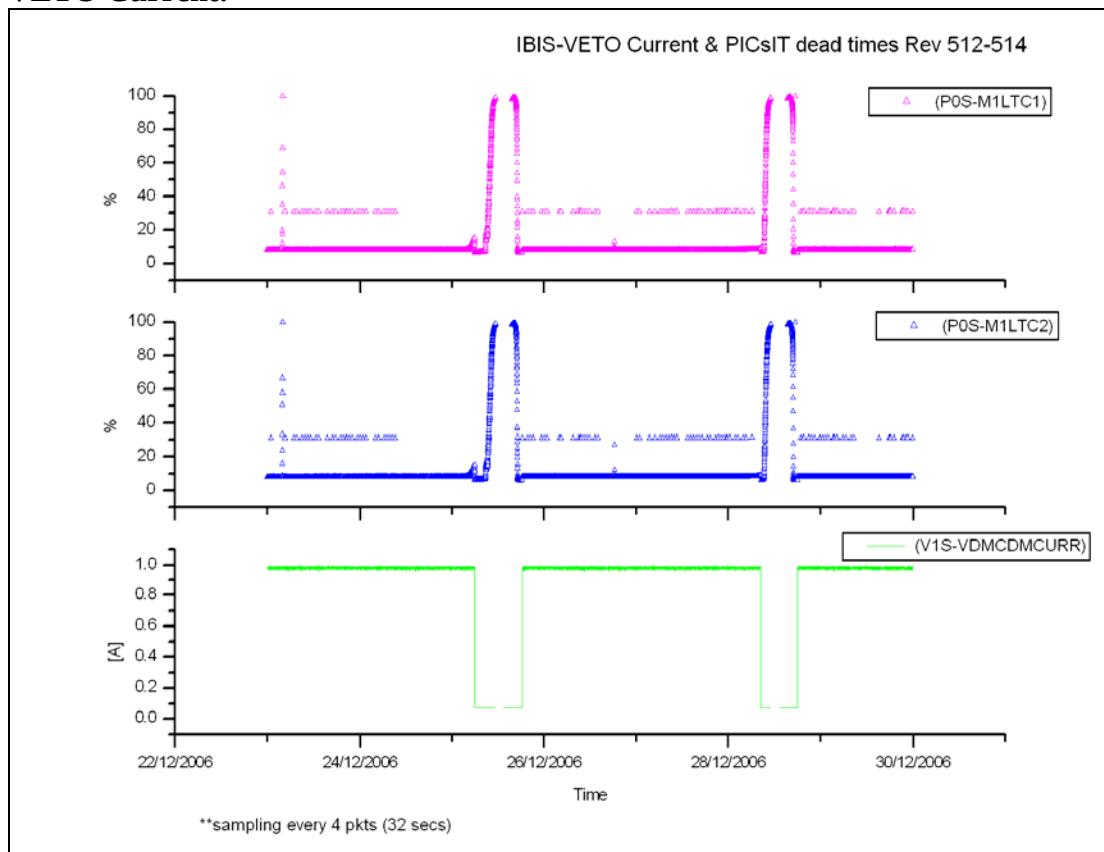


VETO vs Payloads Counters:

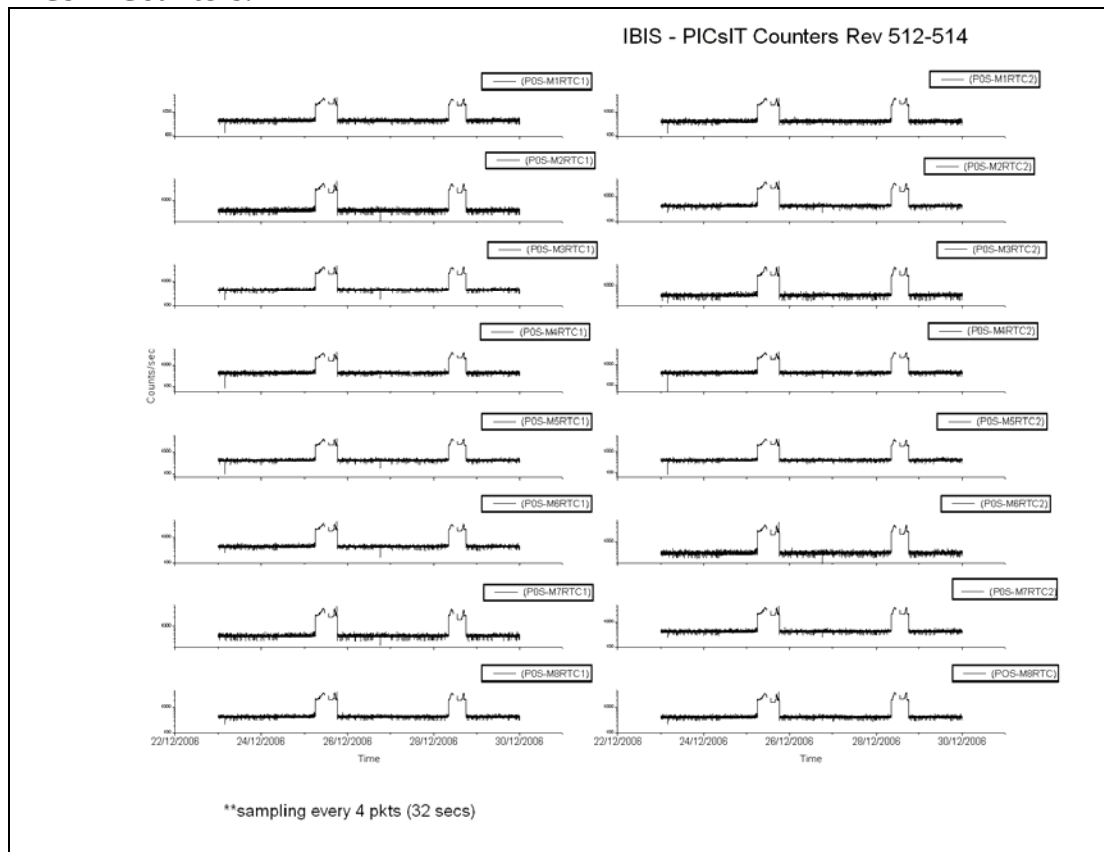


The week was characterised by low radiation.

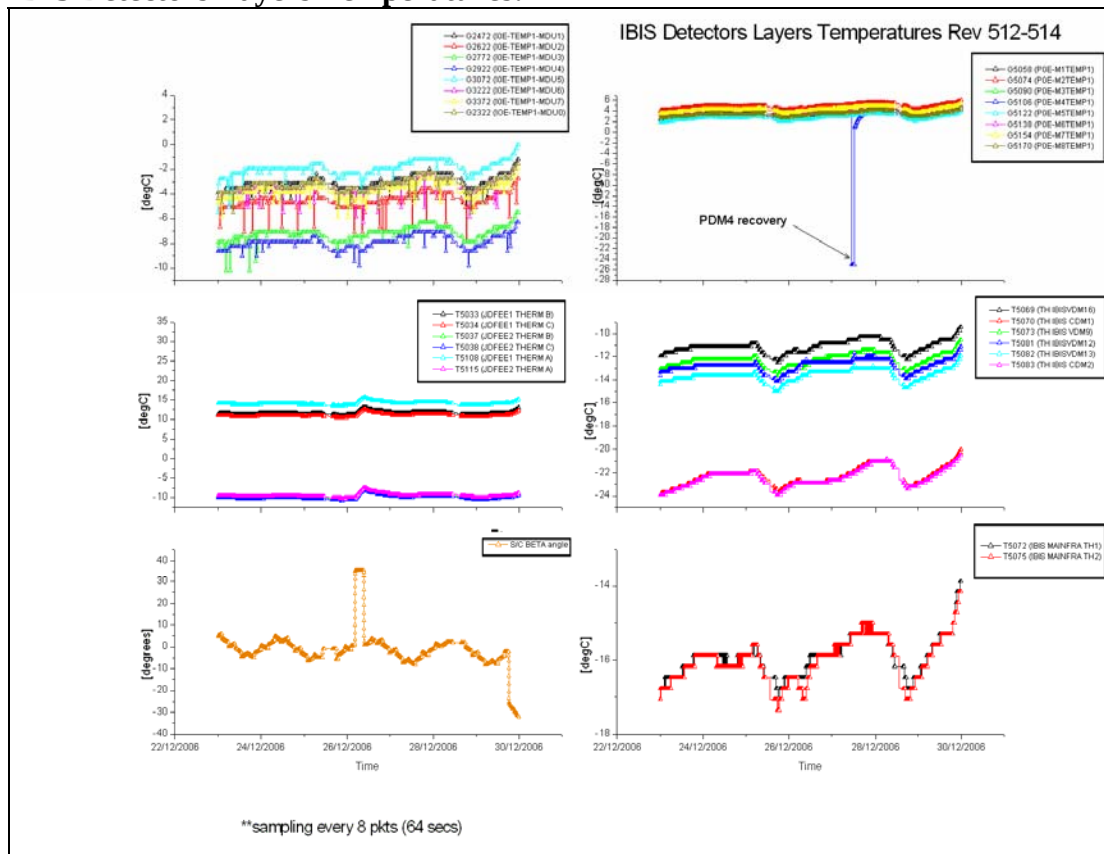
VETO Current:



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 2006.357 (23/12/2006):

At 03:57Z, TM families G5068 and G5072 (P0S-MiF1 & 2 ERRF) were reported OOL Low-Low. At 04:00Z, TM families G5002 and G5003 (P0S-MiRTC1 & 2). At 04:04Z, the OEM APOID 1280, id 132, "IBIS1 IASW HEPI RESYNCHRONISED" was reported.

The coincidence of these 3 events corresponds to an automatic HEPI resynchronisation. And, as indicated in FDIR, no action is required.

DoY 2006.359 (25/12/2006):

At 05:55Z, IBIS went automatically into a Safe configuration due to high radiation as the S/C approached the Radiation Belts. The expected Belts entry was planned in the timeline at 08:45:44Z but the shape of the Belts have probably been affected by the later intense solar activity.

DoY 2006.360 (26/12/2006):

At Radiation Belts exit, due to problems on the Mission control System, the Event Designator GESTAN02 was missed from the timeline at 09:40:35Z. It was manually uplinked at 10:58Z.

DoY 2006.361 (27/12/2006): IBIS PICsIT PDM #4 Latch-Up mode (INT_SC-171)

At 10:38Z, the following OEM was reported:

<< APID 1280, class 1, id 170, IBIS1 PICSIT LATCHED UP MODULE NOTIFICATION>>.

It concerned PDM #4 that reported at the same time TM parameter G5044 (P0E-PDM4STB) OFF. All others PDM were working nominally, and PICsIT was in Nominal mode.

The reason for this change of status remains unknown at the time being.

No radiation was reported by the Payload counters or IREM, at the time of the anomaly.

Following the action in FDIR, the recovery consisted in switching OFF PDM #4, then switching it ON and enabling it.

1/ At 11:19Z IBIS was set in Stand-By mode with TC G0125.

2/ At 11:26Z, PDM #4 was switched OFF with FCP_IBIS1_0321.

3/ At 11:34Z, PDM #4 was switched ON with FCP_IBIS1_0106. Note that the requirements for this procedure were not met since PICsIT was still in Nominal (the

recovery concerned only the PDM, not the PFDM or PEB) and the thermal configuration was also the Nominal one, in particular HTR CSI B CLOSE and HTR CSI A OPEN (the anomaly occurred during normal science operations).

4/ At 12:22Z, PDM #4 was enabled with FCP_IBIS1_0219 using the dynamic TC GU0512 as advised in steps 3. PDM #4, like all the others, showed nominal TM (temperatures, voltages and counters).

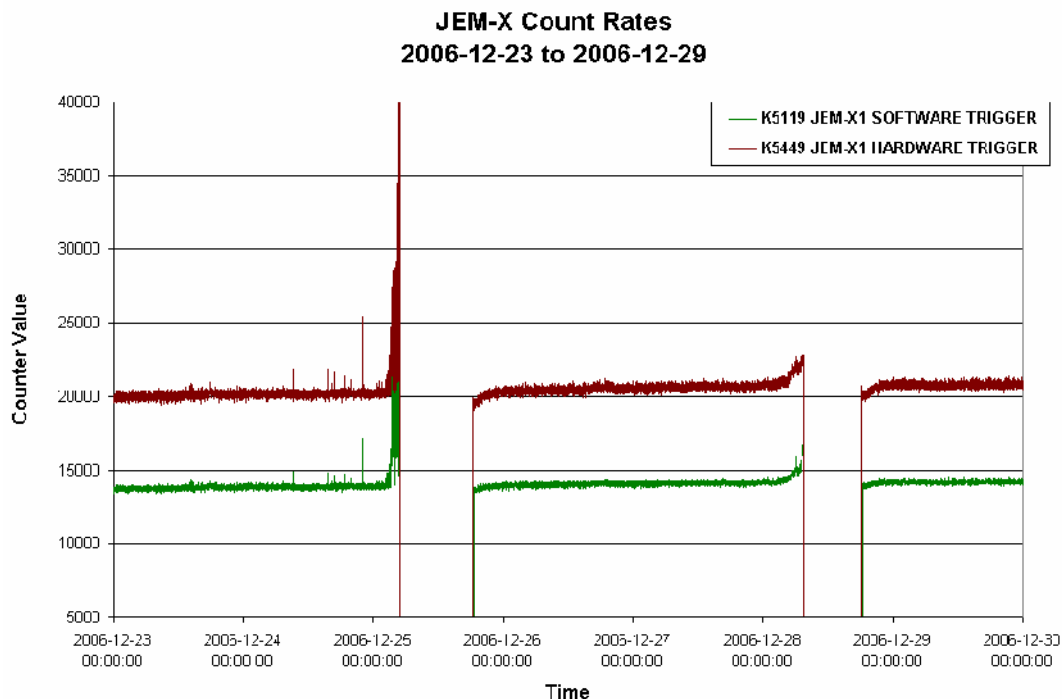
5/ As the recovery was successful, IBIS was set back in Scientific Standard mode at 13:03Z, reloading the latest GESTAN02.

The impact on the science was: Pointing #05130055 was interrupted at the very end, pointings #56 to #58 were missed, and Pointing #59 started with a delay.

8.3.4 JEM-X Operations

JEM-X Count Rates

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

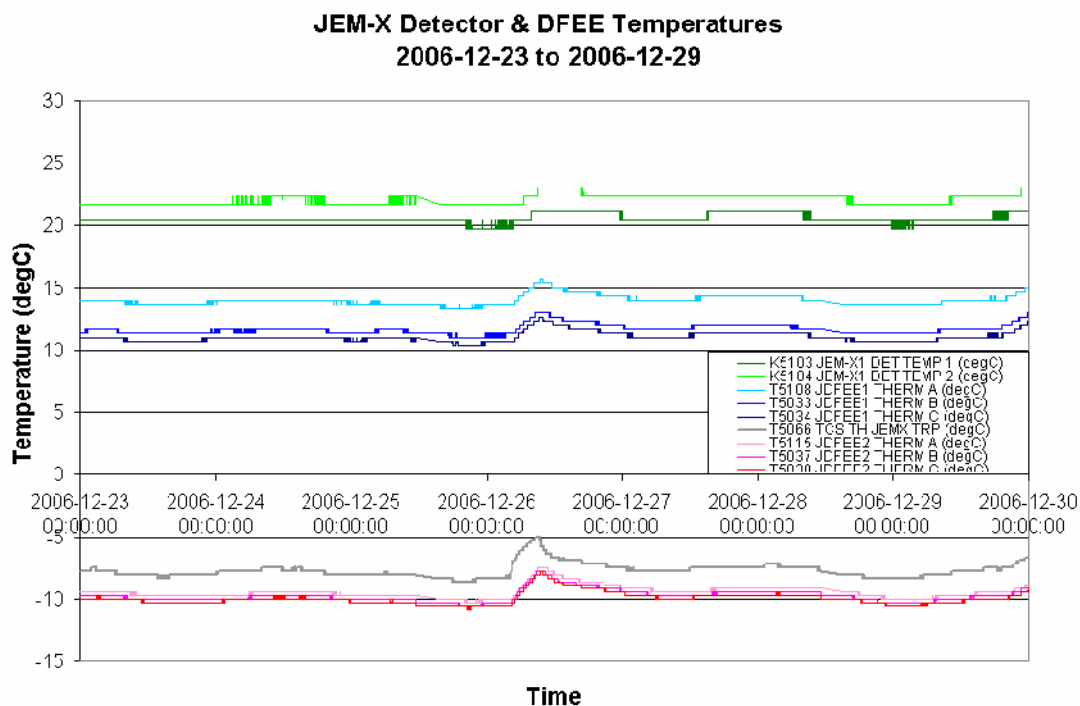


JEM-X Temperatures

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

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

² Data sampled (1 frame in 8)



JEM-X Daily Report

2006-12-23 (DOY 357, Rev 512) to 2006-12-24 (DOY 358, Rev 512)

JEM-X operations executed nominally.

2006-12-25 (DOY 359, Rev 512-513)

Due to high background radiation conditions, at 04:29:33Z the TM parameter K5449 HARDWARE TRIGGER started toggling OOL High and at 04:29:57Z K5136 BUFFER LOSS also briefly went OOL High. This was ~3.5 hours before the planned transition to Safe mode before radiation belt entry of revolution 512. At 04:50:53Z K5119 SOFTWARE TRIGGER also went OOL High and at 04:51:21Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Software Ratemeter. Two occurrences of OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) was received at this time, as the TM parameter K5462 DFEE STATE IASW was reporting state Setup while K5022 DFEE STATUS was Safe. At 04:53:07Z FCP_JEM1_0040 was executed, setting K5462 DFEE STATE IASW to Safe as well and OEM 254 ERROR OFF was received.

JEM-X1 operations continued nominally.

2006-12-26 (DOY 360, Rev 513)

Due to a crash of the command verifier task of the IMCS, some TCs of the sequence KEDATA02 scheduled at 09:40:55Z were unverified. Once operations were moved to the B-chain, this sequence was re-uplinked at 10:50Z.

2006-12-27 (DOY 361, Rev 513) to 2006-12-29 (DOY 363, Rev 514)

JEM-X operations executed nominally.

8.3.5 OMC Operations

2006-12-23 (DoY 357, Rev 512) to 2006-12-25 (DoY 359, Rev 513)

Nothing to report.

2006-12-26 (DoY 360, Rev 513)

At 12:29, a coordination problem when commanding the AOCS, led to the timeline being suspended. The impact was the loss of pointing 05130026.

2006-12-27 (DoY 361, Rev 513)

At 20:00, due to guide star problems, an AOCS command failed release. The impact was the loss of pointing 05130069. It was at this time the following commands were rejected:

2006.361.20.02.06.301	2006.361.20.02.16.607	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					
2006.361.20.02.12.114	2006.361.20.02.16.612	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					

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

2006-12-28 (DoY 362, Rev 513)

Nothing to report.

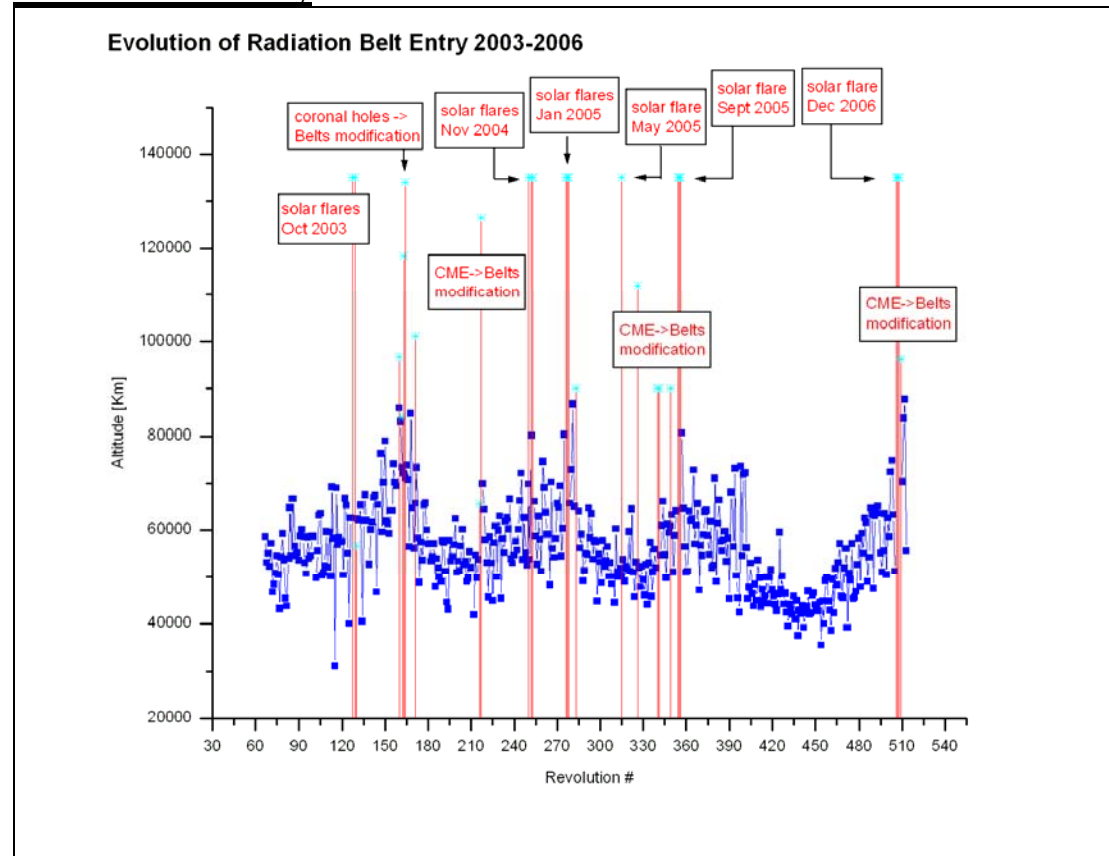
2006-12-29 (DoY 363, Rev 514)

At 20:51, a TM drop from Redu led to the Timeline being suspended. A recovery was executed, and completed at 21:42. The impact was the loss of pointing 05140039.

On DoY 359 at 08:45:51 and DoY 362 at 08:33:59 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

Nothing to report

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
512	RAD_ENTR R 2006-12-25T08:45:44Z	2006-12-25 03:59:41	87665.5	2006-12-25 09:36:13	49094
513	RAD_EXIT R 2006-12-25T18:04:04Z	2006-12-25 17:13:01	>>29752.0	2006-12-25 17:36:13	40990
513	RAD_ENTR R 2006-12-28T08:33:58Z	2006-12-28 08:34:21	55682.7	2006-12-28 09:20:42	48990
514	RAD_EXIT R 2006-12-28T17:52:42Z	2006-12-28 17:07:09	>>29749.8	2006-12-28 17:30:42	42462

Reference

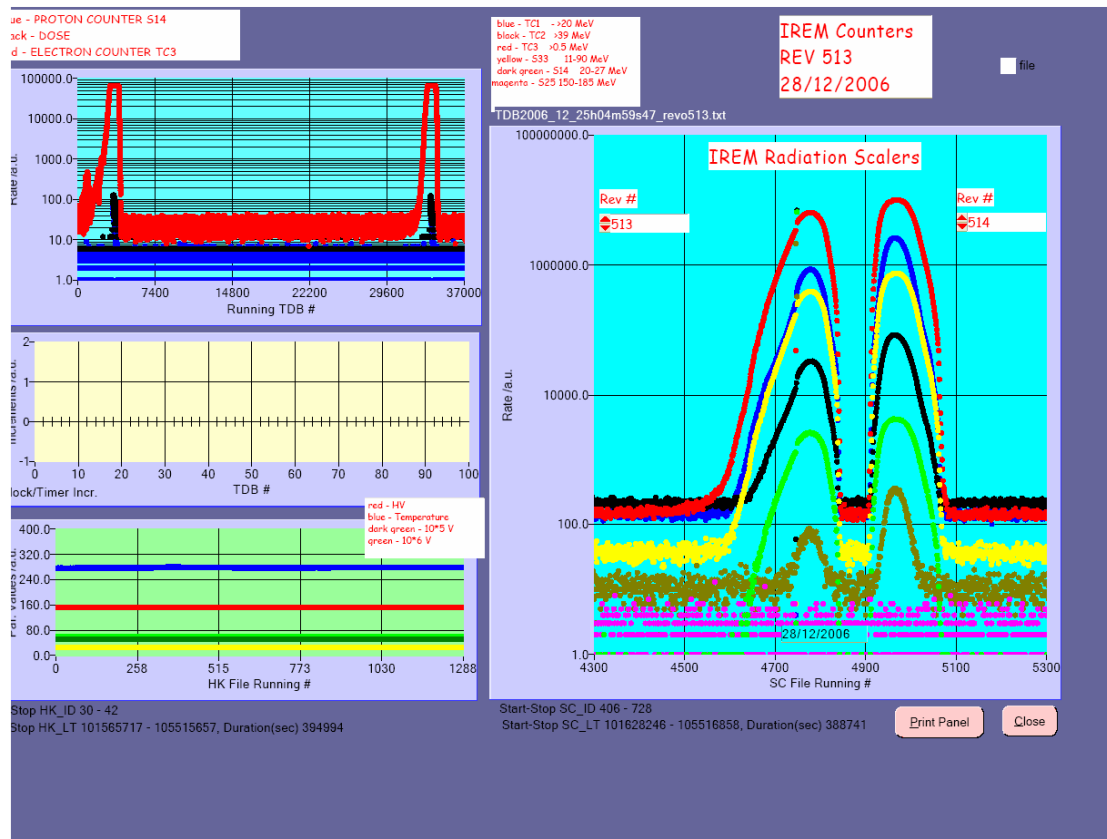
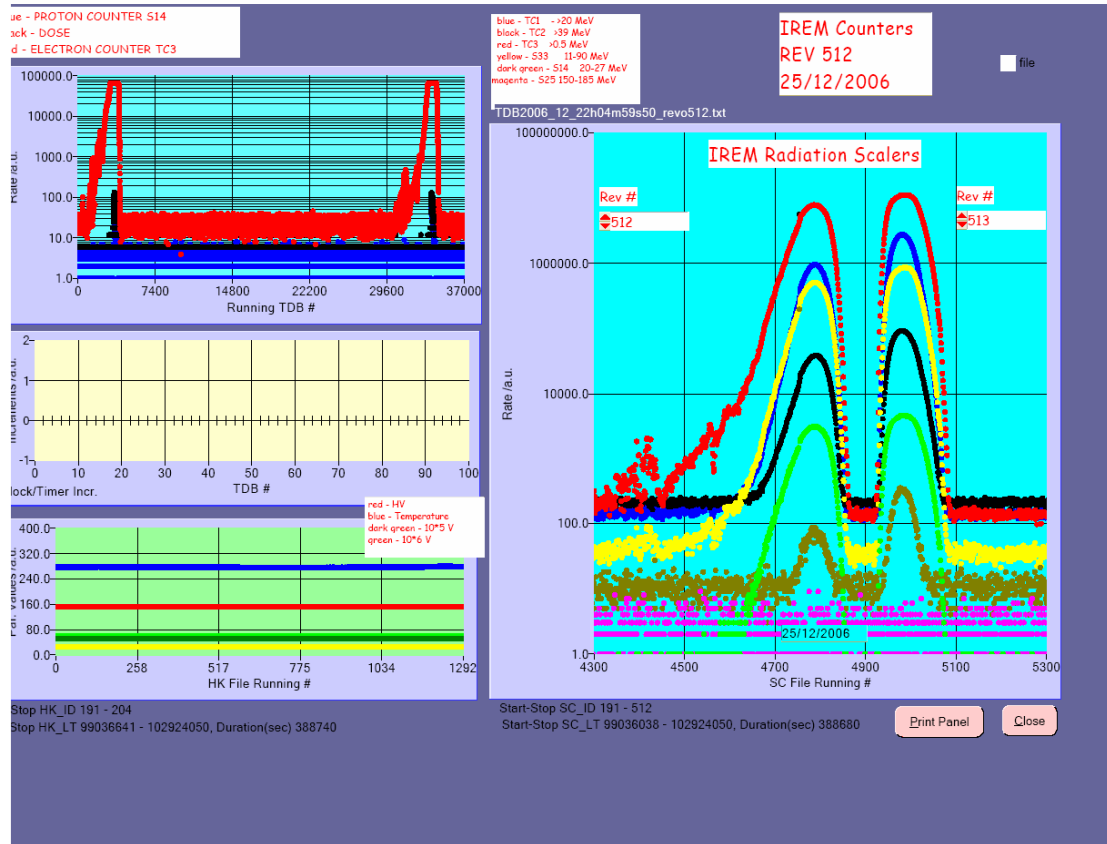
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

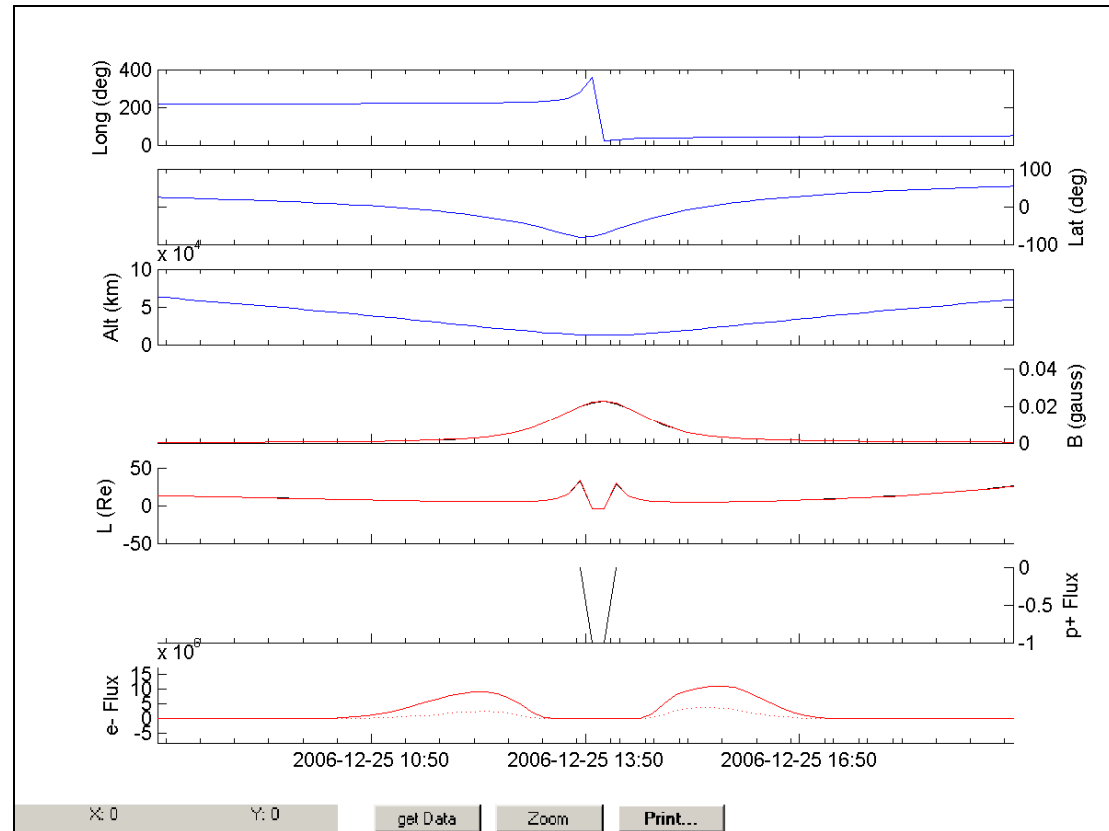
Radiation Spike

IREM radiation counters:

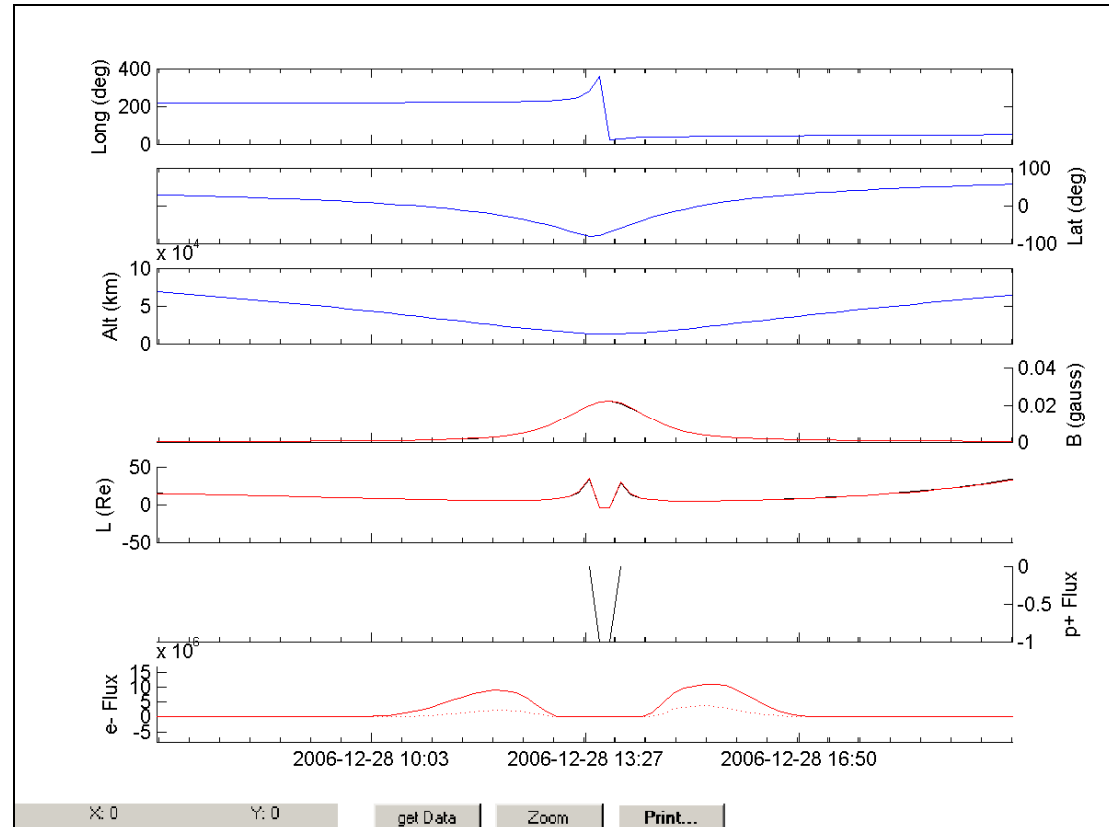


IREM Predicted Radiation Belt Passages

Rev 512



Rev 513



Doc. Title : INTEGRAL Mission Report #223
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 02/01/07

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

SEIS plots are not available this week. The level of radiation was anyway reported to be low.