

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 224
Week 01
08.01.07
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 30.12.06 until 05.01.07 (both dates inclusive) and covers the revolutions 515 and 516.

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 2 raster dithers of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), and 4 Galactic disk scans, at attitudes (RA 14:01:04.80, DEC -59:41:24.0), (RA 14:01:04.80, DEC -59:41:24.0), (RA 14:01:16.80, DEC -59:40:48.0), and (RA 15:06:33.60, DEC -60:39:00.0).

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.

8 slews were missed during the observation period, due to problems with the overall ground system (IFMS, MCS and FDS).

The fuel consumption over the period between 29/12/2006 and 05/01/2007 was 0.2272 Kg. The remaining propellant is in the order of 149.1183 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

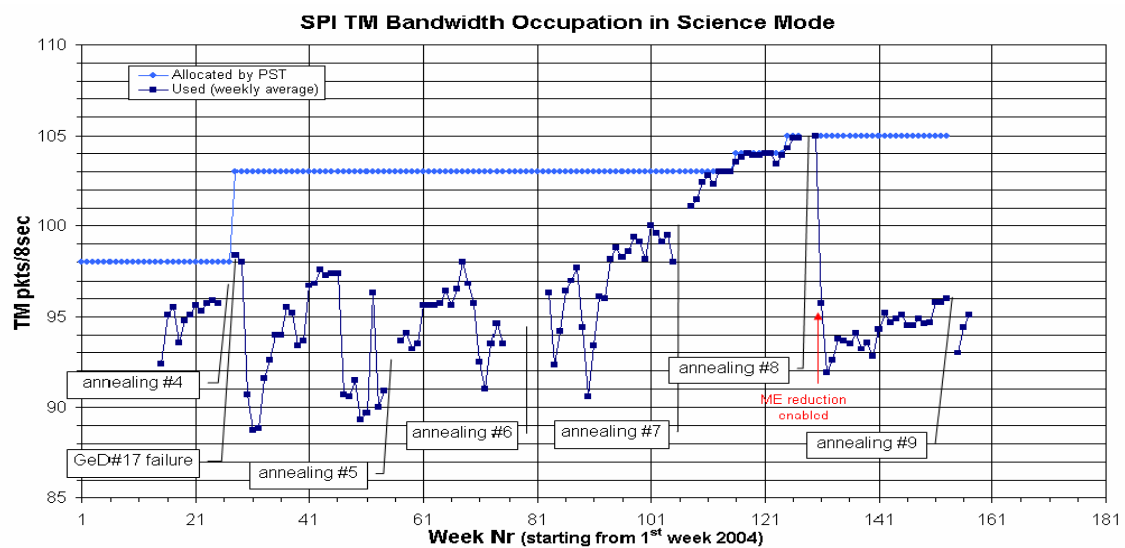
3.2.1 SPI

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.

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 and the average telemetry occupation when the allocation was 105 packets/cycle was 95.1 packets/cycle.

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



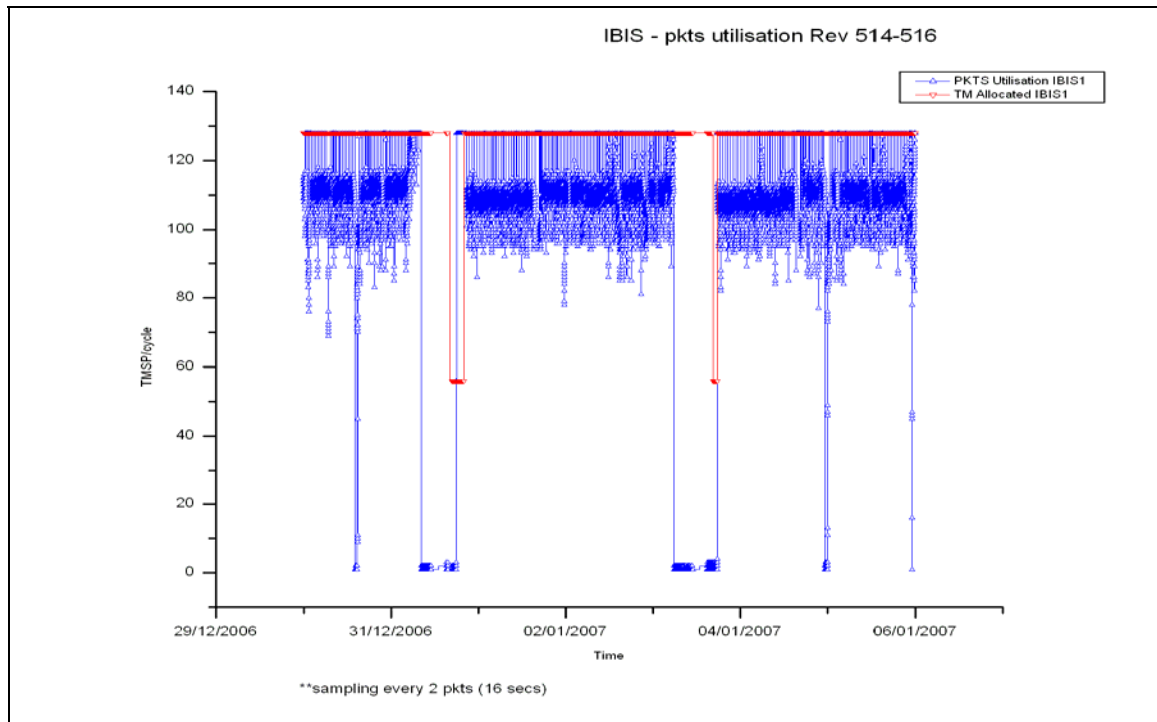
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 111.11 TMPS/cycle, up 1.49 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 2007-01-03 at 06:28:33Z, ~45 minutes earlier than planned before radiation belt entry of revolution 515.

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.

During this reporting period, 214 of the 224 planned science pointings for OMC were executed nominally, 3 were interrupted and 7 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.

On 30/12/2006, sunspot 930 that caused several solar flares in December, returned. Two new sunspots appeared during the week (933 and 934). Neither of these posed a threat for strong solar flare.

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. 8 slews were lost. The overall performance was 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, problems with the imcs caused the loss of 7 pointings, another occasion, TC history task crashed, which had no impact. The overall performance was above the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were, however, numerous occasions of small TM drops, missing source packets, Reed-Solomon errors, hits on the line from Redu, one of which caused the loss of a pointing. The overall performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs were received up to revolution 523, observations have been planned up to 520, with further planning to be done in week 2.

TSF's up to revolution 518 have been received.

2. Observation status

Received ECS up to revolution 508 with all gaps closed. No ECS have been processed in the last two weeks.

3. ISOC Science Data Archive

No news.

4. ISOC system

No changes, version 14.0 will be installed on 8 January.

5. Problems

None.

4.3.2 ISDC

Status of ISDC observation processing on 08/01/2007:

- 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 365, at 15:34, problems with the imcs not receiving TM data forced a swap to the b-chain. However, the problems persisted, with the FD system not receiving data. This was eventually solved at 17:40. A recovery was then initiated, which was finally completed after swapping back to the a-chain at 20:33. The impact was the loss of pointings 05150001 through to 05150007.
- On DoY 002, at 21:36, the TM link with Redu dropped. The impact was a 1924 second delay in the start of pointing 05150083.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-172	15/01/2007	IREM Anomaly: Reset of IREM_CSCI S/W #41, 30/12/2006	Payload	Open
INT_SC-173	15/01/2007	IREM Anomaly: Reset of IREM_CSCI S/W #42, 04/01/2007	Payload	Open

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 515

The observations in revolution 515 began with a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), lasting ~20.6 hours. It continued with a Galactic disk latitude scan, at attitude (RA 14:01:04.80, DEC -59:41:24.0), lasting 17.1 hours. Finally another Galactic disk latitude scan, this time at attitude (RA 14:47:55.20, DEC -61:49:48.0) lasting ~17.1 hours, was performed, until the end of the revolution.

Revolution 516

The observations in revolution 516 began with a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), lasting ~20.6 hours. It continued with a Galactic disk latitude scan, at attitude (RA 14:01:16.80, DEC -59:40:48.0), lasting 17.1 hours. Finally another Galactic disk latitude scan, this time at attitude (RA 15:06:33.60, DEC -60:39:00.0) lasting ~17.1 hours, was performed, until the end of the revolution.

Throughout this observation, all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

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.
2006-12-29T16:40:48.000Z	149.2801	F	Automatic TM processing.
2006-12-30T01:44:01.000Z	149.2732	F	Automatic TM processing.
2006-12-31T19:43:33.000Z	149.2620	F	Automatic TM processing.
2007-01-01T15:42:39.000Z	149.2160	F	Automatic TM processing.
2007-01-02T01:23:20.000Z	149.2070	F	Automatic TM processing.
2007-01-03T15:36:20.000Z	149.1790	F	Automatic TM processing.
2007-01-04T15:34:39.000Z	149.1339	F	Automatic TM processing.
2007-01-05T01:16:56.000Z	149.1183	F	Automatic TM processing.

This report was generated Fri Jan 5 08:00:31 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, 30/12/2006 –05/01/2007

AOCS operations were executed from the Automatic Timeline.

During this period, 90 Open Loop Slews, 148 Closed Loop Slews and 8 Momentum Biases were executed.

8 slews (5 OSL ,3 CSL) were missed from the TL during the observation period due to different problem on the ground system: link with REDU station, IFMS, PDS task on IMCS and FDS reconfiguration.

The OTF was not reached during PID 05140045 and 05140081, due to lost of guide star.

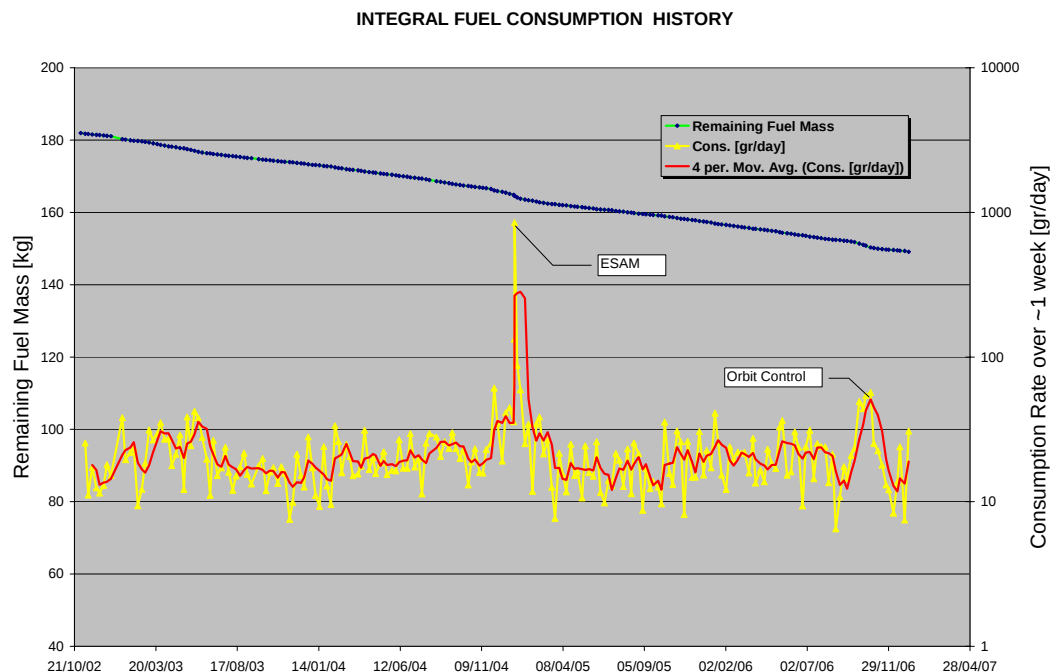
This is equivalent to a ~3.3 % of the total number of slews (244)

Orbit Control

No update.

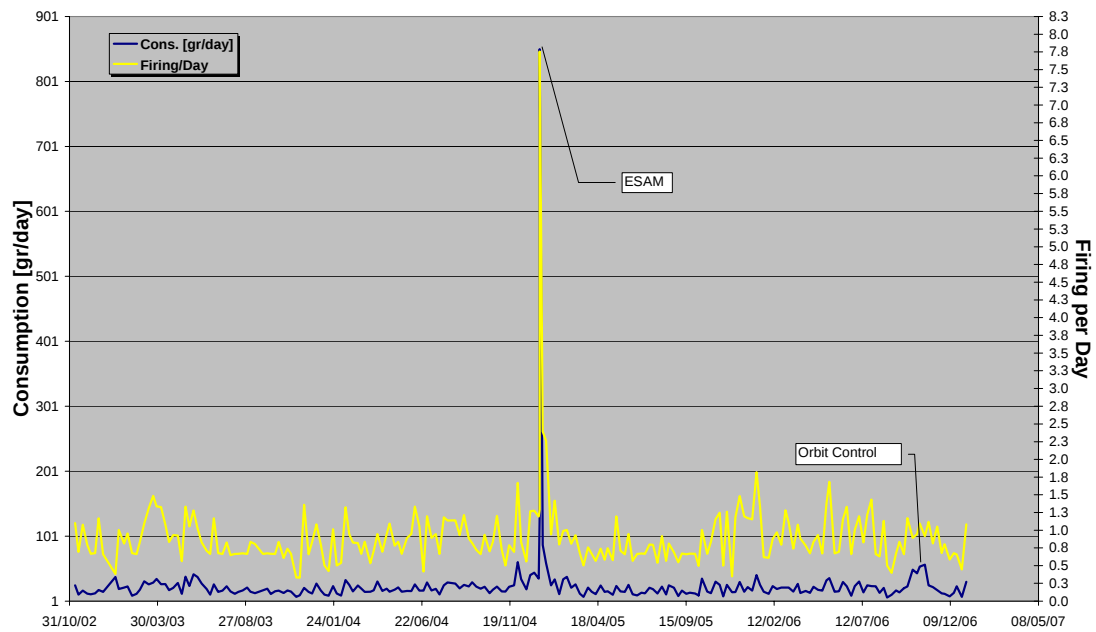
Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 05/01/2007 is reported in the plot below.



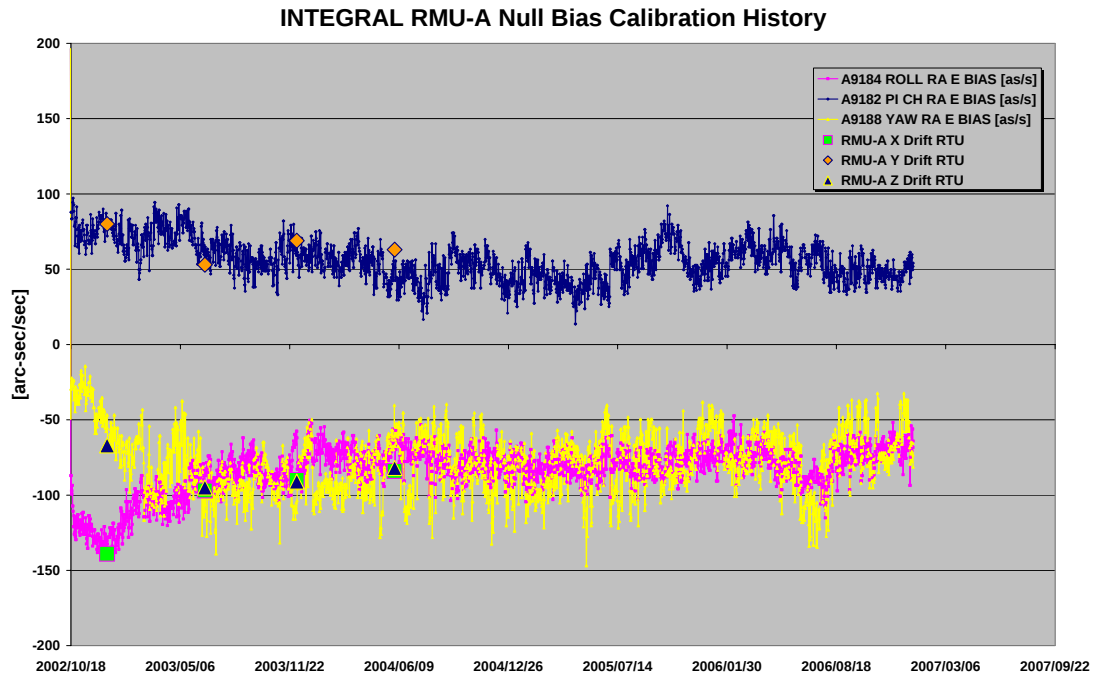
The firing\day over the period between 01/11/2002 and 05/01/2007 is reported in the plot below.

INTEGRAL FIRING PER DAY HISTORY

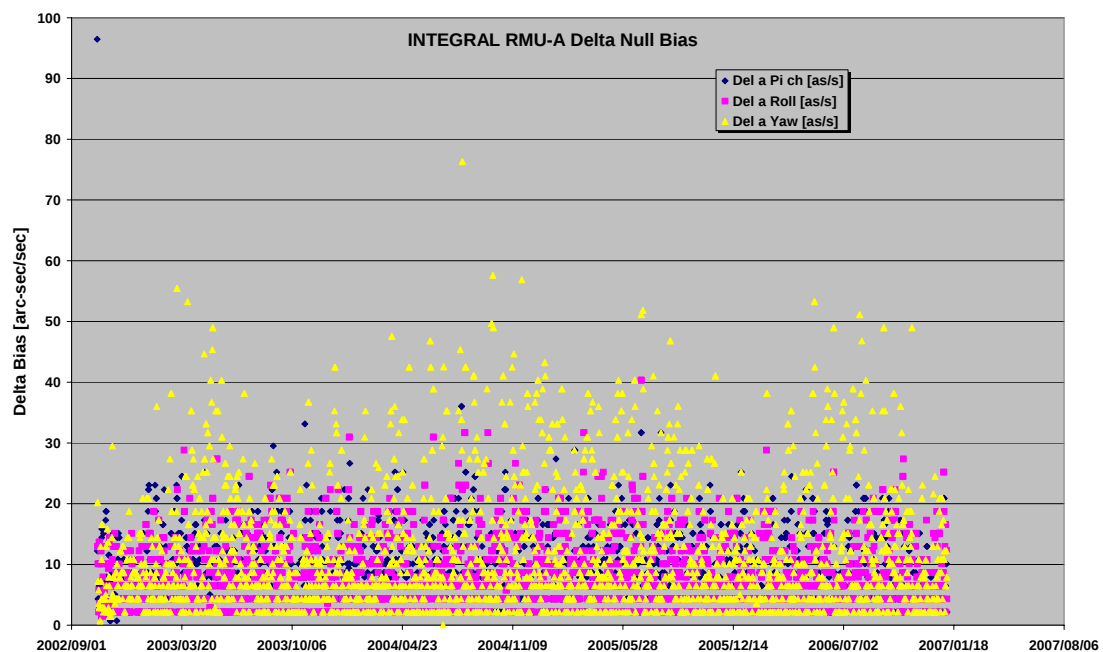


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 05/01/2007 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 05/01/2007 is reported in the plot below



30/12/06 (Day of Year 364, Revolution 514)

STR ACC Threshold exceeded: at 00:35:00z during pointing PID 05140045 the guide star was lost. As automatic reaction the IMU 1 was switched ON and an automatic mapping commanded by the ACC.

The guide star was Mi 7.95 at CCD location [-1684 , 21699]. The new guide star picked after automatic mapping was Mi 7.8 at CCD location [1302 , -6250].

A manual recovery was performed and the next slew ID 05140046 was manually update in TL.

The reason of the lost of guide star is likely the presence of an extended object (PGC 50706) few arcmins from the guide star.

No impact on TL reported except the OTF was not reached during PID 05140045.

STR ACC Threshold exceeded: at 21:50:29z during pointing PID 05140081 the guide star was lost. As automatic reaction the IMU 1 was switched ON and an automatic mapping commanded by the ACC.

The guide star was Mi 5.7 at CCD location [20374 , 13947]. The new guide star picked after automatic mapping was Mi 8.25 at CCD location [4003 , 436].

A manual recovery was performed and the next slew ID 05140082 was manually update in TL.

The reason of the lost of guide star is likely due to the presence of two dim companions Mi 11.8 and Mi 9.58 (9011 5547, 9011 2693) located respectively at ~30 arcsecs and ~2 arcmins from the guide star. The STR could not determine the baricentre of the system and this caused the consequent lost of guide star.

No impact on TL reported except the OTF was not reached during PID 05140081.

31/12/06 (Day of Year 365, Revolution 514-515)

Several problems at beginning revolution 515: at AOS rev 515 (15:16z) due to problems affecting different areas of the ground segment (IFMS 1-2, PDS tasks on the IMCS-A chain, FDS), the commanding capability was initially moved to the B chain and the FDS reconfigured to acquire data from IMCS-B chain.

A complex manual recovery, requiring two RWBs, was then performed from the attitude of PID 05140100 to the attitude of PID 05150007 (through attitude of PID 05150001). The next slew ID 05150008 was manually update in TL and the AOCS s/s enabled in TL at 20:05z .

After several attempts to restart the IMCS-A, with no success, at 20:33z the operations were moved back from IMCS B-chain to A-chain.

The following slews were not executed in TL: 05150001(OSL)-02(OSL)-03(OSL)-04(CSL)-05(CSL)-06(OSL)-07(OSL).

ACC Bad TC sequence: at 15:41:56z , during the recovery of the AOCS s/s, the commands of the sequence AERWB were released from the A/S, while performing a manual mapping from the M/S, while the AOCS s/s was disabled in AS.

The AOCS rejected the AERWB commands because the TC sequence not consistent. The following OEM was generated APID 640 ID 14 <<ACC BAD TC SEQUENCE>> and the internal 'recoverable error' counter increased by one unit.

This is the third occurrence of this kind of problem on the IMCS. A relevant AR (INT-2894) was generated and updated accordingly.

01/01/2007 (Day of Year 001, Revolution 515)

Nothing to report.

02/01/2007 (Day of Year 002, Revolution 515)

Problem on the link with REDU station: at 21:36z due to a problem on the link with REDU station, the slew ID 05150083 failed release.

A manual recovery was then performed from attitude of PID 05150082 to the attitude of PID 05150083. The next slew ID 05150084 was manually update in TL.

The following slew was not executed form TL: 05150083(CSL).

03/01/2007 (Day of Year 003, Revolution 515-516)

Nothing to report.

04/01/2007 (Day of Year 004, Revolution 516)

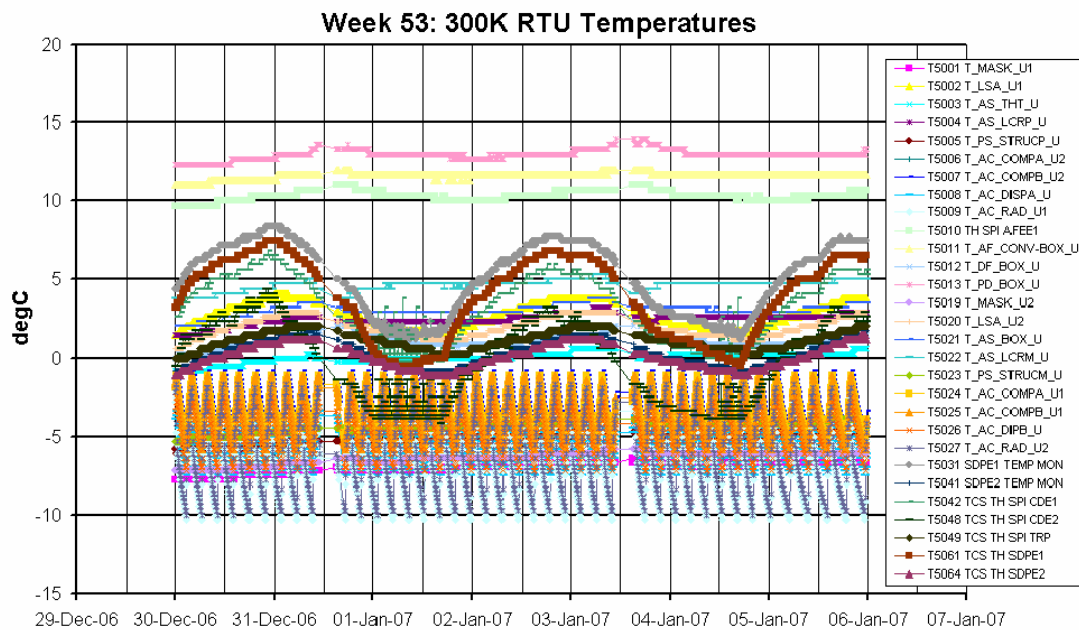
Nothing to report.

05/01/2007 (Day of Year 005, Revolution 516)

Nothing to report.

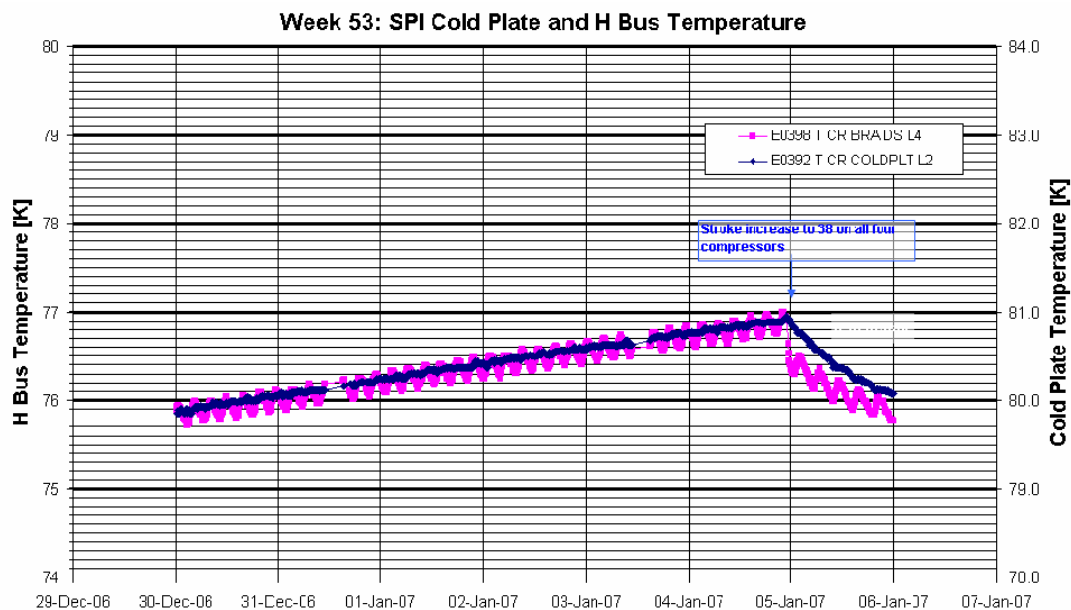
8.3.2 SPI Operations

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 to 80K $\pm$ 1K.

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



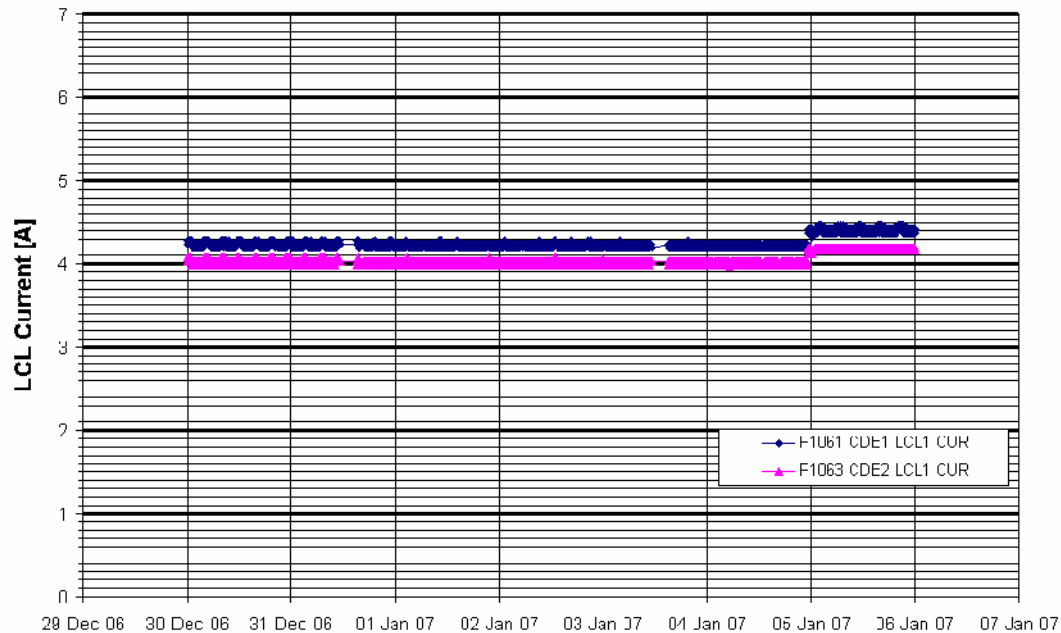
The stroke of all four compressors was set at 37 at the start of the week and was increased to 38 on all four compressors on 2007-01-04 at 23:11:48Z, as the cold plate temperature had reached the upper limit of 80.9K.

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

- Average CDE1 LCL Current = 4.26A
- Average CDE2 LCL Current = 4.05A

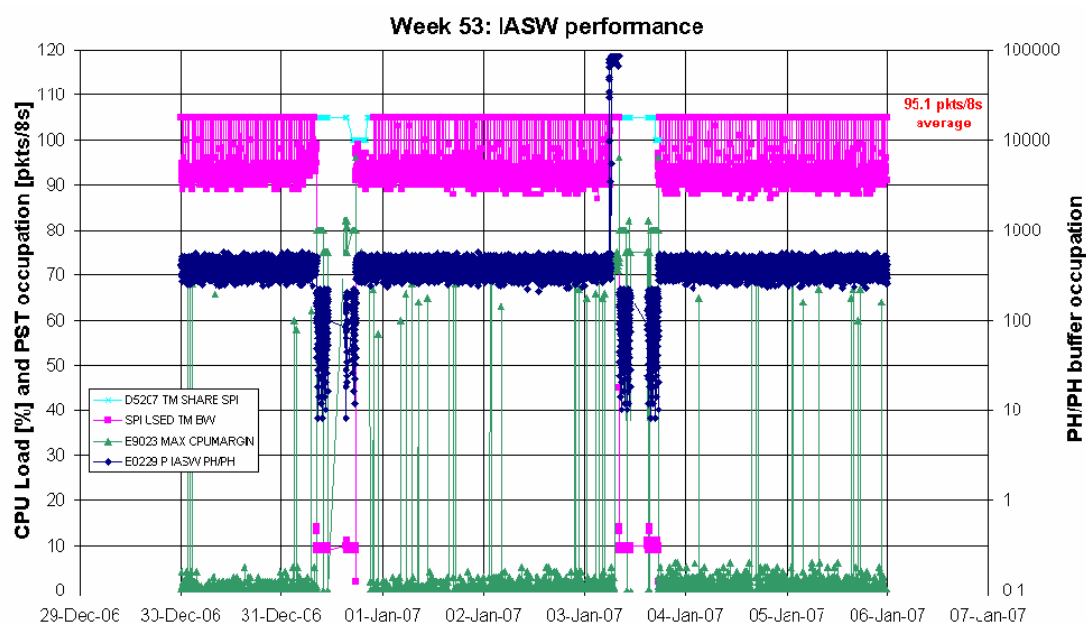
The following plot shows the evolution of the CDE currents during the reporting period.

Week 53: SPI CDE1 and CDE2 LCL Currents



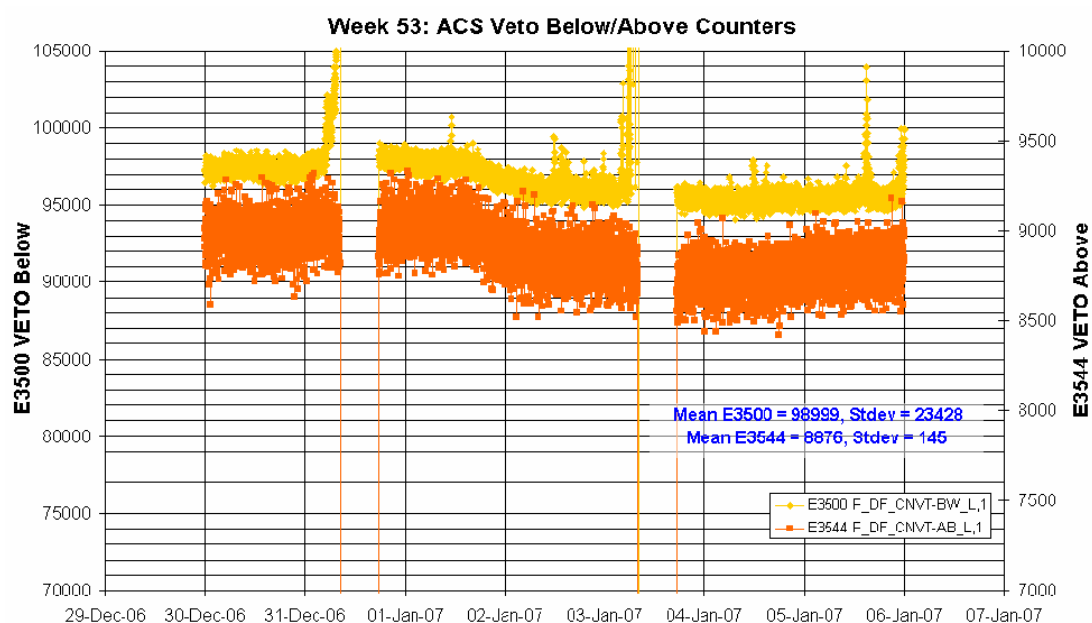
DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432. The average TM bandwidth occupation of SPI was 95.1 packets/cycle over the science window, when the TM allocation was 105 packets/cycle. The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.

Note that on 2006-12-31 between 18:03Z and 20:07Z, due to problems with imca leading to a manual recovery of the Timeline, the broadcast packet was reporting a TM allocation to SPI of 100 packets/cycle although the actual allocation in the PST was 105 packets/cycle.



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).

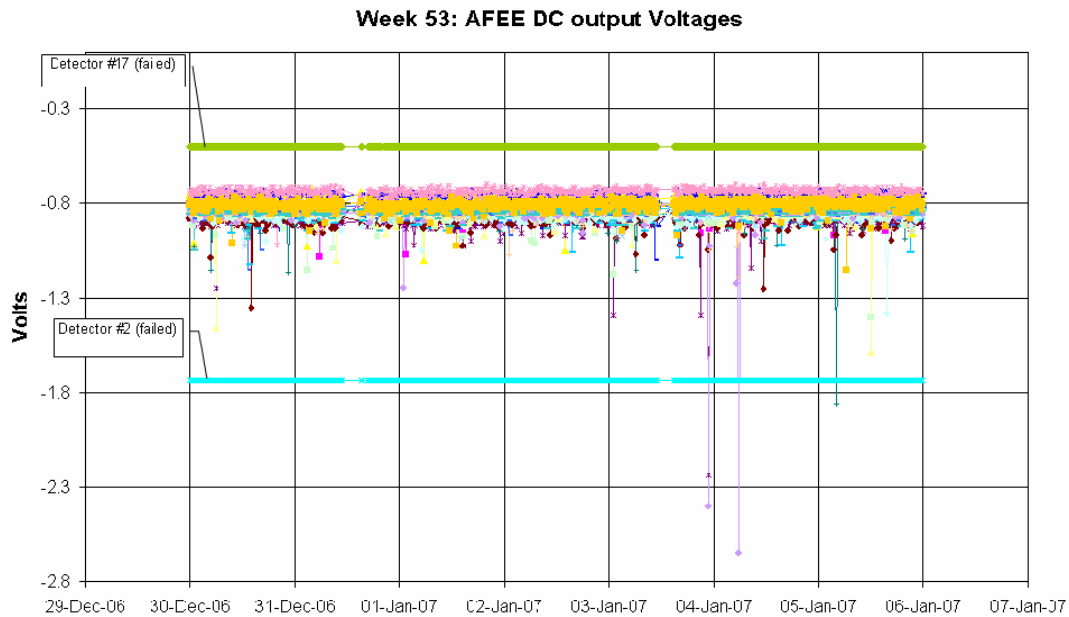
The following plot shows the ACS overall count rate evolution during the reporting period:



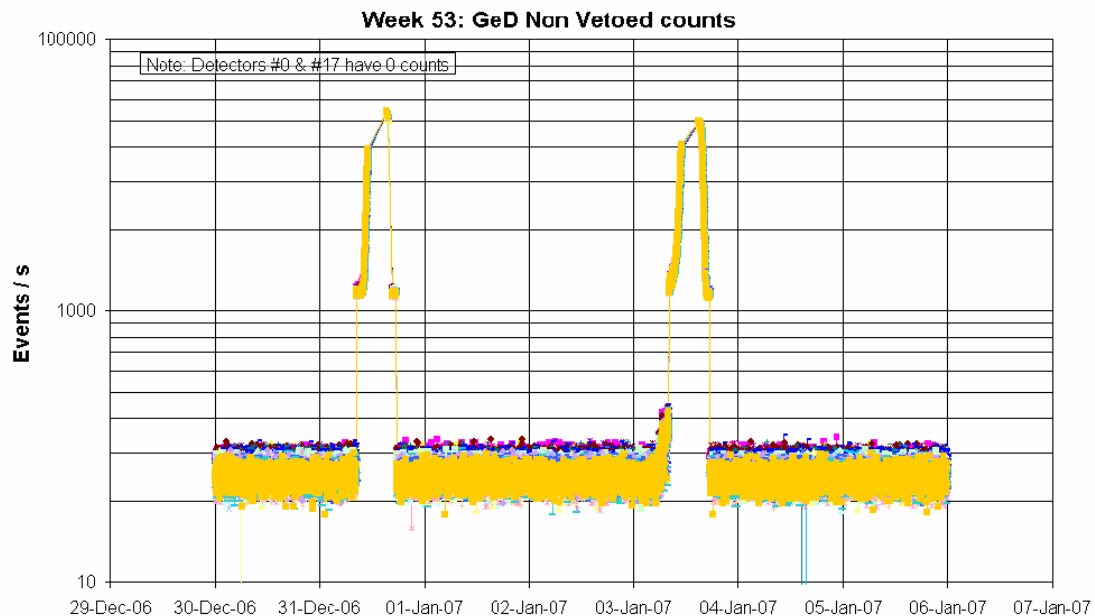
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution. The energy resolution of GeD#4 was recovered with the last annealing.

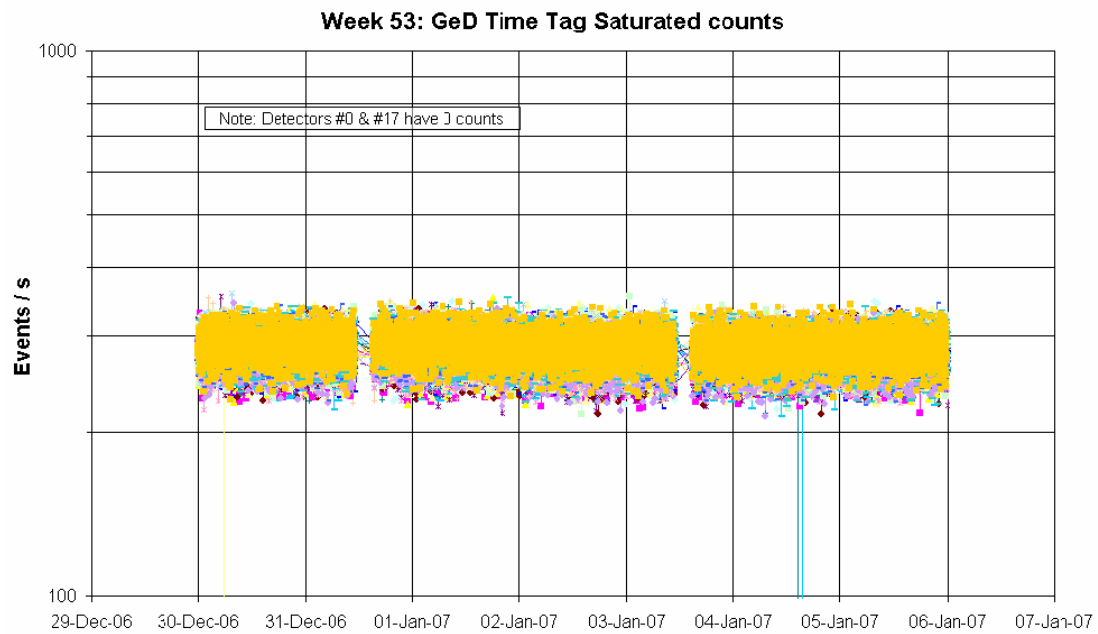
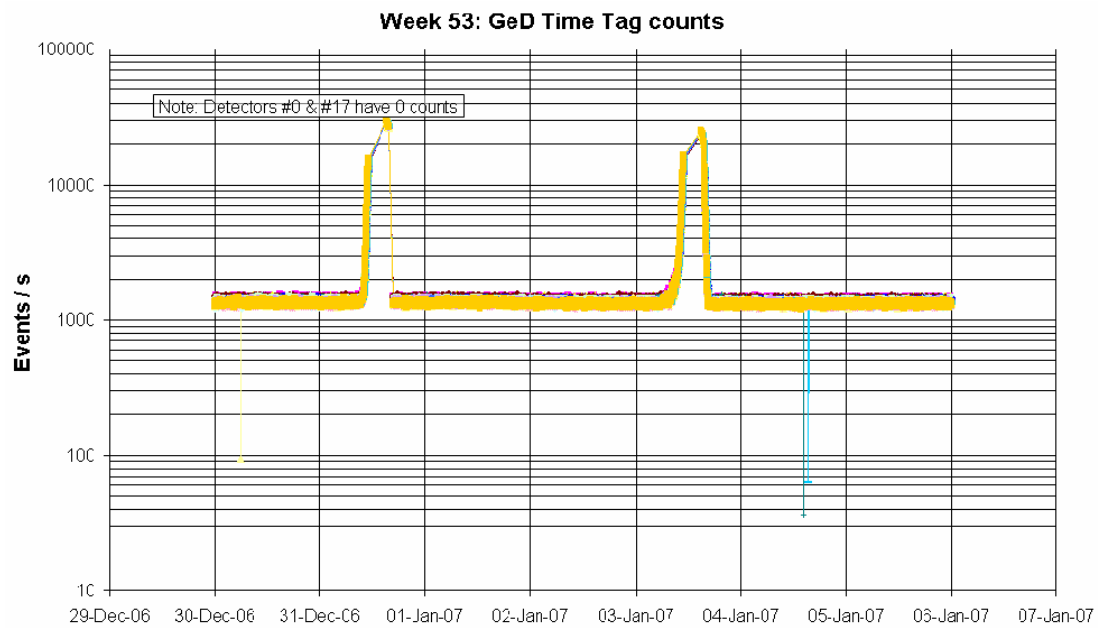
The GeD#12 HV remained at 3.5kV throughout the reporting period.

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

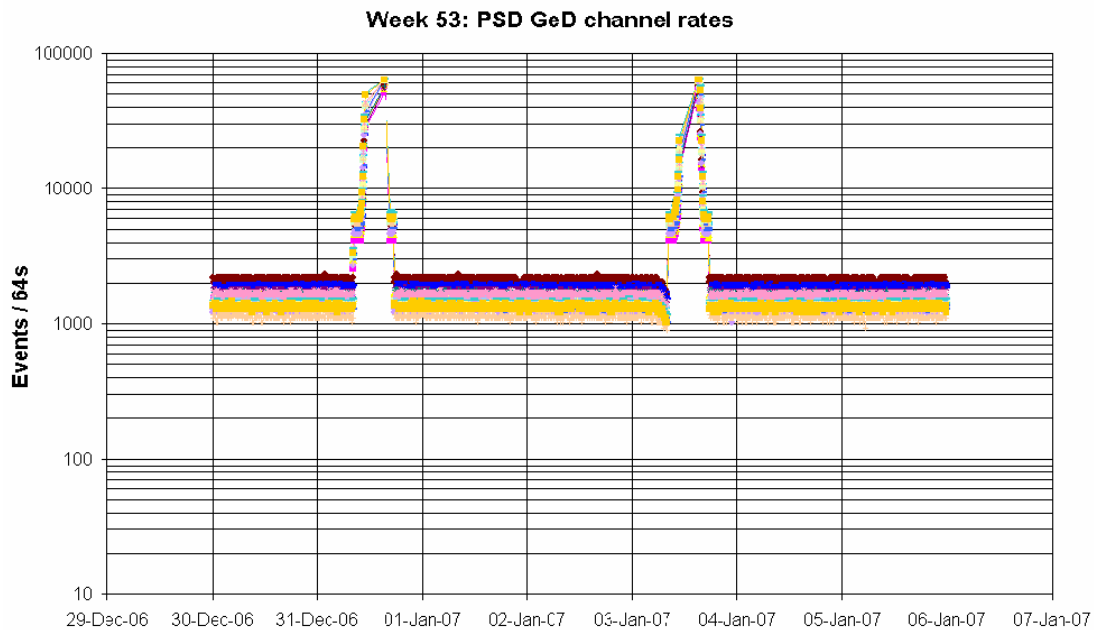


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





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



Event Log:

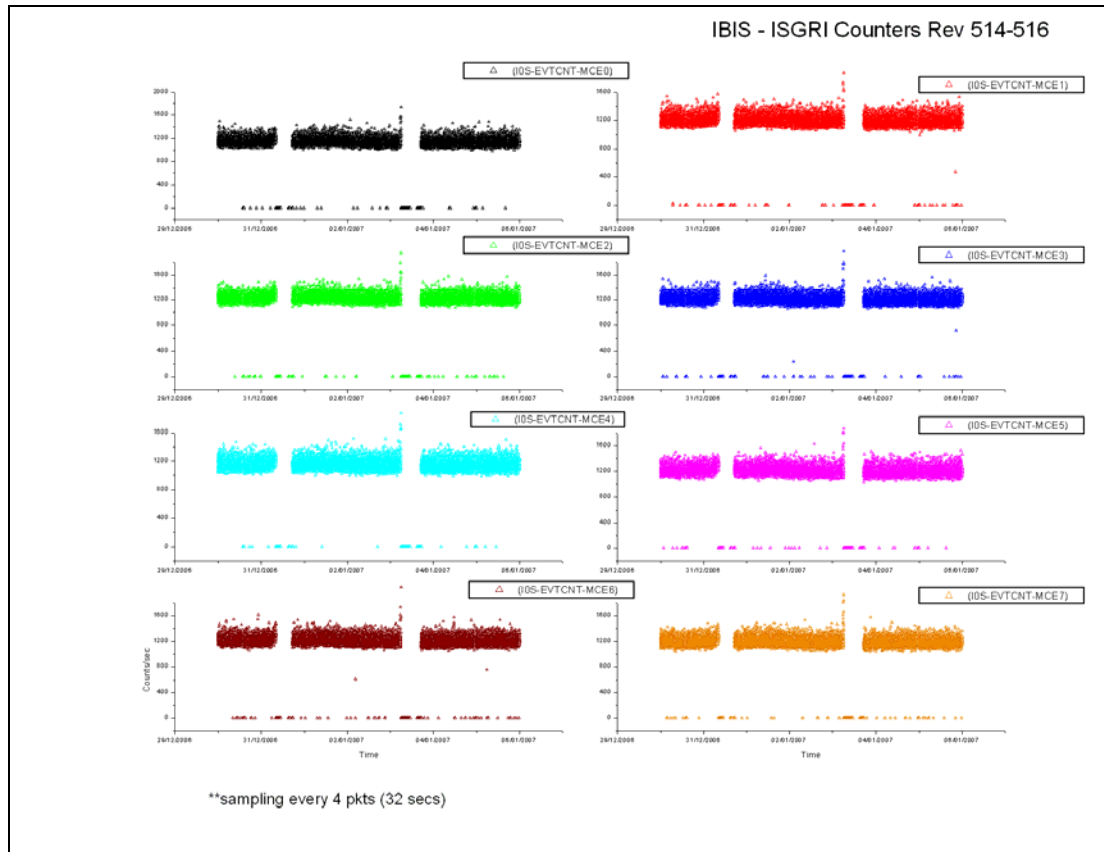
The following non-nominal events occurred on SPI during the reporting period:

- On 2006-12-31 at 07:31:22Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~50 minutes before radiation belt entry of revolution 514 and therefore no action was taken.
- On 2006-12-31 from 15:12Z to 15:35Z TM parameter E4009 S DF HSLERR L fluctuated OOL, indicating errors on the HSL. This was just after AOS of revolution 515.
- On 2007-01-03 at 06:19:22Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~2 hours before radiation belt entry of revolution 515 and therefore no action was taken.
- On 2007-01-03 at 22:48:27Z the TM parameter E0363 U AF DCOUPT L13 went OOL Low (value = -2.4024V). This is the DC output voltage for GeD#13. It returned within limits at 22:59:07Z.
- On 2007-01-04 at 05:44:27Z the TM parameter E0363 U AF DCOUPT L13 went OOL Low (value = -2.652V). This is the DC output voltage for GeD#13. It returned within limits at 05:55:07Z.
- 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.

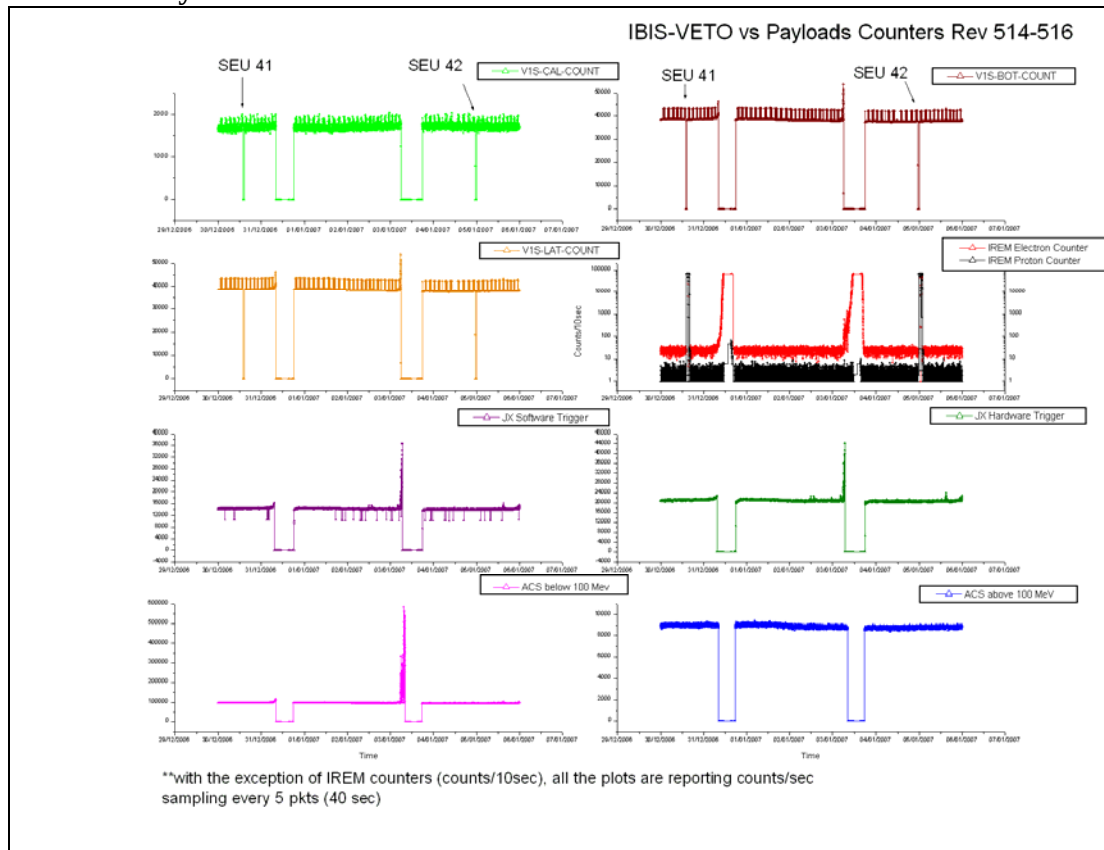
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

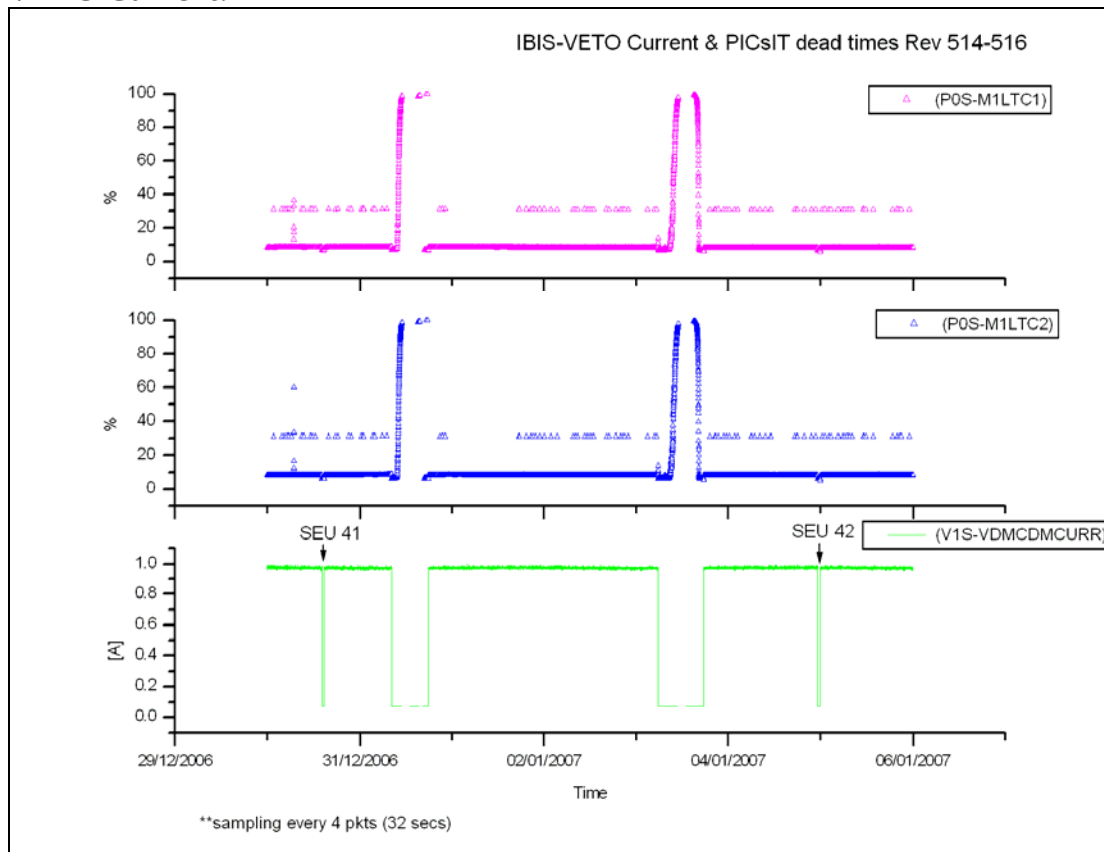


VETO vs Payloads Counters:

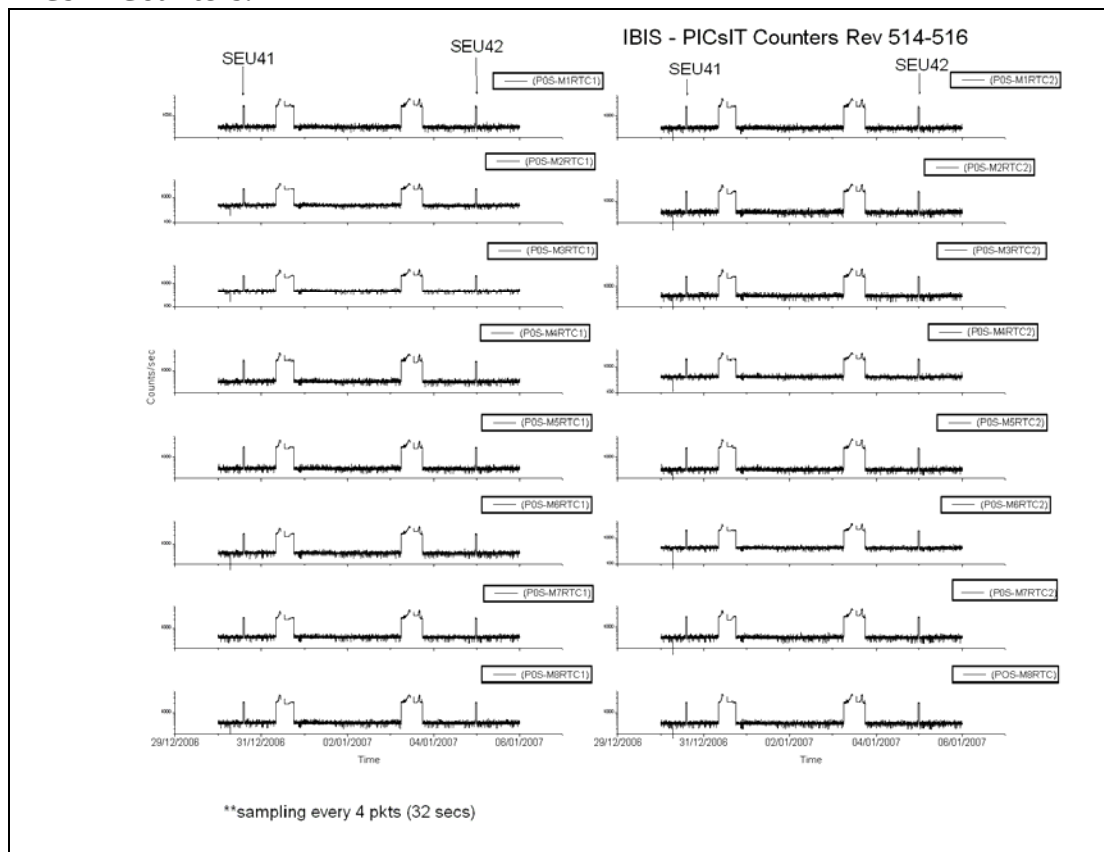


The week was characterised by low radiation.

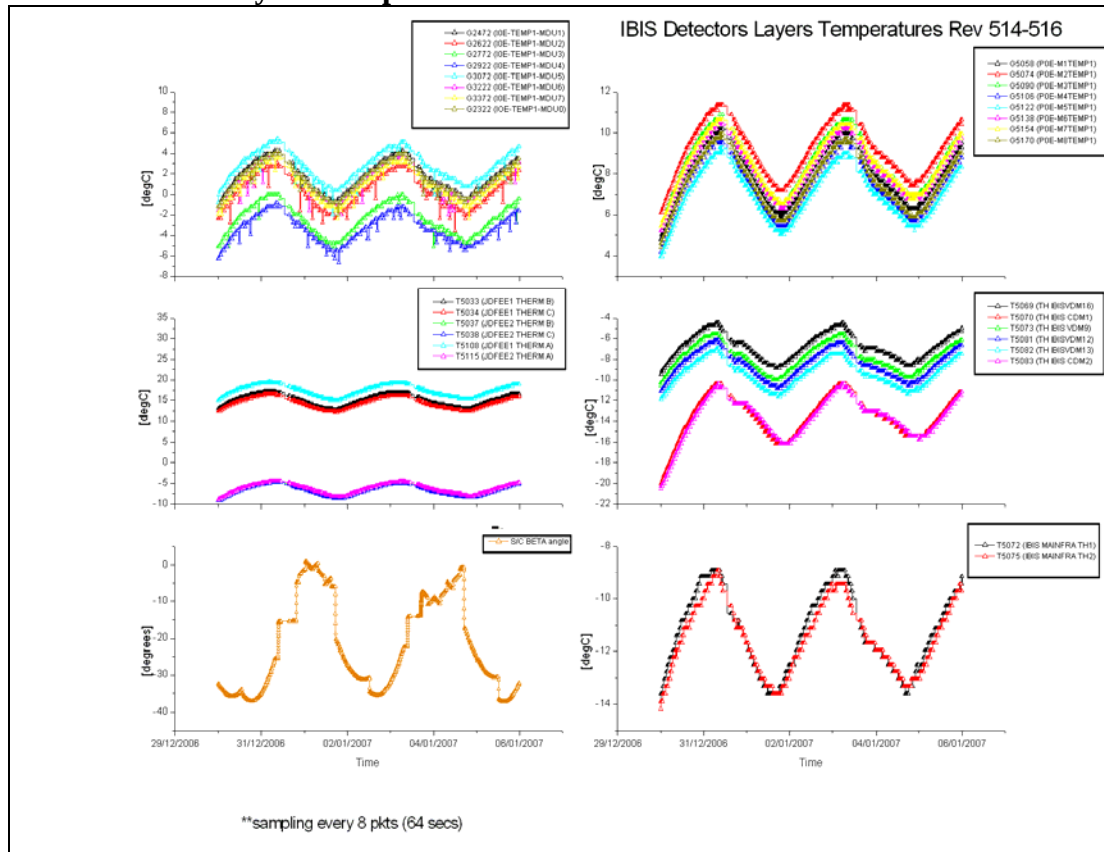
VETO Current:



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 2006.364 (30/12/2006):

At 06:49Z, TM families G5068 and G5072 (P0S-MiF1 & 2 ERRF) were reported OOL Low-Low. As they went back in limit in the next cycles, no action was taken.

DoY 2006.364 (30/12/2006):

At 14:08Z, IBIS went to Stand-By mode as automatic reaction to the IREM SEU #41. The unit was fully recovered by the operator at 14:52Z.

Doy 2006.365 (31/12/2006):

At the beginning of revolution 515, due to problems with the Mission Control System, the PST table uplink (ED DEPST250) was delayed by 8min (from 17:56Z to 18:03Z). Therefore the TM allocation for IBIS changed from 56 TMPS/cycle (patch/dump value) to 128 TMPS/cycle with a slight delay as well.

The TM share parameter (D5208) was updated with the next Event Designator DEBPG200 from the timeline at 20:06Z (previous slews were uplinked manually).

DoY 2007.003 (03/01/2007):

At 05:37Z TM parameters G6062 and G6063 were reported toggling OOL as the S/C was approaching the Radiation Belts. They kept toggling until IBIS went automatically into a Safe configuration at 05:48Z. The expected Belts entry was planned in the timeline at 08:09:42Z but the shape of the Belts had probably been affected by the later intense solar activity.

DoY 2007.004 (04/01/2007):

At 23:20Z, IBIS went to Stand-By mode as automatic reaction to the IREM SEU #42. The unit was fully recovered by the operator at 00:09Z on DoY 2007.005.

DoY 2007.005 (05/01/2007):

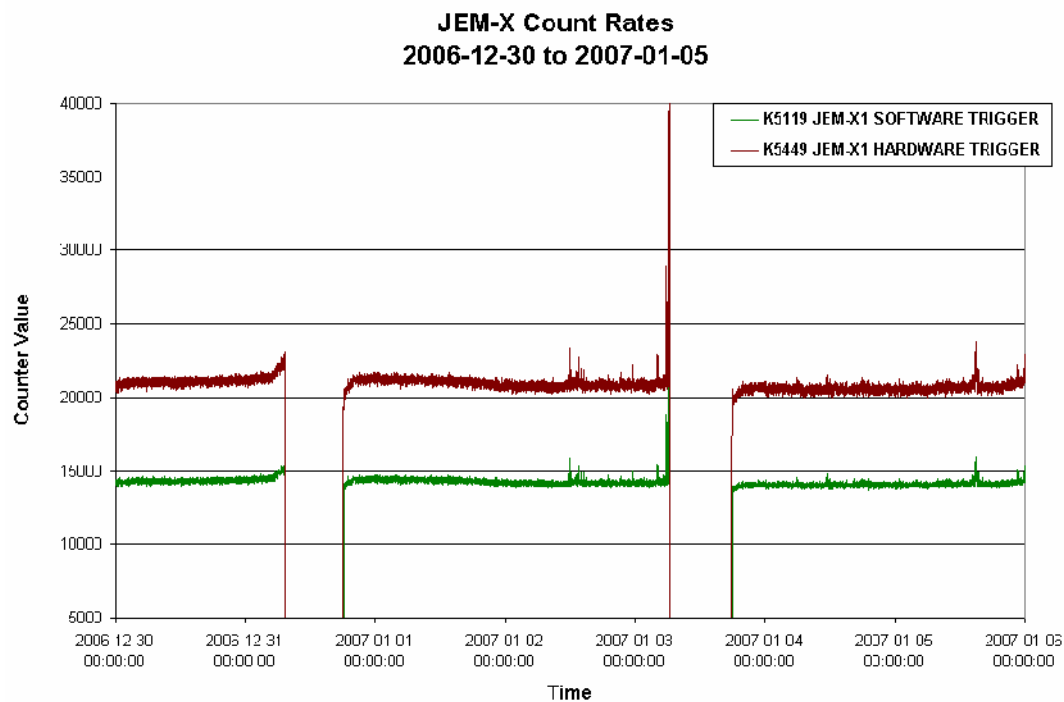
At 22:29Z user defined parameter X7500 (IBIS HIST DWN LD) was reported OOL for several cycles and the histograms had stopped to cycle between buffer in term of integration and downlink. Therefore the operator followed the indication in the FDIR (corresponding to former Operational Request) and executed procedure FCP_IBIS1_0312 (IBIS READ ALL REMAINING HISTOGRAMS). The first step of this procedure put IBIS in Stand-By at 23:08Z. At 23:10Z IBIS was sent back into scientific standard mode via TC G0129. This recovery was successful and the alarm X7500 went back into limits and the histograms restarted cycling.

8.3.4 JEM-X Operations

JEM-X Count Rates

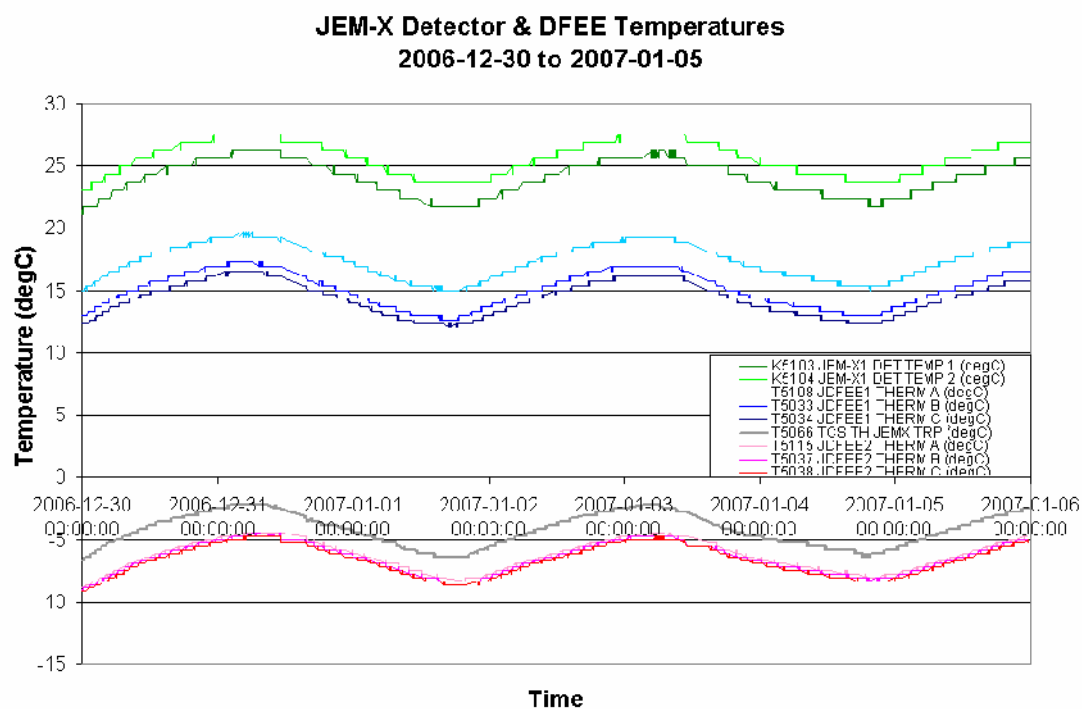
JEM-X count rates over the reporting period are displayed in the following graph¹.

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.



JEM-X Daily Report

² Data sampled (1 frame in 8)

2006-12-30 (DOY 364, Rev 514)

At 14:08Z an IREM SW reset (see INT_SC-172) caused the IREM RMC parameters K5315-K5317 to go OOL high (value = 65535). This did not affect JEM-X1 as the JEM-X reactions to IREM are disabled.

2006-12-31 (DOY 365, Rev 514-515) to 2007-01-02 (DOY 002, Rev 515)

JEM-X operations executed nominally.

2007-01-03 (DOY 003, Rev 515-516)

Due to high background radiation conditions, at 05:47:25Z the TM parameter K5449 HARDWARE TRIGGER started toggling OOL High and at 06:17:41Z K5136 BUFFER LOSS also briefly went OOL High. At 06:26:13Z K5119 SOFTWARE TRIGGER also went OOL High and at 06:28:33Z 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 06:38:11Z 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.

2007-01-04 (DOY 004, Rev 516)

At 23:19:49Z an IREM SW reset (see INT_SC-173) caused the IREM RMC parameters K5315-K5317 to go OOL high (value = 65535). This did not affect JEM-X1 as the JEM-X reactions to IREM are disabled.

2007-01-05 (DOY 005, Rev 516)

JEM-X operations executed nominally.

8.3.5 OMC Operations

2006-12-30 (DoY 364, Rev 514)

At 14:08:23, an IREM SEU forced the unit to SAFE mode. As part of the recovery, the unit was commanded back to Stand-by at 14:27:59, and returned to Normal mode at 14:28:06 by manual commanding. The impact was a delay in the starting of pointing 05140068, which was effectively shortened from a planned 1985 to 756 seconds.

2006-12-31 (DoY 365, Rev 514)

At 15:30, after AOS, extended problems with the imcs caused the loss of pointings 05150004, 05150005, 05150006 & 05150007.

2007-01-01 (DoY 001, Rev 515)

Nothing to Report.

2007-01-02 (DoY 002, Rev 515)

At 21:36, Due to a hit on the line, an AOCS command failed. The timeline was interrupted, and a recovery performed. The OMC commands were manually uplinked at 22:02, although Normal mode was not entered until 22:12:07. The impact was pointing 05150083 was shortened from a planned 3268 to 1344 seconds. It was at this time the following 2 commands were rejected:

2007.002.21.38.18.169	2007.002.21.38.24.598	1792	RealTime	131	TC REJECT		
REJECTED TC1			0	0	65535	PR	N
E E							
2007.002.21.38.24.169	2007.002.21.38.32.555	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.

2007-01-03 (DoY 003, Rev 516)

Nothing to Report.

2007-01-04 (DoY 004, Rev 516)

At 23:19:43, another IREM SEU forced the unit to SAFE mode. As part of the recovery, the unit was commanded back to Stand-by at 00:17:19, and returned to Normal mode at 01:38:15 according to the Timeline. The impact was the interruption after 1705 from a planned 1985 seconds of pointing 05160044, and the loss of pointings 05160045, 05160046 & 05160047.

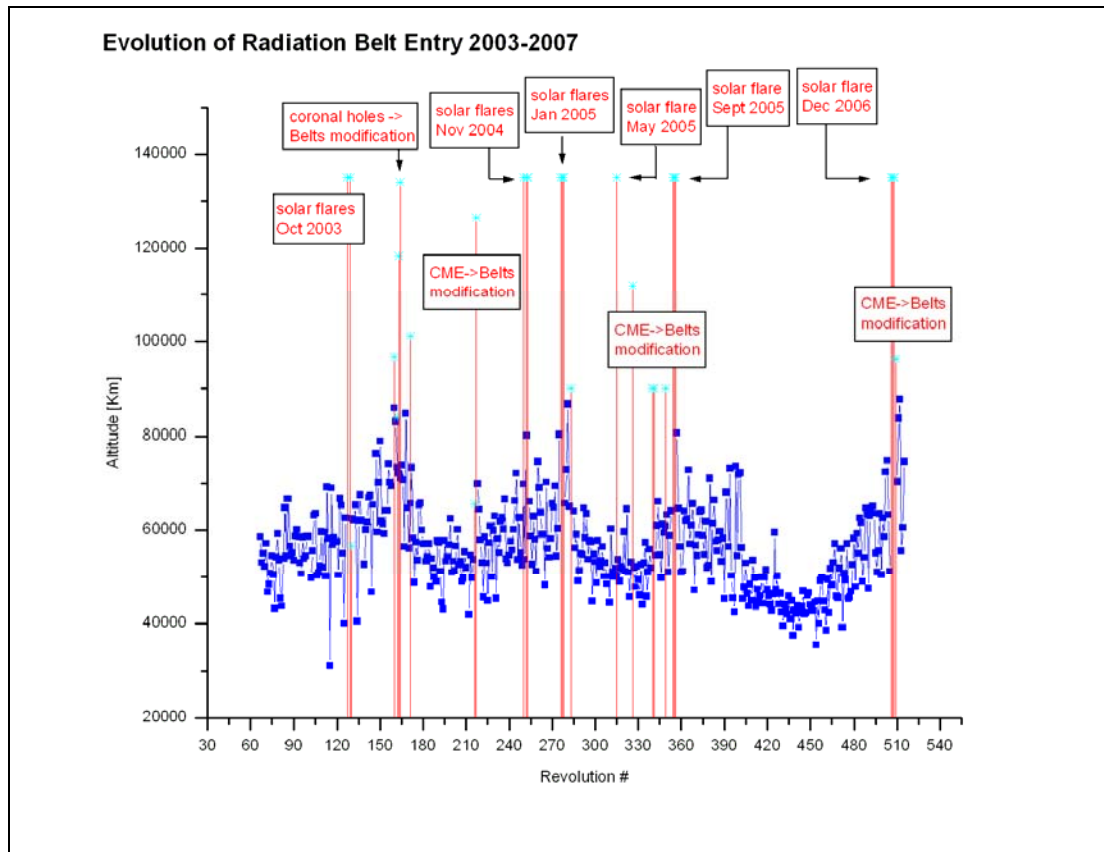
2007-01-05 (DoY 005, Rev 516)

Nothing to Report

On DoY 365 at 08:21:03 and DoY 003 at 08:09:43 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

On 2006/12/30 at 14:08Z and on 2007/01/04 at 23:20Z, two local resets of the IREM CSCI S/W (SEU #41 & #42) occurred as previously (see anomalies on 16/12/2002, 01/01/2003, 03/06/2003, 11/07/2003, 19/07/2003, 05/08/2003, 24/08/2003, 26/12/2003, 13/05/2004, 16/05/2004, 09/06/2004, 12/06/2004, 10/09/2004, 14/09/2004, 28/10/2004, 06/11/2004, 01/12/2004, 11/12/2004, 30/01/2005, 11/02/2005, 04/03/2005, 11/05/2005, 17/05/2005, 15/06/2005, 30/07/2005, 07/09/2005, 20/09/2005, 21/11/2005, 09/04/2006, 30/04/2006, 10/06/2006, 16/08/2006, 08/09/2006, 10/09/2006, 18/09/2006, 29/09/2006, 31/10/2006, 02/12/2006, 07/12/2006 13/12/2006) the status of the unit, before the anomalies, was nominal, here is a summary:

- 1) The temperatures were nominal
- 2) The LCL current was nominal
- 3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits
- 4) The anomalies occurred at 2006.364.14.08Z at 136990.6km and at 2006.004.23.20 at 149725.3km. The unit had performed an automatic transition to Standard Mode (ie. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit
- 5) The recovery of the unit started at 14:22Z for SEU #41 and at 23:25Z for SEU #42 using procedure CRP_SYS_2570. The first dump of the status word after the anomaly showed a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure flag shows YES. The unit was still reporting the status as if it was in Integral

mode with counting ON, accumulation ON and checksum failure flag ON. This value of the status word is assumed to be an old one written by the S/W at the moment of the anomaly.

6) A dump of all the registers gave a status word BC80 HEX = 48256 DEC = 1011110010000000, ie. the unit was still reporting the status as if it was in Integral mode but the Checksum Failure flag was this time OFF and the checksum counter in the register number 3 incremented by 1 unit.

7) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 16:22Z for SEU#41 and at 02:07Z for SEU#42.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the PIs request.

The recovery of the payload was performed with: for SEU#41, OMC at 14:27Z and IBIS re-enabled at 14:52Z, and for SEU#42, IBIS re-enabled at 00:09Z and OMC at 00:17Z.

The cause of these S/W resets is still under investigation, but it is apparently due to the unit's memory device that is sensitive to radiation.

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]
514	RAD_ENTR R 2006-12-31T08:20:58Z	2006-12-31 07:45:58	60680.9	2006-12-31 09:18:24	48316
515	RAD_EXIT R 2006-12-31T17:39:47Z	2006-12-31 15:42:06	26541.4	2006-12-31 17:18:24	41719
515	RAD_ENTR R 2007-01-03T08:09:42Z	2007-01-03 05:34:30	74593.7	2007-01-03 09:06:17	48307
516	RAD_EXIT R 2007-01-03T17:27:52Z	2007-01-03 16:36:22	37241.4	2007-01-03 17:06:17	41851

Reference

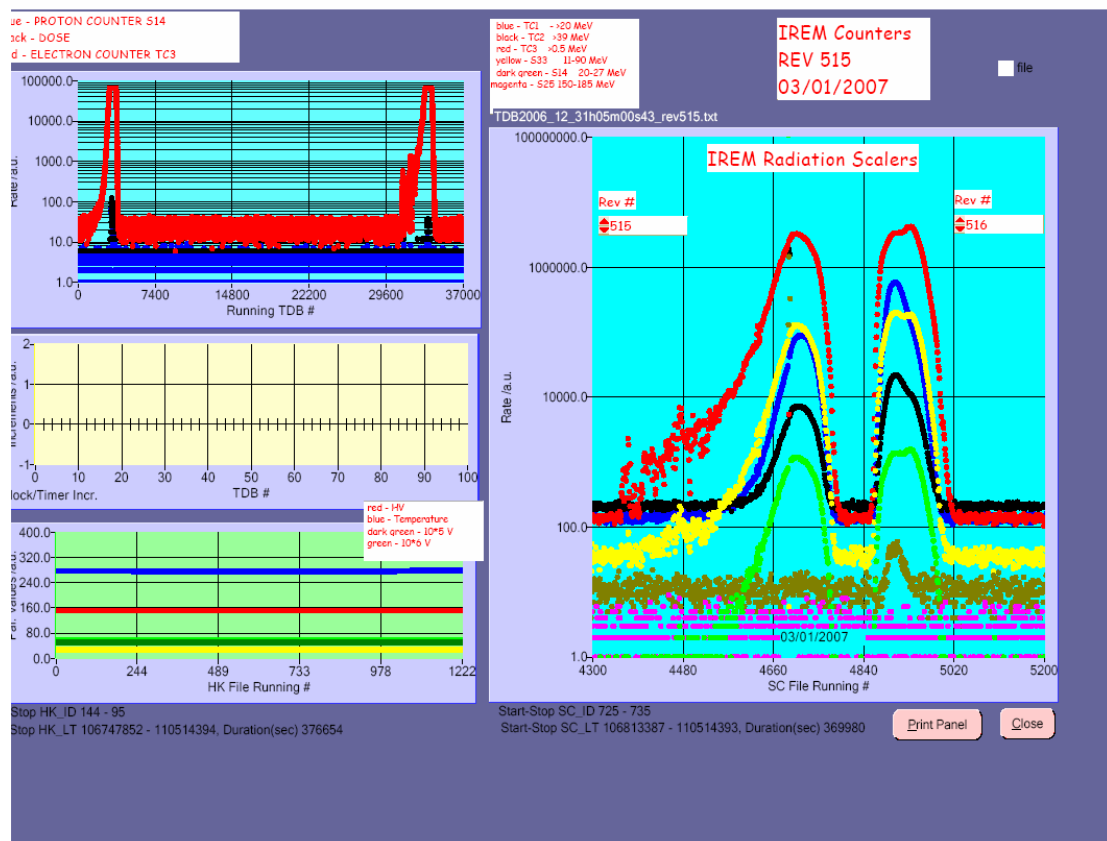
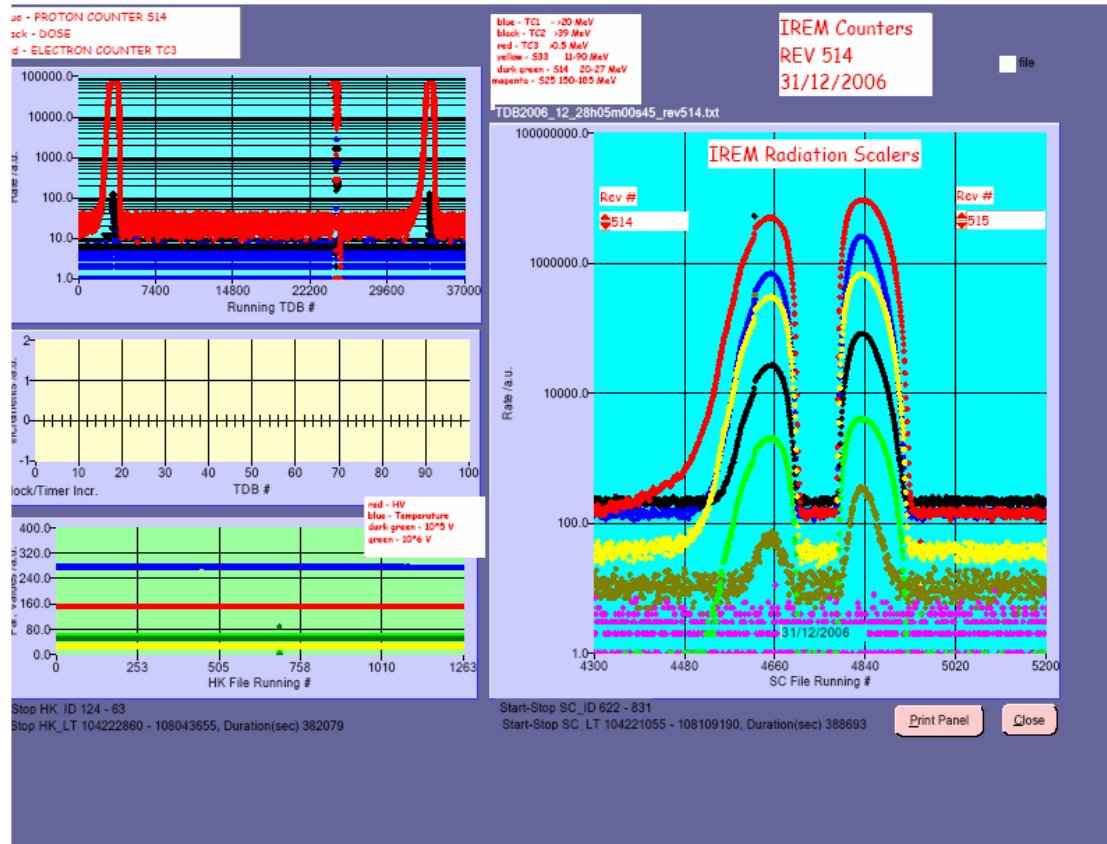
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

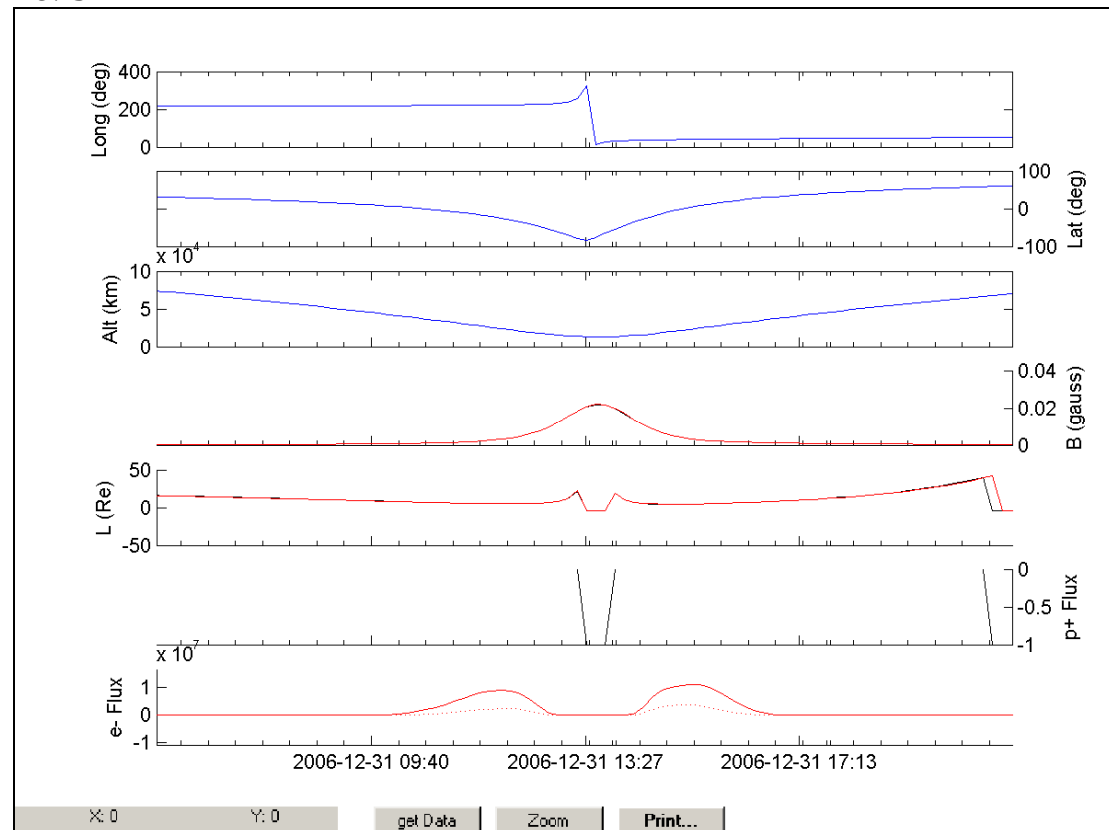
Radiation Spike

IREM radiation counters:

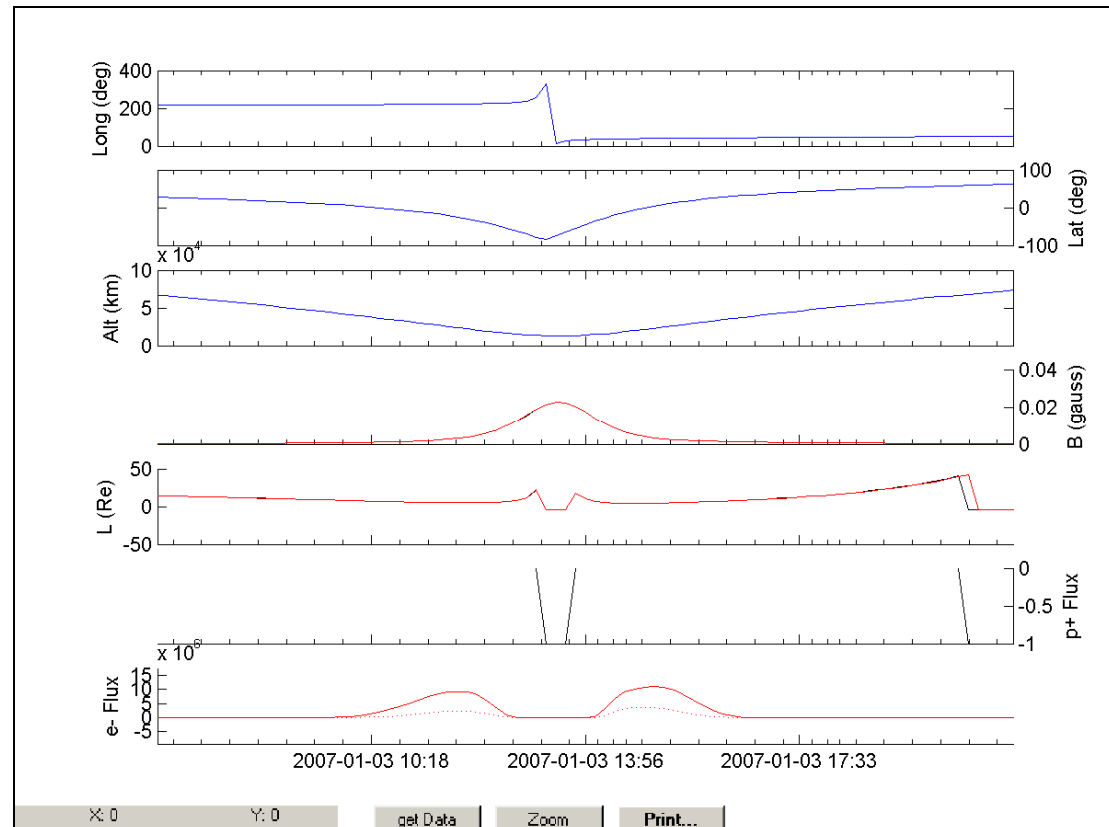


IREM Predicted Radiation Belt Passages

Rev 514

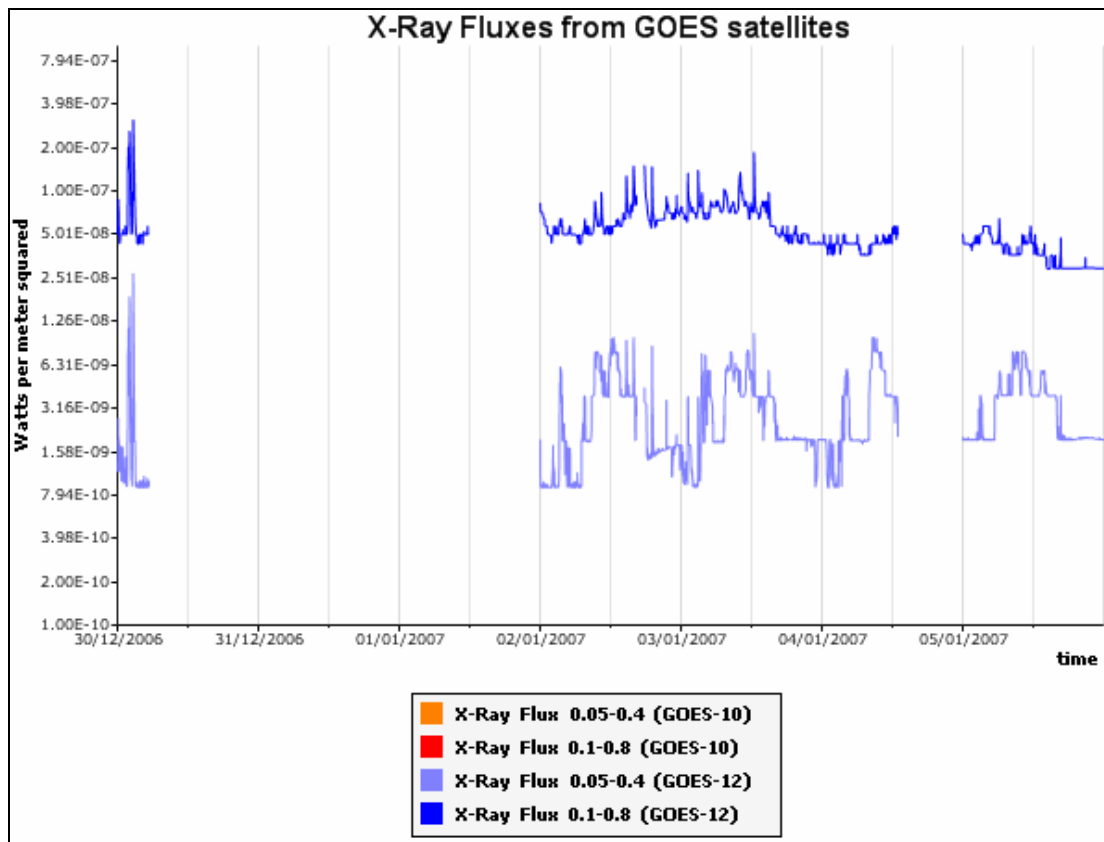


Rev 515

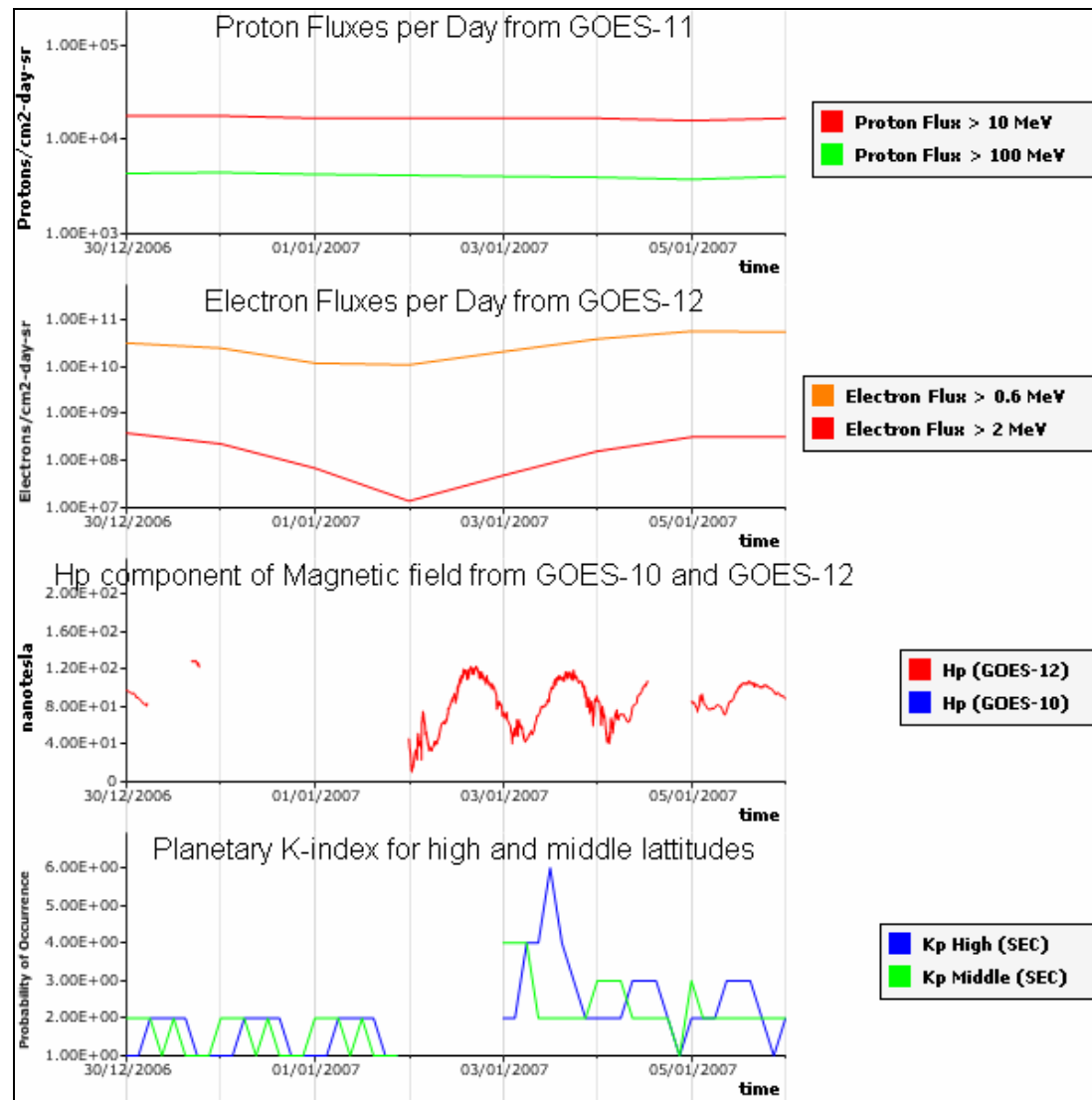


SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):

There were gaps in the data this week, but the radiation was low this week.



X-Ray fluxes start to be significant over 10^{-5} W/m^2 (corresponding to M-class flares). Above 10^{-4} W/m^2 , they correspond to strong X-class flares.



Proton and electron flux report low radiation background.

Hp component of the Geomagnetic Field is essentially parallel to the Earth's rotation axis. A drop near 0 nT is associated with a significant variation in the magnetic field.

Kp index is based on ground magnetometers. Kp ≥ 5 features storm-level geomagnetic activity.