

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 178
Week 07
20.02.06
Routine Phase

Prepared by: M. Walker (OPS-OFO)

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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 11.02.06 until 17.02.06 (both dates inclusive) and covers the revolutions 407, 408 and 409.

2 Summary of Activities

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

The targets of these revolutions were a hexagonal dither of the Galactic Bulge region (RA 17:45:36.00; DEC -28:56:00.0), a Galactic Plane Survey, a raster dither of SN1006 (RA 15:02:48.40; DEC -41:54:42.0) and a hexagonal and raster dither of XTE J1817-330 (RA 18:17:42.00; DEC -33:01:04.8), a Galactic Centre Observation, a staring OMC Flat Field calibration (RA 17:12:48.00; DEC -06:24:00.0), and a raster dither of the Galactic Centre (RA 17:45:40.00; DEC -29:00:28.0).

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.

2 slews were missed from the Timeline during this period due to problem on guide star and on wheels speeds.

The fuel consumption over the period between 10/02/2006 and 16/02/2006 was 0.1420 kg. The remaining propellant is in the order of 156.2777 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 was 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

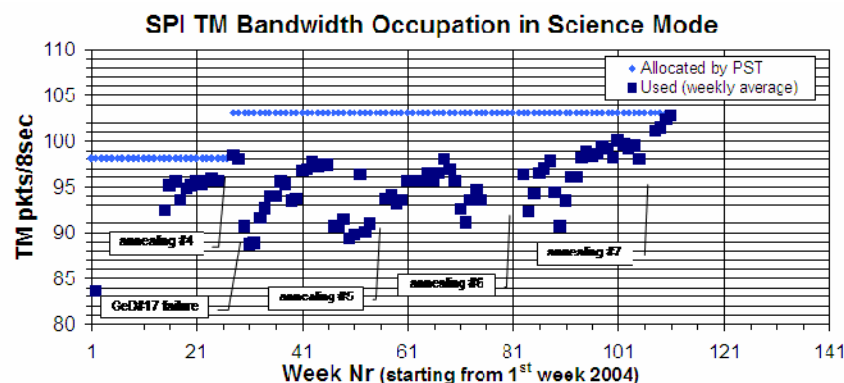
3.2.1 SPI

Following the 7th annealing, ended on 24th January, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #15, which is showing an anomalous energy resolution. Currently the detector #15 is working with slightly reduced high voltage setting, where the energy resolution is almost nominal at low energy, degraded by approx 10% at 1764 keV and 20 % at 2.7 MeV.

During science operations, the instrument was kept in photon-by-photon mode, with spectra TM enabled, an assigned TM bandwidth in the science observation windows of 103 pkts/cycle and an average occupation of 102.8 pkts/cycle. The telemetry downlink is therefore approaching saturation, with the Spectra telemetry downlink already lost most of the times. The Photon telemetry is still ok for most of the revolution except when approaching the belts. If the trend does not revert or the telemetry allocation to SPI is not increased, SPI will start losing Photon science data in the forthcoming days.

The Stirling compressors work nominally, maintaining the Germanium detectors at 85K +/-1K.

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



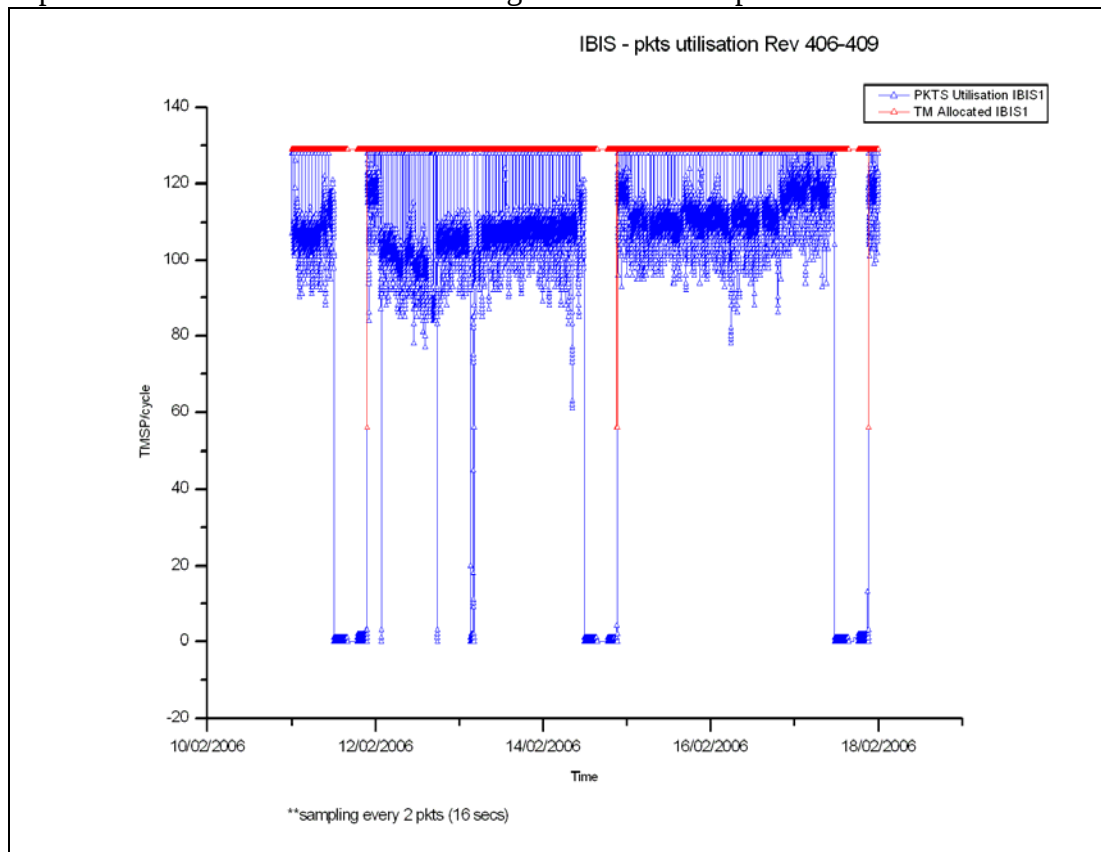
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The Overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 129 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 109.86 TMPS/cycle, up 2.10 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 during science observations throughout the reporting period, with a TM allocation of 8 packets/cycle. In line with OCR-206, the JEM-X1 microstrip gas gain voltage was reduced from 76 RAW to 75 RAW at the start of revolution 407.

JEM-X2 was in Data Taking mode with 1 TM packet/cycle from the start of the reporting period for the remainder of revolution 406. The JEM-X2 DFEE was then switched off at 2006-02-11T12:49Z and JEM-X2 remained dormant (DFEE OFF) with 1 packet/cycle for the rest of the reporting period. During the time in which JEM-X2 was in Data Taking with 1 packet/cycle, the JEM-X2 reactions to the Broadcast Packet TM Share information was disabled, such that JEM-X2 believed it had 8packets/cycle, in order to allow the grey filter algorithm to work as desired (ref: OCR-207 and INT_OR_0238).

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, 159 of the 162 planned science pointings for OMC were executed nominally, three pointings were shortened.

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. However, on the 13th a jump in the IREM MSW counter was reported. The unit could not recover itself from this anomaly and a power cycle was needed.

Solar Activity

The observation period was characterised low solar activity.

The Sun was blank during the beginning of the observation period. On the 14th of February, sunspot 854 appeared but posed no threat for strong solar flares up to the end of the week.

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. There were several minor problems with ground station links, but these had no impact. The overall performance was well above the 95% requirement.

4.1 Mission Operations Centre

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

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. There were several instances though of bad frames and a few TM drops, plus a lot of problems sending data to the ISDC, but these had no impact on the mission. The overall performance though was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSF's for revolutions 416 and 417 have been received. Planning of revolutions 415 and 416 has been performed. No replanning activity has been performed. One ToO request was received but it has been rejected. TSF's up to revolution 410 has been received.

2. Observation status

ECS's for revolutions 395 to 397 were received and processed in ISOC this week. No extra time was credited.

3. ISOC science data archive

A beta 2 release of ISDA version 2.5 was released this week. It is being tested also by external testers. Some fixes to problems related to ingestion of data from ISDC have been removed. Automatic ingestion will be resumed early next week.

4. ISOC system

The version 12.1 was introduced early this week as planned. The system has been used this week, besides normal ISOC work, extensively test the proposal submission in preparation for AO 4. Some minor problem was detected but it could be removed by a patch to the software.

5. AO 4 preparation

This week the preparation has focused on testing the software involved in the AO proposal submission. This testing has been performed by ISOC staff and external people as well from various locations. After some initial problems to communicate through the ESAC firewall the testing could be performed as planned. This campaign resulted in a set of suggestions for enhancements and a few problems that will be implemented or removed. A problem attempting to submit proposals from ESTEC was encountered. It seems the ESA firewall is very strict. The problem will be further investigated. It might also occur for other proposers. It is indeed an increasing problem with the increasing strictness of the firewalls. A solution for this problem is being investigated. If it can not be implemented in time for the actual AO submission there is always a possibility to send in a proposal to INTEGRAL helpdesk using email. ISOC could then detach the proposals and ingest them to the proposal data base.

6. Problems

None besides the communication problem mentioned above.

4.3.2 ISDC

Status of ISDC observation processing on 20/02/2006:

- Latest Standard Analysis completed: observation 03200560001 (Cas A /Tycho, Revolutions 386-395) on 05/02/2006

- Latest products archived: observation 03200560001 (Cas A /Tycho, Revolutions 386-395) on 07/02/2006

- Latest observation products sent to the observer: observation 02297000019 (Cas A, Revolutions 352 & 384-385) on 13/02/2006

5 Special Events

6 Anomalies

There was just one problem relating to the ground segment that impacted the operations:

- On DoY 047, at 14:31, a manual reaction wheel bias had to be performed, as the observed drift of the reaction wheel speeds had deviated significantly from the predicted values. The impact was a shortening of the duration of pointing 04080046.

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

AR id	Date Created	Subject	Segment	Status
INT-2840	20/02/2006	FDS: observed divergence in measured RWs speeds wrt the predicted profiles	FDS	Open

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 407

The observations in revolution 407 began with a Hexagonal dither of the Galactic Bulge region (RA 17:45:36.00; DEC -28:56:00.0), which lasted ~3.5 hours. This was followed by a Galactic Plane Survey lasting ~12.2 hours. Finally a raster dither of SN1006 (RA 15:02:48.40; DEC -41:54:42.0) lasting ~39.8 hours was executed.

Revolution 408

The observations in revolution 408 began with a Hexagonal dither of the Galactic Bulge region (RA 17:45:36.00; DEC -28:56:00.0), which lasted ~3.5 hours. This was followed by a Hexagonal dither of XTE J1817-330 (RA 18:17:42.00; DEC-33:01:04.8) lasting ~40.3 hours. Finally a raster dither lasting ~13.9 hours of the same object was executed.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2 for which the DFEE was off, and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5.

Revolution 409

The observations in revolution 409 began with a Hexagonal dither of the Galactic Bulge region (RA 17:45:36.00; DEC -28:56:00.0), which lasted ~3.5 hours. This was followed by a Galactic Centre Observation lasting ~18 hours. A staring OMC Flat Field calibration followed at an attitude of (RA 17:12:48.00; DEC -06:24:00.0), which lasted ~3.4 hours. Finally a raster dither of the Galactic Centre (RA 17:45:40.00; DEC -29:00:28.0) lasting ~32.9 hours was executed.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2 for which the DFEE was off, and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5 apart from during the Flat Field Calibration, when the allocation was IBIS 90; SPI 84; JEM-X1 8; JEM-X2 1; OMC 63

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-01-21T21:19:41.000Z	156.7708	F	Automatic TM processing.
2006-01-22T04:22:54.000Z	156.7490	F	Automatic TM processing.
2006-01-24T14:23:40.000Z	156.7175	F	Automatic TM processing.
2006-01-25T08:45:34.000Z	156.6832	F	Automatic TM processing.
2006-01-27T15:21:16.000Z	156.6670	F	Automatic TM processing.
2006-01-27T16:36:52.000Z	156.6600	F	Automatic TM processing.
2006-01-27T20:49:48.000Z	156.6390	F	Automatic TM processing.
2006-01-30T20:31:41.000Z	156.6112	F	Automatic TM processing.
2006-02-02T13:20:12.000Z	156.5836	F	Automatic TM processing.
2006-02-03T08:13:02.000Z	156.5489	F	Automatic TM processing.
2006-02-05T13:09:47.000Z	156.5322	F	Automatic TM processing.

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2006-02-08T12:54:11.000Z	156.5101	F	Automatic TM processing.
2006-02-09T07:24:21.000Z	156.4493	F	Automatic TM processing.
2006-02-09T08:30:53.000Z	156.4288	F	Automatic TM processing.
2006-02-09T09:22:13.000Z	156.4197	F	Automatic TM processing.

This report was generated Fri Feb 10 08:00:28 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, 11/02/2006 – 17/02/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 63 Open Loop Slews, 110 Closed Loop Slews and 9 Momentum Bias were executed (TL + Manual Recovery).

2 slews (CSL) were missed from the Timeline during this period due to a problem on guide star for PID 04060051 and a divergence on wheels speeds wrt predicted profiles.

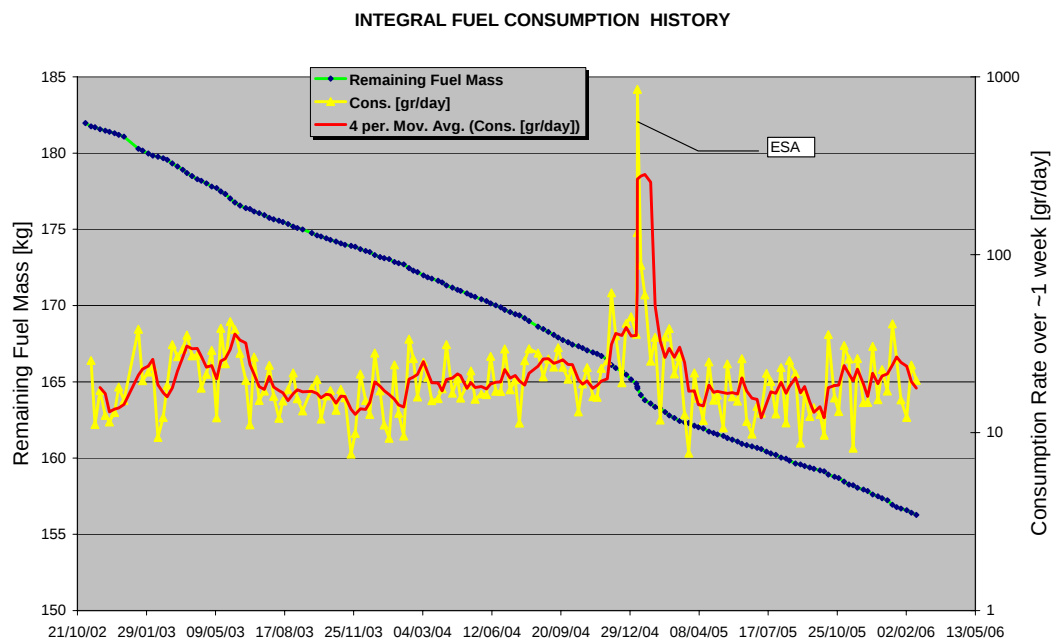
This is equivalent to a 1.2 % of the total number of slews planned (173).

Orbit Control

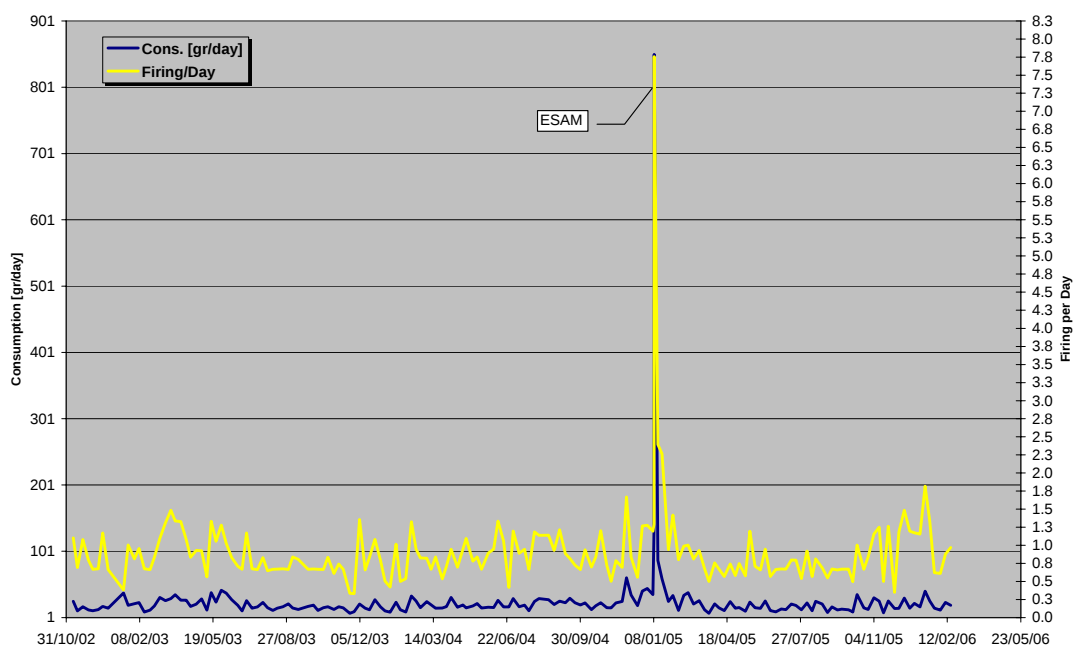
At present time the plan is to reverse the control and to increase the semi-major axis as from mid April 2006 and onwards. The "Redu only" situation could be reached in the second half of 2006, possibly mid August. The apogee longitude would then be about 32 deg East. Plot provided on monthly basis

Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 16/02/2006 is reported in the plot below.

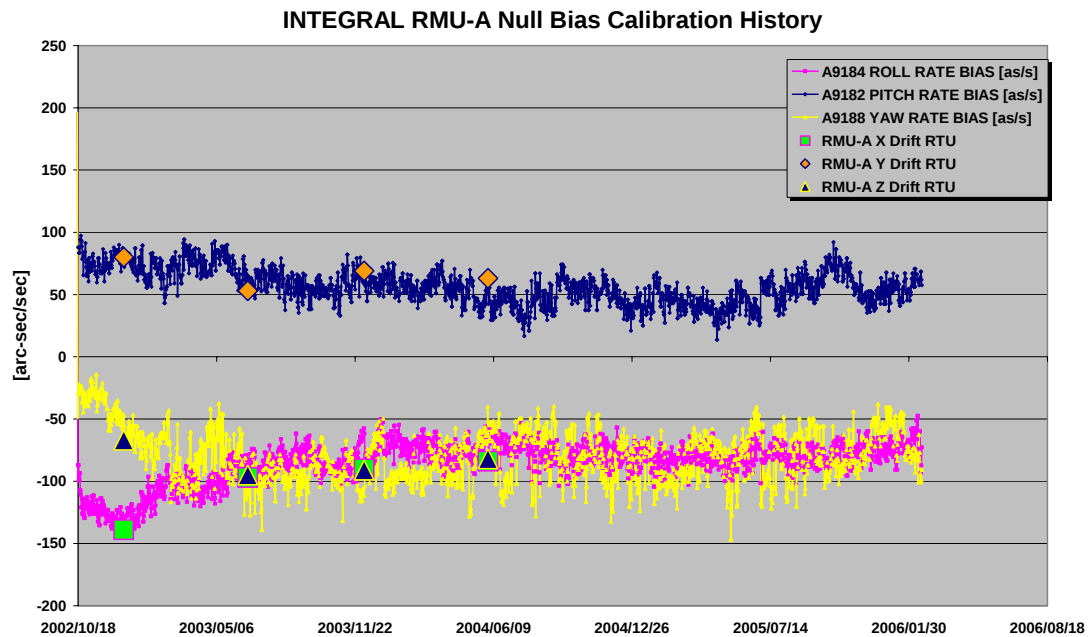


The firing\day over the period between 01/11/2002 and 16/02/2006 is reported in the plot below.

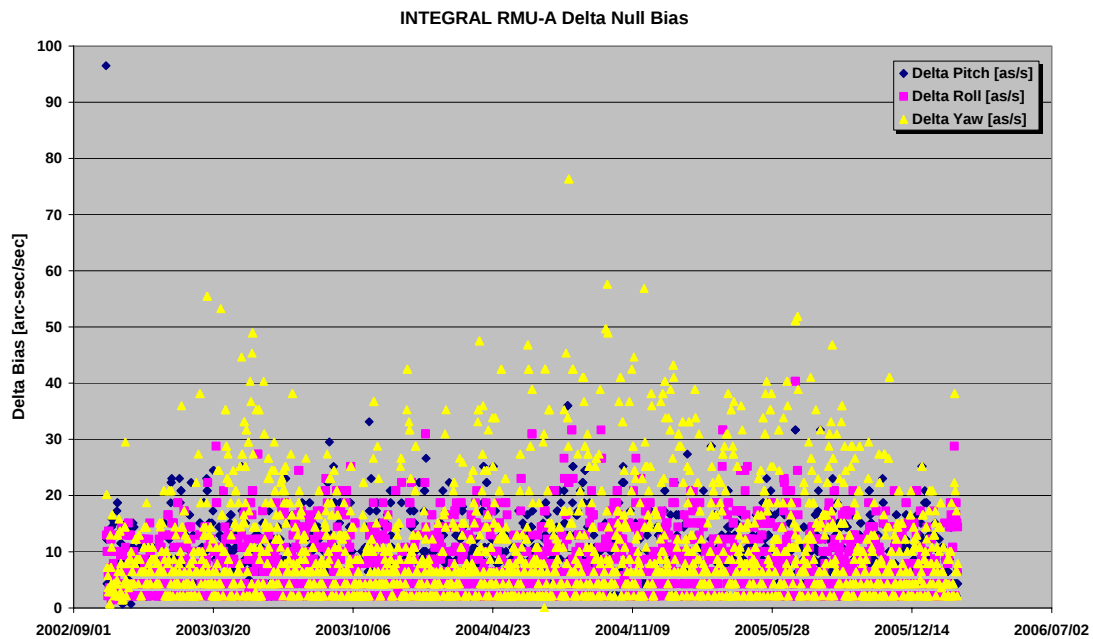


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 17/02/2006 is reported in the plot below.



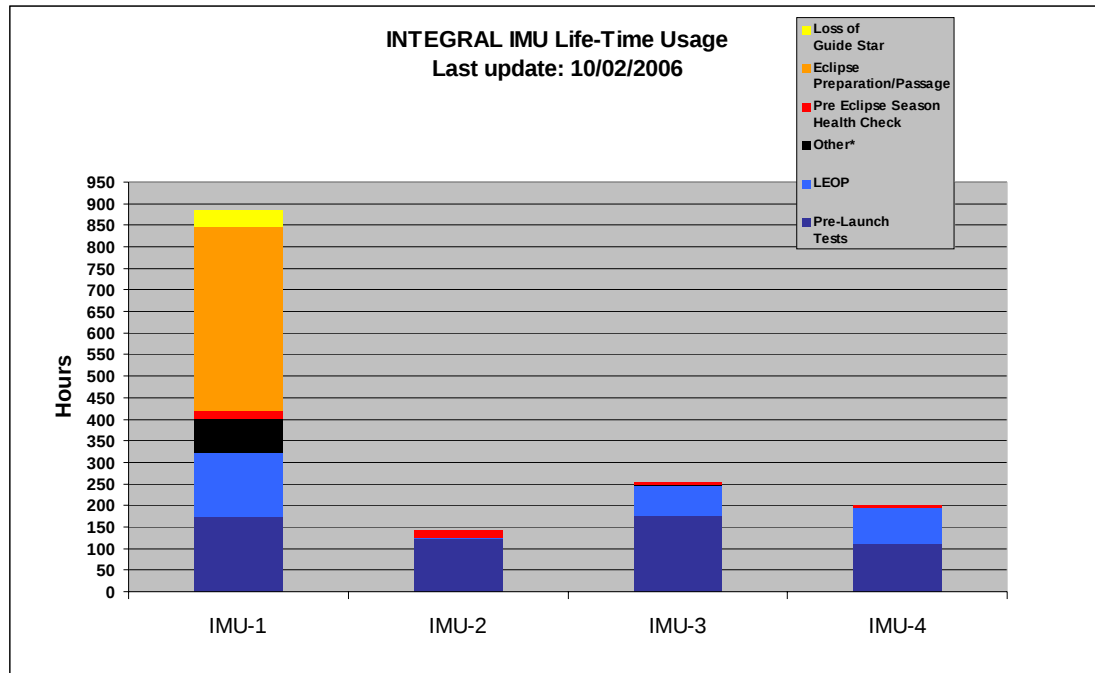
The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 17/02/2006 is reported in the plot below.



The IMU Life Time usage

The IMU time consumption history, on IMU1-2-3-4 over the period between 01/11/2002 and 10/02/2006 (post EO activity) is reported in the plot below.

INTEGRAL IMU Life-Time Usage									
Unit	Total [hours]	% Usage WRT 1800 hr Reserved Flight Time	Pre-Launch Tests	LEOP	Loss of Guide Star	Eclipse Preparation/Passage	Pre Eclipse Season Health Check	Other*	Last Switch-Off
IMU-1	884.273225	49.13	175.045556	147.371944	37.104336	426.978333	18.817778	78.955278	11/02/2006
IMU-2	142.330278	7.91	123.023889	3.871111	0.000000	0.000000	15.435278	0.000000	25/10/2005
IMU-3	254.725278	14.15	175.449167	70.057500	0.000000	0.000000	6.271111	2.947500	11/05/2005
IMU-4	199.760278	11.10	111.528889	80.834167	0.000000	0.000000	5.155556	2.241667	11/05/2005



11/02/06 (Day of Year 042, Revolution 406-407)

Guide star released by the STR SEU Filter: at 23:59:44z the ACC reported lost of guide star: the guide star, Mi 8.35 at CCD location [3915 , 22001] was released and the IMU1 switched ON. The guide star ID 8297-4705 , Mi 4.35 at CCD location [-1972 , -7498] was picked in the first automatic mapping, which was kept afterwards. The OTF was not reached during the last part of PID 04060050 and subsequent slew ID 04060051 failed release.

A manual recovery was then performed to the attitude of PID 04060051 and the following slew ID 04060052 manually updated.

The origin of the problem is not yet clear but could be likely caused by the star's dim companion (ID 7833-208) of Mi 10.03, located at ~ 2 arcmin (~2 CCD pixels away) from the guide star.

The following slew was not executed from TL while recovering the AOCS s/s: 04060051(CSL).

12/02/06 (Day of Year 043, Revolution 407)

Nothing to report.

13/02/06 (Day of Year 044, Revolution 407)

Nothing to report.

14/02/06 (Day of Year 045, Revolution 407-408)

Nothing to report.

15/02/06 (Day of Year 046, Revolution 408)

Nothing to report.

16/02/06 (Day of Year 047, Revolution 408)

Divergence in RWs speeds wrt predicted profiles: reported on DoY 047 a divergence (>100 rpm) on the RW#2 and RW#4 measured speeds wrt the predicted profiles.

This problem was observed at beta angle >31 deg and it is likely due to a limited validity of the S\C external torques model when approaching high beta angles. In order to recover the situation a manual bias was performed and the impact on the TL was the lost of pointing ID 04080046.

Since the problem has been observed few times during the last 6 month, an update of the external torques model is under evaluation, in order to remove such divergence, causing manual recoveries and impacting the observation time.

The following slew was not executed from TL while recovering the AOCS s/s: 04080046(CSL).

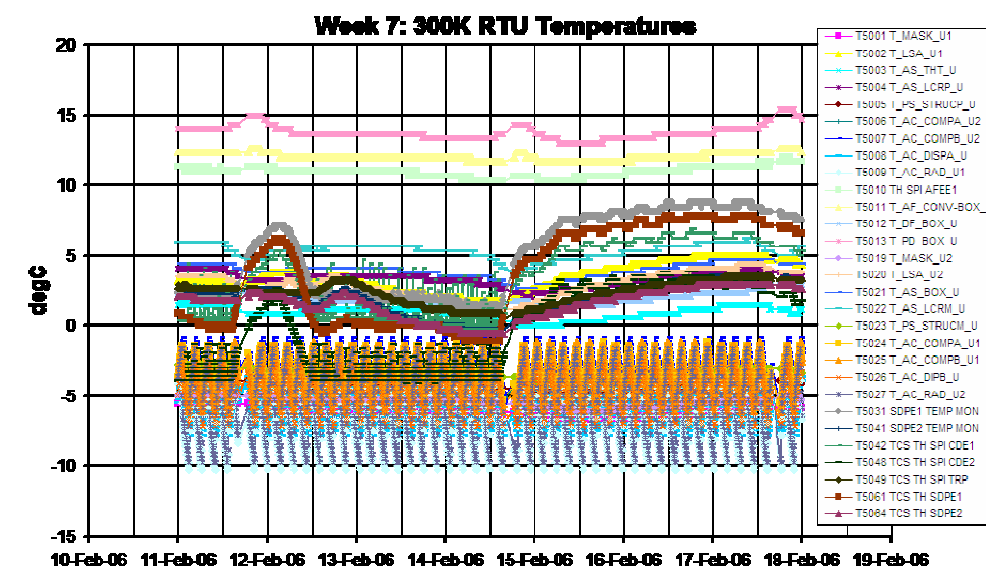
17/02/06 (Day of Year 048, Revolution 408)

Nothing to report.

8.3.2 SPI Operations

Unit Temperatures:

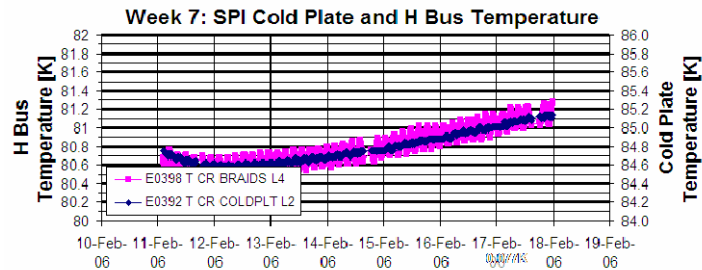
All the equipment temperatures are inside the operational limits. The following plot shows their evolution along the reporting period.



Stirling Compressors and Cryostat:

The performance of the compressors is nominal. The cold plate temperature was maintained at 85K $\pm$ 1K showing the expected positive drift.

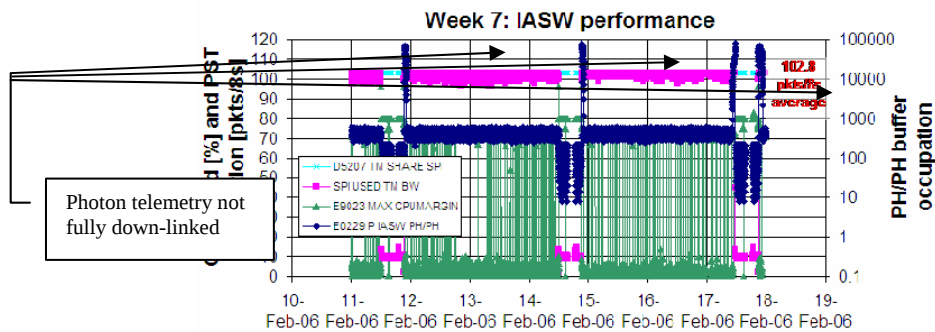
The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.



DPE & IASW:

The Iasw performance is nominal. The current Iasw version installed is 432.

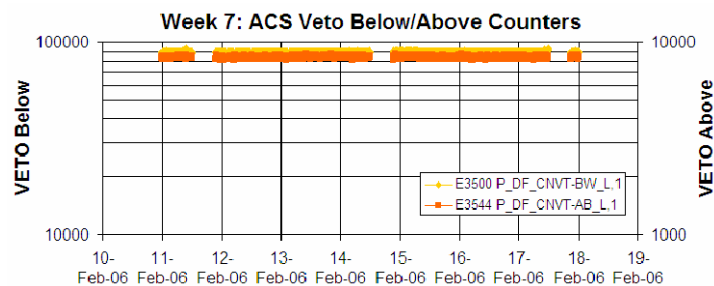
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

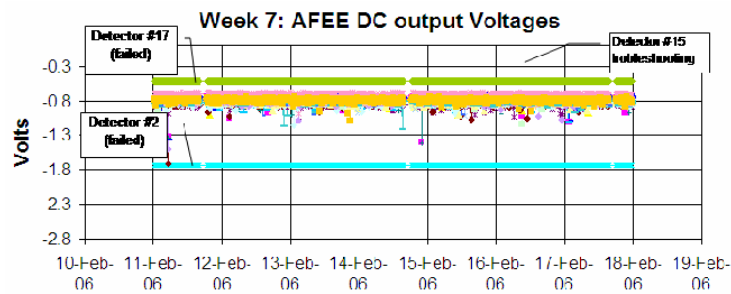
The following plot shows the ACS overall count rate evolution during the reporting period



AFEE:

The performance of the AFEE and the detectors is nominal, except for detector #15, which shows a degraded energy resolution. The anomaly has been recorded in the ESOC Anomaly Report and Tracking System (ARTS) as INT_SC-140. Currently the detector #15 is working with slightly reduced high voltage setting (3kV). In these conditions the energy resolution is almost nominal at low energy, but degraded by approx 10% at 1764 keV and 20 % at 2.7 MeV.

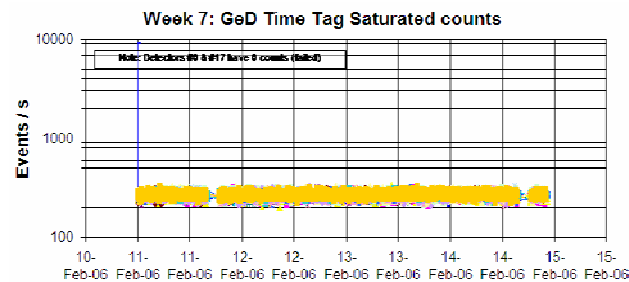
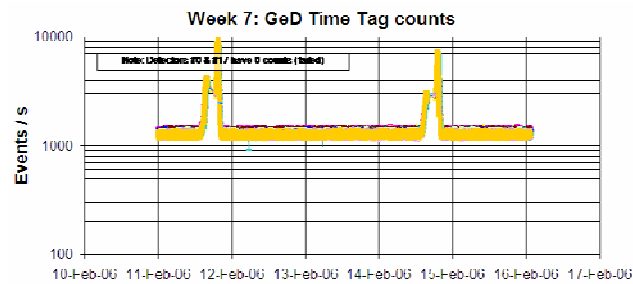
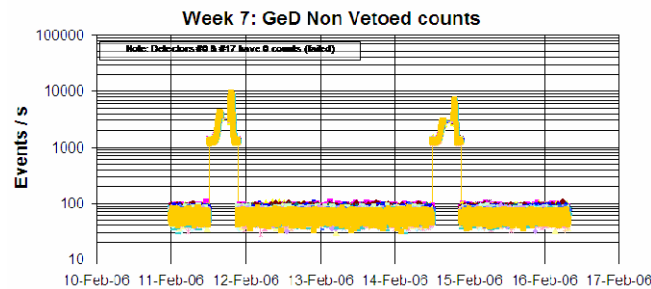
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.



DFEE:

The performance of the unit is nominal.

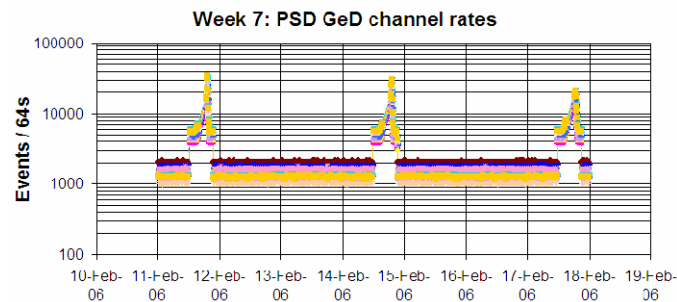
The following plots show the count rates of the detectors during the reporting period (due to problems in the data retrieval tool, some gaps could be present).



PSD:

The performance of the unit is nominal.

The following plots show the PSD channel rates during the reporting period



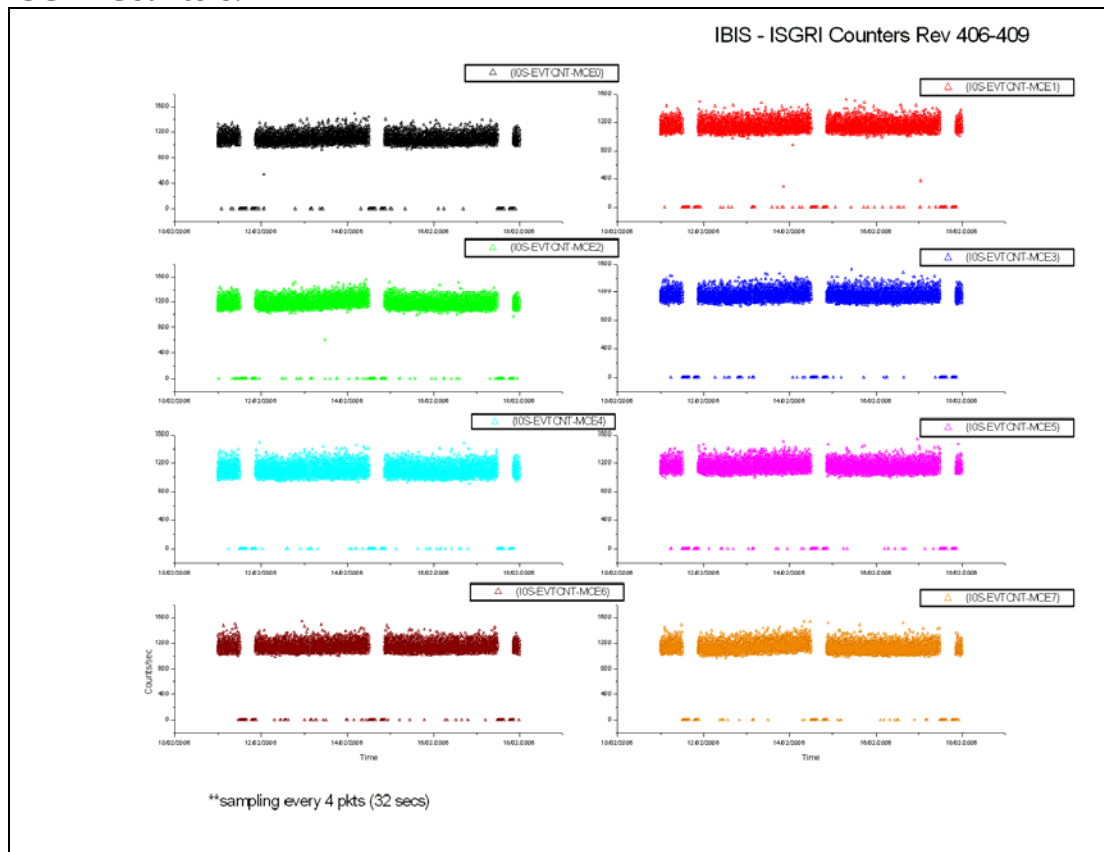
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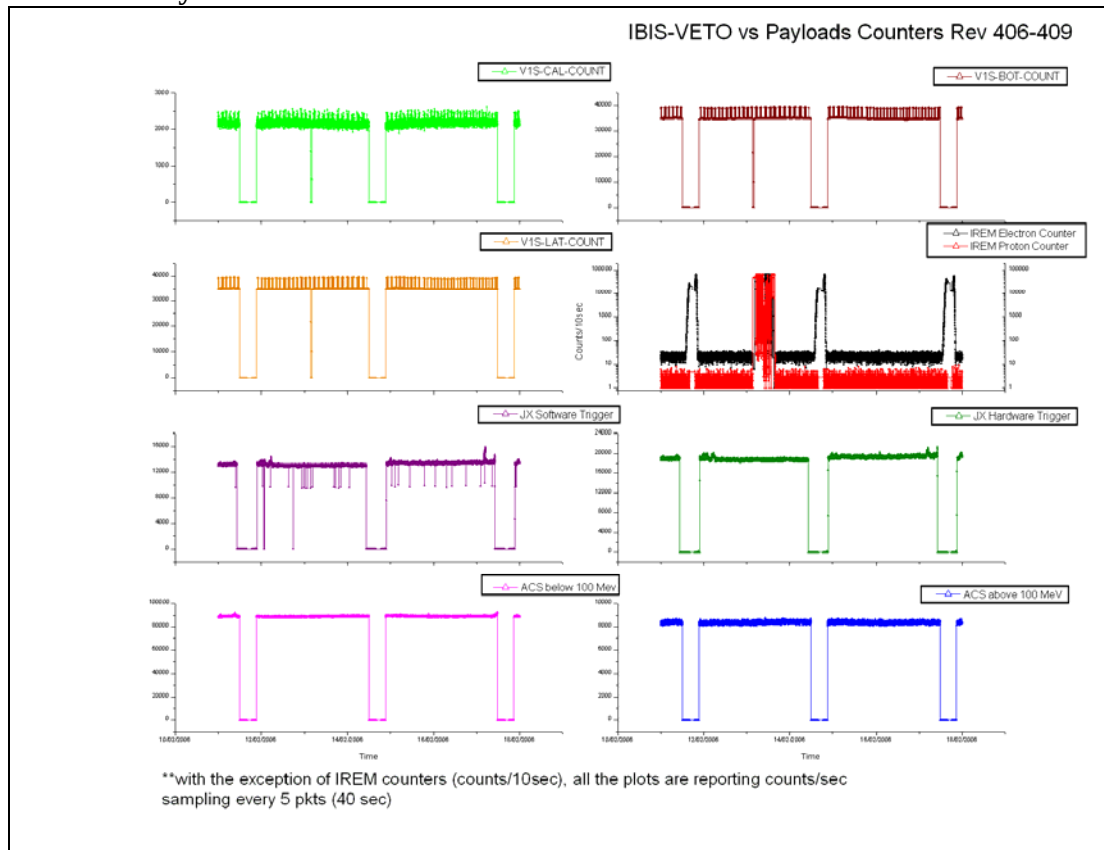
8.3.3 *IBIS Operations*

IBIS Event Counters Plots.

ISGRI Counters:

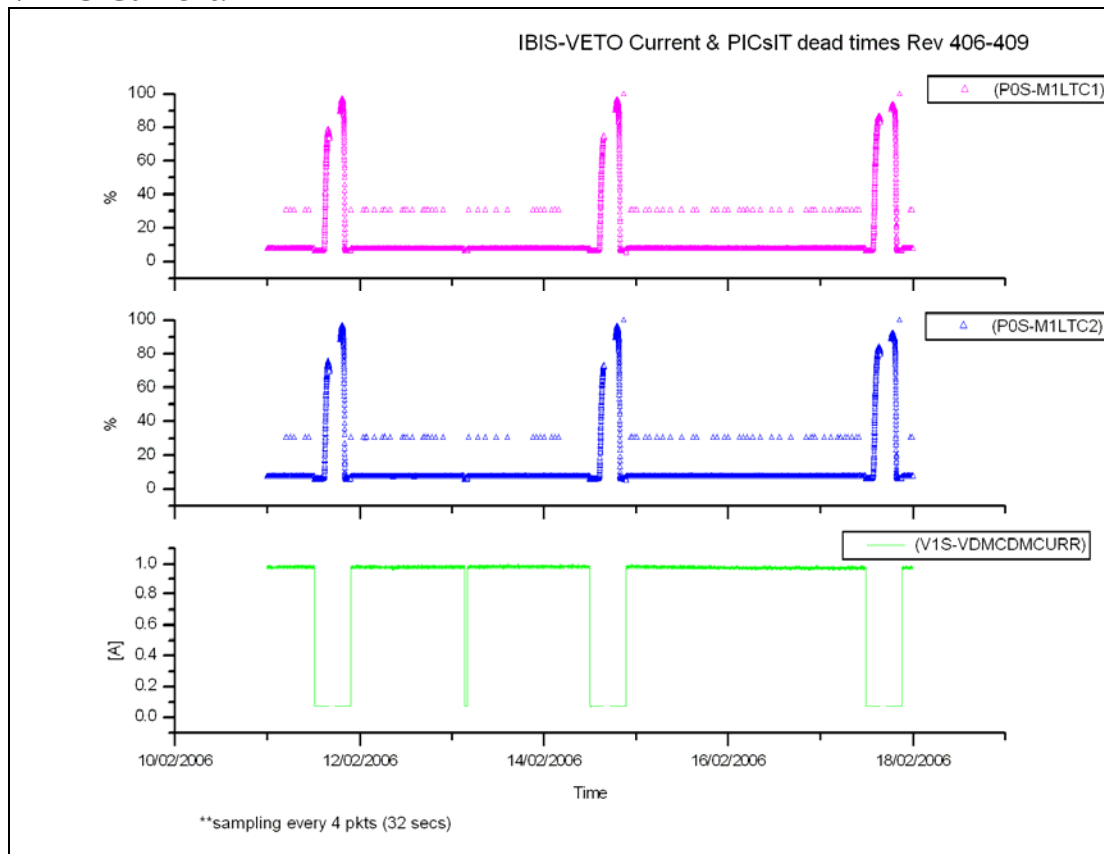


VETO vs Payloads Counters:

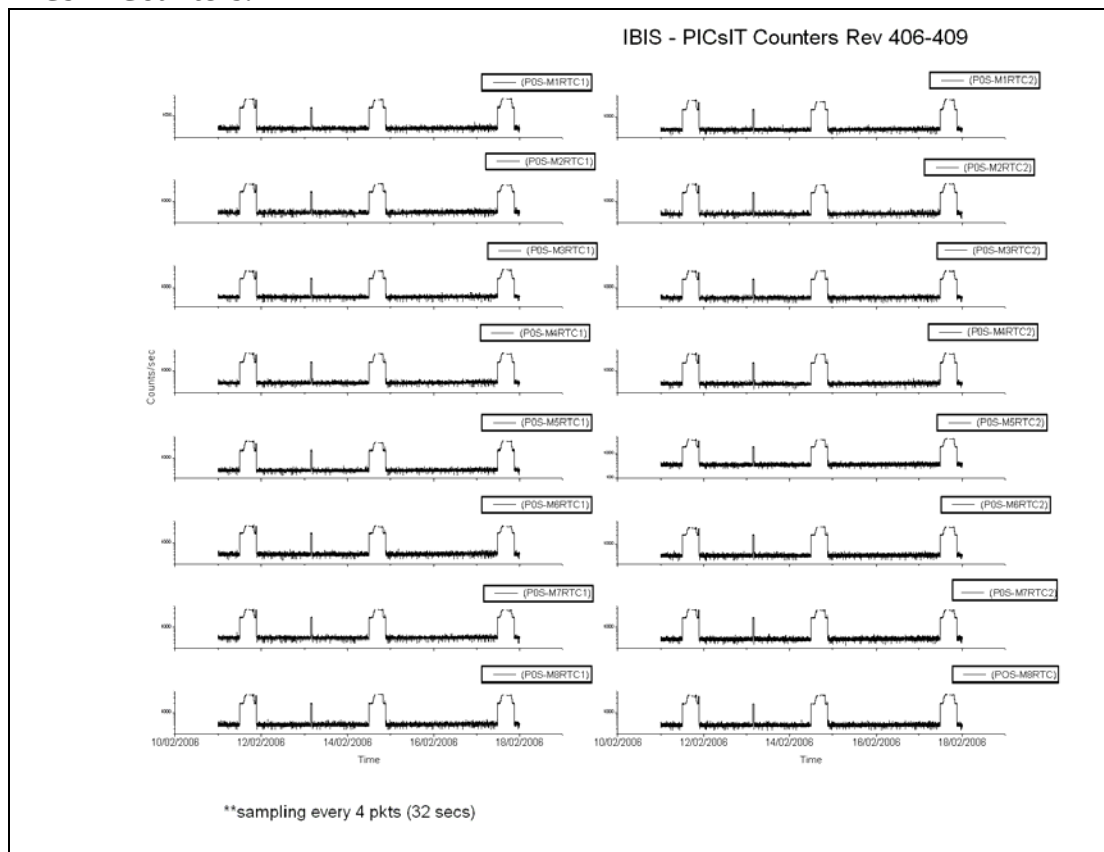


The week was characterised by low radiation.

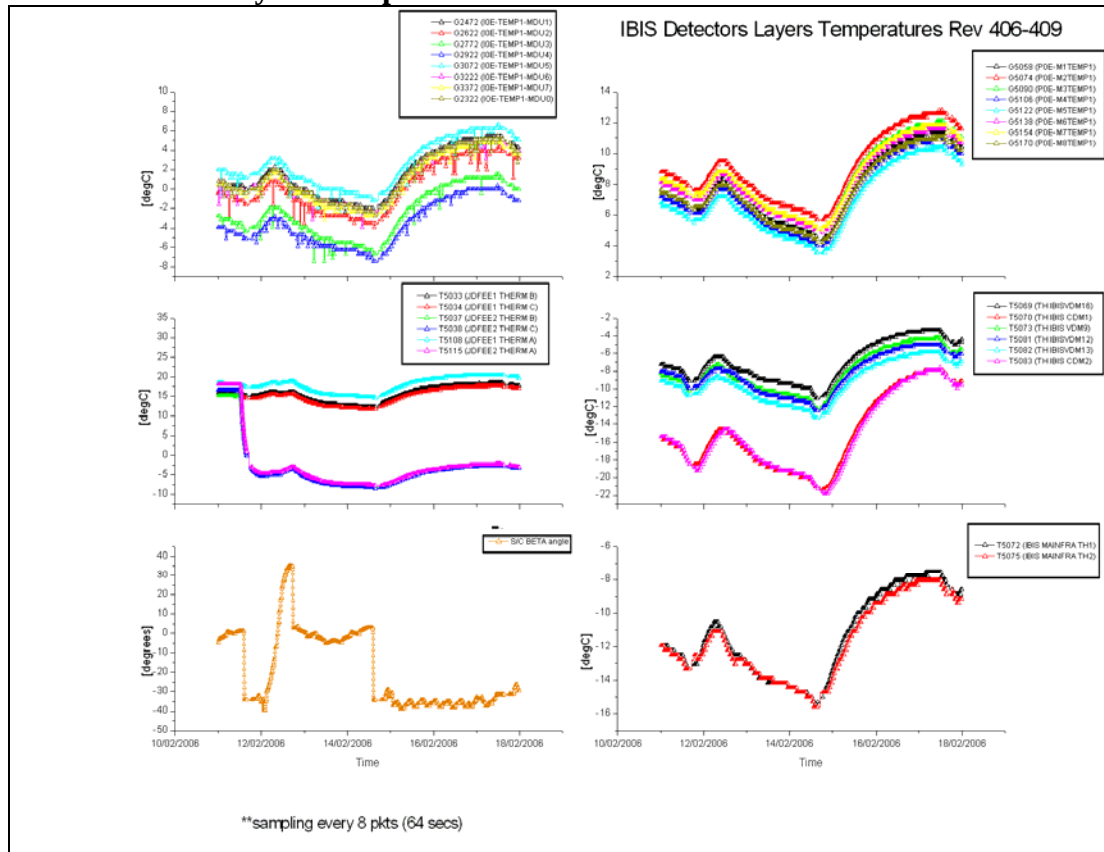
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2006.042 (11/02/2006):

At 12:11Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 21:37Z. As this happened inside the radiation belts, according to V-VLT-1 no action was taken.

Inside the radiation belts, TM parameter G5003 (P0S-M1RTC2) was toggling OOL high. According to P-CNT-1, no action was taken.

DoY 2006.044 (13/02/2006):

At 03:18Z, TM parameter G8015 was reported Out Of Limit high due to an IREM anomaly which forces IBIS into Stand-By mode. It went back inside limit at 04:04Z when IBIS was recovered and back to Scientific Standard mode.

DoY 2006.042 (11/02/2006):

At 11:55Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 21:22Z. As this happened inside the radiation belts, according to V-VLT-1 no action was taken.

Inside the radiation belts, TM parameters G5013 (P0S-M3RTC2) and G5028 (P0S-M6RTC2) were toggling OOL high. According to P-CNT-1, no action was taken.

At 20:58Z, TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, as this happened inside radiation belts, no action was taken.

At 21:31Z TM parameter G6061 (V1S-CAL COUNT) was reported OOL low-low with the value 1996 and back. According to V-CAL-1, no action was taken.

DoY 2006.042 (11/02/2006):

At 11:38Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 21:06Z. As this happened inside the radiation belts, according to V-VLT-1 no action was taken.

Inside the radiation belts, TM parameters G5003 (P0S-M1RTC2), G5012 (P0S-M3RTC1), G5022 (P0S-M5RTC1) and G5028 (P0S-M6RTC2) were toggling OOL high. According to P-CNT-1, no action was taken.

At 20:32Z, TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, as this happened inside radiation belts, no action was taken.

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

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

The high levels of the JEM-X2 Software Trigger are during periods when JEM-X2 is in Data Taking but with a TM allocation of 1 packet/cycle. At the start of each pointing (when the DPE buffer is flushed) the Software Trigger is at a normal value but then builds up as the buffer fills and the grey filter reduces.

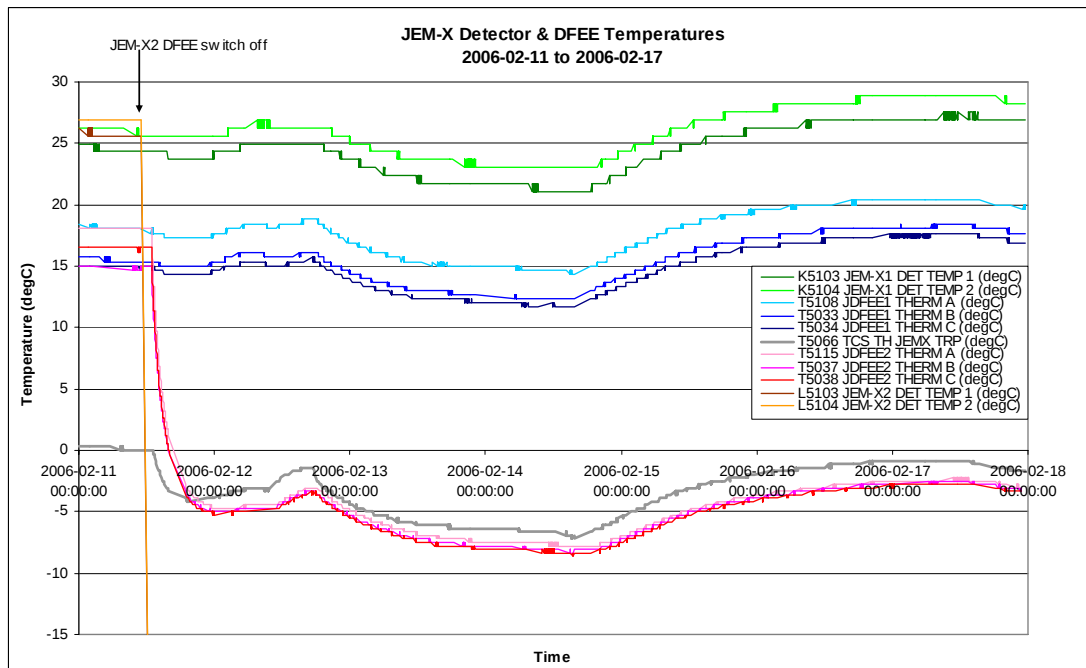
¹ Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.



8.3.4.2 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.

The effect of the switch-off of the JEM-X2 DFEE on 2006-02-11 is evident. The JEM-X1 temperatures decreased by a few degC and those of JEM-X2 by ~20 degC.



² Data sampled (1 frame in 8)

8.3.4.3 JEM-X Daily Report

2006-02-11 (DOY 042, Rev 406-407)

In line with INTGSCCR-82 (INT_OR_0236), the JEM-X2 DFEE was switched off after radiation belt entry of revolution 406 via FCP_JEM2_9010 starting at 12:15Z. As this procedure was performed inside radiation belts, the JEM-X2 reactions to the radiation belt entry/exit times had to be disabled throughout the procedure. Initially, the BCP radiation belt times were still enabled and hence OEM 231 JEM-X2 AUTO EVENT 1 was generated when TC L0008 STATE SAFE of sequence LS9010 was sent and the Setup TC L0009 was rejected with OEM 136 JEM-X2 TC REJECTED 9. The JEM-X2 BCP override for radiation belt times was then disabled at 12:43Z and the rest of FCP_JEM2_9010 proceeded nominally. The JEM-X2 DFEE was switched off at 12:49Z.

When setting the JEM-X2 BCP overrides as part of the DFEE switch-off above, the reaction to the BCP TM SHARE was reset to ENABLED (following the previous disabling in line with OCR-207).

At 19:15:19Z the following OEMs were received from JEM-X2:

OEM 169 JEM-X2 LSL PROBLEM 9

>> indicating a timeout error on the Low Speed Line

OEM 137 JEM-X2 TC REJEC 10

>> indicating a failed TC (command execution started but failed)

The failed TC was the L0021 SW READ INT uplinked at 10:48:30Z as part of the ED LESAFE02 (which could not be executed at the time due to JEM-X2 having only 1 packet/cycle). The above OEMs were generated just after the time when the bandwidth to JEM-X2 was increased from 1 packet/cycle to 9 packets/cycle via the ED DEBWHI00 (Assign TM bandwidth for patch and dump). Therefore, the command rejection is due to the fact that the report TC L0021 had remained pending until the time when the TM allocation was enough to generate the report packet, however at this time the JEM-X2 DFEE was OFF and the TC could no longer be executed.

In line with OCR-206, the JEM-X1 microstrip gas gain voltage was reduced from 76 RAW to 75 RAW at the start of revolution 407. This was set via the POS, with the IODB having been updated accordingly in the last release (perigee pass of revolution 398-399). INT_OR_0237 had been applied to cover the period of inconsistency.

2006-02-12 (DOY 043, Rev 407)

Nothing to report

2006-02-13 (DOY 044, Rev 407)

Due to an IREM anomaly (Jump in the MSW of the block counter, see INT_SC-141), at 03:18:52Z the TM parameter K5315 RAD MONITOR 1 went Out of Limits High (value = 48256). This did not affect JEM-X1 as the reactions to the IREM counters are currently disabled.

2006-02-14 (DOY 045, Rev 407-408) to 2006-02-17 (DOY 048, Rev 408-409)

Nothing to report

8.3.5 OMC Operations

2006-02-11 (DOY 042, Rev 406)

Due to AOCS problems, the slew to the attitude for pointing 04060051 failed. The impact was that pointing was delayed from a planned start of about 00:09:00 to 00:31:49, and the duration of the observation shortened from a planned 3334 to 1976 seconds.

2006-02-12 (DOY 043, Rev 406) to 2006-02-12 (DOY 043, Rev 407)

Nothing to report

2006-02-13 (DOY 044, Rev 407)

At 03:18:46 an IREM SEU forced the unit to SAFE mode. It was manually recovered to Stand-by mode at 03:41:49, and the commands for pointing manually uplinked, with the unit back into Normal mode at 03:45:18. The effect was a 20 minute delay in the start of pointing 04070042, resulting in the duration for that pointing being cut from a nominal 3334 to 2128 seconds

2006-02-14 (DOY 045, Rev 407) to 2006-02-15 (DOY 046, Rev 408)

Nothing to report

2006-02-16 (DOY 047, Rev 408)

At 14:31, a manual Reaction Wheel Bias had to be performed, the impact was the duration of pointing 04080046 was cut from a planned 3453 to 856 seconds.

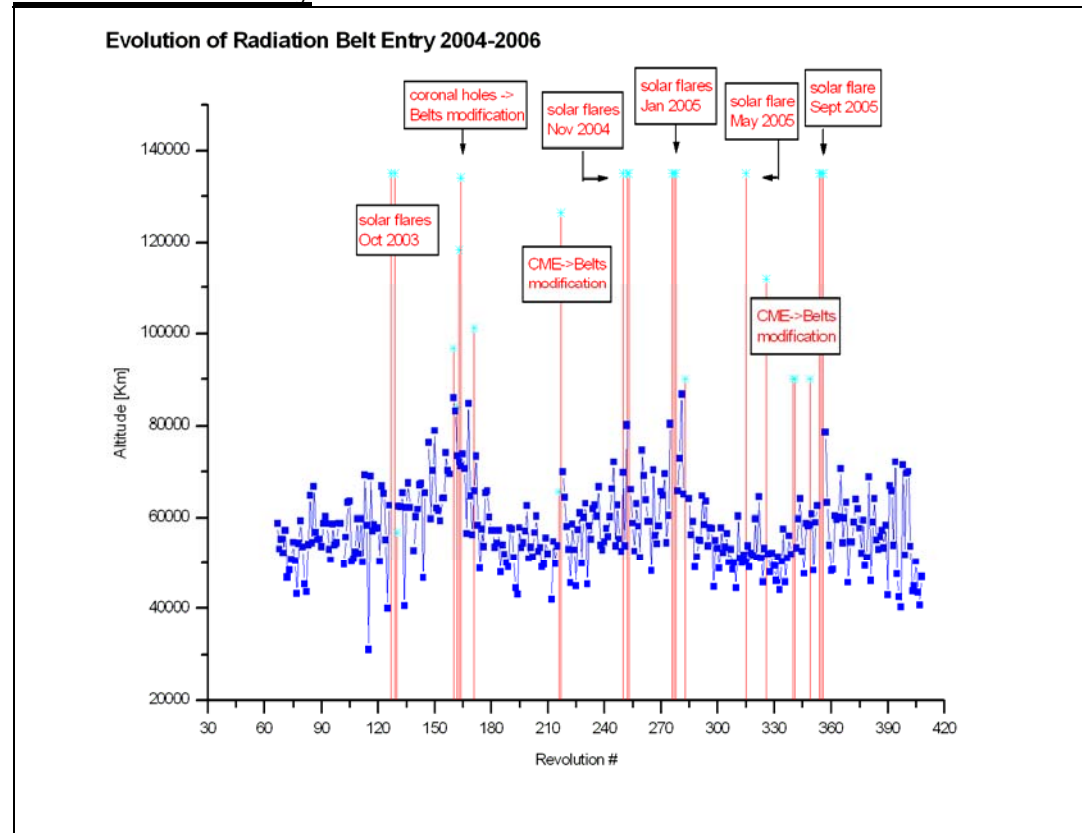
2006-02-17 (DOY 048, Rev 409)

Nothing to report

On DoY 042 at 12:11:26, DoY 045 at 11:55:10 and DoY 048 at 11:38:46 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

2006-02-13 (DOY 044)

At 03:18Z, a jump in the MSW block counter (U9901 from 13 to 3468) was observed. This apparent internal timing problem triggered a very high proton count-rate (U9919 = 48256) as well as several Out Of Limits and corrupted telemetry parameters.

The anomaly affected the instruments since the proton count-rate crossed both OMC and IBIS thresholds (JEMX and SPI IREM automatism being disabled on PIs request). Both instruments entered their respective safe configuration at 03:18Z. OMC was recovered at 03:43Z and IBIS at 04:14Z.

At the time of the anomaly, the radiation background was quiet according to the Monitoring Tool (SEIS).

From a first investigation, this anomaly is similar to the one that occurred on 19/05/2004

(INT_SC_80) but this time the unit did not cure the problem itself. The MSW of the block counter did not come back to its initial value after the jump and corrupted data kept being reported.

The status of the unit pre-anomaly (03:18:37Z) was:

- LCL current = 0.073 A
- radiation counters: proton = 3, dose = 0 and electron = 24
- LSW of the IREM block counter = 52618
- MSW of the IREM block counter = 13.

At the time of the anomaly (03:18:45Z) it was:

- LCL current = 0.073 A
- radiation counters: proton = 48256, dose = 1 and electron = 0
- LSW of the IREM block counter = 52619
- MSW of the IREM block counter = 3468
- and the IREM status word was 16397 [dec]:
0 Integral Ground Link Off
1 BIT/TDB failed
0 Accumulation off
0 Integral Counting off
0 Operation Mode = Standard
0 Command validity = invalid
0 5.0 Voltage Out of range = no
0 6.0 Voltage Out of range = no
0 High Voltage = off
0 Checksum failure = no
0 Watchdog Elapsed = no
0 Electron Alarm Underactivity = no
1 Electron Alarm Hyperactivity = yes
1 Proton Alarm Underactivity = yes
0 Proton Alarm Hyperactivity = no
1 IREM state = busy.

However this value is probably irrelevant during the anomaly.

The first cycle after the anomaly (03:18:53Z) reported:

- LCL current = 0.088 A (inside the determination of the lsb)
- radiation counters: proton = 48256, dose = 1 and electron = 0
- LSW of the IREM block counter = 65535 (FFFF hex)
- MSW of the IREM block counter = 3469.

The second cycle after the anomaly (03:19:01Z) reported:

- LCL current = 0.073 A
- radiation counters: proton = 48256, dose = 2 and electron = 0
- LSW of the IREM block counter = 0
- MSW of the IREM block counter = 3470.

To recover IREM the following activities were performed:

- a complete dump of the memory starting at 10:17Z
- a power reset of the unit: TC P3130 (power off) and TC P3131 (power on)
- an "usual" recovery resuming CRP_SYS_2570 and applying the patch FCP_RM_0080).

2006-02-17 (DOY 048)

At 15:09Z, TC U4921 failed completion, however, the TM indicated the command had succeeded.

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]
406	RAD_ENTR R 2006-02-11T12:11:22Z	2006-02-11 14:13:50	43494.9	2006-02-11 13:26:11	49981
407	RAD_EXIT R 2006-02-11T21:26:23Z	2006-02-11 20:36:46	>>23321.1	2006-02-11 20:36:11	32323
407	RAD_ENTR R 2006-02-14T11:55:04Z	2006-02-14 14:15:26	40685.7	2006-02-14 13:18:48	48709
408	RAD_EXIT R 2006-02-14T21:10:03Z	2006-02-14 20:17:10	>>23319.5	2006-02-14 20:18:48	32189
408	RAD_ENTR R 2006-02-17T11:38:39Z	2006-02-17 13:21:18	<46898.5	2006-02-17 12:58:48	49002
409	RAD_EXIT R 2006-02-17T20:53:58Z	2006-02-17 20:10:06	<<42312.0	2006-02-17 20:08:48	33407

Reference

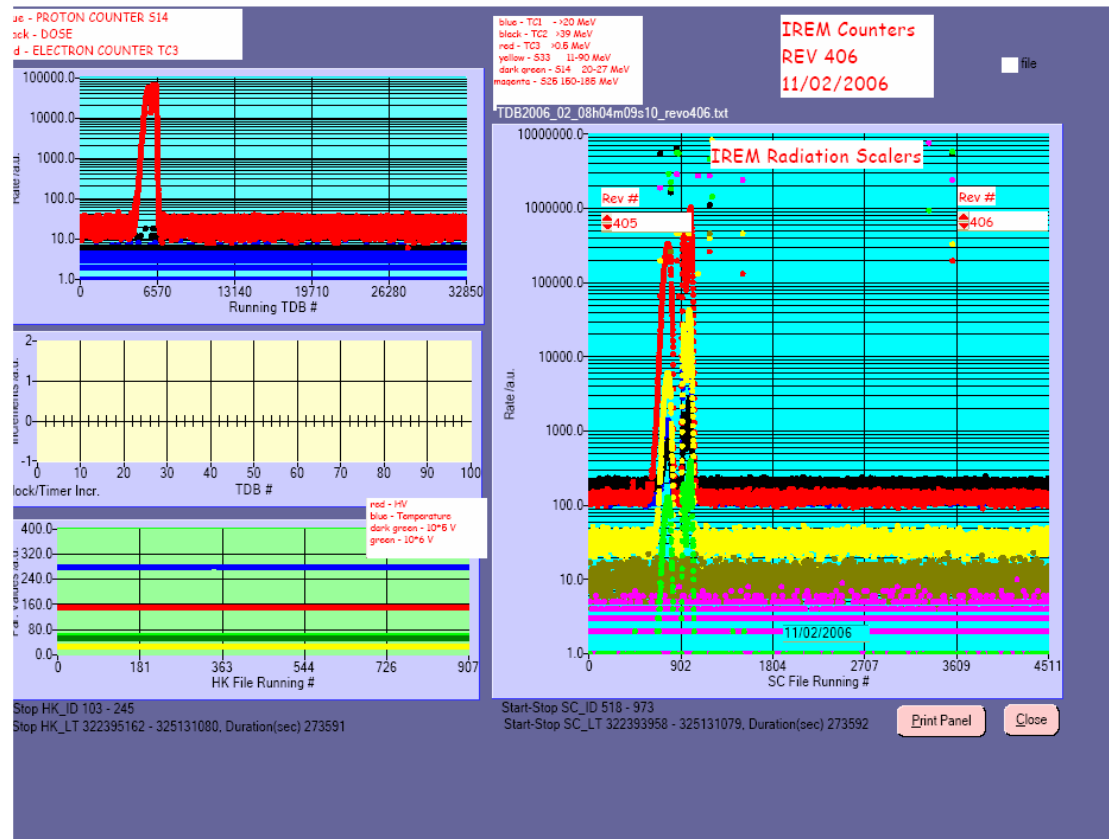
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

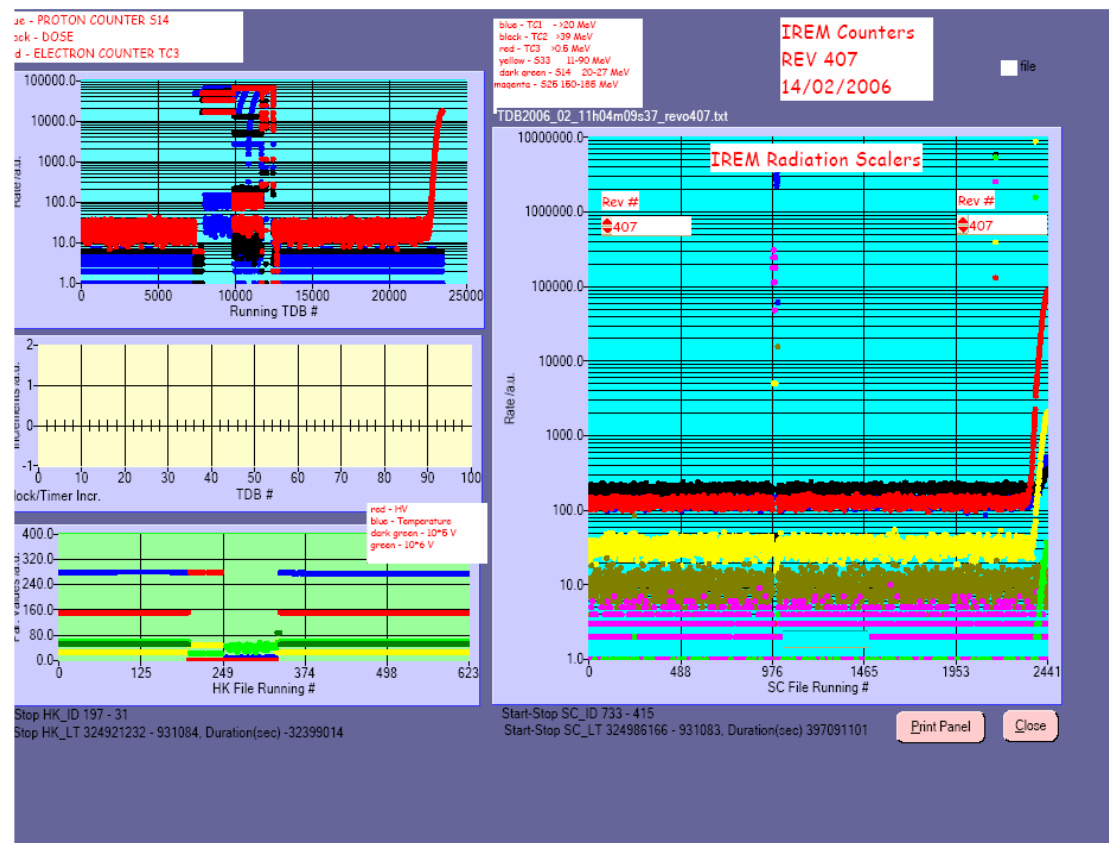
Large error vs reference (more than 30 minutes)

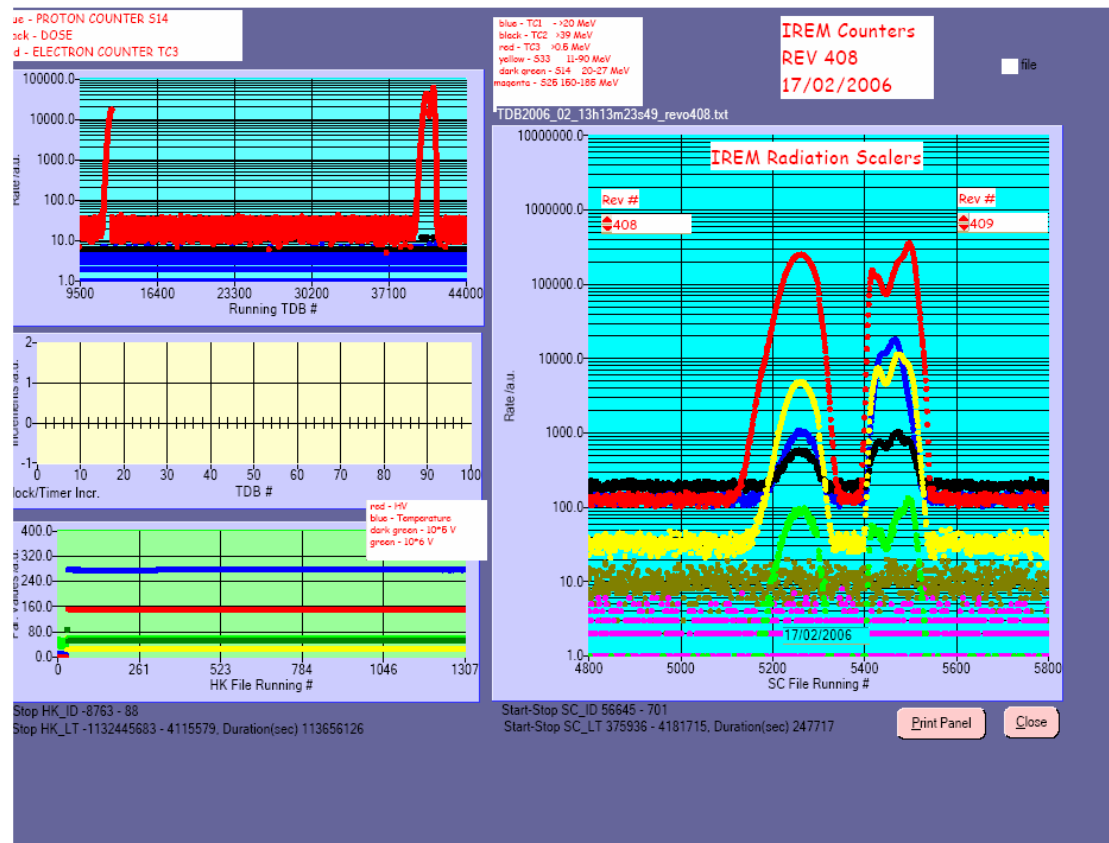
Radiation Spike

IREM radiation counters:



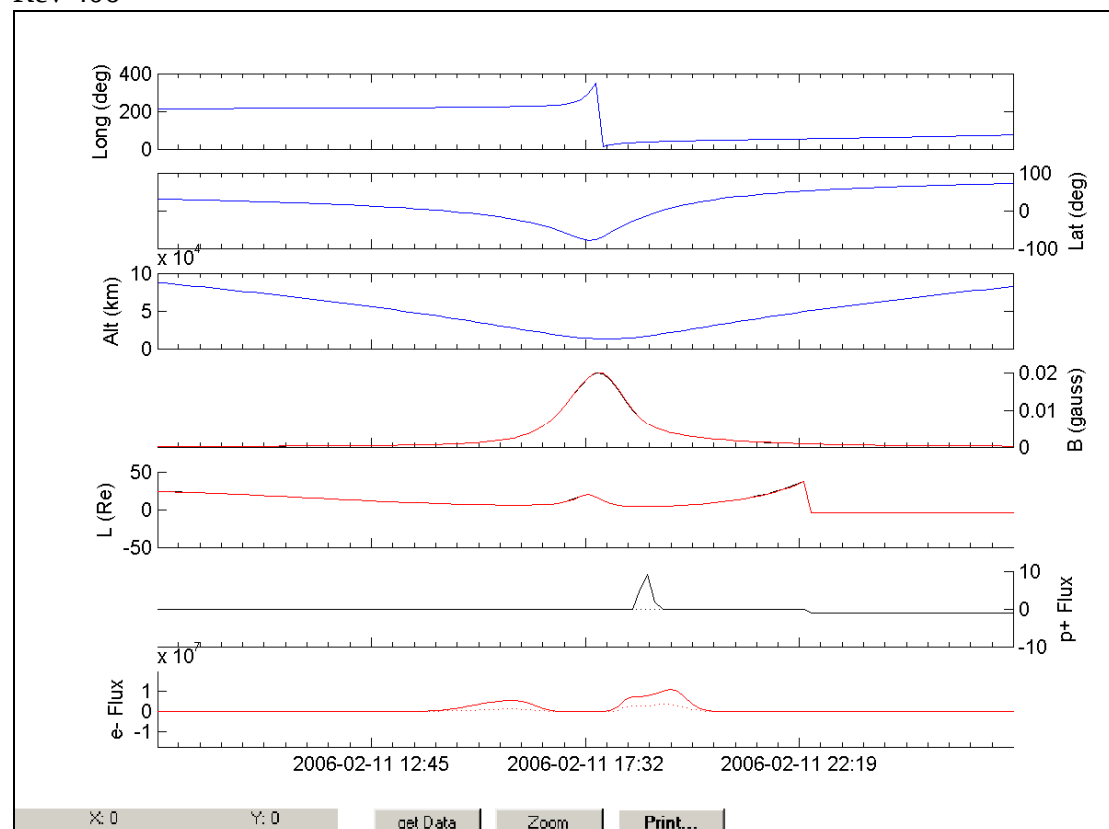
Due to IMCS problems, data for the radiation belt passage from 406 to 407 are not available.



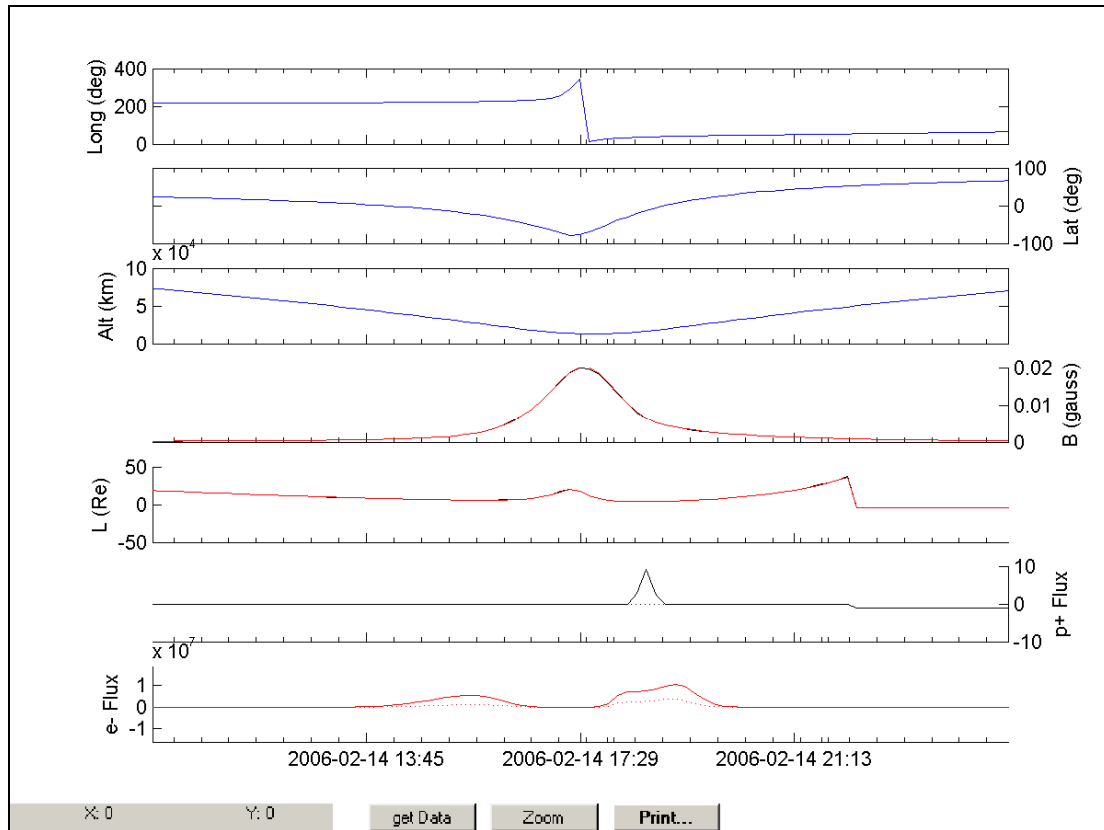


IREM Predicted Radiation Belt Passages:

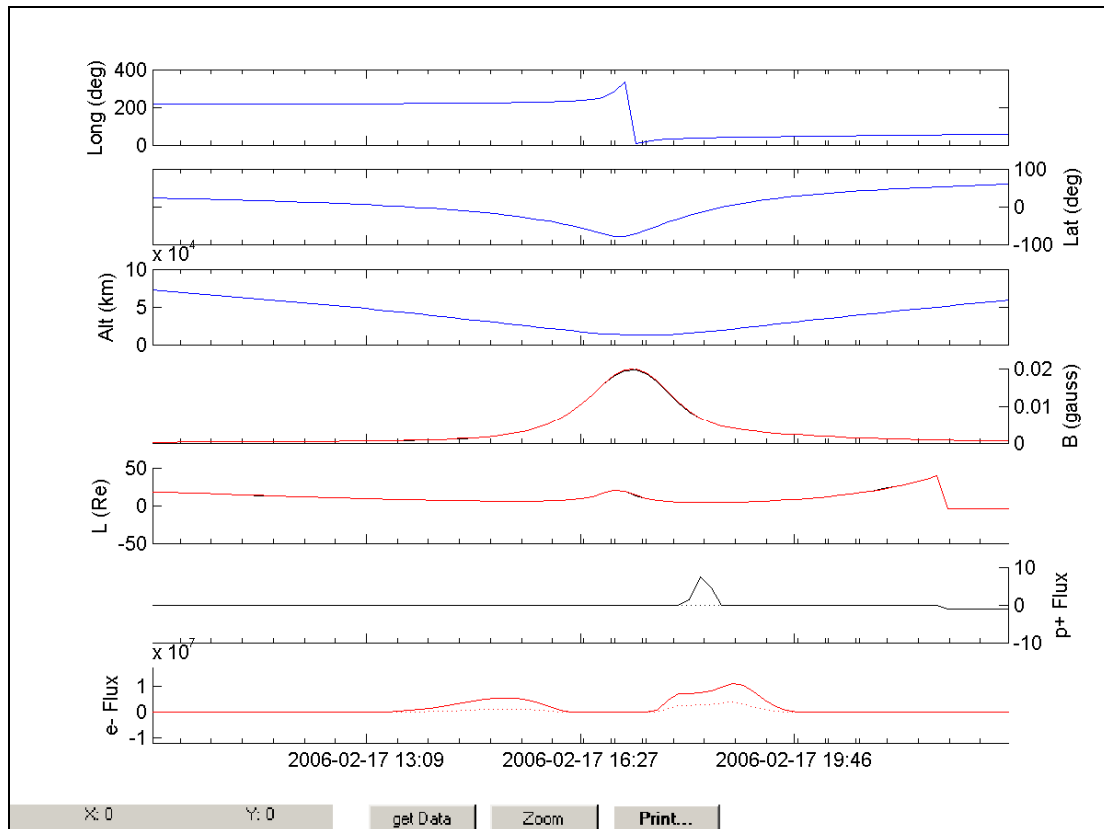
Rev 406



Rev 407



Rev 408



SEC-GOES Observed Particles Fluxes:

