

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 221
Week 50
18.12.06
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 09.12.06 until 15.12.06 (both dates inclusive) and covers the revolutions 508 and 509.

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 entirely of hexagonal dithers of MCG -05-23-016 (RA 09:47:40.10, DEC -30:56:56.0), and EXO 0748-676 (RA 07:48:33.30, DEC -67:45:00.0).

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.

The period was characterized by strong solar activity (see IREM report).

No slews were missed during the observation period.

The fuel consumption over the period between 08/12/2006 and 15/12/2006 was 0.1013 Kg. The remaining propellant is in the order of 149.5216 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

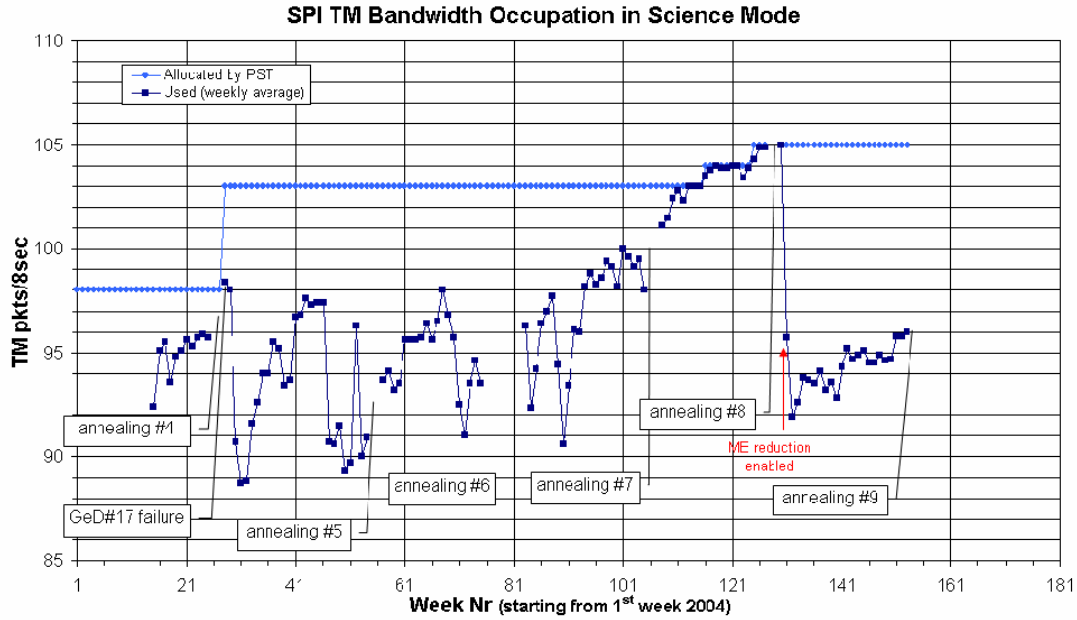
3.2.1 SPI

The overall status of the gamma-ray spectrometer is nominal. The 9th SPI annealing started on 4th December, after radiation belt entry of revolution 505, and is progressing nominally. The summary annealing timeline is included in the future activities section of this report. The following table reports the major events/steps performed so far (i.e. up to 15th December) since the start of the annealing:

Date/Time	Activity
04/12/2006 10:00Z	Configure SPI for start of Annealing and stop SPI active cooling
04/12/2006 11:23Z	Annealing Heater Main ON
04/12/2006 13:23Z	Annealing Heater Redundant ON
05/12/2006 23:22Z	Cold plate temperature reached 377K (104degC)
14/12/2006 13:06Z	Stop SPI Annealing: Annealing Heater Main and Redundant OFF; Heat Pipe Heater Main and Redundant OFF; Antifreeze Heater 1A ON

The ACS Calibration, due to start on the 14th December, at the start of the passive cooling phase, was postponed due to high background radiation conditions following a solar flare.

Due to the ongoing annealing operations, the instrument was kept in CONF mode and the assigned TM bandwidth was 46 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.

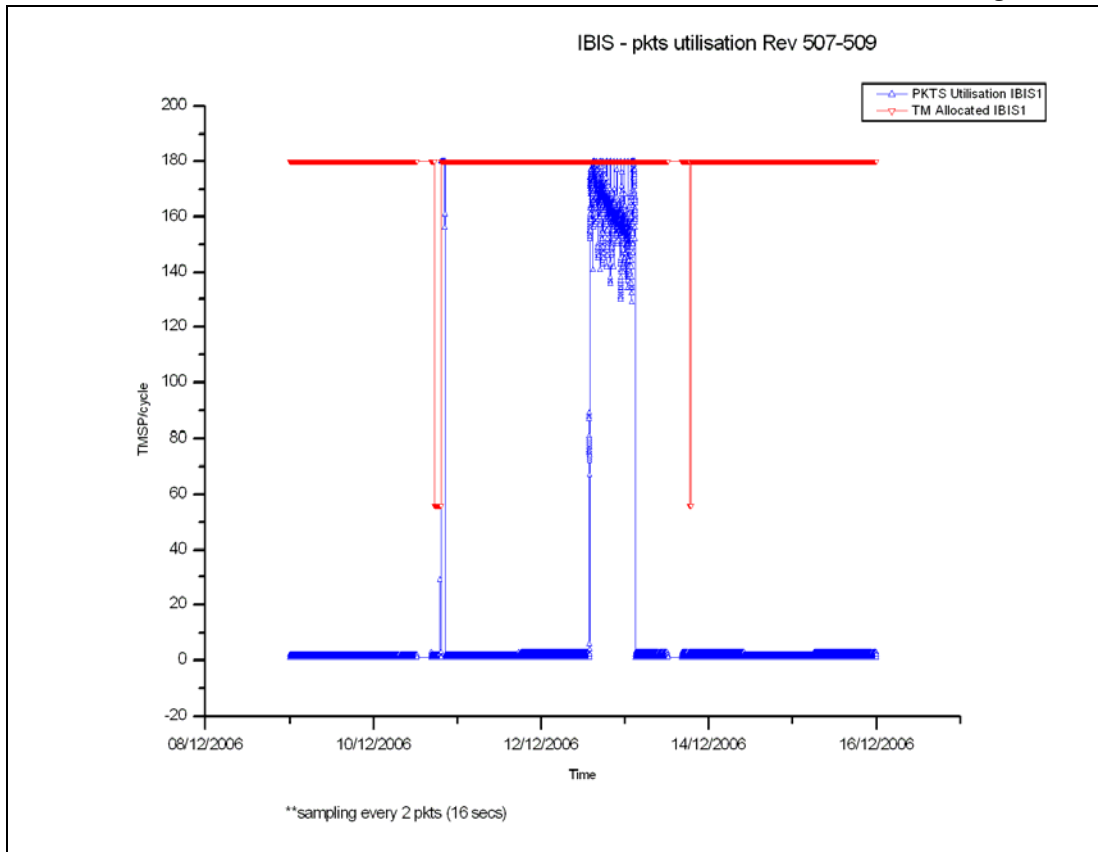
3.2.2 IBIS

The overall status of the unit is nominal.

Due to high radiation background, IBIS was in Safe configuration during most of the reporting period.

During the reporting period, the PST allocation to IBIS was 180 TMPS/cycle due to on-going SPI annealing. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 164.11 TMPS/cycle, up 34.70 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 radiations conditions as a result of a solar flare, JEM-X1 spent the majority of the reporting period in Safe mode as follows:

- From the start of the reporting period until 2006-12-12 at 16:19Z (back to Data Taking)
- From 2006-12-13 at 02:54:52Z for the rest of the reporting period.

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, 22 of the 146 planned science pointings for OMC were executed nominally, 124 were lost due to high radiation.

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

3.2.5 IREM

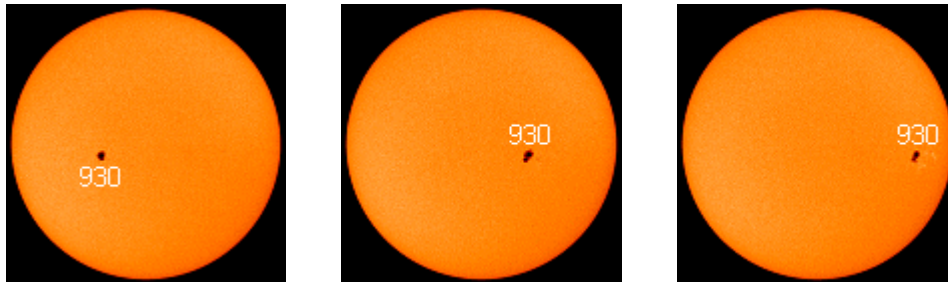
The overall status of the unit is nominal.

On 13/12/2006 at 10:39Z, the IREM reset #40 occurred. It had no impact on instruments that were already in Safe configuration due to Radiation Belts passage. The unit was fully recovered by the operator at 11:50Z.

Solar Activity

The observation period was characterised by high solar activity.

Very active sunspot 930 crossed the surface of the Sun during this week (see pictures below). It posed threat for M- and X-class solar flares during the whole observation period and unleashed an X3 flare on 13/12/2006.



Images of the Sun on 10/12/2006, 13/12/2006 and 15/12/2006.

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. No slews were lost. The overall performance was nearly 100%.

4.1 Mission Operations Centre

The performance of the MOC was good this week. There were, however, a couple of instances where the packetizer task needed to be restarted, as the Manual and Auto-stacks were showing no TM, but the TM desktops tasks were updating merrily, there was no impact. 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, however, a couple of occasions of small TM drops from Redu, without impact. The overall performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

No new PSF's have been received this week, as they were already available well into January. Observations have been planned up to revolution 518.

TSF's up to revolution 514 have been received.

2. Observation status

No change since last week, still at revolution 497.

3. ISOC Science Data Archive

No news.

4. ISOC system

Version 14.0 is to be formally released on Monday but will only be implemented in operations after the holiday season on 8 January.

ISOC will step by step use the mailman system for handling mailing lists.

5. Problems

The review process of the AO-5 Key Programme proposals is somewhat delayed compared to the agreed schedule due to travel by TAC members.

4.3.2 ISDC

Status of ISDC observation processing on 18/12/2006:

- Latest Standard Analysis completed: observation 04200870001 (Ginga 1826-24, Revolution 495) on 23/11/2006.

- Latest products archived: observation 04200240001 (PKS 0537-286, Revolution 493-494) on 24/11/2006.

- Latest observation products sent to the observer: observation 04200240001 (PKS 0537-286, Revolution 493-494) on 04/12/2006.

5 Special Events

6 Anomalies

The following problems that impacted operations were reported:

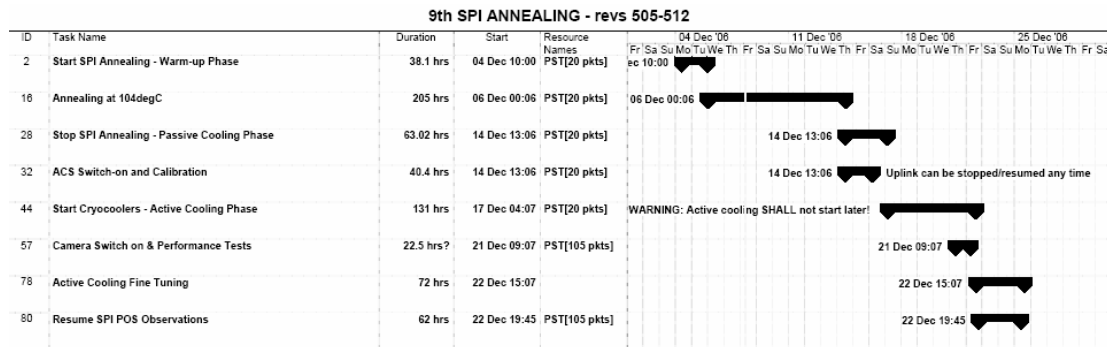
- On DoY 347, at 10:39, IREM SEU (#40) occurred. This had no impact, as IBIS & OMC were in SAFE mode anyway due to radiation belt entry. IREM was recovered at 11:50, without impact.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-168	14/12/2006	IREM Anomaly: Reset of IREM_CSCI S/W #40, 13/12/2006	Payload	Open

7 Future Milestones

The 9th SPI annealing started on 4th December at belts entry of rev. 505. Below is the summary timeline of the planned annealing activities:



8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 508

The observations in revolution 508 consisted entirely of a Hexagonal dither of MCG -05-23-016 (RA 09:47:40.10, DEC -30:56:56.0), lasting ~59.2 hours.

Revolution 509

The observations in revolution 509 consisted entirely of a hexagonal dither of EXO 0748-676 (RA 07:48:33.30, DEC -67:45:00.0), lasting ~59.2 hours.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off, and SPI, which is undergoing annealing. The TM allocation was IBIS 180; SPI 46; JEM-X1 15; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-11-24T04:50:12.000Z	149.7545	F	Automatic TM processing.
2006-11-25T18:12:56.000Z	149.7504	F	Automatic TM processing.
2006-11-27T03:56:51.000Z	149.7281	F	Automatic TM processing.
2006-11-28T18:02:55.000Z	149.7250	F	Automatic TM processing.
2006-11-29T04:29:12.000Z	149.6942	F	Automatic TM processing.
2006-12-01T17:52:00.000Z	149.6890	F	Automatic TM processing.
2006-12-03T03:34:51.000Z	149.6679	F	Automatic TM processing.
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.

This report was generated Fri Dec 15 08:00:33 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, 09/12/2006 –15/12/2006

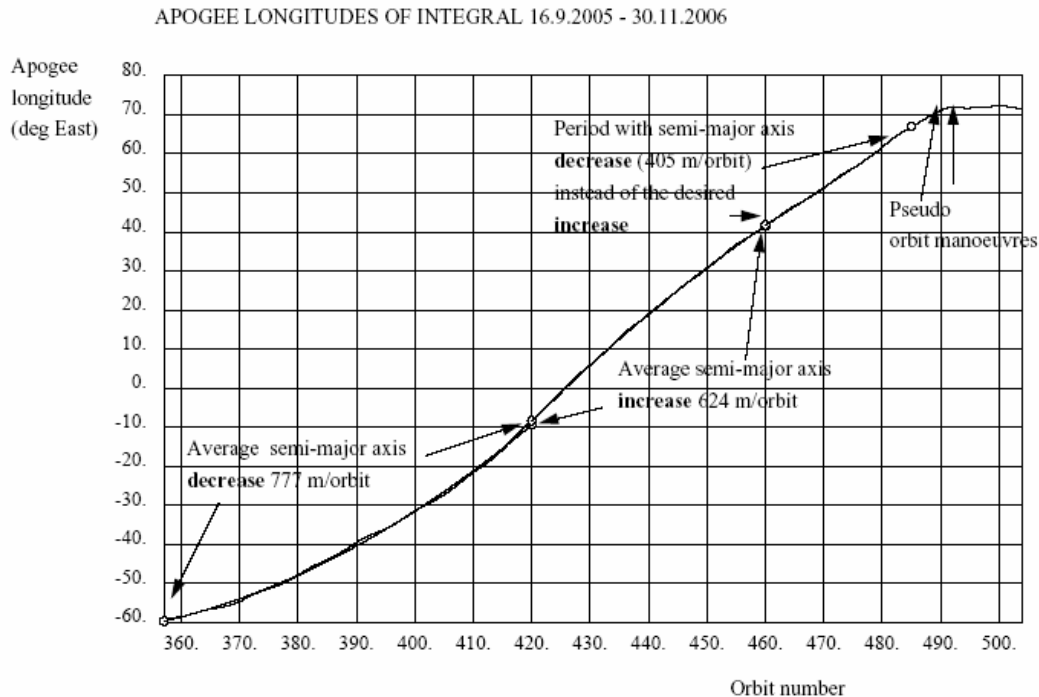
AOCS operations were executed from the Automatic Timeline.

During this period, 35 Open Loop Slews, 117 Closed Loop Slews and 5 Momentum Biases were executed.

No slews were missed from the TL during the observation period. Due to STR SEU filter exceeded the OTF was not reached during PID 05080063.

Orbit Control

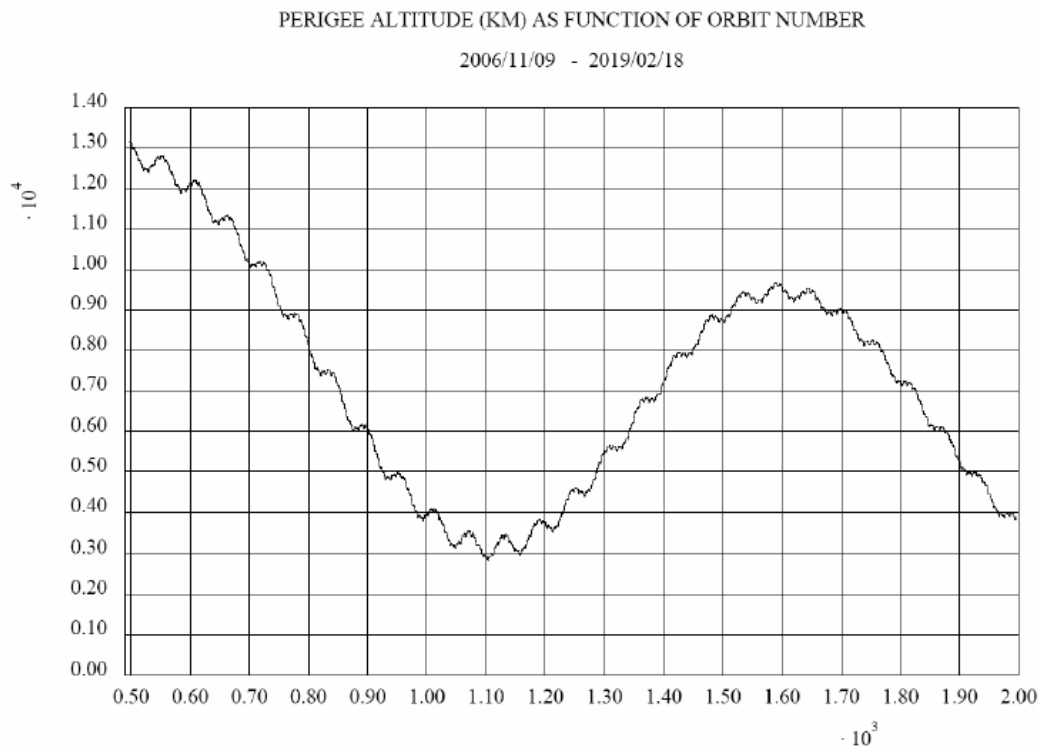
The attached plot shows the apogee longitude of Integral (in deg East) as a function of the orbit number for the period September 2005 - October 2006.



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. Below is reported the perigee altitude for the period 2006/11/09 - 2019/02/18.



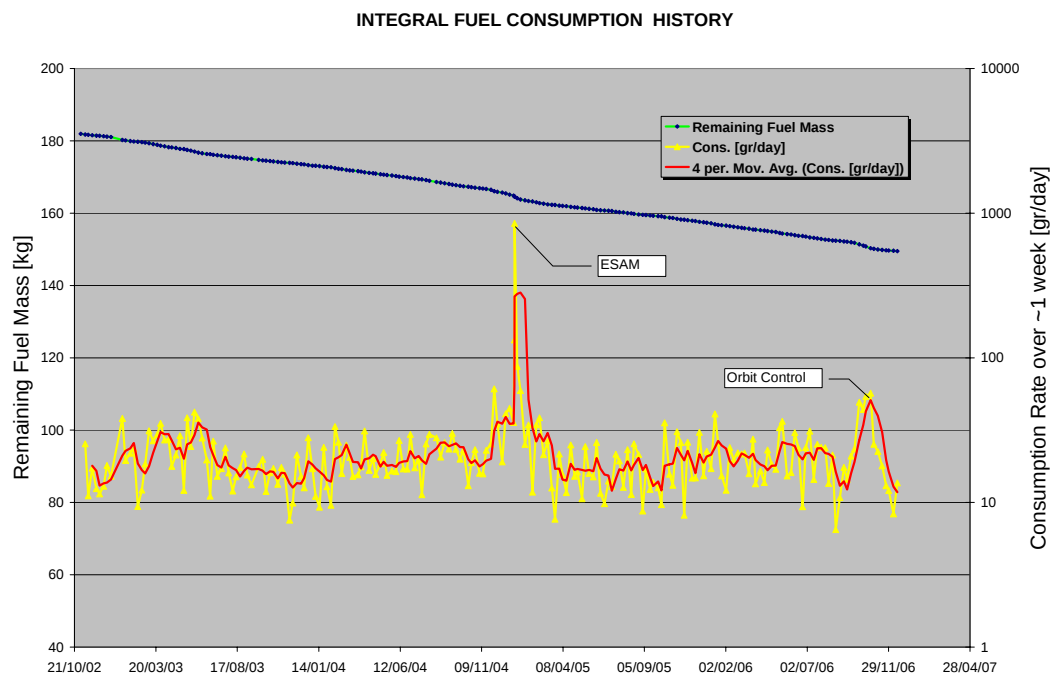
Perigee Height history; abscissa orbit number; ordinate perigee altitude in 10E+4 Km

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.

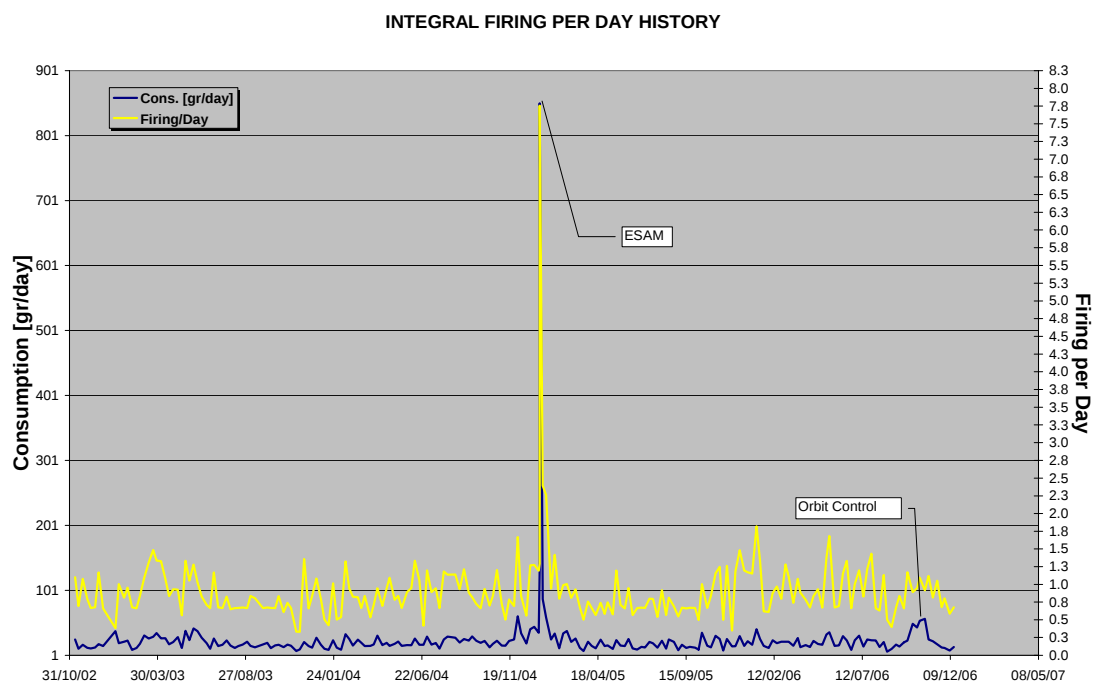
Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 15/12/2006 is reported in the plot below.

The large fuel consumption observed in the last months 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 starting of the eclipse season.

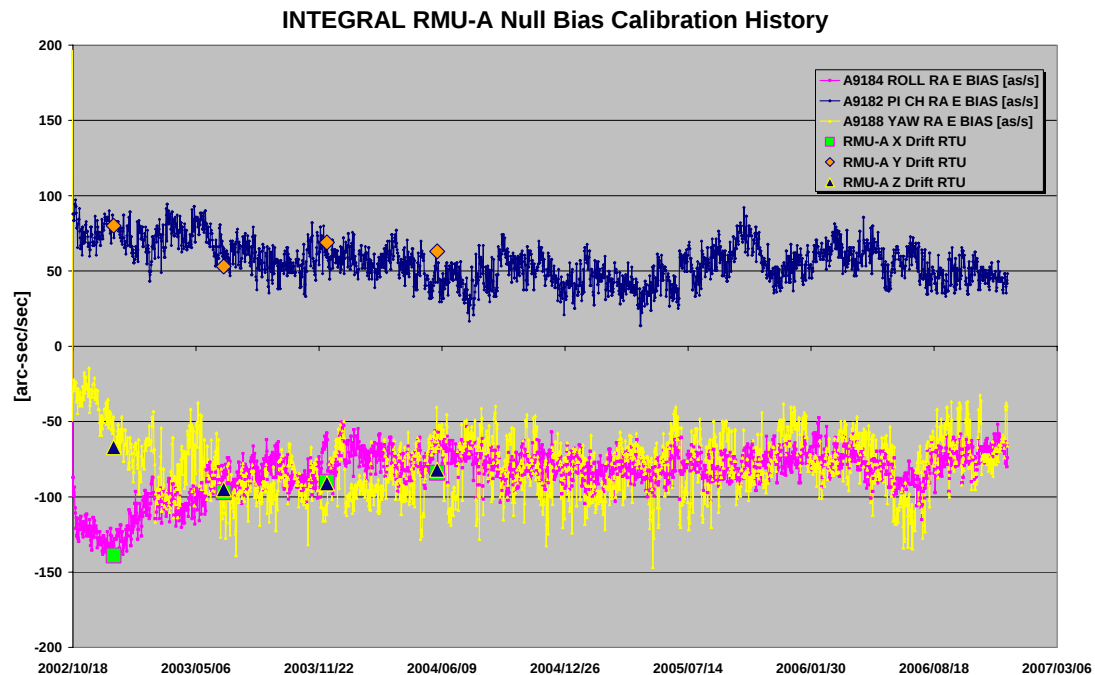


The firing\day over the period between 01/11/2002 and 15/12/2006 is reported in the plot below.

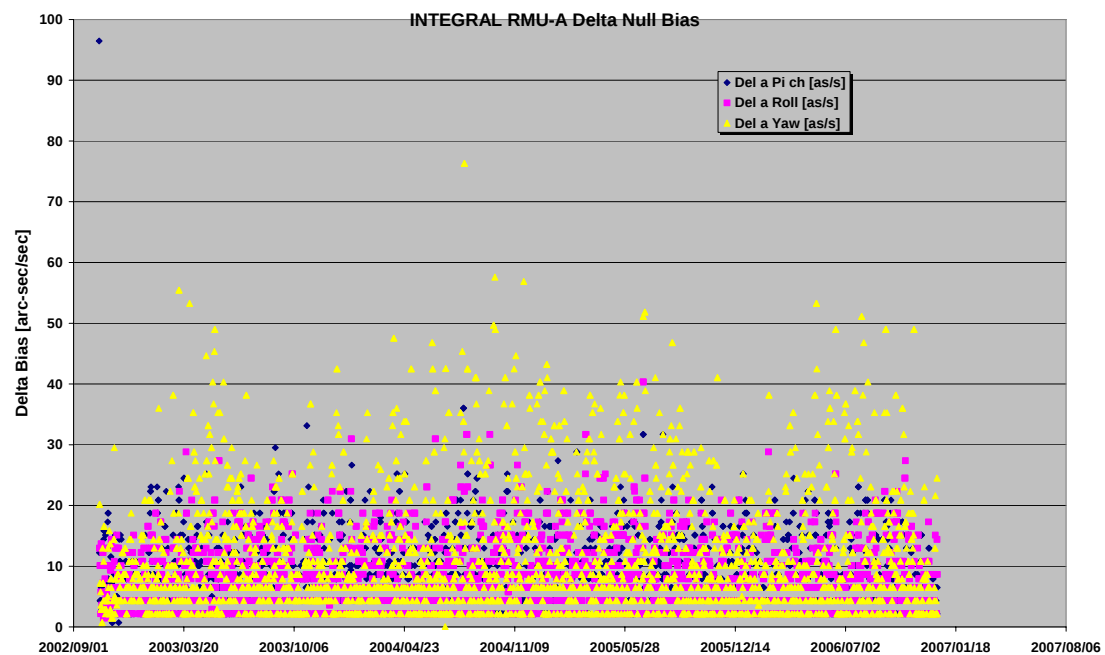


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 15/12/2006 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 15/12/2006 is reported in the plot below



09/12/06 (Day of Year 343, Revolution 507)

Nothing to report.

10/12/06 (Day of Year 344, Revolution 507-508)

Nothing to report.

11/12/06 (Day of Year 345, Revolution 508)

FDS failed update: at 09:31z the FD System failed the generation of update for slew ID 05080019. The system reported a problem in performing the attitude verification process: the orbit file was not available on the FDS. The delivery of the orbit products to the future operational platform reported some side effects on the delivery to the current operational platform. The task did deliver the orbit file to the main platform successfully but got stuck during the attempt to send the orbit products to the backup. During the recovery of this problem the orbit file on the main platform was touched and unavailable for a short while.

This caused the problem on the update generation process.

A manual recovery was performed by FD support and the next slew ID 05080019 update.

No impact on TL was reported.

12/12/06 (Day of Year 346, Revolution 508)

Nothing to report.

13/12/06 (Day of Year 347, Revolution 508-509)

STR ACC Threshold exceeded: at 04:58z – 07:01z -12:46z, the STR SEU threshold was exceeded due false events generated by the on-going strong solar activity.

Before the event, which occurred at 04:58z, a flare class X-3 was reported at 02:55z. The subsequent increasing proton flux, triggered a large number of false events causing the SEU threshold to be exceeded and IMU 1 switched ON. No recovery was performed.

The guide star was Mi 6.5 at CCD location [5049, -1554]. The new guide star picked after automatic mapping was Mi 8.4 at CCD location [8413, 7066].

During the event, which occurred at 07:01z, the SEU threshold was exceeded but the IMU 1 was not activated by the ACC as the event occurred inside the first minute after the end (<<SLEW END>> OEM) of the previous OSL. A manual recovery was performed by updating the next slew in TL.

The guide star at the moment of the false events was Mi 7.9 at CCD location [21018 , -17261].

During the event occurred at 12:46z, the SEU threshold was exceeded and an automatic mapping commanded by the ACC. The new guide star was maintained across the perigee passage and for following RWB activity at the beginning of rev 509, being the coordinates valid for the bias execution. No recovery needed.

The guide star was Mi 7.35 at CCD location [-14523, -2772]. The new guide star picked after automatic mapping was Mi 7.85 at CCD location [12123, -5734].

There was no impact on TL except that the OTF for PID 05080061 was shorter by 43 sec and the OTF was not reached during PID 05080063.

14/12/06 (Day of Year 348, Revolution 509)

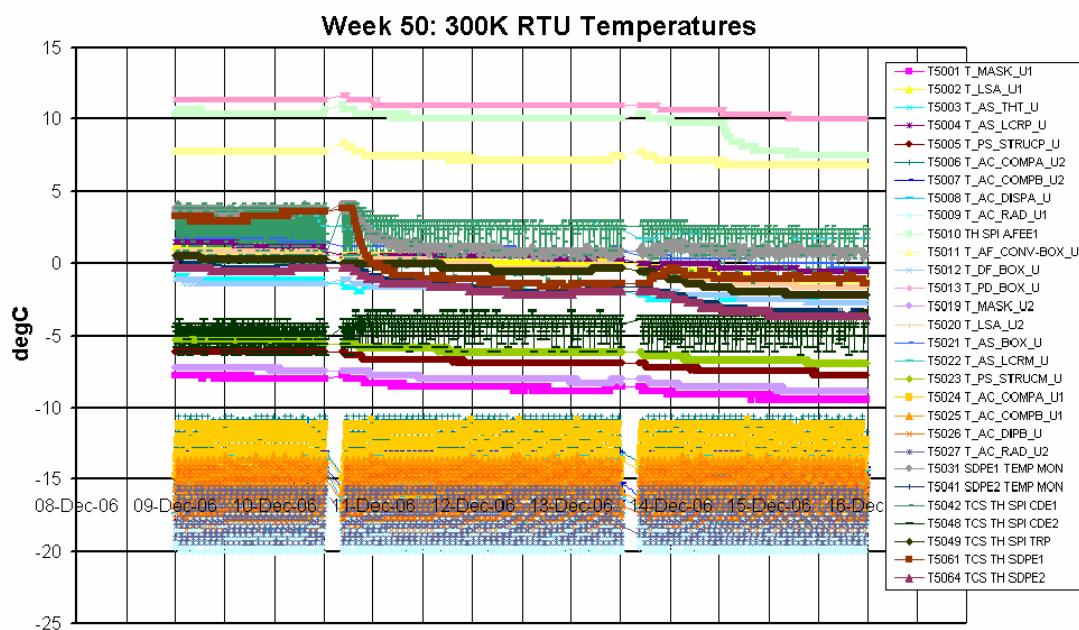
Nothing to report.

15/12/06 (Day of Year 349, Revolution 509)

Nothing to report.

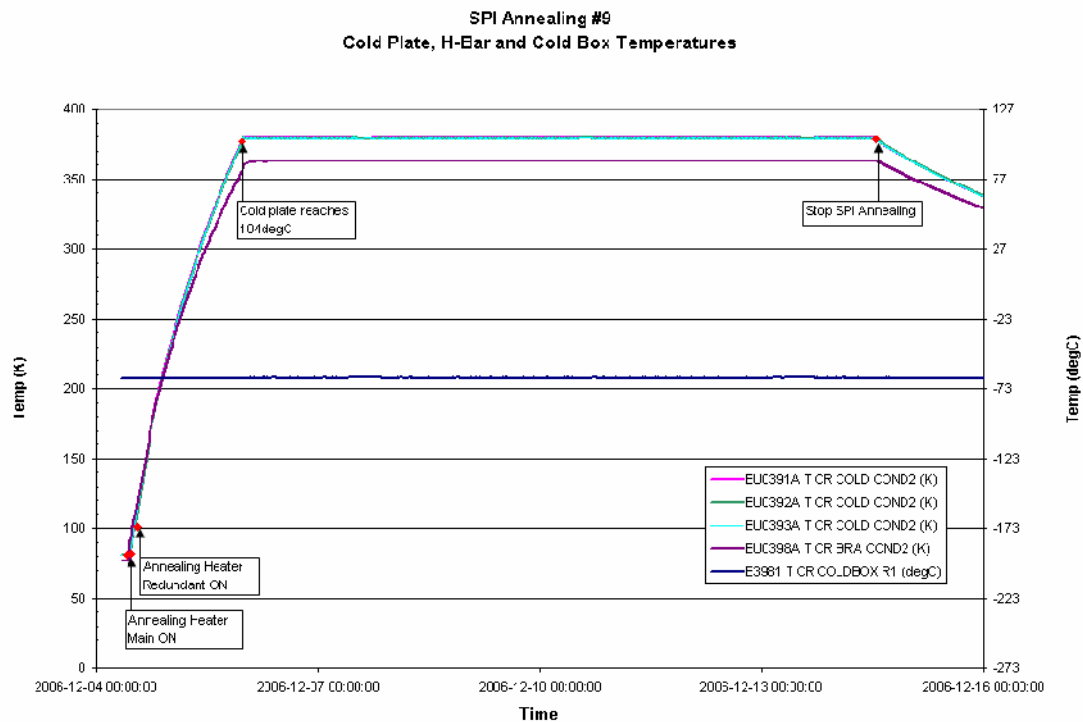
8.3.2 SPI Operations

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

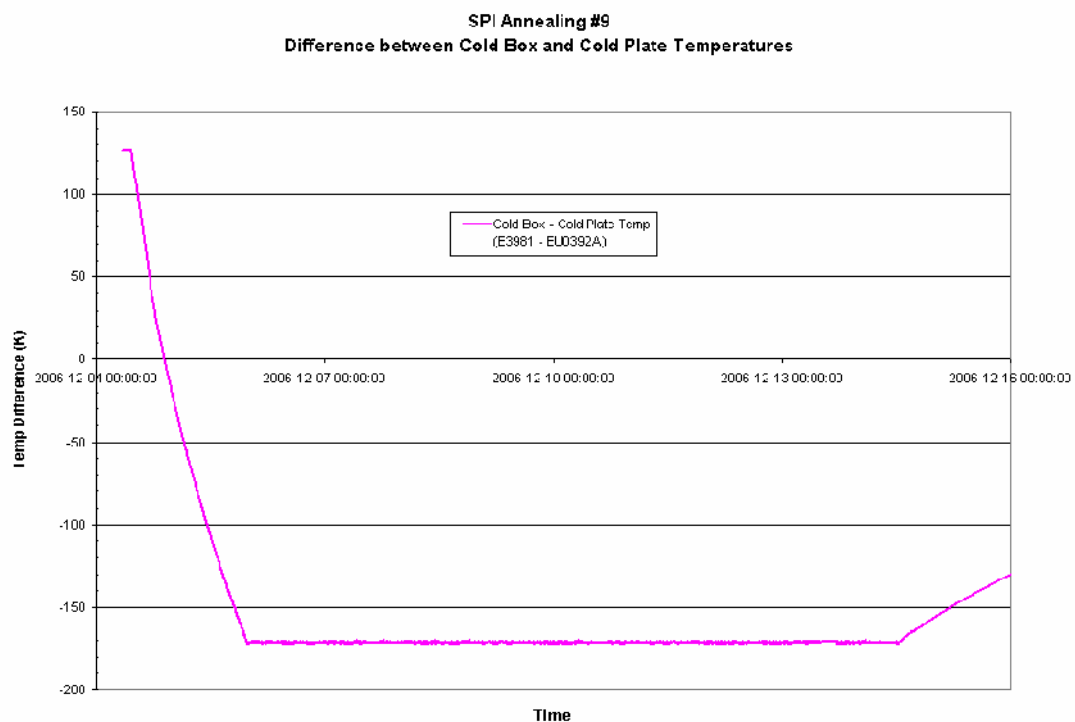


Stirling Compressors and Cryostat: The performance of the compressors is nominal. Due to the ongoing annealing operations, the cryocooler was off during the reporting period.

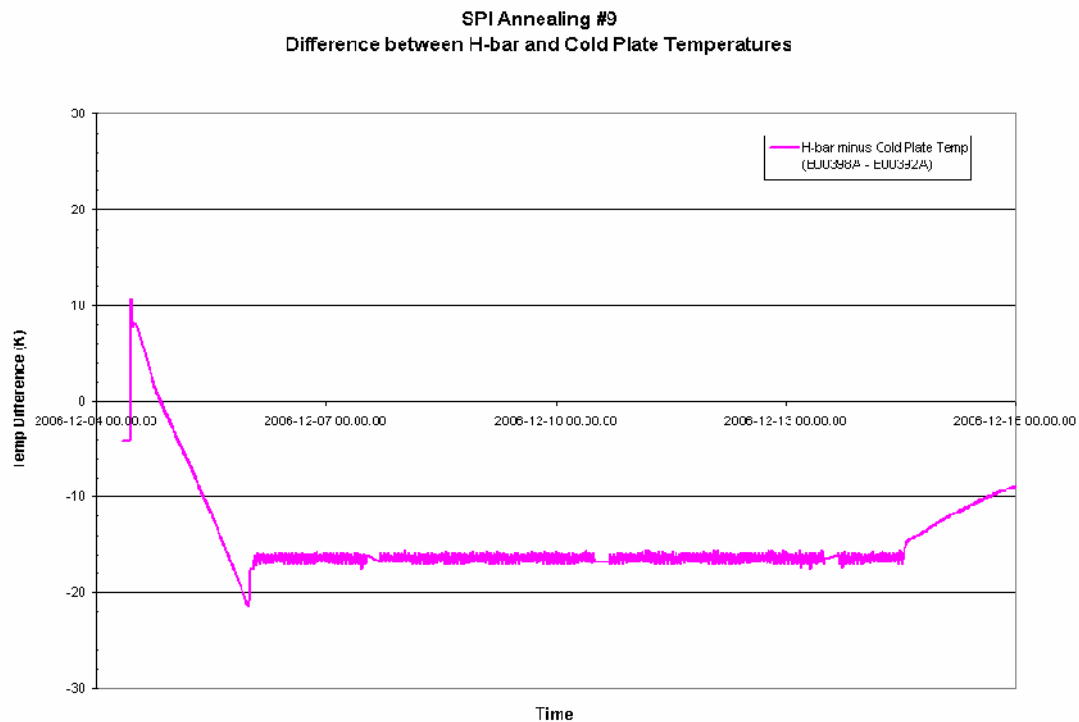
The following plot shows the evolution of the cold plate, H bus and cold box temperatures since the start of annealing.



The following plot shows the difference between the cold box and cold plate temperatures since the start of annealing.

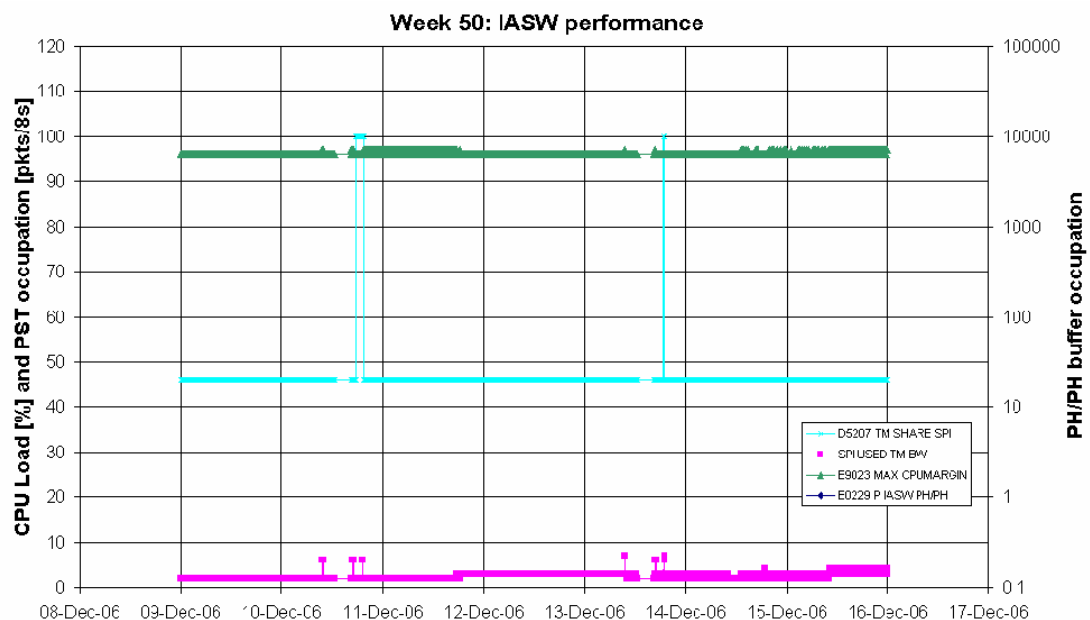


The following plot shows the difference between the H-bar and cold plate temperatures since the start of annealing.



DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432. Due to the ongoing annealing operations, the TM allocation was 46 packets/cycle and the IASW was in CONF mode.

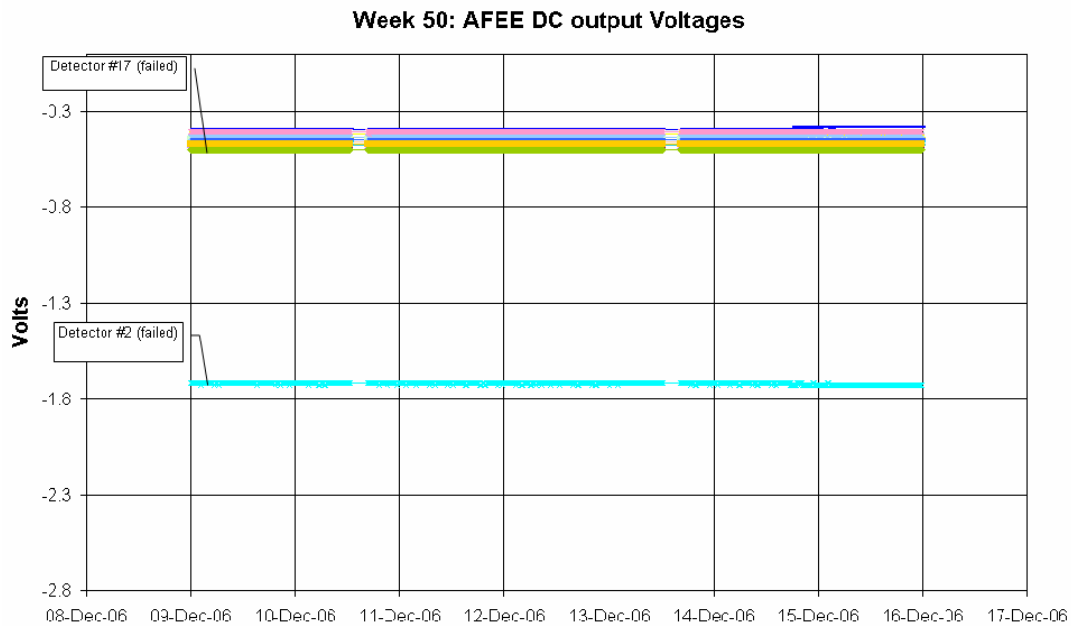
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



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). Due to the ongoing annealing operations, started on 4th December, the ACS HVPSSs have been set to the minimum voltage (~980V) and the ACS is in CONF mode.

AFEE: The health of the AFEE is nominal. Due to the ongoing annealing operations, started on 4th December, all detector HVPSs were switched off and only the LVPSs are left on.

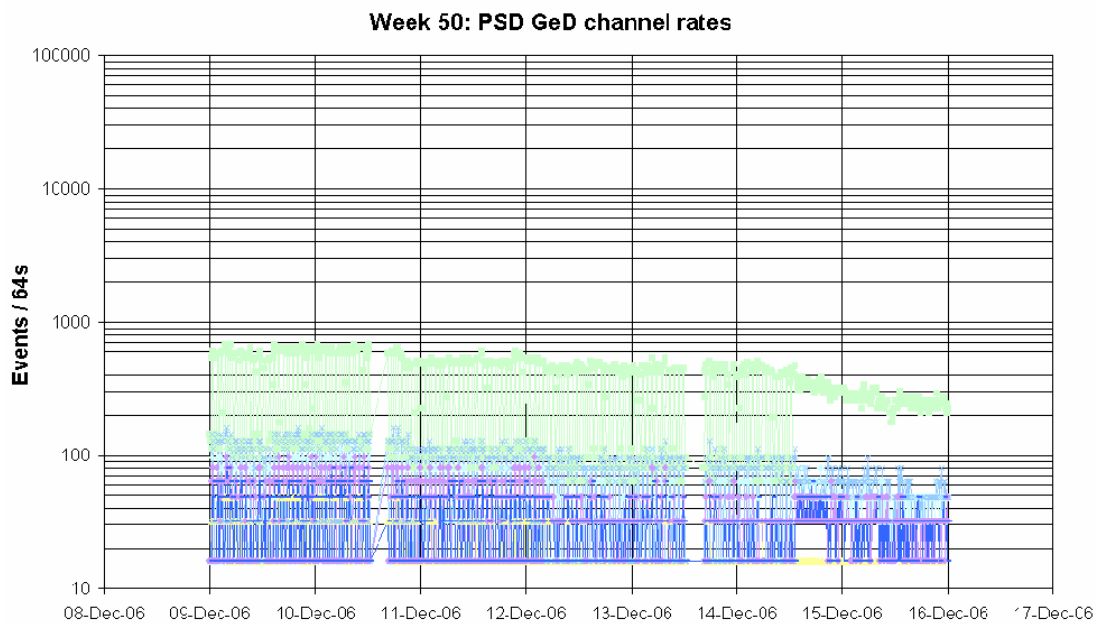
The following plot shows the dc voltage offset of the detector channels during the reporting period. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004



DFEE: The health of the unit is nominal. Due to the ongoing annealing operations, started on 4th December, the DFEE was in CONF mode.

PSD: The health of the unit is nominal. Due to the ongoing annealing operations, started on 4th December, the PSD was in CONF mode.

The following plot shows the PSD channel rates during the reporting period. Note that the scale used is larger than usual.



Event Log:

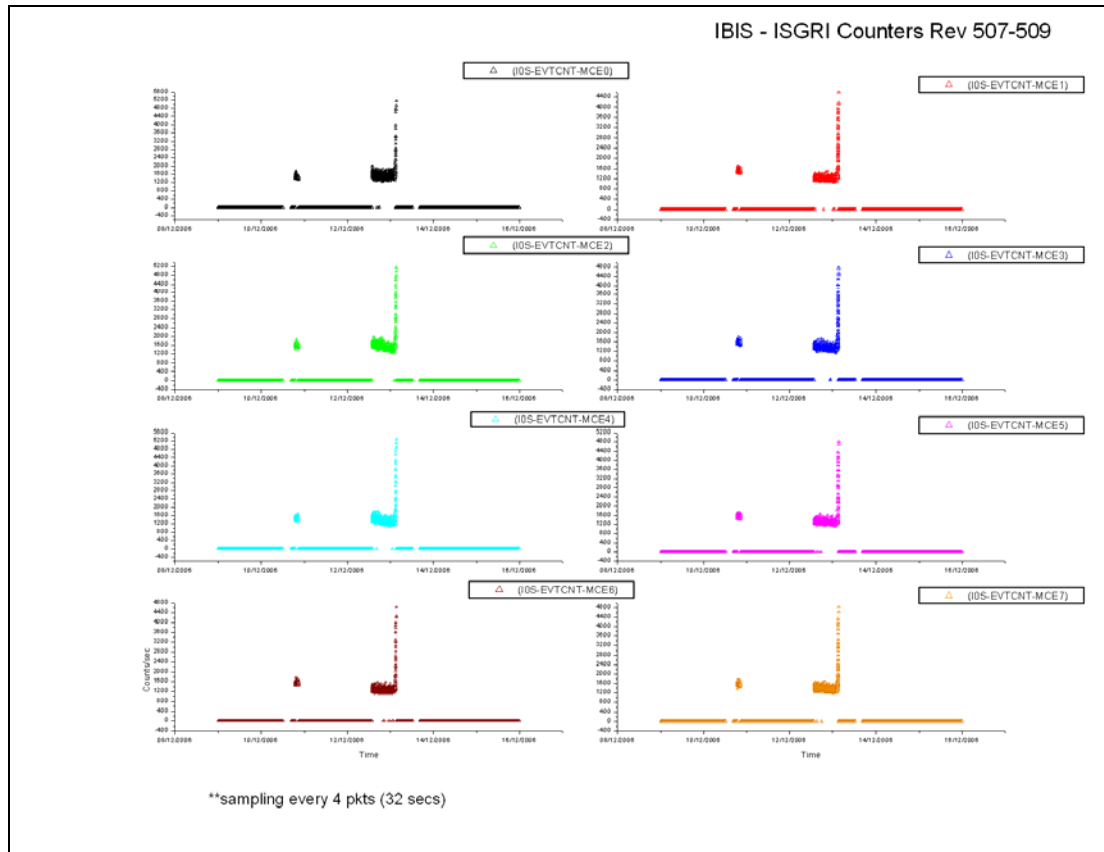
The following non-nominal events occurred on SPI during the reporting period:

- 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.

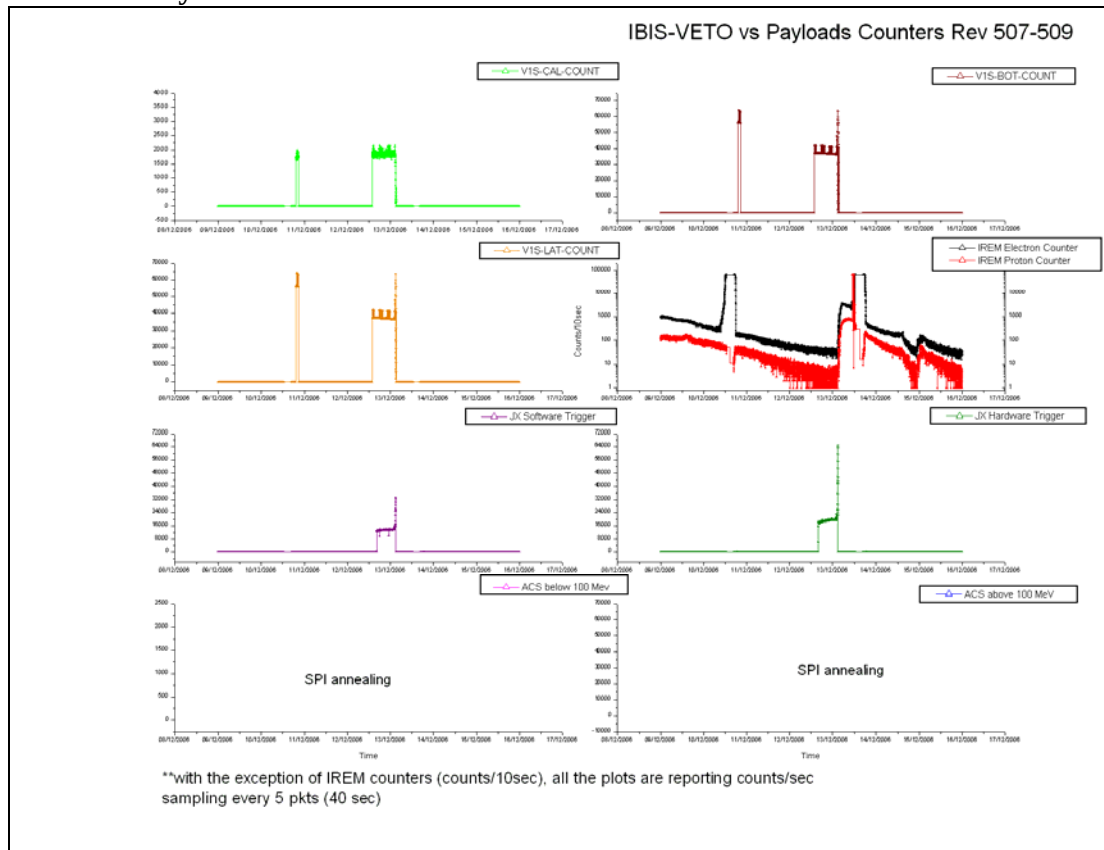
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

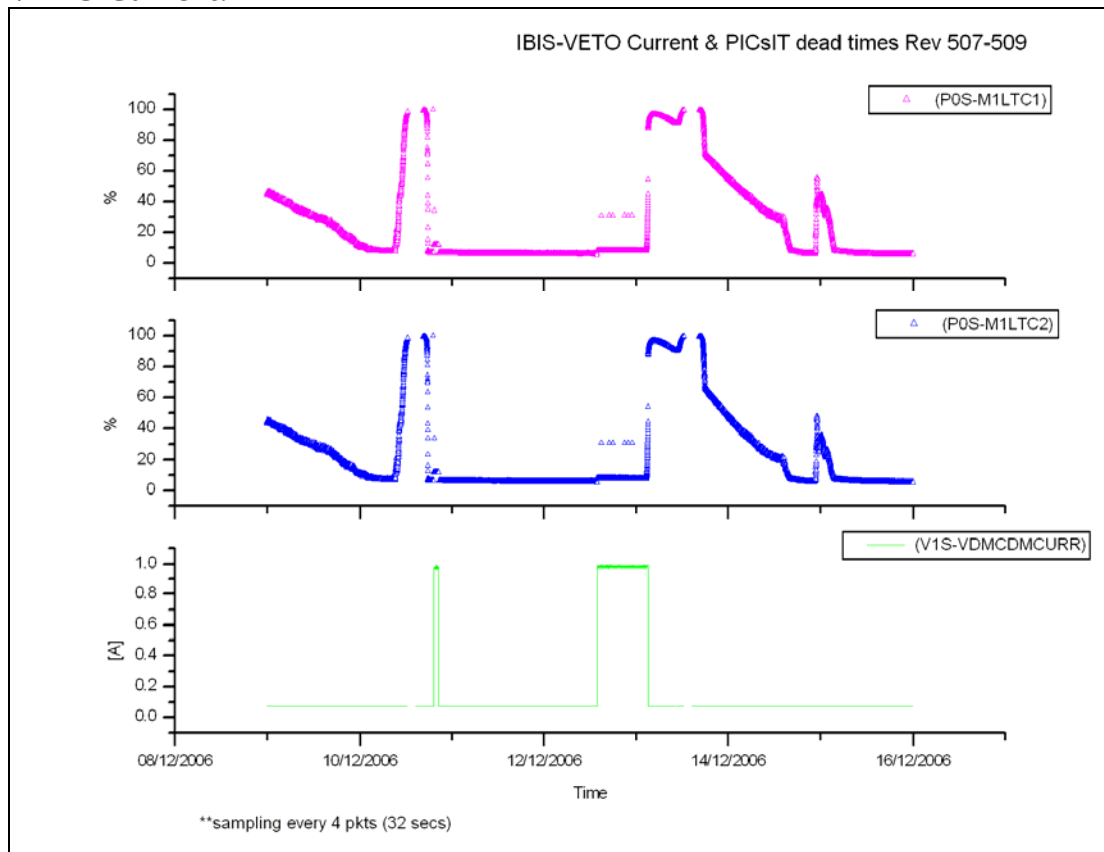


VETO vs Payloads Counters:

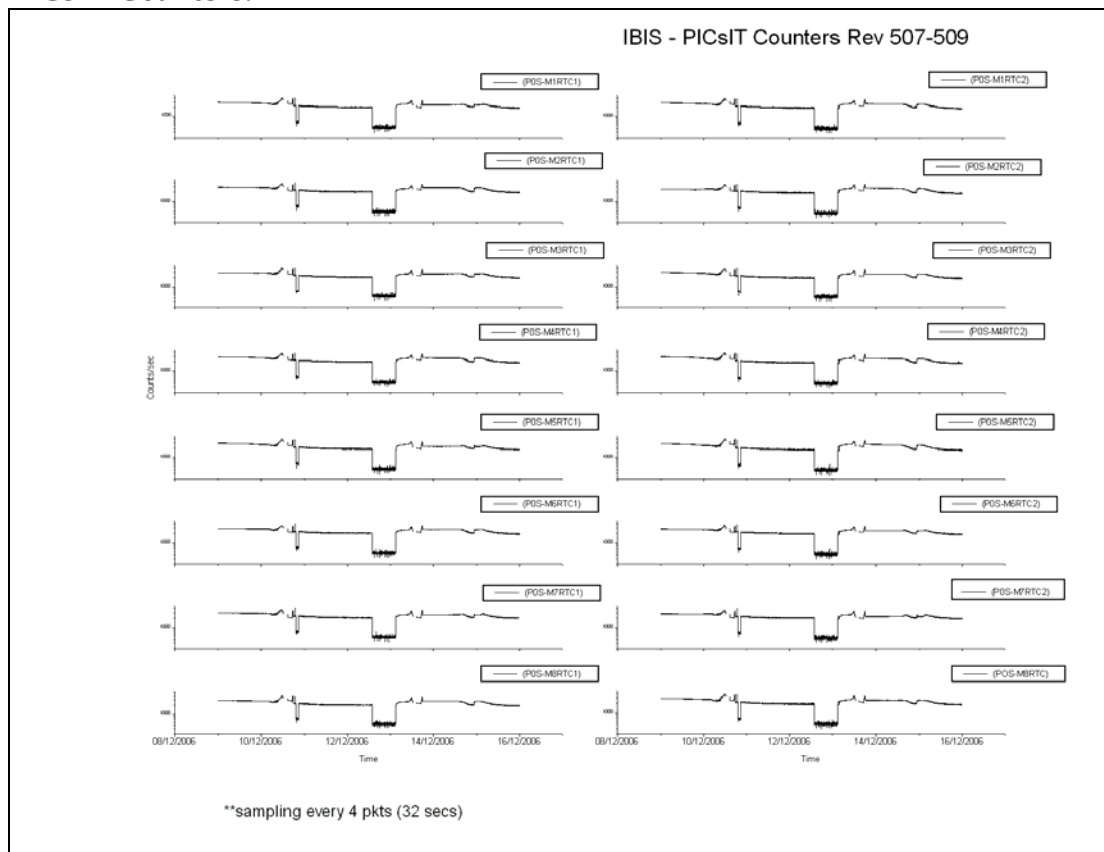


The week was characterised by high radiation.

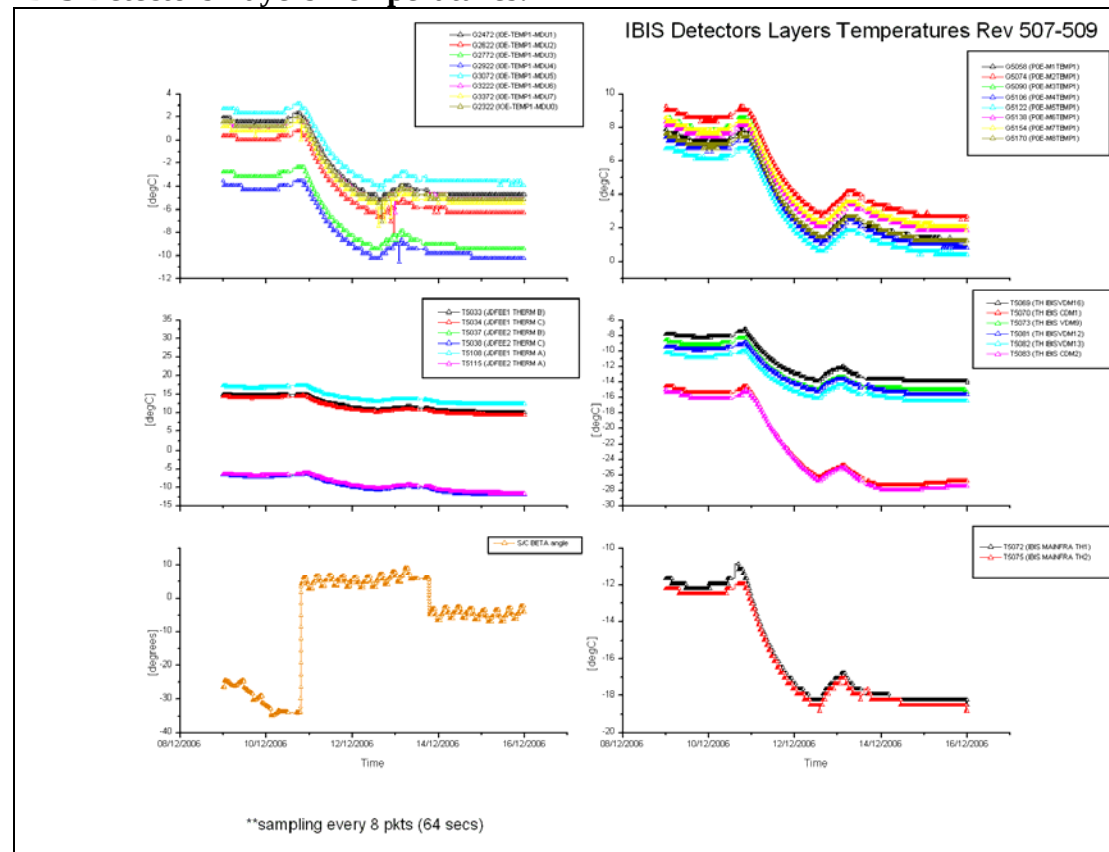
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

Since 07/12/2006 (DoY 341) 01:17Z, IBIS had been in Safe configuration due to high radiation.

On 10/12/2006 (DoY 344), after Belts passage from revolution 507 to 508, as the environment seemed quieter, it was decided to put IBIS back in Science mode following the timeline activation. However Out Of Limits were reported by the VETO count-rates, and since they did not tend to decrease rapidly, at 20:34Z it was decided to force IBIS back to Safe configuration via procedure FCP_IBIS1_0801.

The slowly decreasing radiation background and the high probabilities for M- and X-class solar flares gave confidence to the operator to wait until later in revolution 508 to try and reactivate safely the instrument.

On 12/12/2006 (DoY 346) at 14:11Z, after a radiation assessment, IBIS was sent back in Scientific Standard mode (via FCP_IBIS1_0803 and ED GESTAN02).

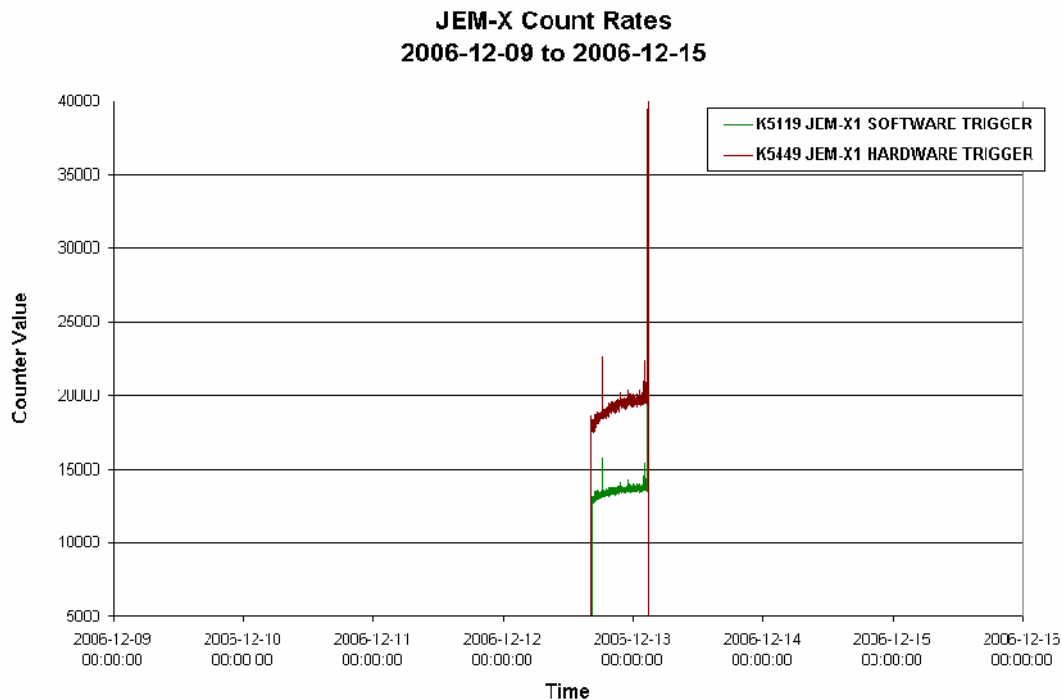
On 13/12/2006 (DoY 347) at ~02:40Z, a new X3 solar flare was reported. The effect on the INTEGRAL satellite was very fast (within half an hour), and Out Of Limits were reported for IBIS on VETO counts, ISGRI counts as well as PICSIT counts. As IREM counters were slowly increasing towards the IBIS thresholds, the operator decided to force manually IBIS into Safe mode at 03:06Z (via FCP_IBIS1_0801).

IBIS remained in Safe mode until DoY 350 at the start of revolution 510.

8.3.4 JEM-X Operations

JEM-X Count Rates

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

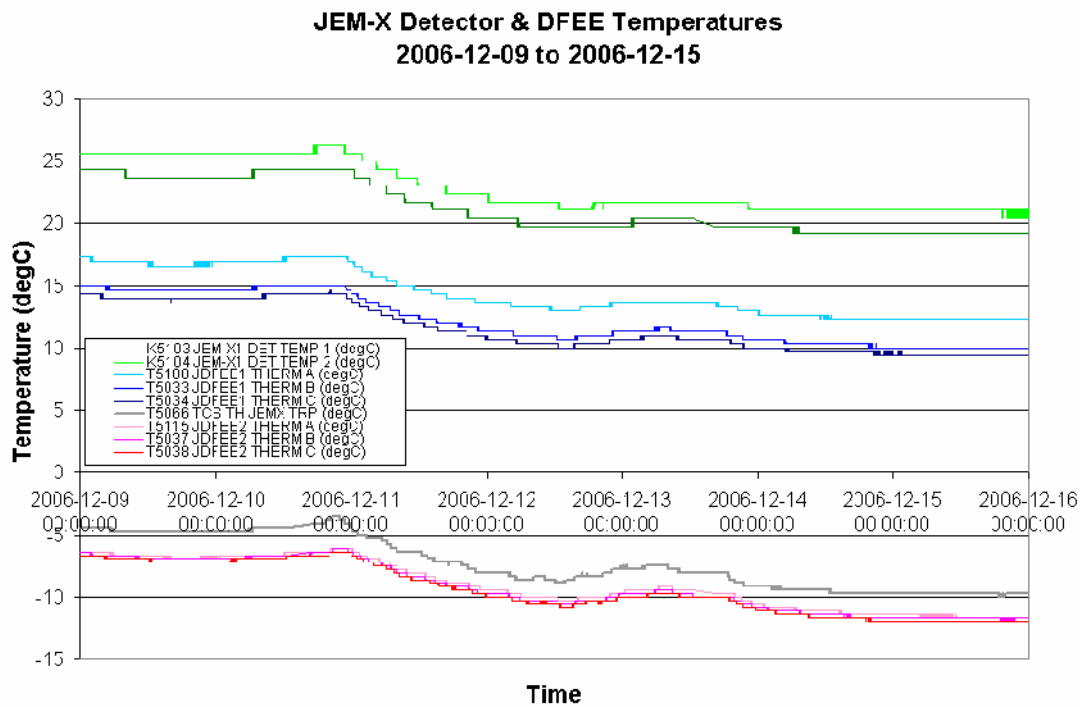


JEM-X Temperatures

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

2006-12-09 (DOY 343, Rev 507)

JEM-X1 remained in Safe mode throughout the day.

2006-12-10 (DOY 344, Rev 507-508)

Due to continuing high background conditions, JEM-X1 remained in Safe mode for the rest of revolution 507. The Anode Calibration ED KEACAL01 was executed from the Timeline at the start of revolution 508 and JEM-X1 was commanded back to Safe mode at 19:05:05Z, after the autonomous transition to Setup mode at radiation belt exit. JEM-X1 remained in Safe mode for the rest of the day.

2006-12-11 (DOY 345, Rev 508)

Due to continuing high background conditions, JEM-X1 remained in Safe mode throughout the day.

2006-12-12 (DOY 346, Rev 508)

After monitoring the background radiation conditions and observing that the IREM counts remained stably below the safe thresholds for JEM-X for a couple of hours, JEM-X1 was reactivated as follows:

- 15:47:12Z ED KEACAL01 re-uplinked
- 16:02:05Z ED KEHVAC01 re-uplinked with the planned parameters from the Timeline

- 16:17:52Z ED KEDATA02 re-uplinked with the planned observation parameters for the ongoing observation.

Commanding to JEM-X1 from the Timeline was re-enabled and JEM-X1 operations continued nominally.

2006-12-13 (DOY 347, Rev 508-509)

Due to another solar flare, at 02:47:08Z the TM parameter K5449 HARDWARE TRIGGER went OOL High and at 02:48:20Z K5136 BUFFER LOSS also started going OOL High. At 02:54:52Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Hardware Ratemeter. 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 02:58:27Z FCP_JEM1_0040 was executed, setting K5462 DFEE STATE IASW to Safe as well and OEM 254 ERROR OFF was received.

JEM-X1 remained in Safe mode for the rest of revolution 508. The Anode Calibration ED KEACAL01 was executed from the Timeline at the start of revolution 509 and JEM-X1 was commanded back to Safe mode at 18:55:04Z, after the autonomous transition to Setup mode at radiation belt exit. JEM-X1 remained in Safe mode for the rest of the day.

2006-12-14 (DOY 348, Rev 509) to 2006-12-15 (DOY 349, Rev 509)

Due to continuing high background conditions, JEM-X1 remained in Safe mode throughout these days.

8.3.5 OMC Operations

2006-12-09 (DOY 343, Rev 507) to 2006-12-11 (DOY 345, Rev 508)

The unit remained in SAFE mode continuously due to high radiation. The impact was the loss of pointings 05070029 to 05070060 and 05080004 to 05080041 inclusive.

2006-12-12 (DOY 346, Rev 508)

At 09:47:21, the radiation had dropped sufficiently to allow the recovery of the unit to Stand-by mode. Pointings 05080042 to 05080058 were then executed nominally.

2006-12-13 (DOY 347, Rev 508)

At 03:00:22, the radiation again triggered an autonomous switch to SAFE mode. The impact was the loss of pointings 05080059 to 05080064.

2006-12-14 (DOY 348, Rev 509)

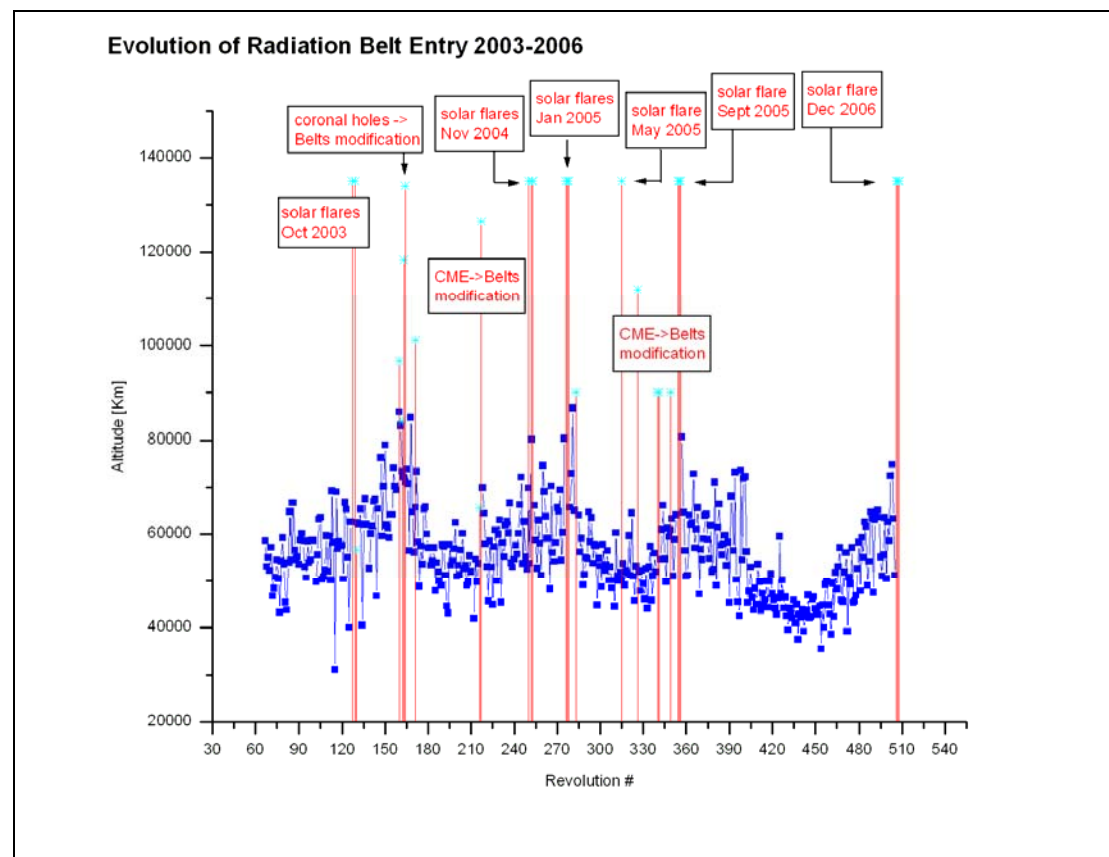
The unit remained in SAFE continuously. Pointings 05090002 to 05090049 were lost.

2006-12-15 (DOY 349, Rev 509)

At 19.34.58, the radiation had dropped sufficiently to allow OMC to be switched back to stand-by mode. Pointings 05090050 to 05090054 were executed nominally.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

On 2006-12-13 at 10:39Z, a local reset of the IREM CSCI S/W (SEU #40) 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) the status of the unit, before the anomaly, 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 2006.347.10.39Z at 46374.8km. 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 10:50Z 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 11:45Z.

The IREM automatic transition to Standard Mode did not affect the instruments as it occurred inside the Radiation Belts window.

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]
507	RAD_ENTR R 2006-12-10T09:43:18Z			2006-12-10 10:39:12	48309
508	RAD_EXIT R 2006-12-10T19:03:28Z			2006-12-10 18:39:12	41602
508	RAD_ENTR R 2006-12-13T09:30:49Z			2006-12-13 10:22:49	48896
509	RAD_EXIT R 2006-12-13T18:51:03Z			2006-12-13 18:32:49	42416

Reference

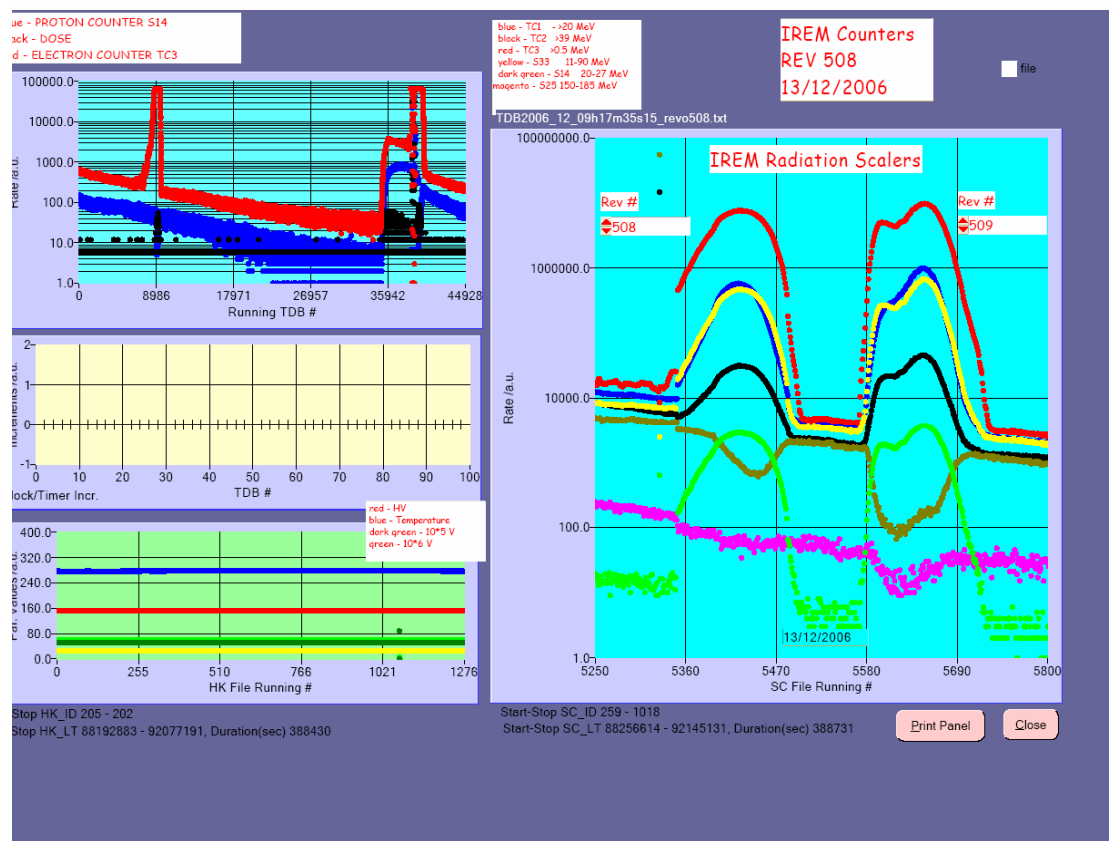
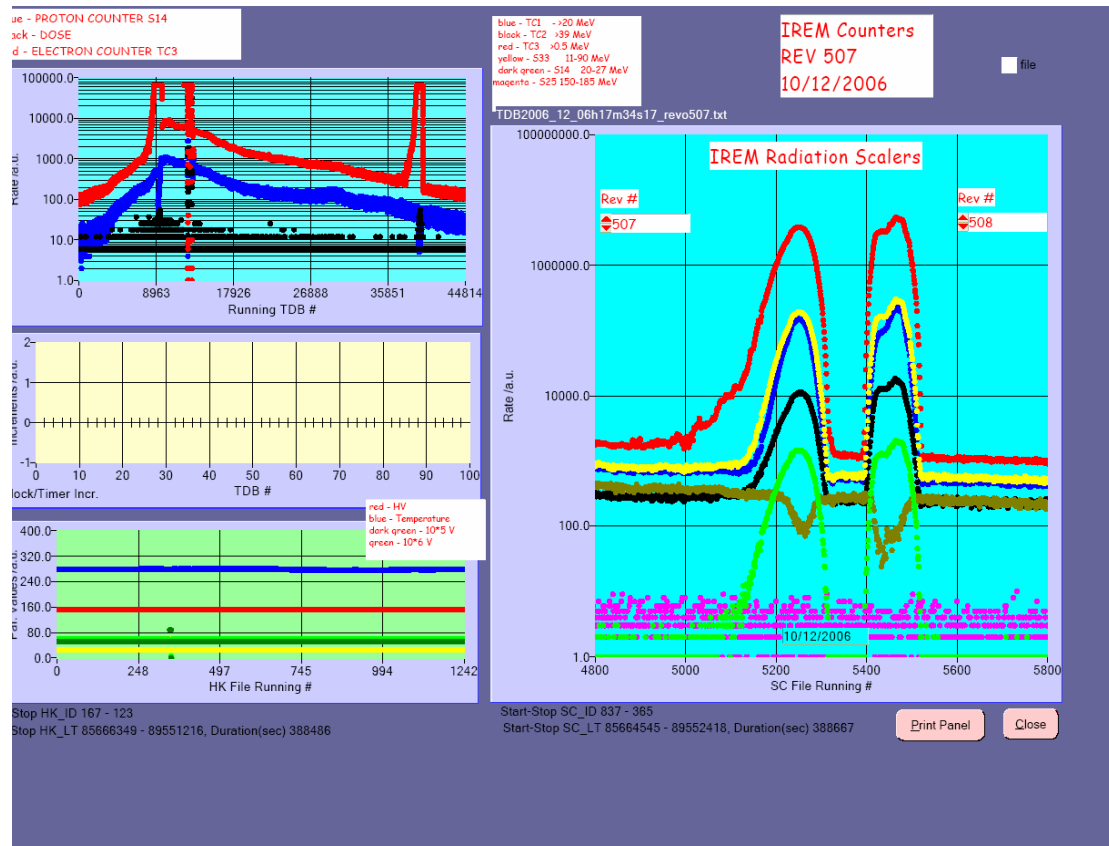
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

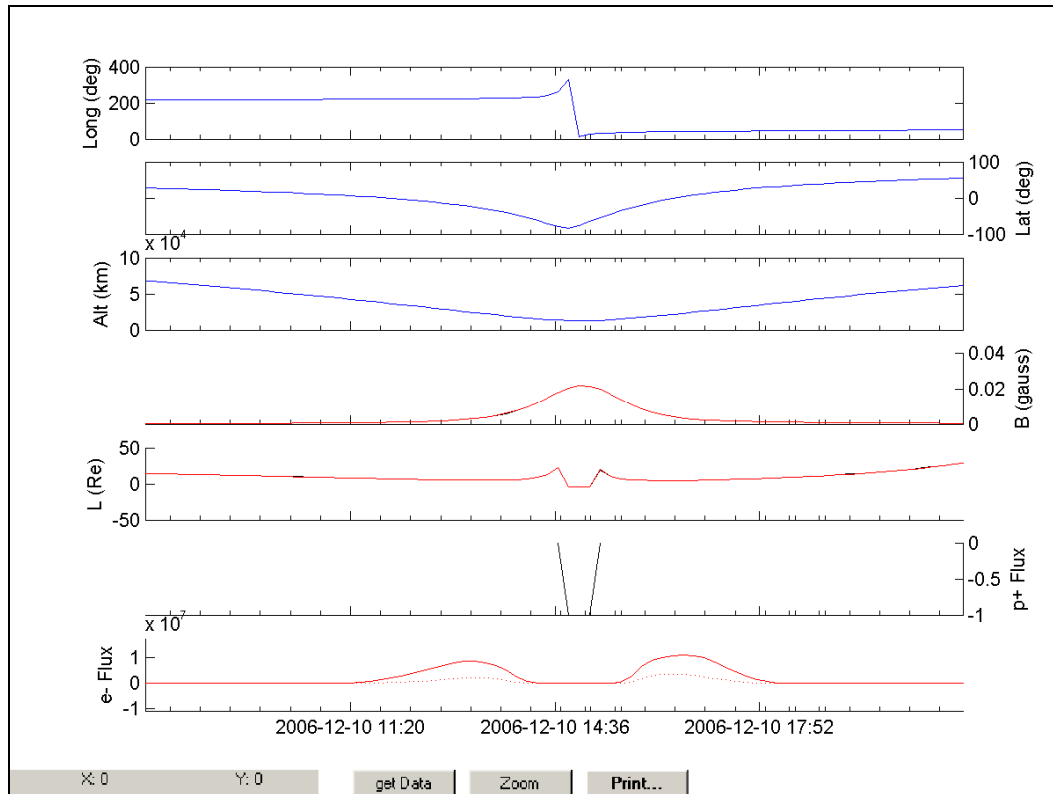
Radiation Spike

IREM radiation counters:

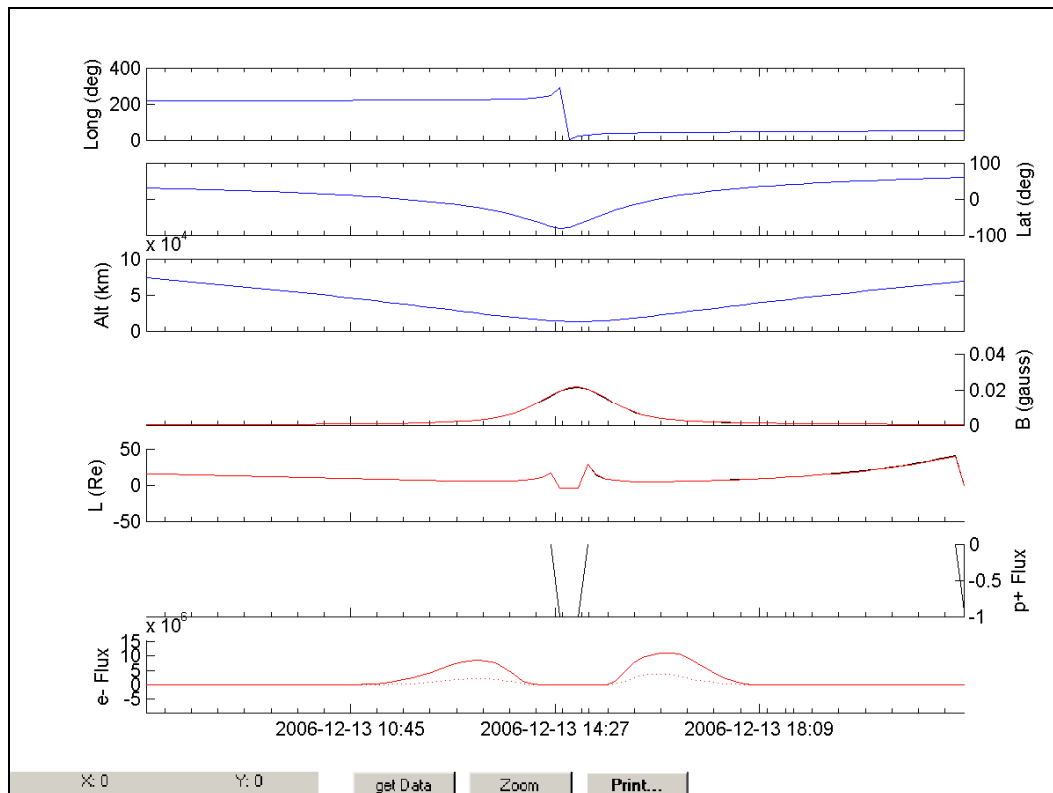


IREM Predicted Radiation Belt Passages

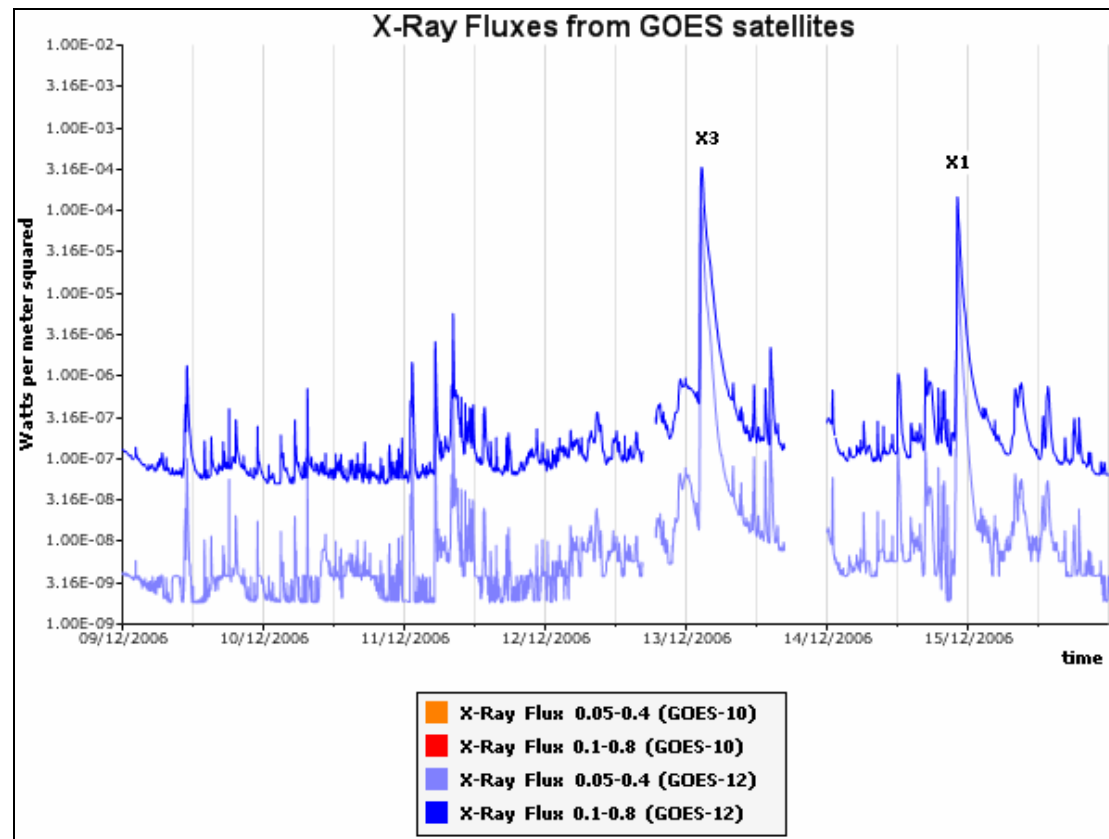
Rev 507



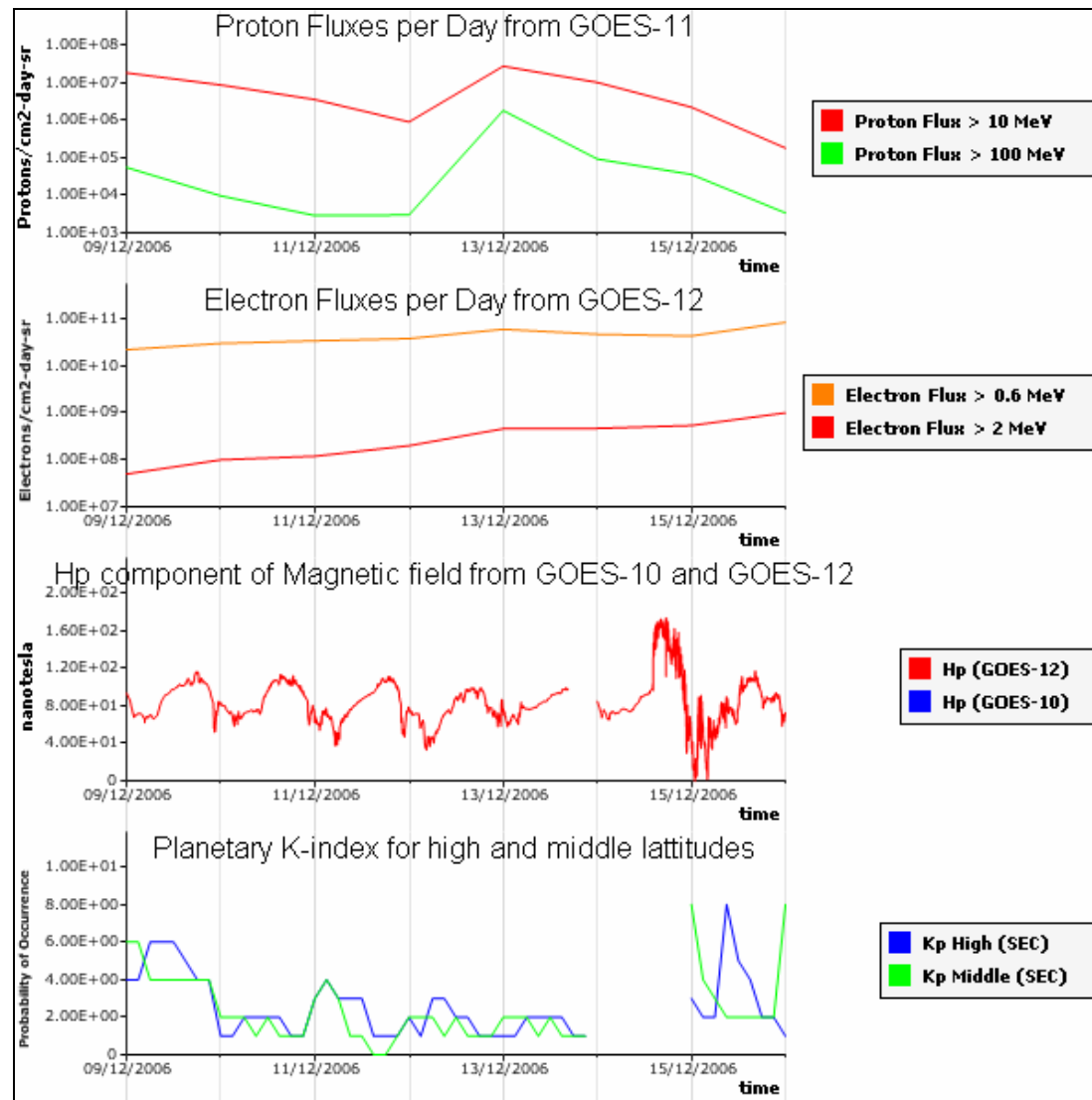
Rev 508



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



X-Ray fluxes start to be significant over 10^{-5} W/m² (corresponding to M-class flares). Above 10^{-4} W /m², they correspond to strong X-class flares.



Proton and electron flux report high 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.