

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 280
Week 05
04.02.08
Routine Phase

Prepared by: M.J.H. Walker (OPS-OAI) and INTEGRAL FCT

LIST OF CONTENTS

1	General.....	3
2	Summary of Activities.....	3
3	Satellite Status.....	3
3.1	Platform.....	3
3.1.1	AOCS.....	3
3.1.2	Power.....	3
3.1.3	Thermal.....	3
3.1.4	OBDH.....	4
3.1.5	RFS.....	4
3.2	Payload.....	4
3.2.1	SPI.....	4
3.2.2	IBIS.....	6
3.2.3	JEM-X.....	8
3.2.4	OMC.....	8
3.2.5	IREM.....	8
4	Ground Facilities.....	9
4.1	Mission Operations Centre.....	9
4.2	Ground Stations & Network.....	9
4.3	Science Ground Segment.....	9
4.3.1	ISOC.....	9
4.3.2	ISDC.....	10
5	Special Events.....	10
6	Anomalies.....	10
7	Future Milestones.....	11
8	Appendix.....	12
8.1	Overview of Revolutions.....	12
8.2	Consumables.....	12
8.2.1	Detailed Fuel Book-keeping.....	12
8.3	Detailed Satellite Information.....	12
8.3.1	AOCS SUMMARY OPERATIONS REPORT, 26/01/2008 – 01/02/2008.....	12
8.3.2	SPI Operations.....	17
8.3.3	IBIS Operations.....	24
8.3.4	JEM-X Operations.....	28
8.3.5	OMC Operations.....	29
8.3.6	IREM Operations.....	31

DISTRIBUTION LIST

Addressees	Copy	Addressees	Copy
D/OPS		ESA HQ	
G. Winters D/OPS	1	D. Southwood D/SCI	1
J. F. Kaufeler OPS-G	1		
N. Bobrinsky OPS-ON	1	ESTEC	
J. Dodsworth OPS-OA	1	J. Louet SCI-P	1
	1		1
	1	ESTEC / PG	
M. Schmidt	1	G. Sarri	
R. Southworth	1		
F. Di Marco	1	ESTEC/RSSD	1
F. Cordero	1	M. Kessler SCI-SD	
M. Walker	1	C. Winkler	
P. Lippi	1	A. Parmar	
S. Fahmy	1		
	1		
		ISDC	
SPACONs	1	T. Courvoisier	1
I. Bayliss	1	R. Walter	1
G. Di Girolamo	1	ISDC Shift Team	1
F. Dreger	1		
G. Gienger	1		
S. Pallaschke	1	ALENIA	
W. Hell	1	M. Montagna	
K.J. Schulz	1	F. Ravera	1
M.A. Larsen	1		1
		PI / Instrument Teams	1
M. Butkovic	1	J. P. Roques – SPI	1
D. Heinzer	1	G. La Rosa – IBIS	
U. Feucht	1	P. Ubertini – IBIS	
Shift - Coord	1	S. Brandt – JEM X	1
Scheduling Office	1	E. De Miguel - OMC	1
T. Beck	1	W. Hajdas – IREM	
J. Wardill	1		
M. Unal	1	JPL / Goldstone	1
P. Maldari	1	D. Holmes	1
		J. Valencia	1
		Jesse Velasco	1
Redu		DSN - MPSETD	1
B. Demellenne			1
ESAC	1		
P. Kretschmar			1
V. Gomez SCI-O			1
E. Kuulkers	1		1
C Gonzales	1		1
ESTEC/SCI-A			
Nicola Rando	1		

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 26.01.08 until 01.02.08 (both dates inclusive) and covers the revolutions 646 and 647.

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 a raster dither of X Per (RA 03:55:23.08, DEC +31:02:45.0), a raster dither of Loop I-Loop IV Super (RA 13:57:10.00, DEC +07:34:37.0), a raster dither of the Galactic Plane Region 3 (RA 13:09:32.98, DEC - 62:47:56.4), and a Galactic disk latitude scan at attitude (RA 14:38:24.00, DEC - 57:58:12.0).

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.

9 slews were missed from TL, during the observation period due to problem on MCS and TC link with DSS24 station.

The fuel consumption over the period between 25/01/2008 and 31/01/2008 was 0.0630 Kg. The remaining propellant is in the order of 142.5346 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 11th annealing started on 12th January and ended on 30th January. This annealing progressed nominally. The following table reports the major events/steps performed during the annealing:

Date/Time	Activity
12/01/2008 06:11Z	Configure SPI for start of Annealing and stop SPI active cooling
12/01/2008 07:12Z	Annealing Heater Main ON
12/01/2008 09:12Z	Annealing Heater Redundant ON
13/01/2008 18:25Z	Cold plate temperature reached 373K (100degC)
21/01/2008 21:40Z	Stop SPI Annealing: Annealing Heater Main and Redundant OFF; Heat Pipe Heater Main and Redundant OFF; Antifreeze Heater 1A ON
22/01/2008 09:40Z	ACS switch-on and calibration start (FEE#57 and FEE#81 ON)
24/01/2008 13:38Z	Thermal braids temperature TM EU0398A reached 308K
24/01/2008 13:47Z	Start of cryocooler switch-on
24/01/2008 15:04Z	Cyrocooler switch-on complete and stroke set to 4x45
24/01/2008 05:23Z	End of ACS Calibration
27/01/2008 22:31Z	Cold plate temperature TM EU0392A reached 127K
27/01/2008 22:31Z	Selected narrow range cyro temps and restored PSD nominal threshold
28/01/2008 17:53Z	Cold plate temperature TM EU0392 reached 100K
28/01/2008 17:43Z	Camera switch-on start; HV of all GeD increased in steps to 0.5kV; 1kV; 1.5kV; 2kV; 2.5kV; 3kV; 3.5kV with acquisitions in PHOTON mode in between
28/01/2008 20:25Z	Camera switch-on end: SPI in PHOTON mode with all GeD HV at 4kV except for GeD#2 (0.5kV) GeD#17 (0.5kV) and GeD#12 (3kV)
28/01/2008 20:50Z	Thermal braid temperature TM E0398 reached 86K
28/01/2008 20:55Z	Start of reduction of cryocooler stroke for 80K target (FCP_SPI1_0072)
29/01/2008 16:43Z	End of reduction of cryocooler stroke for 80K target: Stroke set to 4x37
29/01/2008 17:35Z	Increase GeD#12 HV to 3.5kV

29/01/2008 18:20Z	Increase GeD#12 HV to 4kV
29/01/2008 19:50Z	Test of different GeD HVs (except GeD#2 @ 0.5kV & GeD#17 @ 0.5kV): All set to 1.5kV; 2kV; 2.5kV; 3kV; 3.5kV; 4kV for 30 minutes at each voltage, then staying at 4kV until end of revolution
30/01/2008 11:48Z	Cold plate temperature TM EU0392 reached 80.9K
30/01/2008 12:35Z	To CONF, set nominal IASW parameters (including Cold Plate Monitoring and disable SE compression); set nominal GeD HV (4kV on all GeD except GeD#2 (0.5kV); GeD#17 (0.5kV) & GeD#12 (3.5kV)) and return to PHOTON

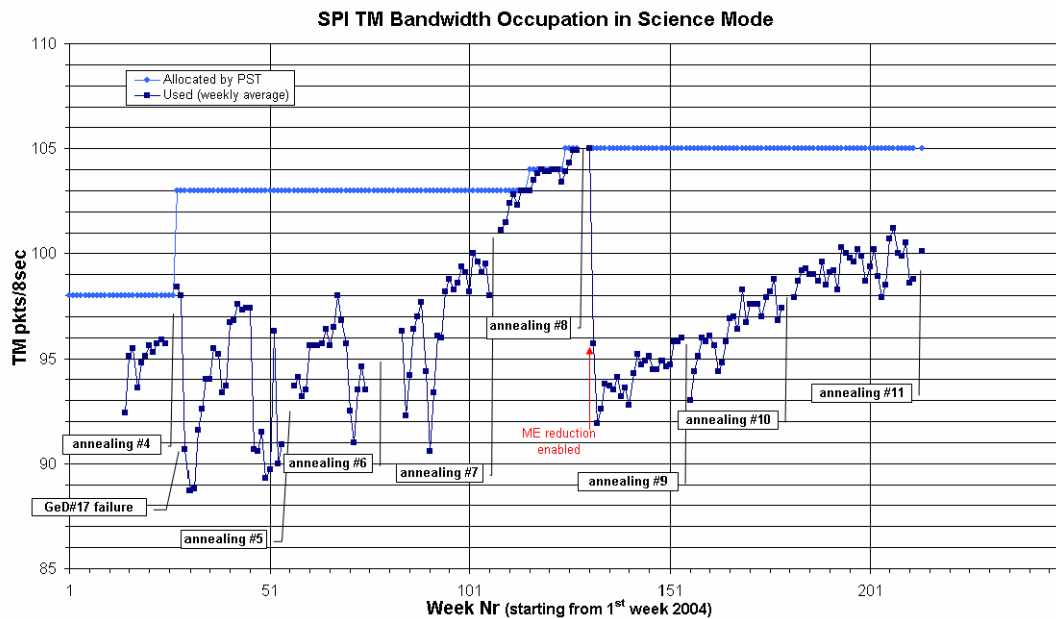
Following the 11th annealing the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which, although it's energy resolution improved since the previous annealing, is still showing a slightly degraded energy resolution compared to the other detectors and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). 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 since the end of annealing.

At the start of the reporting period SPI was in CONF mode due to the annealing. In line with OCR-231, a patch of the IASW to version 4.3.4 was performed in revolution 646 starting on 28/01/2008 at 09:44Z. Following this, SPI remained in CONF until the camera switch-on was started on 28/01/2008 at 17:43Z. From this time until the end of revolution 646 SPI was photon-by-photon mode with various different settings of the GeD HVs (see table above) and IASW parameters due to the tests of the SPI IASW 4.3.4 (see DPE/IASW detailed report in Section 8.3.2). From revolution 647 onwards SPI was in photon-by-photon mode with nominal IASW parameters.

The assigned TM bandwidth to SPI was 46 packets/cycle during revolution 645, increasing to the nominal 105 packets/cycle from revolution 646 onwards (however on 01/02/2008 at 09:16Z an over-allocated PST with 108 packets/cycle to SPI was loaded and remained active until the end of the revolution). The average telemetry occupation in the science observation windows was 100.1 packets/cycle.

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



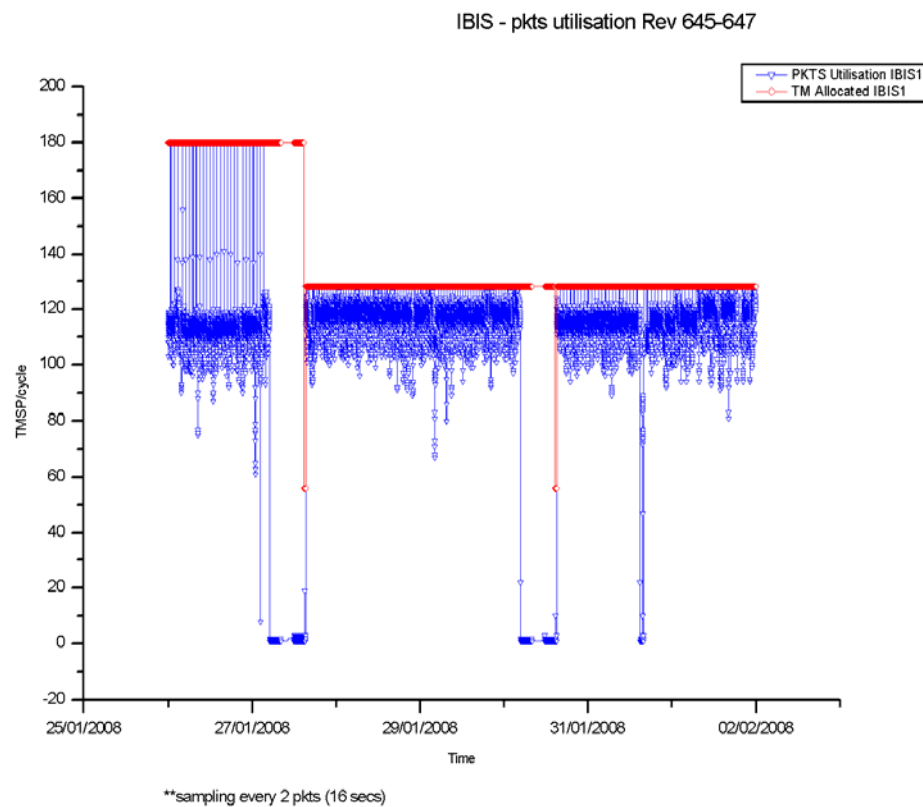
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

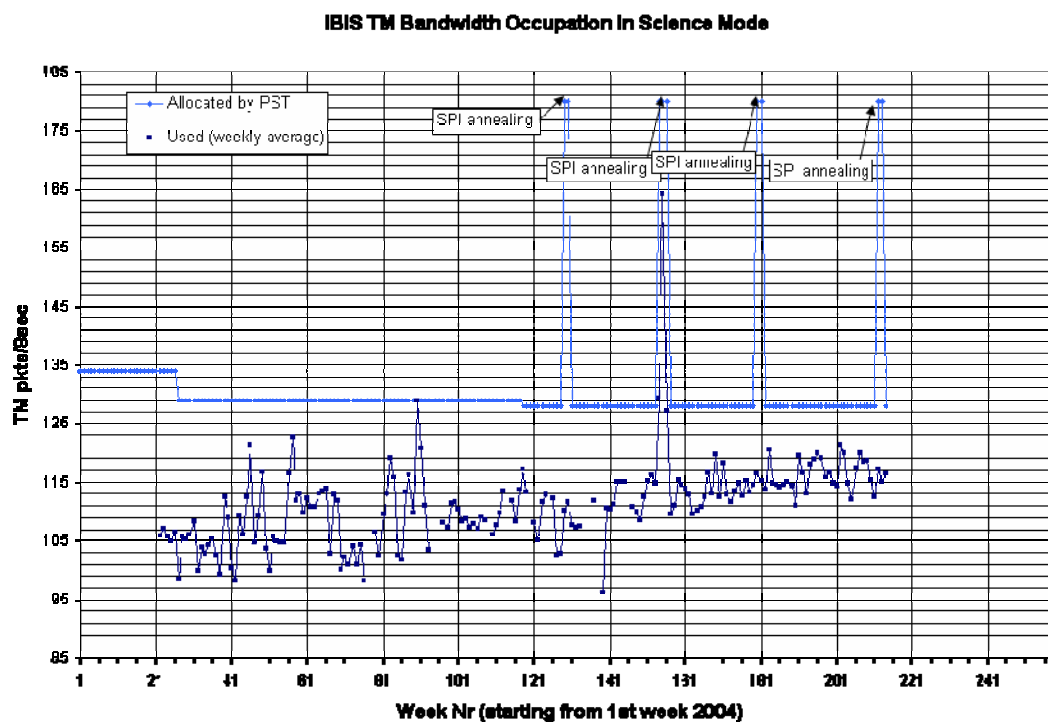
The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS above the radiation belts was 180 packets/cycle in revolution 645 (due to SPI Annealing) and 128 packets/cycle from revolution 646 onwards. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 116.46 packets/cycle, up 1.59 on last week.

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



A plot of the IBIS weekly bandwidth utilisation since 2004 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 15 packets/cycle up to the end of revolution 645 at about 08:30 on DoY 027, thereafter it reverted to 8 packets/cycle for the remainder of the reporting period. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

Note: Some more information concerning the JEM-X operations is provided in the Appendix.

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, 158 of the 168 planned science pointings for OMC were executed nominally, 1 was interrupted and 9 lost.

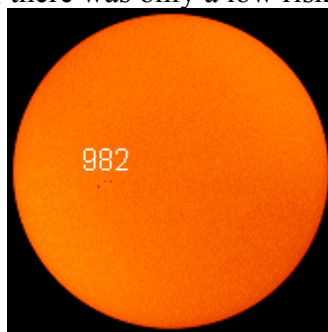
Note: Some more information concerning the OMC operations is provided in the Appendix.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. The Sun was blank until the 30th January, when sunspot # 982 appeared. The spot grew rapidly through the rest of the week, however, there was only a low risk of solar flares.



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 not very good this week. Seven pointings were lost to ground problems. The overall performance was above the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was not very good this week. There was an extended sequence of problems, with TPF transmission, and then commands being sent to the AOCS, although they were disabled in the Autostack, this all led to the loss of five pointings . A pointing was also lost when the connection was lost to the TM RT cache, which led to the Command Verifier crashing, and a failure of the uplink.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There was, however, an occasion where the AD service on the VC7 TC link could not be established, and a pointing was lost. There were also other occasions where the link to Redu and the isds dropped, and two occasions where the voice link with ISDC was not working, all without further impact.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

A new PSF for revolutions 656 has been received. Revolution 654 has been planned.

The TSFs for revolution 647-650 have been received.

2. Observation status

New ECSs have been received and processed for revolutions 637 and 638. The ECS for revolution 633 is still missing.

3. ISOC Science Data Archive

Since 22 Jan, there were some problems ingesting data. A solution is being implemented. The last revolution ingested was 629, the last distributed was 634.

4. ISOC system

Version 18.0 has been released on the test system. This is the version to support AO-6 and will be intensively tested next week.

5. Problems

A PSF for revolution 655 was sent by MOC twice but not received at ISOC. Investigation of the problem is ongoing.

4.3.2 ISDC

Status of ISDC observation processing on 04/02/2008:

- Latest Standard Analysis completed: observation 05200370001 (NGC 4151, Revolutions 634 & 636) on 30/01/2008.
- Latest products archived: observation 05200370001 (NGC 4151, Revolutions 634 & 636) on 30/01/2008.
- Latest observation products sent to the observer: observation 05200370001 (NGC 4151, Revolutions 634 & 636) on 31/01/2008.

5 Special Events

6 Anomalies

The following problems were reported this week that impacted operations:

- On DoY 27, at 15:16, a problem with the selected guide star caused the uplink of the slew commands for pointing 06460002 to fail. A manual recovery was performed rescuing this pointing. However, further problems with subsequent slews caused a lengthy suspension of the Timeline. For further details see the AOCS section in the appendix of this report. The impact was the loss of pointings 06460003 through to 06460007 inclusive.
- On DoY 29, at 04:27, a problem connecting the AD service on VC7 through DSS24, forced the suspension of the Timeline, and a recycling of the links. This was not successful. The decision was made to continue without the VC7 TC link. A recovery was performed, and the Timeline rejoined at 04:59. The impact was the loss of pointing 06460049.
- At 17:42, a lost connection to the TM RT cache led to the Command Verifier crashing. This in turn caused a TC to fail release, which forced the suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 18:44. The impact was the loss of pointing 06460066.
- On DoY 31, at 15:05:07, an IREM SEU (#61), forced IBIS and OMC to SAFE mode. A recovery was performed, OMC returned to Standby at 15:29:03. IBIS was recovered at 16:03. The impact was the interruption of pointing 06470025, and the loss of pointing 06470026 for those instruments.
- On DoY 32, at 18:43:32, a SEU on the Star Tracker caused the IMU to be switched on preventing the OTF from being set. The impact was the loss of pointing 06470060.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-218	2008-02-04	SPI IASW 4.3.4: TM parameter E0229 incorrect	Payload	Pending
INT_SC-219	2008-02-07	IREM Anomaly: Reset of IREM_CSCI S/W #61, 31/01/2008	Payload	Pending

7 Future Milestones

The following activities are foreseen in the next few weeks.

- The next On-Board Clock wrap-around is expected during revolution 650.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 646

The observations in revolution 646 consisted entirely of a raster dither of X Per (RA 03:55:23.08, DEC +31:02:45.0), lasting ~57.0 hours.

Revolution 647

The observations in revolution 647 began with a raster dither of Loop I-Loop IV Super (RA 13:57:10.00, DEC +07:34:37.0), lasting ~24.2 hours. This was followed by a raster dither of the Galactic Plane Region 3 (RA 13:09:32.98, DEC -62:47:56.4), lasting ~14.5 hours. Finally a Galactic disk latitude scan at attitude (RA 14:38:24.00, DEC -57:58:12.0) was performed for ~17.1 hours until the end of the revolution.

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

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2008-01-10T19:08:44.000Z	142.8140	F	Automatic TM processing.
2008-01-12T08:42:00.000Z	142.7945	F	Automatic TM processing.
2008-01-12T13:43:04.000Z	142.7789	F	Automatic TM processing.
2008-01-13T23:41:56.000Z	142.7519	F	Automatic TM processing.
2008-01-15T13:31:36.000Z	142.7354	F	Automatic TM processing.
2008-01-16T22:51:08.000Z	142.7038	F	Automatic TM processing.
2008-01-18T13:15:05.000Z	142.6859	F	Automatic TM processing.
2008-01-19T22:57:48.000Z	142.6543	F	Automatic TM processing.
2008-01-21T13:06:08.000Z	142.6385	F	Automatic TM processing.
2008-01-22T22:23:16.000Z	142.6286	F	Automatic TM processing.
2008-01-24T12:52:56.000Z	142.5976	F	Automatic TM processing.
2008-01-27T12:38:32.000Z	142.5840	F	Automatic TM processing.
2008-01-28T22:28:43.000Z	142.5575	F	Automatic TM processing.
2008-01-30T12:27:12.000Z	142.5495	F	Automatic TM processing.
2008-01-31T16:16:51.000Z	142.5346	F	Automatic TM processing.

This report was generated Fri Feb 1 08:00:24 GMT 2008

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, 26/01/2008 – 01/02/2008

The AOCS operations were executed from the Automatic Timeline.

During this period, 81 Open Loop Slews, 97 Closed Loop Slews and 4 Momentum Biases were executed.

9 slews (5 OSL, 4 CSL) were missed from TL, during the observation period, due to problems with MCS on different task (TPF distributor, Command Verifier, TM-RT cache and AUTOSTACK) and TC link with DSS4 station.

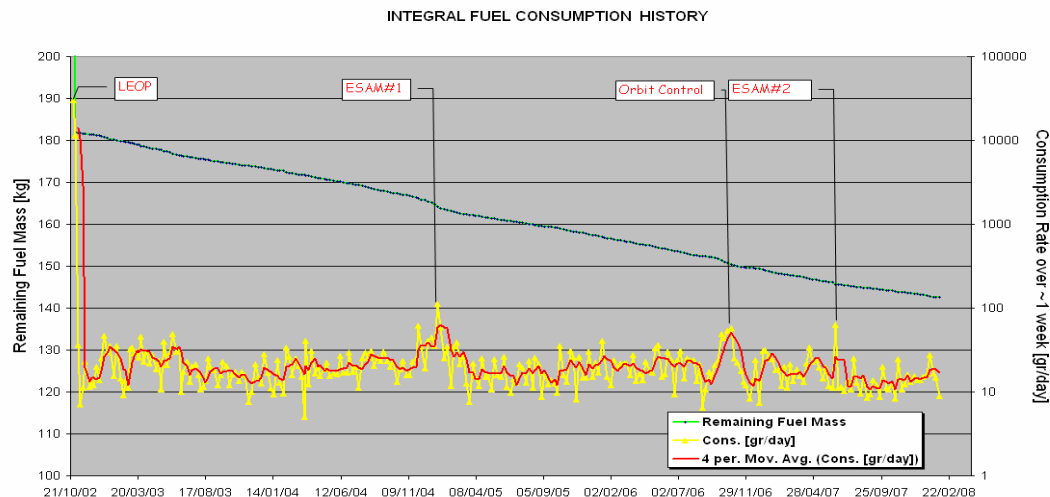
This is equivalent to $\sim 4.9\%$ of the total number of slews planned (182).

Orbit Control

No update.

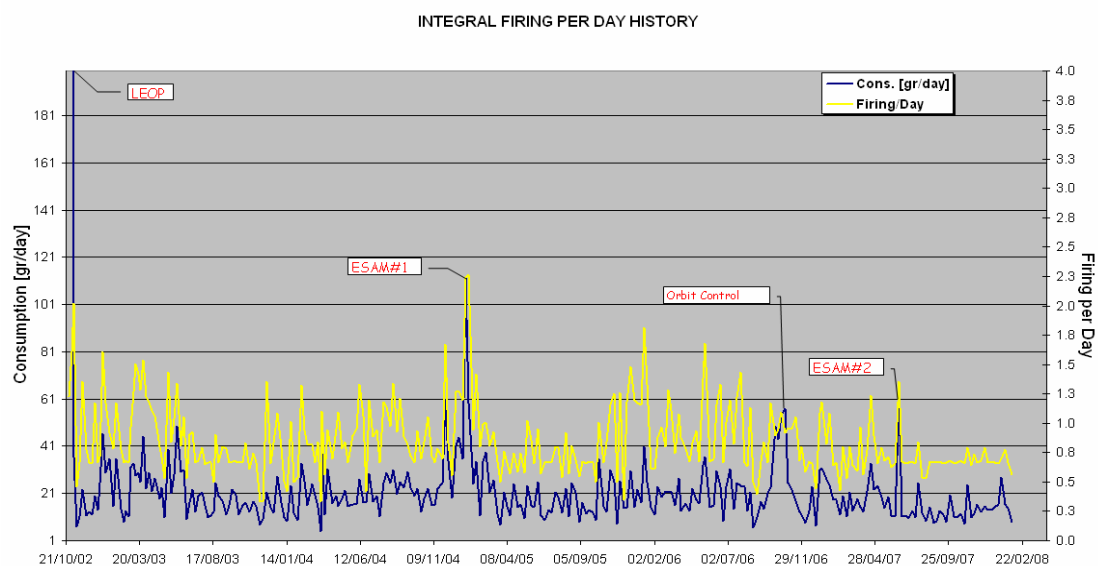
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 31/01/2008 is reported in the plot below.



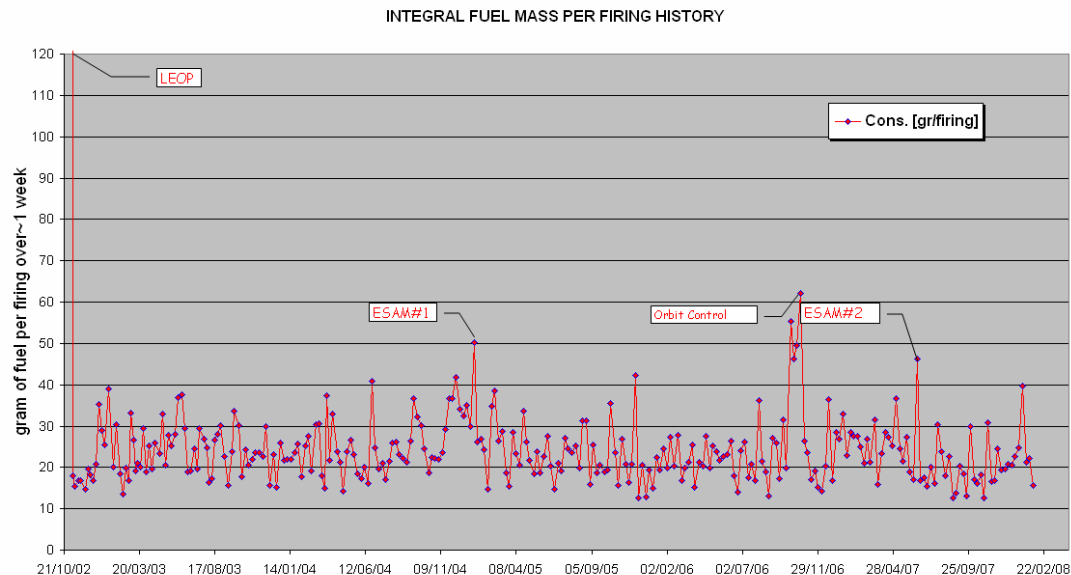
The above plot considers the ESAM fuel consumption spread over period of ~ 1 week.

The firing per day over the period between 01/11/2002 and 31/01/2008 is reported in the plot below.



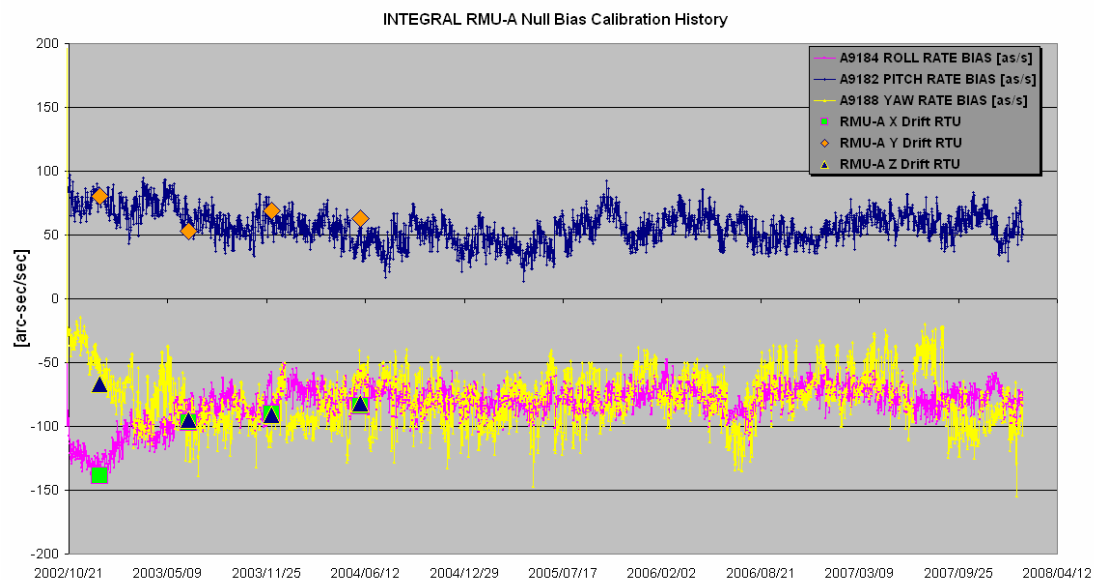
The above plot considers the ESAM fuel consumption spread over period of ~1 week.

The fuel per firing over the period between 01/11/2002 and 31/01/2008 is reported in the plot below.



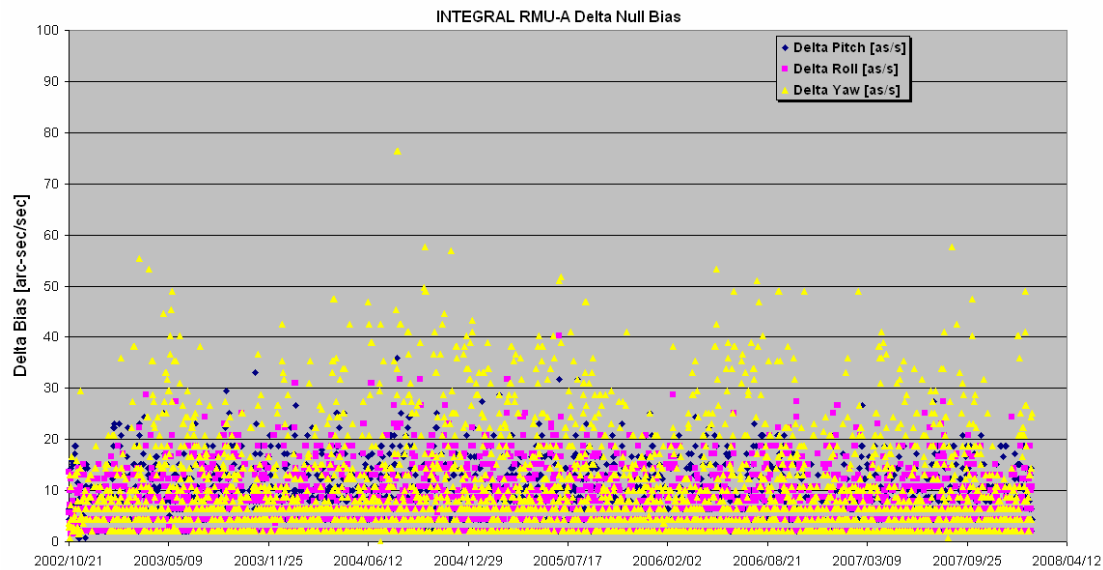
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 01/02/2008 is reported in the plot below.



The evolution of the drift on yaw channel is under constant monitoring.

The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over period between 01/11/2002 and 01/02/2008 is reported in the plot below.



26/01/2008 (Day of Year 026, Revolution 645)

Nothing to report.

27/01/2008 (Day of Year 027, Revolution 645-646)

Problem on IMCS: this began at 15:16z with an unrelated problem on the selected guide star causing the slew ID 06460002 to fail release. The guide star was not found during the previous Search/Track process and the PTV caused the slew commands to fail release.

A manual recovery was performed from attitude of PID 06460001 to the attitude of PID 06460002.

At 15:57z the next slew ID 06460003 was manually updated in TL but the slew parameters checked in TL were different from the TPF slew parameters generated by FDS. As consequence the AOCS s/s was disabled in TL waiting for clarification with on-call SOE.

A manual recovery was then performed from attitude of PID 06460002 to the attitude of PID 06460003 and the next slew 06460004 manually updated. Again the slew parameters checked in the updated TL were different from the generated TPF slews parameters by FDS.

At 16:44z the TPF task distributor was restarted on IMCS-A chain and the TPFs re-sent again to the MCS. The situation did not improve.

It was decided to move then the operations on the IMCS-B chain at 16:50z.

A manual recovery was performed from attitude of PID 06460003 to the attitude of PID 06460005. Unfortunately, during the end of slew execution, an additional problem on AUTOSTACK task, on client sun122, caused few commands for the AOCS s/s to be released even if the relevant s/s disabled in TL (See ARTS INT-

2894). This determined an incorrect configuration on-board of the FDE manoeuvre timer and slew criteria. In order to clean the FDE status, the AOCS SOE authorized the reset of the FDE timer before proceeding to the schedule recovery.

At 19:16z again a manual recovery was performed from attitude of PID 06460005 to the attitude of PID 06460007 and the next slew 06460008 manually updated. This time the slew parameters values in TL and those in the TPF generated by FDS matched (in both MCS chain A/B) and the AOCS s/s was enabled in TL at 19:36z.

The following slews were missed in TL: 006460002(CSL)-03(OSL)-04(OSL)-05(OSL)-06(OSL)-07(CSL).

28/01/2008 (Day of Year 028, Revolution 646)

Nothing to report.

29/01/2008 (Day of Year 029, Revolution 646)

Problem on AD service on TC link to DSS24: at 04:27z was requested by GFCC to recycle the TC link from DSS24 station for testing purposes. During the following reconfiguration of the TC link, a problem occurred causing the slew ID 06460049 to fail release.

A manual recovery was performed to update the next slew ID 06430050 in TL.

At 04:50z the AOCS s/s was enabled in TL.

The following slew was missed in TL: 06460049(OSL).

Problem on IMCS: at 17:42z a problem on the IMCS-A TM-RT cache task and Command Verifier task caused the slew ID 06460066 to fail release.

A manual recovery was performed from attitude of PID 06460065 to the attitude of PID 06460067 and the next slew ID 06460068 manually updated in TL.

At 18:44z the AOCS s/s was enabled in TL.

The following slews were missed in TL: 06460066(CSL)-67(CSL).

30/01/2008 (Day of Year 030, Revolution 646-647)

Problem on FDS: at 01:22z a problem on the RMU drift determination on the FDS caused the update for RMU calibration TPF to fail. Likely the drift rate observed on pitch axis exceeded the hard threshold set in the FDS and this prevented the generation of the calibration TPF.

A manual recovery was performed but the TPF generation failed again. Only after FD on-call action, i.e. update of the Pitch drift rate threshold (in agreement with the AOCS SOE) the TPF was generated.

As general information, the evolution of the RMU-A drifts is under constant monitoring, as reported in the previous section of this report. At moment there is no reason for worries being the evaluated drifts rates within the supplier specifications.

No impact on TL.

Problem on FDS: at 23:13z a problem on the attitude determination process on the FDS caused the update for slew ID 06470011 to fail. The number of valid stars in the STR FoV was below the requested threshold (≥ 3) and no slew update was generated.

A manual recovery was performed and the slew ID 06470011 was updated at 23:22z. This was possible due to the more relaxed constraints applied to the manual recovery schedule tool w.r.t. the automatic job schedule tool.

No impact on TL.

31/01/2008 (Day of Year 031, Revolution 647)

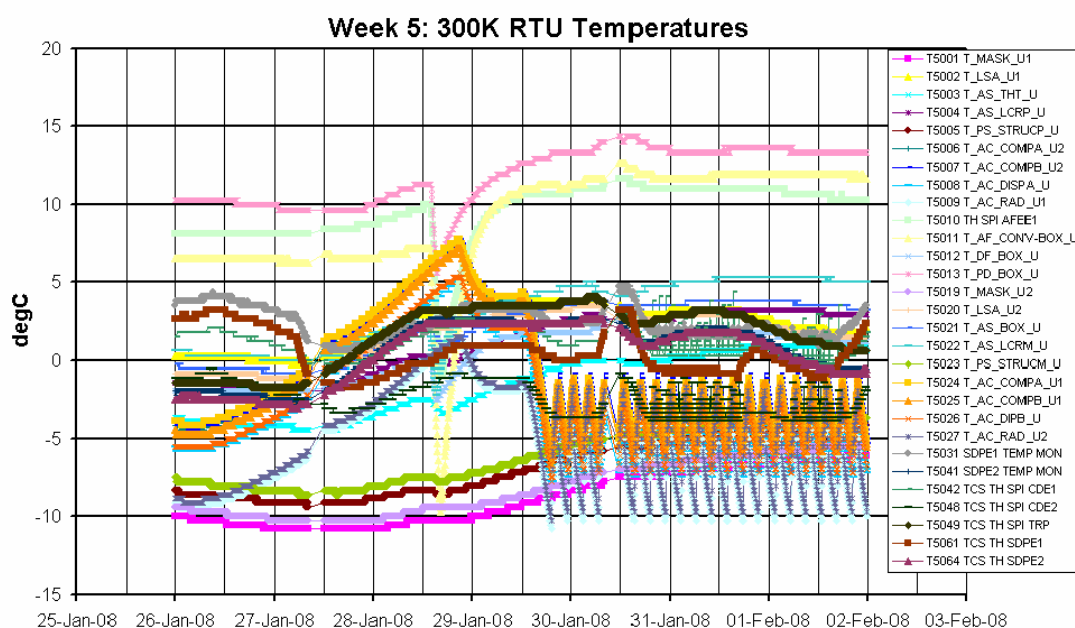
Nothing to report.

01/02/2008 (Day of Year 032, Revolution 647)

Nothing to report.

8.3.2 SPI Operations

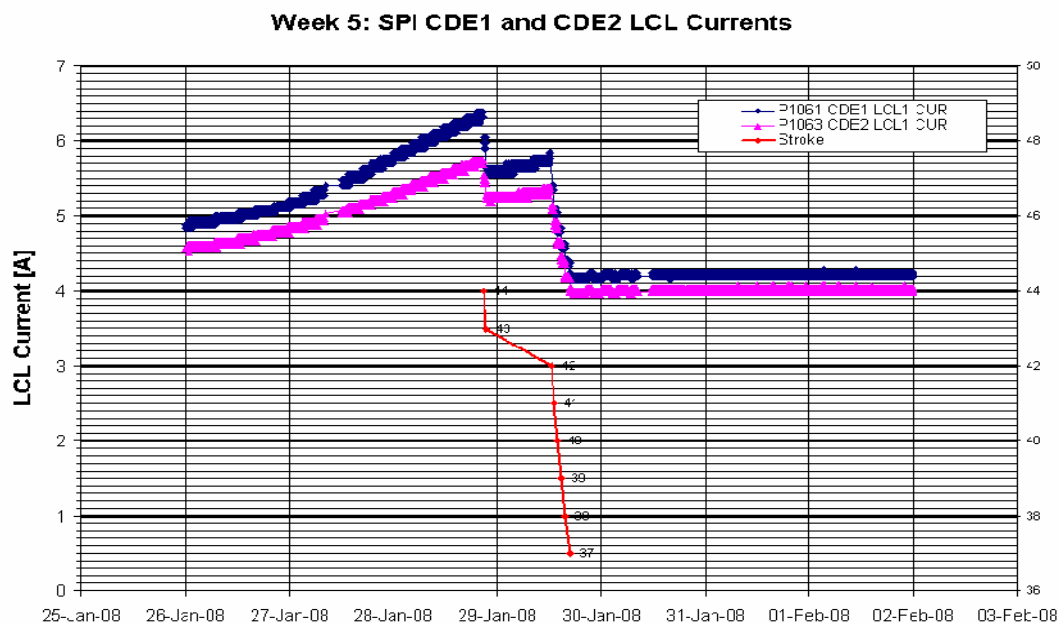
Unit Temperatures: All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period.



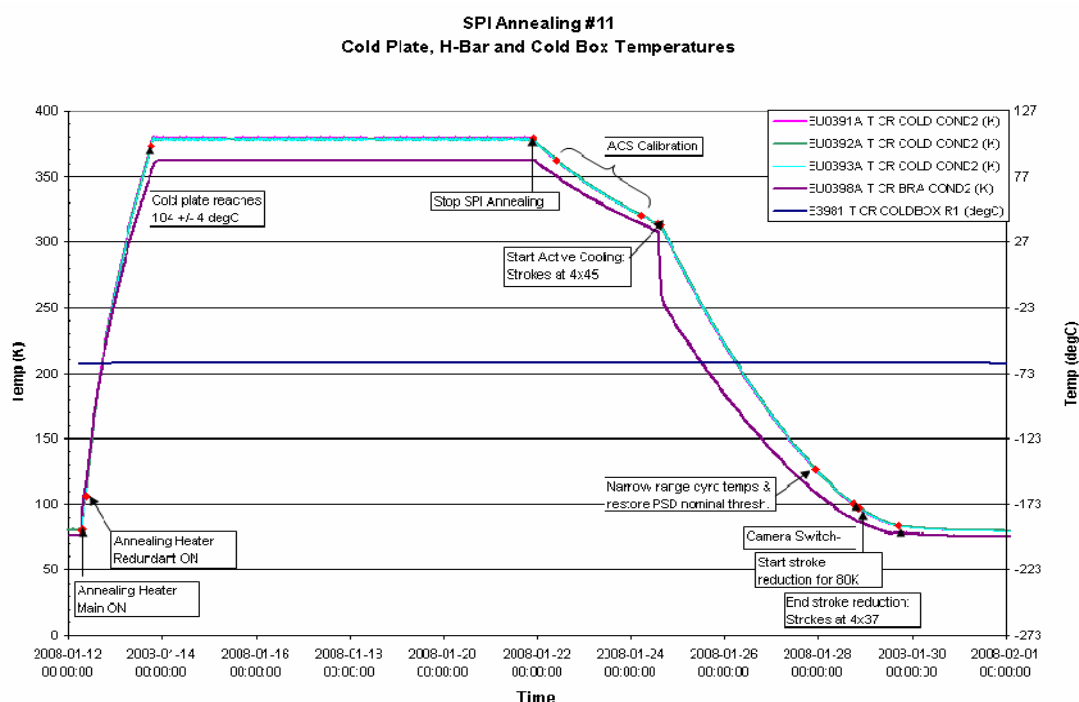
Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K $\pm$ 1K since the end of annealing.

The stroke of all four compressors was set to 45 at the start of the week, until 28/01/2008 at 20:55:00Z, when the stroke reduction operations to reach the cold plate temperature target of 80K were started. The stroke reduction operations were finished on 29/01/2008 at 16:43:00Z, with the stroke of all four compressors set to 37. The stroke remained at 37 for the rest of the reporting period.

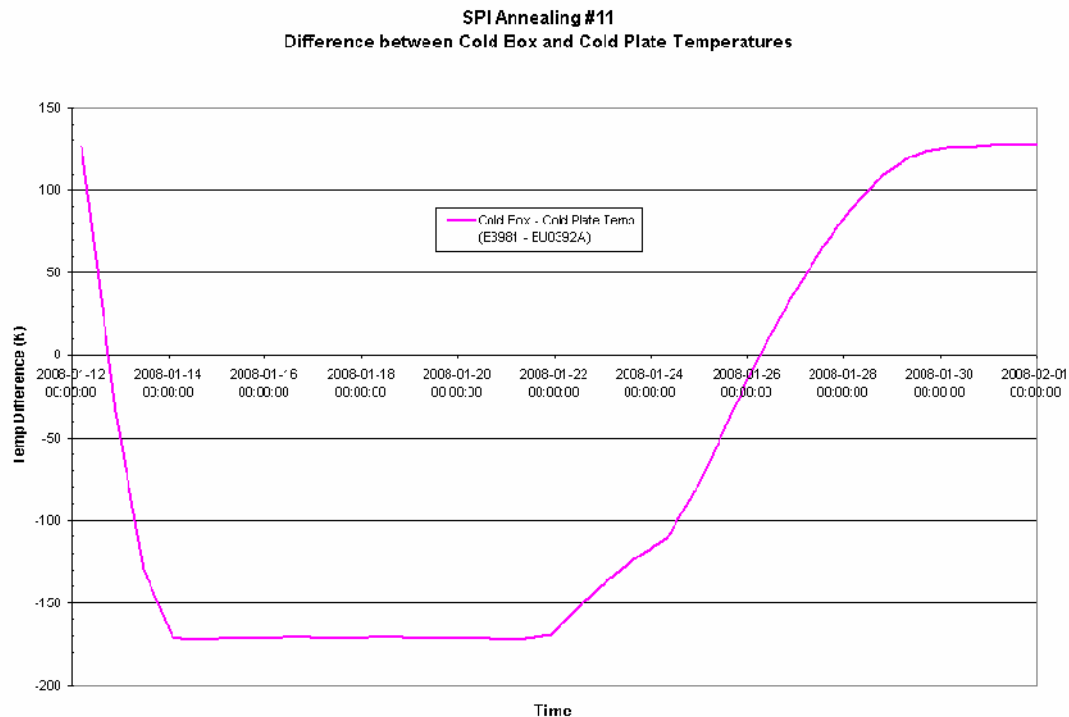
The following plot shows the evolution of the CDE LCL currents during the reporting period, along with the compressor stroke settings.



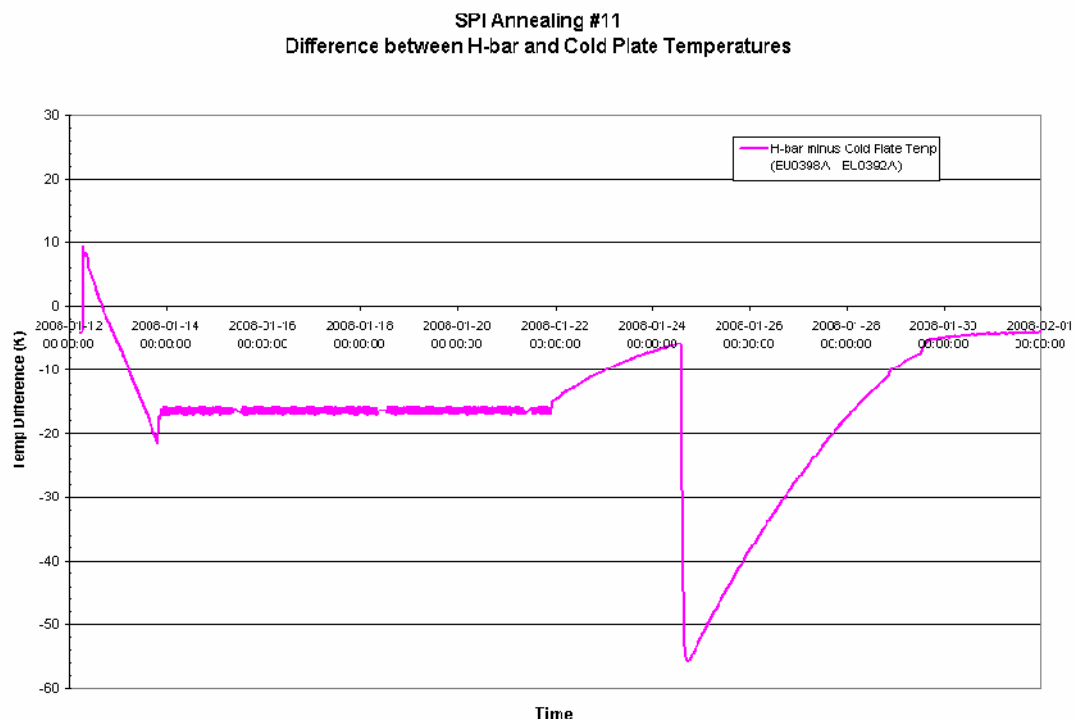
The following plot shows the evolution of the cold plate, cold box and H bar temperatures since the start of annealing.



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 IASW version installed was v4.3.3 patch #1 with the spectra scaling factor set to 8/19 SE until 28/01/2008 at 09:44Z, when a patch of the IASW to version 4.3.4 was

performed in line with OCR-231. The operations for the IASW patch were completed on 28/01/2008 at 16:20Z, after which the IASW remained in CONF until the camera switch-on.

The IASW was in CONF mode due to the ongoing annealing until the camera switch-on was started on 28/01/2008 at 17:43Z. From this time until the end of revolution 646 SPI was photon-by-photon mode with various different settings of the IASW parameters (as specified in OCR-231) in order to test the new functionality of the SPI IASW 4.3.4, as follows:

From	To	ME reduction	SE compression	kE	kdT	Spectra Scaling
2008-01-28 20:25:21Z	2008-01-29 08:50:59Z	ENABLED	DISABLED	N/A	N/A	8/19SE
2008-01-29 08:54:54Z	2008-01-29 09:30:05Z	DISABLED	DISABLED	N/A	N/A	8/19SE
2008-01-29 09:32:50Z	2008-01-29 10:29:41Z	DISABLED	ENABLED	11	3	8/19SE
2008-01-29 10:40:03Z	2008-01-29 11:12:06Z	DISABLED	ENABLED	10	3	8/19SE
2008-01-29 11:13:26Z	2008-01-29 11:44:19Z	DISABLED	ENABLED	12	3	8/19SE
2008-01-29 11:47:15Z	2008-01-29 13:30:19Z	DISABLED	ENABLED	11	4	8/19SE
2008-01-29 13:31:55Z	2008-01-29 13:42:58Z	DISABLED	ENABLED	11	5	8/19SE
2008-01-29 13:48:41Z	2008-01-29 14:12:51Z	DISABLED	ENABLED	11	3	12/19SE
2008-01-29 14:14:07Z	2008-01-29 15:00:16Z	DISABLED	ENABLED	11	3	10/19SE
2008-01-29 15:03:55Z	2008-01-29 15:48:04Z	ENABLED	ENABLED	11	3	8/19SE
2008-01-29 15:52:01Z	2008-01-29 18:34:50Z	ENABLED	DISABLED	N/A	N/A	8/19SE
2008-01-29 18:34:50Z	end of revolution	DISABLED	ENABLED	11	3	9/19SE

From 2008-01-29T16:51:55Z to 2008-01-29T17:33:43Z a test of the fix to Anomaly INT_SC-205 was performed, also in line with OCR-231. The test consisted of several rapid mode transitions CONF-PHOTON. During the test this anomaly did not reappear and has now been closed.

The results of these tests will be reported in a separate document from the PI covering IASW4.3.4 in-flight tests.

From revolution 647 onwards SPI was in photon-by-photon mode with nominal IASW parameters (ME reduction enabled; SE compression disabled and spectra scaling factor set to 8/19SE).

The average TM bandwidth occupation of SPI was 100.1 packets/cycle when SPI was in PHOTON mode. In revolution 645 the TM allocation was 46 packets/cycle due to the annealing. From revolution 646 onwards the TM allocation in the science window was 105 packets/cycle until 01/02/2008 at 09:16Z, when an over-allocated PST with 108 packets/cycle to SPI was loaded and remained active until the end of the revolution.

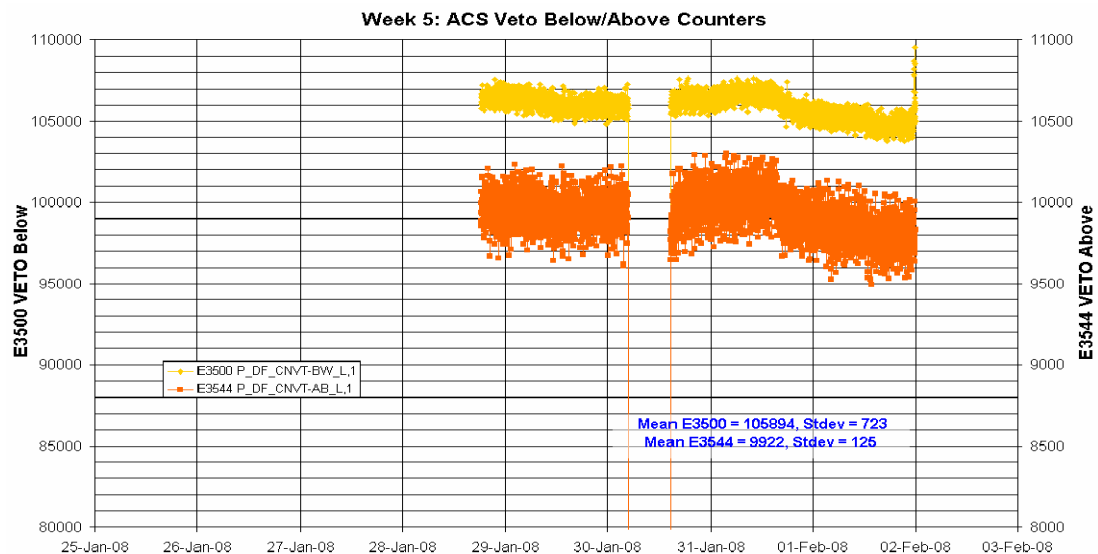
The following plot shows the IASW performance in terms of TM bandwidth and DPE CPU load during the reporting period.



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

For the 11th annealing operations, started on 12th January, the ACS has remained in CONF mode until the camera switch-on, starting on 28/01/2008 at 17:44Z.

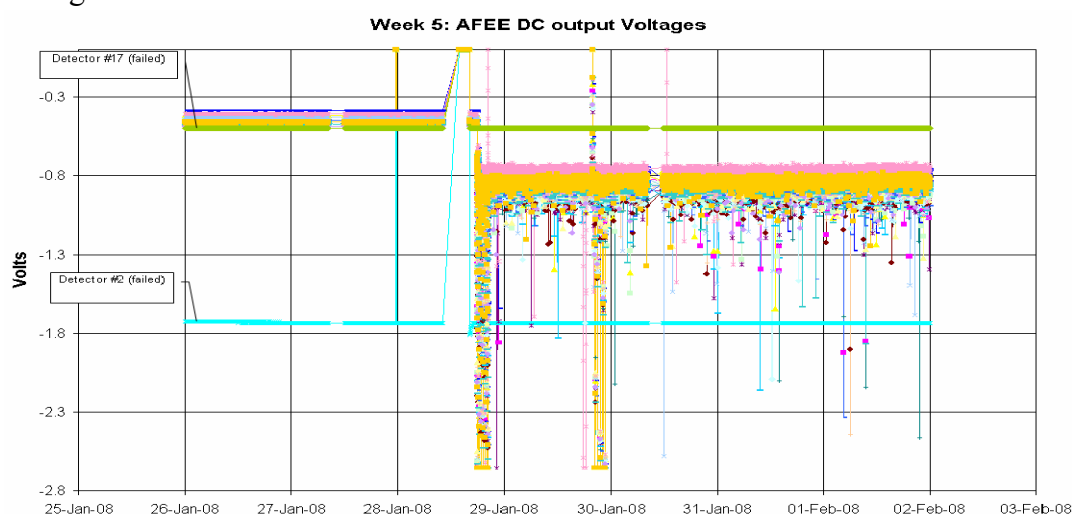
The following plot shows the ACS overall count rate evolution during the reporting period:



AFEE: The health of the AFEE is nominal. For the 11th annealing operations, started on 12th January, all detector HVPSs were switched off and only the LVPSs are left on until the camera switch-on, starting on 28/01/2008 at 17:44Z.

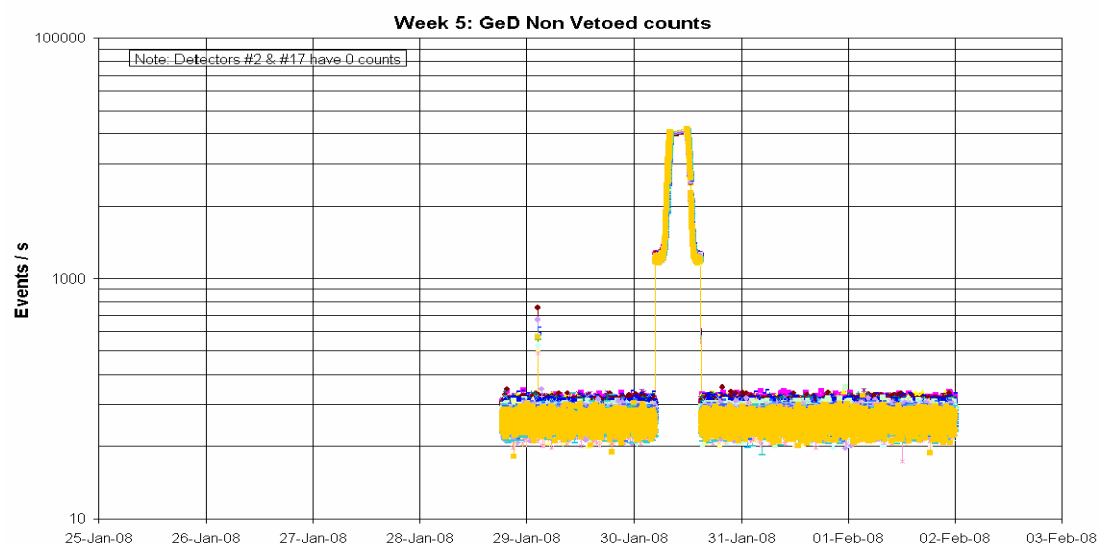
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003 and detector #17 is failed since 17/07/2004.

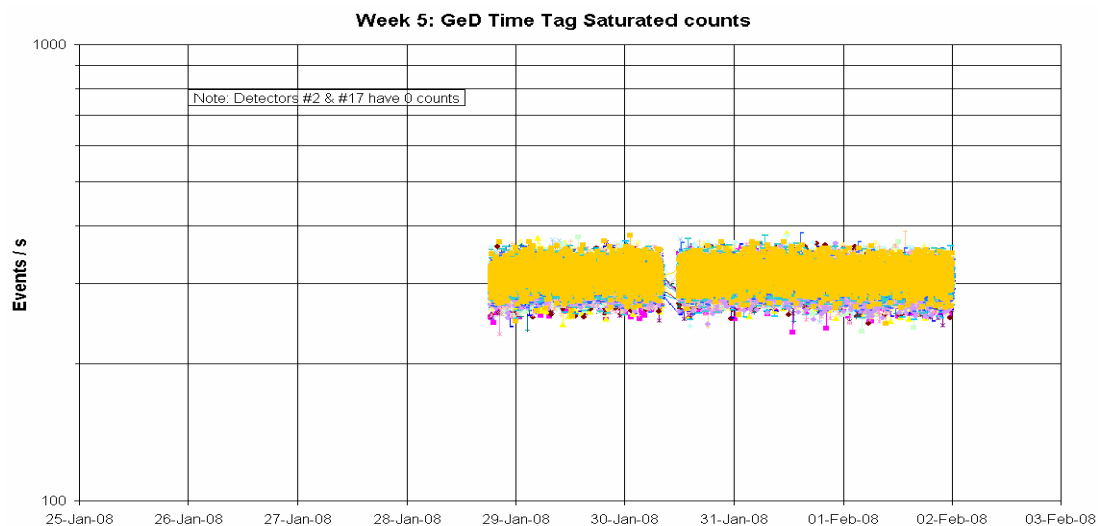
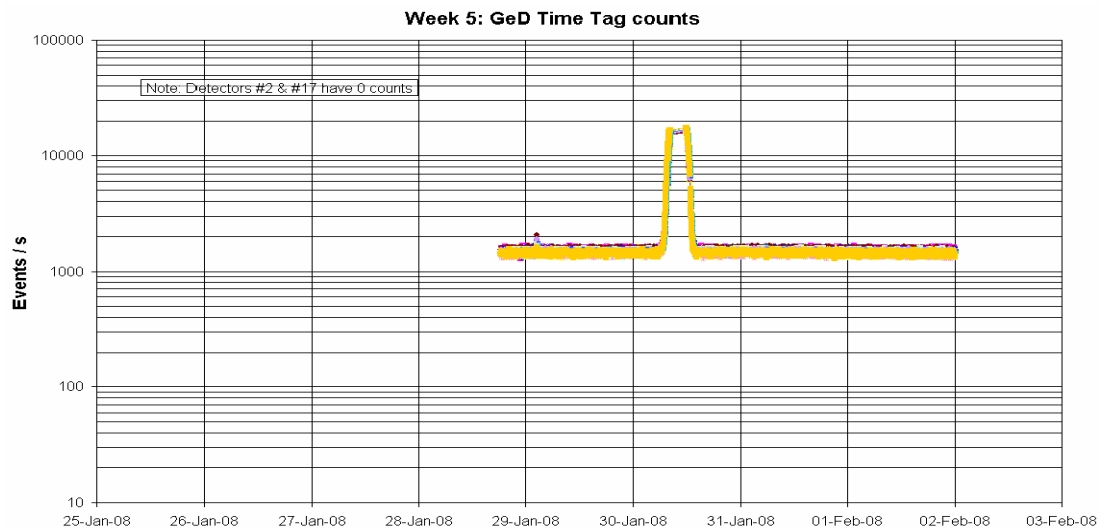
Following the camera switch-on until the end of revolution 646, several tests with various different High Voltage settings for the GeD detectors, in particular GeD#12, were performed. These are reported in the summary table of annealing operations in Section 3.2.1. The large spikes in the plot below are due to these changes of GeD HV setting.



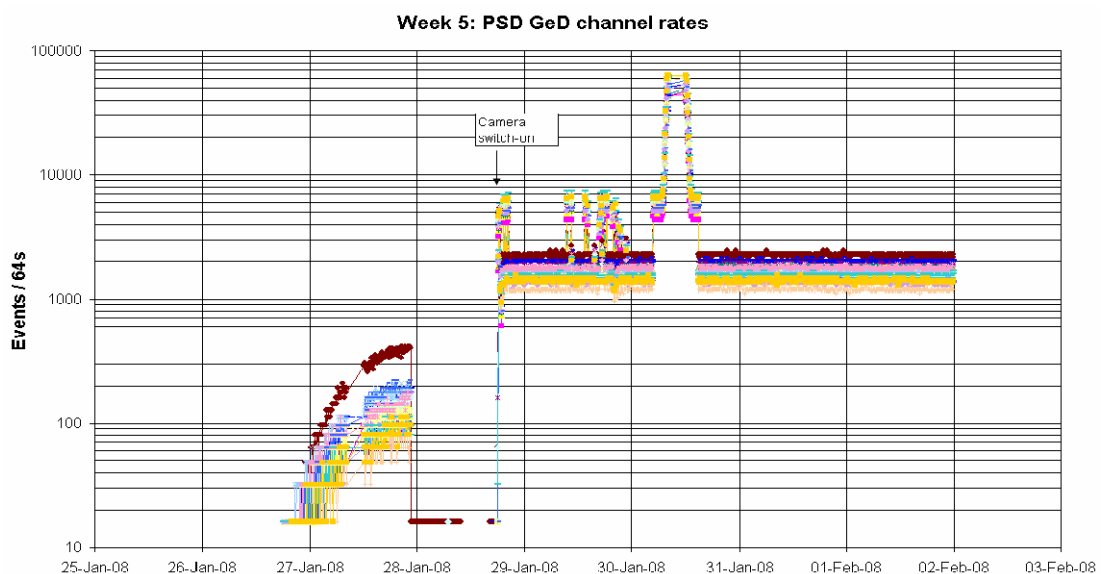
DFEE: The performance of the unit is nominal. For the 11th annealing operations, started on 12th January, the DFEE was in CONF mode until the camera switch-on, starting on 28/01/2008 at 17:44Z.

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. For the 11th annealing operations, started on 12th January, the PSD was in CONF mode until the camera switch-on, starting on 28/01/2008 at 17:44Z. The following plot shows the PSD channel rates during the reporting period.



Event Log:

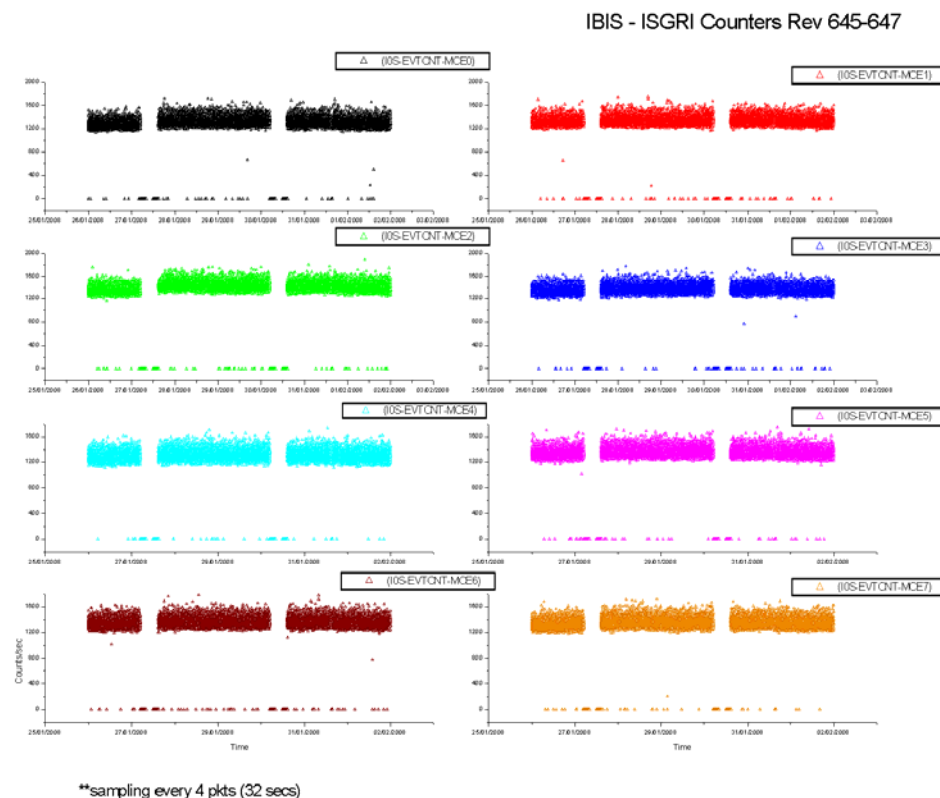
The following non-nominal events occurred on SPI over the reporting period:

- Since the installation of IASW patch, the TM parameter E0229 has been reporting incorrect values. This is raised as AR INT_SC-218.
- Several occurrences of OEM APID 1024 ID 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW have been received throughout the week. These have not been correlated with any specific activity (e.g. OMC FFC). As they have been a few isolated occurrences and have stopped of their own accord, no action was taken however this has been reported to the PI for analysis.

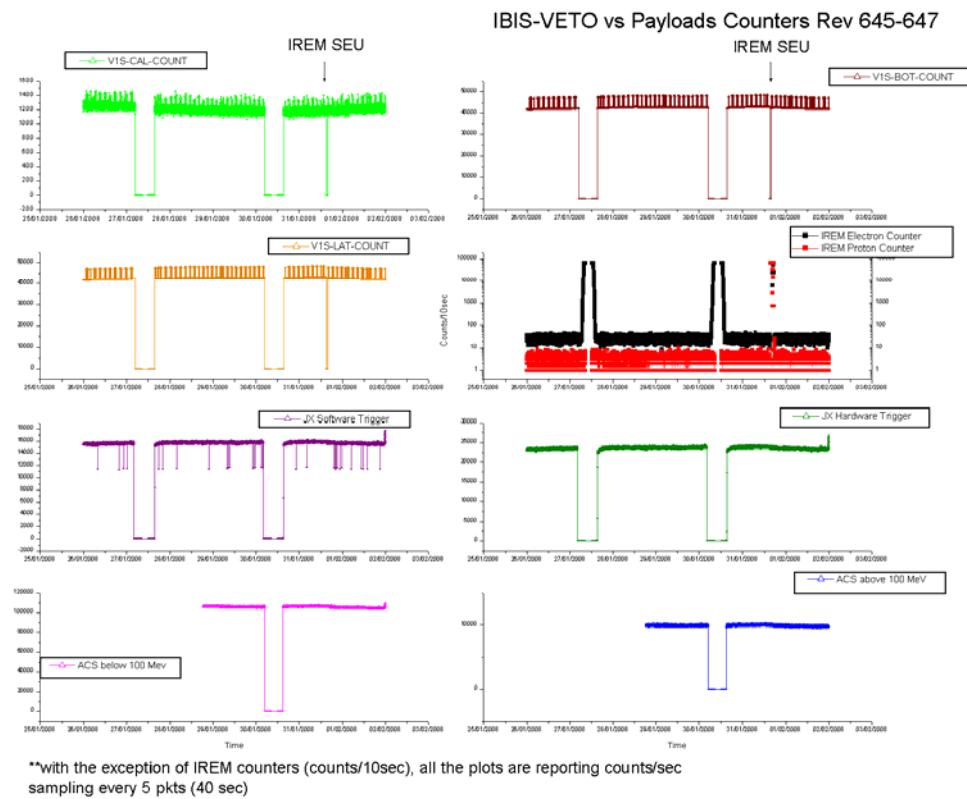
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:



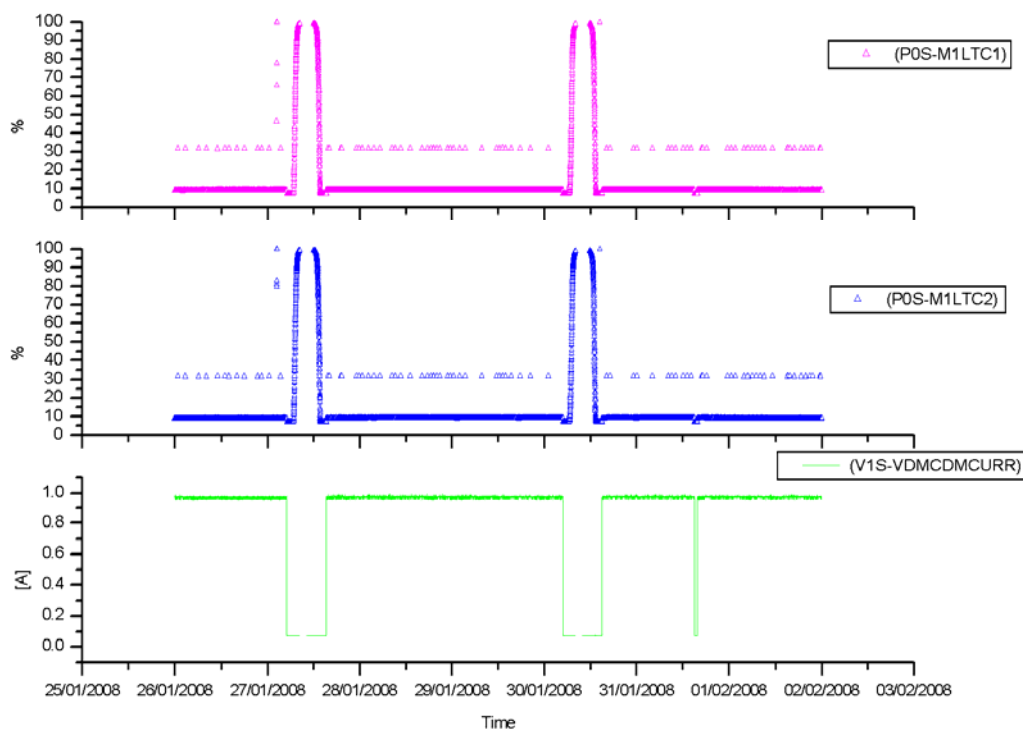
VETO vs Payload Counters:



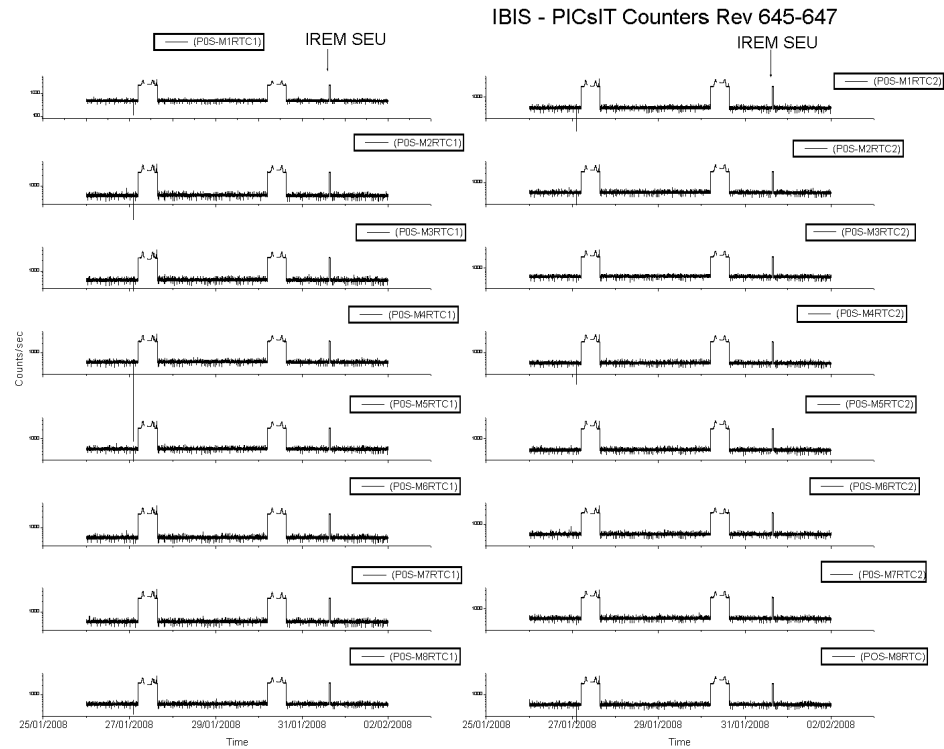
The week was characterised by low radiation as reported by the payload.

VETO Current:

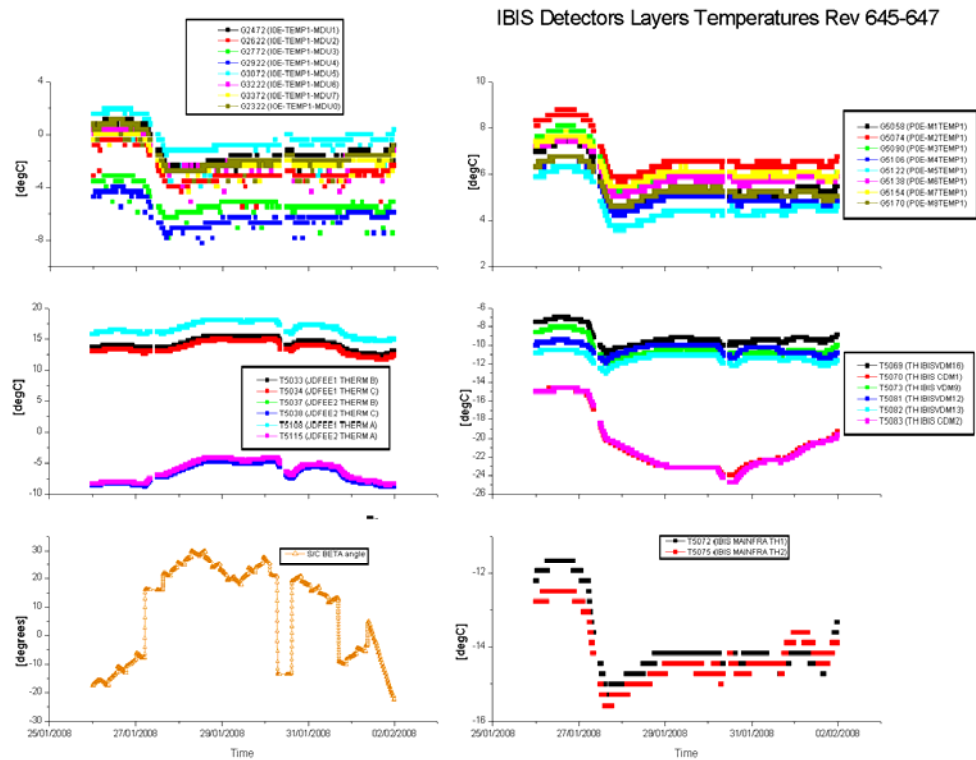
IBIS-VETO Current & PICsIT dead times Rev 645-647



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2) families and G2000 family (I0E-OVFWPXADD-Mi) were received during the radiation belt passages.

In addition, throughout the week:

- TM parameter G8080 went OOL Warning High several times. This is the Valid event rate on HBRA. As at each occurrence it remained OOL for only 1 TM cycle, no action was taken. This indicates an overflow in the counters and affects only the quality of the scientific data but not the safety of the instrument.
- TM parameter G6061 went OOL Low briefly a couple of times this week. This is the VETO Calibration source counter. If this parameter begins to toggle OOL Low more frequently, the IODB limits will be updated to take into account the lower count rates, which is due to the radioactive decay of the source.

2008-01-26 (DOY 026, Rev 645)

IBIS operations executed nominally.

2008-01-27 (DOY 027, Rev 645-646)

At 02:24:17Z the TM parameters families G5002 and G5003 for the PDM semi-module counters started going OOL (value = 0) and at 02:24:46Z the TM parameter families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. As these were followed at 02:29:07Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

2008-01-28 (DOY 028, Rev 646) to 2008-01-29 (DOY 029, Rev 646)

IBIS operations executed nominally.

2008-01-30 (DOY 030, Rev 646-647)

At 07:01:35Z, during the radiation belt passage of revolution 646-647, TM parameter G5079 went OOL High (value = 2.60509804V). This is the PDM2 +2.5 V. As it returned within limits at 07:02:07Z, no action was taken.

2008-01-31 (DOY 031, Rev 647)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 15:05:07Z. It was recovered as follows:

- At 15:40:06Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
- At 16:02:17Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.

IBIS operations continued nominally.

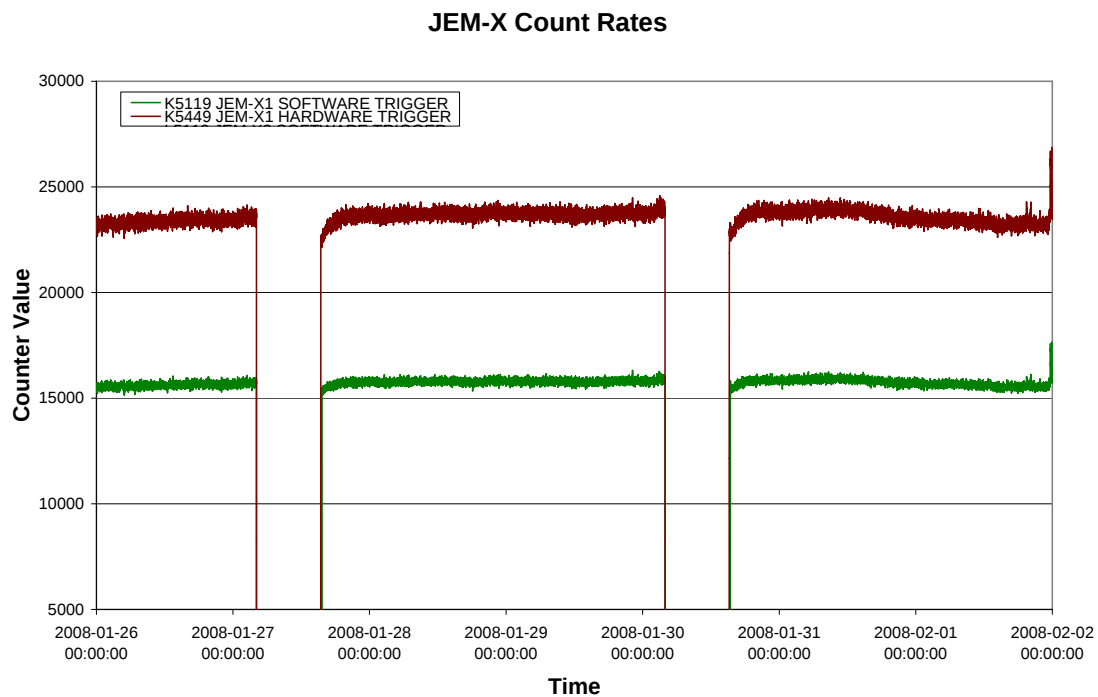
2008-02-01 (DOY 032, Rev 647)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

JEM-X Count Rates

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

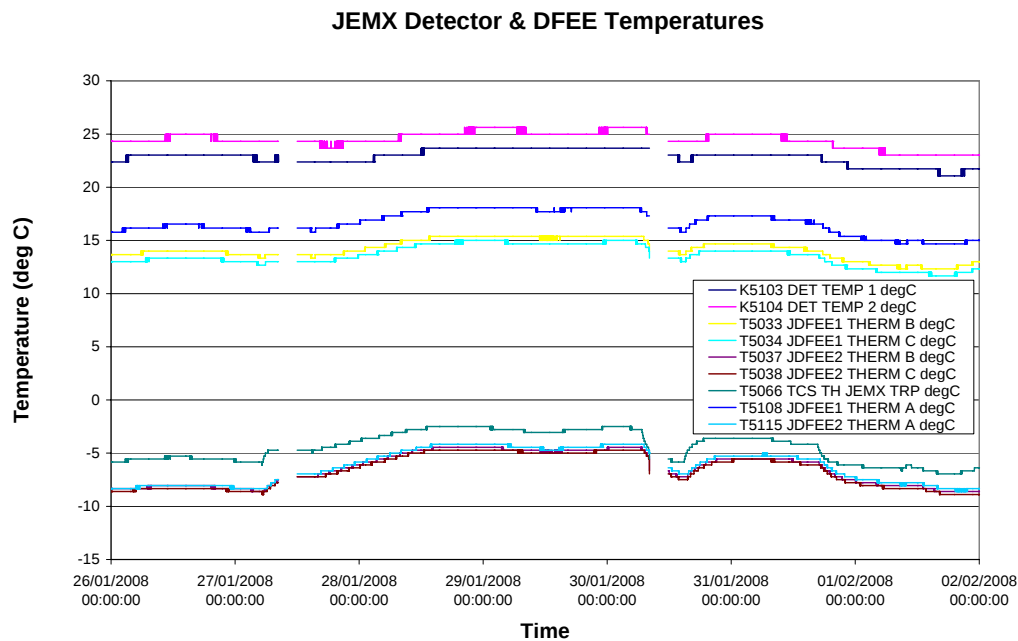


JEM-X Temperatures

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

2008-01-26 (DoY 026, Rev 645) to 2008-01-30 (DoY 030, Rev 646-647)

JEM-X1 operations executed nominally

2008-01-31 (DoY 031, Rev 647)

At 15:05:50 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#61). There was no impact as the reaction has been disabled.

2008-02-01 (DoY 032, Rev 647)

JEM-X1 operations executed nominally

8.3.5 OMC Operations

2008-01-26 (DoY 026, Rev 645)

Nothing to Report.

2008-01-27 (DoY 027, Rev 645-646)

At 15:16, AOCs problems prevented the uplink of a command, a manual recovery was performed, and pointing 06460002 executed nominally. Subsequently, a communication problem appeared between the FDS and the imcs, which forced an interruption in the Timeline. This was eventually resolved, and the Timeline rejoined at 20:16. The impact was the loss of pointings 06460003, 06460004, 06460005, 06460006 & 06460007. It was at this time the following OEMs were received:

```
2008.027.16.06.27.391 2008.027.16.06.38.798 1792 RealTime 131 TC REJECT
REJECTED TC1 0 0 65535 PR N
E E
```

Doc. Title : INTEGRAL Mission Report #280
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
Date : 04/02/08

Issue : 1
Rev. : 0
Page : 30

2008.027.16.06.32.703	2008.027.16.06.38.809	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 pointing 06460003.

2008-01-28 (DoY 028, Rev 646)

Nothing to Report.

2008-01-29 (DoY 029, Rev 646)

At 04:29, after the handover from Redu to DSS-24, the AD commanding on VC7 failed and the Timeline stopped. It was decided to proceed with only VC0, and a recovery was then performed. The Timeline was rejoined at 04:50. The impact was the loss of pointing 06460049.

At 17:42, a lost connection to the TM RT cache caused the Command Verifier to crash. This led to the loss of pointing 06460066. It was at this time the following OEMs were received:

2008.029.17.46.46.458	2008.029.17.46.54.814	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					
2008.029.17.46.52.333	2008.029.17.47.02.798	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.

2008-01-30 (DoY 030, Rev 646-647)

Nothing to Report.

2008-01-31 (DoY 031, Rev 646-647)

At 15:05:08, OMC was sent to SAFE mode by an IREM SEU (#61). A recovery was performed, and the instrument returned to Stand-by at 15:29:03. The impact was pointing 06470025 was cut short after 3176 from a planned 3479 seconds, and pointing 06470026 was lost.

2008-02-01 (DoY 032, Rev 647)

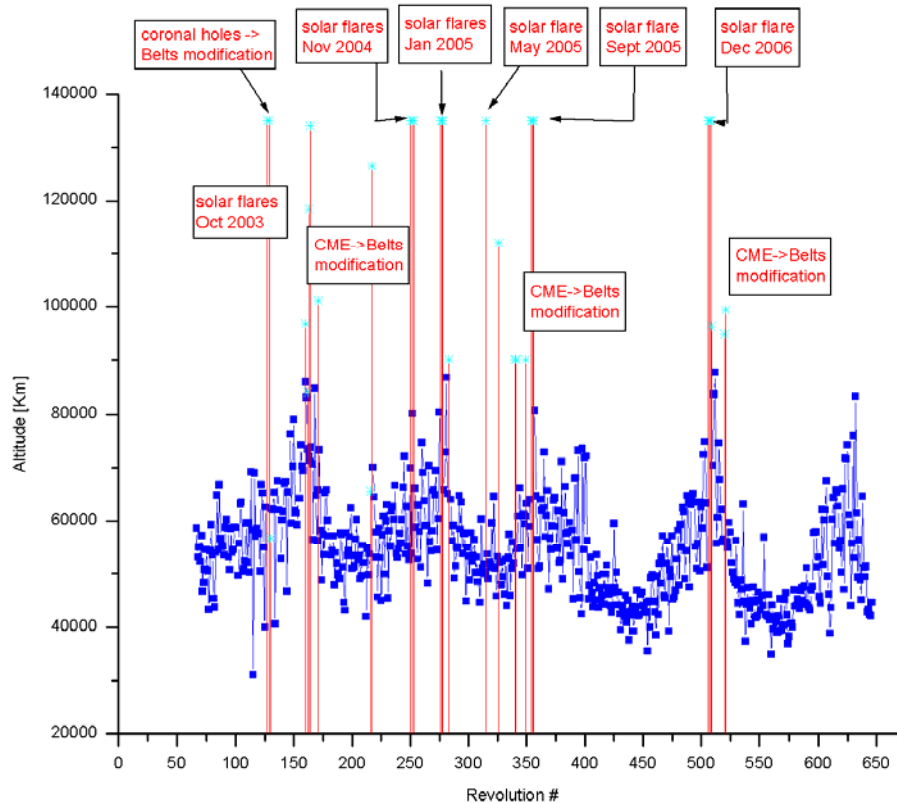
At 18:43:32, a SEU on the Star Tracker caused the IMU to be switched on preventing the OTF from being set. The impact was the loss of pointing 06470060.

On DoY 027 at 05:02:28 and DoY 030 at 04:50:28 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

Evolution of Radiation Belt Entry 2003-2008



IREM daily report

DoY 2008.031 (31/01/2008):

At 15.05.07Z, a local reset of the IREM CSCI S/W (SEU #61) was observed. The status of the unit, before the local reset of the IREM CSCI S/W, 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 anomaly occurred at 2008.031.15.05:07Z at 147572.5 km. 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 15:08Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly reported a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure Flag ON. The unit was still reporting the status as if it was in Integral mode with counting ON and accumulation 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) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 18:01Z.

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. OMC was recovered at 15:29:03Z and IBIS at 16:03Z.

The cause of these S/W resets is apparently due to the unit's memory device that is sensitive to high energy radiation, as proved during test campaign on-ground.

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]
645	RAD_ENTR R 2008-01- 27T05:02:21Z	27/01/2008 06:38:27	42182.0	27-Jan-2008 06:31:27	43266.15
646	RAD_EXIT R 2008-01- 27T15:05:08Z	27/01/2008 13:56:27	>>33255.6	27-Jan-2008 14:11:27	45290.69
646	RAD_ENTR R 2008-01- 30T04:50:26Z	30/01/2008 06:17:39	44572.6	30-Jan-2008 06:17:40	43364.08
647	RAD_EXIT R 2008-01- 30T14:52:51Z	30/01/2008 13:37:39	33267.2	30-Jan-2008 13:57:40	45266.82

Reference

High radiation

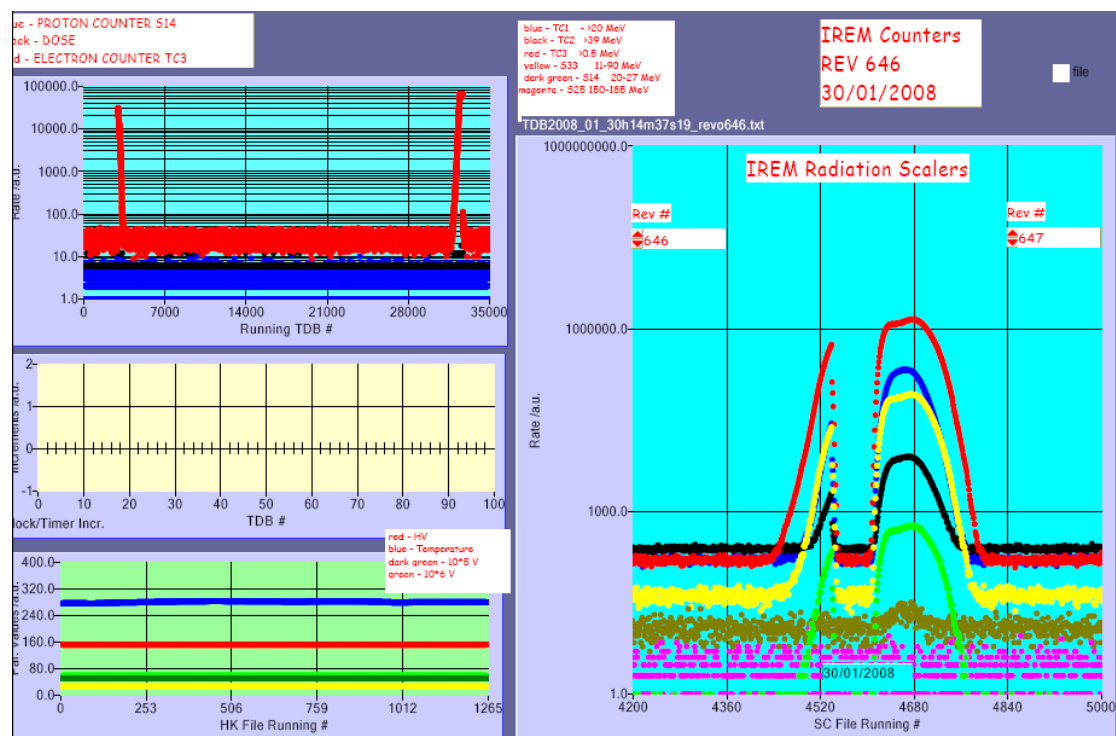
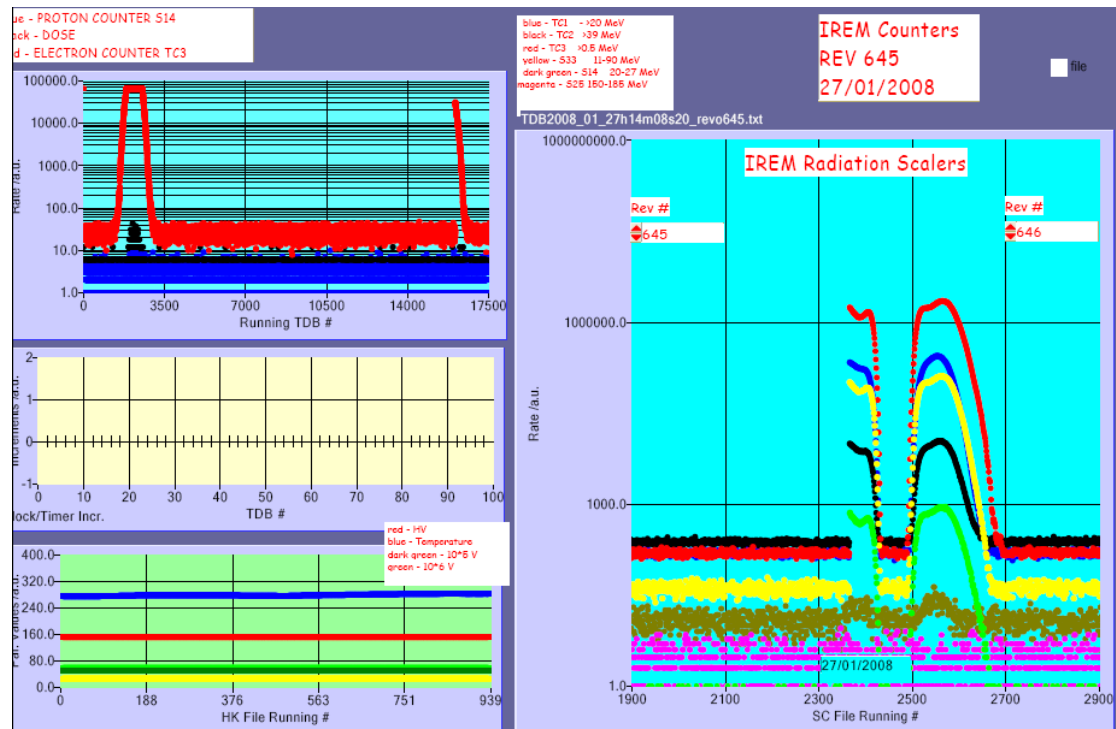
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

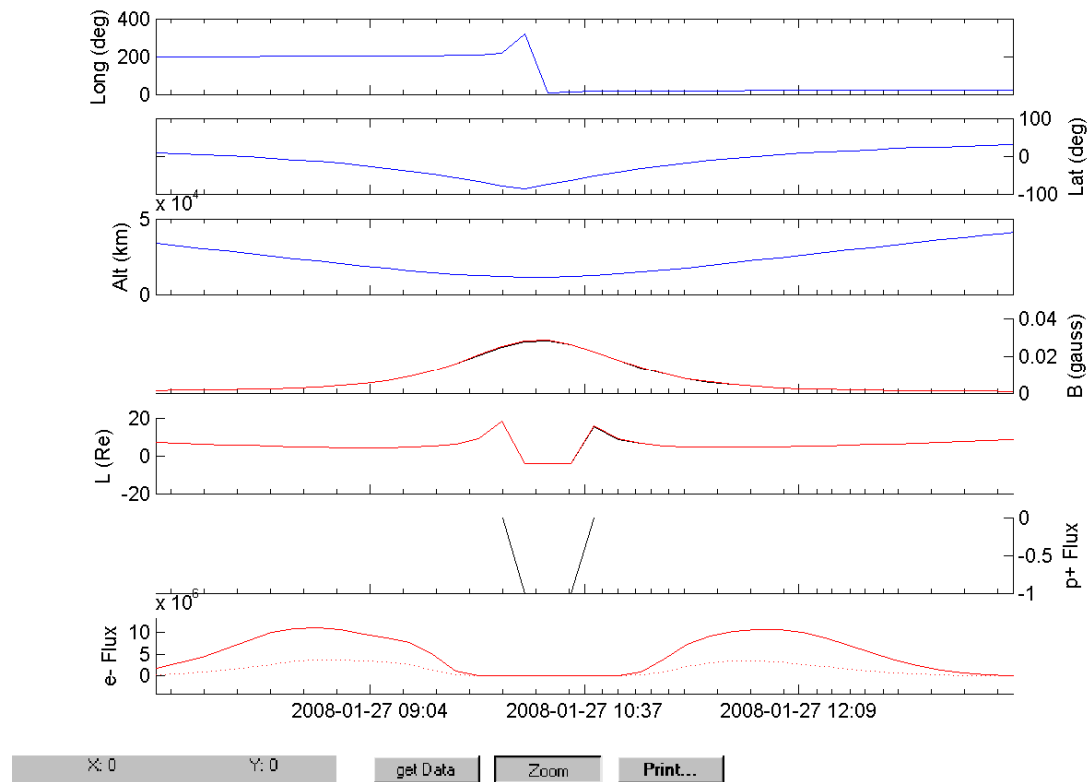
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM radiation counters:

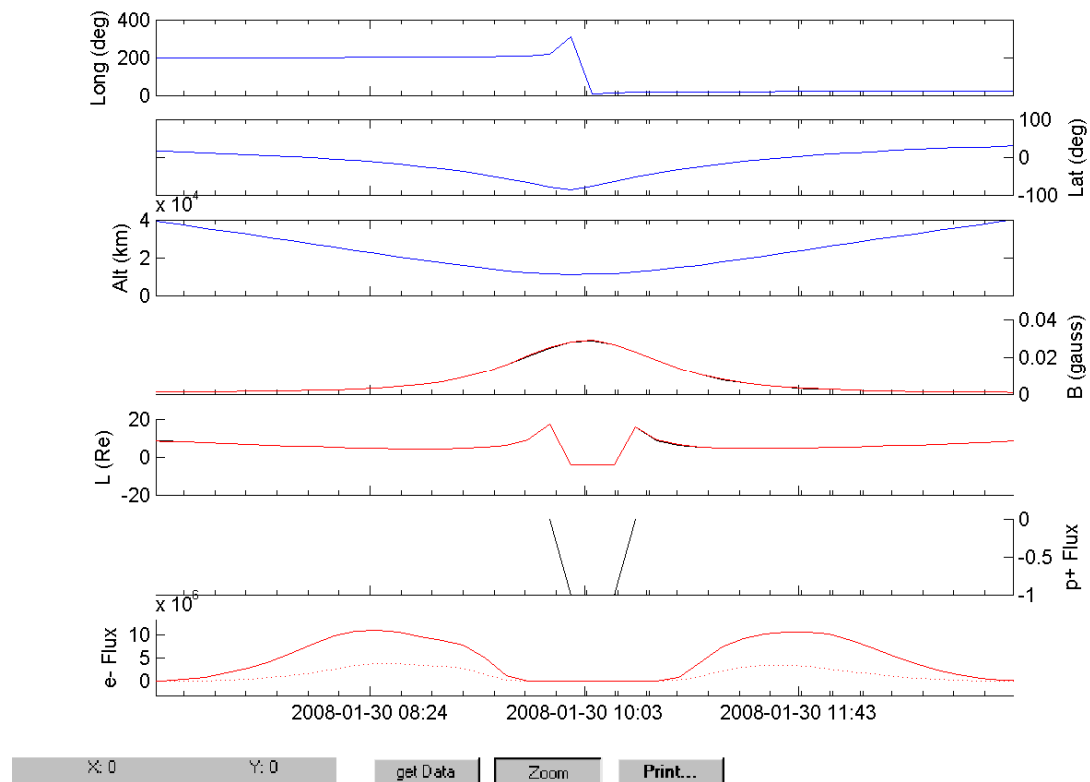


IREM Predicted Radiation Belt Passages

Rev 645



Rev 646



Doc. Title : INTEGRAL Mission Report #280
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
Date : 04/02/08

Issue : 1
Rev. : 0
Page : 35

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

Due to a problem on the SEISOP server, no data are available this week. However, the week was very quiet and no radiation was reported.