

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 189
Week 18
08.05.06
Routine Phase

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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.....	4
3.1.3	Thermal.....	4
3.1.4	OBDH.....	4
3.1.5	RFS.....	4
3.2	Payload.....	4
3.2.1	SPI.....	4
3.2.2	IBIS.....	5
3.2.3	JEM-X.....	6
3.2.4	OMC.....	6
3.2.5	IREM.....	6
4	Ground Facilities.....	6
4.1	Mission Operations Centre.....	7
4.2	Ground Stations & Network.....	7
4.3	Science Ground Segment.....	7
4.3.1	ISOC.....	7
4.3.2	ISDC.....	7
5	Special Events.....	8
6	Anomalies.....	8
7	Future Milestones.....	8
8	Appendix.....	9
8.1	Overview of Revolutions.....	9
8.2	Consumables.....	9
8.2.1	Detailed Fuel Book-keeping.....	9
8.3	Detailed Satellite Information.....	9
8.3.1	AOCS SUMMARY OPERATIONS REPORT, 29/04/2006 – 05/05/2006.....	9
8.3.2	SPI Operations.....	16
8.3.3	IBIS Operations.....	18
8.3.4	JEM-X Operations.....	21
8.3.5	OMC Operations.....	23
8.3.6	IREM Operations.....	24

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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 29.04.06 until 05.05.06 (both dates inclusive) and covers the revolutions 433 and 434.

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 raster dithers of Field 5 (RA 08:53:50.00, DEC +16:12:18.0) and GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9).

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 Eclipse season started with the first eclipse passage on 03/05/2006. The first eclipse passage was nominal from an AOCS point of view.

As results of the periodic IMUs (1-2-3-4) calibration and health-check performed on 26/04/2006, the IMUs drift corrections were uplinked in rev 432.

As part of the AOCS preparation for the summer eclipse season, the onboard AMD thresholds were set to their eclipse season values on , at the beginning of rev 433. In the same time frame were verified the AMD dead band value, the IMU timers, the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

1 slew was lost during the observation period due to problem at planning level for rev 434.

The fuel consumption over the period between 27/04/2006 and 04/05/2006 was 0.1260 kg. The remaining propellant is in the order of 154.7965 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, which ended on 24th January, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #15, which is showing since 09.02.2006 a slightly degraded energy resolution. Detector #2 is failed since 06.12.2003, detector #17 since 17.07.2004.

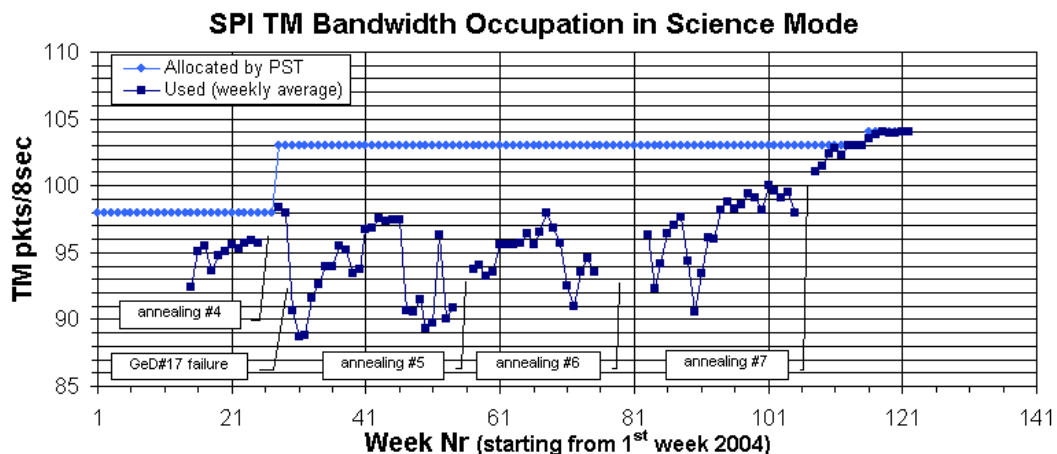
During science operations, the instrument was kept in photon-by-photon mode, with spectra TM enabled, the assigned TM bandwidth in the science observation windows of 104 pkts/cycle and the average telemetry occupation was 104 pkts/cycle. The telemetry downlink of SPI has therefore reached the saturation.

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

On the 3rd May the eclipse season has started and will last till 24th May. The instrument has so far behaved nominally at each post-eclipse re-activation. Some out of limit (OOL) on the PSAC temperatures appeared as expected.

An abnormal background was also detected on the ACS for a period, at belts exit of rev.434, signalled by OOL on the Veto count (<100MeV) and saturation of the TM bandwidth.

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.

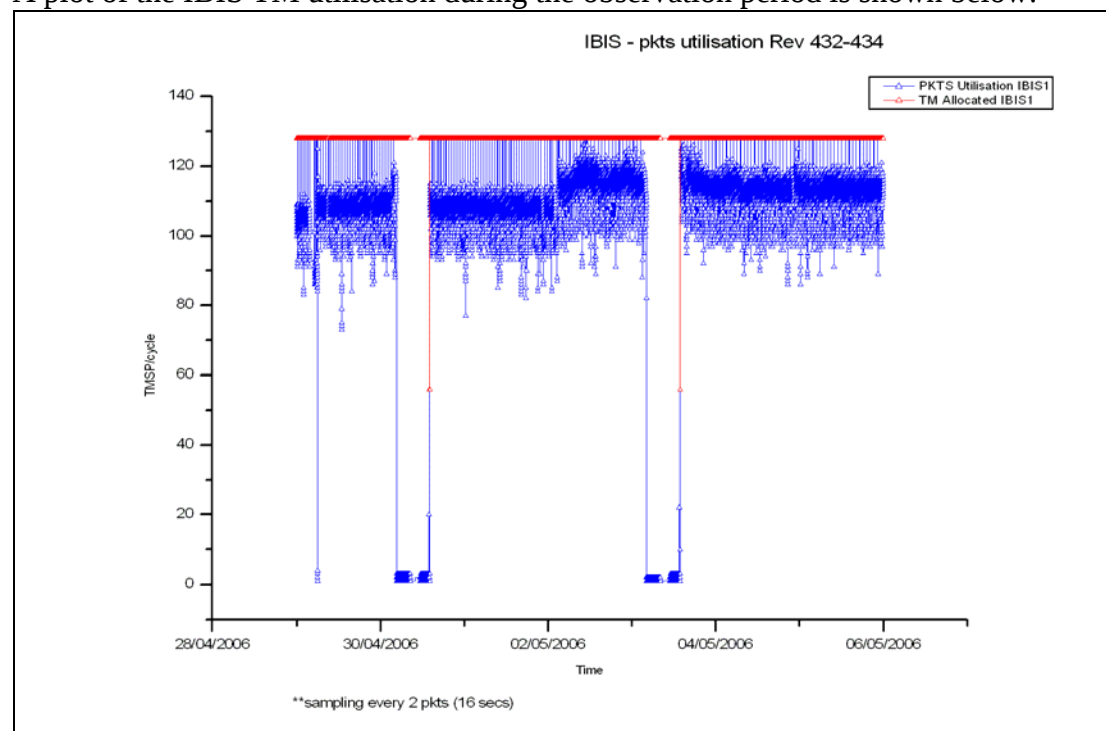
3.2.2 IBIS

The Overall status of the unit is nominal.

The summer eclipse season started on 2006-05-03. The reconfiguration of IBIS at eclipse exit was successful.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 111.57 TMPS/cycle, up 6.57 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 and JEM-X2 was dormant (DFEE OFF) with a TM allocation of 1 packet/cycle.

The first eclipse in the 8th eclipse season occurred on 2005-05-03. The eclipse related operations for JEM-X were nominal.

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, 160 of the 161 planned science pointings for OMC were executed nominally, 1 was lost.

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

3.2.5 IREM

The overall status of the unit is nominal.

On 2006-04-30 the 30th IREM SEU occurred.

Solar Activity

The observation period was characterised by low solar activity.

Sunspot 875, that appeared last week, kept posing threat for M-class solar flares until 02 May. Other sunspots appeared on the Sun but posed no threat until the end of the observation period.

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 very good this week. A non-science pointing was lost to a planning error, and another to a node failure. There

were a few other minor problems with ground stations, but these had no impact. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. A pointing was lost due to a planning error, but this did not affect science operations. The overall performance was well over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. A pointing was lost due to a node failure at Redu, apart from that there were a few instances of bad frames and TM drops, 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 for revolution 442 was received. ISOC planning up to revolution 440 have been performed and the corresponding POS's and ICP's have been sent to MOC and ISDC. Planning from revolution 441 is pending dependant on the final decision to perform a SPI annealing or not. No replanning or ToO requests were received. TSF's for revolutions 434 to 438 were received. TSF for revolution 434 is a redelivery. Some trials have also been performed in preparation for the complete switch off of JEM-X 1 and reallocation of one telemetry packet to SPI.

2. Observation status

ECS's for revolutions 421 to 425, except 422 that is still missing, were received this week. They have been processed by ISOC and the corresponding OCS's have been sent to ISDC. No extra time has been credited.

3. ISOC science data archive

Nothing to report.

4. ISOC system

The ISOC system version 12.3 has been used. No modifications performed.

5. AO 4

Now that the data package is available to the TAC members the work in ISOC is concentrating on performing feasibility checks of the proposals.

6. Problems

The archive hardware problem is still remaining. No other outstanding problems.

4.3.2 ISDC

Status of ISDC observation processing on 08/05/2006:

- Latest Standard Analysis completed: observation 03200920002 (Galactic Centre, Revolution 409,415) on 29/04/2006

- Latest products archived: observation 03200920002 (Galactic Centre, Revolution 409, 415) on 02/05/2006

- Latest observation products sent to the observer: observation 03297000006 (SN1006, Revolutions 404 - 407) on 08/05/2006

5 Special Events

6 Anomalies

The following problem impacted the operations this week:

- On DoY 119, at 09:08, there was a drop in VC0 & VC7 TM from Redu, due to a node failure. A recovery was performed, and the timeline rejoined at 09:38. The impact was the loss of pointing 04320071.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-149	02/05/2006	IREM Anomaly: Reset of IREM_CSCI S/W #30, 30/04/2006	Spacecraft	Open

7 Future Milestones

On the 3rd May the summer eclipse season begins, which continues until the 24th May when. There are a total of 8 eclipses.

A new imcs release will be installed in June. This release will be based on SCOS 2000 3.1 patch M04, to bring the system in-line with that used by XMM.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 433

The observations in revolution 433 began with a raster dither of Field 5 (RA 08:53:50.00, DEC +16:12:18.0) for ~34.1 hours and continued with a raster dither of GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9) for ~23.5 hours until the end of the revolution.

Revolution 434

The observations in revolution 434 consisted entirely of a raster dither of GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9) for ~54.9 hours, which lasted until the end of the revolution.

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 128; SPI 104; JEM-X1 8; JEM-X2 1; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-04-17T15:32:36.000Z	155.1103	F	Automatic TM processing.
2006-04-18T13:06:22.000Z	155.0808	F	Automatic TM processing.
2006-04-19T23:45:30.000Z	155.0597	F	Automatic TM processing.
2006-04-21T23:55:43.000Z	155.0396	F	Automatic TM processing.
2006-04-22T23:01:54.000Z	155.0213	F	Automatic TM processing.
2006-04-24T12:29:10.000Z	155.0048	F	Automatic TM processing.
2006-04-24T21:38:07.000Z	154.9884	F	Automatic TM processing.
2006-04-25T04:48:55.000Z	154.9783	F	Automatic TM processing.
2006-04-25T22:54:25.000Z	154.9429	F	Automatic TM processing.
2006-04-27T12:13:09.000Z	154.9216	F	Automatic TM processing.
2006-04-28T22:44:57.000Z	154.9067	F	Automatic TM processing.
2006-04-29T03:54:50.000Z	154.8455	F	Automatic TM processing.
2006-04-30T12:11:41.000Z	154.8236	F	Automatic TM processing.
2006-05-03T05:49:40.000Z	154.8092	F	Automatic TM processing.
2006-05-04T22:34:24.000Z	154.7956	F	Automatic TM processing.

This report was generated Fri May 5 08:00:35 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, 29/04/2006 – 05/05/2006

AOCS operations were executed from the Automatic Timeline.

Doc. Title : INTEGRAL Mission Report #189
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
 Date : 08/05/06

Issue : 1
 Rev. : 0
 Page : 10

During this period, 57 Open Loop Slews, 110 Closed Loop Slews and 4 Momentum Biases were executed.

1 slew (CSL) was lost during the observation period due to a problem at planning level for rev 434.

This is equivalent to a 0.6 % of the total number of slews planned (167).

The IMUs drift corrections were updated during rev 432 accordingly to the following table (source FD, TPF 0432_0001_M.DRA):

```

IMU1_R_1 R 0.1267676E-05      r/s  D IMU 1 roll 1
IMU1_R_2 R 0.1267676E-05      r/s  D IMU 1 roll 2
IMU1_Y_1 R 0.7489693E-06      r/s  D IMU 1 yaw 1
IMU1_Y_2 R 0.7489693E-06      r/s  D IMU 1 yaw 2
IMU2_R_1 R 0.8001365E-06      r/s  D IMU 2 roll 1
IMU2_R_2 R 0.8001365E-06      r/s  D IMU 2 roll 2
IMU2_Y_1 R -0.2226749E-06     r/s  D IMU 2 yaw 1
IMU2_Y_2 R -0.2226749E-06     r/s  D IMU 2 yaw 2
IMU3_Y_1 R -0.2043005E-06     r/s  D IMU 3 yaw 1
IMU3_Y_2 R -0.2043005E-06     r/s  D IMU 3 yaw
IMU4_R_1 R -0.2728047E-06     r/s  D IMU 4 roll 1
IMU4_R_2 R -0.2728047E-06     r/s  D IMU 4 roll 2
  
```

The AOCS eclipse operations were nominal. For the first eclipse passage, the ACC\FDE\FCE Eclipse Timers and the Time-Tagged sequence to re-enable the IMU Auto Switch-Off function of the ACC were loaded from the Timeline and the pre-eclipse IMU health checks was performed at the planned times. Some information regarding the eclipse times and IMU usage up to this stage of the eclipse season are provided below:

AOCS Eclipse Times															Summer 2006	
Date	LOS	AOS	ACC Eclipse Imminent	Eclipse Start						Eclipse End						Eclipse Duration
				ACC	FDE	FCE	Penumbra	FSS Sun Out	Umbra	Umbra	FSS Sun In	Penumbra	FDE/FCE	ACC		
2006-05-03	08:22:00	11:05:00	06:23:04	07:05:03	07:15:46	07:16:30	07:22:44	07:26:44	07:27:43	07:51:26	07:52:31	07:55:51	08:01:26	08:05:32	0:33:07	

IMU Usage during Eclipse Season						Summer 2006
IMU On	IMU Off	From Health Check		From Auto Calibration	On Time	Accumulated On Time
		Noise Roll [as/s]	Drift Roll [as/s]	Drift Roll [as/s]		
2006-05-03 04:32:40	2006-05-03 08:07:51	0.1877	0.2750	0.2561	3:35:11	3:35:11

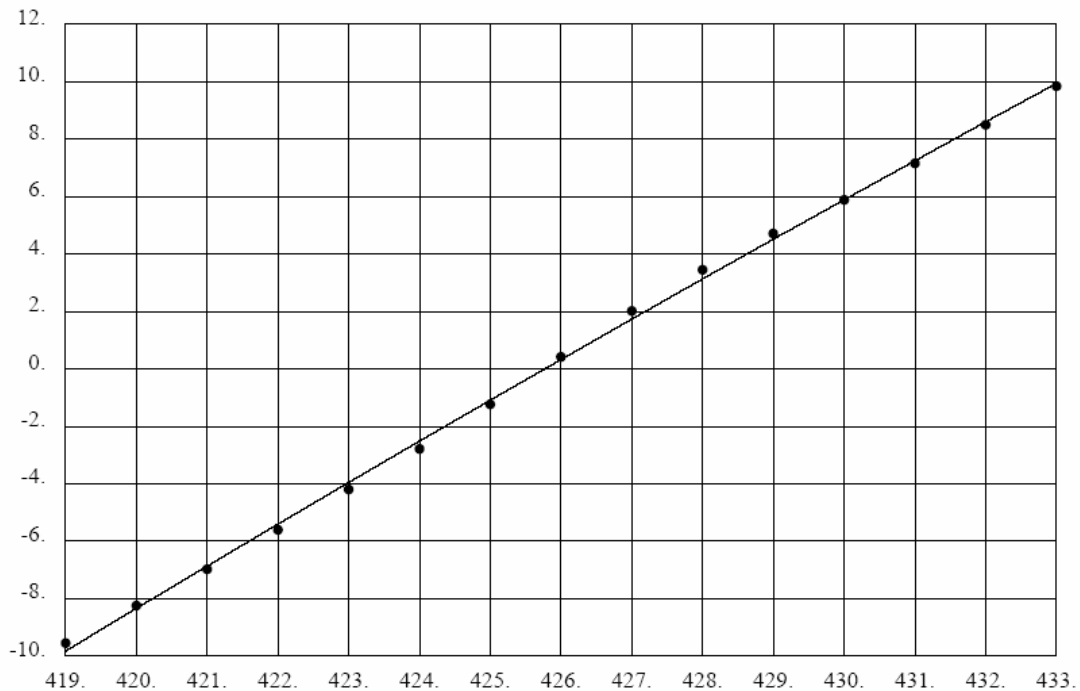
Orbit Control

The following table shows the shortening of the necessary Goldstone pass:

Orbit number	Apogee passage date	Time from LOS Redu to 40000 km altitude
362	2005/10/01	284 min
372	2005/10/31	268 min
382	2005/11/30	244 min
393	2006/01/02	213 min
402	2006/01/29	188 min
412	2006/02/28	159 min
422	2006/03/30	122 min
433	2006/05/01	80 min

From mid July and onwards Redu should give coverage down to 40000 km altitude.
 The attached plot shows the apogee longitude of Integral as a function of the orbit number.

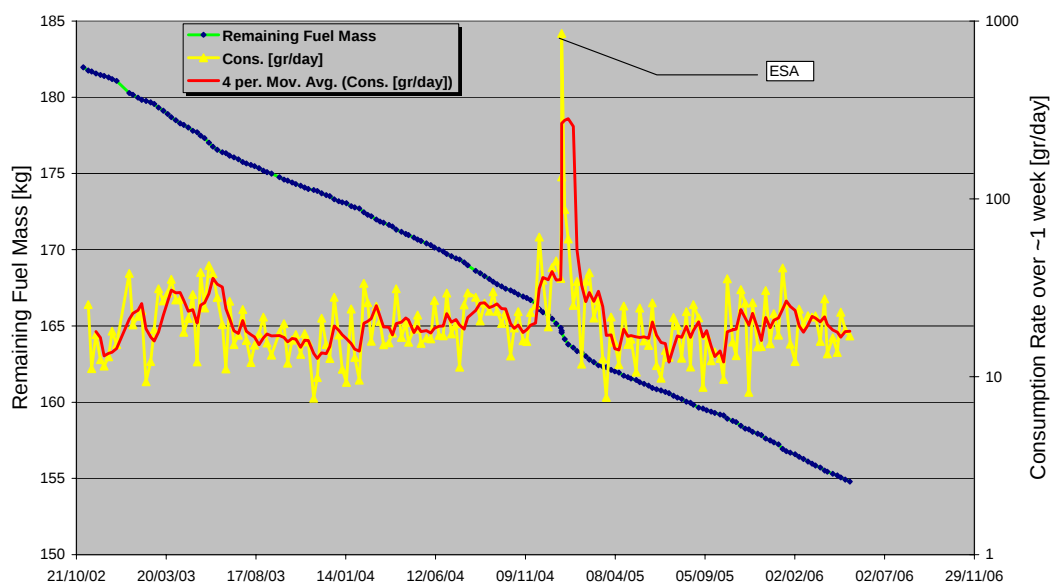
APOGEE LONGITUDES OF INTEGRAL 21.03.2006 - 01.05.2006
 LEAST SQUARES APPROXIMATION WITH PARABLE



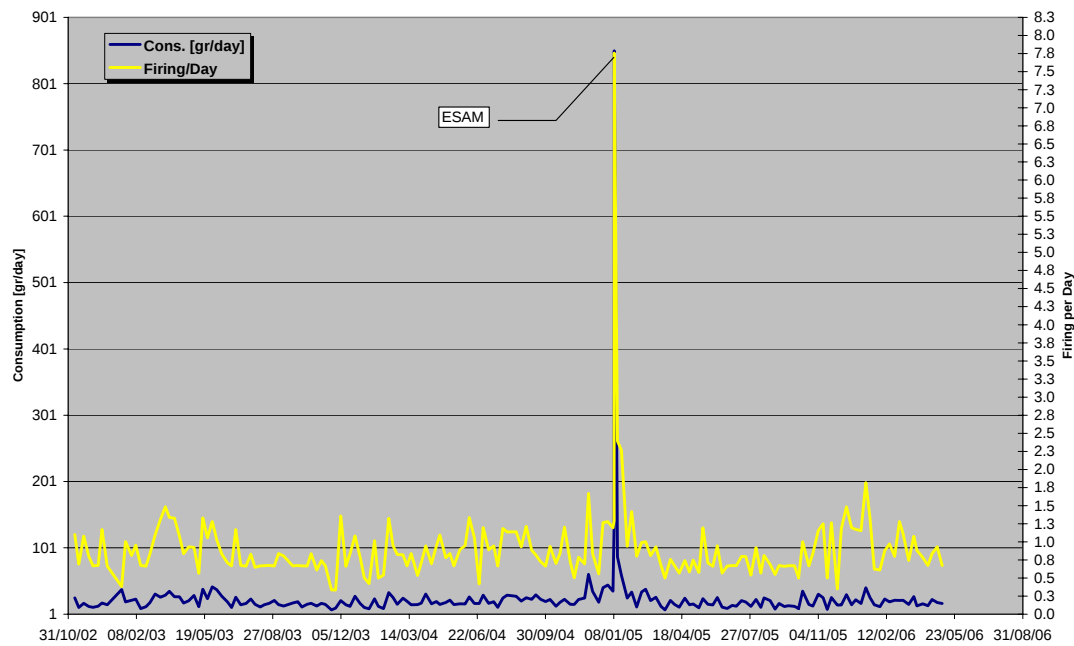
Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 04/05/2006 is reported in the plot below.

INTEGRAL FUEL CONSUMPTION HISTORY

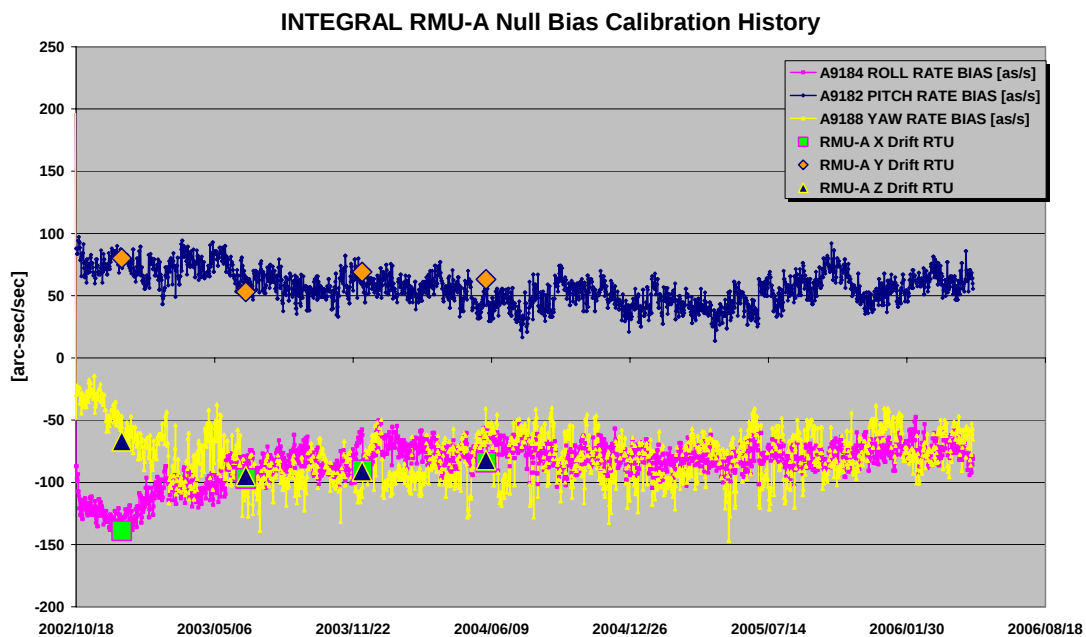


The firing\day over the period between 01/11/2002 and 04/05/2006 is reported in the plot below.

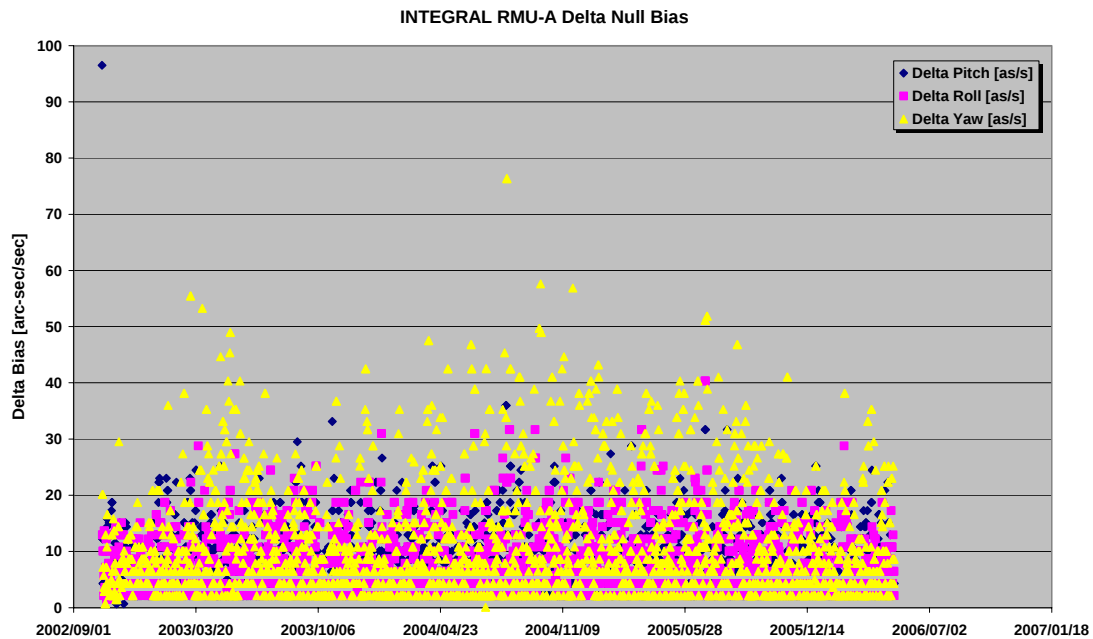


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 05/05/2006 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 05/05/2006 is reported in the plot below.



29/04/06 (Day of Year 119, Revolution 432)

Network node problem: at 09:08z due to a network node failure, the mapping after slew ID 04320071 failed release and the AOCS s/s was disabled in TL. The update for the slew ID 04320072, was manually performed at 09:32z and the AOCS s/s re-enabled in TL at 09:38z.

No impact on TL.

30/04/06 (Day of Year 120, Revolution 432-433)

Loading of the Eclipse Season AMD thresholds: In preparation for the summer eclipse season (according to FCP_AOC_0524), the on-board AMD thresholds were set to their eclipse season values, accordingly to the table below:

Thresholds from INT-MA-AI-0001, 5.3.2.4.2.2, and INT-PR-MMB-0005 page 5-9, modified as per new AMD Threshold agreement for the eclipse season.

01- Update of thresholds after uplink of new RW Inertias on 22/01/2004. 0155_0001_M.RWI

Wheel Inertia:

RW#1:	0.096000	Kgm**2
RW#2:	0.097650	Kgm**2
RW#3:	0.097272	Kgm**2
RW#4:	0.097649	Kgm**2

Eclipse Season:

	Subset 1		Subset 2	
WSMAX	39.5	Nms	35.9	Nms
WSMIN	1.2	Nms	4.8	Nms

Doc. Title : INTEGRAL Mission Report #189
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
 Date : 08/05/06

Issue : 1
 Rev. : 0
 Page : 14

WSMAX	To Uplink:		In rpm:			
	X1	X2	X1	X2		
RW#1:	411.458333	rd/s	373.958333	rd/s	3929	3571
RW#2:	404.507960	rd/s	367.641411	rd/s	3863	3511
RW#3:	406.078637	rd/s	369.068939	rd/s	3878	3524
RW#4:	404.508374	rd/s	367.641788	rd/s	3863	3511

WSMIN	To Uplink:		In rpm:			
	X1	X2	X1	X2		
RW#1:	12.500000	rd/s	50.000000	rd/s	119	477
RW#2:	12.288849	rd/s	49.155398	rd/s	117	469
RW#3:	12.336566	rd/s	49.346265	rd/s	118	471
RW#4:	12.288862	rd/s	49.155448	rd/s	117	469

The uplink was performed at 11:40z.

In the same time frame, were verified the AMD dead band value, the IMU timers, the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

01/05/06 (Day of Year 121, Revolution 433)

Nothing to report

02/05/06 (Day of Year 122, Revolution 433)

Nothing to report

03/04/06 (Day of Year 123, Revolution 433-434)

The first eclipse operations were nominal from the AOCS point of view. Hereafter is reported summary of the first eclipse passage during rev 433:

AOCS ECLIPSE MONITORING			Revolution:	433
Summer 2006			Date:	03/05/2006
			DoY:	123
Penumbra Start:	03/05/2006 07:22:44	LOS:	03/05/2006 08:22:00	antenna swap
Umbra Start:	03/05/2006 07:27:43	AOS:	03/05/2006 11:05:00	
Umbra End:	03/05/2006 07:51:26			
Penumbra End:	03/05/2006 07:55:51			
Eclipse Duration:	0:33:07			
Eclipse Duration [sec]:	1987			
IMU Health Check Start	03/05/2006 13:04:06			
Eclipse Imminent Flag	03/05/2006 06:23:04			
ACC IMU AutoCal Start	03/05/2006 06:37:30			

ACC IMU AutoCal End	03/05/2006 06:57:30
---------------------	------------------------

Sun out of FSS FoV	03/05/2006 07:26:44
Sun back in FSS FoV	03/05/2006 07:52:31

Eclipse Timers	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]		
ACC Eclipse Start	03/05/2006 07:05:03	-1061.00	03/05/2006 07:05:07	-1057.00	-1064	
FDE Eclipse Start	03/05/2006 07:15:46	-418.00	03/05/2006 07:16:36	-368.00	-404	176
FCE Eclipse Start	03/05/2006 07:16:30	-374.00	03/05/2006 07:17:36	-308.00	-360	176

	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]		
FCE Eclipse End	03/05/2006 08:01:26	335	03/05/2006 08:01:52	361.00	360	176
FDE Eclipse End	03/05/2006 08:01:26	335	03/05/2006 08:01:52	361.00	360	176
ACC Eclipse End	03/05/2006 08:05:32	581	03/05/2006 08:05:36	585.00	578	

IMU	Uplink	Execution	WRT Penumbra End [sec]
IMU Auto Off Enable	30/04/2006 11:53:46	03/05/2006 08:07:31	700

IMU On	03/05/2006 04:32:40	IMU H/C Noise Roll [as/s]	0.1877
IMU Off	03/05/2006 08:07:51	IMU H/C Drift Roll [as/s]	0.2750
IMU On Time	3:35:11	IMU Auto Cal Drift Roll [as/s]	0.2561

FDS failed slew update: At 13:55z the first slew of the revolution failed release. The FD system did not update the slew ID 04340001 since the bias window at the beginning of rev 434 had been removed at planning level for orbit control reasons: this caused the uplink of the slew ID 04340001, without the parameters being updated, based on the attitude reconstruction at the perigee passage. As rev 433, was an eclipse rev, the perigee attitude had slightly changed due to the residual drift of the IMU1, when in gyro control during the eclipse passage. The resulting being off-target by about 0.13 deg at AOS REDU. This offset caused the sequence for the S/T (search & track) to fail, during execution of slew ID 04340001, as the expected slew star was falling outside the planned S/T window.

The recovery was manually performed to the attitude of PID 04340001 and the update for the next slew (ID 04340002) from TL was performed at 14:25z.

The following slew ID 04340001 (CSL) was not executed from the TL.

04/04/06 (Day of Year 124, Revolution 434)

Nothing to report.

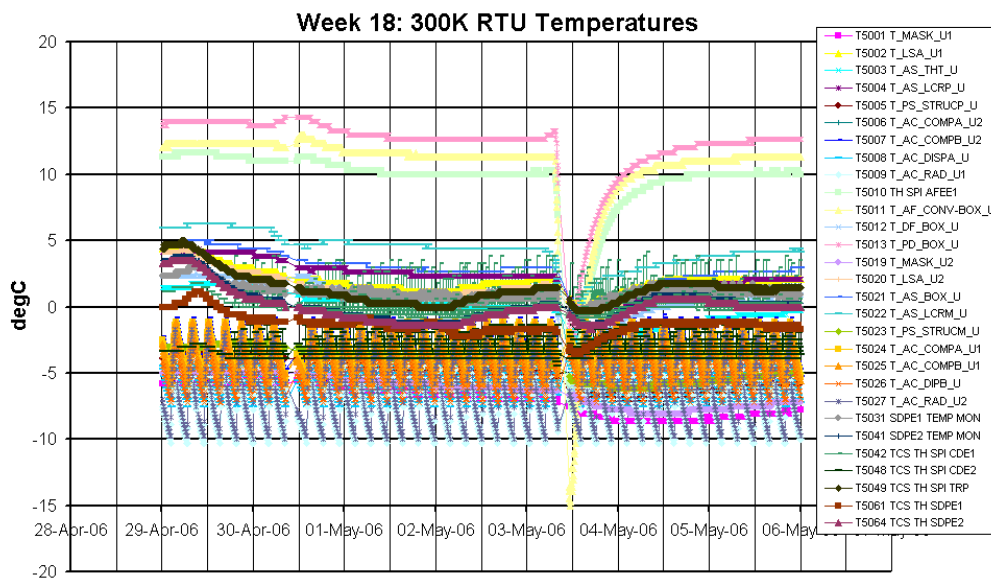
05/05/06 (Day of Year 125, Revolution 434)

Nothing to report.

8.3.2 SPI Operations

Unit Temperatures:

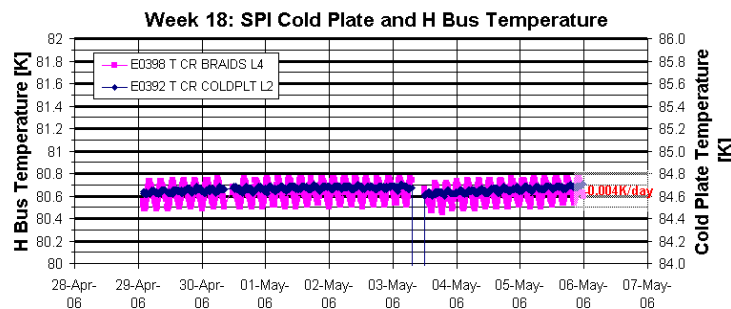
All the equipment temperatures are inside the operational limits. The following plot shows their evolution along the reporting period.



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.

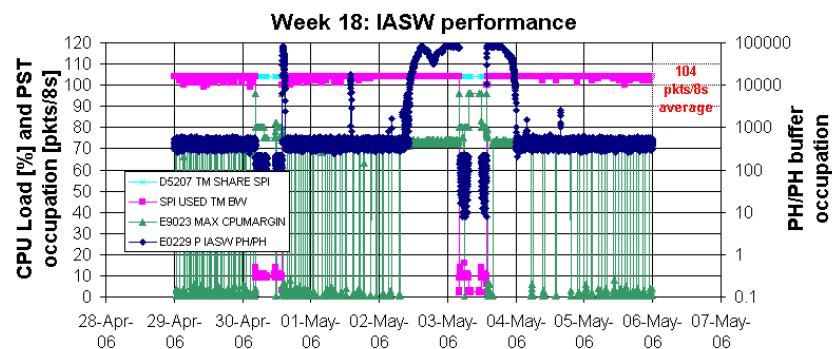
The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.



DPE & IASW:

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

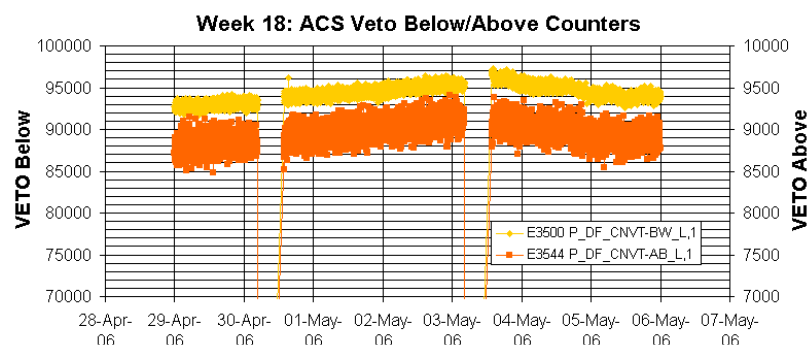
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

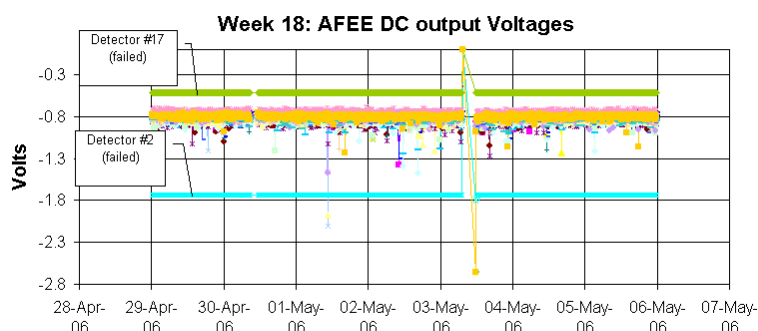
The following plot shows the ACS overall count rate evolution during the reporting period



AFEE:

The performance of the AFEE and the detectors is nominal, except for detector #15, which shows a degraded energy resolution and for this works with a reduced bias of 3kV. The anomaly is recorded in the ESOC Anomaly Report and Tracking System (ARTS) as INT_SC-140.

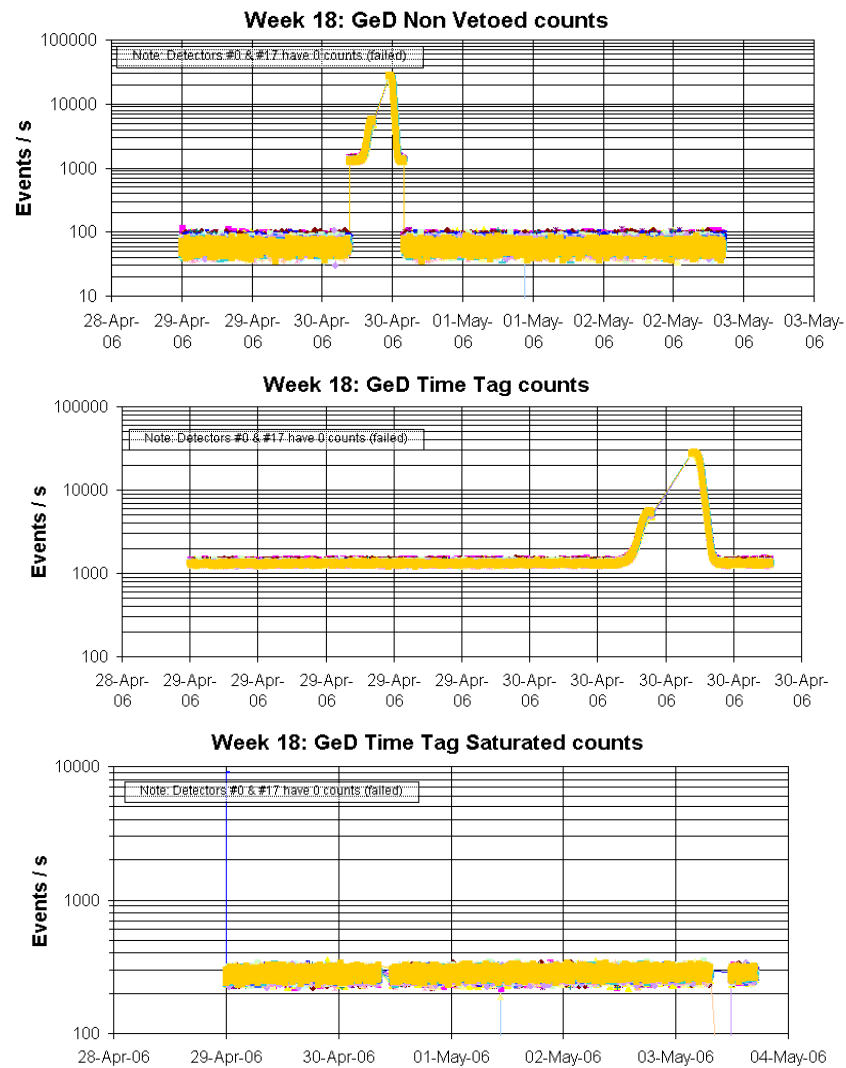
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.



DFEE:

The performance of the unit is nominal.

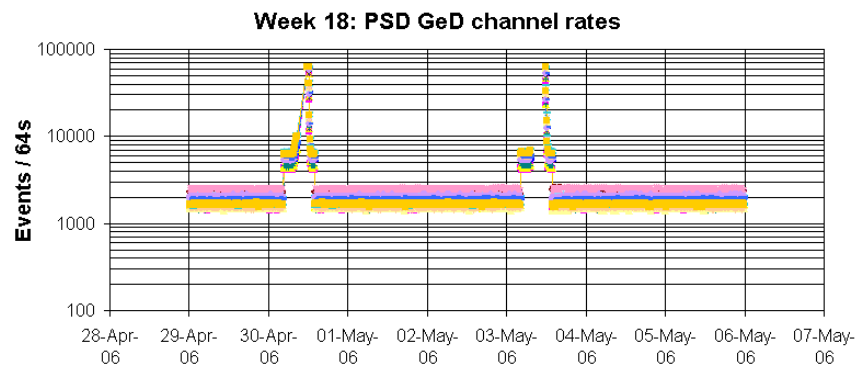
The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.



PSD:

The performance of the unit is nominal.

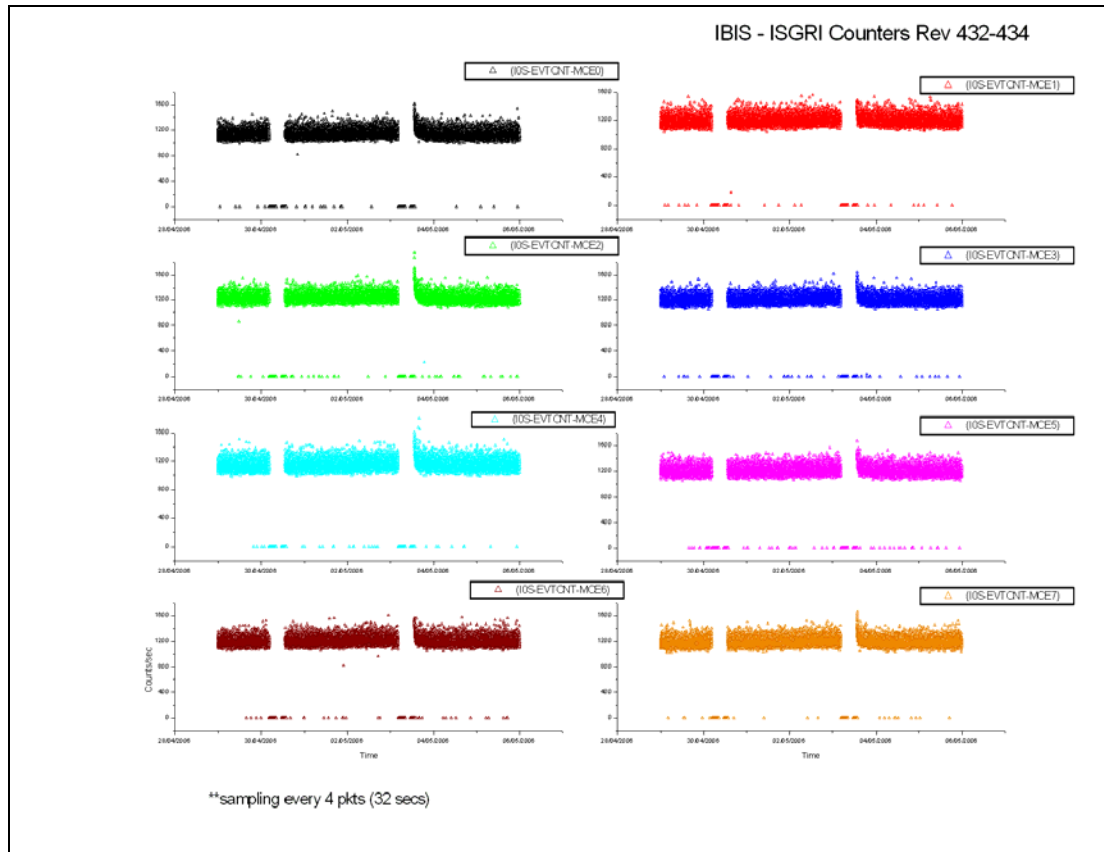
The following plots show the PSD channel rates during the reporting period.



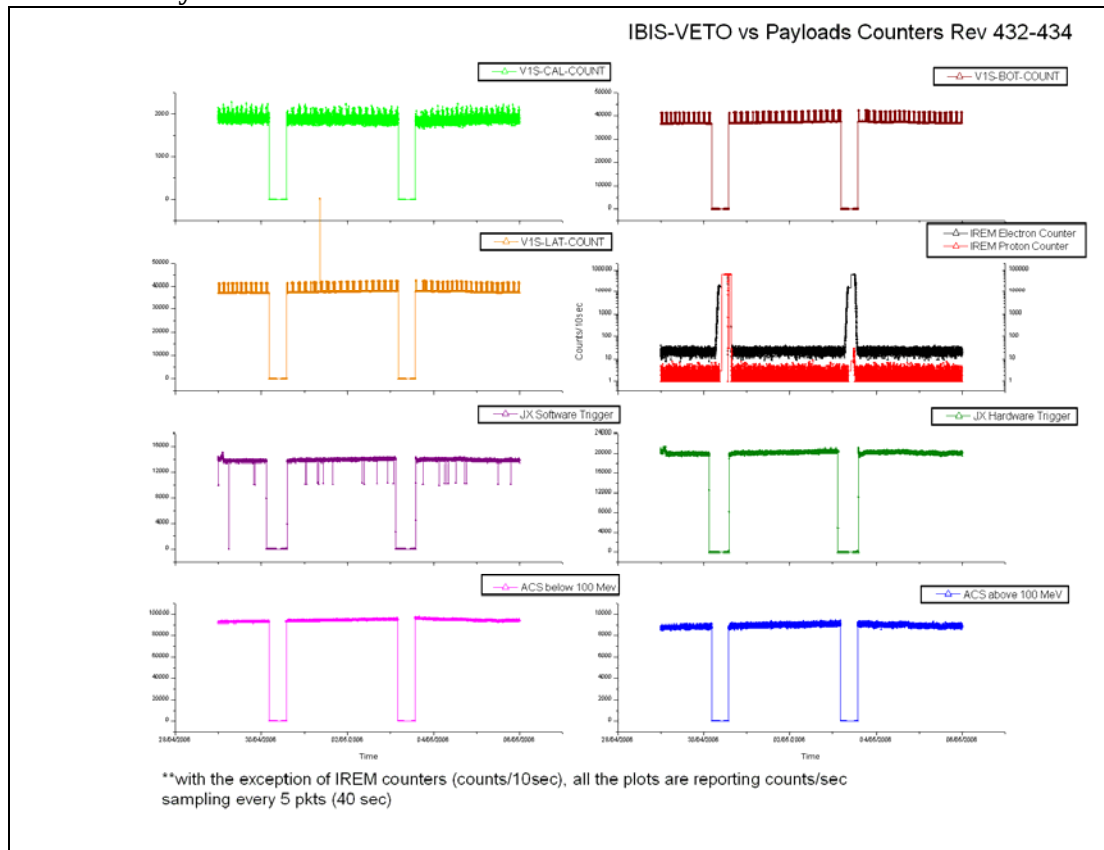
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

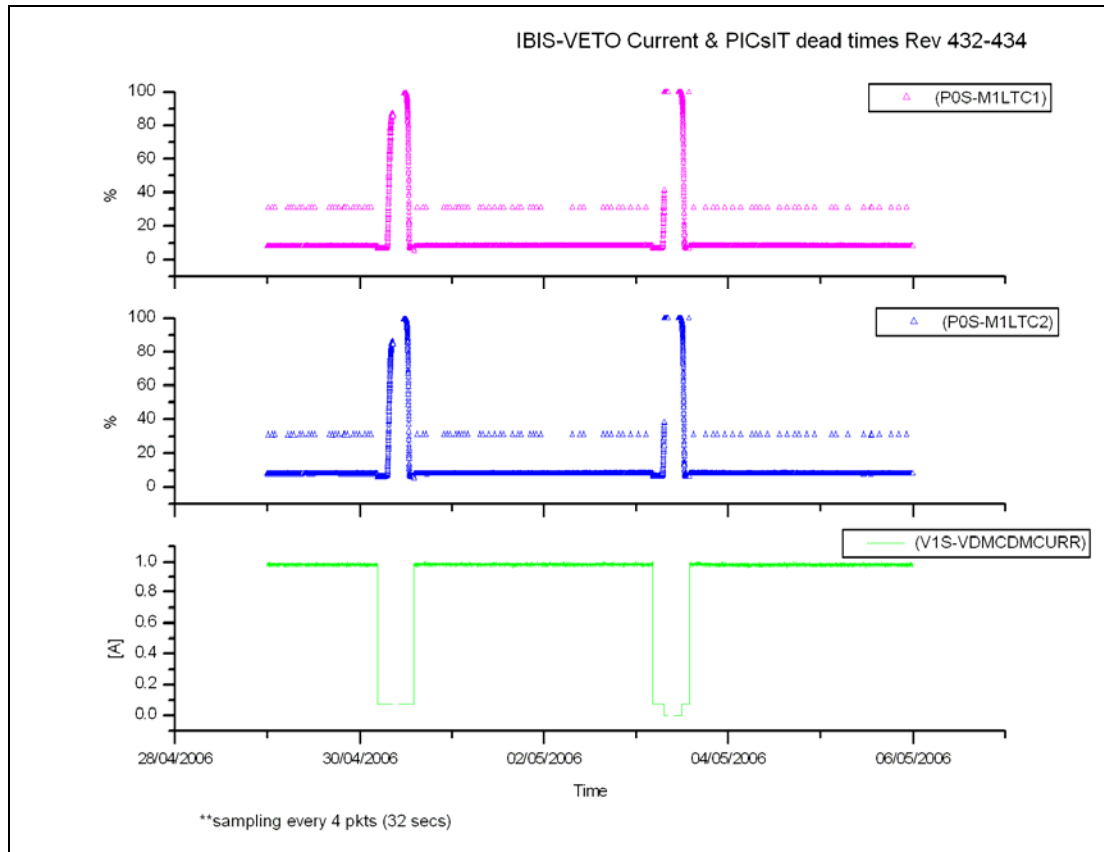


VETO vs Payloads Counters:

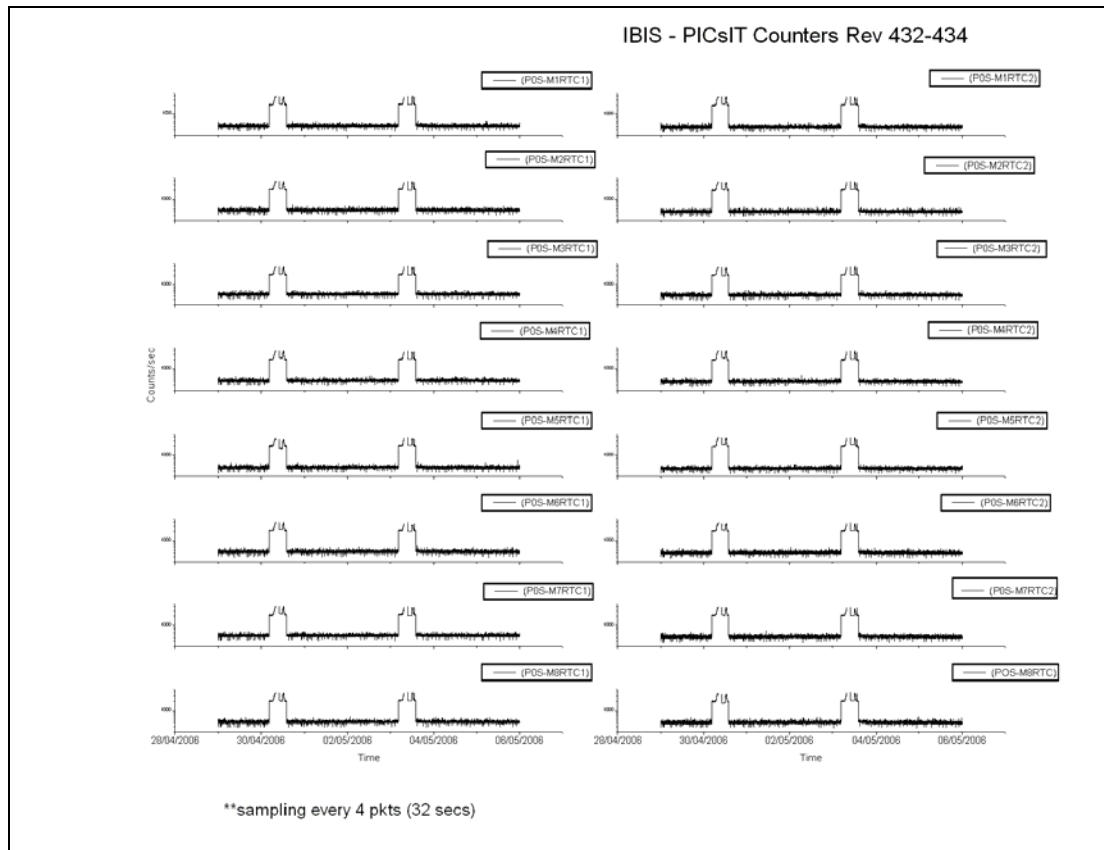


The week was characterised by low radiation.

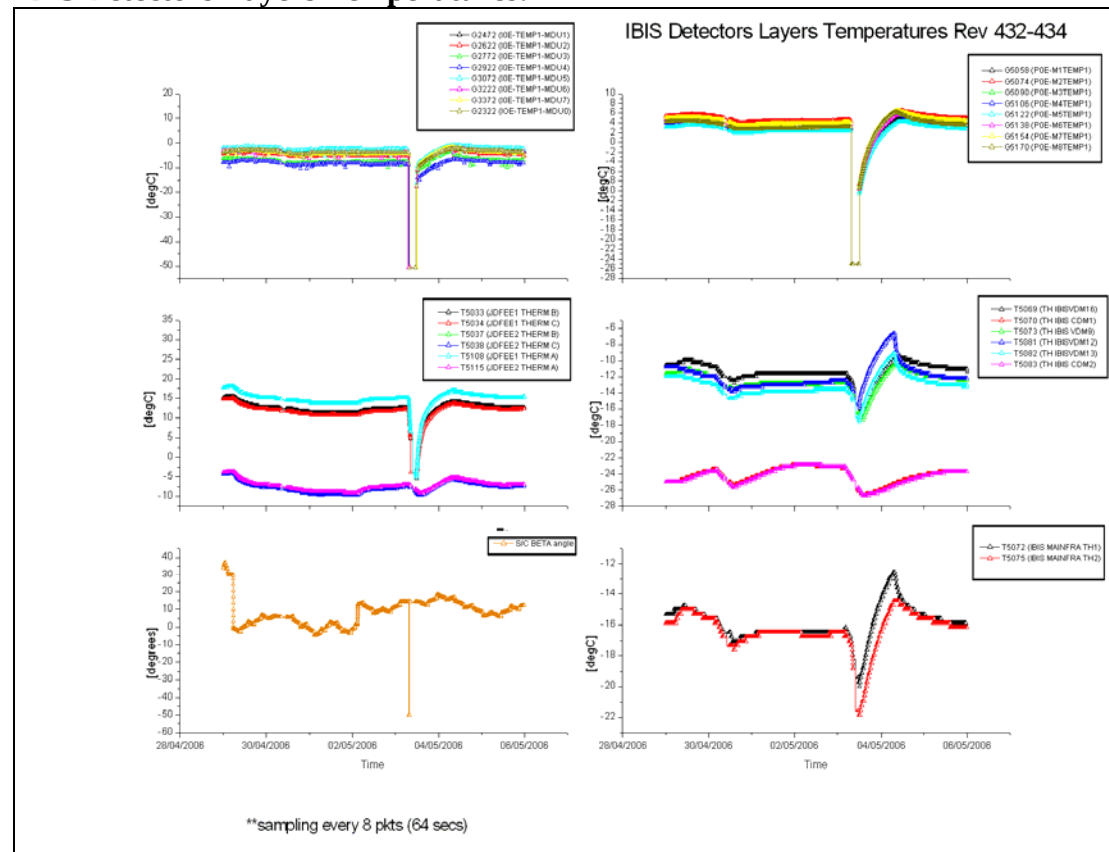
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2006.120 (30/04/2006):

At 04:35Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 14:07Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

DoY 2006.123 (03/05/2006):

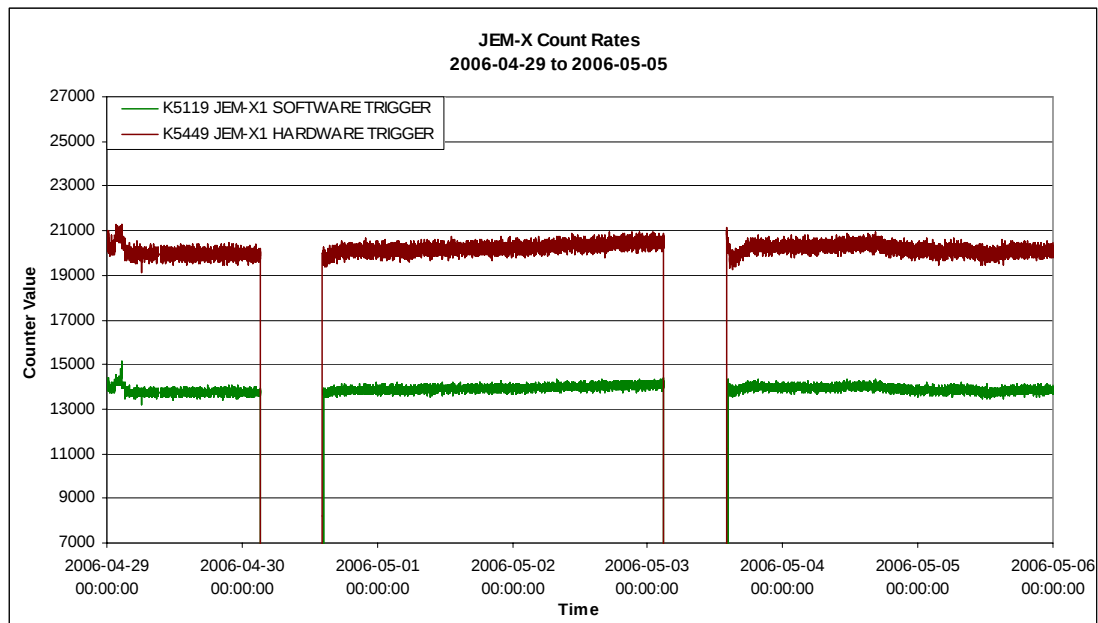
At 04:18Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 13:55Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

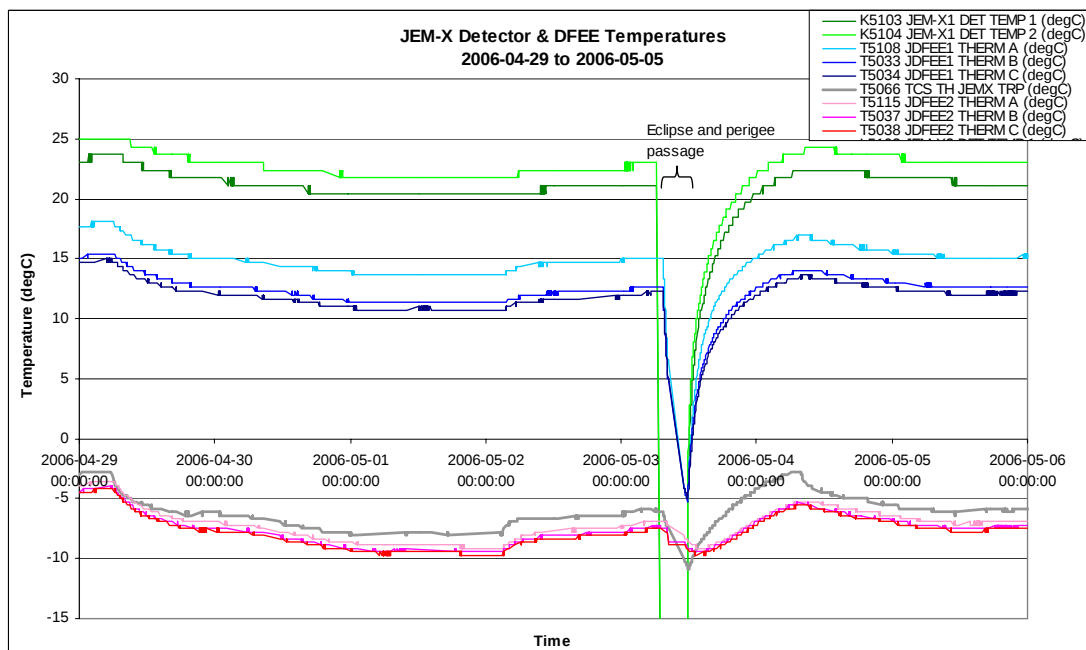
JEM-X count rates over the reporting period are displayed in the following graph¹.

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.



8.3.4.3 JEM-X Daily Report

2006-04-29 (DOY 119, Rev 432) to 2006-05-02 (DOY 122, Rev 433)

² Data sampled (1 frame in 8)

Nothing to report

2006-05-03 (DOY 123, Rev 433-434)

The first eclipse of the 8th eclipse season occurred from 07:24:57Z to 07:54:41Z, before perigee at the end of revolution 433. The eclipse operations for JEM-X1 were executed nominally. JEM-X2 was not affected by the eclipse as the JEM-X2 DFEE was already off.

2006-05-04 (DOY 124, Rev 434) to 2006-05-05 (DOY 125, Rev 434)

Nothing to report

8.3.5 OMC Operations

2006-04-29 (DOY 119, Rev 432)

At 09:08, there was a drop in VC0 & VC7 TM from Redu, which caused the loss of pointing 04320071.

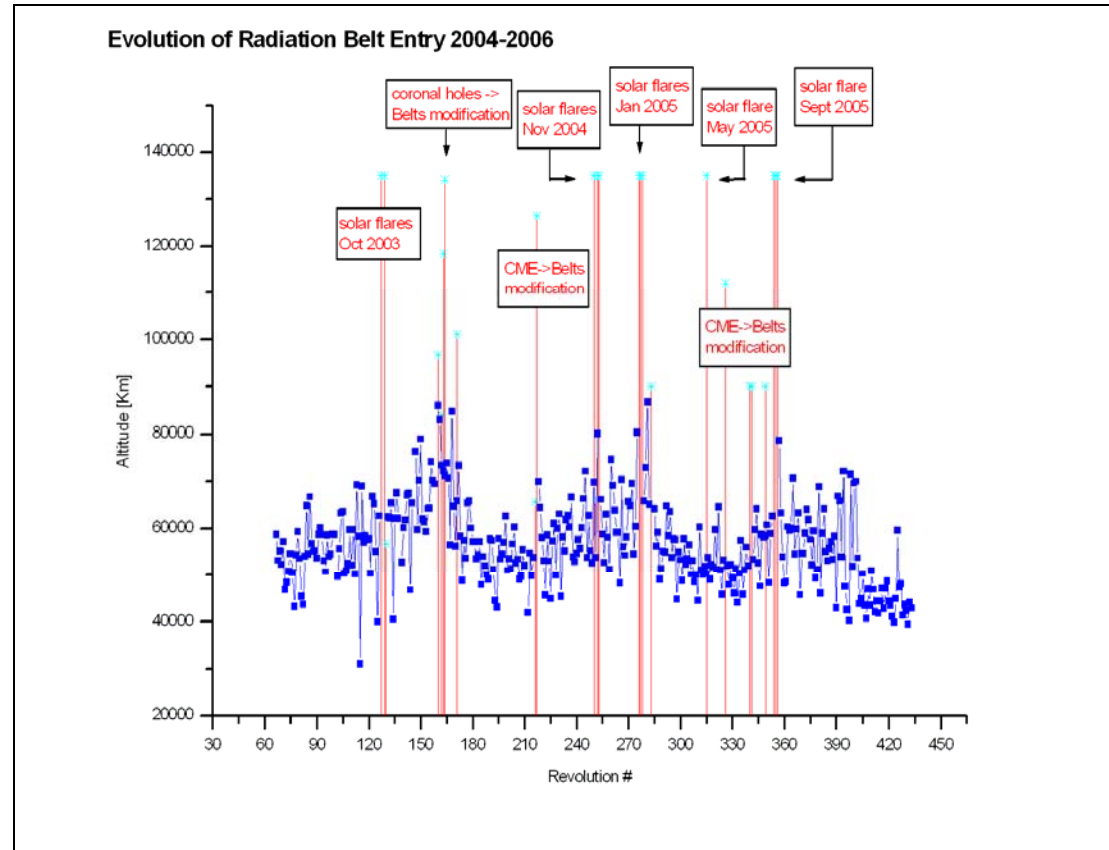
2006-04-30 (DOY 120, Rev 432) to 2006-05-05 (DOY 125, Rev 434)

Nothing to report

On DoY 120 at 04:35:46 and DoY 123 at 04:18:19 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

DoY 2006.120 (30/04/2006):

During Perigee Passage between revolutions 432 and 433, a local reset of the IREM CSCI S/W (SEU #30) occurred: as previously (see anomalies on 16/12/02, 01/01/03, 03/06/03, 11/07/03, 19/07/03, 05/08/03, 24/08/03, 26/12/03, 13/05/04, 16/05/04, 09/06/04, 12/06/04, 10/09/04, 14/09/04, 28/10/04, 06/11/04, 01/12/04, 11/12/04, 30/01/05, 11/02/05, 04/03/05, 11/05/05, 17/05/05, 15/06/05, 30/07/05, 07/09/05, 20/09/05, 21/11/05, 09/04/06) 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 anomaly was seen at AOS at 2006.120.11.25Z at 17677.5km. 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 11:48Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly showed a value of 3CC0 HEX =

15552 DEC = 0011110011000000, i.e the Ground Link was OFF (nominal in Perigee Passage) and the Checksum Failure 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 3C80 HEX = 15488 DEC = 0011110010000000, 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) As this anomaly occurred during the outage, and just 2 days after the first forced reset of IREM, it was decided to perform a power cycle on the unit.

8) The patch was performed successfully with the correct re-starting of the S/W. The operation was completed at 16:14Z.

The IREM automatic transition to Standard Mode did not affect the instruments since they were already in a Safe configuration due to Radiation Belt Passage.

The cause of this S/W reset is still under investigation, but it is apparently due to the unit's memory device that is sensitive to ionising 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]
432	RAD_ENTR R 2006-04-30T04:35:46Z	2006-04-30 06:38:17	44070.6	2006-04-30 06:02:09	48427
433	RAD_EXIT R 2006-04-30T13:55:24Z	2006-04-30 15:13:53	51688.4	2006-04-30 13:32:09	36653
433	RAD_ENTR R 2006-05-03T04:18:12Z	2006-05-03 06:20:49	>42875.3	2006-05-03 05:43:03	48384
434	RAD_EXIT R 2006-05-03T13:37:38Z	2006-05-03 12:55:13	>29721.0	2006-05-03 13:13:03	36757

Reference

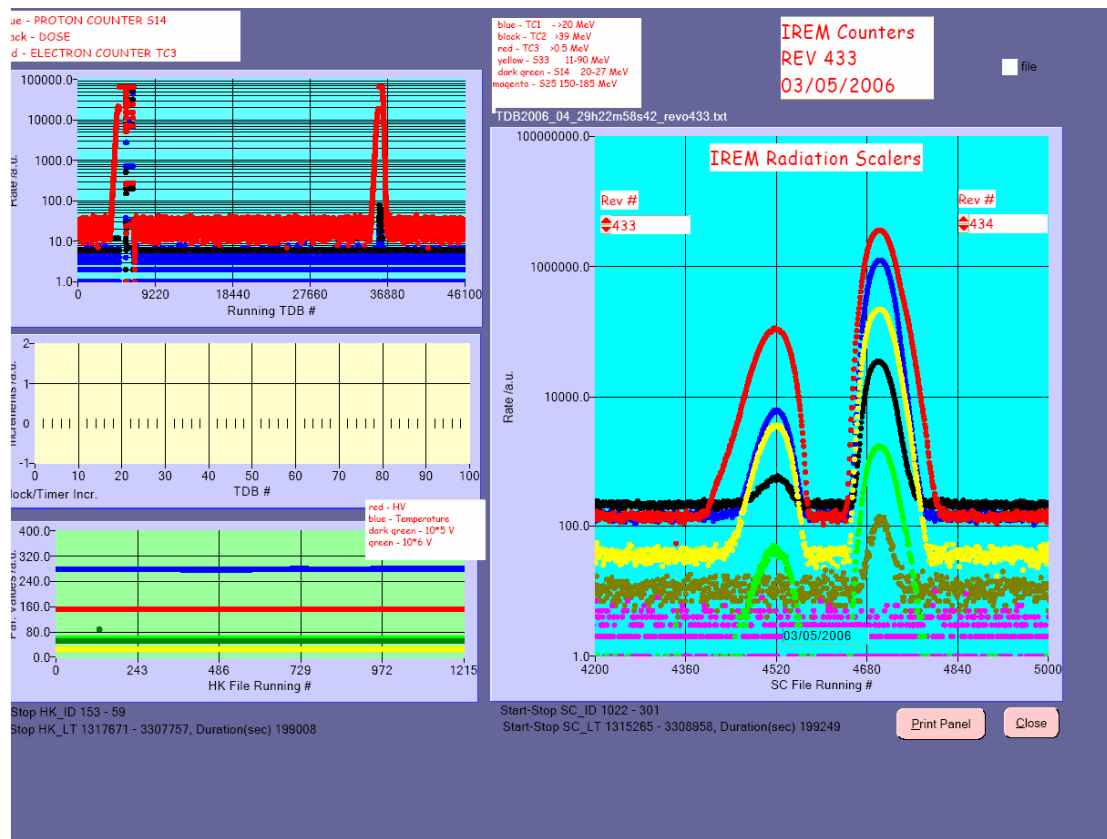
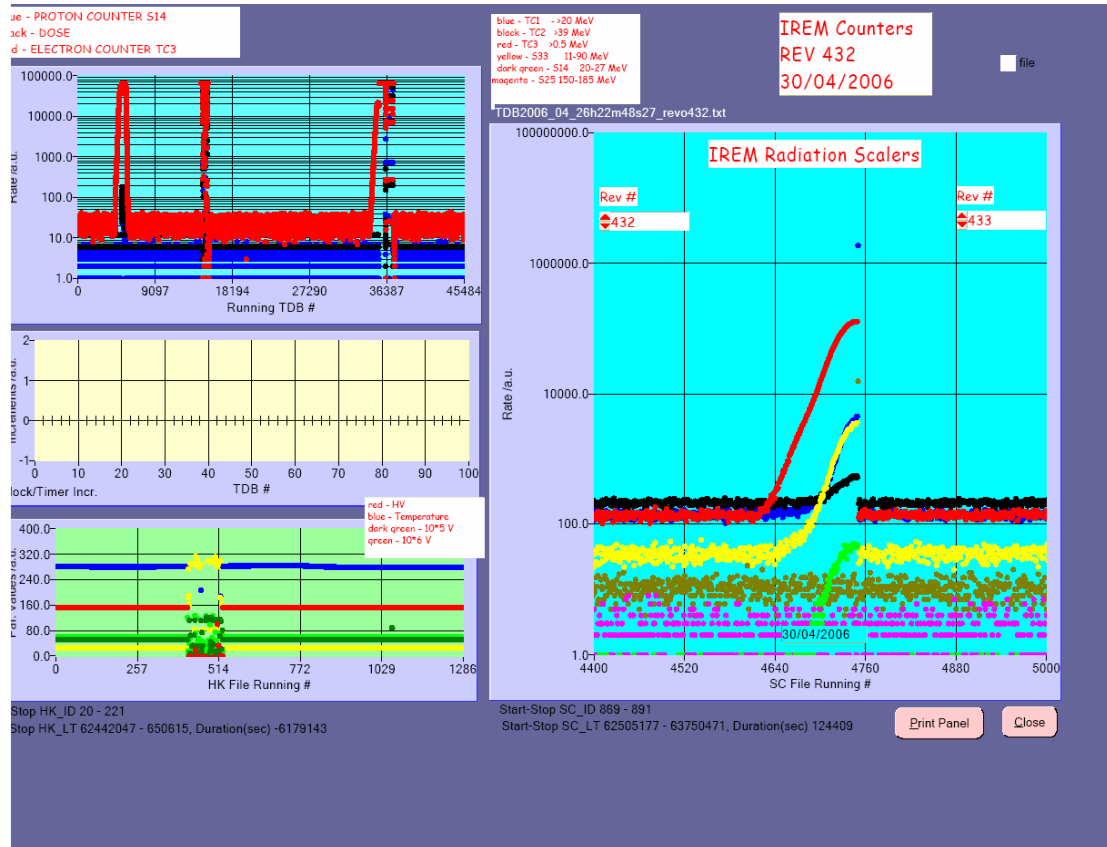
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

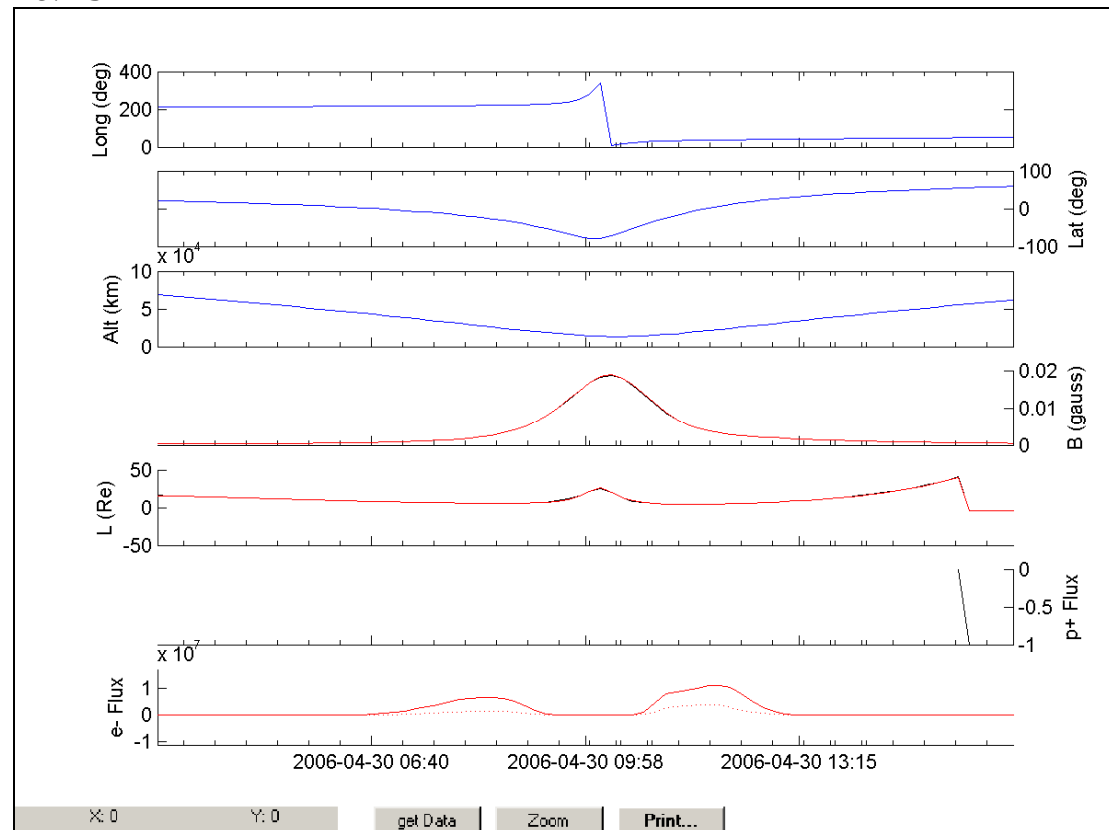
Radiation Spike

IREM radiation counters:

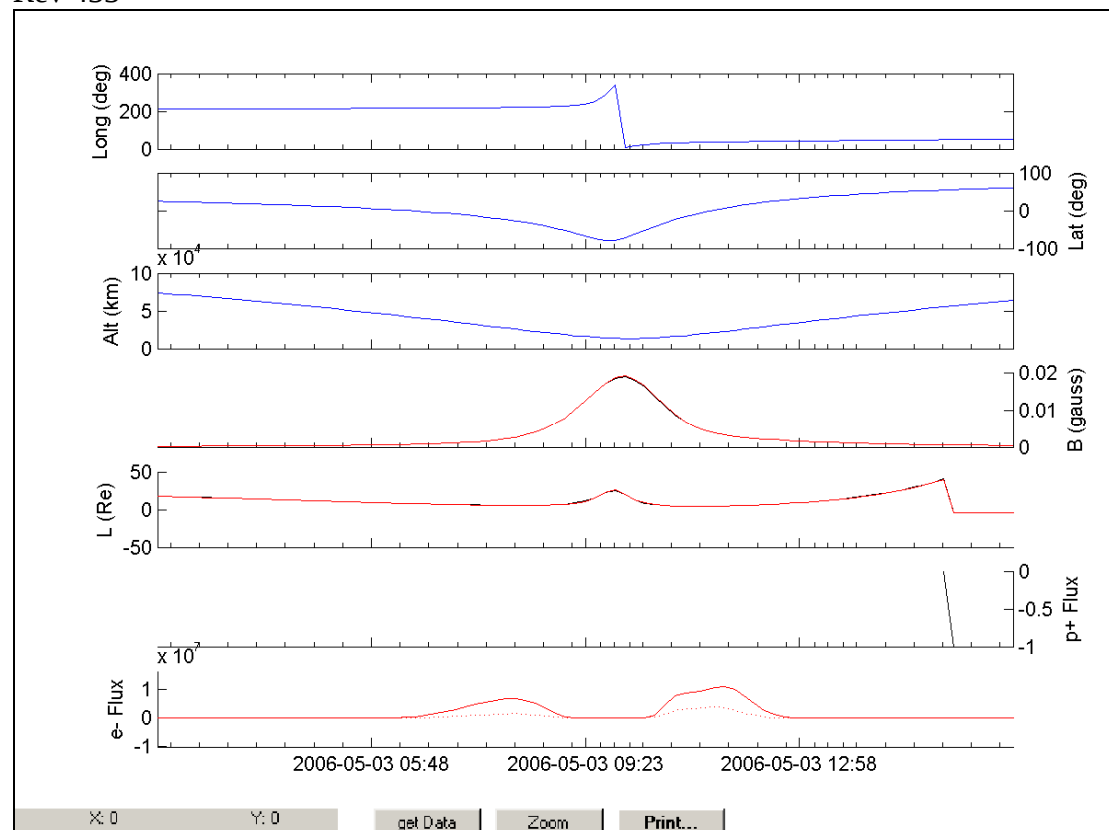


IREM Predicted Radiation Belt Passages:

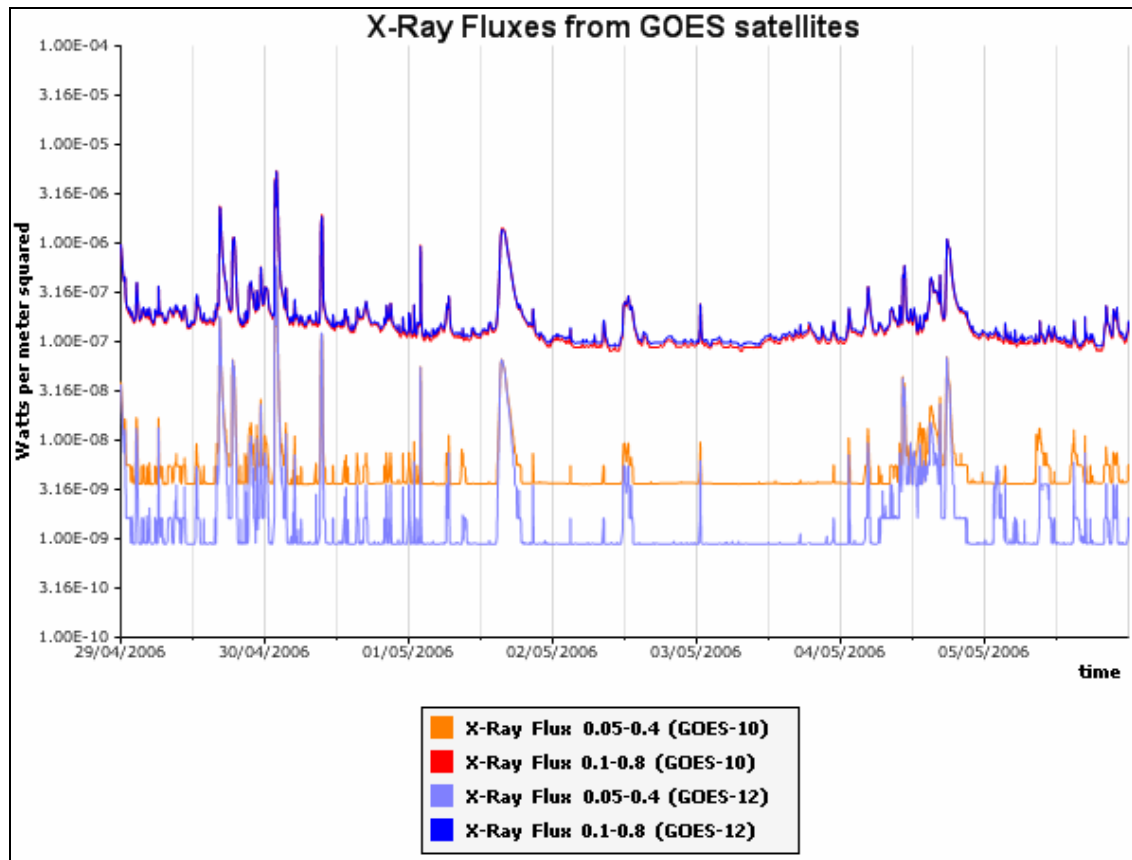
Rev 432



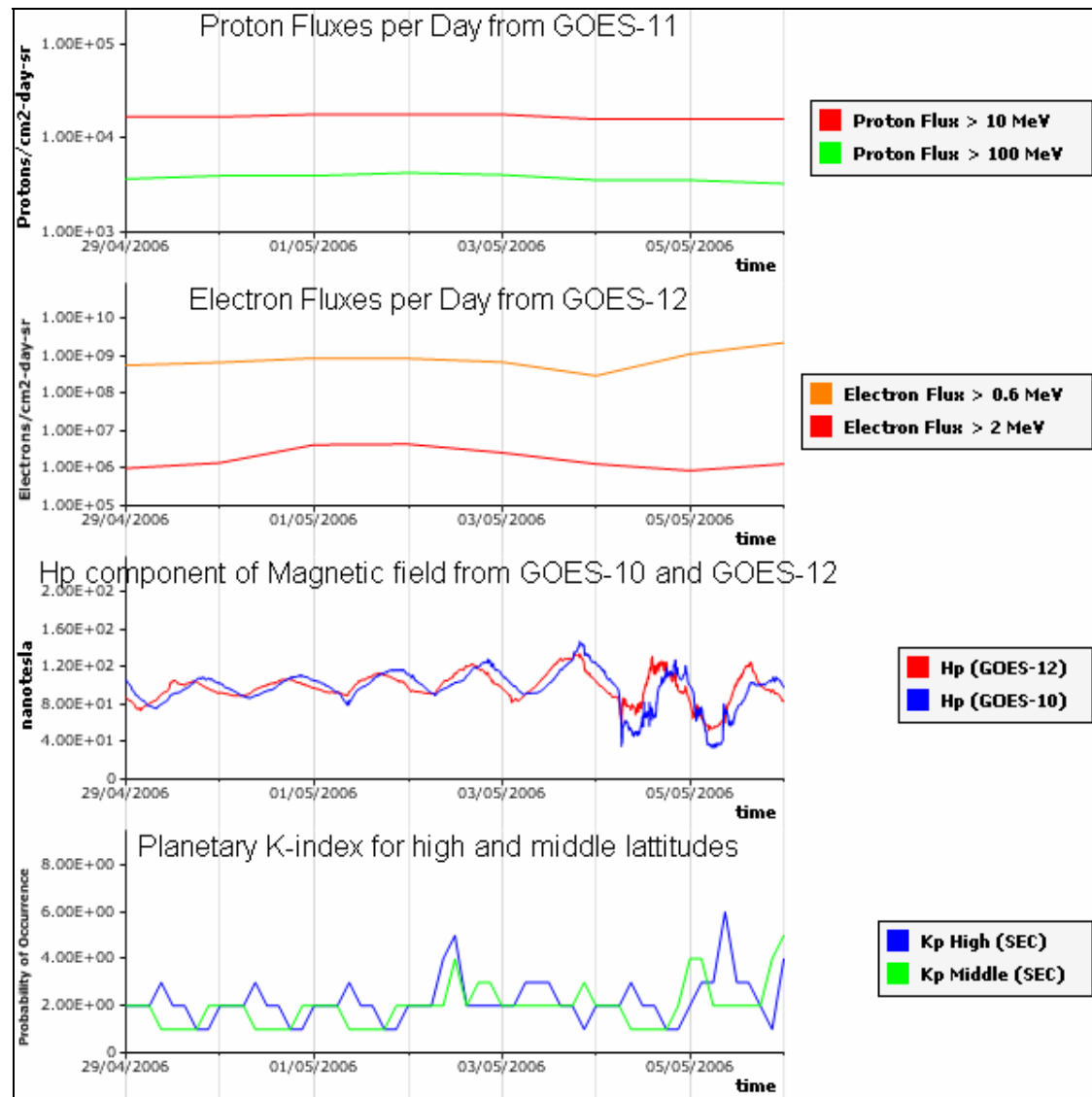
Rev 433



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



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



Proton and electron flux are rather low, reporting no 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.