

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 198
Week 27
10.07.06
Routine Phase

Prepared by: M. Walker (OPS-OFO)

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.....	3
3.1.5	RFS.....	4
3.2	Payload	4
3.2.1	SPI	4
3.2.2	IBIS	5
3.2.3	JEM-X	5
3.2.4	OMC.....	6
3.2.5	IREM	6
4	Ground Facilities.....	7
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.....	8
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, 01/07/2006 – 07/07/2006	10
8.3.2	SPI Operations.....	14
8.3.3	IBIS Operations.....	19
8.3.4	JEM-X Operations.....	24
8.3.5	OMC Operations	26
8.3.6	IREM Operations	27

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
		A. Gimenez-Canete SCI-S	1
M. Schmidt	1		
R. Southworth	1		
F. Di Marco	1	ESTEC / PG	
F. Cordero	1	G. Sarri	1
M. Walker	1		
P. Lippi	1		
R. Lemme	1		
S. Fahmy	1		
SPACONs	1		
O. Bergogne	1	ESTEC/RSSD	
I. Bayliss	1	M. Kessler SCI-SD	1
G. Di Girolamo	1	C. Winkler	1
F. Dreger	1	A. Parmar	1
G. Gienger	1	L. Hansson	1
S. Pallaschke	1	E. Kuulkers	1
W. Hell	1		
K.J. Schulz	1	ISDC	
M.A. Larsen	1	T. Courvoisier	1
K. Capelle	1	R. Walter	1
M. Butkovic	1	N. Mowlavi	1
D. Heinzer	1	ISDC Shift Team	1
U. Feucht	1		
Shift - Coord	1	ALENIA	
Scheduling Office	1	M. Montagna	1
T. Beck	1	F. Ravera	1
J. Wardill	1		
M. Unal	1	PI / Instrument Teams	
P. Maldari	1	J. P. Roques – SPI	1
		G. La Rosa – IBIS	1
		P. Ubertini – IBIS	1
		S. Brandt – JEM X	1
		E. De Miguel - OMC	1
		W. Hajdas – IREM	1
Redu			
B. Demellenne	1	JPL / Goldstone	
		D. Holmes	1
Vilspa		J. Valencia	1
P. Kretschmar	1	Jesse Velasco	1
		DSN - MPSETD	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 01.07.06 until 07.07.06 (both dates inclusive) and covers the revolutions 454 and 455.

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 hexagonal dither of 4U 0142+61 (RA 01:46:22.41, DEC +61:45:03.2), a Target of Opportunity, a raster dither of Field_14 (RA 05:17:33.00, DEC -40:53:55.0), a Galactic Plane Survey, an OMC Flat Field Calibration starting with attitude (RA 13:11:12.00, DEC -00:30:00.0), and a raster dither of LEDA170194 (RA 12:39:06.30, DEC -16:10:47.8).

Note: Some further information concerning the activities is provided in the Appendix.

3 Satellite Status

3.1 Platform

The performance of the platform was good. No new unexpected behaviour / malfunction was identified.

3.1.1 AOCS

The AOCS operations were performed from the timeline during this period.

2 slews were lost during the observation period due to problems at the Redu station.

The fuel consumption over the period between 01/07/2006 and 07/07/2006 was 0.2343 kg. The remaining propellant is in the order of 153.3115 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.

The LOBT wrap-around occurred on DoY 188 at 08:03:03. INT-OR-0232 was manually executed around this time.

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

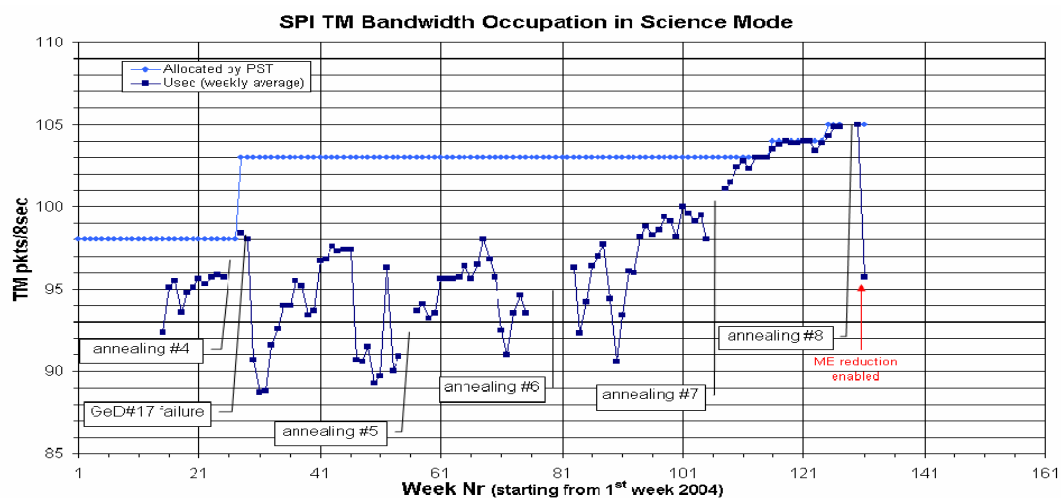
3.2.1 SPI

Following the 8th annealing, which ended on 26th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 has been recovered with this annealing. Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

The Stirling compressors are working nominally, maintaining the Germanium detectors at 85K +/-1K until 04/07/2006 at 22:30Z, when the implementation of OCR-215 (SPI detectors temperature from 85K to 82K) was started. The cold plate reached the new temperature range of 82 +/-1K on 05/07/2006 at 09:40Z and has since been maintained stably within this range.

During science operations, the instrument was kept in photon-by-photon mode with spectra TM enabled. The assigned TM bandwidth in the science observation windows was 105 pkts/cycle. The average telemetry occupation was 105 pkts/cycle until the start of revolution 454, after the Multiple Event Reduction function was enabled (OCR-216). From then on, the average telemetry occupation during the science window was 93.6 pkts/cycle.

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



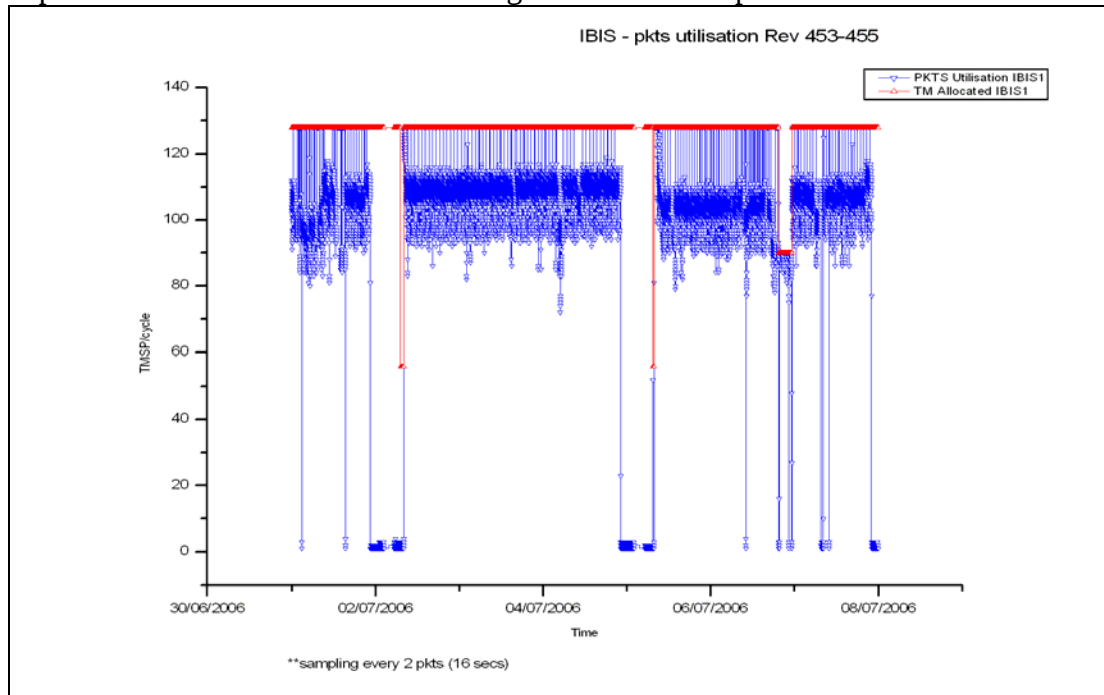
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. However between 2006-07-06 19:37:32Z and 23:24:44Z, it was 90 TMPS/cycle due to an OMC Flat Field Calibration. The IBIS mean bandwidth utilisation during the observation period was 107.39 TMPS/cycle, down 0.38 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 (DPE OFF) with no TM slots allocated.

On 2006-07-05 the high voltage activation of JEM-X1 at the start of revolution 455 failed completion due to high values of the Hardware Trigger causing an autonomous switch-off of the High Voltage. JEM-X1 was then activated manually and reached Data Taking mode ~35 minutes later than planned.

On 2006-07-06 a problem with the verifier caused an interruption to a KEDATA02 ED, leaving JEM-X1 in Setup mode. JEM-X1 was returned to Data Taking mode ~10 minutes later.

A wraparound of the DPEs' LOBT occurred on 2006-07-07 at 08:03:03Z. JEM-X1 was put in Setup mode over the period of the wraparound.

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, 144 of the 147 planned science pointings for OMC were executed nominally, 3 were lost.

A wraparound of the DPEs' LOBT occurred on 2006-07-07 at 08:03:03Z. OMC was put in Stand-by mode over the period of the wraparound.

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

3.2.5 IREM

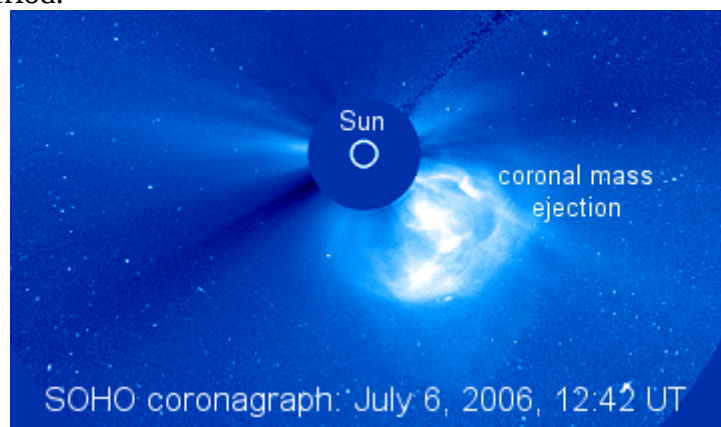
The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low to moderate solar activity.

Last week, on 28/06/2006, big sunspot 898 appeared. It posed no threat of solar flares until 06/07/2006 when it unleashed an M-class solar flare (cf. picture that shows the corresponding Coronal Mass Ejection).

On 05/07/2006, sunspot 899 started appearing but remained small during the whole 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, although 2 pointing was lost to problems at Redu, and 1 to ground station problems. There were also problems with the links with ISDC. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was much better this week with no problems reported. The overall performance was nearly 100%.

4.2 Ground Stations & Network

The performance of the ground stations and Network was not so good this week. 2 pointings were lost due to problems at Redu, and there were numerous short drops or bad frames received from both Redu and VIL2 that fortunately had no impact. There were also an occasion when there was an error sending data to the isds. The overall performance though was well over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSF for revolution 463 was delivered. Due to the unusual eclipse occurring in revolution 461 PSF for this revolution was re-delivered by MOC a couple of times. This was mentioned already last week. After intensive discussions between MOC and ISOC it was agreed that ISOC could relax the slew constraint checks. Once this solution was implemented ISOC could plan the revolution 461 without problem. Further planning was not performed this week due to the very limited manpower available in ISOC due to the INTEGRAL conference in Moscow. It was always foreseen to have maximum ISOC representation at this conference. TSF for revolutions 456 and 457 were received from MOC.

2. Observation status

This week ECS's for revolutions 444 and 446 to 449 were received. Due to the INTEGRAL conference in Moscow the processing in ISOC could not be performed yet.

3. ISOC science data archive

The version 2.5.2 testing was completed and the version was made available for public use. A young graduate started to work this week. His task will consist of production of a tool to visualize the INTEGRAL data in the ISOC science data archive.

4. ISOC system

The ISOC system version 12.4 has been used this week without any problem.

5. AO 4

No activities this week due to the above conference.

6. Problems

No new problems encountered

4.3.2 ISDC

Status of ISDC observation processing on 10/07/2006:

- Latest Standard Analysis completed: observation 03297000008 (GRO J0852-4642, Revolution 439-440) on 02/07/2006.

- Latest products archived: observation 03297000008 (GRO J0852-4642, Revolution 439-440) on 03/07/2006.

- Latest observation products sent to the observer: observation 03201090063 (Galactic Bulge, Revolution 426) on 01/06/2006.

5 Special Events

6 Anomalies

The following problems impacted operations this week:

- On DoY 182, at 07:13, an AOCS command failed release due to the PTV being “no-go”. This led to the OTF not being set, and the loss of pointing 04530003.
- On DoY 186, at 08:35, the Timeline was interrupted due to a commanding problem at Redu. The problem was quickly resolved, and a recovery performed. The Timeline was rejoined at 09:06. The impact was the loss of pointing 04550003.
- At 13:10, a power problem at Redu caused all the links to drop. At 13:16, the Timeline was stopped. At 13:38, the links were back and a recovery performed. After further interruptions, the Timeline was recovered at 14:19. The impact was the loss of pointing 04550009.

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

AR id	Date Created	Subject	Segment	Status
INT-2865	05/07/2006	IFRD not working - no TM to PI W/S	IMCS	Pending

7 Future Milestones

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 454

The observations in revolution 454 consisted entirely of a hexagonal dither of 4U 0142+61 (RA 01:46:22.41, DEC +61:45:03.2), which was a Target of Opportunity and lasted ~56.6 hours.

Revolution 455

The observations in revolution 455 consisted of a raster dither of Field_14 (RA 05:17:33.00, DEC -40:53:55.0), lasting ~24.4hours. This was followed by a Galactic Plane Survey, lasting ~6.7hours. An OMC Flat Field Calibration was next, which was a staring observation with attitude (RA 13:11:12.00, DEC -00:30:00.0), lasting ~3.4hours. Finally a raster dither was performed of LEDA170194 (RA 12:39:06.30, DEC -16:10:47.8), lasting ~20hours up to 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, except from 2006-07-06T19:37:20Z to 2006-07-06T23:24:37Z, during the OMC Flat Field calibration, when the allocation is: IBIS 90; SPI 84; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2006-06-26T06:38:46.000Z	153.6390	F	Automatic TM processing.
2006-06-26T15:34:55.000Z	153.6273	F	Automatic TM processing.
2006-06-26T16:42:23.000Z	153.5893	F	Automatic TM processing.
2006-06-29T00:13:49.000Z	153.5784	F	Automatic TM processing.
2006-06-29T02:24:05.000Z	153.5659	F	Automatic TM processing.
2006-06-29T06:17:50.000Z	153.5458	F	Automatic TM processing.
2006-07-01T13:01:31.000Z	153.5288	F	Automatic TM processing.
2006-07-01T14:35:15.000Z	153.5126	F	Automatic TM processing.
2006-07-02T01:58:04.000Z	153.4859	F	Automatic TM processing.
2006-07-02T06:03:41.000Z	153.4459	F	Automatic TM processing.
2006-07-03T16:12:33.000Z	153.4109	F	Automatic TM processing.
2006-07-05T01:47:25.000Z	153.3953	F	Automatic TM processing.
2006-07-05T05:47:25.000Z	153.3736	F	Automatic TM processing.
2006-07-06T16:18:41.000Z	153.3626	F	Automatic TM processing.
2006-07-06T18:44:49.000Z	153.3115	F	Automatic TM processing.

This report was generated Fri Jul 7 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, 01/07/2006 – 07/07/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 95 Open Loop Slews, 68 Closed Loop Slews and 9 Momentum Biases were executed.

1 Open Loop Slew, and 1 Closed loop Slew were lost during the observation period due to problems at the Redu station.

This is equivalent to 1.2 % of the total number of slews planned (163).

Orbit Control

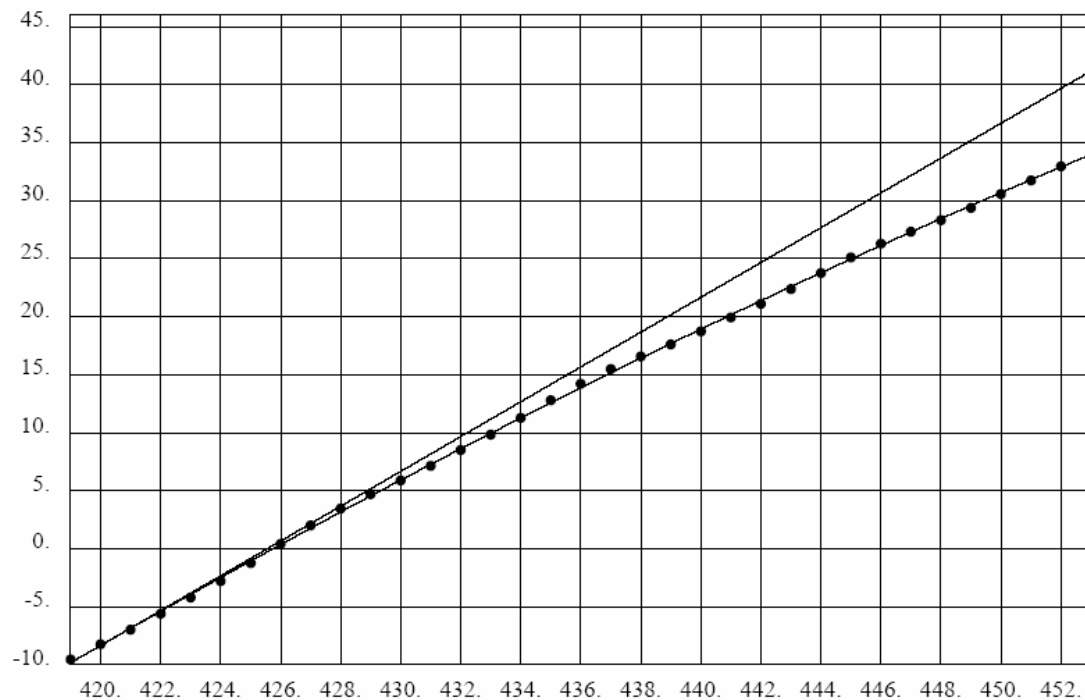
The following table shows the shortening of the necessary Goldstone pass:

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
443	2006/05/31	46 min
453	2006/06/30	16 min

From orbit 461 and onwards Redu will give coverage down to 40000 km altitude.

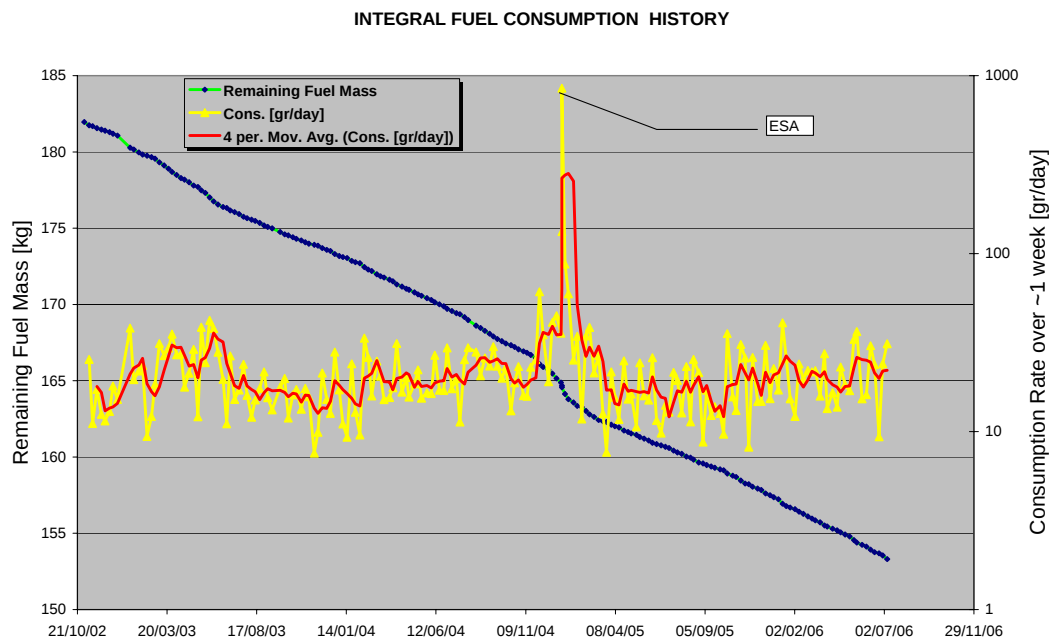
The attached plot shows the apogee longitude of Integral as a function of the orbit number. From this, an estimate of the rate of semi-major axis increase of about 800m per orbital revolution can be made.

APOGEE LONGITUDES OF INTEGRAL 21.03.2006 - 01.07.2006
 LEAST SQUARES APPROXIMATION WITH PARABLE

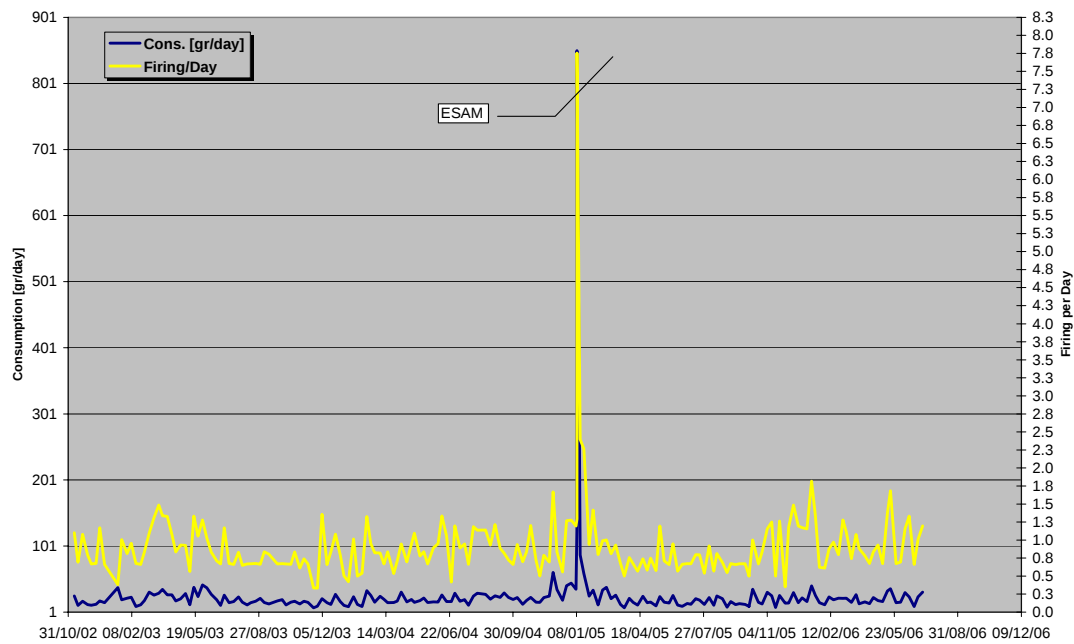


Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 07/07/2006 is reported in the plot below.

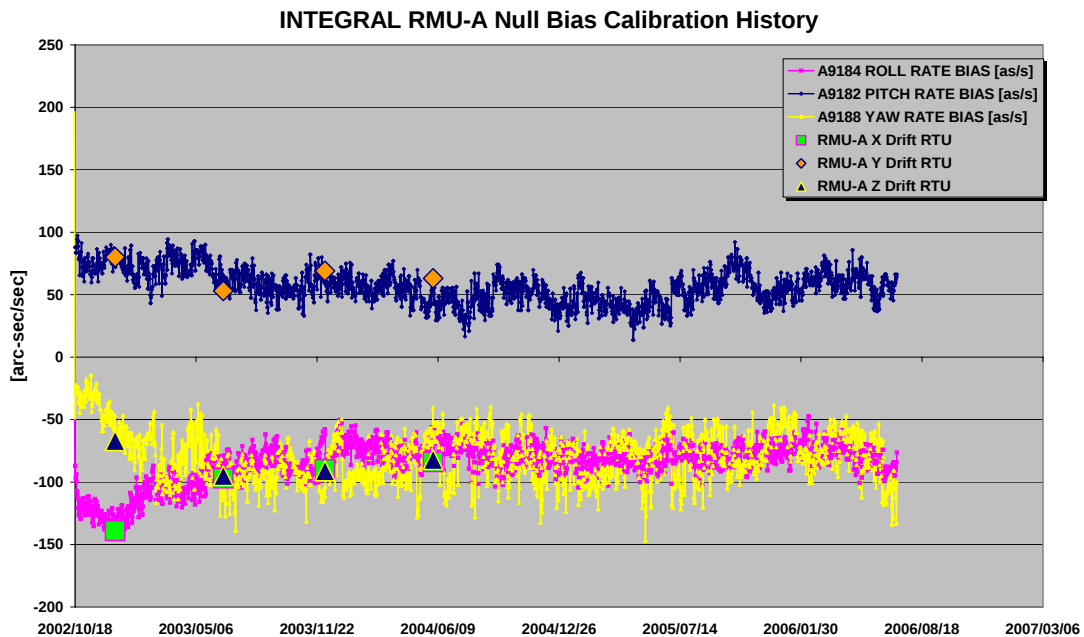


The firing\day over the period between 01/11/2002 and 07/07/2006 is reported in the plot below.

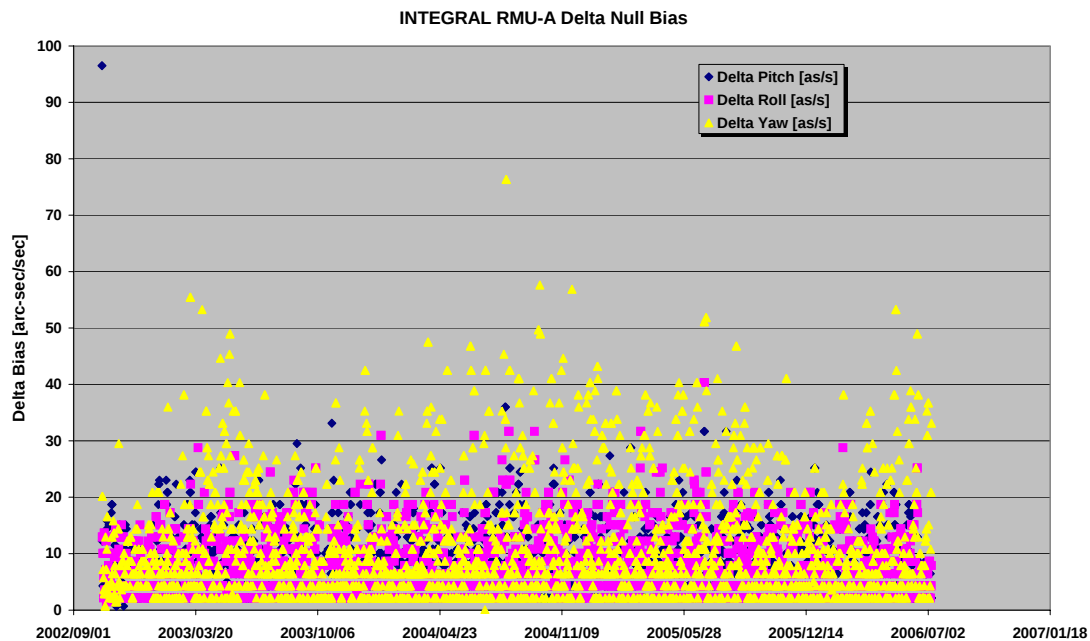


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 07/07/2006 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 07/07/2006 is reported in the plot below.



01/07/06 (Day of Year 182, Revolution 453)

OTF not reached due to command failure: at 07:13, command A3089 (START SUN STEER) failed release due to PTV set to no go. The recovery consisted of performing a manual star mapping, and updating the subsequent slew, which was completed at 07:37. The impact was the OTF was not set for pointing 04530063.

02/07/06 (Day of Year 183, Revolution 453-544)

Nothing to report.

03/07/06 (Day of Year 184, Revolution 454)

Nothing to report.

04/07/06 (Day of Year 185, Revolution 454)

Nothing to report.

05/07/06 (Day of Year 186, Revolution 454-455)

Slew lost due to Commanding problem: At 08:35, the Timeline was interrupted due to a commanding problem at Redu. The problem was quickly resolved, and a recovery performed. A closed loop slew was manually performed at 08:56:26 from the attitude of pointing 04550002 to that of 04550003, and the Timeline rejoined at 09:06.

The following slew was not executed from TL: ID 04550003 (CSL)

Power failure at Redu led to slew loss: At 13:10, a power problem at Redu caused all the links to drop. At 13:16, the Timeline was stopped. At 13:38, the links were back and a recovery performed. At 14:02:57, an open loop slew was manually

performed from the attitude of pointing 04550008 to that of 04550010, the Timeline was rejoined at 14:19.

The following slew was not executed from TL: ID 04550009 (OSL)

06/07/06 (Day of Year 187, Revolution 455)

Nothing to report.

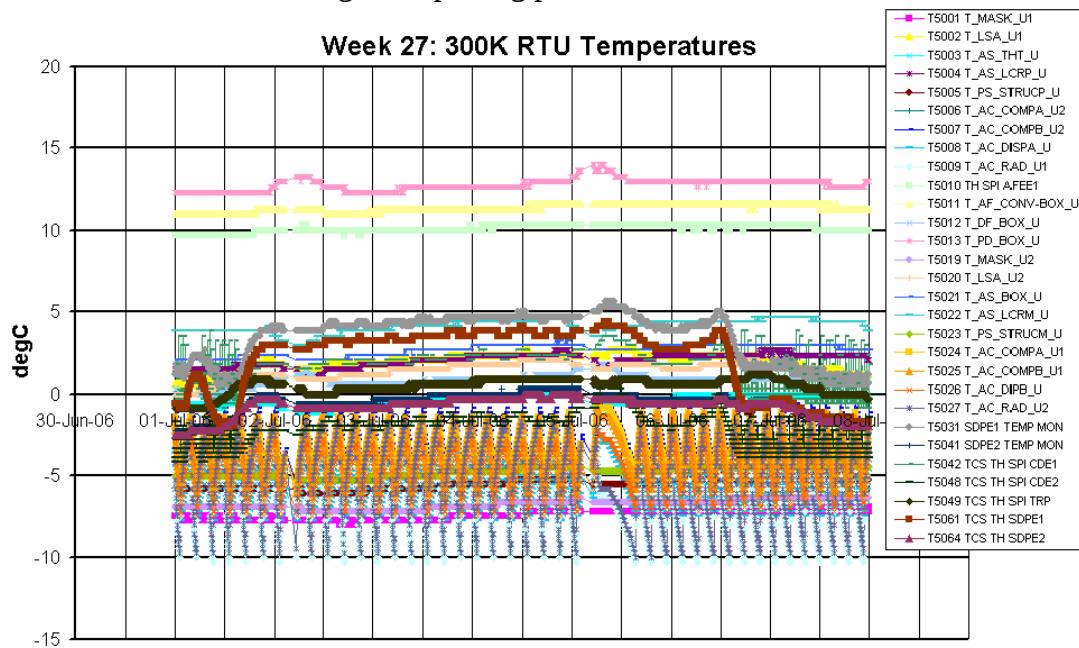
07/07/06 (Day of Year 188, Revolution 455)

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. At the start of the reporting period the cold plate temperature was in the range 85K $\pm$ 1K. On 2006-07-04 at 22:27Z, after radiation belt entry of revolution 454, the implementation of OCR-215 (SPI detectors temperature from 85K to 82K) was started. The stroke of the compressors was adjusted as follows to achieve the target cold plate temperature of 82K $\pm$ 1K:

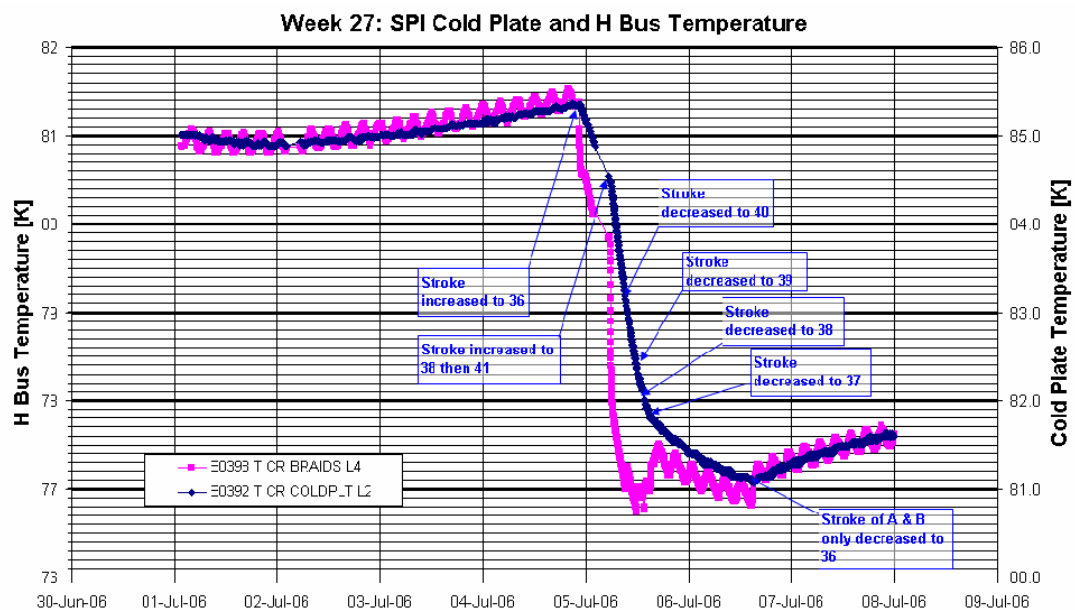
- 2006-07-04T22:27Z Stroke of all compressors increased to 36
- 2006-07-05T05:40Z Stroke of all compressors increased to 38
- 2006-07-05T05:44Z Stroke of all compressors increased to 41
- 2006-07-05T09:17Z Stroke of all compressors decreased to 40
- 2006-07-05T11:58Z Stroke of all compressors decreased to 39

- 2006-07-05T13:46Z Stroke of all compressors decreased to 38
- 2006-07-05T15:00Z Stroke of all compressors decreased to 37
- 2006-07-06T15:05Z Stroke of compressor pair A&B decreased to 36

On 2006-07-05 at 07:43:47Z FCP_SPI1_1700 was executed to load the updated IASW configuration parameters (ES1700_IASW-PAR_fmconfig_0010.TPF), with the cold plate temperature threshold set to 87K.

The cold plate reached the new operating range of 82K $\pm$ 1K on 05/07/2006 at 09:40Z, i.e. $\sim$ 2 hours after radiation belt exit of revolution 455. The cold plate temperature has since remained stably within this range.

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

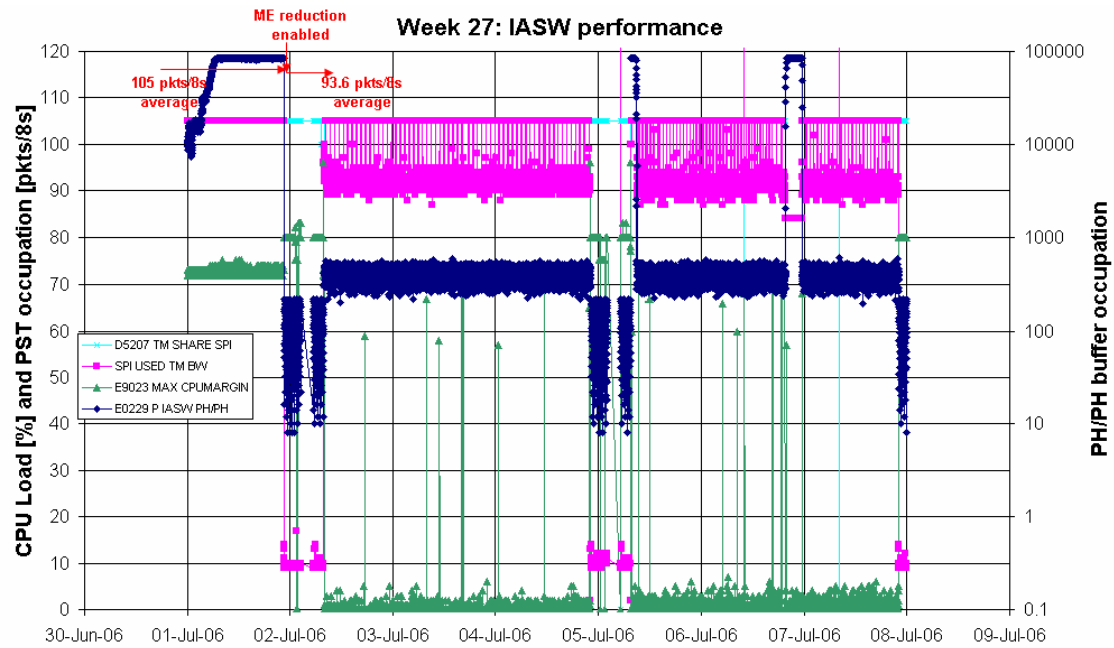


DPE & IASW:

The DPE health and IASW performance is nominal. The current IASW version installed is 432.

OCR-216 SPI Enable of Multiple Event Reduction Function was executed on 2006-07-01 at 22:45:00Z, after radiation belt entry of revolution 453. From revolution 454 onwards the average TM bandwidth occupation of SPI was 93.6 packets/cycle over the science window.

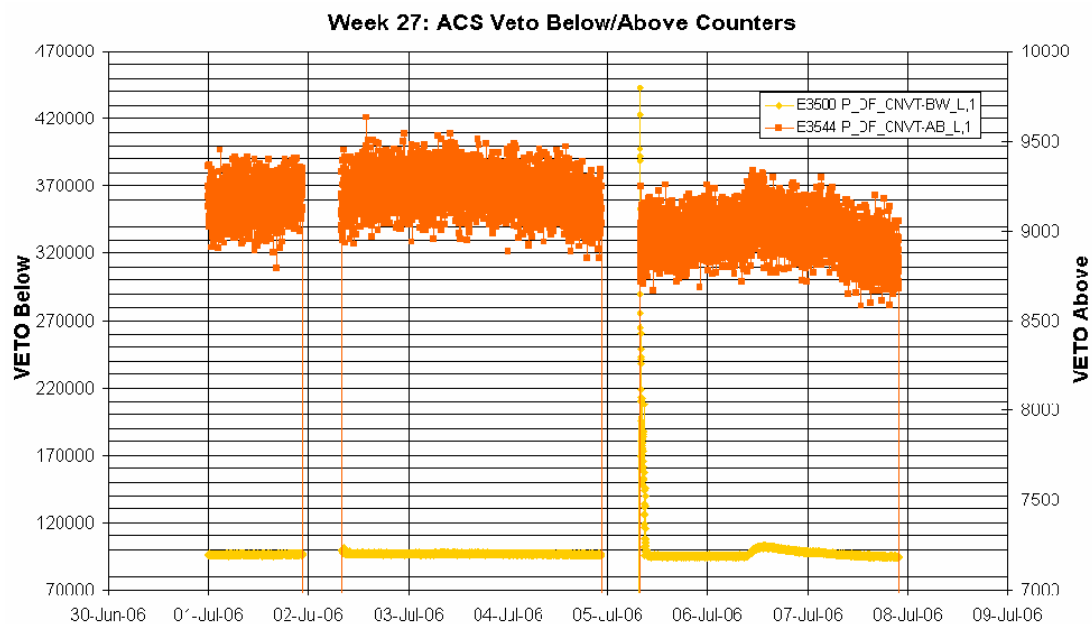
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

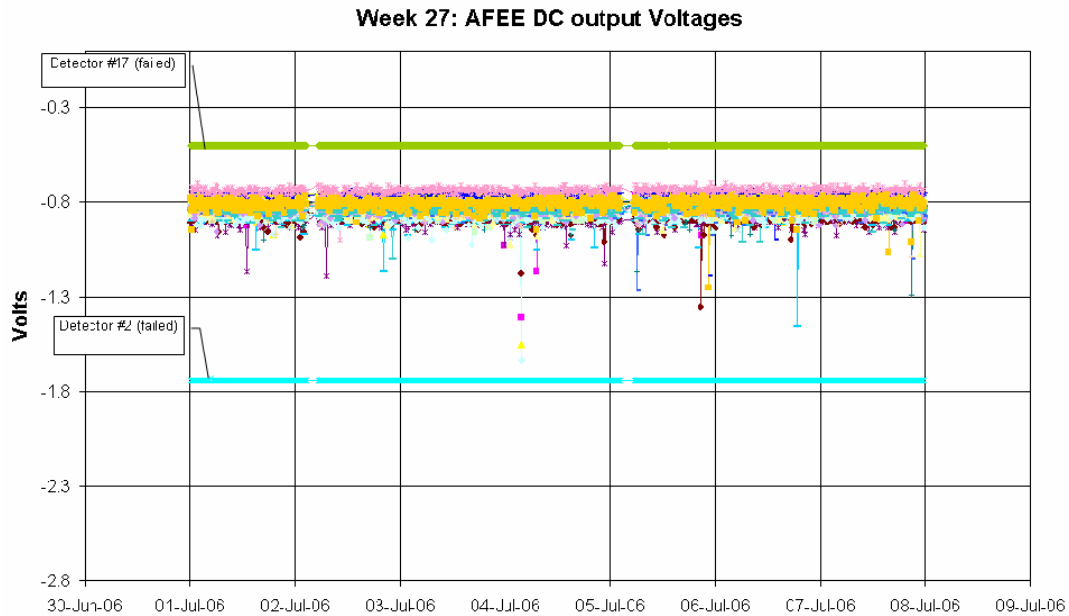
The following plot shows the ACS overall count rate evolution during the reporting period:



AFEE:

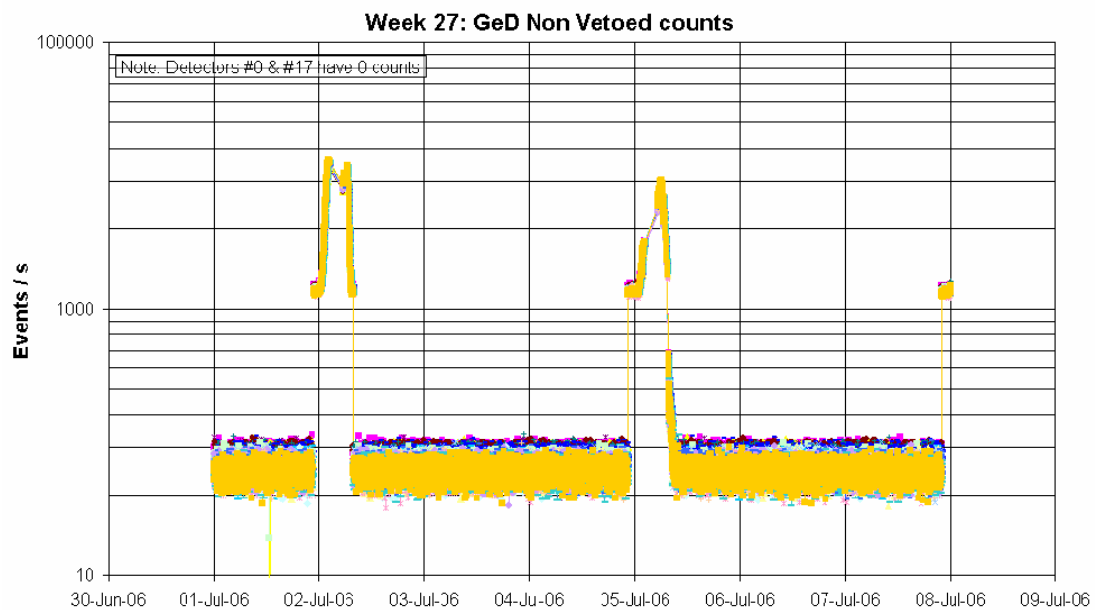
The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with this annealing.

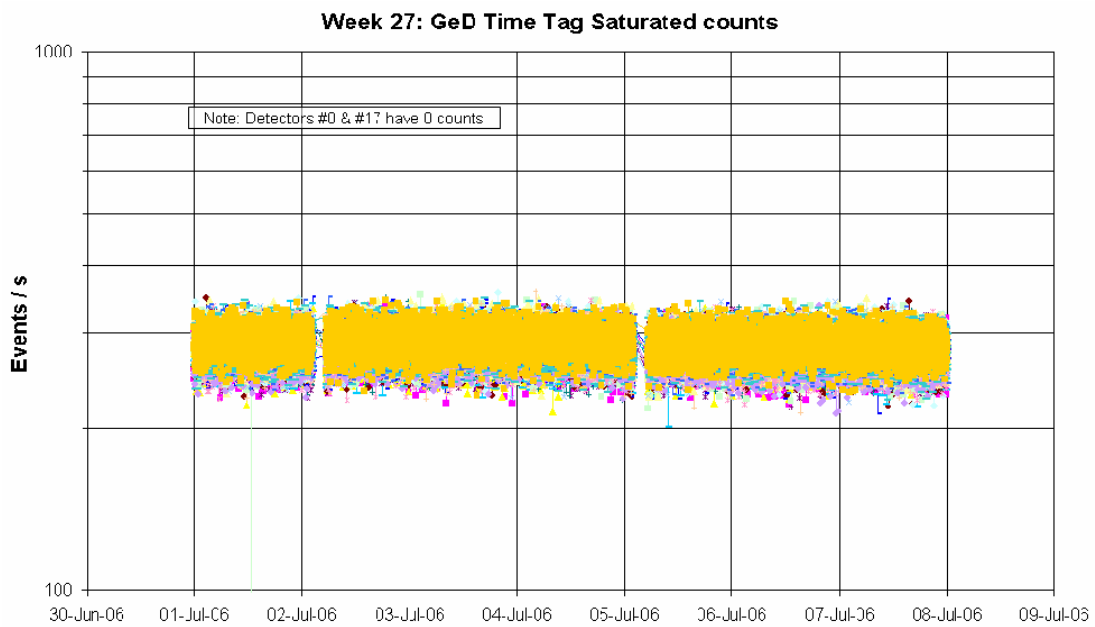
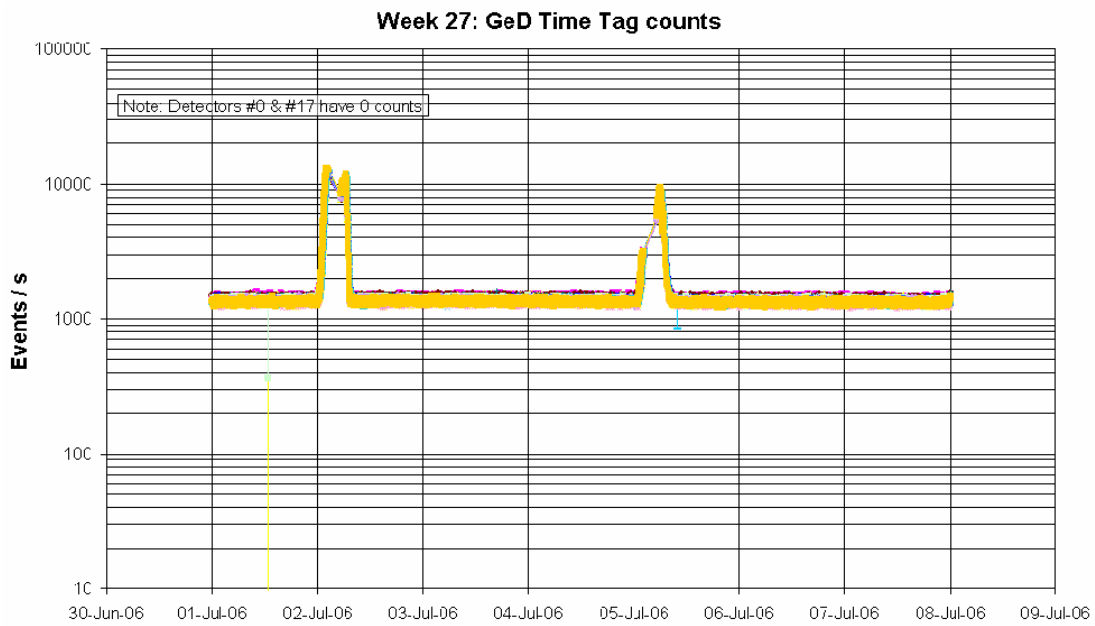
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004



DFEE:

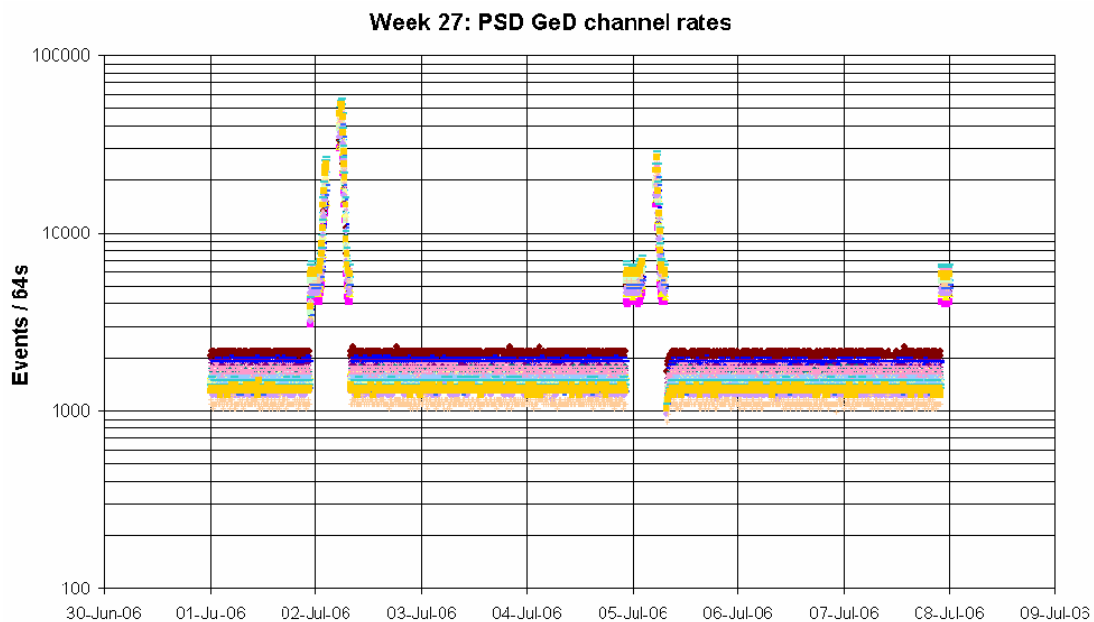
The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD:

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



Event Log

The following non-nominal OEMs were received from SPI during the reporting period:

- On 2006-07-03T06:11:35Z a single occurrence of OEM 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW due to high counts during that TM cycle. No action was required.
- From 2006-07-05T07:38:55Z to 2006-07-05T07:49:43Z several instances of OEM 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW. This was at radiation belt exit of revolution 455 and was due to high background radiation conditions. No action was required.
- From 2006-07-06T23:34:39Z to 2006-07-06T23:35:43Z, 17 occurrences of the following pair of OEMs was received:

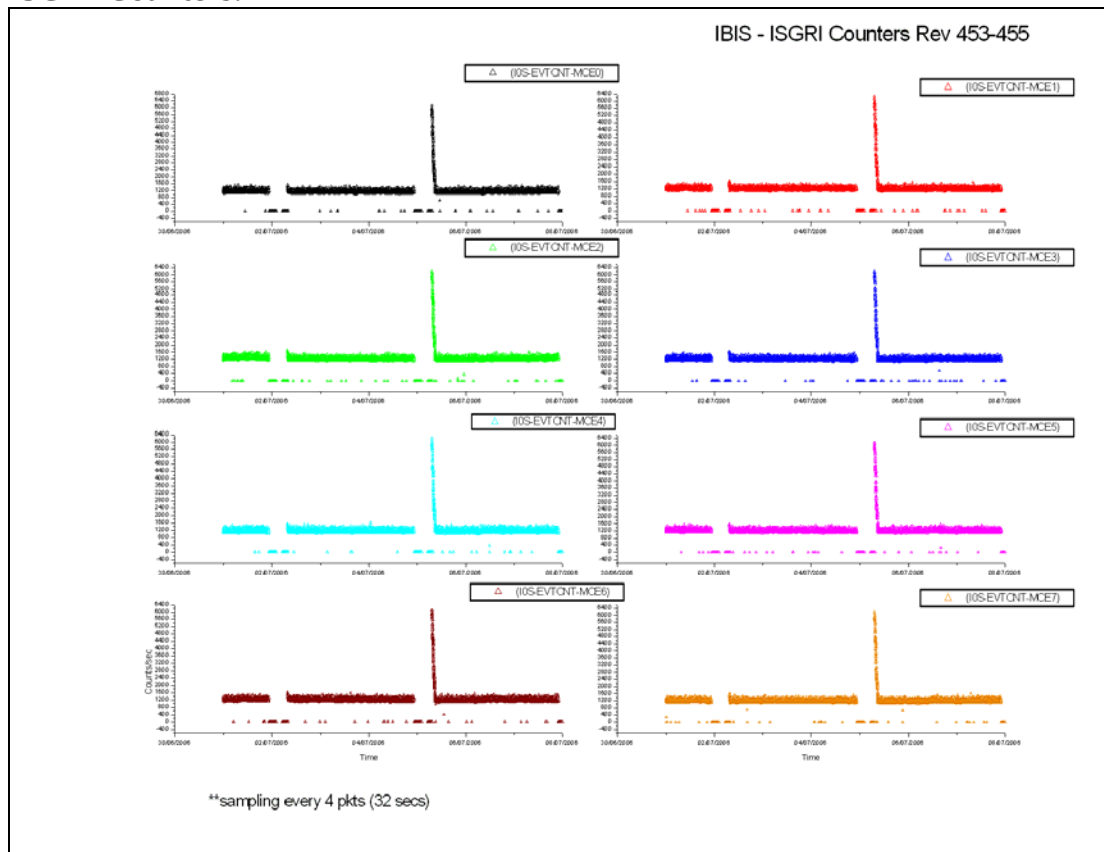
OEM 7	EXCEPTION	SPI1 CONSTRAINT DPE CULPR	
E9073	TASK ID 6		IASW
E9079	MESS CLASS		
E9080	MESS ID		7
E9076	OUT RANGE VALUE		4097
E9067	LOGICAL ADDRESS		11637
OEM 224	EXCEPTION	SPI1 SW ERROR	
FIX6			0
E9079	MESS CLASS		1
E9080	MESS ID		224
E9777	FAULTY TASK ID		3
FIX16			0

indicating a problem with the Spectra Transmitter task. These OEMs stopped of their own accord and SPI operations continued nominally. This is currently under investigation.

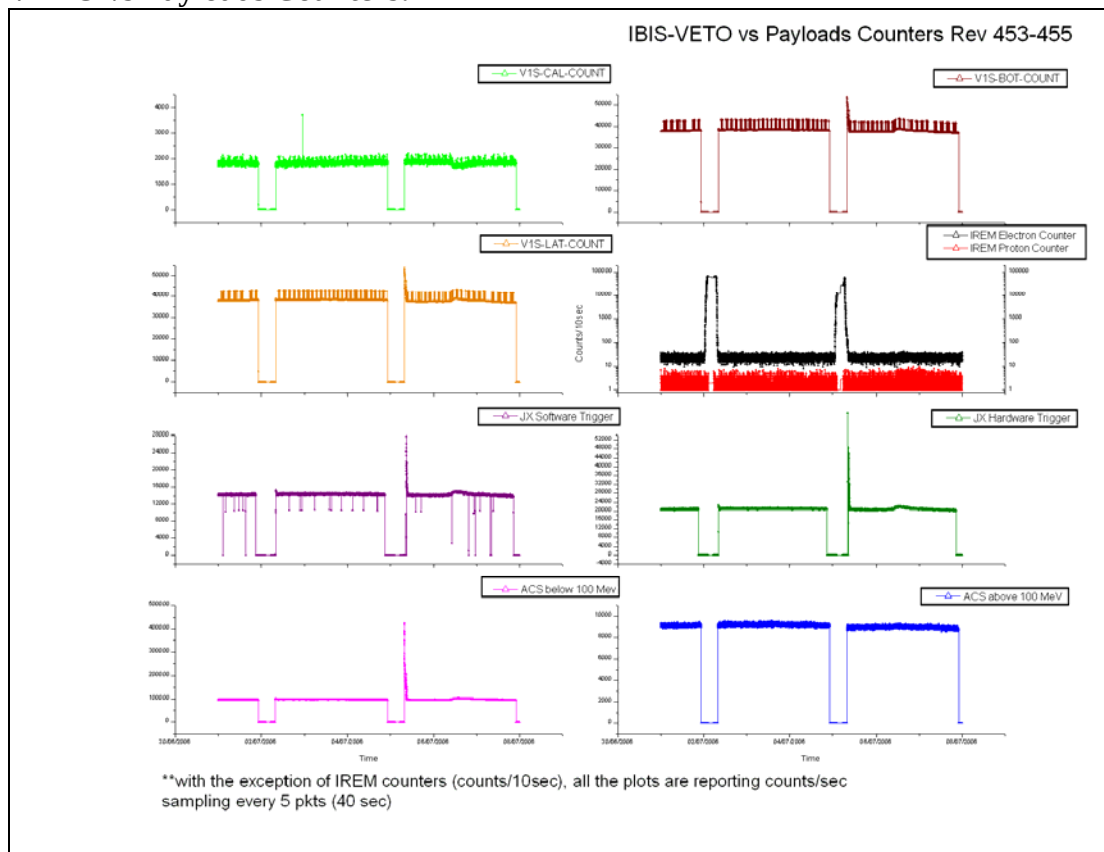
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

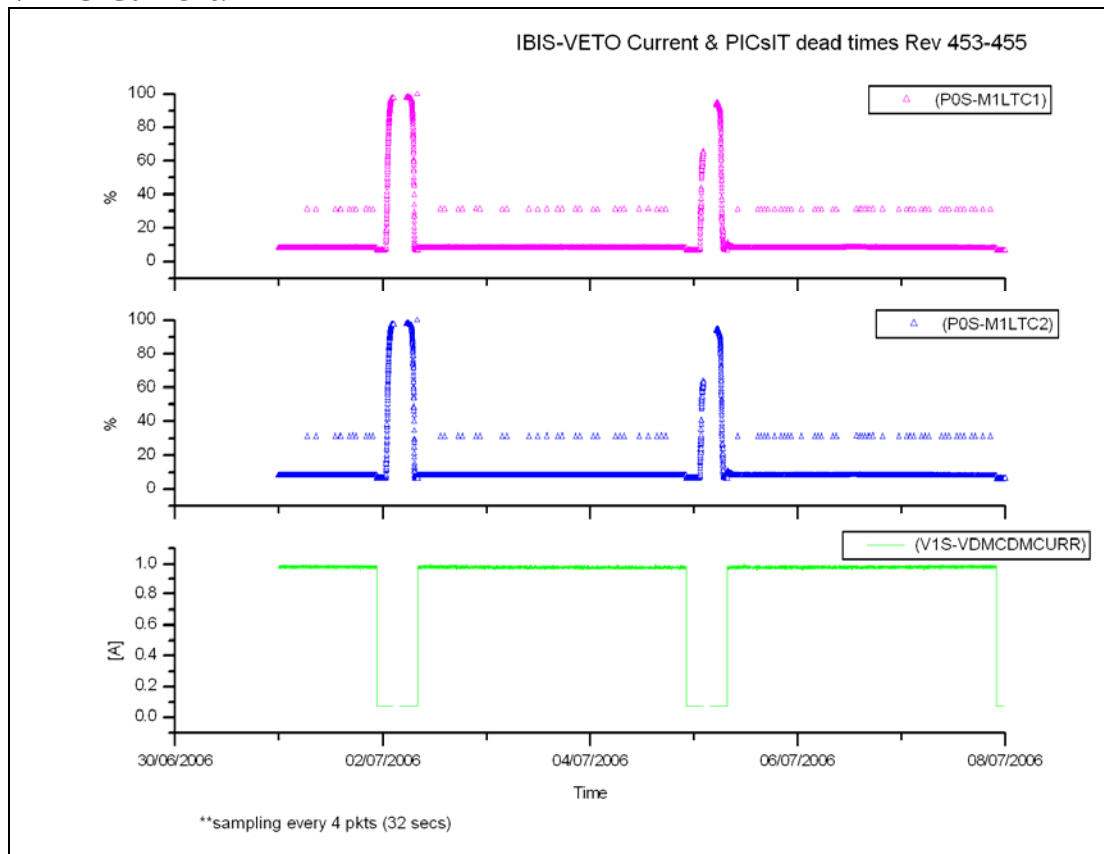


VETO vs Payloads Counters:

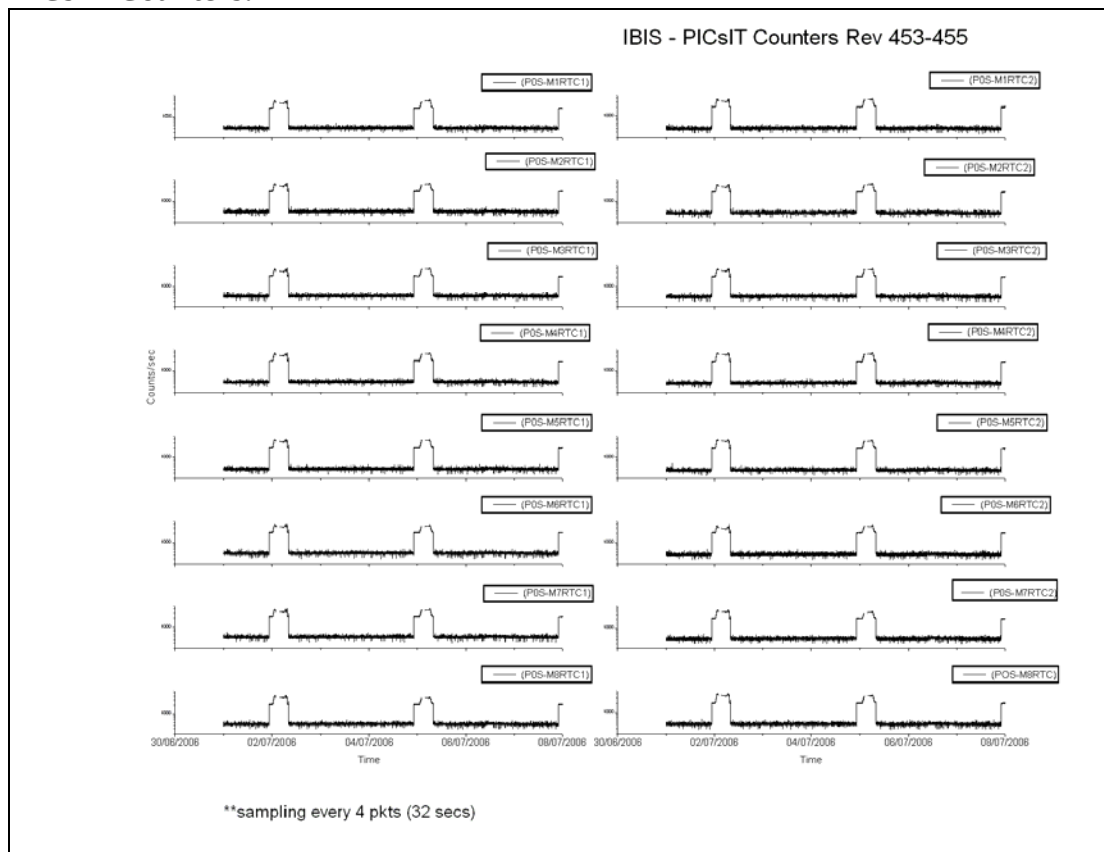


The week was characterised by low radiation.

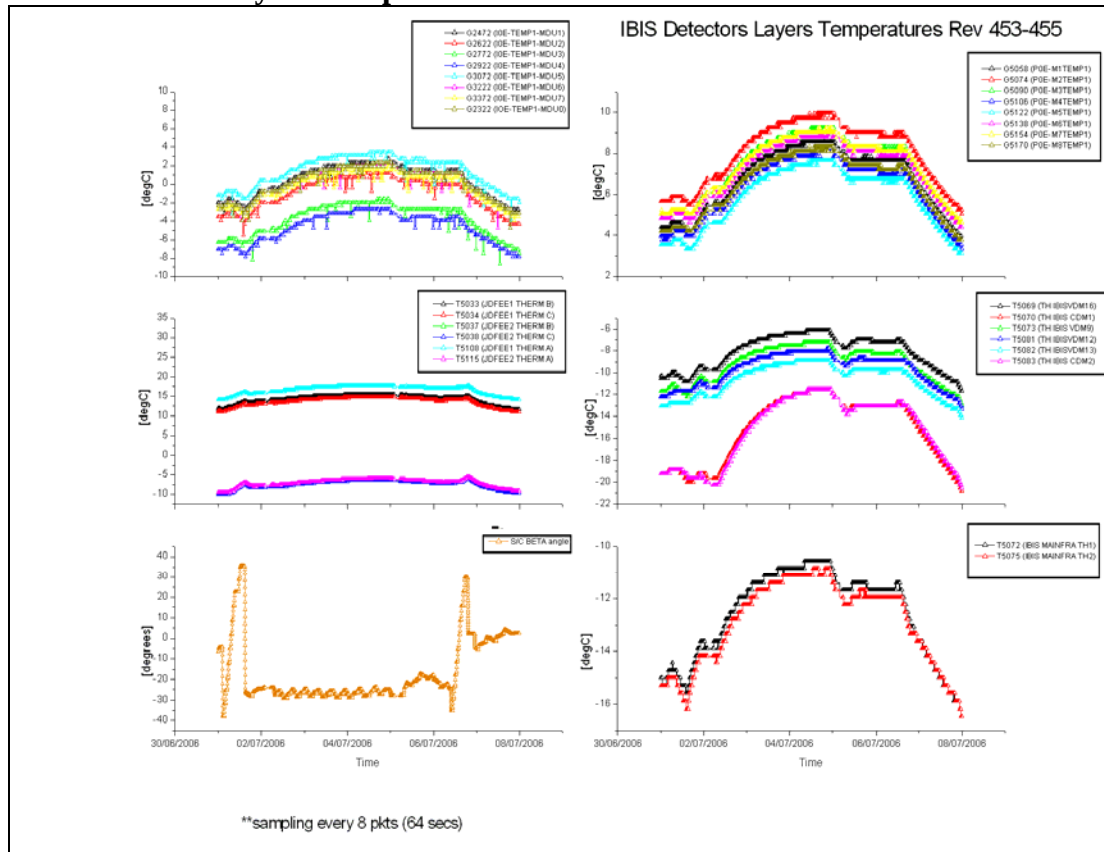
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2006.182 (01/07/2006):

At 22:37Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 183 (02/07/2006) at 08:08Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

DoY 2006.185 (04/07/2006):

At 22:20Z, TM parameter G8015 (S1E-A2 PMT V) was reported Out Of Limit high. It went back inside limit on DoY 186 (05/07/2006) at 07:50Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

During the Belts, several TM parameters from families G5002 (POS-Mi RTC1) and G5003 (POS-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

DoY 2006.186 (05/07/2006):

At 07:32Z TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, no action was taken.

DoY 2006.186 (05/07/2006): High Radiation at Belts exit

At Radiation Belts exit, after the ISGRI calibration (ED GESICL03) at 07:18Z, G2013 family (I0S-EVTCNT-MCEi) was reported toggling OOL High although IREM counts were far below the IBIS thresholds. Similarly after VETO activation (ED GEBEXT01) at 07:55Z, G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were reported toggling OOL High.

This was due to high radiation from the Belts and as the ISGRI and VETO counters were decreasing towards nominal values rather rapidly (back within limits at 08:35Z), no action was taken.

In the future, it may happen that the activation of IBIS after Belts is delayed to protect the detectors.

DoY 2006.187 (06/07/2006):

At 19:37Z the Command Verifier died. Consequently ED GESTAN02 was not released from the system and was hence manually uplinked at 19:40Z.

DoY 2006.188 (07/07/2006): LOBT Wrap-Around

Following INT-OR-0258 "DPE LOBT Wrap-Around", IBIS was sent to Stand-By mode via FCP_IBIS1_0313 at 07:49Z. The wrap-around took place at 08:03Z, and at 08:04Z the CCCF was re-enabled so that CCCF-ED GESTAN02 returns IBIS into Scientific Standard mode.

Later, as commands were sent to the different DPEs to check the time synchronisation, the TM report from IBIS did not occur. After verifying IBIS was still accepting TC, the unit was put in Stand-By mode. This made the report TM to be received on ground and the IBIS DPE time synchronisation to be verified. At 10:05Z, IBIS was sent back to Scientific Standard mode.

For future LOBT wrap-around it may be convenient to check the time synchronisation of IBIS DPE while the unit is still in Stand-By mode.

DoY 2006.188 (07/07/2006): PICsIT Time-Out

At 14:30Z, the following OEM APID 1280 ID 133 CLASS 2 was reported:

"IBIS1 IASW LSL TRANSFER FAILED (LOW LEVEL)"

together with OEM APID 1280 ID 131 CLASS 2:

"IBIS1 IASW LSL TRANSFER FAIL REPORT FOR HIGH-LEVEL MODULE
RESET"

This anomaly is similar to the previous ones that flagged a Time-Out in several peripherals and that refer to the anomaly report INT_SC-113. This time, according to G1581 (parameter of OEM ID 131), the anomaly occurred with PICsIT.

IBIS incurred a timing problem on the Low Speed Line that affected the communication with PICsIT. During this time, a request for HK1 was sent to PICsIT without any answer due to the black-out in communication between the peripheral and the DPE. During this time no valid HK was collected from PICsIT therefore, what was reported in the HK1 was simply the IASW default (i.e all 0000...). This is confirmed by the reading of TM parameters that turned to raw value 0 (POE-PDM status to OFF [raw 0] for example). The unit solved autonomously the internal conflict on the LSL and reported the valid HK1 for PICsIT in next cycle.

8.3.4 JEM-X Operations

JEM-X Count Rates

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

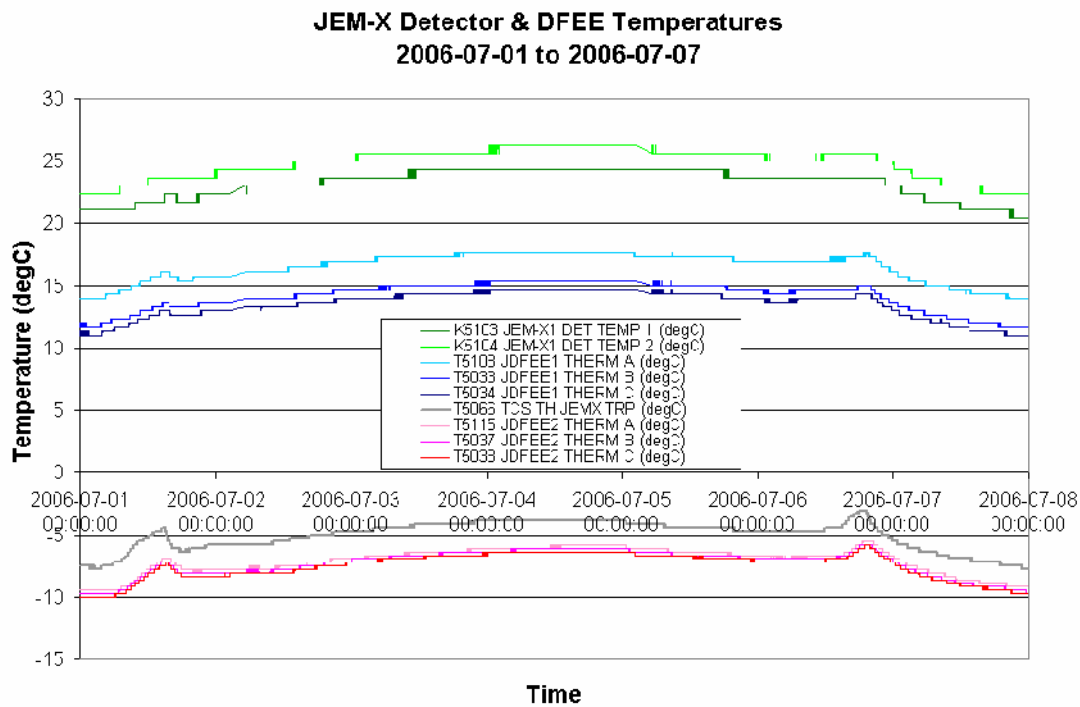


JEM-X Temperatures

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

2006-07-01 (DOY 182, Rev 453) to 2006-07-04 (DOY 185, Rev 454)

Nothing to report

2006-07-05 (DOY 186, Rev 454-455)

After radiation belt exit of revolution 455, due to continuing high background radiation, the TM parameter K5317 RAD MONITOR 3 went OOL High (value = 127) at 07:37:55Z. At 07:59:16Z TM parameter K5449 HARDWARE TRIGGER went OOL Warning High as well and at 07:59:56Z it exceeded the safe threshold for JEM-X1, with a value of 64102, causing the JEM-X1 High Voltage to be switched off autonomously. This was during the execution of the TC K0003 SET HVDELTA sent at 07:58:41Z (as part of the ED KEHVAC01 in the Timeline). Therefore this TC failed completion and the other TCs of the sequence KEHVAC01 failed release. Commanding to JEM-X1 from the Timeline was then disabled.

After observing that the background radiation as measured by IREM was rapidly decreasing, JEM-X1 was recovered as follows:

- 08:17:01Z FCP_JEM1_0040 JEMX1 TRANSITION TO SAFE
- 08:17:52Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP
- 08:20:16Z Sequence KEHVAC01 re-uplinked. During the execution of this ED, after the TC K0013 STATE DIAGNOSTIC was uplinked at 08:29:31Z, OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in HK) was received. This was due to the fact that the TM parameter K5022 DFEE STATUS was SETUP while K5462 DFEE STATE IASW was DATA DUMP because the DFEE output FIFO buffer was over half full at the time of

termination of the diagnostic data collection and thus the IASW did not recognise the autonomous transition of the DFEE back to SETUP. In addition, a problem at the ground station occurred at this stage and caused the last two TCs of the sequence (K0009 STATE SETUP and K0011 STATE DATA TAKE) to time-out at ground station reception and transmission. It was verified that these commands had not been executed as both TM parameters K5022 and K5462 remained unchanged. The TC K0009 STATE SETUP was resent and, although also displayed as timed-out at the station in TC history, was executed on-board, with TM parameter K5462 DFEE STATE IASW going to SETUP ~2 minutes later and the OEM 254 ERROR OFF received. At 08:42:23Z the TC K0011 STATE DATA TAKE was resent successfully and JEM-X1 returned to Data Taking mode with the planned observation parameters.

Commanding to JEM-X1 from the Timeline was then re-enabled and JEM-X1 operations continued nominally. From 08:27:08Z to 09:02:36Z K5449 HARDWARE TRIGGER fluctuated in and out of its Warning High limit, but the values were not high enough to cause a transition of JEM-X1 to Safe mode.

2006-07-06 (DOY 187, Rev 455)

At 19:37Z the connection to the verifier task of the IMCS was lost and consequently the ED KEDATA02 at 19:36:52Z was interrupted as follows:

- TCs KU0014 SW SET INT 84 and K0021 SW READ INT unverified on-board acceptance;
- TC K0011 STATE DATA TAKE failed release, leaving JEM-X1 in Setup mode.

Once the problem was rectified, the above commands were re-uplinked manually starting at 19:42:51Z. JEM-X1 was returned to Data Taking mode at 19:47:29Z and JEM-X1 operations continued nominally.

2006-07-07 (DOY 188, Rev 455)

Due to the upcoming wraparound of the DPE LOBT, JEM-X1 was commanded to Setup mode via FCP_JEM1_0041 at 07:42:51Z. The wraparound occurred at 08:03:03Z, after which JEM-X1 was returned to Data Taking via the CCCF_ED KEDATA02 in the Timeline at 08:24:49Z. As this period was covered by a dedicated SATENG window in the Timeline, no scientific observations were impacted.

8.3.5 OMC Operations

2006-07-01 (DOY 182, Rev 453)

At 07:13, an AOCS command failed release, which led to the On-Target-Flag not being reached. The impact was the loss of pointing 04530063.

2006-07-02 (DOY 183, Rev 453) to 2006-07-04 (DOY 185, Rev 454)

Nothing to report

2006-07-05 (DOY 186, Rev 454-455)

At 08:35, a commanding problem at Redu caused the loss of pointing 04550003.

At 13:10, a power problem at Redu caused the loss of pointing 04550009.

2006-07-06 (DOY 187, Rev 455)

At 10:49 the MU1321 (IMAGING B1) failed release due to the static PTV set to no go. At 10:51, the OMC sequence M1130, MU1310, MU1321, MU1322 was manually resent. Pointing 04550037 was then executed nominally. It was at this time the following commands were rejected:

2006.187.10.49.57.181	2006.187.10.50.08.608	1792	RealTime	133	TC REJECT
REJECTED TC3				0	0 65535
PR N E E					
2006.187.10.49.52.181	2006.187.10.50.00.530	1792	RealTime	133	TC REJECT
REJECTED TC3				0	0 65535
PR N E E					

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for that pointing.

2006-07-07 (DOY 188, Rev 455)

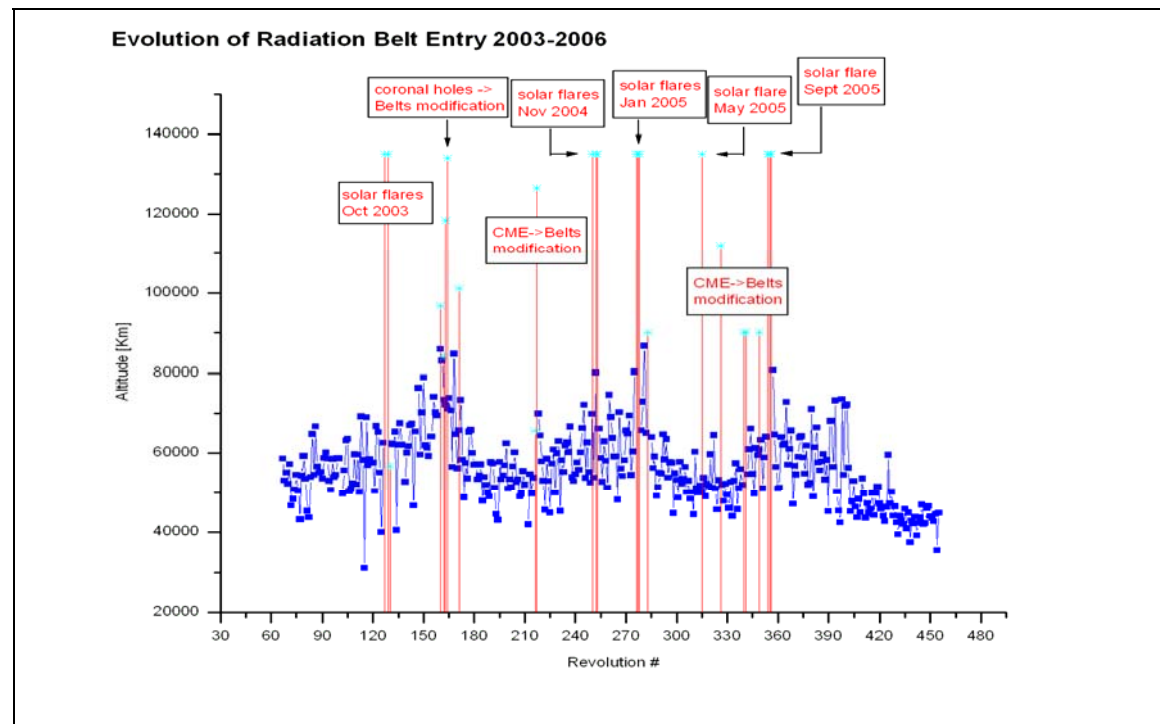
Due to the upcoming wraparound of the DPE LOBT, OMC was commanded to Stand-by mode via FCP_OMC_0042 at 07:40:25. The wraparound occurred at 08:03:03, after which OMC was returned to Normal (Science) mode via the Timeline at 08:26:45. As this period was covered by a dedicated SATENG window in the Timeline, no scientific observations were impacted.

On DoY 182 at 22:37:34, DoY 185 at 22:19:58 and DoY 188 at 22:03:02 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry

The following picture has been updated this week. Actually, since May 2005, an anomaly due to the release of a new IMCS (INT-2851), has wrongly time-stamped (about 16 minutes drift) some retrieved data included the IREM electron counter. The general trend remains however the same.



IREM daily report

Nothing to report

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]
453	RAD_ENTR R 2006-07-01T22:37:27Z	2006-07-02 00:27:56	>44564.0	2006-07-02 00:10:58	47389
454	RAD_EXIT R 2006-07-02T07:55:17Z	2006-07-02 07:35:32	36982.5	2006-07-02 07:40:58	38018
454	RAD_ENTR R 2006-07-04T22:19:54Z	2006-07-05 01:12:28	>35513.6	2006-07-04 23:53:37	47452
455	RAD_EXIT R 2006-07-05T07:37:47Z	2006-07-05 07:59:32	<43933.4	2006-07-05 07:23:37	37930
456	RAD_ENTR R 2006-07-07T22:02:54Z	2006-07-07 23:55:18	44869.8	2006-07-07 23:33:37	48049

Reference

Very small error vs reference (less than 10 minutes)

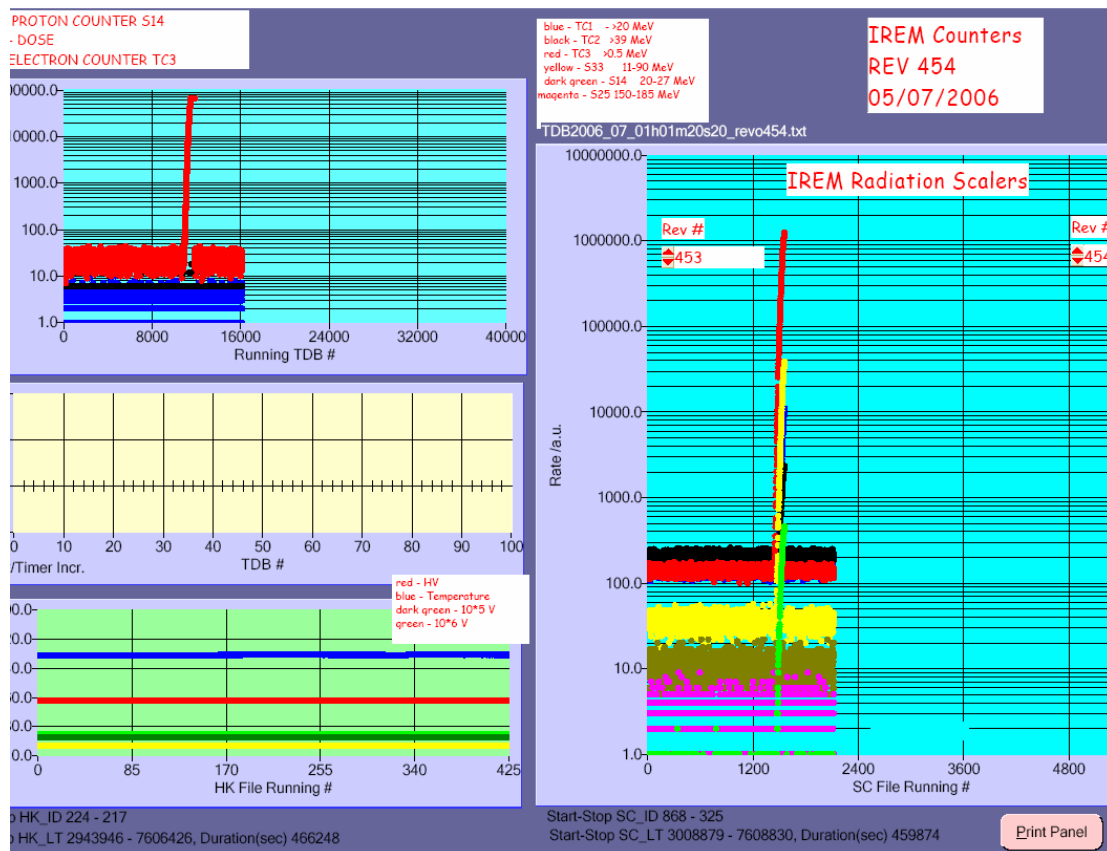
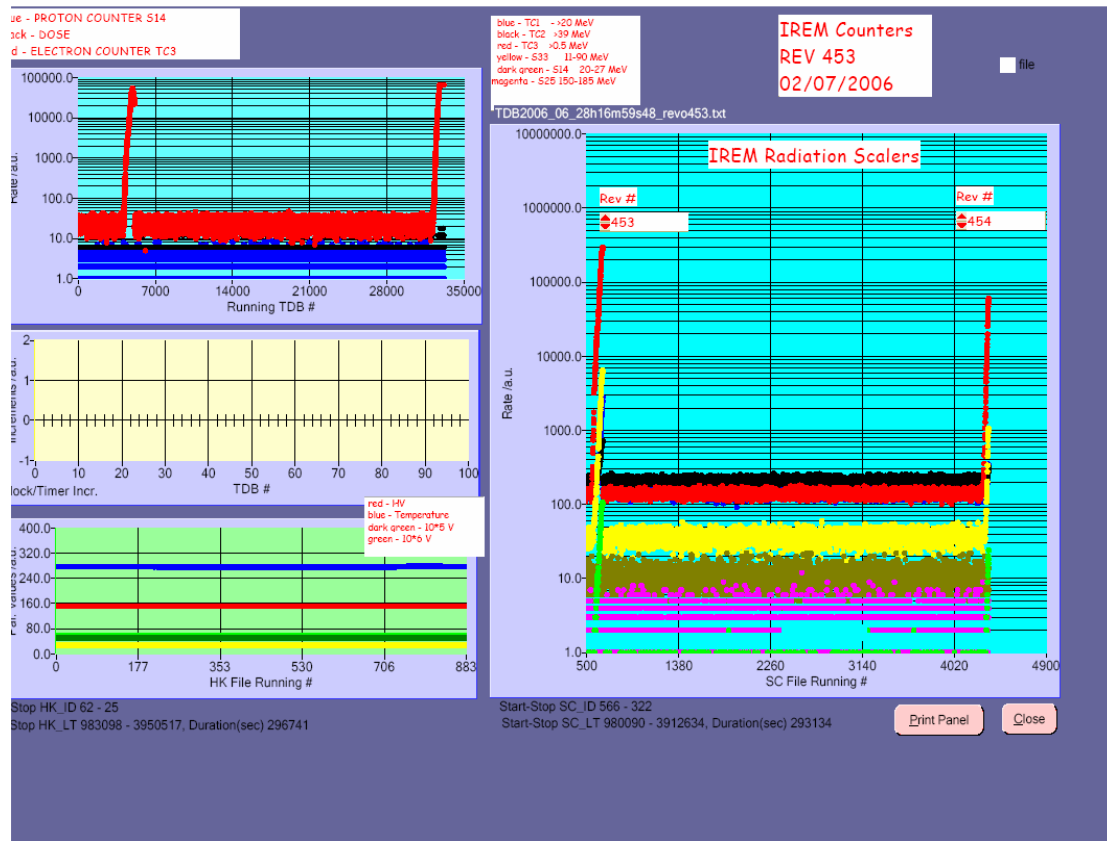
Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

Radiation Spike

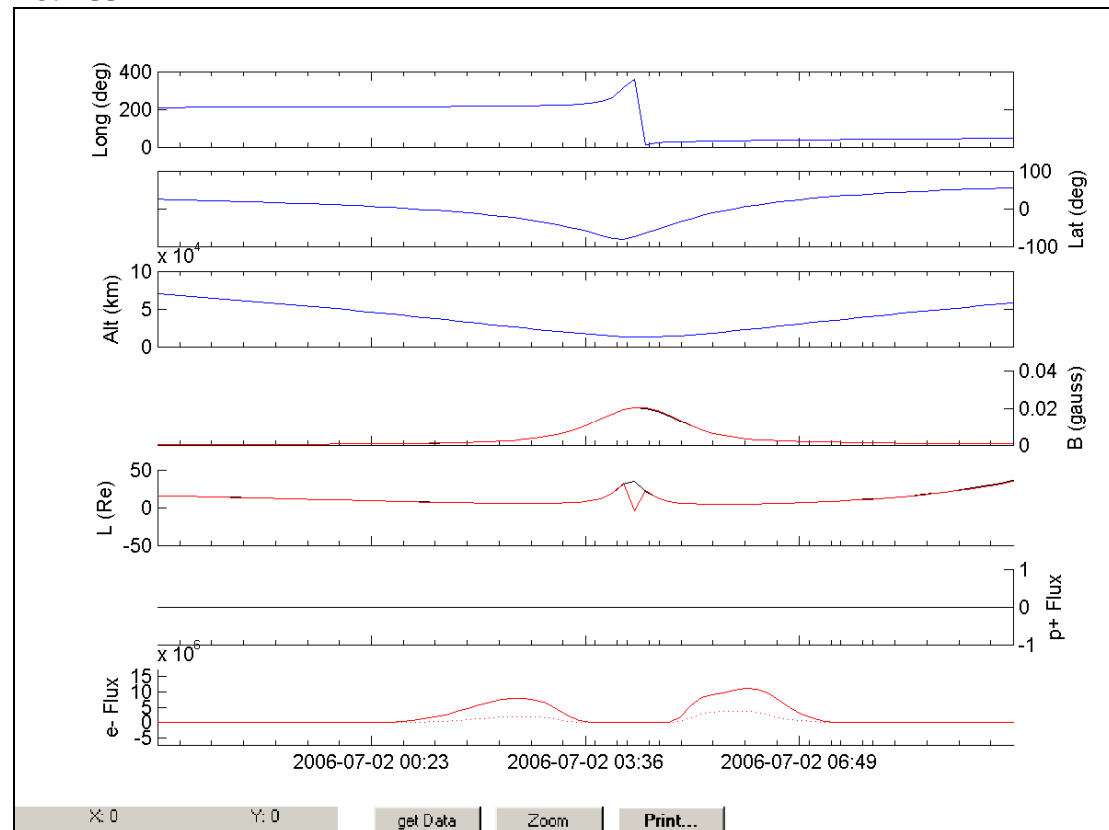
IREM radiation counters:

Due to problems with the Mission Control System, the ECOE machine reported several data gaps, therefore the pictures below present incomplete graphs.

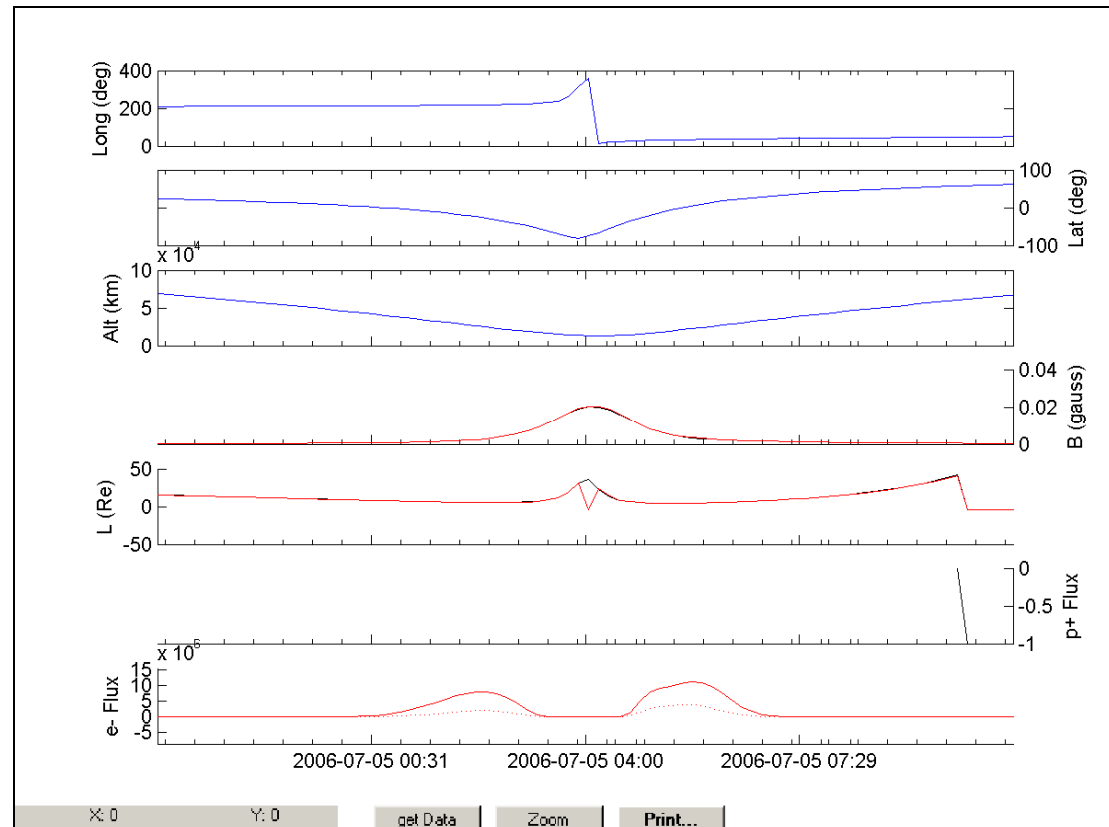


IREM Predicted Radiation Belt Passages:

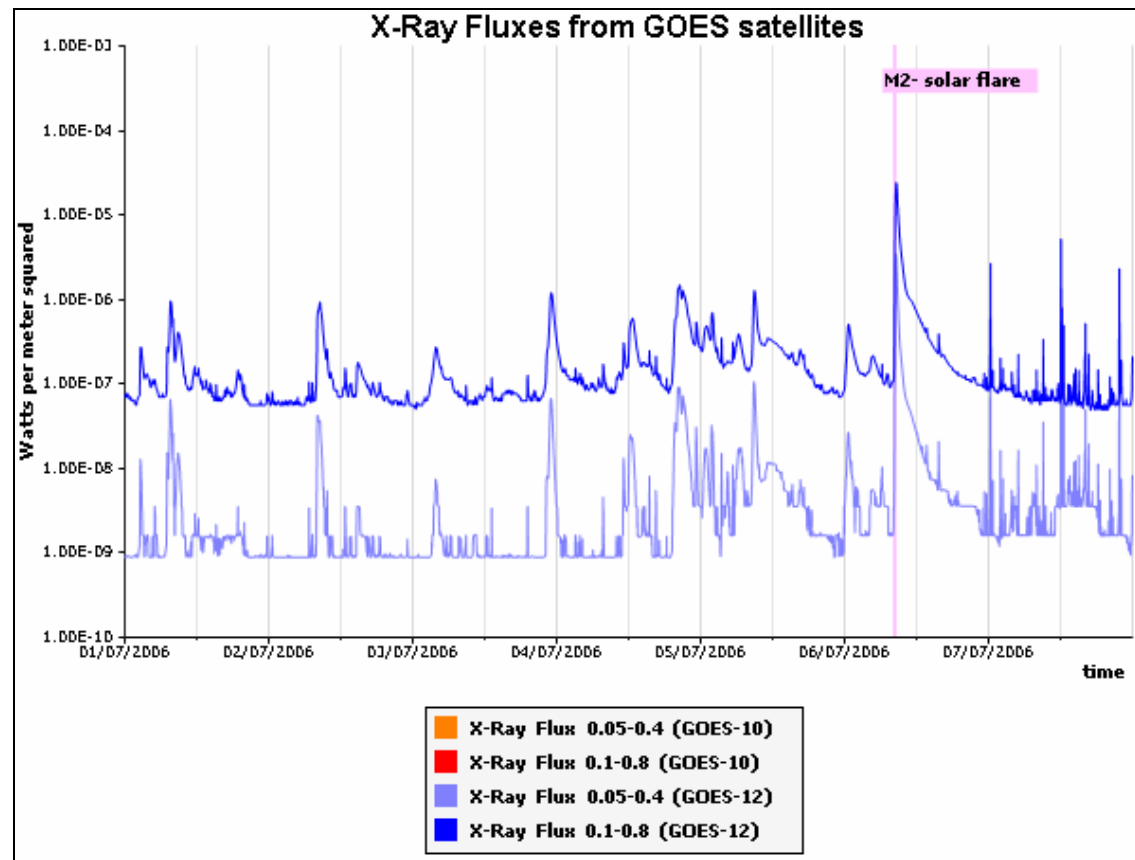
Rev 453



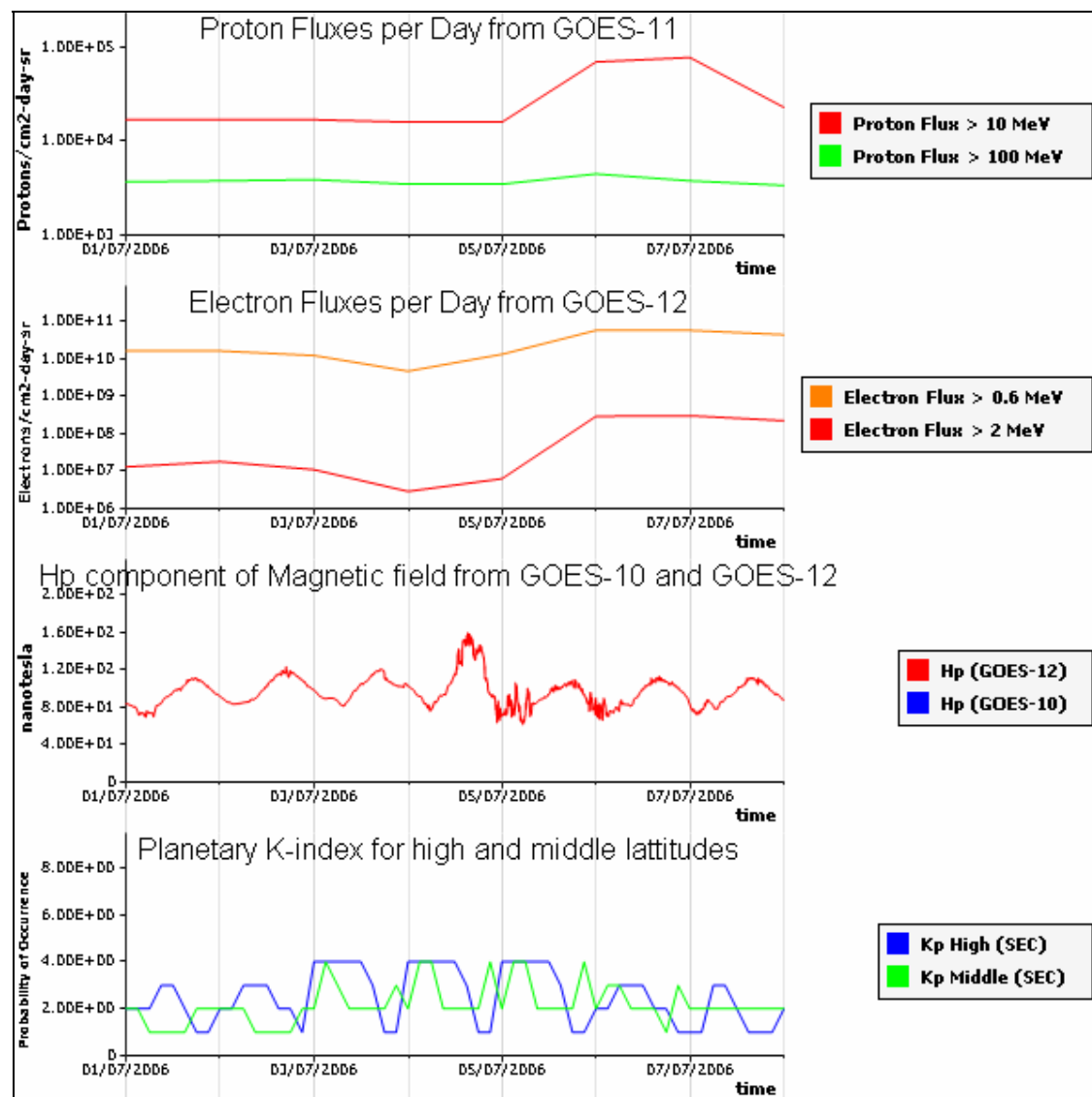
Rev 454



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 report moderate radiation background from the 6th of July, following the M2 X-ray spike.

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. Hp became noisy about 1 day before the Coronal Mass Ejection corresponding to the M-class flare.

Kp index is based on ground magnetometers. Kp ≥ 5 features storm-level geomagnetic activity. Kp increased to 4 due to the big sunspot 898 that unleashed an M-class solar flare.