

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 196
Week 25
26.06.06
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.....	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.....	5
3.2.3	JEM-X.....	5
3.2.4	OMC.....	6
3.2.5	IREM.....	6
4	Ground Facilities.....	6
4.1	Mission Operations Centre.....	6
4.2	Ground Stations & Network.....	6
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.....	10
8.1	Overview of Revolutions.....	10
8.2	Consumables.....	10
8.2.1	Detailed Fuel Book-keeping.....	10
8.3	Detailed Satellite Information.....	11
8.3.1	AOCS SUMMARY OPERATIONS REPORT, 17/06/2006 – 23/06/2006.....	11
8.3.2	SPI Operations.....	18
8.3.3	IBIS Operations.....	21
8.3.4	JEM-X Operations.....	26
8.3.5	OMC Operations.....	28
8.3.6	IREM Operations.....	30

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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 17.06.06 until 23.06.06 (both dates inclusive) and covers the revolutions 449, 450 and 451.

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 only of hexagonal dithers of Mrk 421 (RA 11:04:27.31, DEC +38:12:31.8), a Target of Opportunity.

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.

Following the FSS/STR misalignment calibration and the Thruster torque re-scaling in synch with the end of the Eclipse summer season, the FSS coefficients, AMD on-times, TIMs and Reciprocal Torques were updated during rev 449-450.

6 slews were lost during the observation period due to problem on the IMCS and TC/TM links with VIL2 station.

The fuel consumption over the period between 15/06/2006 and 23/06/2006 was 0.0704 kg. The remaining propellant is in the order of 153.6894 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 planned 8th annealing was started on the 8th June, after radiation belt entry of revolution 445 and is progressing nominally. The summary annealing timeline is included in the future activities section of this report.

The following table reports the major events/steps performed so far (i.e. up to 23th June) since the start of the annealing:

Date/Time	Activity
08/06/2006 00:50Z	Configure SPI for start of Annealing and stop SPI active cooling
08/06/2006 02:07Z	Annealing Heater Main ON
08/06/2006 04:07Z	Annealing Heater Redundant ON
08/06/2006 16:30Z	Heat Pipe Heater Main ON, All Antifreeze Heaters (1A; 2A; 1B; 2B) OFF
09/06/2006 04:30Z	Heat Pipe Heater Redundant ON
09/06/2006 13:40Z	Cold plate temperature reached 377K (104degC)
17/06/2006 12:04Z	Stop SPI Annealing: Annealing Heater Main and Redundant OFF; Heat Pipe Heater Main and Redundant OFF; Antifreeze Heater 1A ON
17/06/2006 12:15Z	Start Toggling of Heat Pipe Heater to manage Cold box temperature: Heat Pipe Heater Main and Redundant ON
17/06/2006 12:31Z	Start ACS Calibration
17/06/2006 18:15Z	Heat Pipe Heater Redundant OFF
18/06/2006 06:15Z	Heat Pipe Heater Main OFF and start toggling of Heat Pipe Heater Main at 75% ON cycle
19/06/2006 00:15Z	Start toggling of Heat Pipe Heater Main at 50% ON cycle
19/06/2006 04:17Z	End ACS Calibration
19/06/2006 18:15Z	Start toggling of Heat Pipe Heater Main at 25% ON cycle
20/06/2006 17:18Z	Thermal braids reached 308K (35degC)
20/06/2006 18:51Z	Start active cooling: Cyrocooler switch on to full stroke
21/06/2006 12:15Z	End toggling of Heat Pipe Heater Main: Heat Pipe Heater Main OFF

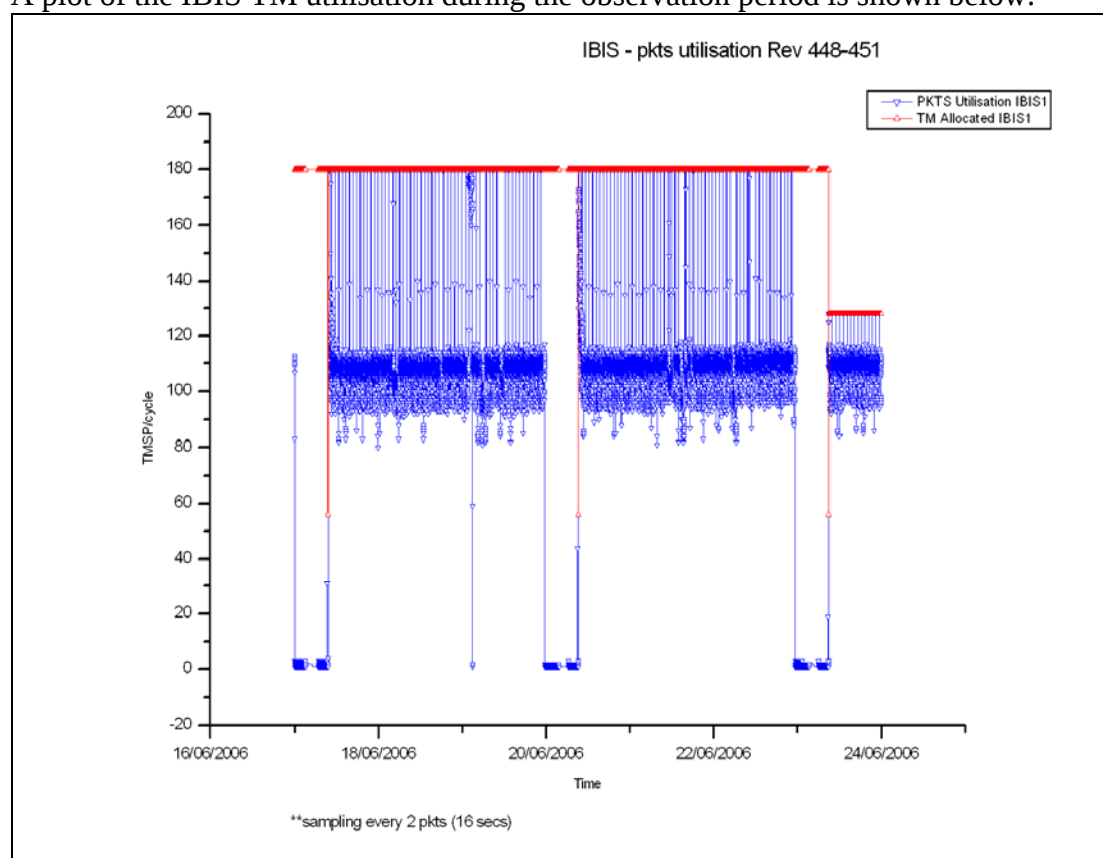
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 180 TMPS/cycle, due to SPI annealing, until revolution 451 when it came back to 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 111.58 TMPS/cycle, up 1.47 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 15 packets/cycle in revolutions 448-450 inclusive and 8 packets/cycle in revolution 451. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

On 2006-06-17 the activation of JEM-X1 at the start of revolution 449 was interrupted due to high values of the Hardware Trigger causing a transition of JEM-X1 to Safe

mode. JEM-X1 was then activated manually and reached Data Taking mode ~1 hour later than planned.

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, 126 of the 131 planned science pointings for OMC were executed nominally, 2 were delayed and 3 were 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.

Solar Activity

The observation period was characterised low solar activity.

Between June 18 and June 21, sunspot 896 appeared, grew and disappeared, posing no threat for strong solar flares. During the rest of the observation period, the sun was blank.

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 5 pointings were lost to MOC problems. There were a few other problems with ground stations, which caused the loss of a further pointing, and the links with ISDC. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was lower this week compared to previous weeks. There were a number of problems with tasks crashing, and lost links with the MISCdynamic server caused the loss of 5 pointings and a delay in the start of another. The overall performance was still over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network also poorer this week, there were many instances of bad frames and TM drops, one of which caused loss of a pointing. 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 457 to 459 were delivered. PSF for revolution 455 was redelivered twice due to an onboard time wrap around occurring in that revolution. Mission planning of revolutions 456 to 458 was performed. Planning of revolution 459 will be finalized after a change in the ISOC data base of the JEM-X high voltage setting. Several replannings of revolutions 452 to 458 had to be performed due to the redelivered PSF for revolution 455 and due to a wrong telemetry setting in an observation in revolution 453 and a wrong IBIS parameter in revolution 452. No ToO request was received. TSF for revolutions 451 to 453 were received from MOC.

2. Observation status

ECS for revolution 442, 443 and 445 were received. The corresponding OCS's have been sent to ISDC. No extra time was credited.

3. ISOC science data archive

Archive discussion meetings held at ISDC. A major conclusion from the meeting is creating an understanding in ISOC of the ingestion problems encountered during the past weeks. Archive team will be informed next week. Delivery of ISDA 2.5.2 has slipped at least three weeks due to the archive scientist having other higher priority tasks. If it slips further, then it risks being seriously delayed due to summer vacations. Maintenance of Ingest software continues to be too time consuming.

4. ISOC system

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

5. AO 4

All TAC results are now entered in the data base. The target of opportunity strategy is being prepared by ISOC. Draft strategies for all panels have been circulated and are being discussed with the PS and Panel Chairs. The PI's have been informed of the TAC results on Friday, after receiving the approval of the TAC results by D/SCI. Amalgamation, finalizing TOO strategies etc. will be done in the following weeks.

6. Problems

No new problems encountered

4.3.2 ISDC

Status of ISDC observation processing on 26/06/2006:

- Latest Standard Analysis completed: observation 03200440001 (1ES 1426+428, Revolutions 441-443) on 27/06/2006.
- Latest products archived: observation 03200140003 (Cygnus X-3, Revolution 438) on 27/06/2006.
- 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 168, at 02:12, during the handover, the Autostack and TCSpaon crashed. The task launcher and the Command verifier also died. There was also a lost connection to the MISCdynamic server. This was shortly before perigee, and the system was not recovered until after the LOS. The impact was pointings 04480060 & 04480061 (both below the critical altitude) were lost. The spacecraft went into perigee with the attitude of pointing 04480059 on the wrong antenna. The timeline was recovered at 08:32 in time for the first slews of Revolution 449.
- On DoY 169, at 03:47, bad TM frames received from Vil2 caused command A2551 (CAE A TH 4 DELAY) to fail release. A recovery had to be performed, and the timeline recovered to 04:31. The impact was a delay in the start of pointing 04490019, which had a planned duration of 3572 seconds, from a scheduled 04:03:33 to 04:22:28.
- On DoY 172, at 10:55, an AOCS command A3189 (START GUIDE STAR) failed release due to MISCdynamic server problems. The timeline was interrupted, and a manual recovery performed. At 12:04, the timeline was re-enabled. The impact was the loss of pointing 04500026.
- At 15:02, the MISCdynamic server again loses its connection, during the recovery all the TM/TC links with Vil2 dropped. The timeline was recovered at 16:14. The impact was the loss of pointings 04500030 & 04500031.
- At 08:35, a problem with the OBQM & CMDverifier tasks caused the sequence for slew 04500047 to fail release. A recovery was performed, and the timeline rejoined at 10:32. The impact was a delay from a planned 09:47:28 to 10:24:36 in the start of pointing 04500047.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-153	20/06/2006	IBIS-VETO Calibration, Bottom and Lateral Counters reported reduced count-rates	Payload	Open

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.

The 8th SPI annealing started on 8th June at belts entry of rev.445. Here is the summary timeline of the planned annealing activities:

Issue : 1
Rev. : 0
Page : 9

8th SPI ANNEALING - revs 445-451																																
ID	Task Name	Duration	Start	Resource Names																												
					12 Jun '06							19 Jun '06							26 Jun '06													
					We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa			
2	Start SPI Annealing - Warm-up Phase	35.35 hrs	08 Jun 00:43	PST[20 pkts]																												
16	Annealing at 104degC	192 hrs	09 Jun 12:04	PST[20 pkts]																												
22	Stop SPI Annealing - Passive Cooling Phase	96.02 hrs?	17 Jun 12:04	PST[20 pkts]																												
33	ACS Switch-on and Calibration	40.4 hrs	17 Jun 12:04	PST[20 pkts]	Uplink can be stopped/resumed any time																											
45	Start Cryocoolers - Active Cooling Phase	138 hrs	20 Jun 18:05	PST[20 pkts]	WARNING: Active cooling SHALL not start later!																											
57	Active Cooling Fine Tuning	72 hrs	26 Jun 12:05	PST[20 pkts]																												
59	Camera Switch on & Performance Tests	31.8 hrs?	24 Jun 14:35	PST[104 pkts]																												
80	Resume SPI POS Observations	62 hrs	26 Jun 08:50	PST[104 pkts]																												

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 449

The observations in revolution 449 consisted entirely of a hexagonal dither of Mrk 421 (RA 11:04:27.31, DEC +38:12:31.8), which was a Target of Opportunity, and lasted ~57.5 hours.

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

Revolution 450

The observations in revolution 450 consisted entirely of a hexagonal dither of Mrk 421 (RA 11:04:27.31, DEC +38:12:31.8), which was a Target of Opportunity, and lasted ~57.5 hours.

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

Revolution 451

The observations in revolution 451 consisted entirely of a hexagonal dither of Mrk 421 (RA 11:04:27.31, DEC +38:12:31.8), which was a Target of Opportunity, and lasted ~57.5 hours.

Throughout these observations all instruments were in their nominal science modes, except SPI, which is undergoing annealing and 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

2006-06-08T23:49:15.000Z	153.9206	F	Automatic TM processing.
2006-06-09T18:51:17.000Z	153.9108	F	Automatic TM processing.
2006-06-11T01:13:28.000Z	153.8999	F	Automatic TM processing.
2006-06-11T08:35:29.000Z	153.8808	F	Automatic TM processing.
2006-06-12T18:09:50.000Z	153.8479	F	Automatic TM processing.
2006-06-13T02:39:42.000Z	153.8350	F	Automatic TM processing.
2006-06-13T04:25:51.000Z	153.8254	F	Automatic TM processing.
2006-06-14T03:49:05.000Z	153.7856	F	Automatic TM processing.
2006-06-14T07:36:33.000Z	153.7770	F	Automatic TM processing.
2006-06-15T17:51:49.000Z	153.7598	F	Automatic TM processing.
2006-06-17T08:13:37.000Z	153.7471	F	Automatic TM processing.
2006-06-18T18:29:24.000Z	153.7344	F	Automatic TM processing.
2006-06-20T07:09:20.000Z	153.7204	F	Automatic TM processing.
2006-06-21T18:14:03.000Z	153.7054	F	Automatic TM processing.
2006-06-23T06:51:51.000Z	153.6894	F	Automatic TM processing.

This report was generated Fri Jun 23 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, 17/06/2006 – 23/06/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 77 Open Loop Slews, 57 Closed Loop Slews and 5 Momentum Biases were executed.

6 slews (3 OSL, 3 CSL) were lost during the observation period due to problem on the IMCS (MISCdynamic server mainly) and TC/TM links with VIL2 station.

This is equivalent to a 4 % of the total number of slews planned (135).

Orbit Control

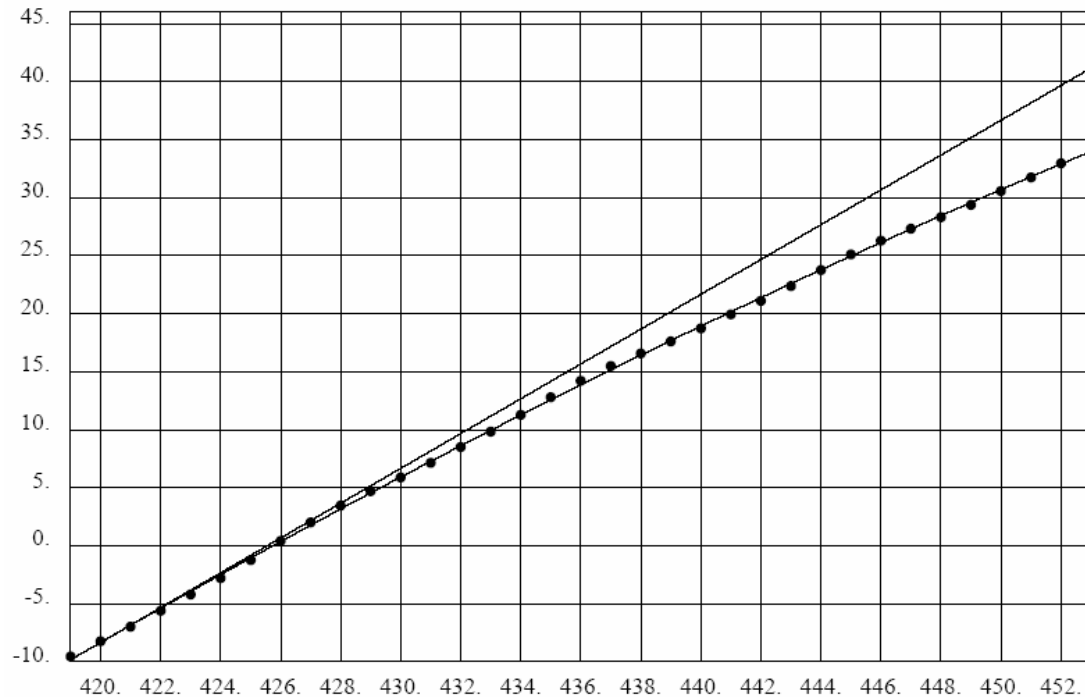
The following table shows the shortening of the necessary Goldstone pass:

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.

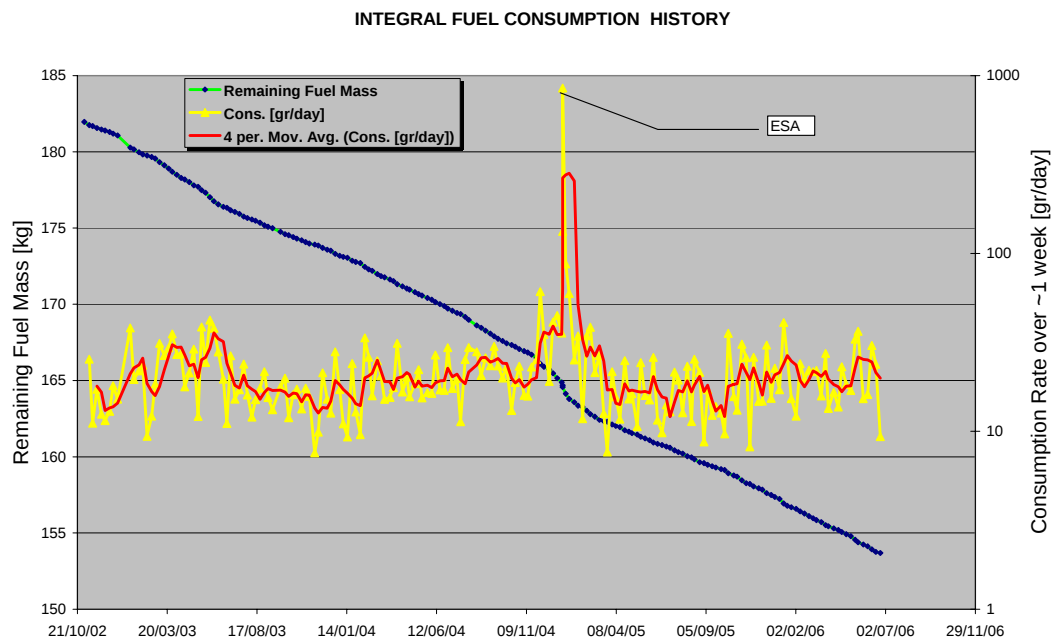
The attached plot shows the apogee longitude of Integral as a function of the orbit number. From this, an estimate of the rate of semi-major axis increase of about 800m per orbital revolution can be made.

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

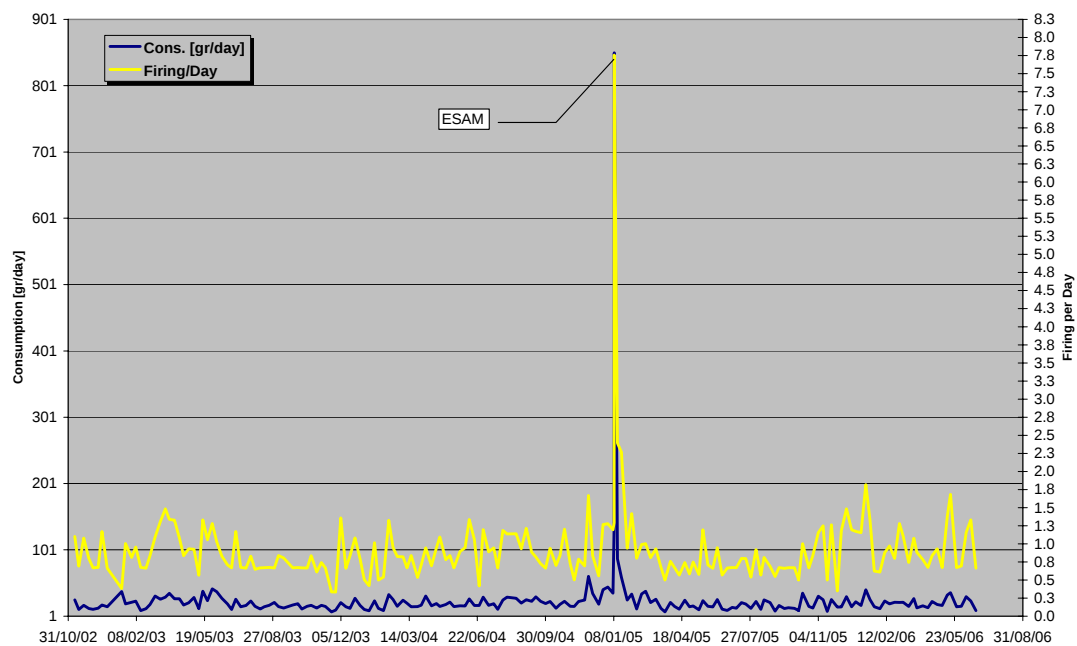


Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 23/06/2006 is reported in the plot below.

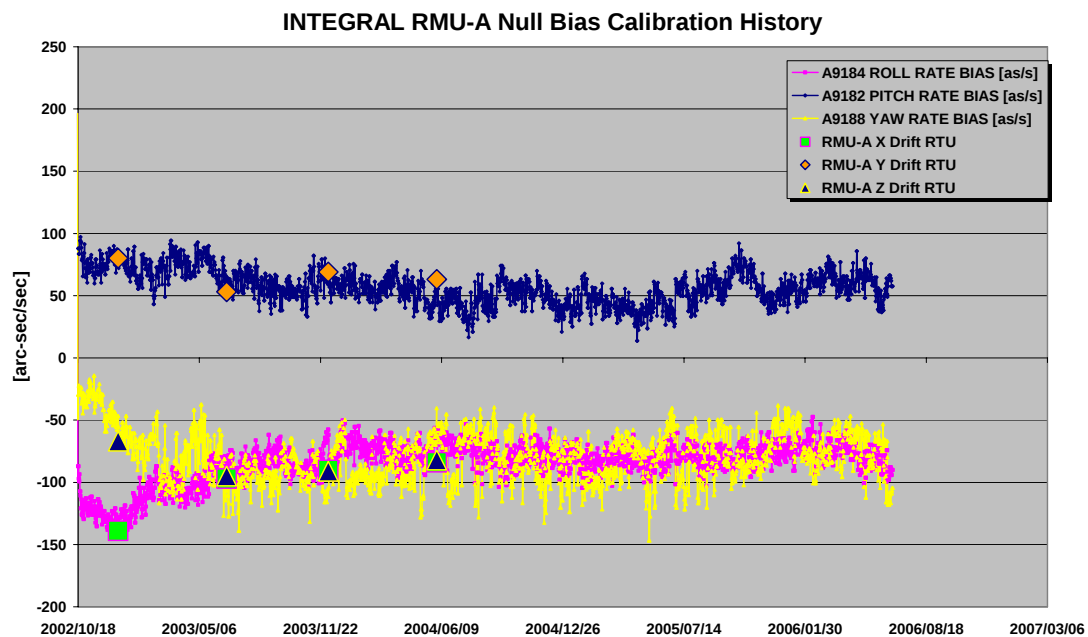


The firing/day over the period between 01/11/2002 and 23/06/2006 is reported in the plot below.

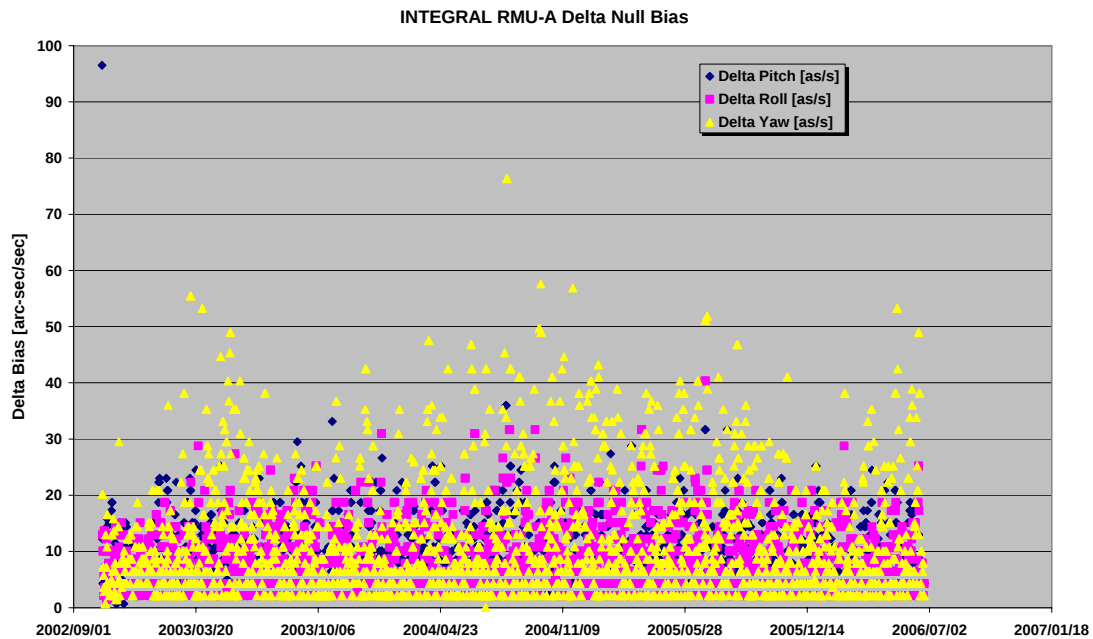


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 23/06/2006 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 23/06/2006 is reported in the plot below.



17/06/06 (Day of Year 168, Revolution 448-449)

Slews failed due to problem on IMCS: at 02:12z due to a problem on the IMCS when executing the station H/O, the sequence for slew ID 04480060 failed release. After verification of the attitude validity for PID 04480059, was decided to go for the perigee passage with the attitude of PID 59 and perform a manual recovery of the TL at beginning of rev 449.

A manual recovery was then started after AOS rev 449, at 07:04z, from attitude of PID 04480059 to the attitude of PID 04480060. The planned RWB and CGS, at the beginning of revolution 449, were manually executed and the first slew in TL (04490001) updated at 08:29z.

The following slews were not executed from TL: ID 04480060 (OSL) and 04480061 (CSL).

18/06/06 (Day of Year 169, Revolution 449)

Dynamic PTV failed due to problem on TM link: at 03:58z due to a problem on the TM link with VIL2 station, the sequence for slew ID 04490019 failed release due to dynamic PTV.

A manual recovery was then started at 04:16z, from attitude of PID 04490018 to the attitude of PID 04490019. The next slew in TL (04490020) was manually updated at 04:30z.

The following slew was not executed from TL: ID 04490019 (CSL).

19/06/06 (Day of Year 170, Revolution 449)

Nothing to report.

20/06/06 (Day of Year 171, Revolution 449-450)

Updated FSS coefficients after FSS/STR misalignment calibration: following the FSS/STR misalignment calibration, the FSS coefficients were updated to the new values at the end of revolution 449, at 03:19z.

The evaluated jump, due to the new coefficients, was for A9 ~7.02 arcsec, and for B9 ~7.07 arcsec.

Below is the history of the FSS\STR misalignment calibrations (source FD, unit in arcsec).

Run Time	Rev	STR	FSS	X	FSS_A9	FSS_A10	FSS_A11	FSS_B9
FSS_B10	FSS_B11							
2002/10/17 06:13:26	0001	B	B		-84.8915860	994.2814731	1314.6779504	
241.1955221	-792.7915340	253.2583531						
2002/10/17 06:13:26	0001	B	A		-147.8659203	1109.3069289	915.3724221	
416.2208104	390.3899050	-218.3484613						
2002/10/17 06:13:26	0001	A	B		21.7121809	1021.6044798	1540.3543536	
136.7246130	-819.8011812	478.7101635						
2002/10/17 06:13:26	0001	A	A		-41.3633903	1136.4981023	1141.0882898	
309.1626097	363.7598917	7.1161076						
2002/10/17 11:57:44	0001	A	A		-10.8869311	1136.4981023	1141.0882898	-
48.3742459	363.7598917	7.1161076						
2002/10/18 14:43:28	0001	A	A	X	-740.7515156	0.0000000	0.0000000	-
62.8992210	0.0000000	0.0000000						
2002/10/22 10:26:13	0002	A	A	X	43.1044362	0.0000000	0.0000000	-
60.6765982	0.0000000	0.0000000						
2002/10/22 10:41:00	0002	A	A	X	31.8405075	0.0000000	0.0000000	-
58.4412611	0.0000000	0.0000000						
2002/10/22 10:46:35	0002	A	A	X	31.9534536	0.0000000	0.0000000	-
58.8179047	0.0000000	0.0000000						
2002/10/23 12:06:48	0002	A	A	X	-575.7521936	0.0000000	0.0000000	-
34.1473518	0.0000000	0.0000000						
2002/10/24 13:47:47	0003	A	A	X	-32.5119135	0.0000000	0.0000000	-
73.1585486	0.0000000	0.0000000						
2002/11/05 13:37:43	0006	A	A	X	67.3772442	1112.4864143	-1250.3529891	-
120.1829934	435.0625162	60.2756867						
2002/11/08 12:33:15	0006	A	A	X	35.1912362	1149.3875188	-1299.6735440	-
106.6436234	278.5268629	185.2164330						
2002/11/08 12:54:28	0006	A	A	X	36.9314406	1129.9547571	-1329.5944015	-
85.0549459	346.9477086	-25.0110177						
2002/11/05 14:00:57	0006	A	A		67.2067387	1131.9618229	-1250.8956817	-
120.4780133	440.9895417	60.8631778						
2003/04/04 08:12:00	0056	A	A		28.0672800	1123.3090000	-1250.8956817	-
120.4780133	440.9895417	60.8631778						
2003/07/23 12:17:34	0094	A	A	X	83.5374642	1144.9283240	-1290.1598577	-
130.3447117	-181.2657279	173.0711922						
2003/07/23 12:26:45	0094	A	A	X	81.4133068	1147.8046516	-1267.0171462	-
126.3265407	-58.8911287	100.5747445						
2004/01/15 08:10:37	0153	A	A	X	85.6545484	1106.1829781	-1051.4112289	-
107.3048338	339.9810564	60.2342427						
2004/01/15 10:28:50	0153	A	A		80.0550152	1113.7525865	-1074.7285836	-
107.3517385	342.7773785	58.3454333						
2004/01/15 12:05:43	0153	A	A	X	87.2218057	1107.2949504	-1061.0560000	-
107.7683725	349.3284022	64.5234373						
2004/06/30 15:52:53	0209	A	A		95.2633969	1145.6387404	-1262.1608365	-
128.2915442	-43.0931566	135.4295645						
2004/12/20 14:38:46	0267	A	A	X	84.3454103	1118.4758548	-1190.1861634	-
68.3442729	309.2098324	-74.9239762						
2005/06/13 18:24:54	0325	A	A		82.1816238	1144.1981013	-1167.4243763	-
97.9780532	152.8463212	138.0643852						
2005/12/07 08:41:53	0384	A	A		84.4927225	1099.6985619	-1163.7823475	-
90.8341826	137.6103579	138.9746936						
2006/06/12 11:15:35	0446	A	A	X	77.4808554	1139.8464017	-1088.5359566	-
83.7667989	485.4745256	-233.0083358						

Update Thrusters Reciprocal Torques, TIMs and AMD on-times: following the Thruster torque re-scaling in synch with the end of the Eclipse summer season, the TIMs thresholds were updated during rev 450, at 09:04z as follows (values provided by FD team):

RTIM: 6.375[51]	rounded up to nearest 0.125s LSb = 6.250
PTIM: 2.250[18]	rounded up to nearest 0.125s LSb = 2.125
YTIM: 33.40625[1069]	rounded up to nearest 0.03125s LSb = 33.21875
TTIM: 432[27]	4000/9.565 = 418.191322 -> rounded up to nearest 16s LSb = 432 TTIM

Mean Thruster Force : 9.565 N

Following the Thruster torque re-scaling, the AMD on-times, thrusters torque reciprocals and PWM look up table have been updated during rev 450 at 09:33z as follows (values provided by FD team):

AMD On-Times

AEOTA_00 S

M F 32

2006-06-23T05:21:46Z

2006-06-23T05:21:46Z

A

MON_W1T1 R 0.6368400E-01	sec D AMD decrease on-time (W1,Th1)
MON_W1T2 R 0.2193560E+00	sec D AMD decrease on-time (W1,Th2)
MON_W1T3 R 0.0000000E+00	sec D AMD decrease on-time (W1,Th3)
MON_W1T4 R 0.2854800E+00	sec D AMD decrease on-time (W1,Th4)
MON_W2T1 R 0.5953600E-01	sec D AMD decrease on-time (W2,Th1)
MON_W2T2 R 0.1361520E+00	sec D AMD decrease on-time (W2,Th2)
MON_W2T3 R 0.7539600E-01	sec D AMD decrease on-time (W2,Th3)
MON_W2T4 R 0.0000000E+00	sec D AMD decrease on-time (W2,Th4)
MON_W3T1 R 0.2888960E+00	sec D AMD decrease on-time (W3,Th1)
MON_W3T2 R 0.0000000E+00	sec D AMD decrease on-time (W3,Th2)
MON_W3T3 R 0.2232600E+00	sec D AMD decrease on-time (W3,Th3)
MON_W3T4 R 0.6661200E-01	sec D AMD decrease on-time (W3,Th4)
MON_W4T1 R 0.1300520E+00	sec D AMD decrease on-time (W4,Th1)
MON_W4T2 R 0.5831600E-01	sec D AMD decrease on-time (W4,Th2)
MON_W4T3 R 0.0000000E+00	sec D AMD decrease on-time (W4,Th3)
MON_W4T4 R 0.6783200E-01	sec D AMD decrease on-time (W4,Th4)
MOFFW1T1 R 0.2203320E+00	sec D AMD increase on-time (W1,Th1)
MOFFW1T2 R 0.7905600E-01	sec D AMD increase on-time (W1,Th2)
MOFFW1T3 R 0.3001200E+00	sec D AMD increase on-time (W1,Th3)
MOFFW1T4 R 0.0000000E+00	sec D AMD increase on-time (W1,Th4)
MOFFW2T1 R 0.7002800E-01	sec D AMD increase on-time (W2,Th1)
MOFFW2T2 R 0.0000000E+00	sec D AMD increase on-time (W2,Th2)
MOFFW2T3 R 0.6148800E-01	sec D AMD increase on-time (W2,Th3)
MOFFW2T4 R 0.1302960E+00	sec D AMD increase on-time (W2,Th4)
MOFFW3T1 R 0.0000000E+00	sec D AMD increase on-time (W3,Th1)
MOFFW3T2 R 0.3037800E+00	sec D AMD increase on-time (W3,Th2)
MOFFW3T3 R 0.8222800E-01	sec D AMD increase on-time (W3,Th3)
MOFFW3T4 R 0.2239920E+00	sec D AMD increase on-time (W3,Th4)
MOFFW4T1 R 0.0000000E+00	sec D AMD increase on-time (W4,Th1)
MOFFW4T2 R 0.7808000E-01	sec D AMD increase on-time (W4,Th2)
MOFFW4T3 R 0.1371280E+00	sec D AMD increase on-time (W4,Th3)
MOFFW4T4 R 0.6246400E-01	sec D AMD increase on-time (W4,Th4)

Thruster Torque Reciprocals and PWM Look up Table

AERCA_00 S

M F 4

Doc. Title : INTEGRAL Mission Report #196
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 26/06/06

Issue : 1
Rev. : 0
Page : 17

2006-06-23T05:21:46Z

2006-06-23T05:21:46Z

A

TORQ_X_A R 0.2547567E+00 1/Nm D Reciprocal Roll Torque (A)

TORQ_Y_A R 0.8356395E-01 1/Nm D Reciprocal Pitch Torque (A)

TORQ_Z_A R 0.6958714E-01 1/Nm D Reciprocal Yaw Torque (A)

PWM_TORQ R 7 D PWM Look Up Table

21/06/06 (Day of Year 172, Revolution 450)

Slew failed due to problem on IMCS: at 10:55z due to a problem on the IMCS MISCdynamic server, the sequence for slew ID 04500026 failed release due to the STATIC PTV NO GO (even if a valid star in slot # 2 was found).

A manual recovery was then started at 11:18z, from attitude of PID 04500025 to the attitude of PID 04500027. The next slew ID 04500027 was manually updated in TL at 11:35z.

The following slew was not executed from TL: ID 04500026 (CSL).

Slew failed due to problem on TM/TC links and IMCS: at 15:08z due to a problem on TM/TC links with VIL2 station and a concurrent problem on the IMCS, the sequence for slew ID 04500031 failed release.

A manual recovery was then started at 15:47z, from attitude of PID 04500030 to the attitude of PID 04500031. The next slew ID 04500032 was manually updated at 16:00z.

The following slew was not executed from TL: ID 04500031 (OSL).

22/06/06 (Day of Year 173, Revolution 450)

Slew failed due to problem on IMCS: at 09:45z due to a problem on the IMCS, the sequence for slew ID 04500047 failed release.

A manual recovery was then started at 10:14z, from attitude of PID 04500046 to the attitude of PID 04500047. The next slew ID 04500048 was manually updated at 10:32z.

The following slew was not executed from TL: ID 04500047 (OSL).

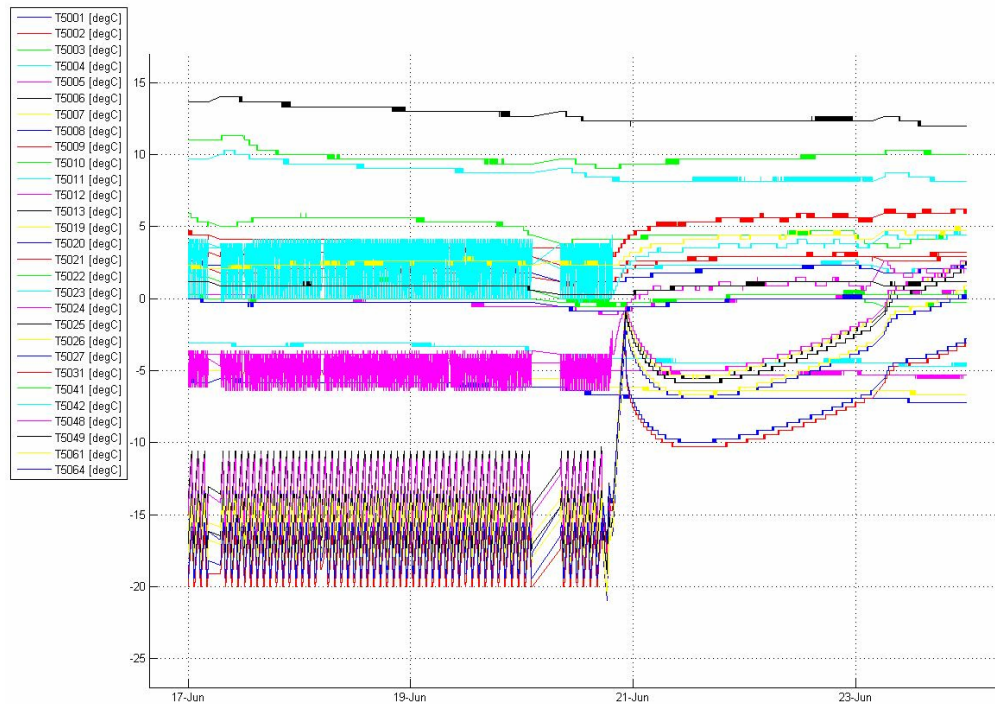
23/06/06 (Day of Year 174, Revolution 450-451)

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:

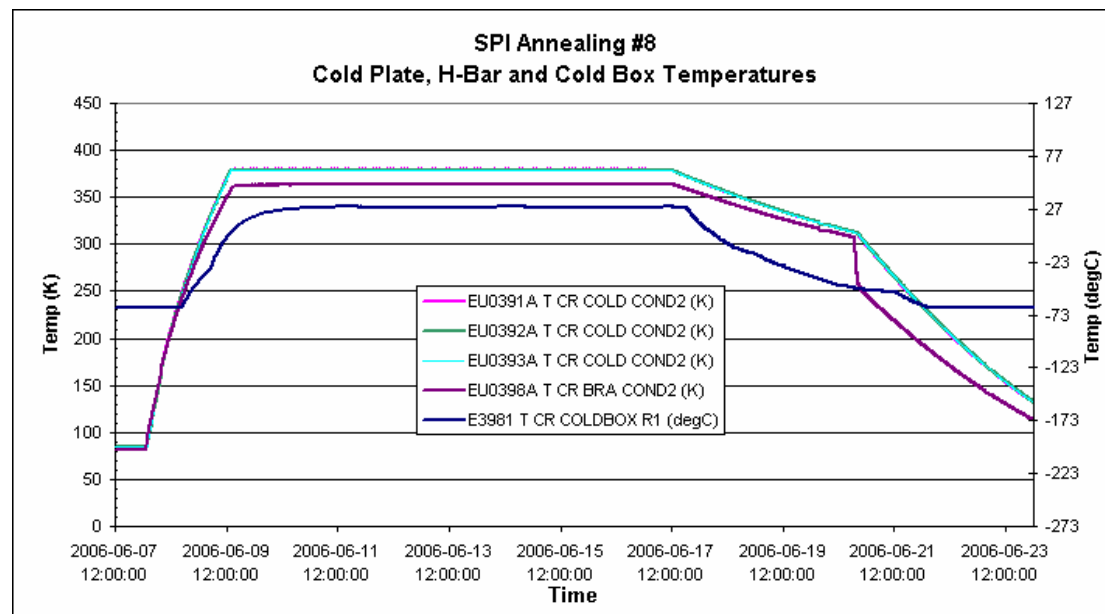
Week 25: 300K RTU Temperatures¹



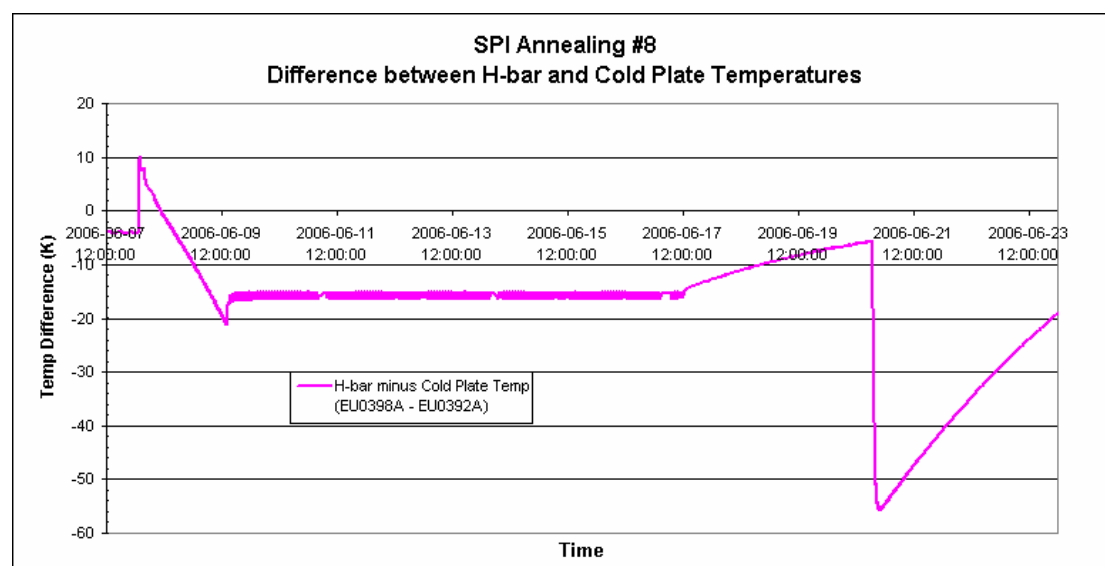
Stirling Compressors and Cryostat: The compressors were off with the CDEs in stand-by mode from the start of annealing on 08/06/2006 until the start of active cooling on 20/06/2006 at 18:51Z.

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

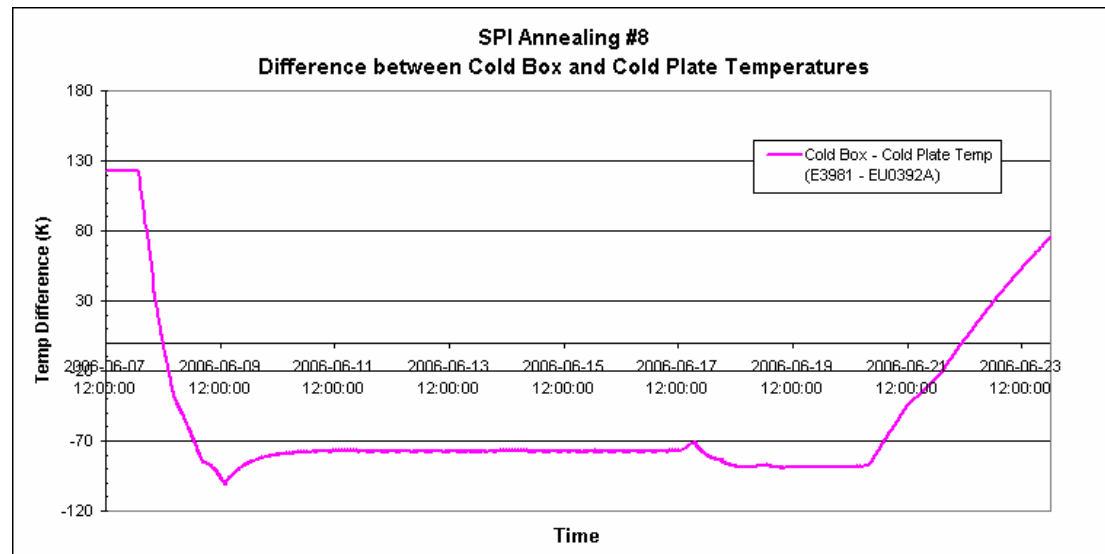
¹ Data plotted using MUST tool



The following plot shows the temperature difference between the cold plate and the H-bar, to identify where the temperature inversions took place:



The following plot shows the temperature difference between the cold plate and the cold-box, to identify where the temperature inversions took place:



DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432.
 The allocated and the actually required PST TM bandwidth during the annealing is here reported:

Revolution	Phase	Assigned bandwidth	Required bandwidth
rev.445	start of annealing	105	20
rev.446	warm up	46	20
rev.447	annealing	46	20
rev.448	Annealing	46	20
rev.449	passive cooling	46	20
rev.450	active cooling	46	20
rev.451	camera switch-on	105	105

ACS: The health of the ACS is nominal. ACS HVPSs were maintained switched on during the annealing at the minimum voltage (~980V). From 17/06/2006 12:31Z to 19/06/2006 04:17Z the ACS Calibration was performed.

AFEE: The health of the AFEE is nominal. The detector HVPSs are switched off during the annealing. Only the LVPSs are left on.

DFEE: The health of the unit is nominal. DFEE is maintained in Conf mode during annealing.

PSD: The health of the unit is nominal. PSD is maintained in Conf mode during annealing.

SPI Event Log:

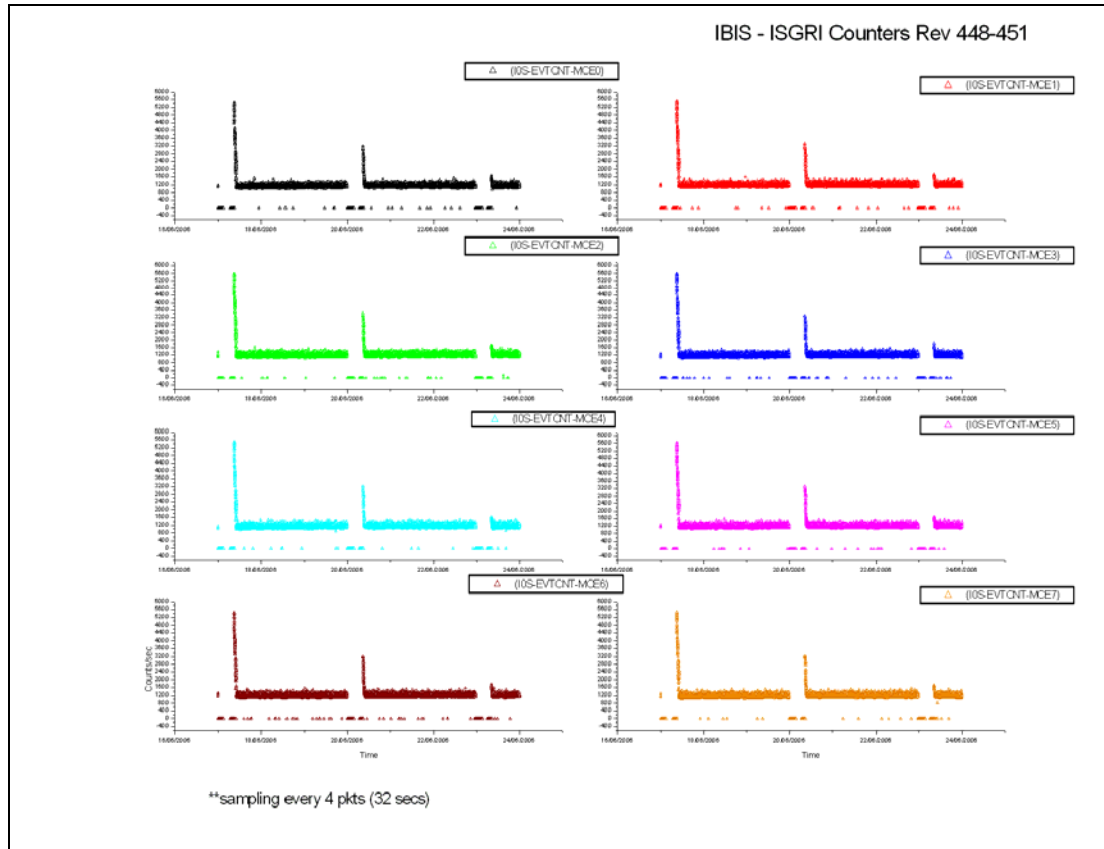
Time	Description	Analysis
18/06/2006 21:50Z	Low limit for parameters E2134-E2141 changed from 50 to 0	To avoid unnecessary OOLs during ACS Calibration

19/06/2006 04:20Z	Low limit for parameters E2134-E2141 changed from 0 to 50	Following end of ACS Calibration
21/06/2006 08:17Z	E2115 warning low limit changed to -15degC	To avoid unnecessary OOL

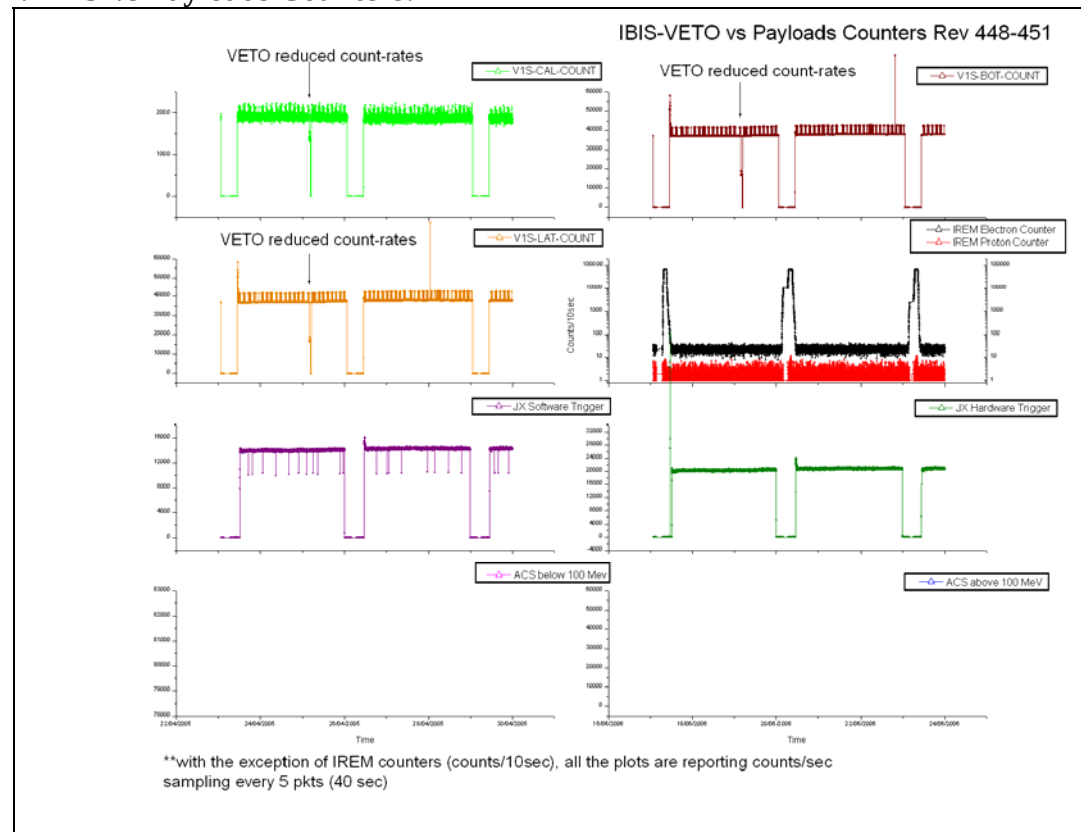
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

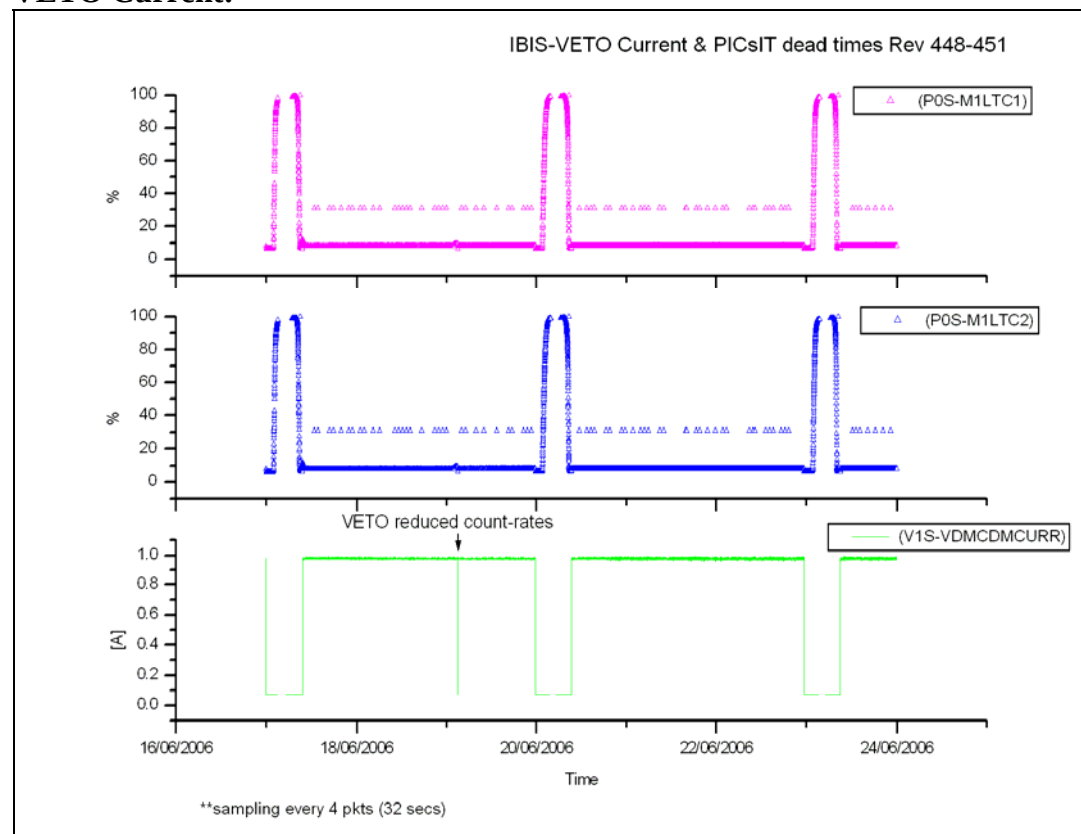


VETO vs Payloads Counters:

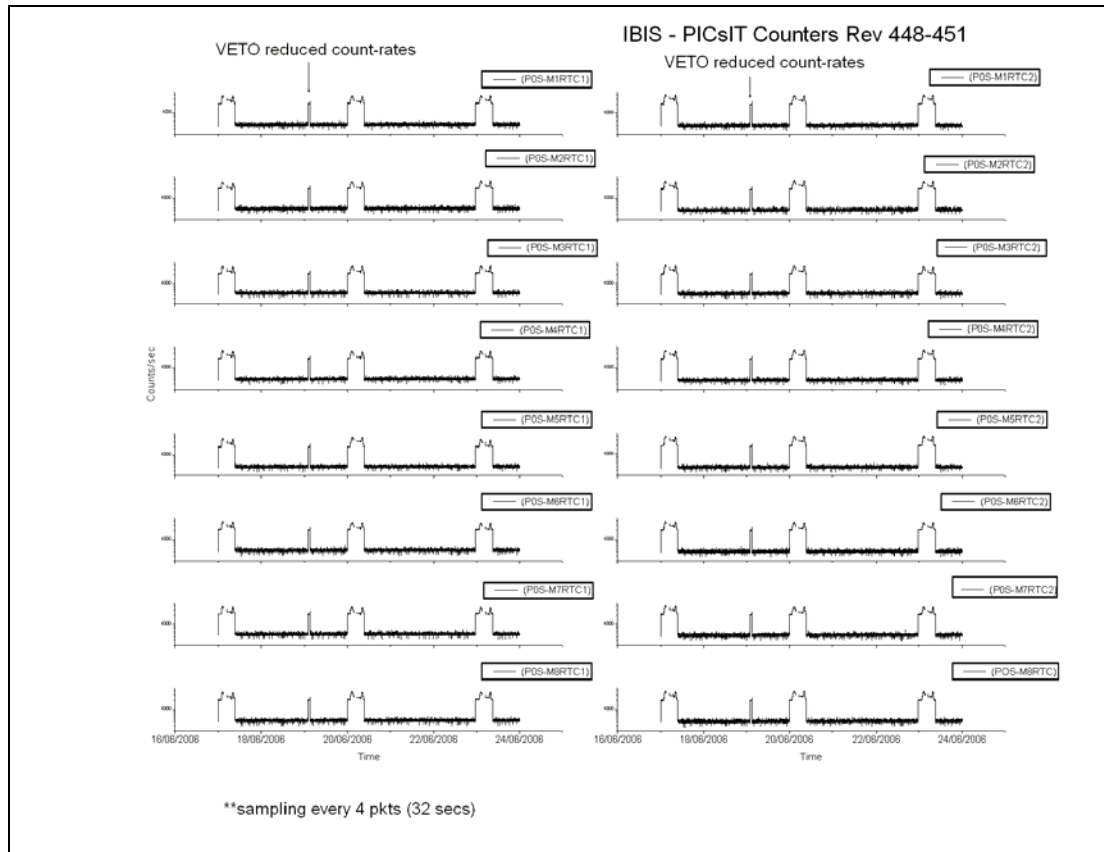


The week was characterised by low radiation.
 SPI data are missing due to the on-going annealing.

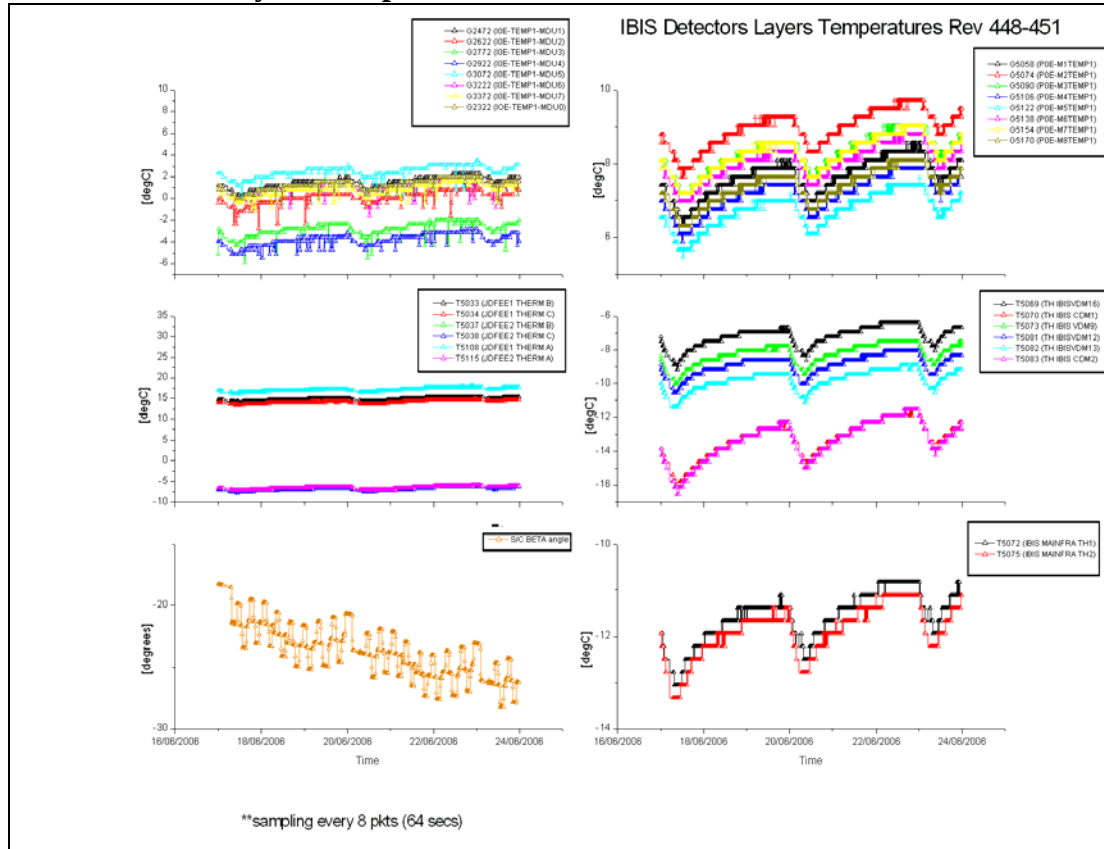
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

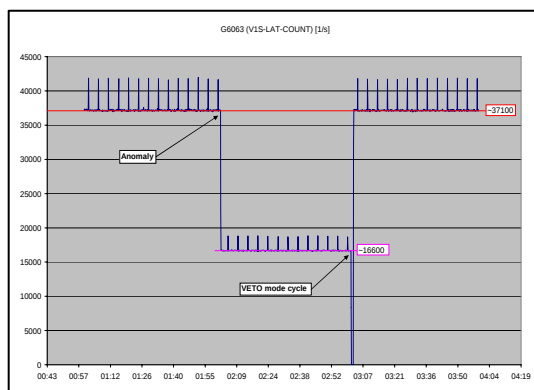
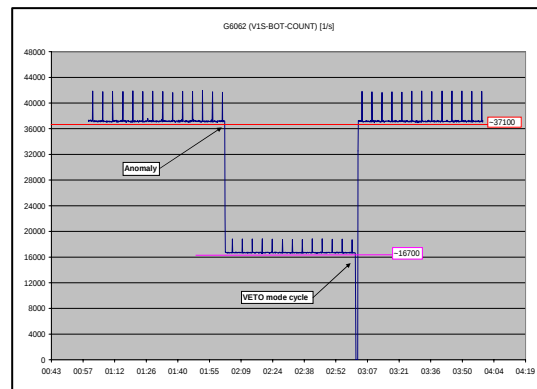
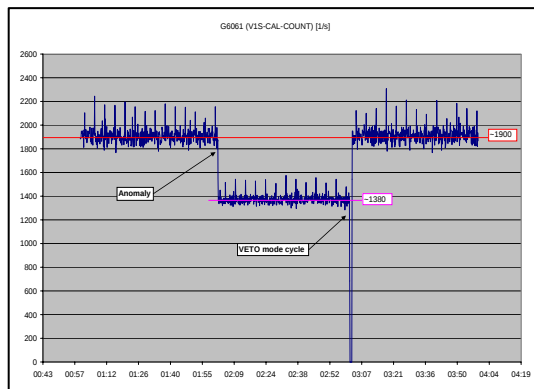
DoY 2006.168 (17//06/2006):

At 00:03Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 09:34Z. 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 (P0S-Mi RTC1) and G5003 (P0S-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

At 09:02Z, TM family G2013 (I0E-EVTCNT-MCEi) was reported toggling OOL High until 10:12Z, as the radiation background was high at the exit of belts. According to I-CNT-1, no action was taken. For the same reason, at 09:35Z G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were reported in OOL high as well. According to V-BOT-1 and V-LAT-1 no action was taken.

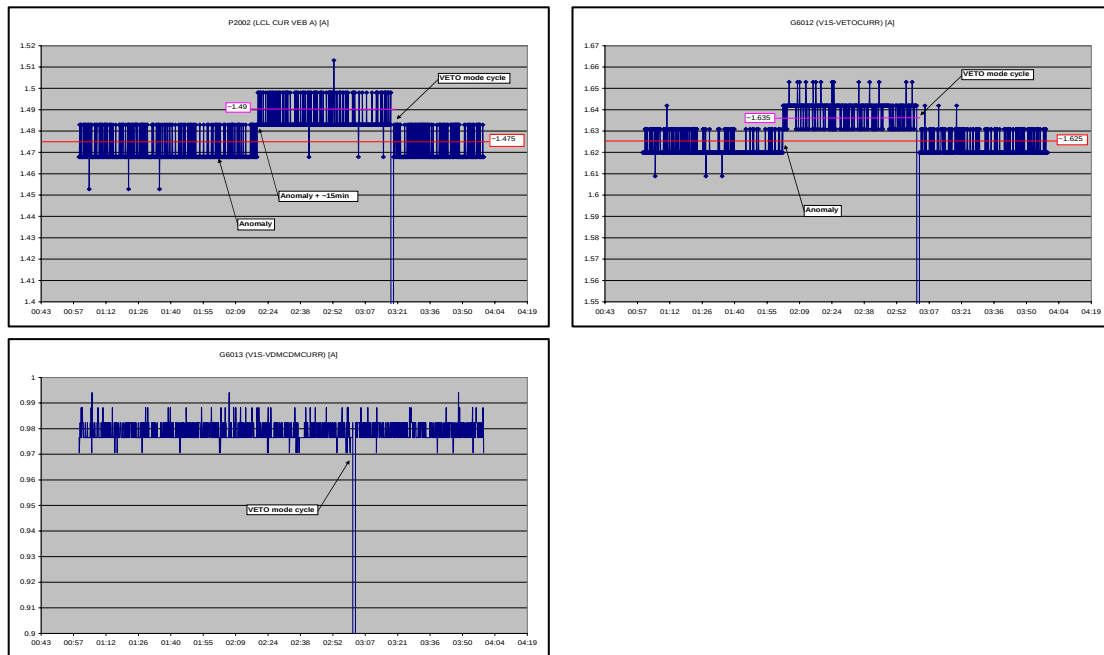
DoY 2006.170 (19/06/2006): IBIS-VETO reduced count-rates (INT_SC-153)



At 02:02Z, parameters G6061 (V1S-CAL-COUNT), G6062 (V1S-BOTCOUNT) and G6063 (V1S-LAT-COUNT) reported a drop. This triggers the OOL "warning low" for G6061 (new limits definition for this parameter since 2006-05-24).

In coincidence with this event, an increase of VETO total current (G6012) has been reported.

About 15min after the anomaly, P2002 (LCL CUR VEB A) also increased slightly from 1.48A to 1.50A.



The radiation background was quiet according to the SEIS-tool and to IREM counters.

After consultation of the on-call SOE, a mode cycle Nominal/Stand-By/Nominal of VETO was preformed. This fixed the problem as VETO counters came back to nominal values.

DoY 2006.170 (19/06/2006):

At 23:47Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit on DoY 171 (20/06/2006) at 09:18Z. 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 (P0S-Mi RTC1) and G5003 (P0S-Mi RTC2) went OOL High and back. According to P-CNT-1, no action was taken.

At 08:46Z, TM family G2013 (I0E-EVTCNT-MCEi) was reported OOL High, as the radiation background was high at the exit of belts. According to I-CNT-1, no action was taken.

At 08:49Z TM parameter G2084 (I0E-OVFWPXADD-M6) failed SCC and back. At 08:53Z TM parameter G2056 (I0E-OVFWPXADD-M4) failed SCC and back. At 09:01Z TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, no action was taken.

DoY 2006.173 (22/06/2006):

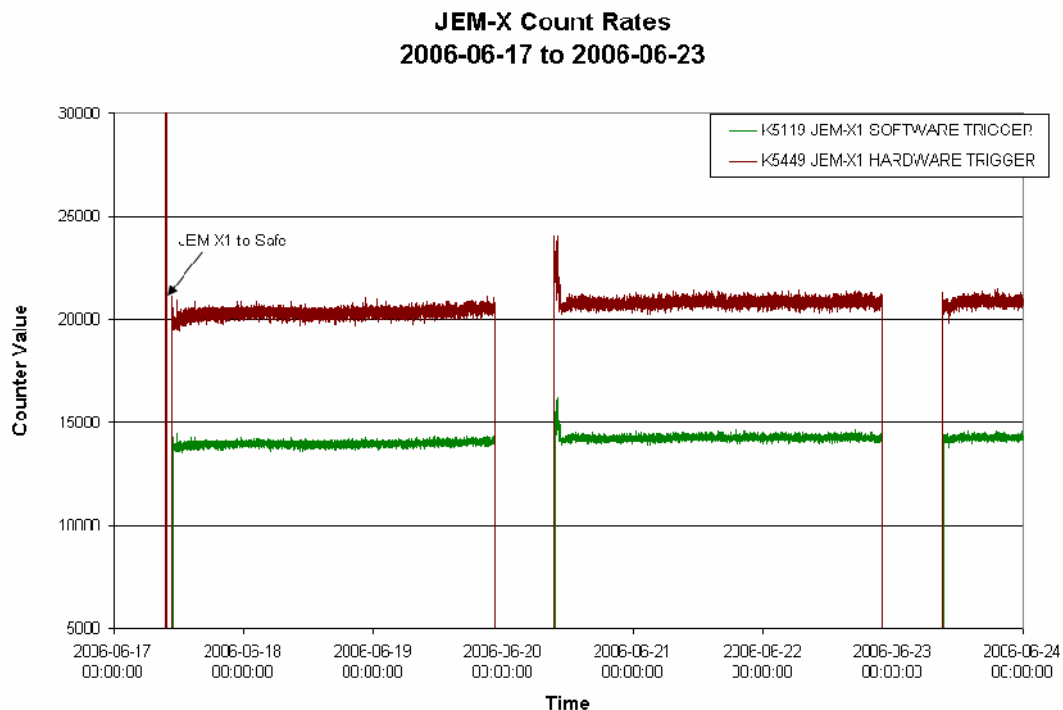
At 23:29Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit on DoY 174 (23/06/2006) at 09:01Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

At 08:33Z TM parameter G2084 (I0E-OVFWPXADD-M6) failed SCC and back. At 08:36Z TM parameters G2014 (I0E-OVFWPXADD-M1) and G2084 (I0E-OVFWPXADD-M6) failed SCC and back. According to I-OVF-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 graph².

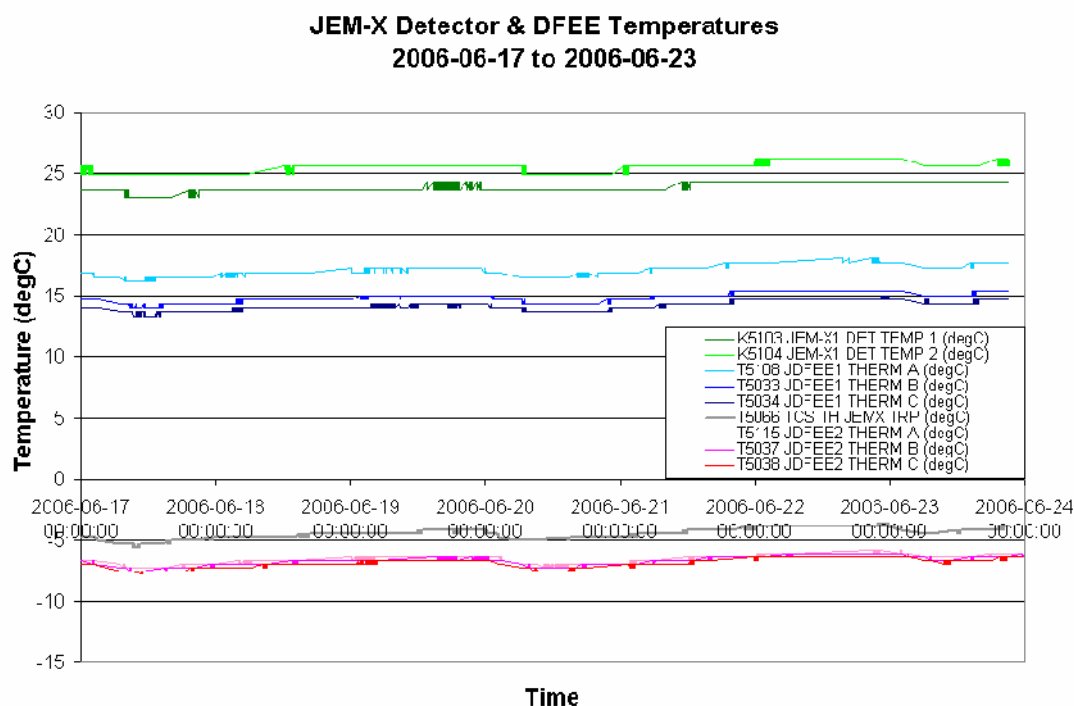


8.3.4.2 JEM-X Temperatures

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 graph³.

² Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.

³ Data sampled (1 frame in 8)



8.3.4.3 JEM-X Daily Report

2006-06-17 (DOY 168, Rev 448-449)

At 09:42:58Z the TM parameter K5449 HARDWARE TRIGGER went Out of Limits High (value = 42870) and remained so until 09:45:54Z, when it exceeded the safe threshold for JEM-X1, causing JEM-X1 to make an autonomous transition to Safe mode.

This was during the execution of the JEM-X1 activation ED KEHVAC01 from the Timeline, after the TC K0013 STATE DIAGNOSTIC had been uplinked at 09:45:42Z. In addition, just after this time, OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) was received, as the TM parameter K5462 DFEE STATE IASW was reporting state Data Dump while K5022 DFEE STATUS was Setup. This was because the DFEE output FIFO buffer was over half full at the time of termination of the diagnostic data collection (K5135 FIFO FULL LOSS = 9544 at 09:45:38Z) and thus the IASW did not recognise the autonomous transition of the DFEE back to Setup.

When the next TC in the sequence, TC K0009 STATE SETUP, was sent at 09:50:42Z both K5022 and K5462 went to Setup and OEM 254 ERROR OFF was received. The next TC, K0011 STATE DATA TAKE, uplinked at 09:51:12Z failed on-board acceptance due to the High Voltage being off, with OEM 183 JEM-X1 PROB DFEE 3 (Negative Acknowledge on LSL, request not valid) and OEM 137 JEM-X1 TC REJEC 10 being issued.

Commanding to JEM-X1 from the Timeline was disabled and JEM-X1 was recovered as follows:

- 09:58:38Z FCP_JEM1_0040 JEMX1 TRANSITION TO SAFE executed

- 10:29:05Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP executed
- 10:38:21Z ED KEHVAC01 re-uplinked
- 10:55:35Z ED KEDATA02 re-uplinked with the planned observation parameters.

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

2006-06-18 (DOY 169, Rev 449) to 2006-06-23 (DOY 174, Rev 450-451)

Nothing to report

8.3.5 OMC Operations

2006-06-17 (DOY 168, Rev 448)

Nothing to report

2006-06-18 (DOY 169, Rev 449)

At 03:47, some bad frames from Vil2 caused an AOCS command to fail release. The Timeline was stopped, and a manual recovery performed. At 04:31, the timeline was recovered. The impact was a delay in the start of pointing 04490019, which had a planned duration of 3572 seconds, from a scheduled 04:03:33 to 04:22:28.

2006-06-19 (DOY 170, Rev 449) to 2006-06-20 (DOY 171, Rev 450)

Nothing to report

2006-06-21 (DOY 172, Rev 450)

At 10:55, problems with the MISCdynamic server caused an AOCS command to fail release. The timeline was interrupted, and a manual recovery performed. At 12:04, the timeline was re-enabled. The impact was the loss of pointing 04500026. It was at this time that the following commands were rejected:

2006.172.10.58.23.190	2006.172.10.58.29.803	1792	RealTime	131	TC REJECT	
REJECTED TC1				0	0	65535 PR
N E E						
2006.172.10.58.29.315	2006.172.10.58.38.734	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.

At 15:02, the MISCdynamic server again loses its connection, during the recovery all the TM/TC links with Vil2 dropped. The timeline was recovered at 16:14. The impact was the loss of pointings 04500030 & 04500031.

It was at this time that the following commands were rejected:

2006.172.16.05.53.200	2006.172.16.05.58.676	1792	RealTime	131	TC REJECT	
REJECTED TC1				0	0	65535 PR
N E E						
2006.172.16.05.59.325	2006.172.16.06.06.591	1792	RealTime	131	TC REJECT	
REJECTED TC1				0	0	65535 PR
N E E						

Doc. Title : INTEGRAL Mission Report #196
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 26/06/06

Issue : 1
Rev. : 0
Page : 29

2006.172.16.14.57.200	2006.172.16.15.03.504	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 04500031, and a failed manual attempt to resend the M1130 (RESET IM) command. The commands failed as the OMC was already in Normal mode. Since the previous valid pointing 04500029.

At 08:35, an IMCS problem caused the Timeline to be interrupted. The impact was a delay in the starting of pointing 04500047, which had a planned duration of 8525 seconds, from a scheduled 09:47:28 to 10:24:36. It was at this time that the following commands were rejected:

2006.173.09.47.09.236	2006.173.09.47.21.148	1792	RealTime	131	TC REJECT	
REJECTED TC1				0	0	65535 PR
N E E						
2006.173.09.47.15.361	2006.173.09.47.21.182	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.

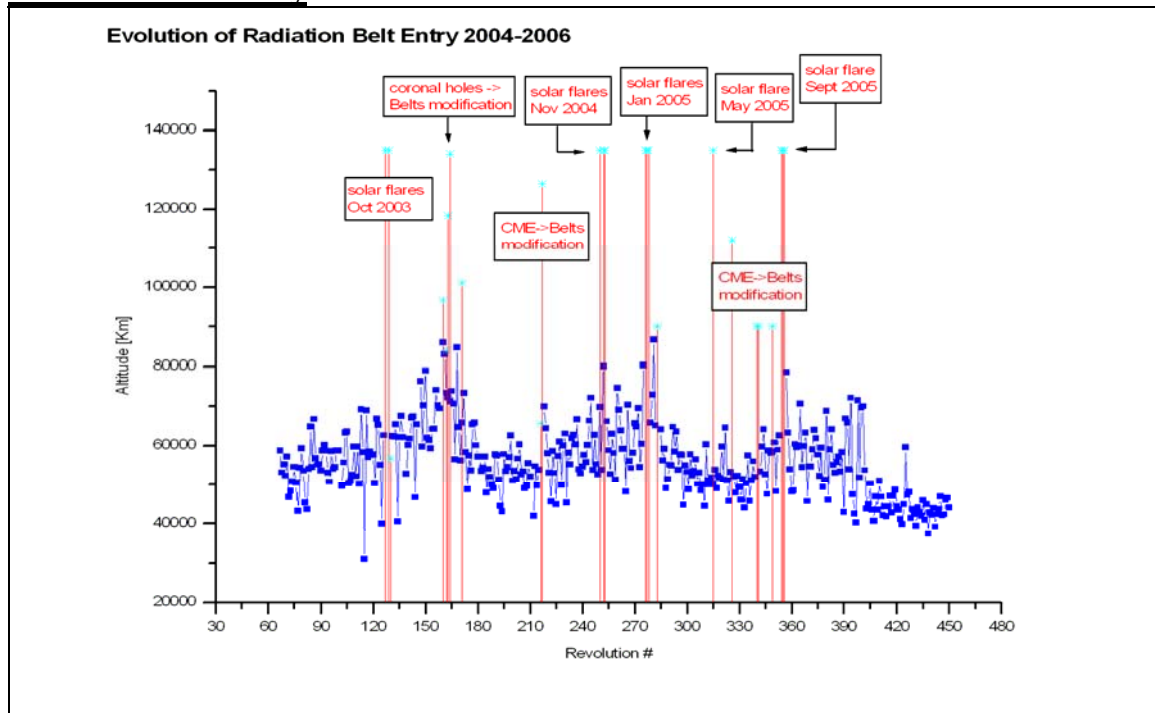
2006-06-17 (DOY 168, Rev 448) to 2006-06-23 (DOY 174, Rev 451)

Nothing to report

On DoY 168 at 00:03:33, DoY 170 at 23:47:09 and DoY 173 at 23:29:09 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



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]
448	RAD_ENTR R 2006-06-17T00:03:26Z	2006-06-17 01:47:56	46051.7	2006-06-17 01:28:43	48526
449	RAD_EXIT R 2006-06-17T09:21:29Z	2006-06-17 09:41:40	>42442.1	2006-06-17 09:08:43	38290
449	RAD_ENTR R 2006-06-19T23:47:07Z	2006-06-20 01:24:12	>46578.0	2006-06-20 01:16:52	47867
450	RAD_EXIT R 2006-06-20T09:05:34Z	2006-06-20 09:07:10	<<42315.5	2006-06-20 08:46:52	37405
450	RAD_ENTR R 2006-06-22T23:29:08Z	2006-06-23 01:26:13	>44058.8	2006-06-23 00:56:52	48067
451	RAD_EXIT R 2006-06-23T08:47:52Z	2006-06-23 08:18:05	<<42375.2	2006-06-23 08:36:52	38684

Reference

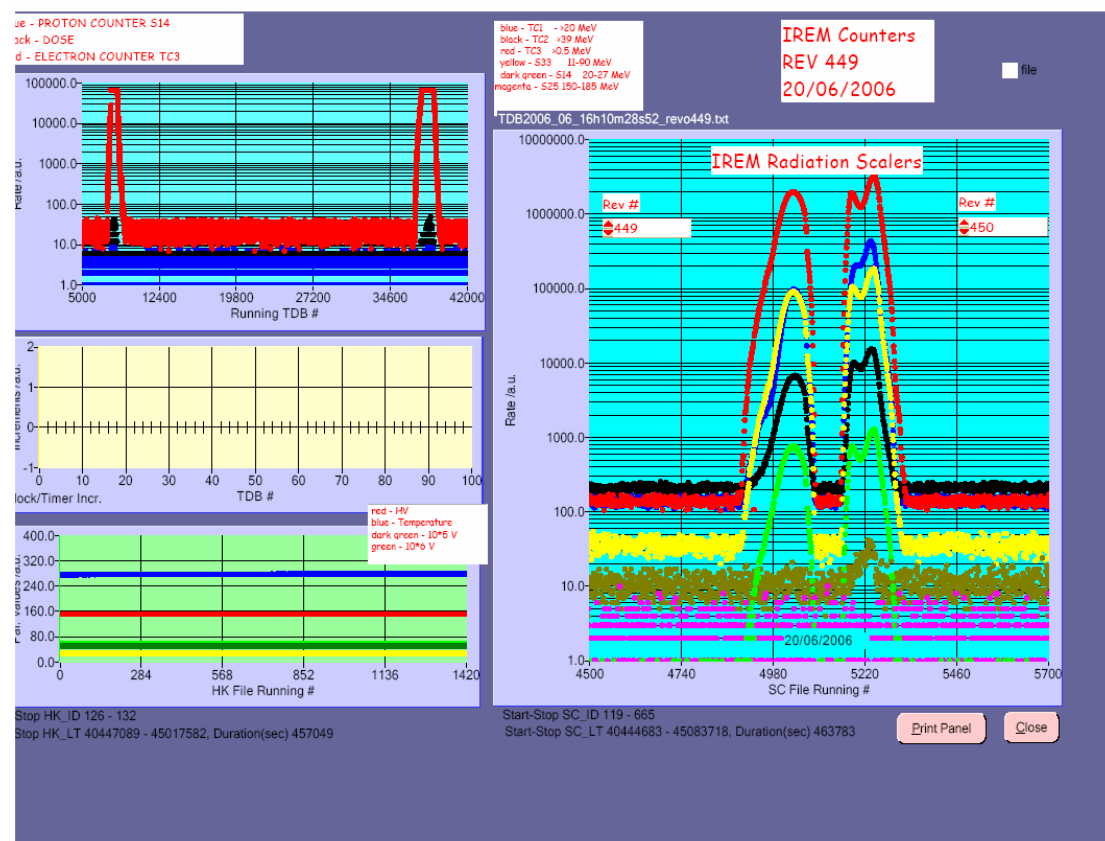
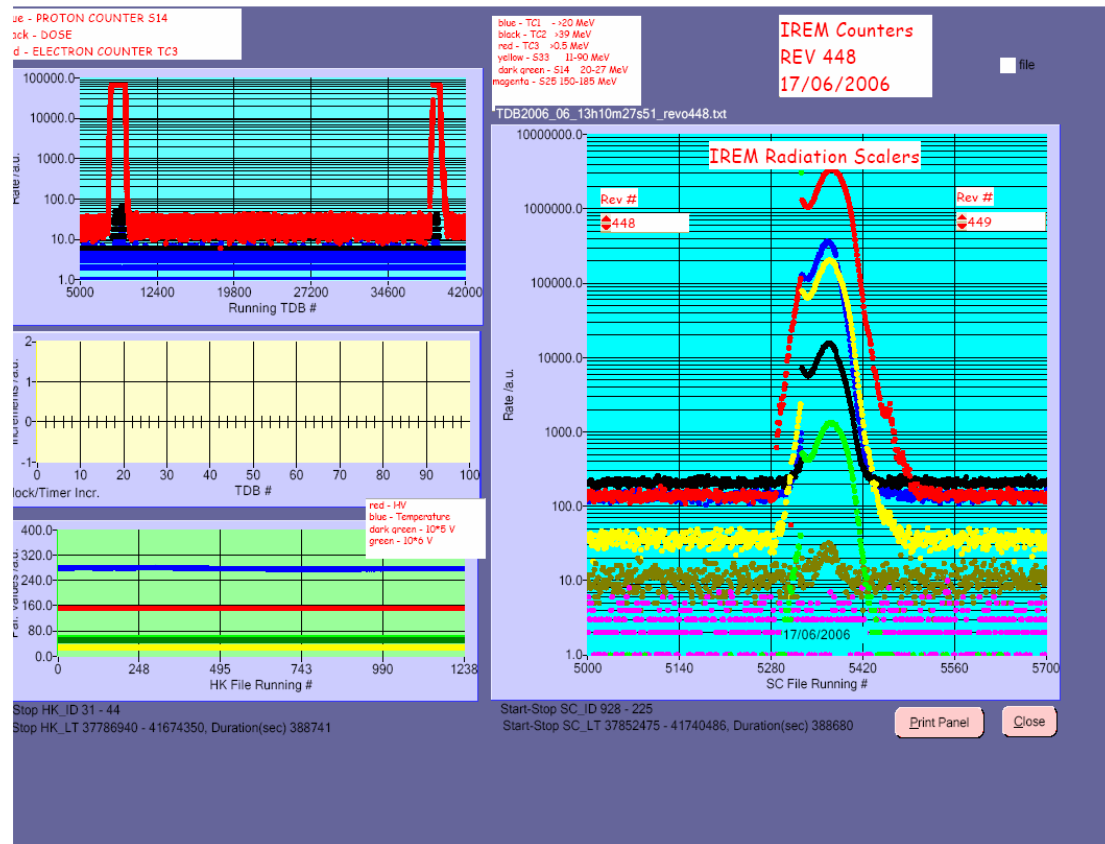
Very small error vs reference (less than 10 minutes)

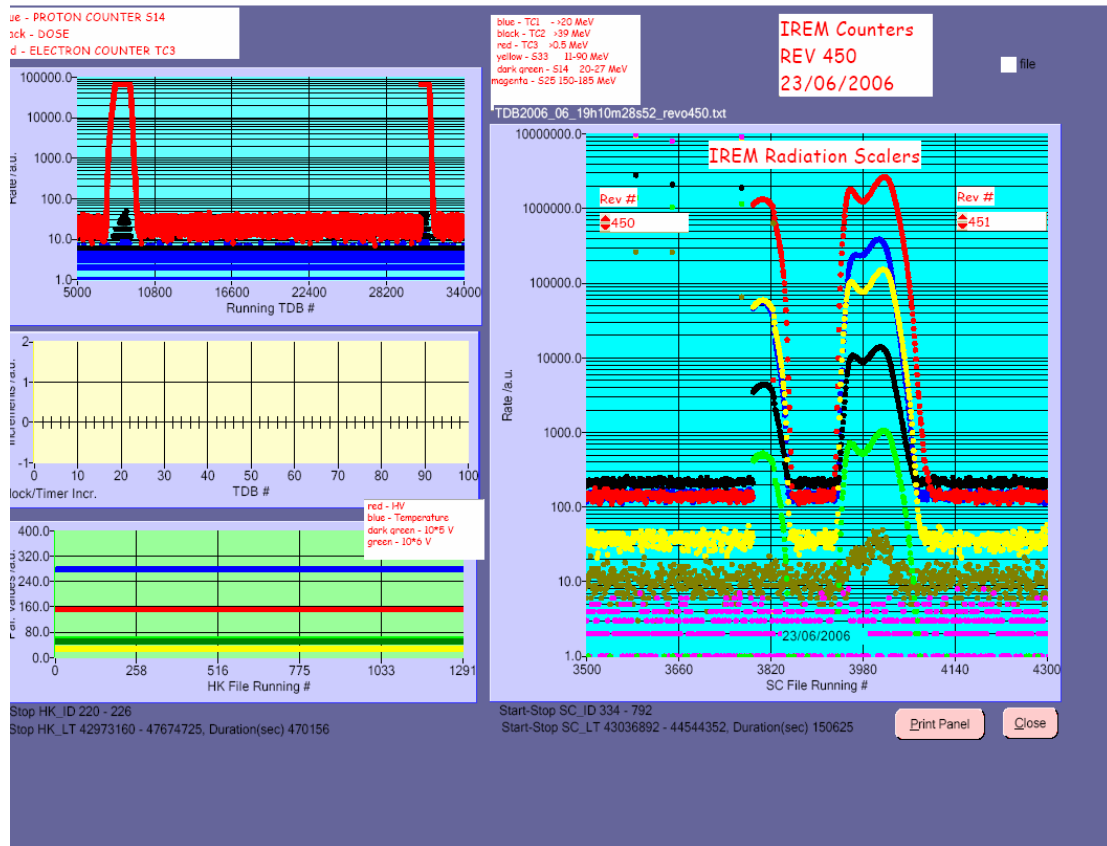
Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

Radiation Spike

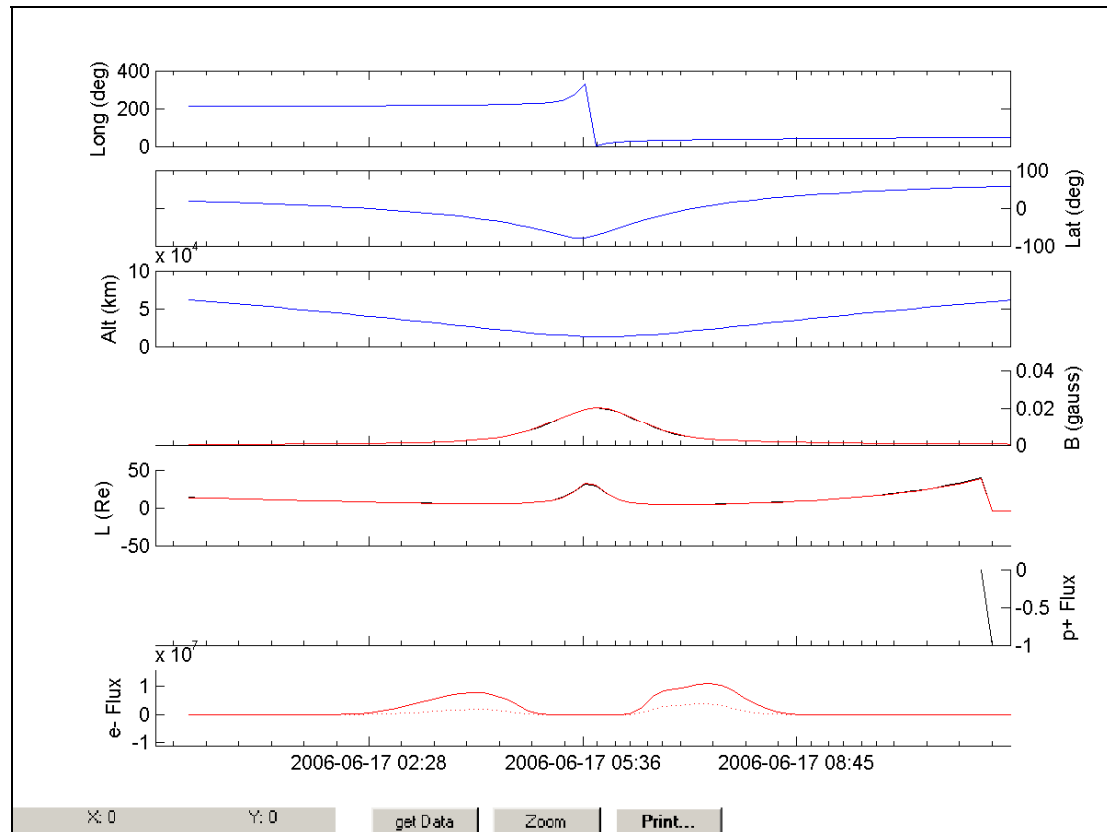
IREM radiation counters:



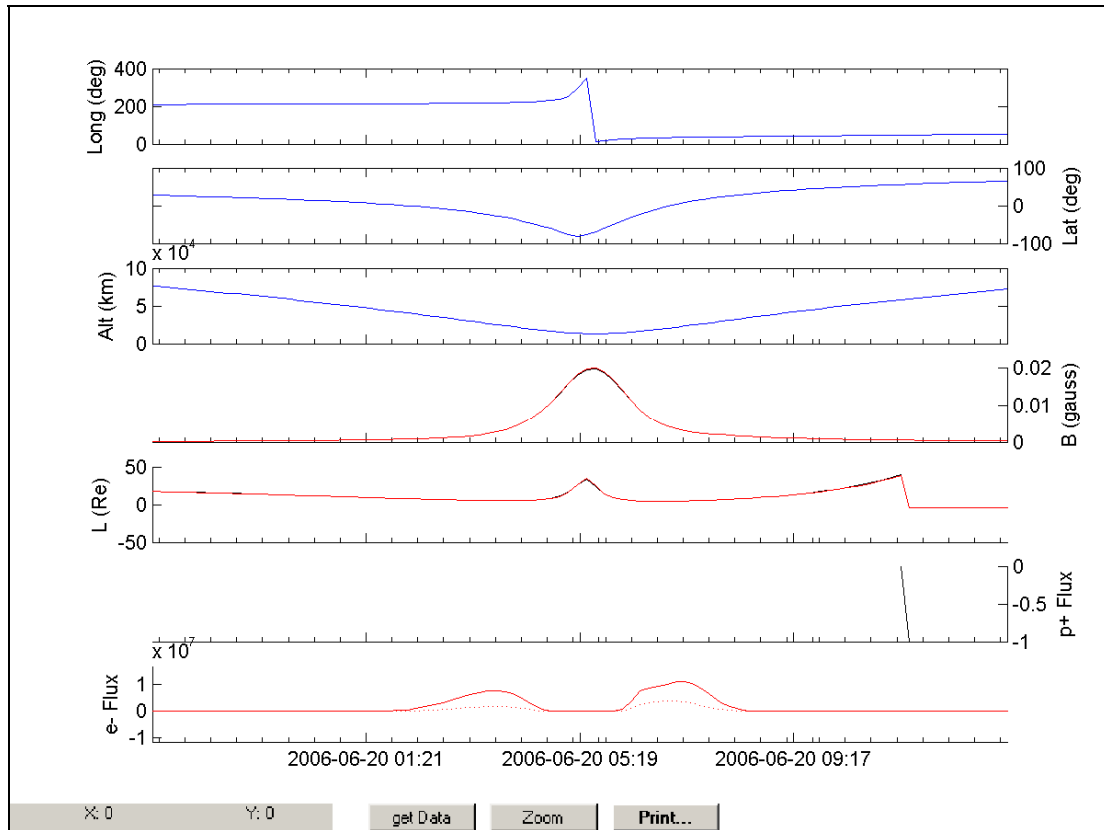


IREM Predicted Radiation Belt Passages:

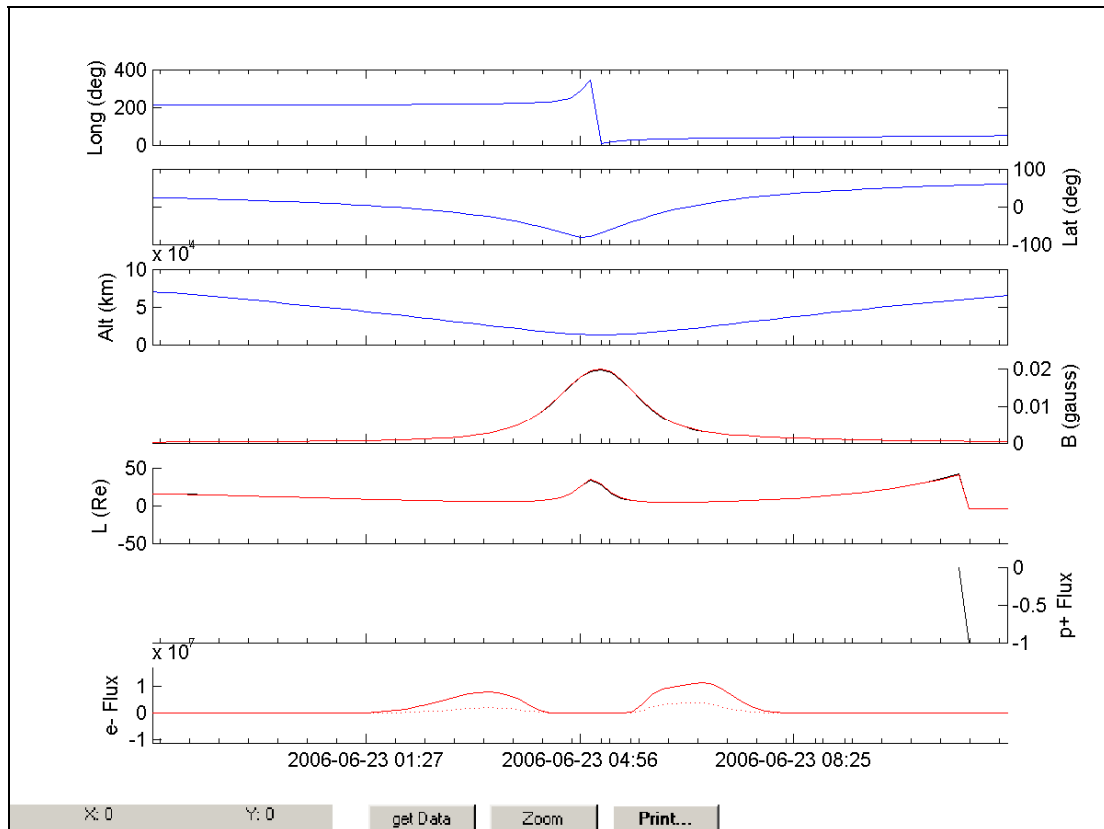
Rev 448



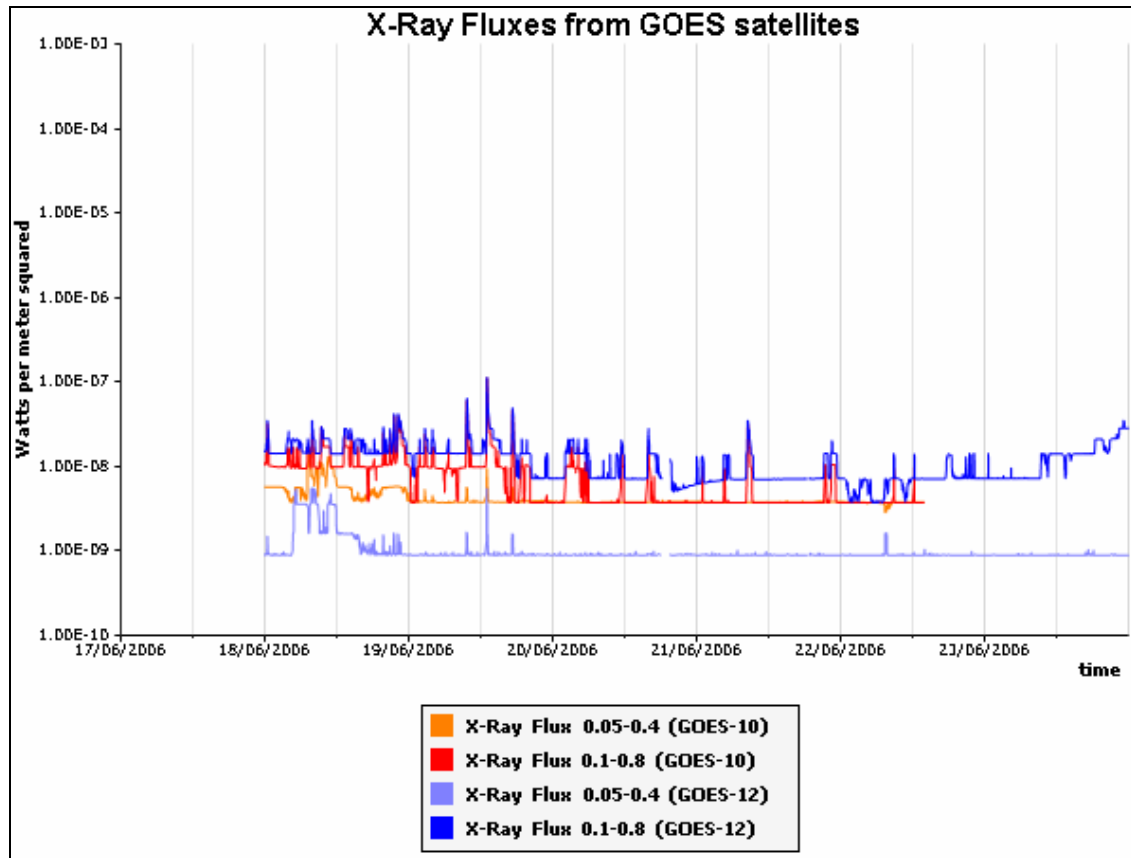
Rev 449



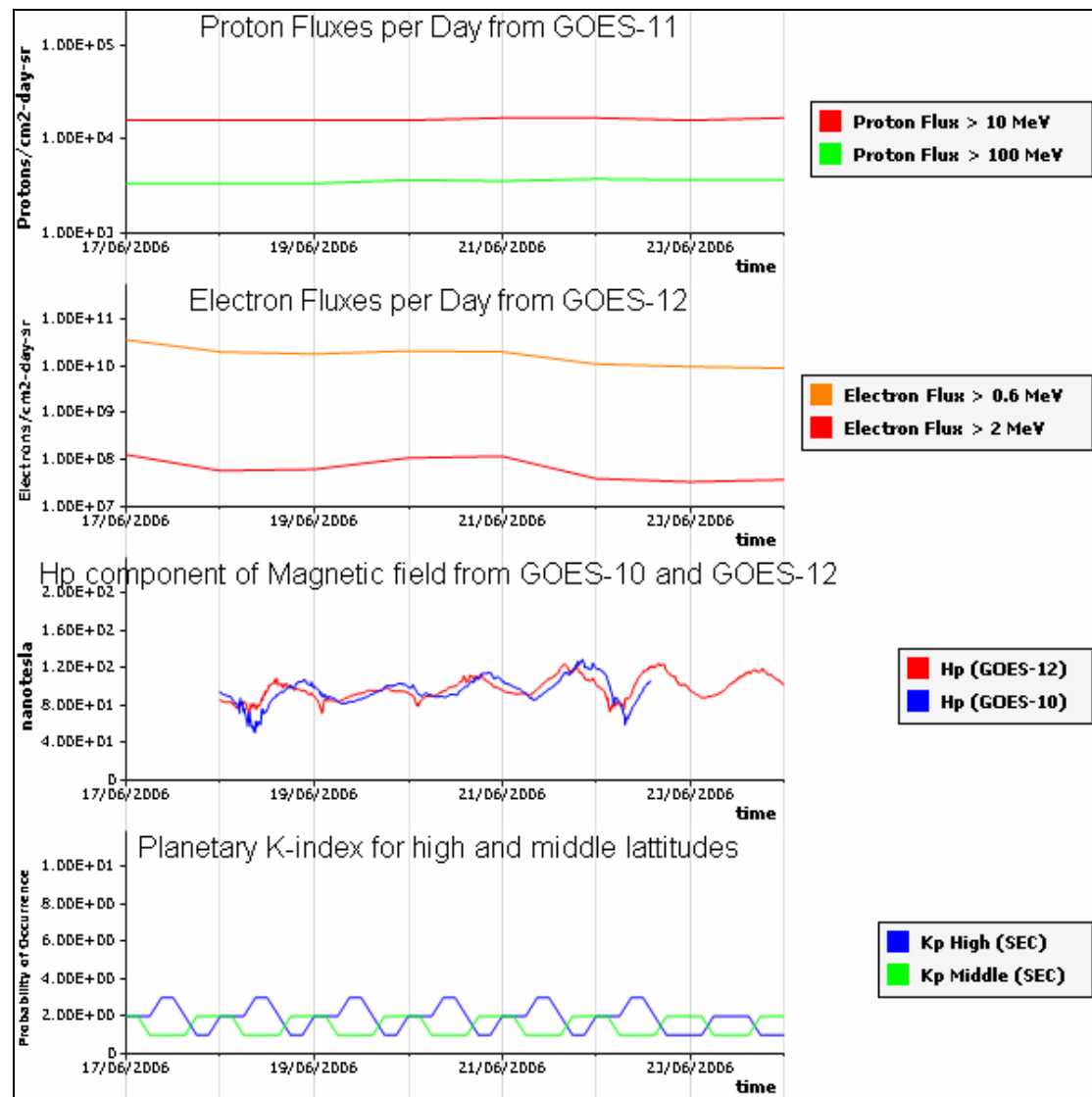
Rev 450



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.