EUROPEAN SPACE AGENCY
DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT
MISSION OPERATIONS DEPARTMENT

INTEGRAL
Mission Report

INT-MOC-SYS-RP-1001-OPS-OF

No. 188
Week 17

02.05.06

Routine Phase

Prepared by: M. Walker (OPS-OFO)

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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 22.04.06 until 28.04.06 (both dates inclusive) and covers the revolutions 431 and 432.

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 a Galactic Plane Survey, a Scutum arm cycle, a hexagonal dither of GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0) and a raster dither of Field_5 (RA 08:53:50.00, DEC +16:12:18.0).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

As part of the periodic AOCS calibrations and in preparation for the summer eclipse season 2006, an IMU 1-2-3-4 calibration and health-check was performed on 26/04/2006. In parallel RMU-B was switched on and its overall status checked. The health checks showed that the IMUs and the redundant RMU are healthy.

As results of the Inertia calibration performed on 30/03/2006, the S/C Inertia matrix, the RW Decoupling matrix and the Reaction Wheel Inertias where updated in rev 431.

2 slews were lost during the observation period due to problem on IMCS.

The fuel consumption over the period between 19/04/2006 and 27/04/2006 was 0.1381 kg. The remaining propellant is in the order of 154.9216 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

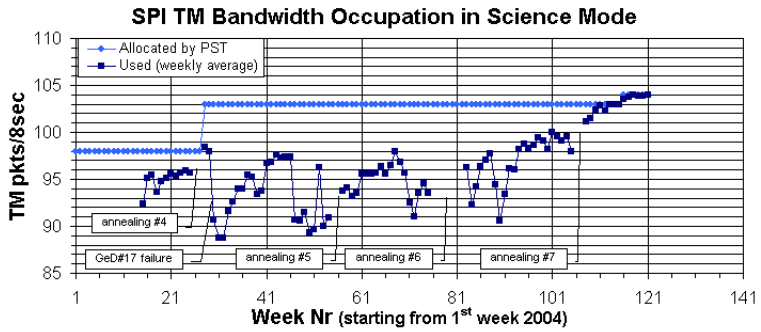
3.2.1 SPI

Following the 7th annealing, 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.

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



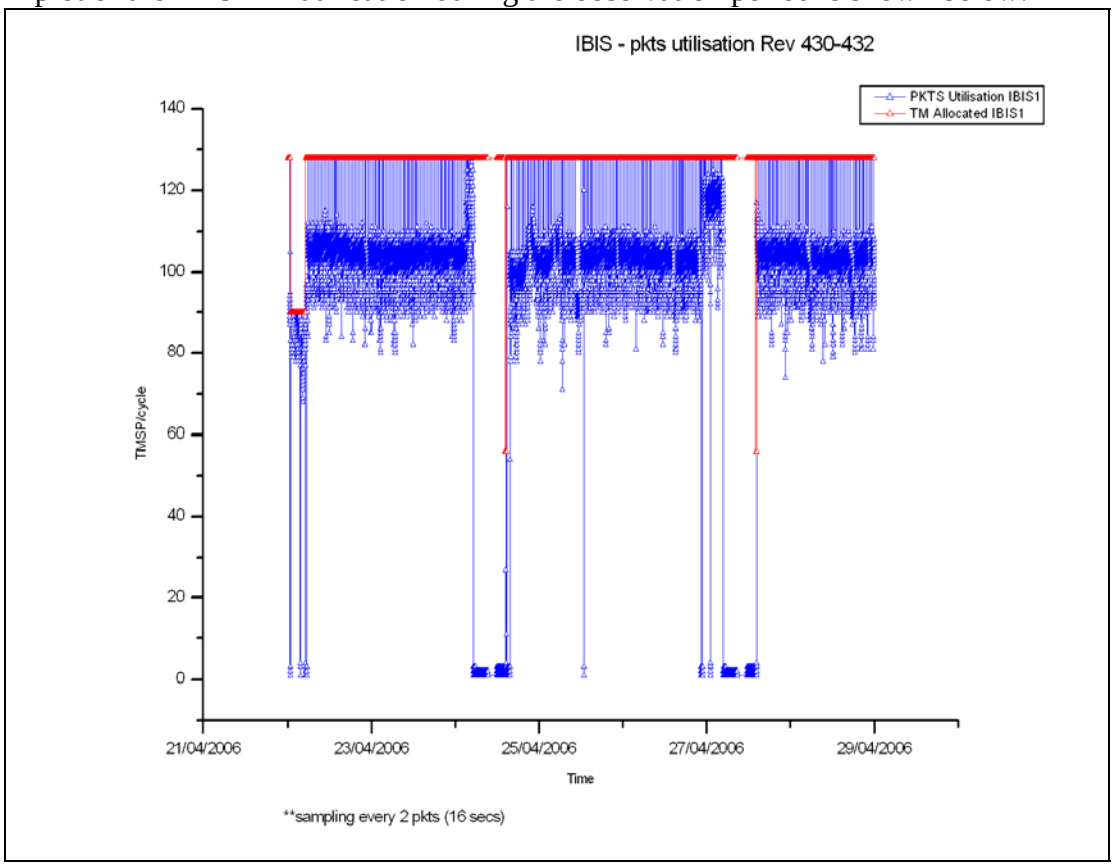
Note: Some more information concerning the SPI operations is provided in the Appendix.

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 2006-04-22 00:47:12Z and 2006-04-22 05:11:12Z it was 90 TMPS/cycle due to an OMC FFC. The IBIS mean bandwidth utilisation during the observation period was 105.0 TMPS/cycle, down 3.2 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.

On 2006-04-22 and 2006-04-26 problems with the command verifier task of the IMCS caused the ED KEDATA02 from the Timeline to partially fail, leaving JEM-X1 in Setup mode. Once the verifier was recovered, these EDs were resent manually, returning JEM-X1 to Data Taking mode.

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, 232 of the 236 planned science pointings for OMC were executed nominally, 1 was interrupted and 3 were lost.

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

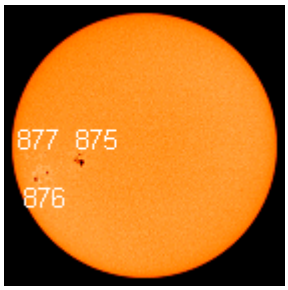
3.2.5 IREM

The overall status of the unit is nominal.

On 2006-04-28 the first IREM forced reset was successfully performed.

Solar Activity
The observation period was characterised low solar activity.

On 2006-04-23 sunspot 875 emerged. It started posing threat for solar flares on 2006-04-25. On 2006-04-27 (cf. picture below), an M8-class solar flare was emitted with no impact on Integral.



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. An OMC pointing was lost to MOC problems, and two more were lost to further MOC problems. There were a few 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. There were two instances where the application verifier died, one of which caused the loss of an OMC pointing, and a Corba exception (a communications problem) forced a reboot of the imca, which lost 2 more pointings. The overall performance was well over the 95% requirement.

Last week, the Integral DCA was moved from E02, to share with XMM in E41.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week There were though 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's for revolutions 437 and 438 were received including redelivery of some PSF's as mentioned last week. Planning for revolutions 434 to 438 has been performed and the corresponding files sent to MOC and ISDC. Further PSF's were received for revolutions 439 to 441 on Thursday, but planning of these will wait until early May to see if some of the proposed instrument configuration changes have to be implemented. When scheduling revolution 434, ISOC encountered a problem to find a suitable attitude for perigee passage. After some iteration with MOC / Flight Dynamics it was concluded ISOC was using too heavy constraints when determining this attitude during eclipse season. The software was modified with relaxed constraints and the planning could be performed as intended. No replanning or ToO requests were received. A meeting held in ESTEC concluded the next SPI annealing should take place in May. ISOC is evaluating in cooperation with the SPI PI a suitable time slot for this activity. Revolution 441 has been proposed as start date by ISOC. TSF's for revolutions 433 to 434 were received. This includes the first revolution with the relaxed constraints mentioned above.

2. Observation status
No ECS's were received this week.

3. ISOC science data archive
Nothing to report.

4. ISOC system
The ISOC system version 12.3 has been used. The system was modified to accommodate the above mentioned change of attitude constraint check at perigee entry.

5. AO 4
The statistics from the AO 4 proposal submission have been generated and distributed. Also a systematic check of all data submitted has been performed. In a few cases ISOC had to request the PI to resubmit corrupted or unreadable justification files. At the end of the week the data package to be used by the TAC members was timely made available and checked by ISOC.

6. Problems
The archive hardware problem is still remaining. No other problem outstanding.

4.3.2 ISDC

Status of ISDC observation processing on 02/05/2006:

- 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 02297000019 (Cas A, Revolutions 352 & 384-385) on 13/02/2006

5 Special Events

6 Anomalies

The following problems impacted the operations this week:

- On DoY 115, at 10:42, a Corba System Exception occurred on all clients, which forced the suspension of the timeline. The imca and idda machines were restarted, and a recovery performed. The impact was the loss of pointings 04310032, & 04310033, and an interruption of pointing 04310035 when OR_0209 was executed.
- On DoY 116, at 22:31, the task verifier on IMCA crashed and did not immediately restart. A recovery was performed, the impact was the loss of pointing 04310092.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-148	24/04/2006	IBIS: VETO CDM1 High Voltage break down	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 431

The observations in revolution 431 began with a Galactic Plane Survey, which lasted ~13.4 hours. It continued with a Scutum arm Cycle (a grid observation of the Galactic arm) for ~36.7 hours. Finally a hexagonal dither of GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0) was performed for ~6.0 hours.

Revolution 432

The observations in revolution 432 began with a Scutum arm Cycle (a grid observation of the Galactic arm) for ~34.4 hours. It continued with a raster dither of Field_5 (RA 08:53:50.00, DEC +16:12:18.0) for ~21.5 hours 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

```
2006-04-12T13:39:34.000Z     155.2363    F   Automatic TM processing.
2006-04-14T00:03:14.000Z     155.1979    F   Automatic TM processing.
2006-04-14T21:51:00.000Z     155.1673    F   Automatic TM processing.
2006-04-15T08:16:29.000Z     155.1601    F   Automatic TM processing.
2006-04-16T23:40:02.000Z     155.1435    F   Automatic TM processing.
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.

This report was generated  Fri Apr 28 08:00:30 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, 22/04/2006 – 28/04/2006

AOCS operations were executed from the Automatic Timeline.

During this period, 121 Open Loop Slews, 126 Closed Loop Slews and 7 Momentum Biases were executed.

2 slews (CSL, OSL) were lost during the observation period due to a problem on communications between the server IMCA and clients

This is equivalent to a 0.8 % of the total number of slews planned (249).

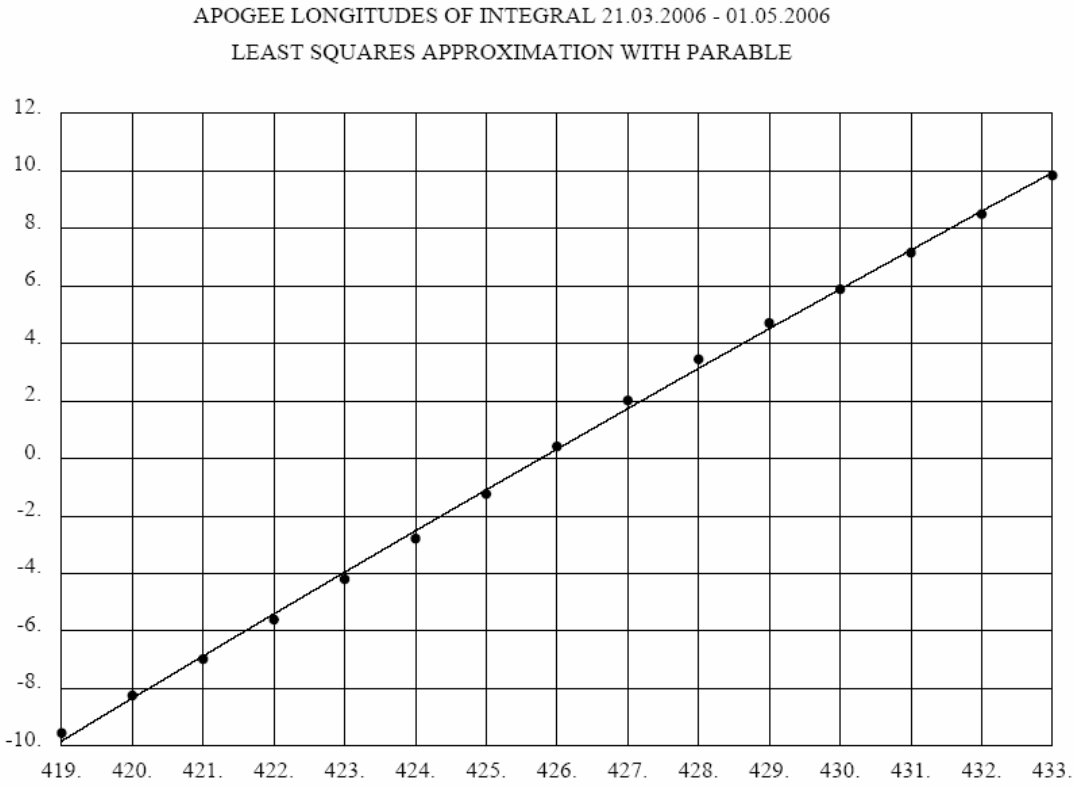
Orbit Control

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

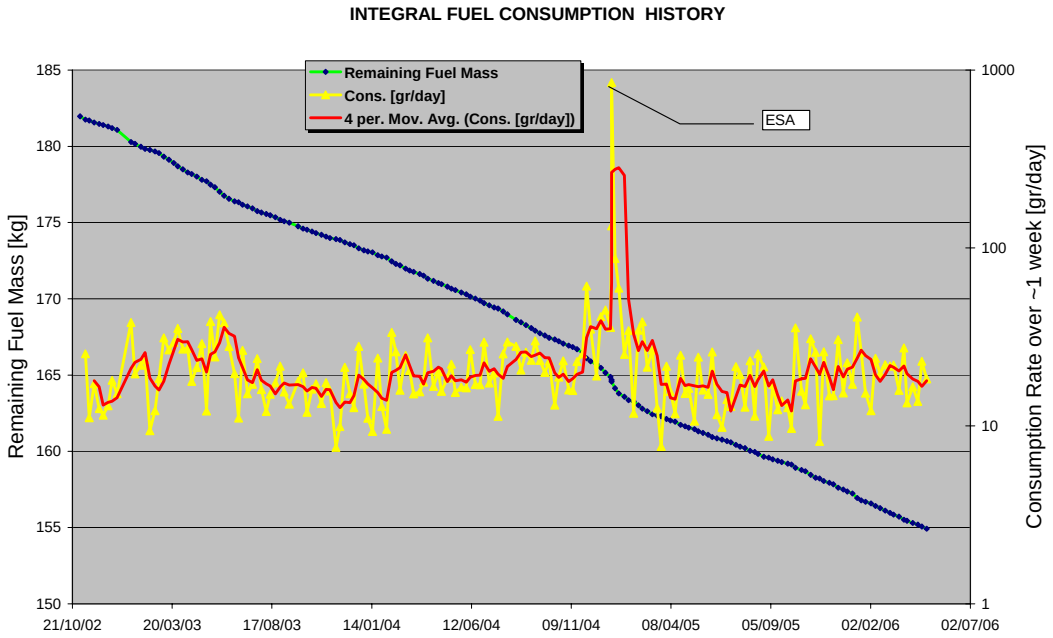
From mid July and onwards Redu should give coverage down to 40000 km altitude.

The attached plot shows the apogee longitude of Integral as a function of the orbit number.

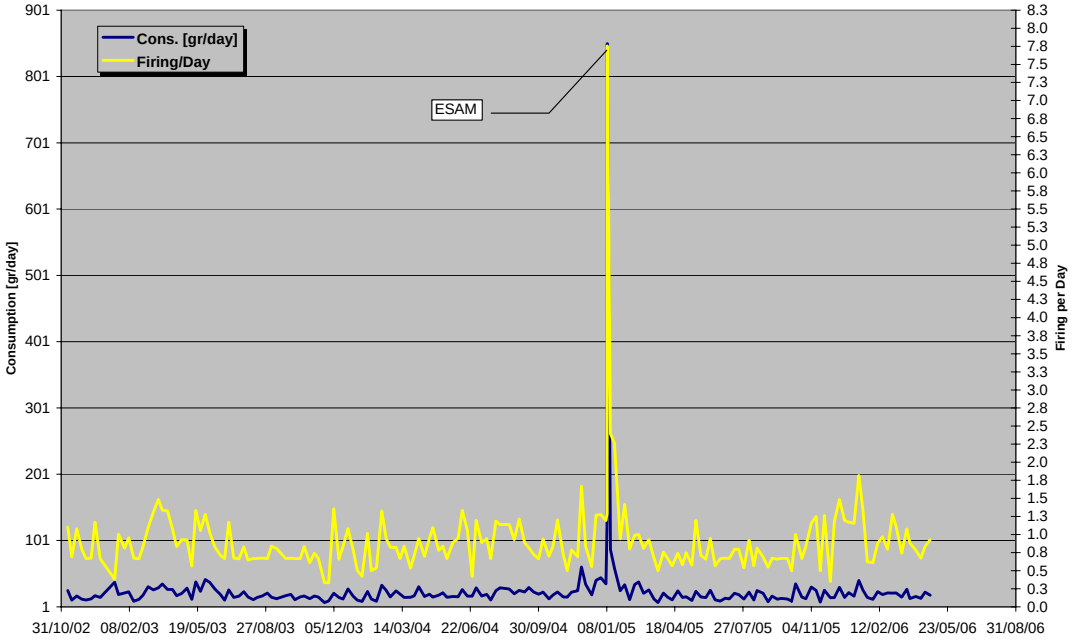


Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 27/04/2006 is reported in the plot below.

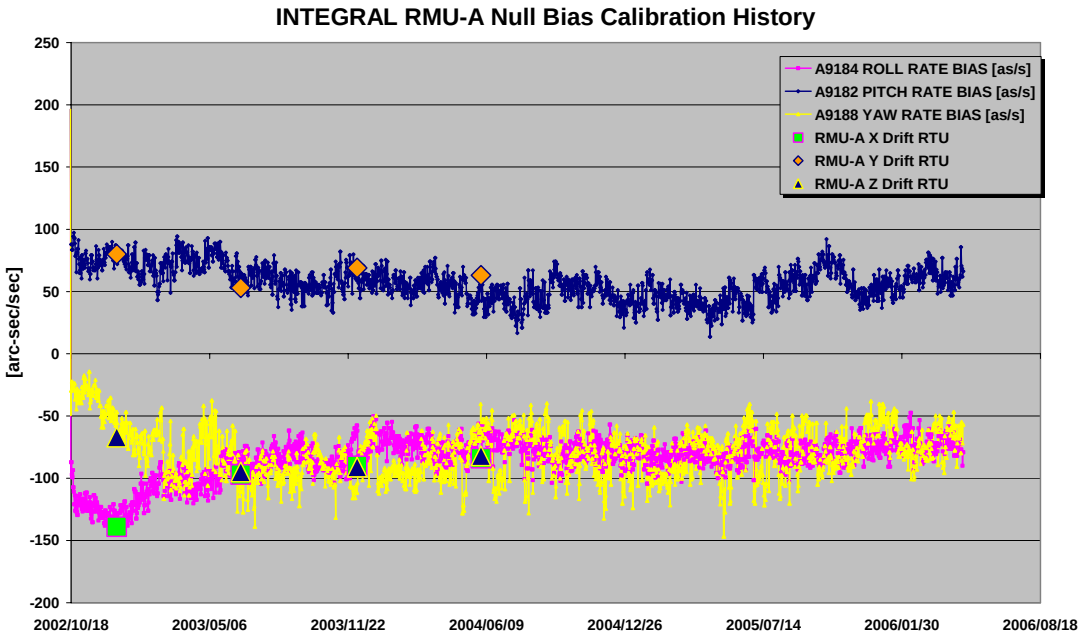


The firing\day over the period between 01/11/2002 and 27/04/2006 is reported in the plot below.

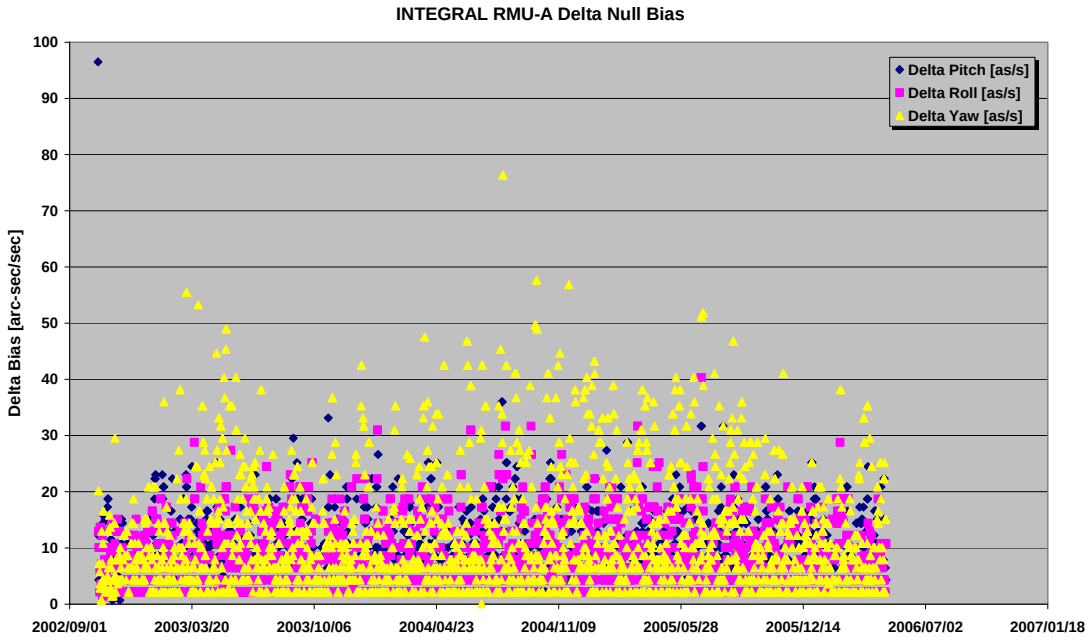


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 28/04/2006 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 28/04/2006 is reported in the plot below.



22/04/06 (Day of Year 112, Revolution 430)

Nothing to report

23/04/06 (Day of Year 113, Revolution 430)

Nothing to report

24/04/06 (Day of Year 114, Revolution 430-431)

Nothing to report

25/04/06 (Day of Year 115, Revolution 431)

Slew missed from the Timeline: at 10:42z due to a problem on the communications between the server IMC-A and the clients, the slews IDs 04310032-33 (CSL, OSL) failed release.

The TL was stopped at 10:42z and a manual recovery performed from the attitude of PID 04310031 to the attitude of PID 04310034. The update for the next slew (ID 04310035) from TL was performed at 12:27z and the AOCS s/s was re-enabled in TL at 12:30z.

The following slews IDs 04310032-33 (CSL, OSL) were not executed from the TL.

26/04/06 (Day of Year 116, Revolution 431)

IMU 1-2-3-4 calibration/health-check and RMU-B health-check: In preparation for the summer eclipse season and as part of the periodic AOCS calibrations, a calibration and health-check of IMU 1-2-3-4 units was performed. In parallel, RMU-B was switched on and its overall status was checked. The checks showed that all the IMUs as well as the redundant RMU are healthy. The timeline of this operation and the calculated drifts and noises levels for the selected IMU channels are presented in the following table:

Time z	**Complete IMU Health-Check / Calibration and RMU-B Health Check 26/04/2006 (DoY 116)**	
07:05	*Verify the end of AOCS TL commanding* Disable ACC Autonomous IMU Switch Off, FCP-AOC-1051 *Remark for procedure AOC_1051:* *Step 2.2 the correct TC-parameters setting is A1379=INHIBIT, A1380=ENABLE, A1381=ENABLE* *Step 3.2 the right TC is that (A2712) reported in sequence and not in procedure* *Step 3.5 the right TC is that (A2722) reported in sequence and not in procedure*	Step 1, **IMU1 and IMU3** PID 04310065 Start at 06:54:05Z End at 07:23:06Z
07:13:24 07:17:21 07:19:07	IMU1 Switch On, FCP-AOC-1600 *Remark for procedure AOC_1600:* *Step 4.2 remember to log the IMU time of activation in the IMU lifetime log* IMU3 Switch On, FCP-AOC-1604 *Remark for procedure AOC_1604:* *Step 4.2 remember to log the IMU time of activation in the IMU lifetime log* RMU-B switch On, FCP-AOC-1902 *Remark for procedure AOC_1902:* *Step 3.2 refer to RMU-B rates*	(AOCS TL commanding start at 07:23:06Z)
	IMUs warm-up time (>30 minutes)	
	Set IMU Selection	PID 04310066

07:39 07:46	ACC: IMU1 on Roll, IMU1 on Yaw, FCP-AOC-1050 FDE: IMU1-X on Roll(X), IMU3-Y on Pitch(Y), IMU3-Z on Yaw(Z), FCP-AOC-1218		Start at 07:29:20Z End at 07:58:21Z (AOCS TL commanding start at 07:58:21Z)
08:45:54 08:46:39	*Verify the end of AOCS TL commanding* Reset IAAD Accumulators, FCP-AOC-1210 Reset FCE RMU Integrators, FCP-AOC-1254 *Remark for procedure AOC_1254:* *Step 2.1 TM verification as follows, A9183(roll rate), A9181(pitch rate), A9956(yaw rate)* Perform IMU-1 Drift and Noise evaluation, FCP-AOC-1623		PID 04310068 Start at 08:39:49Z End at 09:08:50Z (AOCS TL commanding start at 08:33:36Z)
08:40:00 to 09:12:00	>30 minutes of data collection From TM: IMU1 Noise Roll = 0.2425 as/s IMU1 Drift Roll = 0.2600 as/s IMU1 Noise Yaw = 0.0567as/s IMU1 Drift Yaw = 0.1617as/s	**Calculated by FD:** **=> 0.2575 as/s** **=> 0.1545 as/s**	Stable pointing: PID 04310068 Start of Slew 04310069: 09:13:09Z
09:28 09:34	*Verify the end of AOCS TL commanding* Set IMU Selection ACC: IMU1 on Roll, IMU3 on Yaw, FCP-AOC-1050 FDE: IMU1-X on Roll(X), IMU3-Y on Pitch(Y), IMU1-Z on Yaw(Z), FCPAOC-1218		PID 04310069 Start at 09:15:03Z End at 09:45:01Z (AOCS TL commanding start at 09:45:01Z)
09:55:43 09:56:19	Reset IAAD Accumulators, FCP-AOC-1210 Reset FCE RMU Integrators, FCP-AOC-1254 *Remark for procedure AOC_1254:* *Step 2.1 TM verification as follows, A9183(roll rate), A9181(pitch rate), A9956(yaw rate)* Perform IMU-3 Drift and Noise evaluation, FCP-AOC-1623 *Remark: compare with values of the previous IMU drift reported in the specific IMU drift file*		PID 04310070 Start at 09:50:19Z End at 10:20:17Z
09:51:00 to 10:22:00	>30 minutes of data collection From TM: IMU1 Noise Roll = 0.2133as/s IMU1 Drift Roll = 0.2533as/s IMU3 Noise Yaw = 0.0292as/s IMU3 Drift Yaw = -0.0416 as/s	**Calculated by FD:** **=> 0.2614 as/s** **=> -0.0421 as/s**	Stable pointing: PID 04310070 Start of Slew 04310071: 10:23:29Z
10:31	**8.3.1.1 Verify the end of AOCS TL commanding** Deselect IMU1 and IMU3 from ACC Word B, FCP-AOC-1050		PID 04310071 Start at 10:25:35Z End at 10:54:36Z
10:35	Deselect IMU1 and IMU3 from FDE, FCP-AOC-1218		
10:39:34	Switch Off IMU1, FCP-AOC-1601 *Remark: report the IMU1 on-time in the log*		
10:42:45	Switch Off IMU3, FCP-AOC-1605 *Remark: report the IMU3 on-time in the log*		
10:46	Re-enable ACC Autonomous IMU Switch Off, FCP-AOC-0526 *Remark for procedure AOC-0526* *Step 4.1 use AND A1004 (not A1005)*		

10:50:15	RMU-B switch Off, FCP-AOC-1903	PID 04310072 Start at 11:00:51Z End at 11:30:49Z
Thermal stabilisation after IMU1 and IMU3 Switch Off (> 2 hours) PID 04310072-PID 04310075 11:00:51 – 13:21:50		
13:27	**Verify the end of AOCS TL commanding** Disable ACC Autonomous IMU Switch Off, FCP-AOC-1051 *Remark for procedure AOC_1051:* *Step 2.2 the correct TC-parameters setting is A1379=INHIBIT, A1380=ENABLE, A1381=ENABLE* *Step 3.2 the right TC is that (A2712) reported in sequence and not in procedure* *Step 3.5 the right TC is that (A2722) reported in sequence and not in procedure*	Step 2, **IMU2 and IMU4** PID 04310076 Start at 13:21:50Z End at 13:51:48Z
13:34:33	IMU2 Switch On, FCP-AOC-1602 *Remark for procedure AOC-1602:* *Step 2.2.1 do not requested to check if IMU1 is selected for YAW. If for any reason during the calibration, the guide star is lost the controller will switch ON the IMU1: the contingency reaction foresees to switch OFF the IMU2 to avoid thermal problem* *Step 4.2 remember to log the IMU time of activation in the IMU lifetime log*	
13:39:17	IMU4 Switch On, FCP-AOC-1606 *Remark for procedure AOC-1606:* *Step 4.2 remember to log the IMU time of activation in the IMU lifetime log*	
13:42 13:47	Set IMU Selection ACC: IMU2 on Roll, IMU2 on Yaw, FCP-AOC-1050 FDE: IMU2-X on Roll(X), IMU4-Y on Pitch(Y), IMU2-Z on Yaw(Z), FCP-AOC-1218	(AOCS TL commanding start at 13:51:48Z)
	IMUs warm-up time (>30 minutes)	
14:03:17	Reset IAAD Accumulators, FCP-AOC-1210 Perform IMU-2 Drift and Noise evaluation, FCP-AOC-1623 *Remark: compare with values of the previous IMU drift reported in the specific IMU drift file*	PID 04310077 Start at 13:57:06Z End at 14:27:04Z (AOCS TL commanding start at 14:27:04Z)
14:01:00 to 14:30:00	~30 minutes of data collection From TM: IMU2 Noise Roll = 0.2073 as/s IMU2 Drift Roll = 0.1672 as/s IMU2 Noise Yaw = 0.0515as/s IMU2 Drift Yaw = - 0.0624as/s **Calculated by FD:** **=> 0.1650 as/s** **=> -0.0669 as/s**	Stable pointing: PID 04310077 Start of Slew 04310078: 14:30:26Z
14:35 14:40	*Verify the end of AOCS TL commanding* Set IMU Selection ACC: IMU4 on Roll, IMU2 on Yaw, FCP-AOC-1050 FDE: IMU4-X on Roll(X), IMU4-Y on Pitch(Y), IMU2-Z on Yaw(Z), FCP-AOC-1218	PID 04310078 Start at 14:32:22Z End at 15:02:20Z (AOCS TL commanding start at 15:02:20Z)
15:13:49	Reset IAAD Accumulators, FCP-AOC-1210 Perform IMU-4 Drift and Noise evaluation, FCP-AOC-1623	PID 04310079 Start at 15:07:38Z End at 15:40:58Z (AOCS TL commanding

	Remark: compare with values of the previous IMU drift reported in the specific IMU drift file		start at 15:36:39Z)
15:11:00 to 15:40:00	>30 minutes of data collection From TM: IMU4 Noise Roll = 0.2013as/s IMU4 Drift Roll = -0.0571as/s IMU2 Noise Yaw = 0.1466 as/s IMU2 Drift Yaw = -0.0422as/s	**Calculated by FD:** **=> -0.0563 as/s** **=> -0.0459 as/s**	Stable pointing: PID 04310079 Start of Slew PID 04310080: 15:40:58Z
15:50	Deselect IMU2 and IMU4 from ACC Word B, FCP-AOC-1050		PID PID 04310080 Start at 15:42:51Z End at 16:12:49Z
15:56	Deselect IMU2 and IMU4 from FDE, FCP-AOC-1218		
16:11:11	Switch Off IMU2, FCP-AOC-1603 *Remark: report the IMU2 on-time in the log*		
16:23:34	Switch Off IMU4, FCP-AOC-1607 *Remark: report the IMU4 on-time in the log*		
16:33	Re-enable ACC Autonomous IMU Switch Off, FCP-AOC-0526 *Remark for procedure AOC-0526* *Step 4.1 use AND A1004 (not A1005)*		

OTF low due to star lost: at 14:36z due to star lost on STR, when the guide star was Mi 7.8 at CCD location [29911, -16614], the OTF went low during PID 04310078. The reason of the star lost is likely due a false event and to the position of the guide star, at the edge of the STR FOV.
The event happened during the IMUs calibration with the IMU2 ON and configured in word B (MACS units selected for control) since 14:35z. Even if the IMU1 was selected in ACC word D (IMU selected for control) , in the situation of the lost of guide star the ACC used , as expected, the unit configured in Word B (IMU2) rather than switching IMU 1 ON.

The guide star found after the automatic mapping automatically commanded by ACC was Mi 6.6 at CCD location [10050, -598].

The next slew for PID 04310079 was manually updated and executed from the Timeline.

No impact on TL, except the OTF low during PID 04310078.

IMCS verifier task reported problem: at 22:34z due to a problem on the verifier task on IMCS the AOCS s/s was disabled in TL. The update for the slew ID 04310093, was manually performed at 22:45z and the AOCS s/s re-enabled in TL at 22:46z.

No impact on TL, except the OTF low during part of PID 04310079 due to the delayed uplink of ED DEBPFU00 caused by the IMCS problem above.

27/04/06 (Day of Year 117, Revolution 431-432)

Update of S/C Inertia matrix, Decoupling matrix and Reaction Wheel Inertias: following the Inertia calibration performed on 30/03/2006 the S/C Inertia Matrix , the RW Decoupling matrix and the Reaction Wheel Inertias where updated below 60000 Km during rev 431.

Hereafter follow the update TPFs, generated by FD Team, and uplinked starting at 06:16z:

AESCI_00 S
M F 6
2006-04-27T11:00:00Z
2006-04-27T11:00:00Z
AAAA1
IXX R 0.6202630E+04 Kgm2 D S/C inertia Ixx
IYY R 0.8185100E+04 Kgm2 D S/C inertia Iyy
IZZ R 0.8328350E+04 Kgm2 D S/C inertia Izz
IXY R 0.4168780E+02 Kgm2 D S/C inertia Ixy
IXZ R -0.1631500E+03 Kgm2 D S/C inertia Ixz
IYZ R 0.1433710E+02 Kgm2 D S/C inertia Iyz

AEDCM_00 S
M F 96
2006-04-27T11:00:00Z
2006-04-27T11:00:00Z
AAAA1
ABW_1_R1 R 0.0000000E+00 D body to wheel [1,roll]
ABW_1_P1 R 0.0000000E+00 D body to wheel [1,pitch]
ABW_1_Y1 R 0.0000000E+00 D body to wheel [1,yaw]
ABW_2_R1 R -0.7079092E+00 D body to wheel [1,roll]
ABW_2_P1 R -0.7058016E+00 D body to wheel [1,pitch]
ABW_2_Y1 R 0.7075151E+00 D body to wheel [1,yaw]
ABW_3_R1 R -0.1412990E+01 D body to wheel [1,roll]
ABW_3_P1 R 0.5900862E-02 D body to wheel [1,pitch]
ABW_3_Y1 R 0.4098872E-02 D body to wheel [1,yaw]
ABW_4_R1 R 0.7123445E+00 D body to wheel [1,roll]
ABW_4_P1 R 0.7050487E+00 D body to wheel [1,pitch]
ABW_4_Y1 R 0.7041494E+00 D body to wheel [1,yaw]
BWB_1_R1 R 0.0000000E+00 D wheel to body [1,roll]
BWB_1_P1 R 0.0000000E+00 D wheel to body [1,pitch]
BWB_1_Y1 R 0.0000000E+00 D wheel to body [1,yaw]
BWB_2_R1 R -0.8953778E-03 D wheel to body [1,roll]
BWB_2_P1 R -0.7062021E+00 D wheel to body [1,pitch]
BWB_2_Y1 R 0.7080098E+00 D wheel to body [1,yaw]
BWB_3_R1 R -0.7047488E+00 D wheel to body [1,roll]
BWB_3_P1 R 0.7094522E+00 D wheel to body [1,pitch]
BWB_3_Y1 R 0.2592691E-02 D wheel to body [1,yaw]
BWB_4_R1 R 0.5002019E-02 D wheel to body [1,roll]
BWB_4_P1 R 0.7054478E+00 D wheel to body [1,pitch]
BWB_4_Y1 R 0.7087442E+00 D wheel to body [1,yaw]
ABW_1_R2 R 0.7111280E+00 D body to wheel [2,roll]
ABW_1_P2 R 0.7088635E+00 D body to wheel [2,pitch]
ABW_1_Y2 R -0.7116653E+00 D body to wheel [2,yaw]
ABW_2_R2 R 0.0000000E+00 D body to wheel [2,roll]
ABW_2_P2 R 0.0000000E+00 D body to wheel [2,pitch]
ABW_2_Y2 R 0.0000000E+00 D body to wheel [2,yaw]
ABW_3_R2 R -0.7081114E+00 D body to wheel [2,roll]
ABW_3_P2 R 0.7088908E+00 D body to wheel [2,pitch]

ABW_3_Y2 R -0.6984741E+00 D body to wheel [2,yaw]
ABW_4_R2 R -0.2911665E-02 D body to wheel [2,roll]
ABW_4_P2 R -0.8511538E-02 D body to wheel [2,pitch]
ABW_4_Y2 R 0.1418930E+01 D body to wheel [2,yaw]
BWB_1_R2 R 0.7046694E+00 D wheel to body [2,roll]
BWB_1_P2 R 0.7095129E+00 D wheel to body [2,pitch]
BWB_1_Y2 R 0.5702047E-02 D wheel to body [2,yaw]
BWB_2_R2 R 0.0000000E+00 D wheel to body [2,roll]
BWB_2_P2 R 0.0000000E+00 D wheel to body [2,pitch]
BWB_2_Y2 R 0.0000000E+00 D wheel to body [2,yaw]
BWB_3_R2 R -0.7045630E+00 D wheel to body [2,roll]
BWB_3_P2 R 0.7096359E+00 D wheel to body [2,pitch]
BWB_3_Y2 R 0.2811020E-02 D wheel to body [2,yaw]
BWB_4_R2 R 0.6603407E-02 D wheel to body [2,roll]
BWB_4_P2 R 0.7051777E+00 D wheel to body [2,pitch]
BWB_4_Y2 R 0.7089999E+00 D wheel to body [2,yaw]
ABW_1_R3 R 0.1427854E+01 D body to wheel [3,roll]
ABW_1_P3 R -0.8650926E-02 D body to wheel [3,pitch]
ABW_1_Y3 R -0.4694300E-02 D body to wheel [3,yaw]
ABW_2_R3 R 0.7125547E+00 D body to wheel [3,roll]
ABW_2_P3 R -0.7133390E+00 D body to wheel [3,pitch]
ABW_2_Y3 R 0.7028569E+00 D body to wheel [3,yaw]
ABW_3_R3 R 0.0000000E+00 D body to wheel [3,roll]
ABW_3_P3 R 0.0000000E+00 D body to wheel [3,pitch]
ABW_3_Y3 R 0.0000000E+00 D body to wheel [3,yaw]
ABW_4_R3 R -0.7229256E+00 D body to wheel [3,roll]
ABW_4_P3 R 0.7122949E+00 D body to wheel [3,pitch]
ABW_4_Y3 R 0.7087156E+00 D body to wheel [3,yaw]
BWB_1_R3 R 0.7046694E+00 D wheel to body [3,roll]
BWB_1_P3 R 0.7095129E+00 D wheel to body [3,pitch]
BWB_1_Y3 R 0.5702047E-02 D wheel to body [3,yaw]
BWB_2_R3 R -0.1952045E-02 D wheel to body [3,roll]
BWB_2_P3 R -0.7063170E+00 D wheel to body [3,pitch]
BWB_2_Y3 R 0.7078930E+00 D wheel to body [3,yaw]
BWB_3_R3 R 0.0000000E+00 D wheel to body [3,roll]
BWB_3_P3 R 0.0000000E+00 D wheel to body [3,pitch]
BWB_3_Y3 R 0.0000000E+00 D wheel to body [3,yaw]
BWB_4_R3 R 0.6603407E-02 D wheel to body [3,roll]
BWB_4_P3 R 0.7051777E+00 D wheel to body [3,pitch]
BWB_4_Y3 R 0.7089999E+00 D wheel to body [3,yaw]
ABW_1_R4 R 0.7082297E+00 D body to wheel [4,roll]
ABW_1_P4 R 0.7003909E+00 D body to wheel [4,pitch]
ABW_1_Y4 R 0.7007846E+00 D body to wheel [4,yaw]
ABW_2_R4 R -0.2881500E-02 D body to wheel [4,roll]
ABW_2_P4 R -0.8423360E-02 D body to wheel [4,pitch]
ABW_2_Y4 R 0.1404230E+01 D body to wheel [4,yaw]
ABW_3_R4 R -0.7109749E+00 D body to wheel [4,roll]
ABW_3_P4 R 0.7005199E+00 D body to wheel [4,pitch]
ABW_3_Y4 R 0.6969998E+00 D body to wheel [4,yaw]
ABW_4_R4 R 0.0000000E+00 D body to wheel [4,roll]
ABW_4_P4 R 0.0000000E+00 D body to wheel [4,pitch]
ABW_4_Y4 R 0.0000000E+00 D body to wheel [4,yaw]
BWB_1_R4 R 0.7046694E+00 D wheel to body [4,roll]
BWB_1_P4 R 0.7095129E+00 D wheel to body [4,pitch]
BWB_1_Y4 R 0.5702047E-02 D wheel to body [4,yaw]
BWB_2_R4 R -0.1952045E-02 D wheel to body [4,roll]
BWB_2_P4 R -0.7063170E+00 D wheel to body [4,pitch]
BWB_2_Y4 R 0.7078930E+00 D wheel to body [4,yaw]
BWB_3_R4 R -0.7045630E+00 D wheel to body [4,roll]

BWB_3_P4 R 0.7096359E+00 D wheel to body [4,pitch]
BWB_3_Y4 R 0.2811020E-02 D wheel to body [4,yaw]
BWB_4_R4 R 0.0000000E+00 D wheel to body [4,roll]
BWB_4_P4 R 0.0000000E+00 D wheel to body [4,pitch]
BWB_4_Y4 R 0.0000000E+00 D wheel to body [4,yaw]

AERWI_00 S
M F 4
2006-04-27T11:00:00Z
2006-04-27T11:00:00Z
AAAA1
RW_INE_1 R 0.9600000E-01 Kgm2 D wheel 1 inertia
RW_INE_2 R 0.9774460E-01 Kgm2 D wheel 2 inertia
RW_INE_3 R 0.9715270E-01 Kgm2 D wheel 3 inertia
RW_INE_4 R 0.9771910E-01 Kgm2 D wheel 4 inertia

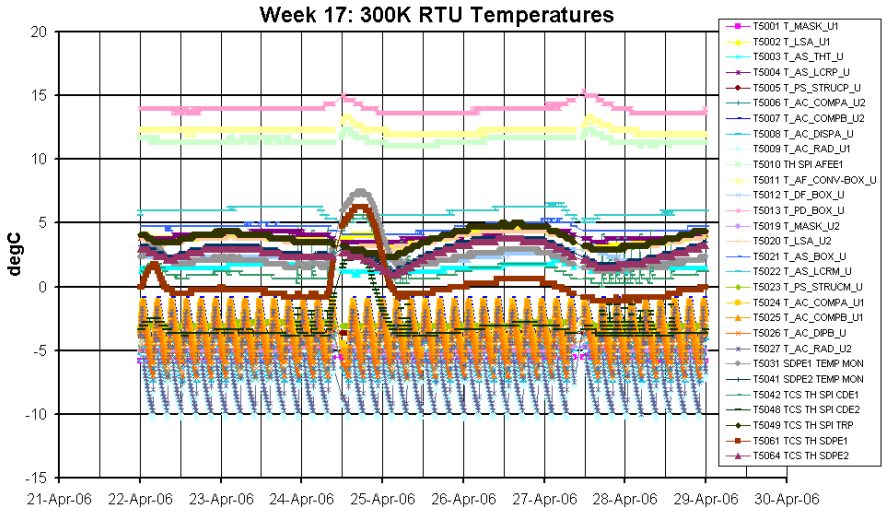
28/04/06 (Day of Year 118, Revolution 432)

FDS failed slew update: At 15:35Z the FD system failed the update of the slew ID 04320044 (OSL). The recovery was manually performed and the update for the next slew (ID 04320044) from TL was performed at 15:42Z.

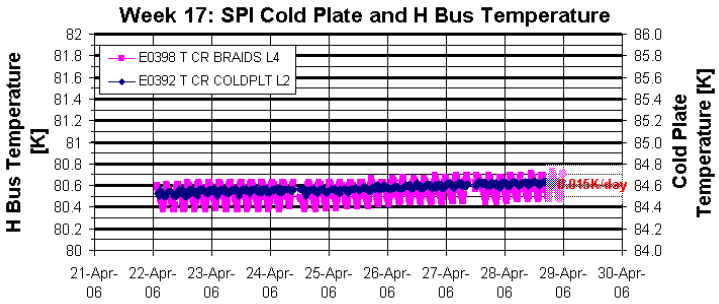
No impact on TL reported.

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.



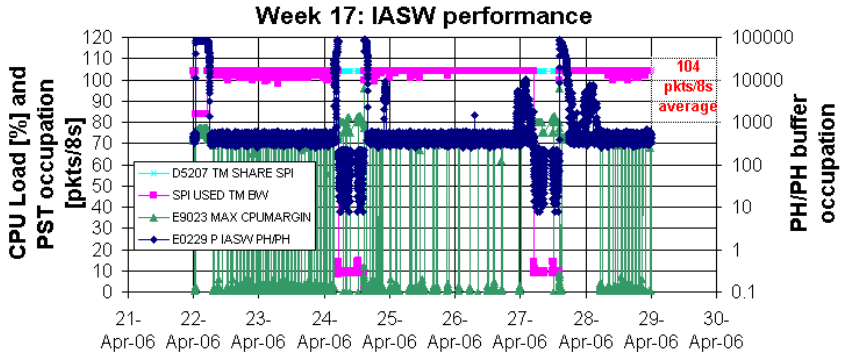
Stirling Compressors and Cryostat:
The performance of the compressors is nominal. The cold plate temperature was maintained at 85K+/-1K showing the expected positive drift. The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.



DPE & IASW:

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

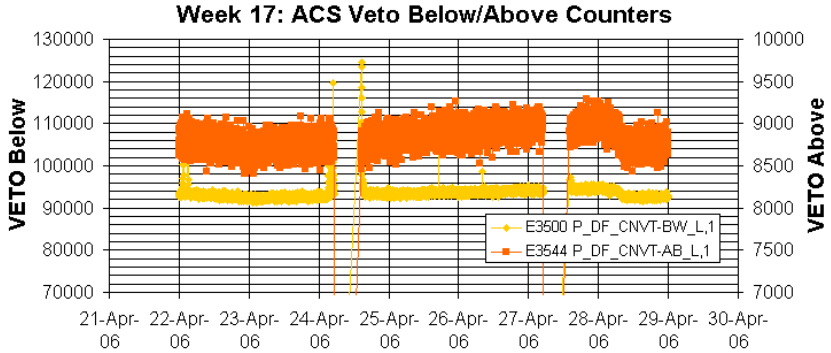
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

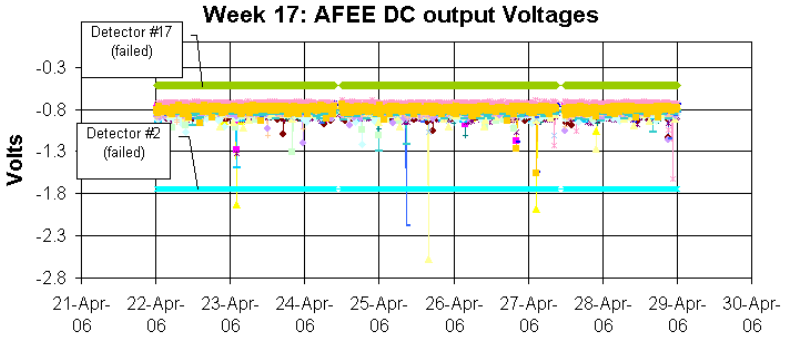
The following plot shows the ACS overall count rate evolution during the reporting period



AFEE:

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

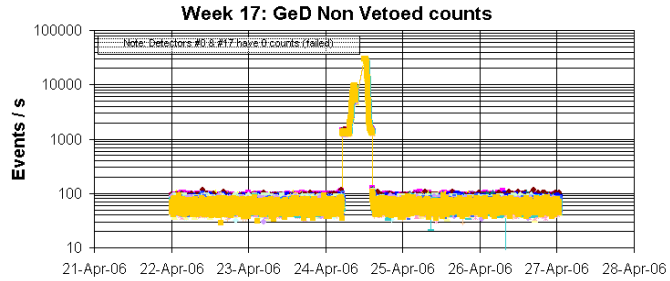
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.

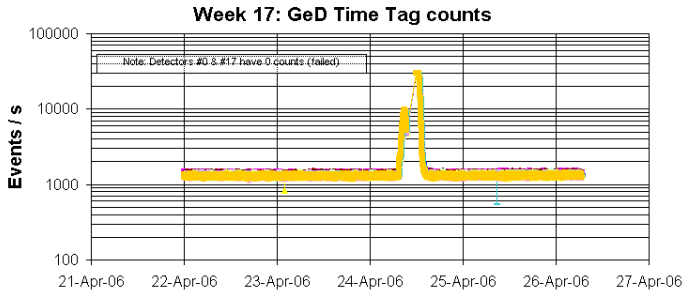


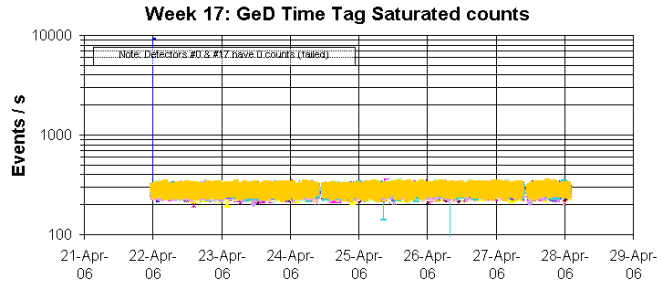
DFEE:

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.



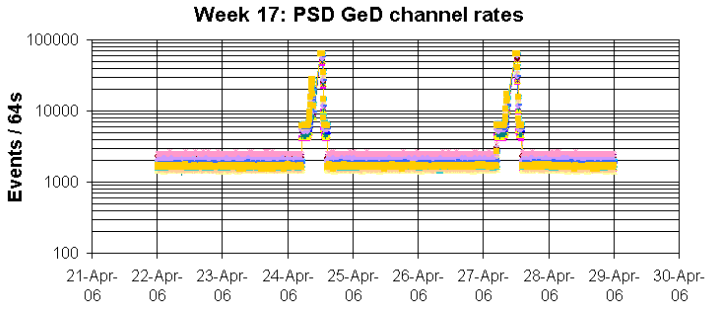




PSD:

The performance of the unit is nominal.

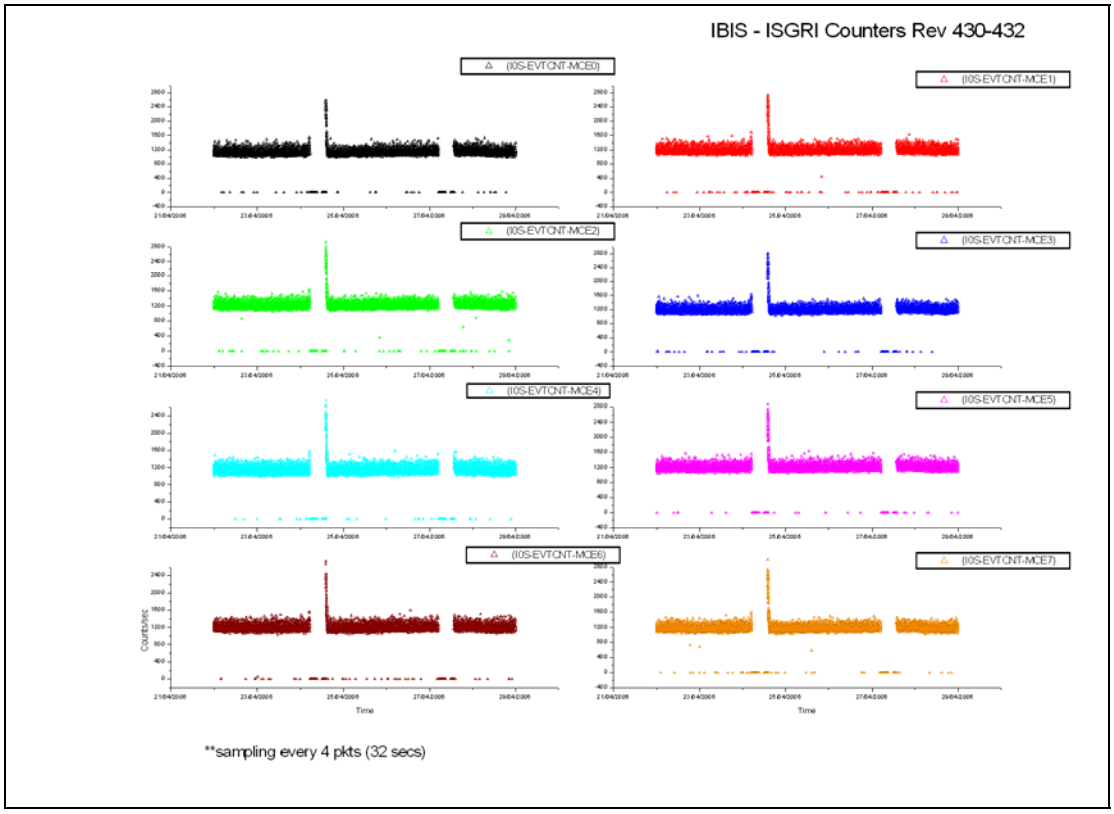
The following plots show the PSD channel rates during the reporting period.



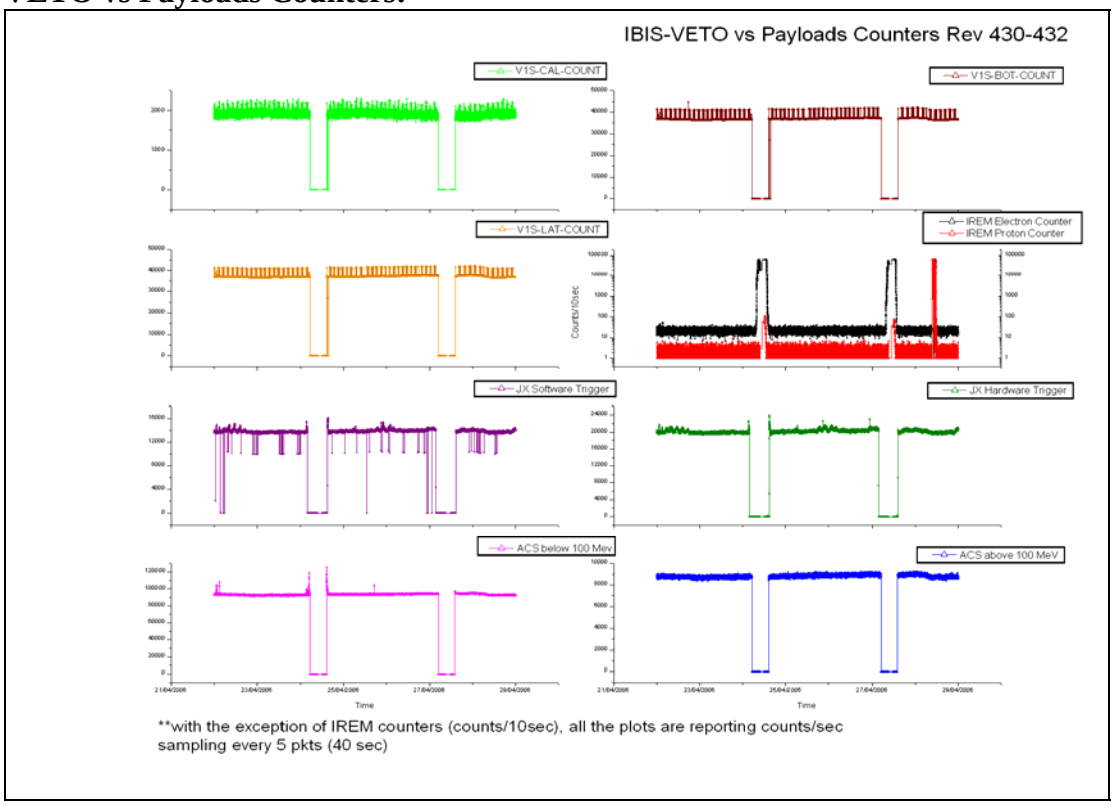
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

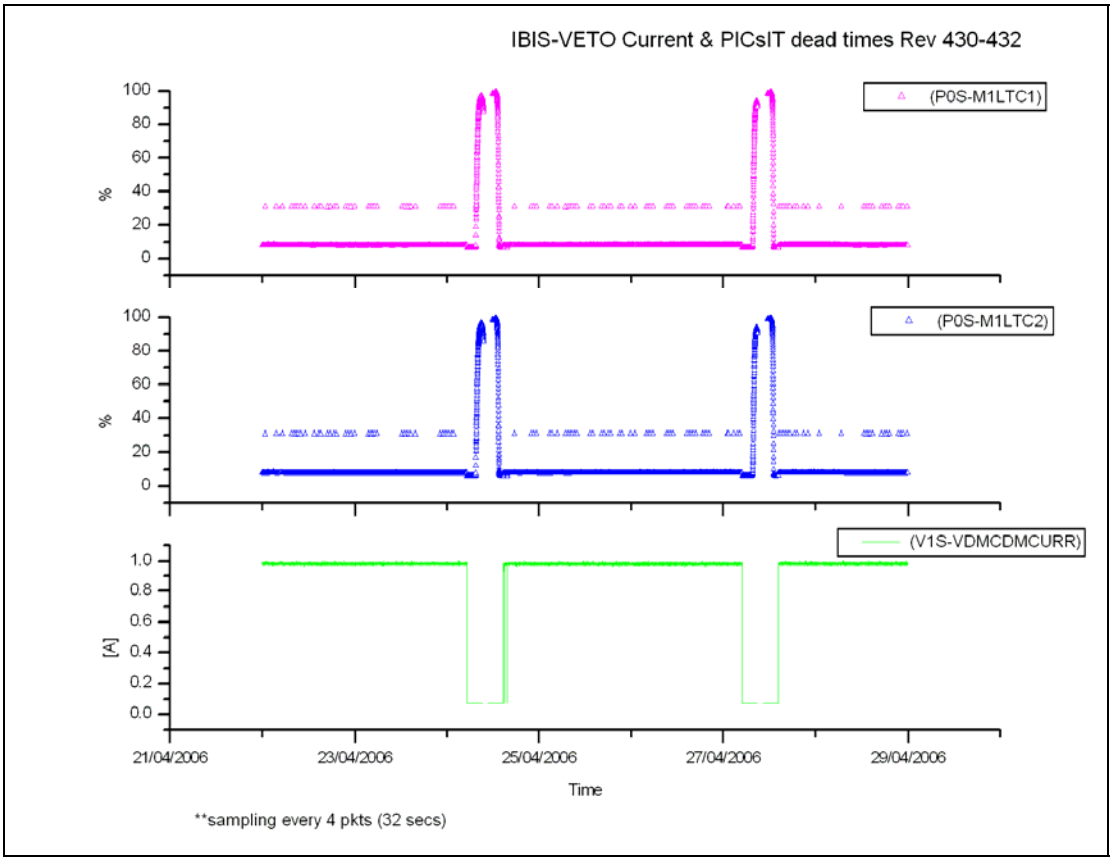


VETO vs Payloads Counters:

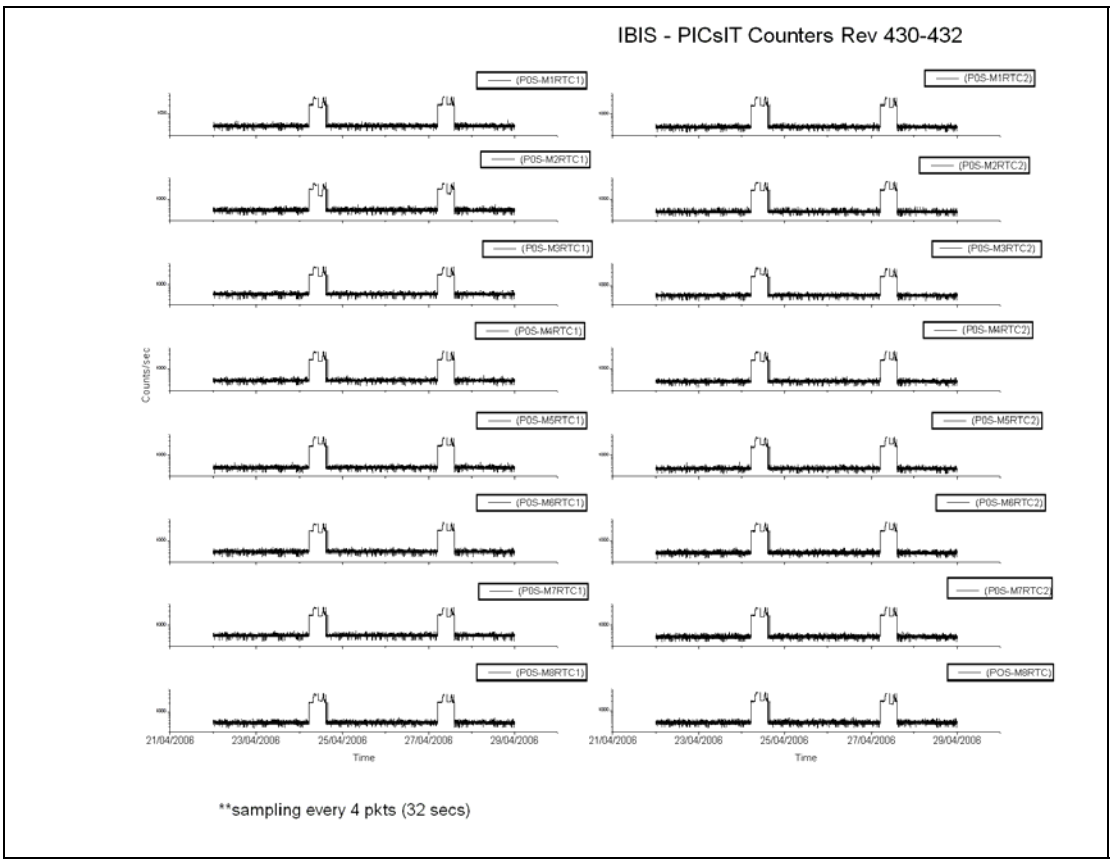


The week was characterised by low radiation. On 2006-04-28, IREM counters reported high values (FFFF hex) as a power cycle, with no impact on instruments, was performed.

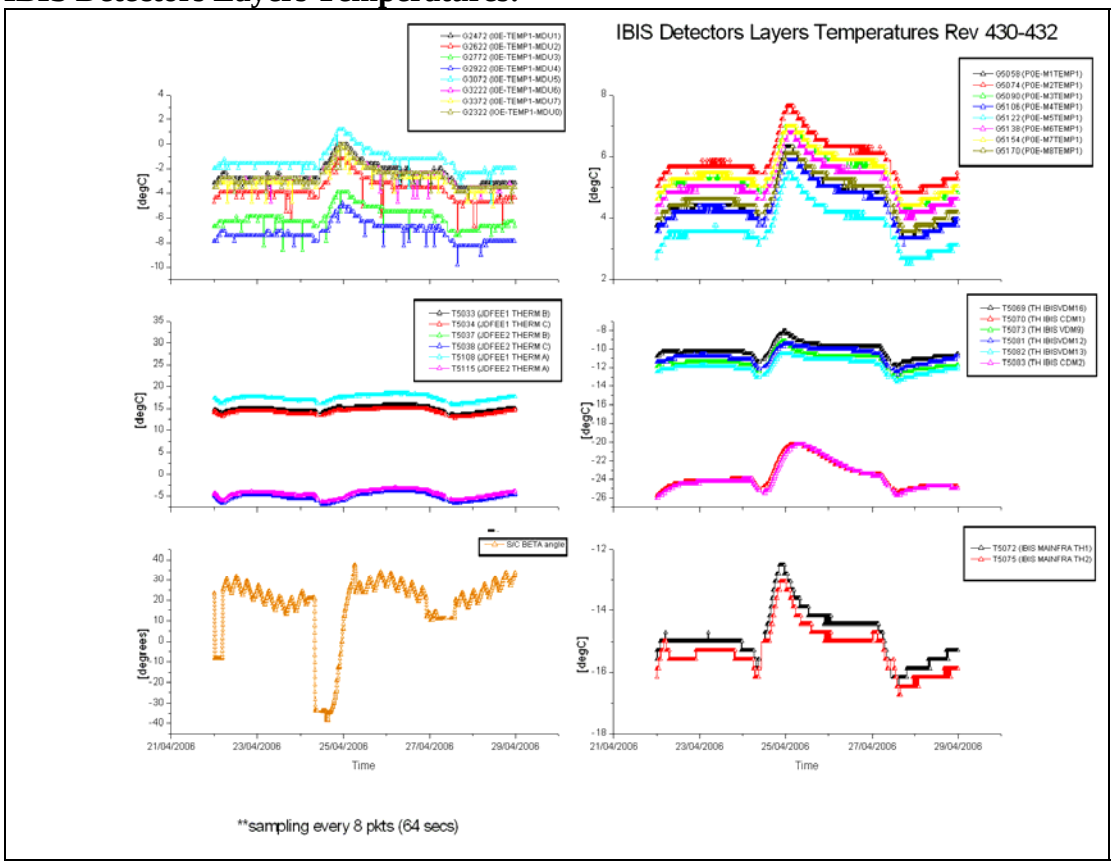
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2006.114 (24/04/2006):

Due to Command Verifier dying, ED GESTAN02 was manually uplinked at 05:18Z.

DoY 2006.114 (24/04/2006):

At 05:12Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 14:43Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

Inside the radiation belts, TM parameters G5013 (P0S-M3RTC2), G5022 (P0S-M5RTC1) and G5037 (P0S-M8RTC1) were toggling OOL high. According to P-CNT-1, no action was taken.

At 14:59Z, TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, as this happened inside radiation belts, no action was taken.

At 14:17Z, G2013 family was reported OOL High and back. As this happened in Radiation Belts, according to I-CNT-1, no action was taken.

DoY 2006.114 (24/04/2006): IBIS VETO CMD01 HV breakdown

At 14:51Z, VETO CDM #01 reported a high voltage break-down with the characteristic OEM ID 186 and TM parameter G6051 (V1S-CMD01HV) ~0V.
In addition the other TM parameters for CDM unit reported corrupted data: G6011 (V1S-CDM1TEMP) = 104.4degC and G6061 (V1S-CAL-COUNT) = 0/s. The reason for this is still to be understood.

The recovery was performed as indicated in FDIR action V-HV-1 and the unit was back operationally at 15:47Z (cf. INT_AR-148).

DoY 2006.116 (26/04/2006):

Due to Command Verifier dying, ED GESTAN02 was manually uplinked at 22:56Z.

DoY 2006.117 (27/04/2006):

At 04:54Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 14:26Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

At 13:59Z, TM parameter G2084 (I0E-OVFWPXADD-M6) failed SCC and back. At 14:05Z, TM parameter G2014 (I0E-OVFWPXADD-M1) failed SCC and back. According to I-OVF-1, as this happened inside radiation belts, no action was taken.

At 19:22Z, the LOW limit of parameter G6061 (V1S-CAL-COUNT) was changed from 1800 cnts/s to 1700 cnts/s on the IMCS due to frequent toggling of the parameter around 1800 cnts/s.

8.3.4 JEM-X Operations

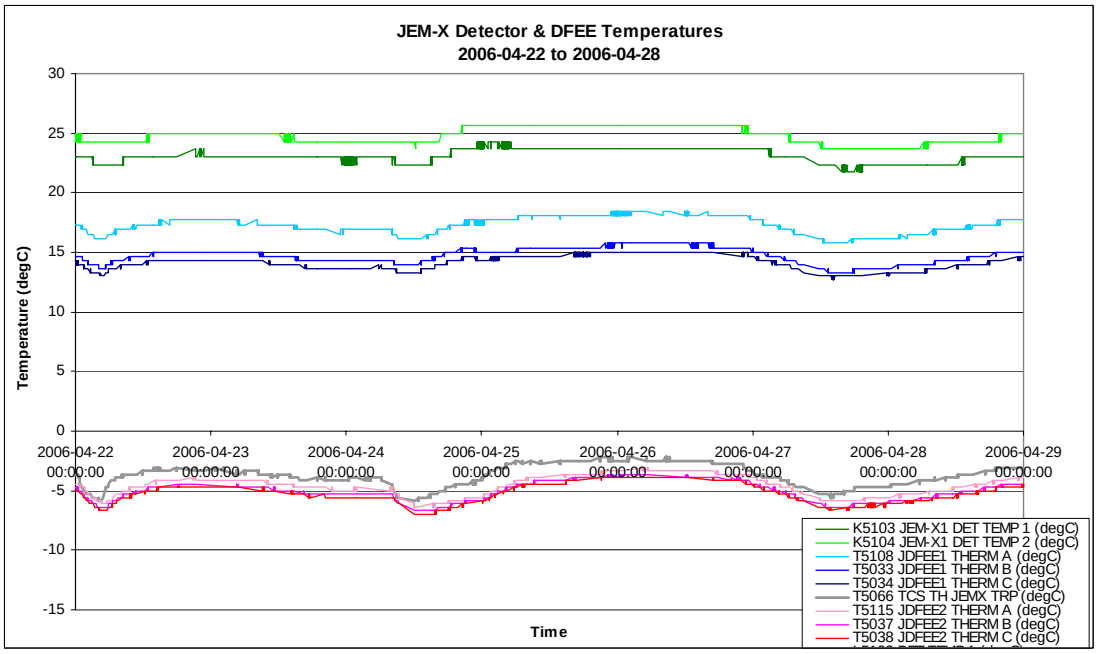
8.3.4.1 JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph[1].

[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 graph[2].



8.3.4.3 JEM-X Daily Report

2006-04-22 (DOY 112, Rev 430)

[2] Data sampled (1 frame in 8)

At 05:11Z, due a problem with the command verifier task of the IMCS, the TCs KU0014 and K0021 of the ED KEDATA02 (scheduled at 05:10:48Z) failed on-board acceptance verification and the TC K0011 STATE DATA TAKE failed release. Thus JEM-X1 remained in Setup mode until the IMCS was recovered and this ED was re-uplinked manually, at 05:43:58Z, returning JEM-X1 to Data Taking mode. JEM-X1 operations then continued nominally.

2006-04-23 (DOY 113, Rev 430) to 2006-04-25 (DOY 115, Rev 431)

Nothing to report

2006-04-26 (DOY 116, Rev 431)

Due to further problems with the command verifier task of the IMCS, the TCs KU0014 and K0021 of the ED KEDATA02 scheduled 22:31:00Z failed on-board acceptance verification and the TC K0011 STATE DATA TAKE failed release. Thus JEM-X1 remained in Setup mode until the verifier was restarted and this ED was re-uplinked manually, at 22:52:01Z, returning JEM-X1 to Data Taking mode. JEM-X1 operations then continued nominally.

2006-04-27 (DOY 117, Rev 431-432) to 2006-04-28 (DOY 118, Rev 432)

Nothing to report

8.3.5 OMC Operations

2006-04-22 (DOY 112, Rev 430)

From 00:46:31 until 03:39:31, an OMC Flat Field Calibration was performed, this was followed as usual by a Dark Current Calibration from 03:40:00 until 04:12:05, both calibrations were performed successfully.

2006-04-23 (DOY 113, Rev 430) to 2006-04-24 (DOY 114, Rev 431)

Nothing to report

2006-04-25 (DOY 115, Rev 431)

At 10:42, a software problem forced the suspension of the timeline, which was not recovered until 12:30. The impact was the loss of pointing 04310032, & 04310033, pointing 04310034 was executed nominally. Pointing 04310035 was interrupted when OR_0209 was executed.

2006-04-26 (DOY 116, Rev 431)

At 22:32, a crash of an imcs task caused the suspension of the timeline, the impact was the loss of pointing 04310092.

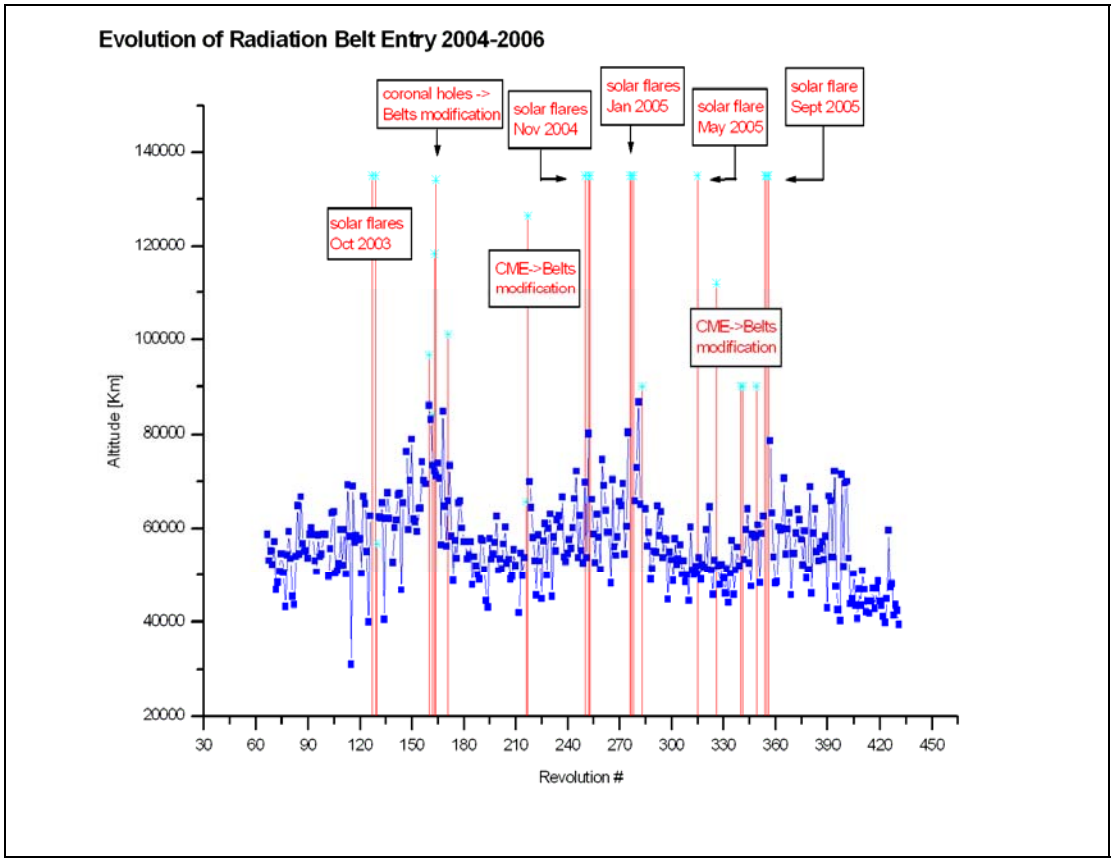
2006-04-27 (DOY 117, Rev 431) to 2006-04-28 (DOY 118, Rev 432)

Nothing to report

On DoY 114 at 05:12:02 and DoY 117 at 04:54:18 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

On 2006-04-28, the first forced IREM reset was performed to try to reduce the number of SEU affecting the unit. This activity will be run every 2 months during 6 months as a start. After that, the efficiency of this operation will be assessed and possible extensions will be discussed.

The activity took place as follows:

1. Radiation assessment with SEIS tool
2. At 09:03Z, power OFF of IREM with FCP_RM_9000
3. At 09:14Z, power ON of IREM with FCP_RM_0010
4. At 09:18Z, patch for IREM counters rescaling factors with FCP_RM_0080. A dump of memory after patch was performed between 10:12:43Z and 11:32:59Z.

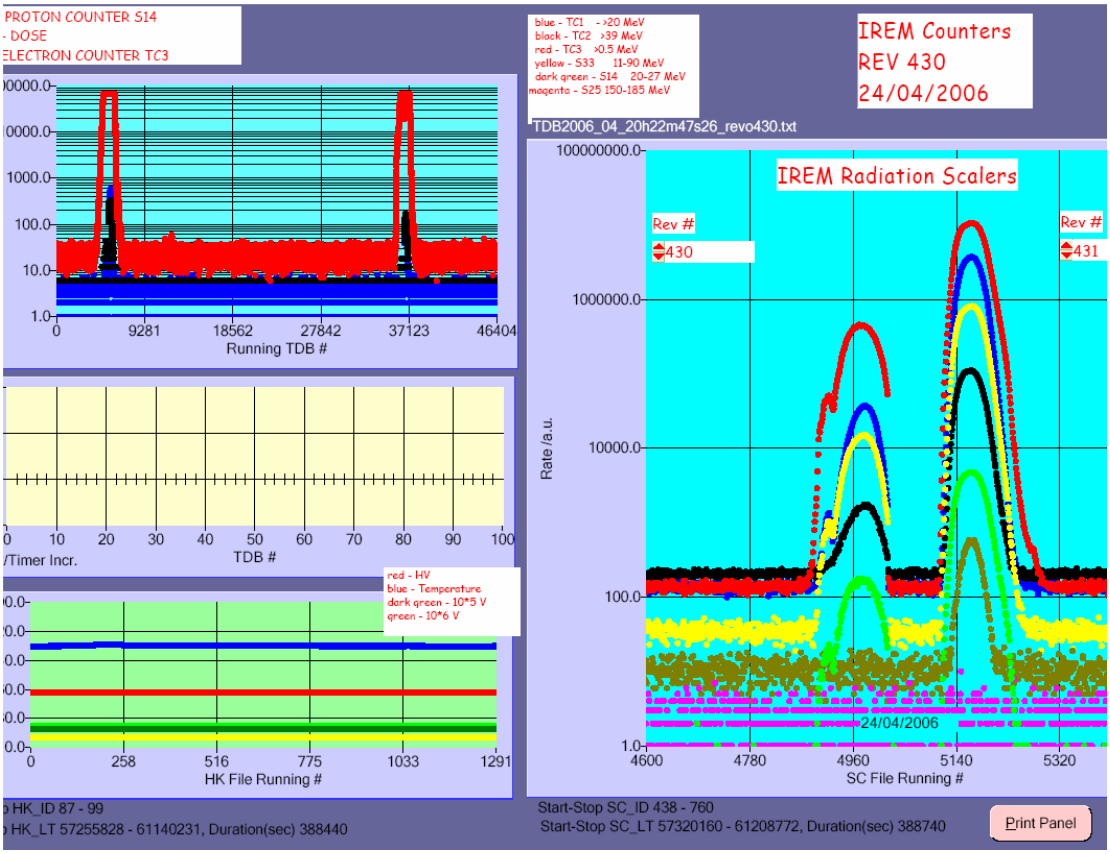
This operation did not affect the instruments as the DRMC flag was disabled.

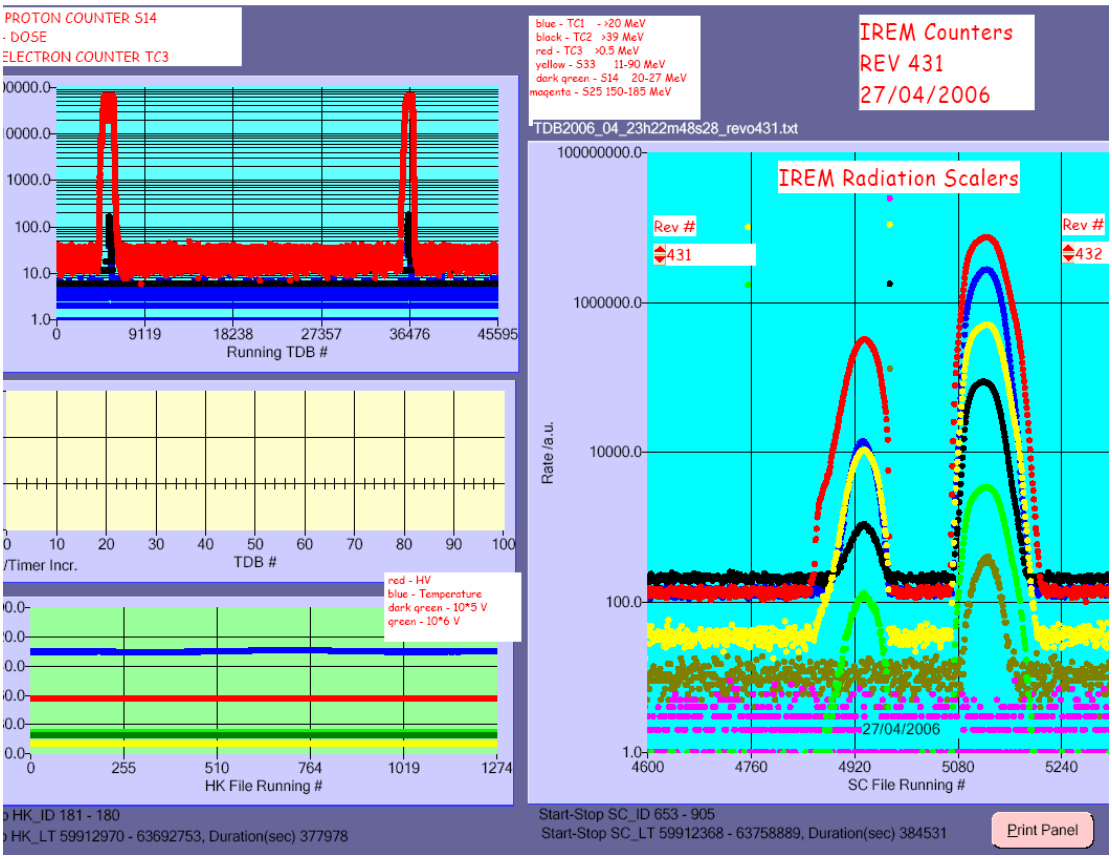
Electron Belts

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]
430	RAD_ENTR R 2006-04-24T05:12:01Z	2006-04-24 07:23:20	<42436.4	2006-04-24 06:37:08	48532
431	RAD_EXIT R 2006-04-24T14:30:19Z	2006-04-24 14:05:28	<<38145.4	2006-04-24 13:57:08	35158
431	RAD_ENTR R 2006-04-27T04:54:10Z	2006-04-27 07:26:33	<39473.8	2006-04-27 06:19:41	48757
432	RAD_EXIT R 2006-04-27T14:13:19Z	2006-04-27 13:21:53	<<39316.5	2006-04-27 13:49:41	36334

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

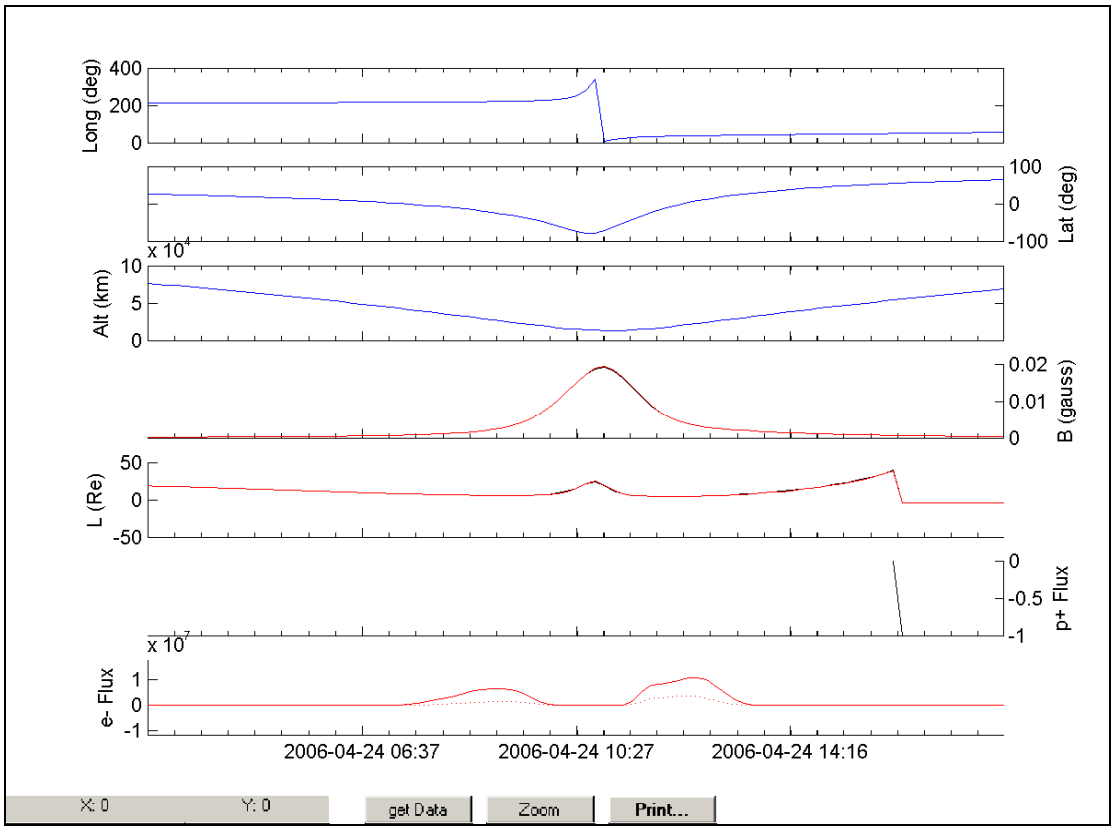
IREM radiation counters:



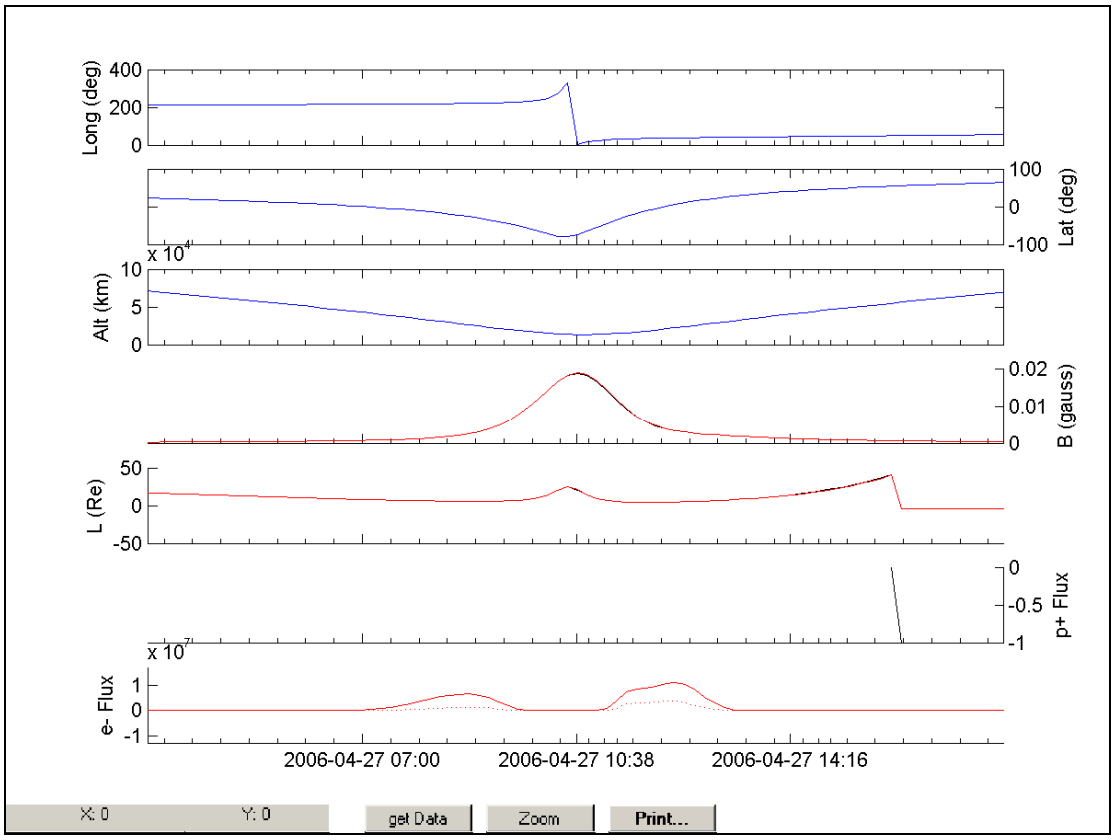


IREM Predicted Radiation Belt Passages:

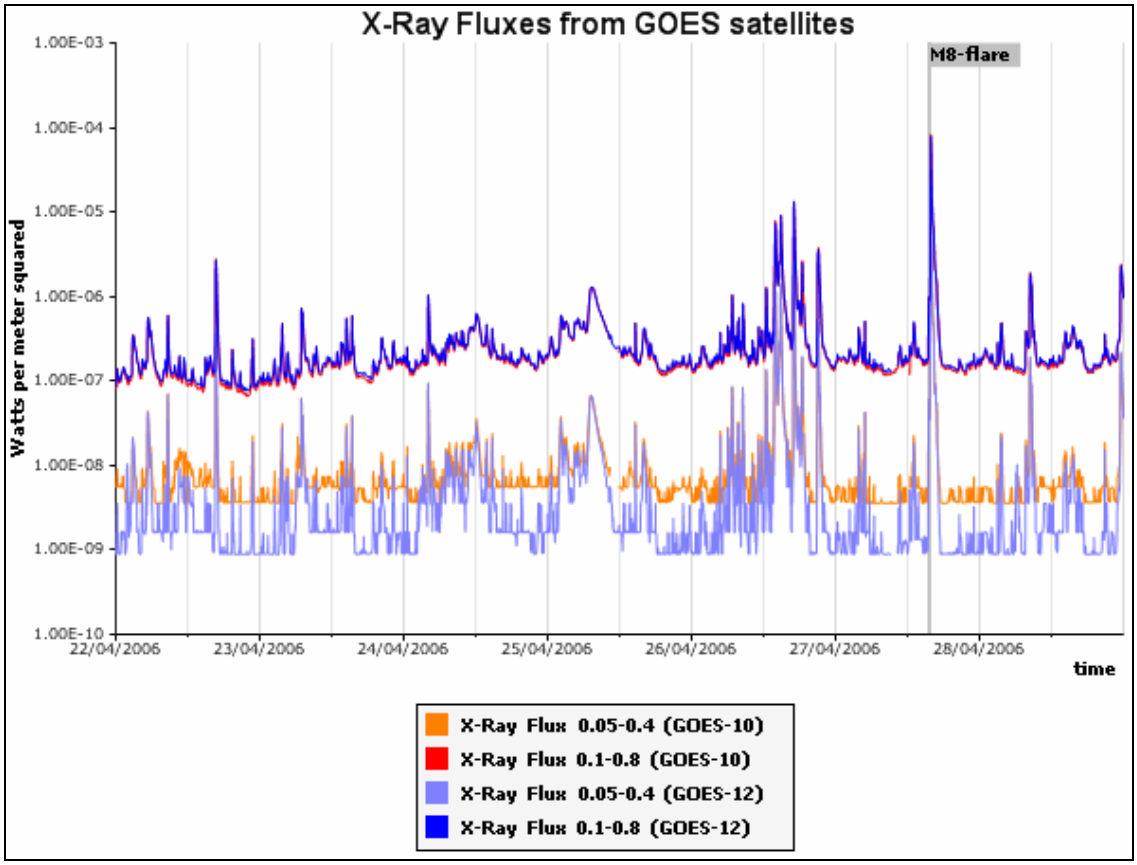
Rev 430



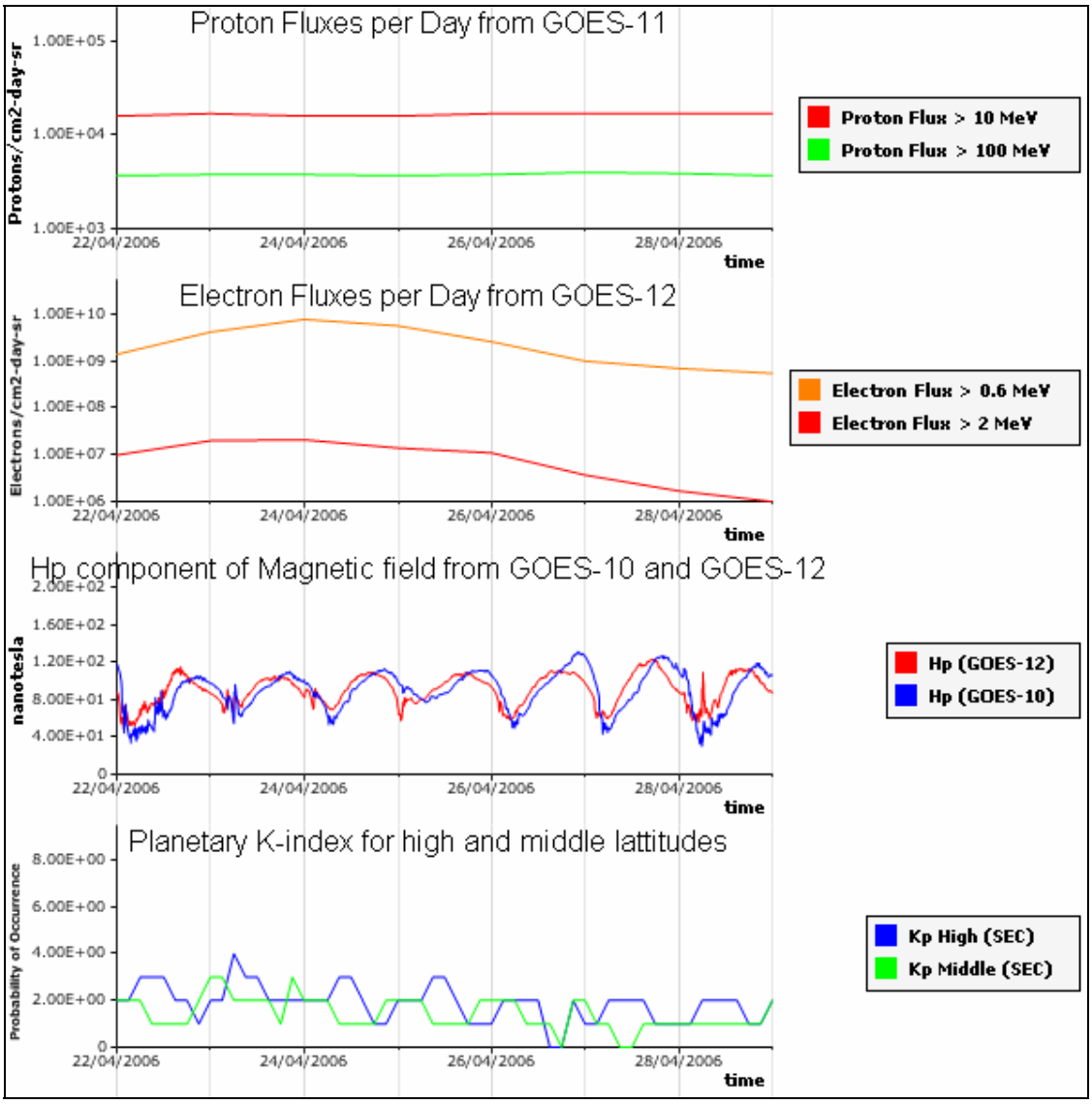
Rev 431



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.