

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 341
Week 14
06.04.09
Routine Phase

Prepared by: F.Schmidt (OPS-OAI) and INTEGRAL FCT

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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 28.03.09 until 03.04.09 (both dates inclusive) and covers the revolutions 788, 789 and 790.

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 GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), a raster dither of the Galactic disk, $l=-25$ (RA 16:27:14.74, DEC -48:57:19.9), a raster dither of the Galactic Center (RA 18:36:53.70, DEC -07:03:19.4), a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), a Galactic disk scan, a raster dither of the Galactic disk, $l=+25$ (RA 18:36:53.70, DEC -07:03:19.4) and a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

The summer 2009 eclipse passages were nominal from the AOCS point of view. In the same time frame were verified the AMD dead band value, the IMU timers, the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

Two slews were missed from TL, during the observation period, due to a problem on REDU station.

The fuel consumption over the period between 28/03/2009 and 03/04/2009 was 0.1181 Kg. The remaining propellant is in the order of 135.0470 Kg.

Note: Some more information concerning the AOCS operations and the fuel budget is provided in the Appendix.

3.1.2 Power

All the other units of EPS are 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 PST was over-subscribed by 3 packets, which were allocated to SPI during the Instrument window for the entire reporting period.

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

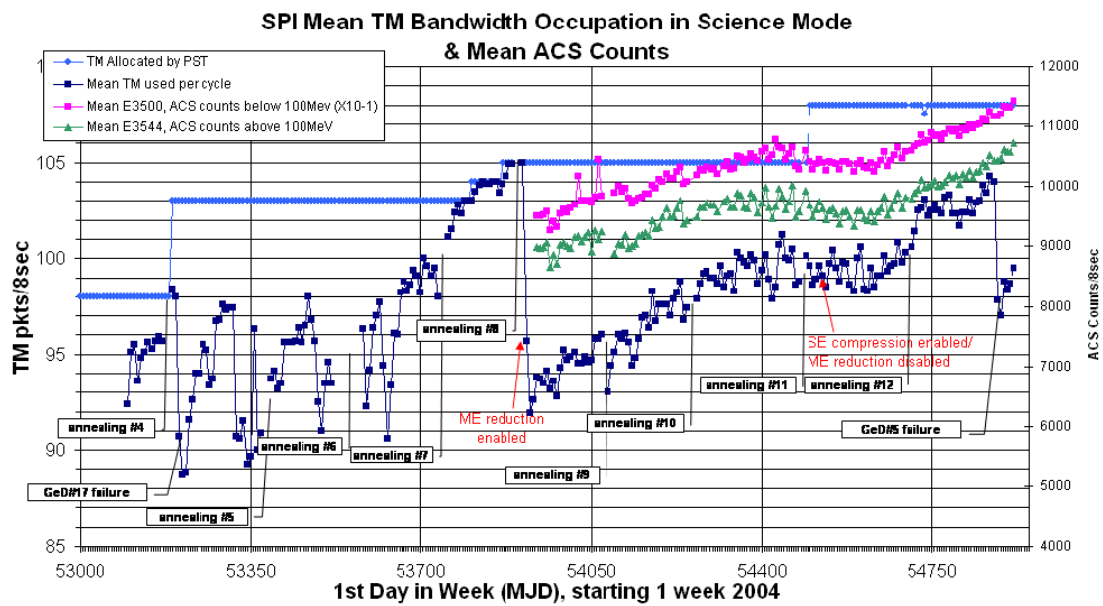
Following the 12th annealing, ended on 04/09/2008 at 23:50Z, the overall status of the gamma-ray spectrometer is nominal, except for detector #2 (failed since 06/12/2003); detector #17 (failed since 17/07/2004) and detector #5 (failed since 19/02/2009). The energy resolution of the previously degraded GeD#12 has improved following this annealing and the bias of this detector is now set to 4kV as for the other detectors.

The Stirling compressors are working nominally. The Germanium detectors temperature was kept in the range 80K $\pm$ 1K throughout the week.

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 108 packets/cycle and the average telemetry occupation was 99.5 packets/cycle.

Eclipse operations for SPI were executed nominally throughout the week.

The following plot shows the evolution of the assigned and the average occupation of the SPI TM bandwidth along with the mean ACS count rate evolution (since July 2006). As can be seen, there is a strong correlation between the evolution of the background as measured by the ACS and the overall TM bandwidth usage.



Note: Some more information concerning the SPI operations is provided in the Appendix 8.3.2.

3.2.2 IBIS

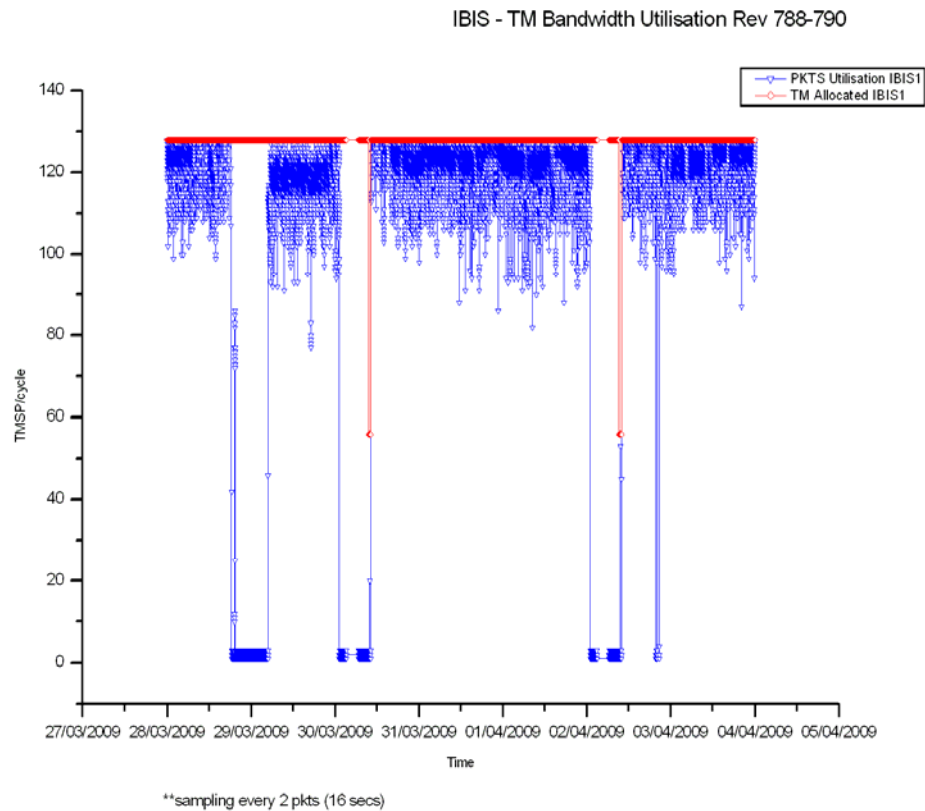
The overall status of the unit is nominal.

Eclipse operations for IBIS continued to be performed nominally during the reporting period.

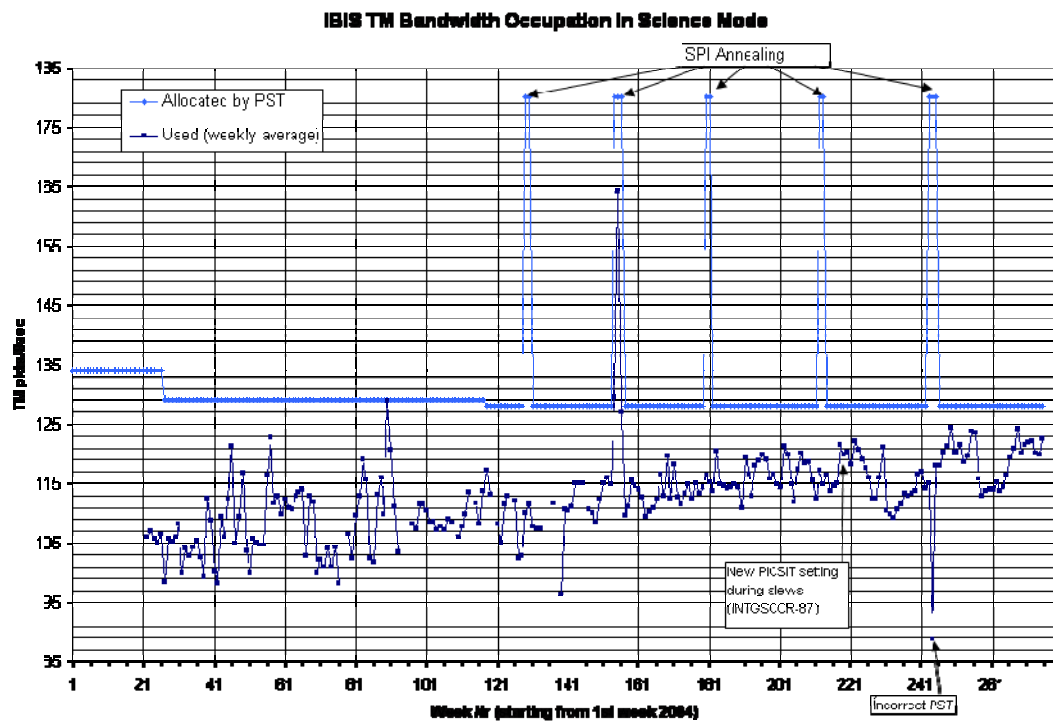
During the reporting period, the TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 128 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 122.65 packets/cycle (up 2.7 on previous week)
- Percentage of TM cycles in which full bandwidth (128 packets/cycle) was used: 29.38%

The plot below shows the IBIS TM utilisation during the reporting period.



A plot of the IBIS weekly bandwidth utilisation since 2004 is shown below:



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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

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

During this reporting period, 211 of the 215 planned science pointings were executed nominally, 2 were cut short and 2 lost.

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

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. The sun was blank all week. The risk of solar flares was very low.



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 good this week. The overall performance was over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. Two slews were not executed from the timeline on two occasions due to a drop in telemetry.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. On DoY 089 at 13:55z the VC-0 & VC-7 TM links dropped out from G/S REDU due to ongoing tests at REDU G/S. On DoY 091 at 07:03z a drop in VC-0 & VC-7 TM occurred from G/S: DSS24 for a few seconds. On DoY 093 at 03:01z the TM and TC links dropped out from G/S: DSS27 due to very high wind speed, DR# G109340. Aldo Miedan will investigate the possibility of delaying REDU maintenance in case of further slips of H-P launch, since the requested coverage of H-P from VIL2 could impact Integral in this period.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 793 to 797. The PSF for revolution 792 was updated to include a missing NEXT_ECLIPSE window.

New observations have been planned for revolutions 793 to 795. Due to the change in PSF for 792, observations have been replanned for revolutions 792 to 795.

New TSFs have been received for revolutions 791 to 794.

2. Observation status

ECS files have been received up to revolution 781 with 780 missing and processed up to revolution 778.

3. ISOC Science Data Archive

Data up to revolution 775 has been ingested, but recent revolutions are not yet available via the Web interface as this requires an update of the software by the archive team, expected in the coming weeks.

A meeting on plans for improvements has been scheduled for April 16.

4. ISOC system

Version V21.1 has been installed. Work on V22 is ongoing.

5. Problems

No new problems.

4.3.2 ISDC

Status of ISDC observation processing on 03/04/2009:

- Latest Standard Analysis completed: observation 06200620004 (1E 1547.0-5408, Revolution 772) on 28/03/2009.
- Latest products archived: observation 06200620004 (1E 1547.0-5408, Revolution 772) on 30/03/2009.
- Latest observation products sent to the observer: observation 06200620004 (1E 1547.0-5408, Revolution 772) on 30/03/2009.

5 Special Events

sun098 and xwn567 moved from E101 to E41, sun098 is now sun120.

Its17 and 18 configured on idda, backup policy to be verified.

LINUX MCS ongoing, problem areas detected so far: TDS, OL, WAIT mode commanding.

6 Anomalies

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

AR id	Date Created	Subject	Segment	Status
INT-3060	2009-03-28	IBIS - Erroneous Recovery after IREM SEU (DOY 087)	Payload	Pending
INT-3059	2009-03-30	REDU - on site testing caused TM & TC loss (DOY 089)	ESA Stations	Pending
INT_SC-249	2009-04-01	IBIS PICSIT PDM01 LATCH UP	Payload	Pending
INT_SC-250	2009-04-02	IREM Anomaly: Reset of IREM_CSCI S/W #72, 28/03/2009	Payload	Pending

7 Future Milestones

Eclipse season #14 finishes on 11/4/2009

From revolution 788 the CRIT_INST_ALT_ASC will be delayed by 30min. following the problem experienced last week during the instrument activation

Installation and configuration of MUSTI

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 788

The observations in revolution 788 began with a hexagonal dither of GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.5 hours. They continued with a raster dither of the Galactic disk, $l=+25$ (RA 18:36:53.70, DEC -07:03:19.4), lasting ~12.5 hours. This was followed by a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by another raster dither of the Galactic disk, $l=-25$ (RA 16:27:14.74, DEC -48:57:19.9), lasting ~12.5 hours. They continued with a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3), lasting ~21.3 hours, until the end of the revolution.

Revolution 789

The observations in revolution 789 began with a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. They continued with a raster dither of the Galactic Center (RA 18:36:53.70, DEC -07:03:19.4), lasting ~12.5 hours. This was followed by a Galactic disk scan, lasting ~33.1 hours, until the end of the revolution.

Revolution 790

The observations in revolution 790 began with a raster dither of the Galactic disk, $l=-25$ (RA 16:27:14.74, DEC -48:57:19.9), lasting ~12.5 hours. They continued with a raster dither of the Galactic Center (RA 18:36:53.70, DEC -07:03:19.4), lasting ~10.6 hours. This was followed by a raster dither of the Galactic disk, $l=+25$ (RA 18:36:53.70, DEC -07:03:19.4), lasting ~12.5 hours. This was followed by a Galactic disk scan, lasting ~14.5 hours. They continued with a hexagonal dither of GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.5 hours, until the end of the revolution.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 108; JEM-X1 8; JEM-X2 0; OMC 5.

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8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2009-03-15T09:05:28.000Z	135.4312	F	Automatic TM processing.
2009-03-16T17:52:12.000Z	135.3795	F	Automatic TM processing.
2009-03-18T08:57:52.000Z	135.3299	F	Automatic TM processing.
2009-03-19T17:49:32.000Z	135.2878	F	Automatic TM processing.
2009-03-21T08:45:05.000Z	135.2742	F	Automatic TM processing.
2009-03-22T18:19:09.000Z	135.2533	F	Automatic TM processing.
2009-03-24T08:28:25.000Z	135.2450	F	Automatic TM processing.
2009-03-25T17:08:28.000Z	135.2214	F	Automatic TM processing.
2009-03-27T08:15:20.000Z	135.2095	F	Automatic TM processing.
2009-03-27T10:51:21.000Z	135.1972	F	Automatic TM processing.
2009-03-28T16:54:12.000Z	135.1651	F	Automatic TM processing.
2009-03-30T01:44:00.000Z	135.1157	F	Automatic TM processing.
2009-03-30T08:02:24.000Z	135.0996	F	Automatic TM processing.
2009-03-31T16:34:12.000Z	135.0655	F	Automatic TM processing.
2009-04-02T07:50:00.000Z	135.0470	F	Automatic TM processing.

This report was generated Fri Apr 3 08:00:10 GMT 2009

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, 28/03/2009 – 03/04/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 143 Open Loop Slews, 83 Closed Loop Slews and 6 Momentum Biases were executed (as reported by ACC OEM).

2 slews (1 OSL, 1 CSL) were missed from TL, during the observation period, due to a problem on TM links at REDU station.

This is equivalent to $\sim 0.9\%$ of the total number of slews planned (227).

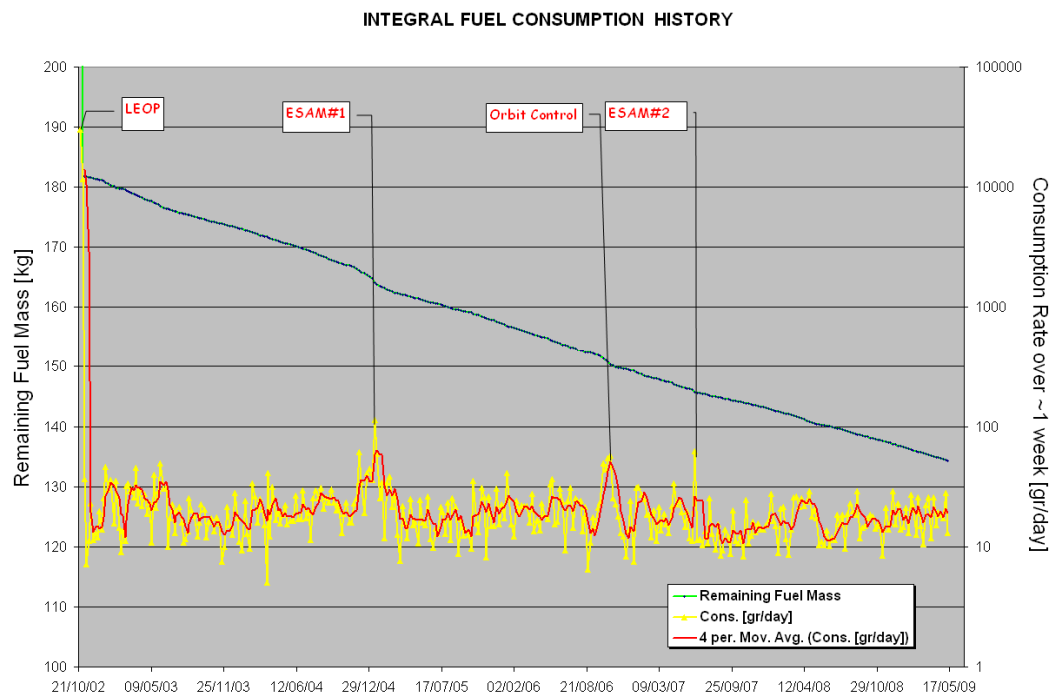
The OTF was not reached during part of PID 07900032.

Orbit Control

No update.

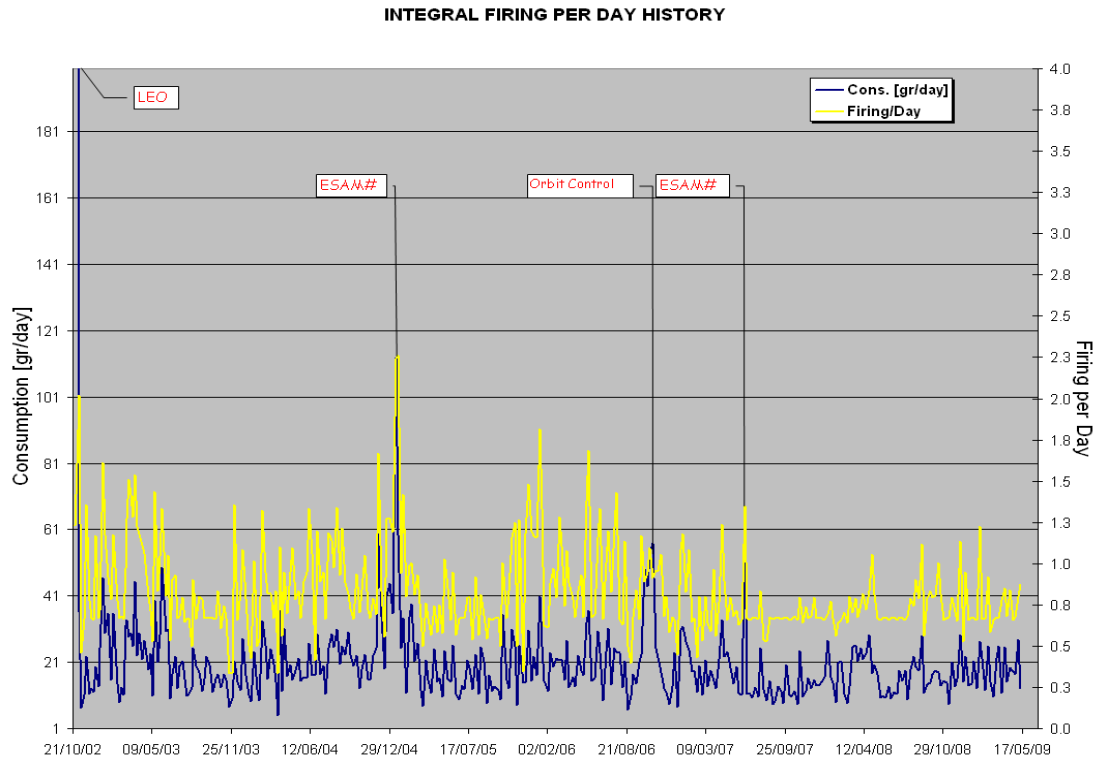
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 03/04/2009 is reported in the plot below.



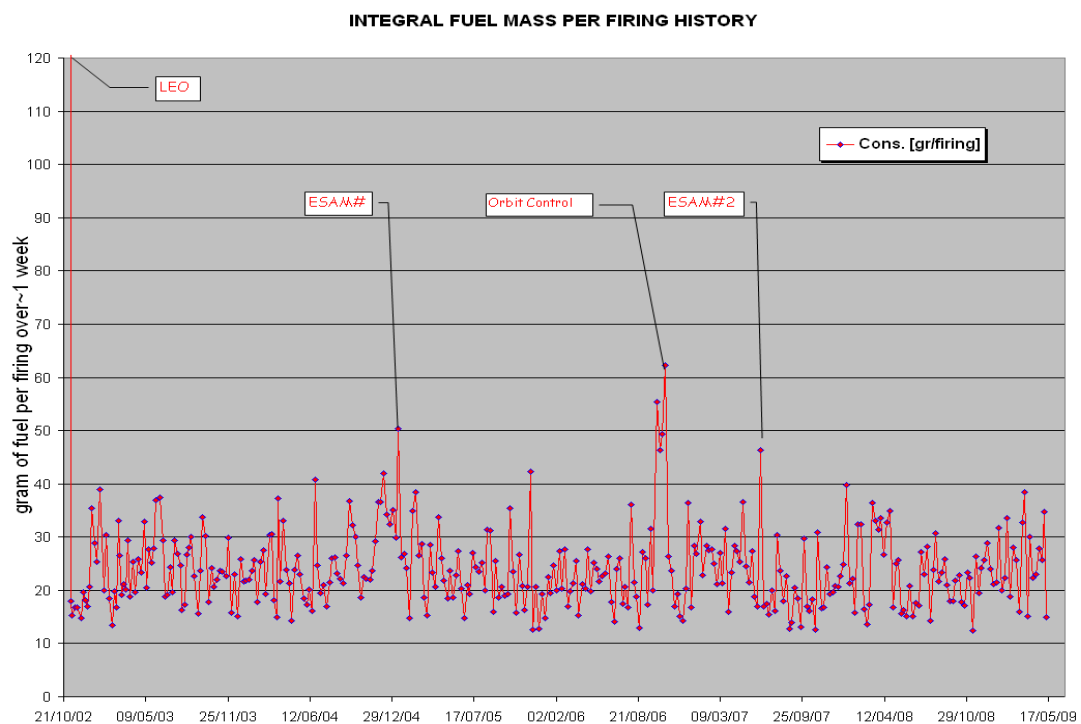
The above plot considers the ESAM fuel consumption spread over period of ~ 1 week.

The firing per day over the period between 01/11/2002 and 03/04/2009 is reported in the plot below.



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

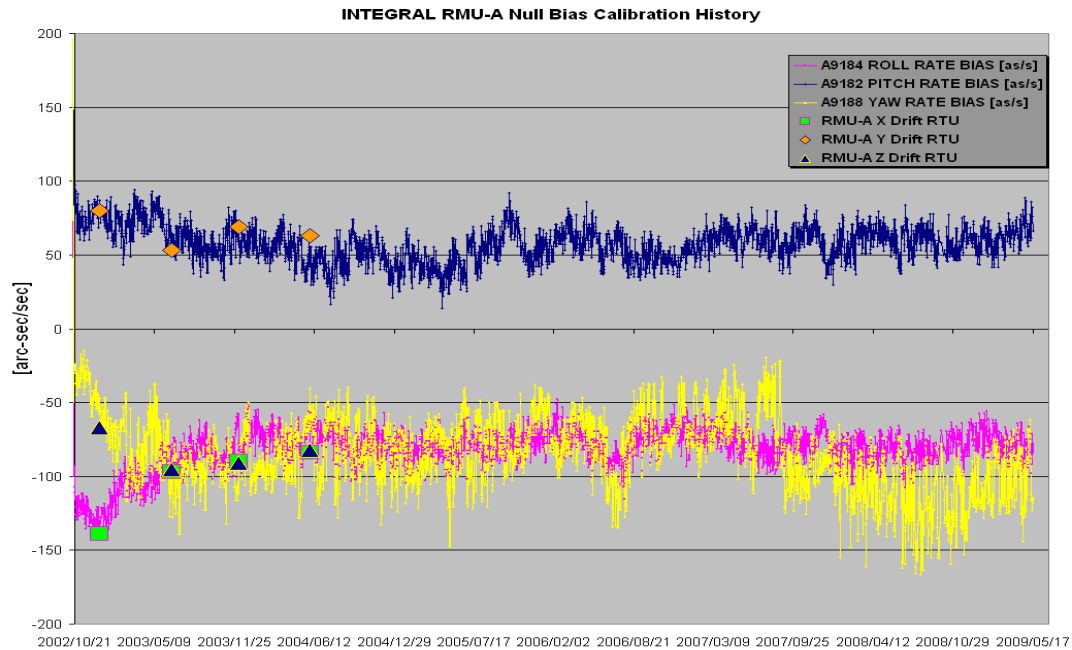
The fuel per firing over the period between 01/11/2002 and 03/04/2009 is shown in the plot below.



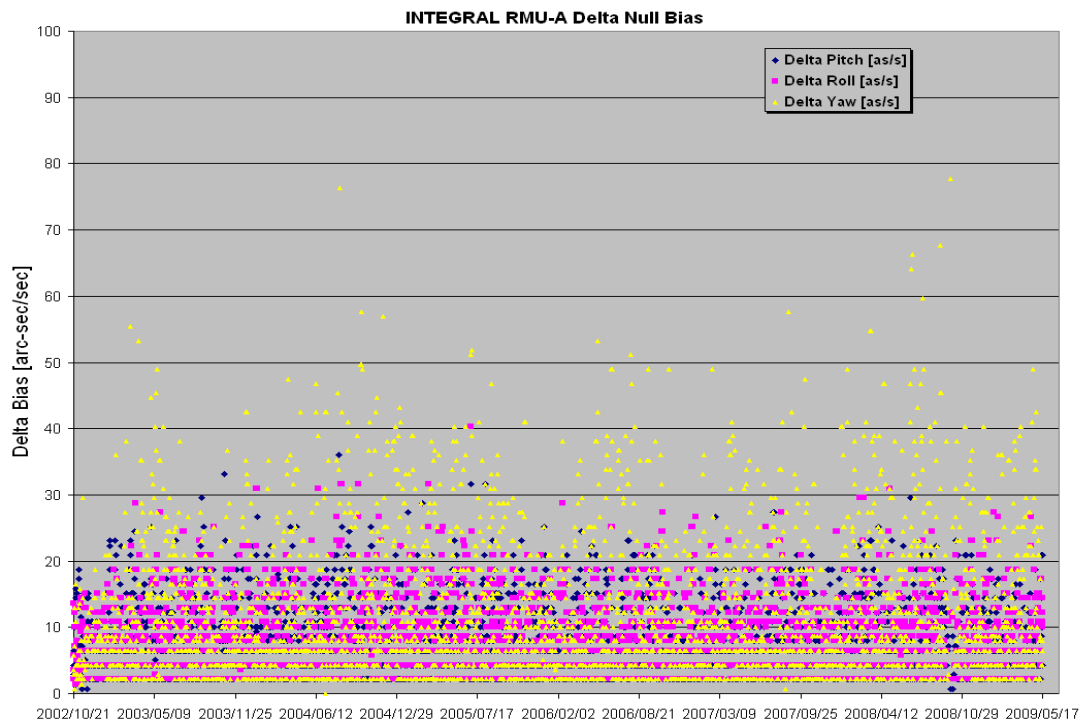
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 03/04/2009 is reported in the plot below.

The evolution of the drift on yaw channel is under constant monitoring but the values are still well within the specs. At moment the current constraints (for drift update generation) on the FDS have been relaxed to cope with the current situation.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over period between 01/11/2002 and 03/04/2009 is reported in the plot below.



28/03/2009 (Day of Year 087, Revolution 788)

Nothing to report.

29/03/2009 (Day of Year 088, Revolution 788)

Nothing to report.

30/03/2009 (Day of Year 089, Revolution 788-789)

The <<Summer>> 2009 eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 785-786:

INPUT		AOCS ECLIPSE MONITORING		Revolution:	788
		Summer 2009		Date:	30/03/2009
				DoY:	89
Penumbra Start	30/03/2009 03:12:43	Penumbra Start:	30/03/2009 03:12:43	LOS:	30/03/2009 03:17:00
Penumbra End	30/03/2009 04:02:08	Umbra Start:	30/03/2009 03:13:48	AOS:	30/03/2009 06:44:00
Umbra Start	30/03/2009 03:13:48	Umbra End:	30/03/2009 04:01:22		
Umbra End	30/03/2009 04:01:22	Penumbra End:	30/03/2009 04:02:08		
ACC Sample Time	29/03/2009 14:07:12	Eclipse Duration:	0:49:25		
FDE Sample Time	29/03/2009 14:07:12	Eclipse Duration [sec]:	2965		
FCE Sample Time	29/03/2009 14:07:12	IMU Health Check Start	29/03/2009 23:57:00		
ACC Eclipse Counter:	194618	Eclipse Imminent Flag	30/03/2009 02:13:03		
ACC Eclipse Start:	240687	ACC IMU Auto Cal Start	30/03/2009 02:27:29		
ACC Eclipse End:	245294	ACC IMU Auto Cal End	30/03/2009 02:47:29		
FDE Eclipse Start:	241106	Sun out of FSS FoV	30/03/2009 03:13:35		
FDE Left to Eclipse Start	46626	Sun back in FSS FoV	30/03/2009 04:01:30		
FDE Eclipse Duration:	3708				
FCE Eclipse Start:	241150				
FCE Left to Eclipse Start:	46670				
FCE Eclipse Duration:	3664				
		Eclipse Timers			
		From Loaded Timers		Actual From Telemetry	
		Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]
		ACC Eclipse Start	30/03/2009 02:55:01	-1062.00	30/03/2009 02:55:00
		FDE Eclipse Start	30/03/2009 03:04:18	-505.00	
		FCE Eclipse Start	30/03/2009 03:05:02	-461.00	
		From Loaded Timers		Actual From Telemetry	
		Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]
		FCE Eclipse End	30/03/2009 04:06:06	238	
		FDE Eclipse End	30/03/2009 04:06:06	238	
		ACC Eclipse End	30/03/2009 04:11:48	580	30/03/2009 04:11:48
		IMU	Uplink	Execution	WRT Penumbra End [sec]
		IMU Auto Off Enable	29/03/2009 02:57:00	30/03/2009 04:14:01	713
		IMU On	29/03/2009 23:59:20	IMU H/C Noise Roll [as/s]	0.1897
		IMU Off	30/03/2009 04:14:01	IMU H/C Drift Roll [as/s]	0.2650
		IMU On Time	4:14:41	IMU Auto Cal Drift Roll [as/s]	0.3248

Problem at REDU station: at 13:55z a problem on TM links at REDU station caused the slew ID 07890009 to fail release.

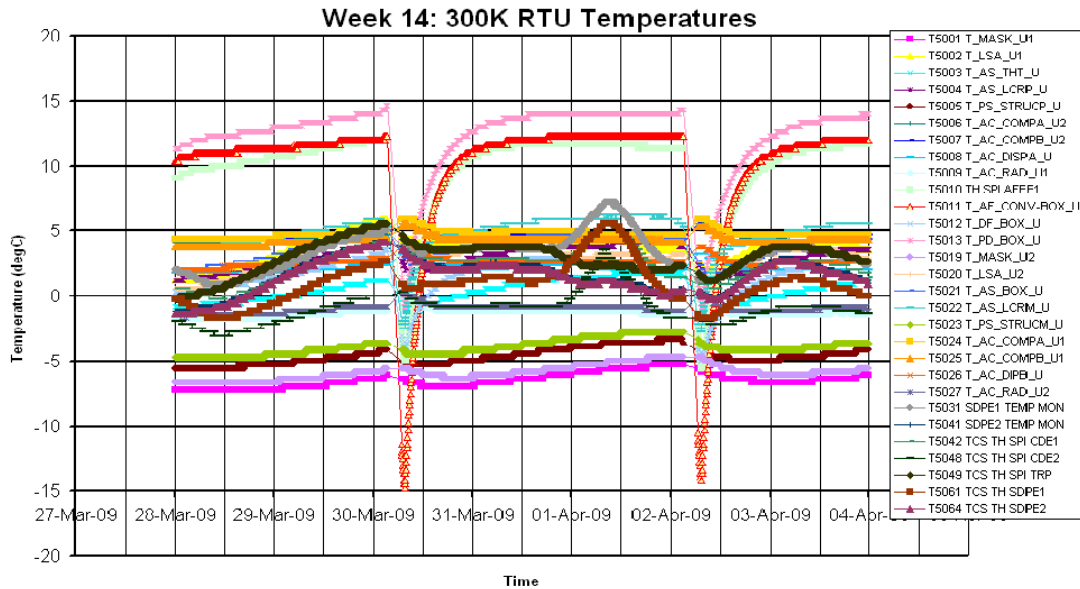
After the TM link was back a manual recovery was performed from the attitude of PID 07890008 to the attitude of PID 07890010. The next slew ID 07890011 was manually updated in TL.

The AOCS s/s was enabled in TL at 14:48z.

The following slews were missed in TL: PID 07890009 (OSL) -10 (CSL)

8.3.2 SPI Operations

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



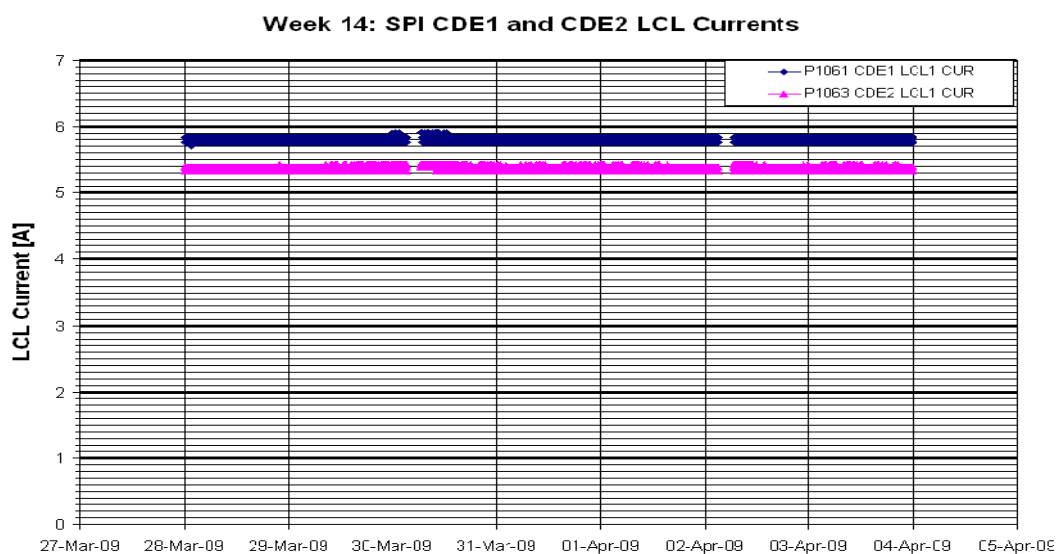
Stirling Compressors and Cryostat: The performance of the compressors is nominal.

The cold plate temperature was maintained in the range 80K +/-1K.

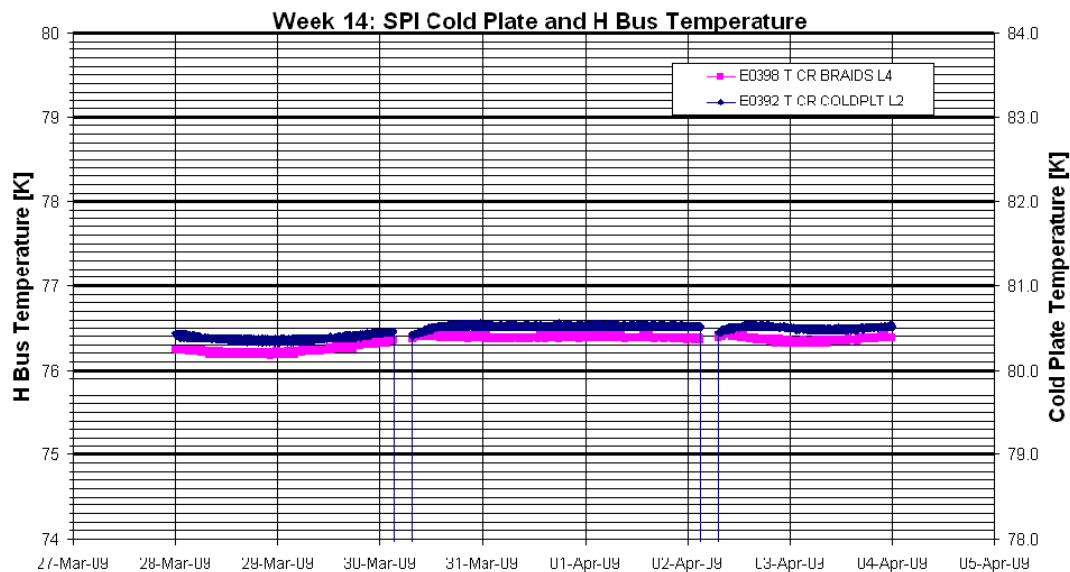
The stroke of all four compressors was set to 43 throughout the week and the average CDE LCL currents were as follows:

- CDE1 LCL Current = 5.81A
- CDE2 LCL Current = 5.37A

The following plot shows the evolution of the CDE LCL currents during the reporting period.



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 are nominal.

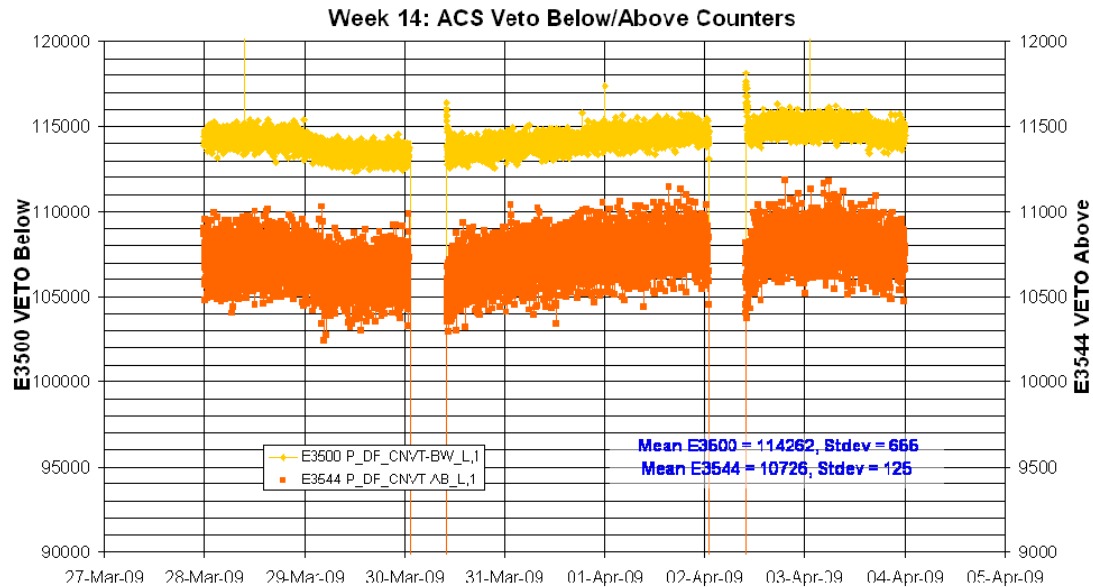
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 99.5 packets/cycle over the science window when the TM allocation was 108 packets/cycle.

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

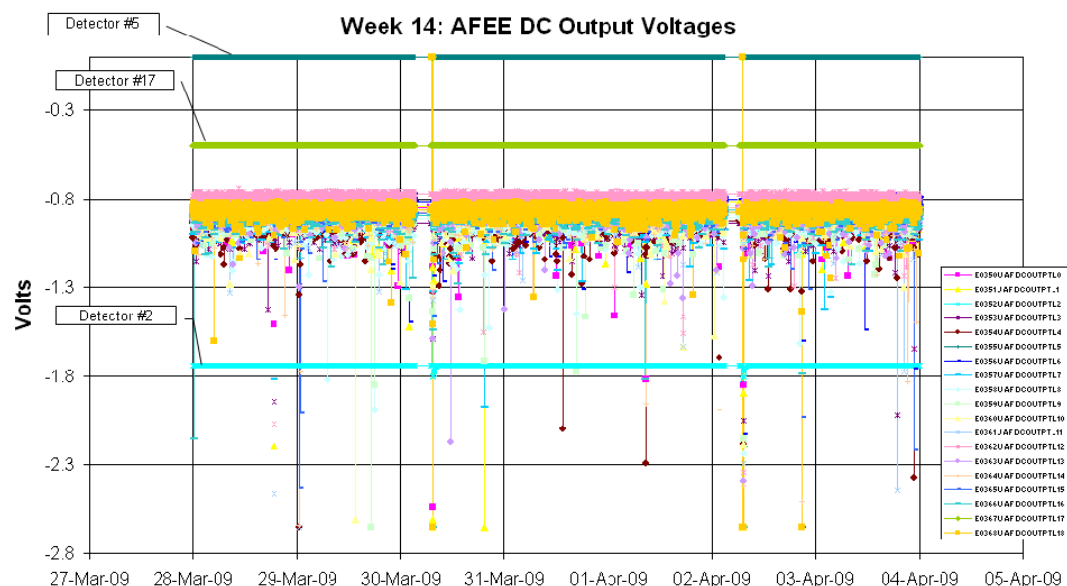


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

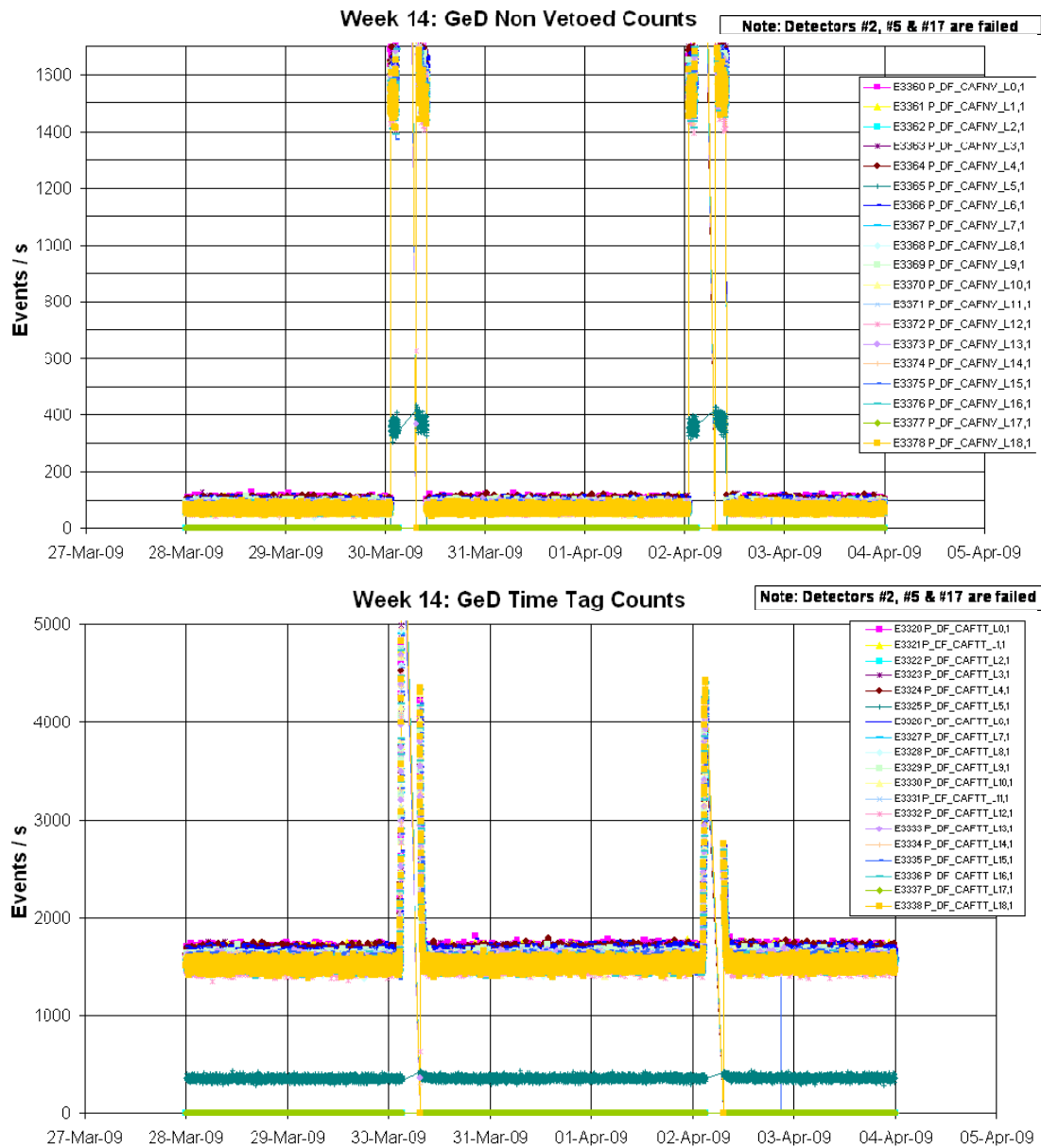
The following plot shows the ACS overall count rate evolution during the reporting period:

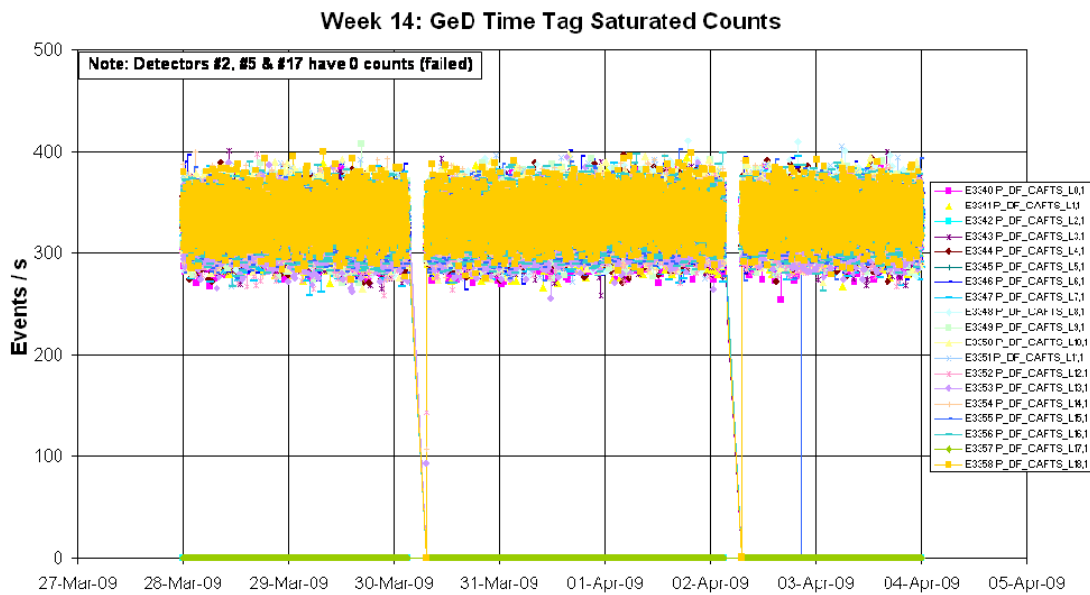


AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003; detector #17 is failed since 17/07/2004 and detector #5 is failed since 19/02/2009. The HV of the failed detectors are set to 0.5kV.

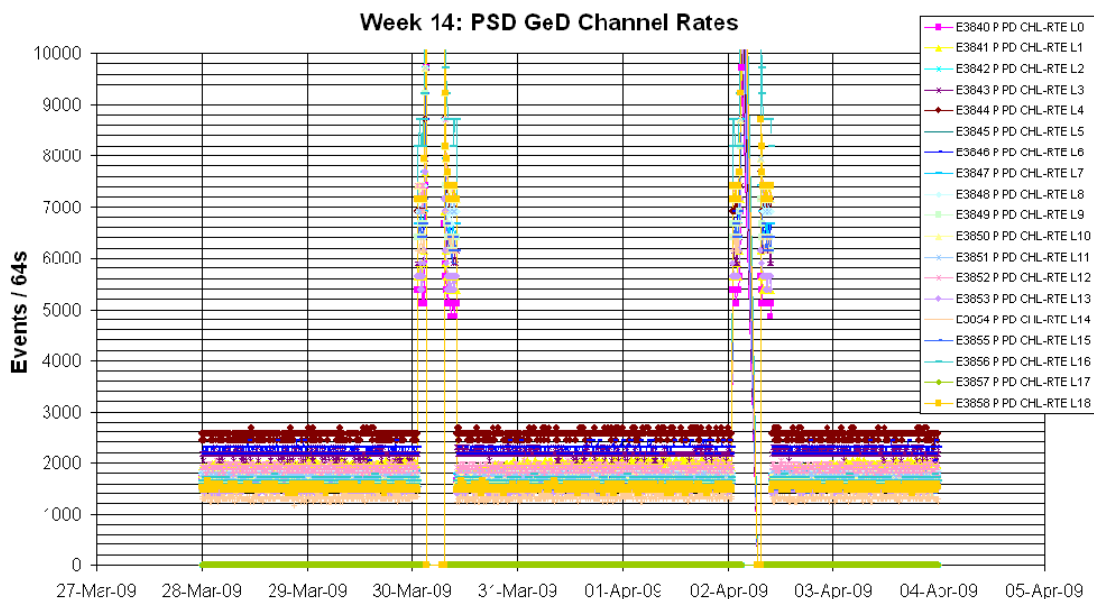


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoes, Time Tag and Time Tag Saturated Event count rates during the reporting period.





PSD: The health of the unit is nominal. The following plot shows the PSD channel rates during the reporting period. The failed detectors (GeD#2, GeD#5 and GeD#17) are disabled in the PSD.



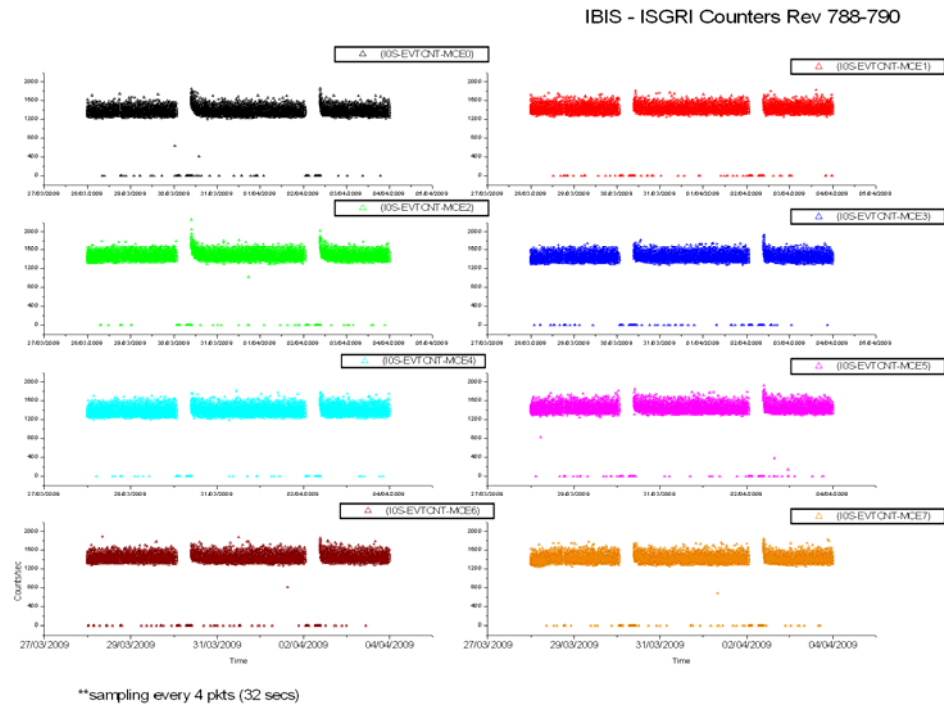
Event Log:

- Due to continuing high radiation after the expected radiation belt exit of revolutions 789 and 790, TM parameter E3500 (ACS CntVetoBelow) was OOL High for ~10 minutes after radiation belt exit of these revolutions. In each case it returned within limits of its own accord and no action was taken.
- On 2009-04-02 at 12:22:46Z TM parameter E2017 went OOL (value = NO EXIST VAL). This is the ACS FEE HV status #15. The report sequence FCP_SPI1_1831 SPI REPORT ACS HK DATA was executed and the parameter returned within limits at 12:32:48Z.

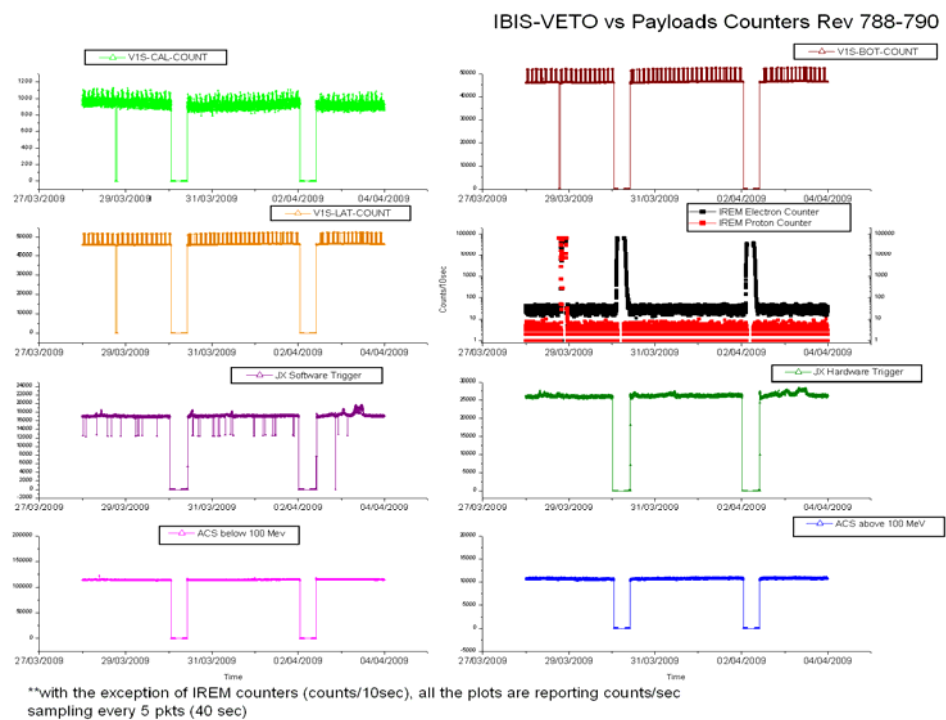
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:

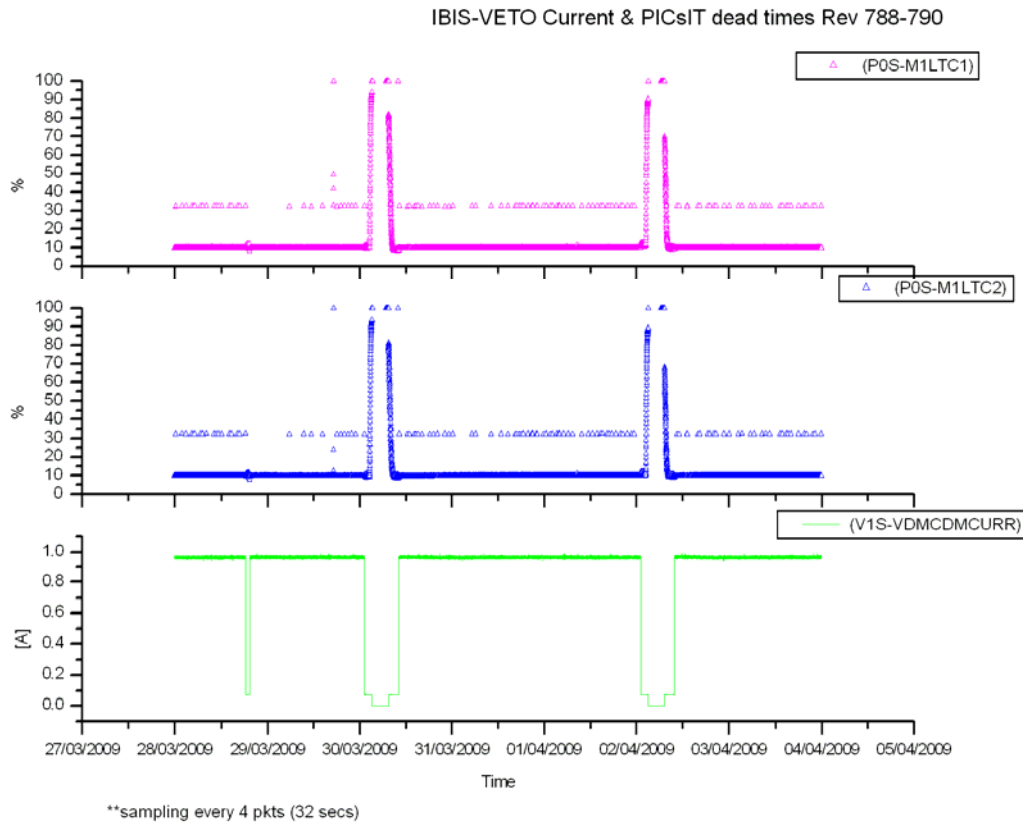


VETO vs Payload Counters:

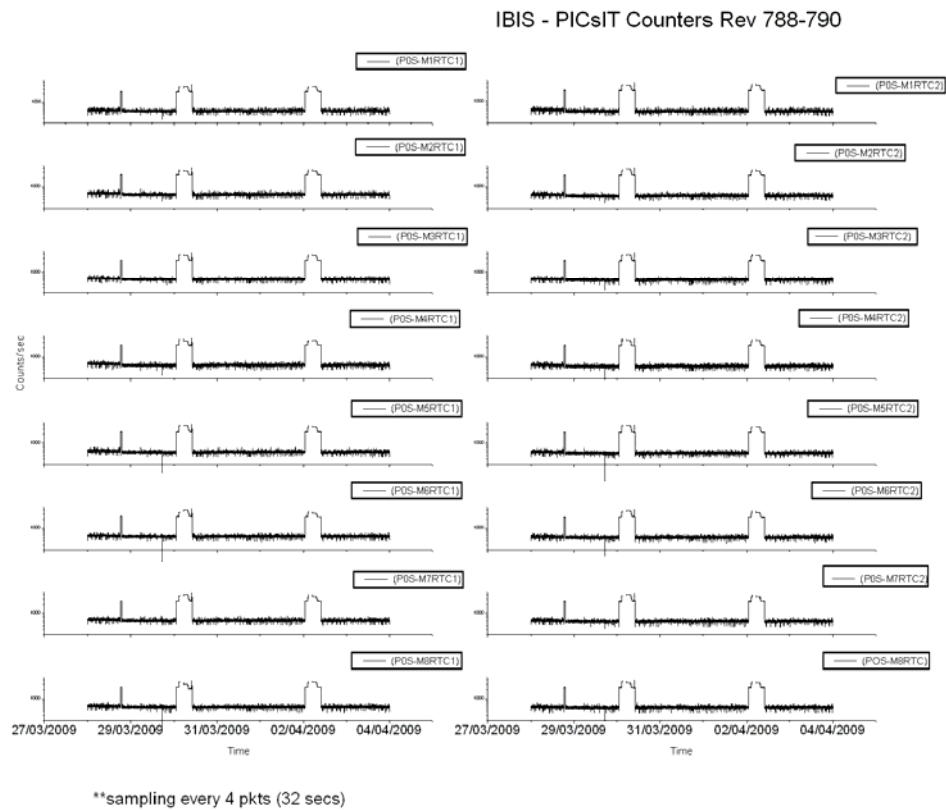


The background radiation level was low during the week.

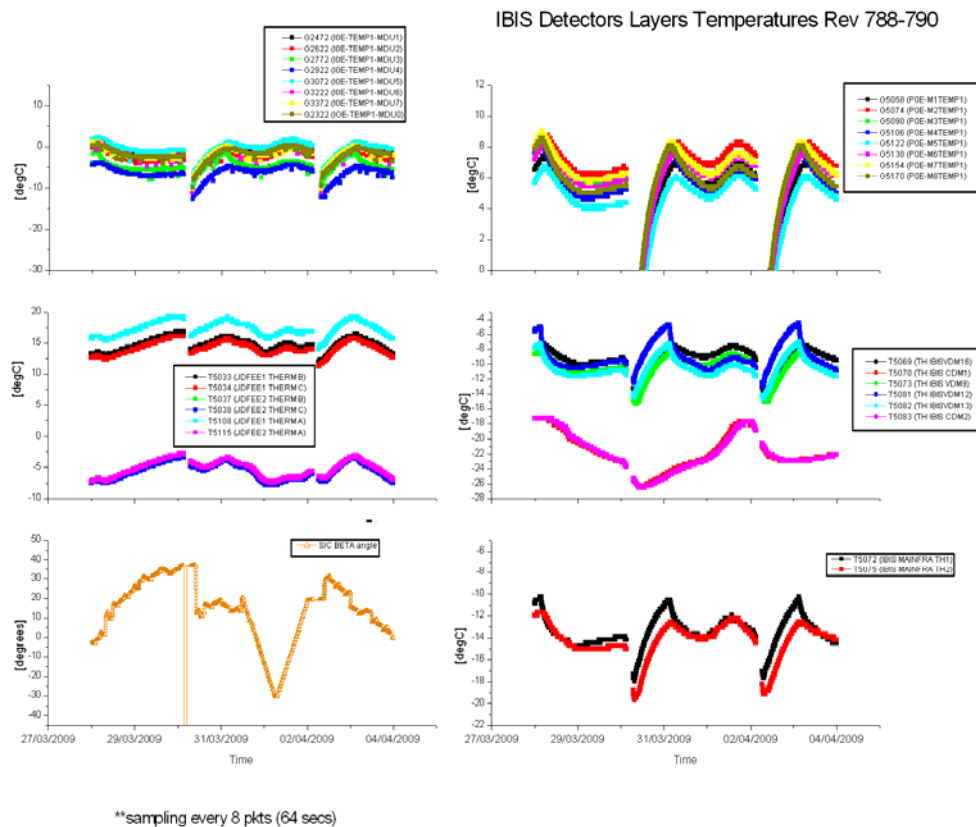
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report:

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

TM parameter G6061 went OOL Warning Low several times during the week. This is the VETO calibration counter. As in each case it returned within limits of its own accord at the next TM cycle, no action was taken.

2009-03-28 (DOY 087, Rev 788)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 18:24:45Z. The first part of the recovery, FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE, was performed at 19:11:56Z, however the ED GESTAN02 to return IBIS to Science mode was missed (N.B. parallel recovery operations were ongoing with XMM at the time). This was not noticed until the following day and therefore IBIS remained in Standby mode for the rest of the day.

2009-03-29 (DOY 088, Rev 788)

When the missed ED GESTAN02 from the previous day was noticed, this was uplinked at 04:54:17Z with the planned observation parameters. IBIS operations continued nominally. This anomaly is detailed in Anomaly Report INT-3060.

At 17:10:53Z the TM parameters families G5002 and G5003 for the PDM semi-module counters went OOL Low. As they returned within limits of their own accord at 17:11:04Z, no action was taken.

2009-03-30 (DOY 089, Rev 788-789)

At 00:28:32Z TM parameter G2013 went OOL Low (value = 0). This is the number of events triggering the MCE0 per second. As it returned within limits of its own accord at 00:31:12Z, no action was taken.

2009-03-31 (DOY 090, Rev 789) to 2009-04-01 (DOY 091, Rev 789)

IBIS operations executed nominally.

2009-04-02 (DOY 092, Rev 789-790)

At 19:41:20Z TM parameter G5045 (PDM3: on/off status) went OOL (value = OFF), indicating that PICsIT PDM03 had switched OFF. At the same time, OEM APID 1280 ID 170 EXCEPTION IBIS1 PICSIT LATCHED UP MODULE NOTIFICATION was received. In order to recover, a restart of PDM03 was performed as follows:

- 19:53:47Z FCP_IBIS1_0313 (IBIS transition to StandBy)
- 19:57:24Z FCP_IBIS1_0319 PICSIT PDM3 OFF
- 20:01:19Z FCP_IBIS1_0105 PICSIT PDM3 Activation, step 3.3 only (heater configuration left unchanged)
- 20:04:11Z FCP_IBIS1_0083 to re-enable PDM3 (parameter for PDM3 set to ON, all others populated by dynamic default)
- 20:11:23Z ED GESTAN02 re-uplinked with the planned observation parameters to return IBIS to Science Standard mode.

IBIS operations continued nominally. This is recorded as AR INT_SC-251.

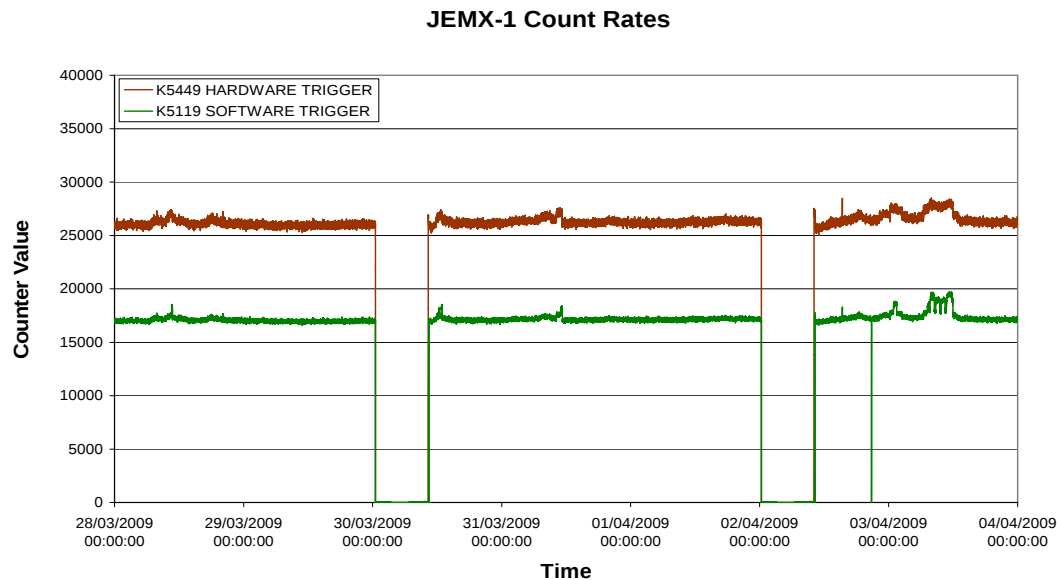
2009-04-03 (DOY 093, Rev 790)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

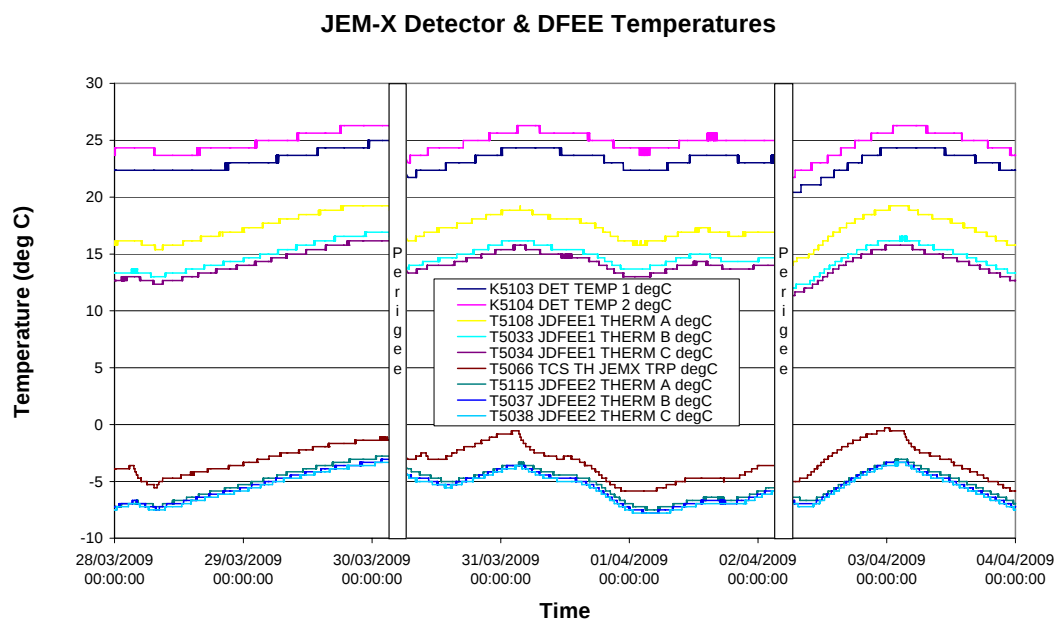
JEM-X Count Rates

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



JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph².



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

² Data sampled (1 frame in 8)

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JEM-X Daily Report

2009-03-28 (DoY 087, Rev 788)

At 18:25:17 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#72). There was no impact as the reaction has been disabled.

At the indicated times, the following OEMs were received:

2009.087.18.51.36.986	2009.087.18.51.39.921	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.030	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.032	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.033	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.034	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.034	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.087.18.51.36.986	2009.087.18.51.40.035	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535	PR N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	5336				

No action was taken, and there was no impact.

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2009-03-29 (DoY 088, Rev 788)

At the indicated times, the following OEMs were received:

2009.088.02.34.41.005	2009.088.02.34.42.092	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.139	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.140	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.141	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.142	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.142	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.088.02.34.41.005	2009.088.02.34.42.143	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	5336				

No action was taken, and there was no impact.

2009-03-30 (DoY 089, Rev 788-789)

At 00:32:18, TC KU0014 terminated with status AFFECTED, at 00:32:25, this changed to UNVERIFIED.

At 07:21:06, TM parameter K5317 exceeded hard limits.

No action was taken, and there was no impact on either occasion

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2009-03-31 (DoY 090, Rev 789)

At the indicated times, the following OEMs were received:

2009.090.02.21.05.142	2009.090.02.21.07.139	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.156	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.157	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.158	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.159	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.159	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	4989				
2009.090.02.21.05.142	2009.090.02.21.07.160	1536	RealTime	5		ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR	N
E E						
FIX6		0				
K9079	MESS CLASS	2				
K9080	MESS ID	5				
K9074	TASK ID 16	12				
K9067	LOGICAL ADDRESS	5336				

No action was taken, and there was no impact.

2009-04-01 (DoY 091, Rev 789)

JEM-X 1 operations executed nominally.

2009-04-02 (DoY 092, Rev 789-790)

At 07:02:40, TM parameter K5317 exceeded hard limits.

No action was taken, and there was no impact

2009-04-03 (DoY 093, Rev 790)

JEM-X 1 operations executed nominally.

8.3.5 OMC Operations

2009-03-28 (DoY 087, Rev 788)

At 18:24:34, OMC was sent to SAFE mode by an IREM SEU (#72). A recovery was performed, and at 19:02:46 the unit was returned to Stand-by. Science operations resumed at 19:22:41. The impact was the interruption of pointing 07880056 after 325 from a planned 1800 seconds, and the loss of pointing 07880057.

2009-03-29 (DoY 088, Rev 788)

Nothing to report.

2009-03-30 (DoY 089, Rev 788-789)

At 13:55, testing at Redu, caused a drop in the TM link, which forced a suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 14:48. The impact was the loss of pointing 07890010. It was at this time the following OEMs were received:

2009.089.14.12.57.812	2009.089.14.13.09.985	1792	RealTime	131	TC	REJECT
REJECTED TC1			0	0	65535	PR N
E E						
2009.089.14.13.03.851	2009.089.14.13.10.024	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.

2009-03-31 (DoY 090, Rev 789) to 2009-04-01 (DoY 091, Rev 789)

Nothing to report.

2009-04-02 (DoY 092, Rev 789-790)

At 20:48:34, due to a problem with IBIS, the CCCFs were enabled, which then interrupted pointing 07900022. At 20:51:00, the commands for this pointing were then manually re-uplinked. The impact was pointing 07900022 was cut short from a planned 1800 to 1272 seconds.

2009-04-03 (DoY 093, Rev 790)

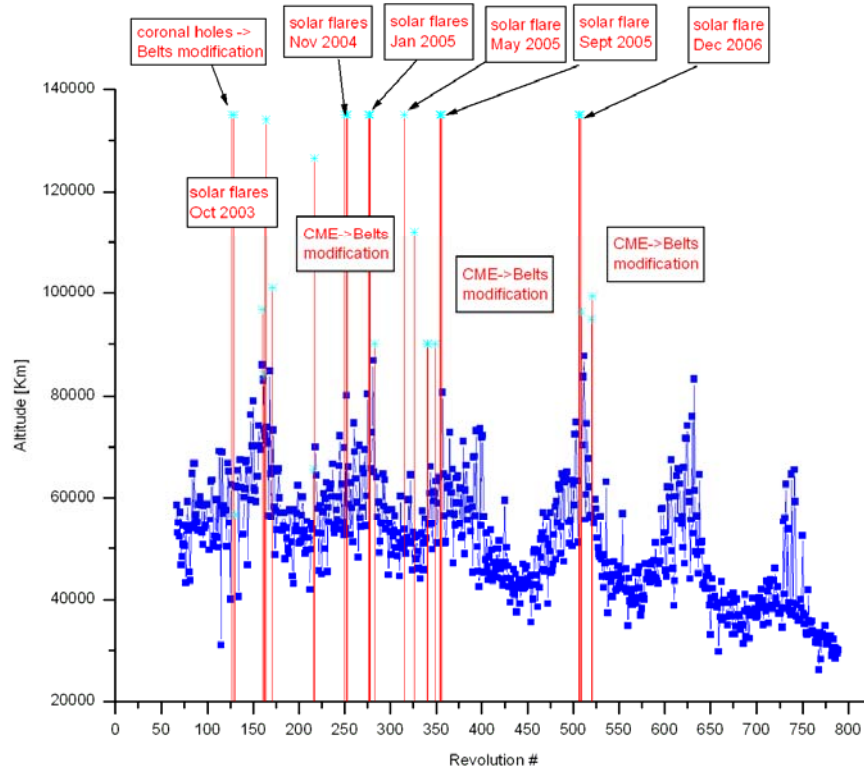
Nothing to report.

On DoY 089 at 01:17:05 and DoY 092 at 01:04:26 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry

Evolution of Radiation Belt Entry 2003-2008



IREM daily report

DoY 2009.087 (28/03/2009):

At 18:24:33Z, a local reset of the IREM CSCI S/W (SEU #72) occurred. The status of the unit, before the local reset of the IREM CSCI S/W, was nominal, here is a summary:

- 1) The temperatures were nominal;
- 2) The LCL current was nominal;
- 3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits;
- 4) The anomaly occurred at 2009.087.18.24:33Z (153959.3 km). The unit had performed an automatic transition to Standard Mode (ie. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit;
- 5) The recovery of the unit started immediately using procedure CRP_SYS_2570. The first dump of the status word after the anomaly reported a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure Flag ON. The unit was still reporting the status as if it was in Integral mode with counting ON and accumulation ON. This value of the status word is assumed to be an old one written by the S/W at the moment of the anomaly.
- 6) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 23:34:00Z.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the PIs request. OMC was recovered at 19:02:46Z and IBIS at 19:50:00Z.

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

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
788	RAD_ENTR R 2009-03- 30T01:17:01Z	30/03/2009 02:33:29	29528.1	30-Mar-2009 02:11:16	33635.64
789	RAD_EXIT R 2009-03- 30T09:58:06Z	30/03/2009 09:23:21	>>40823.7	30-Mar-2009 08:51:16	47577.67
789	RAD_ENTR R 2009-04- 02T01:04:25Z	02/04/2009 02:25:53	30082.8	02-Apr-2009 01:59:55	33439.83
790	RAD_EXIT R 2009-04- 02T09:44:58Z	02/04/2009 08:31:13	>>40857.8	02-Apr-2009 08:39:55	47774.64

Reference

High radiation

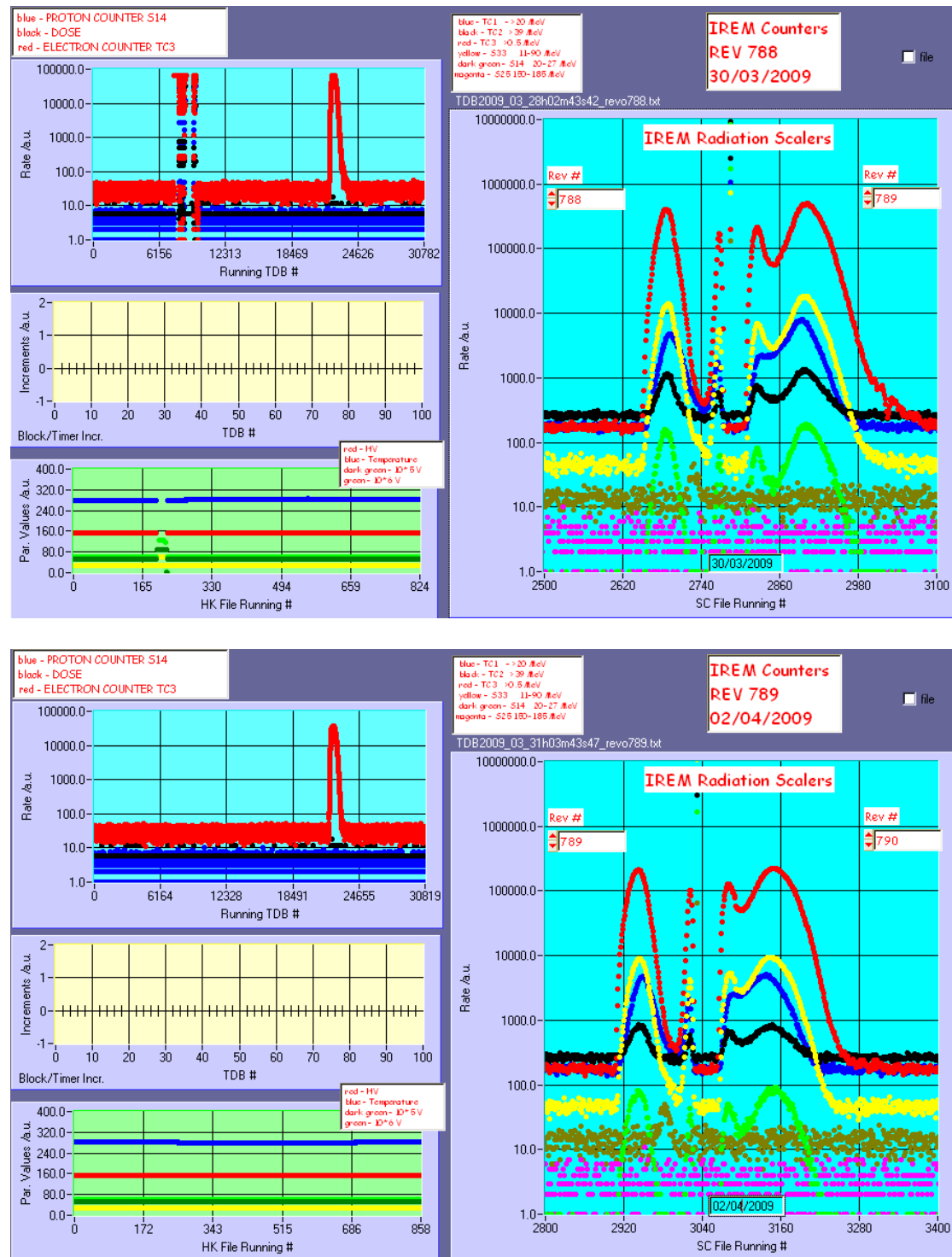
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

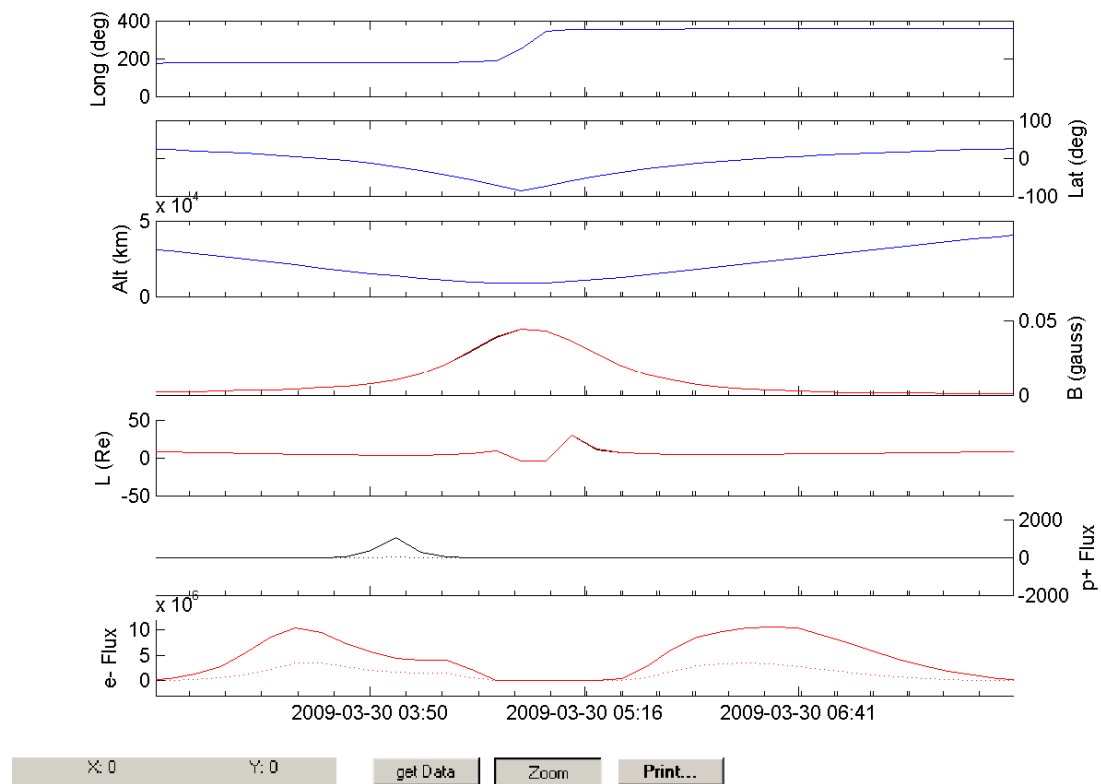
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM radiation counters:

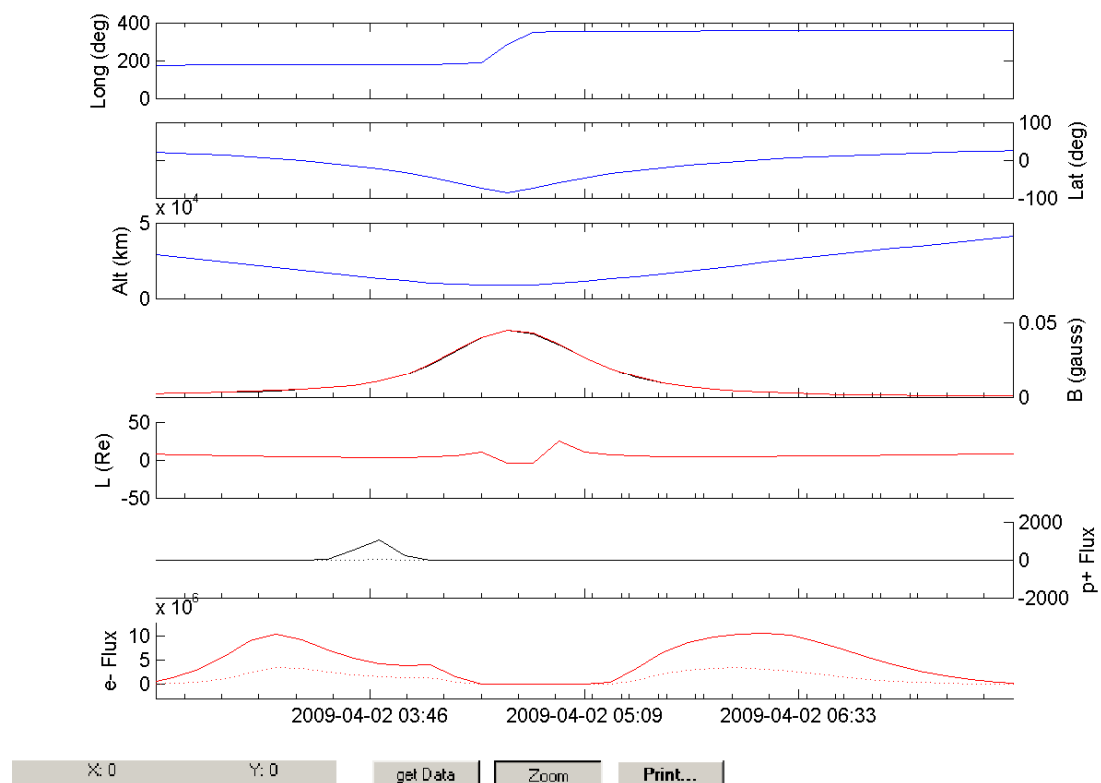


IREM Predicted Radiation Belt Passages

Rev 788



Rev 789



Radiation Assessment

Generated with SEIS Report and Analysis tool.

INTRODUCTION

This note summarises the space weather status over the observation period

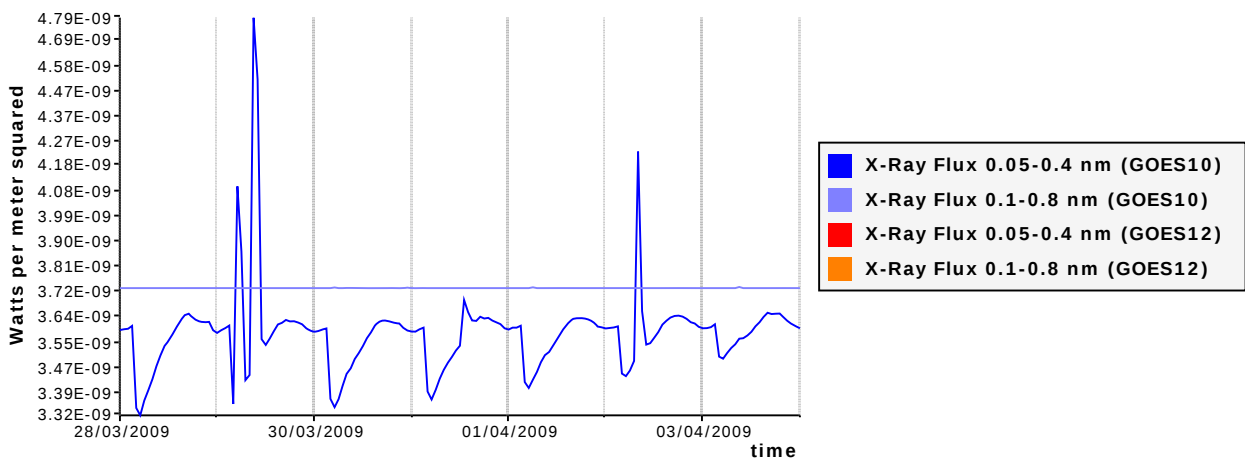
DAILY SUN

see in WR section 3.2.5

RADIATION FLUXES

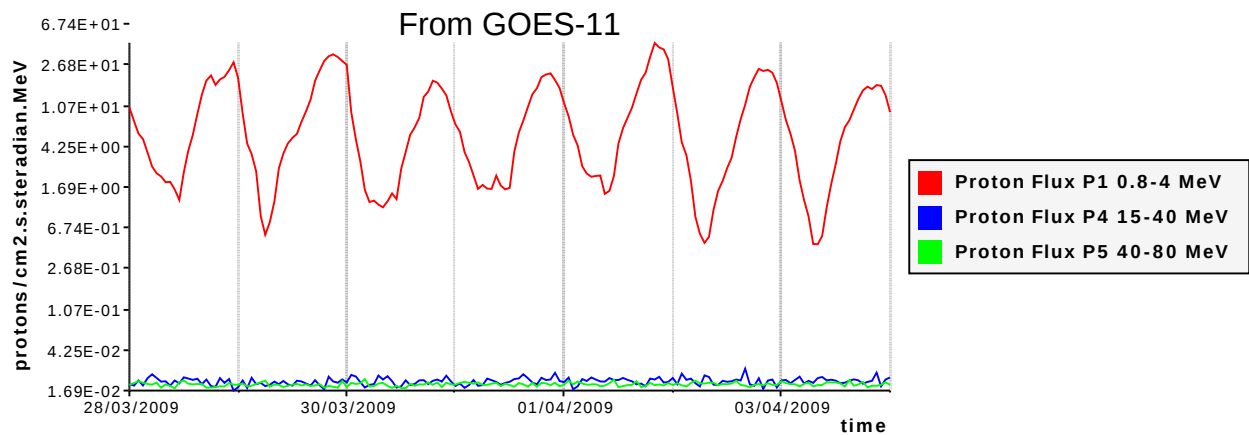
X-ray fluxes

X-ray fluxes for different energies are presented below as reported by GOES satellites. From $1\text{E-}5$ W/m^2 , they start featuring significant radiation activity corresponding to M-class solar flares from $1\text{E-}5$ to $1\text{E-}4$ W/m^2 , and to X-class solar flares from $1\text{E-}4$ and onwards.



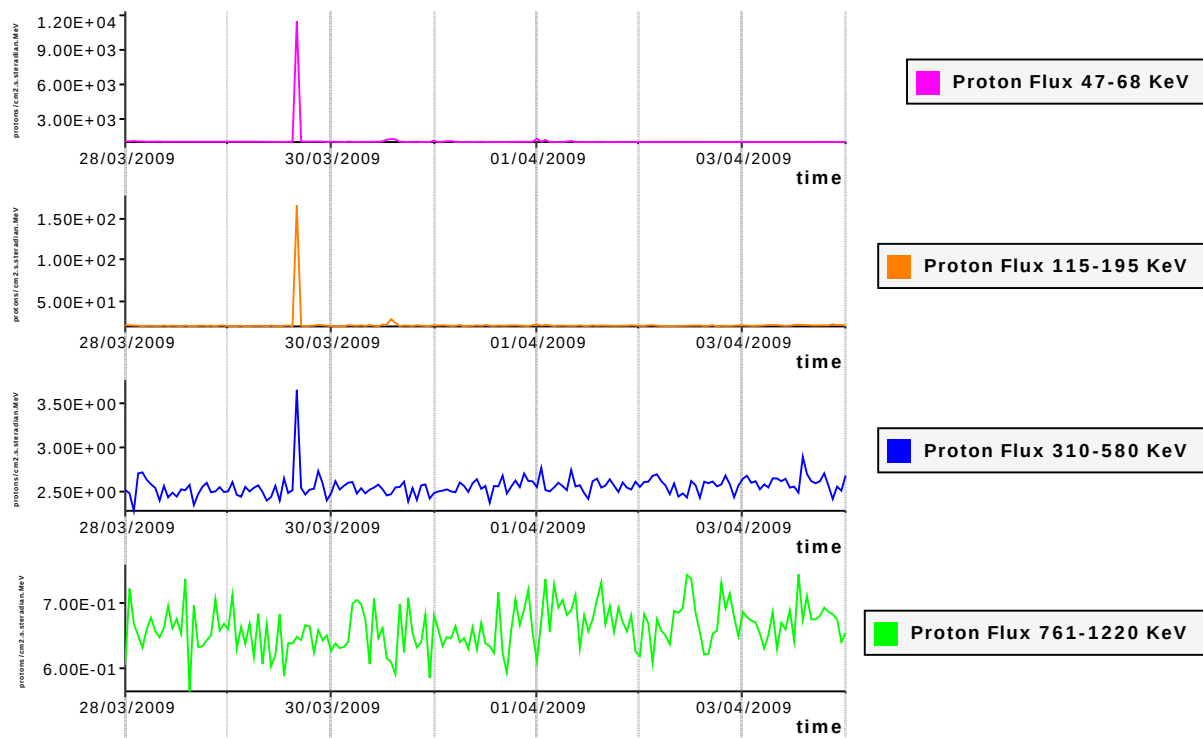
Proton fluxes (GOES-11)

Proton fluxes as measured by GOES satellites are presented in the following plot. Usually P1 oscillates between $1\text{E}+1$ and $1\text{E}+2$, while P2 and P3 evolve around $1\text{E-}2$.



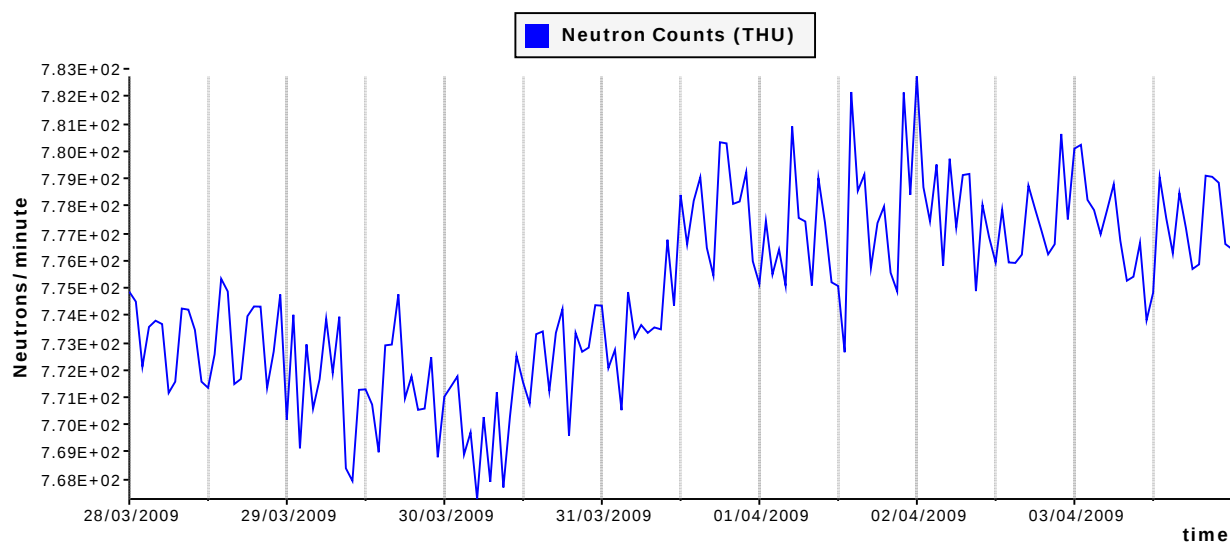
Proton fluxes (ACE)

Proton fluxes as measured by ACE satellite are presented in the following plot.



Neutron counts

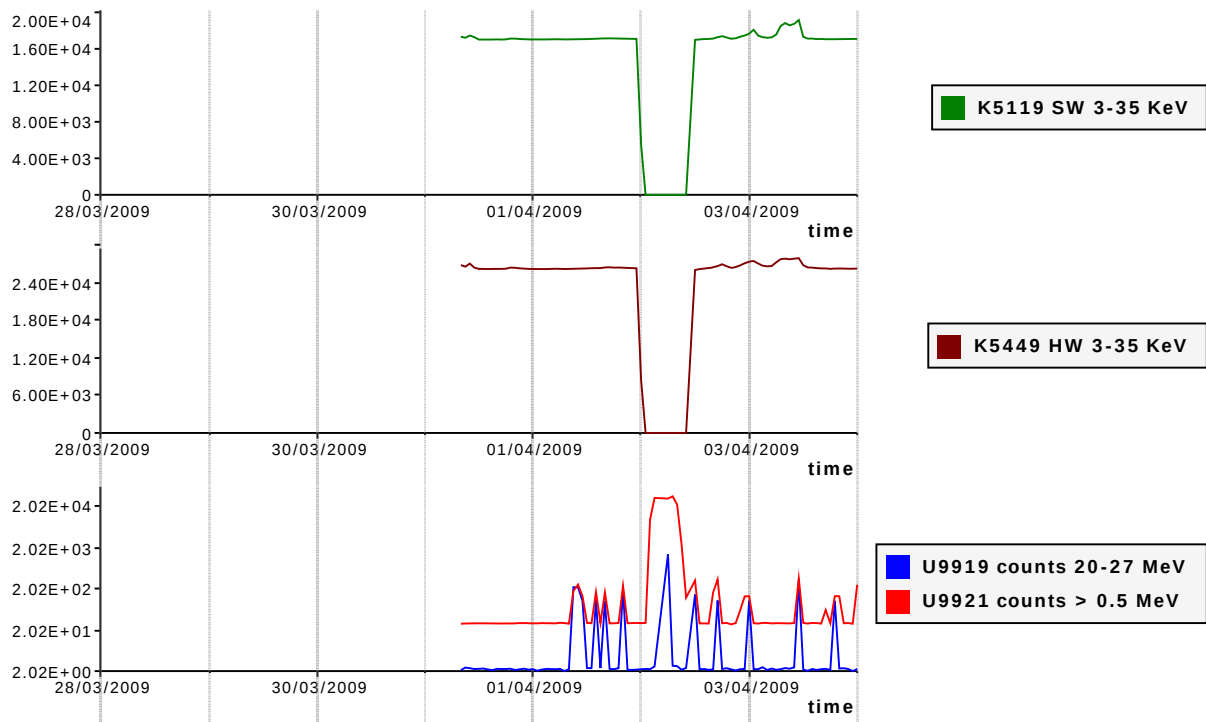
The neutron counts for the last 3 days are presented in the following plot. Nominally they remain stable around $7.2\text{E}+2$.



IREM and JEM-X (INTEGRAL)

IREM proton and electron fluxes as well as JEM-X1 software and hardware triggers are presented in the following plots.

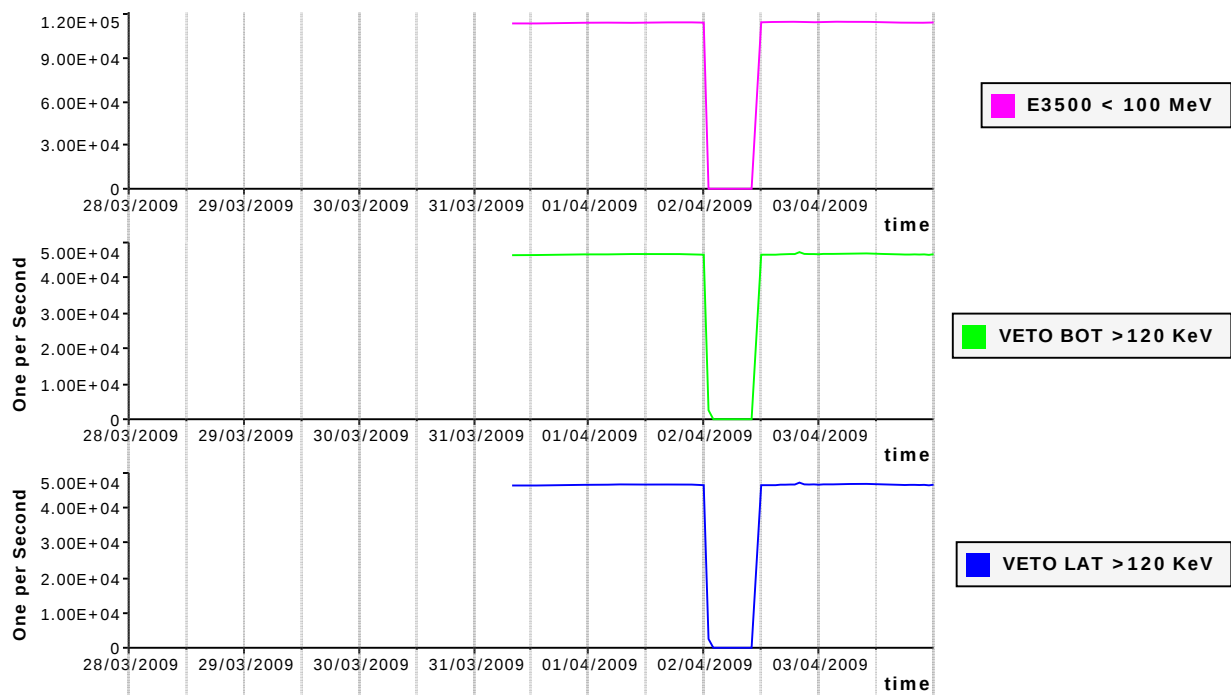
Nominal values are respectively about 1 and 18 for IREM counts, and, 13000 and 19000 for JEM-X ones.



SPI and IBIS (INTEGRAL)

SPI-ACS counters below 100MeV as well as IBIS-VETO bottom and lateral counters are presented in the following plots.

Nominal values are respectively about 90000 for SPI counts, and 36000 for IBIS ones.



SOLAR FLARES FORECAST

The probabilities of M and X-class solar flares during the last month are presented below. Chances of solar flare start to be meaningful from 15%.



