

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 342
Week 15
13.04.09
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 04.04.09 until 10.04.09 (both dates inclusive) and covers the revolutions 790, 791 and 792.

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 and a raster dither of the Galactic disk, $l=+25$ (RA 18:36:53.70, DEC -07:03:19.4).

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 antenna swap during nominal TL operations.

The fuel consumption over the period between 04/04/2009 and 10/04/2009 was 0.11161 Kg. The remaining propellant is in the order of 134.9354 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

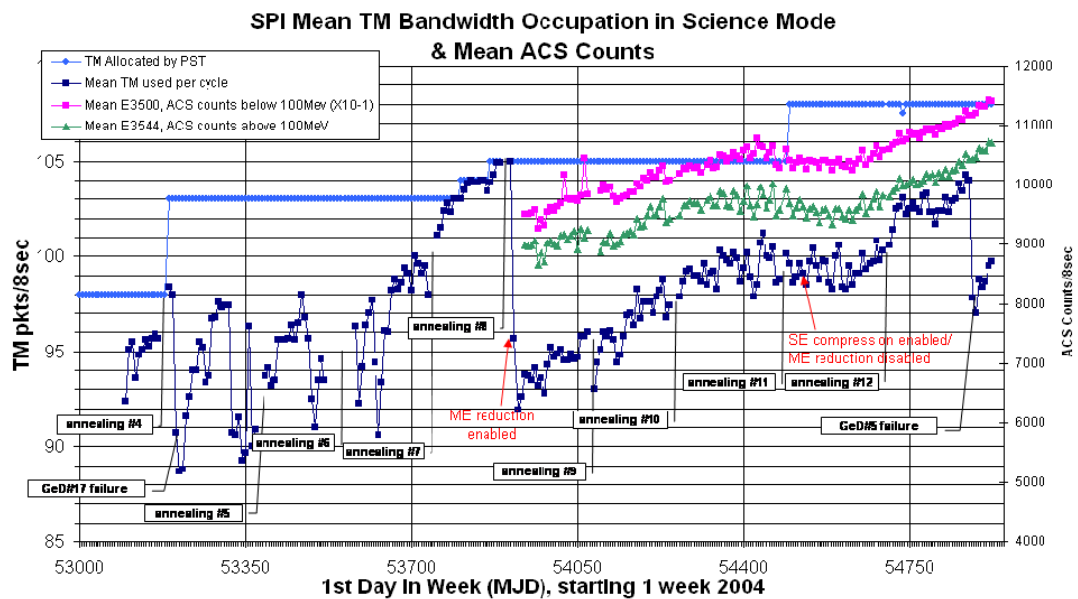
Following the 12th annealing, ended on 04/09/2008 at 23:50Z, the overall status of the gamma-ray spectrometer is nominal, except for detector #2 (failed since 06/12/2003); detector #17 (failed since 17/07/2004) and detector #5 (failed since 19/02/2009). The energy resolution of the previously degraded 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 99.7 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.

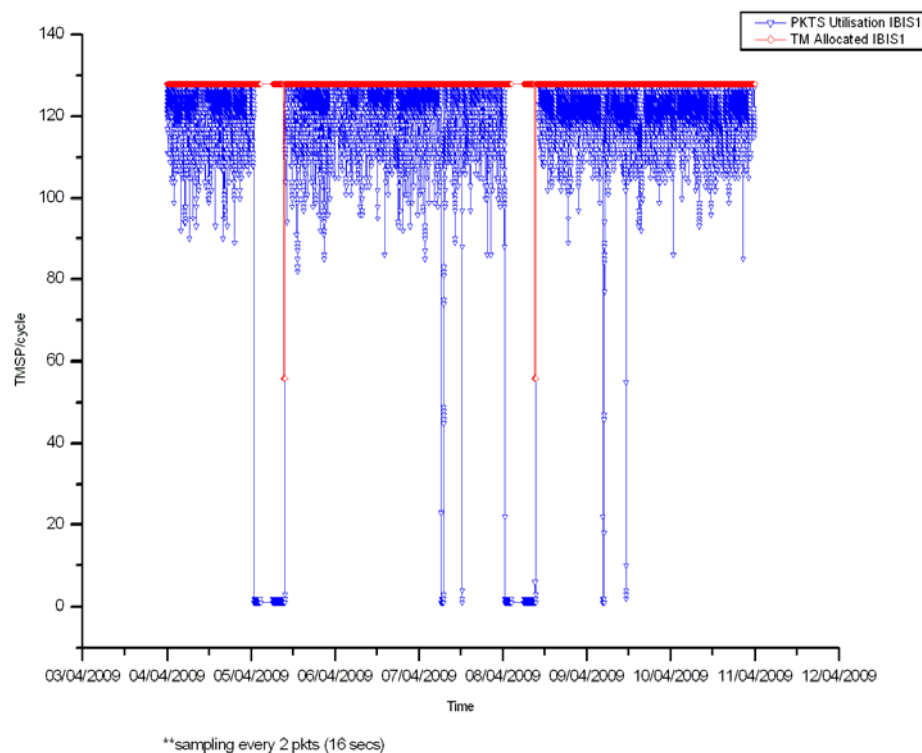
Eclipse operations for IBIS continued to be performed nominally during the reporting period.

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

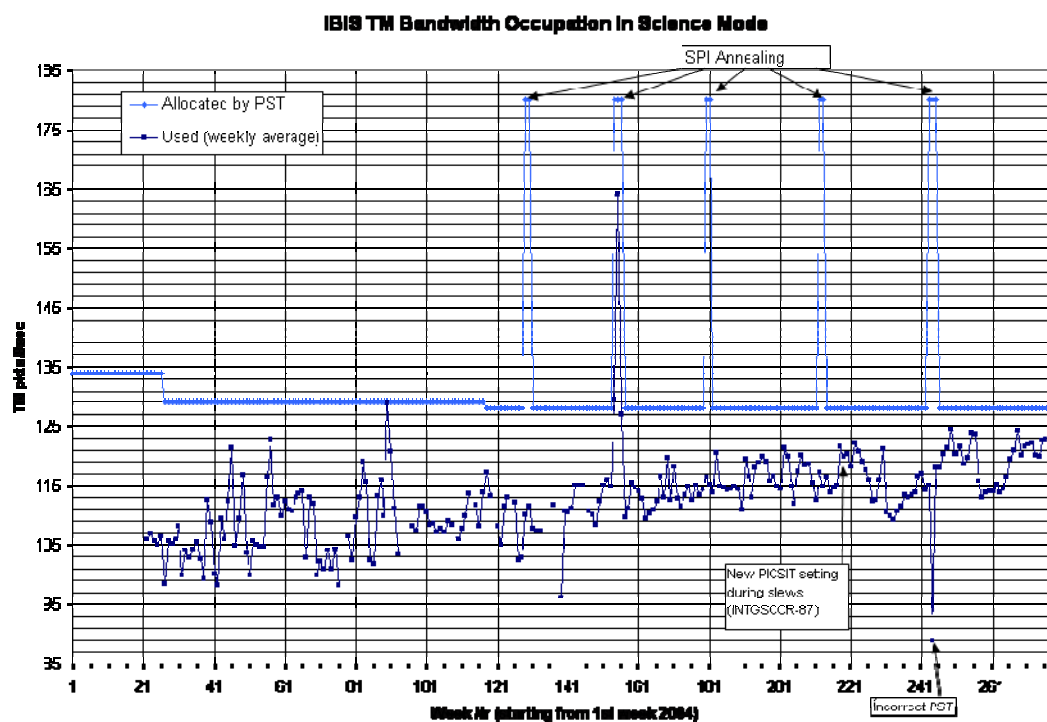
- PST allocation to IBIS above radiation belts: 128 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 122.72 packets/cycle (up 0.08 on previous week)
- Percentage of TM cycles in which full bandwidth (128 packets/cycle) was used: 27.87%

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

IBIS - TM Bandwidth Utilisation Rev 790-792



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, 200 of the 204 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 missed from TL, during the observation period, due to a problem on antenna swap during nominal TL operations.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. One incident occurred on DoY 094 at 17:44z. Redu's STC disconnected and it was reconnected 15 min later and ranging was again restarted. On DoY 098 from 13:01Z-14:42Z a successful test with Weilheim was performed. The operations were moved to the B-chain during the test period. On DoY 100 at 01:19Z a drop in TM occurred from Goldstone. The TM links were recovered 01:26Z. There was no impact.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 798 to 800.

As agreed previously on request of MOC, no routine planning was done. Observations have been planned previously up to revolution 795.

No new TSFs have been received.

2. Observation status

ECS files have been received up for revolutions 780 and 782. The last processed is for revolution 778.

3. ISOC Science Data Archive

No news.

4. ISOC system

Work on V22 is ongoing, a CCB was held on 7 May, clarifying priorities.

5. Problems

No new problems.

4.3.2 ISDC

Status of ISDC observation processing on 10/04/2009:

- 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.

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

Installation of NCTRS 11.1.0 to be done on C Chain for testing, old installation will remain in case of rollback.

Eclipse season #14 finishes on 11/04/2009

6 Anomalies

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

AR id	Date Created	Subject	Segment	Status
INT_SC-253	2009-04-09	IREM Anomaly: Reset of IREM_CSCI S/W #74, 9/04/2009	Payload	Pending
INT_SC-252	2009-04-09	IREM Anomaly: Reset of IREM_CSCI S/W #73, 7/04/2009	Payload	Pending

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

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.

Revolution 791

The observations in revolution 791 began with a raster dither of the Galactic disk, $l=+25$ (RA 18:36:53.70, DEC -07:03:19.4), lasting ~12.5 hours. They continued with a hexagonal dither of the Gal. Bulge region (RA 17:45:36.00, DEC -28:56:00.0), lasting ~3.5 hours. This was followed by a raster dither of the Galactic disk, $l=-25$ (RA 16:27:14.74, DEC -48:57:19.9), lasting ~12.5 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 raster dither of the Galactic disk, $l=-25$ (RA 16:27:14.74, DEC -48:57:19.9), lasting ~12.5 hours, until the end of the revolution.

Revolution 792

The observations in revolution 792 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 Center (RA 17:45:40.03, DEC -29:00:28.1), lasting ~50.2 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.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2009-04-03T16:35:24.000Z	135.0003	F	Automatic TM processing.
2009-04-05T07:36:32.000Z	134.9860	F	Automatic TM processing.
2009-04-06T16:27:24.000Z	134.9587	F	Automatic TM processing.
2009-04-08T07:21:05.000Z	134.9442	F	Automatic TM processing.
2009-04-09T16:28:44.000Z	134.9354	F	Automatic TM processing.

This report was generated Fri Apr 10 08:00:30 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, 04/04/2009 – 10/04/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 159 Open Loop Slews, 63 Closed Loop Slews and 4 Momentum Biases were executed (as reported by ACC OEM).

2 slews (OSL) were missed from TL, during the observation period, due to a problem on Antenna swap during nominal TL operations.

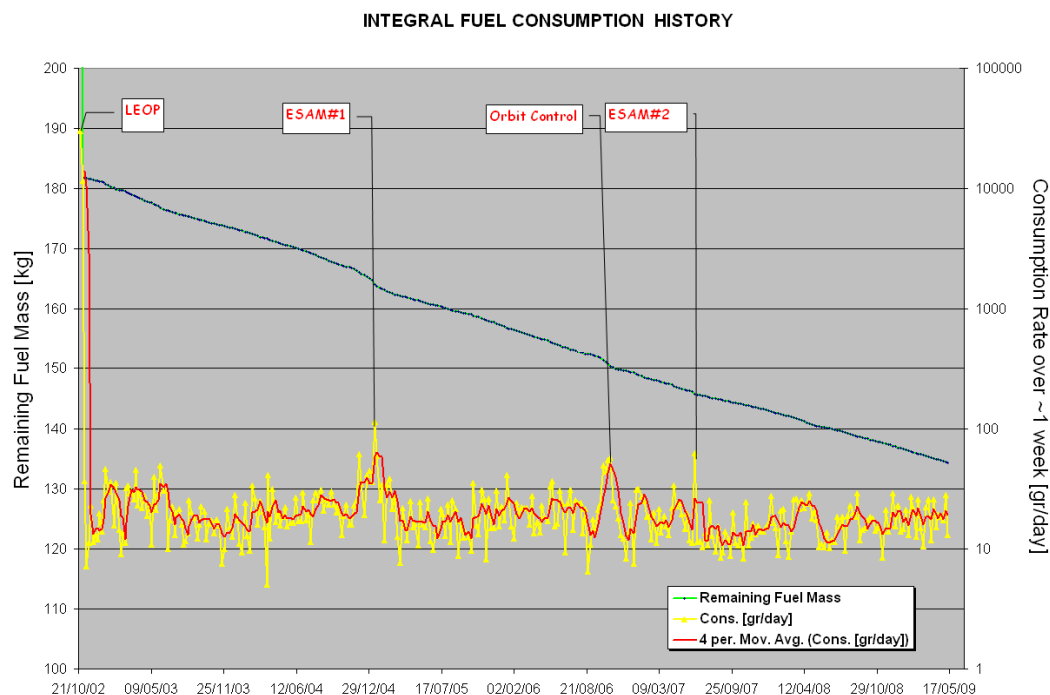
This is equivalent to $\sim 0.9\%$ of the total number of slews planned (223).

Orbit Control

No update.

Fuel consumption

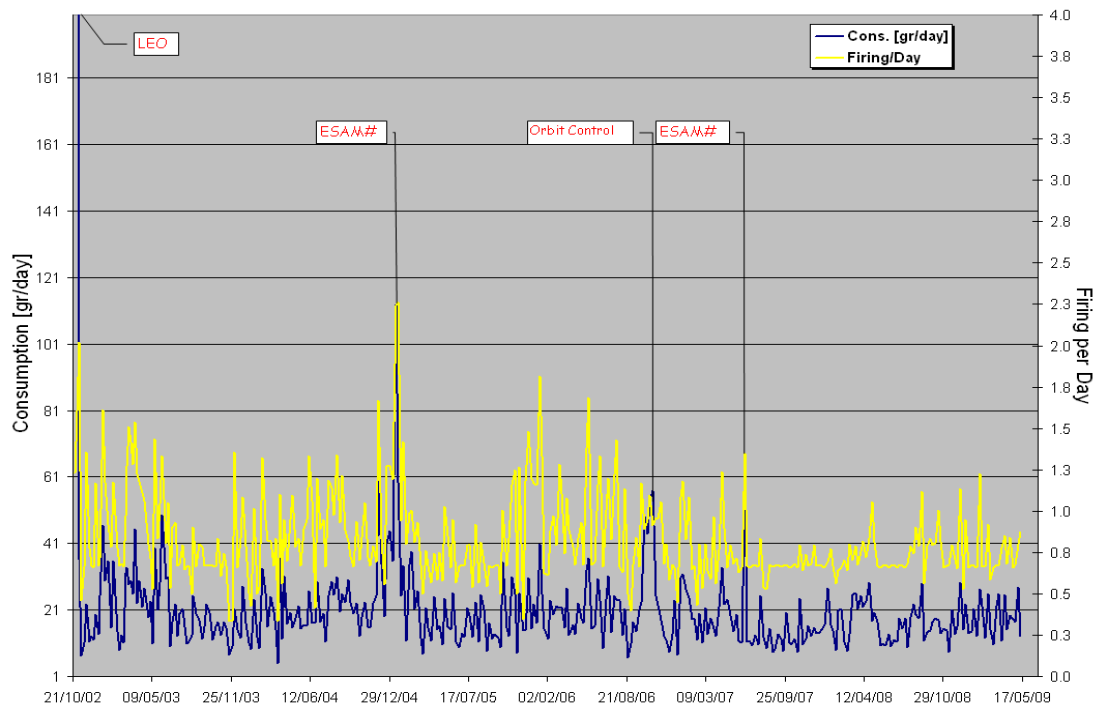
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 10/04/2009 is reported in the plot below.



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 10/04/2009 is reported in the plot below.

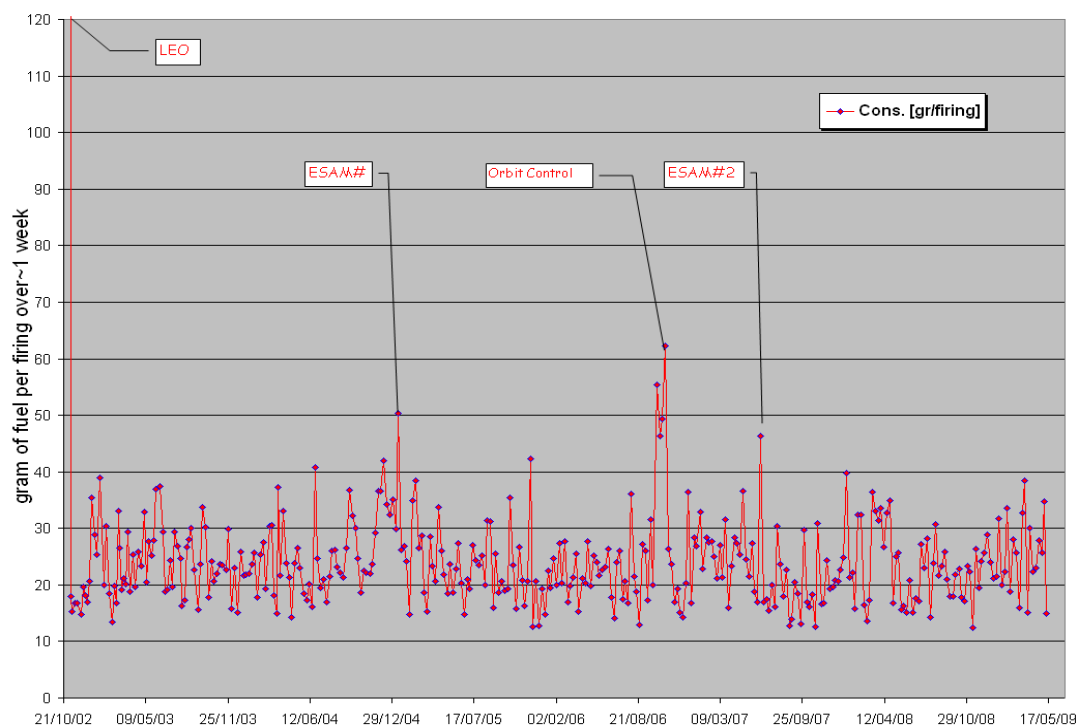
INTEGRAL FIRING PER DAY HISTORY



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 10/04/2009 is shown in the plot below.

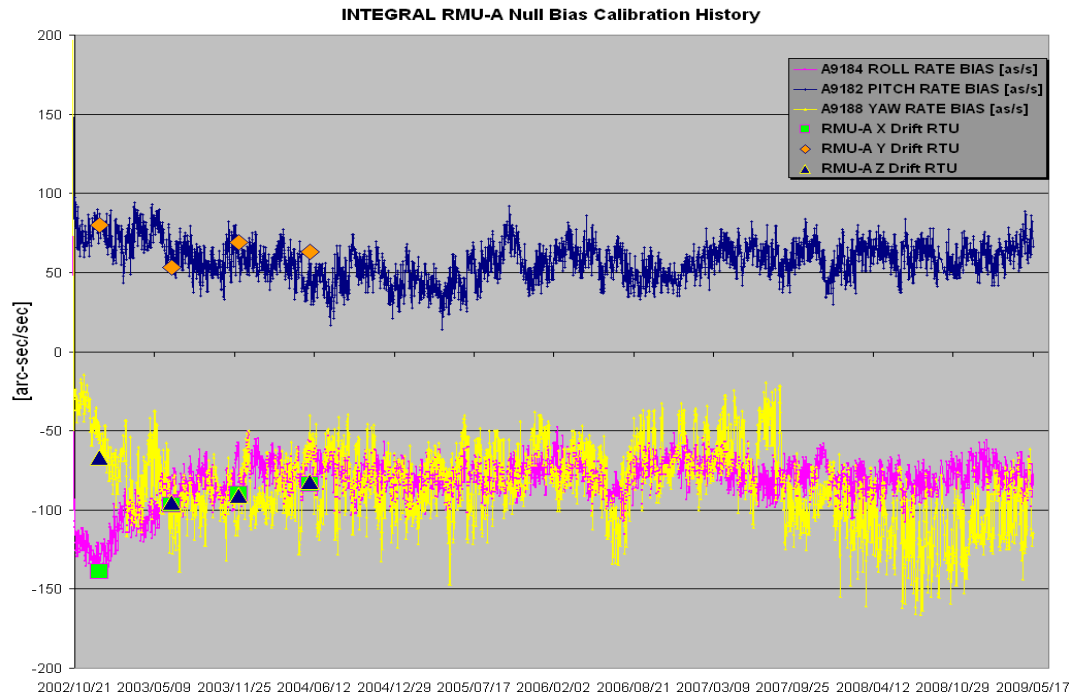
INTEGRAL FUEL MASS PER FIRING HISTORY



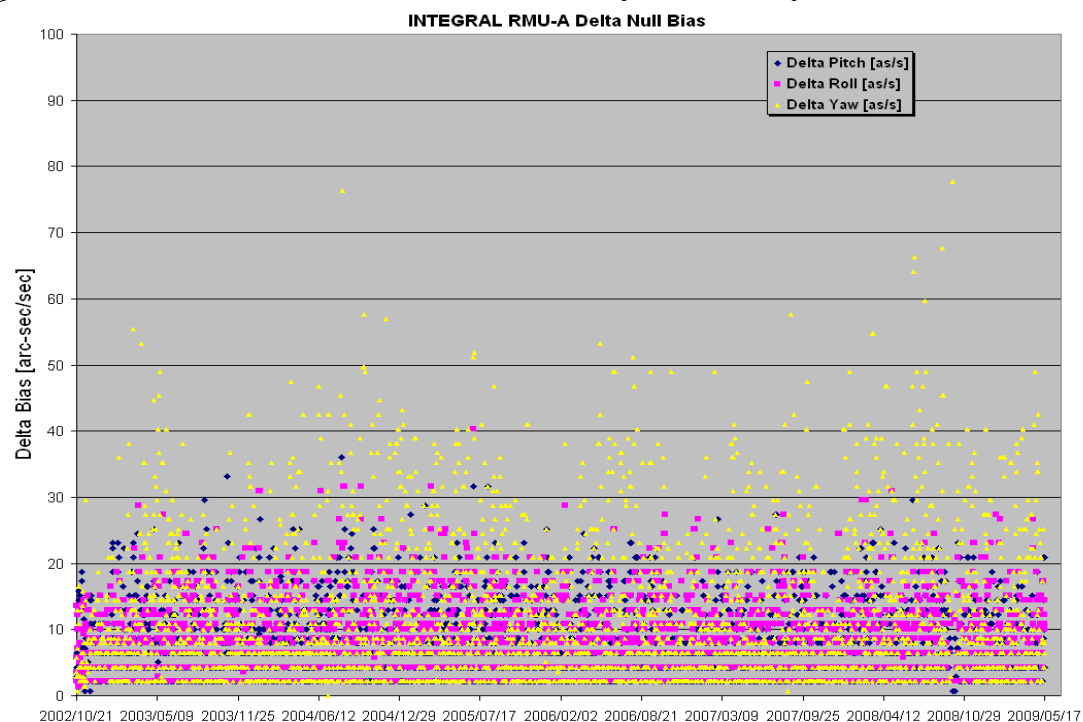
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 10/04/2009 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 10/04/2009 is reported in the plot below.



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 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
 Date : 13/04/09

Issue : 1
 Rev. : 0
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04/03/2009 (Day of Year 094, Revolution 790)

Nothing to report.

05/03/2009 (Day of Year 095, Revolution 790)

The <<Summer>> 2009 eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 790-791:

AOCS ECLIPSE MONITORING										Revolution:	790
Summer 2009										Date:	05/04/2009
										DoY:	95
INPUT											
Penumbra Start	05/04/2009 02:57:02	Penumbra Start:	05/04/2009 02:57:02	LOS:	05/04/2009 02:39:12						
Penumbra End	05/04/2009 03:36:23	Umbra Start:	05/04/2009 02:58:12	AOS:	05/04/2009 06:16:00						
Umbra Start	05/04/2009 02:58:12	Umbra End:	05/04/2009 03:35:32								
Umbra End	05/04/2009 03:35:32	Penumbra End:	05/04/2009 03:36:23								
		Eclipse Duration:	0:39:21								
ACC Sample Time:	04/04/2009 14:06:56	Eclipse Duration [sec]:	2361								
FDE Sample Time:	04/04/2009 14:10:50										
FCE Sample Time:	04/04/2009 14:10:50	IMU Health Check Start	04/04/2009 23:59:00								
		Eclipse Imminent Flag	05/04/2009 01:57:22								
ACC Eclipse Counter:	196078	ACC IMU AutoCal Start	05/04/2009 02:11:48								
ACC Eclipse Start:	241215	ACC IMU AutoCal End	05/04/2009 02:31:48								
ACC Eclipse End:	245220										
		Sun out of FSS FoV	05/04/2009 02:57:57								
FDE Eclipse Start:	241634	Sun back in FSS FoV	05/04/2009 03:35:40								
FDE Left to Eclipse Start:	45746										
FDE Eclipse Duration:	3136										
FCE Eclipse Start:	241678										
FCE Left to Eclipse Start:	45790										
FCE Eclipse Duration:	3092										
		Eclipse Timers		From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]		
				Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]				
		ACC Eclipse Start	05/04/2009 02:39:13	-1069.00		05/04/2009 02:39:12	-1070.00	-1064			
		FDE Eclipse Start	05/04/2009 02:53:16	-226.00				-404	176		
		FCE Eclipse Start	05/04/2009 02:54:00	-182.00				-360	176		
				From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]		
				Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]				
		FCE Eclipse End	05/04/2009 03:45:32	549				360	176		
		FDE Eclipse End	05/04/2009 03:45:32	549				360	176		
		ACC Eclipse End	05/04/2009 03:45:58	575		05/04/2009 03:45:58	575.00	578			
		IMU	Uplink	Execution	WRT Penumbra End [sec]						
		IMU Auto Off Enable	02/04/2009 07:32:45	05/04/2009 03:48:35	732						
		IMU On	04/04/2009 23:59:12	IMU H/C Noise Roll [as/s]	0.2105						
		IMU Off	05/04/2009 03:48:35	IMU H/C Drift Roll [as/s]	0.2100						
		IMU On Time	3:49:23	IMU Auto Cal Drift Roll [as/s]	0.2340						

06/03/2009 (Day of Year 096, Revolution 790-791)

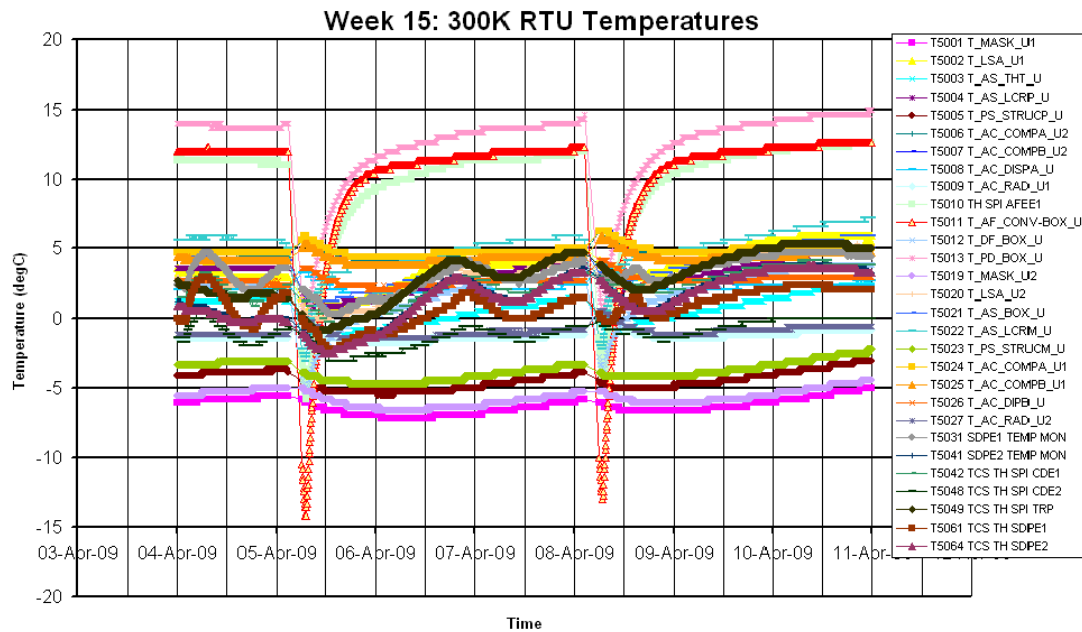
Nothing to report.

07/03/2009 (Day of Year 097, Revolution 791)

Nothing to report.

8.3.2 SPI Operations

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



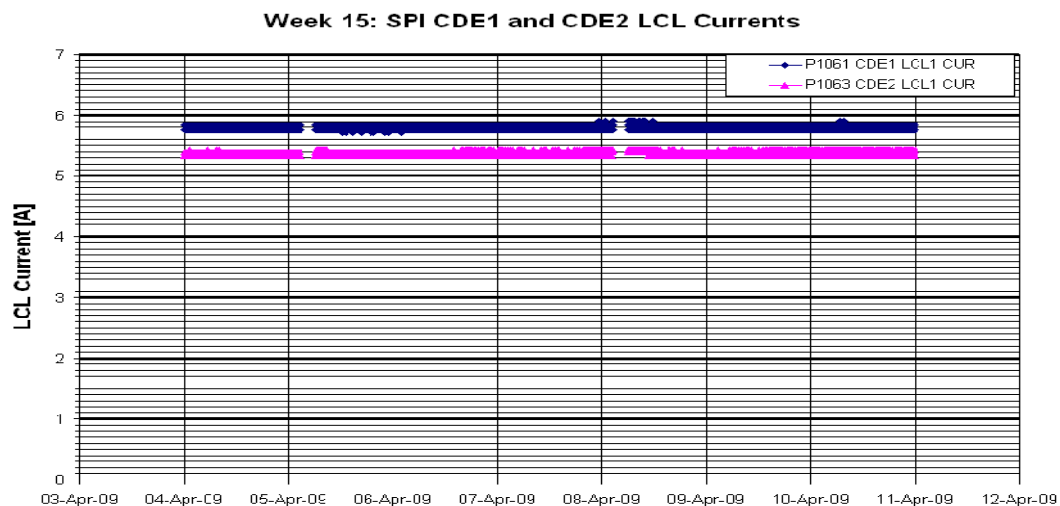
Stirling Compressors and Cryostat: The performance of the compressors is nominal.

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

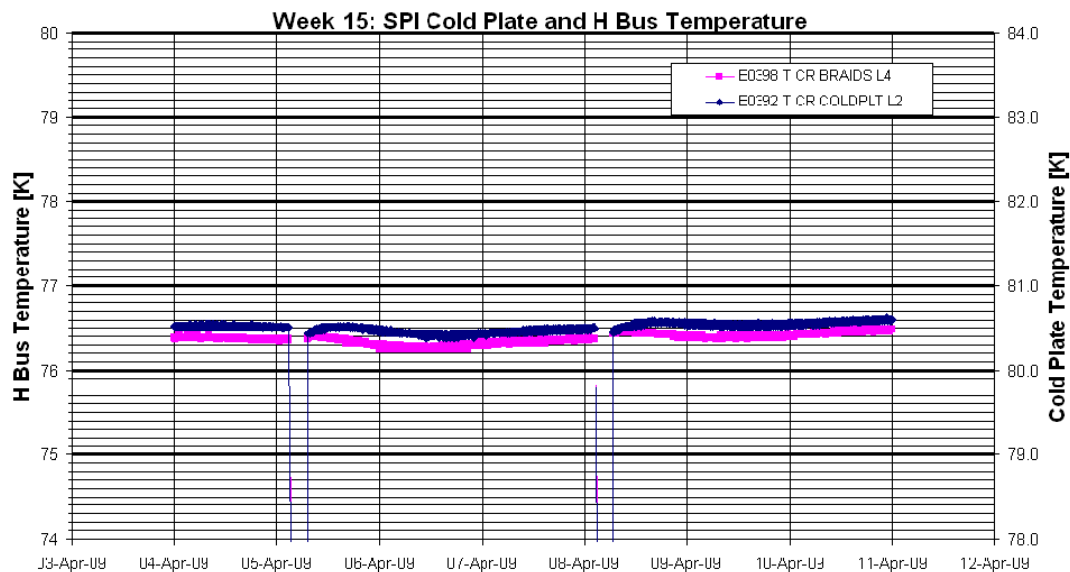
The stroke of all four compressors was set to 43 throughout the week and the average CDE LCL currents were as follows:

- 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.



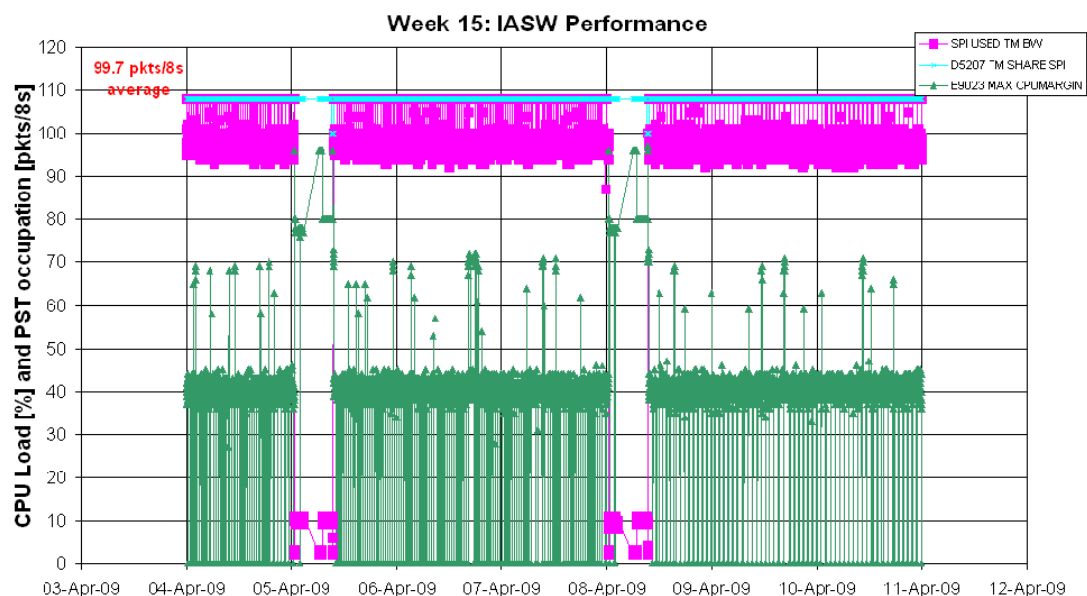
The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



DPE & IASW: The DPE health and IASW performance are nominal.

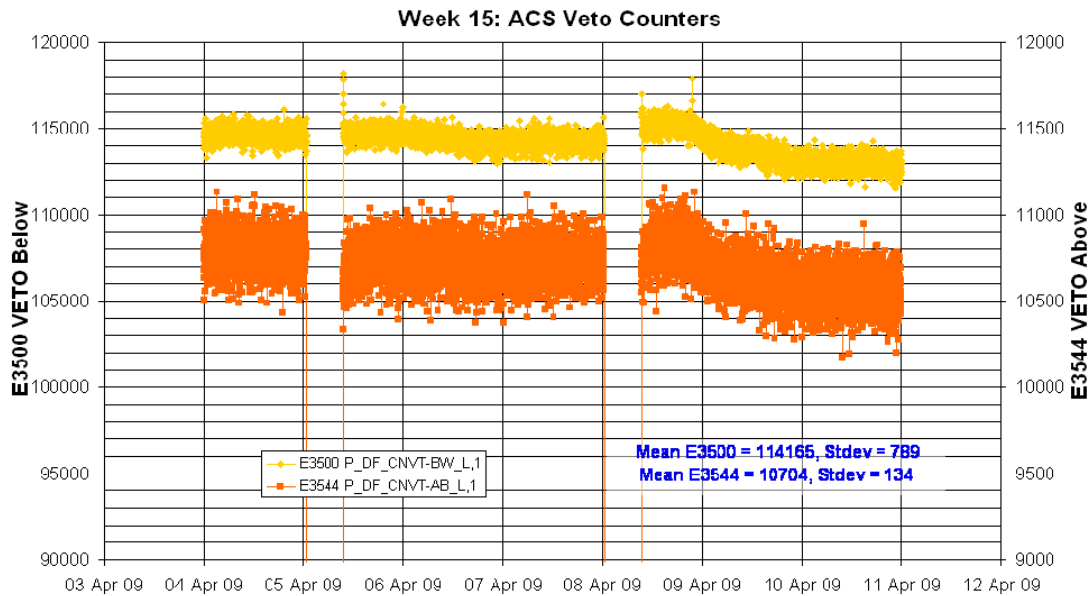
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 99.7 packets/cycle over the science window when the TM allocation was 108 packets/cycle.

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

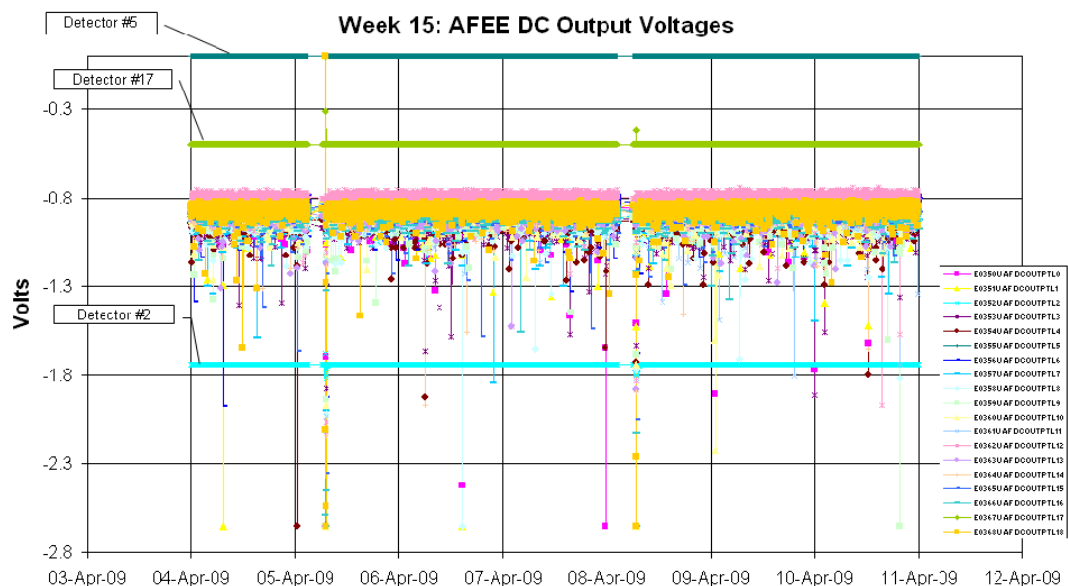


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

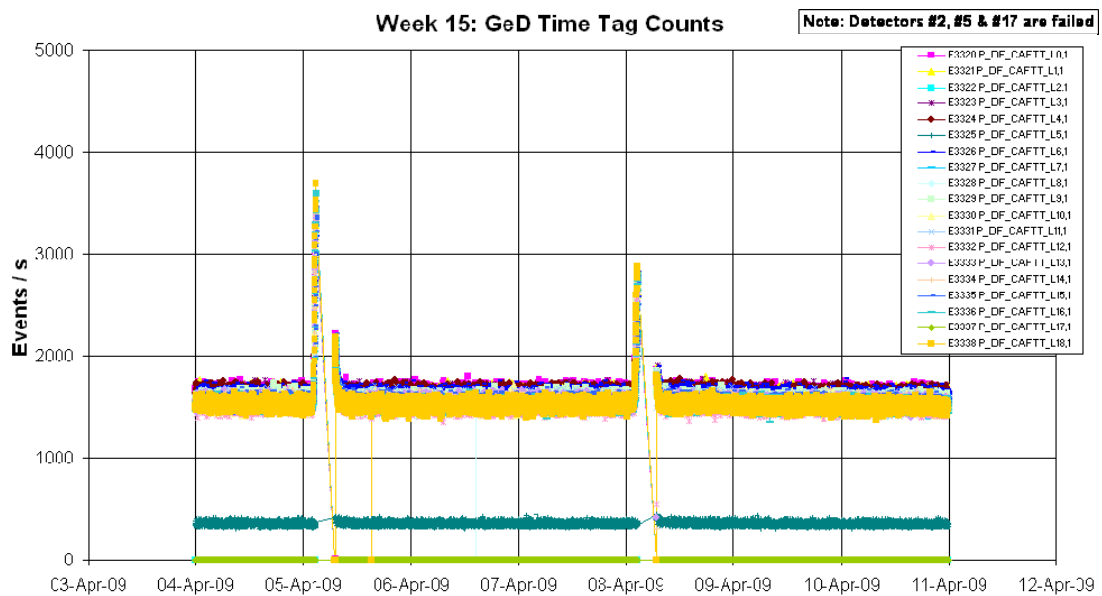
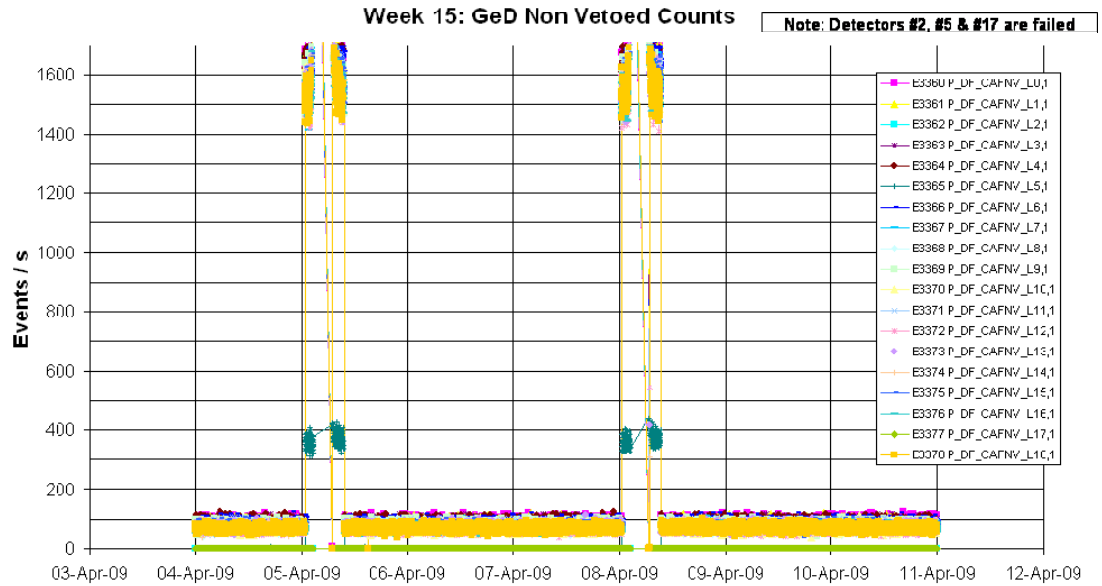
The following plot shows the ACS overall count rate evolution during the reporting period:

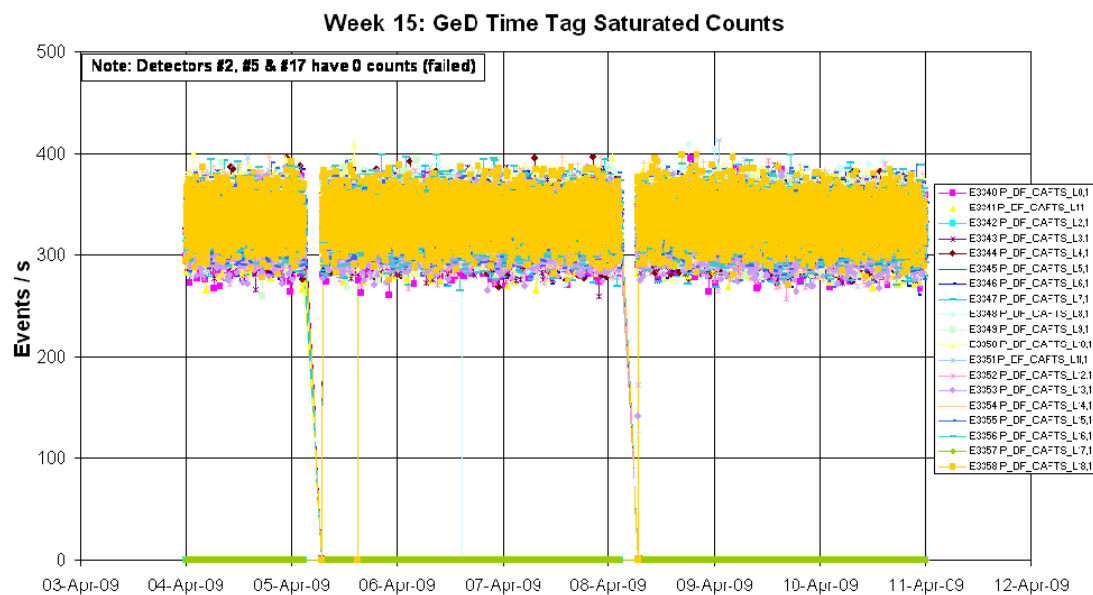


AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003; detector #17 is failed since 17/07/2004 and detector #5 is failed since 19/02/2009. The HV of the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

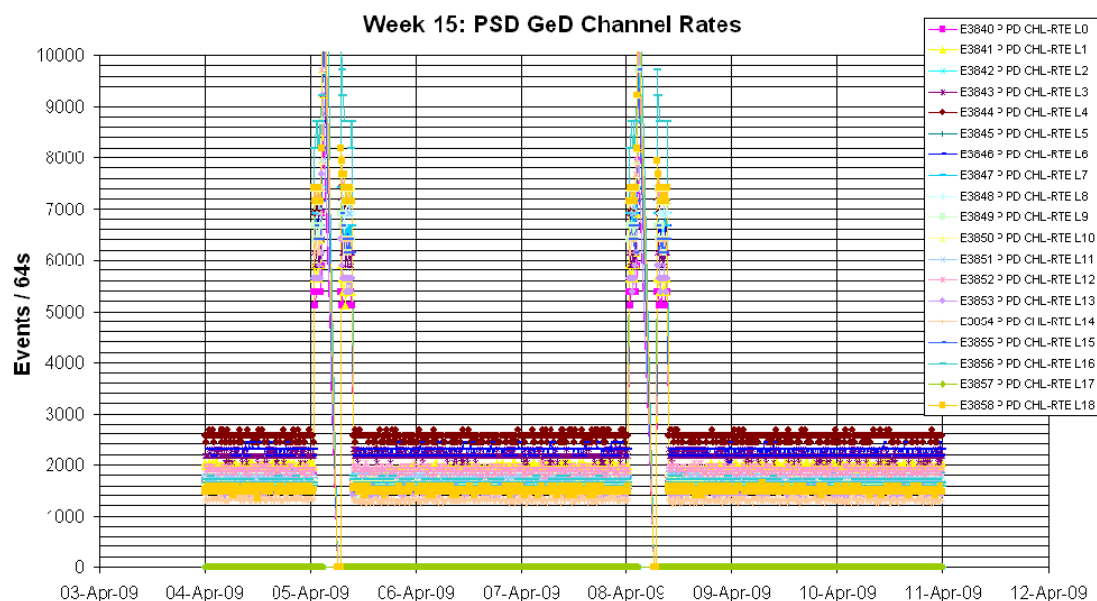


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period.





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



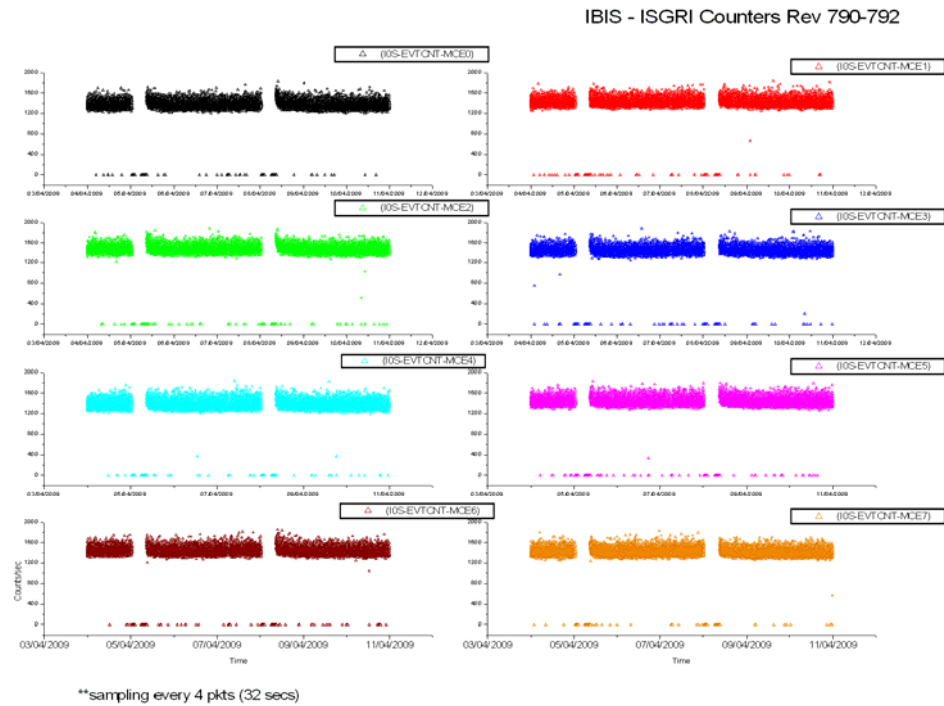
Event Log:

- On 2009-04-07 at 03:06:19Z one occurrence of OEM APID 1024 ID 243 EXCEPTION SPI1 SPECTRA BUILDING NOT COMPLETED was received with parameter E9780 (DETECTOR ID) = 14. As this was a single occurrence, no action was taken.
- Due to continuing high radiation after the expected radiation belt exit of revolution 792, TM parameter E3500 (ACS CntVetoBelow) was OOL High for a few minutes after radiation belt exit. As it returned within limits of its own accord, no action was taken.

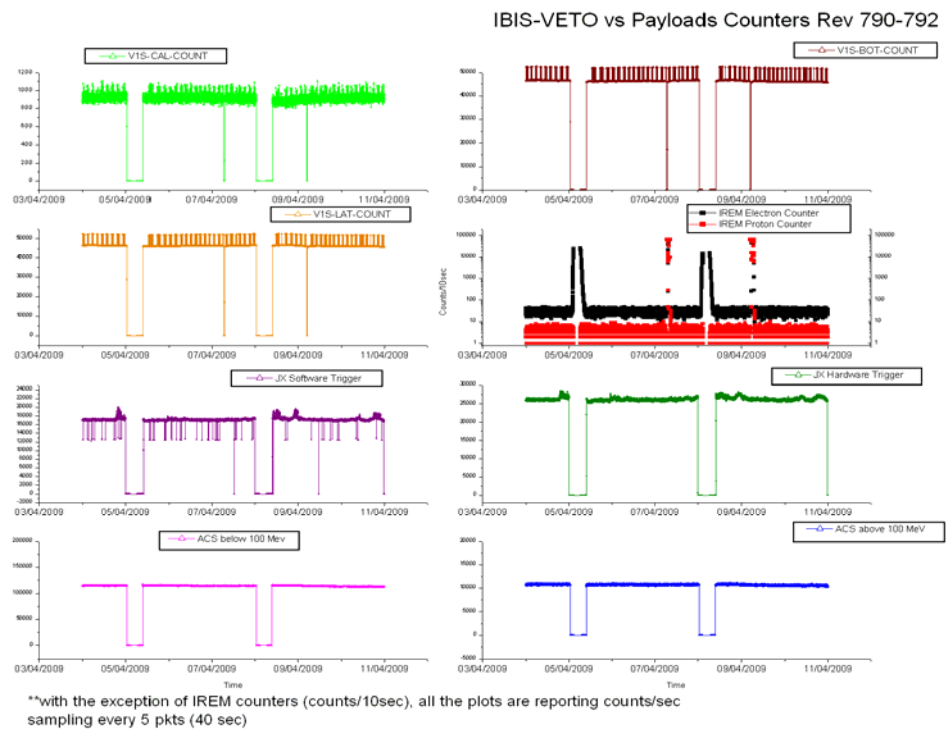
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:

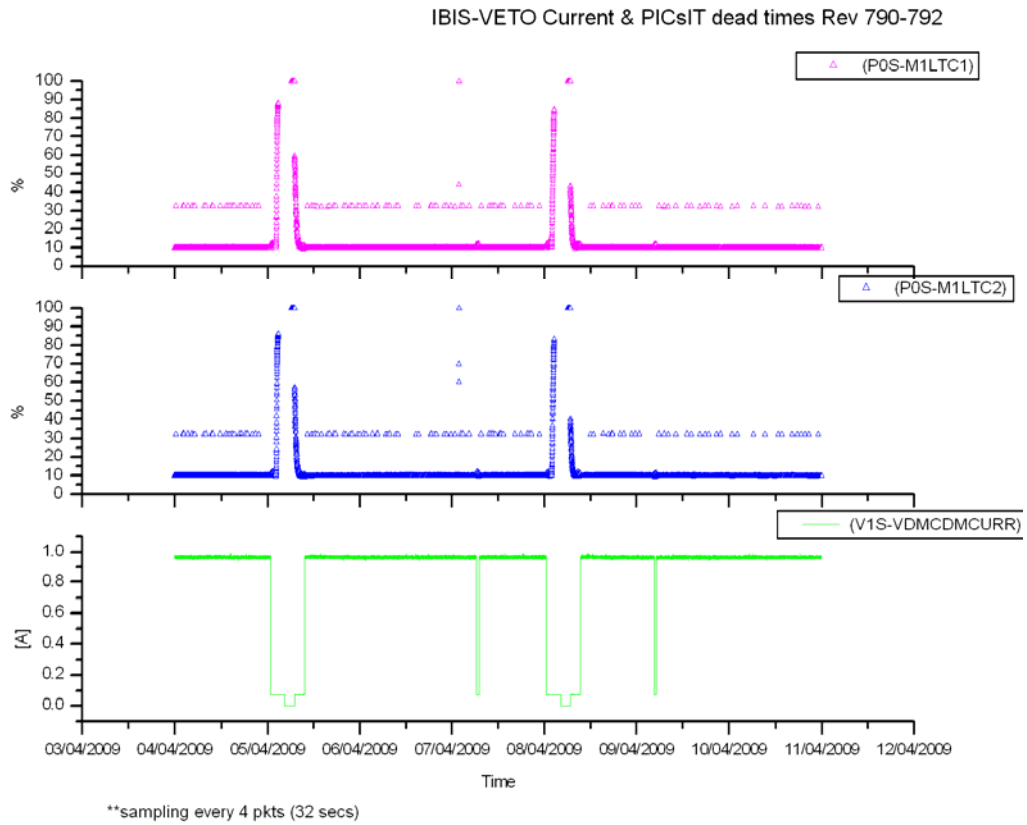


VETO vs Payload Counters:

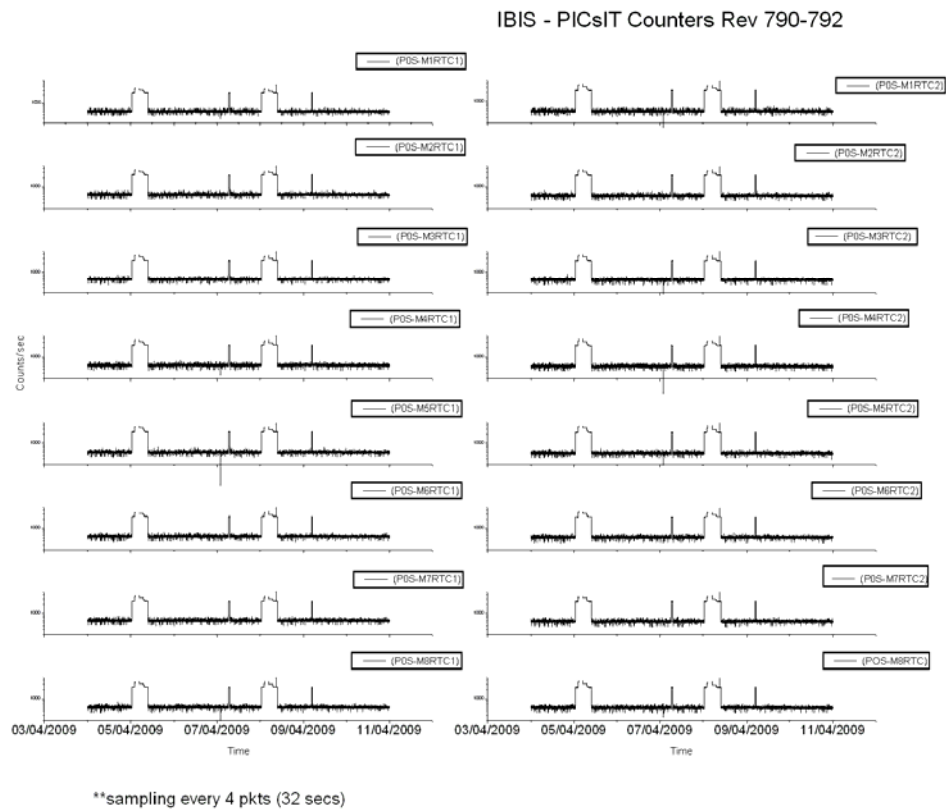


The background radiation level was low during the week.

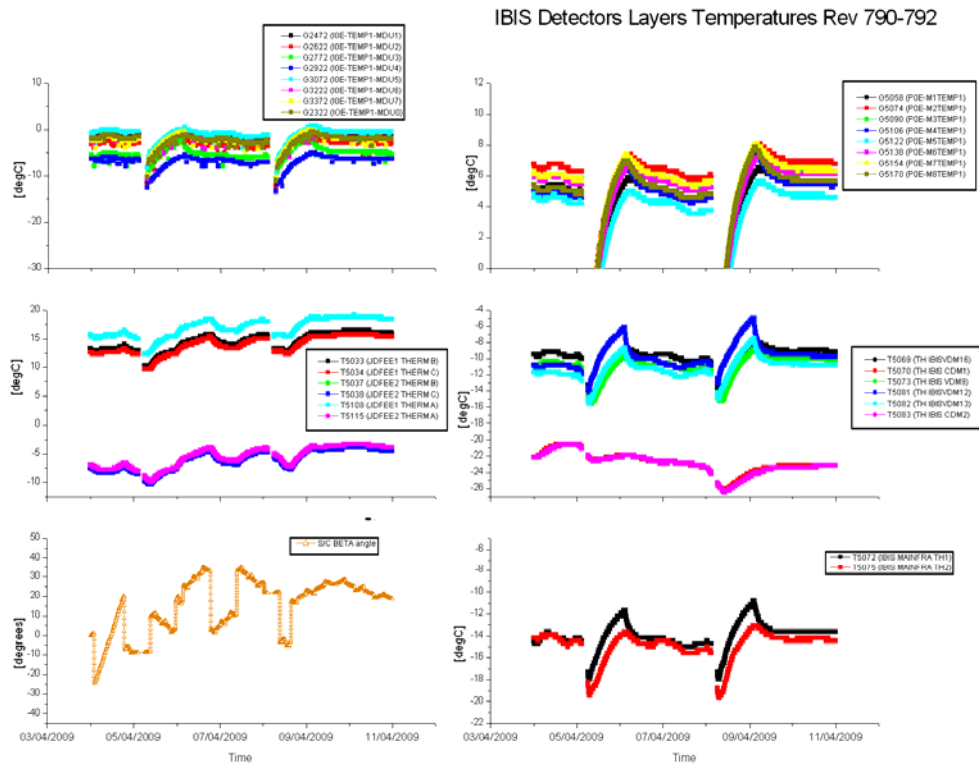
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



**sampling every 8 pkts (64 secs)

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.

2009-04-04 (DOY 094, Rev 790) to 2009-04-06 (DOY 096, Rev 791)

IBIS operations executed nominally.

2009-04-07 (DOY 097, Rev 791)

At 01.49.04Z the TM parameters families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As they all returned within limits of their own accord at 01.50.08Z, no action was taken.

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 06:24:50Z. It was recovered as follows:

- At 06:58:42Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
 - At 07:10:13Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.
- IBIS operations continued nominally.

2009-04-08 (DOY 098, Rev 791-792)

IBIS operations executed nominally.

2009-04-09 (DOY 099, Rev 792)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 04:37:22Z. It was recovered as follows:

- At 04:58:03Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
 - At 05:09:25Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.
- IBIS operations continued nominally.

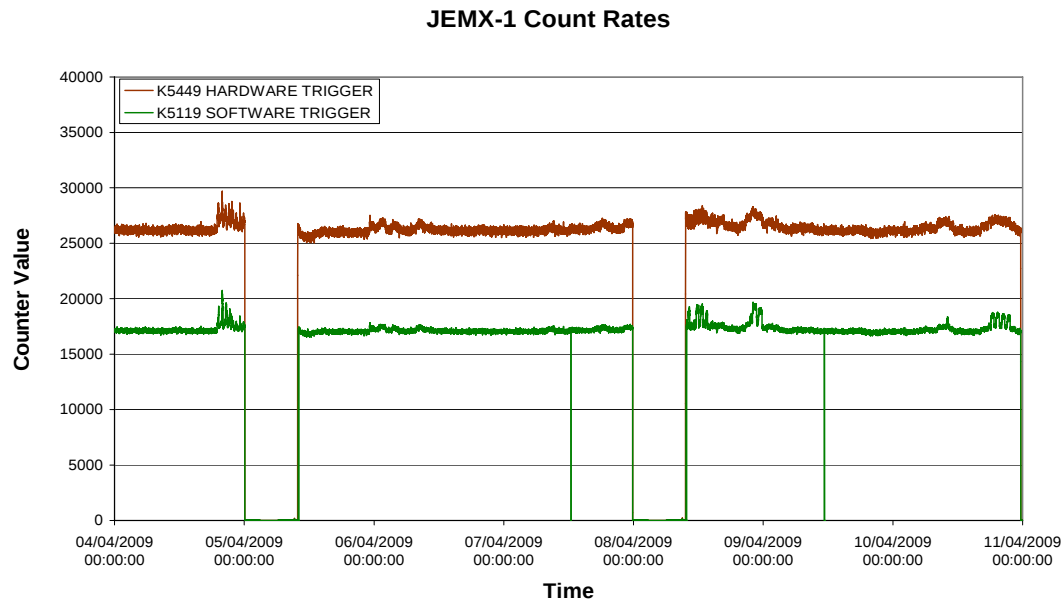
2009-04-10 (DOY 100, Rev 792)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

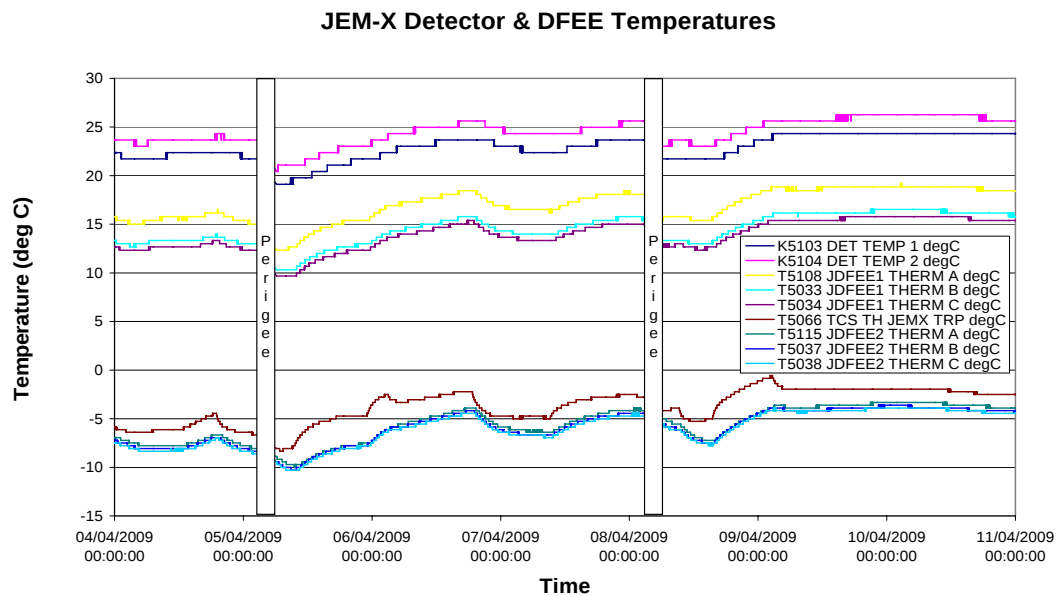
JEM-X Count Rates

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)

JEM-X Daily Report

2009-04-04 (DoY 094, Rev 790)

JEM-X 1 operations executed nominally.

2009-04-05 (DoY 095, Rev 790-791)

At 06:58:21, TM parameter K5317 exceeded hard limits.
No action was taken, and there was no impact

2009-04-06 (DoY 096, Rev 791)

JEM-X 1 operations executed nominally.

2009-04-07 (DoY 097, Rev 791)

At 06:25:23 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#73). There was no impact as the reaction has been disabled.

2009-04-08 (DoY 098, Rev 791-792)

At 06:41:28, TM parameter K5317 exceeded hard limits.
No action was taken, and there was no impact

2009-04-09 (DoY 099, Rev 792)

At 04:37:57 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#74). There was no impact as the reaction has been disabled.

2009-04-10 (DoY 100, Rev 792)

JEM-X 1 operations executed nominally.

8.3.5 OMC Operations

2009-04-04 (DoY 094, Rev 790) to 2009-04-06 (DoY 096, Rev 791)

Nothing to report.

2009-04-07 (DoY 097, Rev 791)

At 06:24:42, OMC was sent to SAFE mode by an IREM SEU (#73). A recovery was performed, and at 06:43:57 the unit was returned to Stand-by. Science operations resumed at 07:40:10. The impact was the interruption of pointing 07910085 after 1089 from a planned 1800 seconds, and the loss of pointing 07910086.

2009-04-08 (DoY 098, Rev 791-792)

Nothing to report.

2009-04-09 (DoY 099, Rev 792)

At 04:37:15, OMC was sent to SAFE mode by an IREM SEU (#74). A recovery was performed, and at 04:56:33 the unit was returned to Stand-by. Science operations resumed at 05:47:30. The impact was the interruption of pointing 07920022 after 2993 from a planned 3479 seconds, and the loss of pointing 07920023.

2009-04-10 (DoY 100, Rev 792)

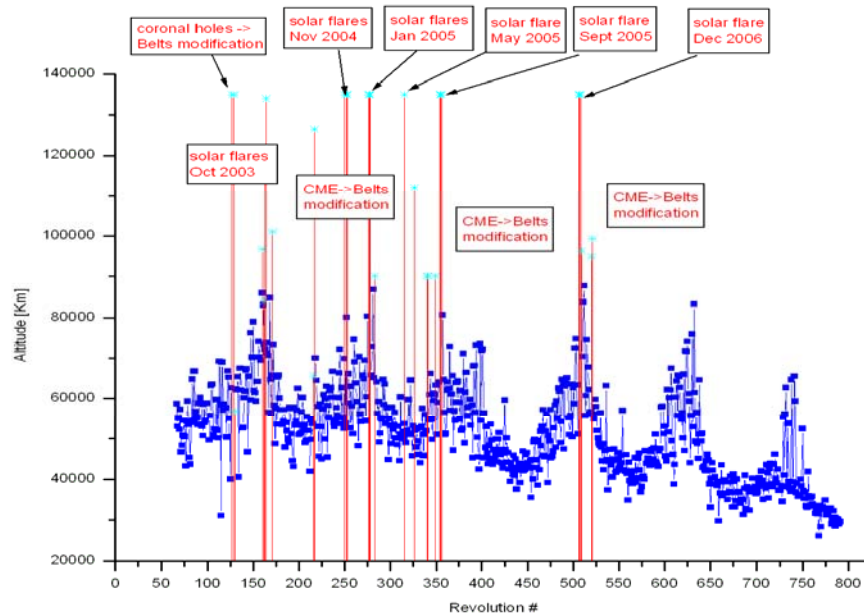
Nothing to report.

On DoY 095 at 00:50:27 and DoY 098 at 00:36:42 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 2009.097 (07/04/2009):

At 06:24:42Z, a local reset of the IREM CSCI S/W (SEU #73) 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 2009.097.06.24:42Z (136829.4 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 11:04:00Z.

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 06:43:57Z and IBIS at 07:14:00Z.

DoY 2009.099 (09/04/2009):

At 04:37:14Z, a local reset of the IREM CSCI S/W (SEU #74) 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 2009.099.04.37:14Z (143034.4 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 07:30:00Z.

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 04:56:33Z and IBIS at 05:12:00Z.

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]
790	RAD_ENTR R 2009-04-05T00:50:23Z	05/04/2009 02:14:09	29042.2	05-Apr-2009 01:47:13	33250.22
791	RAD_EXIT R 2009-04-05T09:31:04Z	05/04/2009 08:56:49	>>40849.7	05-Apr-2009 08:27:13	47889.88
791	RAD_ENTR R 2009-04-08T00:36:40Z	08/04/2009 01:55:30	29548.4	08-Apr-2009 01:27:47	34199.68
792	RAD_EXIT R 2009-04-08T09:16:53Z	08/04/2009 07:47:06	>>40876.4	08-Apr-2009 08:07:47	47140.73

Reference

High radiation

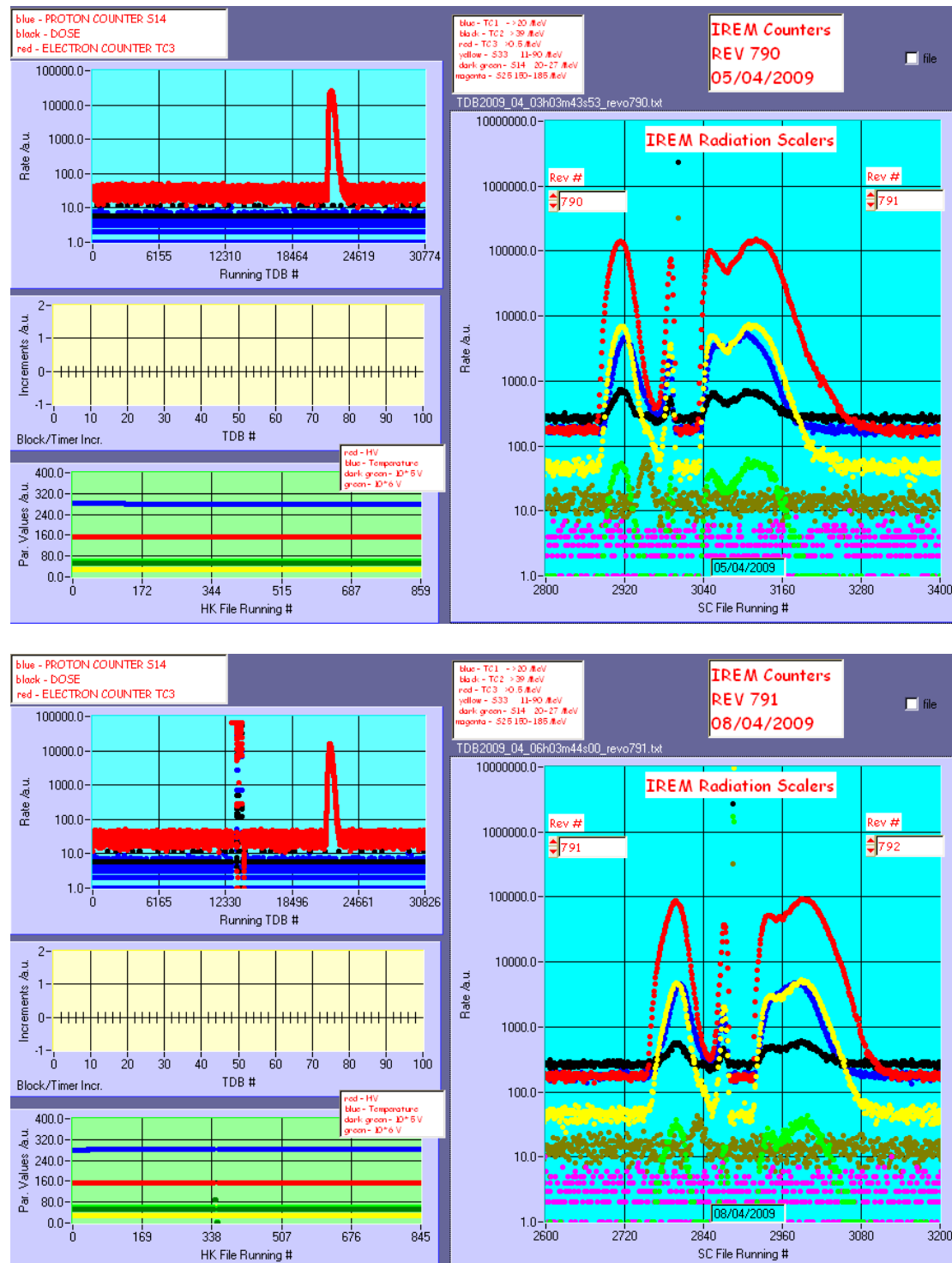
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

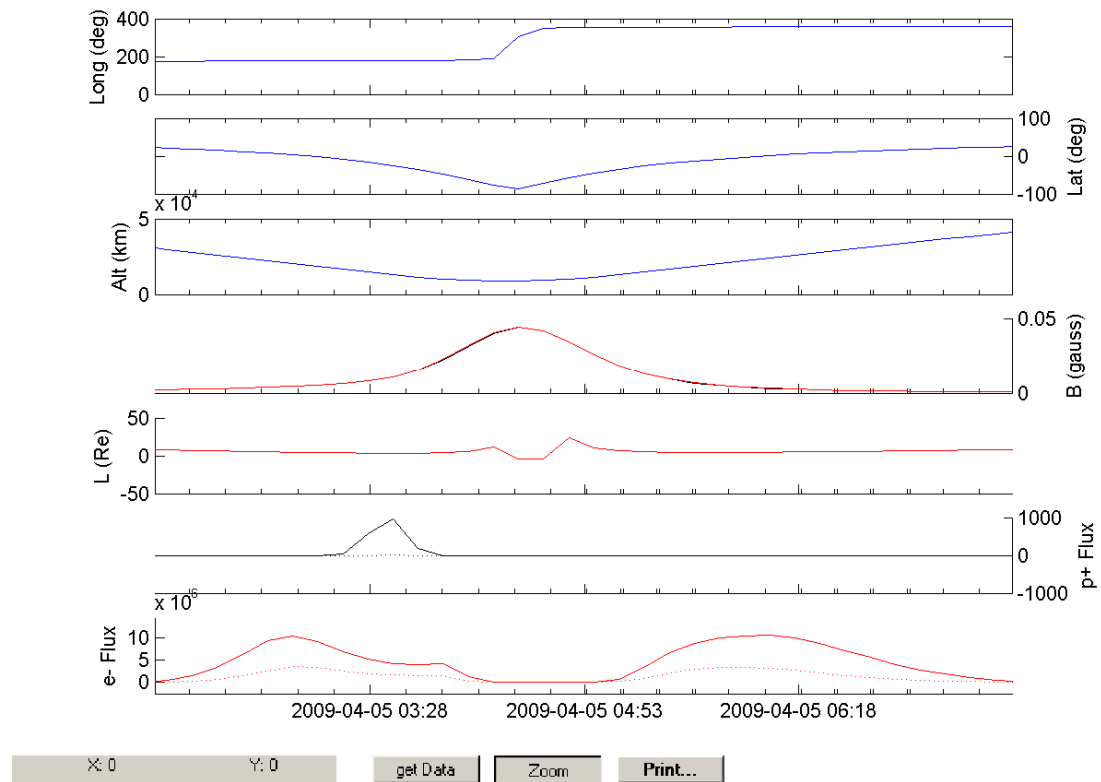
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM radiation counters:

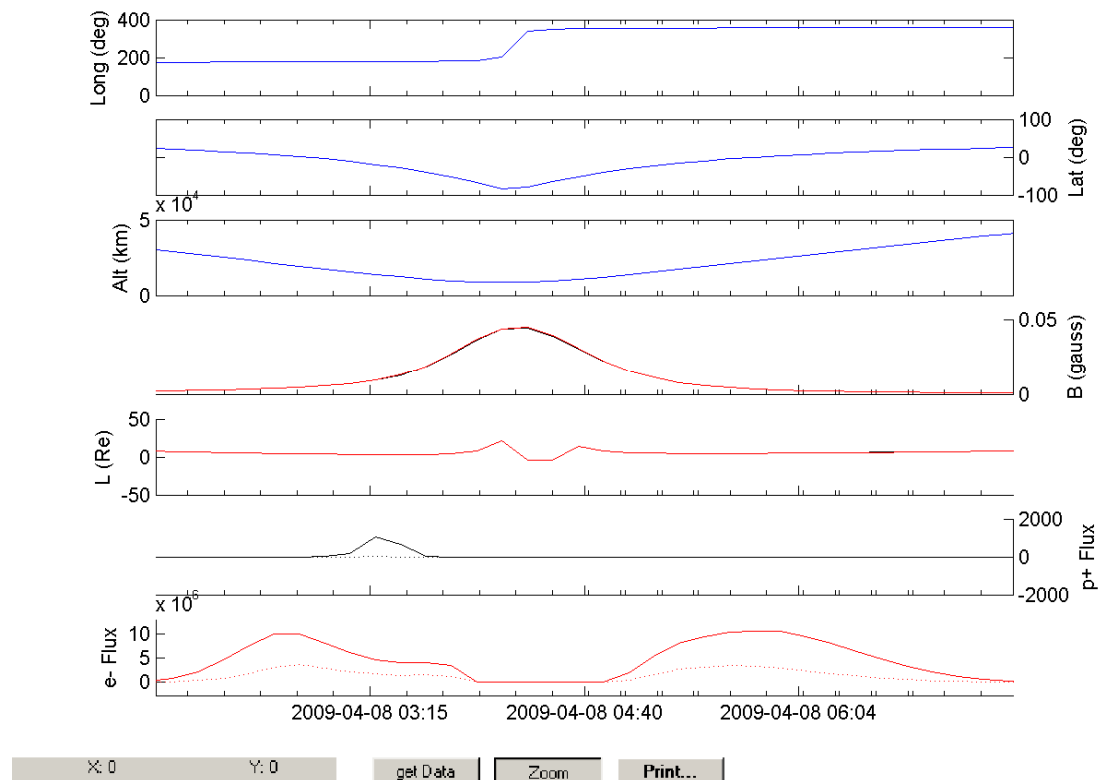


IREM Predicted Radiation Belt Passages

Rev 790



Rev 791



Radiation Assessment

Generated with SEIS Report and Analysis tool.

INTRODUCTION

This note summarises the space weather status over the observation period

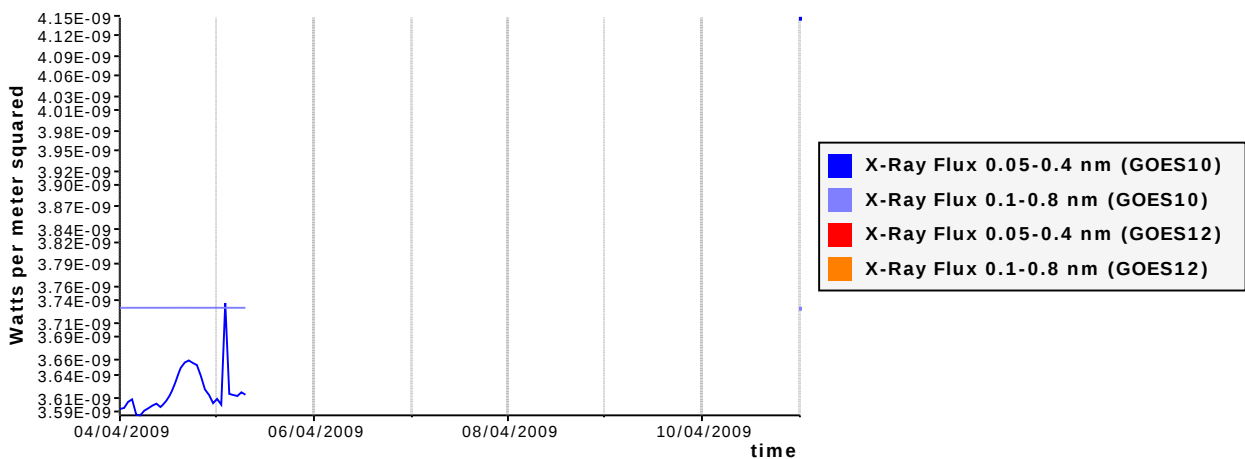
DAILY SUN

see in WR section 3.2.5

RADIATION FLUXES

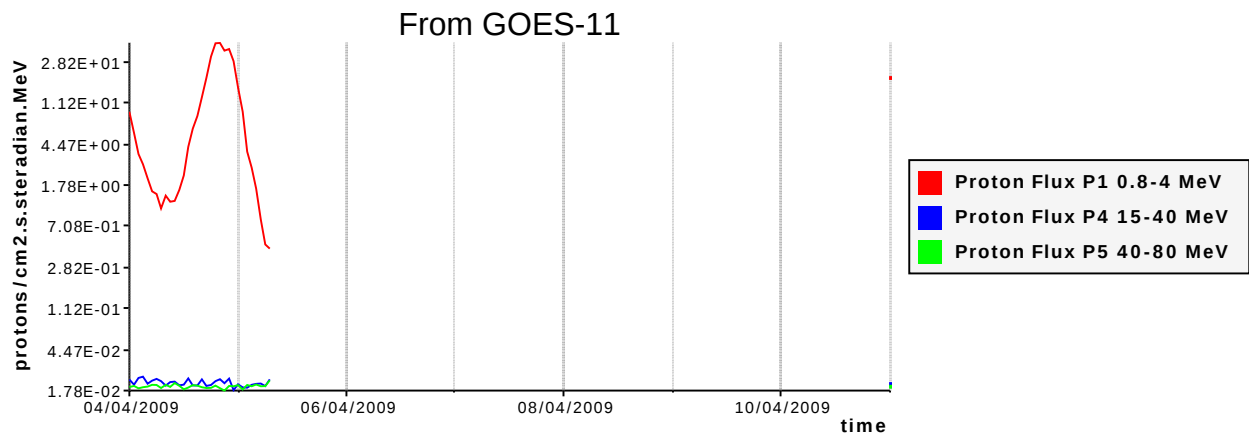
X-ray fluxes

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.



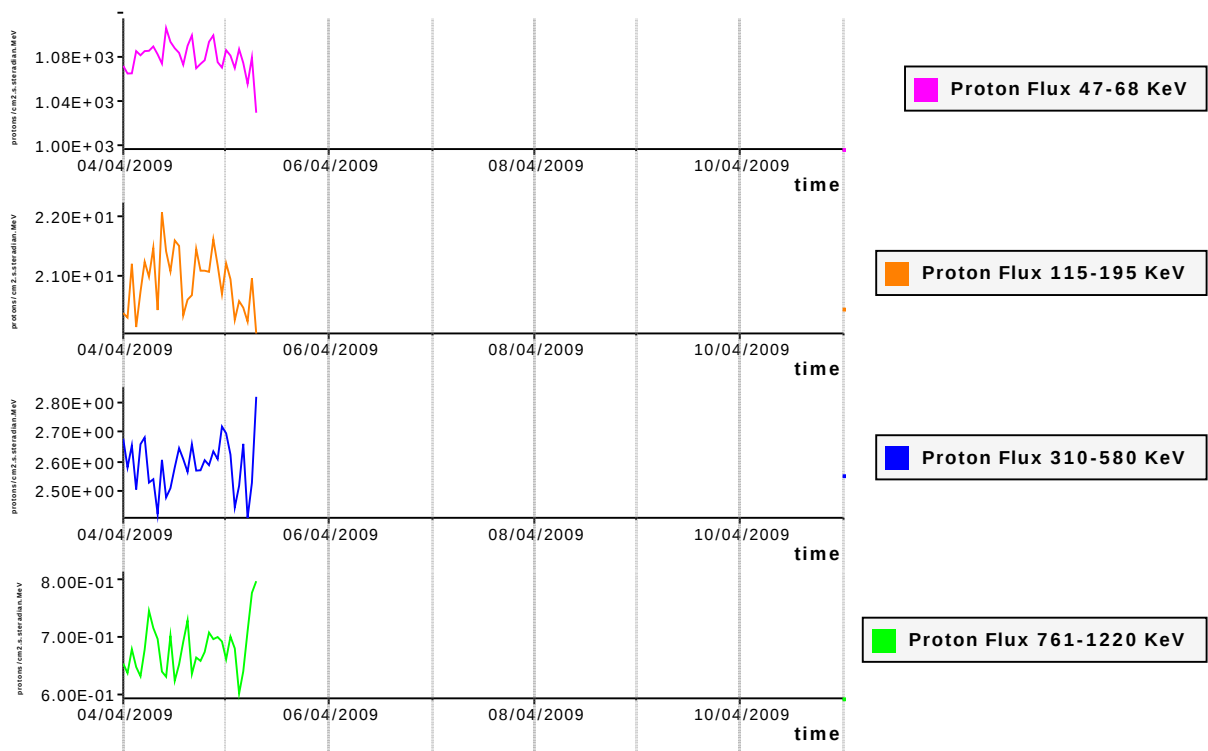
Proton fluxes (GOES-11)

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 $1\text{E-}2$.



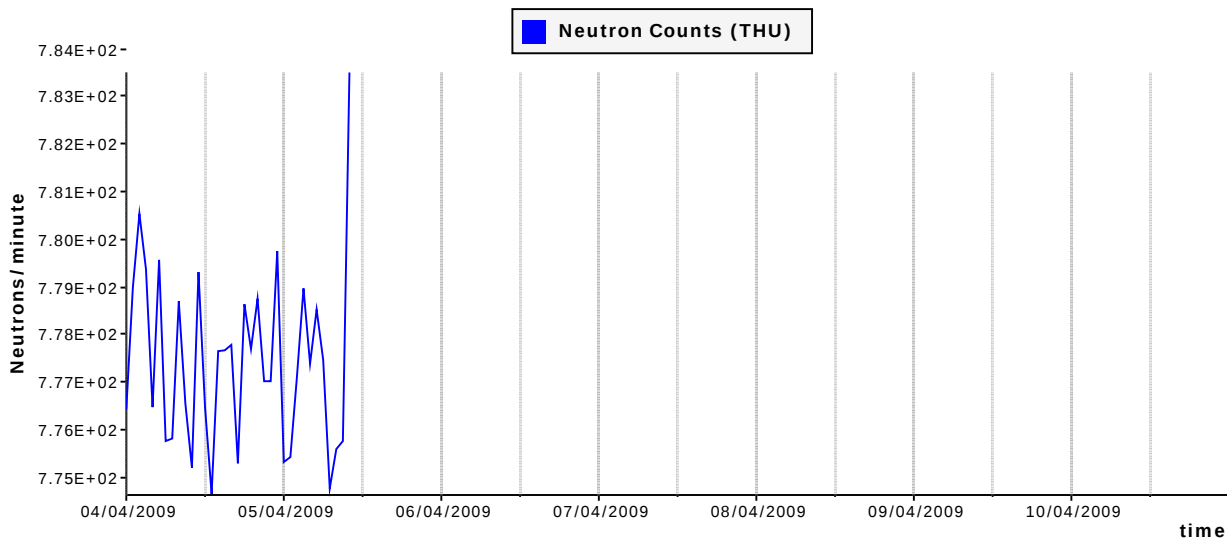
Proton fluxes (ACE)

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



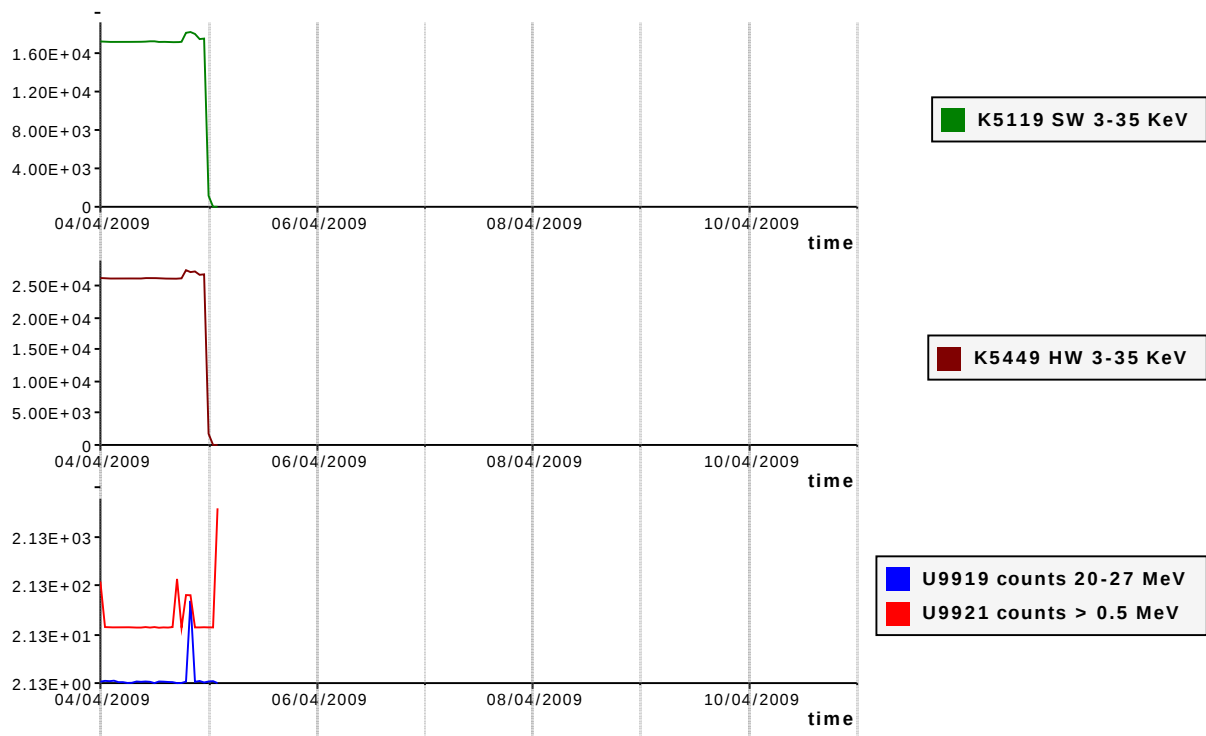
Neutron counts

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



IREM and JEM-X (INTEGRAL)

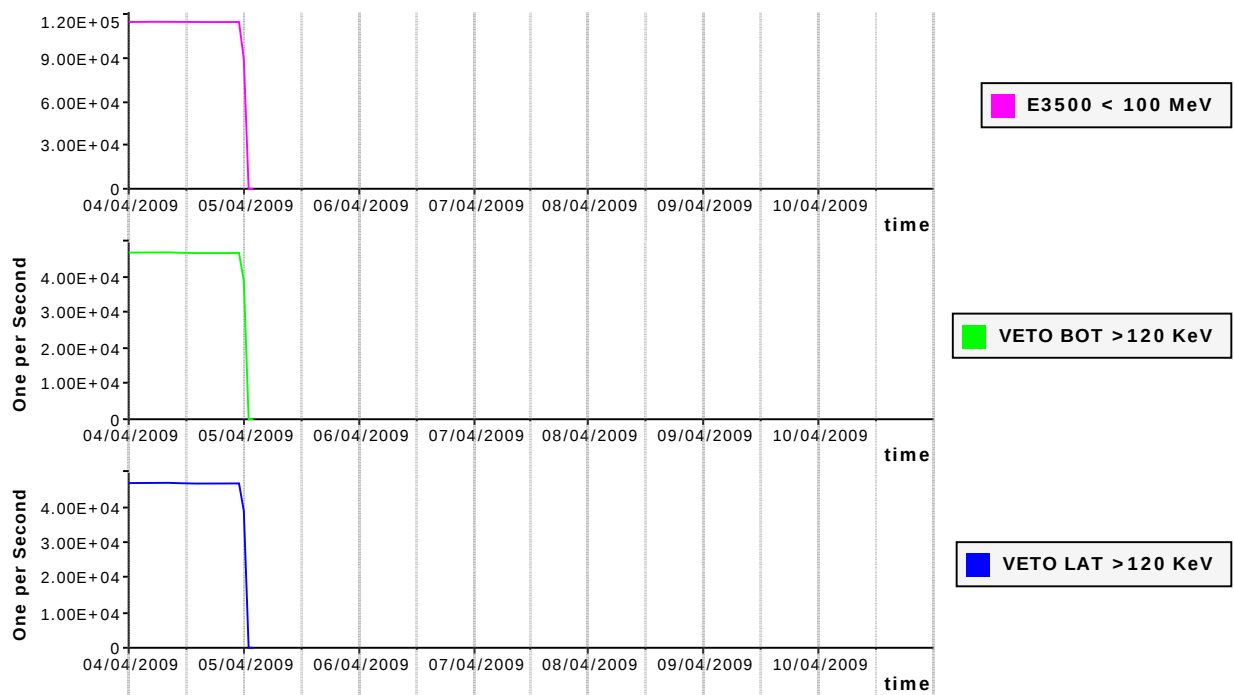
IREM proton and electron fluxes as well as JEM-X1 software and hardware triggers are presented in the following plots. Nominal values are respectively about 1 and 18 for IREM counts, and, 13000 and 19000 for JEM-X ones.



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%.



