

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 343
Week 16
20.04.09
Routine Phase

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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 11.04.09 until 17.04.09 (both dates inclusive) and covers the revolutions 792, 793 and 794.

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 Center (RA 17:45:40.03, DEC -29:00:28.1), a hexagonal dither of the Gal. Bulge region (RA 17:45:36.00, DEC -28:56:00.0), a Galactic disk scan and a raster dither of the Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0)

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.

The summer 2009 eclipse ended on 11/04/2009. The Eclipse passages were all 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.

As part of the AOCS reconfiguration after the summer eclipse season, the ACC\FDE\FCE eclipse timers were stopped and the AMD thresholds were set to their non-eclipse season values during rev 793.

Four slews were missed from TL, during the observation period, due to problem on FDS and loss of guide star.

The fuel consumption over the period between 11/04/2009 and 17/04/2009 was 0.1316 Kg. The remaining propellant is in the order of 134.8038 Kg.

Summer Eclipse Season 2009 Summary

The AOCS eclipse operations were nominal. After the end of the season the ACC/FDE/FCE Eclipse Timers were stopped and the AMD thresholds were set to

their non-eclipse season values. The complete eclipse times and IMUs usages are provided below:

Complete Eclipse Times

AOCS Eclipse Times															Summer 2009	
Date	LOS	AOS	ACC Eclipse Imminent	Eclipse Start						Eclipse End					Eclipse Duration	
				ACC	FDE	FCE	Penumbra	FSS Sun Out	Umbra	Umbra	FSS Sun In	Penumbra	FDE/FCE	ACC		
2009-02-25	05:33:00	09:04:00	09:28:37	10:10:11	10:19:34	10:20:18	10:28:17	MOON	00:00:00	00:00:00	MOON	11:07:39	11:11:50	11:16:57	0:39:22	
2009-03-12	04:28:00	07:55:00	03:25:58	04:07:58	04:18:51	04:19:35	04:25:38	04:27:54	04:28:45	04:47:07	04:47:43	04:49:48	04:55:43	04:59:30	0:24:10	
2009-03-15	04:16:00	07:39:00	03:07:41	03:54:21	04:03:17	04:04:01	04:07:21	04:08:44	04:05:26	04:47:41	04:46:39	04:48:46	04:56:17	05:02:03	0:41:25	
2009-03-18	04:06:00	07:29:00	02:54:50	03:37:02	03:47:13	03:47:57	03:54:30	03:55:38	03:55:53	04:41:41	04:41:50	04:42:40	04:48:17	04:52:34	0:48:10	
2009-03-21	03:55:00	07:17:00	02:43:49	03:25:45	03:35:13	03:35:57	03:43:29	03:44:30	03:44:42	04:34:35	04:34:41	04:35:26	04:39:57	04:45:04	0:51:57	
2009-03-24	03:43:00	07:05:00	02:32:56	03:15:05	03:24:14	03:24:58	03:32:36	03:33:34	03:33:46	04:24:53	04:25:00	04:25:40	04:29:42	04:35:32	0:53:04	
2009-03-27	03:29:00	06:52:00	02:22:08	03:04:08	03:13:13	03:13:57	03:21:48	03:22:44	03:22:54	04:13:09	04:13:15	04:13:55	04:17:57	04:23:37	0:52:07	
2009-03-30	03:17:00	06:44:00	02:13:03	02:55:01	03:04:18	03:05:02	03:12:43	03:13:35	03:13:48	04:01:22	04:01:30	04:02:08	04:06:06	04:11:48	0:49:25	
2009-04-02	03:06:00	06:27:00	02:05:37	02:47:29	02:58:38	02:59:22	03:05:17	03:06:09	03:06:23	03:49:33	03:49:40	03:50:20	03:56:46	03:59:54	0:45:03	
2009-04-05	02:39:12	06:16:00	01:57:22	02:39:13	02:53:16	02:54:00	02:57:02	02:57:57	02:58:12	03:35:32	03:35:40	03:36:23	03:45:32	03:45:58	0:39:21	
2009-04-08	08:04:20	06:03:00	01:50:38	02:32:45	02:43:30	02:44:14	02:50:18	02:51:18	02:51:38	03:21:34	03:21:46	03:22:36	03:28:26	03:32:23	0:32:18	
2009-04-11	02:29:00	05:46:00	01:47:36	02:29:32	02:40:30	02:41:13	02:47:16	02:48:29	02:48:59	03:08:24	03:08:50	03:09:51	03:15:53	03:19:35	0:22:35	

IMU1 Usage during Eclipse

IMU Usage during Eclipse Season				Summer 2009		
IMU On	IMU Off	From Health Check		From Auto Calibration	On Time	Accumulated On Time
		Noise Roll [as/s]	Drift Roll [as/s]	Drift Roll [as/s]		
2009-02-25 02:31:26	2009-02-25 11:19:31	0.2254	0.2094		8:48:05	8:48:05
2009-03-12 01:15:46	2009-03-12 05:01:42	0.2265	0.1661	0.2117	3:45:56	12:34:01
2009-03-15 01:06:26	2009-03-15 05:00:46	0.2059	0.2335	0.2344	3:54:20	16:28:21
2009-03-18 00:44:23	2009-03-18 04:54:40	0.2718	0.1579	0.1784	4:10:17	20:38:38
2009-03-21 00:35:19	2009-03-21 04:47:18	0.2604	0.2094	0.2414	4:11:59	24:50:37
2009-03-24 00:23:11	2009-03-24 04:37:22	0.2016	0.2220	0.2454	4:14:11	29:04:48
2009-03-27 00:22:55	2009-03-27 04:25:51	0.1996	0.2648	0.2984	4:02:56	33:07:44
2009-03-29 23:59:20	2009-03-30 04:14:01	0.1897	0.2850	0.3248	4:14:41	37:22:25
2009-04-01 23:33:04	2009-04-02 04:02:26	0.2351	0.2697	0.3025	4:29:22	41:51:47
2009-04-04 23:59:12	2009-04-05 03:48:35	0.2105	0.2100	0.2340	3:49:23	45:41:10
2009-04-07 22:57:20	2009-04-08 03:34:37	0.2047	0.3367		4:37:17	50:18:27
2009-04-10 23:24:40	2009-04-11 03:21:55	0.1085	0.3182		3:57:15	54:15:42

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

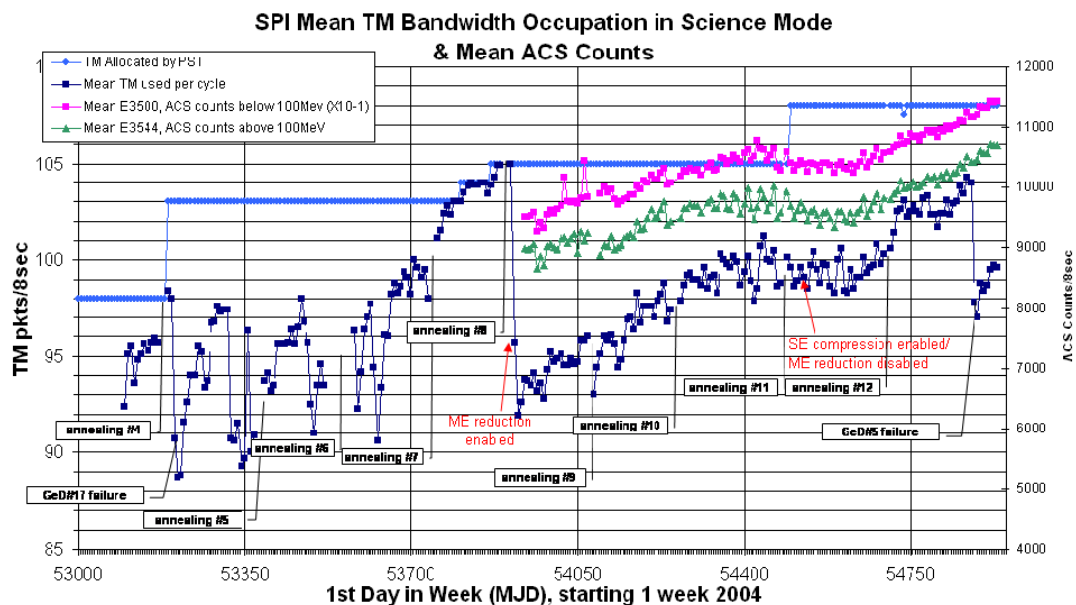
3.2.1 SPI

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 99.6 packets/cycle.

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

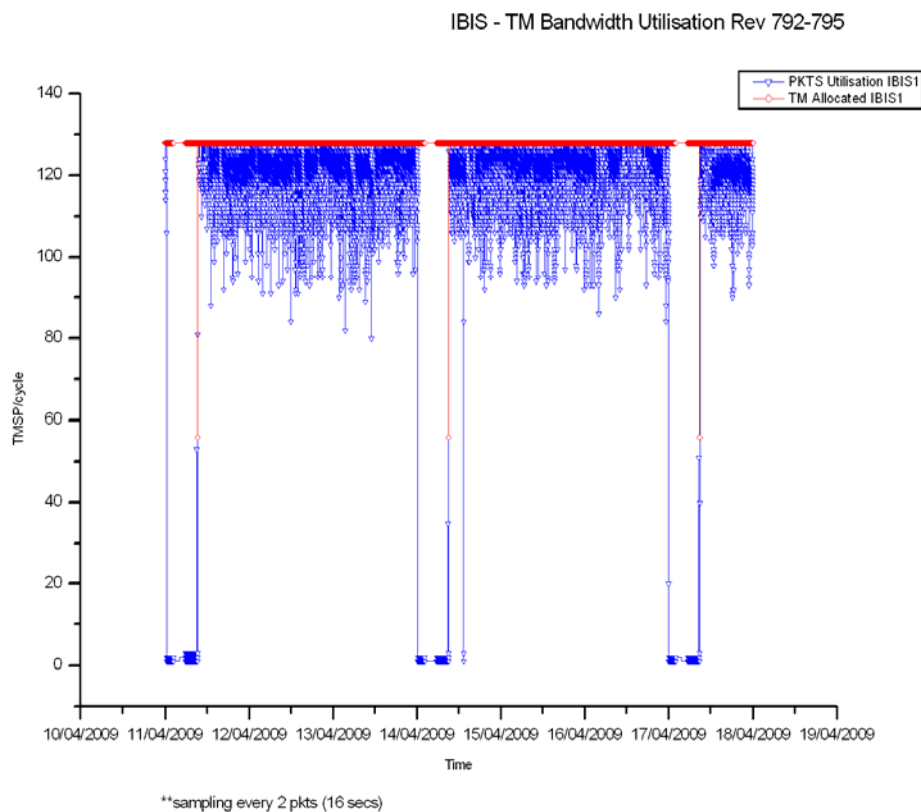
The overall status of the unit is nominal.

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

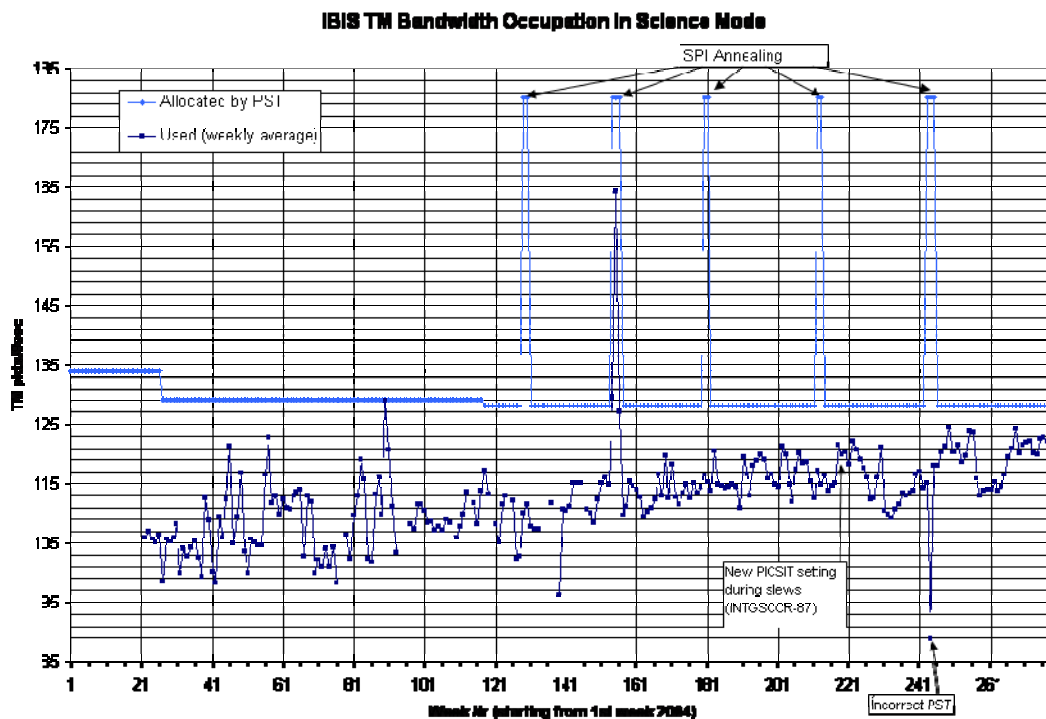
During the reporting period, the TM bandwidth statistics were as follows:

- PST allocation to IBIS above radiation belts: 128 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 122.12 packets/cycle (down 0.60 on previous week)
- Percentage of TM cycles in which full bandwidth (128 packets/cycle) was used: 21.82%

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, 214 of the 218 planned science pointings were executed nominally, 2 were cut short and 2 were 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. 4 slews (3 CSL, 1 OSL) were missed from TL, during the observation period, due to problem on FDS and loss of guide star. During the reporting period frequent restarts of IFRD and ISDS tasks on the isdsb machine were required. The reason for the instability is not known.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. Weilheim station has been re-validated for INT support, as it was Redu for the Eutelsat fleet. The Emergency Support period for Eutelsat from Redu has started on DOY 102 (12.04) and will last until DOY 123 (03.05). On DOY 106 16/04/2009 at 20:41z a G/S drop VC0/VC7 from REDU was reported. There was no impact.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

No new PSFs have been received.

Observations have been planned for revolutions 796 to 799.

New TSFs have been received for revolutions 795 and 796.

2. Observation status

ECS files have been received and processed up to revolution 785.

3. ISOC Science Data Archive

Ingestion of new data from ISDC is held due to some changes in the data contents requiring an update of GINGEST, which is expected soon.

4. ISOC system

Work on V22 is ongoing.

5. Problems

No new problems.

4.3.2 ISDC

Status of ISDC observation processing on 17/04/2009:

- Latest Standard Analysis completed: observation 06200010021 (Galactic Bulge region, Revolution780) on 16/04/2009.
- Latest products archived: observation 06200010021 (Galactic Bulge region, Revolution780) on 17/04/2009.
- Latest observation products sent to the observer: observation 05297000004 (Perseus OB2 Cloud , Revolution 772) on 09/04/2009.

5 Special Events

Next SPI annealing to start on 20 April 2009.

6 Anomalies

No anomaly reports were entered into the ARTS system this week.

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

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.

Revolution 793

The observations in revolution 793 began with a hexagonal dither of the Gal. 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 17:45:40.03, DEC -29:00:28.1), lasting ~2.9 hours. This was followed by a Galactic disk scan, lasting ~49.4 hours, until the end of the revolution.

Revolution 794

The observations in revolution 794 began with a hexagonal dither of GRS 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.5 hours. This was followed by a Galactic disk scan, lasting ~33.7 hours. This was followed by a raster dither of the Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0), lasting ~16.1 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

2009-03-30T01:44:00.000Z	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.
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.
2009-04-11T06:54:49.000Z	134.9259	F	Automatic TM processing.
2009-04-11T16:09:54.000Z	134.8928	F	Automatic TM processing.
2009-04-14T01:46:16.000Z	134.8664	F	Automatic TM processing.
2009-04-14T06:13:28.000Z	134.8509	F	Automatic TM processing.
2009-04-15T15:30:20.000Z	134.8203	F	Automatic TM processing.
2009-04-17T06:03:04.000Z	134.8038	F	Automatic TM processing.

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, 11/04/2009 – 17/04/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 131 Open Loop Slews, 104 Closed Loop Slews and 6 Momentum Biases were executed (as reported by ACC OEM).

4 slews (3 CSL, 1 OSL) were missed from TL, during the observation period, due to problem on FDS and loss of guide star.

This is equivalent to $\sim 1.7\%$ of the total number of slews planned (236).

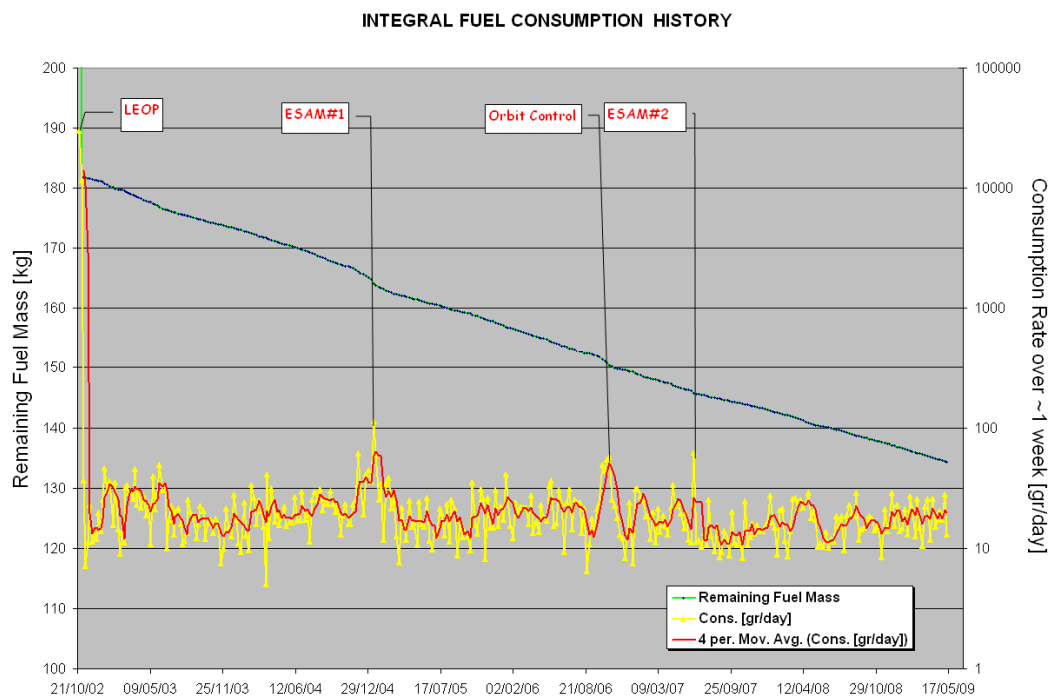
The OTF was not reached during part of PID 07940007.

Orbit Control

No update.

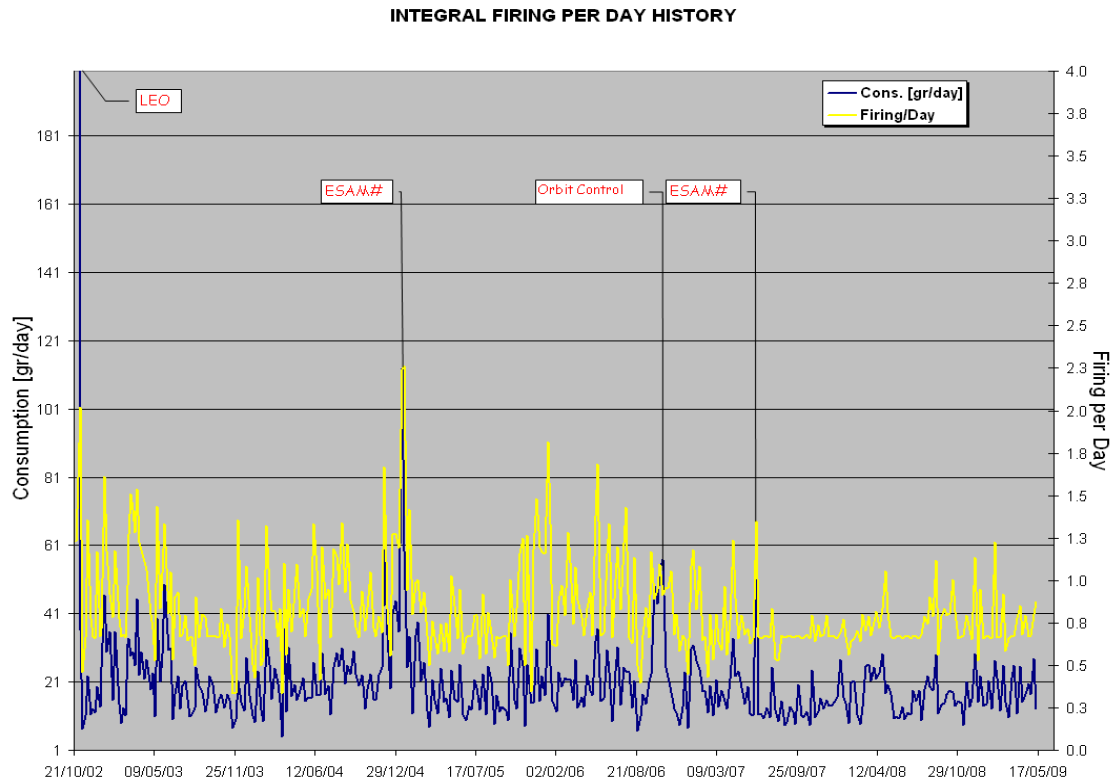
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 17/04/2009 is reported in the plot below.



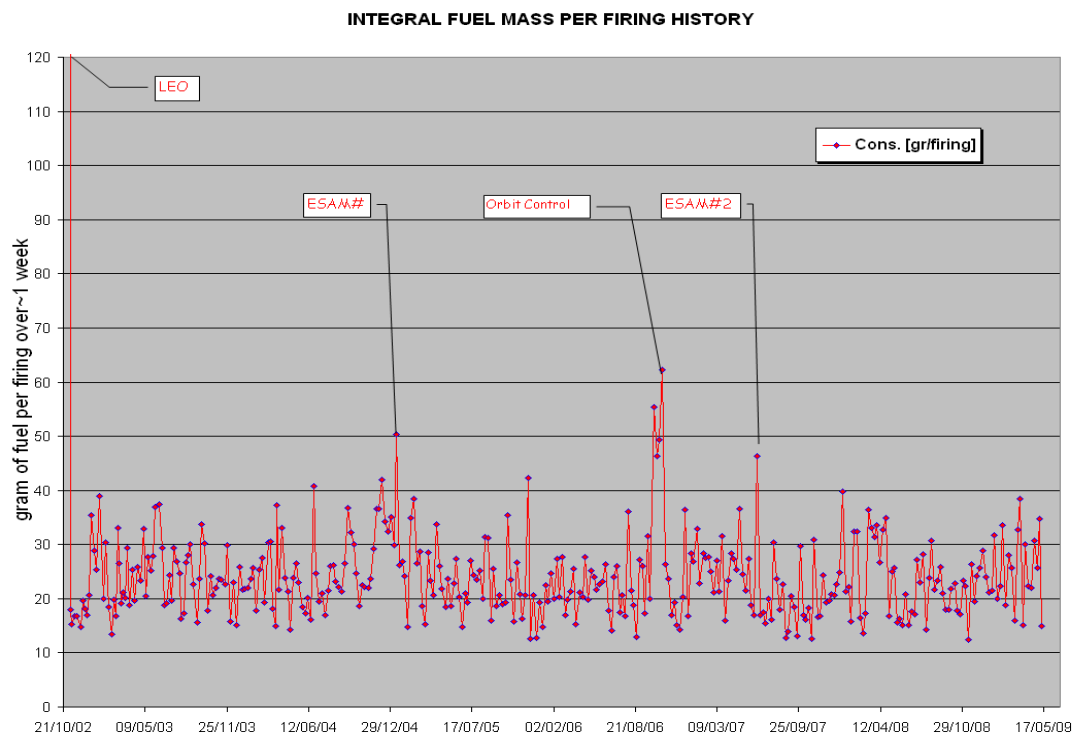
The above plot considers the ESAM fuel consumption spread over period of ~ 1 week.

The firing per day over the period between 01/11/2002 and 17/04/2009 is reported in the plot below.



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

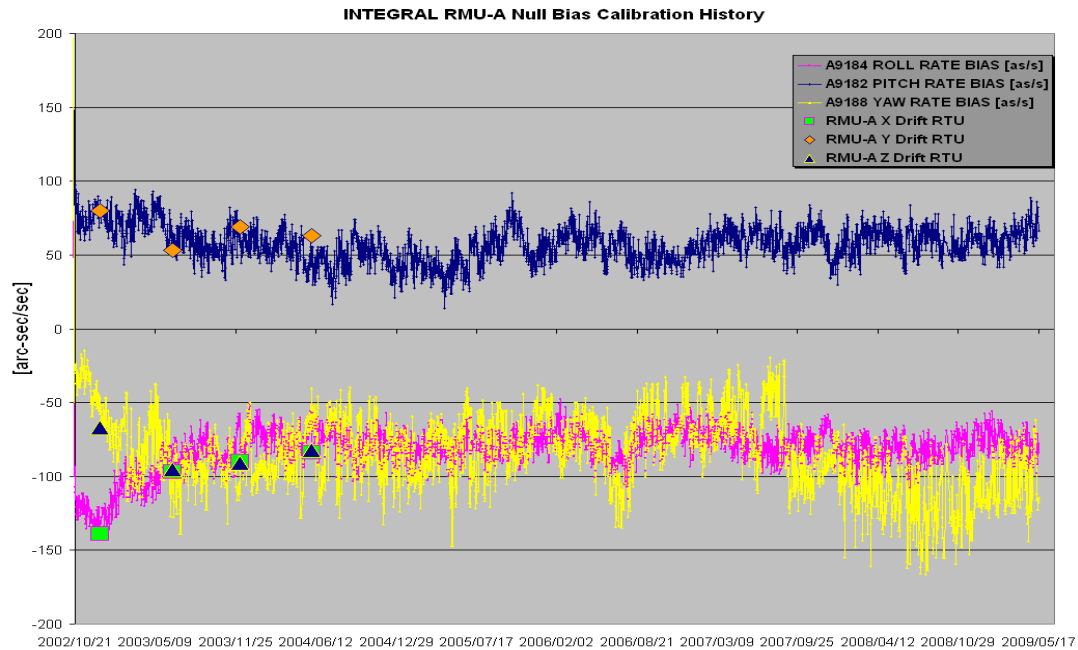
The fuel per firing over the period between 01/11/2002 and 17/04/2009 is shown in the plot below.



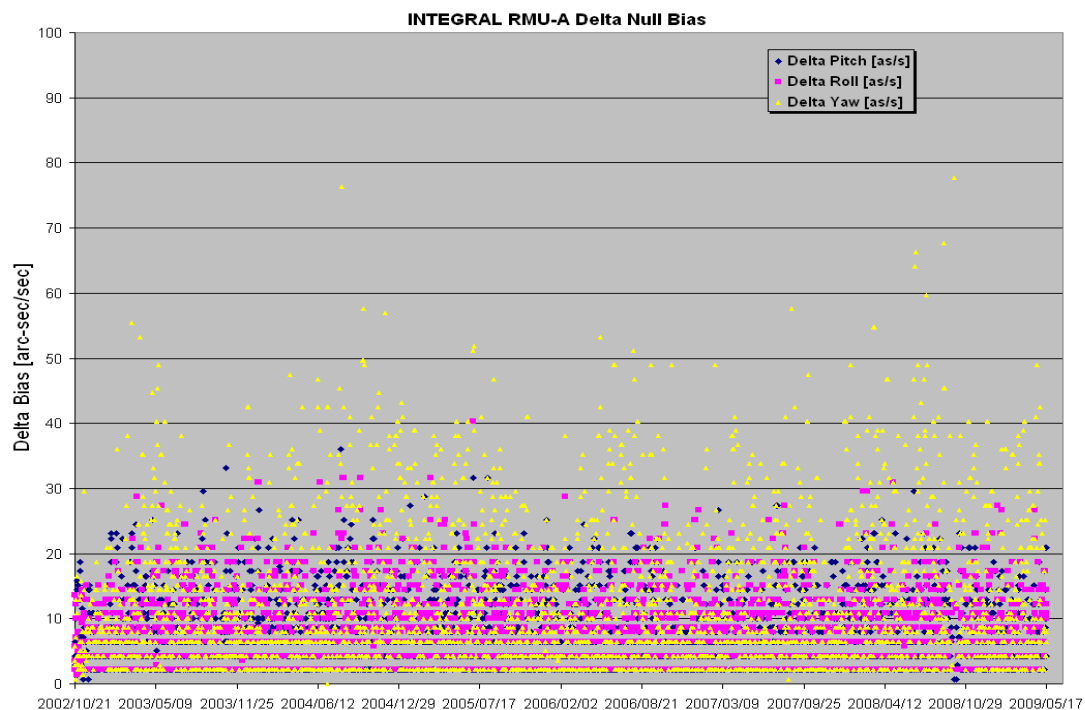
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 17/04/2009 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 17/04/2009 is reported in the plot below.



11/04/2009 (Day of Year 101, Revolution 792-793)

The <<Summer>> 2009 eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 792-793:

INPUT		AOCS ECLIPSE MONITORING				Revolution:	792
		Summer 2009				Date:	11/04/2009
						DoY:	101
Penumbra Start	11/04/2009 02:47:16	Penumbra Start:	11/04/2009 02:47:16	LOS:	11/04/2009 02:29:00		
Penumbra End	11/04/2009 03:09:51	Umbra Start:	11/04/2009 02:48:59	AOS:	11/04/2009 05:46:00		
Umbra Start	11/04/2009 02:48:59	Umbra End:	11/04/2009 03:08:24				
Umbra End	11/04/2009 03:08:24	Penumbra End:	11/04/2009 03:09:51				
		Eclipse Duration:	0:22:35				
ACC Sample Time	08/04/2009 07:11:41	Eclipse Duration [sec]:	1355				
FDE Sample Time	08/04/2009 07:15:40						
FCE Sample Time	08/04/2009 07:15:39	IMU Health Check Start	10/04/2009 23:23:00				
		Eclipse Imminent Flag	11/04/2009 01:47:36				
ACC Eclipse Counter:	0	ACC IMU Auto Cal Start	11/04/2009 02:02:02				
ACC Eclipse Start:	242271	ACC IMU Auto Cal End	11/04/2009 02:22:02				
ACC Eclipse End:	245274						
		Sun out of FSS FoV	11/04/2009 02:48:29				
FDE Eclipse Start:	242690	Sun back in FSS FoV	11/04/2009 03:08:50				
FDE Left to Eclipse Start	242690						
FDE Eclipse Duration:	2124						
		Eclipse Timers		From Loaded Timers		Actual From Telemetry	
				Absolute	WRT Pen. Start [sec]	UM [sec]	LSB [sec]
FCE Eclipse Start:	242734	ACC Eclipse Start	11/04/2009 02:29:32	-1064.00	11/04/2009 02:29:38	-1064	
FCE Left to Eclipse Start	242734	FDE Eclipse Start	11/04/2009 02:40:30	-406.00		-404	176
FCE Eclipse Duration:	2080	FCE Eclipse Start	11/04/2009 02:41:13	-363.00		-360	176
				Absolute	WRT Pen. End [sec]	UM [sec]	LSB [sec]
		FCE Eclipse End	11/04/2009 03:15:53	362		360	176
		FDE Eclipse End	11/04/2009 03:15:54	363		360	176
		ACC Eclipse End	11/04/2009 03:19:35	584	11/04/2009 03:19:41	580.00	578
		IMU	Uplink	Execution	WRT Penumbra End [sec]		
		IMU Auto Off Enable	08/04/2009 07:03:41	11/04/2009 03:21:35	704		
		IMU On	10/04/2009 23:24:40	IMU H/C Noise Roll [as/s]	0.1085		
		IMU Off	11/04/2009 03:21:55	IMU H/C Drift Roll [as/s]	0.3182		
		IMU On Time	3:57:15	IMU Auto Cal Drift Roll [as/s]			

FDS problem: at 17:01z the FDS did not perform the update of the slew ID 07930013. A manual recovery was performed and the slew updated again in TL. Unfortunately the manual update did not work either because the next slew in TL was expected to be a Close Loop Slew instead of an Open Loop Slew

A manual recovery was performed from attitude of PID 07930012 to the attitude of PID 07930013. The next slew 07930014 was manually updated in TL.

The following slew was missed in TL: 07930013 (CSL)

12/04/2009 (Day of Year 102, Revolution 793)

Reconfiguration of the AOCS after the eclipse season: With the end of the summer 2009 eclipse season, the AMD thresholds were set back to their non-eclipse season values.

Thresholds from INT-MA-AI-0001, 5.3.2.4.2.2, and INT-PR-MMB-0005 page 5-9, modified as per new AMD Threshold agreement for the eclipse season.									
01- Update of thresholds after uplink of new RW Inertias on 22/01/2004. 0155_0001_M.RWI									
Wheel Inertia:									
RW#1:	0.096000	Kgm**2							
RW#2:	0.097650	Kgm**2							
RW#3:	0.097272	Kgm**2							
RW#4:	0.097649	Kgm**2							
Sunlight Season:									
Subset 1			Subset 2						
WSMAX	39			35.9					
WSMIN	2.2			4.8					
WSMAX	To Uplink:					In rpm:			
	X1		X2			X1	X2		
RW#1:	406.250000	rd/s	373.958333	rd/s		3879	3571		
RW#2:	399.387606	rd/s	367.641411	rd/s		3814	3511		
RW#3:	400.938401	rd/s	369.068939	rd/s		3829	3524		
RW#4:	399.388015	rd/s	367.641788	rd/s		3814	3511		
WSMIN	To Uplink:					In rpm:			
	X1		X2			X1	X2		
RW#1:	22.916667	rd/s	50.000000	rd/s		219	477		
RW#2:	22.529557	rd/s	49.155398	rd/s		215	469		
RW#3:	22.617038	rd/s	49.346265	rd/s		216	471		
RW#4:	22.529580	rd/s	49.155448	rd/s		215	469		

In the same time frame the ACC/FDE/FCE Eclipse Timers were stopped to reconfigure permanently the S/C in sunlight.

13/04/2009 (Day of Year 103, Revolution 793)

Nothing to report.

14/04/2009 (Day of Year 104, Revolution 793-794)

Loss of guide star: at 14:39:31z a loss of the selected guide star occurred during PID 07940007. The origin of the event is likely due to false event affecting the STR.

As foreseen by the IPS logic, the ACC did switch ON the IMU 1, a new automatic mapping was commanded and a new guide star picked. A manual recovery was performed from attitude of PID 07940007 to the attitude of PID 07940010. The next slew 07940011 was manually updated in TL.

The OTF was not reached during part of PID 07940007.

The following slews were missed in TL: 07940008 (OSL) – 09 (CSL) – 10 (CSL)

15/04/2009 (Day of Year 105, Revolution 794)

Nothing to report.

16/04/2009 (Day of Year 106, Revolution 794)

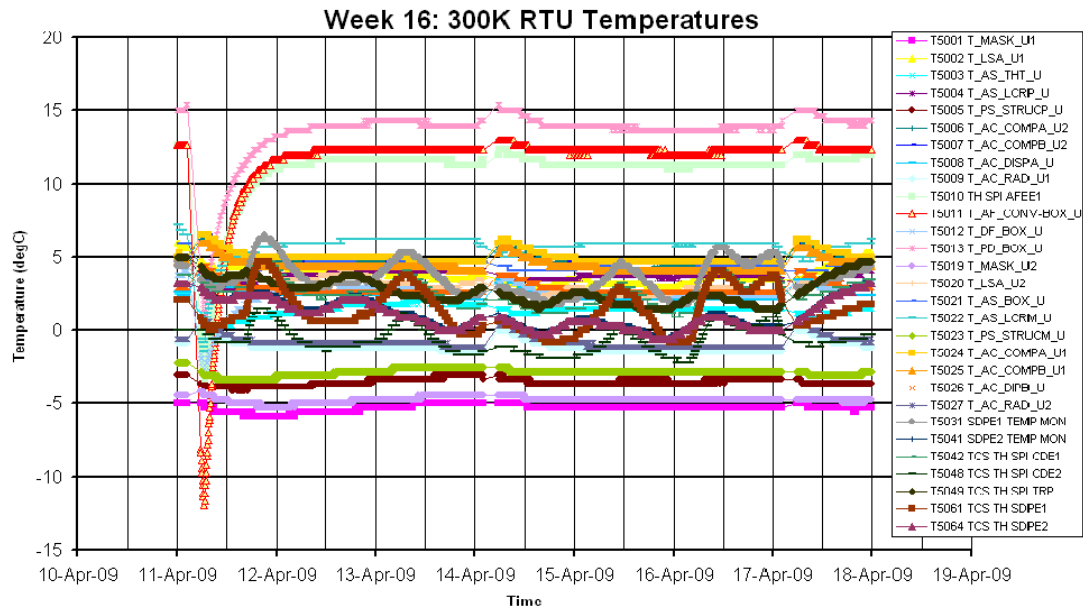
Nothing to report.

17/04/2009 (Day of Year 107, Revolution 794-795)

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.



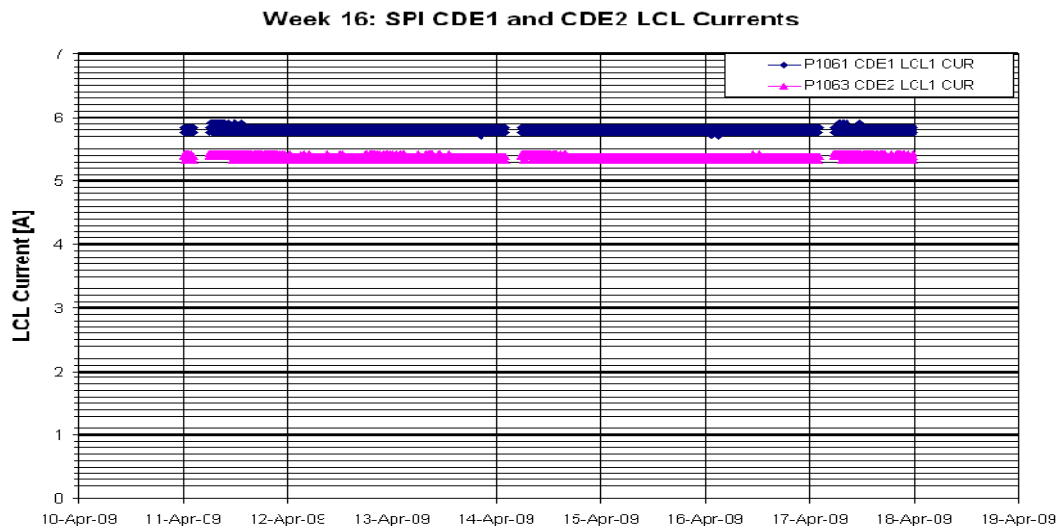
Stirling Compressors and Cryostat: The performance of the compressors is nominal.

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

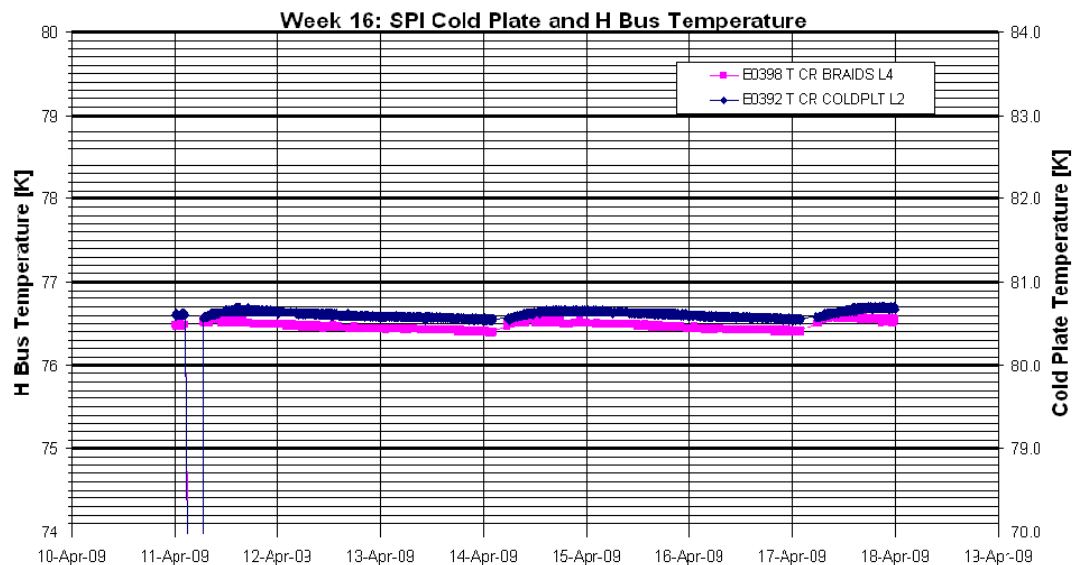
The stroke of all four compressors was set to 43 throughout the week and the average CDE LCL currents were as follows:

- 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.



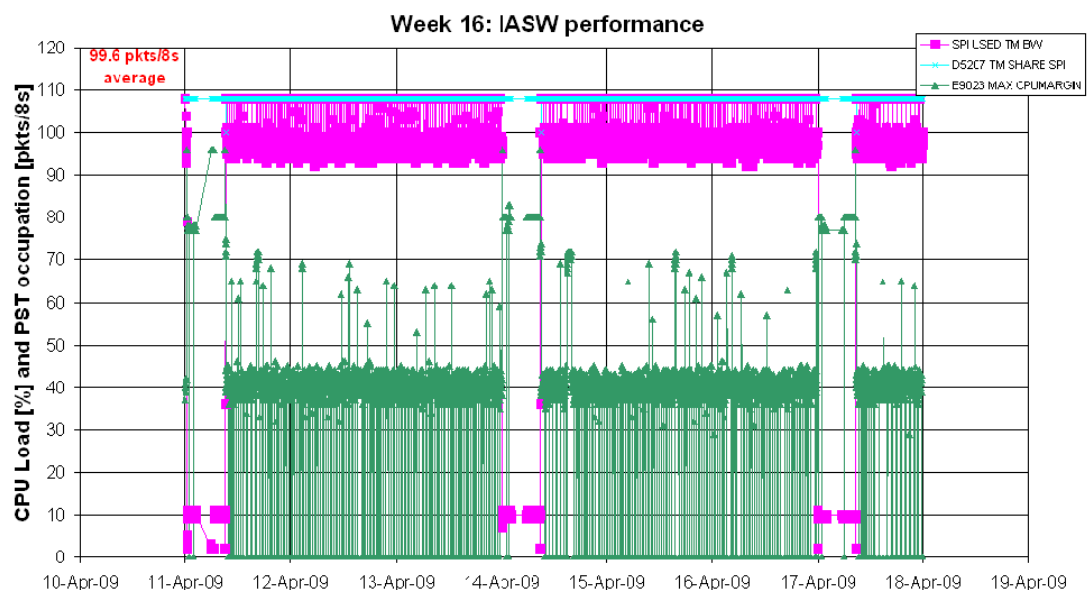
The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



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

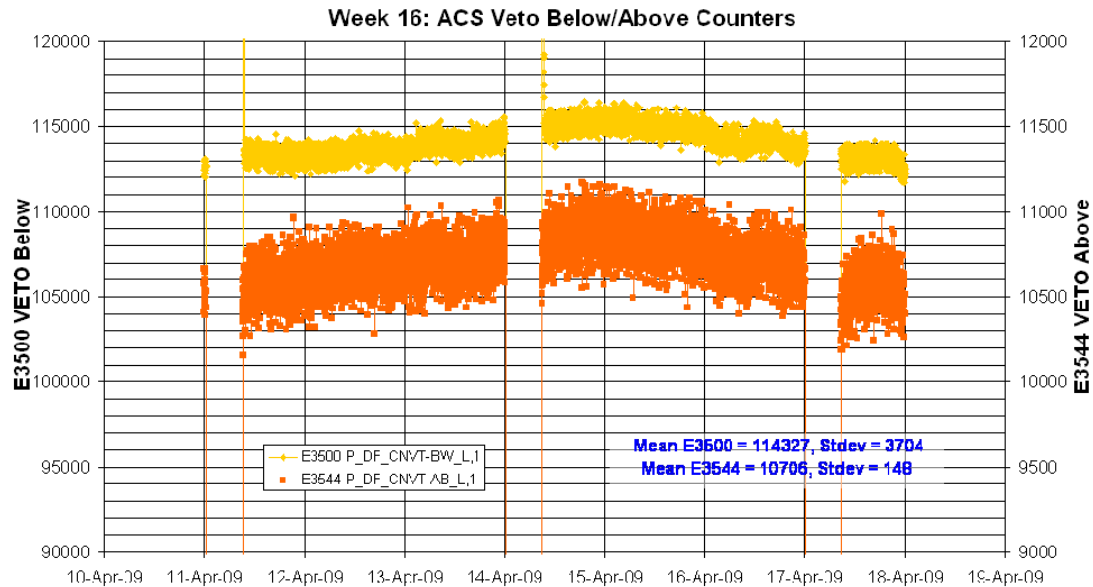
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 99.6 packets/cycle over the science window when the TM allocation was 108 packets/cycle.

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

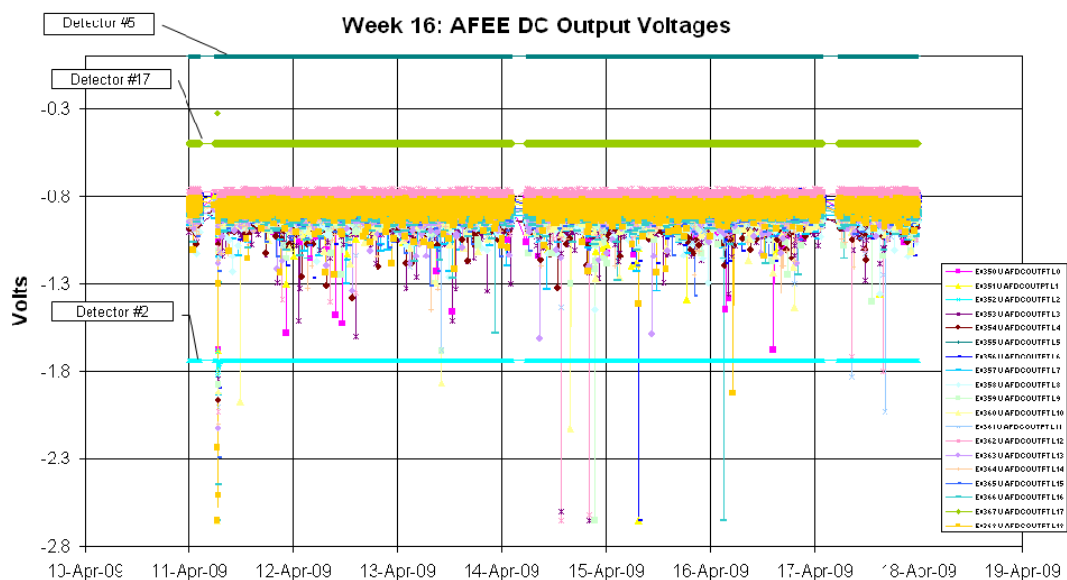


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

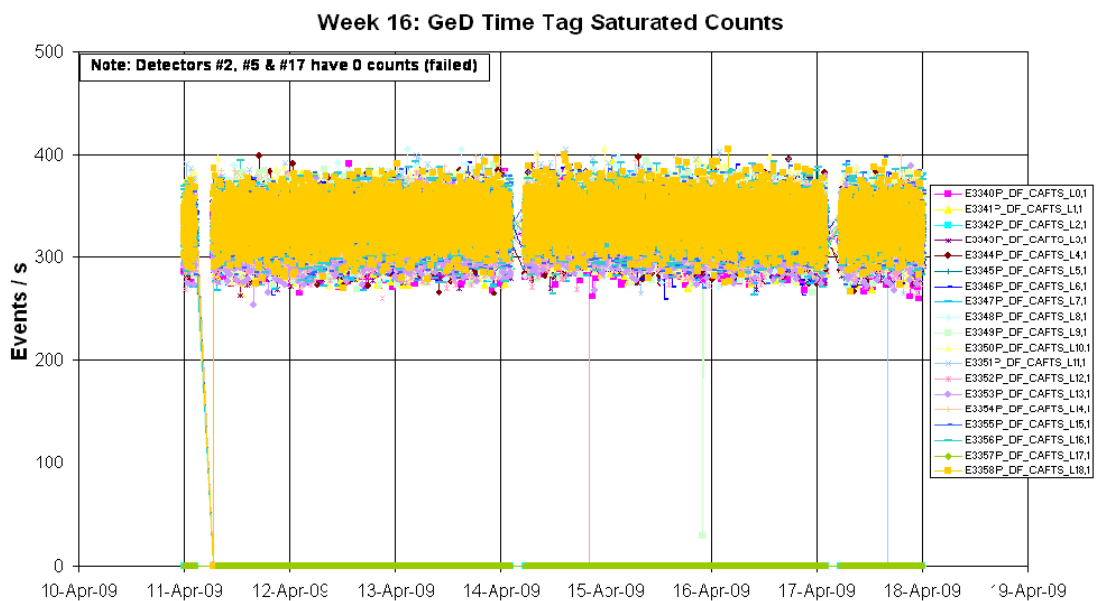
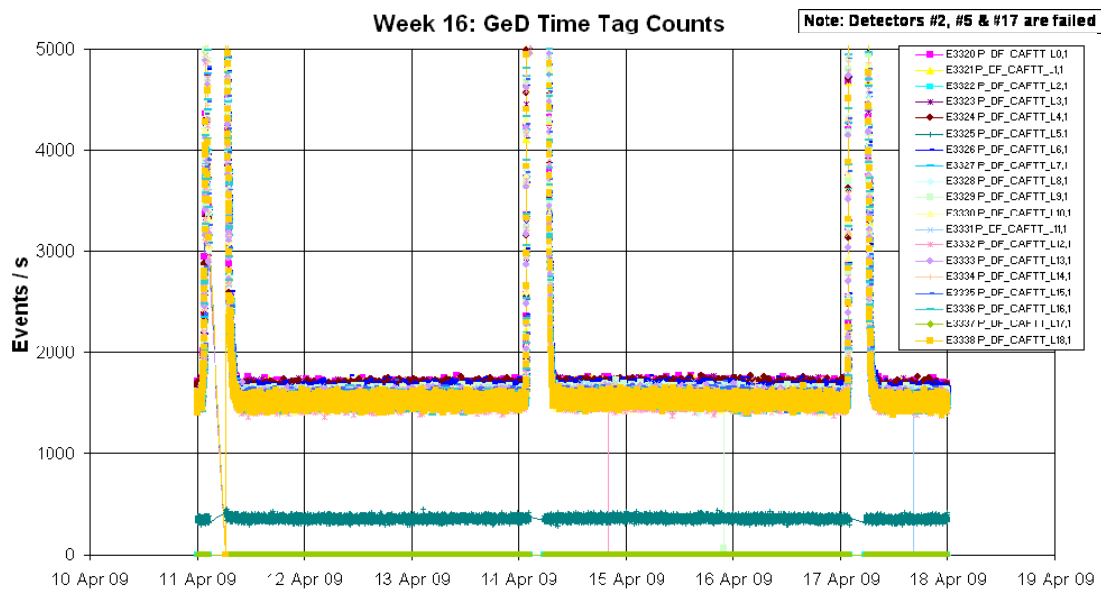
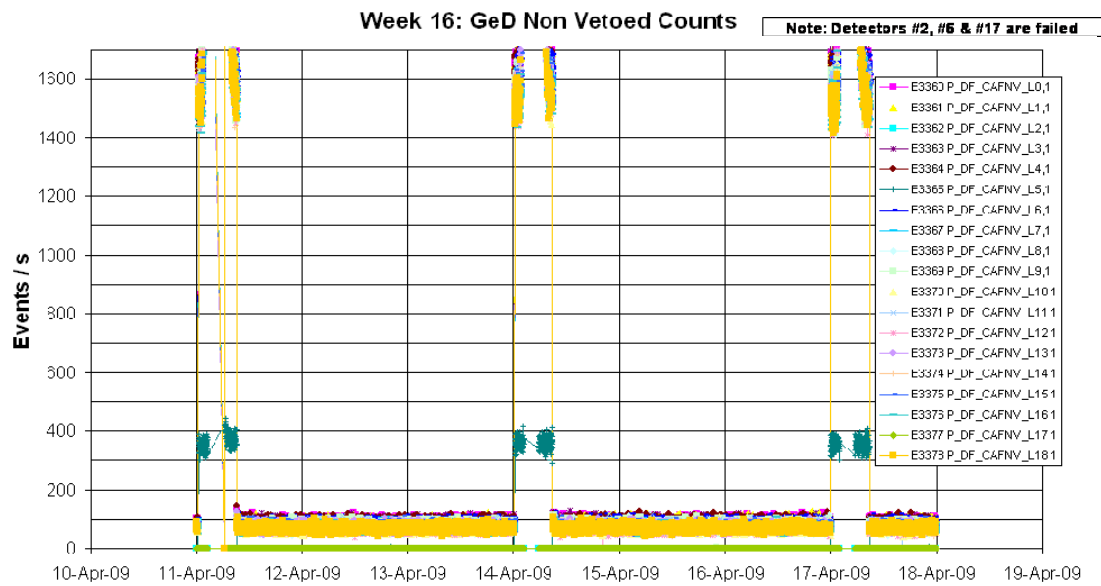
The following plot shows the ACS overall count rate evolution during the reporting period:



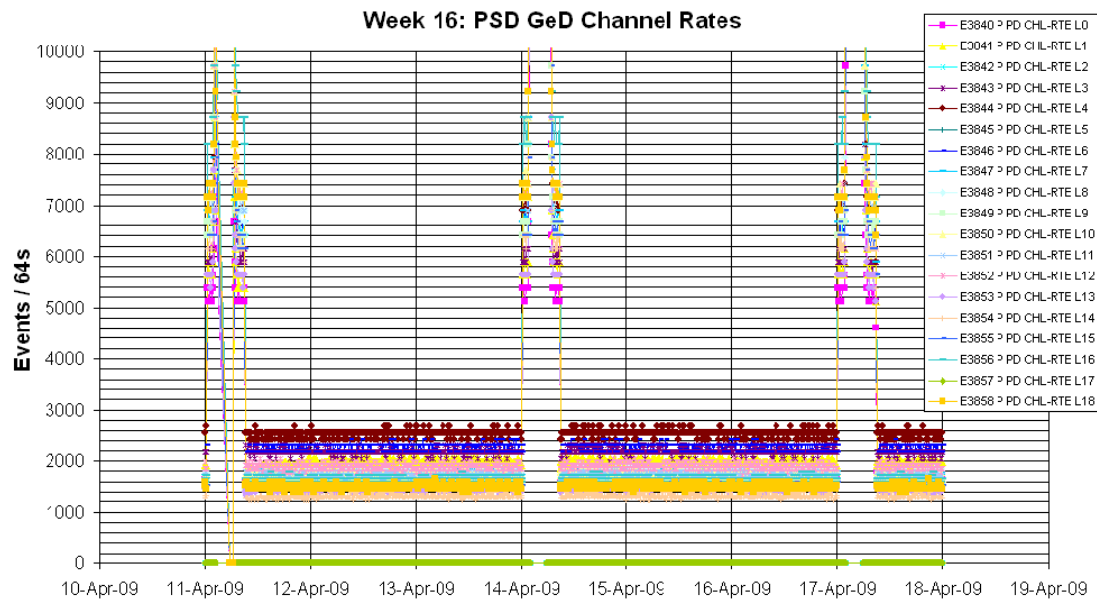
AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003; detector #17 is failed since 17/07/2004 and detector #5 is failed since 19/02/2009. The HV of the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



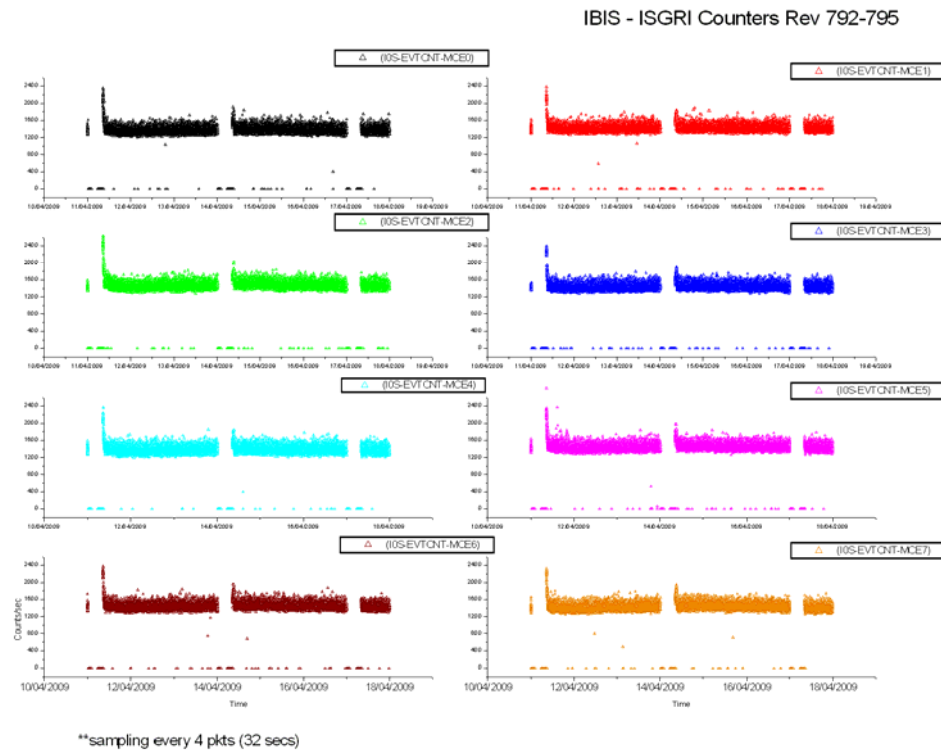
Event Log:

- On 2009-04-11 at 10:10:26Z 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 revolutions 793 and 794, TM parameter E3500 (ACS CntVetoBelow) was OOL High for ~15-30 minutes after radiation belt exit of these revolutions. In each case it returned within limits of its own accord and no action was taken.

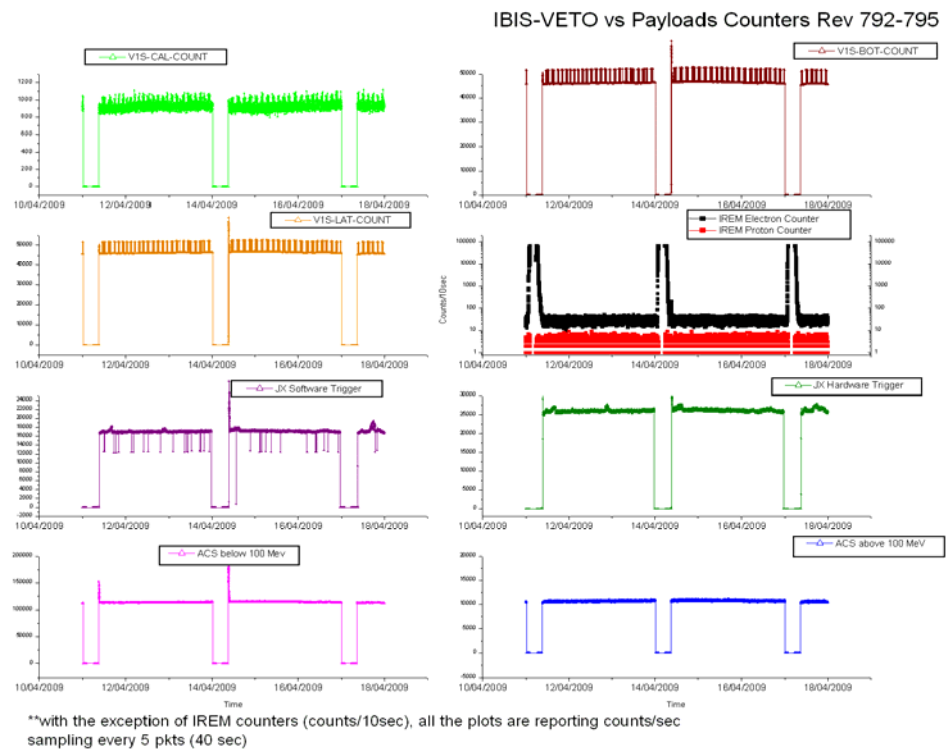
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:

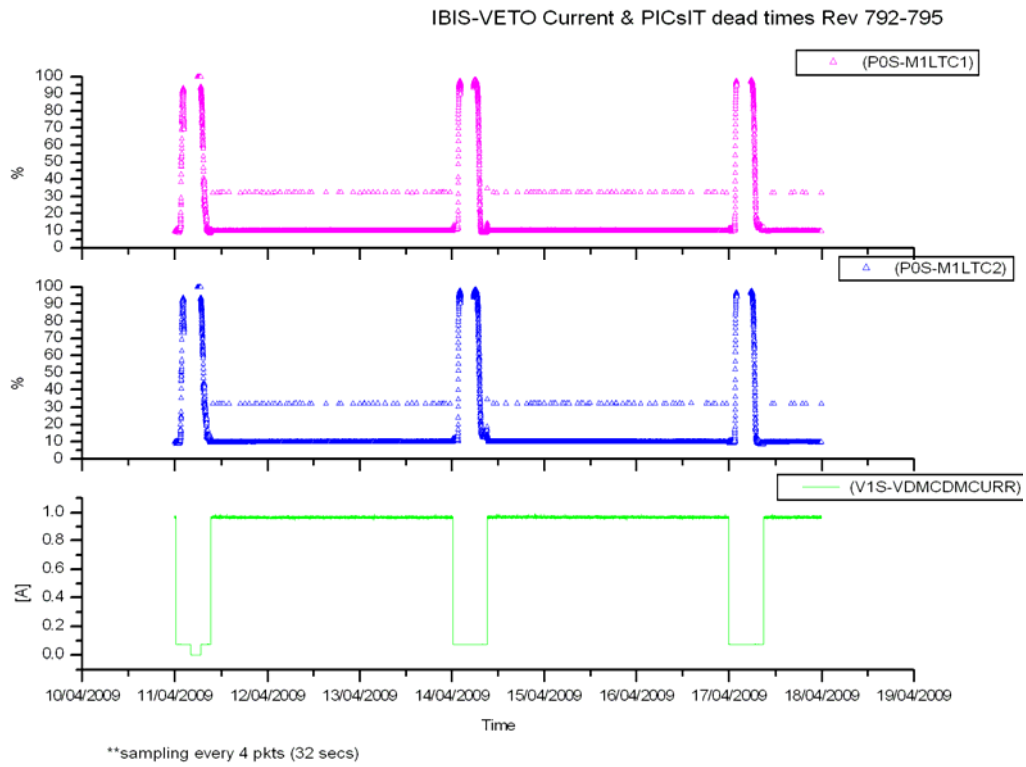


VETO vs Payload Counters:

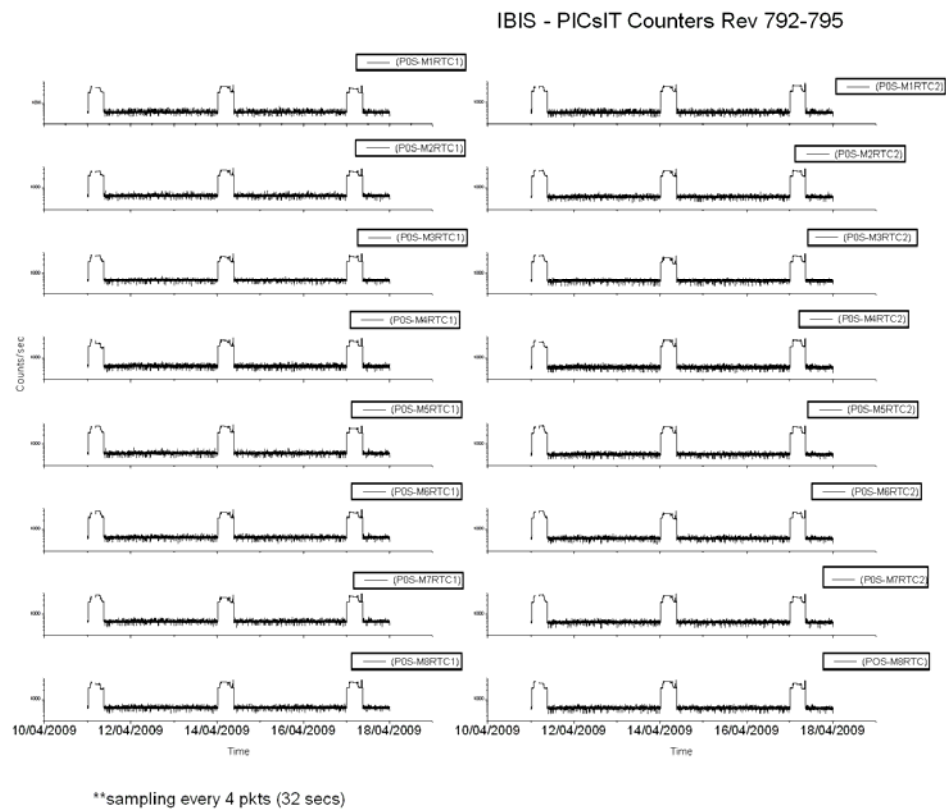


The background radiation level was low during the week, except for a brief period of high radiation after the expected radiation belt exit of revolution 794.

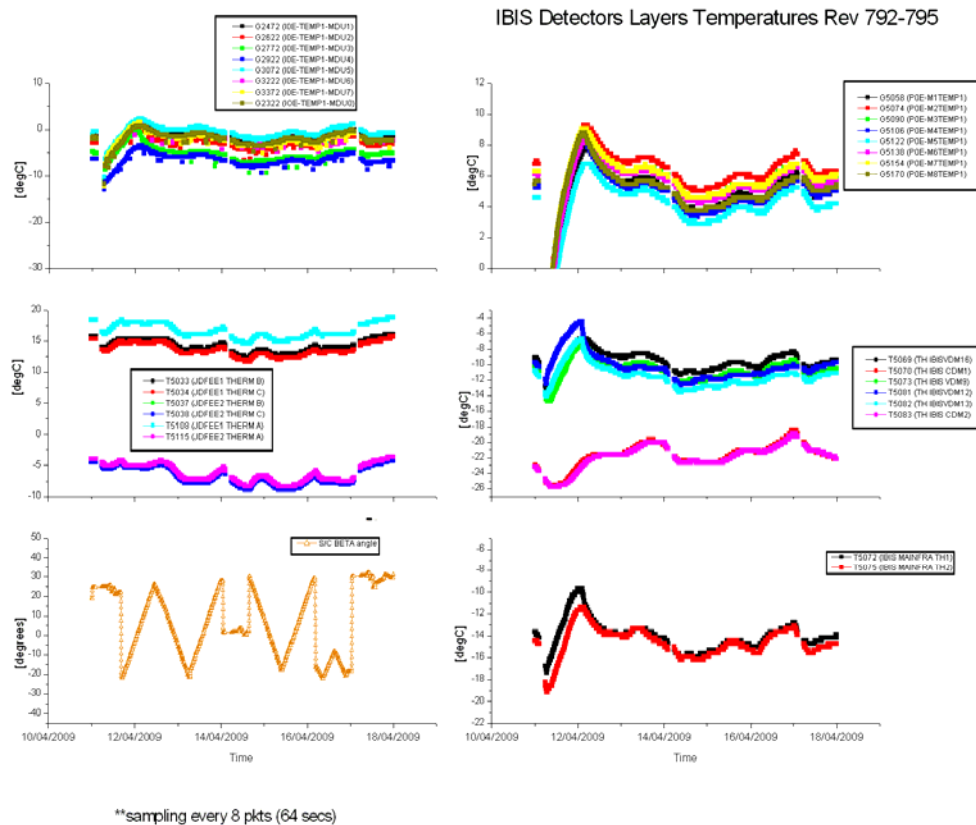
VETO Current:



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.

2009-04-11 (DOY 101, Rev 792-793) to 2009-04-13 (DOY 103, Rev 793)

IBIS operations executed nominally.

2009-04-14 (DOY 104, Rev 793-794)

Due to continuing high radiation after the expected radiation belt exit of revolution 794, TM parameters G6062, G6063 (VETO bottom and lateral counters respectively) started toggling OOL Warning High at 09:06:41Z. As they had returned stably within limits of their own accord by 09:27:29Z, no action was taken.

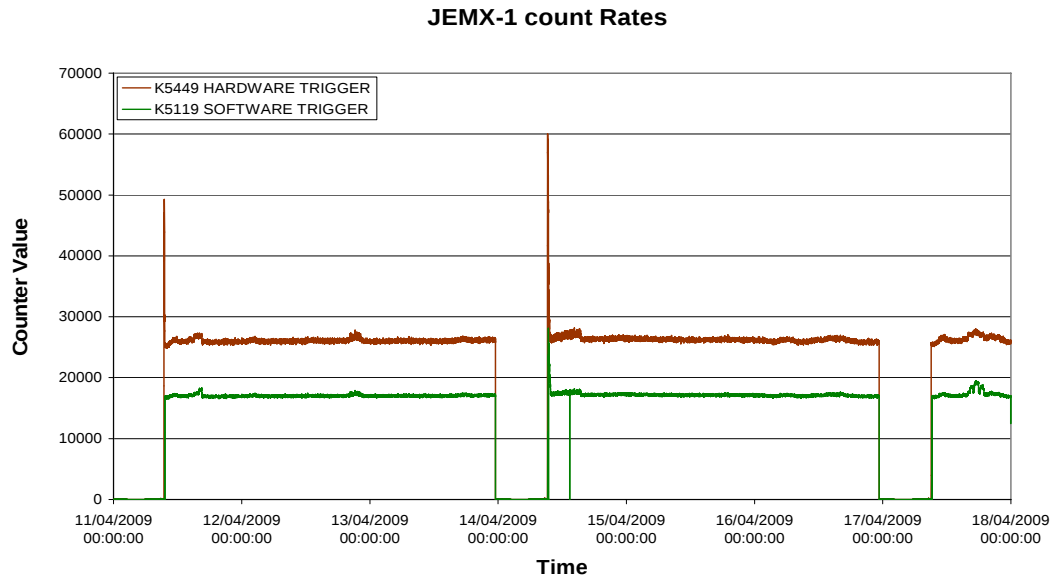
2009-04-15 (DOY 105, Rev 794) to 2009-04-17 (DOY 107, Rev 794-795)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

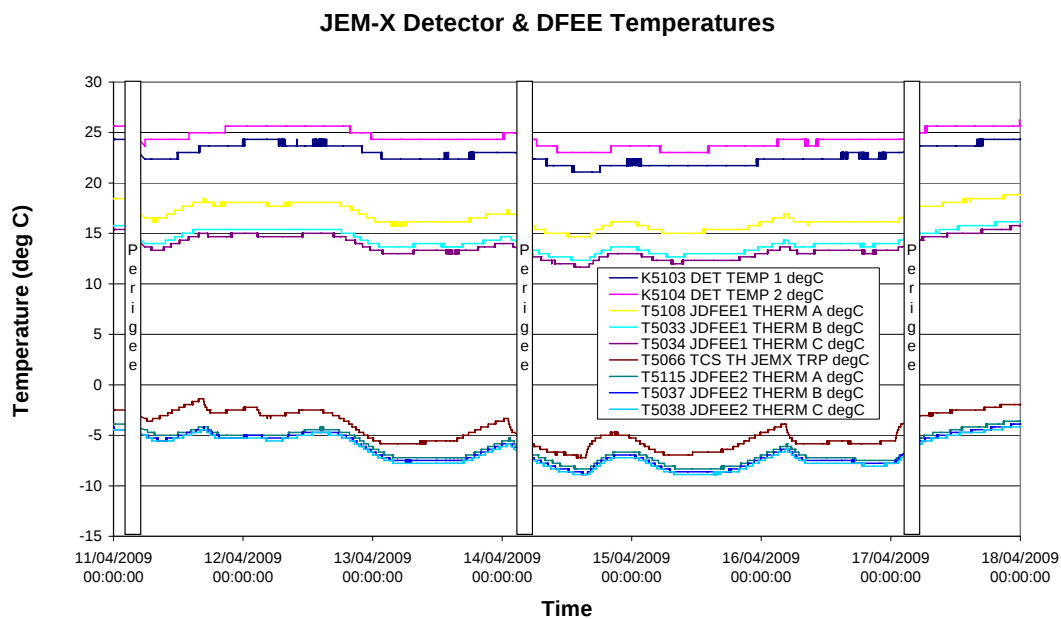
JEM-X Count Rates

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

2009-04-11 (DoY 101, Rev 792-793)

At 06:31:28, 08:51:35 and 08:54:11 the TM parameter K5317 exceeded hard limits.
At 09:29:07, TM parameter K9116 exceeded soft limits.
At 09:30:27, 09:30:36 and 09:33:01, TM parameter K5449 exceeded soft limits.
From 09:30:52 to 09:33:55, TM parameter KD5020D had an incorrect status.
No action was taken on any of the above events, and there was no impact.

2009-04-12 (DoY 102, Rev 793)

JEM-X 1 operations executed nominally.

2009-04-13 (DoY 103, Rev 793)

JEM-X 1 operations executed nominally.

2009-04-14 (DoY 104, Rev 793-794)

At 08:55:19 and 08:58:45, the TM parameter K5317 exceeded hard limits.
At 09:16:05, the TM parameter K5449 exceeded hard limits.
At 09:18:20, the TM parameter K9104 exceeded soft limits.
From 09:20:03 to 09:23:07, the TM parameter KD5020D had an incorrect status.
At 09:22:51, 09:23:07, 09:23:17, 09:31:47, 09:32:44 the TM parameter K5449 exceeded soft limits.
At 09:23:49, 09:25:47, 09:27:09, the TM parameter K5136 exceeded soft limits.
At 09:25:38, the TCs K0021 and KU0014 had a completion status of UNKNOWN.
At this point, the CCCF TCs were enabled to ensure JEMX-1 was in the correct state.
At 13:22, the KEDATA02 ED was sent via the timeline.
At 13:24:19, 13:24:26 and 13:24:50, the TC pairs of K0021 & KU0014 had completion statuses of AFFECTED, UNVERIFIED & UNKNOWN respectively.
At 20:36:50, the completion status of TC K0021 was UNCERTAIN_FAILED.
No action was taken on any of the above events, and there was no impact.

2009-04-15 (DoY 105, Rev 794)

At the indicated times, the following OEMs were received:

2009.105.14.09.54.060	2009.105.14.09.58.817	1536	RealTime	5	ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535 PR N
E					
FIX6		0			
K9079	MESS CLASS	2			
K9080	MESS ID	5			
K9074	TASK ID 16	12			
K9067	LOGICAL ADDRESS	4989			
2009.105.14.09.54.060	2009.105.14.09.58.901	1536	RealTime	5	ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO			0	0	65535 PR N
E					
FIX6		0			
K9079	MESS CLASS	2			
K9080	MESS ID	5			
K9074	TASK ID 16	12			
K9067	LOGICAL ADDRESS	4989			

Doc. Title : INTEGRAL Mission Report #343
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
 Date : 20/04/09

Issue : 1
 Rev. : 0
 Page : 27

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2009.105.14.09.54.060    2009.105.14.09.58.902    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
2009.105.14.09.54.060    2009.105.14.09.58.903    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
2009.105.14.09.54.060    2009.105.14.09.58.908    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
2009.105.14.09.54.060    2009.105.14.09.58.919    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
2009.105.14.09.54.060    2009.105.14.09.58.920    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.

2009-04-16 (DoY 106, Rev 794)

At 23:20:14, the TC KU0014 briefly went to AFFECTED, then UNVERIFIED, no action was taken.

2009-04-17 (DoY 107, Rev 794-795)

JEM-X 1 operations executed nominally.

The spring eclipse season for 2009 has now finished, the re-activation of the DFEE after eclipse exit proceeded smoothly on each occasion. Also, the CRC was dumped once an orbit to verify the status of the on-board DFEE software.

The results on each occasion were (All figures in hex):

Start Address	Length	CRC
B000	2000	F1B3
B000	1000	F074
C000	1000	CF9F

8.3.5 OMC Operations

2009-04-11 (DoY 101, Rev 792-793)

At 17:01, an FD problem forced a suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 17:43. The impact was the loss of pointing 07930013.

2009-04-12 (DoY 102, Rev 793) to 2009-04-13 (DoY 103, Rev 793)

Nothing to report.

2009-04-14 (DoY 104, Rev 793-794)

At 13:22, due to a possible problem with JEMX, the CCCF EDs were uplinked. This caused OMC to switch back to Standby. At 13:34:10, the pointing was manually restarted. The impact was pointing 07940006 was cut short from a planned 2858 to 1920 seconds.

At 14:39, an AOCS problem forced a suspension of the Timeline. A recovery was performed, and the timeline rejoined at 16:12. The impact was the loss of pointing 07940009, with pointing 07940010 cut short from a planned 1955 to 1448 seconds.

2009-04-15 (DoY 105, Rev 794) to 2009-04-17 (DoY 107, Rev 795)

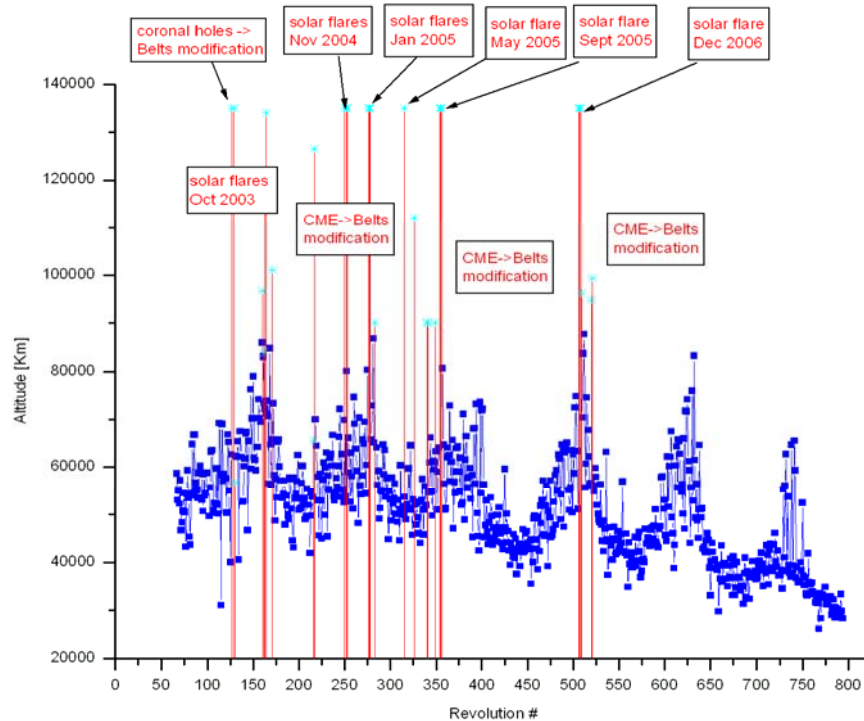
Nothing to report.

On DoY 101 at 00:25:23, DoY 104 at 00:15:15 and DoY 107 at 00:04:43 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

Nothing to report.

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
792	RAD_ENTR R 2009-04-11T00:25:15Z	11/04/2009 01:25:46	33346.1	11-Apr-2009 01:19:35	33597.59
793	RAD_EXIT R 2009-04-11T09:04:28Z	11/04/2009 08:54:42	>>39282.3	11-Apr-2009 07:59:35	47775.08
793	RAD_ENTR R 2009-04-14T00:15:14Z	14/04/2009 01:34:02	29831.7	14-Apr-2009 01:08:45	33581.58
794	RAD_EXIT R 2009-04-14T08:53:42Z	14/04/2009 09:26:10	60622.7	14-Apr-2009 07:48:45	47904.32
794	RAD_ENTR R 2009-04-17T00:04:40Z	17/04/2009 01:33:06	28316.5	17-Apr-2009 00:58:45	33262.56
795	RAD_EXIT R 2009-04-17T08:42:57Z	17/04/2009 07:31:54	>>34196.1	17-Apr-2009 07:28:45	46661.03

Reference

High radiation

Very small error vs reference (less than 10 minutes)

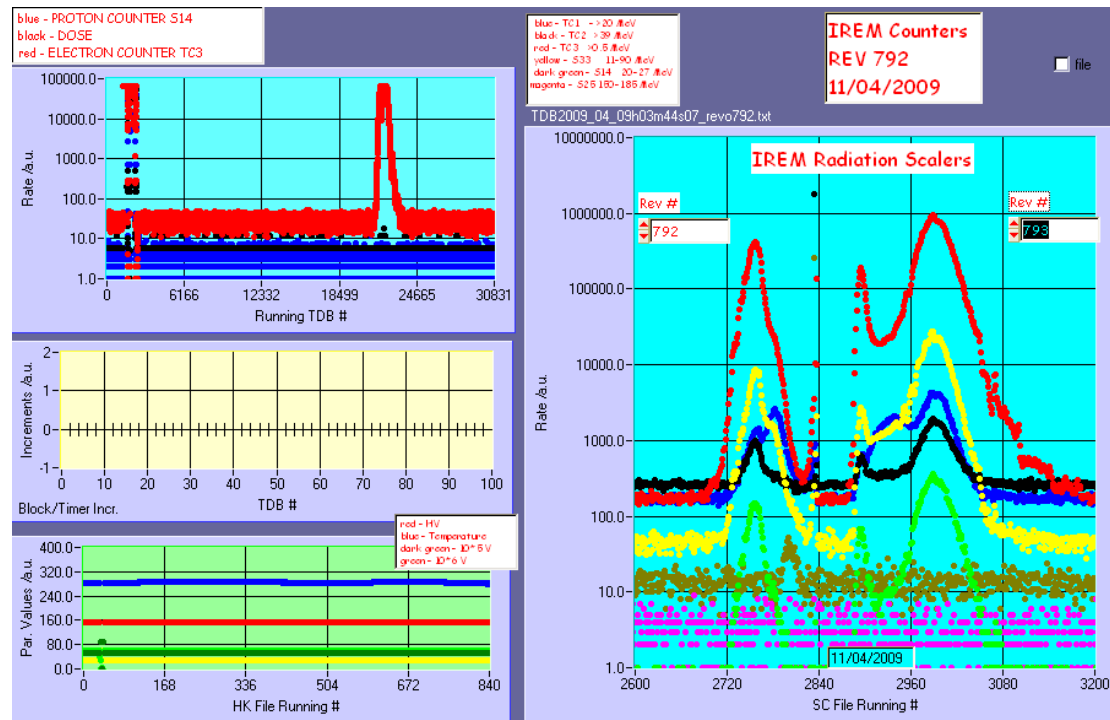
Small error vs reference (between 10 and 30 minutes)

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.

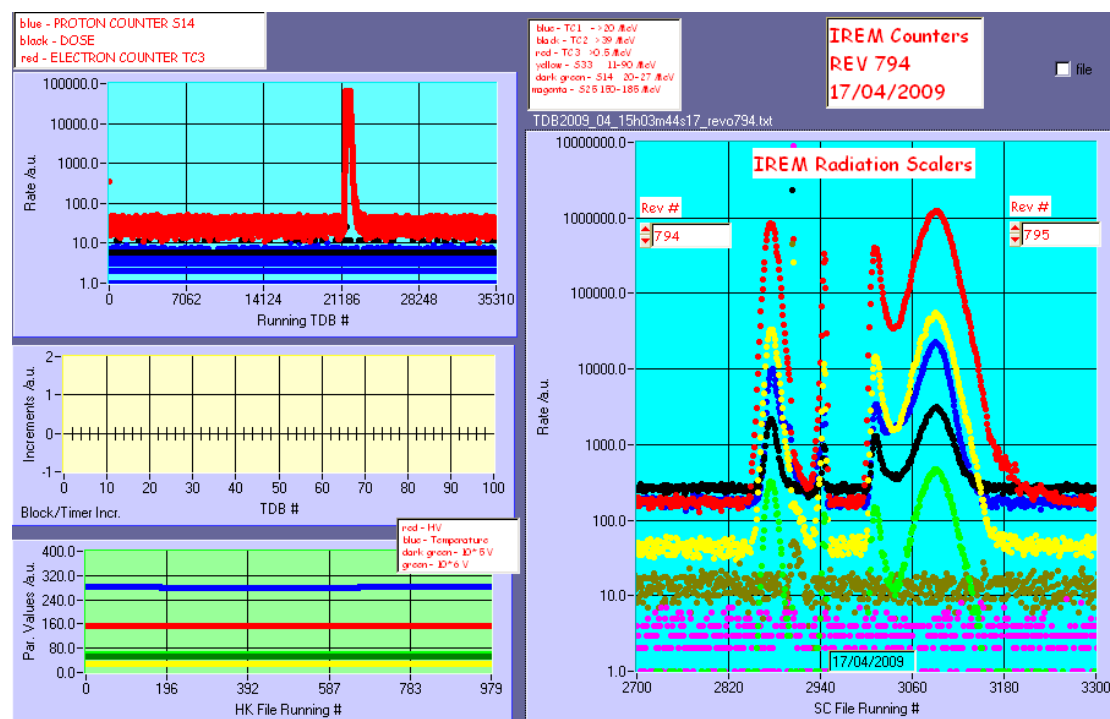
IREM radiation counters:

Rev 792



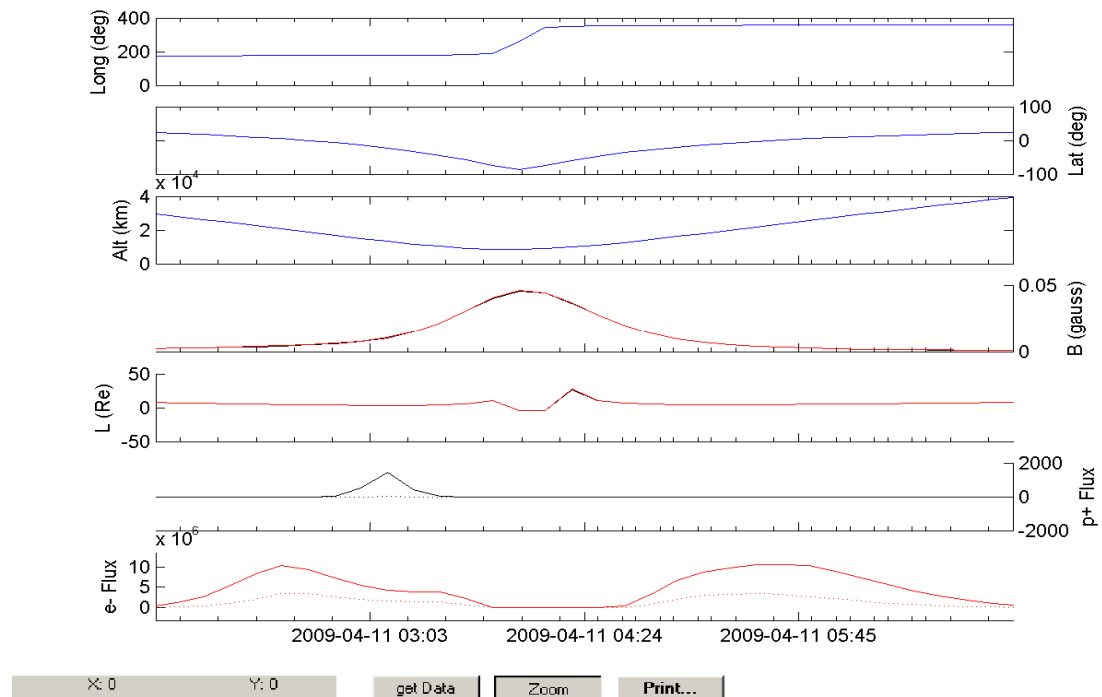
Rev 793 not available

Rev 794

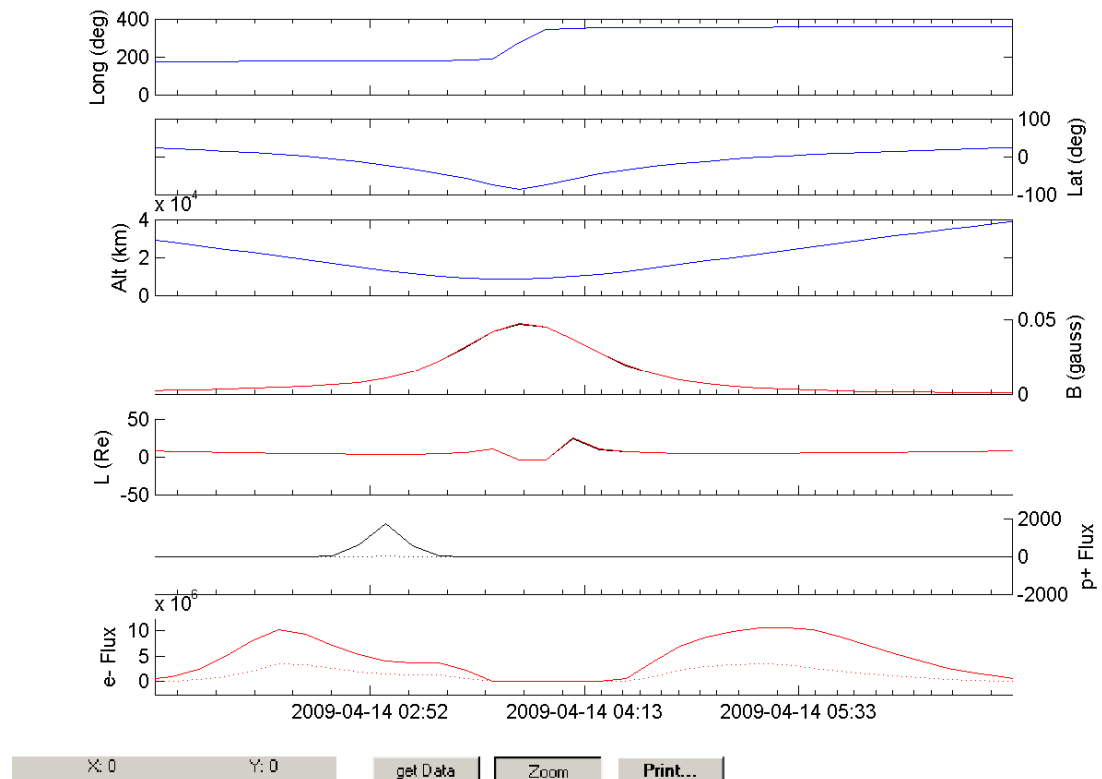


IREM Predicted Radiation Belt Passages

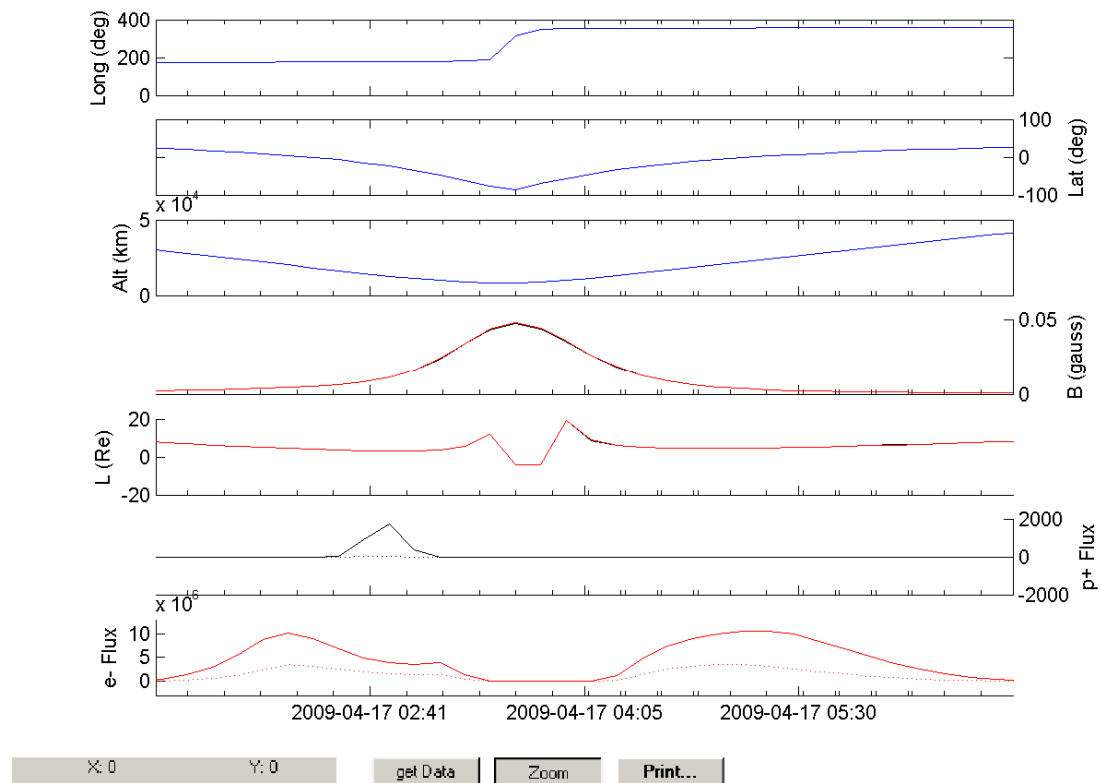
Rev 792



Rev 793



Rev 794



Radiation Assessment

Generated with SEIS Report and Analysis tool.

INTRODUCTION

This note summarises the space weather status over the observation period

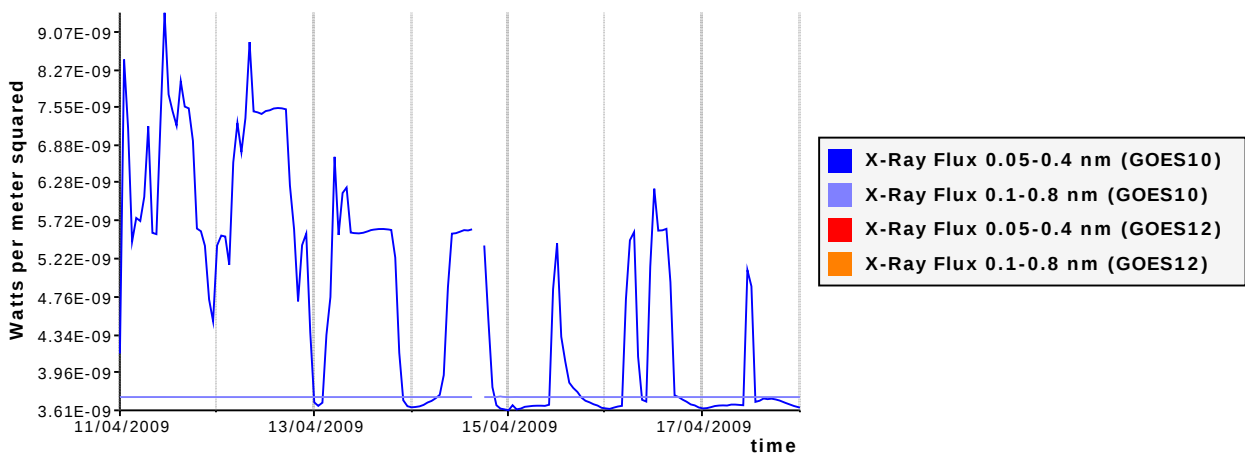
DAILY SUN

see in WR section 3.2.5

RADIATION FLUXES

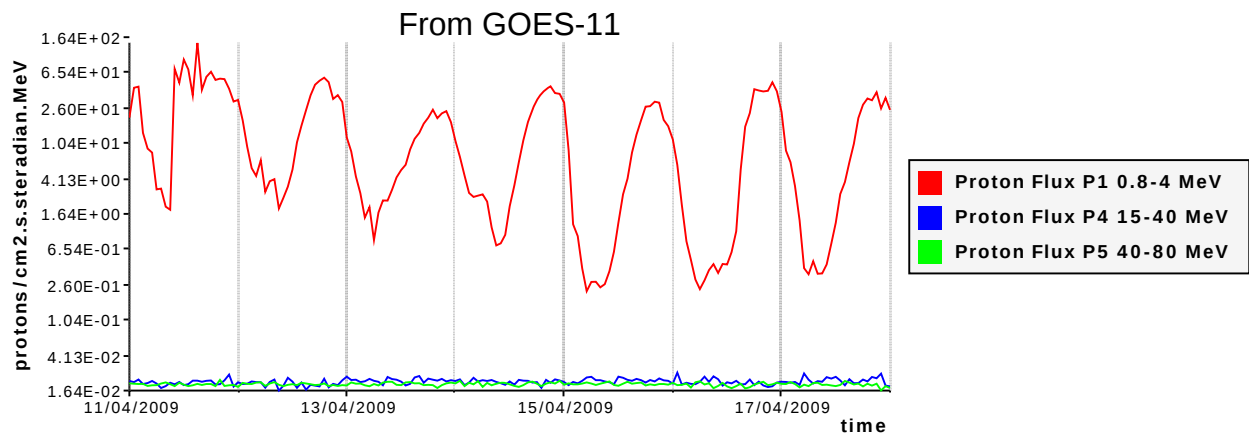
X-ray fluxes

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.



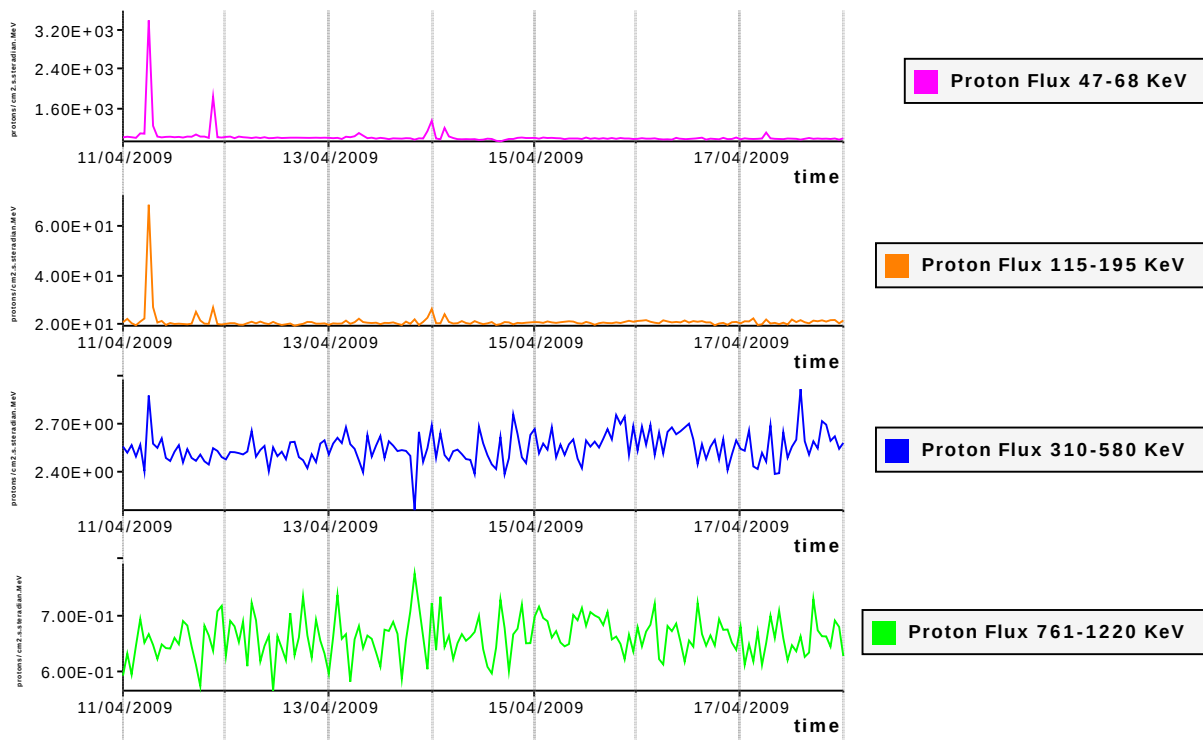
Proton fluxes (GOES-11)

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 $1\text{E-}2$.



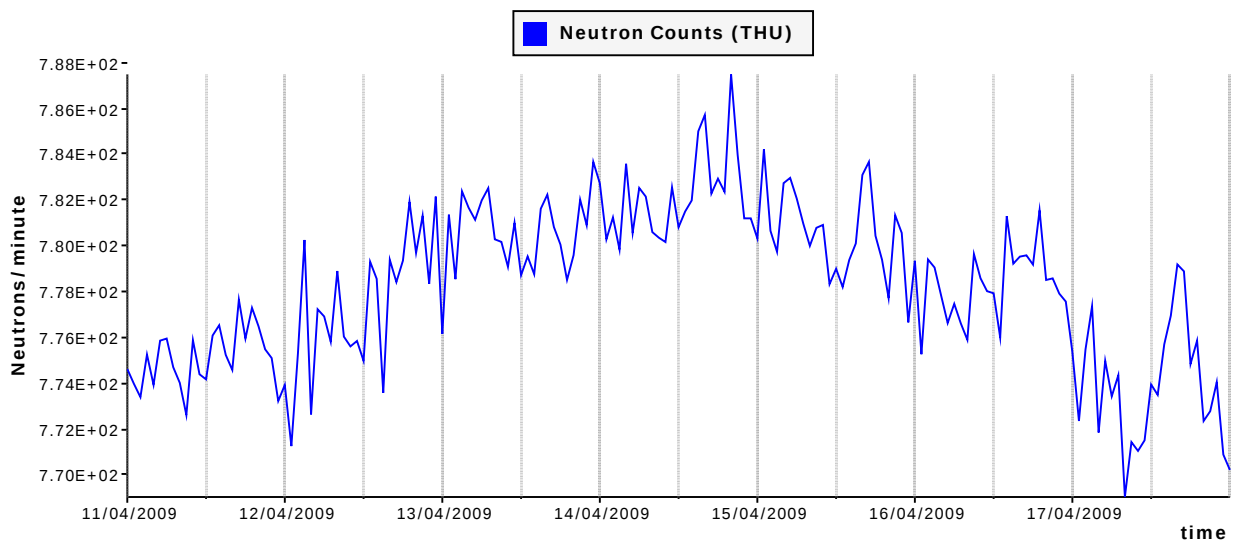
Proton fluxes (ACE)

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



Neutron counts

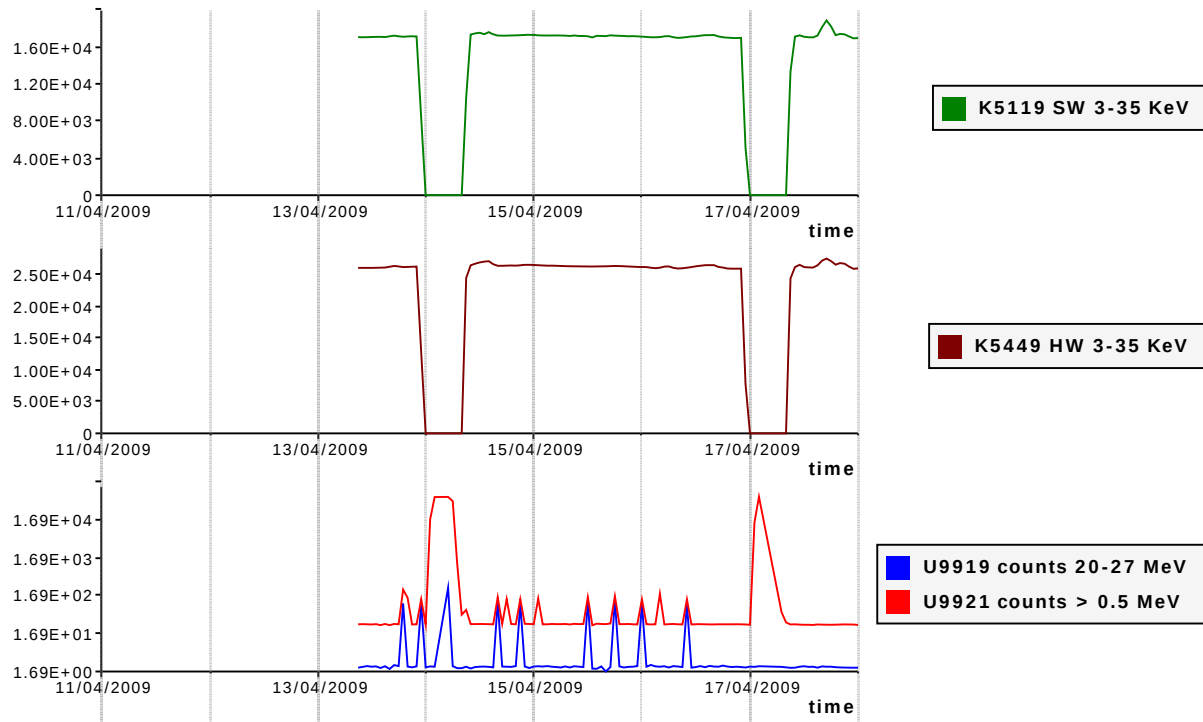
The neutron counts for the last 3 days are presented in the following plot. Nominally they remain stable around 7.2E+2.



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.

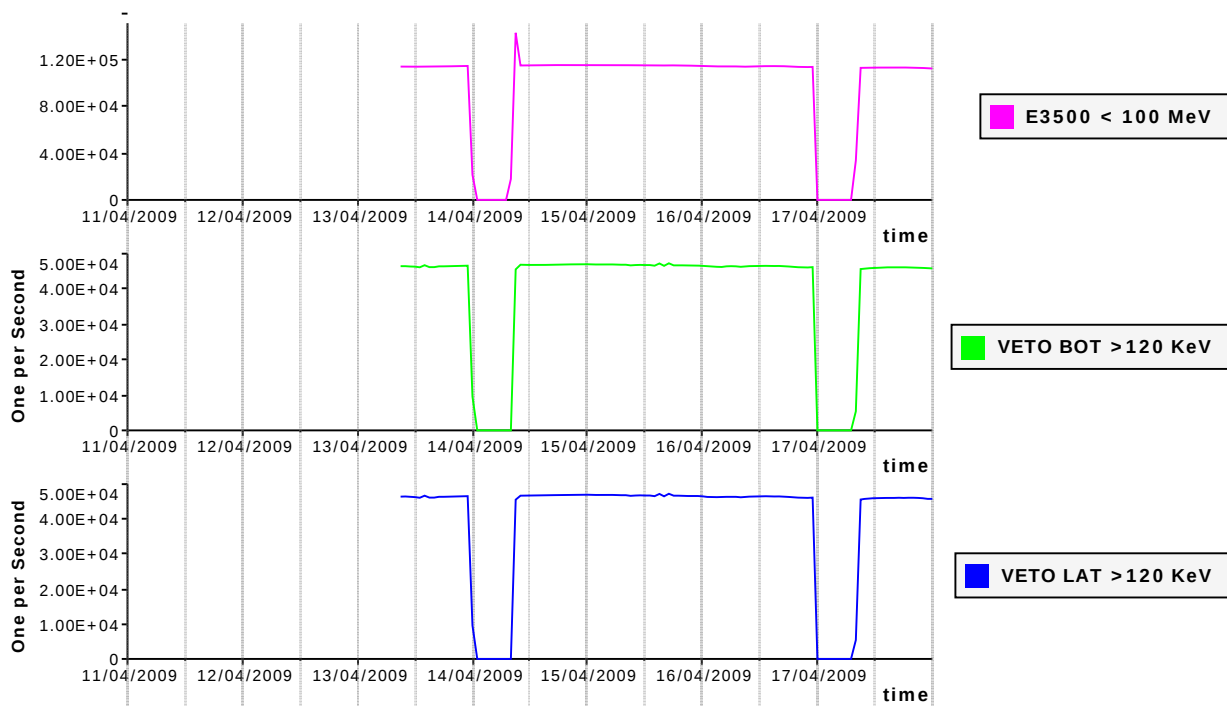
Nominal values are respectively about 1 and 18 for IREM counts, and, 13000 and 19000 for JEM-X ones.



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%.

