

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 339
Week 12
23.03.09
Routine Phase

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LIST OF CONTENTS

1	General.....	3
2	Summary of Activities.....	3
3	Satellite Status.....	3
3.1	Platform.....	3
3.1.1	AOCS.....	3
3.1.2	Power.....	4
3.1.3	Thermal.....	4
3.1.4	OBDH.....	4
3.1.5	RFS.....	4
3.2	Payload.....	4
3.2.1	SPI.....	4
3.2.2	IBIS.....	5
3.2.3	JEM-X.....	7
3.2.4	OMC.....	7
3.2.5	IREM.....	7
4	Ground Facilities.....	8
4.1	Mission Operations Centre.....	8
4.2	Ground Stations & Network.....	8
4.3	Science Ground Segment.....	8
4.3.1	ISOC.....	8
4.3.2	ISDC.....	9
5	Special Events.....	9
6	Anomalies.....	9
7	Future Milestones.....	9
8	Appendix.....	10
8.1	Overview of Revolutions.....	10
8.2	Consumables.....	10
8.2.1	Detailed Fuel Book-keeping.....	10
8.3	Detailed Satellite Information.....	11
8.3.1	AOCS SUMMARY OPERATIONS REPORT, 14/03/2009 – 20/03/2009.....	11
8.3.2	SPI Operations.....	18
8.3.3	IBIS Operations.....	24
8.3.4	JEM-X Operations.....	29
8.3.5	OMC Operations.....	31
8.3.6	IREM Operations.....	32

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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 14.03.09 until 20.03.09 (both dates inclusive) and covers the revolutions 783, 784 and 785.

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 Perseus Arm region (RA 04:46:58.46, DEC +45:14:46.4), a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), a raster dither of the Galactic disk, l=-25 (RA 16:27:14.74, DEC -48:57:19.9), a hexagonal dither of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0) 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.

Four slews were missed from TL, during the observation period, due to problem on STR.

The fuel consumption over the period between 14/03/2009 and 20/03/2009 was 0.1540 Kg. The remaining propellant is in the order of 135.2878 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

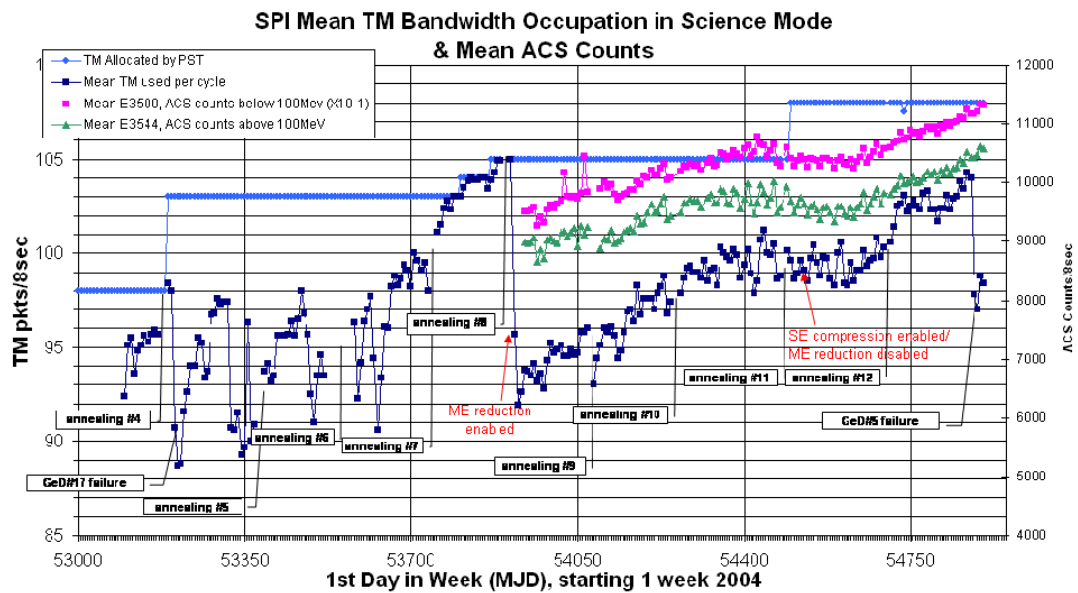
Following the 12th annealing, ended on 04/09/2008 at 23:50Z, the overall status of the gamma-ray spectrometer is nominal, except for detector #2 (failed since 06/12/2003); detector #17 (failed since 17/07/2004) and detector #5 (failed since 19/02/2009). The energy resolution of the previously degraded 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 98.4 packets/cycle.

Some problems occurred with the post-eclipse activation of SPI this week. These are reported in the Event Log in Section 8.3.2.

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.

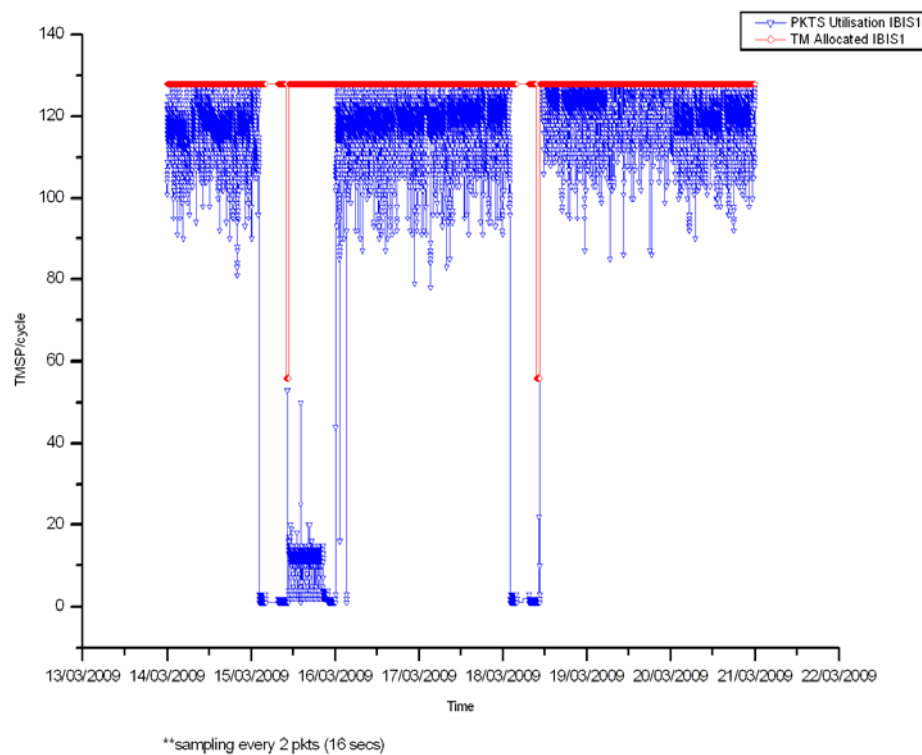
Eclipse operations for IBIS continued to be performed nominally during the reporting period.

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

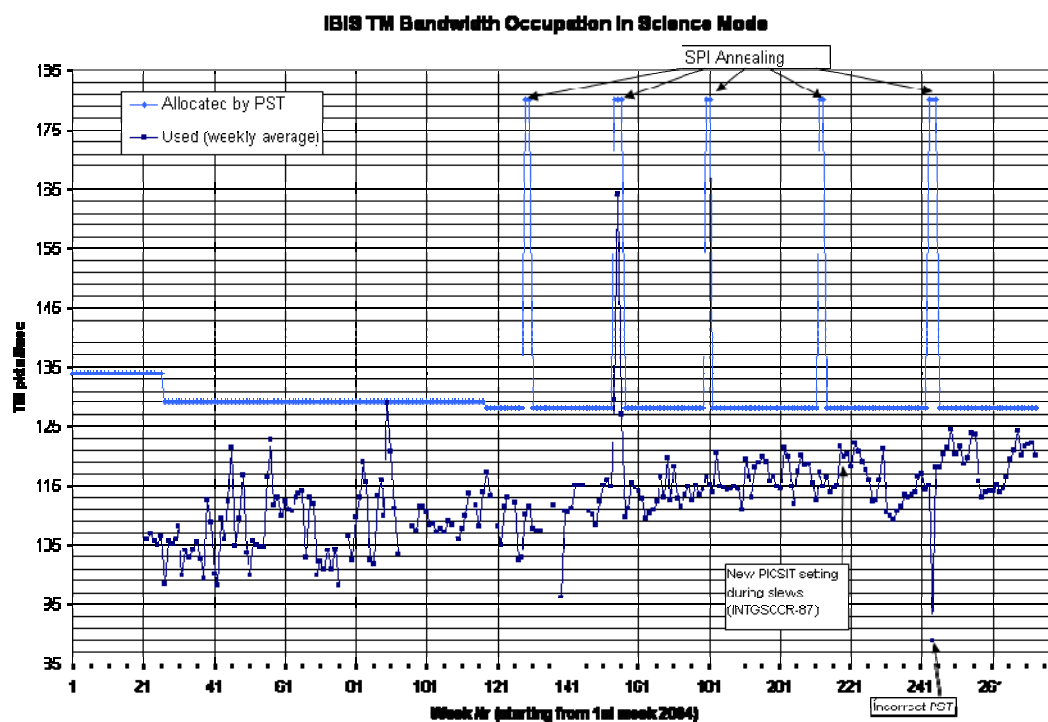
- PST allocation to IBIS above radiation belts: 128 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 120.14 packets/cycle (down 2.01 on previous week)
- Percentage of TM cycles in which full bandwidth (128 packets/cycle) was used: 17.22%

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

IBIS - TM Bandwidth Utilisation Rev 783-785



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, 201 of the 204 planned science pointings were executed nominally, 3 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. The slew update failed on one occasion due to a bright object in FoV of the STR. 4 slews were missed from the TL due to that problem.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. No problems were reported. The MPLS line to VIL2 delta-validation test from INCTRA was completed on last Monday. INTEGRAL used VIL2 on DoY 071 and DoY 072 to release Redu for the Proba-1 tracking campaign.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New or updated PSFs have been received for revolutions 788 to 790.

Observations have been planned for revolutions 788 to 790, but a problem was reported by Flight Dynamics for revolution 788.

A new TSF has been received for revolution 786.

2. Observation status

ECS files have been received up to revolution 775, including the previously missing 772.

3. ISOC Science Data Archive

Ingestion is running, expected to be complete up to 774 in the next days.

4. ISOC system

Work is continuing on V22 (post TAC s/w).

5. Problems

No new problems.

4.3.2 ISDC

Status of ISDC observation processing on 20/03/2009:

- Latest Standard Analysis completed: observation 06200620004 (1E 1547.0-5408, Revolution 0768) on 08/03/2009.
- Latest products archived: observation 06200620004 (1E 1547.0-5408, Revolution 0768) on 09/03/2009.
- Latest observation products sent to the observer: observation 06200620004 (1E 1547.0-5408, Revolution 0768) on 09/03/2009.

5 Special Events

Oratos Job Scheduler migration completed.

6 Anomalies

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

AR id	Date Created	Subject	Segment	Status
INT-3061	2009-03-15	IBIS ISGRI in Standby mode DOY 2009.074	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

Linux S2k beta delivery installed on imcf (Testing ongoing, Problem with Time correlation, appears to be a packetiser problem)

Installation and configuration of MUSTI

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 783

The observations in revolution 783 began with a raster dither of the Galactic Centre (RA 17:45:40.03, DEC -29:00:28.1), lasting ~30.0 hours. They continued with a raster dither of Eta Carinae (RA 10:45:03.59, DEC -59:41:04.3), lasting ~27.8 hours, until the end of the revolution.

Revolution 784

The observation in revolution 784 was a raster dither of the Perseus Arm region (RA 04:46:58.46, DEC +45:14:46.4), lasting ~58.1 hours.

Revolution 785

The observations in revolution 785 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.

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

2009-02-26T19:25:24.000Z	135.6852	F	Automatic TM processing.
2009-02-28T09:24:00.000Z	135.6680	F	Automatic TM processing.
2009-03-01T18:59:48.000Z	135.6480	F	Automatic TM processing.
2009-03-03T09:08:57.000Z	135.6327	F	Automatic TM processing.
2009-03-04T19:14:13.000Z	135.6148	F	Automatic TM processing.
2009-03-06T08:59:37.000Z	135.6057	F	Automatic TM processing.
2009-03-07T16:32:52.000Z	135.5720	F	Automatic TM processing.
2009-03-09T09:03:29.000Z	135.5378	F	Automatic TM processing.
2009-03-10T04:46:35.000Z	135.4780	F	Automatic TM processing.
2009-03-12T09:19:21.000Z	135.4705	F	Automatic TM processing.
2009-03-13T18:04:28.000Z	135.4418	F	Automatic TM processing.
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.

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, 14/03/2009 – 20/03/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 146 Open Loop Slews, 66 Closed Loop Slews and 4 Momentum Biases were executed (as reported by ACC OEM).

4 slews (3 OSL, 1 CSL) were missed from TL, during the observation period, due to problem on STR (STR 1750 fault).

This is equivalent to $\sim 1.8\%$ of the total number of slews planned (214).

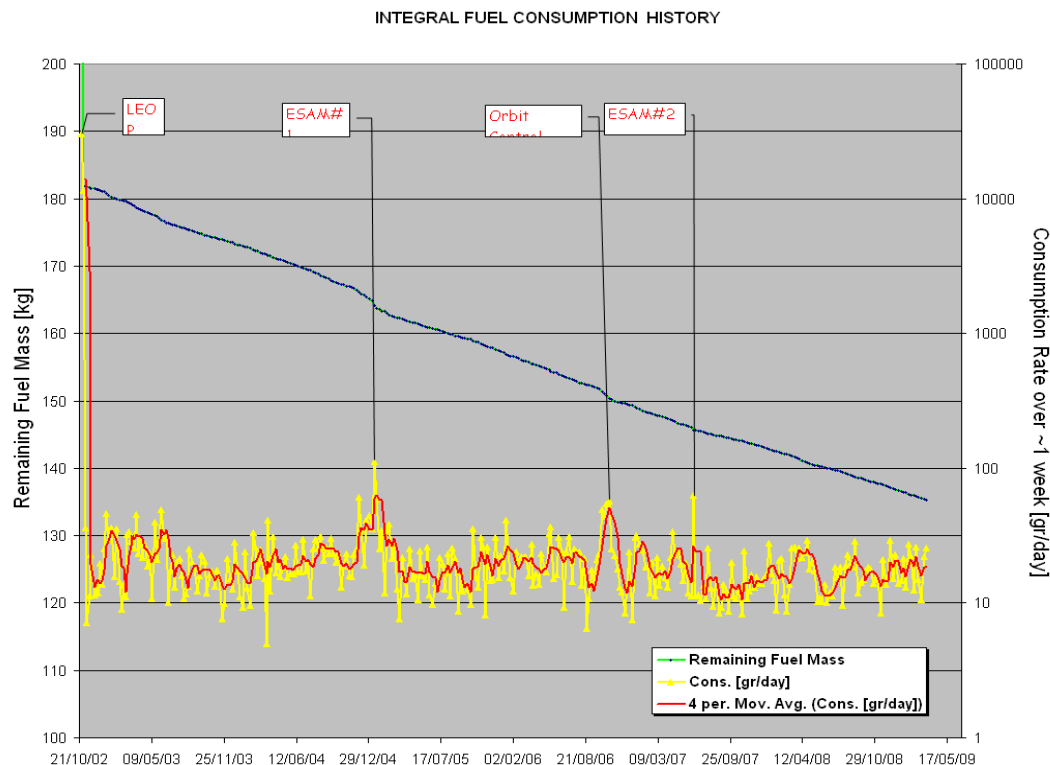
The OTF was not reached during part of PIDs 07840017 - 07840061, due a bright object (Capella star, Alpha Aur, Mi 0.08) presents in the STR FOV.

Orbit Control

No update.

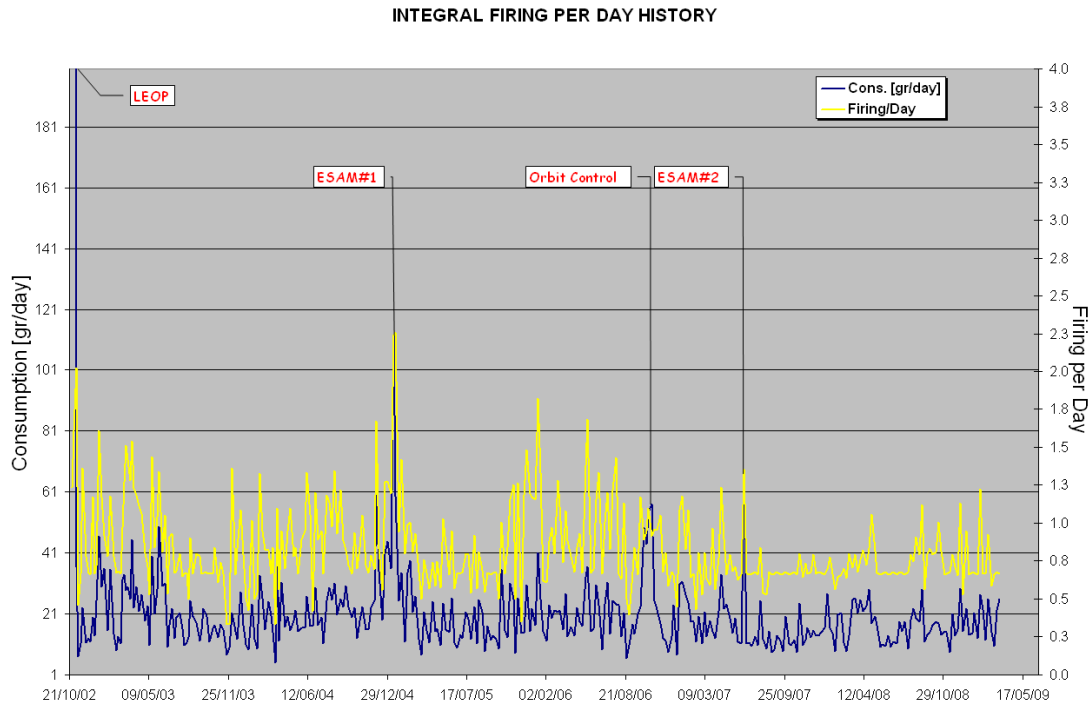
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 20/03/2009 is reported in the plot below.



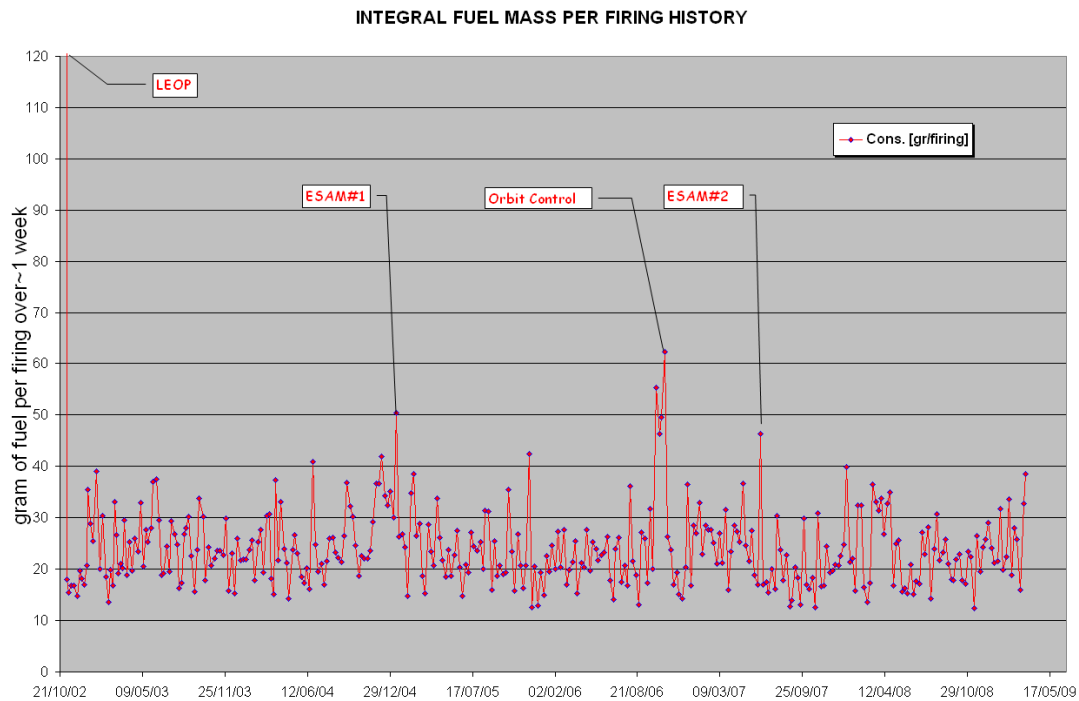
The above plot considers the ESAM fuel consumption spread over period of ~ 1 week.

The firing per day over the period between 01/11/2002 and 20/03/2009 is reported in the plot below.



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

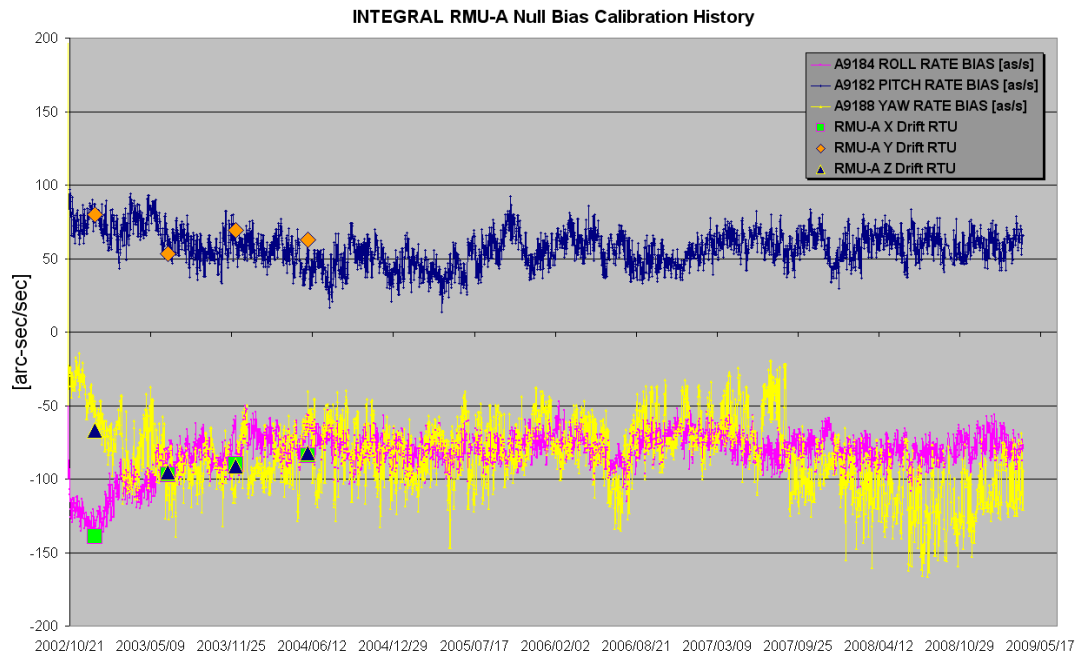
The fuel per firing over the period between 01/11/2002 and 20/03/2009 is shown in the plot below.



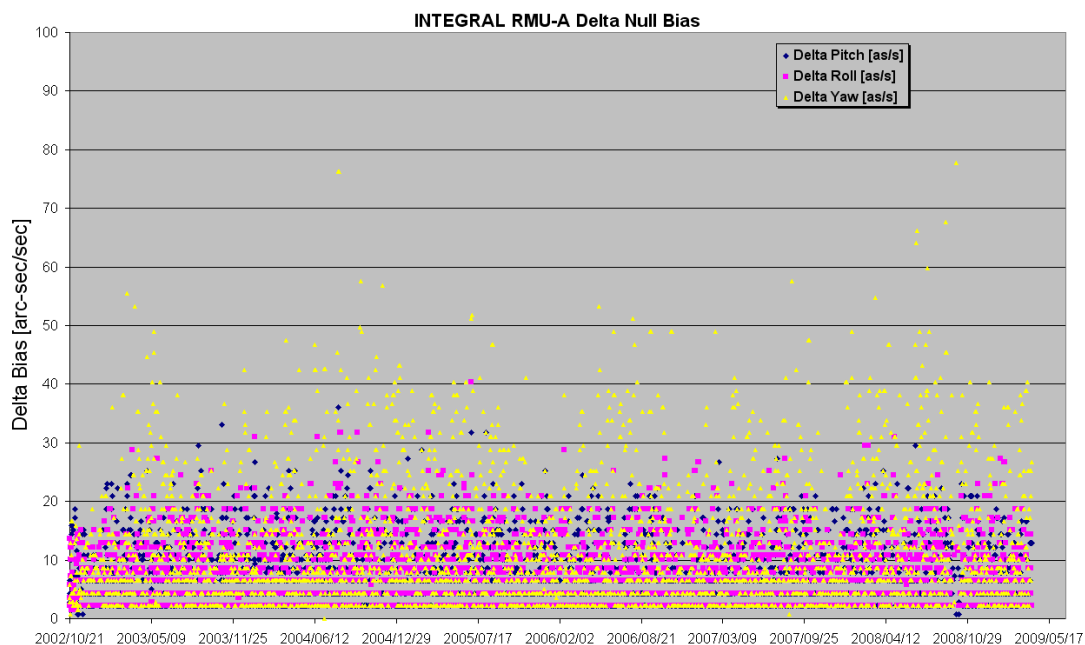
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 20/03/2009 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 20/03/2009 is reported in the plot below.



14/03/2009 (Day of Year 073, Revolution 783)

Loss of guide star: at 08:31:49z a loss of the selected guide star occurred during PID 07830047. 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 started and the next slew 07830048 was manually updated in TL.

The OTF was not reached during part of PID 07830047.

15/03/2009 (Day of Year 074, Revolution 783-784)

The <<Summer>> 2009 eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 783-784:

STR 1750 fault: at 20:45z the FD system failed the update of slew ID 07840018. At 20:49:30z the IMU 1 went ON, after manual mapping commanded to recover the failed slew update, likely caused by a bright objects (Capella, Alpha Aur) present in the FOV of the STR. A manual recovery was attempted several times by commanding a mapping: the mappings resulted shortened in duration and the IMU1 went ON.

The AOCS was disabled in TL.

The anomalous condition above was identified as STR 1750 fault.

STR was not able to establish stable pointing due to bright celestial object in FOV, as consequence of STR 1750 fault, OOLs were reported from the STR such as:

A5091 '1750 FAULT' status-OOL (value= FAULT)

A manual recovery was performed by assuming the Spacecraft in target for PID 07840017 (with small error) and slewing to the attitude of PID 07840021. The next slew (ID 07840022) in TL was manually updated.

From offline investigation resulted that one extremely bright objects was present in the STR FOV at the moment of the IMU 1 ON event occurred (at the end of the OSL ID 7840017). The bright object was the Star Capella (Mi 0.08) about at the centre of STR FOV. This likely caused the STR 1750 failure.

The AOCS was enabled in TL at 23:21z.

The following slews were missed in TL: PID 07840018 (OSL) -19 (OSL) – 20 (CSL) – 21 (OSL)

The OTF was not reached during large part of PID 07840017.

16/03/2009 (Day of Year 075, Revolution 784)

Nothing to report.

17/03/2009 (Day of Year 076, Revolution 784)

Loss of guide star: at 02:06:37z a loss of the selected guide star occurred during PID 07840061. The origin of the event is likely due to a bright object (Capella, Alpha Aur) present in the STR FOV.

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.

After advice from FD on-call the next slew was left run from the TL without update of slew parameters.

The OTF was not reached during part of PID 07840061.

18/03/2009 (Day of Year 077, Revolution 784-785)

The <<Summer>> 2009 eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 784-785:

19/03/2009 (Day of Year 078, Revolution 785)

Nothing to report.

20/03/2009 (Day of Year 079, Revolution 785)

Nothing to report.

Doc. Title : INTEGRAL Mission Report #339
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
 Date : 23/03/09

Issue : 1
 Rev. : 0
 Page : 16

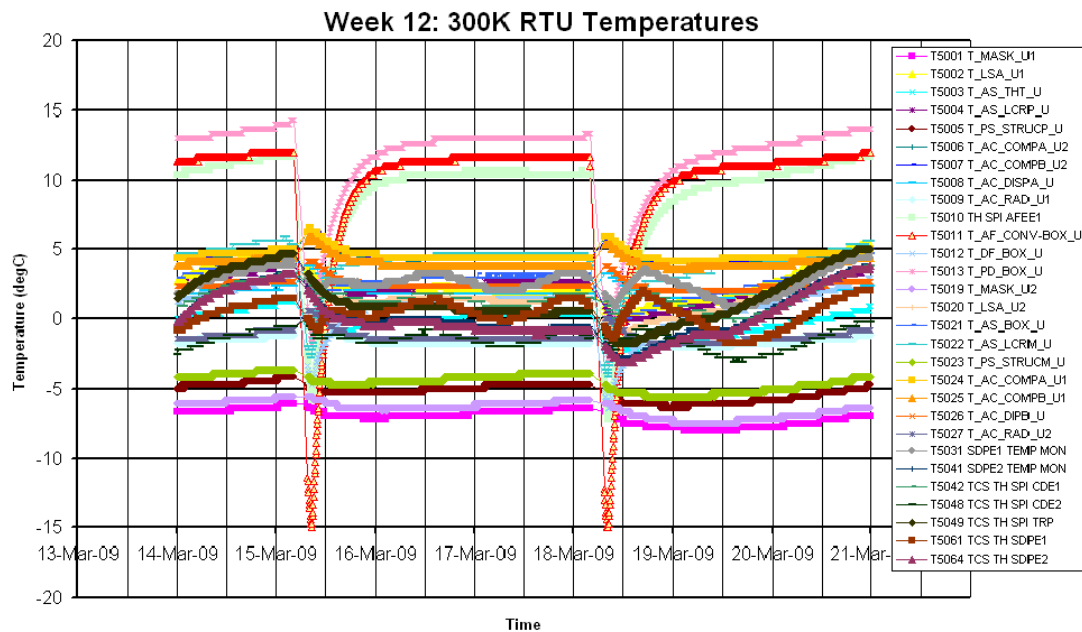
		AOCS ECLIPSE MONITORING				Revolution:	783
		Summer 2009				Date:	15/03/2009
						DoY:	74
INPUT							
Penumbra Start	15/03/2009 04:07	Penumbra Start:	15/03/2009 04:07:21	LOS:	15/03/2009 04:16		
Penumbra End	15/03/2009 04:48	Umbra Start:	15/03/2009 04:05:26	AOS:	15/03/2009 07:39		
Umbra Start	15/03/2009 04:06	Umbra End:	15/03/2009 04:47:41				
Umbra End	15/03/2009 04:47	Penumbra End:	15/03/2009 04:48:46				
ACC Sample Time:	13/03/2009 18:01	Eclipse Duration:	0:41:25				
FDE Sample Time:	13/03/2009 18:01	Eclipse Duration [sec]:	2485				
FCE Sample Time:	13/03/2009 18:01						
		IMU Health Check Start	15/03/2009 01:03				
ACC Eclipse Counter:	118213	Eclipse Imminent Flag	15/03/2009 03:07:41				
ACC Eclipse Start:	240159	ACC IMU AutoCal Start	15/03/2009 03:22:07				
ACC Eclipse End:	244221	ACC IMU AutoCal End	15/03/2009 03:42:07				
FDE Eclipse Start:	240578	Sun out of FSS FoV	15/03/2009 04:08				
FDE Left to Eclipse Start:	122482	Sun back in FSS FoV	15/03/2009 04:46				
FDE Eclipse Duration:	3180						
FCE Eclipse Start:	240622	Eclipse Timers		From Loaded Timers		Actual From Telemetry	
FCE Left to Eclipse Start:	122526			Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]
FCE Eclipse Duration:	3136			15/03/2009 03:54:21	-780.00	15/03/2009 03:50	-992.00
				15/03/2009 04:03:17	-244.00		-1064
				15/03/2009 04:04:01	-200.00		-404
							176
							-360
							176
				From Loaded Timers		Actual From Telemetry	
				Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]
				15/03/2009 04:56:17	451		360
				15/03/2009 04:56:17	451		176
				15/03/2009 05:02:03	797	15/03/2009 04:58	585.00
							578
		IMU	Uplink	Execution	WRT Penumbra End [sec]		
		IMU Auto Off Enable	12/03/2009 09:01	15/03/2009 05:00	720		
		IMU On	15/03/2009 01:06	IMU H/C Noise Roll [as/s]	0.2059		
		IMU Off	15/03/2009 05:00	IMU H/C Drift Roll [as/s]	0.2335		
		IMU On Time	3:54:20	IMU Auto Cal Drift Roll [as/s]	0.2344		

Issue : 1
Rev. : 0
Page : 17

AOCs ECLIPSE MONITORING						Revolution:	784
Summer 2008						Date:	18/03/2009
						DoY:	77
INPUT		Penumbra Start:	18/03/2009 03:54:30	LOS:	18/03/2009 04:06:00		
Penumbra Start	18/03/2009 03:54:30	Umbra Start:	18/03/2009 03:55:53	AOS:	18/03/2009 07:29:00		
Penumbra End	18/03/2009 04:42:40	Umbra End:	18/03/2009 04:41:41				
Umbra Start	18/03/2009 03:55:53	Penumbra End:	18/03/2009 04:42:40				
Umbra End	18/03/2009 04:41:41						
		Eclipse Duration:	0:48:10				
ACC Sample Time:	17/03/2009 13:07:27	Eclipse Duration [sec]:	2890				
FDE Sample Time:	17/03/2009 13:07:27						
FCE Sample Time:	17/03/2009 13:07:27	IMU Health Check Start	18/03/2009 00:41:00				
		Eclipse Imminent Flag	18/03/2009 02:54:50				
ACC Eclipse Counter:	187984	ACC IMU AutoCal Start	18/03/2009 03:09:16				
ACC Eclipse Start:	240159	ACC IMU AutoCal End	18/03/2009 03:29:16				
ACC Eclipse End:	244691						
		Sun out of FSS FoV	18/03/2009 03:55:38				
FDE Eclipse Start:	240578	Sun back in FSS FoV	18/03/2009 04:41:50				
FDE Left to Eclipse Start	52786						
FDE Eclipse Duration:	3664						
		Eclipse Timers					
			From Loaded Timers		Actual From Telemetry		
			Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]	UM [sec] LSB [sec]
FCE Eclipse Start:	240622	ACC Eclipse Start	18/03/2009 03:37:02	-1048.00	18/03/2009 03:36:54	-1056.00	-1064
FCE Left to Eclipse Start	52830	FDE Eclipse Start	18/03/2009 03:47:13	-437.00			-404 176
FCE Eclipse Duration:	3620	FCE Eclipse Start	18/03/2009 03:47:57	-393.00			-360 176
			From Loaded Timers		Actual From Telemetry		
			Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]	UM [sec] LSB [sec]
		FCE Eclipse End	18/03/2009 04:48:17	337			360 176
		FDE Eclipse End	18/03/2009 04:48:17	337			360 176
		ACC Eclipse End	18/03/2009 04:52:34	594	18/03/2009 04:52:26	586.00	578
		IMU	Uplink	Execution	WRT Penumbra End [sec]		
		IMU Auto Off Enable	15/03/2009 08:48:08	18/03/2009 04:54:21	701		
		IMU On	18/03/2009 00:44:23	IMU H/C Noise Roll [as/s]	0.2718		
		IMU Off	18/03/2009 04:54:40	IMU H/C Drift Roll [as/s]	0.1579		
		IMU On Time	4:10:17	IMU Auto Cal Drift Roll [as/s]	0.1784		

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.



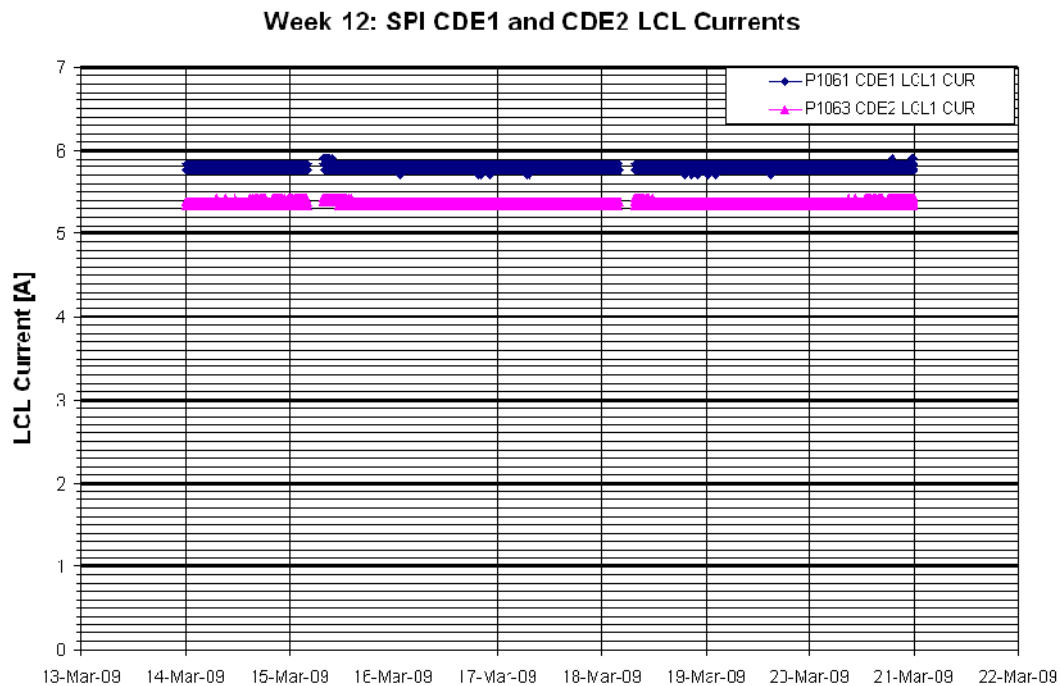
Stirling Compressors and Cryostat: The performance of the compressors is nominal.

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

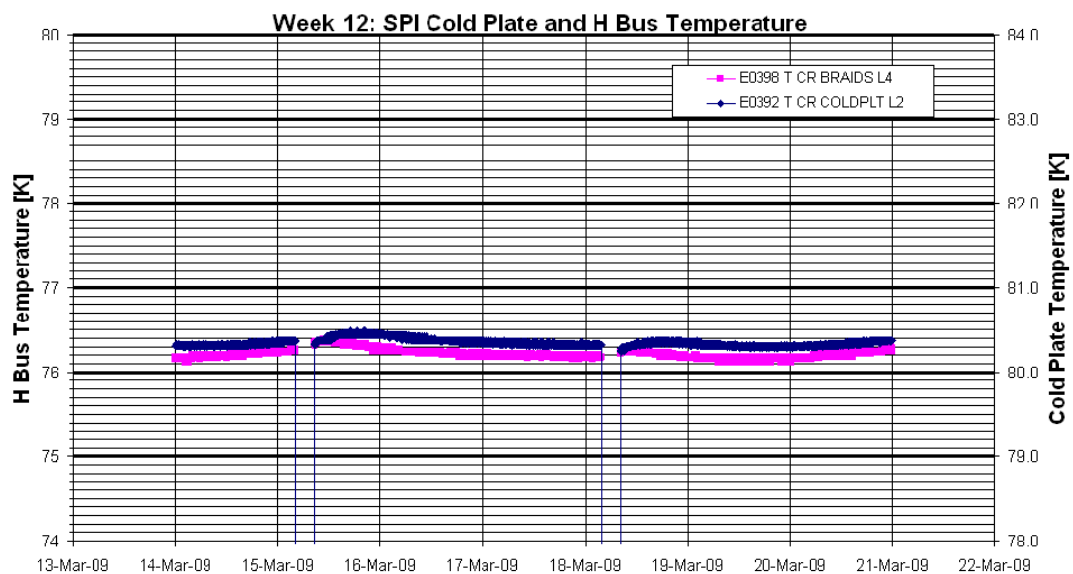
The stroke of all four compressors was set to 43 throughout the week and the average CDE LCL currents were as follows:

- CDE1 LCL Current = 5.80A
- 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.

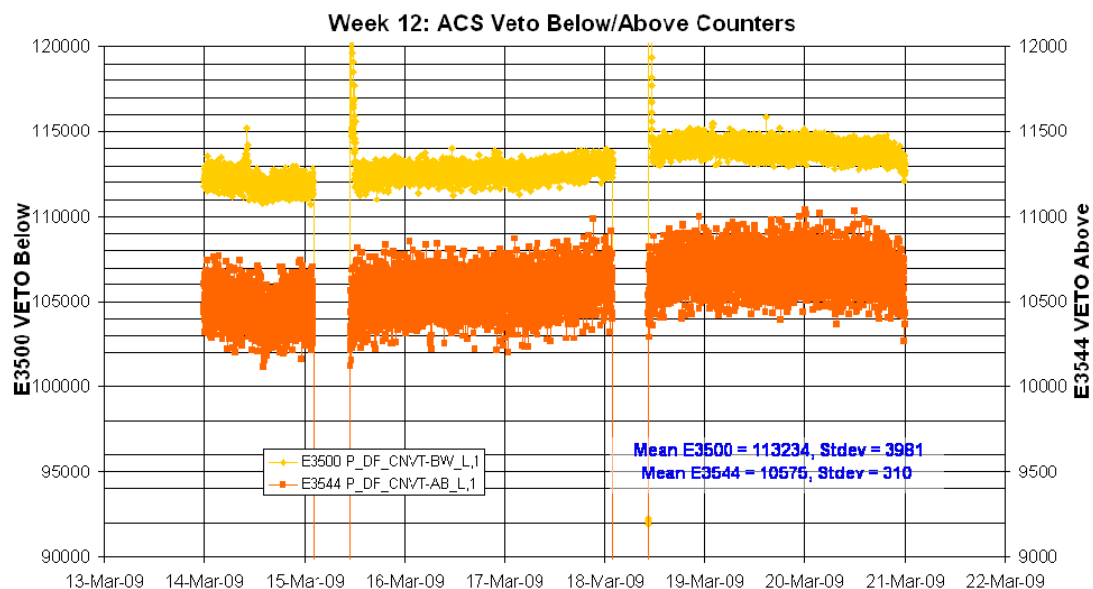
The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 98.4 packets/cycle over the science window when the TM allocation was 108 packets/cycle.

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

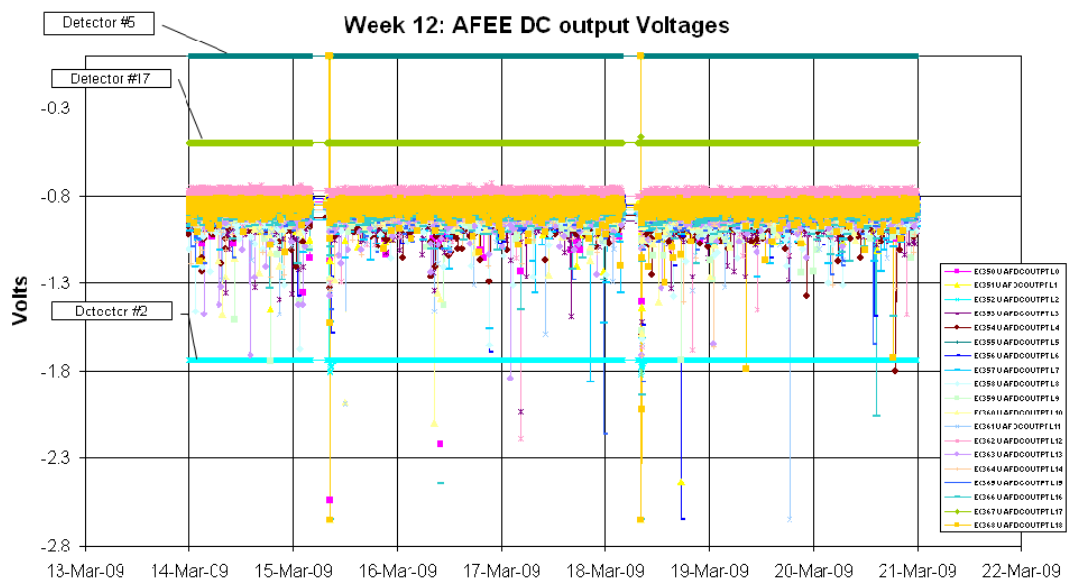


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

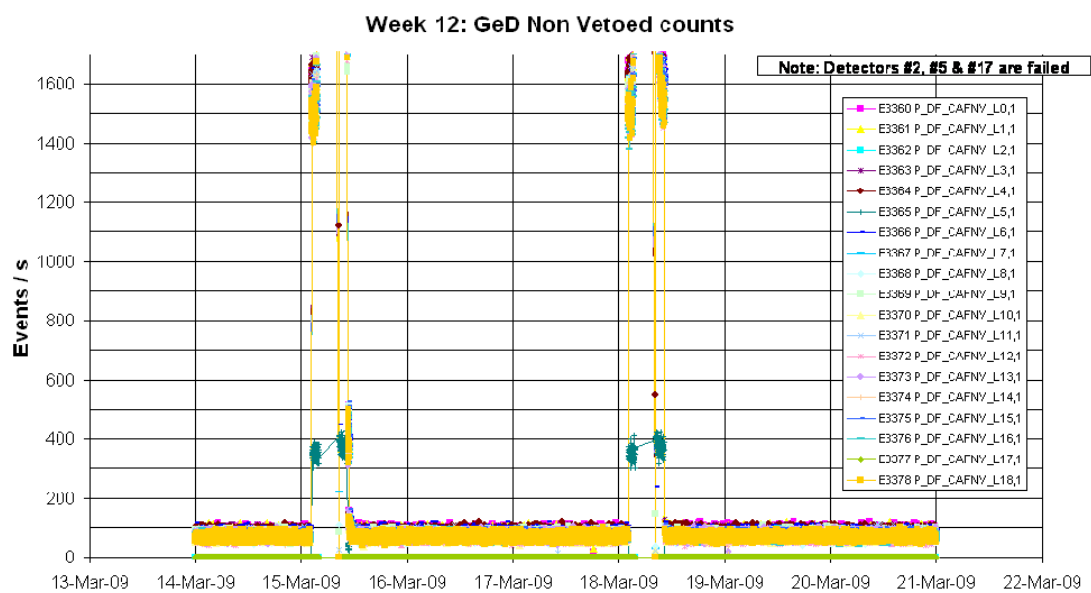
The following plot shows the ACS overall count rate evolution during the reporting period:

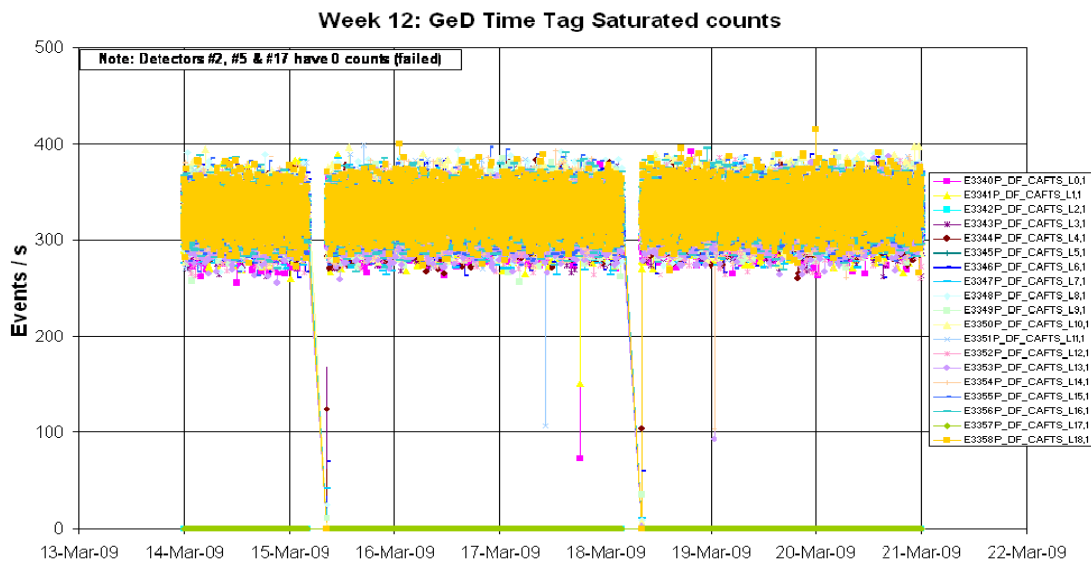
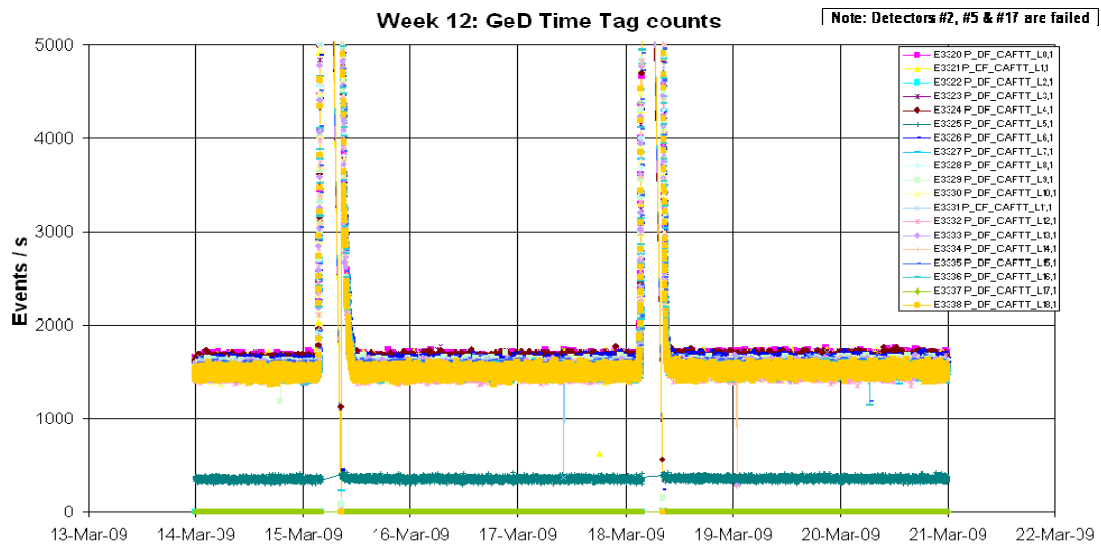


AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003; detector #17 is failed since 17/07/2004 and detector #5 is failed since 19/02/2009. The HV of the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

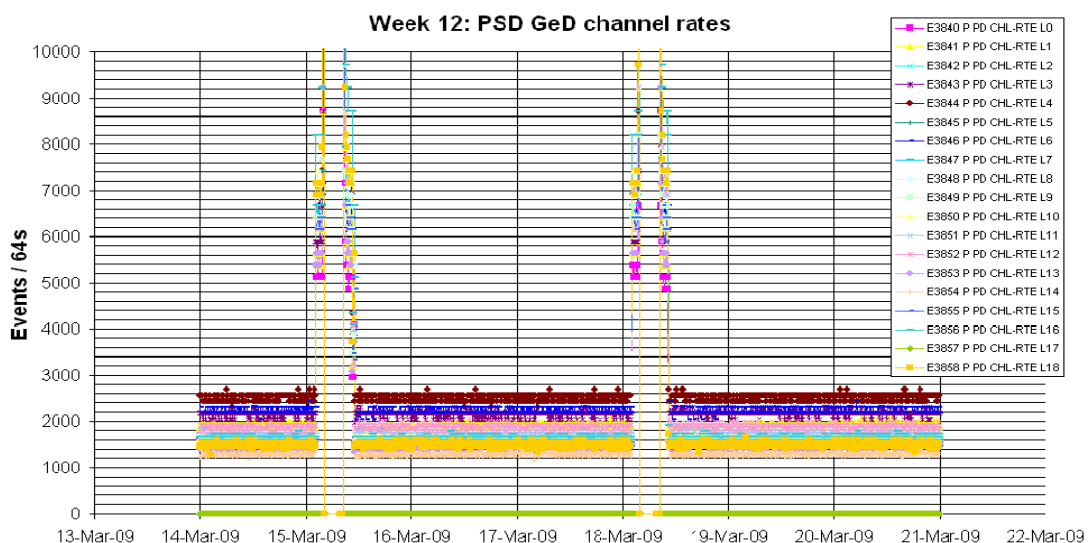


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period.





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:

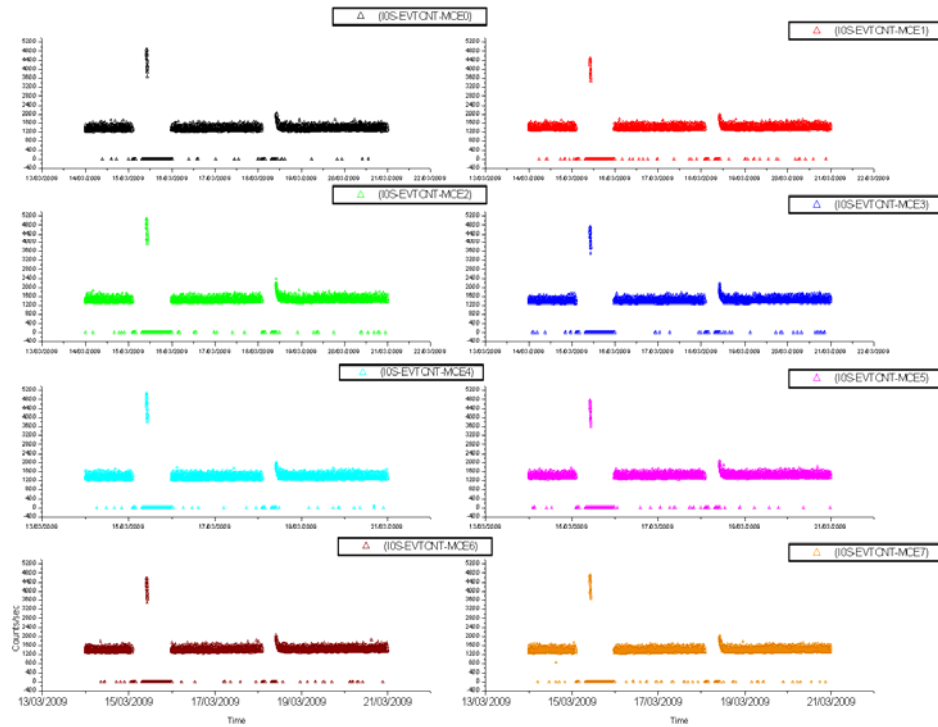
- On 2009-03-14 at 23:27:23Z one occurrence of OEM APID 1024 ID 243 EXCEPTION SPI1 SPECTRA BUILDING NOT COMPLETED was received with parameter E9780 (DETECTOR ID) = 14. As this was a single occurrence, no action was taken.
- Due to continuing high radiation after the expected radiation belt exit of revolutions 784 and 785, TM parameter E3500 (ACS CntVetoBelow) was OOL High for ~40-50 minutes after radiation belt exit of these revolutions. In each case it returned within limits of its own accord and no action was taken. However, the planned radiation belt exit altitude (currently 53000km) will be increased to 57000km from revolution 788 onwards.
- The following problems occurred with the post eclipse and radiation belt activation of SPI during this reporting period:
 - On 2009-03-15, at the start of revolution 784, the ED EEXIT-02 to configure SPI after a radiation belt passage in eclipse season failed at the stage of TC EU0201D TC-C AS SERV1 scheduled at 10:38:23Z. This TC, as well as the following TC EU0202D, which set the HV of the ACS FEEs to ON, failed release. This was due to late update of the dynamic default parameters of this TC (the corresponding TM parameters being reported by the previous TCs of the sequence TC E0252 TC-R AS SERV2 and TC E0251 TC-R AS SERV1). The rest of the ED continued to execute successfully, however the later report TCs EU0251D and EU0252D failed completion (as no corresponding load TCs had been sent). The HV of FEE#0 to FEE#61 therefore remained OFF. During this time, from 10:39:47Z to 10:46:57Z several occurrences of OEM ID APID 1024 ID 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW were received (2 for each detector except GeD#2 and GeD#17 (but including one for GeD#5) and one additional for GeD#16 and GeD#18). The ED EEXIT-02 was re-uplinked manually starting at 10:55:58Z and executed nominally. SPI operations then continued nominally.
 - On 2009-03-18, at the start of revolution 785, the ED EEXIT-02 failed again at the stage of TC EU0201D TC-C AS SERV1 scheduled at 10:27:11Z, which failed release due to late update of the dynamic default parameters. The rest of the ED continued to execute successfully, however the later report TC EU0251D failed completion (as no corresponding load TC had been sent). Consequently, the HV of FEE#0 to FEE#30 remained OFF. The ED EEXIT-02 was re-uplinked manually starting at 10:32:36Z and executed nominally. SPI operations then continued nominally.

8.3.3 IBIS Operations

IBIS Event Counters Plots

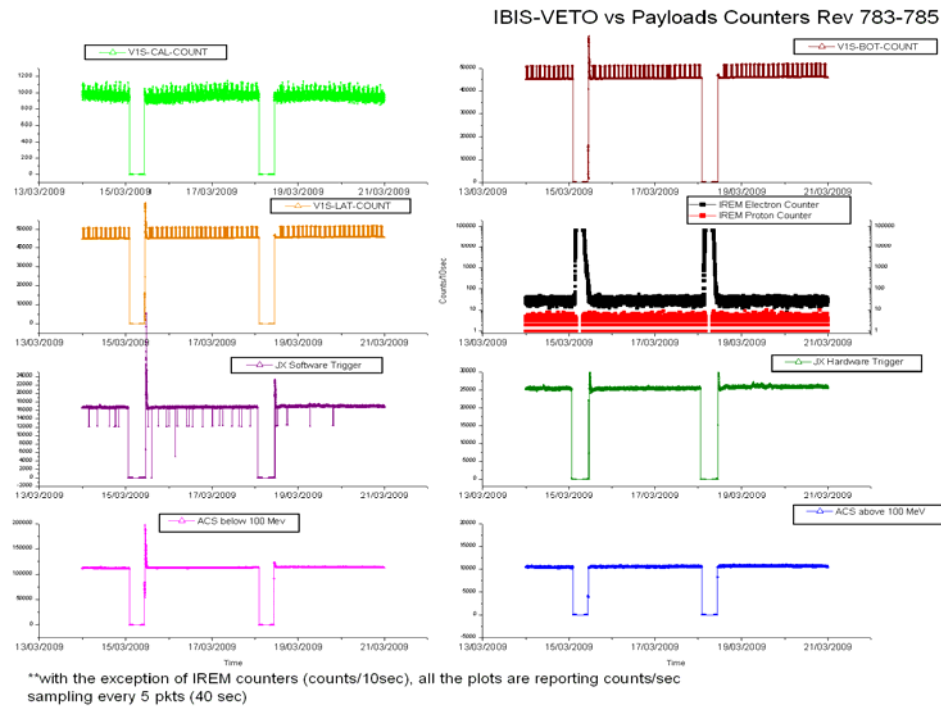
ISGRI Counters:

IBIS - ISGRI Counters Rev 783-785



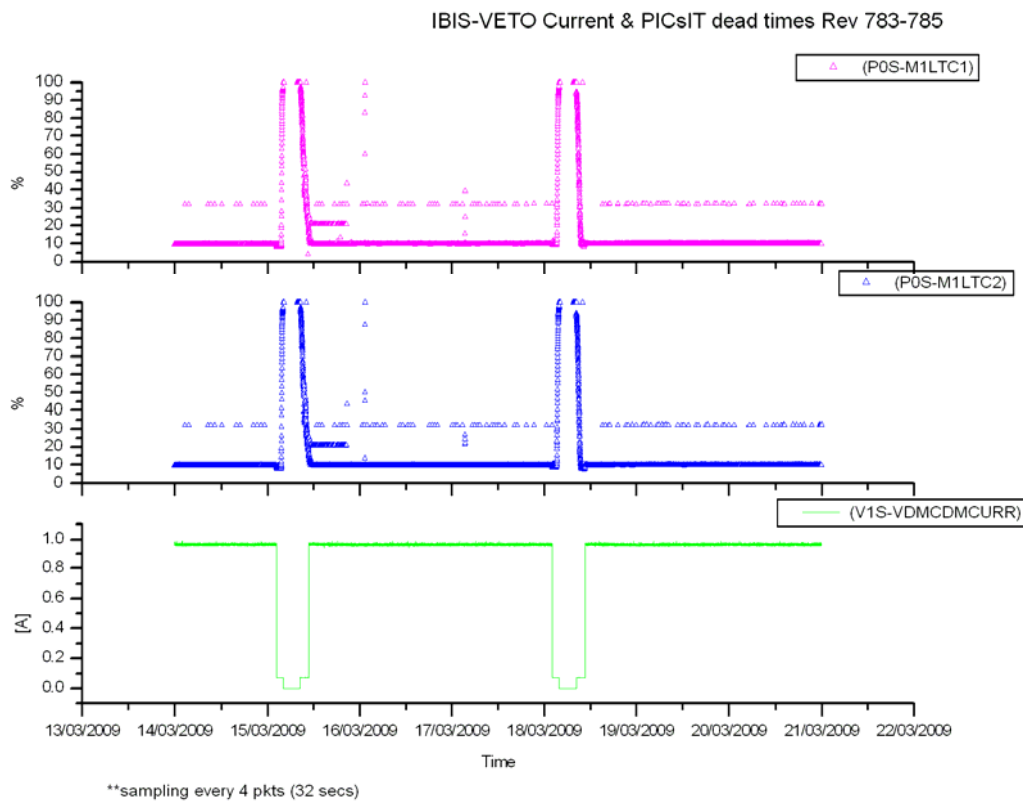
**sampling every 4 pkts (32 secs)

VETO vs Payload Counters:



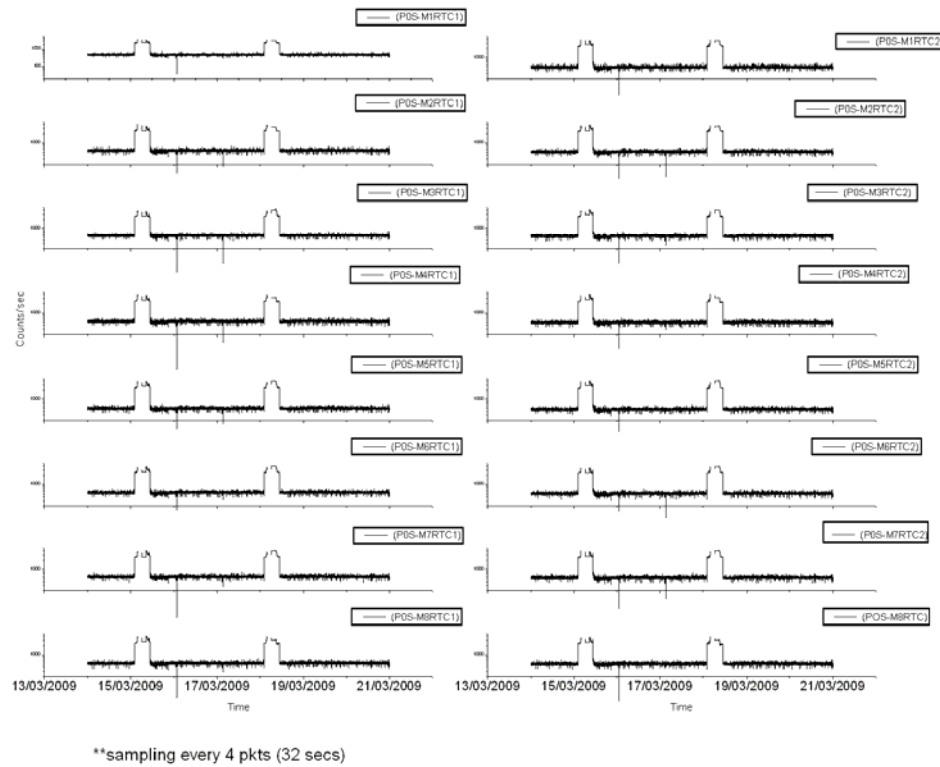
The background radiation level was low during the week, although a short period of high radiation was experienced by the instruments after the expected radiation belt exit of revolution 784.

VETO Current:



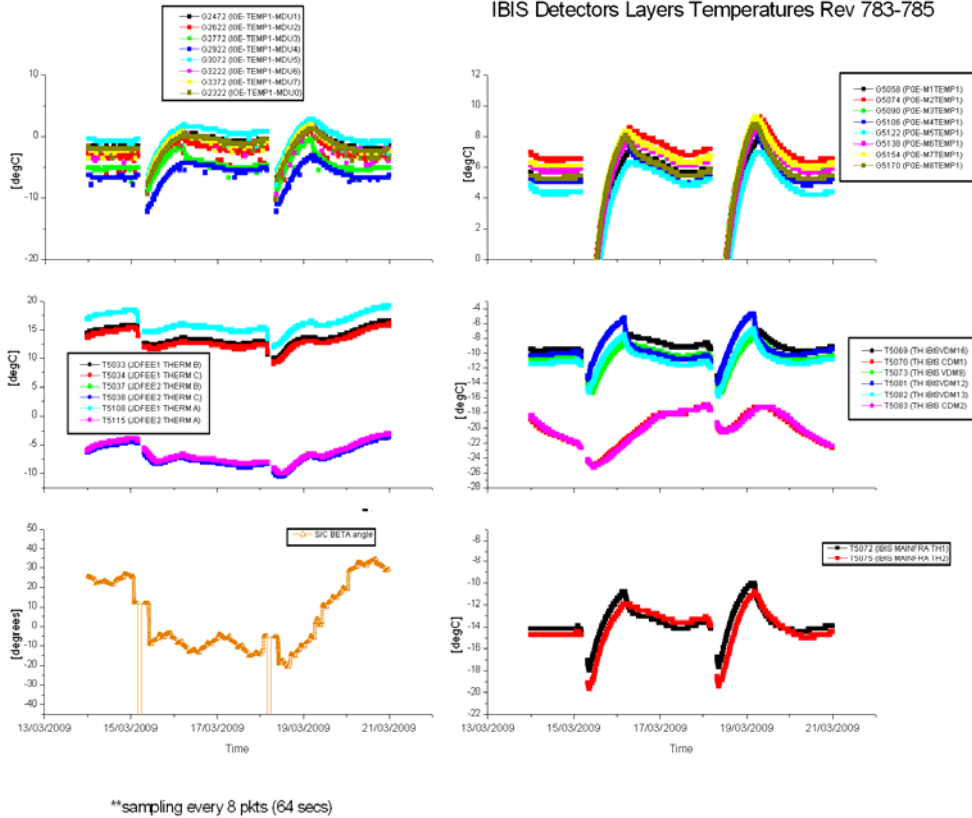
PICsIT Counters:

IBIS - PICsIT Counters Rev 783-785



IBIS Detectors Layers Temperatures:

IBIS Detectors Layers Temperatures Rev 783-785



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.

2009-03-14 (DOY 073, Rev 783)

IBIS operations executed nominally.

2009-03-15 (DOY 074, Rev 783-784) to 2009-03-16 (DOY 075, Rev 784)

During the execution of the ED GEISCL03 prior to radiation belt exit of revolution 784, the TM parameter family G2013 (number of events triggering the MCEi per second) went OOL Warning High starting at 10:13:11Z, indicating high radiation. Due to continuing high radiation after the expected radiation belt exit, and following the successful execution of the ED GEISCL03 to activate ISGRI following radiation belt exit (ended at 10:32:24Z), the following 3 OEMs were received:

- 2009.074.10.34.03.904 APID 1280 ID 128 EVENT
IBIS1 IASW VETO SWITCH OFF PERFORMED DUE TO AUTOMATISM
- 2009.074.10.34.41.178 1280 ID 128 EVENT IBIS1
IASW VETO SWITCH OFF PERFORMED DUE TO AUTOMATISM
- 2009.074.10.37.05.042 1280 ID 128 EVENT IBIS1
IASW VETO SWITCH OFF PERFORMED DUE TO AUTOMATISM

These indicate an automatic configuration of IBIS to safe configuration. In this case (as the IASW and VETO were still in Standby having not been reactivated yet by the Timeline) it was only ISGRI which reacted, with all modules returning to STANDBY.

(In addition, due to the high background radiation, TM parameters G6062 and G6063, for the VETO bottom and lateral counters respectively, started toggling OOL at 10:50:15Z. They returned stably within limits at 11:31:51Z.)

Following this, the ED GEBEXT01 scheduled at 10:45:11Z to activate VETO and ED GESTAN02 scheduled at 10:47:49Z to put IBIS in Science Standard mode were executed nominally. Therefore, following execution of the ED GESTAN02 (completed at 10:48:57Z) IBIS was in Standard mode with PICsIT and VETO in Nominal but with ISGRI in Standby.

As a consequence, TM parameter G8080 (Valid event rate on HBRA) went OOL Low (value = 0) at 10:49:03Z and continued to be almost continually OOL, only returning within limits for brief periods. In addition, starting at 10:49:05Z, OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED began to be received every 8 seconds, as frequent HEPI re-synchronizations were occurring, triggered by the low event rate due to ISGRI being in Standby.

This was not observed by the operator until 20:15Z, at which time the SOE on-call was notified and the following recovery actions were performed:

- 22:03:30Z IBIS to STANDBY via FCP_IBIS_0313. (At this time the OEMs APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED stopped).

- 23:22Z Re-uplink ISGRI context tables
- 23:44:43Z Re-uplink GEISCL03
- 2009-03-16 at 00:13:41Z Uplink GESTAN02 with planned observation parameters. This returned IBIS to Science Standard with the correct configuration. TM parameter G8080 was stably within limits after this time.

IBIS operations continued nominally.

This is recorded as Anomaly Report INT-3061.

Also during the above period, at 13:55:16Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. They returned within limits of their own accord at 13:55:48Z.

On 2009-03-16 at 01:20:36Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE) again. At 01:21:43Z the TM parameter families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As these were followed at 01:25:14Z by a single occurrence of OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

2009-03-17 (DOY 076, Rev 784)

At 03:23:16Z the TM parameters families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semi-module FIFO error flags. At 03:24:39Z the TM parameter families G5002 and G5003 for the PDM semi-module counters started going OOL Low. As these parameters had all returned within limits of their own accord by 03:24:47Z, no action was taken.

2009-03-18 (DOY 077, Rev 784-785)

IBIS operations executed nominally.

2009-03-19 (DOY 078, Rev 785)

At 07:53:59Z TM parameter G2097 went OOL Low (value =0). This is the number of events triggering the MCE6 per second. As it returned within limits of its own accord at 07:55:59Z, no action was taken.

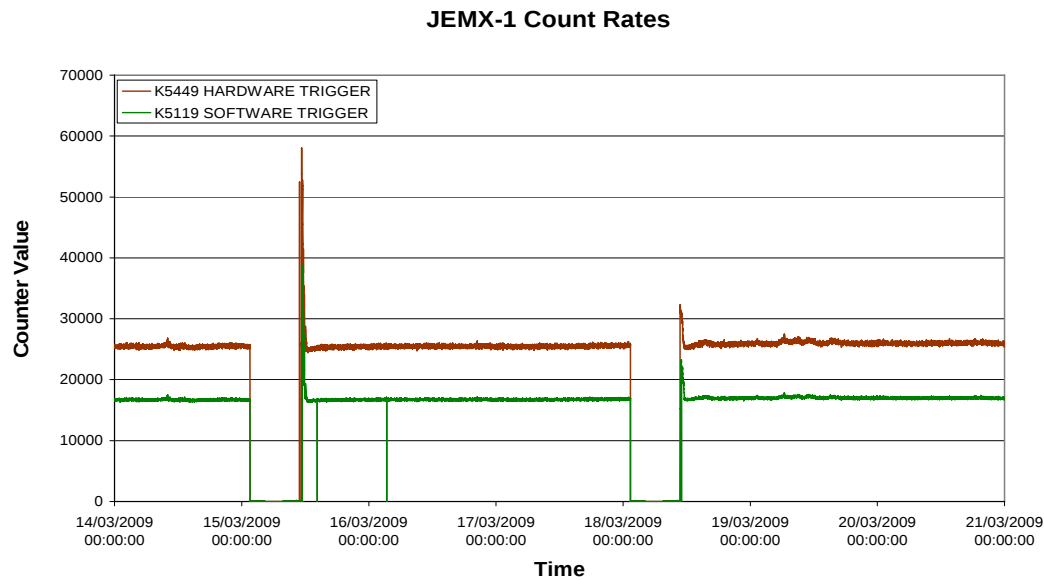
2009-03-20 (DOY 079, Rev 785)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

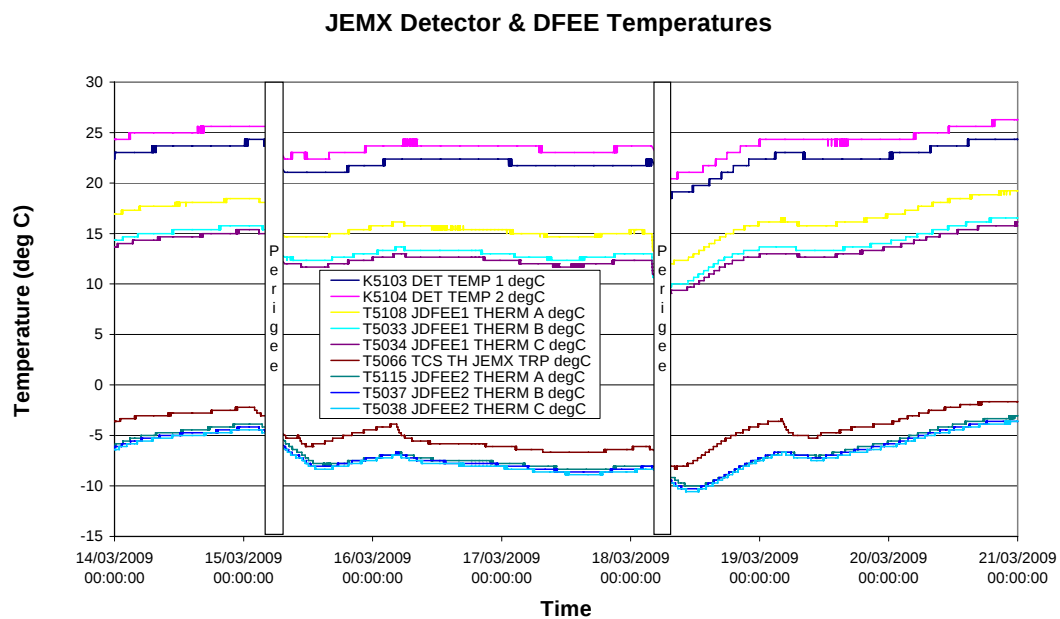
JEM-X Count Rates

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

2009-03-14 (DoY 073, Rev 783)

JEM-X 1 operations executed nominally.

2009-03-15 (DoY 074, Rev 783-784)

Between 07:59:01 and 11:50:03, parameters K5449, K5136, K5119, K5317 repeatedly exceeded soft and sometimes hard limits. No action was taken on any occasion, and there was no impact.

2009-03-16 (DoY 075, Rev 784) to 2009-03-17 (DoY 076, Rev 784)

JEM-X 1 operations executed nominally.

2009-03-18 (DoY 077, Rev 784-785)

At 07:50:07 and 07:55:29, parameter K5317 exceeded hard limits.
At 10:44:26 and 10:58:18, parameter K5449 exceeded soft limits.
No action was taken on any of the above events, and there was no impact.

2009-03-19 (DoY 078, Rev 785) to 2009-03-20 (DoY 079, Rev 785)

JEM-X 1 operations executed nominally.

The eclipse exit ED KECLEX01 was time-tagged to occur 5 minutes after penumbra exit, which was outside ground contact to minimise the temperature drop. 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

2009-03-14 (DoY 073, Rev 783)

Nothing to report.

2009-03-15 (DoY 074, Rev 783-784)

At 20:45, FD problems forced a suspension of the Timeline. A recovery was performed, and the Timeline re-acquired at 23:21. The impact was the loss of pointings 07840018, 07840019 & 07840020. It was at this time the following OEMs were received:

2009.074.22.40.04.773	2009.074.22.40.09.526	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					
2009.074.22.40.10.898	2009.074.22.40.21.401	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for pointing 07840020.

2009-03-16 (DoY 075, Rev 784) to 2009-03-20 (DoY 079, Rev 785)

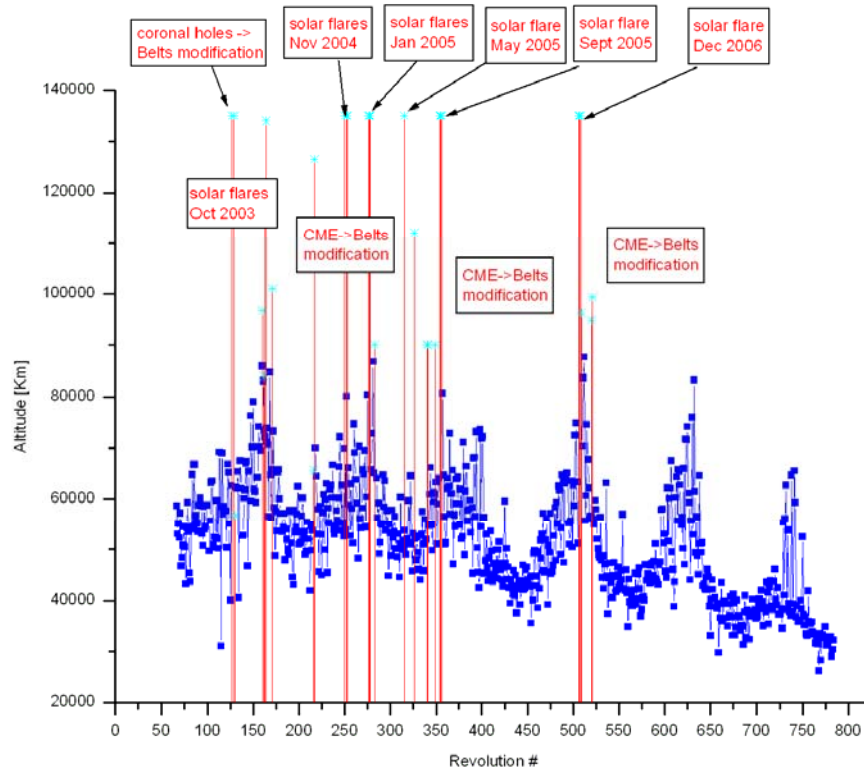
Nothing to report.

On DoY 074 at 02:19:21 and DoY 077 at 02:07:45 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]
783	RAD_ENTR R 2009-03-15T02:19:19Z	15/03/2009 03:35:04	30412.2	15-Mar-2009 03:20:38	34415.84
784	RAD_EXIT R 2009-03-15T10:32:43Z	15/03/2009 11:39:44	62364.7	15-Mar-2009 10:00:38	46795.12
784	RAD_ENTR R 2009-03-18T02:07:38Z	18/03/2009 03:17:28	32273.5	18-Mar-2009 03:20:38	33283.46
785	RAD_EXIT R 2009-03-18T10:20:34Z	18/03/2009 10:01:04	50133.7	18-Mar-2009 09:50:38	46310.17

Reference

High radiation

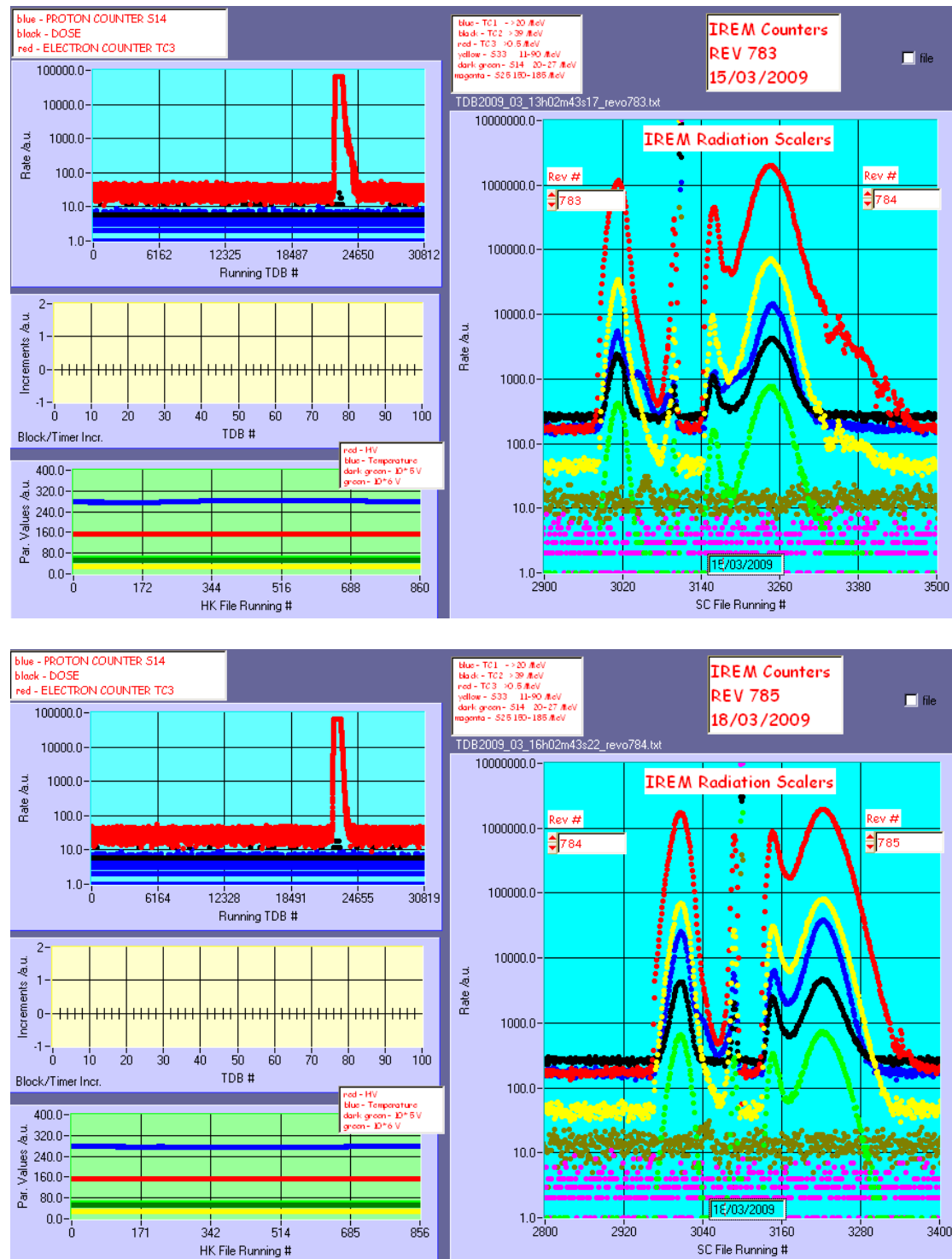
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

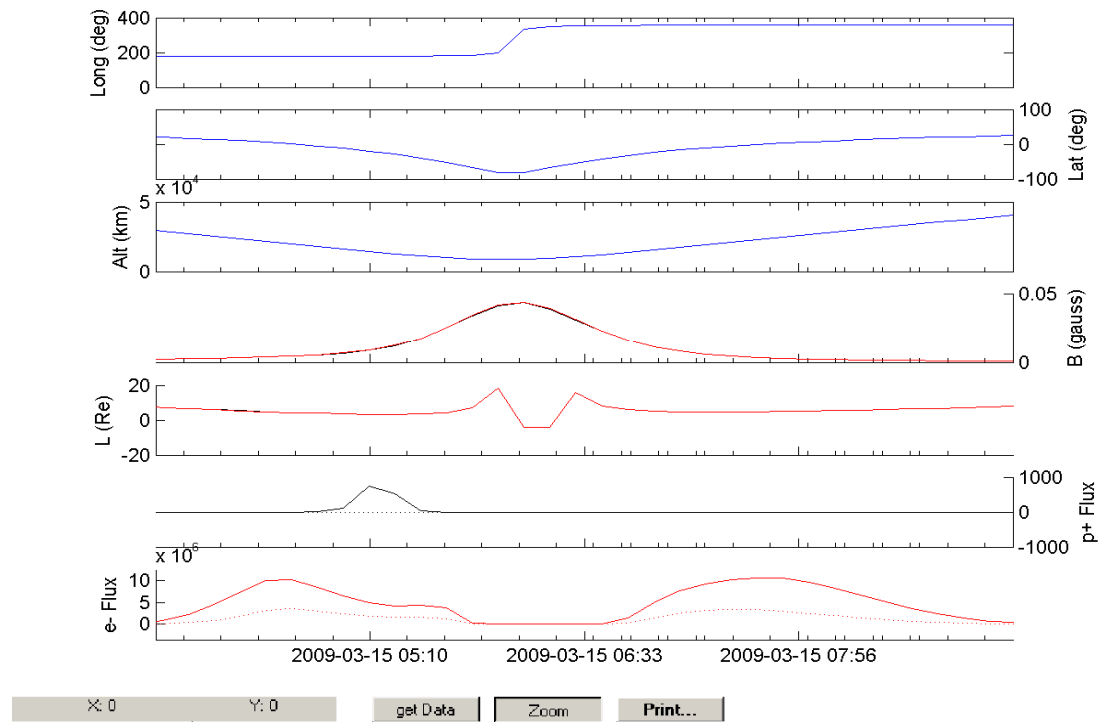
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM radiation counters:

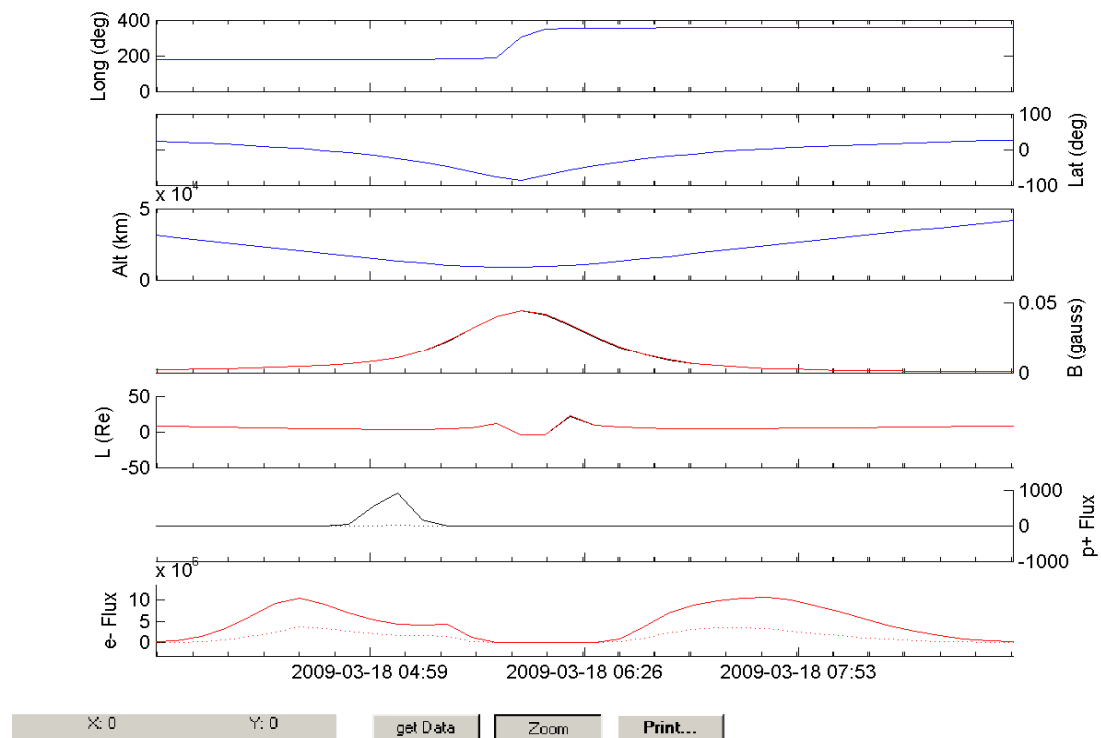


IREM Predicted Radiation Belt Passages

Rev 783



Rev 784



Radiation Assessment

Generated with SEIS Report and Analysis tool.

INTRODUCTION

This note summarises the space weather status over the observation period

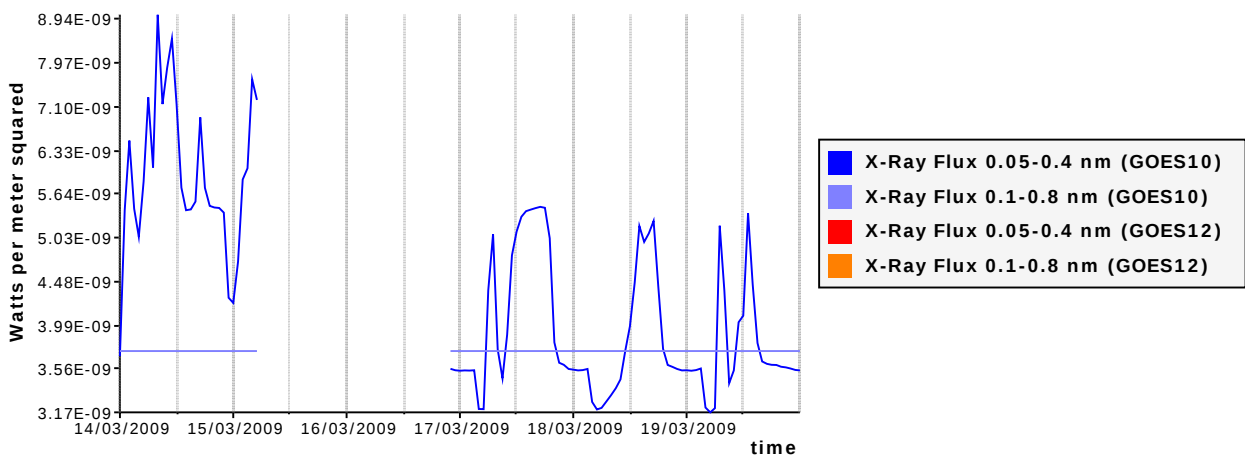
DAILY SUN

see in WR section 3.2.5

RADIATION FLUXES

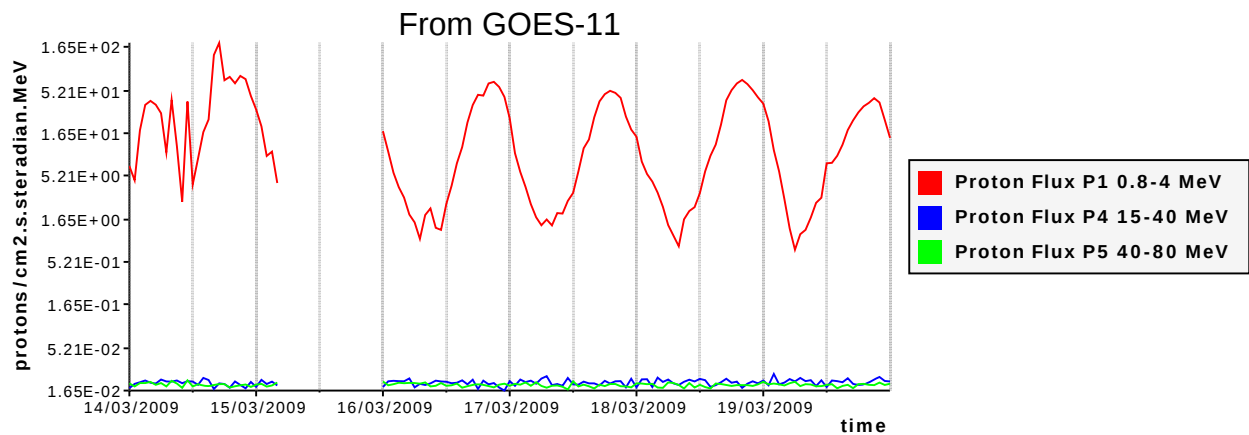
X-ray fluxes

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.



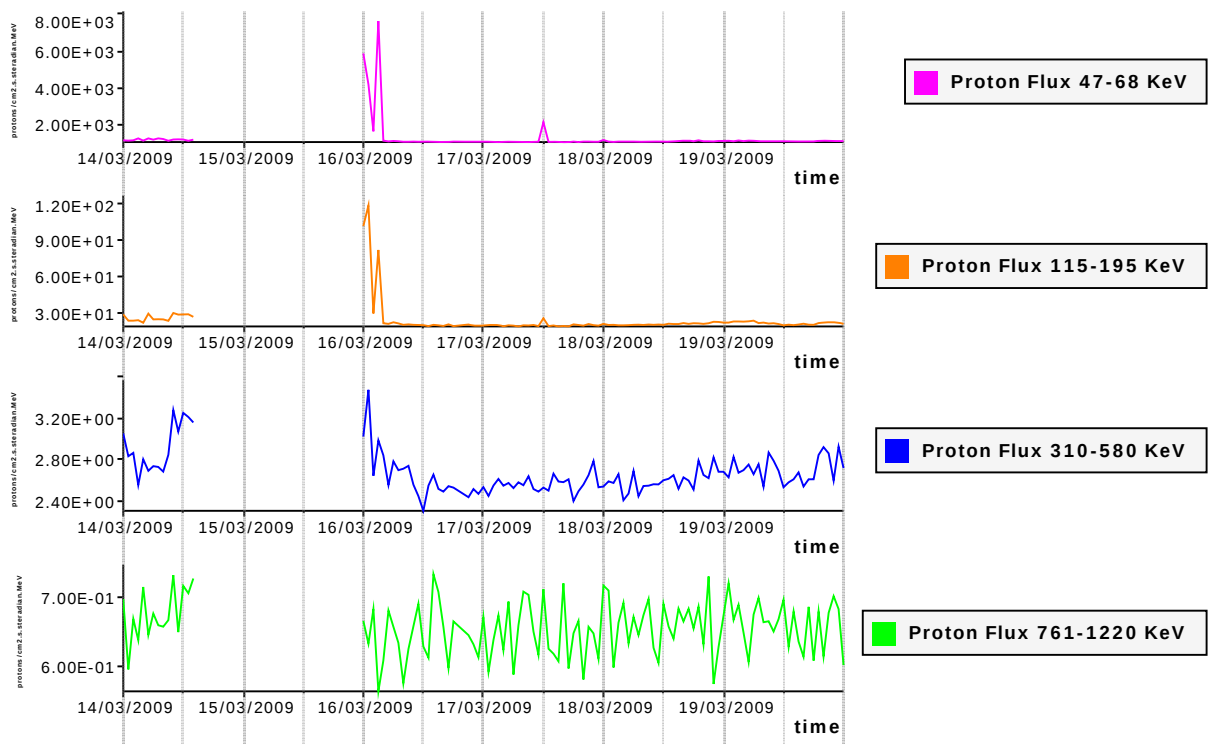
Proton fluxes (GOES-11)

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 $1\text{E-}2$.



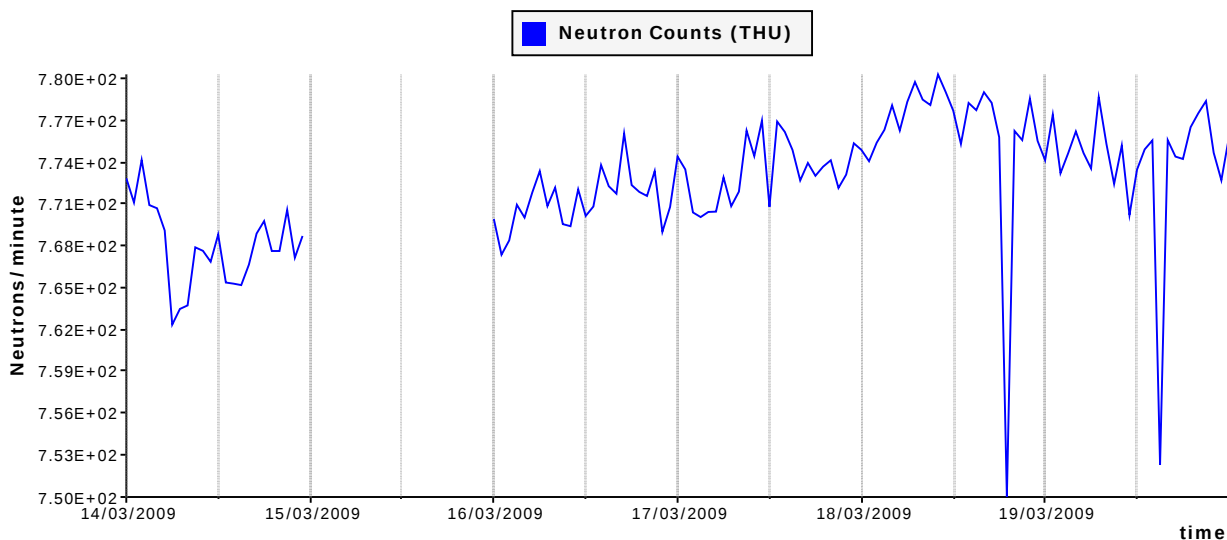
Proton fluxes (ACE)

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



Neutron counts

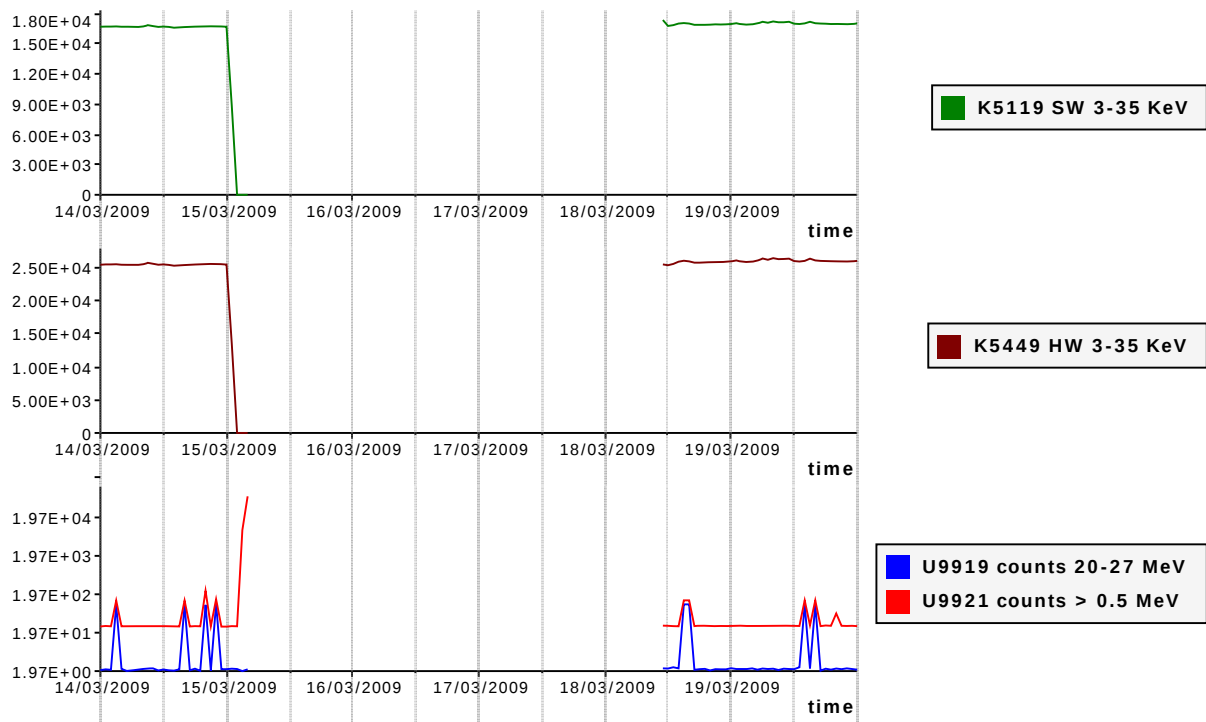
The neutron counts for the last 3 days are presented in the following plot. Nominally they remain stable around $7.2\text{E}+2$.



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.

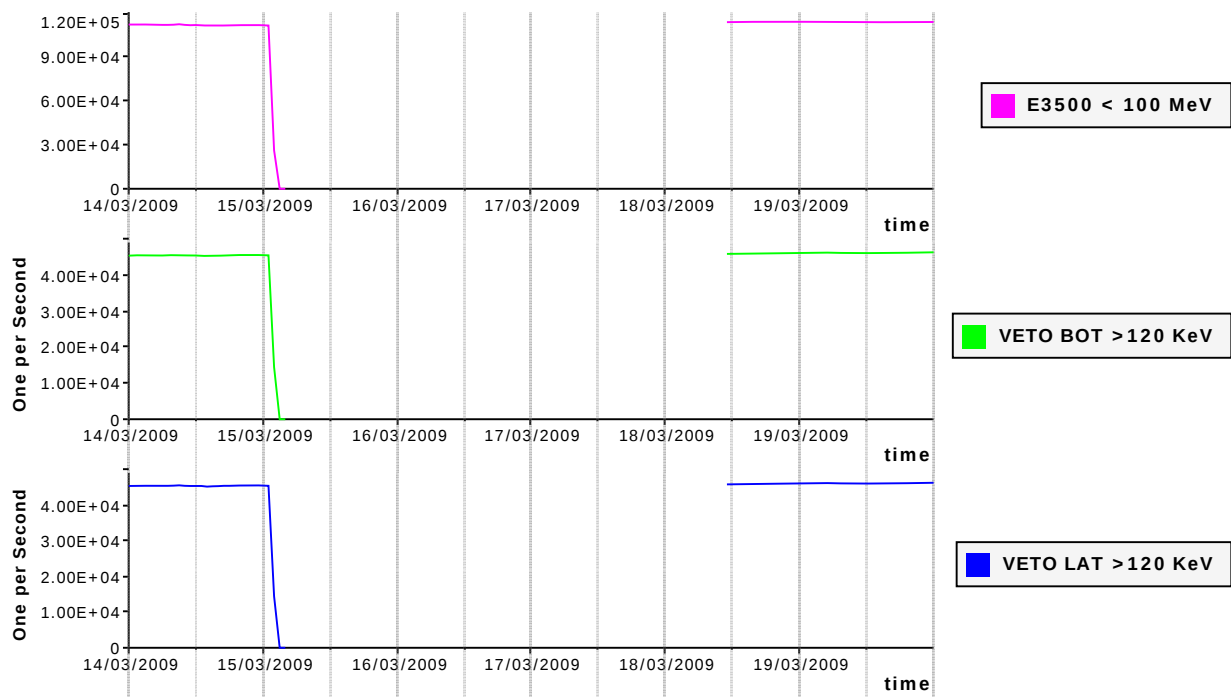
Nominal values are respectively about 1 and 18 for IREM counts, and, 13000 and 19000 for JEM-X ones.



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%.



