

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 369
Week 42
19.10.09
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.....	3
3.1.3	Thermal.....	3
3.1.4	OBDH.....	3
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
3.2.6	Radiation Background.....	7
4	Ground Facilities.....	10
4.1	Mission Operations Centre.....	10
4.2	Ground Stations & Network.....	10
4.3	Science Ground Segment.....	10
4.3.1	ISOC.....	10
5	Special Events.....	11
6	Anomalies.....	11
7	Future Milestones.....	11
8	Appendix.....	12
8.1	Detailed Satellite Information.....	12
8.1.1	AOCS SUMMARY OPERATIONS REPORT, 10/10/2009 –16/10/2009.....	12
8.1.2	SPI Operations.....	14
8.1.3	IBIS Operations.....	19
8.1.4	JEM-X Operations.....	22
8.1.5	OMC Operations.....	25
8.1.6	IREM Operations.....	26

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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 10.10.09 until 16.10.09 (both dates inclusive) and covers the revolutions 854 and 855.

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 raster dither of MCG +8-11-11 (RA 05:54:53.60, +46:26:21.6), a raster dither of Mkn 509 (RA 20:44:09.76, -10:43:24.7) and a hexagonal dither of NGC 2110 (RA 05:52:11.40, -07:27:22.0)

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.

Slews 08540012 and 08540013 were missed from the Timeline.

The fuel consumption over the period between 10/10/2009 and 16/10/2009 was 0.1280 Kg. The remaining propellant is in the order of 132.0157 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

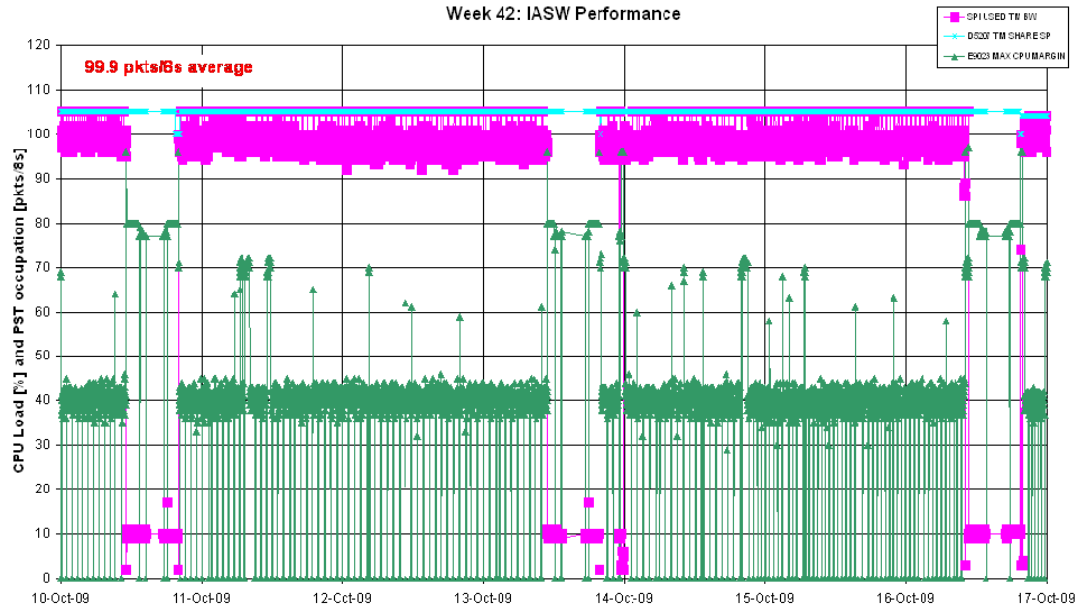
3.2.1 SPI

Following the 13th SPI annealing, which ended on 11/05/2009, 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 Stirling compressors are working nominally. The Germanium detectors' temperature was kept in the range 80K+/-1K.

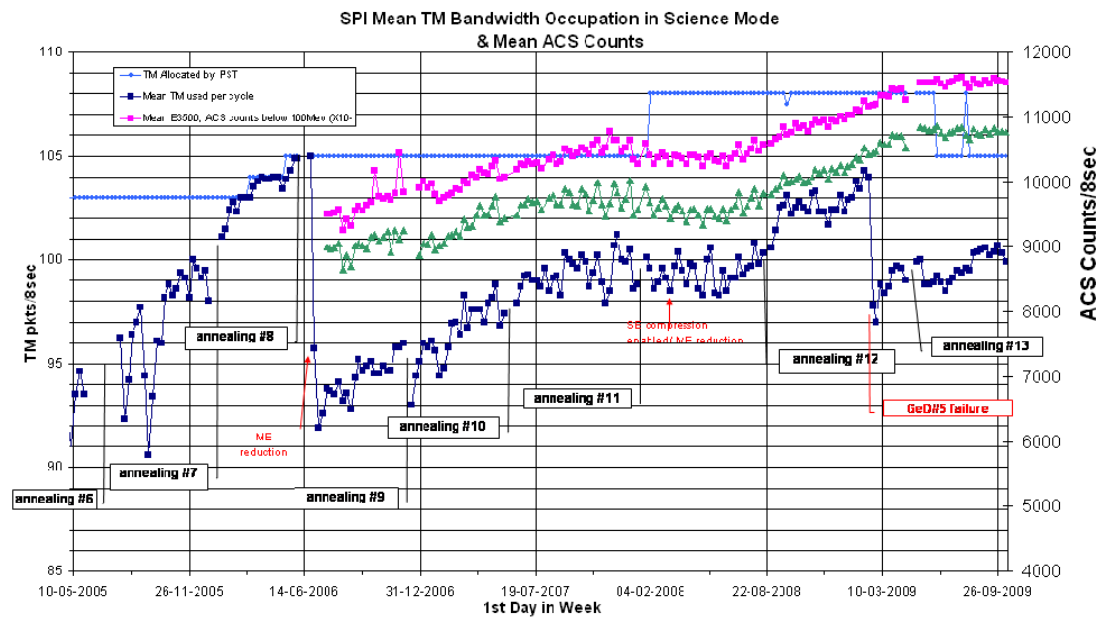
SPI was operated in photon-by-photon mode with spectra TM enabled during science observations. The assigned TM bandwidth in the science observation windows was 105 packets/cycle and the average telemetry occupation was 99.9 packets/cycle.

The following plot shows the TM bandwidth allocation, occupation and DPE CPU load during the reporting period¹:



The following plot shows the evolution of the assigned and the average occupation of the SPI TM bandwidth since May 2005 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.

¹ Data sampled every 8th packet (64sec)



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

3.2.2 IBIS

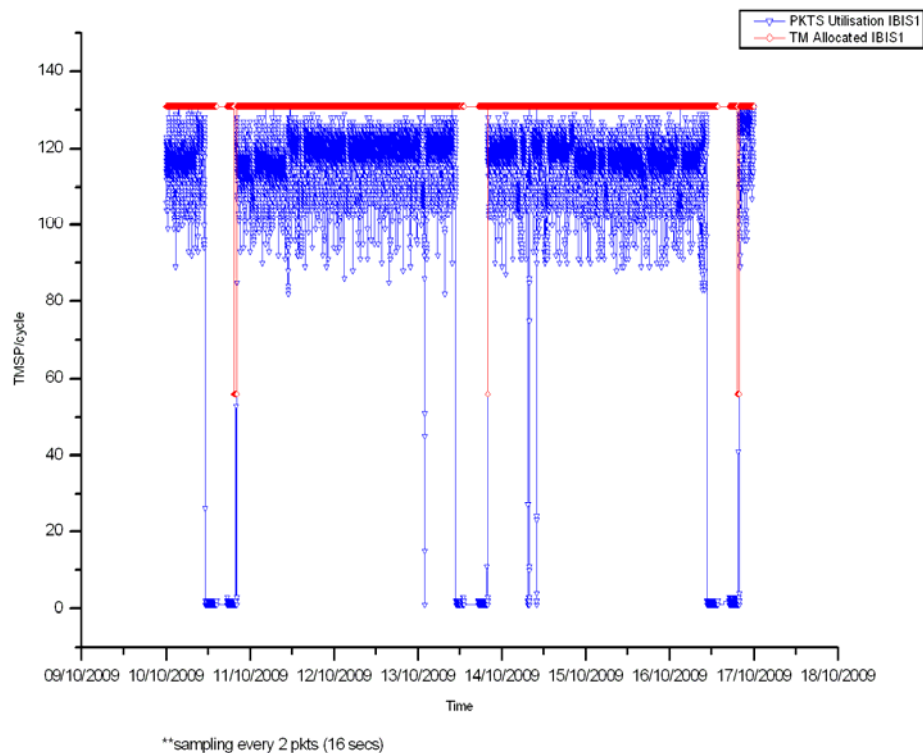
The overall status of IBIS is nominal.

During the reporting period, IBIS was operated in Science Standard mode during science observations. The TM bandwidth statistics were as follows:

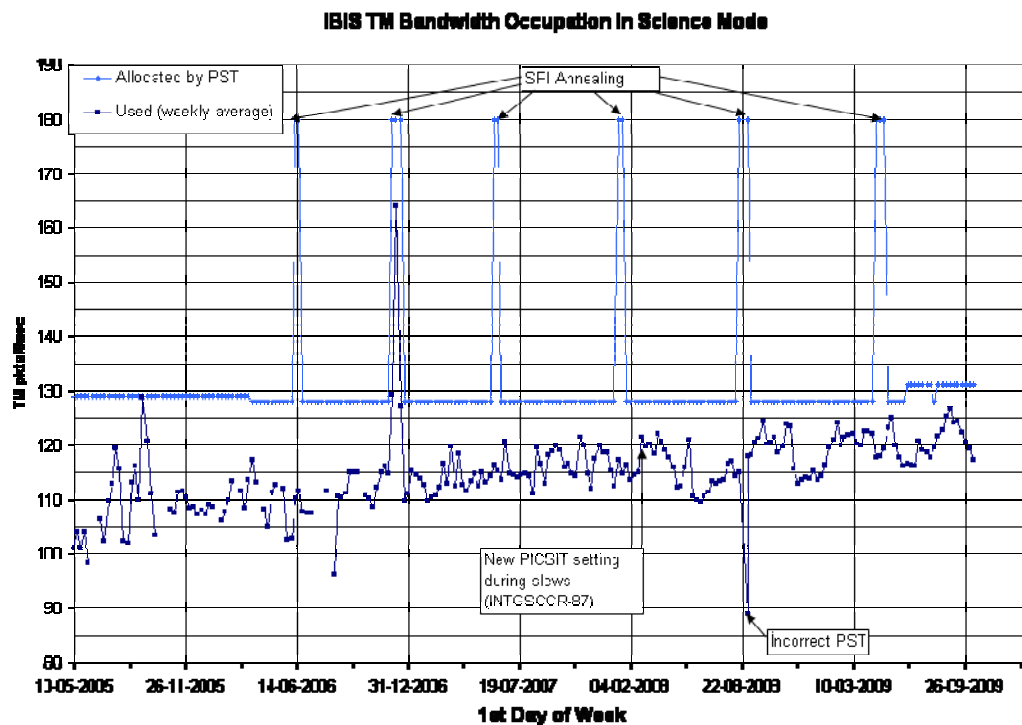
- PST allocation to IBIS above radiation belts: 131 packets/cycle
- IBIS mean bandwidth utilisation in science mode: 117.24 packets/cycle (down 2.07 on previous week)
- Percentage of TM cycles for which full bandwidth was used: 0.9%

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

IBIS - TM Bandwidth Utilisation Rev 853-856



A plot of the IBIS weekly bandwidth utilisation since May 2005 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.

At the beginning of the week, JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle, with JEM-X2 dormant (DPE OFF) and no TM slots allocated. On Friday 16th October, JEM-X2 was switched on, and operated in Data Taking mode with a TM allocation of 8 packets/cycle, with JEM-X1 in SAFE with 1 TM slot allocated for house-keeping only.

Note: Further information on JEM-X operations can be found in the Appendix Section 8.3.4.

3.2.4 OMC

The status of OMC is nominal.

OMC operations were performed by the automatic Timeline. OMC was operated in Science Normal mode during science observations, with a TM allocation of 5 packets / cycle.

During this reporting period, 145 of the 148 planned science pointings were executed nominally, 1 was lost, and 2 were cut short.

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

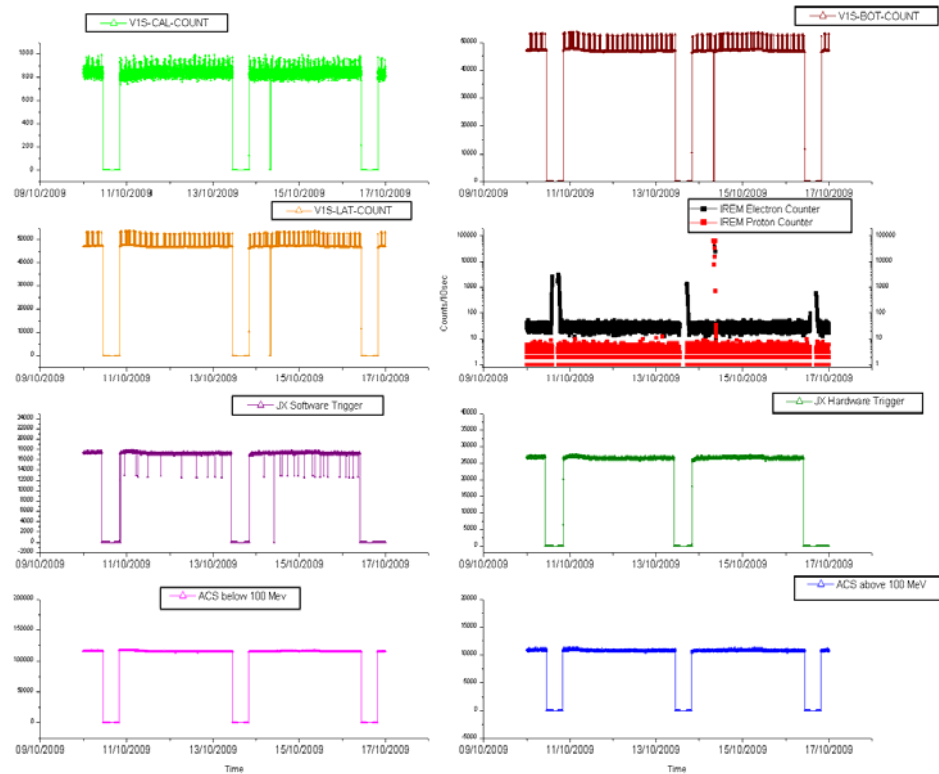
Note: Some more information concerning the IREM operations is provided in the Appendix Section 8.3.6.

3.2.6 Radiation Background

The background radiation level as measured by the instrument counters was low during the reporting period. The following plots show the SPI ACS, IBIS VETO, JEM-X Triggers and IREM count rates over the week²:

² Data sampled every 6th packet (48sec)

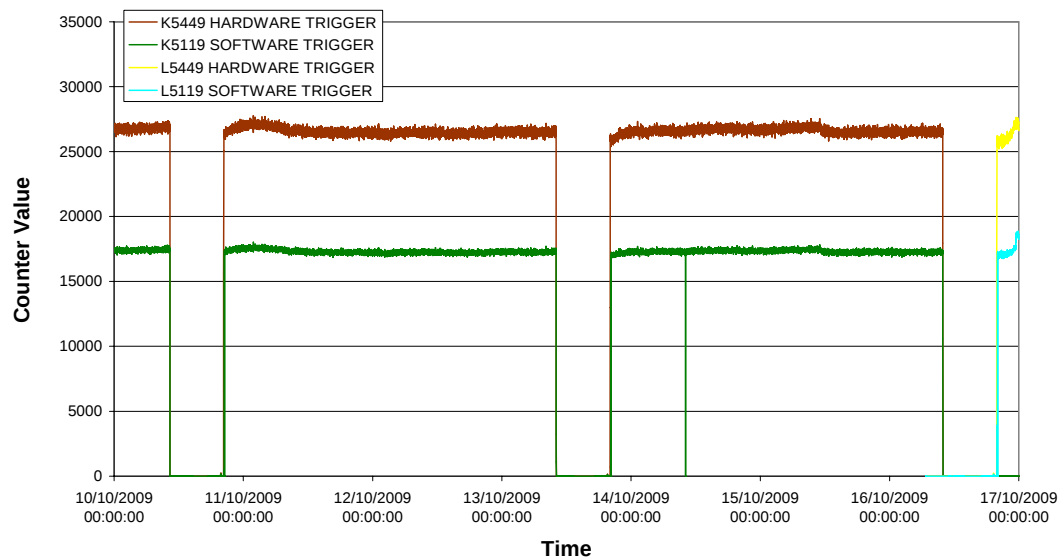
Radiation Background: Instrument Count Rates Rev 853-856



JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph³.

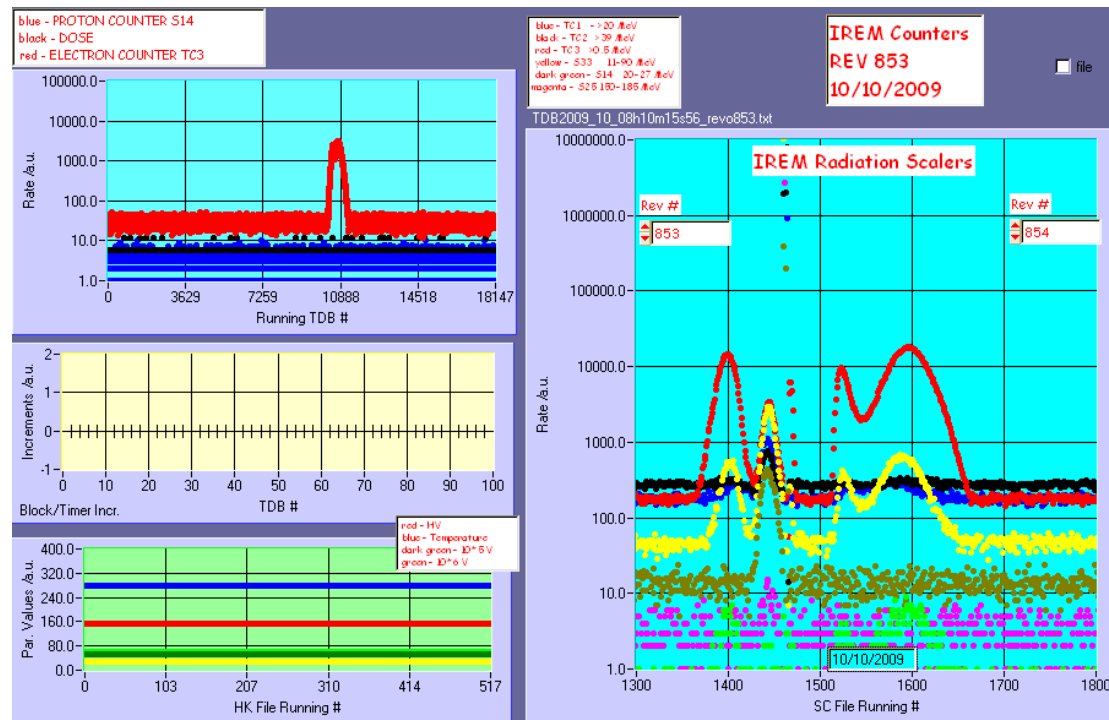
JEMX Count Rates



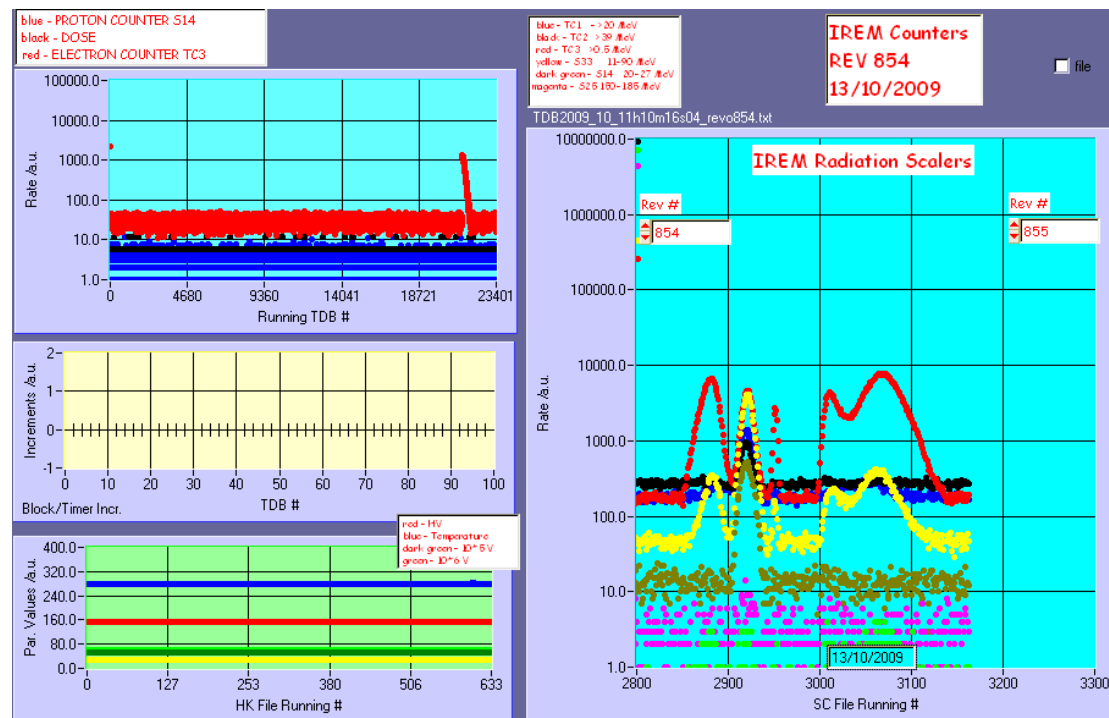
³ Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.

IREM radiation counters:

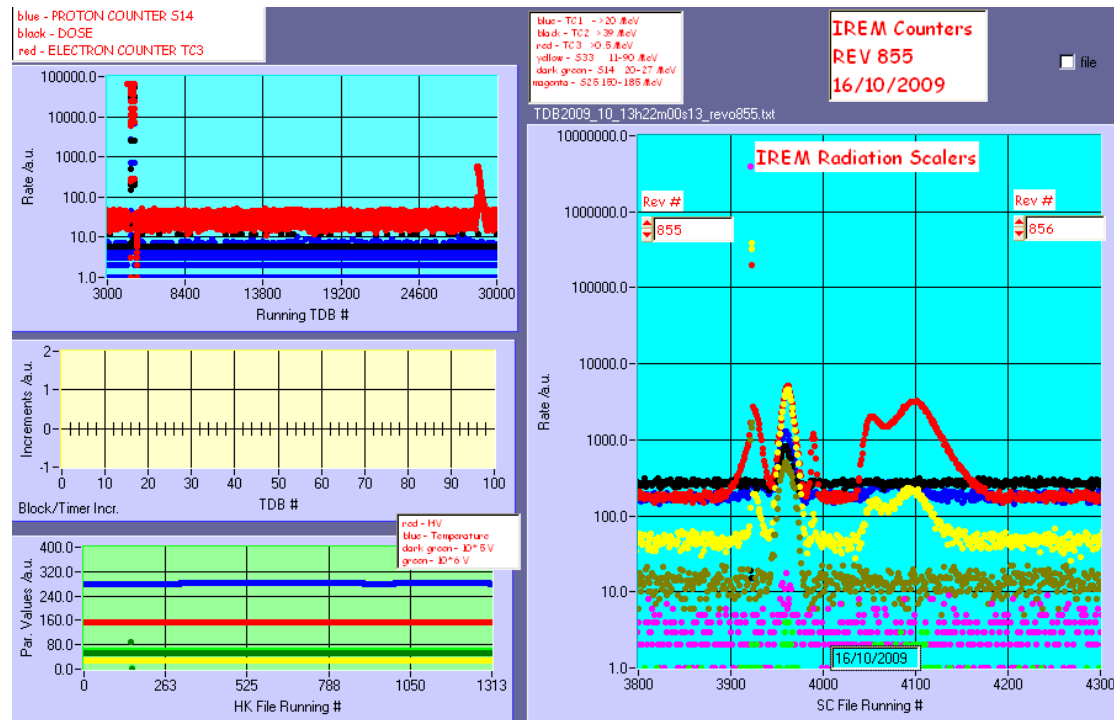
Revolution 853



Revolution 854



Revolution 855



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 very good this week. There was one occasion when the links to ISDC dropped, necessitating a restart of the isds & ifrd. There was no impact.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. On 11.10.2009 there was one unexpected ground station handover from Redu to VIL2, due to the Proba launch campaign. There were three occasions of a TM drop VC0 and VC7 from DSS27 and one occasion where after ground station handover from Redu to DSS27 network had a slight delay putting the VC-0 links in on NCTRSB.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 862-864. PSF updates were received for revolutions 861 (handover change) and 862 (thruster torque calibration).

No further observations have been planned. AO7 started officially on Oct 16 with revolution 856 (but a few AO7 observations had started 1-2 revolutions earlier). JEM-X2 is now the default JEM-X instrument delivering science data. TOO strategy using INTEGRAL observations as trigger has been delivered to ISDC.

New TSFs have been received for revolution 857.

2. Observation status

New ECS files have been received for revolutions 839 and 841-846.

3. ISOC Science Data Archive

Archiving of raw TM completed until Oct. 7th.

The next ISDA release will be delayed due to people being busy as well as not available. New hardware replacement plans for ISDA are currently ongoing.

4. ISOC system

No news.

5. Problems

No new problems.

5 Special Events

04.11.2009: Thruster calibration

6 Anomalies

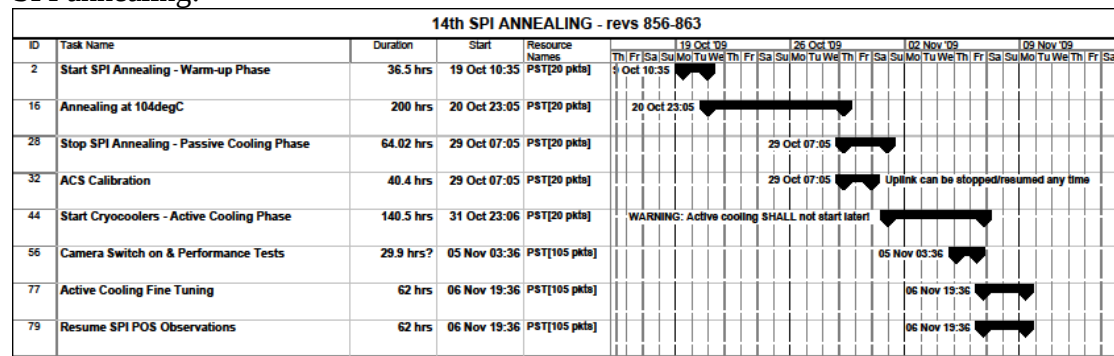
The following anomaly occurred this week:

AR id	Date Created	Subject	Segment	Status
INT_SC-272	2009-10-14	IREM Anomaly: Reset of IREM_CSCI S/W #82, 14/10/2009	Payload	Testing
INT_SC-271	2009-10-16	SPI: PSD Autonomous Transition to Standby (reset?)	Payload	Closed
INT_SC-270	2009-10-13	SPI AFEE Detector Line A LCL trip OPEN	Payload	Closed

7 Future Milestones

17.10.2009: Seven years of Integral in space

SPI annealing:



8 Appendix

The appendix includes various detailed information.

8.1 Detailed Satellite Information

This section contains some detailed information concerning the various subsystems of the satellite and instruments.

8.1.1 AOCS SUMMARY OPERATIONS REPORT, 10/10/2009 –16/10/2009

The AOCS operations were executed from the Automatic Timeline.

During this period, 108 Open Loop Slews, 46 Closed Loop Slews and 6 Momentum Biases were executed (as reported by ACC OEM).

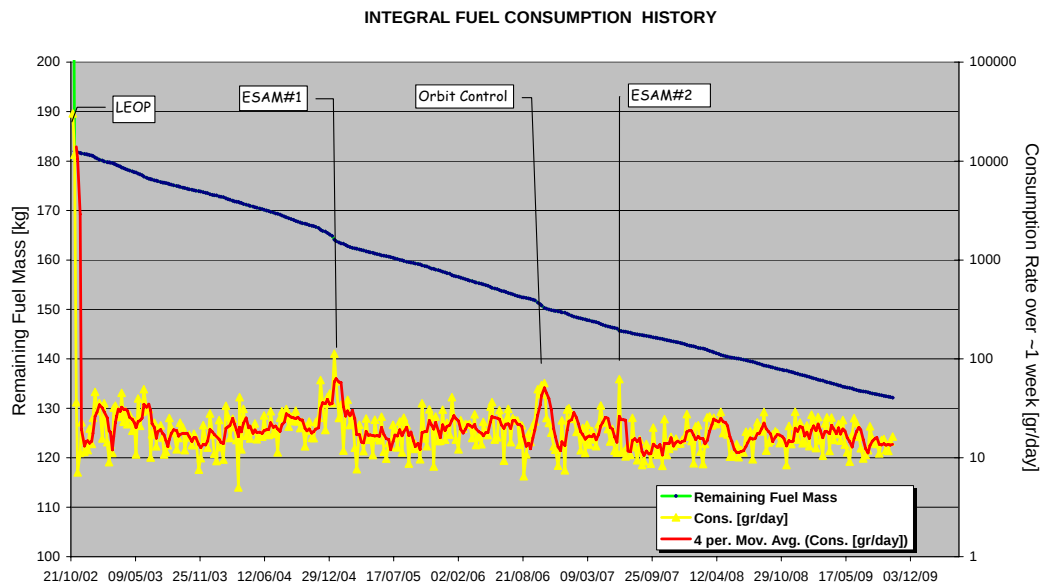
Slews 08540012 and 08540013 were missed from the Timeline, neither the OTF was reached for their PIDs.

Orbit Control

No update.

Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 16/10/2009 is reported in the plot on the next page.

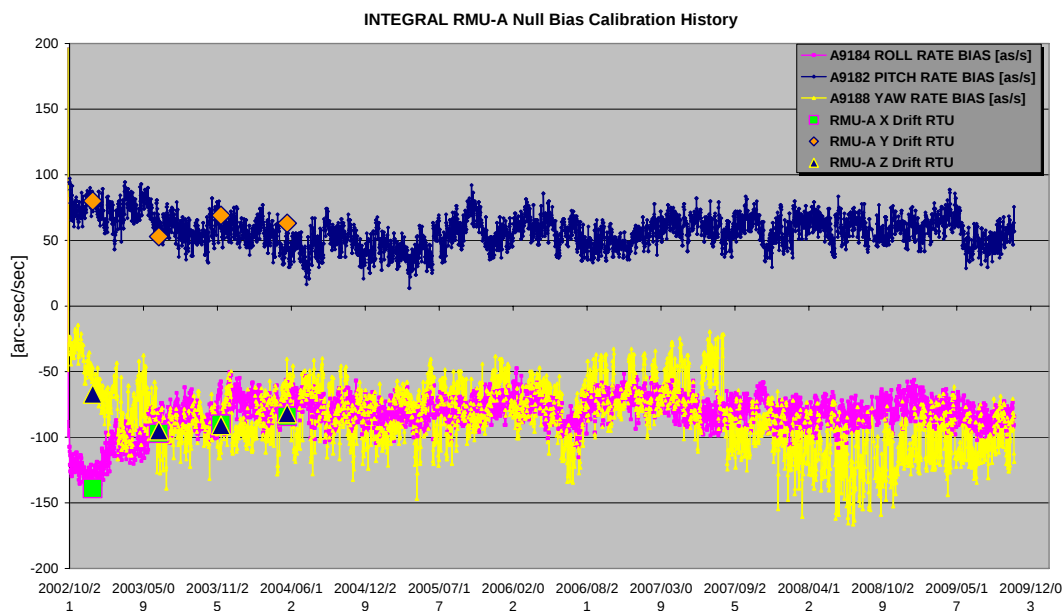


The above plot considers the ESAM fuel consumption spread over period of ~1 week.

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 16/10/2009 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.



Daily events Log:

10/10/2009 (Day of Year 283, Revolution 853 to 854)

Nothing to report

11/10/2009 (Day of Year 284, Revolution 854)

- CSL 08540012 failure (06:17:00Z) due to to a PTV “no go” at release time. The reason for this was that the star in slot #2 (slew star) just before the execution of TC A3189 “START GUIDE STAR” couldn’t be found.

A manual slew was generated (spacontool) from attitude 08540011 to attitude 08540013 and the parameters for slew 08540014 were afterwards manually updated (spacontool) on the Timeline.

Slews 08540012 and 08540013 were missed from the Timeline

OTF was not reached for PID 08540012.

12/10/2009 (Day of Year 285, Revolution 854)

Nothing to report

13/10/2009 (Day of Year 286, Revolution 854 to 855)

Nothing to report

14/10/2009 (Day of Year 287, Revolution 855)

Nothing to report

15/10/2009 (Day of Year 288, Revolution 855)

Nothing to report

16/10/2009 (Day of Year 289, Revolution 855 to 856)

Nothing to report

8.1.2 SPI Operations

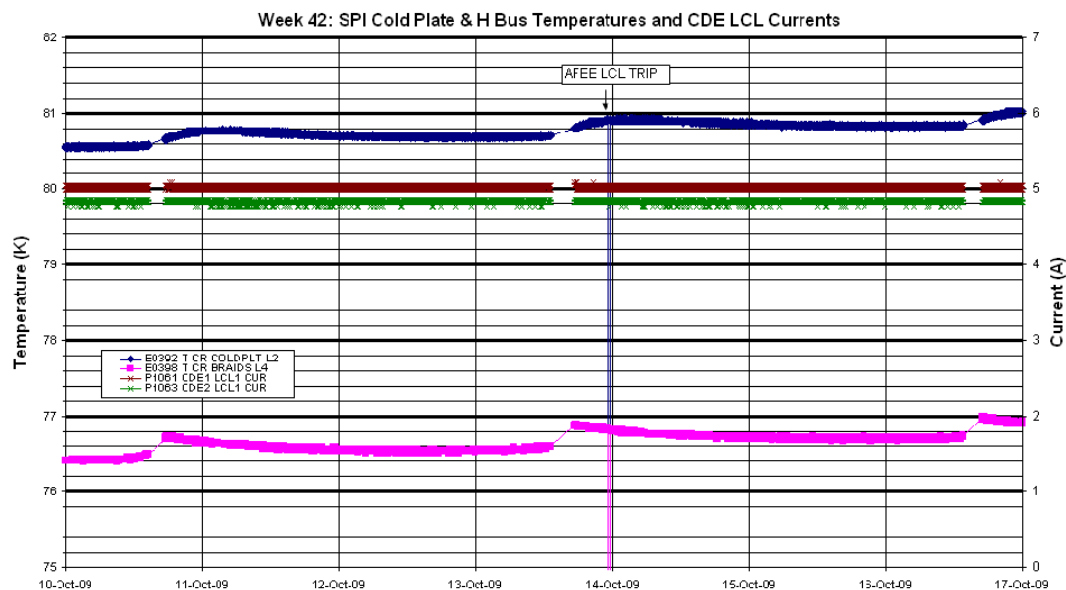
Unit Temperatures: All the equipment temperatures are inside the operational limits.

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 41 throughout the week and the average CDE LCL currents were as follows:

- CDE1 LCL Current = 5.02A
- CDE2 LCL Current = 4.83A

The following plot shows the evolution of the cold plate and H bus temperature as well as the CDE LCL currents during the reporting period⁴:



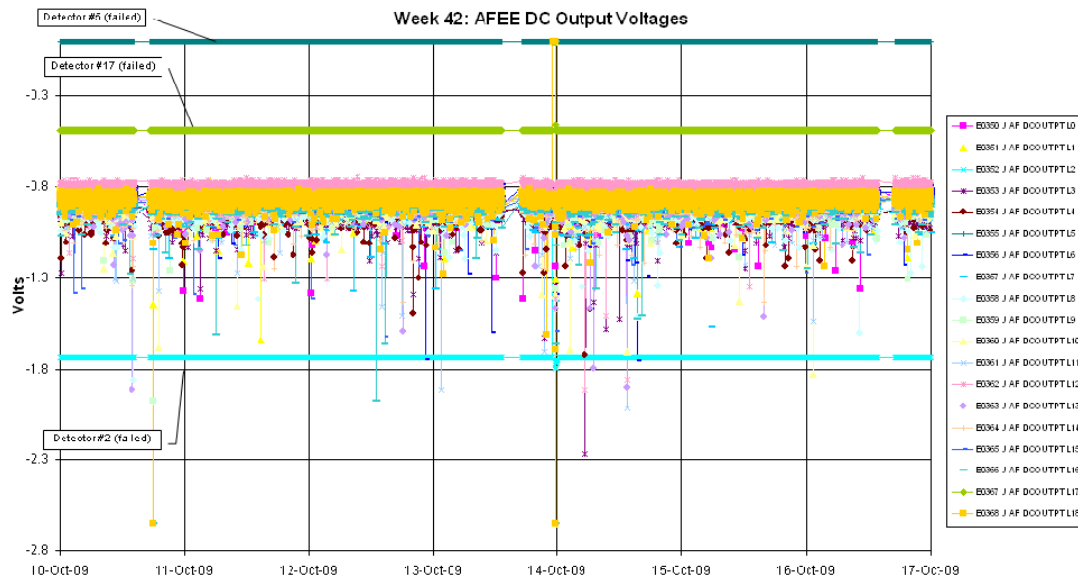
DPE & IASW: The DPE health and IASW performance are nominal. The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE. The DPE CPU usage was nominal during the reporting period (see plot in Section 3.2.1).

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). A plot of the ACS counts is given in Section 3.2.6.

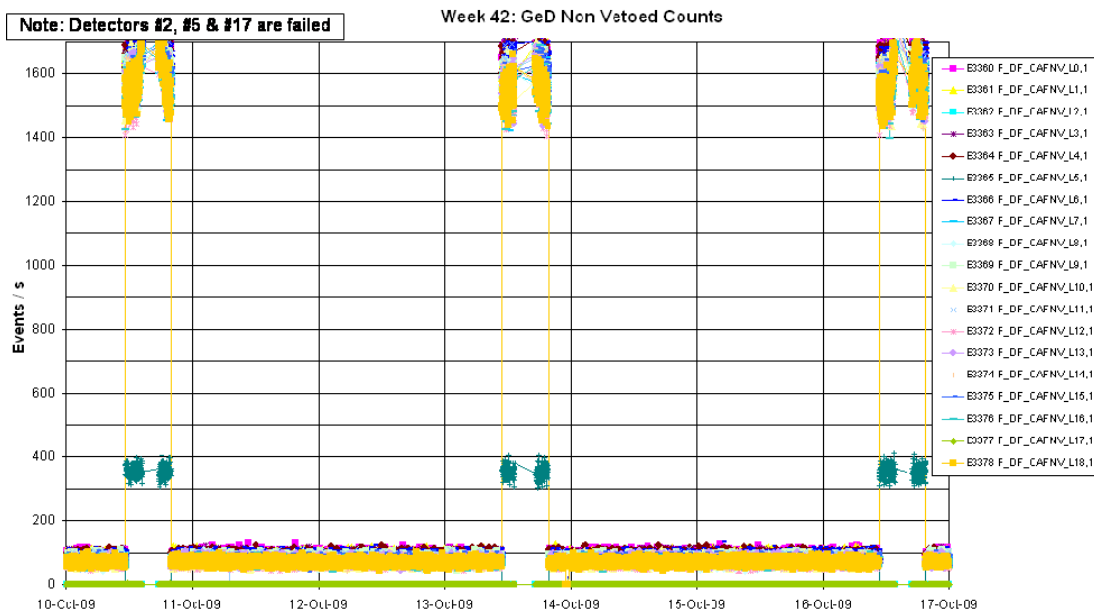
AFEE: The health of the AFEE is nominal. However, an LCL trip of the AFEE occurred during the week. This is reported in the Event Log section below. The following plot shows the dc output voltage of the detector channels during the reporting period⁵. The values are nominal. Detector #2 is failed since 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 nominally set to 0.5kV.

⁴ Data sampled every 8th packet (64sec)

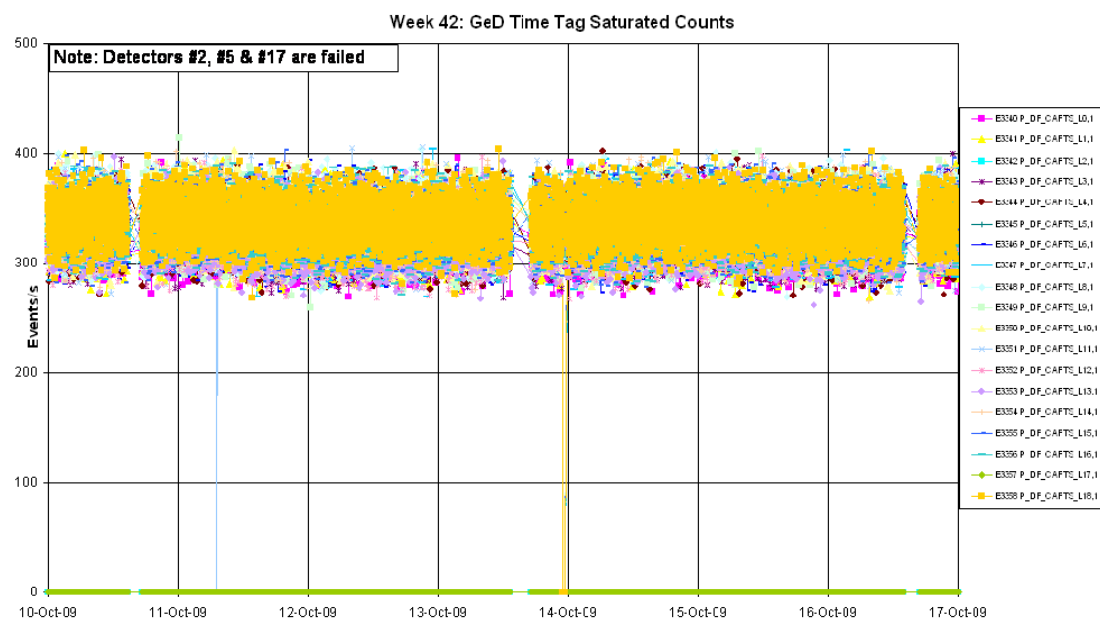
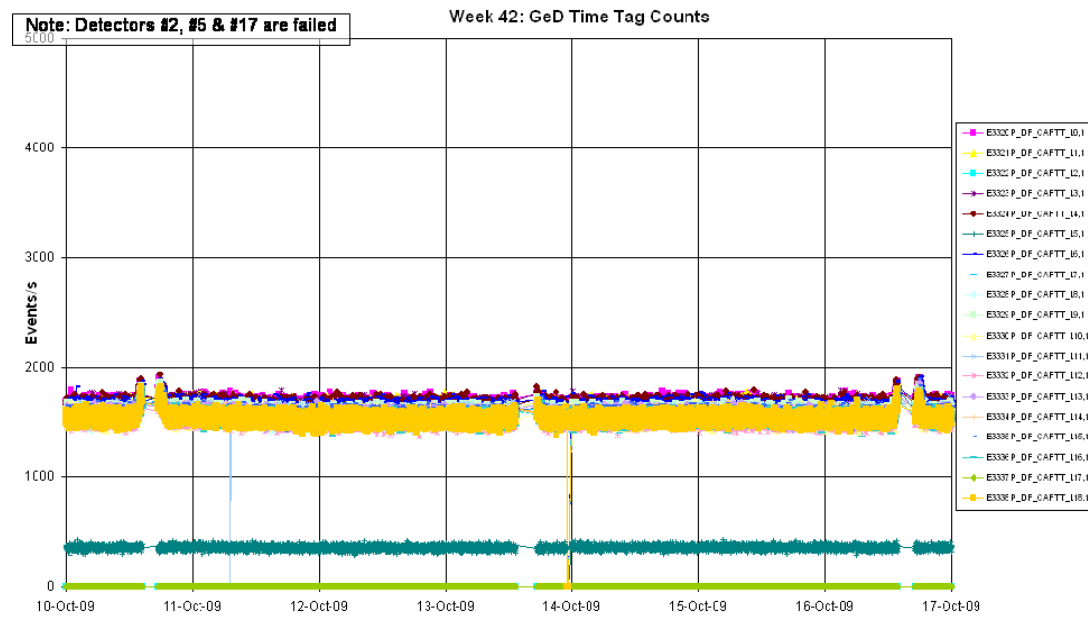
⁵ Data sampled every 8th packet (64sec)



DFEE: The health of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period⁶.

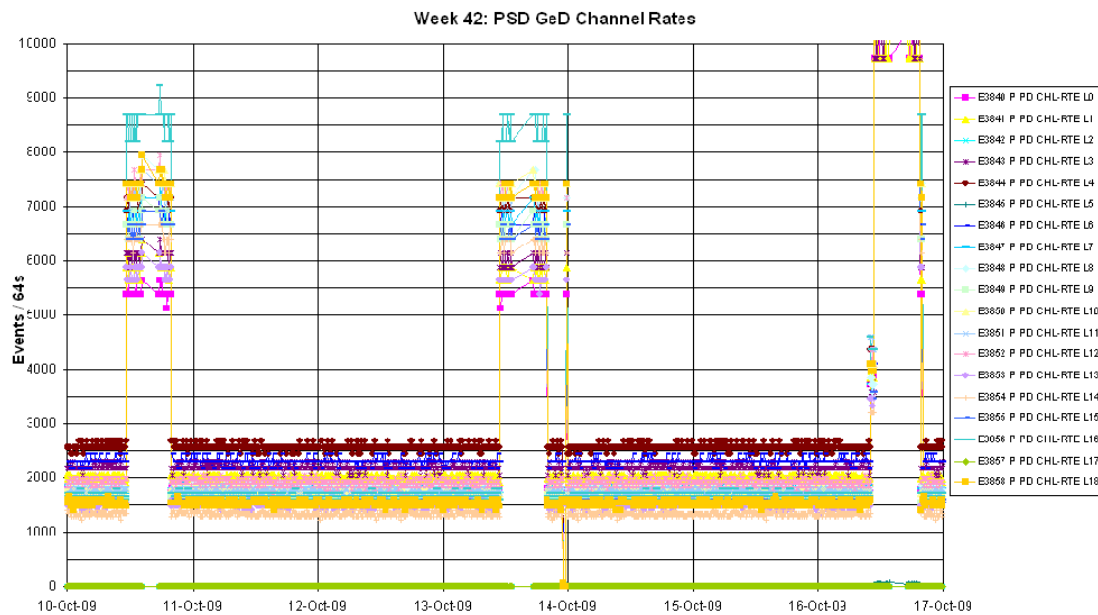


⁶ Data sampled every 8th packet (64sec)



PSD: The overall health of the unit is nominal. However, a PSD reset anomaly occurred during week. This is reported in the Event Log section below. The following plot shows the PSD channel rates over the reporting period⁷:

⁷ Data sampled every 8th packet (64sec)



Event Log:

Two major anomalies occurred during the reporting period; an LCL trip on the AFEE and a reset of the PSD. These are reported below:

INT_SC-270 SPI AFEE Detector Line A LCL trip OPEN

On 2009-10-13 at 23:00:59Z TM parameter P2121 LCL STA AF2 DT A failed Status Consistency Check, spuriously changing status from CLOSE to OPEN. This is the SPI AFEE2 Detector Line A LCL Status. In addition, at this time, TM parameter P2017 (LCL CUR AF2 DT A) went OOL Low, value = 0A.

As a consequence of the AFEE LCL trip-off, several other SPI parameters soon went OOL Low with value zero, including:

- GeD High Voltages (TM E0250 - E0268)
- DFEE Time tagged counts (except those for failed GeDs)
- PSD channel rates

SPI was recovered by performing a reset of the AFEE according to procedure CRPSP113010 SPI AFEE RESET. The recovery was started at 23:22:48Z and completed by 23:49:32Z, with all operations progressing nominally. Following the recovery, all parameters were back within limits with the exception of the AFEE PA2 temperatures, which were soft Out Of Limits (due to the cooling down of the electronics during the time the AFEE was off). However, the AFEE PA2 temperatures had all returned within limits by 23:57:29Z.

The health and performance of SPI following the recovery seems nominal.

This anomaly occurred approximately 3 hours after radiation belt exit of revolution 855.

INT_SC-271 SPI: PSD Autonomous Transition to Standby (reset?)

On 2009-10-16 starting at 09:53:14Z OEM APID 1024 ID 242 EXCEPTION SPI1 FAILURE IN ANALYSING HSL DATA began to be received at a rate of 8 OEMs/8sec cycle, with the following parameters:

E9786	HSL LINE	PSD
E9787	SYNCH WORD ERR	EOT

E9788 ERROR LEVEL INVALID

Indicating that the HSL data from the PSD could not be analysed by the DPE as it had an invalid End Of Transfer word.

It was then observed that the PSD was in Standby mode, having transitioned autonomously at 09:53:15Z. No Out of Limits were received however at 09:53:17Z OEM APID 1024 ID 145 EXCEPTION SPI1 LSL ERROR was received with the following parameters:

E9759	LSL ERROR TYPE	NACK
E9760	LSL CHANNEL	PSD
E9761	RECEIVED NACK	64
E9762	TYPE OF COMMAND	K
E9763	HK CONF TC NUMB	0

This was not observed in real time due to the large number of HSL OEMs but it indicates that the transition to Standby was likely due to an autonomous reset of the PSD, as this OEM is nominally received following a PSD reset.

This was approximately 50 minutes before the expected radiation belt entry of revolution 855 (at 2009-10-16T10:44:07Z).

In order to recover, a mode cycle was performed as follows:

- 10:05:01Z SPI to CONF via FCP_SPI1_0160. At this point the PSD correctly transitioned to CONF. Following this, OEM APID 1024 ID 242 EXCEPTION SPI1 FAILURE IN ANALYSING HSL DATA stopped (last one received at 10:05:01Z).
- 10:07:55Z SPI to PHOTON mode via FCP_SPI1_0130.

Investigation of the status of the PSD at this point revealed that at 2009-10-16T09:53:32Z, i.e. in the TM cycle following the transition to Standby, all PSD channel rates went to zero. They then recovered to non-zero values at the following cycle, however the values were higher than nominal (~4000 counts/64 sec versus ~2000 counts/64 sec), and remained so following the mode cycle performed at 10:05Z. This may have been due to the loss of the nominal configuration as a result of the transition to Standby/reset.

In order to ensure the correct configuration of the PSD, the following was then performed after radiation belt exit of revolution 856:

- 19:38:39Z SPI to CONF via FCP_SPI1_0160;
- 19:46:01Z Load PSD nominal flight configuration via FCP_SPI1_0171;
- 19:58:46Z SPI to PHOTON mode via FCP_SPI1_0130.

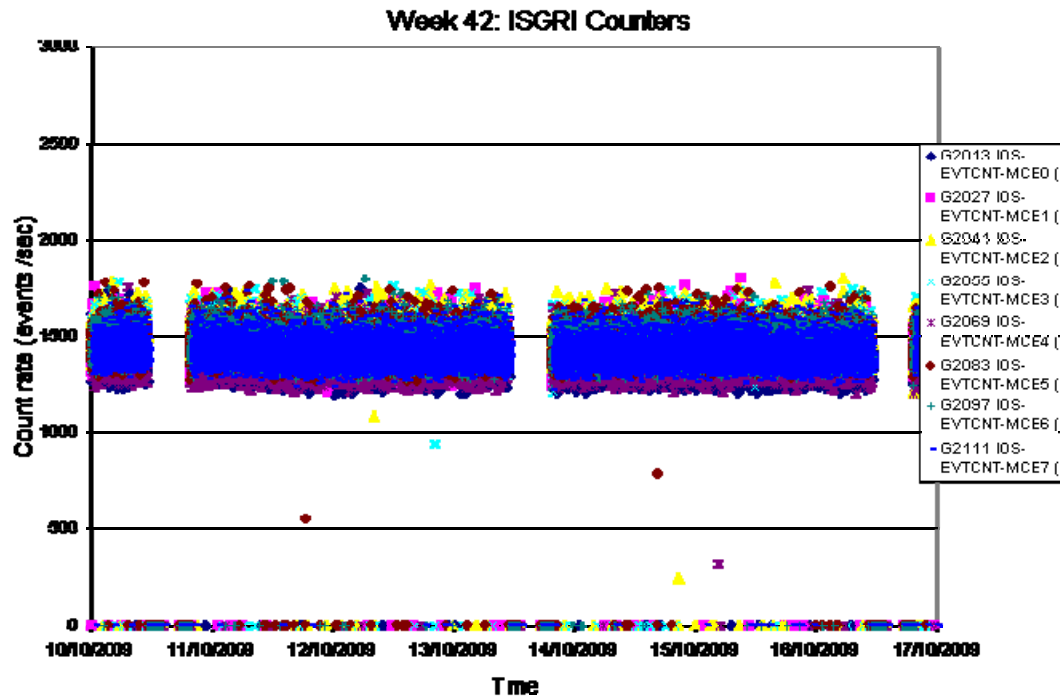
Following this the health and performance of the PSD was nominal, in particular the PSD count rates returned to nominal values.

8.1.3 IBIS Operations

Unit Temperatures: All the equipment temperatures were inside the operational limits throughout the week.

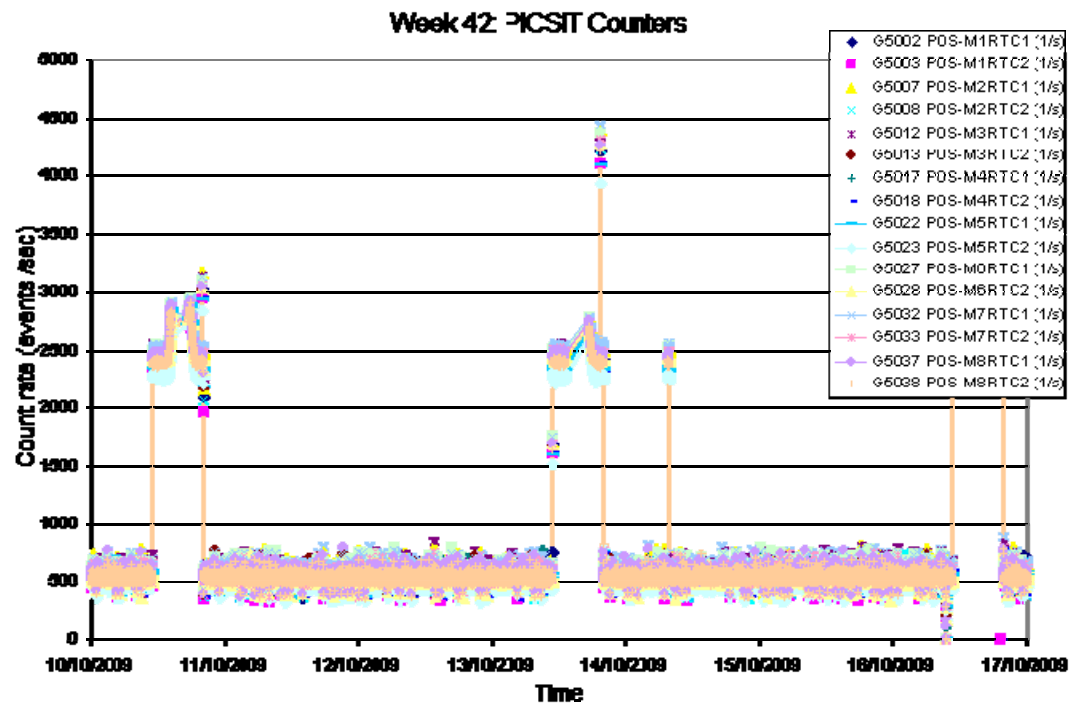
ISGRI

The health and performance of ISGRI was nominal during the reporting period. The following plot shows the ISGRI MCE counters during the week⁸:



PICsIT

The health and performance of PICsIT was nominal during the reporting period. The following plot shows the PICsIT semi-module counters during the week⁹:

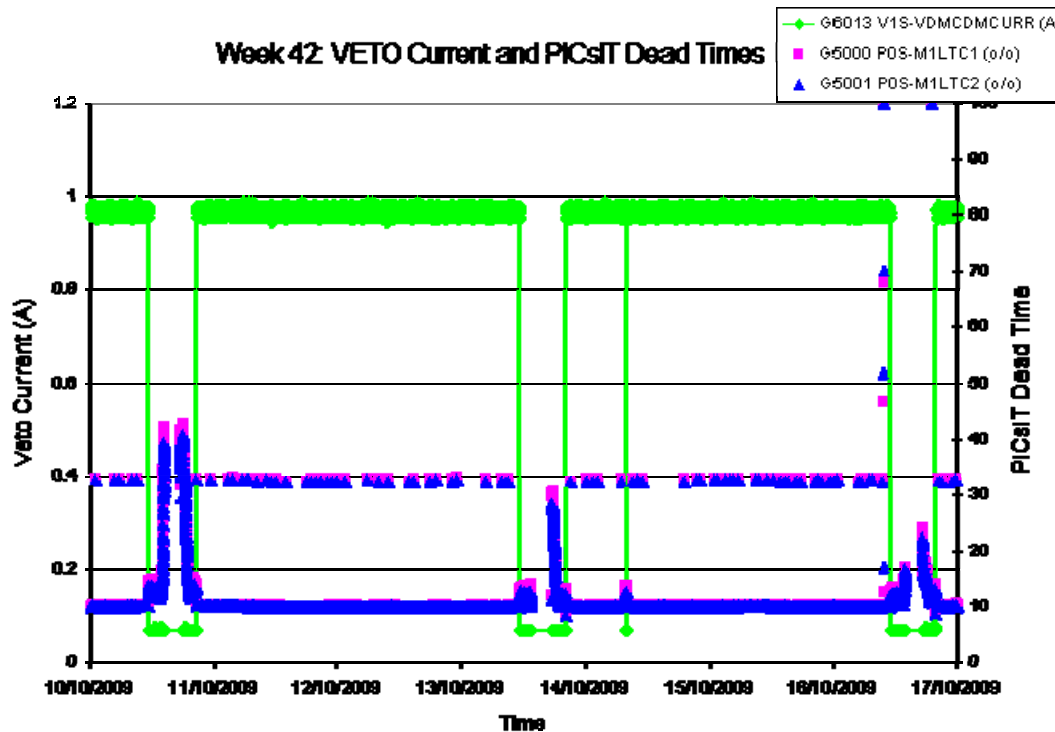


⁸ Data sampled every 4th packet (32sec)

⁹ Data sampled every 4th packet (32sec)

VETO

The health and performance of VETO was nominal during the reporting period. The following plot shows the VETO current and PICsIT dead-times during the week¹⁰:



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 G2070 briefly toggled OOL several times during the week, indicating an overflow of the noisy pixel address buffer in MCE5. As in each case it returned within limits of its own accord, no action was taken.

2009-10-10 (DOY 283, Rev. 853-854) to 2009-10-12 (DOY 285, Rev. 854)

IBIS operations executed nominally.

2009-10-13 (DOY 286, Rev. 854-855)

At 01:42Z, following a ground station handover, TM parameter X7500 went OOL, indicating a problem with the histogram process. The following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 01.56.55Z FCP_IBIS1_0312
- 01.58.13Z TC G0129 uplinked to return IBIS to Science Standard mode.

¹⁰ Data sampled every 4th packet (32sec)

IBIS operations continued nominally.

2009-10-14 (DOY 287, Rev. 855)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 07:36:54Z. It was recovered as follows:

- At 07.49.20Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
 - At 07.58.30Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.
- IBIS operations continued nominally.

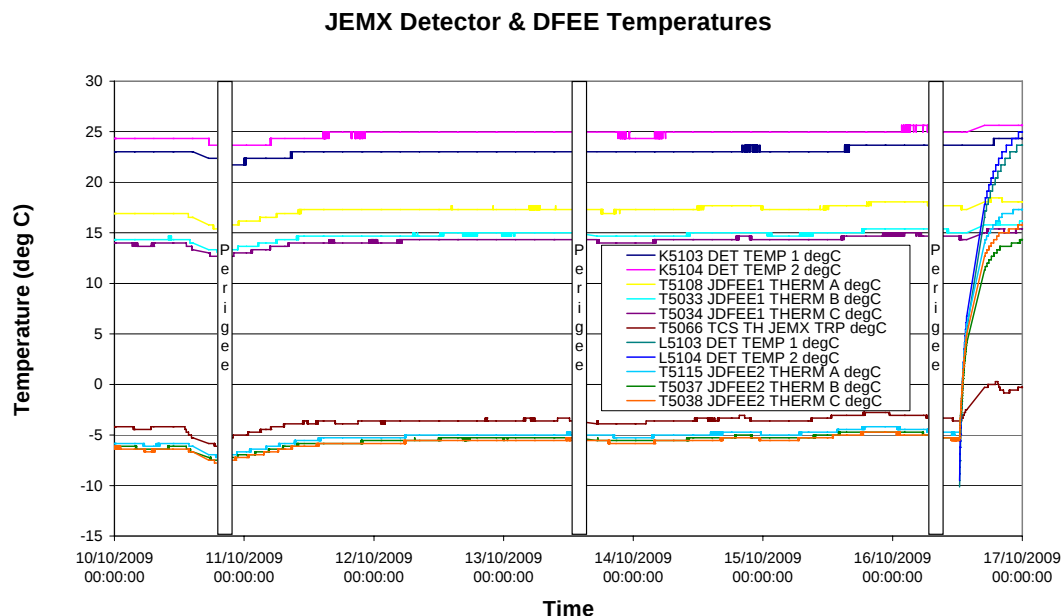
2009-10-15 (DOY 288, Rev. 855) to 2009-10-16 (DOY 289, Rev. 855-856)

IBIS operations executed nominally.

8.1.4 JEM-X Operations

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 graph¹¹.



JEM-X Daily Report

2009-10-10 (DoY 283 Rev 853-854)

JEM-X 1 operations executed nominally.

¹¹ Data sampled (1 frame in 8)

Doc. Title : INTEGRAL Mission Report #369
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
Date : 19/10/09

Issue : 1
Rev. : 0
Page : 23

2009-10-11 (DoY 284 Rev 854)

At the indicated times, the following OEMs were received:

2009.284.00.01.53.854	2009.284.00.01.58.668	1536	RealTime	5	EXCEPTION
JEM-X1 EXC IACS INTERF EXID		0	0	65535	PR N
E E					
FIX6		0			
K9079	MESS CLASS	1			
K9080	MESS ID	5			
K9065	CSSW OPERAT ID	START			
K9066	TASK ID 8	IASW			
K9067	LOGICAL ADDRESS	4989			
2009.284.00.01.53.854	2009.284.00.01.58.697	1536	RealTime	6	EXCEPTION
JEM-X1 EXC IACS INTERF CULP		0	0	65535	PR N
E E					
FIX6		0			
K9079	MESS CLASS	1			
K9080	MESS ID	6			
K9065	CSSW OPERAT ID	START			
K9066	TASK ID 8	IASW			
K9067	LOGICAL ADDRESS	19726			

No action was taken, and there was no impact.

2009-10-12 (DoY 285 Rev 854) to 2009-10-13 (DoY 286 Rev 854-855)

JEM-X 1 operations executed nominally.

2009-10-14 (DoY 287 Rev 855)

At the indicated times, the following OEMs were received:

2009.287.05.57.48.053	2009.287.05.57.49.811	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			
2009.287.05.57.48.053	2009.287.05.57.49.865	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			
2009.287.05.57.48.053	2009.287.05.57.49.866	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			
2009.287.05.57.48.053	2009.287.05.57.49.867	1536	RealTime	5	ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO		0	0	65535	PR N
E E					
FIX6		0			
K9079	MESS CLASS	2			

Doc. Title : INTEGRAL Mission Report #369
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OAI
 Date : 19/10/09

Issue : 1
 Rev. : 0
 Page : 24

K9080	MESS ID	5					
K9074	TASK ID 16	12					
K9067	LOGICAL ADDRESS	4989					
2009.287.05.57.48.053	2009.287.05.57.49.869	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					
2009.287.05.57.48.053	2009.287.05.57.49.869	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.

At 07:37:26 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#82). There was no impact as the reaction has been disabled.

2009-10-15 (DoY 288 Rev 855)

JEM-X 1 operations executed nominally.

2009-10-16 (DoY 289 Rev 855-856)

At 10:46, operations to activate JEMX-2 were commenced. At the indicated times, the following procedures were completed:

10:48:00 DEBWHI00 (Allocation of PST)
 10:54:00 FCP_JEM2_0010 JEMX2 DPE AND CSSW ACTIVATION
 11:51:00 FCP_JEM2_0015 JEMX2 IASW ACTIVATION
 12:09:00 FCP_JEM2_0016 JEMX2 ENABLE BCP DISTRIBUTION
 12:17:00 FCP_JEM2_0017 JEMX IASW EXTENDED TM CHECK
 12:23:00 FCP_JEM2_0020 JEMX2 DFEE 1ST ACTIVATION AFTER DPE SWITCH
 12:53:00 FCP_JEM2_0040 JEMX2 TRANSITION TO SAFE

The operations were completed by 12:55, before LOS at 13:15:18.

From 17:00:05 to 20:43:32, there was a string of L5101 & L5102 out of limits associated with the switch-on, but these were normal, and disappeared after the unit had warmed up.

The Energy linearization table update was inadvertently forgotten and performed later at the end of revolution 855 (See next week's report).

JEMX-1 was left in SAFE mode for the following revolution, with 1 house-keeping packet per cycle allocated.

8.1.5 OMC Operations

2009-10-10 (DoY 283, Rev 853-854)

Nothing to report.

2009-10-11 (DoY 284, Rev 854)

At 06:17, an AOCS command failed release forcing a suspension of the timeline. A manual slew was performed and the timeline rejoined at 07:24. The impact was the loss of pointing 08540012. It was at this time that the following pair of commands were rejected:

2009.284.06.20.09.111	2009.284.06.20.14.429	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					
2009.284.06.20.15.236	2009.284.06.20.24.344	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					

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

2009-10-12 (DoY 285, Rev 854) to 2009-10-13 (DoY 286, Rev 854-855)

Nothing to report.

2009-10-14 (DoY 287, Rev 855)

At 07:36:45, an IREM SEU (#82) forced OMC to SAFE mode, a recovery was performed, and the unit returned to standby at 05:58:54. Furthermore, after completion of the IREM recovery, the CCCFs were enabled, and as a precaution, the OMC commands were re-sent. The impact was the interruption after 2385 from a planned 3572 seconds of pointing 08550011, and a shortening of pointing 08550014 to 2329 from a planned 3572 seconds.

2009-10-15 (DoY 288, Rev 855) to 2009-10-16 (DoY 289, Rev 855-856)

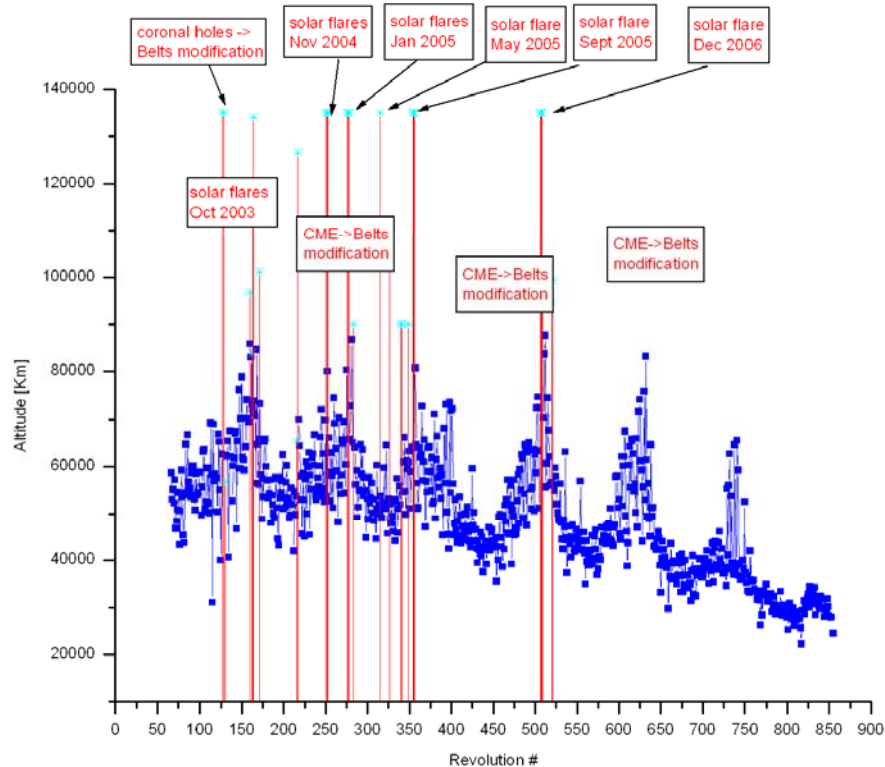
Nothing to report.

On DoY 283 at 11:09:09, DoY 286 at 10:55:49 and DoY 289 at 10:43:41 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.1.6 IREM Operations

Radiation Belts Entry

Evolution of Radiation Belt Entry 2003-2008



IREM daily report

DoY 2009.286 (13/10/2009):

At 12:22:00Z, a problem at the ground station interrupted TM flow, and as such the radiation belt entry for revolution 854 was not observed.

DoY 2009.287 (14/10/2009):

At 07:36:44Z, a local reset of the IREM CSCI S/W (SEU #82) 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 2009.287.07.36:44Z (120541.4 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 09:29:00Z.

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 07:46:52Z and IBIS at 07:58:00Z.

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]
853	RAD_ENTR R 2009-10-10T11:09:08Z	10/10/2009 13:50:52	27962.3	10-Oct-2009 13:44:29	27847.82
854	RAD_EXIT R 2009-10-10T19:58:52Z	10/10/2009 18:45:32	>>32983.9	10-Oct-2009 19:44:29	47785.01
854	RAD_ENTR R 2009-10-13T10:55:42Z	Not Available	Not Available	13-Oct-2009 13:27:50	28625.89
855	RAD_EXIT R 2009-10-13T19:45:25Z	13/10/2009 18:17:00	>>32983.4	13-Oct-2009 19:27:50	47141.48
855	RAD_ENTR R 2009-10-16T10:43:35Z	16/10/2009 13:37:32	24465.4	16-Oct-2009 13:17:50	28376.04
856	RAD_EXIT R 2009-10-16T19:32:26Z	16/10/2009 17:57:56	33025.7	16-Oct-2009 19:17:50	47431.85

Reference

High radiation

Very small error vs reference (less than 10 minutes)

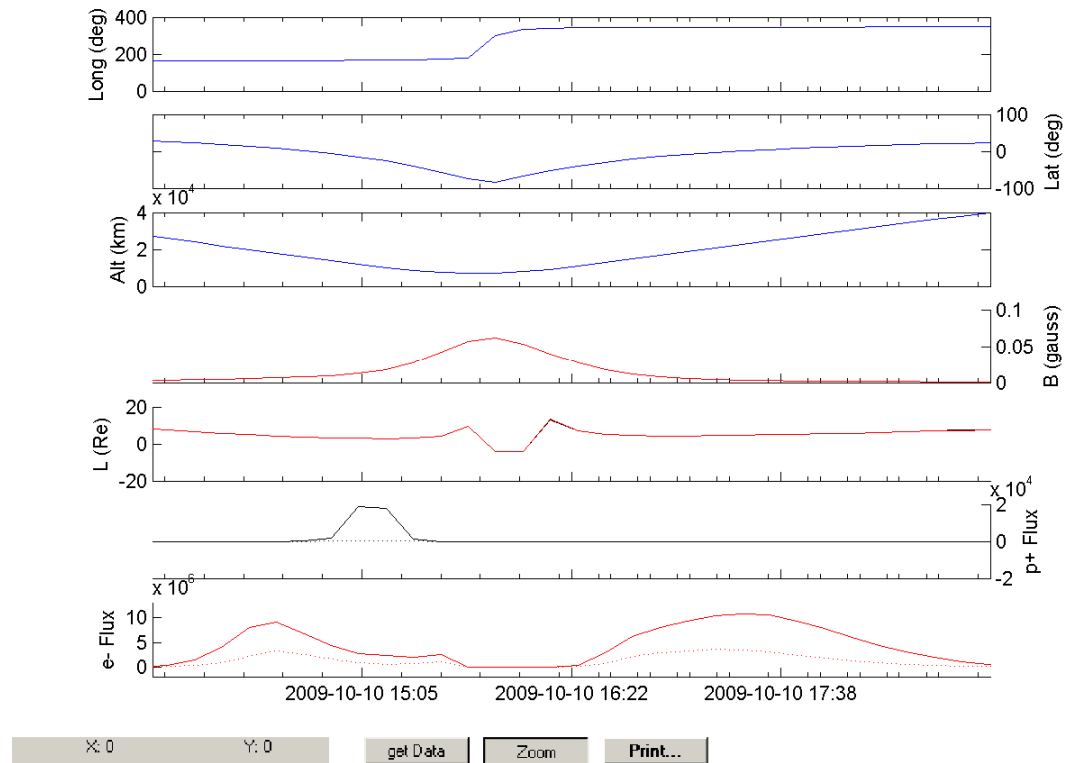
Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

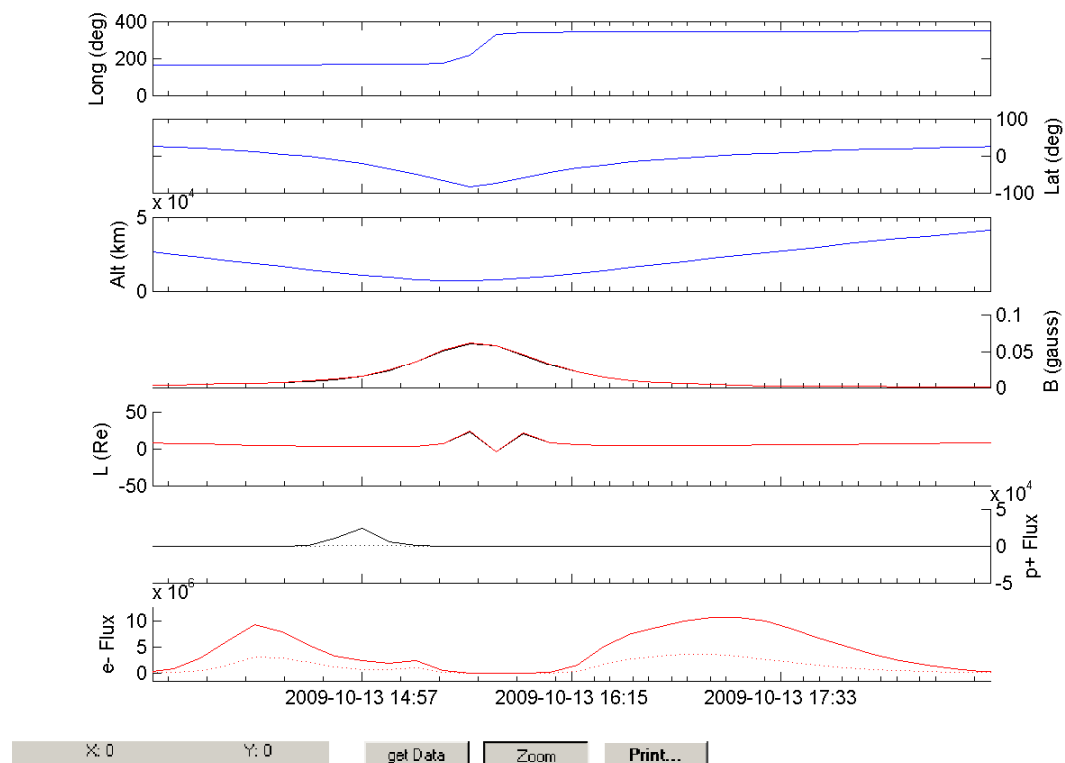
Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM Predicted Radiation Belt Passages

Rev 853



Rev 854



Rev 855

