EUROPEAN SPACE AGENCY
DIRECTORATE OF TECHNICAL & OPERATIONAL SUPPORT
MISSION OPERATIONS DEPARTMENT

INTEGRAL
Mission Report

INT-MOC-SYS-RP-1001-OPS-OAI

No. 267
Week 44

05.11.07

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 27.10.07 until 02.11.07 (both dates inclusive) and covers the revolutions 616 and 617.

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 the mid-latitude 1 region (RA 18:36:17.05, DEC -60:24:50.7), a hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), and a raster dither of the mid-latitude 1 region (RA 18:36:17.05, DEC -60:24:50.7).

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 winter 2007 eclipse season started on 11/10/2007. The 7th and 8th eclipse passages were nominal from an AOCS point of view.

As part of the AOCS preparation for the winter 2007 eclipse season, were verified 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.

Five slews were missed from TL, during the observation period, due to a problem on STR search/track process and problems on TM links from REDU station.

The fuel consumption over the period between 27/10/2007 and 02/11/2007 was 0.1543 Kg. The remaining propellant is in the order of 143.8929 Kg.

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

3.1.2 Power

The EPS is working nominally; available power from the arrays is of the order of 2100W.

The eclipse season 11 finished on 1/11/2007, the table below gives an overview of the EPS performance

Date	Total Eclipse Duration	Umbra Duration Only	DOD1 (Ah)*	DOD2 (Ah)*	Mean discharge I in Umbra 1 (A)	Mean discharge I in Umbra 2 (A)	Recharge Duration Battery 1	Recharge Duration Battery 2	Ratio Recharge to Discharge time
11/10/07	0:24:13	0:16:14	1.8	1.78	5.68	5.61	01:01:50	01:01:02	3.809035
14/10/07	0:44:09	0:40:02	4.04	3.99	5.93	5.86	02:23:58	02:22:22	3.596170
17/10/07	0:55:45	0:52:23	5.24	5.18	5.93	5.86	03:07:29	03:05:13	3.579065
20/10/07	1:02:46	0:59:37	6.13	6.06	6.13	6.06	03:39:22	03:36:50	3.679620
23/10/07	1:05:44	1:02:30	6.4	6.33	6.06	6	03:48:34	03:46:10	3.657067
26/10/07	1:04:25	1:00:55	6.18	6.11	5.98	5.91	03:40:22	03:37:58	3.617510
29/10/07	0:57:12	0:52:59	5.39	5.32	5.96	5.89	03:11:21	03:09:13	3.611513
01/11/07	0:38:26	0:31:33	3.18	3.15	5.7	5.63	01:50:46	01:49:26	3.510829

*Note that the battery capacity is 24Ah, therefore maximum observed depth of discharge was just 26.7%.

From the EPS point of view all eclipse passages were nominal.

Following the eclipse season the battery full charge rate was set to C/26 (nominal full charge rate outside eclipse season) and the on-board monitoring table valid for operations outside the eclipse season was loaded.

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.

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 10th annealing, which ended on 17th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

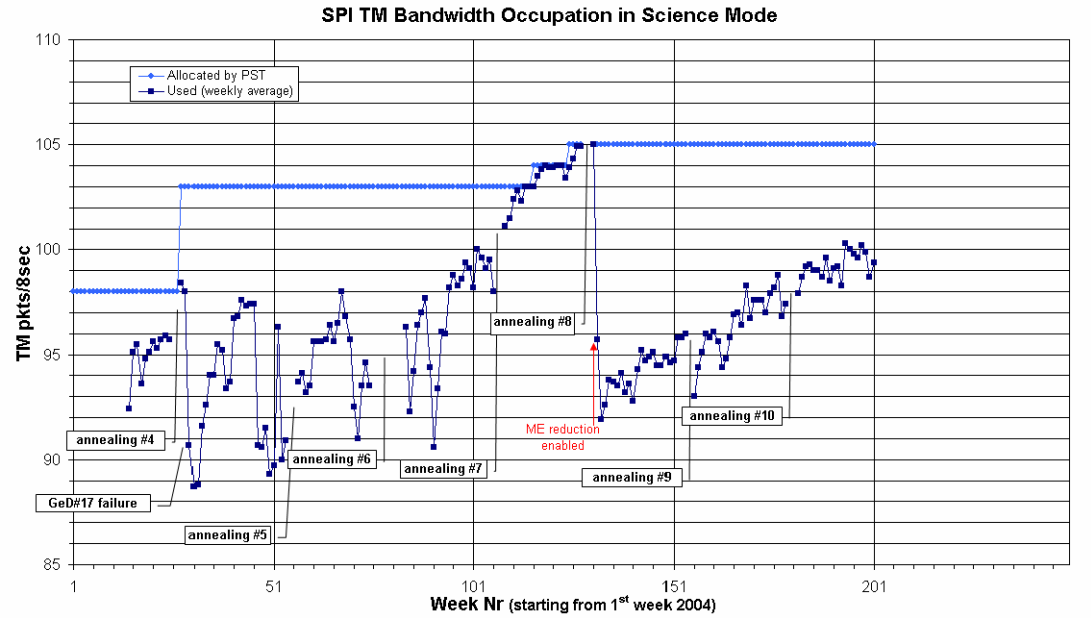
The Stirling compressors are working nominally, maintaining the Germanium detectors at 80 +/-1K.

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 105 packets/cycle except. The average telemetry occupation when the TM allocation was 105 packets/cycle was 99.4 packets/cycle.

During the reporting period, SPI operations for eclipse continued to be executed nominally.

The following plot shows the assigned and the average occupation of the SPI TM bandwidth.



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

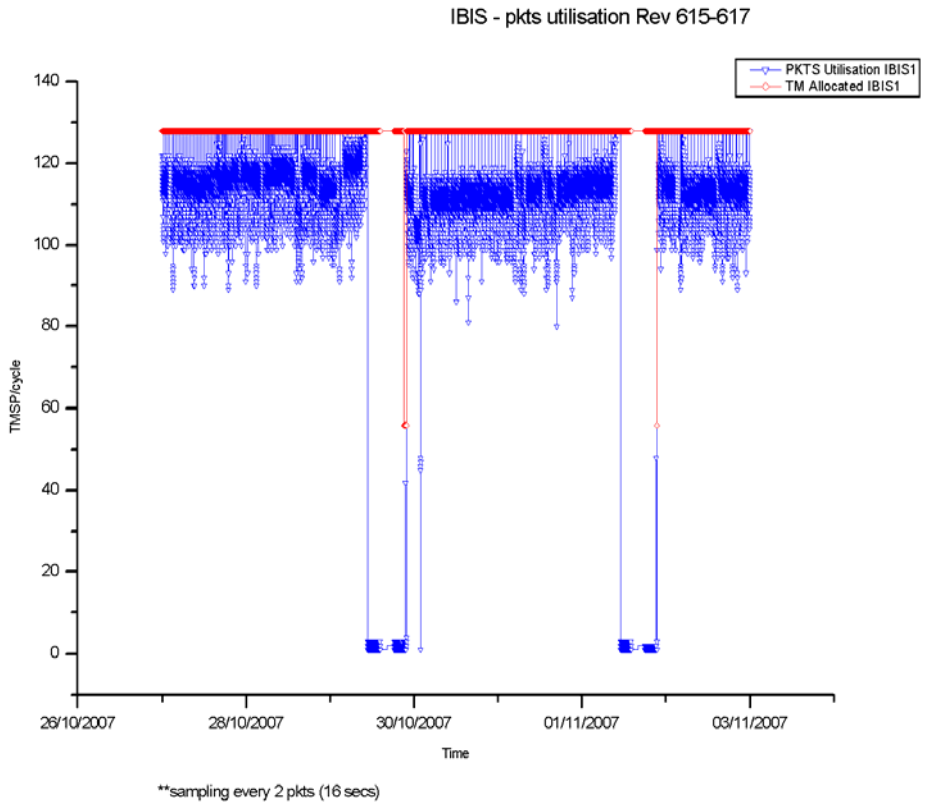
3.2.2 IBIS

The overall status of the unit is nominal.

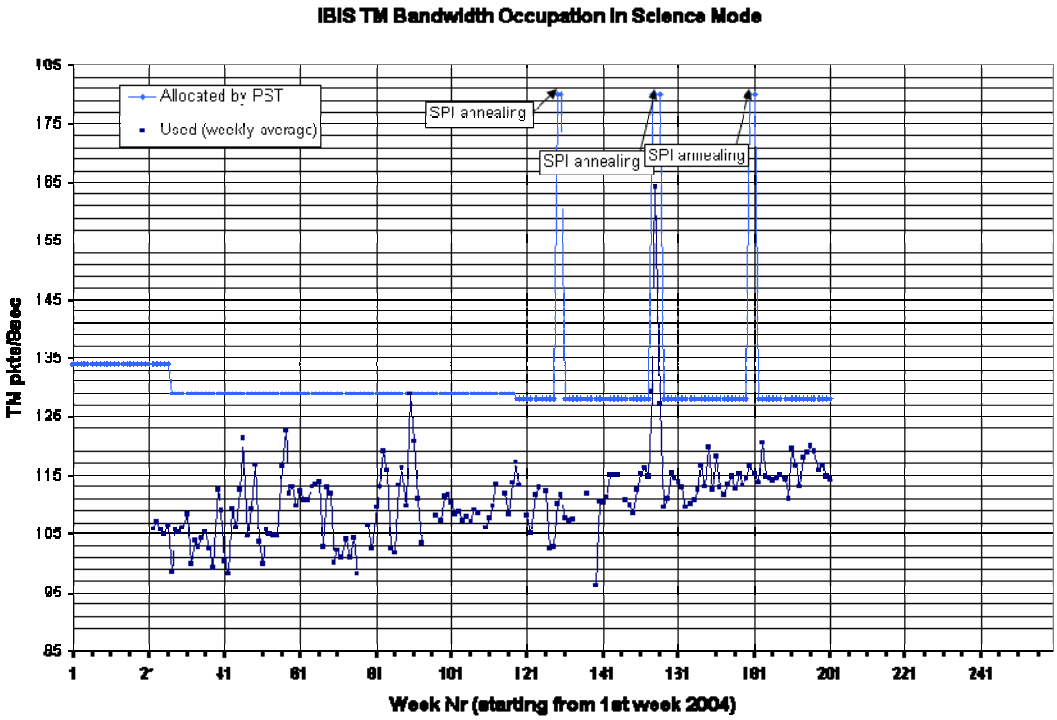
During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 114.38 TMPS/cycle, down 0.44 on last week.

During the reporting period IBIS operations for eclipse continued to be executed nominally.

A plot of the IBIS TM utilisation during the observation period is shown below:



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.

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, 171 of the 173 planned science pointings for OMC were executed nominally, 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 very good this week, one non-science pointing was missed from the Timeline due to ground problems. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was very good this week. There was an FD problem with updating slews, but this had no impact. The overall performance was well over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were, however, 7 occasions of small TM drops from Redu, (1 of which led to the loss of a non-science pointing) 1 from DSS27 when problems with frame synchronisation were reported, and 1 occasion from Vil2. Also a handover from Redu to Vil2 was postponed by 2½hours due to Vil2 being 'dead', all without impact on science return. The overall performance was well over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs received for revolutions 623 & 624, updated PSFs for revolutions 618, 621 and 622 leading to a re-plan of 618 to 621. Further planning has been waiting for the release of ISOC V16.0.1 with the new roll-angle stepping.

The TSFs for revolutions 619 has been received.

2. Observation status

No new ECS have been received this week.

3. ISOC Science Data Archive

No news.

4. ISOC system

The update to include roll-angle stepping for the 5*5 patterns is still being tested after some inconsistencies have been found.

5. Problems

None.

4.3.2 ISDC

Status of ISDC observation processing on 05/11/2007:

- Latest Standard Analysis completed: observation 05200050003 (SGR1806-20, Revolution 606) on 30/10/2007.

- Latest products archived: observation 05200710002 (Galactic disk, Revolution 607) on 02/11/2007.

- Latest observation products sent to the observer: observation 05200710001 (Galactic disk, Revolution 607) on 05/11/2007.

5 Special Events

6 Anomalies

The following problems were reported that impacted operations:

- On DoY 305, at 21:30, the VC0 & VC7 TM links from Redu dropped. The impact was the loss of pointing 06170001, which was not a science pointing.

The following anomaly report was entered into the ARTS system this week.

AR id	Date Created	Subject	Segment	Status
INT_SC-209	2007-11-08	JEM-X1 DFEE CRC Anomaly following eclipse on 2007-11-01	Payload	Pending

7 Future Milestones

The following activities are foreseen in the next few weeks.

- A new imcs database is foreseen to be installed shortly, no date has yet been specified.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 616

The observations in revolution 616 consisted entirely of a raster dither of the mid-latitude 1 region (RA 18:36:17.05, DEC -60:24:50.7), lasting ~54.6 hours.

Revolution 617

The observations in revolution 617 began with a hexagonal dither of the Gamma Ray Source 1915+105 (RA 19:15:11.50, DEC +10:56:44.0), lasting ~5.6 hours. This was followed by a raster dither of the mid-latitude 1 region (RA 18:36:17.05, DEC -60:24:50.7), lasting ~50.0 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 105; JEM-X1 8; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2007-10-13T06:06:00.000Z     144.1817    F   Automatic TM processing.
2007-10-14T20:53:48.000Z     144.1645    F   Automatic TM processing.
2007-10-16T05:36:57.000Z     144.1420    F   Automatic TM processing.
2007-10-17T20:51:57.000Z     144.1282    F   Automatic TM processing.
2007-10-19T05:57:52.000Z     144.1102    F   Automatic TM processing.
2007-10-20T20:48:28.000Z     144.1076    F   Automatic TM processing.
2007-10-22T05:09:12.000Z     144.0864    F   Automatic TM processing.
2007-10-23T20:42:28.000Z     144.0775    F   Automatic TM processing.
2007-10-25T04:59:19.000Z     144.0498    F   Automatic TM processing.
2007-10-26T20:31:23.000Z     144.0472    F   Automatic TM processing.
2007-10-28T04:51:03.000Z     143.9682    F   Automatic TM processing.
2007-10-29T20:14:19.000Z     143.9563    F   Automatic TM processing.
2007-10-31T05:08:30.000Z     143.9325    F   Automatic TM processing.
2007-11-01T19:37:54.000Z     143.9215    F   Automatic TM processing.
2007-11-02T03:29:15.000Z     143.8929    F   Automatic TM processing.

This report was generated  Fri Nov 2 08:00:23 GMT 2007
```

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, 27/10/2007 – 02/11/2007

The AOCS operations were executed from the Automatic Timeline.

During this period, 58 Open Loop Slews, 126 Closed Loop Slews and 5 Momentum Biases were executed.

5 slews (4 CSL, 1 OSL) were missed from TL, during the observation period, due to STR search/track process fail and drop on the TM VC0 and VC7 from REDU station.

The OTF was not reached during PID 06150009.

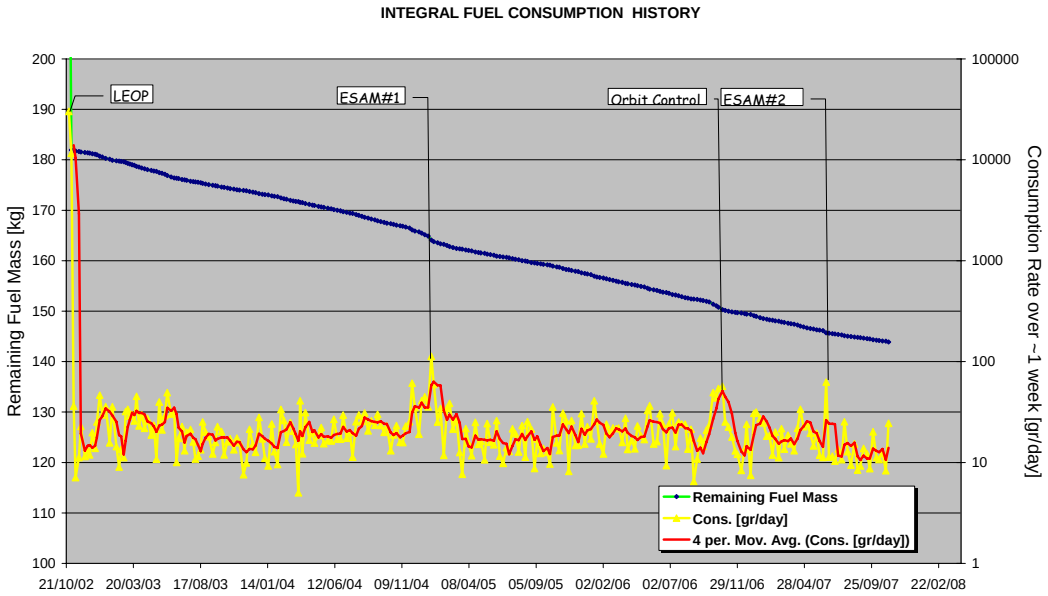
This is equivalent to ~ 2.7 % of the total number of slews planned (185).

Orbit Control

No update.

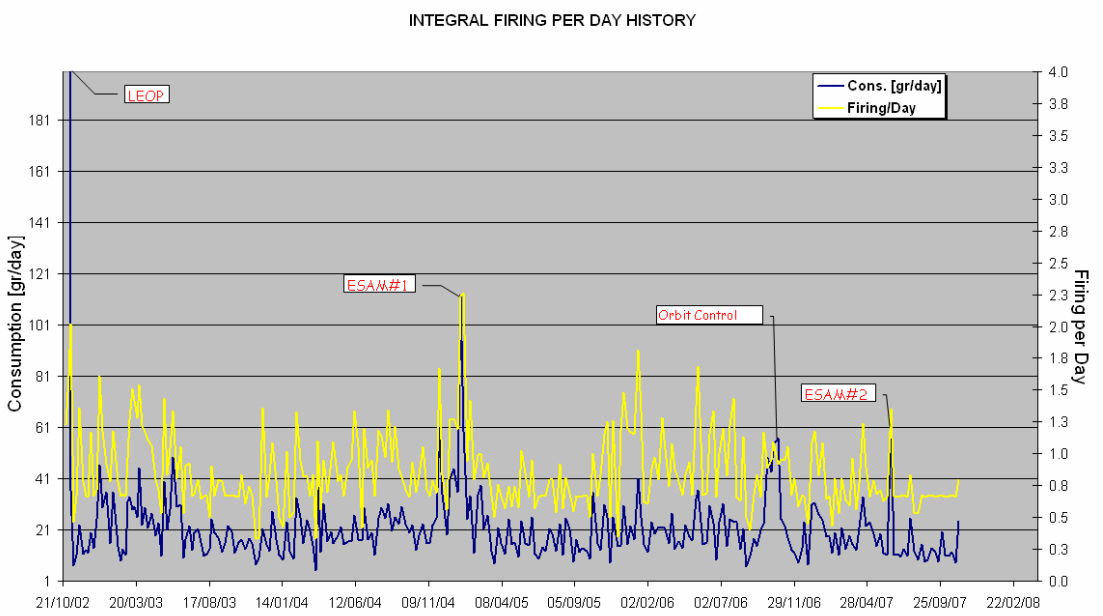
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 02/11/2007 is reported in the plot below.



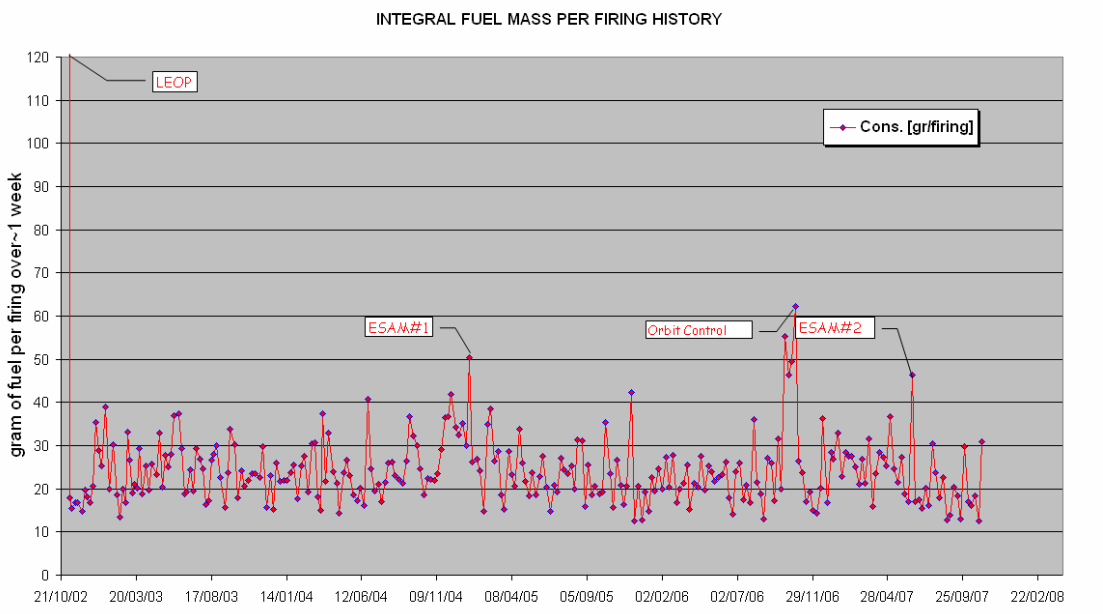
The plot above consider the ESAM fuel consumption spread over period of ~1 week.

The firing per day over the period between 01/11/2002 and 02/11/2007 is reported in the plot below.



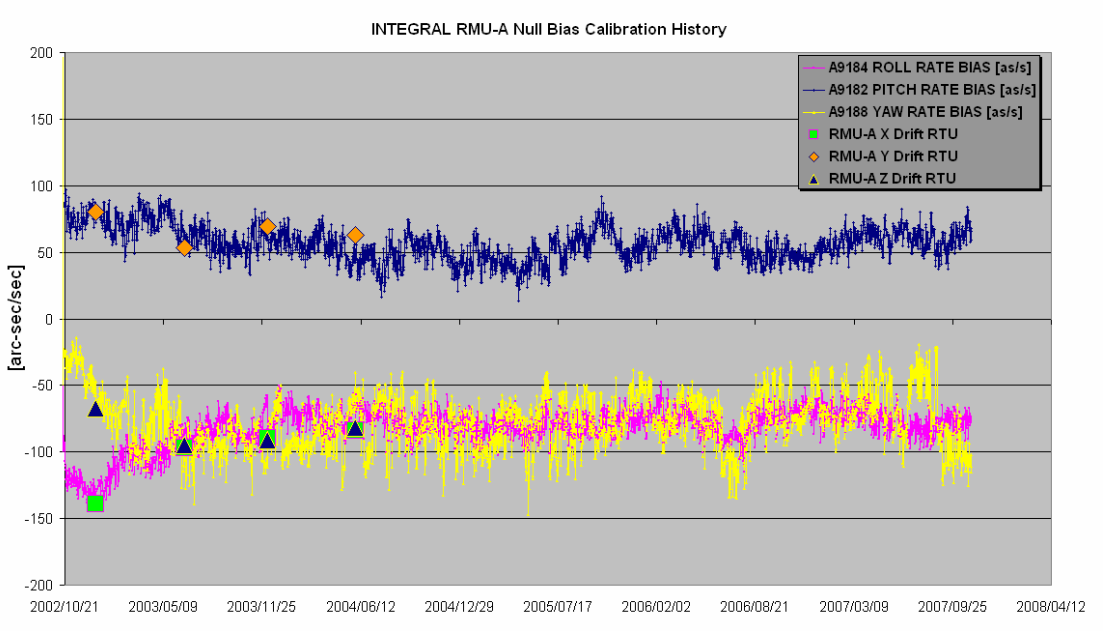
The plot above consider the ESAM fuel consumption spread over period of ~1 week.

The fuel per firing over the period between 01/11/2002 and 02/11/2007 is reported in the plot below.



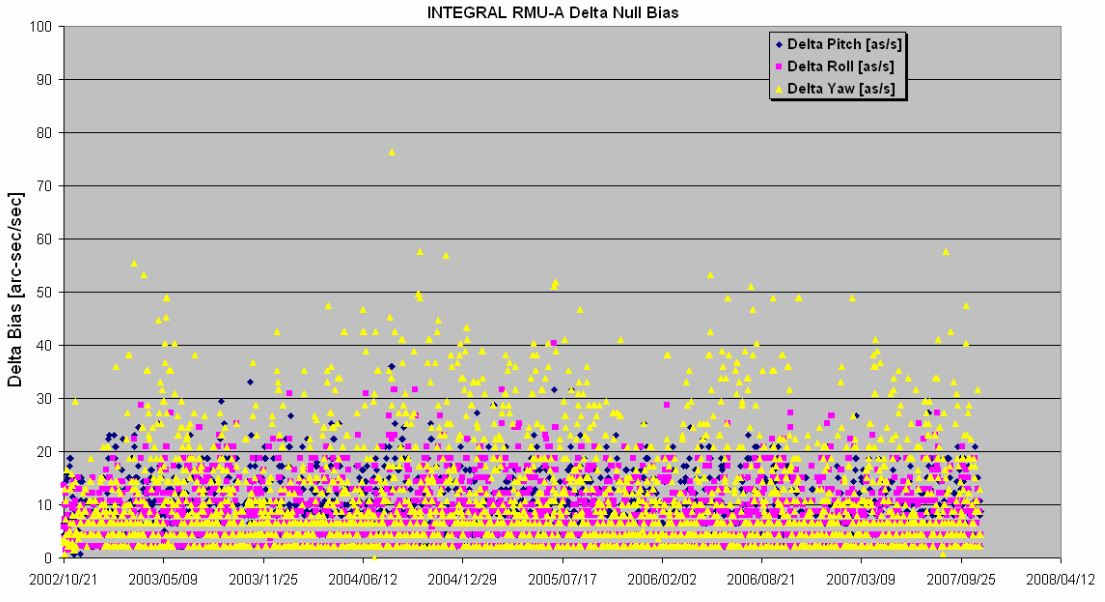
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 02/11/2007 is reported in the plot below.



The evolution of the drift on yaw channel is under constant monitoring.

The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over period between 01/11/2002 and 02/11/2007 is reported in the plot below.



27/10/2007 (Day of Year 300, Revolution 615)

Loss of guide star: at 02:17:05z a loss of the selected guide star, occurred during the execution of PID 06150009.

As foreseen by the IPS logic, the ACC switched ON the IMU 1, a new automatic mapping was commanded and a new guide star picked.

A manual recovery was performed at 02:31z from attitude of PID 06150009 to the attitude of PID 06150010. The next slew was manually updated in TL.

At 03:07z the AOCS s/s was enabled in TL.

The following slew was not executed from TL: 06150010 (OSL).

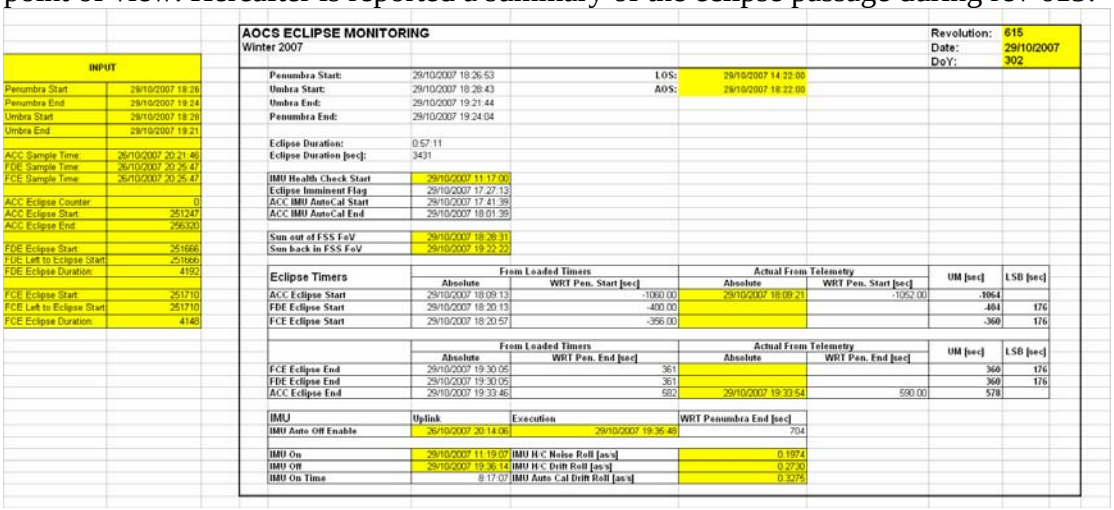
The OTF was not reached during PID 06150009.

28/10/2007 (Day of Year 301, Revolution 615)

Nothing to report.

29/10/2007 (Day of Year 302, Revolution 615-616)

Eclipse passage rev 615: the 7th eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 615:



AOCS ECLIPSE MONITORING
Winter 2007

Revolution: 615
Date: 29/10/2007
DoY: 302

INPUT	
Penumbra Start	29/10/2007 18:26
Penumbra End	29/10/2007 19:24
Umbra Start	29/10/2007 18:28
Umbra End	29/10/2007 19:21
ACC Sample Time:	26/10/2007 20:21:46
FDE Sample Time:	26/10/2007 20:25:47
FCE Sample Time:	26/10/2007 20:25:47
ACC Eclipse Counter	0
ACC Eclipse Start	251247
ACC Eclipse End	256320
FDE Eclipse Start:	251666
FDE Left to Eclipse Start:	251666
FDE Eclipse Duration:	4192
FCE Eclipse Start:	251710
FCE Left to Eclipse Start:	251710
FCE Eclipse Duration:	4148

Penumbra Start:	29/10/2007 18:26:53	LOS:	29/10/2007 14:22:00	
Umbra Start:	29/10/2007 18:28:43	AOS:	29/10/2007 18:22:00	
Umbra End:	29/10/2007 19:21:44			
Penumbra End:	29/10/2007 19:24:04			
Eclipse Duration:	0:57:11			
Eclipse Duration [sec]:	3431			
IMU Health Check Start	29/10/2007 11:17:00			
Eclipse Imminent Flag	29/10/2007 17:27:13			
ACC IMU AutoCal Start	29/10/2007 17:41:39			
ACC IMU AutoCal End	29/10/2007 18:01:39			
Sun out of FSS FoV	29/10/2007 18:28:31			
Sun back in FSS FoV	29/10/2007 19:22:22			

Eclipse Timers	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]		
ACC Eclipse Start	29/10/2007 18:09:13	-1060.00	29/10/2007 18:09:21	-1052.00	-1064	
FDE Eclipse Start	29/10/2007 18:20:13	-400.00			-404	176
FCE Eclipse Start	29/10/2007 18:20:57	-356.00			-360	176

	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]		
FCE Eclipse End	29/10/2007 19:30:05	361			360	176
FDE Eclipse End	29/10/2007 19:30:05	361			360	176
ACC Eclipse End	29/10/2007 19:33:46	582	29/10/2007 19:33:54	590.00	578	

IMU	Uplink	Execution	WRT Penumbra End [sec]
IMU Auto Off Enable	26/10/2007 20:14:06	29/10/2007 19:35:48	704
IMU On	29/10/2007 11:19:07	IMU H/C Noise Roll [as/s]	0.1974
IMU Off	29/10/2007 19:36:14	IMU H/C Drift Roll [as/s]	0.2730
IMU On Time	8:17:07	IMU Auto Cal Drift Roll [as/s]	0.3275

30/10/2007 (Day of Year 303, Revolution 616)

STR Search/Track process failed: at 08:48z the S/T process for the slew ID 06160012 failed, no star found, and the slew failed execution.

A manual recovery was performed from attitude of PID 06160011 to the attitude of PID 06160013 by generating the manoeuvre as an OSL (Open Loop Slew).

The next slew 06160014 was manually updated in TL.

At 10:00z the AOCS s/s was enabled in TL.

The following slews were missed in TL: 06160012-13 (CSL)

31/10/2007 (Day of Year 304, Revolution 616)

STR Search/Track process failed: at 20:00z the S/T process for the slew ID 06160046 failed (no star found) causing the slew to fail execution.

A manual recovery was performed from attitude of PID 06160045 to the attitude of PID 06160046 by generating the manoeuvre as a CSL (Close Loop Slew).

The next slew 06160047 was manually updated in TL.

At 20:41z the AOCS s/s was enabled in TL.

The following slews were missed in TL: 06160046 (CSL)

01/11/2007 (Day of Year 305, Revolution 616-617)

Eclipse passage rev 616: the 8th eclipse operations were nominal from the AOCS point of view. Hereafter is reported a summary of the eclipse passage during rev 616:

INPUT	
Penumbra Start	01/11/2007 18:24
Penumbra End	01/11/2007 19:02
Umbra Start	01/11/2007 18:27
Umbra End	01/11/2007 18:58
ACC Sample Time:	29/10/2007 20:04:00
FDE Sample Time:	29/10/2007 20:08:06
FCE Sample Time:	29/10/2007 20:08:09
ACC Eclipse Counter:	0
ACC Eclipse Start:	252127
ACC Eclipse End:	256080
FDE Eclipse Start:	252546
FDE Left to Eclipse Start:	252546
FDE Eclipse Duration:	3092
FCE Eclipse Start:	252590
FCE Left to Eclipse Start:	252590
FCE Eclipse Duration:	3048

AOCS ECLIPSE MONITORING
Winter 2007

Revolution:	616		
Date:	01/11/2007		
DoY:	305		

Penumbra Start:	01/11/2007 18:24:03	LOS:	01/11/2007 14:12:00
Umbra Start:	01/11/2007 18:27:13	AOS:	01/11/2007 18:09:00
Umbra End:	01/11/2007 18:58:51		
Penumbra End:	01/11/2007 19:02:33		
Eclipse Duration:	0:38:30		
Eclipse Duration [sec]:	2310		
IMU Health Check Start	01/11/2007 11:13:00		
Eclipse Imminent Flag	01/11/2007 17:24:23		
ACC IMU AutoCal Start	01/11/2007 17:38:49		
ACC IMU AutoCal End	01/11/2007 17:58:49		
Sun out of FSS FoV	01/11/2007 18:26:38		
Sun back in FSS FoV	01/11/2007 18:59:50		

Eclipse Timers	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. Start [sec]	Absolute	WRT Pen. Start [sec]		
ACC Eclipse Start	01/11/2007 18:06:15	-1068.00	01/11/2007 18:06:23	-1060.00	-1064	
FDE Eclipse Start	01/11/2007 18:17:14	-409.00			-404	176
FCE Eclipse Start	01/11/2007 18:17:59	-364.00			-360	176

	From Loaded Timers		Actual From Telemetry		UM [sec]	LSB [sec]
	Absolute	WRT Pen. End [sec]	Absolute	WRT Pen. End [sec]		
FCE Eclipse End	01/11/2007 19:08:47	374			360	176
FDE Eclipse End	01/11/2007 19:08:46	373			360	176
ACC Eclipse End	01/11/2007 19:12:08	575	01/11/2007 19:12:16	583.00	578	

IMU	Uplink	Execution	WRT Penumbra End [sec]
IMU Auto Off Enable	29/10/2007 19:57:03	01/11/2007 19:14:10	697

IMU On	01/11/2007 11:17:10	IMU H/C Noise Roll [as/s]	0.1863
IMU Off	01/11/2007 19:14:39	IMU H/C Drift Roll [as/s]	0.2395
IMU On Time	7:57:29	IMU Auto Cal Drift Roll [as/s]	0.3275

Drop on TM Links from REDU: at 21:30z the VC0 and VC7 TM links from REDU station reported a drop. As consequence, the slew ID 06170001 failed release and the AOCS s/s was disabled in TL.

A manual recovery was performed at 21:38z and the slew ID 0617002 manually updated in TL.

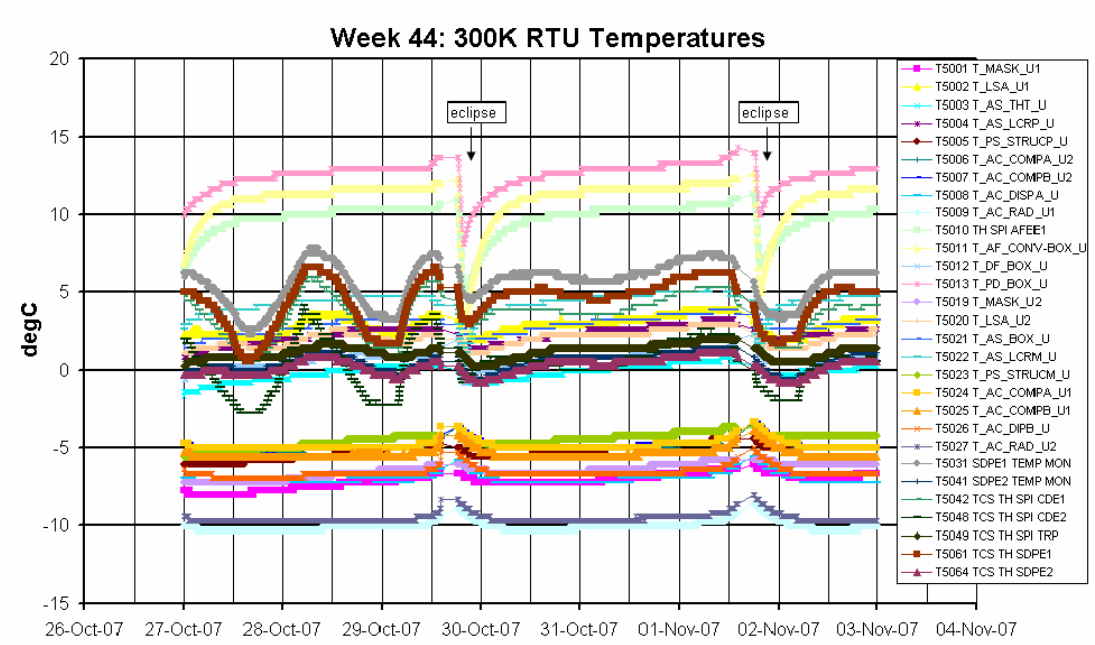
The following slew was missed in TL: 06170001 (CSL)

02/11/2007 (Day of Year 306, Revolution 617)

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.

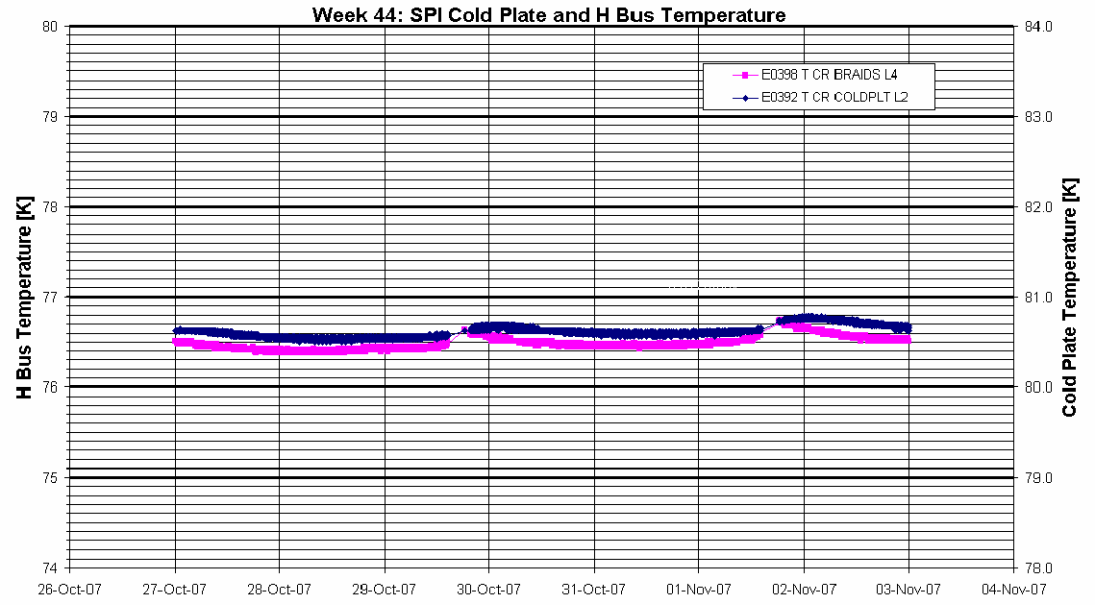


Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K +/-1K.

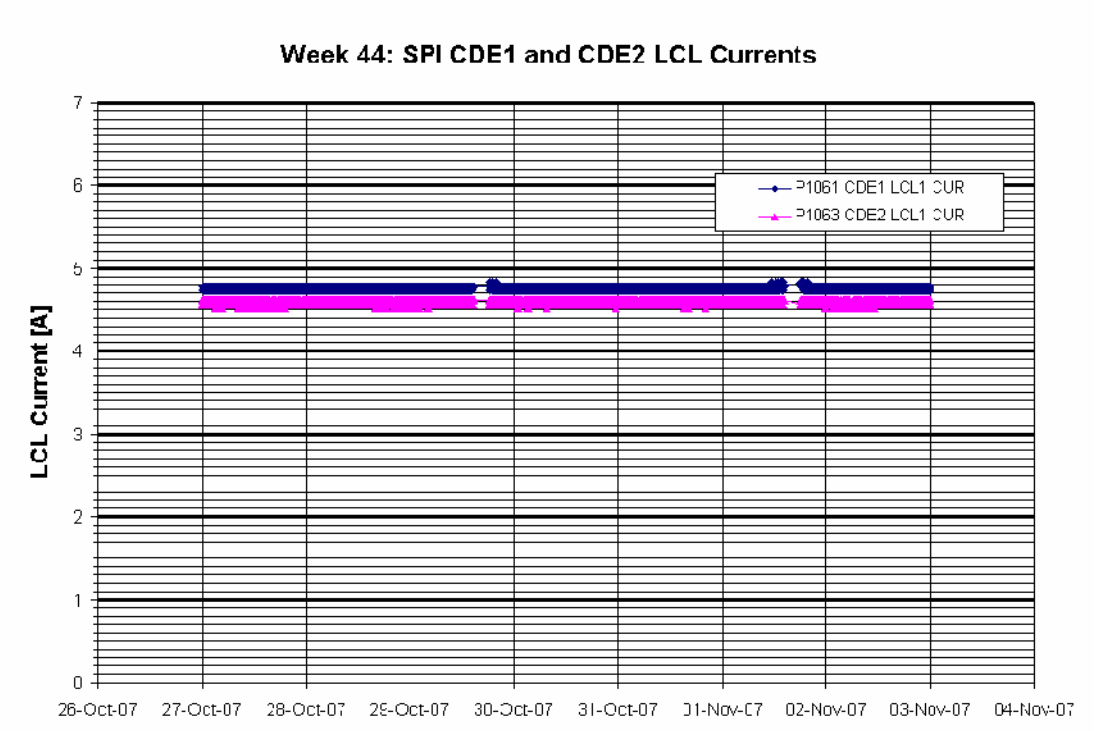
The stroke of all four compressors was set 40 throughout the week with the average CDE LCL currents as follows:

- CDE1 LCL Current = 4.77A
- CDE2 LCL Current = 4.57A

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

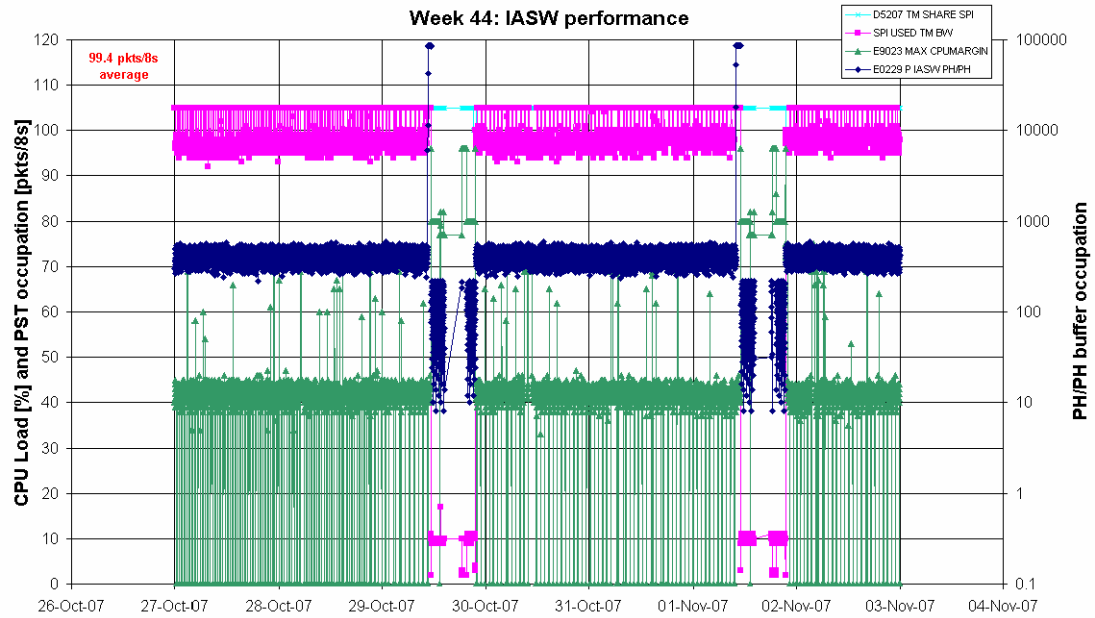


The following plot shows the evolution of the CDE currents during the reporting period.



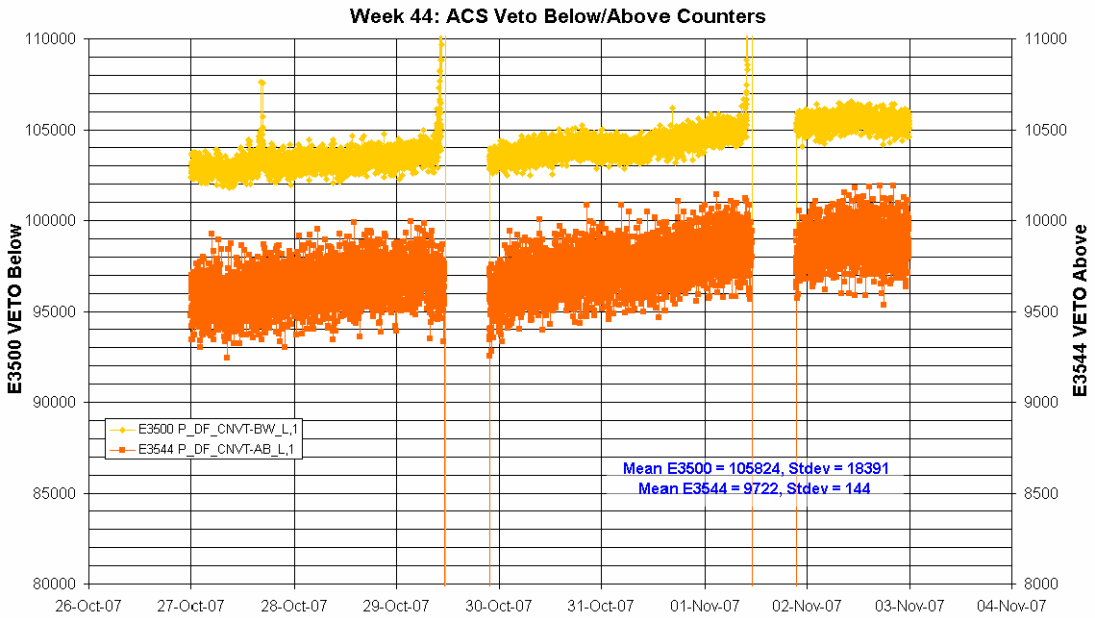
DPE & IASW: The DPE health and IASW performance is nominal. The IASW version installed is v433 patch #1 with the spectra scaling factor set to 8/19 SE. The average TM bandwidth occupation of SPI was 99.4 packets/cycle over the science window, when the TM allocation was 105 packets/cycle.

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



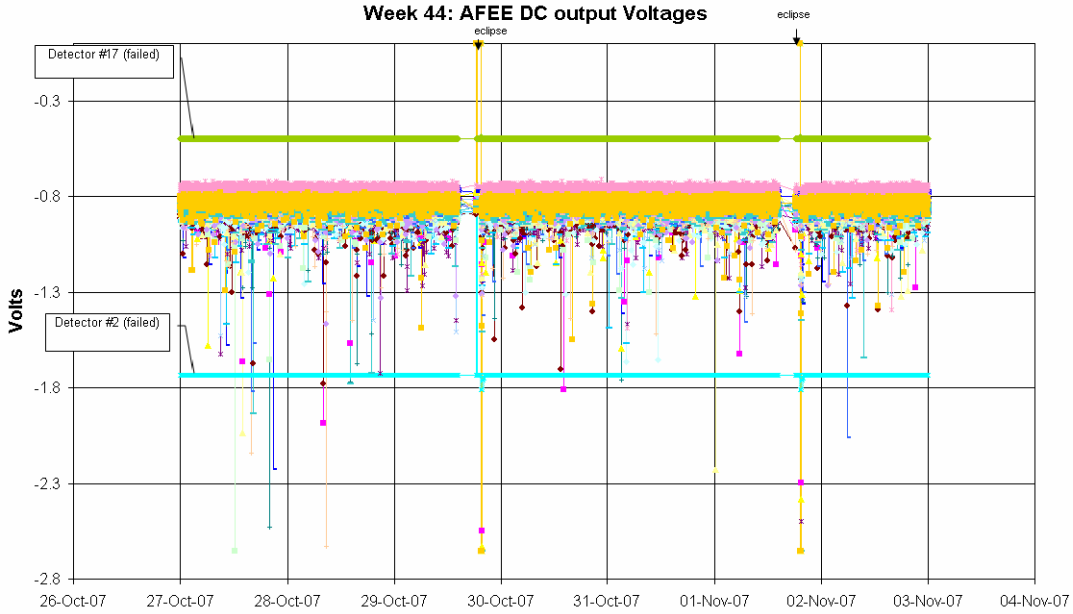
ACS: The performance of the ACS is nominal, except for FEE #81 which remains switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is still OFF due to the anomaly on 5/8/2003 (INT_SC-61).

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

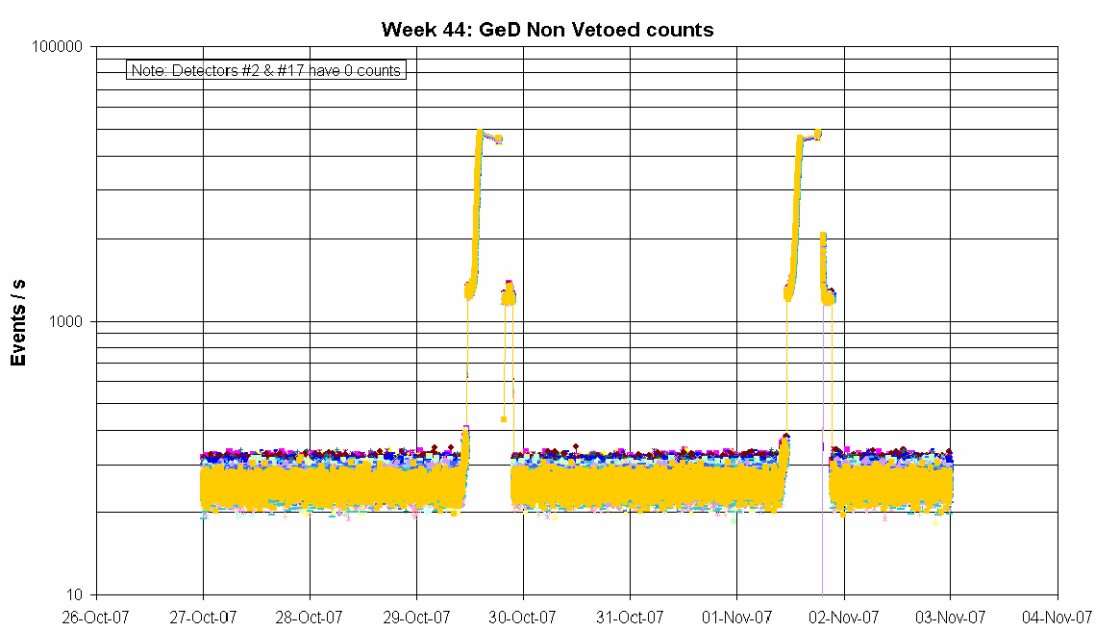


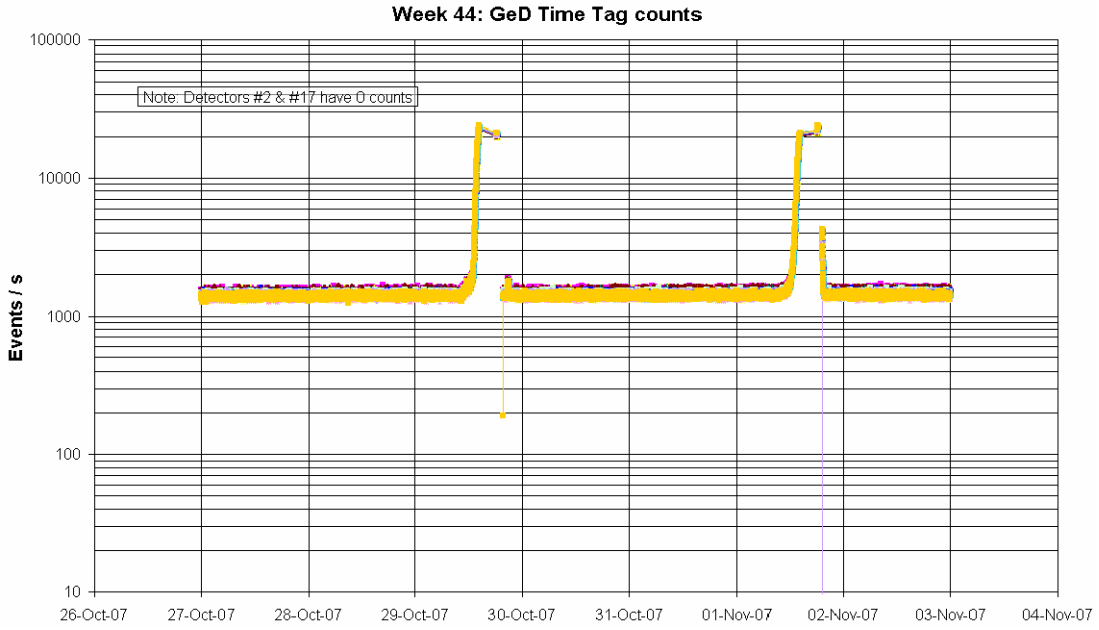
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operated at a lower HV setting of 3.5kV (instead of 4kV).

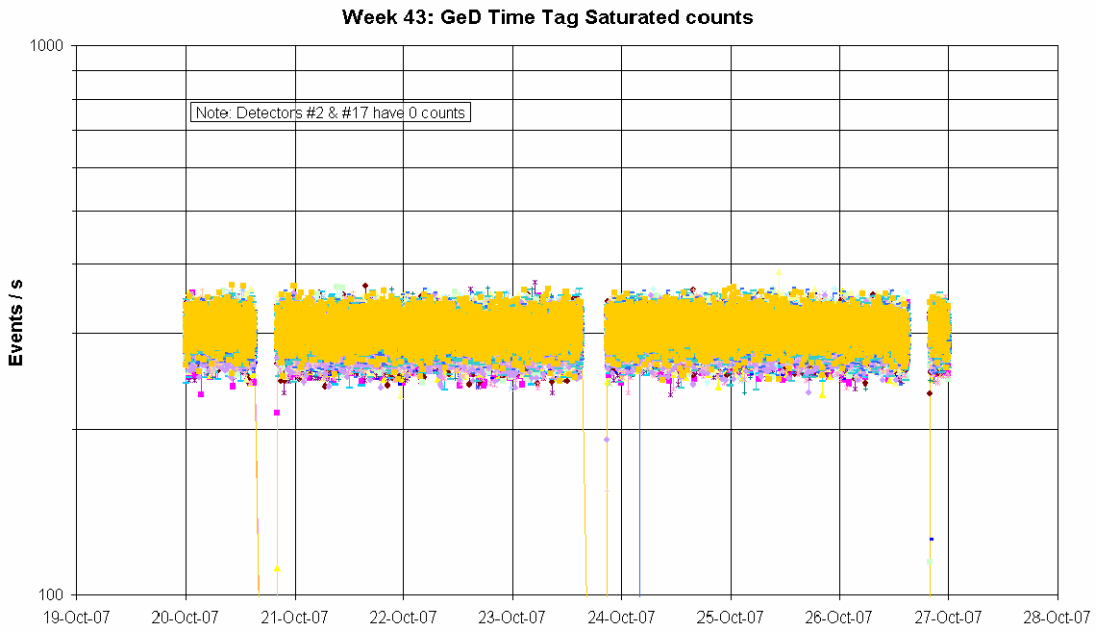
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.



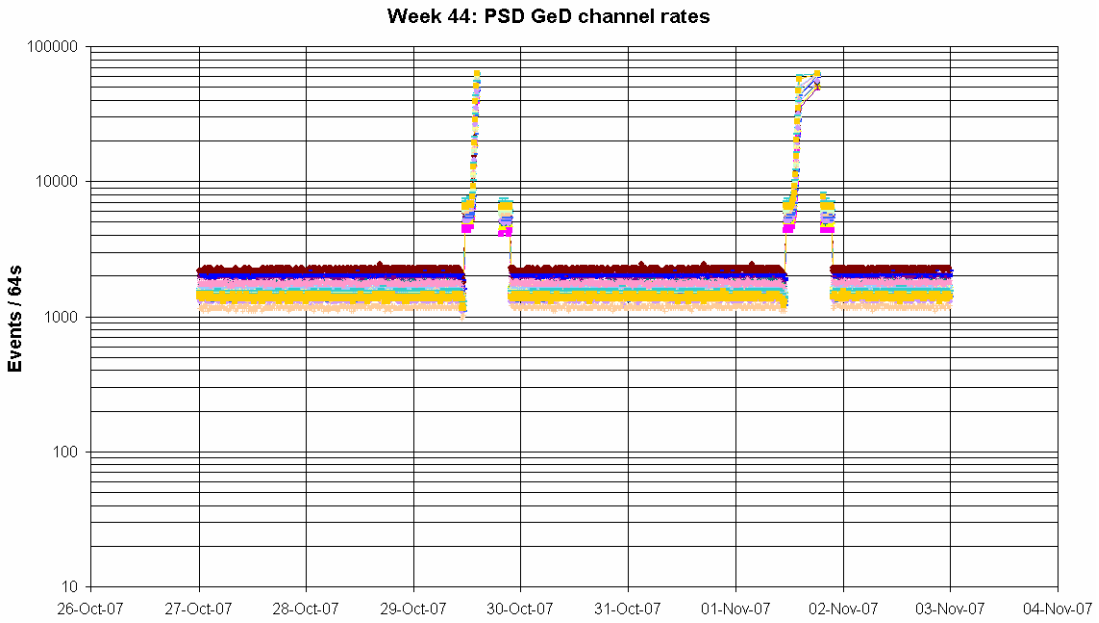
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.


Week 44: GeD Non Vetoed counts
Note: Detectors #2 & #17 have 0 counts
Events / s
100000
1000
10
26-Oct-07
27-Oct-07
28-Oct-07
29-Oct-07
30-Oct-07
31-Oct-07
01-Nov-07
02-Nov-07
03-Nov-07
04-Nov-07


Week 44: GeD Time Tag counts
Note: Detectors #2 & #17 have 0 counts
Events / s
100000
10000
1000
100
10
26-Oct-07
27-Oct-07
28-Oct-07
29-Oct-07
30-Oct-07
31-Oct-07
01-Nov-07
02-Nov-07
03-Nov-07
04-Nov-07



PSD: The health of the unit is nominal. The following plot shows the PSD channel rates during the reporting period.



Event Log:

The following non-nominal events occurred on SPI during the reporting period:

- 34 occurrences of OEM APID 1024 ID 243 EXCEPTION SPI1 SPECTRA BUILDING NOT COMPLETED were received during the week. As they were all single occurrences, no action was taken.
- TM parameter E2115 (Plastic Scintillator temperature) fluctuated OOL warning low several times during the week. As these were small fluctuations around the limit, not accompanied by other OOLs and all heaters were in the correct configuration, no action was taken.
- Due to high background radiation conditions before the expected radiation belt entry of revolution 615, on 2007-10-29 at 10:34:38Z TM parameter E3500

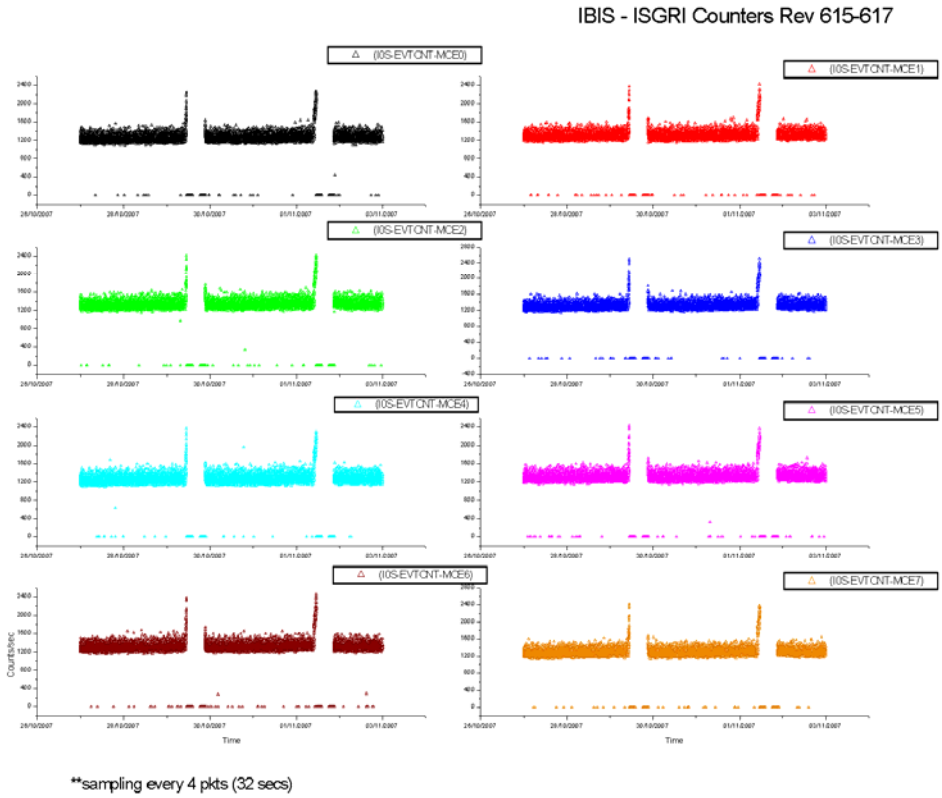
went OOL High, remaining OOL until the execution of the ED EENTRY02 before belt entry, at 11:17:42Z.

- Due to high background radiation conditions before the expected radiation belt entry of revolution 616, on 2007-11-01 at 10:00:13Z TM parameter E3500 went OOL High, remaining OOL until the execution of the ED EENTRY02 before belt entry, at 11:03:46Z.

8.3.3 IBIS Operations

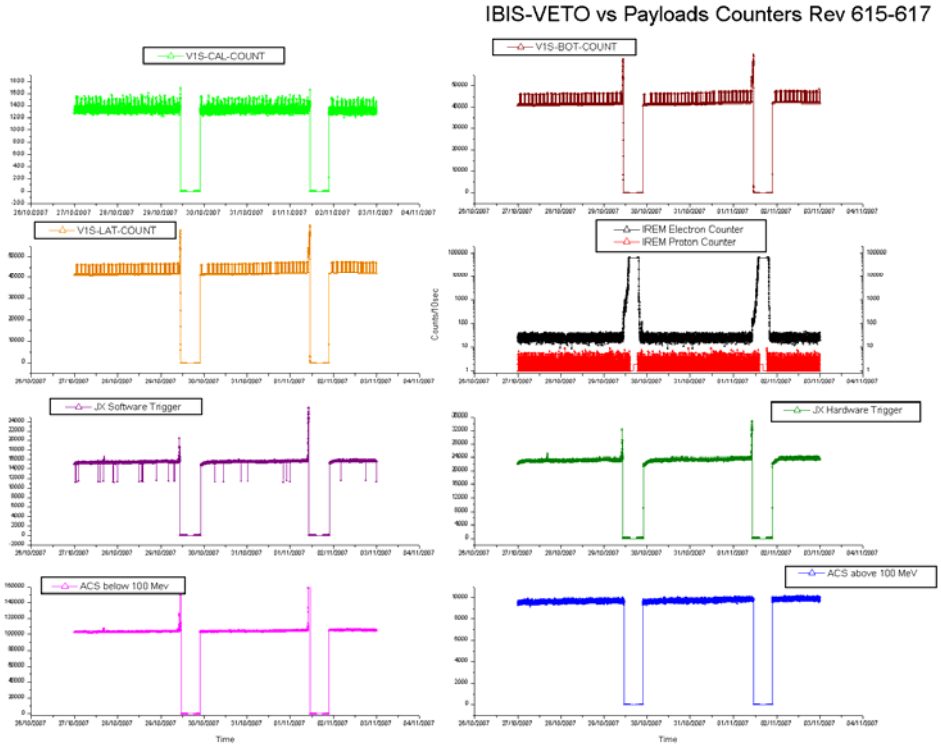
IBIS Event Counters Plots

ISGRI Counters:



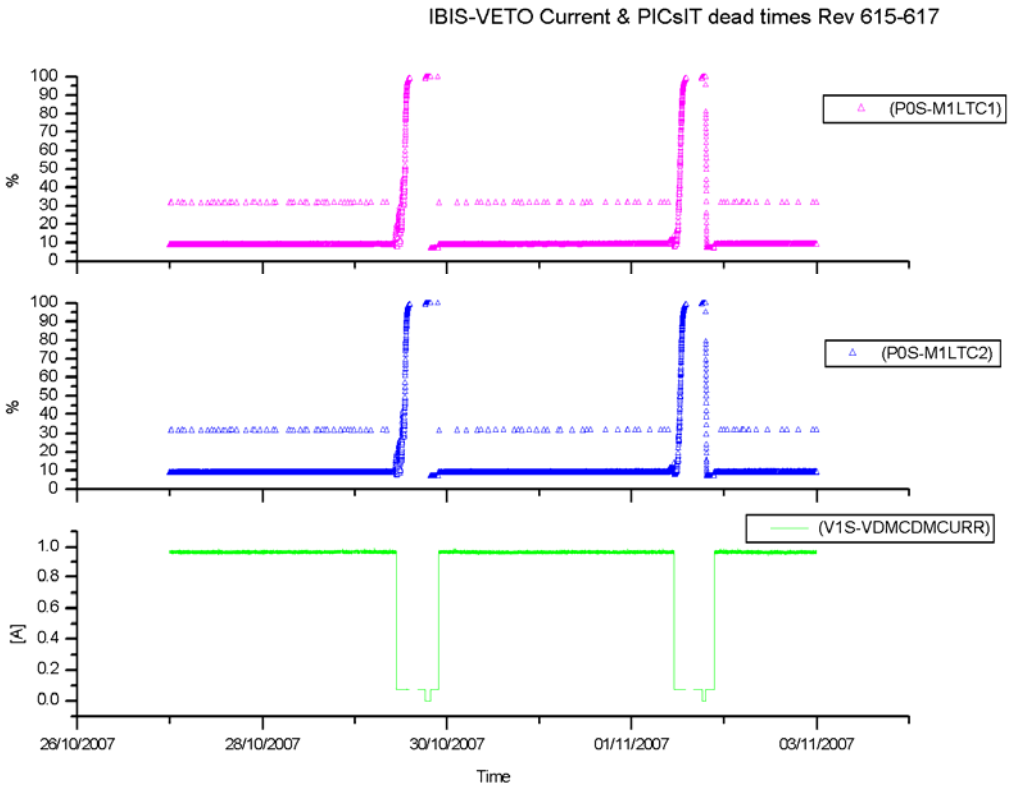
The week was characterised by high radiation before the expected radiation belt entry of revolutions 615 and 616 as reported by the payload. Note that the plots of the ACS below 100MeV and the JEM-X count rates have a smaller scale than usual and the ACS below 100MeV graph is cropped where it goes off-scale.

VETO vs Payloads Counters:



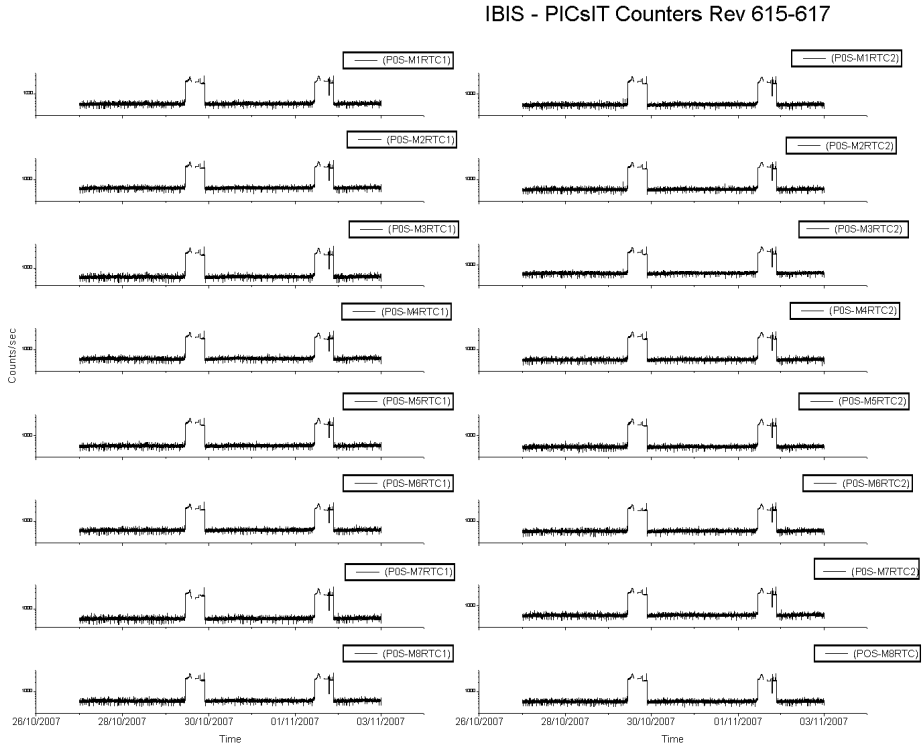
**with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec sampling every 5 pkts (40 sec)

VETO Current:



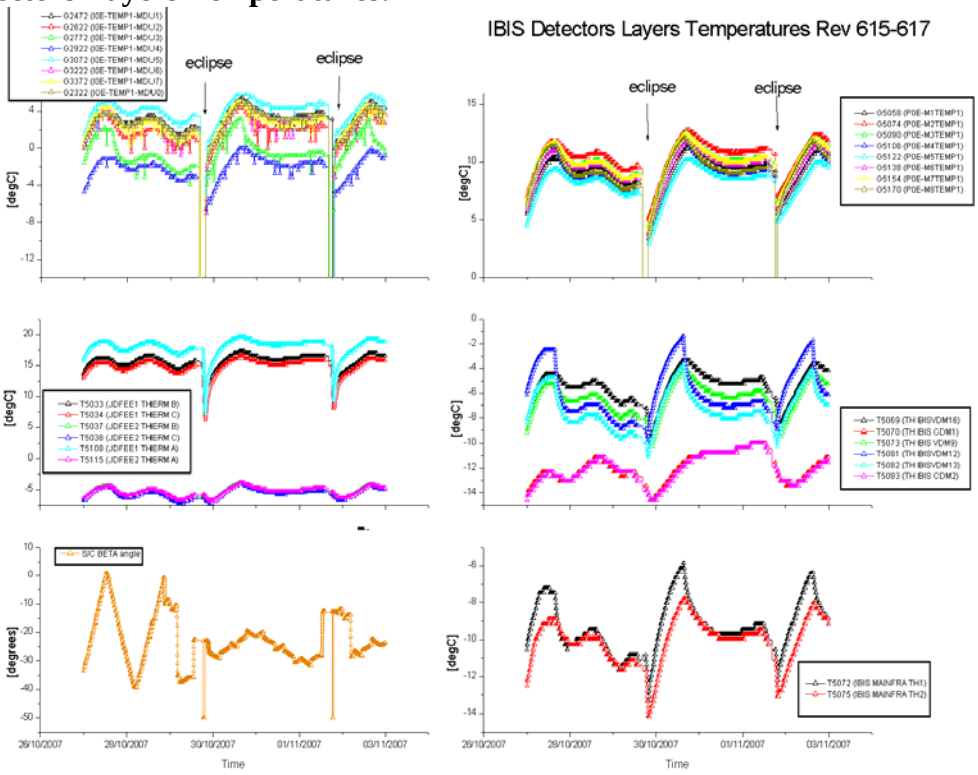
**sampling every 4 pkts (32 secs)

PICsIT Counters:



**sampling every 4 pkts (32 secs)

IBIS Detectors Layers Temperatures:



**sampling every 8 pkts (64 secs)

IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2) families and G2000 family (I0E-OVFWPXADD-Mi) were received during the radiation belt passages.

In addition, throughout the week the TM parameter G8080 went OOL Warning High several times. This is the Valid event rate on HBRA. As at each occurrence it remained OOL for only 1 TM cycle, no action was taken.

2007-10-27 (DOY 300, Rev 615) to 2007-10-28 (DOY 301, Rev 615)

IBIS operations executed nominally.

2007-10-29 (DOY 302, Rev 615-616)

At 05:17:13Z, the following OEM APID 1280 ID 133 CLASS 2 (ANOMALY) was received:

"IBIS1 IASW LSL TRANSFER FAILED (LOW LEVEL)"

together with OEM APID 1280 ID 131 CLASS 2 (ANOMALY):

"IBIS1 IASW LSL TRANSFER FAIL REPORT FOR HIGH-LEVEL MODULE RESET".

These 2 OEMs were followed at the next TM cycle by OEM APID1280 ID 206 CLASS 3 (TC REJECT) IBIS1 MCE1 TIME OUT.

This anomaly is similar to the previous ones that indicated a Time-Out in several peripherals (see Anomaly Report INT_SC-113). This time, according to G1581 (parameter of OEM ID 131), the anomaly occurred with ISGRI MCE1. Summarising, IBIS incurred a timing problem on the Low Speed Line that affected the communication with the peripheral. During this time, a HK acquisition request was sent to the MCE1 without any answer due to a black out in communication between the peripheral and the DPE. The IASW flagged the lack of generation of HK data from MCE1 as an on-board rejection (time-out) of the internal TC for HK acquisition. The unit solved the internal conflict on the LSL autonomously and reported valid HK for MCE1 in the next cycle and therefore no action was required.

At 10:33:41Z, ~50 minutes before radiation belt entry of revolution 615, TM parameters G6062 and G6063 started toggling OOL High. These are the VETO bottom and lateral counters respectively. These parameters continued to toggle OOL until IBIS went to Safe mode autonomously due to the high radiation conditions at 10:47:42Z. This was about 35 minutes before the planned radiation belt entry time.

At 12:17:14Z, during the radiation belt passage of revolution 615-616, TM parameter G5079 went OOL warning high (value = 2.60509804V). This is the PDM2 +2.5V. As it returned within limits at 12:17:46Z, no action was taken.

At 21:40:05Z, just after radiation belt exit of revolution 616, the TM parameter G2055 went OOL Low (value = 0). This is the number of events triggering the MCE3 per second. As it returned within limits of its own accord at 21:43:49Z no action was taken.

2007-10-30 (DOY 303, Rev 616)

At 00:47Z TM parameter X7500 went OOL, indicating a problem with the histogram process. In fact, the downlinking of histograms had not resumed following the end of the ground station handover. The following recovery procedure was then executed to force the histogram accumulation and download process to resume:

- 01:55:19Z FCP_IBIS1_0312
- 01.59.52Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

2007-10-31 (DOY 304, Rev 616)

IBIS operations executed nominally.

2007-11-01 (DOY 305, Rev 616-617)

At 10:00:13Z, ~1 hour before the expected radiation belt entry of revolution 616, TM parameters G6062 and G6063 started toggling OOL High. These are the VETO bottom and lateral counters respectively. At 10:59:25Z the G2013 family (number of events triggering the MCEs per second) also started going OOL High. All these parameters remained OOL High until radiation belt entry at 11:08:46Z.

2007-11-02 (DOY 306, Rev 617)

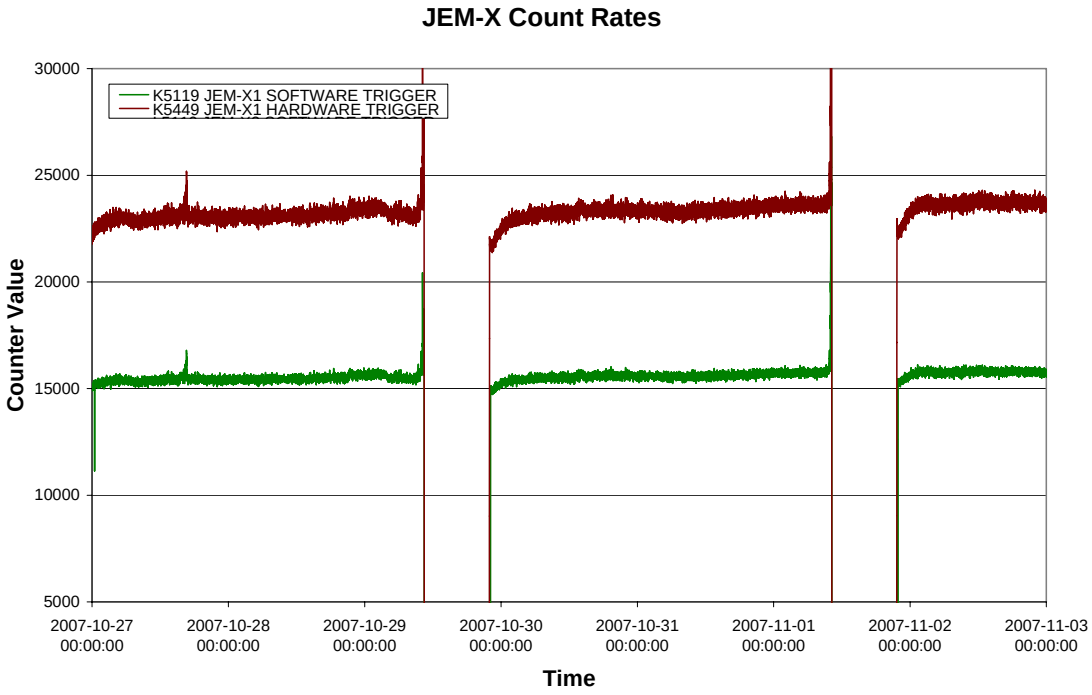
IBIS operations executed nominally.

8.3.4 JEM-X Operations

JEM-X Count Rates

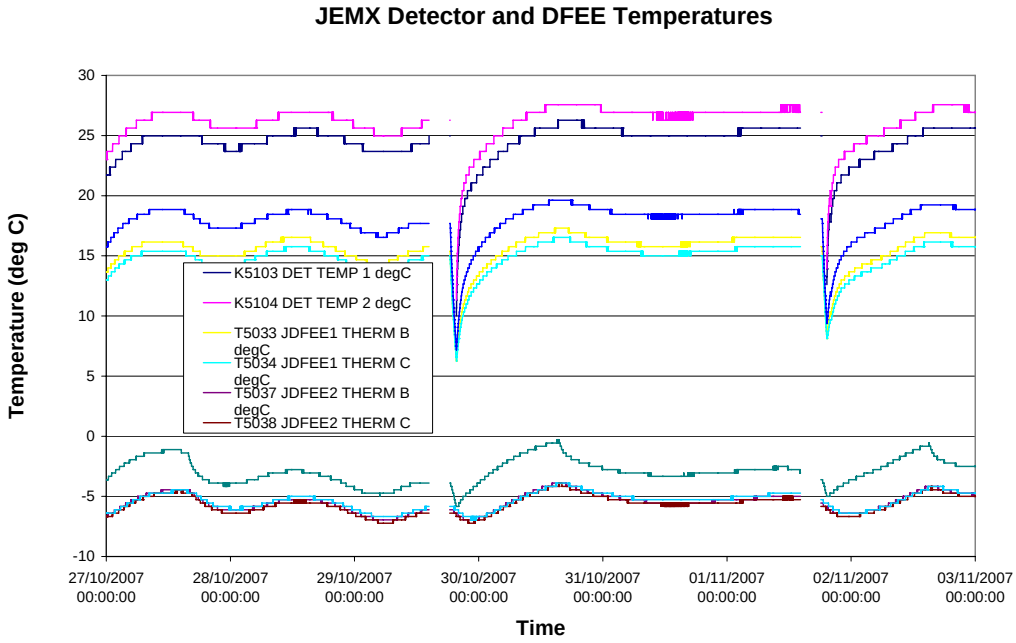
JEM-X count rates over the reporting period are displayed in the following graph[1].

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



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 graph[2].



JEM-X Daily Report

2007-10-20 (DoY 293, Rev 612)

[2] Data sampled (1 frame in 8)

At 20:15:37, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range for 24 seconds. No action was taken, and there was no impact.

2007-10-21 (DoY 294, Rev 613) to 2007-10-22 (DoY 295, Rev 613)

JEM-X1 operations executed nominally

2007-10-23 (DoY 296, Rev 613)

At 10:46:24, parameter K5449 (JEMX-1 Hardware Trigger), went briefly outside the upper hard limit.

At 10:46:33 and again at 10:47:04, parameter K5119 (JEMX-1 Software Trigger), went briefly outside the upper hard limit.

At 10:49:12, parameter KD5020D (EQ DFEE STATE) was outside the nominal range for 32 seconds.

At 10:58:40, parameter K5317 (RAD MONITOR 3), went briefly outside the upper hard limit.

At 20:09:38, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range for 24 seconds.

No action was taken on any of the above events, and there was no impact.

2007-10-24 (DoY 297, Rev 614) to 2007-10-25 (DoY 298, Rev 614)

JEM-X1 operations executed nominally

2007-10-26 (DoY 299, Rev 614)

At 19:58:33, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range for 24 seconds. No action was taken, and there was no impact.

2007-10-27 (DoY 300, Rev 615) to 2007-10-28 (DoY 301, Rev 615)

JEM-X1 operations executed nominally

2007-10-29 (DoY 302, Rev 615-616)

At 10:11:13, the TM parameter K5449 (JEMX-1 Hardware Trigger), went briefly outside the upper soft limit. No action was taken, and there was no impact.

At 19:41:29, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range for 24 seconds. No action was taken, and there was no impact.

2007-10-30 (DoY 303, Rev 616) to 2007-10-31 (DoY 304, Rev 616)

JEM-X1 operations executed nominally

2007-11-01 (DoY 305, Rev 616-617)

At 09:59:21, the TM parameter K5449 (JEMX-1 Hardware Trigger), went briefly outside the upper soft limit. No action was taken, and there was no impact.

At 09:59:54, and again at 10:14:49, the TM parameter K5317 (RAD MONITOR 3), went outside the upper hard limit. No action was taken, and there was no impact.

At 19:19:53, during the post-eclipse reconfiguration of JEM-X1 following the 8th eclipse of this season, another DFEE anomaly occurred like those observed on 2004-06-20, 2004-06-23, 2004-12-08; 2005-05-18; 2005-11-14 and 2006-10-26 2007-04-30 (ref: Anomaly Reports INT_SC-84; INT_SC-104; INT_SC-119; INT_SC-131; INT_SC-161 and INT_SC-187).

The symptoms were as follows:

At 19:19:53, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range.

At 19:20:17, the TM parameters K9104 (EM #1 IDENTIFIER) & K9110 (EM #2 IDENTIFIER) went outside their soft upper limits.

At 19:20:32, the TM parameter K5317 (RAD MONITOR 3), went outside the upper hard limit.

At 19:20:49, the TM parameter K5583 (CPU MODE) was showing 8 MHz instead of the required 16 MHz.

The following OEMs were received after the JEM-X1 DFEE was switched on by the ED KECLEX01 in the Timeline (uplinked at 2007-11-01T19:19:30Z):

2007.305.19.20.10.715 2007.305.19.20.16.682 1536 RealTime 191 EVENT
JEM-X1 PROB DFEE 11 0 0 65535 PR N E E

FIX6		11
K9079	MESS CLASS	0
K9080	MESS ID	191
FIX16		8
FIX16		0

>> Indicating that the operation “Load DFEE context” was unsuccessful due to CRC failure of the area B000 (hex) to CFFF (hex).

2007.305.19.20.10.715 2007.305.19.20.16.718 1536 RealTime 234 EVENT
JEM-X1 AUTO EVENT 4 0 0 65535 PR N E E

FIX6		4
K9079	MESS CLASS	0
K9080	MESS ID	234
K5419	ACTUAL LEVEL	ECLIPSE

K5420 TARGET LEVEL RAD.

>>> Indicating failure of the automatic recovery from shutdown level ECLIPSE to shutdown level RAD. BELTS

Following the KECLEX01 ED, the JEM-X1 DFEE state (TM parameter K5022) remained MEMORY, instead of SAFE, and the Active Shutdown Level (TM parameter K5381) remained ECLIPSE instead of RAD. BELTS.

The DFEE CPU speed, TM parameter K5583 CPU MODE, remained at a value of 8 MHz WAIT (as at start-up) rather than the nominal value of 16MHz.

In response to this, the following operations were performed:

1) In order to recover JEM-X1, a DFEE power cycle was then performed according to CRP_JEM1_5010 JEMX1 DFEE POWER CYCLE, consisting of:
- 19:57Z FCP_JEM1_0120 JEMX1 SET BCP OVERRIDES
- 19:59Z FCP_JEM1_9010 JEMX1 DFEE SWITCH OFF
- 20:05Z FCP_JEM1_0021 JEMX1 DFEE ACTIVATION

2) At 20:27Z FCP_JEM1_0120 JEMX1 SET BCP OVERRIDES was executed to e-enable the JEM-X1 reactions to the Broadcast Packet radiation belt times.

The above recovery proceeded nominally and JEM-X1 operations then continued nominally from the Timeline with the ED KEACAL01 (anode calibration at radiation belt exit).

During the recovery the following was observed:

At 20:03:29, the TM parameters K5111 & K5108, went outside their soft limits for 16 seconds.

At 20:05:37, the TM parameter KD5380D (EQ SHuTDoWN LEVel) was outside nominal range, for 104 seconds.

At 20:06:33, the TM parameter K5583 (CPU MODE) was showing 8 MHz instead of the required 16 MHz, this returned to the correct value at 20:09:14.

There was no impact on science operations.

2007-11-02 (DoY 306, Rev 617)

JEM-X1 operations executed nominally

8.3.5 OMC Operations

2007-10-27 (DoY 300, Rev 615) to 2007-10-29 (DoY 302, Rev 616)

Nothing to Report.

2007-10-30 (DoY 303, Rev 616)

At 08:49, an AOCS command failed release. This forced the suspension of the Timeline. The first attempted recovery failed at the same point as before, and another recovery was necessary. The Timeline rejoined at 09:35. The impact was the loss of pointing 06160012.

2007-10-31 (DoY 304, Rev 616)

At 20:00, an AOCS problem forced an interruption in the Timeline. A recovery was subsequently performed, and the Timeline rejoined at 20:39. The impact was the loss of pointing 06160046. It was at this time the following OEMs were received:

```
2007.304.20.04.07.907   2007.304.20.04.16.880   1792   RealTime   131     TC REJECT
REJECTED TC1                                          0       0    65535   PR    N
E   E
2007.304.20.04.14.720   2007.304.20.04.25.470   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.

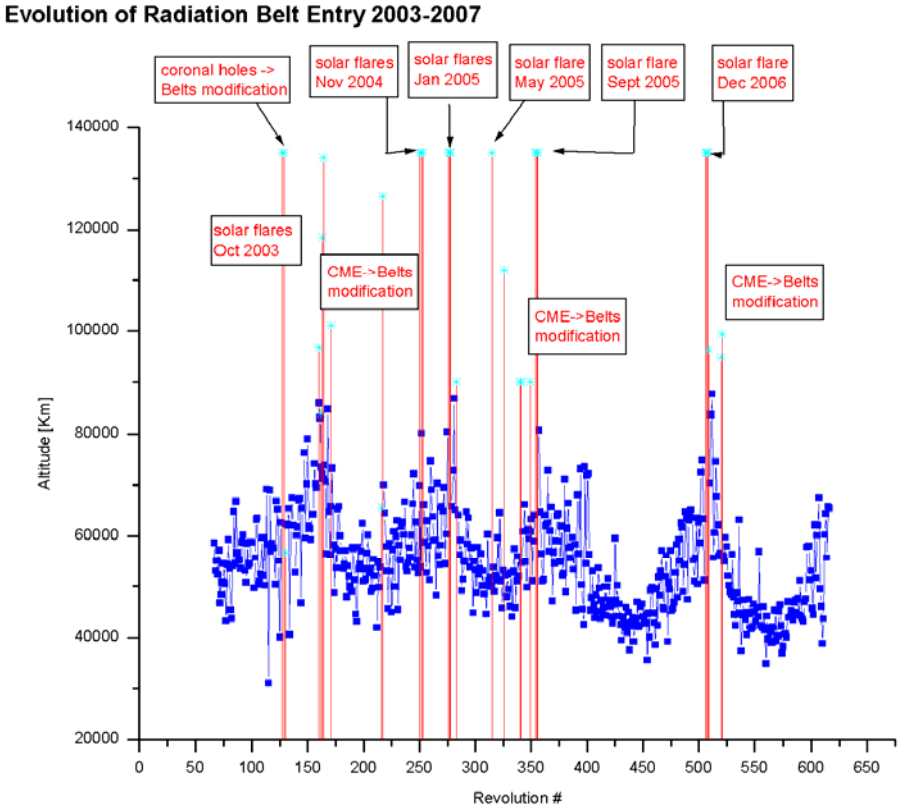
2007-11-01 (DoY 305, Rev 616) to 2007-11-02 (DoY 306, Rev 617)

Nothing to Report.

On DoY 302 at 11:22:47 and DoY 305 at 11:08:47 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



IREM daily report

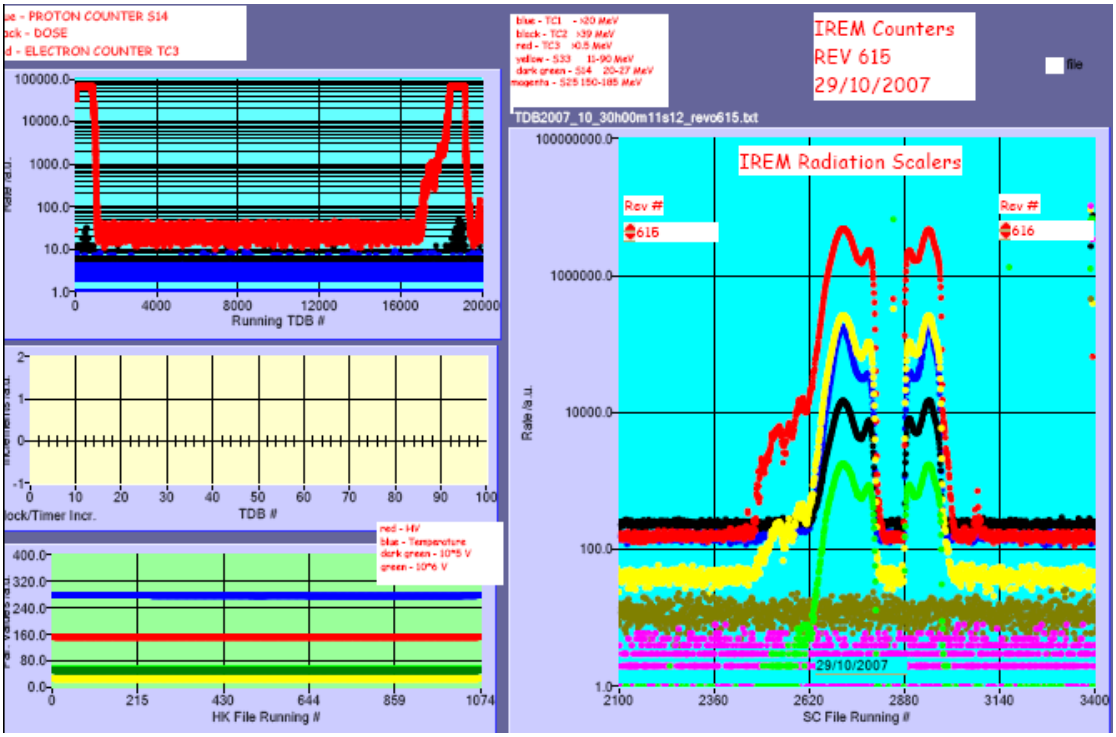
Nothing to report.

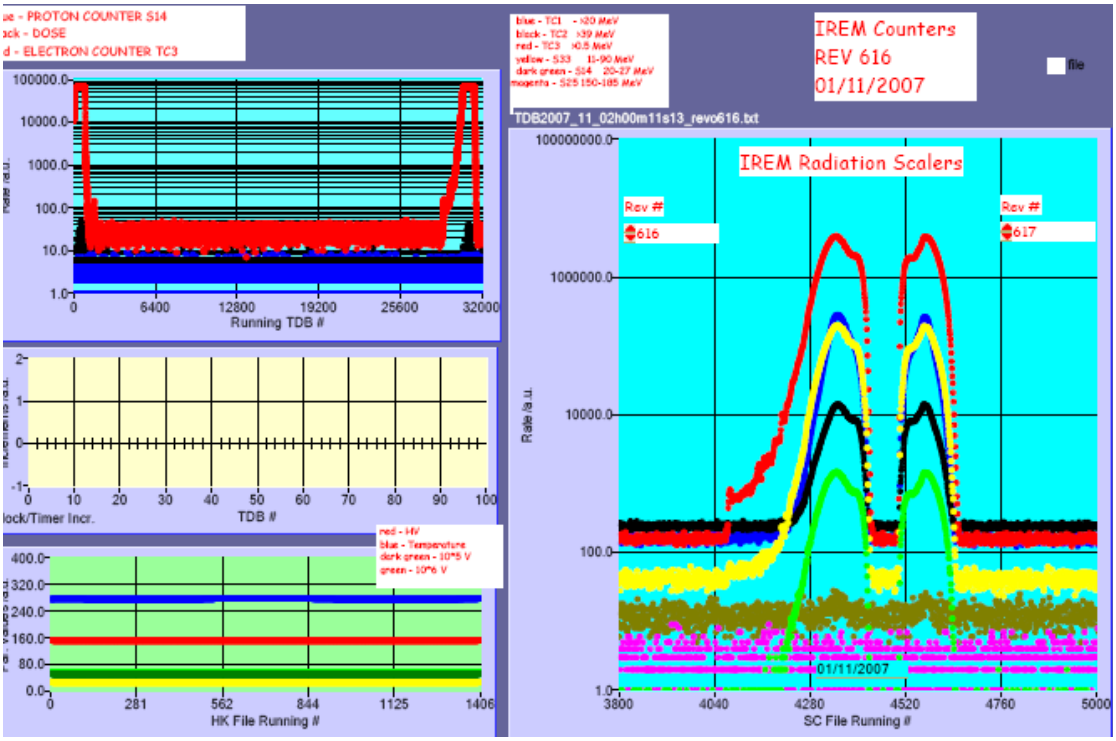
Electron Belts

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]
615	RAD_ENTR R 2007-10-29T11:22:42Z	29/10/2007 10:09:58	65833.0	29-Oct-2007 12:42:20	44465.09
616	RAD_EXIT R 2007-10-29T21:33:27Z	29/10/2007 20:54:14	>>43883.7	29-Oct-2007 20:32:20	44827.8
616	RAD_ENTR R 2007-11-01T11:08:46Z	01/11/2007 09:57:42	65482.2	01-Nov-2007 11:54:27	45564.83
617	RAD_EXIT R 2007-11-01T21:19:08Z	01/11/2007 19:39:34	>>37816.0	01-Nov-2007 19:54:27	45047.86

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)

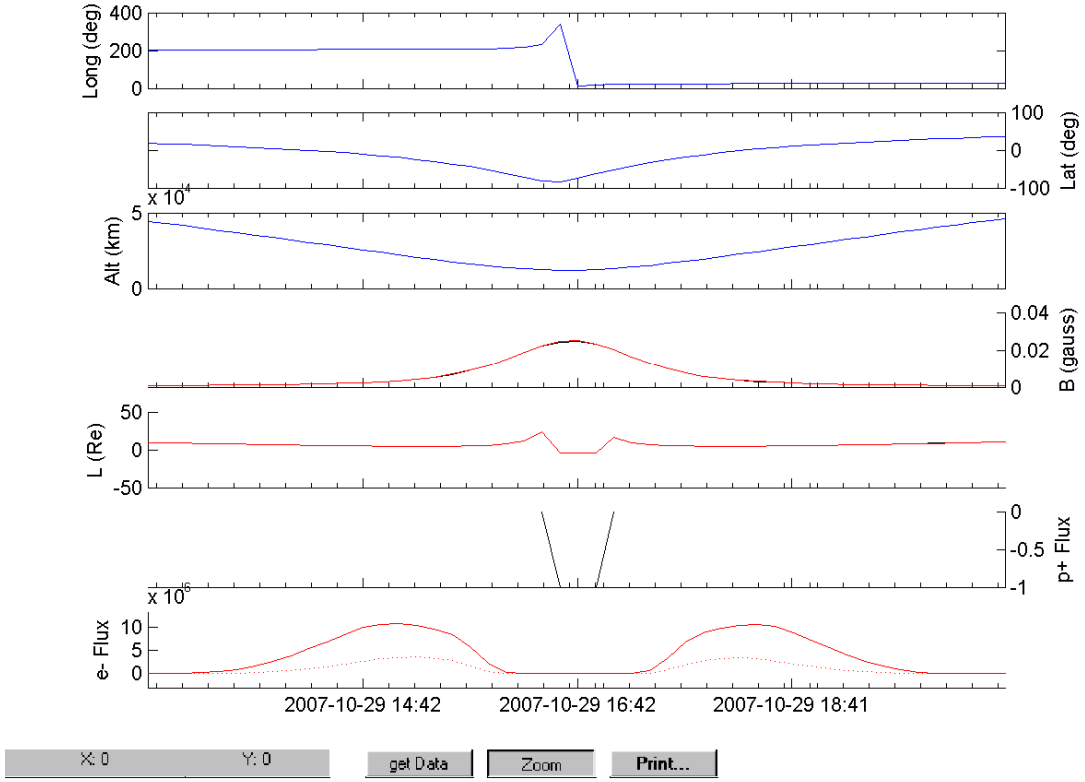
IREM radiation counters:



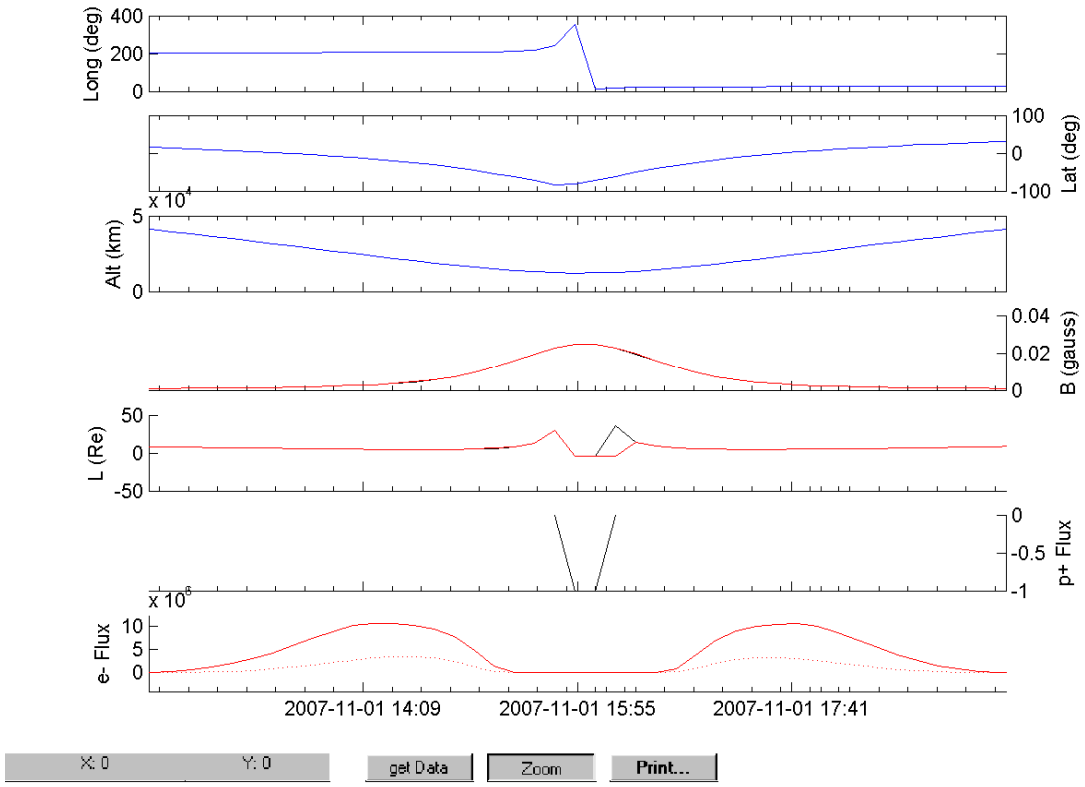


IREM Predicted Radiation Belt Passages

Rev 615



Rev 616



SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):

Due to a problem on the SEISOP server, no data are available this week. However, the week was very quiet and no radiation was reported.