

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 289
Week 14
07.04.08
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 29.03.08 until 04.04.08 (both dates inclusive) and covers the revolutions 667 and 668.

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 two hexagonal dithers, of the object 4U0115+63 (a TOO) (RA 01:18:31.90, DEC +64:14:24.0), a custom pointing of the Galactic disk (RA 19:04:22.00, DEC +06:17:13.0), a hexagonal dither, of the Galactic bulge region (RA 17:45:36.00, DEC -28:56:00.0), an OMC Flat Field calibration at attitude (RA 19:57:12.00, DEC -22:36:00.0) and a hexagonal dither of XTE J1810-189 (RA 18:10:20.48, DEC -19:04:21.4).

Note: Some further information concerning the activities is provided in the Appendix.

3 Satellite Status

3.1 Platform

The performance of the platform was good. No new unexpected behaviour / malfunction was identified.

3.1.1 AOCS

The AOCS operations were performed from the timeline during this period.

The Eclipse season started with the first eclipse passage on 30/03/2008. The first and second eclipse passages were nominal from an AOCS point of view.

As part of the AOCS preparation for the summer eclipse season, the onboard AMD thresholds were set to their eclipse season values during rev 666. In the same time frame were verified the AMD dead band value, the IMU timers, the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

Two slews were missed from TL, during the observation period, due to loss of guide star and glitch on TM links.

The fuel consumption over the period between 28/03/2008 and 03/04/2008 was 0.1346 Kg. The remaining propellant is in the order of 141.3342 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 1st and 2nd eclipses of the 12th eclipse season took place on 30th March and 2nd April, the relevant details are given below

Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit	Total Eclipse Duration	Umbra duration Only	Observed DOD 1	Observed DOD 2	Recharge Duration Battery 1	Recharge Duration Battery 2
30/03/2008	03:49:13			04:04:53	0:15:40	0:00:00	0.22	0.21	0:03:37	0:03:21
02/04/2008	03:25:21	03:27:35	04:06:20	04:08:06	0:42:45	0:38:45	3.92	3.88	2:19:20	2:18:00

From the EPS point of view the eclipse passage was entirely nominal.

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. However, one minor software anomaly occurred during the reporting period.

On 11/4/2008 at eclipse entry the OBM entry for parameter P3118 was flagged out of limits by the OBM task as expected.

According to the Integral Users Manual (page 5.1-233):

1. The parameter is acquired, bit-masked if necessary and compared against its lower and upper limit.
2. If the parameter is smaller than the lower limit or greater than the upper limit an OEM 177 (EVE_MO_PARAMETER_OUT_OF_RANGE) is generated.
3. Monitoring of the parameter continues and if a limit is transgressed on **three consecutive checks** the OEM 178 (EVE_MO_PAR_3_TIME_OUT_OF_RANGE) is generated. The value is then stored in the memory with the OBT found in the TM packet. The Recovery Action Command Packets (RACP), if any, are executed.

Note: the number of consecutive checks made on a parameter before Recovery Actions are performed (i.e. 3) is fixed and not re-definable by ground.

On this occasion the parameter was OOL for 5 consecutive checks before the OEM 178 was issued. Following this the Recovery Action commands were issued correctly. All other monitoring entries associated with the eclipse executed nominally.

The OBM entry associated with P3118 at eclipse entry has been in use since launch without change, no such behaviour has been observed in the past.

Following the observed anomaly the on-board monitoring list was reported and the entry for P3118 verified as correct. At the subsequent eclipse entry its behaviour was nominal.

The PST Allocation was over-subscribed by 3 packets to SPI for 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

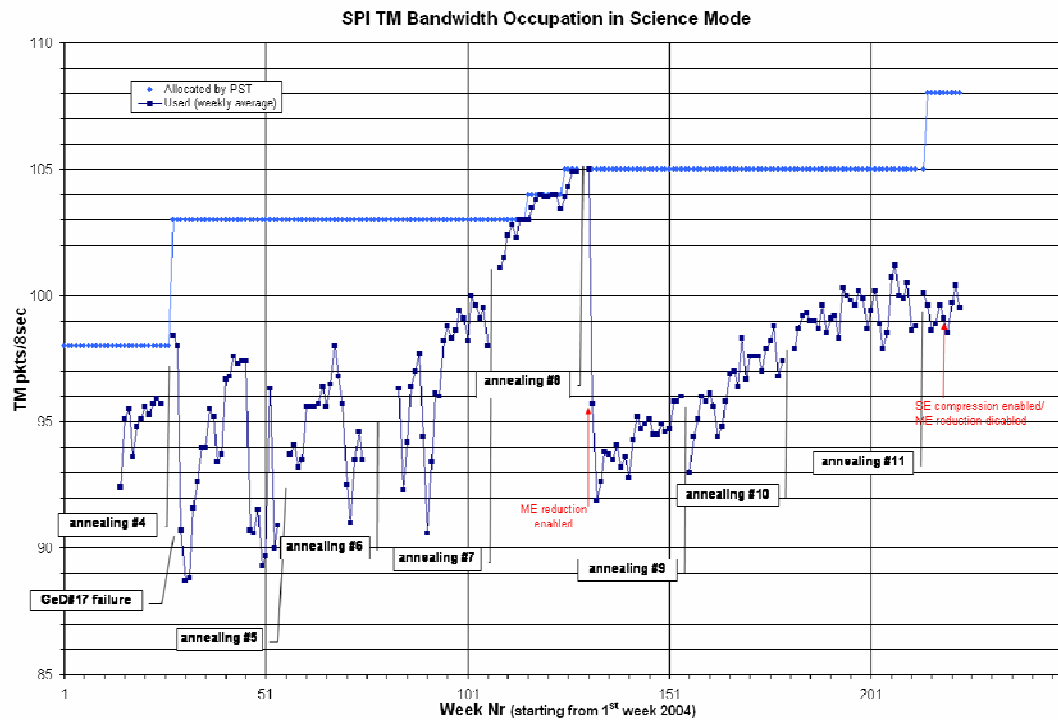
Following the 11th annealing, which ended on 30th January, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which, although its energy resolution improved since the previous annealing, is still showing a slightly degraded energy resolution compared to the other detectors 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.

The first eclipse in the 12th eclipse season occurred on 30/03/2008. Eclipse operations for SPI have been progressing nominally.

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 except from 2008-04-01T21:01:20Z until the end of revolution 667 when it was 88 packets/cycle. The over-allocated PST with an additional 3 packets/cycle for SPI was used however the Broadcast Packet TM allocation was not updated. The average telemetry occupation in the science window was 99.5 packets/cycle.

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.

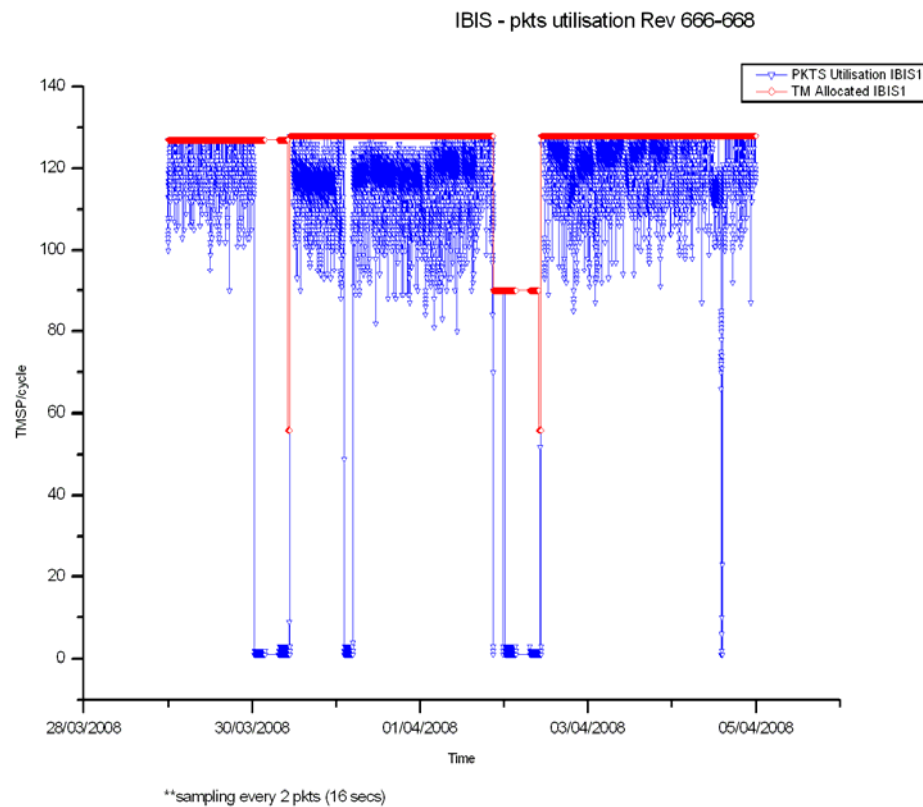
During the reporting period, the PST allocation to IBIS above the radiation belts was as follows:

- 127 packets/cycle in revolution 666
- 128 packets/cycle in revolution 667 and 668 except from 2008-04-01T21:01:20Z until the end of revolution 667 when it was 90 packets/cycle due to an OMC Flat Field Calibration.

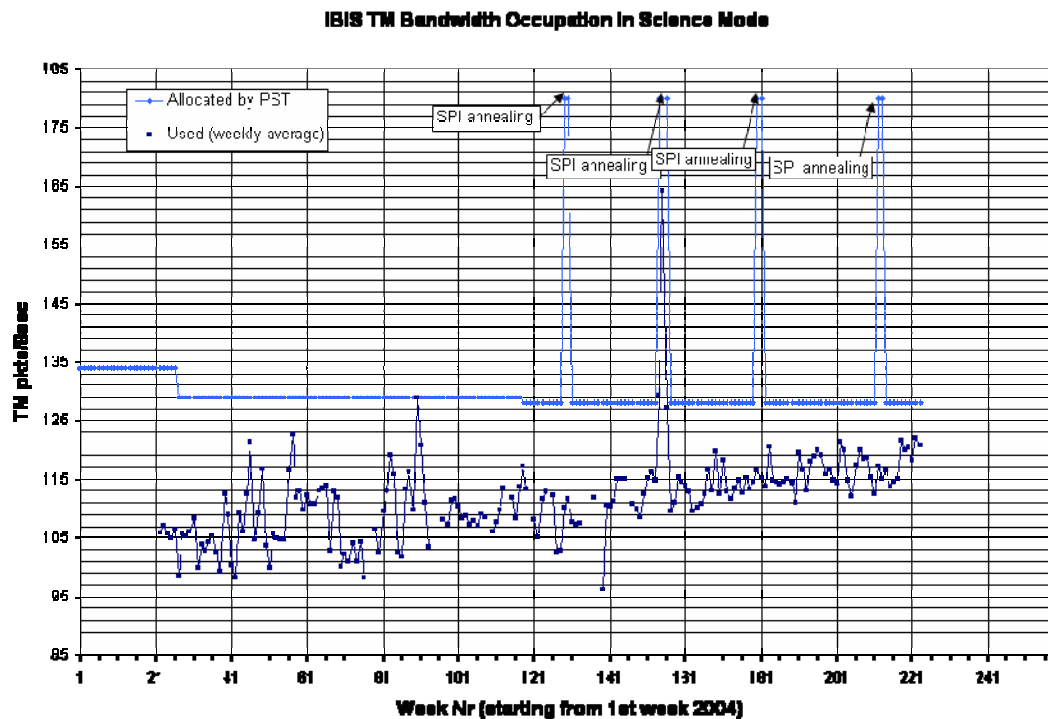
The first eclipse in the 12th eclipse season occurred on 30/03/2008. Eclipse operations for IBIS have been progressing nominally.

The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 120.71 packets/cycle, down 1.36 on last week.

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 and JEMX2 were operated in Data Taking mode with a TM allocation of 5 packets/cycle each until DoY 090 at 01:12:00, the end of revolution 666. For the remainder of the reporting period, JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle and 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, except from 2008-04-01T21:02:03 to 2008-04-02T00:24:01 during the Flat-Field calibration, when it was 63 packets/cycle.

During this reporting period, 179 of the 180 planned science pointings were executed nominally, 1 was cut short.

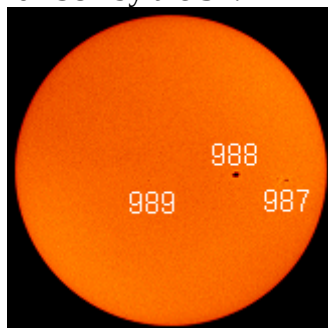
Note: Some more information concerning the OMC operations is provided in the Appendix.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. Three sun spots were visible this week, #987, #988, and #989 none posed a threat of solar flares. #989 had disappeared by the 1st April, and #987 by the 3rd.



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. No pointings were lost to ground problems. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. No problems were reported that led to the loss of data.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. There were however 2 occasions where TM was briefly dropped from DSS 27, and 2 from Redu, one of which led to a slight delay in the execution of a slew. There was no loss of scientific data.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 672 to 675.

Observations have been planned and sent up to revolution 672. Further planning was kept on hold to wait for an assessment on ongoing and possible TOO's.

New TSFs have been received for revolutions 668 and 669.

2. Observation status

A new ECS has been received for revolution 660.

3. ISOC Science Data Archive

No news.

4. ISOC system

Version 19.0 has been tested and is in finalisation.

5. Problems

None.

ISDC

Status of ISDC observation processing on 07/04/2008:

- Latest Standard Analysis completed: observation 05200010020 (Galactic Bulge region, Revolutions 657) on 26/03/2008.

- Latest products archived: observation 05200010021 (Galactic Bulge region, Revolutions 658) on 27/03/2008.

- Latest observation products sent to the observer: observation 04200080003 on 29/03/2008.

5 Special Events

6 Anomalies

The following problem was reported this week that impacted operations.

- On DoY 095, at 00:52:21, probably due to Bad frames from Redu, an AOCS command failed. A manual recovery was performed, without loss of scientific data.

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

AR id	Date Created	Subject	Segment	Status
INT-2984	2008-03-27	Incorrect IBIS setting in POS/ICP 0667_05.ICP	ISOC	Open
INT-2985	2008-04-01	VC-0 playbacks not written to frame archive	IMCS	Closed
INT-2986	2008-04-01	The Frame checker produces incorrect gap files for playbacks	IMCS	Pending
INT_SC-221	2008-04-04	IBIS VETO: CDM#1 HV Breakdown	Spacecraft	Pending

.

7 Future Milestones

The following activity is foreseen in the next few weeks.

- The Spring eclipse season starts on the 30th March 2008, at the end of revolution 666, and continues until the last eclipse on 26th April.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 667

The observations in revolution 667 began with a hexagonal dither, of the object 4U0115+63 (a TOO) (RA 01:18:31.90, DEC +64:14:24.0), lasting ~13.1 hours. They continued with a custom pointing of the Galactic disk (RA 19:04:22.00, DEC +06:17:13.0), lasting ~33.7 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. Finally an OMC Flat Field calibration was performed, a staring observation at attitude (RA 19:57:12.00, DEC -22:36:00.0), for ~3.3 hours, until the end of the revolution.

Revolution 668

The observations in revolution 668 began with a hexagonal dither, of the object 4U0115+63 (a TOO) (RA 01:18:31.90, DEC +64:14:24.0), lasting ~13.9 hours. They continued with a hexagonal dither of XTE J1810-189 (RA 18:10:20.48, DEC -19:04:21.4), lasting ~41.7 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, except from 2008-04-01T21:02:03Z to 2008-04-02T00:24:01Z during the OMC FF calibration when it was: IBIS 90; SPI 88; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2008-03-15T09:20:21.000Z	141.8082	F	Automatic TM processing.
2008-03-15T15:50:38.000Z	141.7553	F	Automatic TM processing.
2008-03-16T18:36:57.000Z	141.7058	F	Automatic TM processing.
2008-03-18T09:08:05.000Z	141.6880	F	Automatic TM processing.
2008-03-19T18:32:25.000Z	141.6682	F	Automatic TM processing.
2008-03-21T08:58:05.000Z	141.6259	F	Automatic TM processing.
2008-03-22T16:21:44.000Z	141.5701	F	Automatic TM processing.
2008-03-24T02:08:04.000Z	141.5587	F	Automatic TM processing.
2008-03-24T08:45:25.000Z	141.5216	F	Automatic TM processing.
2008-03-27T08:44:36.000Z	141.5067	F	Automatic TM processing.
2008-03-28T18:04:16.000Z	141.4688	F	Automatic TM processing.
2008-03-30T09:06:52.000Z	141.4107	F	Automatic TM processing.
2008-03-31T17:54:23.000Z	141.3717	F	Automatic TM processing.
2008-04-02T08:52:19.000Z	141.3565	F	Automatic TM processing.
2008-04-03T01:10:21.000Z	141.3342	F	Automatic TM processing.

This report was generated Fri Apr 4 08:00:43 GMT 2008

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, 29/03/2008 – 04/04/2008

The AOCS operations were executed from the Automatic Timeline.

During this period, 81 Open Loop Slews, 116 Closed Loop Slews and 4 Momentum Biases were executed (as reported by ACC).

2 slews (CSL) were missed from TL, during the observation period due to loss of guide star and glitch on TM links.

This is equivalent to $\sim 1\%$ of the total number of slews planned (197).

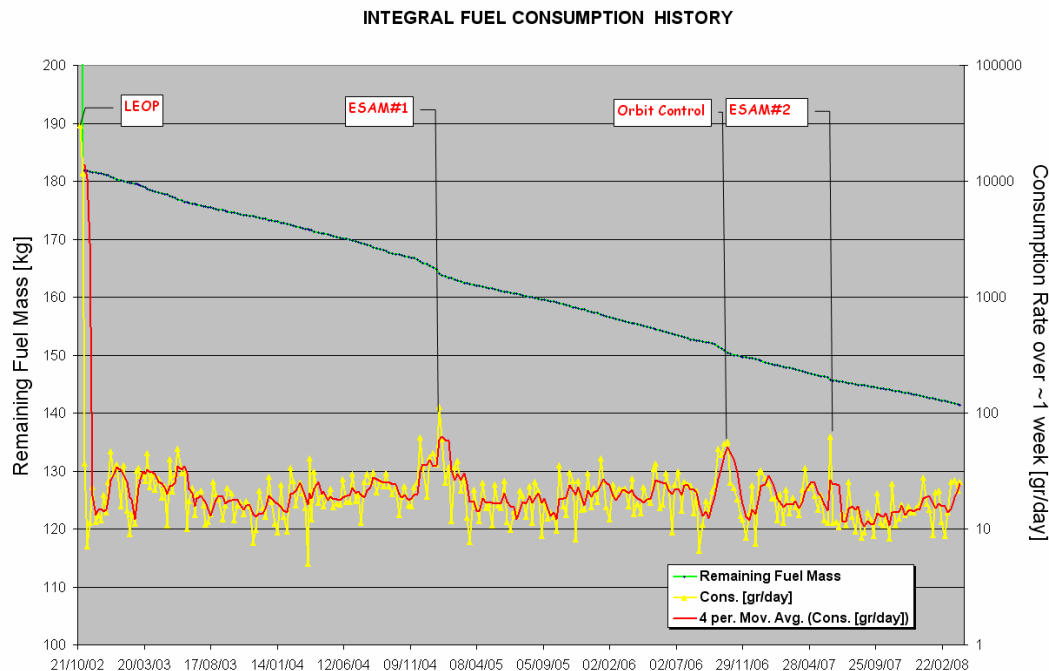
The OTF was not reached during PID 06680026

Orbit Control

No update

Fuel consumption

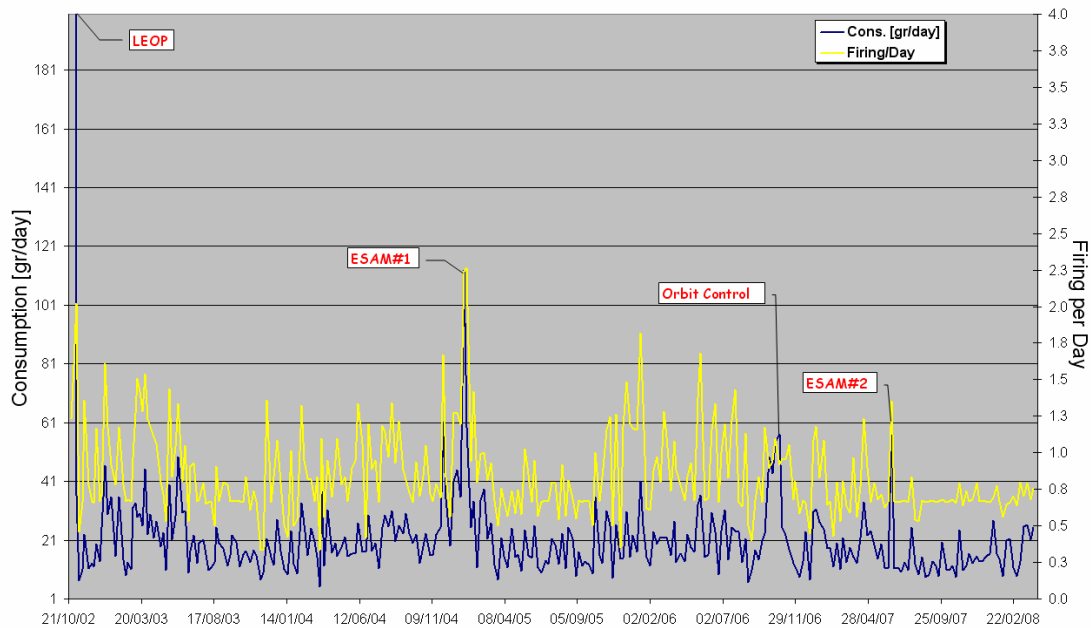
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 03/04/2008 is reported in the plot below.



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 03/04/2008 is reported in the plot below.

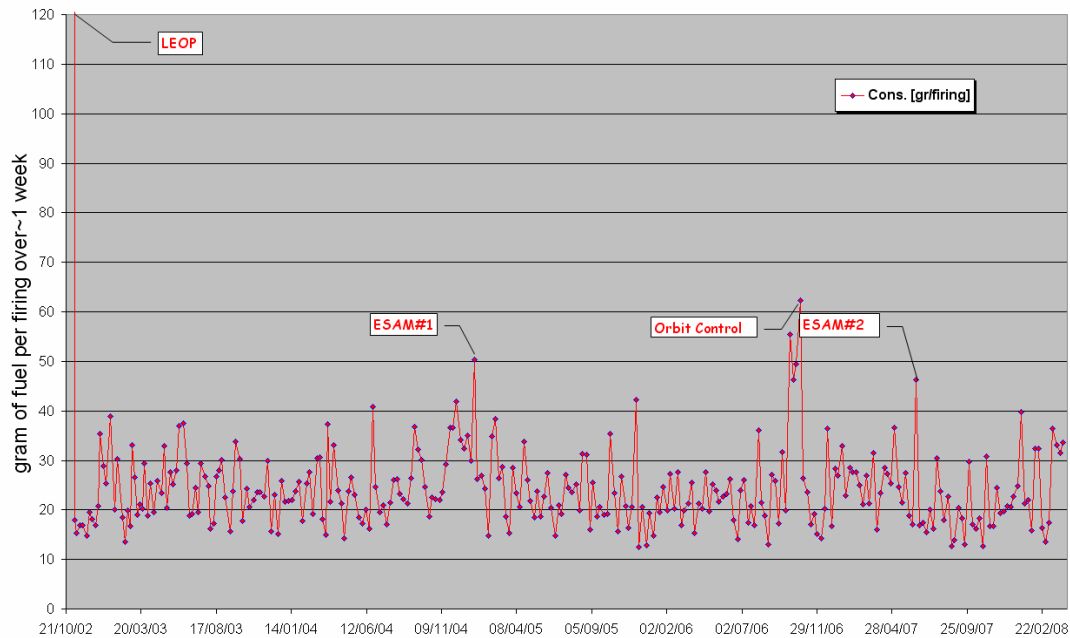
INTEGRAL FIRING PER DAY HISTORY



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

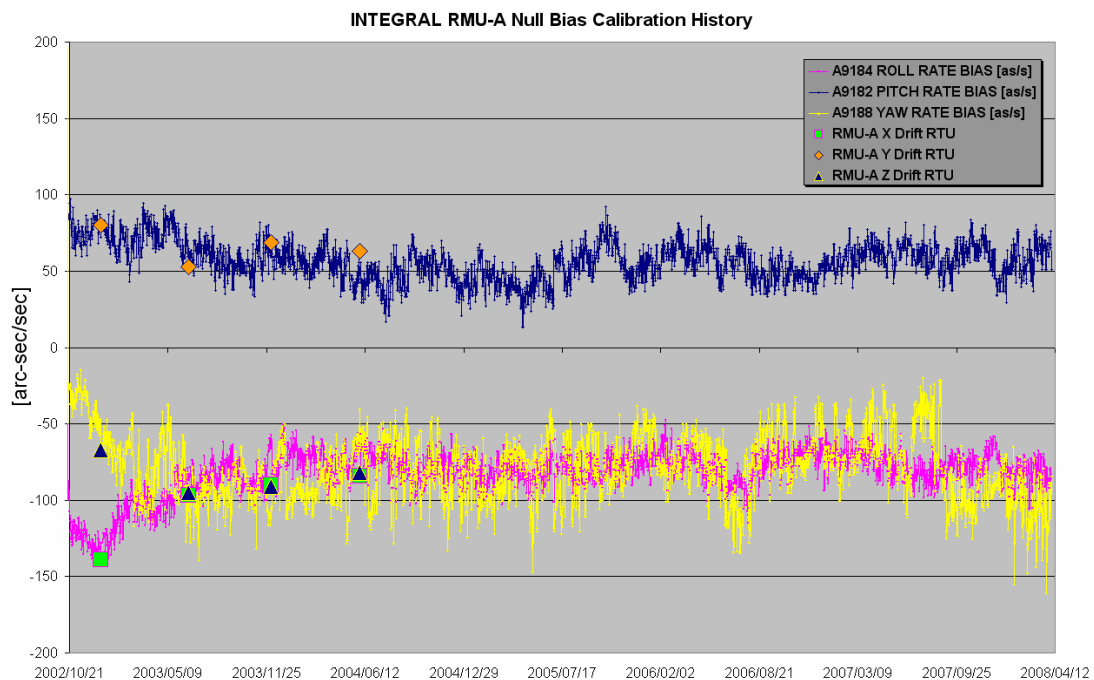
The fuel per firing over the period between 01/11/2002 and 03/04/2008 is shown in the plot below.

INTEGRAL FUEL MASS PER FIRING HISTORY



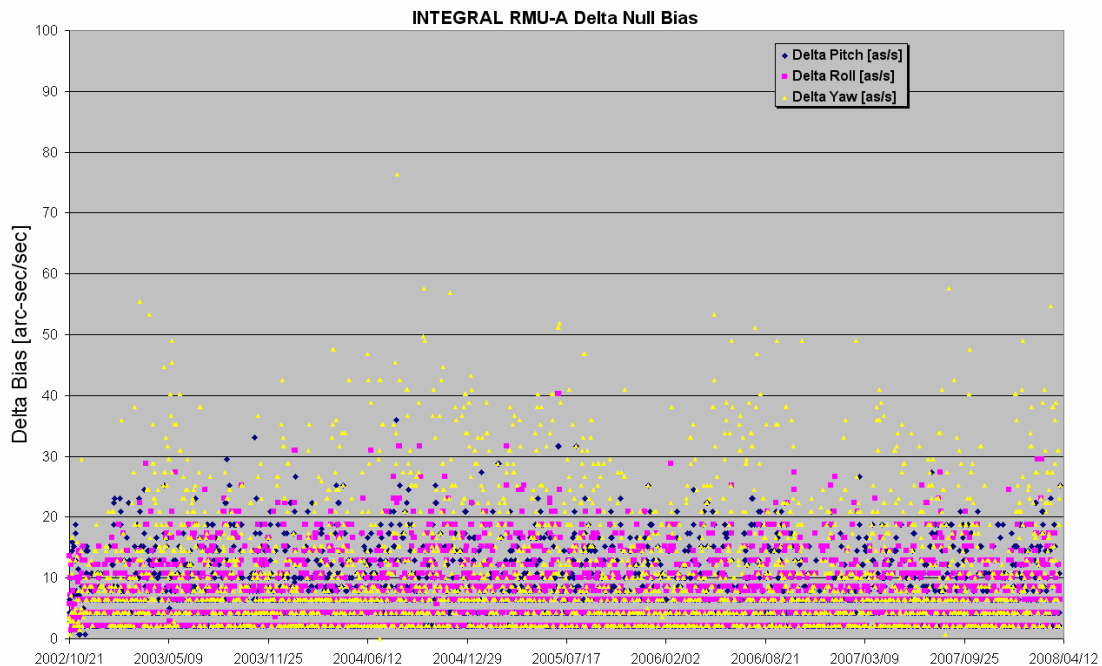
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 04/04/2008 is reported in the plot below.



Problems have been reported during the last period on FDS when generating the drift update for the RMU-A Yaw channel: the limits set on FDS have been violated few times. 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 04/04/2008 is reported in the plot below.



29/03/2008 (Day of Year 089, Revolution 666)

Nothing to report.

Issue : 1
Rev. : 0
Page : 15

The first eclipse operations were nominal from the AOCS point of view. Hereafter is reported summary of the first eclipse passage during rev 666:

		ACCS ECLIPSE MONITORING				Revolution: 666	
		Summer 2008				Date: 30/03/2008	
						DoY: 90	
INPUT							
Penumbra Start		30/03/2008 03:49:00		LOS:		30/03/2008 03:48:00	
Penumbra End		30/03/2008 04:04:40		AOS:		30/03/2008 07:37:00	
Umbr Start		30/03/2008 03:49:00					
Umbr End		30/03/2008 04:04:40					
Eclipse Duration:		0 15 40					
Eclipse Duration [sec]:		940					
IMU Health Check Start		30/03/2008 00:00:01					
Eclipse Imminent Flag		30/03/2008 02:49:20					
ACC IMU AutoCal Start		30/03/2008 03:03:46					
ACC IMU AutoCal End		30/03/2008 03:23:46					
Sun out of FSS FoV		na					
Sun back in FSS FoV		na					
ACC Sample Time		20/03/2008 00:18:05					
FDE Sample Time		20/03/2008 00:18:05					
FCE Sample Time		20/03/2008 00:18:05					
ACC Eclipse Counter		86426					
ACC Eclipse Start		241039					
ACC Eclipse End		243621					
FDE Eclipse Start		241468					
FDE Lark to Eclipse Start		126274					
FDE Eclipse Duration:		1684					
FCE Eclipse Start		241950					
FCE Lark to Eclipse Start		156318					
FCE Eclipse Duration:		1640					
Eclipse Timers		From Loaded Timers		Actual From Telemetry			
		Absolute WRT Pen. Start [sec]		Absolute WRT Pen. Start [sec]		UM [sec] LSD [sec]	
ACC Eclipse Start		30/03/2008 03:31:38		-1042.00 30/03/2008 03:31:38		-1064	
FDE Eclipse Start		30/03/2008 03:42:39		-381.00 30/03/2008 03:42:38		-404 176	
FCE Eclipse Start		30/03/2008 03:43:23		-337.00 30/03/2008 03:43:54		-360 176	
		From Loaded Timers		Actual From Telemetry			
		Absolute WRT Pen. End [sec]		Absolute WRT Pen. End [sec]		UM [sec] LSD [sec]	
FCE Eclipse End		30/03/2008 04:10:43		363		360 176	
FDE Eclipse End		30/03/2008 04:10:43		363		360 176	
ACC Eclipse End		30/03/2008 04:14:40		600 30/03/2008 04:14:38		578	
IMU		Uplink Execution WRT Penumbra End [sec]					
IMU Auto Off Enable		27/03/2008 08:27:18 30/03/2008 04:16:33		713			
IMU On		30/03/2008 03:04:03 IMU H/C Noise Roll [sec]		0.2259			
IMU Off		30/03/2008 04:16:52 IMU H/C Drift Roll [sec]		0.2217			
IMU On Time		8 12 49 IMU Auto Cal Drift Roll [sec]		0.2477			

Nothing to report.

Nothing to report.

The second eclipse operations were nominal from the AOCS point of view. Hereafter is reported summary of the first eclipse passage during rev 667:

ACCS ECLIPSE MONITORING						Revolution: 867	
Summer 2008						Date: 02/04/2008	
						DoY: 93	
INPUT							
Penumbra Start	02/04/2008 03:25	Penumbra Start:		02/04/2008 03:25 10	LOS:	02/04/2008 03:36 00	
Penumbra End	02/04/2008 04:07	Umbral Start:		02/04/2008 03:27 24	AOS:	02/04/2008 07:29 00	
Umbral Start	02/04/2008 03:27	Umbral End:		02/04/2008 04:06 07			
Umbral End	02/04/2008 04:06	Penumbra End:		02/04/2008 04:07 55			
ACC Sample Time		Eclipse Duration:		0.42 45			
FCE Sample Time	01/04/2008 09:53 25	Eclipse Duration [sec]:		2565			
FDE Sample Time	01/04/2008 09:53 25	IMU Health Check Start		02/04/2008 00:00 00			
FDE Sample Time	01/04/2008 09:53 25	Eclipse Imminent Flag		02/04/2008 02:25 30			
ACC Eclipse Counter	176349	ACC IMU AutoCal Start		02/04/2008 02:39 46			
ACC Eclipse Start	220399	ACC IMU AutoCal End		02/04/2008 02:59 56			
ACC Eclipse End	247609	Sun out of FSS FoV		02/04/2008 03:26 56			
FDE Eclipse Start	220818	Sun back in FSS FoV		02/04/2008 04:06 31			
FDE Lat to Eclipse Start	6.044	Eclipse Timers					
FDE Eclipse Duration	3312	Absolute		From Loaded Timers		Actual From Telemetry	
FCE Eclipse Start	239903	WRT Pen. Start [sec]		Absolute		WRT Pen. Start [sec]	
FCE Lat to Eclipse Start	62606	FCE Eclipse Start		-1095.00	02/04/2008 03:07 34		-1095.00
FCE Eclipse Duration	3266	FDE Eclipse Start		-463.00	02/04/2008 03:18 37		-464.00
		FCE Eclipse Start		-419.00	02/04/2008 03:19 30		-337.00
		Absolute		Actual From Telemetry		UM [sec] LSO [sec]	
		WRT Pen. End [sec]		Absolute		WRT Pen. End [sec]	
		FCE Eclipse End		264	02/04/2008 04:12 39		360
		FDE Eclipse End		264	02/04/2008 04:12 39		360
		ACC Eclipse End		590	02/04/2008 04:17 45		578
		IMU		Execution		WRT Penumbra End [sec]	
		UpLink		30/03/2008 06:46 04		694	
		IMU On		02/04/2008 00:11 36		IMU H/C Noise Roll [on/s] 0.3040	
		IMU Off		02/04/2008 04:19 40		IMU H/C Drift Roll [on/s] 0.1623	
		IMU On Time		4:06:13		IMU Auto Cal Drift Roll [on/s] 0.2133	

Loss of guide star: at 18:48:19z a loss of the current guide star occurred. As foreseen by the IPS logic, the IMU1 went on until a new guide star picked. The AOCS s/s was disabled in TL and the slew ID 066800010 was not executed from TL.

The operator performed a manual mapping and a manual recovery from attitude from PID 06680009 to the attitude of PID 06680010. The next slew ID 06680011 was manually updated in TL.

The AOCS s/s was enabled in TL at 19:24z.

The following slew was not executed from TL: 06680010 (CSL).

03/04/2008 (Day of Year 094, Revolution 668)

Loss of guide star: at 10:26:32z a loss of the current guide star occurred. As foreseen by the IPS logic, the IMU1 went on until a new guide star picked.

The operator performed a manual mapping and the next slew ID 06680027 was manually updated in TL.

No impact on TL. The OTF was not reached during PID 06680026.

04/04/2008 (Day of Year 095, Revolution 668)

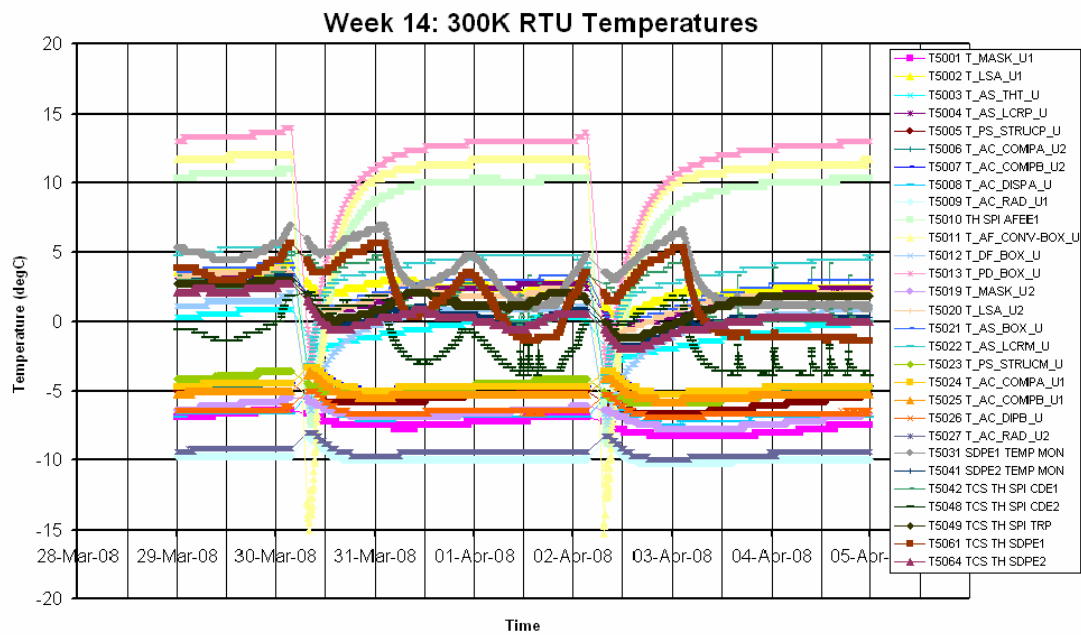
CEV timed out (glitch on TM links) during slew execution: at 00:52z a timed out (likely due to a glitch on the TM links) of the Command Execution Verification (CEV) associated to the TC A8119 (FDE manoeuvre timer) caused the slew ID 06680040 to fail release. The AOCS s/s was disabled in TL.

The operator performed a manual mapping and a manual recovery from attitude from PID 06680039 to the attitude of PID 06680040. The next slew ID 06680041 was manually updated in TL. The AOCS s/s was enabled in TL at 01:33z.

The following slew was not executed from TL: 06680040 (CSL).

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.

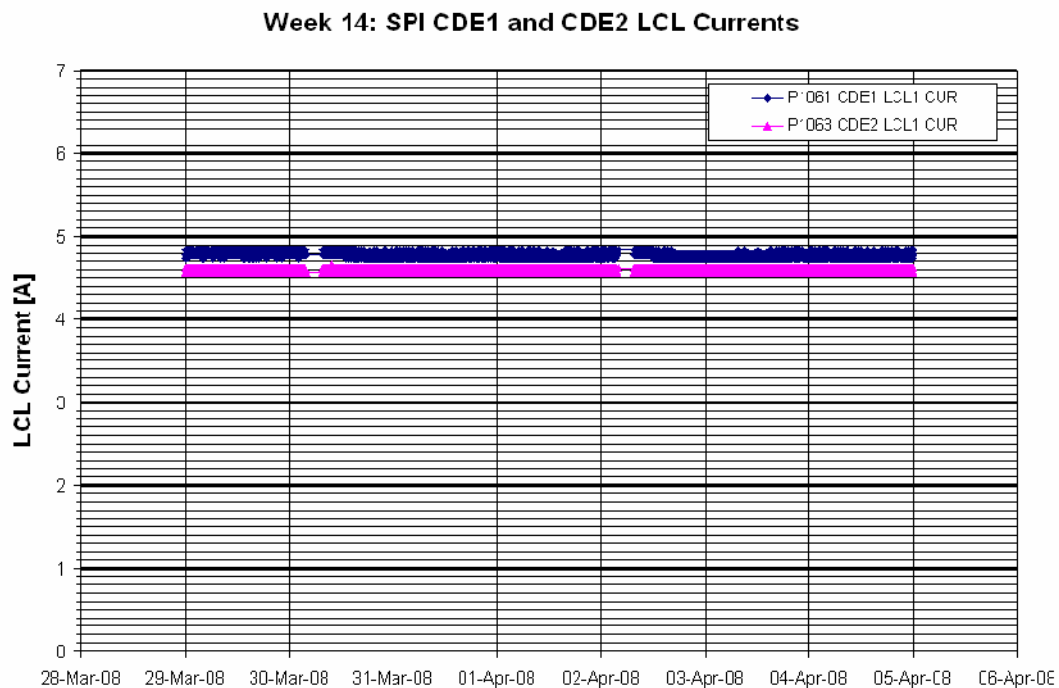


Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K +/-1K.

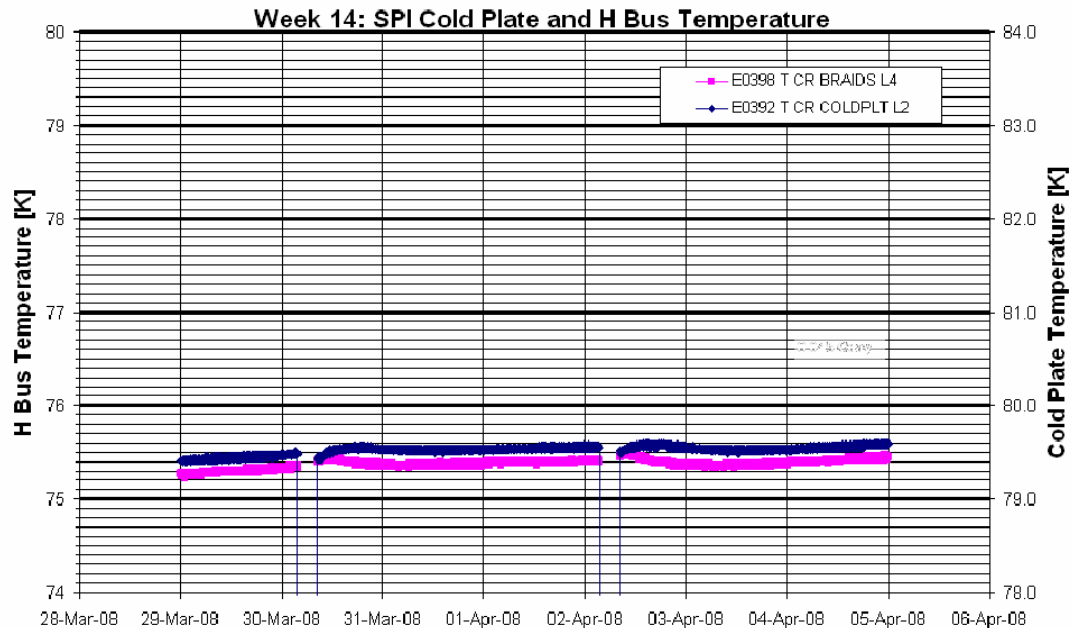
The stroke of all four compressors was set to 40 throughout the week. The average CDE LCL currents were as follows:

- CDE1 LCL Current = 4.78A
- CDE2 LCL Current = 4.58A

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.

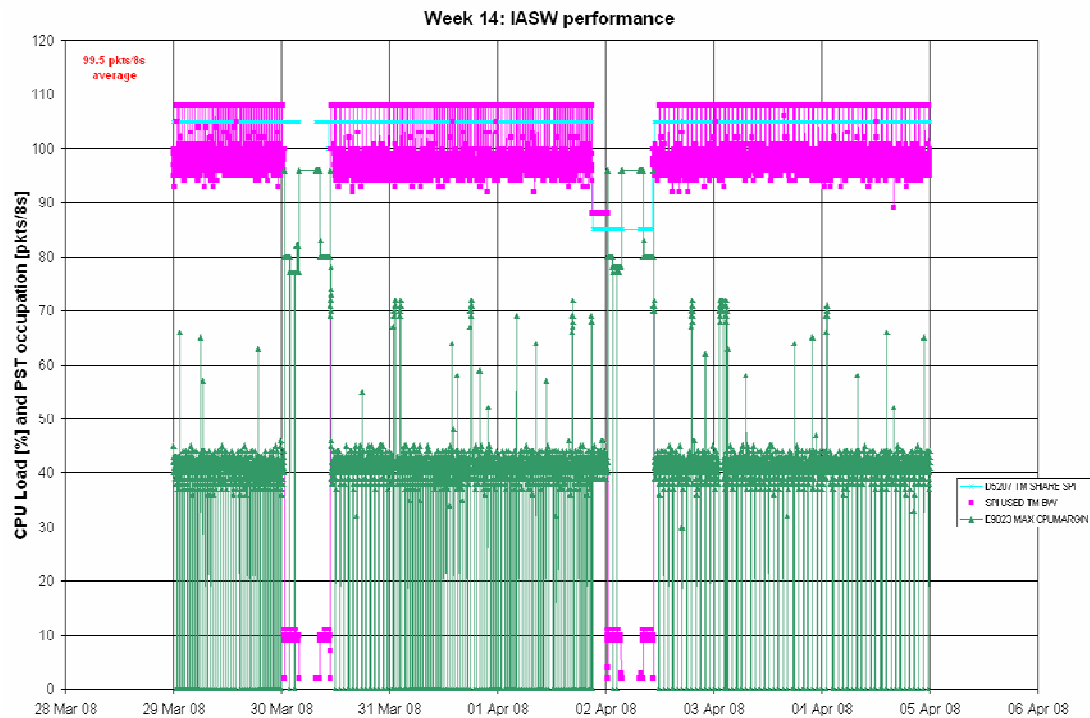


DPE & IASW: The DPE health and IASW performance is nominal.

The IASW version installed is v4.3.4 with SE compression only enabled and the spectra scaling factor set to 8/19 SE.

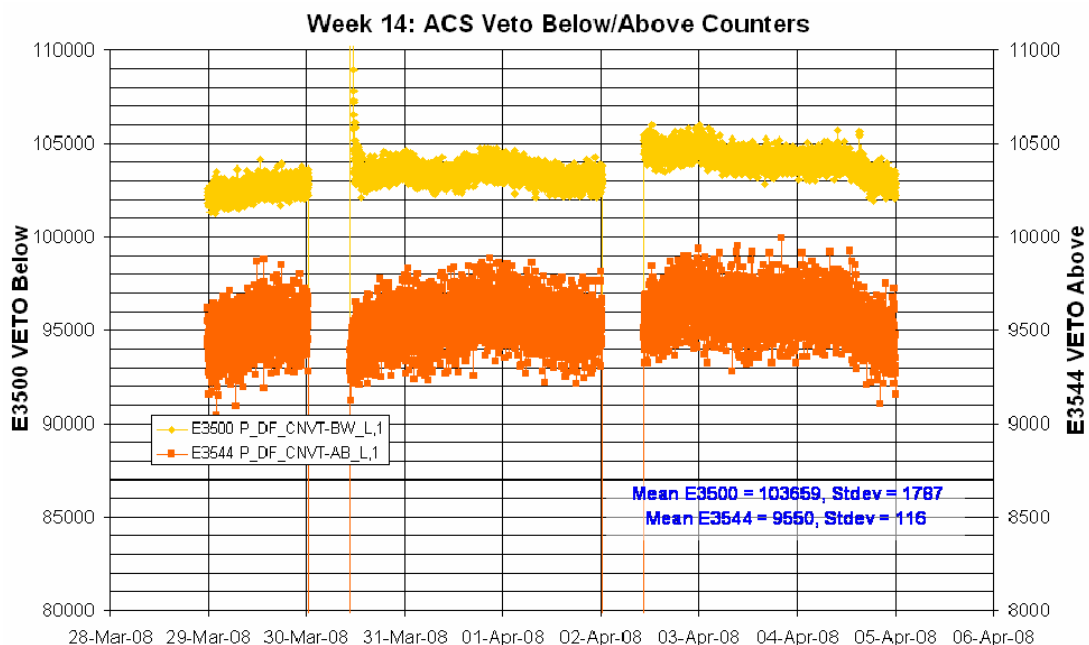
The average TM bandwidth occupation of SPI was 99.5 packets/cycle over the science window. The TM allocation in the science window was 108 packets/cycle, except from 2008-04-01T21:01:20Z until the end of revolution 667 when it was 88 packets/cycle (OMC FFC). This allocation is considering that the over-allocated PST with the additional 3 packets/cycle for SPI was being used, however the Broadcast Packet TM allocation was not updated (see plot below).

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

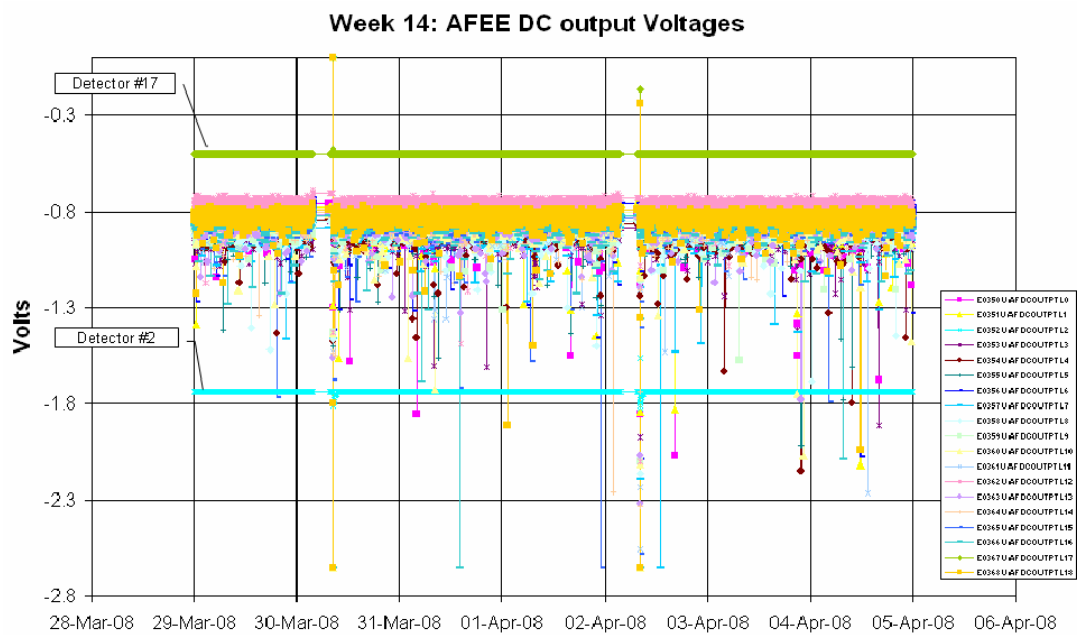


ACS: The performance of the ACS is nominal, except for FEE #81 which remains nominally switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is nominally OFF due to the anomaly on 5/8/2003 (INT_SC-61).

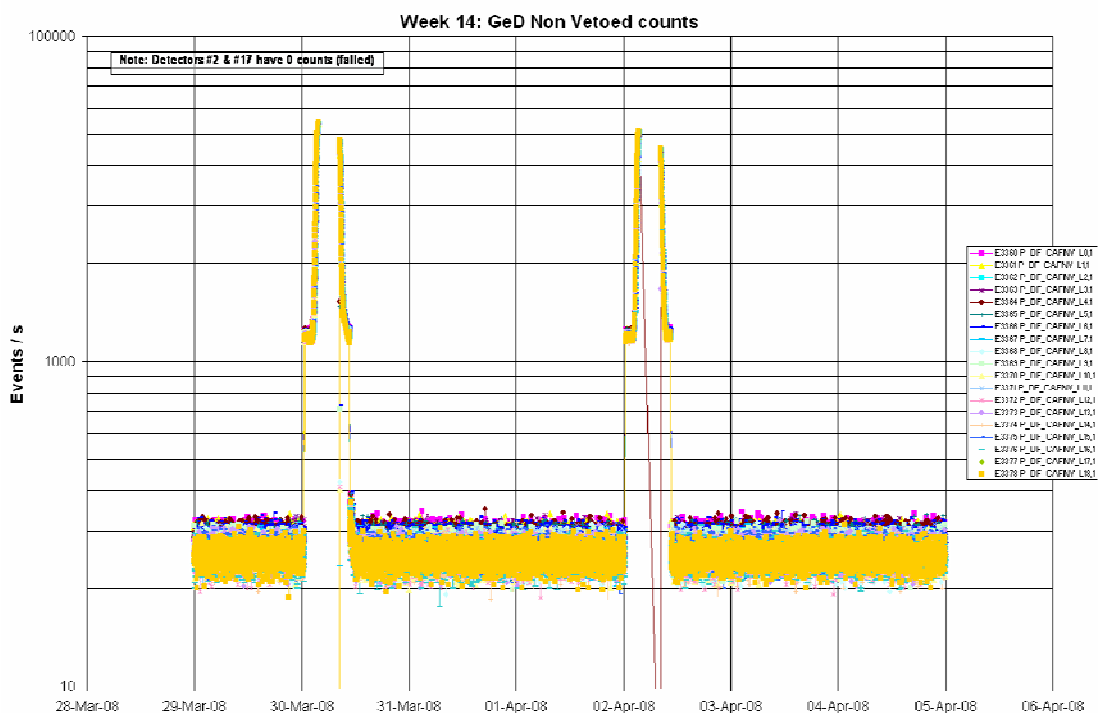
The following plot shows the ACS overall count rate evolution during the reporting period:

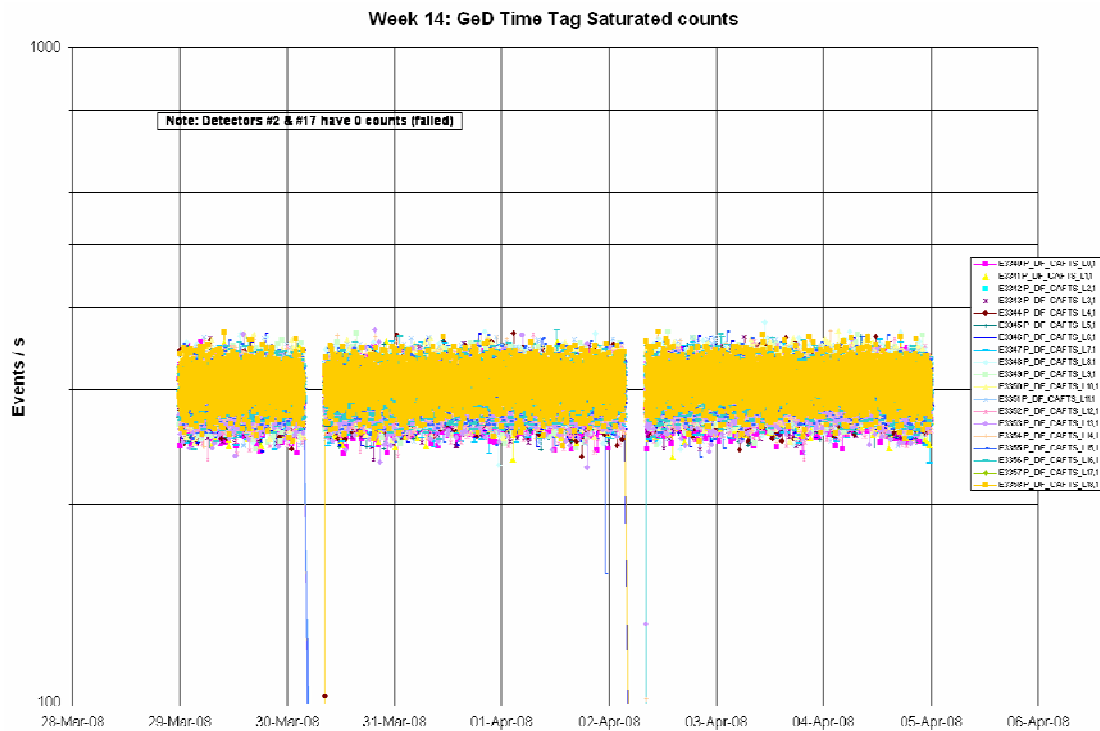
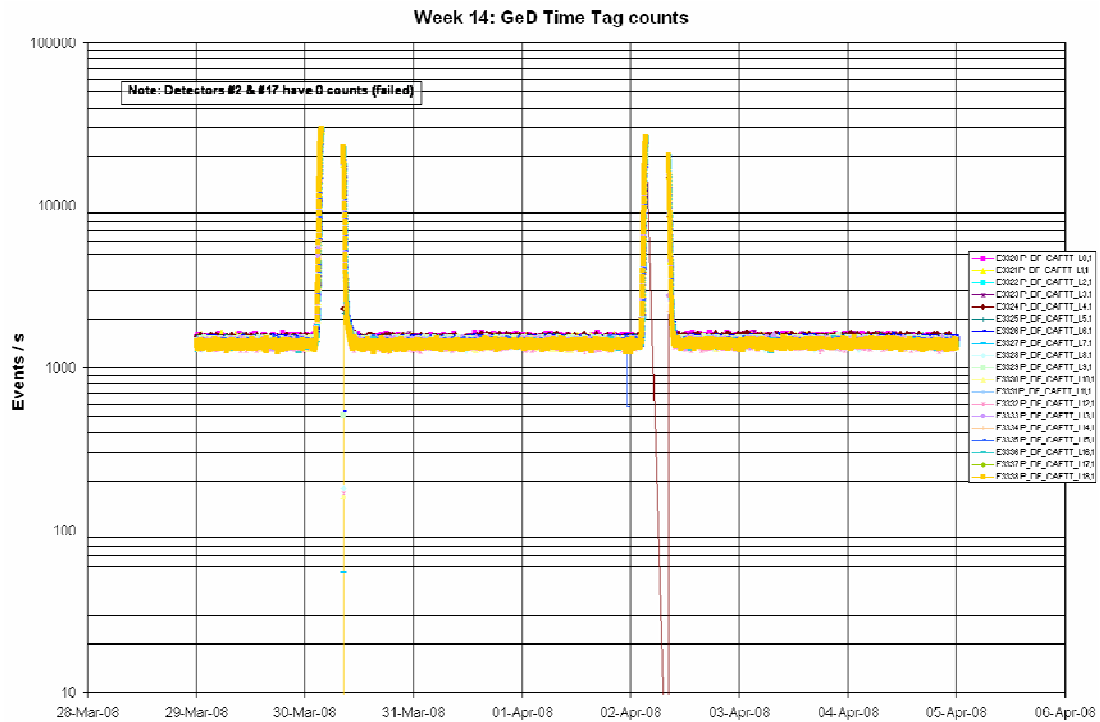


AFEE: The health of the AFEE is nominal. The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06/12/2003 and detector #17 is failed since 17/07/2004.

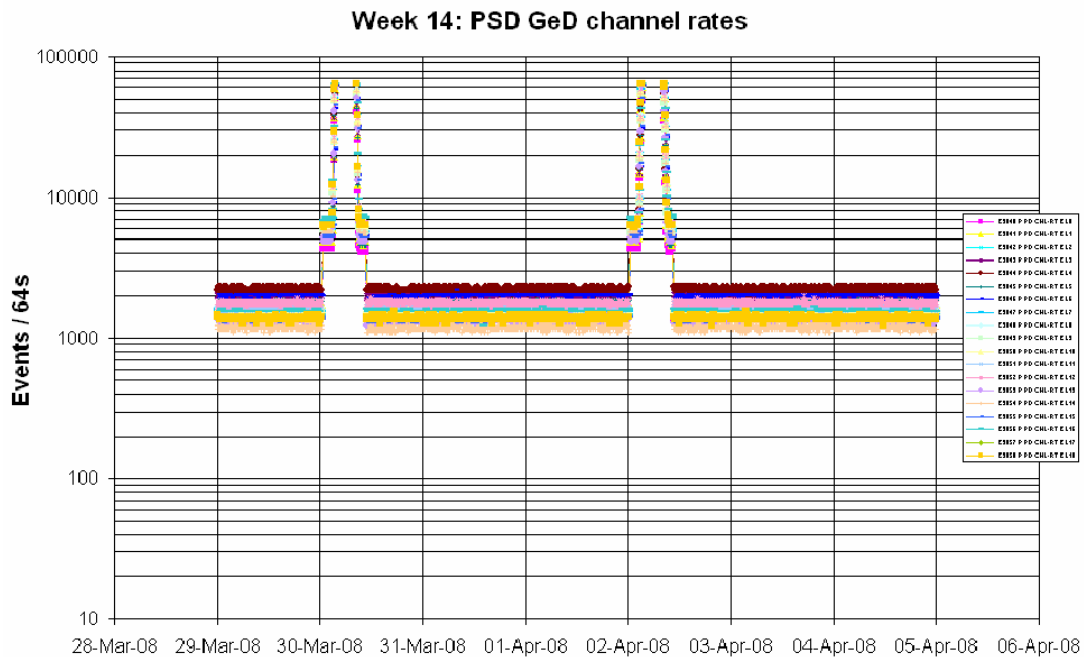


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event count rates during the reporting period.





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



Event Log:

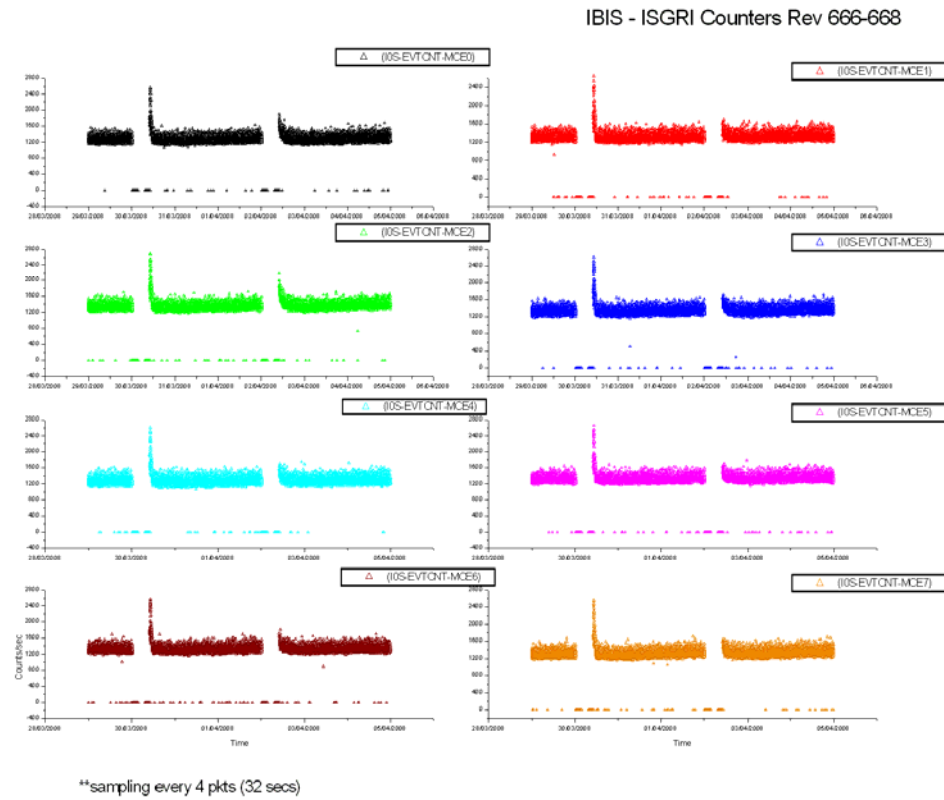
The following non-nominal events occurred on SPI over the reporting period:

- Due to continuing high radiation after the expected belt exit of revolution 667, the TM parameter E3500 started toggling OOLHigh at 10:50:37Z. It returned within limits at 11:23:17Z and no action was taken.
- On 2008-04-02 starting at 12:01:07Z TM parameters E0330- E0348 started going OOL Warning Low. These are the AFEE Analogue Digital Converter temperatures. As they all returned within limits by 13:59:39Z, no action was taken.
- On 2008-04-03 at 12:22:27Z TM parameter E3279 went OOL (value = PARAM > SPEC). This is the ACS FEE HV status #83. After the TCs E0282-E0287 were sent to report the ACS HK data, it returned within limits at 12:33:07Z and no action was taken.
- On 2008-04-03 at 15:23:47Z TM parameter E2187 went OOL (value = PARAM > SPEC). This is the ACS FEE digital status 5 V #37. After the TCs E0282-E0287 were sent to report the ACS HK data, it returned within limits at 15:33:14Z and no action was taken.
- TM parameter E2115 went OOL warning low on several occasions on 2008-04-02 and 2008-04-03. As in each case it returned within limits of its own accord, no action was taken.

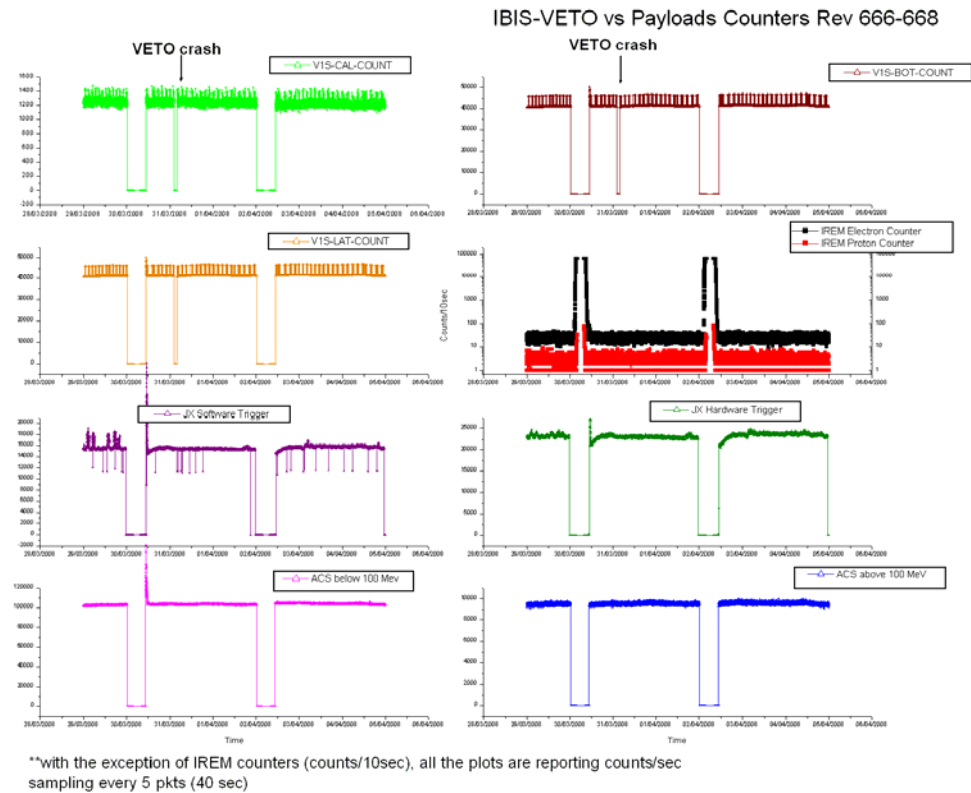
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:



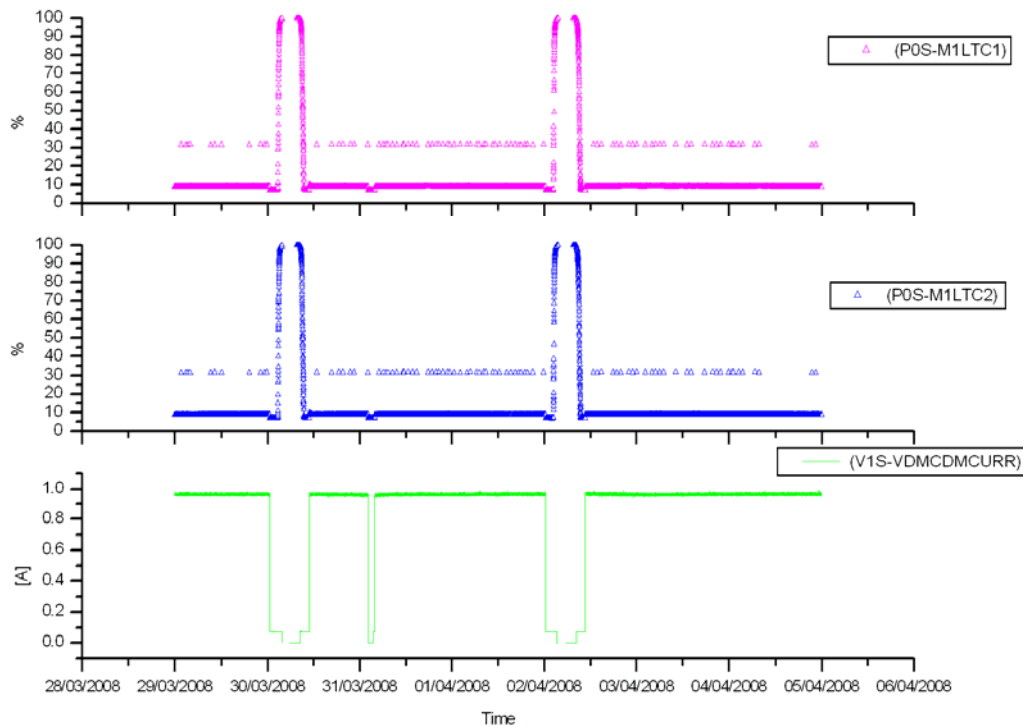
VETO vs Payload Counters:



The week was characterised by low radiation as reported by the payload.

VETO Current:

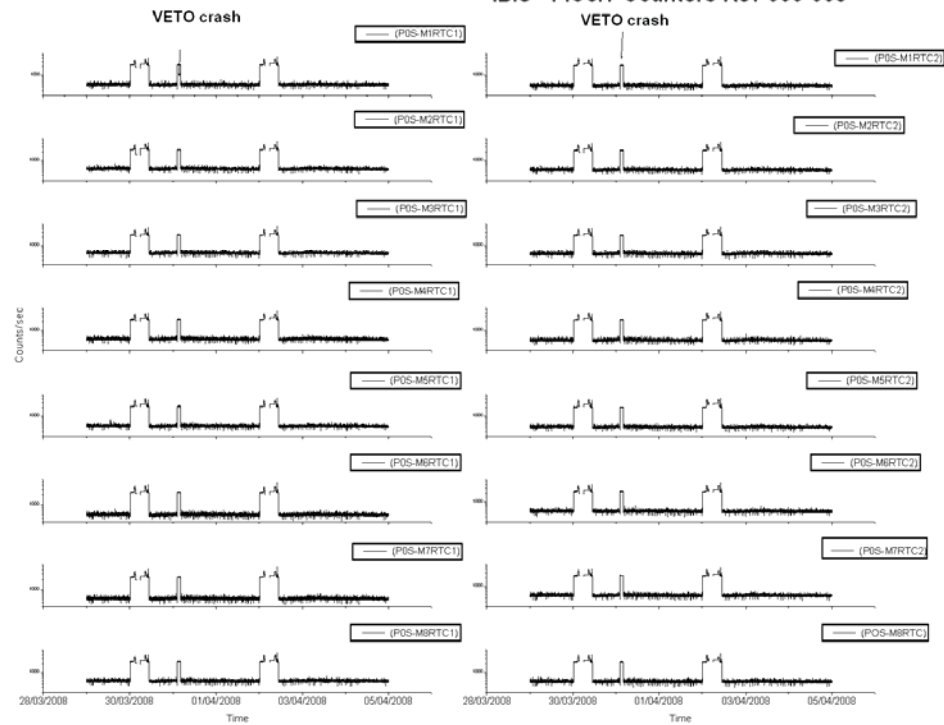
IBIS-VETO Current & PICsIT dead times Rev 666-668



**sampling every 4 pkts (32 secs)

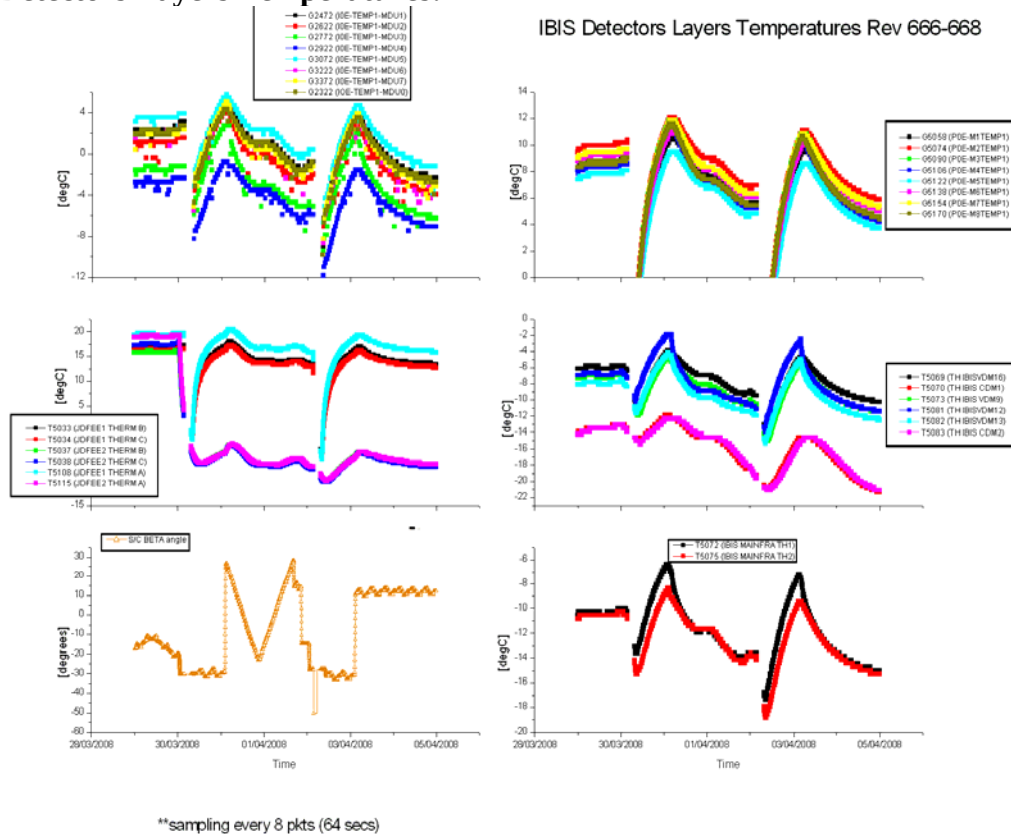
PICsIT Counters:

IBIS - PICsIT Counters Rev 666-668



**sampling every 4 pkts (32 secs)

IBIS Detectors Layers Temperatures:



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 (IOE-OVFWPXADD-Mi) were received during the radiation belt passages.

2008-03-29 (DOY 089, Rev 666)

IBIS operations executed nominally.

2008-03-30 (DOY 090, Rev 666-667)

Following a request from the IBIS PI, the Module Counter Maximum of the Noisy Pixel Handling System was changed from 10000 to 20000 at the start of revolution 667. This was done by disabling the Timeline such that the ED GEISCL03 for the ISGRI calibration scheduled at 10:13:27Z was not released and a manually edited GEISCL03 sequence with the new parameter value was uplinked instead.

2008-03-31 (DOY 091, Rev 667)

At 02:11:25Z the following OOLs were received on the VETO currents:

- G6012 V1S-VETOCURR Alarm Low , Value = 0A
- G6013 V1S-VDMCDMCURR Alarm Low, Vale = 0A

followed at 02:11:41Z by an OOL on the Veto Electronic Box LCL current:

- P2002 LCL CUR VEB A Alarm Low, Value = 0.30A

At the same time, the following OEM began to be generated every 8 seconds:
2008.091.02.11.22.466 2008.091.02.11.27.406 1280 RealTime 129 ANOMALY
IBIS1 IASW TIME-OUT TRANSMITTING LSL DATA
This indicated a problem in transmitting housekeeping data to the DPE.

Prior to the anomaly all VETO, as well as other IBIS, TM parameters were nominal and the behaviour of the instrument was nominal.

Following the anomaly, in addition to the above OOLs and OEMs, the following parameters were showing non-nominal values (all equal to 0 RAW):

- VETO mode: TM G6008 V1S-NOMBIT = STAND/BY (This would indicate VETO had transitioned to Standby mode autonomously.)
- VDM statuses: TM G6014-G6029 = OFF
- CDM01 status: TM G6031 = OFF (CDM02 also OFF as nominal)
- VDM and CDM High Voltages: TM G6035-G6052 = 0 Raw and invalid (due to VDMs and CDM being OFF)
- VETO bottom, lateral and calibration counters: TM G6061-G6063 = 0
- TM G6011 V1S-CDM1TEMP = 104.4degC [0 RAW]
- TM G6002 V1S-SWNR = 0 (This would indicate standard VETO SW, instead of nominal value of 2.)
- TM G6004 V1S-WATCHSTAT = 0 (instead of 0.64 sec)
- EPROMBIT and RAMBIT: TM G6005-G6006 = NOT OK
- Current Essential HK Number: TM G6009 V1S-ESSHKNR = 0
- Internal VECU counter: TM G6010 V1S-VEUCOUNT = 0
- Internal counter of executed TCs: TM G6053 V1S-COMEXNR = 0

However, as these values are all simply zero, they do not necessarily reflect the real condition. In fact all the parameters in the VETO block of the SPID 79102 (i.e. from byte B2 hex to D7 hex) were zero following the anomaly:

```
2008-03-31T02:11:17.302360
SPID: (65535:79102) Time: 2008.091.02.11.17.302360 Seq: 130015 Size: 504
Header:
 0: 0 0 0 0 47F04845 0 49D18 47F0484F 0 4 6DD 0 0 0 1 079 0 A 0 0 1F8
20:1138FFFF 0 1FBDF 0 134FE 0 0 0 0
Body:
0: 8D 0F487 1B118 0 32FE2760 07E6BE3 FFFF 512 275C 07C 6AE2FFFF 4B42759
20: 07C6CE3 FFFF 4E8 2755 081 71E3FFFF 4D32752 07A6AE3 FFFF 496 274B 07F
40: 69E3FFFF 4D62748 07D68E2 FFFF 4E4 2745 07D 6AE2FFFF 4FD7491 74A2 EEB
60: E3E 813 745C7499 11 5 EC8 8147478 7485 FE7 F73 814 745474A5 11AB E38
80: 8147497 74C7 F13 D F 814 747B7487 1046 FC1 8137476 74591067 11C6 813
A0: 74807494 FC4 F F 813FFE6 01A29B8 D E 0 0 0 0 0 0 0 0 0 0 0 0 0 0
C0: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 3944B0 0 136C87 0
E0: 37E3224 F3 0 04C 0 04C5B 15 07A80 0 0 0 0 0 FFC0F8 0 E2 0D2 0 0 0 041
100: E0F8707F E07FE0FE 3DE28C21 0 0 0 0 FFFFF0 0 0 0 0 0 AA9A 11C 1039 9 0
120: 0 0 0 D A82A5E45 EB 058 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
140: 22 0 0 0 0604233 6FFFFE0 C8C2C8CA CA7B 0 F A1E0F155 1018 0 1 1DAE4233
160: 32A9281 80 62EEB FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
180: FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF
1A0: FFFFFFFF FFFFFFFF FFFFFFFF FFFF 0CA B7 2 3 1 20 3BAFB 0 0 060 1DAE4233
1C0: 0 0 0 0 80 62EEB
```

In line with the OOL reaction specified for TM parameters G6012 and G6013, the following were performed:

- 02:23:57Z FCP_IBIS1_0313 IBIS Standby Mode
- 02:28:34Z FCP_IBIS1_0203 VETO Stand-By Mode

- 03:05:38Z CRP_IBIS1_0061 IBIS Unconditioned Switch-Off, only the part relating to VETO switch OFF, i.e. TC P4008 LCL IBIS VEBA OF.
(N.B. At this time the status of the VETO Nominal Substitution Heater (TM T8007) was OPEN, instead of CLOSE as is the nominal configuration in sunlight. This was due to the fact that this was an eclipse revolution and the anomaly occurred after the end of the post-eclipse activation but before the ED TENPE_00 to enable nominal substitution heaters, scheduled in the Timeline at 2008-03-31T04:13:04Z.)

At this point, OEM APID 1280 ID 129 ANOMALY IBIS1 IASW TIME-OUT TRANSMITTING LSL DATA were still being received, as the VETO ECR was still ON (hence IASW considered VETO to be ON). Therefore the VETO ECR was then switched off as follows:

- 03:13:41Z FCP_IBIS1_0084 IBIS ECR(s) Setting by Dynamic Default, with TC parameter G8740 = OFF to set the VETO ECR OFF

Following this the OEM APID 1280 ID 129 ANOMALY IBIS1 IASW TIME-OUT TRANSMITTING LSL DATA stopped.

(N.B. The above actions were cross-checked against the nominal VEB-A deactivation procedure FCP_IBIS1_0332 to verify that they were equivalent.)

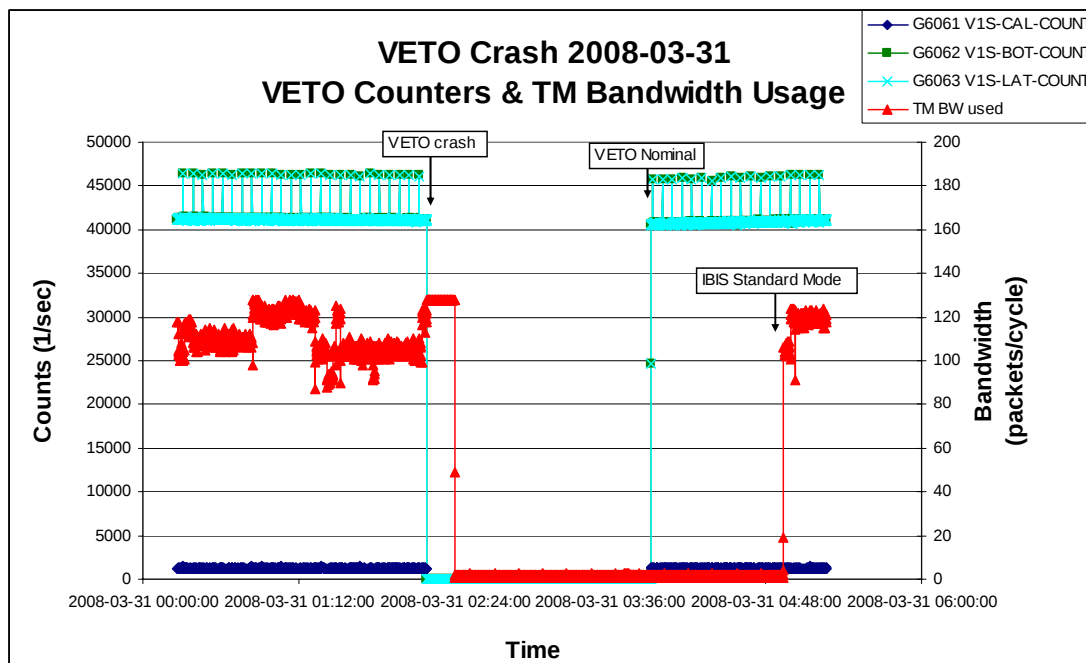
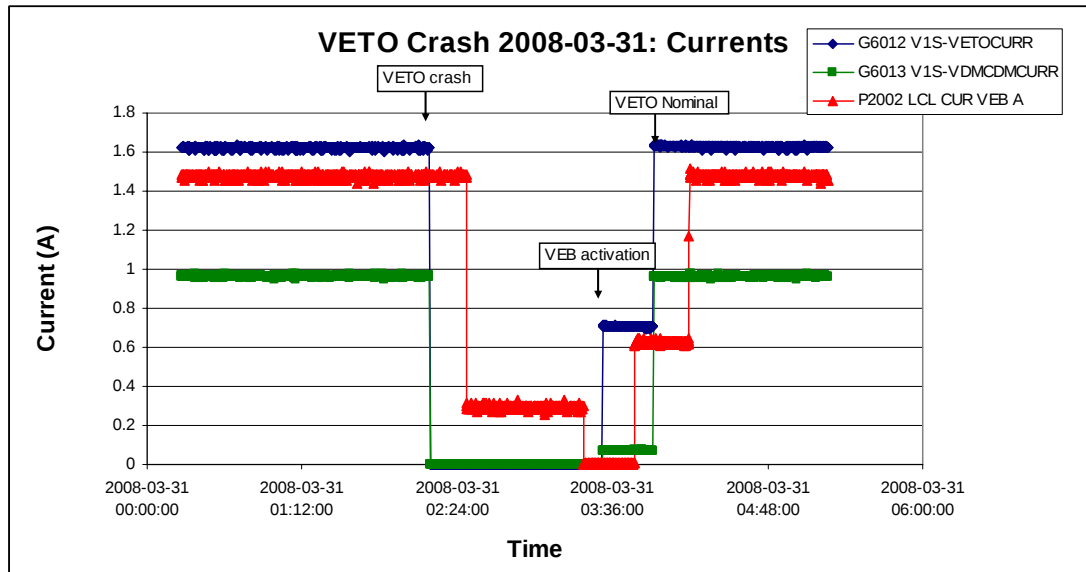
In order to recover the unit the following procedures were then performed:

- 03:28:43Z FCP_IBIS1_0111 VETO VEB ACTIVATION (In this procedure the TCs to disable the VEB Heater A for the duration of the procedure were omitted as the VEB Heater A was already disabled following post-eclipse reconfiguration and was due to be enabled by the Timeline at later stage.)
- 03:39:57Z FCP_IBIS1_0199 IBIS: VETO Restore CTX
- 03:42:02Z ED GEVESP01 (IBIS VETO SW Patch) up-linked
- 03:54:47Z FCP_IBIS1_0201 VETO Nominal Mode. Following this a delay of 15 minutes was introduced, as indicated in the procedure, as the first HK4 packets have old (and meaningless values). During this period several parameters therefore went OOL as expected but later returned within limits. FCP_IBIS1_0201_A0 to FCP_IBIS1_0201_A18 were then performed to check the VETO telemetry. All parameters were found to be nominal.
- 04:55:00Z ED GESTAN02 up-linked with the planned observation parameters

IBIS was back in Science Standard mode at 04:56:10Z and commanding from the Timeline re-enabled. Following the recovery all parameters are nominal and IBIS is operating nominally.

This is recorded as Anomaly Report INT_SC-222.

The following plots show the VETO currents, counters and overall IBIS TM usage before, during and after the anomaly and recovery.



2008-04-01 (DOY 092, Rev 667)

IBIS operations executed nominally.

2008-04-02 (DOY 093, Rev 667-668)

Following a request from the IBIS PI, the Module Counter Maximum of the Noisy Pixel Handling System was changed from 10000 to 20000 at the start of revolution 668. As for the previous revolutions, this was done by up-linking a manually edited GEISCL03 sequence instead of the one in the Timeline. It is planned to continue with this manual procedure until enough data is gathered to determine if the MCM should be set to the new value permanently.

2008-04-03 (DOY 094, Rev 668)

IBIS operations executed nominally.

2008-04-04 (DOY 095, Rev 668)

At 13:19Z, 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:

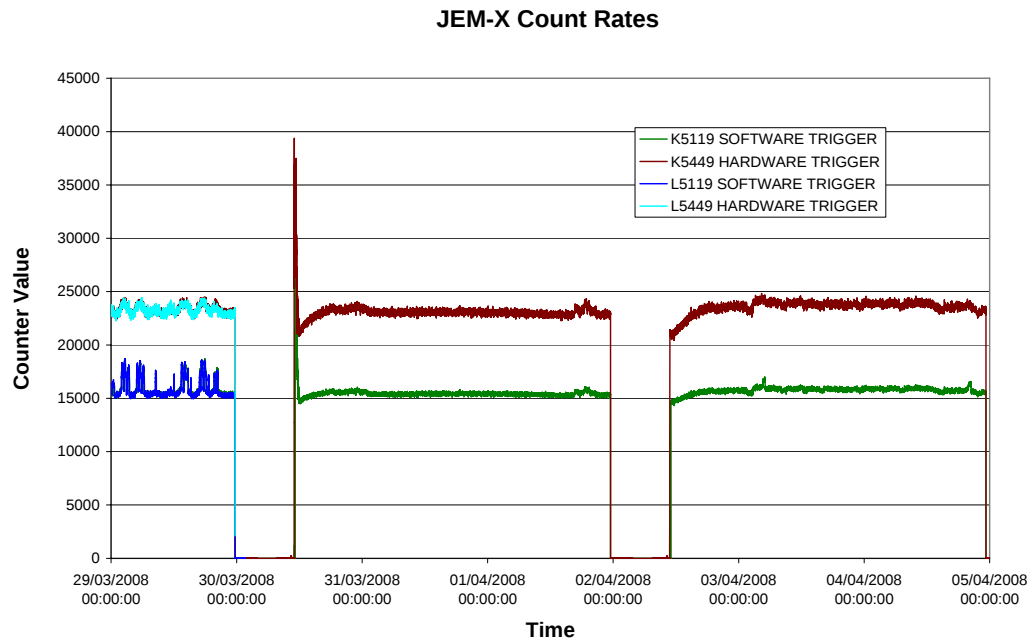
- 14:00:41Z FCP_IBIS1_0312
- 14:24:42Z TC G0129 up-linked to return IBIS to Science Standard mode.

IBIS operations continued 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.

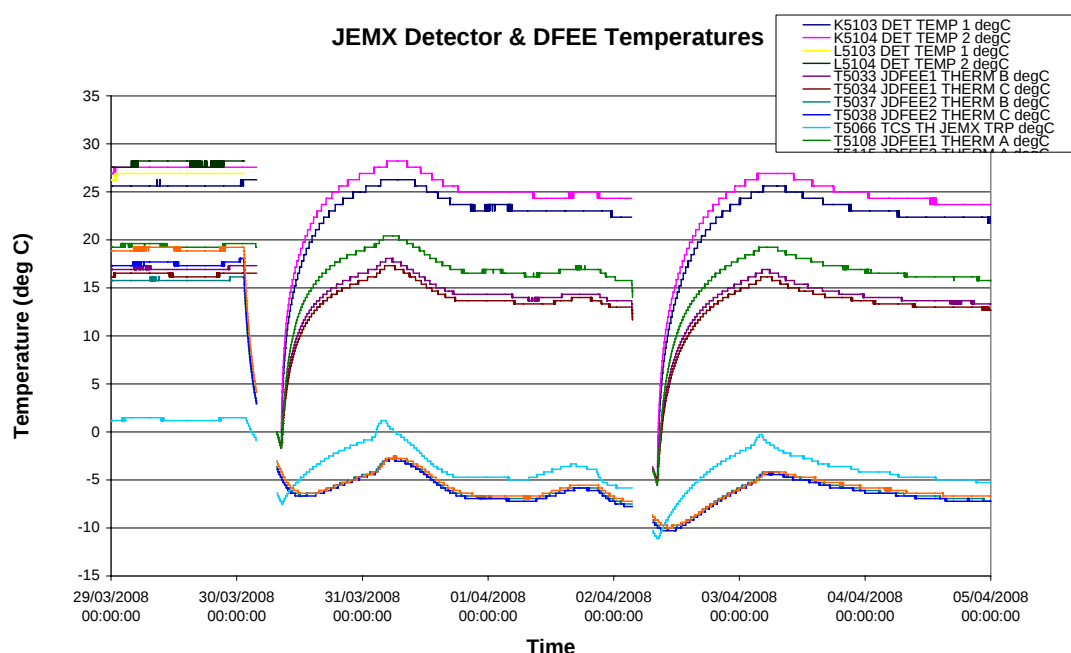


JEM-X Temperatures

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

2008-03-29 (DoY 089, Rev 666)

JEM-X1 and JEM-X2 operations executed nominally.

2008-03-30 (DoY 090, Rev 666)

At 01:12:00, procedures FCP_JEM2_0120 BCP override, FCP_JEM2_9010 to switch off the JEMX-2 DFEE, FCP_JEM2_0120 again were executed. This was followed at 01:27:00 by procedure FCP_JEM2_9001, to disable JEMX-2 in the Broadcast packet, and at 01:34:00, by procedure FCP_JEM2_9000 to switch off JEMX-2. All procedures were performed nominally. These were according to OR 324 raised in response to OCR 233.

From 08:30:34 to 08:30:55, parameter KD5380D was briefly out of hard limits. No action was taken, and there was no impact.

At 11:00:48, 11:06:01, 11:25:21 and 11:27:35, parameter K5449 briefly went out of soft limits. At 11:08:33 and 11:10:31, parameter K5136 exceeded soft limits. No action was taken, and there was no impact.

2008-03-31 (DoY 091, Rev 667) to 2008-04-01 (DoY 092, Rev 667)

JEM-X1 and operations executed nominally.

2008-04-02 (DoY 093, Rev 667)

From 08:19:28 to 08:19:56, parameter KD5380D was briefly out of hard limits. No action was taken, and there was no impact.

From 08:56:00 to 10:40:33, parameter K5102 repeatedly went out of soft limits. No action was taken, and there was no impact.

2008-04-03 (DoY 094, Rev 668) to 2008-04-04 (DoY 095, Rev 668)

JEM-X1 and operations executed nominally.

8.3.5 OMC Operations

2008-03-29 (DoY 089, Rev 666) to 2008-03-31 (DoY 091, Rev 667)

Nothing to Report.

2008-04-01 (DoY 092, Rev 667)

From 21:01:35 to 23:53:14, an OMC Flat-Field calibration was conducted. This was followed by a Dark Current calibration from 23:53:44 to 00:24:01. Both were performed nominally.

2008-04-02 (DoY 093, Rev 668)

Nothing to Report.

2008-04-03 (DoY 094, Rev 668)

At 18:48:19, an AOCS problem (loss of guide star), forced an interruption of the Timeline. A recovery was performed, and the OMC commands manually up-linked at 19:15:27. The impact was pointing 06680010 was cut short from a planned 3572 to 2505 seconds.

2008-04-04 (DoY 095, Rev 668)

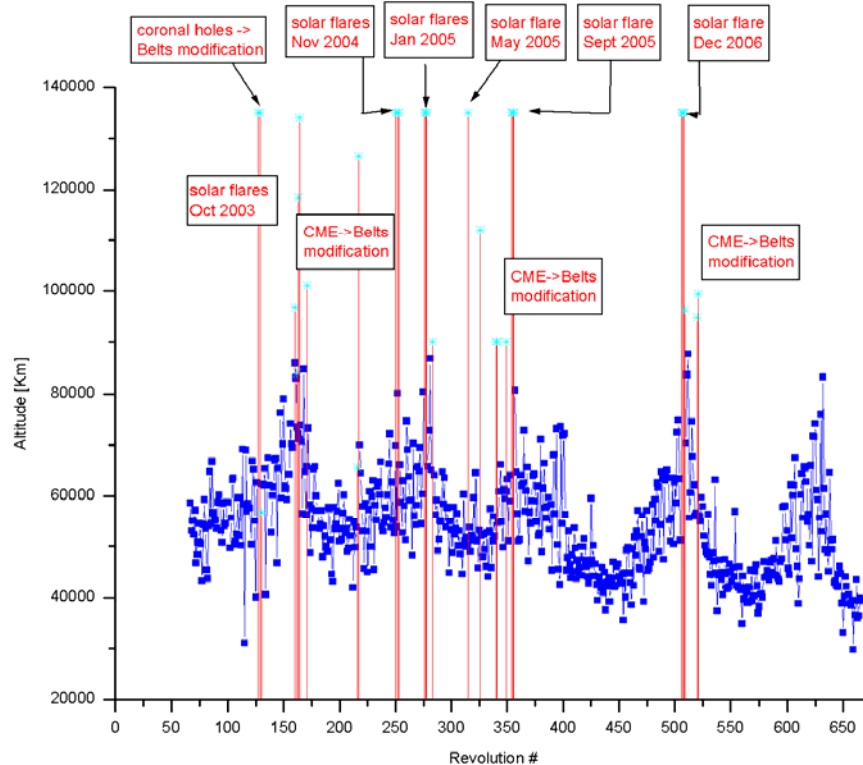
At 00:52:21, an AOCS command failed, probably due to a brief drop in TM. The Timeline was suspended, and a recovery performed. The OMC commands were manually uplinked at 01:13:19. Pointing 06680040 was completed nominally.

On DoY 090 at 00:36:07 and DoY 093 at 00:24:24 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]
666	RAD_ENTR R 2008-03-30T00:36:02Z	30/03/2008 02:28:22	39395.8	30-Mar-2008 02:13:22	41800.41
667	RAD_EXIT R 2008-03-30T10:38:58Z	30/03/2008 10:59:50	55276.2	30-Mar-2008 09:43:22	45239.3
667	RAD_ENTR R 2008-04-02T00:24:17Z	02/04/2008 02:21:02	39340.3	02-Apr-2008 01:59:29	42238.81
668	RAD_EXIT R 2008-04-02T10:27:26Z	02/04/2008 09:38:14	>>41228.2	02-Apr-2008 09:39:29	46243.98

Reference

High radiation

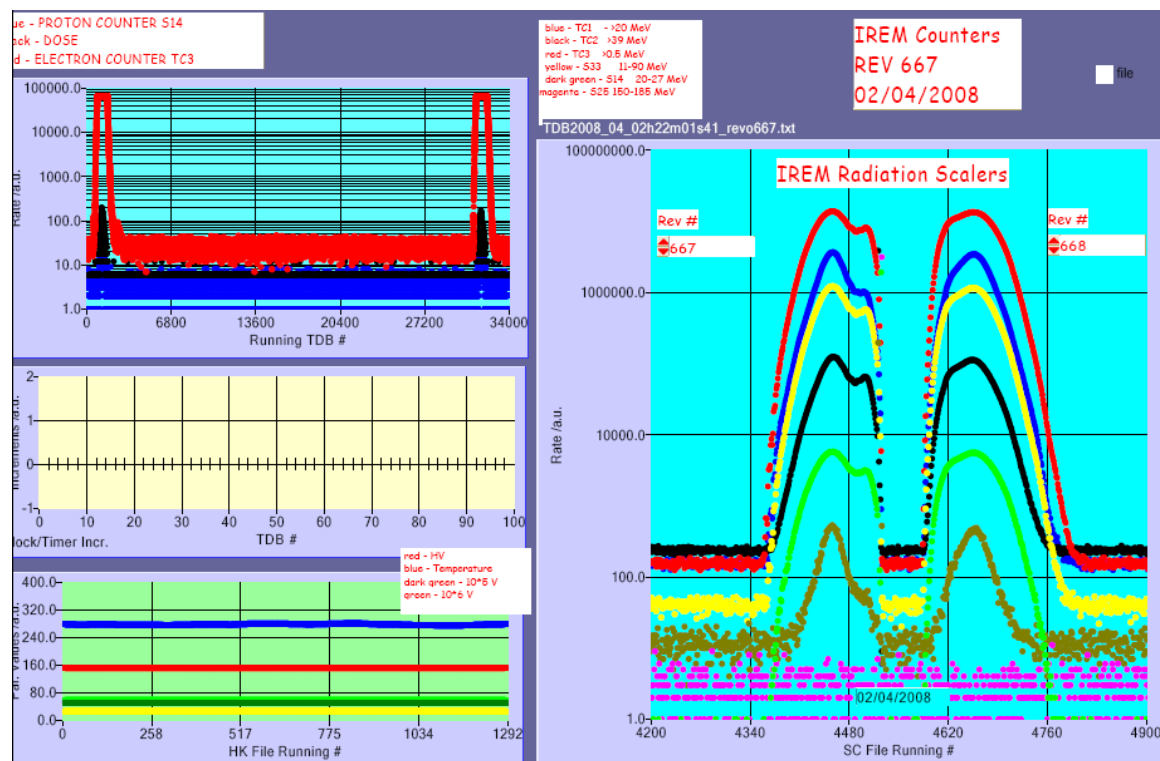
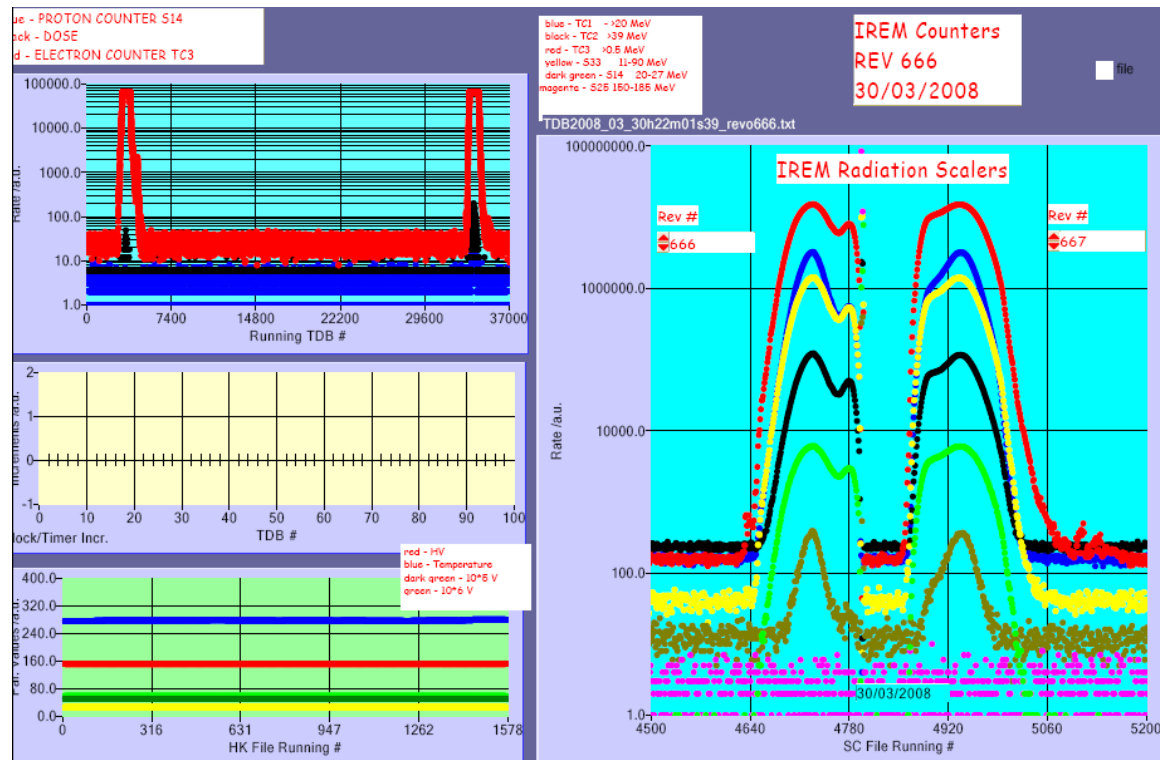
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

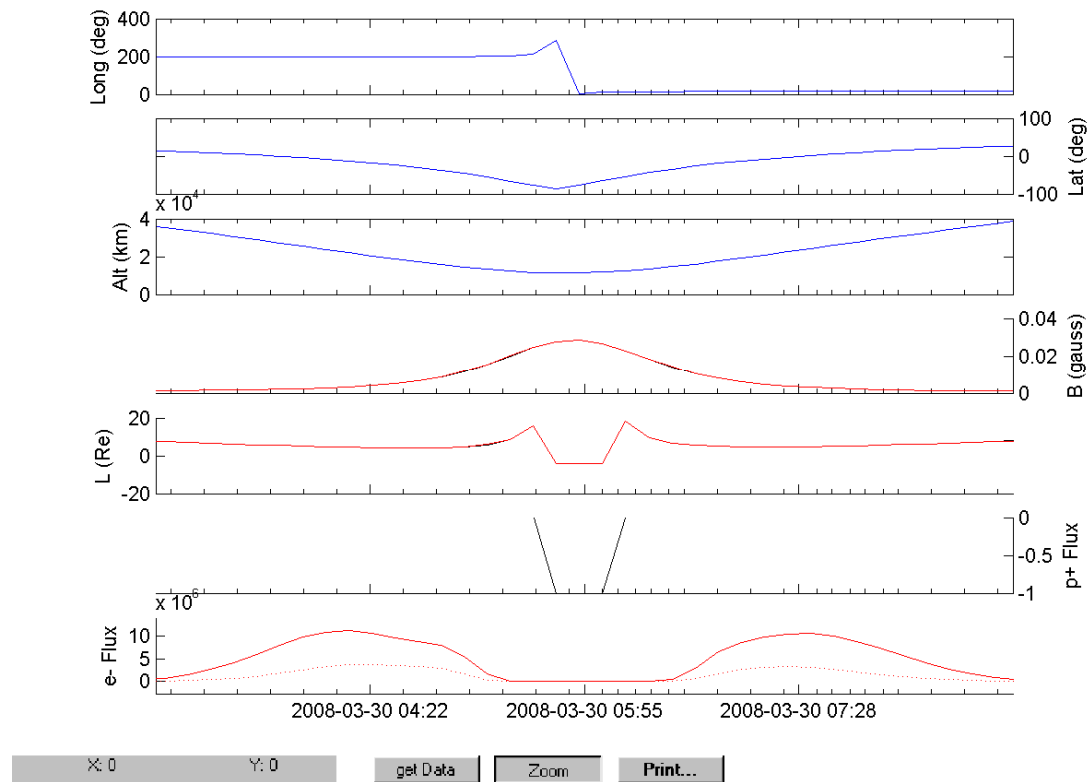
* Rad belt entry time ignoring previous threshold crossings where a gap of more than 30 minutes is present.

IREM radiation counters:

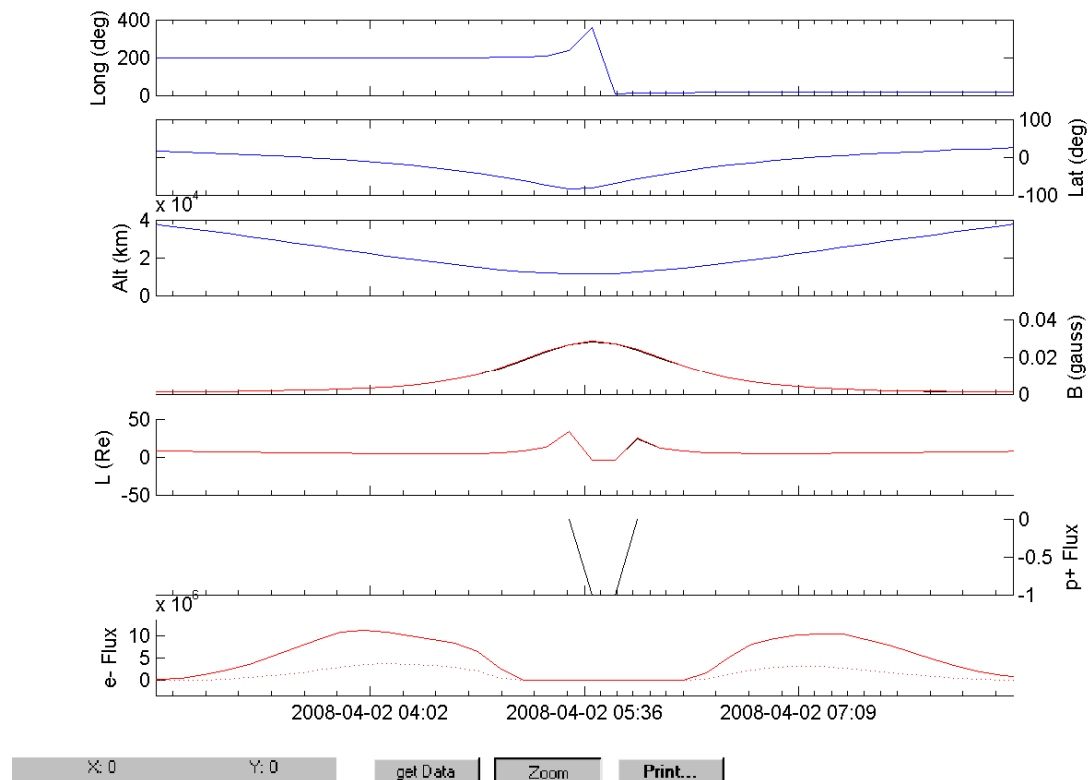


IREM Predicted Radiation Belt Passages

Rev 666

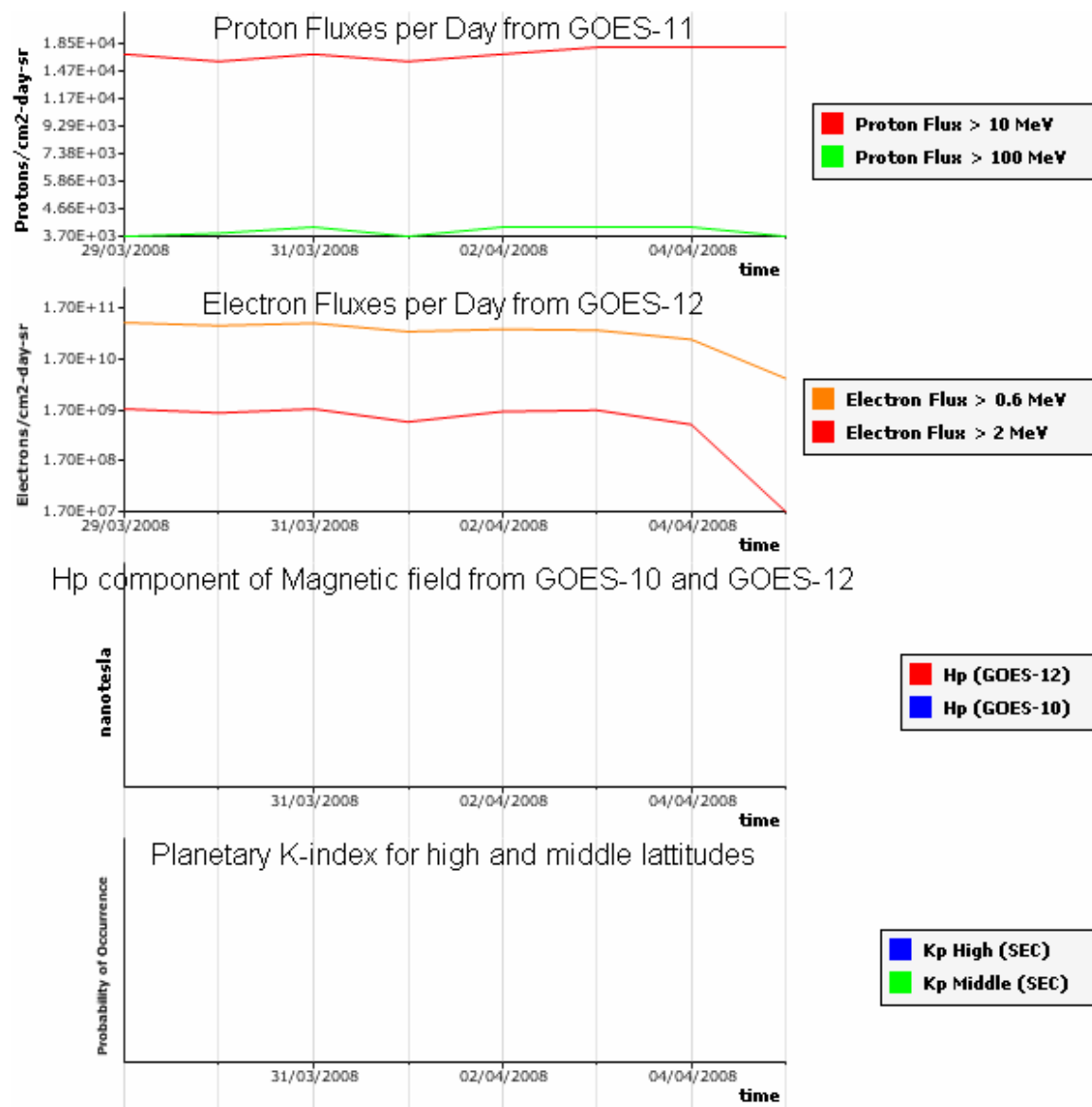


Rev 667



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

The data from the X-Ray fluxes is not available this week.



Proton and electron flux report low radiation background.

Hp component of the Geomagnetic Field is essentially parallel to the Earth's rotation axis. A drop near 0 nT is associated with a significant variation in the magnetic field. Kp index is based on ground magnetometers. Kp ≥ 5 features storm-level geomagnetic activity.