

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OAI
No. 254
Week 31
06.08.07
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 29.07.07 until 04.08.07 (both dates inclusive) and covers the revolutions 585 and 586.

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 series of Galactic Disk Latitude Scans (RA 14:38:19.20, DEC -57:58:48.0), (RA 14:27:57.60, DEC -62:50:24.0), (RA 14:26:19.20, DEC -58:37:48.0), (RA 14:22:07.20, DEC -58:49:48.0), (RA 14:22:52.80, DEC -63:03:36.0), and (RA 14:20:55.20, DEC -58:53:24.0), and a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6).

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 wrap around of the COBT occurred as expected on the 30/07/2007.

4 slews were missed from TL, during the observation period, due to problem with TM link at REDU station, FDS failing slew update and S/T process.

The fuel consumption over the period between 26/07/2007 and 02/08/2007 was 0.0948 Kg. The remaining propellant is in the order of 145.0497 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.

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

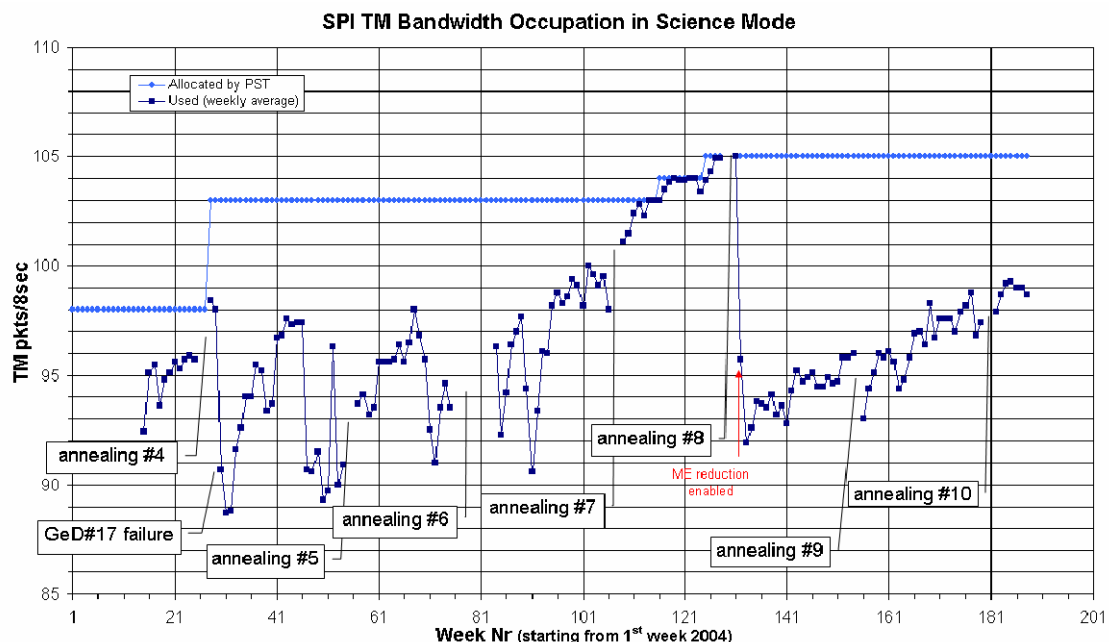
Following the 10th annealing, which ended on 17th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). Detector #2 is failed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

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

On 2007-08-01, an anomaly occurred in the automatic reconfiguration of SPI at radiation belt exit of revolution 586 (recorded in Anomaly Report INT_SC-196).

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. The average telemetry occupation when the TM allocation was 105 packets/cycle was 98.7 packets/cycle.

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



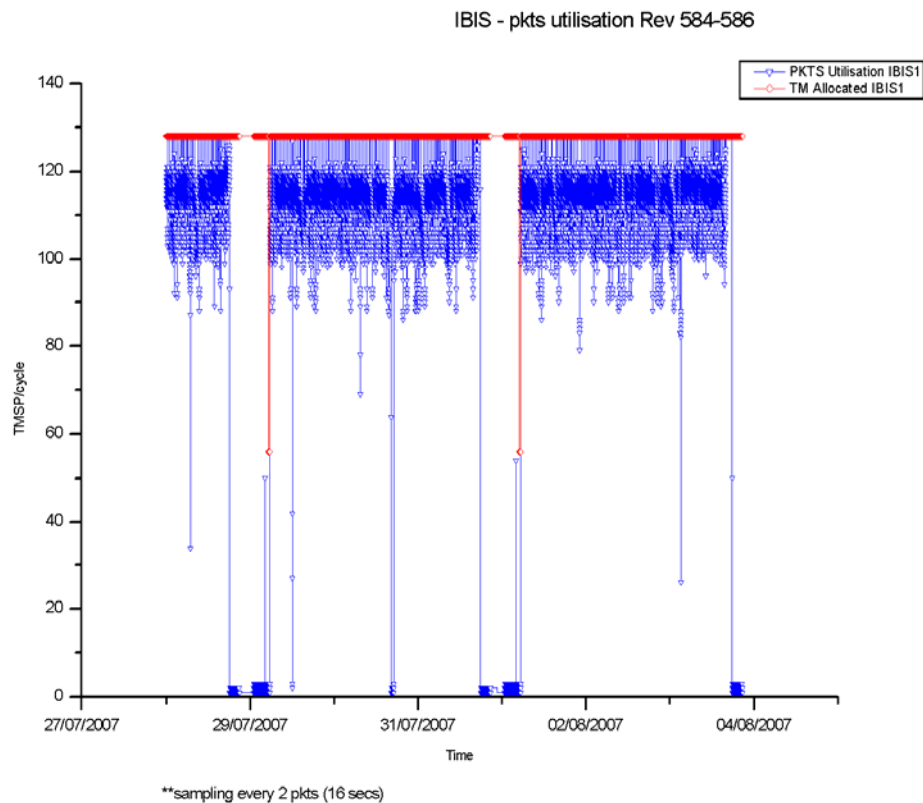
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

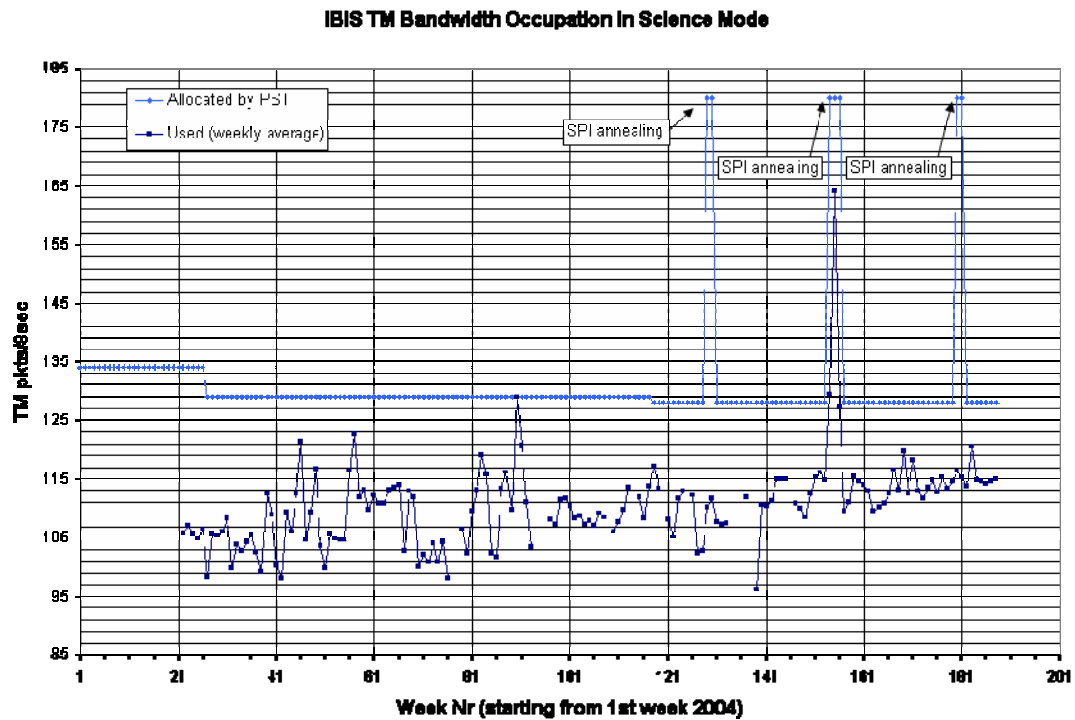
The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 114.86 TMPS/cycle, up 0.38 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 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, 214 of the 217 planned science pointings for OMC were executed nominally, 1 was shortened and 2 were lost.

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

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by very low solar activity.

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. Two pointings were lost due 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. The FDS had several occurrences of slew updates failing to arrive, and having to be manually sent and one occasion of a lost guide star, which led to the loss of a pointing. The Command verifier also crashed, leading to some science loss. 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 6 occasions of a TM drop from Redu, one of which led to the loss of a pointing, and 2 from DSS27 without impact. The overall performance was well over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs are available up to revolution 596. No new observations were planned or approved this week.

TSFs received up to revolution 589.

2. Observation status

ECS files have been received and processed up to revolution 580.

3. ISOC Science Data Archive

In preparation of future added contents in the archive, a bulk processing of selected Integral data has been set up and started.

4. ISOC system

Version 15.3 is under testing for a release in the near future. Work is ongoing on V16 to support the next KP AO.

5. Problems

None.

4.3.2 ISDC

Status of ISDC observation processing on 06/08/2007:

- Latest Standard Analysis completed: observation 04200730017 (Galactic disk latitude scans, Revolution 578) on 06/08/2007.
- Latest products archived: observations 04200730023 (Gal disk lat scans, Revolution 576) and 04200030002 (MCG -05-23-016, Revolution 565) on 23/07/2007.
- Latest observation products sent to the observer: observation 04700020002 (1E 1048.1-5937, Revolution 560) on 14/06/2007.

5 Special Events

6 Anomalies

The following problems were reported that impacted operations:

- On DoY 209, at 01:00, AOCS problems forced the suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 02:04. The impact was the loss of pointing 05840071.
- On DoY 214, at 20:23, Reed-Solomon errors at Redu, and a hit on the line caused a TM drop. This prevented an AOCS command from being uplinked, forcing the suspension of the Timeline. A recovery performed and the Timeline rejoined at 20:54. The impact was the loss of pointing 05860068.

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

AR id	Date Created	Subject	Segment	Status
INT-2940	2007-07-29	TMPH - Telemetry Packet History Display Crash	IMCS	Pending
INT-2941	2007-08-01	No updating TPF generated by FDS	FDS	Pending
INT-2942	2007-08-01	No updating TPF generated by FDS	FDS	Pending
INT_SC-196	2007-08-02	SPI Reconfiguration Anomaly at Radiation Belt Exit	Payload	Open

7 Future Milestones

The following activities are foreseen in the next few weeks.

- Lunar eclipse on 11th September 2007, at the end of revolution 599.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 585

The observations in revolution 585 began with a series of Galactic Disk Latitude Scans (RA 14:38:19.20, DEC -57:58:48.0), for ~9.4 hours, then (RA 14:27:57.60, DEC -62:50:24.0), for ~8.8 hours, then (RA 14:26:19.20, DEC -58:37:48.0), for ~17.1 hours, then back to (RA 14:27:57.60, DEC -62:50:24.0), for a further ~8.3 hours, then back to (RA 14:38:19.20, DEC -57:58:48.0), for a further ~7.7 hours. Finally, a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6), which lasted ~0.7 hours was performed, until the end of the revolution.

Revolution 586

The observations in revolution 586 began with a series of Galactic Disk Latitude Scans (RA 14:22:07.20, DEC -58:49:48.0), for ~8.3 hours, then (RA 14:22:52.80, DEC -63:03:36.0), for ~8.8 hours, then (RA 14:20:55.20, DEC -58:53:24.0), for ~17.1 hours, then back to (RA 14:22:52.80, DEC -63:03:36.0), for a further ~8.3 hours, then back to (RA 14:22:07.20, DEC -58:49:48.0), for a further ~8.8 hours. Finally, a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6), which lasted ~1.4 hours was performed, 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

2007-07-12T12:47:34.000Z	145.3770	F	Automatic TM processing.
2007-07-14T02:37:38.000Z	145.3630	F	Automatic TM processing.
2007-07-15T12:13:43.000Z	145.3441	F	Automatic TM processing.
2007-07-17T02:26:03.000Z	145.3345	F	Automatic TM processing.
2007-07-18T12:19:51.000Z	145.3074	F	Automatic TM processing.
2007-07-20T02:14:35.000Z	145.2964	F	Automatic TM processing.
2007-07-20T15:00:04.000Z	145.2624	F	Automatic TM processing.
2007-07-20T19:56:37.000Z	145.2135	F	Automatic TM processing.
2007-07-23T01:59:30.000Z	145.2022	F	Automatic TM processing.
2007-07-23T11:36:03.000Z	145.1565	F	Automatic TM processing.
2007-07-26T01:48:26.000Z	145.1445	F	Automatic TM processing.
2007-07-27T11:40:54.000Z	145.1059	F	Automatic TM processing.
2007-07-29T01:38:02.000Z	145.0879	F	Automatic TM processing.
2007-07-30T11:09:09.000Z	145.0703	F	Automatic TM processing.
2007-08-02T11:01:26.000Z	145.0497	F	Automatic TM processing.

This report was generated Fri Aug 3 08:00:18 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, 28/07/2007 – 03/08/2007

AOCS operations were executed from the Automatic Timeline.

During this period, 74 Open Loop Slews, 163 Closed Loop Slews and 4 Momentum Biases were executed.

The wrap around of the COBT occurred as expected on the 30/07/2007 at 16:43z.

4 slews (3 CSL , 1 OSL) were missed from TL, during the observation period, due to problem with TM link at REDU station, FDS failing the slew update due to a problem of the job scheduler and S/T process failing (star not found in the STR FOV).

The OTF was not reached during PID 05850101

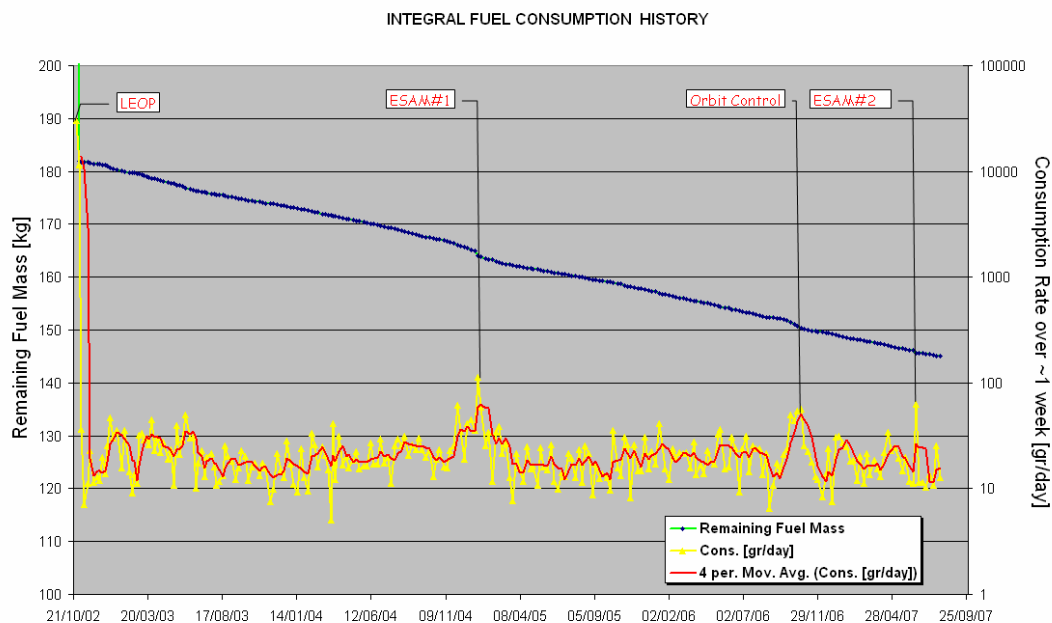
This is equivalent to $\sim 1.7\%$ of the total number of slews planned (238).

Orbit Control

No update.

Fuel consumption

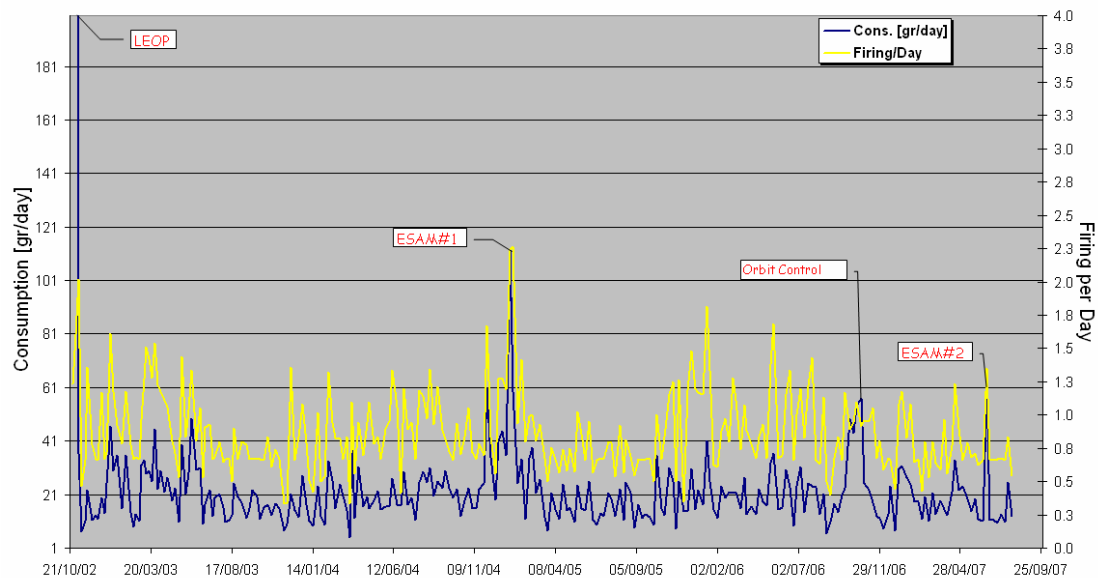
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 02/08/2007 is reported in the plot below.



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 02/08/2007 is reported in the plot below.

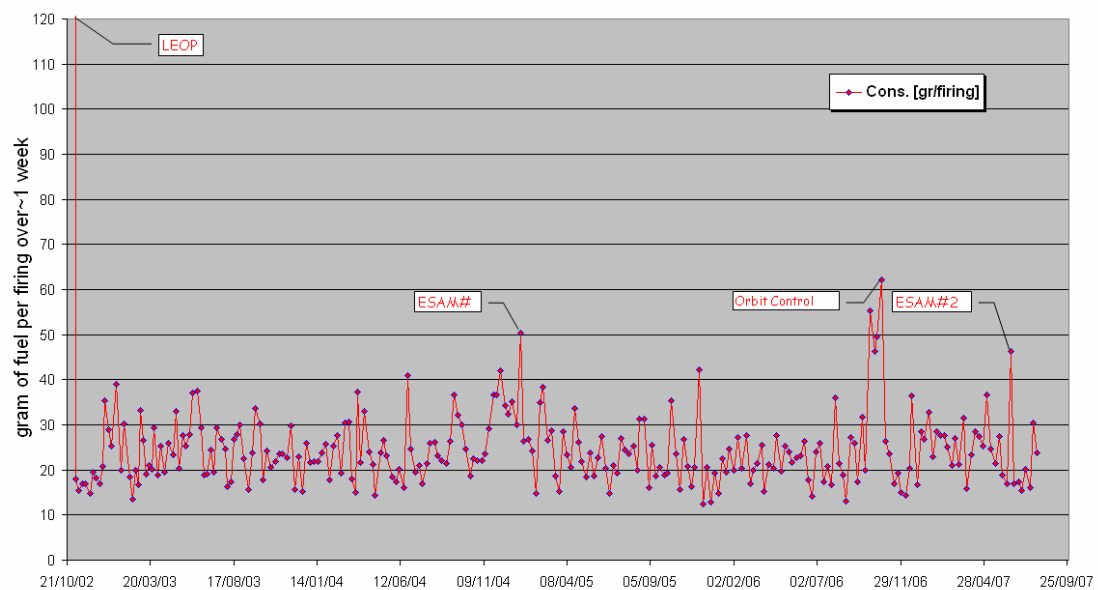
INTEGRAL FIRING PER DAY HISTORY



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

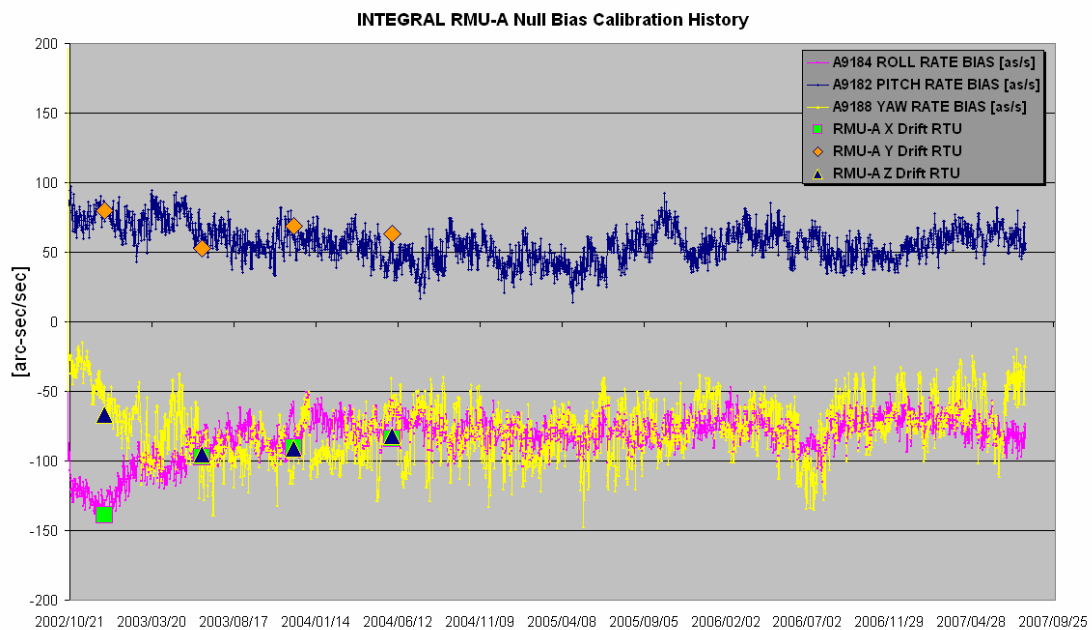
The fuel per firing over the period between 01/11/2002 and 02/08/2007 is reported in the plot below.

INTEGRAL FUEL MASS PER FIRING HISTORY

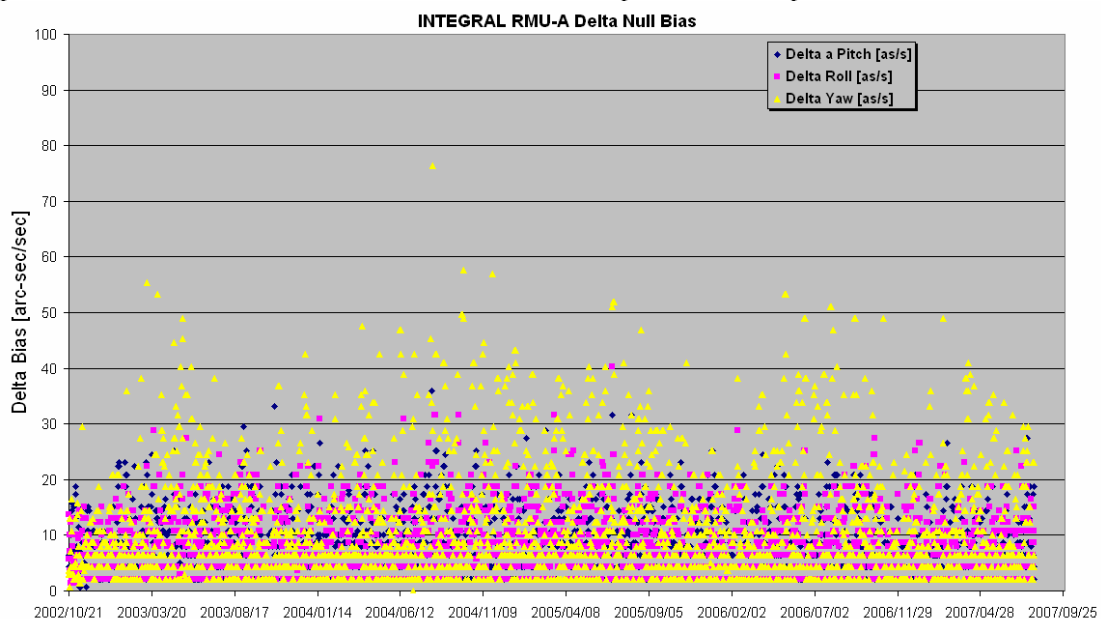


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 03/08/2007 is reported in the plot below.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over period between 01/11/2002 and 03/08/2007 is reported in the plot below.



28/07/2007 (Day of Year 209, Revolution 584)

FDS failed slew update: at 00:05z the FDS failed the update of slew ID 05840070. FDS reported the following error: the job scheduler was down and did not kick off the update jobs. The updates for slew 05840070 through 05840073 were not kicked off from the scheduler.

Several manual recoveries were then performed and the slew ID 05840070-71 manually updated in TL.

In addition, at 01:00z, the S/T process failed and no slew star was found in slot#2 for slew 05860071: the slew star selected (ID 9266-00845) is a variable star of Mi 6.52 with magnitude variation of +/- 0.06 Mi. The threshold set for the S/T was likely at the limit of the star magnitude and this caused the STR to not find the star and the slew for PID 05840071 to stop commanding (PTV failure).

A manual recovery was then started at 01:30, from attitude of PID 05840070 to the attitude of PID 05840073. At 02:46 the slew ID 05840074 was manually updated in TL.

The following slews were missed in TL: 058471(CSL) -72(OSL) -73(CSL).

29/07/2007 (Day of Year 210, Revolution 584-585)

FDS failed slew update: at 15:43z the FDS failed the update of slew ID 05850021. FDS reported an error during the update process: the TPF update software spotted a constraint violation on the initial attitude of pointing 05850020 at 2007-07-29T16:29:14Z (STR occultation by earth). That is about one minute before starting the slew at 2007-07-29T16:30:16Z to attitude 05850021. The TPF generation was aborted. The TPF could be produced by running Recover Schedule some time later.

A manual recovery was performed at 16:00z and the slew 05850021 manually updated in TL.

No impact on TL.

Remark: the constraint check during TPF update starts at the command release time unlike for mission planning at EPOS level and manual recovery using the Recover Schedule tool. The latter two applications start the constraint check with the manoeuvre execution time which is some minutes after the command release time. In case pointing are placed just at the edge of an allowed region (so that the constraint moves away with time) the TPF update could spot a violation while EPOS planning and Recover Schedule do not.

30/07/2007 (Day of Year 211, Revolution 585)

FDS failed slew update: at 02:45z the FDS failed the update of slew ID 05850039. FDS reported an error during the update process, similar to the one rose on DoY 184 and 193: the update TPF job which runs after each slew is kicked off relatively to the slew end of the previous slew. In order to read the current wheel speeds the software accesses the TM at a time which is, however, relative to the slew start of the previous slew (in this case a CSL). It happened that the previous CSL took longer than 3 minutes which caused the TPF update software to read RWs speeds TM during the slew. These wheel speeds, however, were not suitable to perform the slew. The TPF generation was aborted.

A manual recovery was performed and the slew 05850039 manually updated in TL.

No impact on TL.

Remark: the problem appears like a timing problem when accessing the Wheels speeds TM.

OBT wrap around: at 16:43z as expected, the wrap around of the COBT (central on-board time) occurred. The AOCS LOBT (local) was synchronised with the CDMU time and no impact for the AOCS s/s reported.

31/07/2007 (Day of Year 212, Revolution 585)

Loss of guide star: at 17:05:19z a loss of the selected guide star, Mi 5.5 at CCD location [-10290,-16130] (ID 9006-5415), occurred during PID 05850101.

As foreseen by the IPS logic, the IMU 1 did come ON because the loss of guide star occurred after the end of the slew manoeuvre, with the manoeuvre timer already elapsed.

A new automatic mapping was commanded by the ACC and a new guide star picked.

No impact on TL. The OTF was not reached during PID 05850101.

Unexpected change of the FDE IAAD thresholds: see description later, on DoY 215.

01/08/2007 (Day of Year 213, Revolution 585-586)

FDS failed slew update: at 03:27z the FDS failed the update of slew ID 05860001. FDS reported an error during the update process: there was no TPF update for the first slew 05860001 after perigee passage arriving on the MCS, neither was there was an entry in the log file. There was an automatic restart of the job scheduler around 01:29:51Z

A manual recovery was performed and the slew 05860001 manually updated in TL.

No impact on TL.

Remark: still under investigation by FD Team.

FDS failed slew update: at 12:50z the FDS failed the update of slew ID 05860016. FDS reported an error during the update process: the TPF update software spotted a constraint violation on the initial attitude of pointing 05860015 at 2007-08-01T13:15:04Z (STR occultation by earth). That is about two minutes before starting the slew at 2007-08-01T13:17:07Z to attitude 05860016. The TPF generation was aborted. The TPF could be produced by running Recover Schedule some time later.

A manual recovery was performed at 13:02z and 13:42z and the slews 05860016-17 manually updated in TL.

No impact on TL.

Remark: the constraint check during TPF update starts at the command release time unlike for mission planning at EPOS level and manual recovery using the Recover Schedule tool. The latter two applications start the constraint check with the manoeuvre execution time which is some minutes after the command release time. In case pointing are placed just at the edge of an allowed region (so that the constraint moves away with time) the TPF update could spot a violation while EPOS planning and Recover Schedule do not.

02/08/2007 (Day of Year 214, Revolution 586)

IMCS HFA task problem: at 10:02z the History File Archive task on IMCS-A stopped, causing no TM distribution to the FDS and the failing of update process for the next coming activity (change of guide star, CGS). The HFA task was restarted and the FD on call verified the reception of live TM on FDS.

The FD on call advised the FCT to leave the CGS uplinked without update.

No impact in TL.

Loss of TM link at REDU station: at 20:23z the slew ID 05860068 failed release due to a drop on VC0 TM link at REDU station.

Once the TM link was established again, a manual recovery was performed from attitude of PID 05860067 to the attitude of PID 05860068. The next slew ID 05860069 was manually updated in TL.

The following slew was missed in TL: 05860068 (CSL).

03/08/2007 (Day of Year 215, Revolution 586)

Unexpected change of the FDE IAAD criteria thresholds: at 12:48z during a verification of AOCS configuration (performed every 2 days), the following TM parameters A9217-18-19 (FDE criteria IAAD X-Y-Z thresholds) were reporting different values wrt the assigned values (fixed since the LEOP phase). From an investigation resulted that the change occurred few days before on DoY 212.17.05.20z. In addition the TM parameters A9300 (selecting the IMU channel to be acquired by FDE) and A9229 (reporting the integrated rate value on X) resulted selected for acquisition from IMU1, even if not requested by the mission phase and IMU OFF.

These criteria are not used during the current mission phase (routine) and the change had no impact on S/C.

At the same time of the event (DoY 212.17.05.20z) the STR reported a loss the guide star and the IMU1 was automatically switched ON by the ACC (see report on DoY 212).

This could be likely the result of an upset affecting the STR and the part of memory were the FDE criteria and thresholds are maintained.

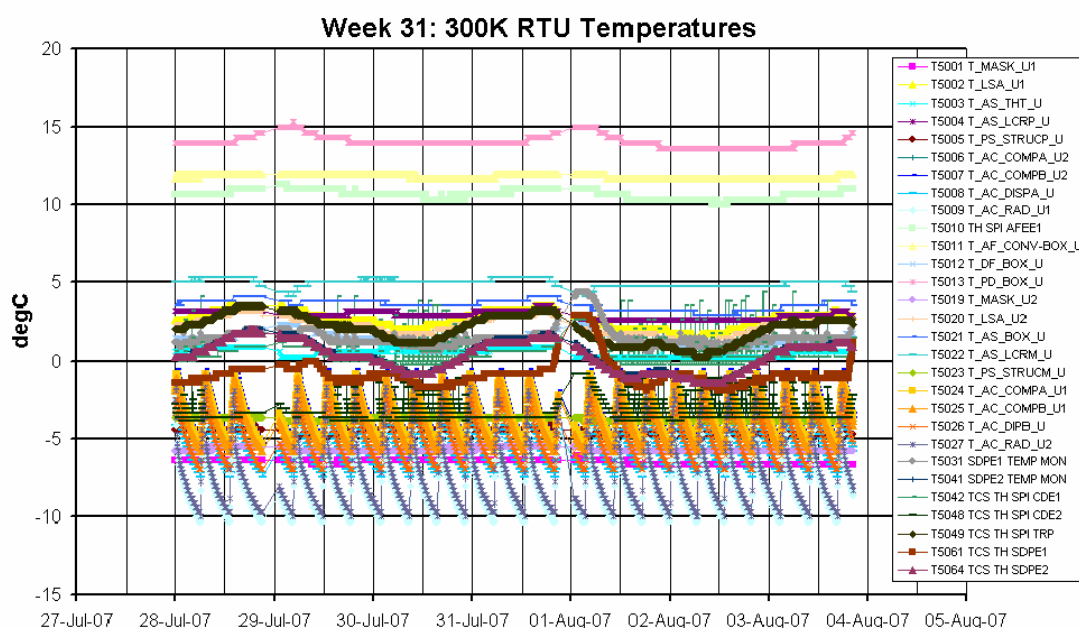
Similar problem occurred on DoY 2006.363 at 05.03.49, for the same group of parameters and a relevant AR was already generated (AR INT_177).

A prompt recovery was performed in order to re-establish the correct configuration of FDE (failure detection electronics). In order to better detect these problem, since the beginning of the mission a daily AOCS check is executed and a more detailed AOCS configuration verification performed every two days. An automatic mean (at IMCS level) to detect such modification, induced by SEU, is under implementation for the next future. No special radiation activity was registered by SEISOP tool at the moment of the event.

Investigations are still on-going to understand if the origin of the event is really connected to an external upset.

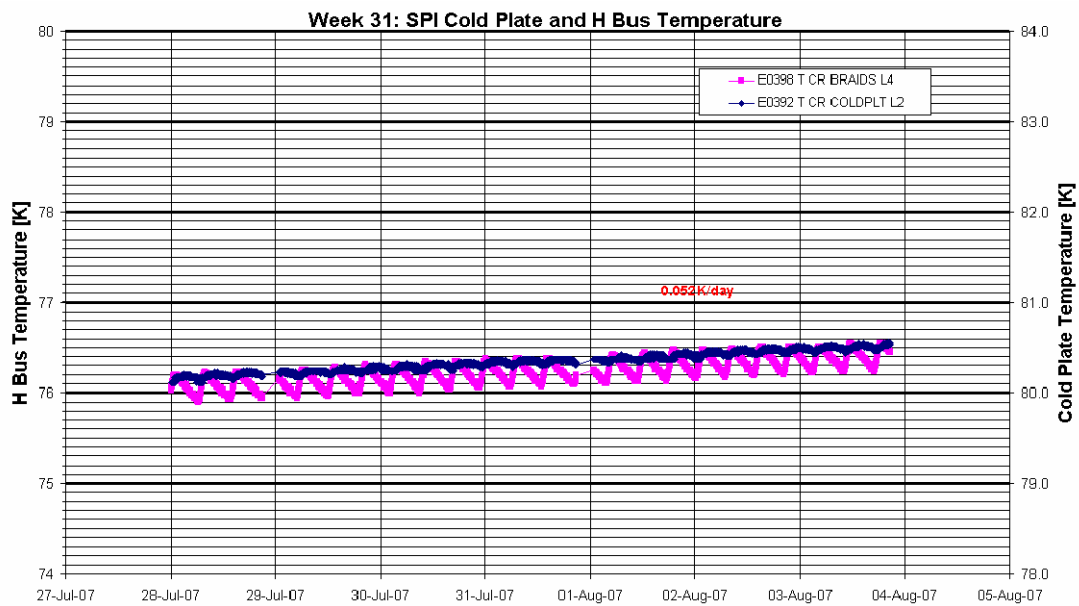
8.3.2 SPI Operations

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 with a positive drift of 0.052K/day.

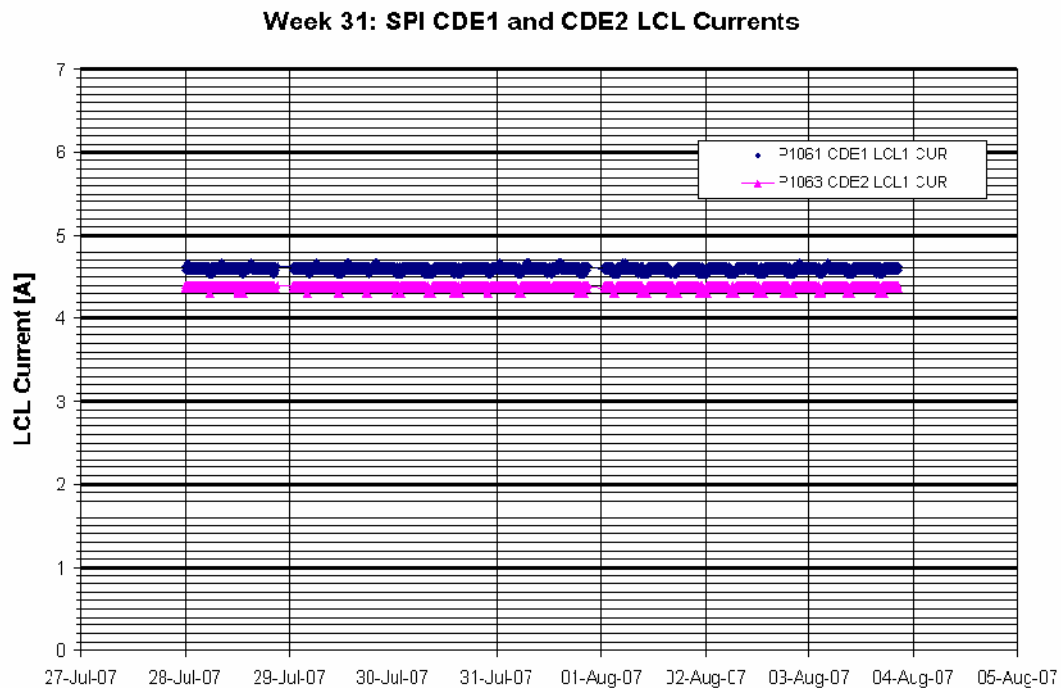
The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



The stroke of all four compressors remained at 39 throughout the week. The average CDE LCL currents over the week were:

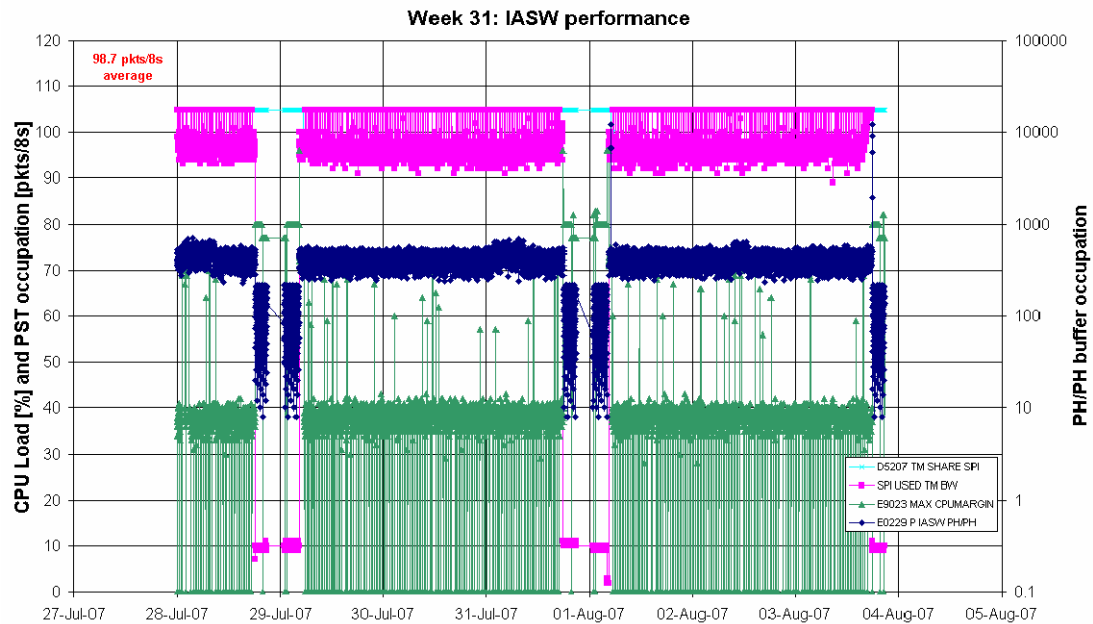
- CDE1 LCL current = 4.60A
- CDE2 LCL current = 4.37A

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



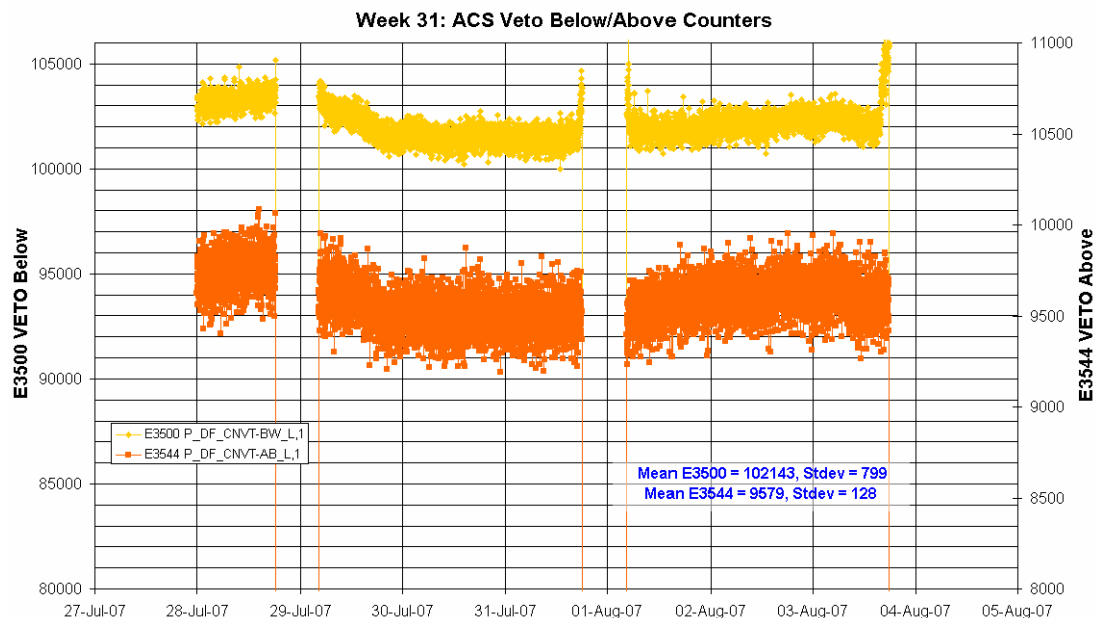
DPE & IASW: The DPE health and IASW performance is nominal. The IASW version installed is v433 patch #1 with the spectra scaling factor set to 9/19 SE. The average TM bandwidth occupation of SPI was 98.7 packets/cycle over the science window, when the TM allocation was 105 packets/cycle.

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



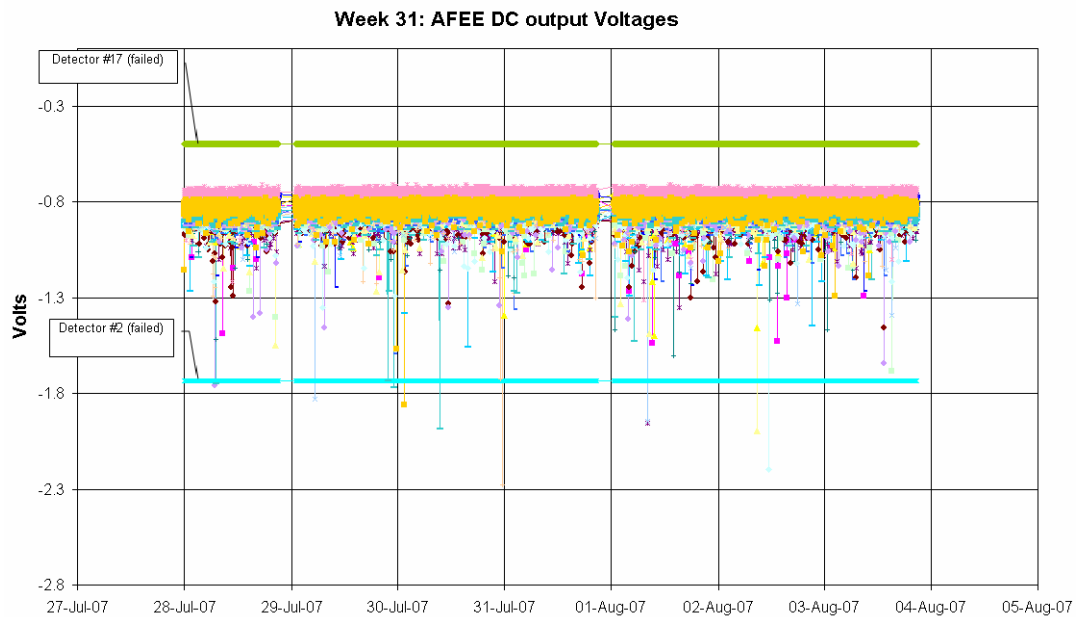
ACS: The performance of the ACS is nominal, except for FEE #81 which remains switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is still OFF due to the anomaly on 5/8/2003 (INT_SC-61).

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

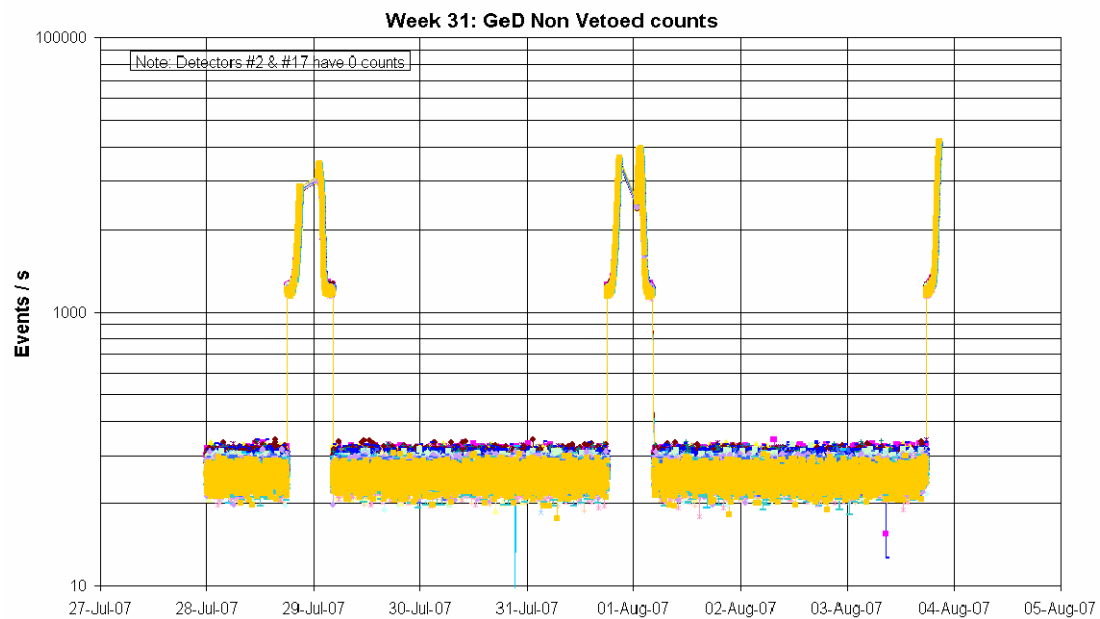


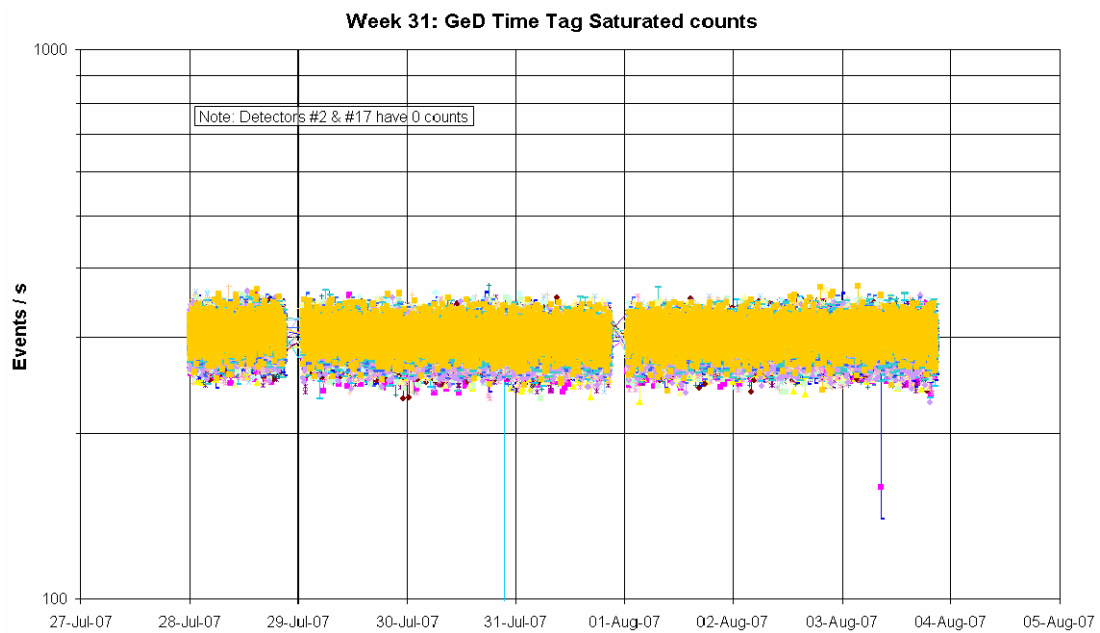
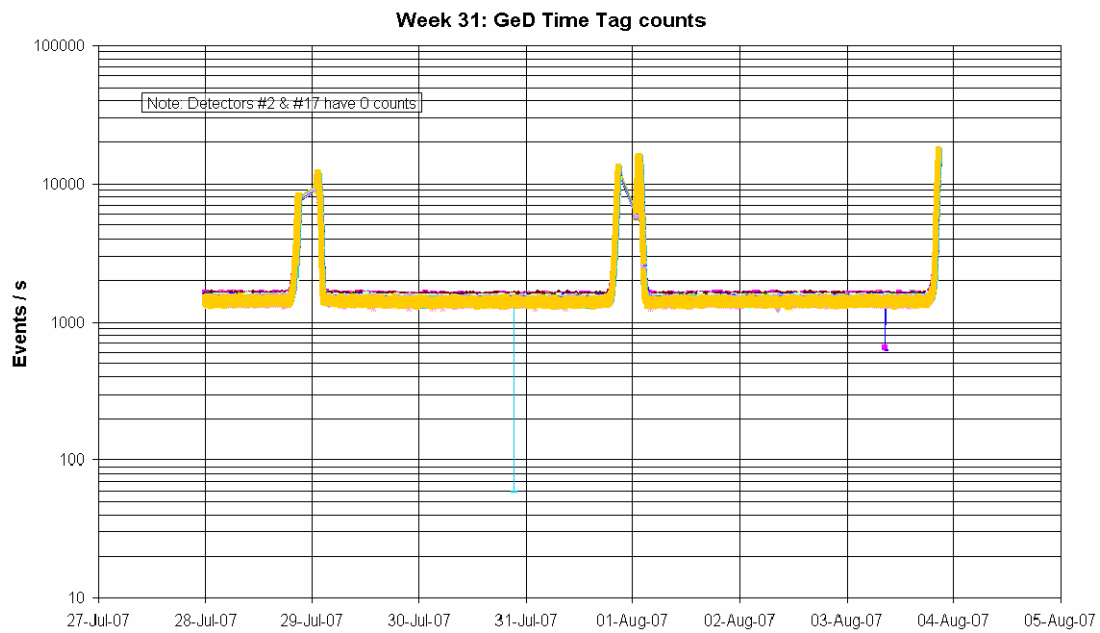
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operated at a lower HV setting of 3.5kV (instead of 4kV).

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.

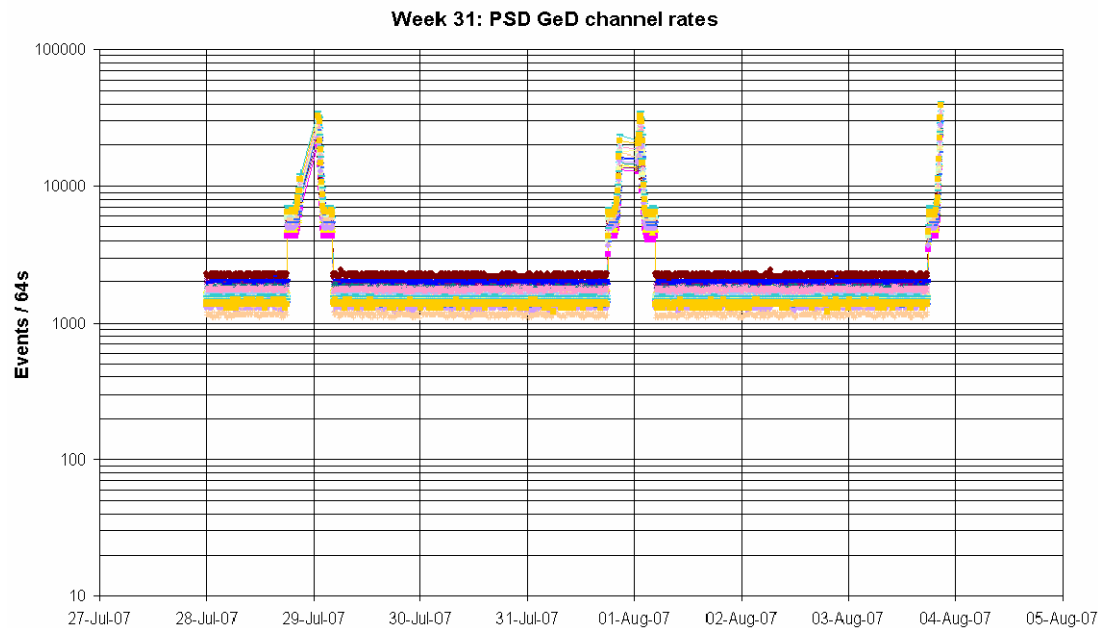


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





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:

- On 2007-08-01, an anomaly occurred in the automatic reconfiguration of SPI at radiation belt exit of revolution 586 (recorded in Anomaly Report INT_SC-196). The sequence of events was as follows:

At Broadcast Packet radiation belt exit time the following **nominal** OEMs were received:

2007.213.04.09.45.828	2007.213.04.09.55.458	1024	RealTime	129	EVENT
SPI1 ONBOARD EVENTS					
FIX6		0			
E9079	MESS CLASS	0			
E9080	MESS ID	129			
E9753	EVENT BEGIN END	END			
E9754	EVENT TYPE	FLARE			
2007.213.04.09.45.828	2007.213.04.09.55.507	1024	RealTime	130	EVENT
SPI1 STATE CHANGE					
FIX6		0			
E9079	MESS CLASS	0			
E9080	MESS ID	130			
E9755	OLD STATE	PROTECTED			
E9756	NEW STATE	AUTOMATIC			
2007.213.04.09.45.828	2007.213.04.09.55.510	1024	RealTime	128	EVENT
SPI1 MODE CHANGE					
E9750	MODE CHANGE	AUTOMATIC			
E9079	MESS CLASS	0			
E9080	MESS ID	128			
E9751	OLD MODE	PHOTON			
E9752	NEW MODE	CONF			

>> Indicating the exit from radiation belt and the nominal start of the automatic reconfiguration for SPI, i.e. the transition of SPI from PHOTON mode/PROTEGE state to CONF mode/AUTOMATIC state.

Following this the following **non-nominal** OEMs were received:

2007.213.04.10.34.457	2007.213.04.10.44.107	1024	RealTime	176	ANOMALY
SPI1 CONFIGURATION STATUS ACQ ERROR					
E9765	S/A AUTOTEST ERR	PSD			
E9079	MESS CLASS	2			
E9080	MESS ID	176			
E9766	HIGH BYTE	33			

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E9767	MEDIUM BYTE	0
E9768	LOW BYTE	0
FIX8		161

>> Indicating an error in the configuration status acquisition from the PSD.

2007.213.04.10.34.457	2007.213.04.10.44.124	1024	RealTime	177	ANOMALY
SPI1 AUTOMATIC RECONFIGURATION ERROR					
E9769	AUTOMATIC STEP	CONF STATUS			
E9079	MESS CLASS	2			
E9080	MESS ID	177			
FIX16		0			
FIX16		0			

>> Indicating an error in the automatic reconfiguration process at the stage of requesting the subassemblies configuration status. (The stages of the reconfiguration are: AUTOTEST; CONF MODE; CONF LOAD; PATCH LOAD; CONF STATUS; START MODE.)

2007.213.04.10.34.457	2007.213.04.10.44.127	1024	RealTime	130	EVENT
SPI1 STATE CHANGE					
FIX6		0			
E9079	MESS CLASS	0			
E9080	MESS ID	130			
E9755	OLD STATE	AUTOMATIC			
E9756	NEW STATE	COMMANDED			

>>This is in fact nominal and indicates the state change from AUTOMATIC back to COMMANDED.

2007.213.04.10.34.457	2007.213.04.10.44.143	1024	RealTime	192	TC REJECT
SPI1 TC NOT EXECUTED					
E9771	TC REJECT REASON	TC BAD EXEC			
E9079	MESS CLASS	3			
E9080	MESS ID	192			
FIX5		0			
E9781	APID REJECT TC	1025			
FIX2		0			
E9770	SSC NOT EXEC TC	8195			

>>Indicating the rejection of the Broadcast Packet TC with the reason that the TC was badly executed. (SSC = 8195 dec = 0010000000000011 bin, i.e. SRC = 1 (on-board TC) and SSC = 3 (broadcast packet).)

The above OEMs imply that the automatic reconfiguration failed at the point of 'auto_ask_for_status_conf'/'STATUS_AUTO_ANSWER'. The reconfiguration stopped at this point, i.e. the 'auto_units_start' and 'enable_scientific_HK' were not executed. This is verified in telemetry by the fact that the mode of the IASW and all subassemblies remained CONF (and no science HK was being acquired). No OOLs or other OEMs were received and the status telemetry from the subassemblies up to the time of the anomalous OEMs had been nominal.

In order to recover, at 04:33Z SPI was commanded to PHOTON mode via FCP_SPI1_0130 , at which point the IASW transitioned to PHOTON mode, all subassemblies transitioned to OPER and the following OEM was received:

2007.213.04.33.51.083	2007.213.04.33.55.482	1024	RealTime	128	EVENT
SPI1 MODE CHANGE					
E9750	MODE CHANGE	COMMANDED			
E9079	MESS CLASS	0			
E9080	MESS ID	128			
E9751	OLD MODE	CONF			

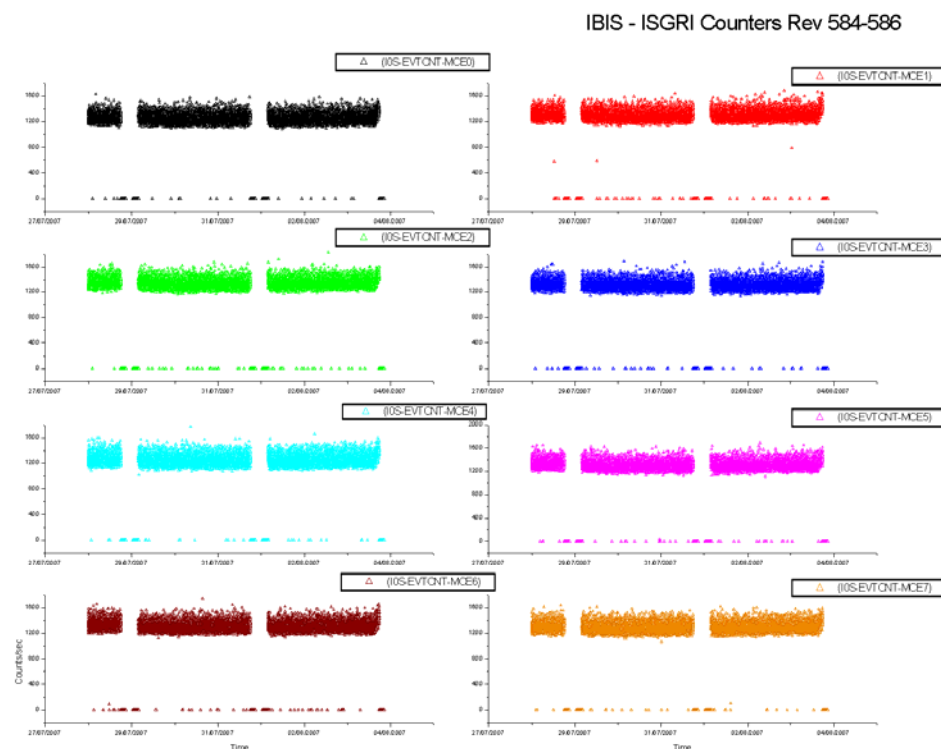
Science HK acquisition started at this point, with nominal values for the count rates. A check of the subassemblies' configuration parameters affected by the belts exit was performed and all was found to be nominal. SPI operations continued nominally.

- On 2007-08-03 at 08:02:36Z OEM APID 1024 ID 243 EXCEPTION SPI1 SPECTRA BUILDING NOT COMPLETED was received. This was during Pointing ID 05860087. As this was a single occurrence, no action was taken.
- On 2007-08-03 at 16:58:57Z the TM parameter E3500 ACS Counter Below started toggling OOL High. This was ~45 minutes before radiation belt entry of revolution 586 and therefore no action was taken.
- On 2007-08-03 at 20:19:00Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. This was during the LOS_CHK window of revolution 586, when the time verification TC was sent. This OEM is sometimes received when this TC is sent and no action was taken

8.3.3 IBIS Operations

IBIS Event Counters Plots

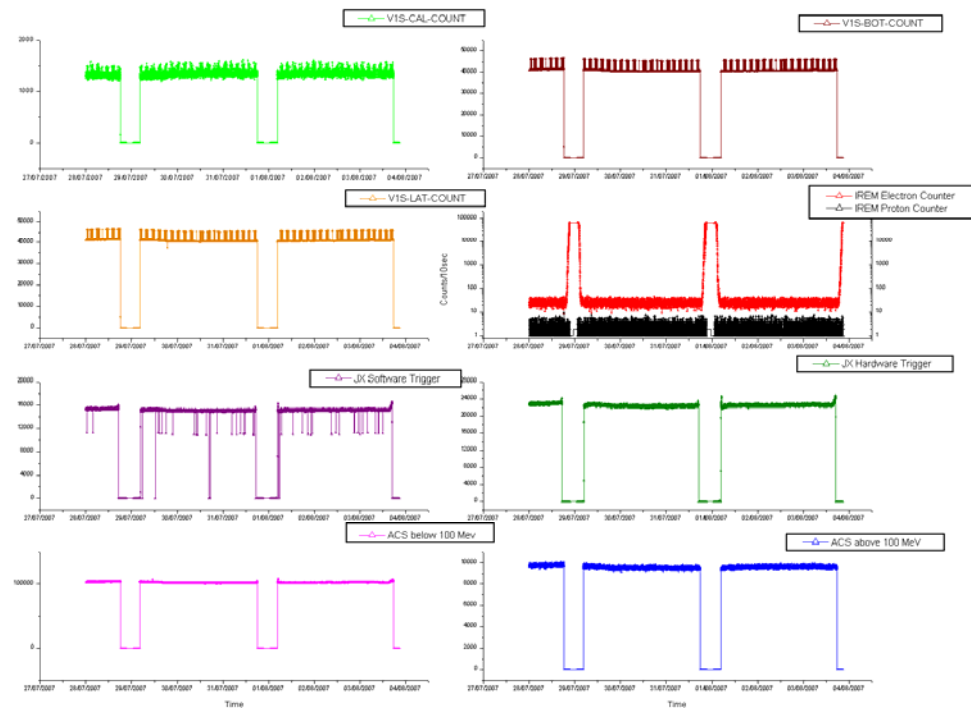
ISGRI Counters:



*sampling every 4 pkts (32 secs)

VETO vs Payloads Counters:

IBIS-VETO vs Payloads Counters Rev 584-586

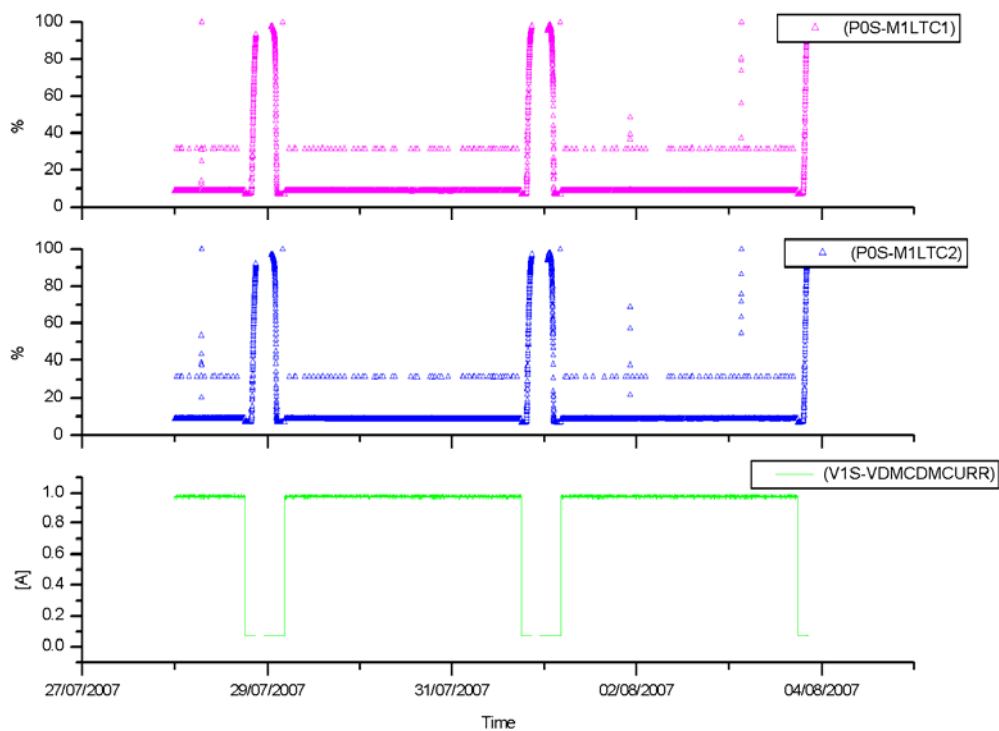


**with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec sampling every 5 pkts (40 sec)

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

VETO Current:

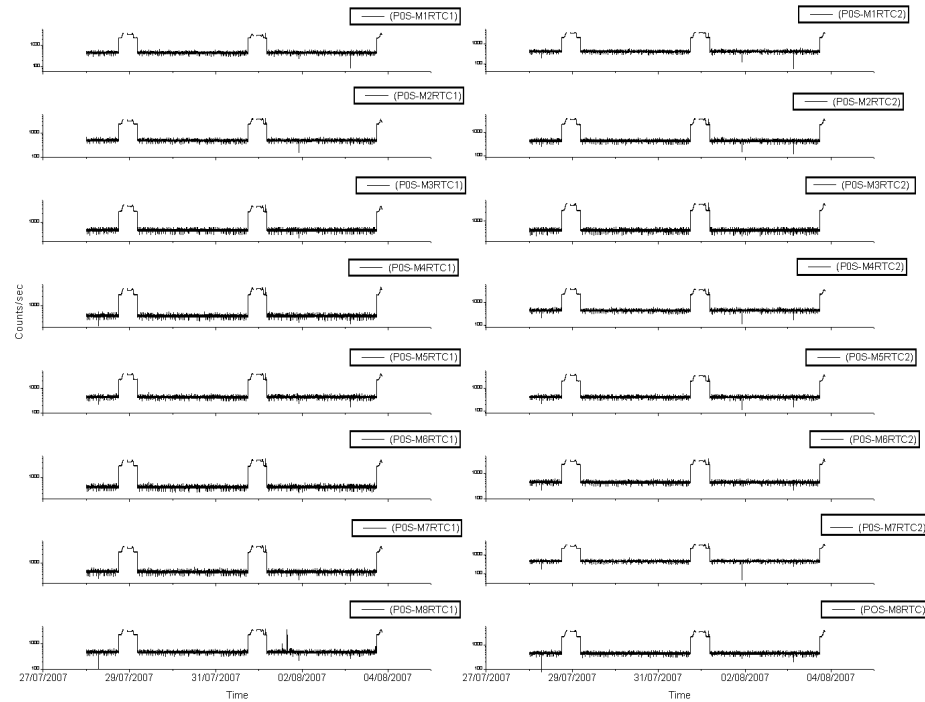
IBIS-VETO Current & PICsIT dead times Rev 584-586



**sampling every 4 pkts (32 secs)

PICsIT Counters:

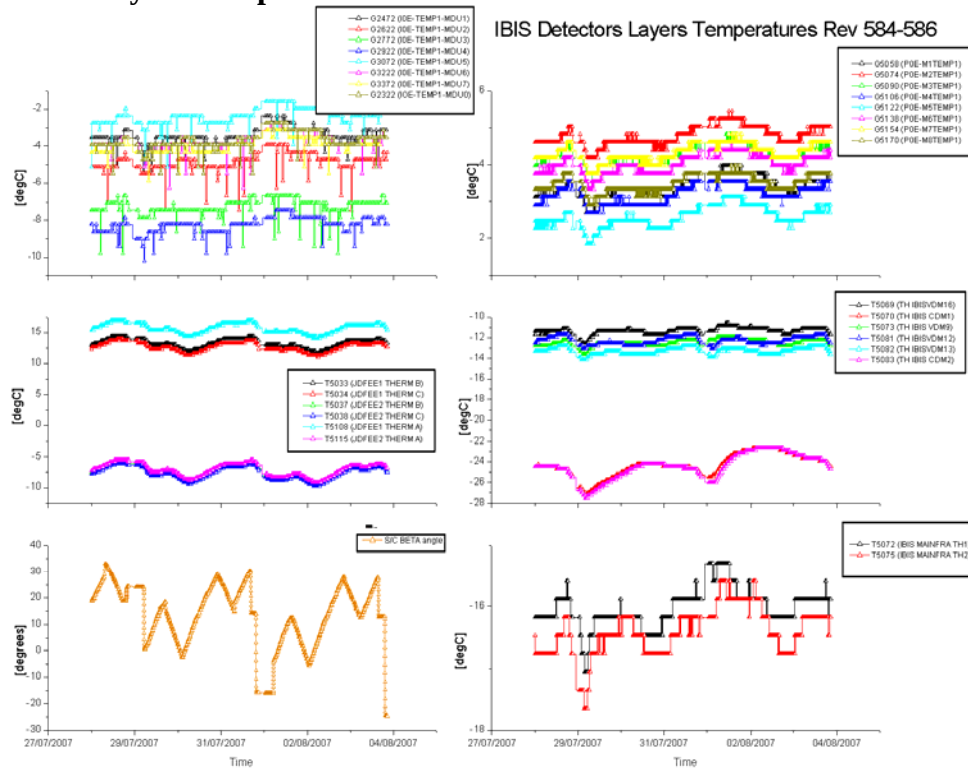
IBIS - PICsIT Counters Rev 584-586



**sampling every 4 pkts (32 secs)

IBIS Detectors Layers Temperatures:

IBIS Detectors Layers Temperatures Rev 584-586



**sampling every 8 pkts (64 secs)

IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), families G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2), families G2000 (I0E-OVFWPXADD-Mi) were reported at Radiation Belts passage.

2007-07-28 (DOY 209, Rev 584-585)

At 06:50:45Z the TM parameter families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semimodule FIFO error flags. At 06:52:48Z the TM parameters families G5002 and G5003 for the PDM semimodule counters also went OOL (value = 0). As these were followed at 06:56:11Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

2007-07-29 (DOY 210, Rev 585)

At 04:26:40Z TM parameter G2083 (number of events triggering the ISGRI MCE5 per second) went OOL low (value = 0). This was just before radiation belt exit of revolution 585. As it returned within limits of its own accord at 04:28:00Z no action was taken.

2007-07-30 (DOY 211, Rev 585)

At 14:11:20Z TM parameter G2097 (number of events triggering the ISGRI MCE6 per second) went OOL Low (value = 0). As it returned within limits of its own accord at 14:15:12Z no action was taken.

In line with INT_OPS_295, due to the upcoming OBT wraparound, IBIS was commanded to Standby mode at 16:22:19Z via FCP_IBIS1_0313. It was commanded back to Scientific Standard mode via the CCCF in the Timeline at 17:04:19Z.

2007-07-31 (DOY 212, Rev 585-586)

IBIS operations executed nominally.

2007-08-01 (DOY 213, Rev 586)

At 15:25:52Z TM parameter G5037 P0S-M8RTC1 started toggling OOL high, in each instance remaining OOL for ~1 minute or less. This is the PDM8 semimodule #1 counter. It returned stably within limits at 15:45:04Z and therefore no action was taken

At 22:20:21Z the TM parameter families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semimodule FIFO error flags. As they returned within limits of their own accord at 22:20:53Z no action was taken.

2007-08-02 (DOY 214, Rev 586)

IBIS operations executed nominally.

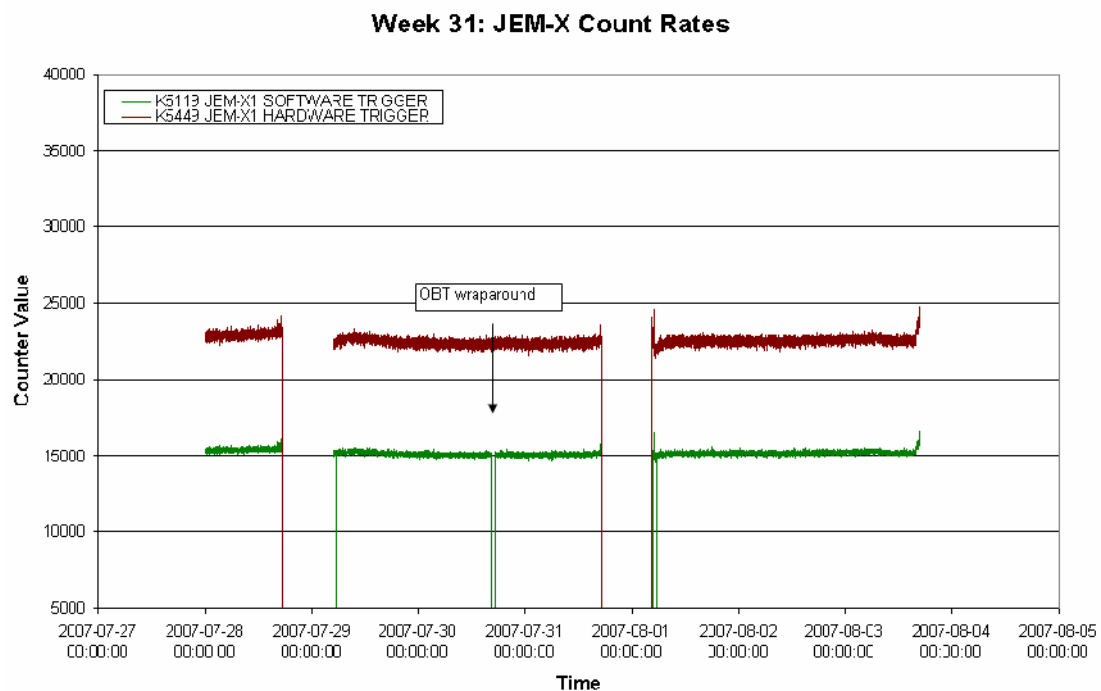
2007-08-03 (DOY 215, Rev 586-587)

At 03:14:13Z the TM parameter families G5068 and G5072 failed status consistency check (value = TRUE). These are the PDM semimodule FIFO error flags. At 03:16:00Z the TM parameters families G5002 and G5003 for the PDM semimodule counters also went OOL (value = 0). As these were followed at 03:19:24Z by OEM APID 1280 ID 132 EVENT IBIS1 IASW HEPI RESYNCHRONIZED, indicating that HEPI resynchronised autonomously, by which time all the above parameters had returned within limits, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph¹.



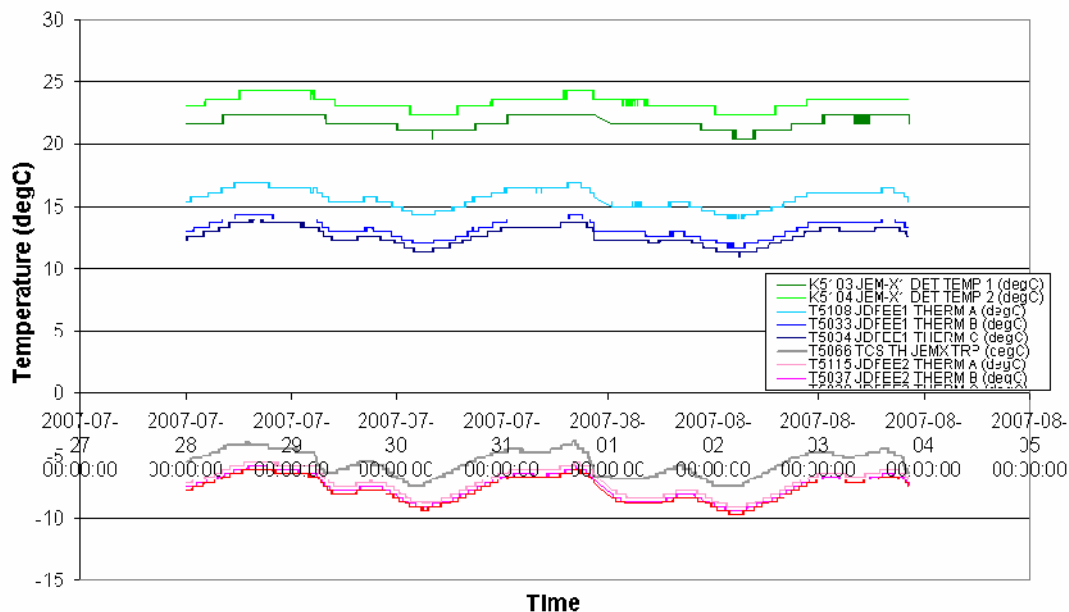
JEM-X Temperatures

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)

Week 31: JEM-X Detector and DFEE Temperatures



JEM-X Daily Report

2007-07-28 (DOY 209, Rev 584-585) to 2007-07-29 (DOY 210, Rev 585)

JEM-X1 operations executed nominally.

2007-07-30 (DOY 211, Rev 585)

In line with INT_OPS_295, due to the upcoming OBT wraparound, JEM-X1 was commanded to Setup mode at 16:20:27Z via FCP_JEM1_0041. It was commanded back to Data Taking mode via the CCCF in the Timeline at 17:04:19Z.

2007-07-31 (DOY 212, Rev 585-586) to 2007-08-03 (DOY 215, Rev 586-587)

JEM-X1 operations executed nominally.

8.3.5 OMC Operations

2007-07-28 (DOY 209, Rev 584)

At 01:00, AOCS problems forced the suspension of the Timeline. A recovery was performed, and the Timeline rejoined at 02:04. The impact was the loss of pointing 05840071. It was at this time the following OEMs were received:

```
2007.209.01.03.51.962  2007.209.01.03.55.530  1792  RealTime  131  TC REJECT
REJECTED TC1          0          0  65535  PR    N
E    E
2007.209.01.03.58.212  2007.209.01.04.04.381  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.

2007-07-29 (DOY 210, Rev 585)

At 12:07, due to a misunderstanding over instrument state following a command verifier crash, OMC was manually reset to stand-by, and at 12:14:41 returned to Science. The impact was pointing 05850014 was shortened from a planned 1985 to 1232 seconds.

2007-07-30 (DOY 211, Rev 585) to 2007-08-01 (DOY 213, Rev 586)

Nothing to report.

2007-08-02 (DOY 214, Rev 586)

At 20:23, Reed-Solomon errors at Redu, and a hit on the line caused a TM drop. This prevented an AOCs command from being uplinked, forcing the suspension of the Timeline. A recovery performed and the Timeline rejoined at 20:54. The impact was the loss of pointing 05860068. It was at this time the following OEMs were received:

2007.214.20.24.49.035	2007.214.20.24.52.747	1792	RealTime	131	TC REJECT
REJECTED TC1			0	0	65535 PR N
E E					
2007.214.20.24.55.160	2007.214.20.25.01.123	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.

2007-08-03 (DOY 215, Rev 586)

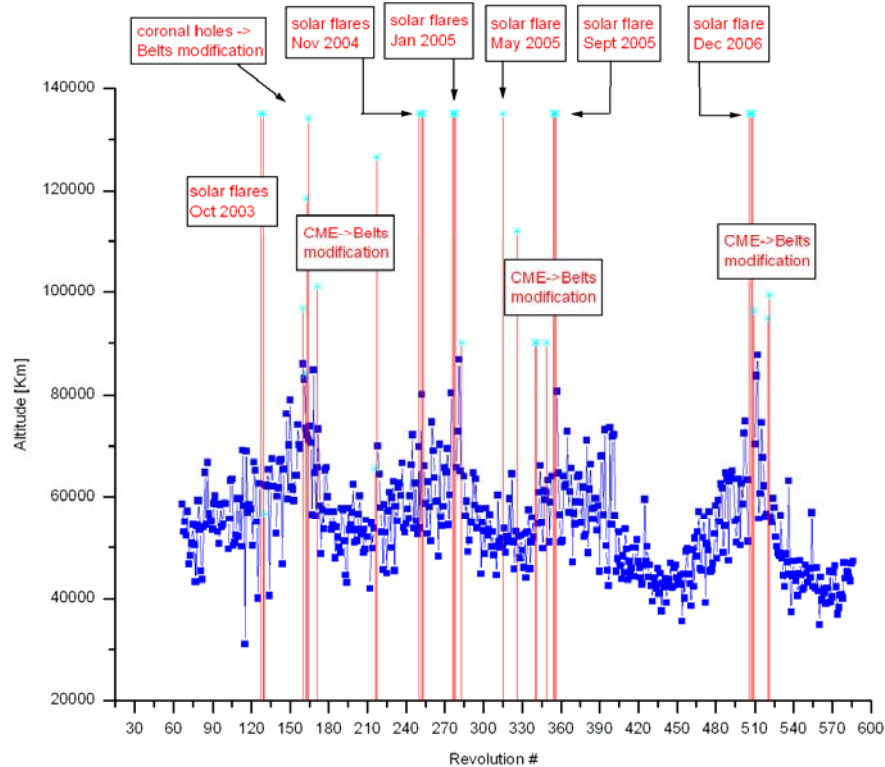
Nothing to report.

On DoY 209 at 18:11:30, DoY 212 at 18:00:35, and DoY 215 at 17:47:47 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

Evolution of Radiation Belt Entry 2003-2007



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]
584	RAD_ENTR R 2007-07-28T18:11:22Z	28/07/2007 19:40:50	43418	28-Jul-2007 19:45:26	44224
585	RAD_EXIT R 2007-07-29T04:20:11Z	29/07/2007 02:56:02	>>29828	29-Jul-2007 03:15:26	42268
585	RAD_ENTR R 2007-07-31T18:00:27Z	31/07/2007 19:10:18	~46785	31-Jul-2007 19:27:50	45409
586	RAD_EXIT R 2007-08-01T04:09:31Z	01/08/2007 03:19:46	>>29825	01-Aug-2007 03:07:50	42492
586	RAD_ENTR R 2007-08-03T17:47:46Z	03/08/2007 18:50:03	47334	03-Aug-2007 19:21:23	44717

Reference

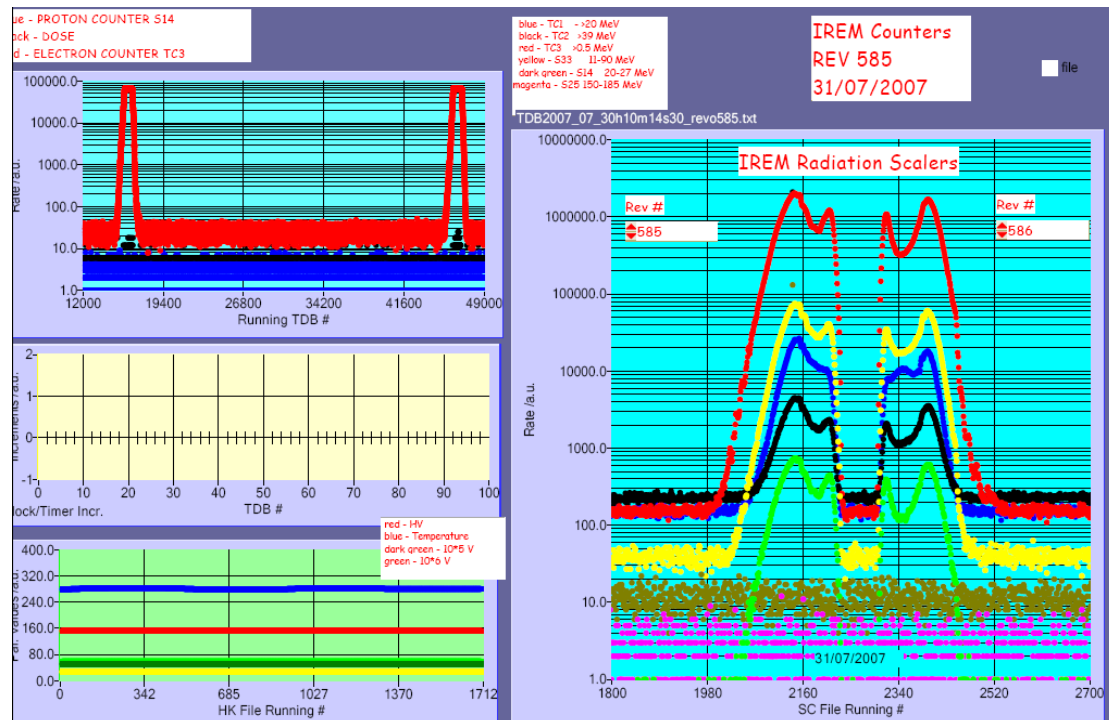
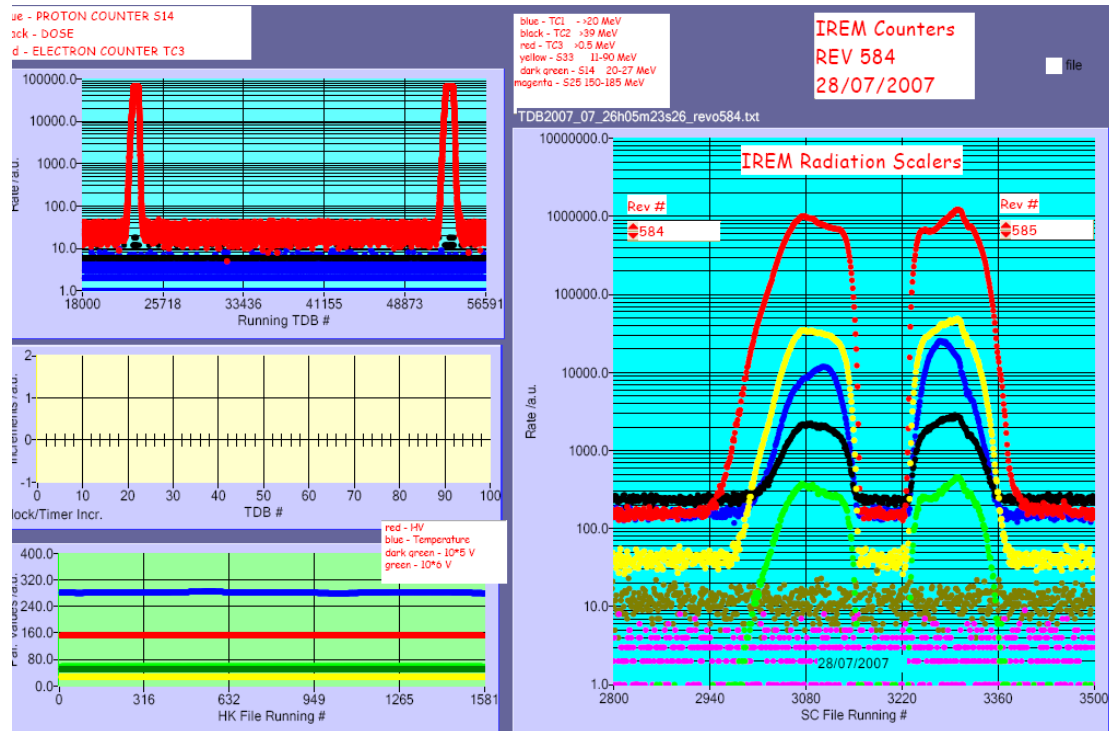
High radiation

Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

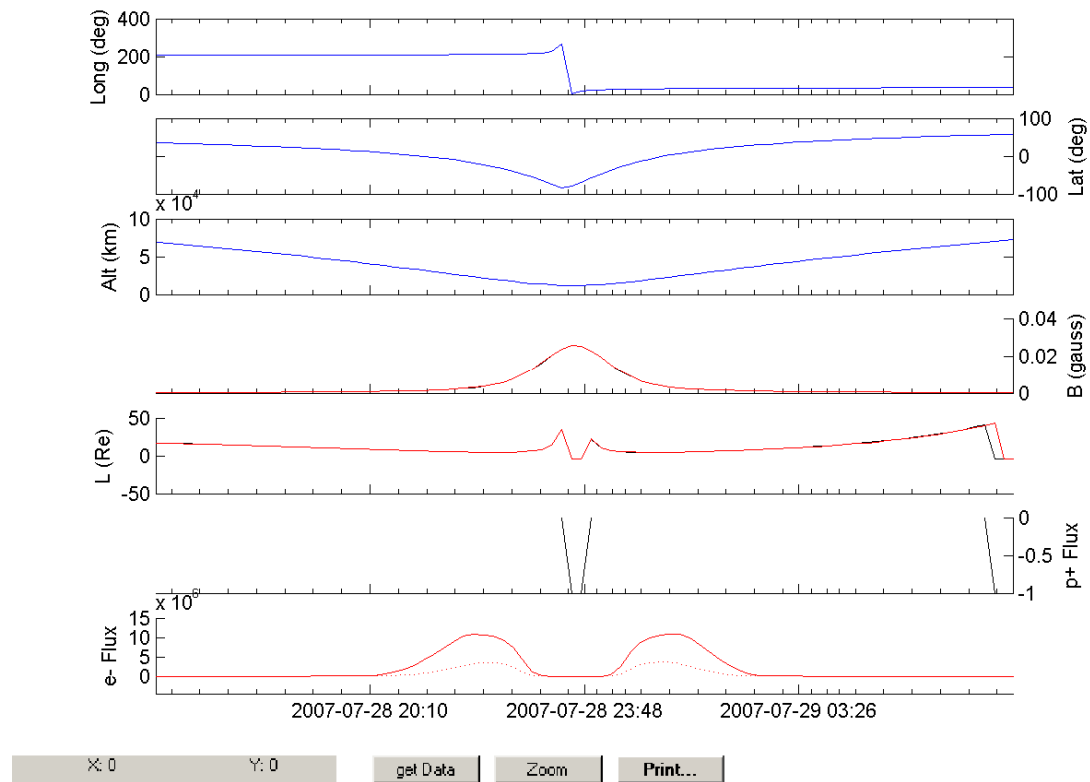
Large error vs reference (more than 30 minutes)

IREM radiation counters:

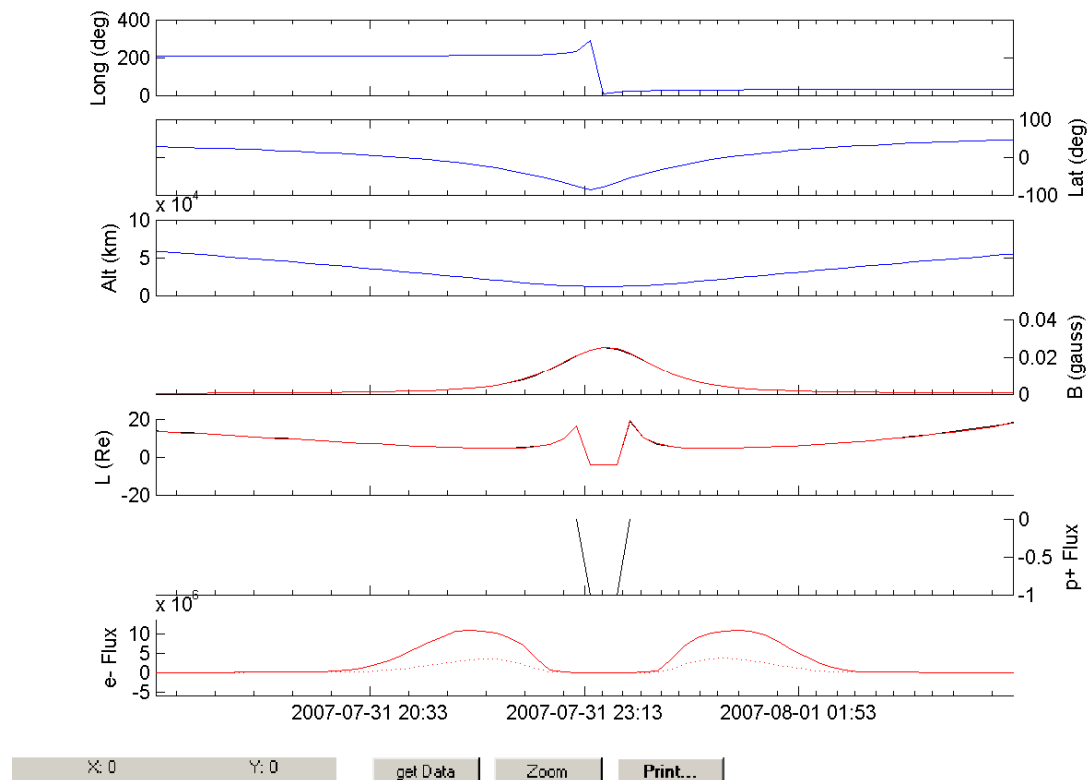


IREM Predicted Radiation Belt Passages

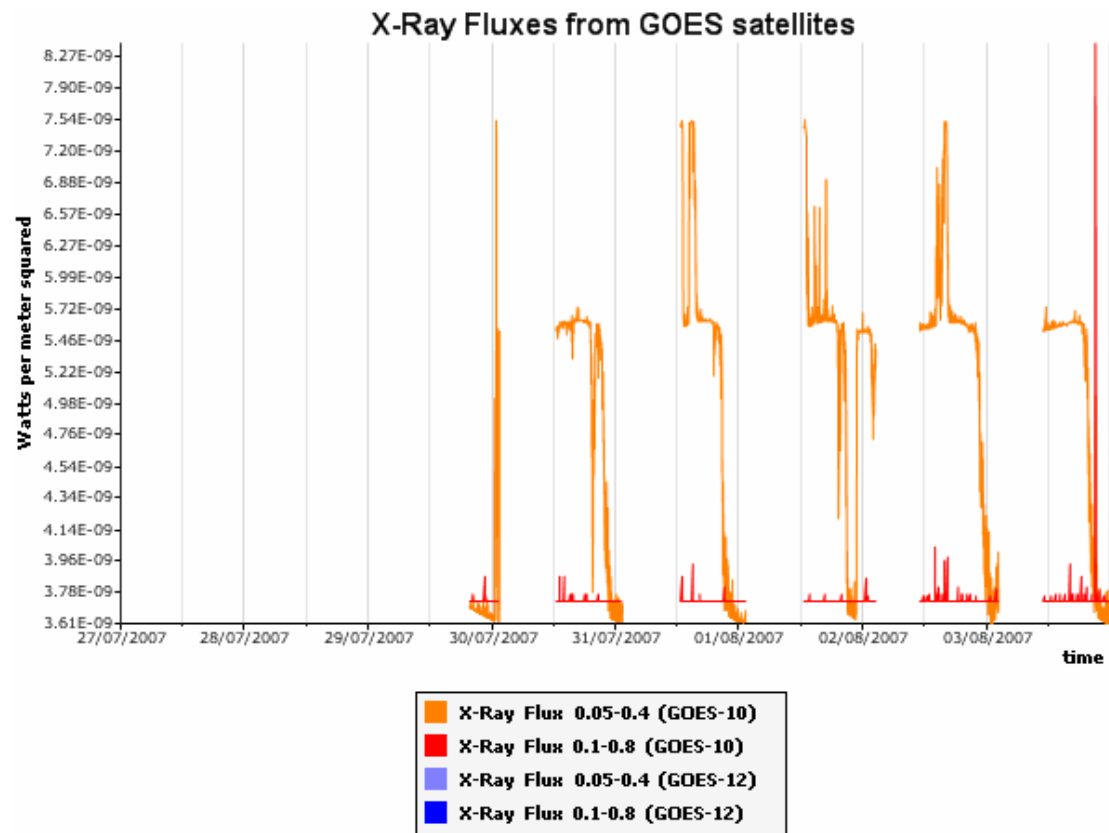
Rev 584



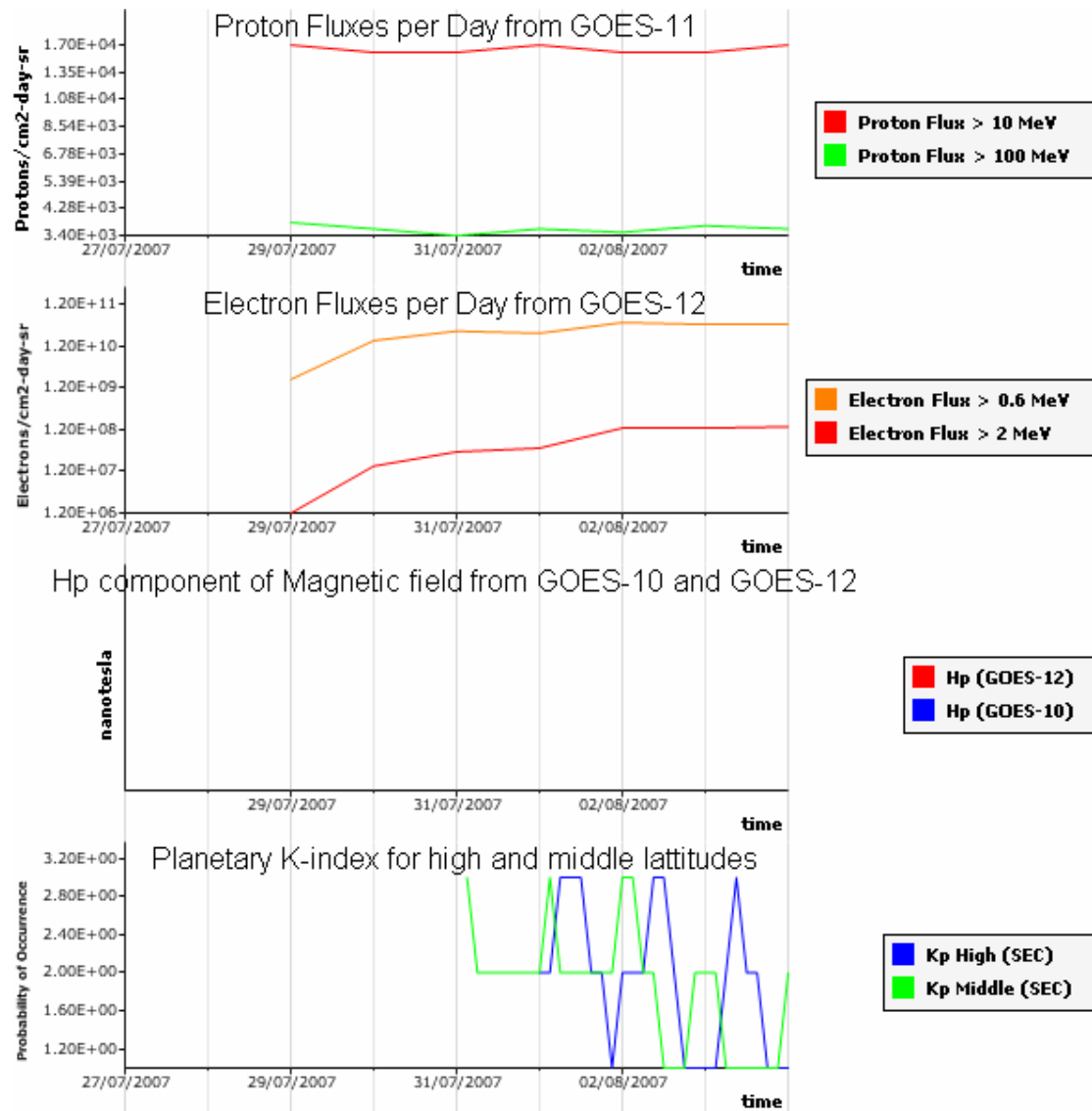
Rev 585



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



X-Ray fluxes start to be significant over 10^{-5} W/m² (corresponding to M-class flares). Above 10^{-4} W/m², they correspond to strong X-class flares.



Proton and electron flux are reporting low radiation background this week. 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.