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

INTEGRAL
Mission Report

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

No. 273
Week 50

17.12.07

Routine Phase

Prepared by: M.J.H. Walker (OPS-OAI) and INTEGRAL FCT

LIST OF CONTENTS

DISTRIBUTION LIST

Addressees	Copy	Addressees	Copy
D/OPS		ESA HQ	
G. Winters D/OPS	1	D. Southwood D/SCI	1
J. F. Kaufeler OPS-G	1		
N. Bobrinsky OPS-ON	1	ESTEC	
J. Dodsworth OPS-OA	1	J. Louet SCI-P	1
	1		1
	1	ESTEC / PG	
M. Schmidt	1	G. Sarri	
R. Southworth	1		
F. Di Marco	1	ESTEC/RSSD	1
F. Cordero	1	M. Kessler SCI-SD	
M. Walker	1	C. Winkler	
P. Lippi	1	A. Parmar	
R. Lemme	1		
S. Fahmy	1		
		ISDC	
SPACONs	1	T. Courvoisier	1
I. Bayliss	1	R. Walter	1
G. Di Girolamo	1	ISDC Shift Team	1
F. Dreger	1		
G. Gienger	1		
S. Pallaschke	1	ALENIA	
W. Hell	1	M. Montagna	
K.J. Schulz	1	F. Ravera	1
M.A. Larsen	1		1
		PI / Instrument Teams	1
M. Butkovic	1	J. P. Roques – SPI	1
D. Heinzer	1	G. La Rosa – IBIS	
U. Feucht	1	P. Ubertini – IBIS	
Shift - Coord	1	S. Brandt – JEM X	1
Scheduling Office	1	E. De Miguel - OMC	1
T. Beck	1	W. Hajdas – IREM	
J. Wardill	1		
M. Unal	1	JPL / Goldstone	1
P. Maldari	1	D. Holmes	1
		J. Valencia	1
		Jesse Velasco	1
Redu		DSN - MPSETD	1
B. Demelenne			1
ESAC	1		
P. Kretschmar			1
V. Gomez SCI-O			1
E. Kuulkers	1		1
C Gonzales	1		1
ESTEC/SCI-A			
Nicola Rando	1		

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 08.12.07 until 14.12.07 (both dates inclusive) and covers the revolutions 630 and 631.

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 three raster dithers of Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0), and an OMC Flat-Field calibration, at attitude (RA 23:43:36.00, DEC -06:12:00.0).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

One slew was missed from TL, during the observation period, due to problems the DSS27 station.

The fuel consumption over the period between 08/12/2007 and 13/12/2007 was 0.0831 Kg. The remaining propellant is in the order of 143.3304 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

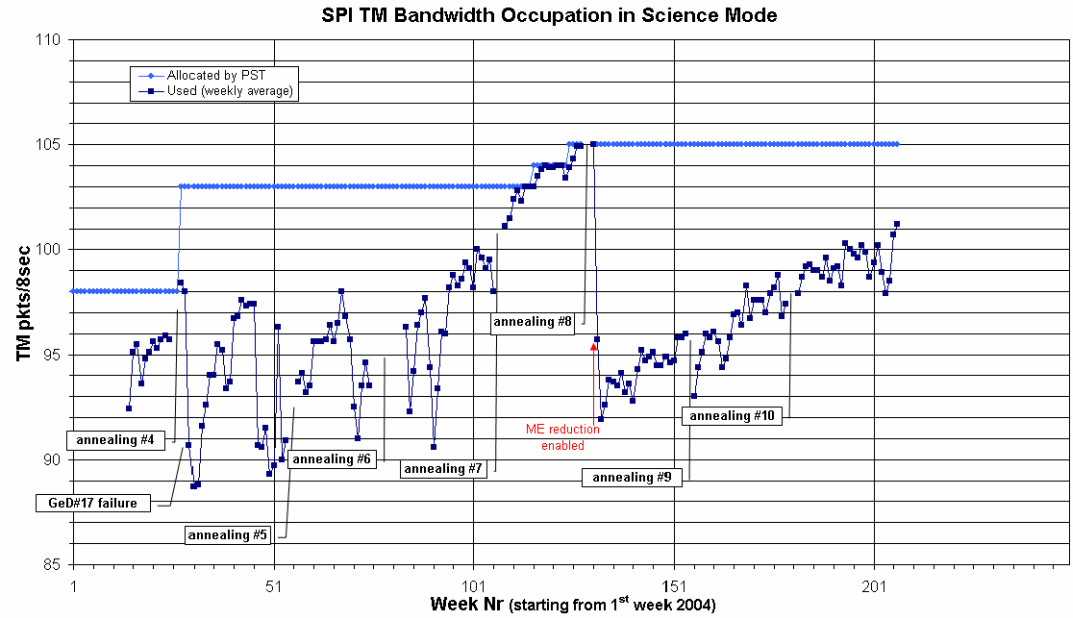
3.2.1 SPI

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.

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 from 2007-12-11T04:57:16Z to 2007-12-11T 09:24:18Z, when the TM allocation was 85packets/cycle due to an OMC Flat Field Calibration. The average telemetry occupation when the TM allocation was 105 packets/cycle was 101.2 packets/cycle.

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



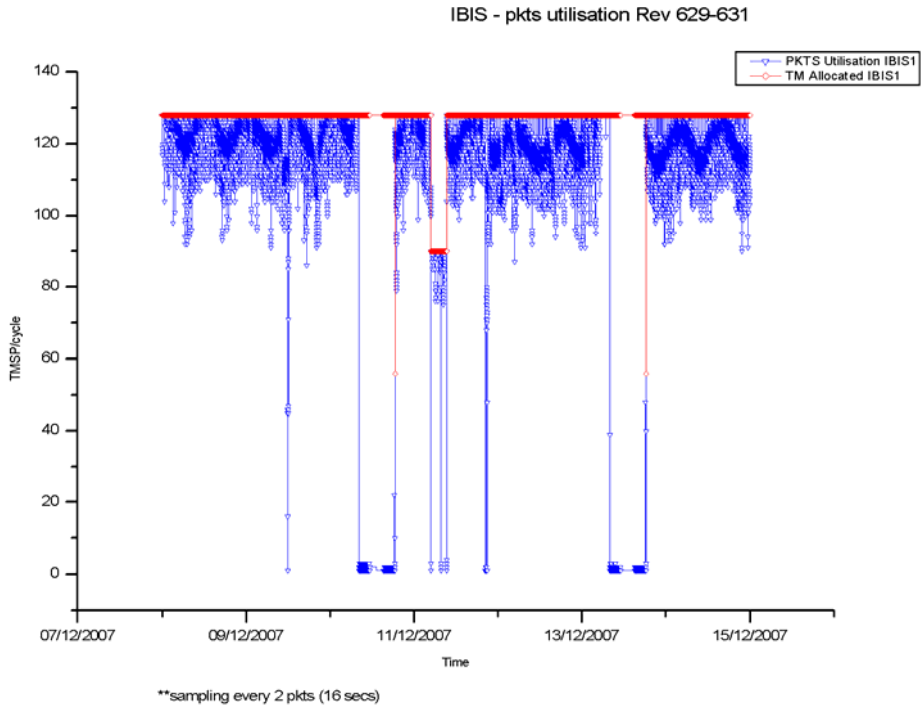
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

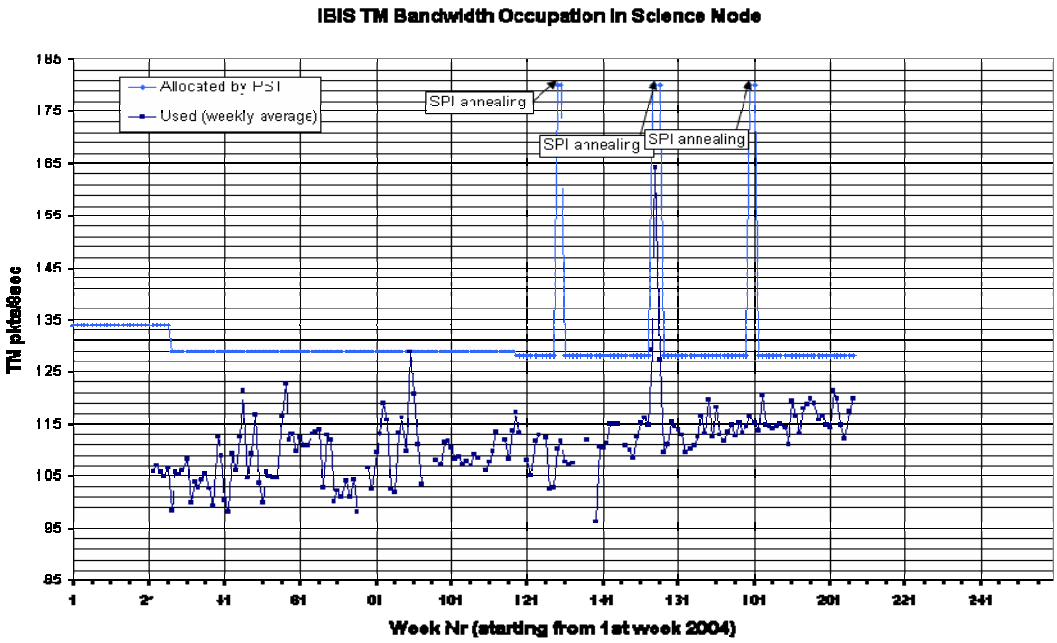
The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 packets/cycle, except from 2007-12-11T04:57:16Z to 2007-12-11T09:24:18Z, when the TM allocation was 90 packets/cycle due to an OMC Flat Field Calibration. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 120.02 packets/cycle, up 2.50 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, except during the Flat-Field calibration from 2007-12-11T04:57:59Z to 2007-12-11T09:25:01Z, when it was 63 packets/cycle.

During this reporting period, 233 of the 235 planned science pointings for OMC were executed nominally, 2 were cut short.

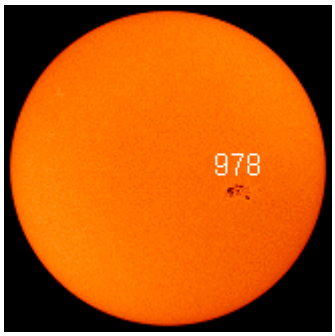
Note: Some more information concerning the OMC operations is provided in the Appendix.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity. Sun spot number 978 grew throughout the week, developing a beta-gamma magnetic field harbouring energy for M-class solar flares. However, only low radiation levels were experienced by Integral.



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 pointing was cut short due to ground problems. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was excellent this week. There no problems reported. The overall performance was well over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. There were, however, 4 occasions of TM drops from Redu, 2 from DSS27, which led to the shortening of a pointing, and a couple of incidences where the link with ISDC dropped. The overall performance was well over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

New PSFs have been received for revolutions 638-641. The PSFs for revolutions 638 and 641 were changed again to accommodate maintenance at Redu.

Revolutions have been planned up to revolution 641, with the last four being planned twice because of the PSF changes. Revolution 641 will have to be redone again because of the final decision on the SPI annealing.

The TSFs for revolution 632 & 633 have been received.

2. Observation status

Now new ECS for have been received, the latest is from revolutions 618.

3. ISOC Science Data Archive

A new version of the INVITE tool with various new functionalities, e.g. image browsing and OMC VO access is about to be released.

4. ISOC system

ISOC system V16.2 was released Monday, 10 December. The changes for V17 have been successfully tested and the release is expected early next week.

5. Problems

None.

4.3.2 ISDC

Status of ISDC observation processing on 17/12/2007:

- Latest Standard Analysis completed: observation 05200260001 (mid-latitude 1 region, Revolution 616-617) on 08/12/2007.

- Latest products archived: observation 05200260001 (mid-latitude 1 region, Revolution 616-617) on 08/12/2007.

- Latest observation products sent to the observer: observation 05200260001 (mid-latitude 1 region, Revolution 616-617) on 10/12/2007.

5 Special Events

6 Anomalies

The following problem was reported that impacted operations:

- On DoY 345, at 20:20, an IREM SEU (#58) occurred. See appendix for details.
- On DoY 346, from 05:01 to 06:20 there were repeated drops of TM from DSS27, probably due to RFI. The impact was missing packets from pointings 06300052 & 06300053 and pointing 06300054 was shortened from a scheduled 2000 to 1064 seconds.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-215	2007-12-20	IREM Anomaly: Reset of IREM_CSCI S/W #58, 11/12/2007	Payload	Pending
INT-2969	2007-12-19	Low Bit Rate ON VC7 TM From DSS24	NASA Station	Pending
INT-2970	2007-12-10	VC7 TM Link From Redu in Drop	ESA Stations	Pending
INT-2971	2007-12-17	Voice Loop to ISDC Not Operational	Comms	Pending

7 Future Milestones

The following activities are foreseen in the next few weeks.

- A SPI annealing activity is foreseen to be performed during revolution 641..

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 630

The observations in revolution 630 began with a raster dither of Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0), lasting ~8.3 hours. It continued with an OMC Flat-Field calibration, a staring observation at attitude (RA 23:43:36.00, DEC -06:12:00.0), lasting ~3.4hours. Finally, a return to the raster dither of Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0), was executed for ~42.8 hours, until the end of the revolution.

Revolution 631

The observations in revolution 631 consisted entirely of a raster dither of Cygnus Region (RA 20:35:53.00, DEC +40:39:49.0), lasting ~56.1 hours.

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, except during the OMC Flat-Field calibration from 2007-12-11T04:57:59Z to 2007-12-11T09:25:01Z, when it was: IBIS 90; SPI 85; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2007-11-24T02:35:18.000Z     143.6118    F   Automatic TM processing.
2007-11-25T17:02:42.000Z     143.5963    F   Automatic TM processing.
2007-11-27T02:20:37.000Z     143.5719    F   Automatic TM processing.
2007-11-28T17:01:14.000Z     143.5549    F   Automatic TM processing.
2007-11-30T02:19:09.000Z     143.5315    F   Automatic TM processing.
2007-12-01T16:37:29.000Z     143.5174    F   Automatic TM processing.
2007-12-03T02:26:05.000Z     143.5051    F   Automatic TM processing.
2007-12-05T08:28:03.000Z     143.4804    F   Automatic TM processing.
2007-12-05T13:00:00.000Z     143.4593    F   After thruster torque
calibration
2007-12-05T13:33:07.000Z     143.4298    F   Automatic TM processing.
2007-12-07T16:09:13.000Z     143.4135    F   Automatic TM processing.
2007-12-09T01:42:28.000Z     143.3920    F   Automatic TM processing.
2007-12-10T15:57:53.000Z     143.3795    F   Automatic TM processing.
2007-12-11T04:05:14.000Z     143.3505    F   Automatic TM processing.
2007-12-13T15:47:29.000Z     143.3304    F   Automatic TM processing.

This report was generated  Fri Dec 14 08:00:19 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, 08/12/2007 – 14/12/2007

The AOCS operations were executed from the Automatic Timeline.

During this period, 39 Open Loop Slews, 202 Closed Loop Slews and 4 Momentum Biases were executed.

1 slew (CSL) was missed from TL, during the observation period, due to a problem with the DSS27 station.

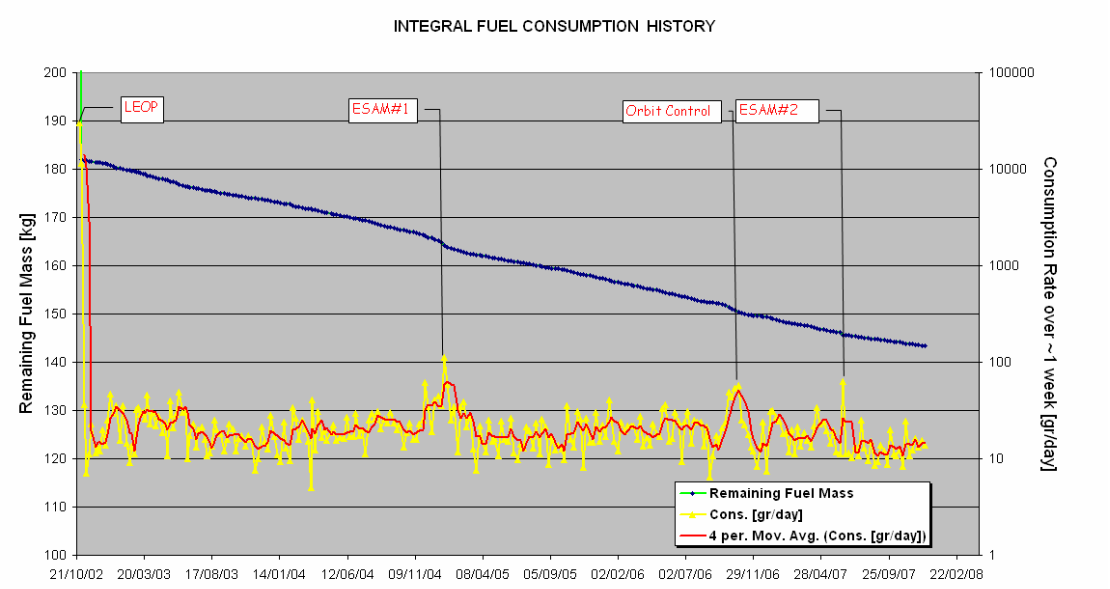
This is equivalent to ~ 0.4 % of the total number of slews planned (241).

Orbit Control

No update.

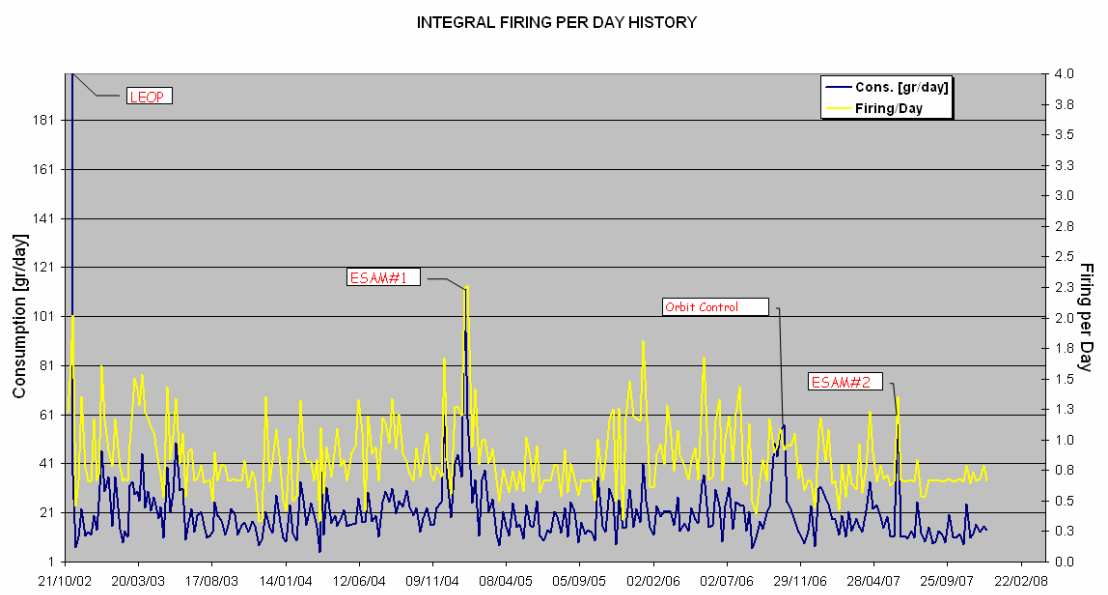
Fuel consumption

The fuel consumption (total, grams per day) over the period between 01/11/2002 and 14/12/2007 is reported in the plot below.



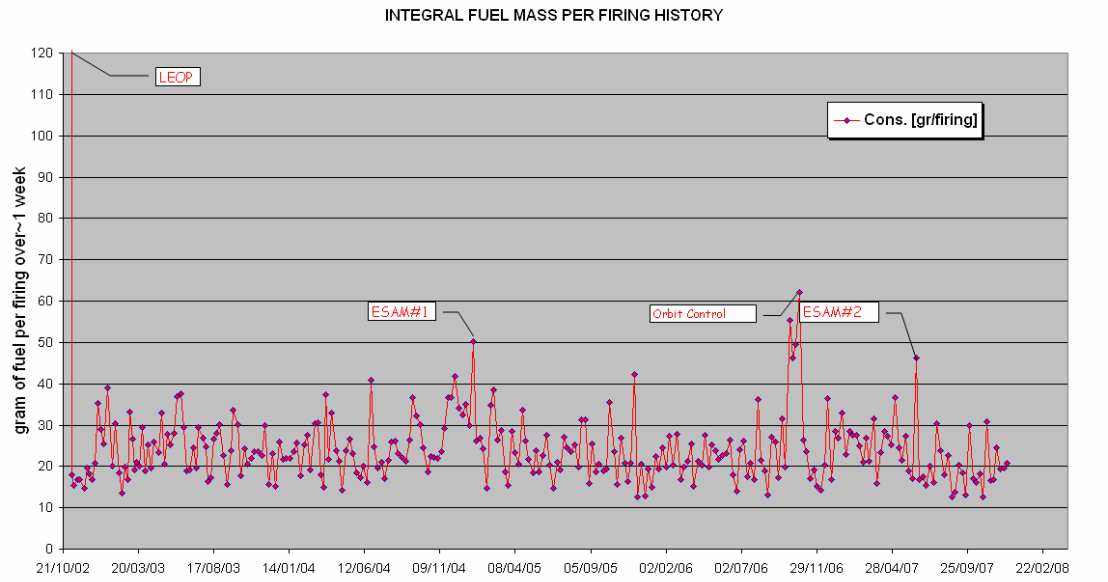
The plot above considers the ESAM fuel consumption spread over period of ~1 week.

The firing per day over the period between 01/11/2002 and 14/12/2007 is reported in the plot below.



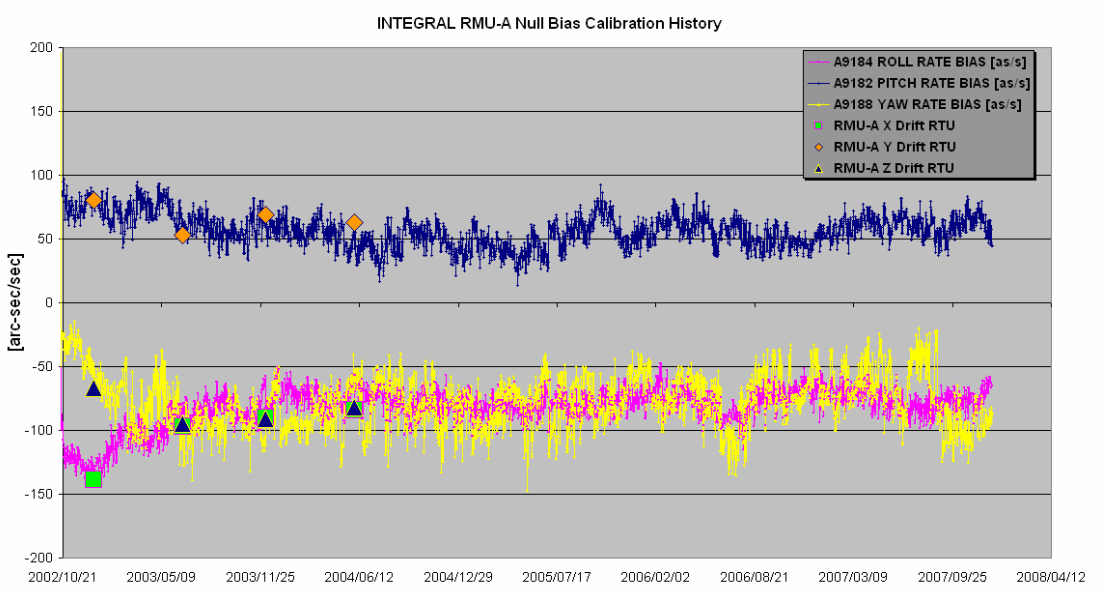
The plot above considers the ESAM fuel consumption spread over period of ~1 week.

The fuel per firing over the period between 01/11/2002 and 14/12/2007 is reported in the plot below.



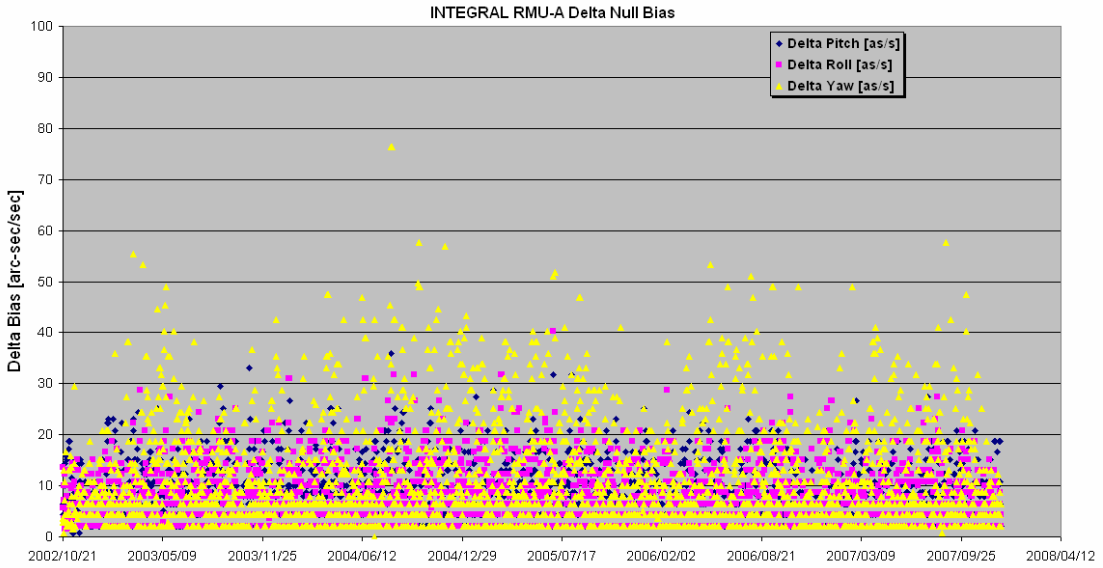
The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 14/12/2007 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 14/12/2007 is reported in the plot below.



08/12/2007 (Day of Year 342, Revolution 629)

Nothing to report.

09/12/2007 (Day of Year 343, Revolution 629)

Nothing to report.

10/12/2007 (Day of Year 344, Revolution 629-630)

Nothing to report.

11/12/2007 (Day of Year 345, Revolution 630)

Nothing to report.

12/12/2007 (Day of Year 346, Revolution 630)

RFI problem at DSS27: at 05:26z the FDS failed the update of the slew ID 06300053. The problem was caused by unstable TM links at DSS27 station likely due to RFI (see DR G-108223).

The slew ID 06300053 was then manually updated in TL.

At 06:16z the same problem occurred again, preventing the uplink of slew 06300054.

The slew was then manually recovered and the next slew ID 06300055 manually updated in TL.

At 06:43z the AOCS s/s was enabled in TL.

The following slew was missed in TL: 06300054(CSL)

13/12/2007 (Day of Year 347, Revolution 630-631)

Nothing to report.

14/12/2007 (Day of Year 348, Revolution 631)

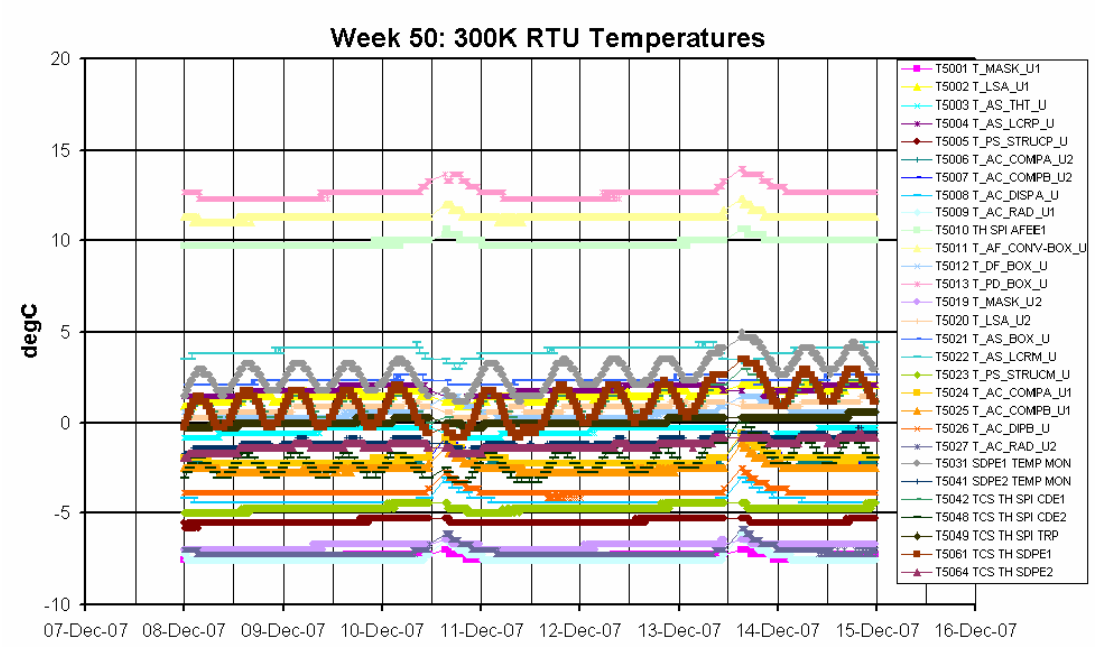
OTF not reached: at 22:19z a problem in the yaw coordinate of the selected guide star occurred during the execution of PID 06310049. This caused the OTF threshold in Yaw axis to be exceeded and the OTF not reached during PID 06310049.

As foreseen by the IPS logic, the following OEM was generated:
<< ACC YAW ERROR OOL >> APID 640 ID 50 class EVENT (0)

The OTF was not reached during PID 06310049.

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.

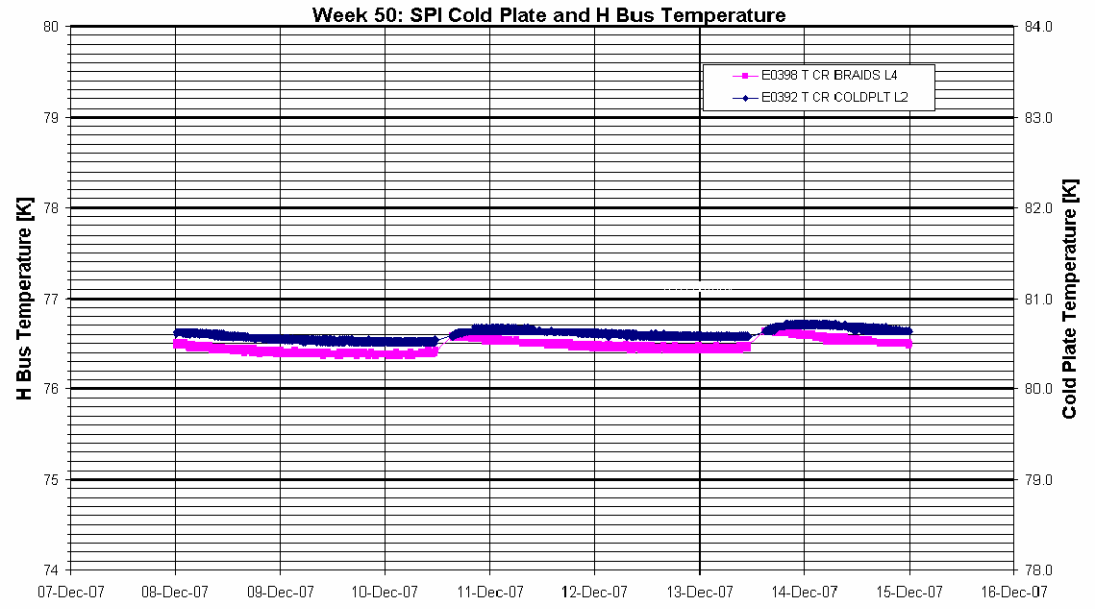


Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range 80K +/-1K.

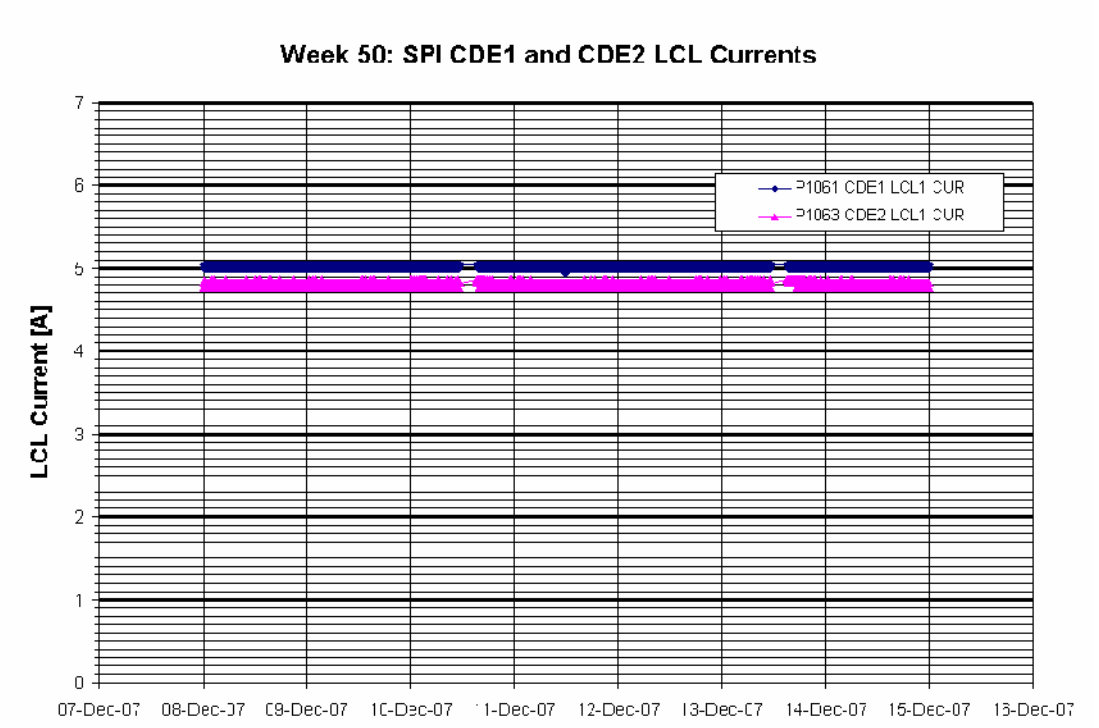
The stroke of all four compressors was set to 41 throughout the week. The average CDE LCL currents over the week were as follows:

- CDE1 LCL Current = 5.01A
- CDE2 LCL Current = 4.81A

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



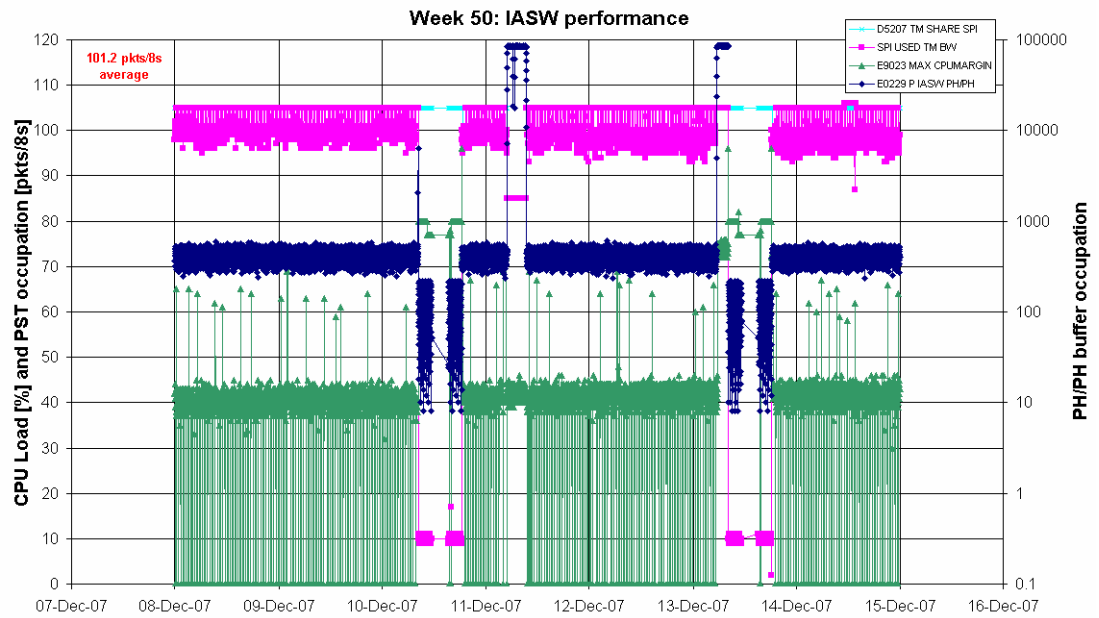
The following plot shows the evolution of the CDE currents during the reporting period.



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 101.2 packets/cycle over the science window, when the TM allocation was 105 packets/cycle.

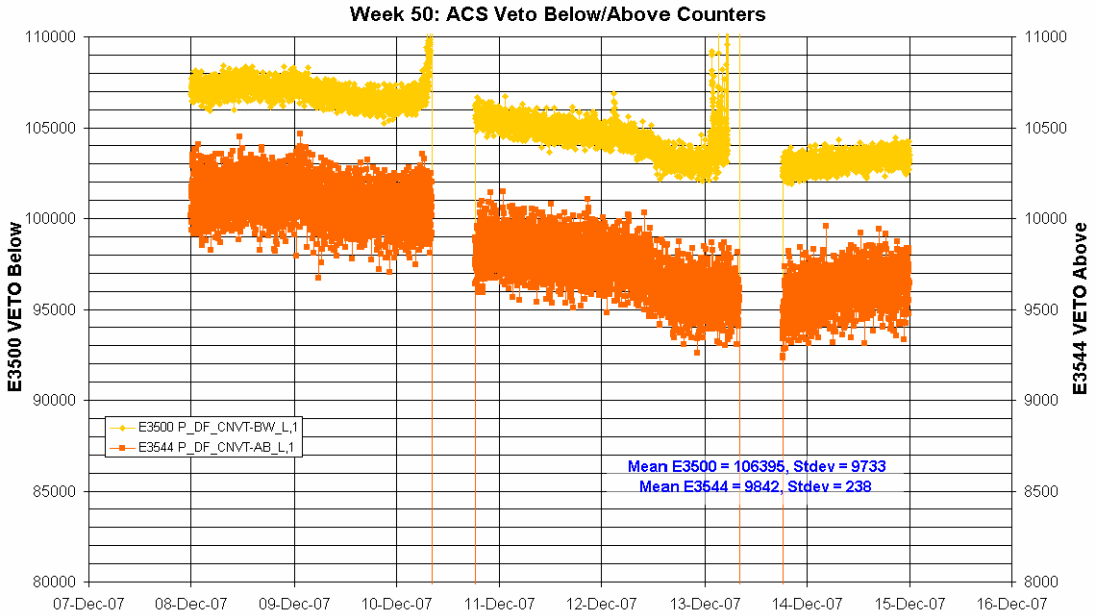
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.

Note that from 2007-12-11T04:57:16Z to 2007-12-11T09:24:18Z the TM allocation was 85packets/cycle due to an OMC Flat Field Calibration. Also, on 2007-12-14 from 11:14Z to 13:47Z a test was performed increasing the PST allocation to SPI by 1 packet in line with OCR-229. The broadcast packet was not updated. As expected SPI used the additional packet during spectra transmission and no problems were encountered.



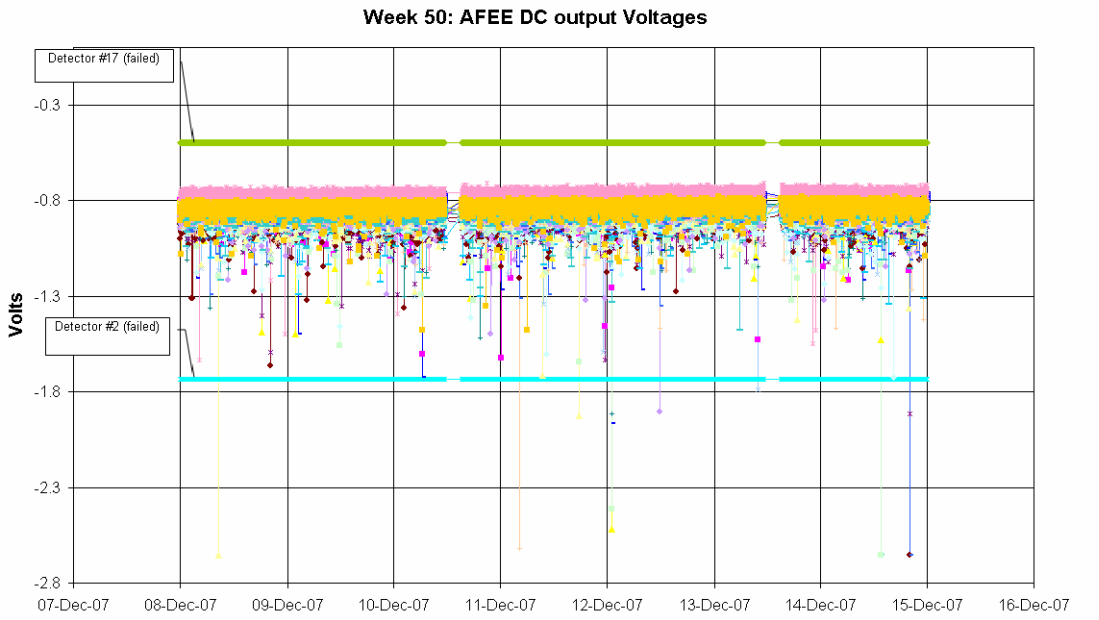
ACS: The performance of the ACS is nominal, except for FEE #81 which remains switched off since the anomaly on 29/10/2006 (INT_SC-162) and FEE #57 which is still OFF due to the anomaly on 5/8/2003 (INT_SC-61).

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

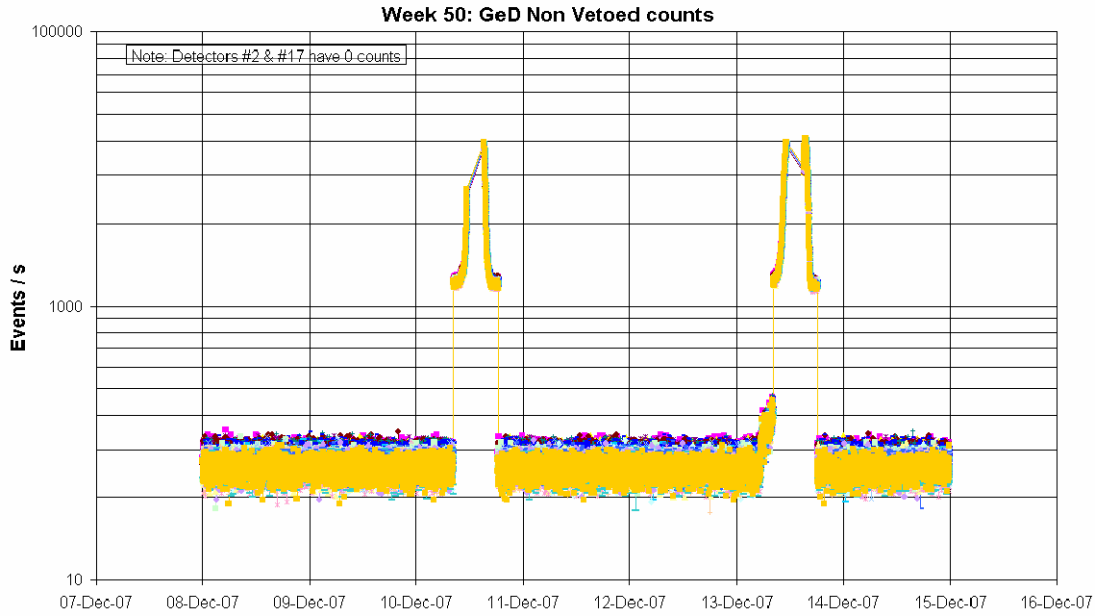


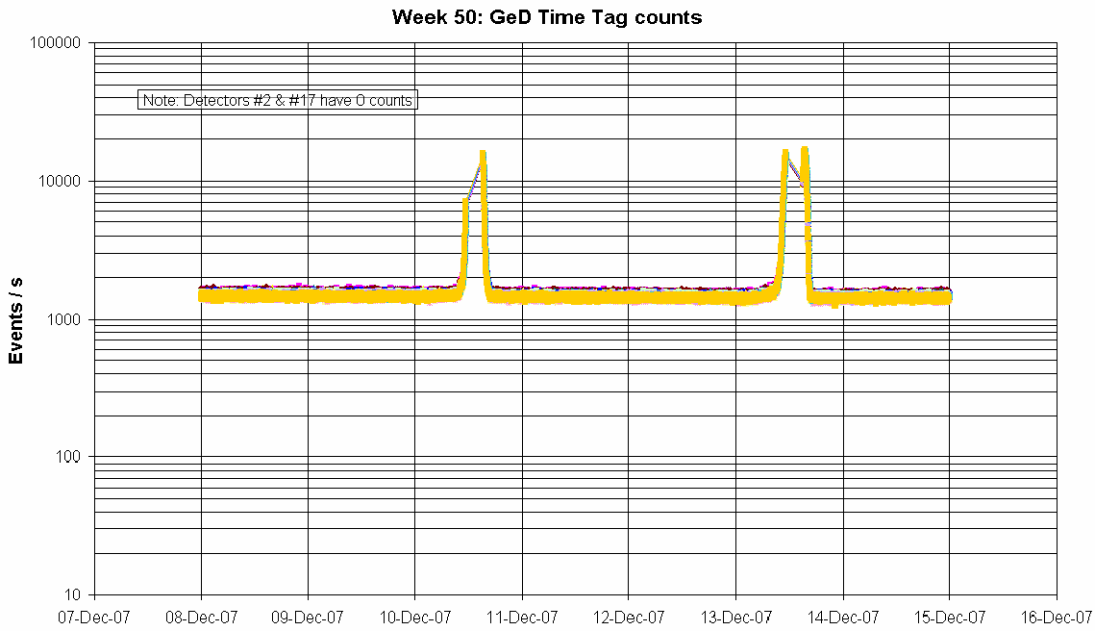
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operated at a lower HV setting of 3.5kV (instead of 4kV).

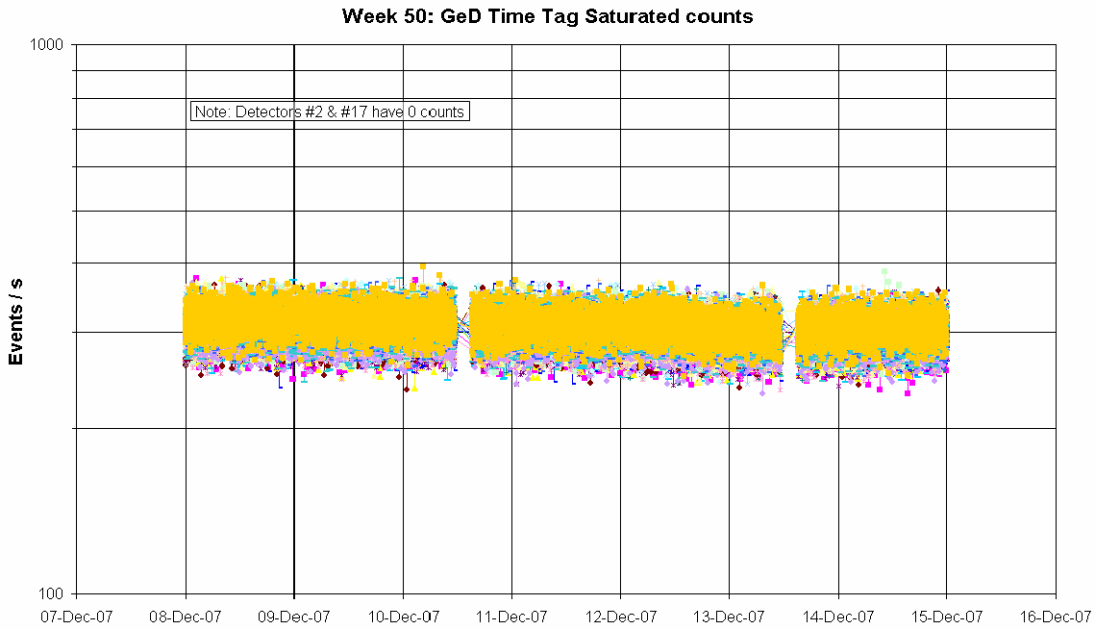
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.



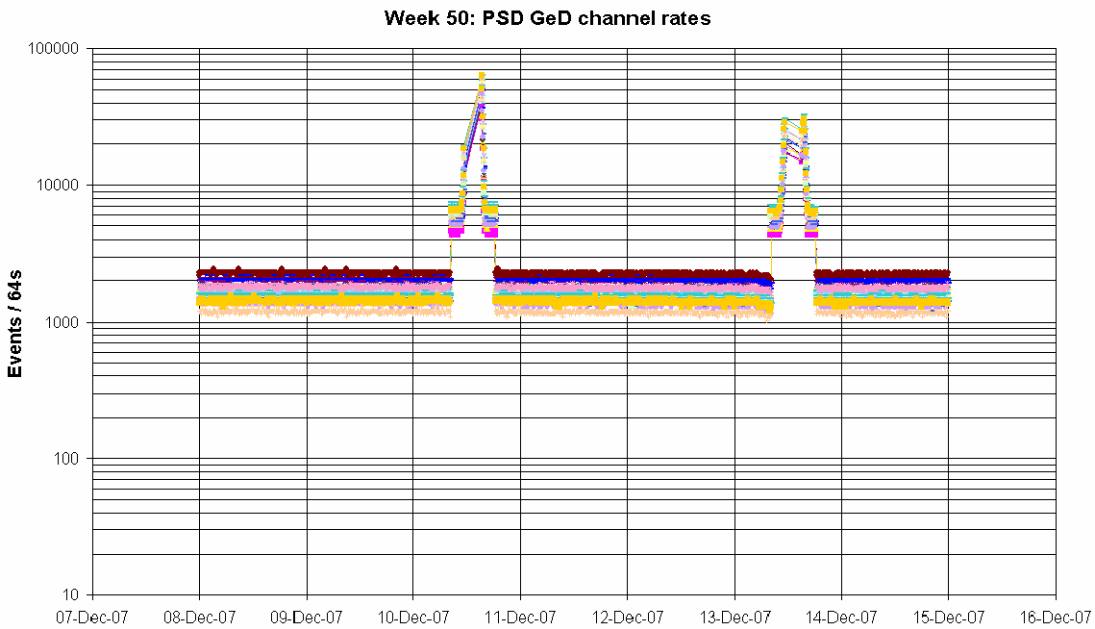
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.







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:

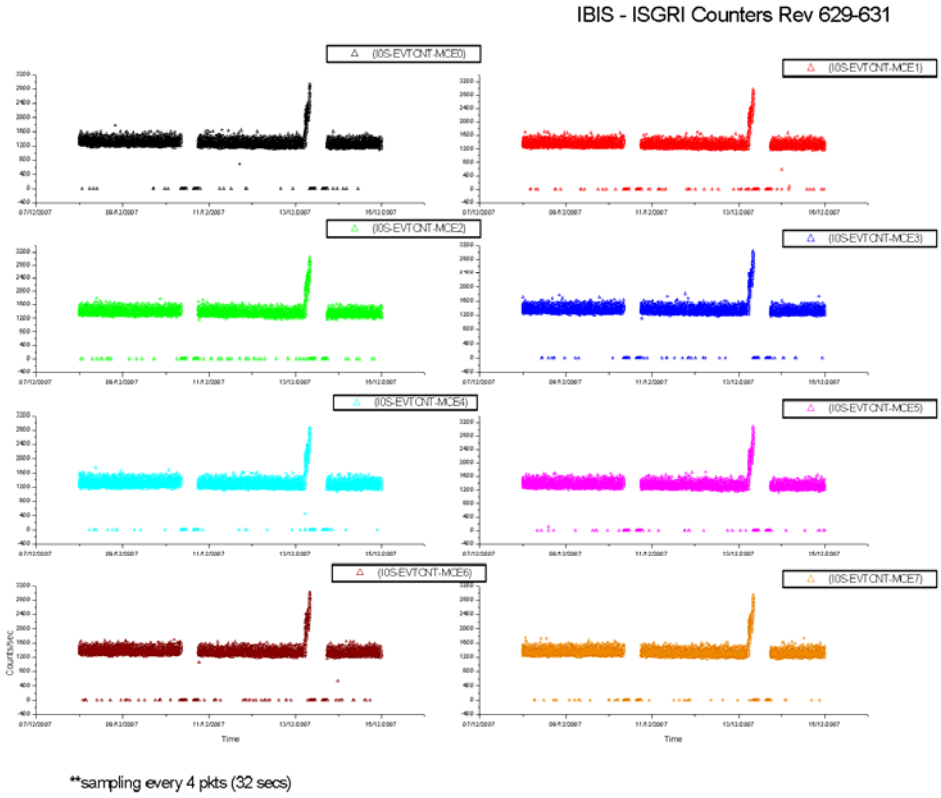
- 21 occurrences of OEM APID 1024 ID 243 EXCEPTION SPI1 SPECTRA BUILDING NOT COMPLETED were received during the week. As they were all single occurrences, no action was taken.
- On 2007-12-10 at 08:22:05Z TM parameters E3981-E3984; E3986; E3988; E3991-E3992 and E3995-E3996 all went OOL with value = 0. These are the Coldbox temperatures; DFEE and PSD box temperatures; VCU temperature; Heat pipe temperatures and the AFEE power supply board temperature and are all in SPID 60602. This was shortly after radiation belt entry of revolution 629 and was the first mode-change initiated packet. The parameters returned within limits when the next packet (2nd mode-change packet) was received at 08:24:57Z. This is covered by Anomaly Report INT_SC-205.
- On 2007-12-10 at 15:43:31Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. This was during the AOS_CHK window of revolution 630, when the time verification TC was sent. This OEM is sometimes received when this TC is sent and no action was taken.
- On 2007-12-11 from 09:44:19Z to 09:49:31Z, 17 occurrences of OEM APID 1024 ID 245 EXCEPTION SPI1 SPECTRA COMPRESSION OVERFLOW were received (one for each GeD), followed at 09:49:31Z by OEM APID 1024 ID 244 EXCEPTION SPI1 SPECTRA COMPRESSION NOT COMPLETED. This was about 20 minutes after the TM allocation to SPI was changed back from 85 packets/cycle (due to the OMC FFC) to 105 packets/cycle. These OEMs, indicating problems with the spectra compression due to insufficient bandwidth, are nominal following periods of low TM allocation to SPI. They stopped of their own accord and SPI operations continued nominally.
- Due to high background radiation conditions before the expected radiation belt entry of revolution 630, on 2007-12-13 at 05:31:56Z TM parameter E3500 went OOL High, remaining OOL until radiation belt entry, at 08:09Z.

- On 2007-12-13 at 08:08:29Z, during the reconfiguration of SPI at radiation belt entry of revolution 630, TM parameters E2381; E3195 and E3234 all went OOL (value = 0 [PARAM > SPEC]). These are the ACS FEE analogue status -5 V #31; ACS FEE temperature status #31 and ACS FEE temperature status #70. They are in the SPID 60601. They returned within limits when the next packet was received at 08:10:21Z and no action was taken. This is a re-occurrence of part of a previously observed problem with acquiring ACS data during the radiation belt transition, covered by Anomaly Report INT_SC-211.
- On 2007-12-13 at 08:11:33Z TM parameters E3981-E3984; E3986; E3988; E3991-E3992 and E3995-E3996 all went OOL with value = 0. These are the Coldbox temperatures; DFEE and PSD box temperatures; VCU temperature; Heat pipe temperatures and the AFEE power supply board temperature and are all in SPID 60602. This was shortly after radiation belt entry of revolution 630. The parameters returned within limits when the next packet was received at 08:14:25Z. This is covered by Anomaly Report INT_SC-205.

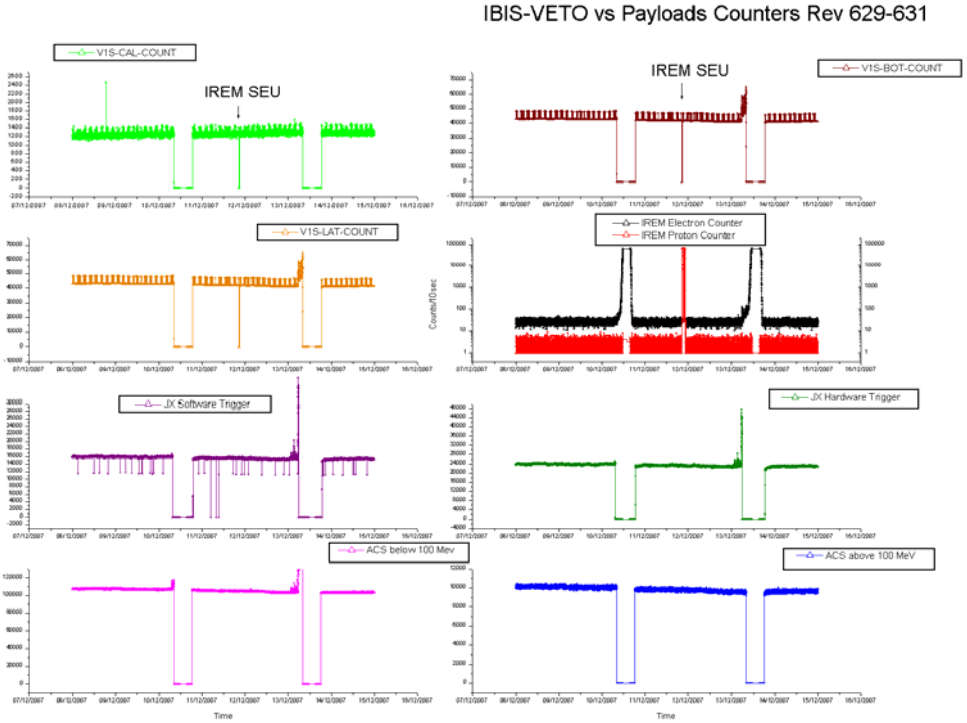
8.3.3 IBIS Operations

IBIS Event Counters Plots

ISGRI Counters:



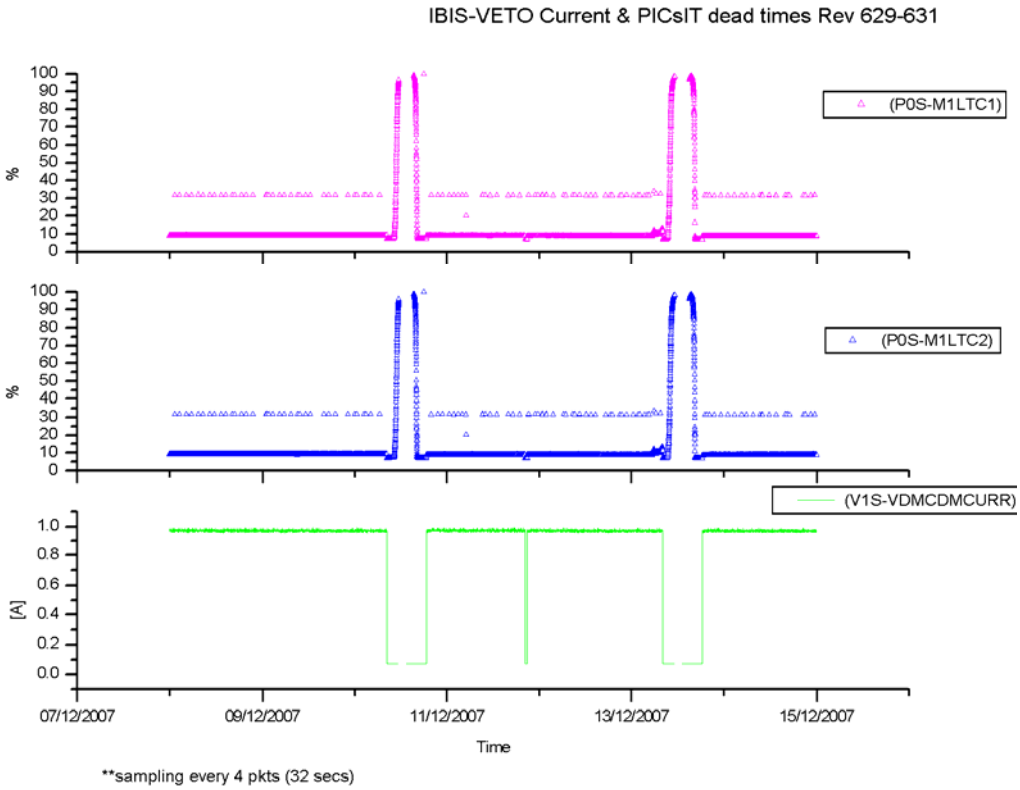
VETO vs Payloads Counters:



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

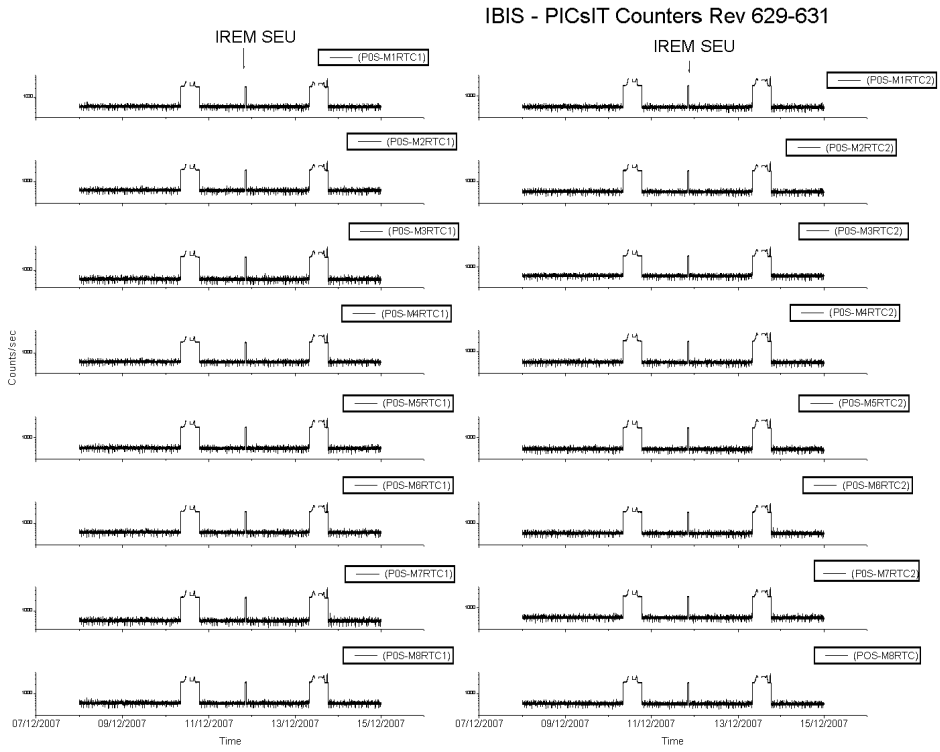
The week was characterised by high radiation before the expected radiation belt entry of revolution 630 as reported by the payload.

VETO Current:



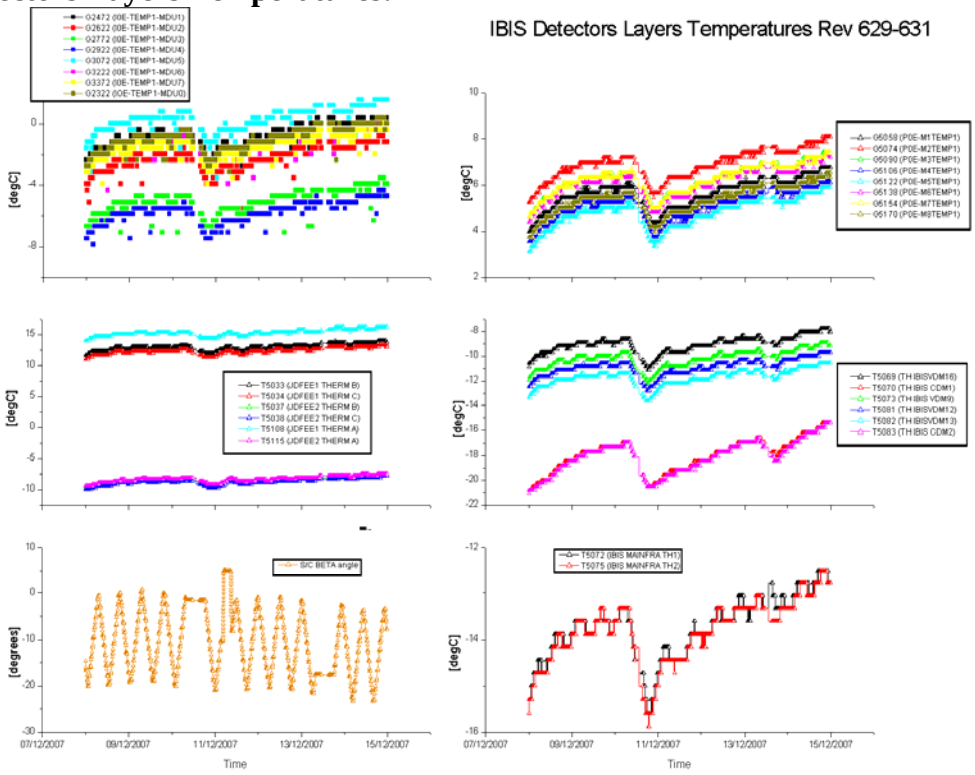
**sampling every 4 pkts (32 secs)

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, 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. This indicates an overflow in the counters and affects only the quality of the scientific data but not the safety of the instrument.

2007-12-08 (DOY 342, Rev 629)

IBIS operations executed nominally.

2007-12-09 (DOY 343, Rev 629)

At 11:11Z, 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:

- 12:03:05Z FCP_IBIS1_0312
- 12:08:17Z TC G0129 uplinked to return IBIS to Science Standard mode.

IBIS operations continued nominally.

2007-12-10 (DOY 344, Rev 629-630)

IBIS operations executed nominally.

2007-12-11 (DOY 345, Rev 630)

Due to an IREM SEU, IBIS transitioned autonomously to Safe configuration at 20:20:18Z It was recovered as follows:

- At 20:43:12Z FCP_IBIS1_0803 IBIS EXIT FROM SAFE MODE
- At 20:59:02Z ED GESTAN02 uplinked with the planned observation parameters and commanding to IBIS from the Timeline re-enabled.

IBIS operations continued nominally.

2007-12-12 (DOY 346, Rev 630)

IBIS operations executed nominally.

2007-12-13 (DOY 347, Rev 630-631)

Due to the high background radiation, at 05:31:19Z, ~2.5 hours before radiation belt entry of revolution 630, TM parameters G6062 and G6063 started toggling OOL High. These are the VETO bottom and lateral counters respectively. In addition, starting at 05:52:31Z the G2013 family (Number of events triggering the MCEi per

second) also started toggling OOL High. These parameters continued to toggle OOL until radiation belt entry at 08:08:59Z.

At 18:19:43Z, just after radiation belt exit of revolution 631, TM parameter G2027went OOL Low (value =0). This is the number of events triggering the MCE1 per second. As it returned within limits at 18:20:07Z, no action was taken.

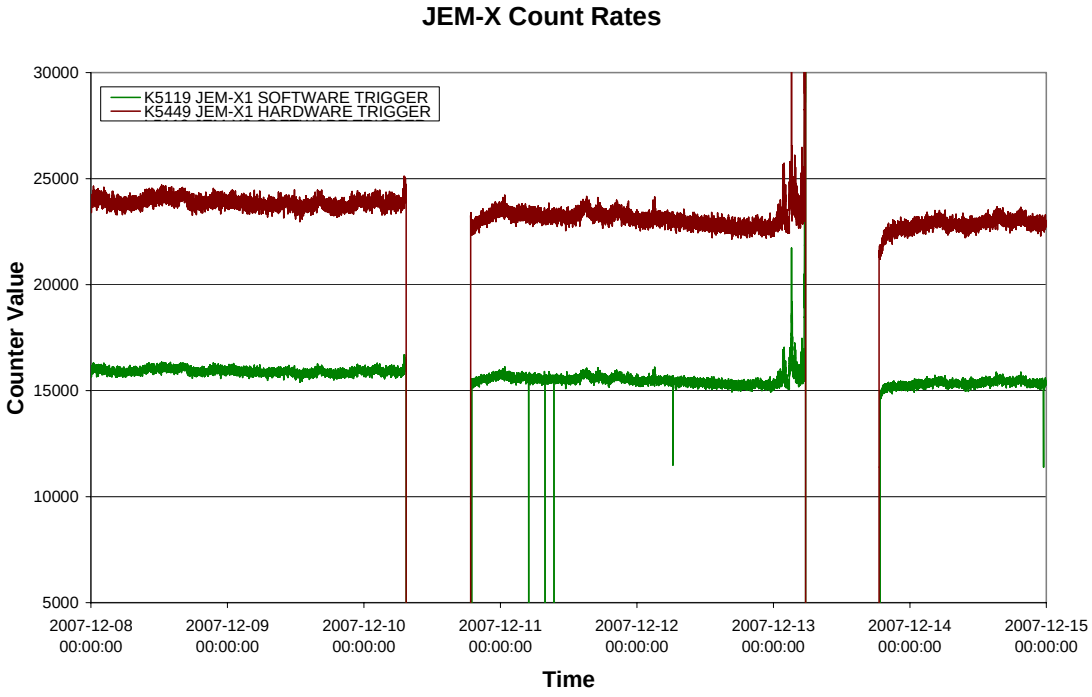
2007-12-14 (DOY 348, Rev 631)

IBIS operations executed nominally.

8.3.4 JEM-X Operations

JEM-X Count Rates

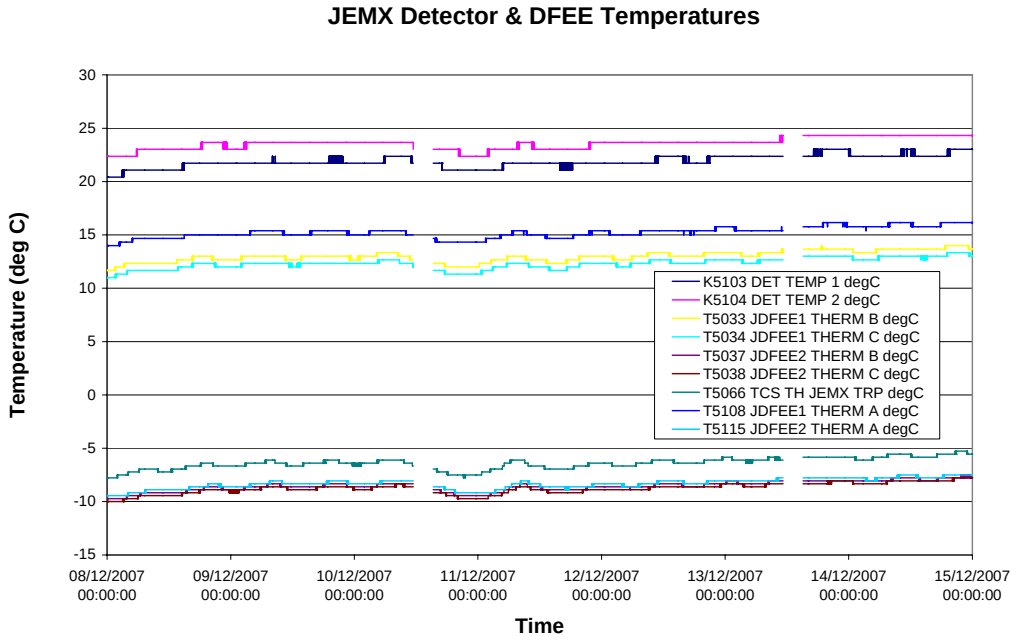
JEM-X count rates over the reporting period are displayed in the following graph[1].



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].

[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

2007-12-08 (DoY 342, Rev 629) to 2007-12-10 (DoY 344, Rev 629-630)

JEM-X1 operations executed nominally

2007-12-11 (DoY 345, Rev 630)

At 20:20:52 JEMX parameters K5315, K5316 & K5317 went Out-of-Limits due to an IREM SEU (#58). There was no impact as the reaction has been disabled.

2007-12-12 (DoY 346, Rev 630)

On this day, the following group of anomalous OEMs were received, at the indicated times:

```
2007.346.21.24.32.569   2007.346.21.24.34.785   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                          0       0    65535   PR    N
E   E
    FIX6                                        0
    K9079          MESS CLASS                   2
    K9080          MESS ID                      5
    K9074          TASK ID 16                   12
    K9067          LOGICAL ADDRESS              4989
2007.346.21.24.32.569   2007.346.21.24.34.823   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                          0       0    65535   PR    N
E   E
    FIX6                                        0
    K9079          MESS CLASS                   2
    K9080          MESS ID                      5
    K9074          TASK ID 16                   12
    K9067          LOGICAL ADDRESS              4989
2007.346.21.24.32.569   2007.346.21.24.34.826   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                          0       0    65535   PR    N
E   E
    FIX6                                        0
    K9079          MESS CLASS                   2
    K9080          MESS ID                      5
    K9074          TASK ID 16                   12
    K9067          LOGICAL ADDRESS              4989
```

```
2007.346.21.24.32.569   2007.346.21.24.34.828   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       2
    K9080          MESS ID                          5
    K9074          TASK ID 16                       12
    K9067          LOGICAL ADDRESS                  4989
2007.346.21.24.32.569   2007.346.21.24.34.831   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       2
    K9080          MESS ID                          5
    K9074          TASK ID 16                       12
    K9067          LOGICAL ADDRESS                  4989
2007.346.21.24.32.569   2007.346.21.24.34.833   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       2
    K9080          MESS ID                          5
    K9074          TASK ID 16                       12
    K9067          LOGICAL ADDRESS                  4989
2007.346.21.24.32.569   2007.346.21.24.34.835   1536   RealTime   5       ANOMALY
JEM-X1 CSSW INT ER EXCEPTIO                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       2
    K9080          MESS ID                          5
    K9074          TASK ID 16                       12
    K9067          LOGICAL ADDRESS                  5336
```

No action was taken and the messages did not reappear. There was no impact.

2007-12-13 (DoY 347, Rev 630-631)

From 03:11:07 to 05:41:55, in the run-up to the belt entry, there were repeated warnings about parameters K5449, K5119, K5317 & KD5020D being out of hard and/or soft limit. No action was taken and there was no impact.

2007-12-14 (DoY 348, Rev 631)

On this day, the following group of anomalous OEMs were received, at the indicated times:

```
2007.348.15.11.10.657   2007.348.15.11.15.418   1536   RealTime   5       EXCEPTION
JEM-X1 EXC IACS INTERF EXID                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       1
    K9080          MESS ID                          5
    K9065          CSSW OPERAT ID                   START
    K9066          TASK ID 8                        IASW
    K9067          LOGICAL ADDRESS                  4989
2007.348.15.11.10.657   2007.348.15.11.15.505   1536   RealTime   6       EXCEPTION
JEM-X1 EXC IACS INTERF CULP                              0       0    65535   PR    N
E   E
    FIX6                                            0
    K9079          MESS CLASS                       1
    K9080          MESS ID                          6
    K9065          CSSW OPERAT ID                   START
    K9066          TASK ID 8                        IASW
    K9067          LOGICAL ADDRESS                  19726
```

No action was taken and the messages did not reappear. There was no impact.

8.3.5 OMC Operations

2007-12-08 (DoY 342, Rev 629) to 2007-12-10 (DoY 344, Rev 629-630)

Nothing to Report.

2007-12-11 (DoY 345, Rev 630)

The Flat-field and dark current calibration exercises from 04:57:59 to 09:25:01 were executed nominally.

At 20.20.10, an IREM SEU (#58) caused OMC to switch to SAFE mode. A recovery was performed, and the unit returned to standby at 20:39:41. The impact was the interruption of pointing 06300038 after 851 from the planned 2000 seconds.

2007-12-12 (DoY 346, Rev 630)

At 05:10, due to RFI at DSS-27, the OEM indicating the start of pointing 06300052 was missed. The pointing, however, was executed nominally.

At 06:16, due to continuing RFI problems, the uplink of slew 06300054 was prevented. A recovery was performed, and the unit manually set to science mode at 06:37:05. The impact was that pointing was shortened from the planned 2000 to 1064 seconds.

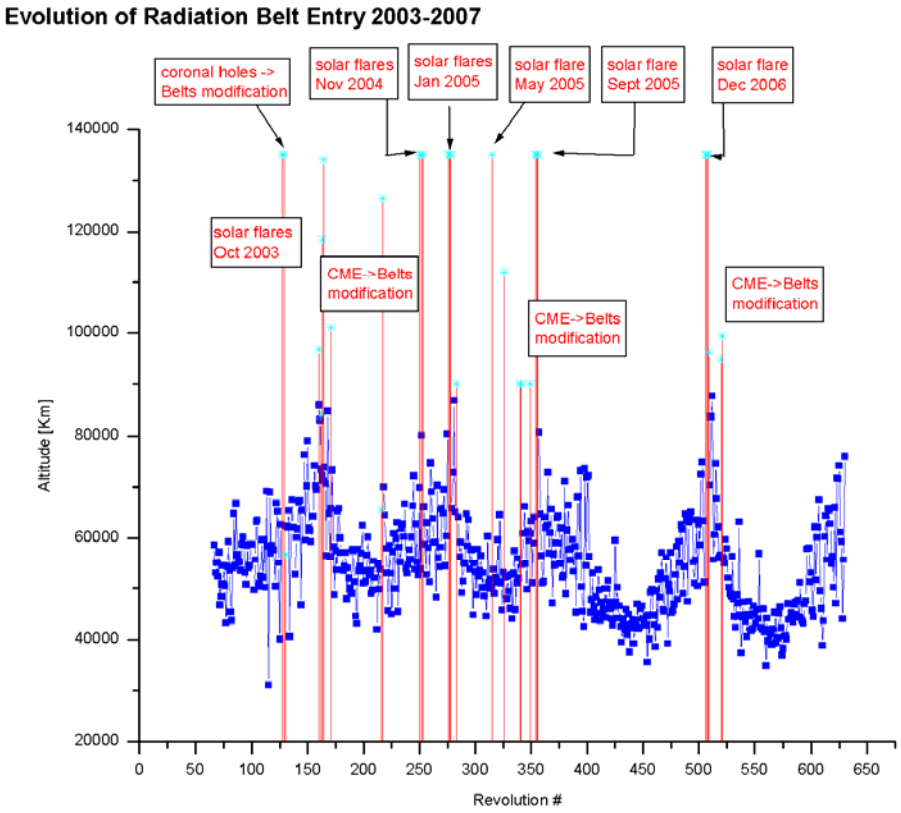
2007-12-13 (DoY 347, Rev 630-631) to 2007-12-14 (DoY 348, Rev 631)

Nothing to Report.

On DoY 344 at 08:19:22 and DoY 347 at 08:08:50 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

DoY 2007.345 (11/12/2007):

At 20.20.08Z, a local reset of the IREM CSCI S/W (SEU #58) occurred. The status of the unit, before the local reset of the IREM CSCI S/W, was nominal, here is a summary:

1) The temperatures were nominal;
2) The LCL current was nominal;
3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits;
4) The anomaly occurred at 2007.345.20.20:08Z at 149000.9 km. The unit had performed an automatic transition to Standard Mode (ie. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit;
5) The recovery of the unit started at 20:24Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly reported a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure Flag ON. The unit was still reporting the status as if it was in Integral mode with counting ON and accumulation ON. This value of the status word is assumed to be an old one written by the S/W at the moment of the anomaly.
6) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 22:47Z.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the PIs request. OMC was recovered at 20:33:16Z and IBIS at 21:00Z.

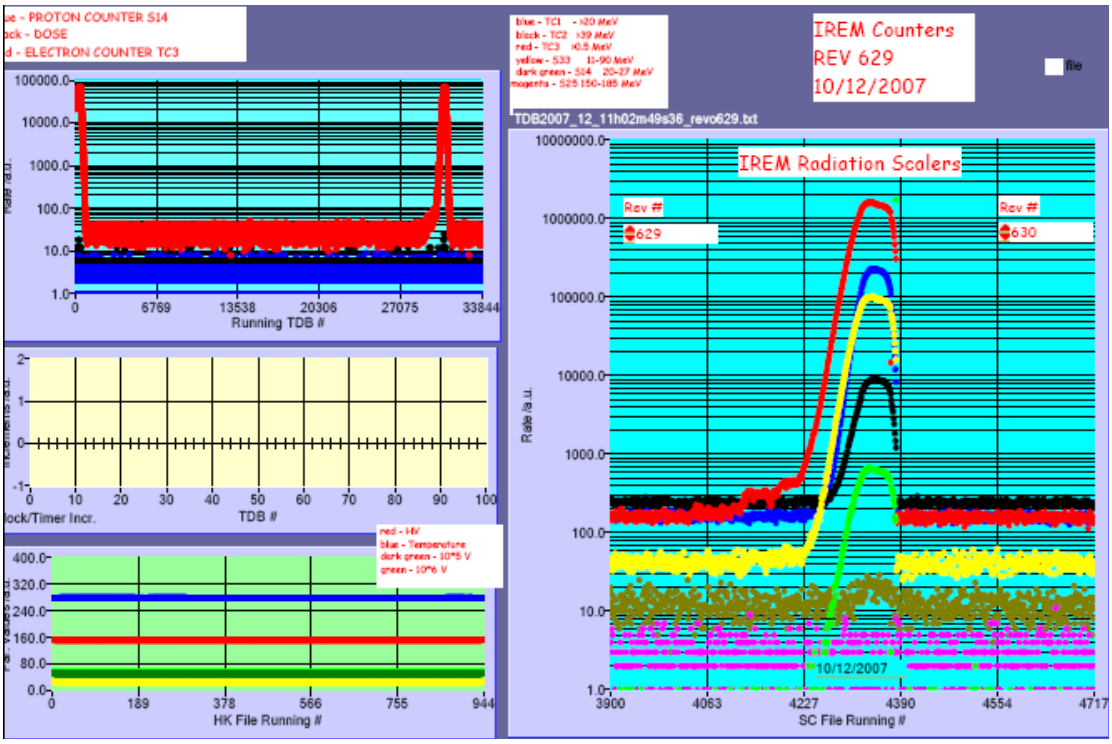
The cause of these S/W resets is apparently due to the unit's memory device that is sensitive to high energy radiation, as proved during test campaign on-ground.

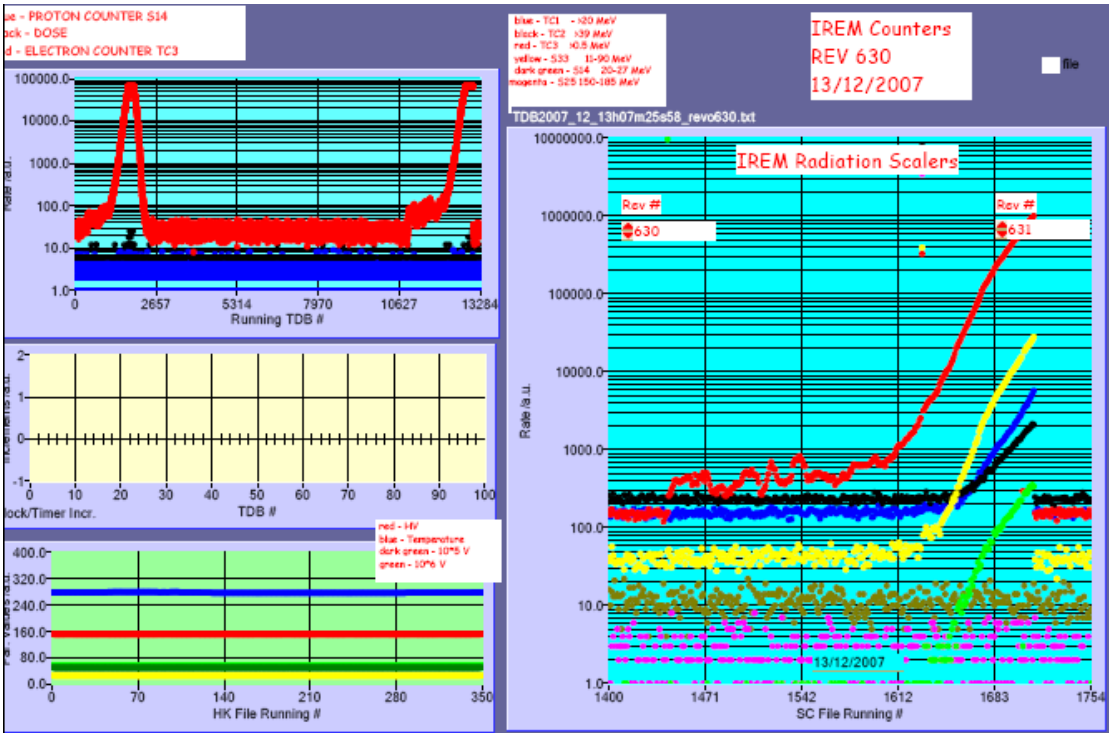
Electron Belts

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]
629	RAD_ENTR R 2007-12-10T08:19:16Z	10/12/2007 08:26:48	55744.4	10-Dec-2007 09:55:51	42989.67
630	RAD_EXIT R 2007-12-10T18:24:29Z	10/12/2007 16:29:04	>>33188.1	10-Dec-2007 17:25:51	43935
630	RAD_ENTR R 2007-12-13T08:08:46Z	13/12/2007 05:26:25	75974.1	13-Dec-2007 09:41:59	43570.75
631	RAD_EXIT R 2007-12-13T18:13:30Z	13/12/2007 16:42:49	>>33202.0	13-Dec-2007 17:21:59	44829.86

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)

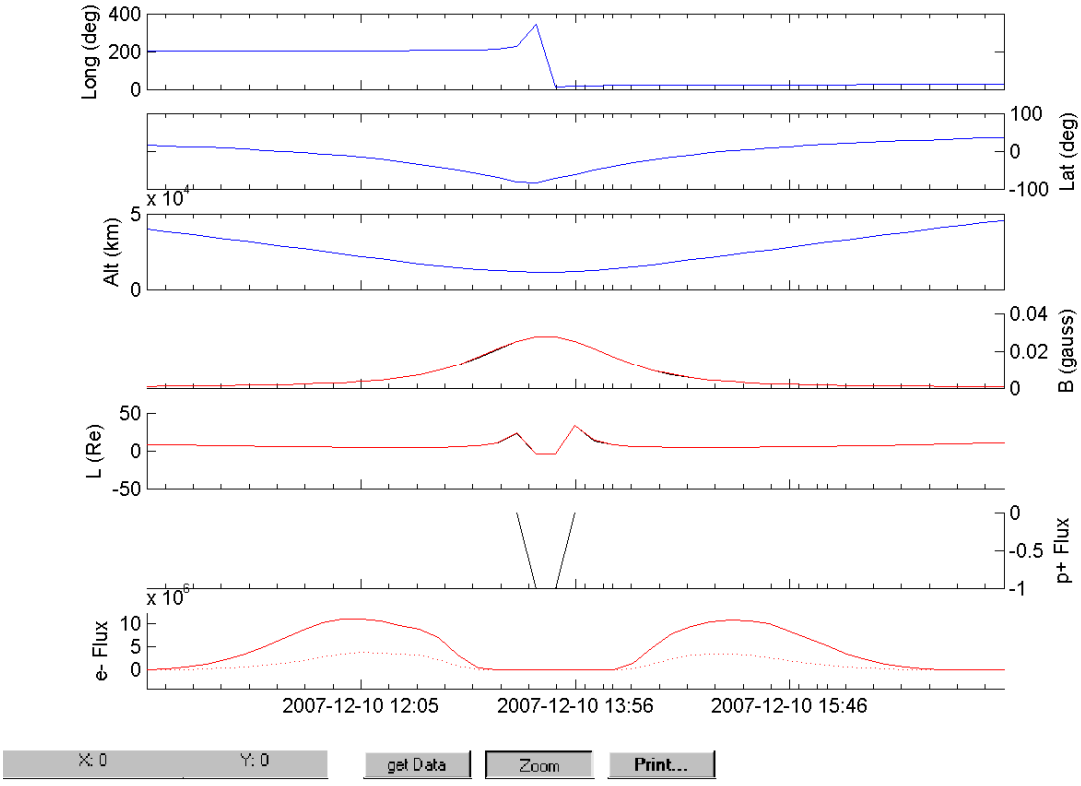
IREM radiation counters:



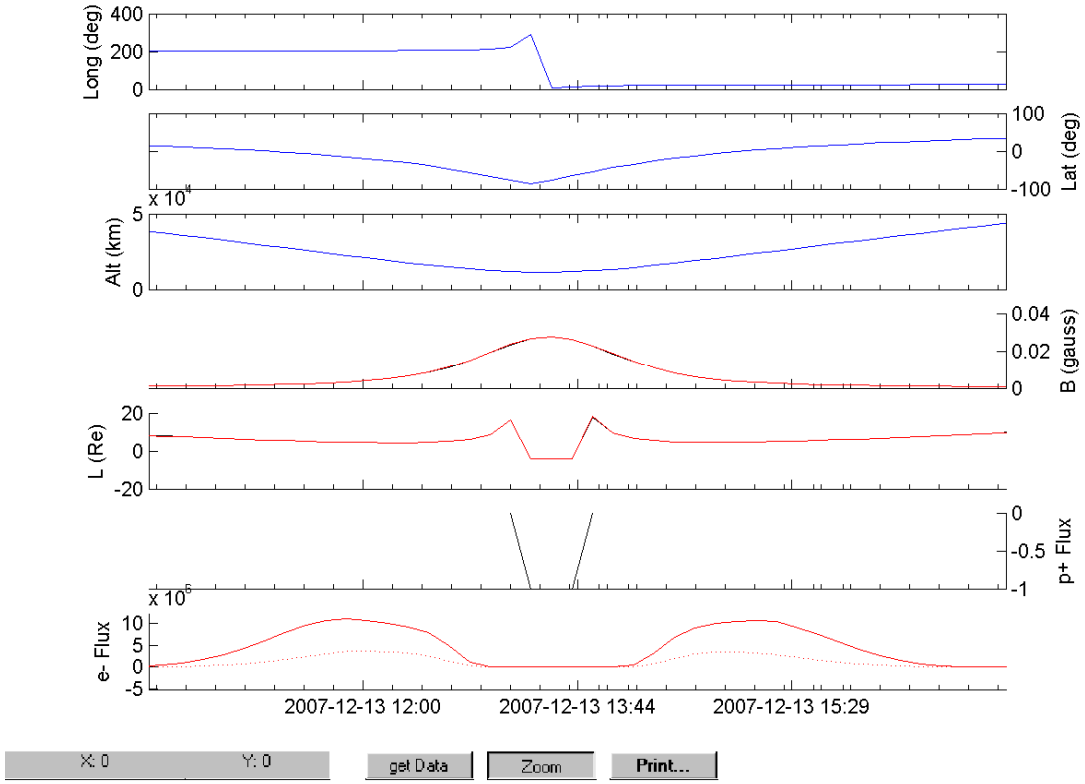


IREM Predicted Radiation Belt Passages

Rev 629



Rev 630



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.