

**INTEGRAL**  
**Mission Report**  
**INT-MOC-SYS-RP-1001-OPS-OF**  
**No. 101**  
**Week 35**  
**30.08.04**  
**Routine Phase**

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## LIST OF CONTENTS

|       |                                                            |    |
|-------|------------------------------------------------------------|----|
| 1     | General.....                                               | 3  |
| 2     | Summary of Activities.....                                 | 3  |
| 3     | Satellite Status.....                                      | 3  |
| 3.1   | Platform .....                                             | 3  |
| 3.1.1 | AOCS .....                                                 | 3  |
| 3.1.2 | Power .....                                                | 4  |
| 3.1.3 | Thermal.....                                               | 4  |
| 3.1.4 | OBDH.....                                                  | 4  |
| 3.1.5 | RFS .....                                                  | 4  |
| 3.2   | Payload .....                                              | 4  |
| 3.2.1 | SPI .....                                                  | 4  |
| 3.2.2 | IBIS .....                                                 | 4  |
| 3.2.3 | JEM-X .....                                                | 5  |
| 3.2.4 | OMC.....                                                   | 5  |
| 3.2.5 | IREM .....                                                 | 5  |
| 4     | Ground Facilities.....                                     | 6  |
| 4.1   | Mission Operations Centre.....                             | 6  |
| 4.2   | Ground Stations & Network.....                             | 6  |
| 4.3   | Science Ground Segment.....                                | 6  |
| 4.3.1 | ISOC .....                                                 | 6  |
| 4.3.2 | ISDC.....                                                  | 7  |
| 5     | Special Events.....                                        | 7  |
| 6     | Anomalies.....                                             | 7  |
| 7     | Future Milestones .....                                    | 8  |
| 8     | Appendix.....                                              | 9  |
| 8.1   | Overview of Revolutions .....                              | 9  |
| 8.2   | Consumables .....                                          | 9  |
| 8.2.1 | Detailed Fuel Book-keeping.....                            | 9  |
| 8.3   | Detailed Satellite Information .....                       | 9  |
| 8.3.1 | AOCS Summary Operations Report 21/08/2004-27/08/2004 ..... | 10 |
| 8.3.2 | SPI Operations.....                                        | 12 |
| 8.3.3 | IBIS Operations.....                                       | 15 |
| 8.3.4 | JEM-X Operations.....                                      | 21 |
| 8.3.5 | OMC Operations .....                                       | 26 |
| 8.3.6 | IREM Operations .....                                      | 27 |

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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 21.08.04 until 27.08.04 (both dates inclusive) and covers the revolutions 227 & 228.

## 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 were the galactic center; the GC field (RA 17:45:40.00; DEC -29:00:28.0) and the galactic disk l<0 (RA 16:18:32.00; DEC -50:22:26.0). The activities consisted of raster dithering and GCDE observations.

*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.

Two slews were executed manually with some delay with respect to their planned times. In one instance the target attitude was marginally violating the STR moon constraint at the slew execution time and the slew had to be delayed to avoid the constraint. In the other case, the FDS failed to update a close loop slew. FD is investigating the cause of this.

Due to a high radiation background during the perigee pass on DoY 238, the STR condition was unstable for a period of about 37 minutes. The guide star was released/lost 15 times during this period.

Two open loop slews ended with roll errors. The errors were introduced by rather poor attitude determinations that were used for updating the slews. Another flickering of the pointing-bit was caused by a pitch error due to an undetected false event on the STR. None of these attitude errors were seen at OTF level.

The guide star was lost/released several times during this period either because of false events or because after open loop slews the ACC had picked a guide star which was at the edge of the STR FoV.

The fuel consumption over the period between 20/08/2004 and 27/08/2004 was 0.155 kg. The remaining propellant is in the order of 168.464 Kg on the 27<sup>th</sup> of August.

*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 was 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**

After the failure of Germanium Detector#17, on 17<sup>th</sup> July, the overall status of the instrument in this week is nominal, except for the PSD (Pulse Shape Discriminator), which reproduced three times the anomaly of zero counts on all the channel rates, for a few minutes.

The instrument was however maintained in photon-by-photon mode with spectra TM enabled, an assigned TM bandwidth in the science windows of 103 pkts/cycle and an actual average occupation of 94 pkts/cycle.

The cryo-cooler is working well, maintaining the temperature within 85+/-1K.

*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.

In line with OR-INT 165, the JEM-X2 Digital Front End Electronics were switched off: this activity was requested to assess the decrease in temperature of JEM-X1 (currently the operational unit) and consequent decreasing of the detector gain. Due to the switch off of the JEM-X2 DFEE the thermal impact on IBIS was verified in line with OR-INT-166.

During the reporting period the PST Allocation to IBIS was 129 TMSP / Cycle. The mean IBIS Bandwidth usage was 104.2 TMSP / Cycle, up 1.4 TMSP on last week.

*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 during science observations; with a TM allocation of 8 packets/cycle. JEM-X2 was dormant with a TM allocation of 1 packet/cycle.

In line with OCR-175 the JEM-X2 DFEE was switched off at the start of revolution 228, at 2004-08-25T11:32Z, and remained off throughout the rest of revolution 228.

JEM-X1 made two autonomous transitions to Safe mode during the reporting period, triggered on both occasions by a peak in the unit's Software Trigger. In both cases, no increase in the background radiation conditions as measured by IREM was observed and therefore JEM-X1 was reactivated soon afterwards. Thus, JEM-X1 was not in its planned mode (Data Taking) during the following time periods:

- 2004-08-25T19:20Z to 2004-08-25T21:47Z;
- 2004-08-27T19:10Z to 2004-08-27T20:25Z.

Several out of limits were received on the TM parameters K5119 SOFTWARE TRIGGER and K5136 BUFFER LOSS during revolution 228.

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

### **3.2.4 OMC**

The status of OMC is nominal.

During the reporting period OMC operations were performed by the automatic timeline, with the TM allocation to OMC of 5 packets/cycle.

There were 194 OMC pointings executed nominally, 1 was lost, and 1 was delayed.

*Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.*

### **3.2.5 IREM**

The overall status of the unit is Nominal.

### **Solar Activity**

The solar activity during the observation period was low. The structure of the Radiation Belts was characterised by the influence of the recent solar activity. The inner part of the Belts passage started to reveal part of the typical footprint of the Integral orbit, but still appeared compressed around the perigee area.

No major event was reported during the observation period.

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

## **4 Ground Facilities**

The performance of the Operational ground facilities was very good this week, well above the system performance requirements, one pointing was lost, and one delayed

### **4.1 Mission Operations Centre**

The performance of the MOC was in general good in the reporting period, there was an instance where problems were experienced sending data to the isds, and two problems with the FD tool which caused data loss, but apart from that, another quiet week.

### **4.2 Ground Stations & Network**

The performance of the ground stations and Network was in general good this week. There were several minor problems reported this week with the data links to Redu, no problems at all were reported with DSS-16. The overall performance though was well above the 95% requirement. In addition there was a test performed on DoY238 at 06:33 to obtain TM from Perth ground station. This was only partially successful, with regular drops in the data flow.

### **4.3 Science Ground Segment**

#### **4.3.1 ISOC**

##### **1. Mission planning**

PSFs: up to 232 received

POS and POD: POS / POD sent up to rev 232.

TSFs: complete up to revolution 231.

One ToO was received but rejected. Rev 231 was re-planned on MOC request to avoid long slew during a pass using Perth ground station. This is an exceptional situation due to non-availability of Goldstone.

##### **2. Observation status**

ECS rev 213 received. This means everything is received up to rev 216. Corresponding OCS sent. No extra time credited.

##### **3. ISOC science data archive**

No work this work due to holidays.

##### **4. ISOC system**

The version 10.5.0 that was installed last wee has been used without problems this week. An enhance mechanism for selecting observations for scheduling was demonstrated to the users and agreed. This function is planned to become operational within a month. It is an essential feature for future scheduling with new staff when ISOC is moved to ESAC / Vilspa. The next version, 10.6 is planned to be ready in time for the implementation of the next Crab calibration campaign, see below

##### **5. AO 3 preparation**

The preparation status has been reviewed this week in ISOC. Documentation is still being updated in some areas. The aim is to have everything ready by 3 September. The software required to support the AO 3 proposal submission is available. Remaining work is to test and tune the PGT installation scripts to make them as user friendly as possible. For the OTE it is required to verify the consistency between the output from this software with the documentation provided. It is expected the software will be timely available.

## 6. Crab calibration

The next Crab calibration is planned for revolution 239 starting 27 September. ISOC is in contact with the instrument teams who have provided requirements. Effort is made to ensure they fit into one revolution. For this campaign also a new observation type is required to avoid implementation of lots of new staring observations. See above.

### 4.3.2 ISDC

Status of ISDC observation processing on 30/08/2004:

- Latest Standard Analysis completed: observation 02201450003 (Mkn 590, Revolution 208) on 28/08/2004
- Latest products archived: observation 02201450004 (Mkn 590, Revolution 210) on 26/08/2004
- Latest observation products sent to the observer: amalgamated observations 02200210001, 02201030001, 02297000004 (Carina, Revolution 197-200) on 07/08/2004

## 5 Special Events

## 6 Anomalies

There were a number of problems related to the ground segment that impacted the operations:

- On DoY 236, at 06:28, there was a brief drop in the bad frame link with Redu. There was no impact.
- Later, at 11:25, there were three occurrences in the log of errors sending data to the ISDS. The system recovered autonomously without impact.
- On DoY 237 at 03:37 the NCTRS-A had to be restarted due to the presence of a ghost link, there was no impact.
- Later, at 08:52, the IMCA swap space was down to 42MB. At 09:07, both application launchers were restarted curing the problem, again there was no impact.
- At 13:37, due to a problem with the FD tool failing to update the parameters for slew 02270079, after a fast recovery, this pointing was recovered.
- On DoY 238 at 13:30, the FD tool failed to find a guide star. The AOCS sub-system was disabled, and a recovery performed. The impact was pointing 02280004 was started 10 minutes late.

- On DoY 239, at 12:25 there was an error sending data to the ISDS, the system recovered autonomously after about 30 seconds.
- Later, at 22:31, there was a 1 second drop in the TM link with Redu. There was no impact.
- At 23:06, both the TM & TC links with Redu dropped for about 3 minutes, there was no impact.
- On DoY 240, at 10:25, CCC reported File System fault messages from from idda, there was no impact.
- Later at 15:03, there was a drop in AD service from Redu, again no impact.

The following new anomaly reports were entered into the ARTS system for last week.

| AR id    | Date Occurrence | Subject                               | Segment      | Status  |
|----------|-----------------|---------------------------------------|--------------|---------|
| INT-2635 | 27/08/2004      | Problems with VC7 TM.                 | Simulator    | Pending |
| INT-2636 | 30/08/2004      | TM drop & CLCW protocol error at REDU | ESA Stations | Pending |
| INT-2637 | 30/08/2004      | AD service terminated at REDU         | ESA Stations | Pending |

## 7 Future Milestones

## 8 Appendix

The appendix includes various detailed information.

### 8.1 Overview of Revolutions

#### Revolution 227

The observations in revolution 227 consisted of a raster dithering observation of the Galactic Centre field (RA 17:45:40.00; DEC -29:00:28.0) lasting ~43 hours, followed by an amalgamated raster dithering observation of the galactic disk  $l < 0$  (RA 16:18:32.00; DEC -50:22:26.0), performed for the remaining ~16 hours of observation time.

Throughout these observations all instruments were in their nominal science modes, except for JEM-X2, which was in Safe mode, and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5.

#### Revolution 228

In revolution 228 a GCDE was performed throughout the available observation time (~61 hours).

Throughout this observation all instruments were in their nominal science modes, except for JEM-X2, which was dormant, and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5.

### 8.2 Consumables

#### 8.2.1 Detailed Fuel Book-keeping

|                          |          |   |                          |
|--------------------------|----------|---|--------------------------|
| 2004-08-13T11:38:56.000Z | 168.7812 | F | Automatic TM processing. |
| 2004-08-14T18:38:19.000Z | 168.7471 | F | Automatic TM processing. |
| 2004-08-14T20:19:47.000Z | 168.7351 | F | Automatic TM processing. |
| 2004-08-14T21:58:03.000Z | 168.6773 | F | Automatic TM processing. |
| 2004-08-16T11:24:31.000Z | 168.6673 | F | Automatic TM processing. |
| 2004-08-16T20:16:24.000Z | 168.6504 | F | Automatic TM processing. |
| 2004-08-17T03:26:01.000Z | 168.6350 | F | Automatic TM processing. |
| 2004-08-17T22:11:23.000Z | 168.6185 | F | Automatic TM processing. |
| 2004-08-19T11:13:51.000Z | 168.6040 | F | Automatic TM processing. |
| 2004-08-20T21:24:51.000Z | 168.5850 | F | Automatic TM processing. |
| 2004-08-21T14:05:57.000Z | 168.5480 | F | Automatic TM processing. |
| 2004-08-22T04:39:10.000Z | 168.5230 | F | Automatic TM processing. |
| 2004-08-22T11:01:11.000Z | 168.5110 | F | Automatic TM processing. |
| 2004-08-23T21:19:06.000Z | 168.4823 | F | Automatic TM processing. |
| 2004-08-25T10:44:14.000Z | 168.4635 | F | Automatic TM processing. |

This report was generated Fri Aug 27 08:00:23 GMT 2004

### 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 21/08/2004-27/08/2004**

AOCs operations were executed from the Automatic Timeline.

During this period, 133 Open Loop Slews, 75 Closed Loop Slews and 5 Momentum Bias were executed. Two slews were missed or executed manually. This is equivalent to a 1.0%.

#### **21/08/04 (Day of Year 234, Revolution 226)**

**Loss of Guide Star:** At 03:41:27, the magnitude 5.45 Guide star was lost because it was very close to the edge of the STR FoV, [-4570, -22220]. This star was picked by the ACC after an open loop slew.

**Loss of Guide Star:** At 13:07:21, the magnitude 7.65 Guide star was lost because it was very close to the edge of the STR FoV, [13739, -22263]. This star was picked by the ACC after an open loop slew.

**Loss of Guide Star:** At 18:06:07, the magnitude 7.55 Guide star was lost because it was very close to the edge of the STR FoV, [26893, -22263]. This star was picked by the ACC after an open loop slew.

**Flickering of the Pointing-Bit at the end of corrective open loop slew due to Roll Error:** At the end of corrective open loop slew 02260065 the error in roll with respect to the Sun-Steering-Law assumed roll angle was -126 arc-seconds. This is more than the OTF threshold for roll and resulted in the flickering of the Pointing-Bit, which was not seen at BCP level. This error already existed at the start of the slew and was introduced by the attitude reconstruction after open loop slew 02260064. The attitude determination was based on the first mapping after this slew, during which the SSL was enabled. The jitter caused by enabling of the SSL after the rather large slew introduced the error in roll, which was propagated to the next slew by the slew update.

#### **22/08/04 (Day of Year 235, Revolution 226-227)**

**Guide star released by the STR SEU Filter during perigee passage:** At 10:07:36, the SUE Filter threshold of the ACC exceeded and the guide star was released. At LOS the magnitude 6.7 guide star was located at [9489, 17095]. At AOS the new guide star was located at [311, -15100] with magnitude 7.55.

#### **23/08/04 (Day of Year 236, Revolution 227)**

Nothing to report.

#### **24/08/04 (Day of Year 237, Revolution 227)**

**Flickering of the Pointing-Bit due to Pitch Error:** At 00:42:20 an undetected False Event on the STR caused a jump of +43.6 arc-seconds in the Y position of the Guide Star. The error was more than the OTF threshold for pitch, and caused the flickering of the Pointing-Bit, which was not seen at BCP level. The magnitude 8.0 Guide Star was picked by the ACC after an open loop slew, [-2297, -2631].

**Close Loop Slew 02270049 missed from the Timeline:** The FDS did not generate the update for close loop slew 02270049, due to a STR moon constraint violation. The target attitude of this slew was marginally within the constraint at the planned slew execution time. There was an orbit update between the last EPOS generation and the actual slew execution. According to the older orbit data the constraint would not be violated and therefore the slew was allowed at EPOS generation. In the presence of FD, the slew was executed manually with a delay of about 20 minutes, to avoid the constraint. The manual close loop slew to the attitude of PID 02270049 started at 15:13:21 and ended at 15:15:26.

#### **25/08/04 (Day of Year 238, Revolution 227-228)**

**Guide star released by the STR SEU Filter during perigee passage:** At 09:24:17, the SUE Filter threshold of the ACC exceeded and the guide star was released. At LOS the magnitude 7.8 guide star was located at [10951, -7021]. From this time until 10:01:35, the guide star was released/lost 15 times because of the high radiation background.

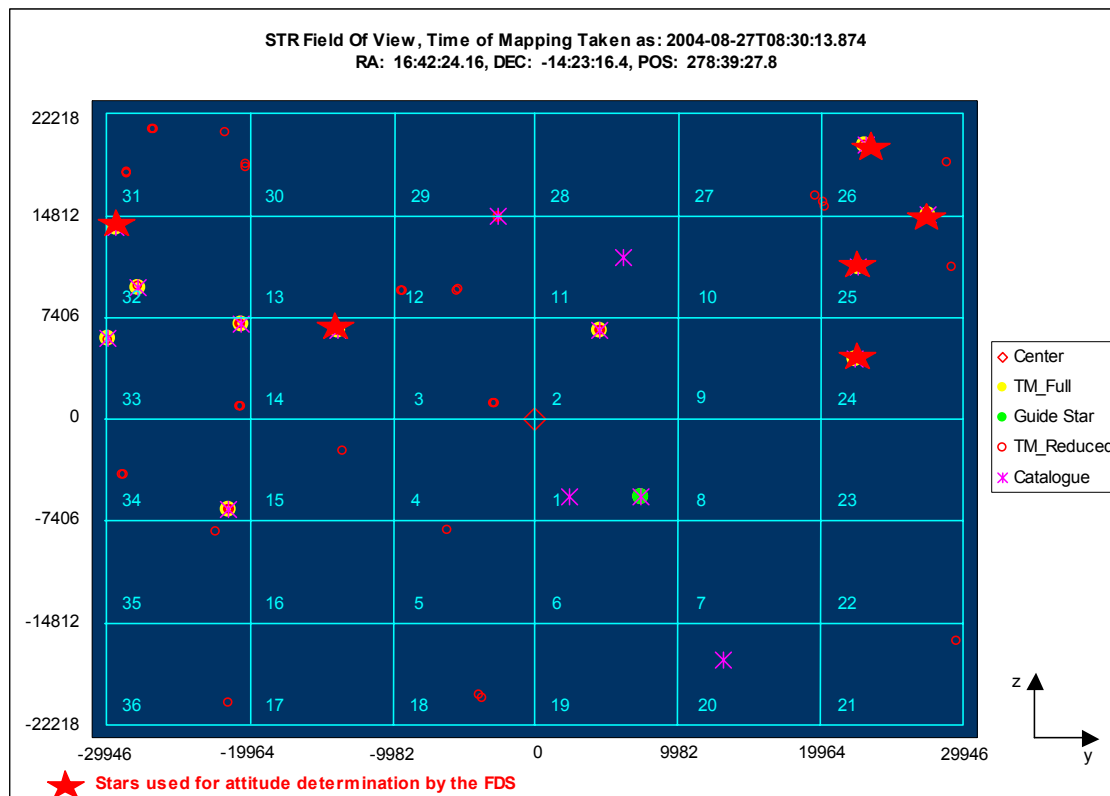
**Close Loop Slew 02280004 missed from the Timeline:** The FDS did not generate the update for close loop slew 02280004. FD is investigating the reason for this. To rejoin the Timeline, a manual open loop slew was performed to the attitude of PID 02280004. This attitude was reached 8 minutes later than the Timeline planned time.

#### **26/08/04 (Day of Year 239, Revolution 228)**

Nothing to report.

#### **27/08/04 (Day of Year 240, Revolution 228)**

**Flickering of the Pointing-Bit at the end of open loop slew:** At the end of open loop slew 02280082, the error in roll with respect to the SSL assumed roll angle was about -122 arc-seconds. This is more than the OTF threshold for roll and resulted in the flickering of the Pointing-Bit, which was not seen at BCP level. This error already existed at the beginning of the 2.4° slew. Looking into the mapping after the previous slew, the error was probably introduced by a poor attitude reconstruction, resulting from the arrangement of the stars used for attitude determination. Six stars were used by the FDS for attitude determination, four of which are rather close to each other and the other two have a low offset in Y with respect to the others. This is to be confirmed by FD.



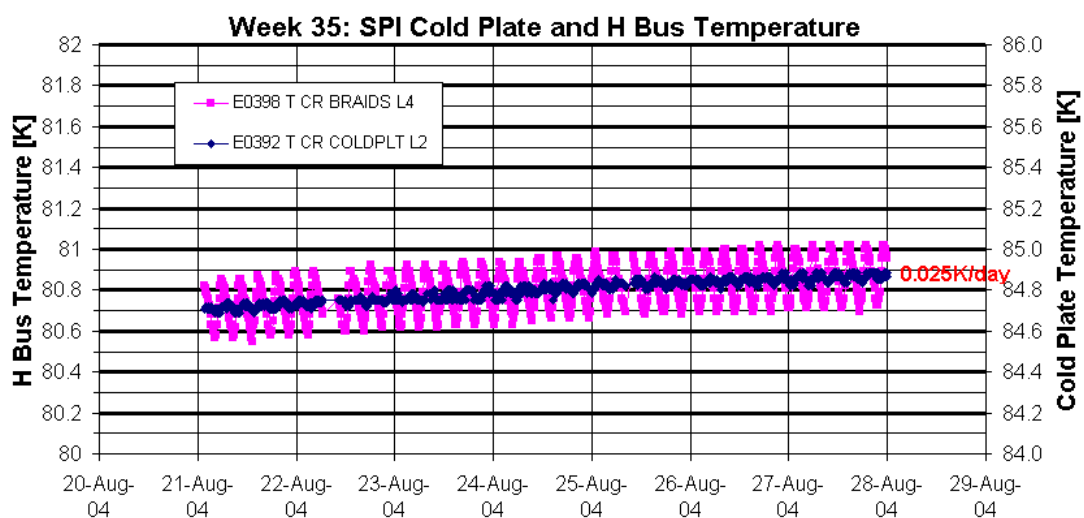
### 8.3.2 SPI Operations

#### Cryo-cooler / Detector Cold-Plate:

The performance of the cryo-cooler is nominal.

The cold plate temperature was maintained at 85K $\pm$ 1K with the expected small positive drift.

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

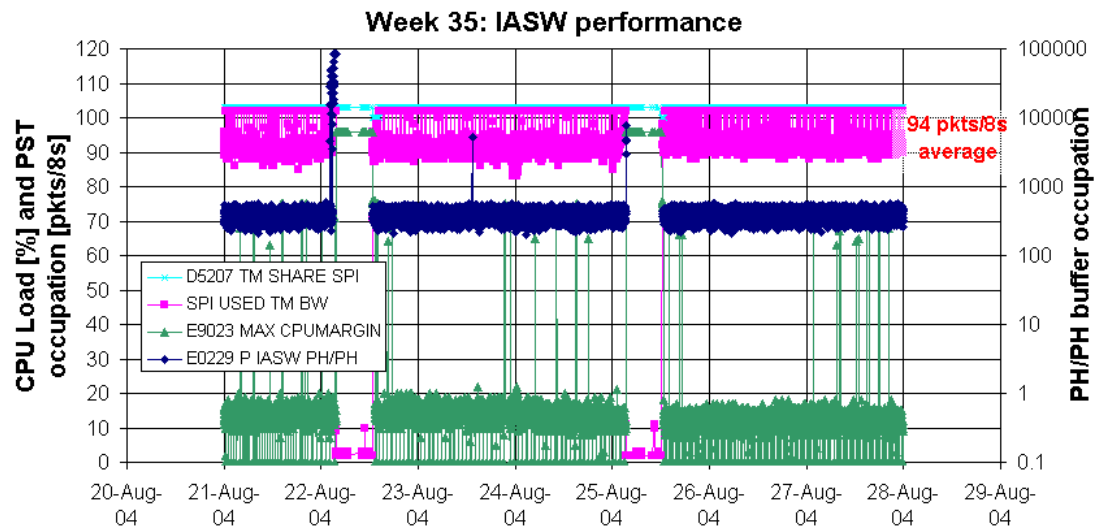


#### IASW/DPE:

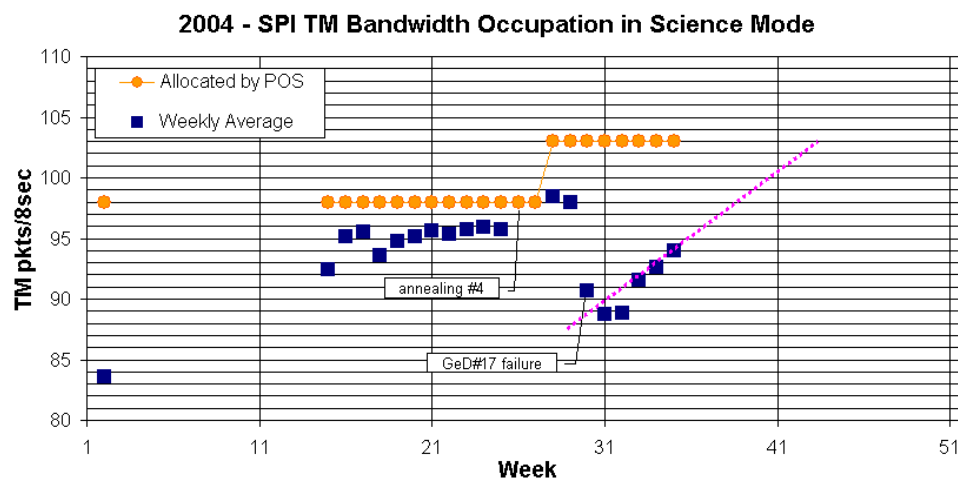
The performance of the IASW/DPE is nominal.

The average TM bandwidth occupation was 94 pkts/cycle in the science windows.

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



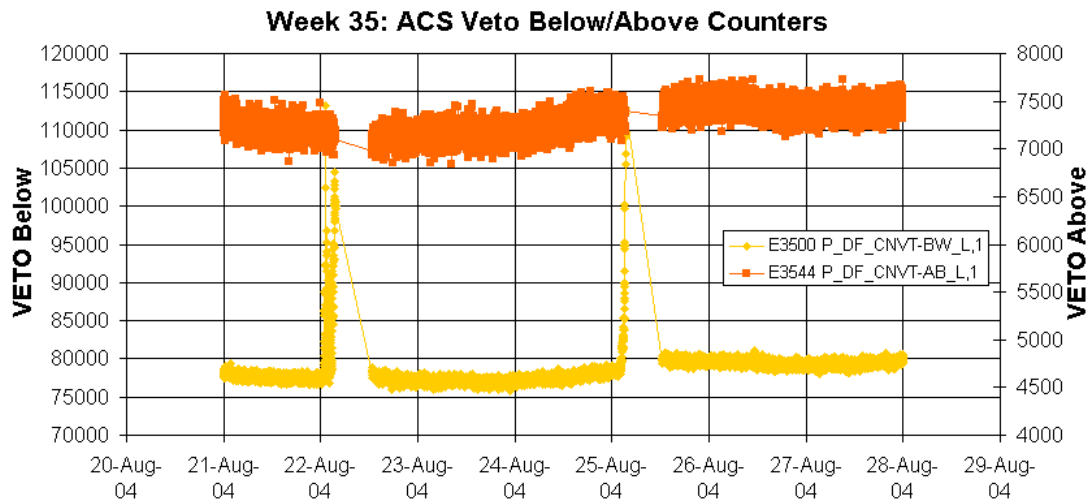
The following plot shows the trend of the occupied bandwidth, since beginning of 2004.



#### ACS:

The performance of the ACS is nominal.

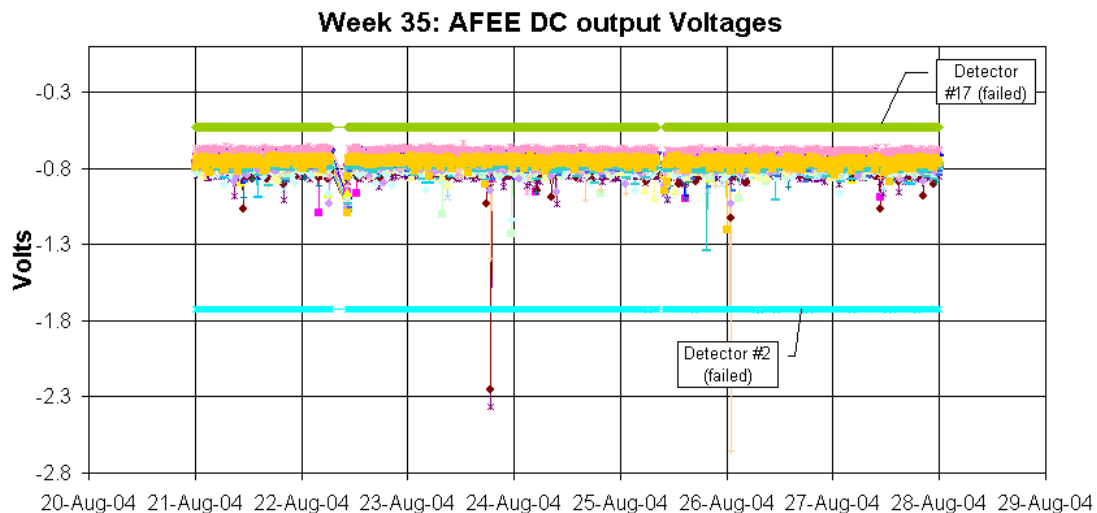
The following plot shows the ACS overall count rate evolution during the reporting period.



**AFEE:**

The performance of the detectors is nominal except for the detector #2, failed since 06.12.2003, and detector #17, failed since 17.07.2004.

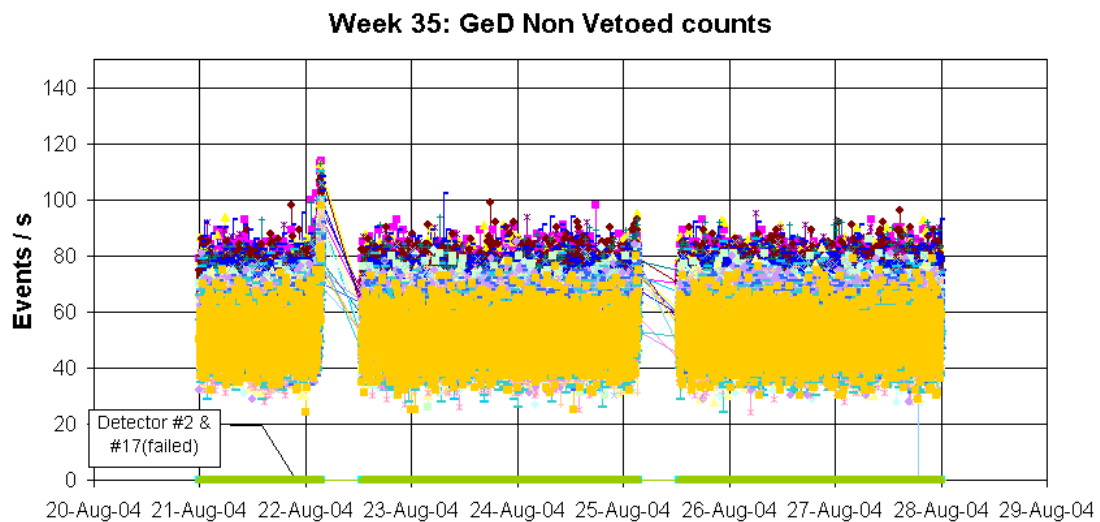
The following plot shows the AFEE dc output signals during the reporting period.



**DFEE:**

The performance of the unit is nominal.

The following plot shows the Non Vetoed event rates processed by the DFEE during the reporting period. The count rate of each detector is within the expected range, except for the failed detector #2 and #17.



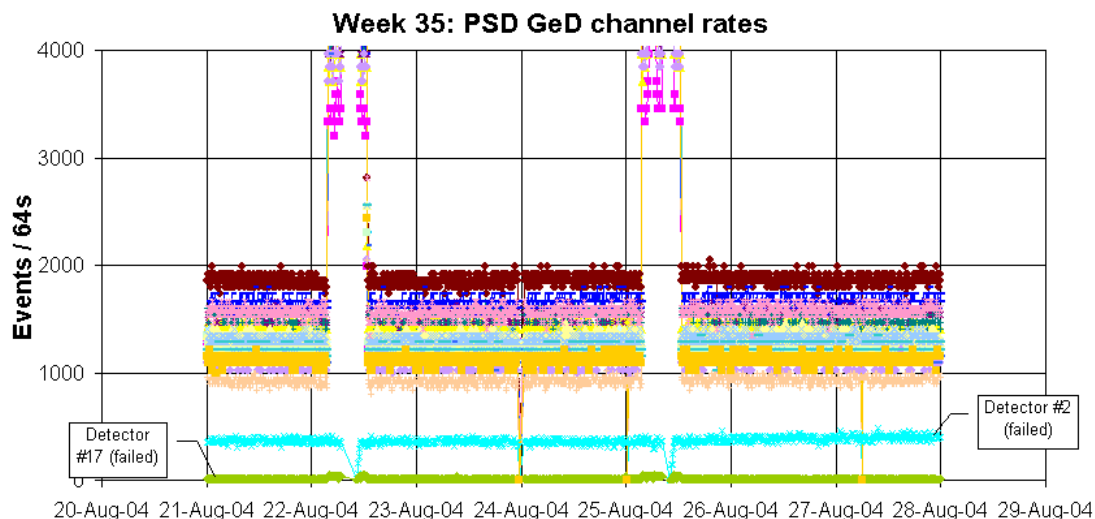
#### PSD:

The performance of the unit is nominal, though the malfunction of all PSD channel rates dropping to zero counts for a few minutes repeated itself three times (this malfunction is described by AR INT\_SC-90).

The anomaly affected only the PSD locally as the GeD count rates measured by the DFEE (see above) were still nominal; also the dc output voltage showed a nominal pattern during the malfunction.

This anomaly was first recorded the day after the GeD#17 failure and present explanations correlate it to this failure. A possible recovery procedure is under discussion with the PI.

The following plot shows the PSD channel rates during the reporting period.

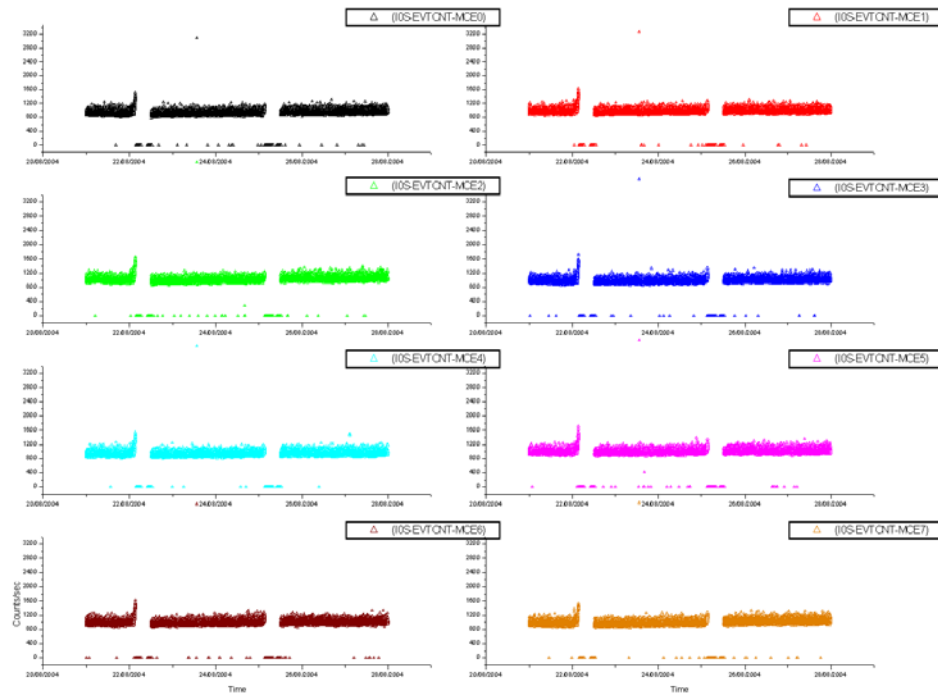


### **8.3.3 IBIS Operations**

#### **IBIS Event Counters Plots.**

#### ISGRI Counters:

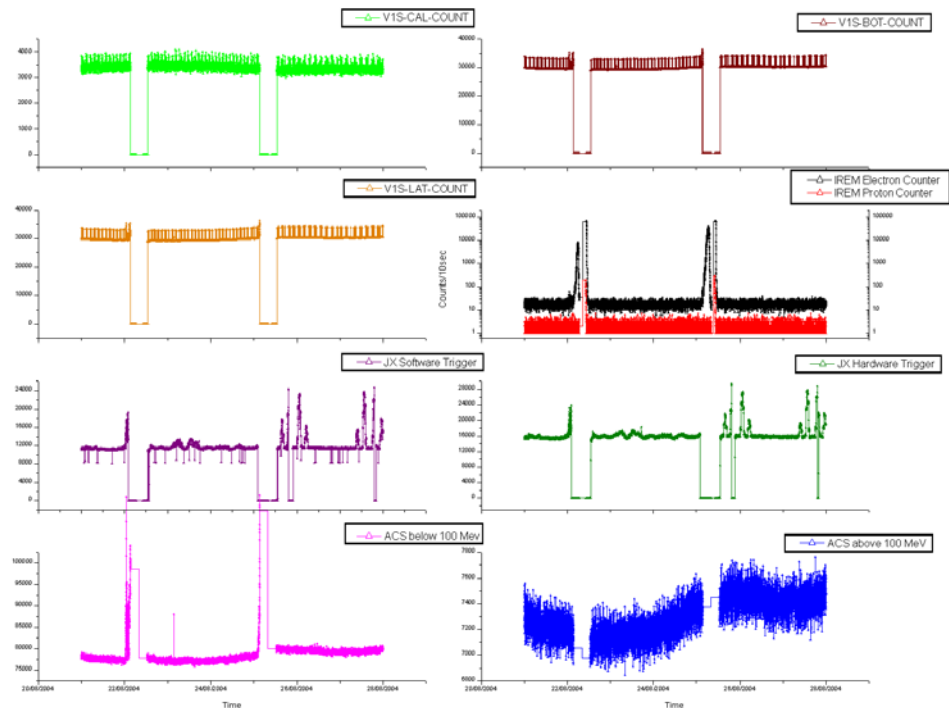
IBIS - ISGRI Counters Rev 227-228



#### VETO vs Payloads Counters:

A comparison between the count-rates reported by VETO, the SPI-ACS, the IREM counters and JEM-X hardware/software triggers, show a stabilisation of the radiation background. Some irregularities were again observed in the JEM-X count-rates due probably to specific observation plan. On a few occasions these events triggered H/W and S/W counter-out-of limits (see JEM-X part for details).

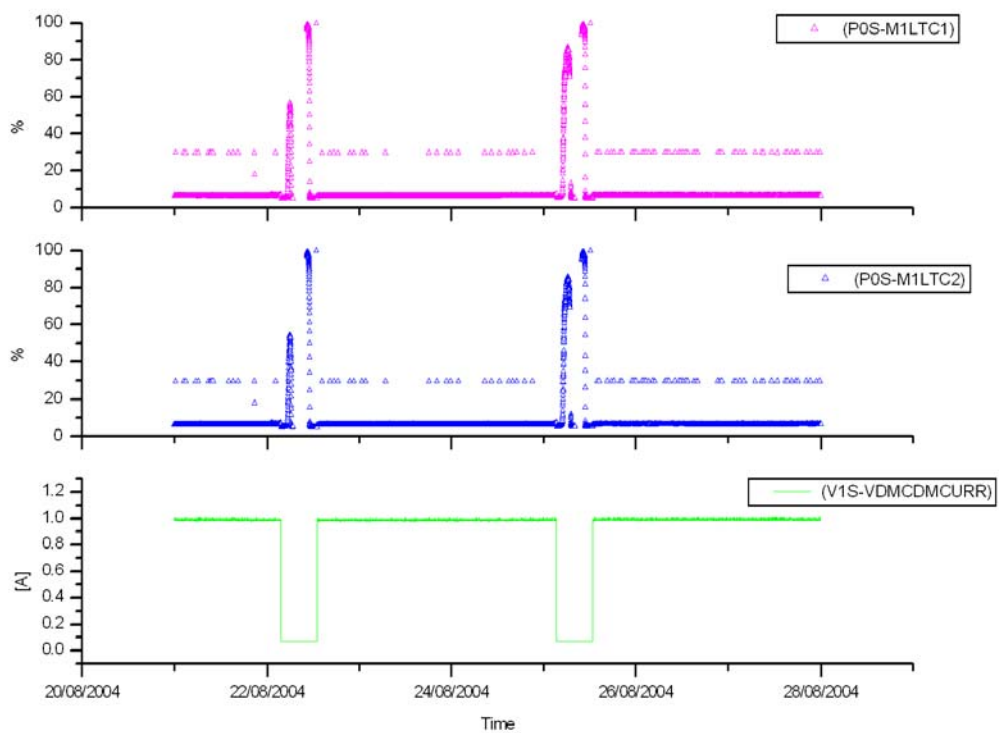
# IBIS-VETO vs Payloads Counters Rev 227-228



\*\*with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec

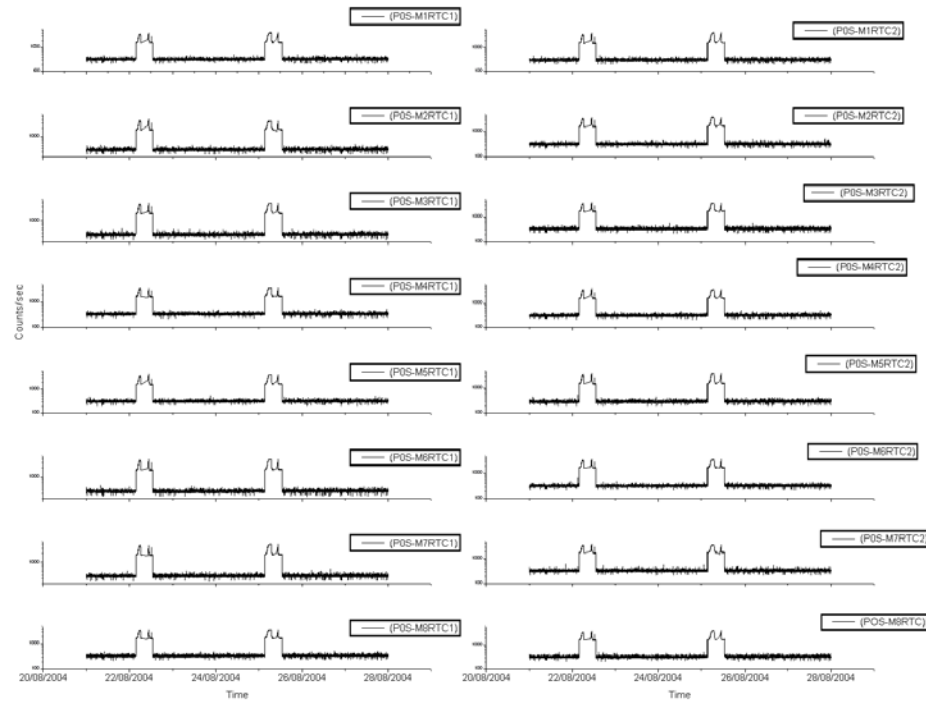
## Veto Current:

### IBIS-VETO Current & PICsIT dead times Rev 227-228



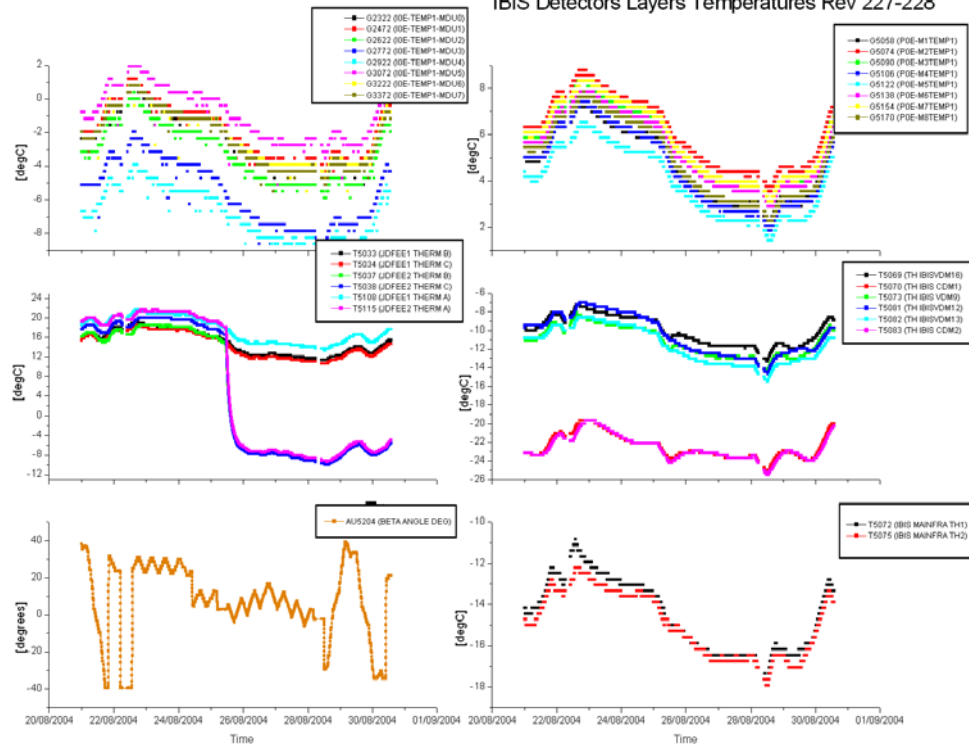
## Picsit Counters

IBIS - PICsIT Counters Rev 227-228



## IBIS Detectors Layers Temperatures

IBIS Detectors Layers Temperatures Rev 227-228



IBIS daily report

**DoY 2004.234 (21/08/04)**

Nothing to report.

**DoY 2004.235 (22/07/04)**

There were a few reports during the Belt passage of the OEM APID 1280 ID 167 Class 2 <<IBIS1 PICsIT NOISY SEMIMODULE SIGNALLING>> due to the PICsIT detectors being ON without the VETO anticoincidence system, as required by the PIs.

**DoY 2004.236 (23/08/04)**

Nothing to report.

**DoY 2004.237 (24/08/04)**

Nothing to report.

**DoY 2004.238 (25/08/04)**

At 11:14Z in line with OR-INT 165, the JEM-X2 Digital Front End Electronics were switched off: this activity was requested to assess the decrease in temperature of JEM-X1 (currently the operational unit) and consequent decreasing of the detector gain. Due to the switch off of the JEM-X2 DFEE, a reduction of about 25 Watts in the thermal budget of the IBIS-JEM-X2 system, and the thermal impact on IBIS was verified in line with OR-INT-166.

JEM-X2 DFEE was switched off at the start of revolution 228. The switch off period has now been extended until the end of revolution 237 (see JEM-X report for more details).

During revs 228 and 229, the temperatures of IBIS detectors (ISGRI-PICsIT-VETO) were monitored, following OR-INT-166, and no significant variations in the gradient between the ISGRI detector modules or out of limit temperatures were observed for any detector module.

The following was verified:

- detectors temperatures, (by parameters families):

|        |                                                                                  |              |
|--------|----------------------------------------------------------------------------------|--------------|
| ISGRI  | G2009 IOE-TEMP2-MDUX (ISGRI HK1)<br>G2322 IOE-TEMP1-MDUX (ISGRI HK3)             |              |
| PICsIT | G5058 POE-MXTEMP1<br>G5059 POE-MXTEMP2<br>G5060 POE-MXTEMP3<br>G5061 POE-MXTEMP4 | (PICsIT HK3) |
| VETO   | G6119 VOE-VDMXXHPVS (VETOHK4)                                                    |              |

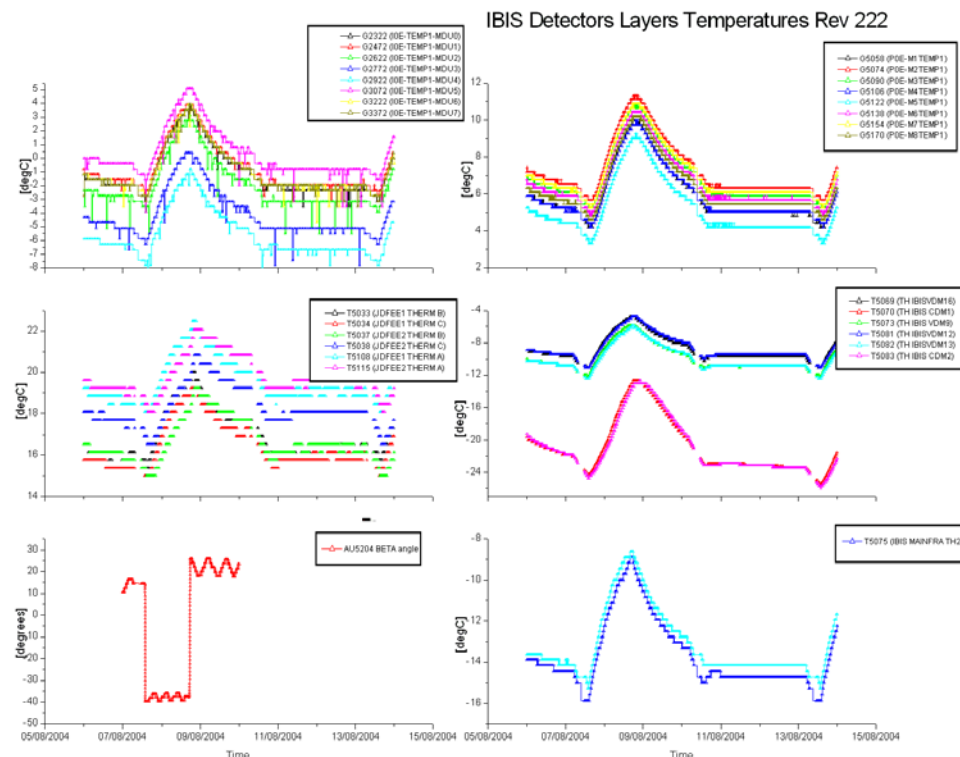
T5069-70-73-81-82-83

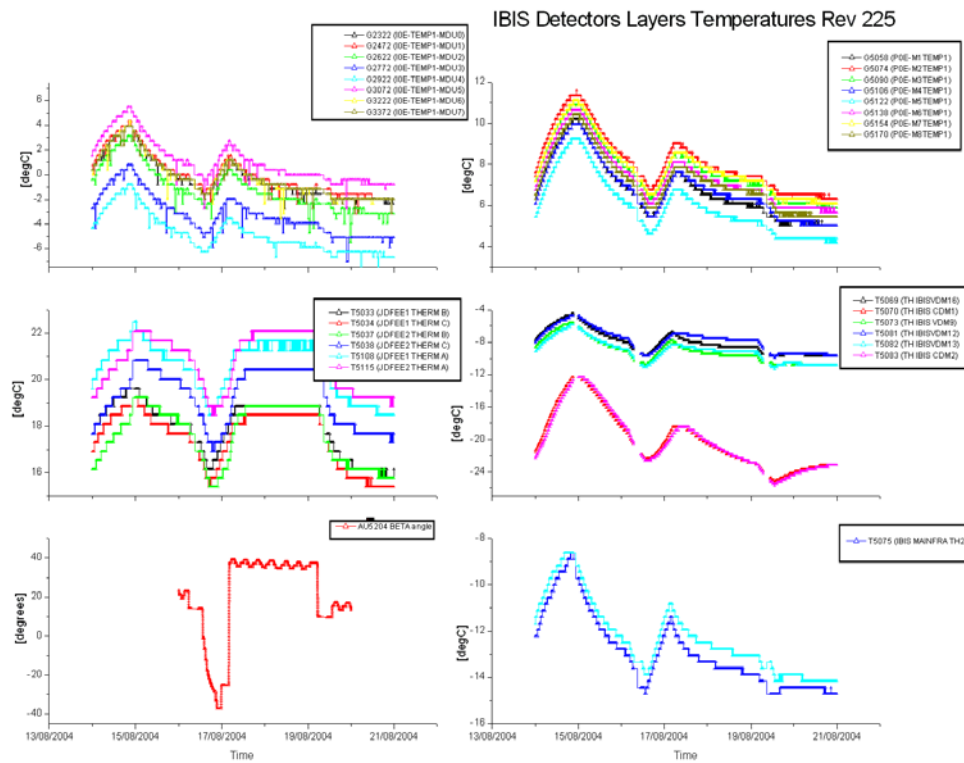
(PLM\_RTU\_PKT)

- monitored the HK3 temperature parameters G2322-2472-2622-2772-2922-3072-3222-3372 defining the ISGRI MDUs TEMP1, by using the rules:
- any two temperature differences between the parameters G2322 - 2472 - 2622 - 3072 - 3222 - 3373 did not exceed  $\sim 2.5$  degC
- the difference between the parameters G2772 and G2922 did not exceed  $\sim 2.5$  degC
- the difference between the parameters G2772 and G2622 did not exceed  $\sim 3$  degC

The ratios between the ISGRI temperatures were maintained constant during all the duration of the revolutions as shown in the plot of the IBIS Detector Layers Temperatures (in the section above). As evidenced in the plot the effect of the pitch angle (BETA angle) was in most of the cases larger than the effect of the JEM-X2 DFEE switch OFF: apparently large positive values of pitch determined min detector temperature, while large negative pitch values determined max detector temperature, due to the more favourable exposition of the detectors to the sun.

See the plots below calculated for rev 222 and 225 characterized by large positive/negative pitch angles.





**DoY 2004.239 (26/08/04)**

Nothing to report.

**DoY 2004.240 (27/08/04)**

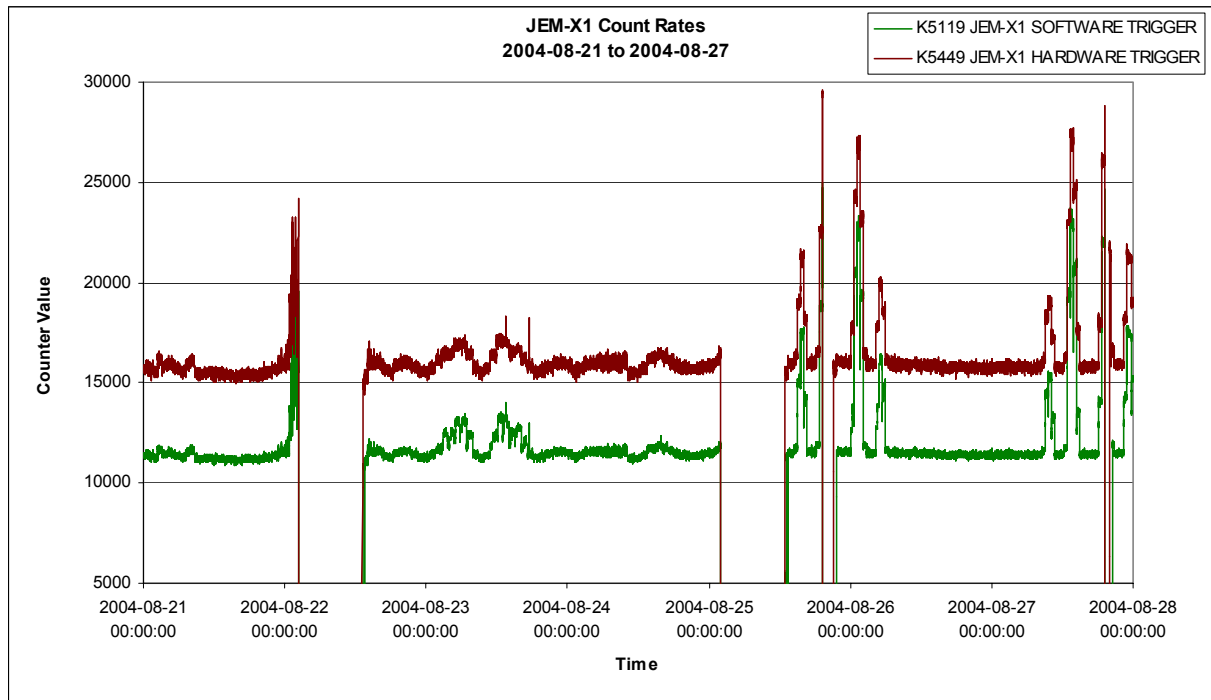
Nothing to report.

### 8.3.4 JEM-X Operations

#### 8.3.4.1 JEM-X Count Rates

JEM-X count rates over the reporting period are displayed in the following graph<sup>1</sup>.

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

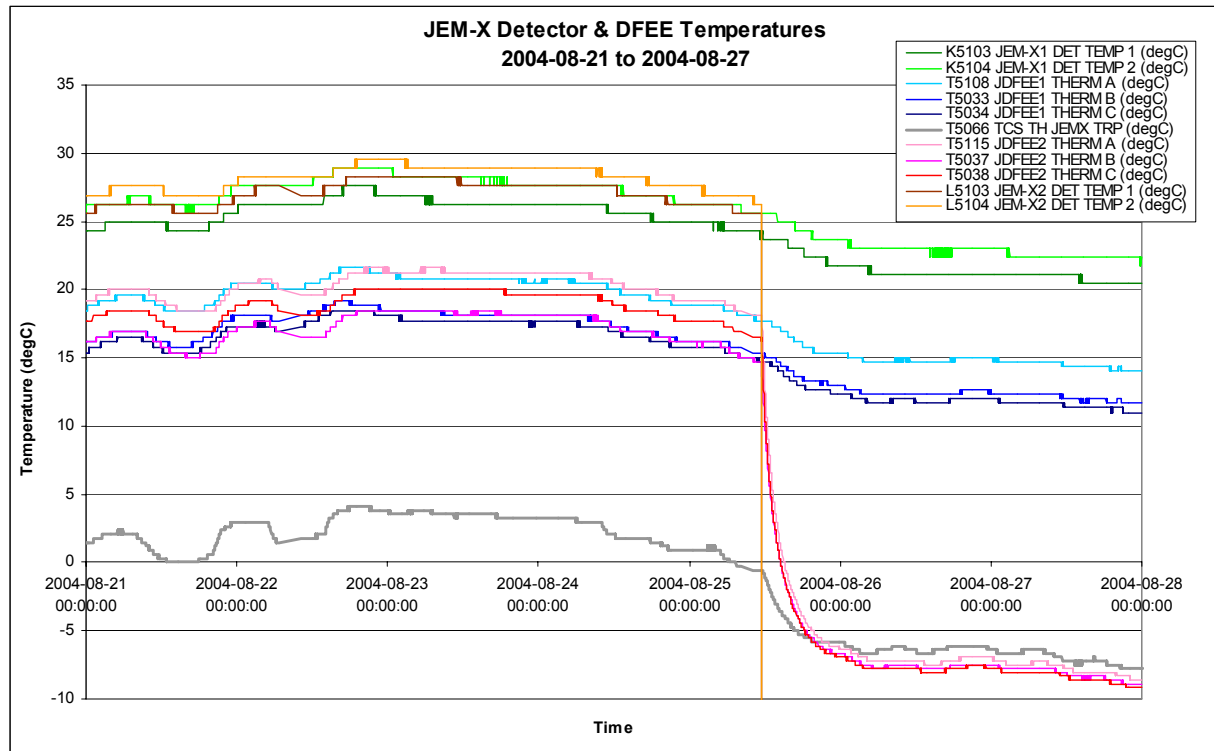


#### 8.3.4.2 JEM-X Temperatures

The JEM-X1 and JEM-X2 detector temperatures over the reporting period are displayed in the following graph, along with the temperatures at a selection of DFEE locations and on the detector bench between the two units<sup>2</sup>.

The effect of switching off the JEM-X2 DFEE, on 2004-08-25, on the temperatures of both units can be clearly seen. The JEM-X1 temperatures stabilised after ~12 hours, with an average decrease in JEM-X1 temperatures of about 5degC and in the JEM-X2 temperatures of about 25degC.

<sup>2</sup> Data sampled (1 frame in 8)



### 8.3.4.3 JEM-X Daily Report

#### 2004-08-21 (DOY 234, Rev 226)

Nothing to report

#### 2004-08-22 (DOY 235, Rev 226-227)

At 02:14:50Z the TM parameter K5136 BUFFER LOSS went out of limits (value = 119), but then returned within limits by the next TM cycle.

#### 2004-08-23 (DOY 236, Rev 227) to 2004-08-24 (DOY 237, Rev 227)

Nothing to report

#### 2004-08-25 (DOY 238, Rev 227-228)

In line with OCR-175 (Switching off the DFEE of the redundant JEM-X2 unit for one revolution), the JEM-X2 DFEE was switched off at the start of revolution 228, before radiation belt exit. The operations were performed according to INT\_OR\_0165. As this JDFEE2 switch-off was performed inside the radiation belts, the Broadcast Packet distribution to JEM-X2 and the JEM-X2 reactions to the Broadcast Packet radiation monitor counters from IREM and the Broadcast Packet radiation belt entry/exit times were disabled for the duration of the procedure.

The JEM-X2 DFEE was switched OFF at 11:32Z.

The purpose of switching off the JEM-X2 DFEE was to assess the thermal impacts on JEM-X1 and IBIS. It is hoped that lowering the temperature of JEM-X1 will slow

down the degradation of the instrument. The temperatures of both JEM-X1 and IBIS were monitored closely throughout the remainder of the revolution. The thermal effects on both JEM-X units are reported in Section 8.3.4.2 above. No negative impacts on IBIS were observed (see IBIS section of this report).

Starting at 18:46Z, the following out of limits were received:

- At 18:46:34Z the TM parameter K5136 BUFFER LOSS went out of limits (value = 214) and remained out of limits until 18:48:34Z.
- At 19:17:30Z the TM parameter K5119 SOFTWARE TRIGGER went out of limits warning high (value = 20482) and at 19:18:18Z it then went out of limits alarm high. However, it returned within limits at 19:19:06Z.
- At 19:19:14Z K5136 BUFFER LOSS went out of limits (value = 3793), returning within limits at 19:20:18Z.

At 19:20:02Z K5119 SOFTWARE TRIGGER went out of limits again and at 19:20:58Z, it exceeded the JEM-X1 Safe threshold of 25000, causing JEM-X1 to perform an autonomous transition to Safe mode. The parameter K5462 DFEE STATE IASW reported state Safe (value = 1) on one occurrence but then started to report state Setup (value = 5), and there were two occurrences of the OEM189 JEM-X1 PROB DFEE 9 at this time. JEM-X1 commanding from the Timeline was then disabled at 19:29Z.

At 19:32Z procedure FCP\_JEM1\_0040 was executed to command JEM-X1 to Safe mode, thereby setting the DFEE State IASW to Safe mode as well. At this time, the OEM 254 ERROR OFF was received.

No increase in the radiation monitoring parameters from IREM had been observed. These were monitored for over 1 hour and continued to remain low. Therefore, at 20:43Z the recovery of JEM-X1 was started by executing procedure FCP\_JEM1\_0041 to return JEM-X1 to Setup mode, followed by FCP\_JEM1\_1010 (JEM-X1 Configuration Setting for Science Ops). At 21:47Z procedure FCP\_JEM1\_0044 was executed to return JEM-X1 to Data Taking mode. Timeline commanding to JEM-X1 was then re-enabled at 21:50Z.

#### **2004-08-26 (DOY 239, Rev 228)**

Starting at 00:39Z, the following out of limits were received:

- 00:39:06Z K5119 SOFTWARE TRIGGER warning high (value = 20076), returned within limits at next TM cycle;
- 00:39:30Z K5136 BUFFER LOSS went out of limits (value = 575), returned within limits at 00:40:34Z;
- 00:41:38Z K5119 SOFTWARE TRIGGER warning high (value = 20344), returned within limits at 01:04:42Z;
- 01:04:50Z K5119 SOFTWARE TRIGGER warning high (value = 20234), returned within limits at 01:05:38Z;
- 01:05:46Z K5119 SOFTWARE TRIGGER warning high (value = 20187), returned within limits at 01:11:14Z;
- 01:11:22Z K5136 BUFFER LOSS went out of limits (value = 1656), returned within limits at 01:12:18Z;

- 01:12:26 K5119 SOFTWARE TRIGGER warning high (value = 20255), returned within limits at 01:42:50Z;
- 01:43:22Z K5136 BUFFER LOSS went out of limits (value = 302), returned within limits at 01:44:26Z.

During this day, the JEM-X2 DFEE remained off and the temperatures of both JEM-X units remained stable.

#### **2004-08-27 (DOY 240, Rev 228)**

Starting at 12:45Z, the following out of limits were received:

- 12:45:46Z K5136 BUFFER LOSS went out of limits (value = 141), returned within limits at 12:47:38Z;
- 13:16:34Z K5119 SOFTWARE TRIGGER warning high (value = 20008), returned within limits at 13:18:18Z;
- 13:18:26Z K5136 BUFFER LOSS went out of limits (value = 2080), returned within limits at 13:19:22Z;
- 13:19:30Z K5119 SOFTWARE TRIGGER warning high (value = 20895), returned within limits at 13:50:18Z;
- 13:50:26Z K5136 BUFFER LOSS went out of limits (value = 751), returned within limits at 13:51:30Z;
- 13:52:26Z K5119 SOFTWARE TRIGGER warning high (value = 20375), returned within limits at 14:20:34Z.

Then, starting at 18:37Z, the following out of limits were received:

- 18:37:54Z K5119 SOFTWARE TRIGGER warning high (value = 20004), returned within limits at 18:38:34Z;
- 18:38:42Z K5136 BUFFER LOSS went out of limits (value = 1315), returned within limits at 18:39:38Z.

At 18:39:54Z K5119 SOFTWARE TRIGGER went soft out of limits again (value = 20258) and at 19:10:02Z it exceeded the JEM-X1 Safe threshold of 25000, causing JEM-X1 to perform an autonomous transition to Safe mode. The parameter K5462 DFEE STATE IASW reported state Safe (value = 1) on one occurrence but then started to report state Setup (value = 5), and there were two occurrences of the OEM189 JEM-X1 PROB DFEE 9 at this time. JEM-X1 commanding from the Timeline was then disabled at 19:11Z.

At 19:40Z procedure FCP\_JEM1\_0040 was executed to command JEM-X1 to Safe mode, thereby setting the DFEE State IASW to Safe mode as well. At this time, the OEM 254 ERROR OFF was received.

As was the case on 2004-08-25, no increase in the radiation monitoring parameters from IREM had been observed. Therefore, at 19:49Z the recovery of JEM-X1 was started by executing procedure FCP\_JEM1\_0041 to return JEM-X1 to Setup mode. At 19:54Z procedure FCP\_JEM1\_1010 (JEM-X1 Configuration Setting for Science Ops) was started and at 20:25Z JEM-X1 was returned to Data Taking mode by procedure FCP\_JEM1\_0044. Timeline commanding to JEM-X1 was re-enabled at 20:26Z.

At 22:55:22Z the TM parameter K5136 BUFFER LOSS went out of limits (value = 101) but returned within limits at the next TM cycle. At 22:55:46Z K5136 BUFFER LOSS again went out of limits (value = 107) and returned within limits at the next TM cycle.

During this day, the JEM-X2 DFEE remained off and the temperatures of both JEM-X units remained stable.

### **8.3.5 OMC Operations**

On DoY 237, at 13:37, there was a problem with the FD tool updating a slew, the instrument was switched to SCIENCE mode at the nominal time, however, the attitude was incorrect, and pointing 02270049 was lost.

On DoY 238, at 13:56:39, due to the failure of the FD tool to find a suitable guide star, pointing 02280004 was delayed by 10 minutes, it was at this time that the following pair of commands were rejected:

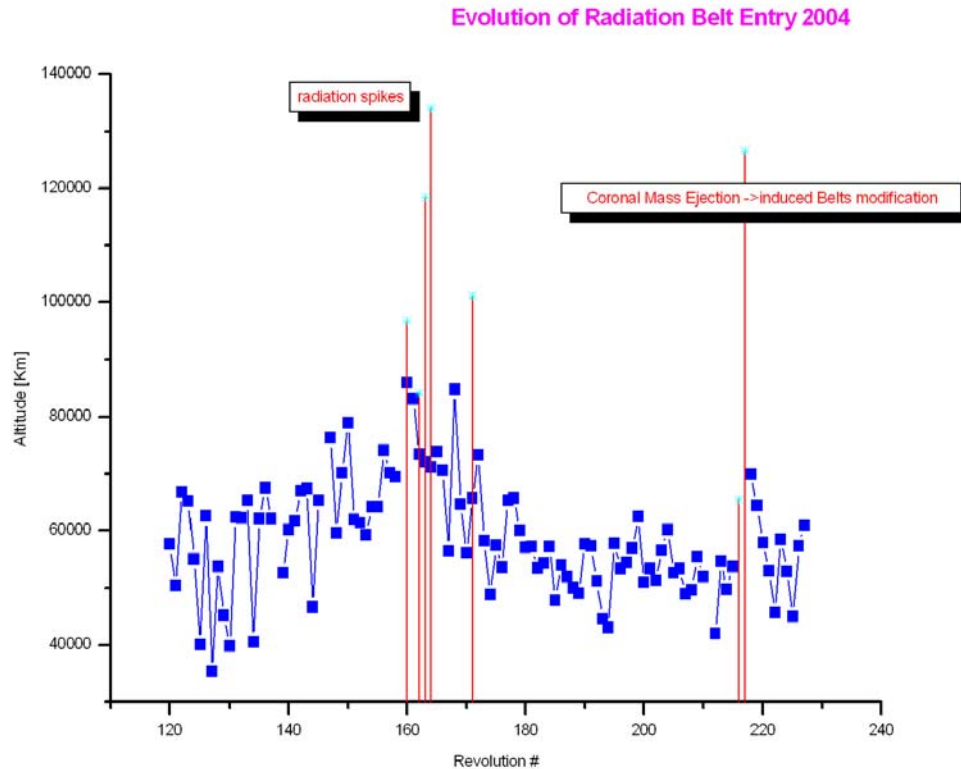
```
2004.238.13.56.38.988 2004.238.13.56.32.915 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=60,IM A M9068=1 FIX2=0 M9069=277
2004.238.13.56.31.349 2004.238.13.56.26.165 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=130,RESET IM M9068=1 FIX2=0
M9069=276
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for that pointing. The pointing was eventually commanded manually at 14:06:14

On DoY 235 at 03:39:08 and DoY 238 at 03:23:27, OMC was switched by the Timeline to SAFE mode, at the nominal time.

### 8.3.6 IREM Operations

#### Radiation Belts Entry



#### 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] |
|-----|---------------------------------|--------------------------------------|-----------------------------------|---------------------------------------|------------------------------------|
| 226 | RAD ENTR R 2004-08-22T03:38:47Z | 2004-08-22 03:59:23                  | 57341.2                           | 22-Aug-2004 04:25                     | 53943                              |
| 227 | RAD EXIT R 2004-08-22T12:44:59Z | 2004-08-22 11:19:47                  | 24847.2                           | 22-Aug-2004 11:35                     | 28525                              |
| 227 | RAD ENTR R 2004-08-25T03:23:14Z | 2004-08-25 03:17:15                  | 60934.9                           | 25-Aug-2004 04:11                     | 54105                              |
| 228 | RAD EXIT R 2004-08-25T12:29:22Z | 2004-08-25 11:05:07                  | 24847.0                           | 25-Aug-2004 11:21                     | 28351                              |

#### Reference

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)

Radiation Spike

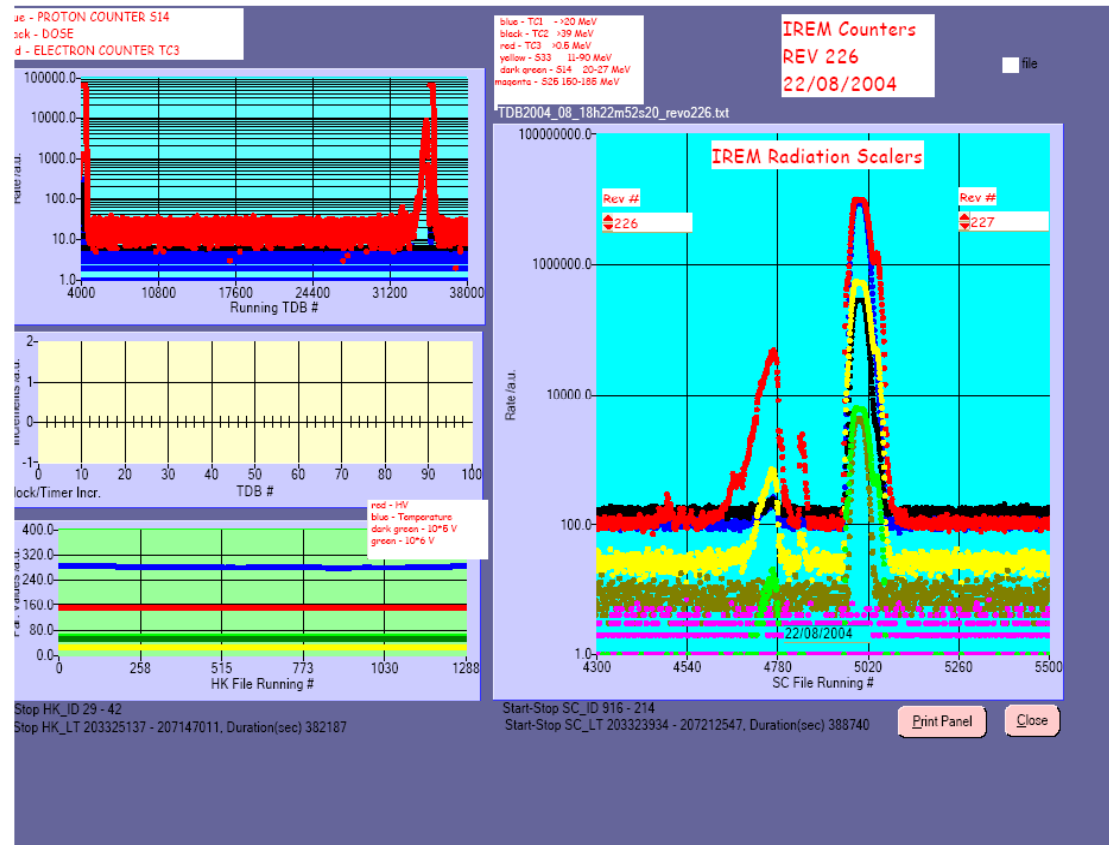
#### Proton Belts

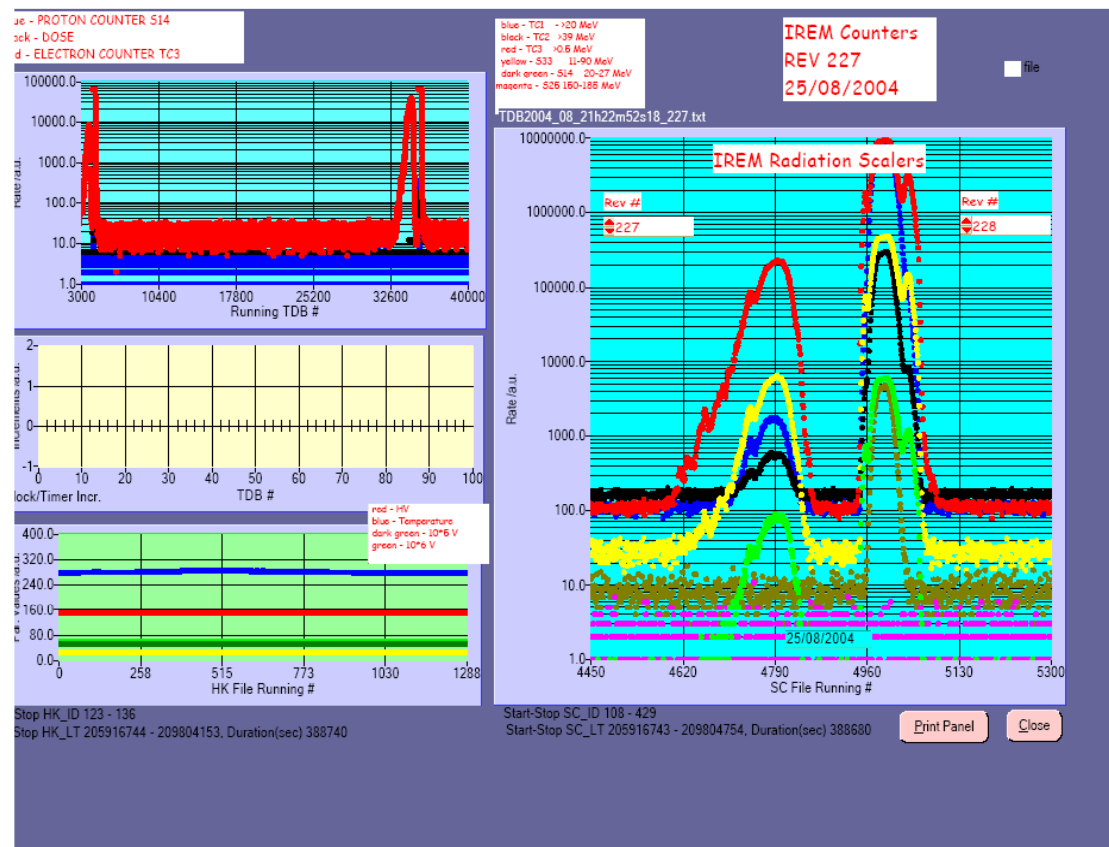
| REV |                 | Proton CUT-OFF Predicted Entry/Exit | ALT[Km] predicted |
|-----|-----------------|-------------------------------------|-------------------|
| 226 | PROTON_RAD_ENTR | 22-Aug-2004 09:55                   | 13134             |
| 227 | PROTON_RAD_EXIT | 22-Aug-2004 10:15                   | 15553             |
| 227 | PROTON_RAD_ENTR | 25-Aug-2004 09:41                   | 13012             |
| 228 | PROTON_RAD_EXIT | 25-Aug-2004 10:01                   | 15397             |

## IREM daily report

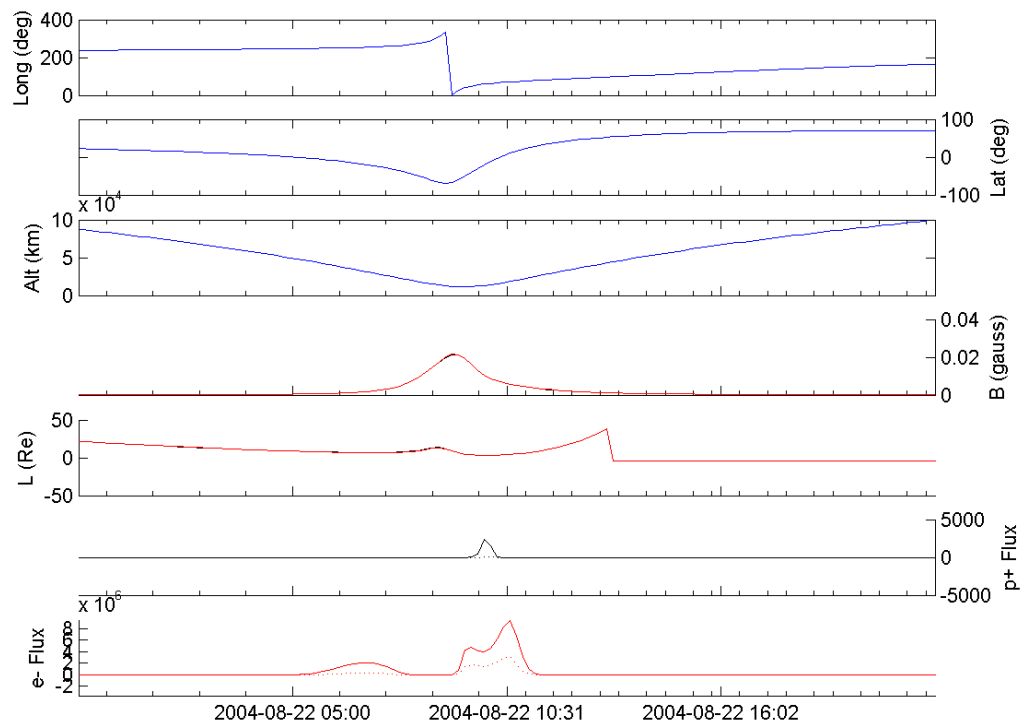
Nothing to report.

## IREM radiation counters



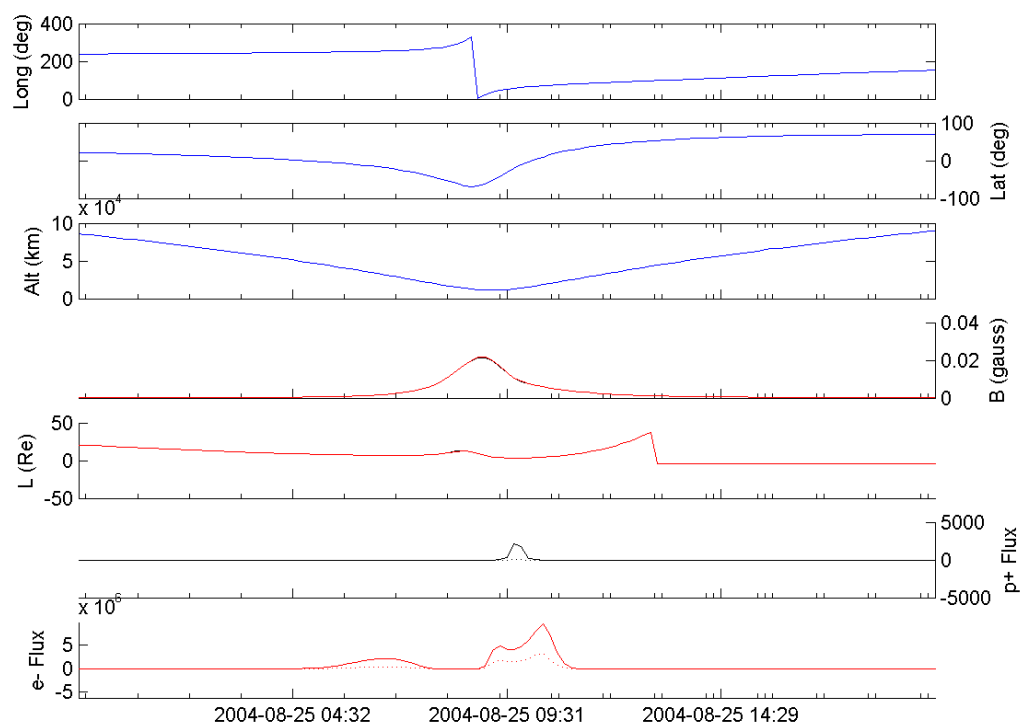


## IREM Predicted Radiation Belt Passages.Rev 226



X: 0 Y: 0 [get Data](#) [Zoom](#) [Print...](#)

Rev 227



X: 0 Y: 0 [get Data](#) [Zoom](#) [Print...](#)

# SEC-GOES Observed Particles Fluxes.

