

**INTEGRAL**  
**Mission Report**  
**INT-MOC-SYS-RP-1001-OPS-OF**  
**No. 160**  
**Week 41**  
**17.10.05**  
**Routine Phase**

Prepared by: O. Bergogne (OPS-OFO)

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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 08.10.05 until 14.10.05 (both dates inclusive) and covers the revolutions 365 & 366.

## **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 Scutum Arm; the Galactic Bulge region (RA 17:45:36.00; DEC -28:55:60.0); the Crab (RA 05:34:31.97; DEC +22:00:52.1) and SS433 (RA 19:11:49.56; DEC +04:58:57.6). The activities consisted of hexagonal and raster dithering, staring and grid observations. In addition, payload Crab calibrations were performed.

*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.

20 slews (11 CSL, 9 OSL) were not executed from the Timeline during this period, due to Cryosat launch, problem on FDS and DSS16 station.

The fuel consumption over the period between 01/09/2005 and 12/10/2005 was 0.2127 kg. The remaining propellant is in the order of 158.9160 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 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

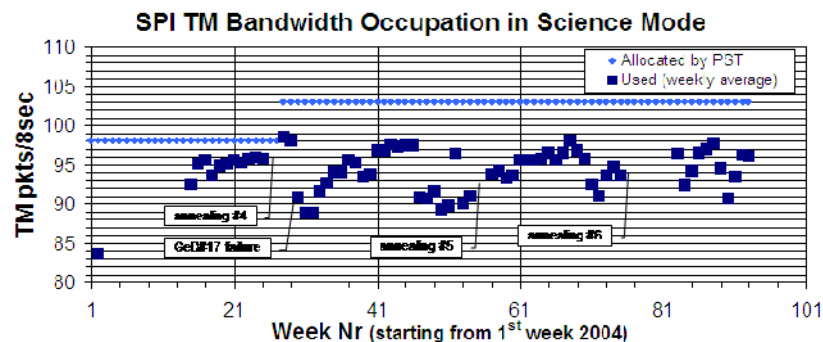
### 3.2.1 SPI

The overall status of the instrument is nominal.

During science operations, the instrument was kept in photon-by-photon mode, with spectra TM enabled, an assigned TM bandwidth in the science observation windows of 103 pkts/cycle and an average occupation of 96 pkts/cycle.

The Stirling compressors are working well, maintaining the detector cold-plate temperature within 85+/-1K.

The following plot shows the TM bandwidth occupation information.



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

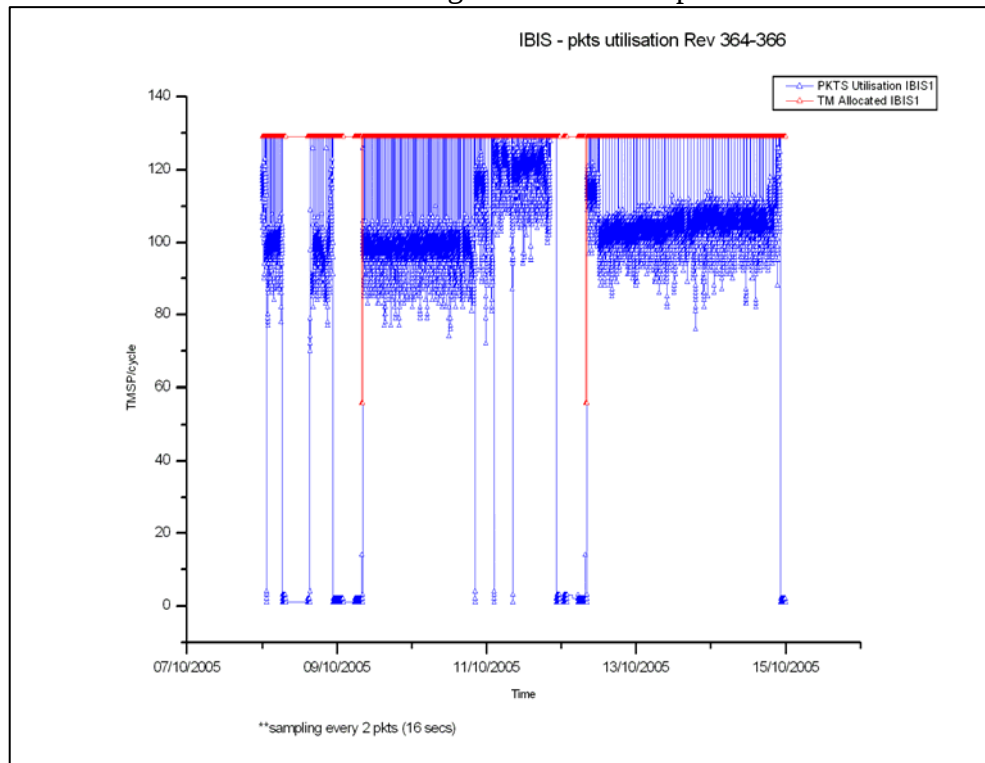
### 3.2.2 IBIS

The Overall status of the unit is Nominal.

On DoY 2005.284, in revolution 365, the CRAB Payload Calibration was scheduled. However no specific configuration was required for IBIS.

During the reporting period, the PST allocation to IBIS was most of the time 129 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 106.65 TMPS/cycle, up 3.19 on last week.

A plot of the IBIS TM utilisation during the observation period 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 combined with some manual commanding.

JEM-X1 was operated in Data Taking mode during science observations with a TM allocation of 8 packets/cycle, except during the period from 2005-10-11T02:28:08Z to 2005-10-11T08:32:34Z (Crab calibration), for which it had 15 packets/cycle.

The JEM-X2 configuration throughout the reporting period was as follows:

- Start of reporting period - 2005-10-09T07:46:16Z: Safe mode with a TM allocation of 1 packet/cycle
- 2005-10-09T07:46:16Z - 2005-10-09T08:32:11Z: Nominal activation by the automatic Timeline
- 2005-10-09T08:32:11Z - 2005-10-11T02:29:08Z: Setup mode with HV on and TM allocation of 1 packet/cycle
- 2005-10-11T02:29:08Z - 2005-10-11T08:18:00Z: Data Taking with TM allocation of 15 packets/cycle (Crab calibration)
- 2005-10-11T08:18:00Z - 2005-10-11T22:44:31Z: Safe mode with a TM allocation of 1 packet/cycle
- 2005-10-11T22:44:31Z – end of reporting period: DFEE OFF with a TM allocation of 1 packet/cycle

On 2005-10-08, due to a ground station outage, JEM-X1 was commanded to Safe mode at 06:29:19Z and was returned to Data Taking mode at 15:48:00Z.

On 2005-10-11 a Crab calibration observation was performed, with special configurations for JEM-X1 and JEM-X2 according to OCR-200 (Special JEM-X operations during the October 2005 Crab Calibration).

*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.

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, 185 of the 202 planned science pointings for OMC were executed nominally, 16 (PID 03640068-03640083) were missed due a ground station outage as a result of the Cryosat launch and 1 (PID 03650103) was missed due to an inability to generate the slew parameter update.

*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 observation period was characterised by low solar activity.

The sun was very quiet this week. At the beginning of the observing period tiny sunspot 813 posed no threat of solar flare. From the 10<sup>th</sup>, the sun was blank.

*Reference: [www.spaceweather.com](http://www.spaceweather.com)*

*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 good this week. 16 science pointings were lost due to CRYOSAT launch, and one due to problem to update a slew from the FDS tool. Several drops in TM were reported in REDU. The overall performance was well above the 95% requirement.

### **4.1 Mission Operations Centre**

The performance of the MOC was good this week. One pointing was lost due to problems at the MOC with the FDS (slew update unsuccessful). And 16 were lost due

to the launch of CRYOSAT. The overall performance was well above the 95% requirement.

## **4.2 Ground Stations & Network**

The performance of the ground stations and Network was good this week. 4 gaps in TM were reported in REDU. A delayed handover occurred between Redu and Goldstone due to lack of bit-lock. And a problem of connection with DSS16 was reported that caused a slew to be not performed. But none of these had any impact on science operations. The overall performance was well above the 95% requirement.

## **4.3 Science Ground Segment**

### **4.3.1 ISOC**

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

PSF's have been received up to revolution 370 with those of 368 and 370 redone to account for Redu maintenance.

An urgent TOO request for observation of the new source IGR J17269-4737 was received Friday, Oct 14 afternoon and implemented within a few hours for revolution 367, beginning on Saturday, thanks to a strong effort on all sides.

The TSF for revolution 367 was received.

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

ECS's received up to revolution 359. No extra time has been credited.

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

A new disk array will be configured by 17 Oct 2005, just in time to avoid serious problems.

Specification of user requirements for inclusion of the second ISGRI catalogue will be completed this week. However, they are already several weeks overdue, which may cause a delay in the next ISDA release.

The ISDA database hardware has crashed twice in the last few months.

A watchdog will be installed.

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

The current system is 11.1.5; an upgrade to 11.2 with several significant improvements, like Hex Pattern COP move and unsplitting of observations is planned to be released soon.

#### **5. Problems**

None.

### **4.3.2 ISDC**

Status of ISDC observation processing on 17/10/2005:

- Latest Standard Analysis completed: observation 03201090028 (Galactic Bulge, Revolution 355) on 10/10/2005

- Latest products archived: observation 03201090028 (Galactic Bulge, Revolution 355) on 11/10/2005

- Latest observation products sent to the observer: observation 02297000020 (galactic disk  $l < 0$ , Revolution 347) on 03/10/2005.

## 5 Special Events

None.

## 6 Anomalies

There were a number of problems that impacted the operations:

- On DoY 281, at 03:44Z, on the B-chain, there were about 40 repetitions of the event log message: "TPKT, imcb, Fatal Error, Software, Invalid months segment specification". Software support was contacted and the following iddb MADDS applications were restarted: TMDS\_RT, TMDS\_PB, Tcon\_RT and Tcon\_PB. After monitoring, the problem seemed to have disappeared. On DoY 282 however, the event log messages were again reported. In addition "TMDSmain, iddb, Error, Software, Error sending data to ISDS" was logged. ISDS-B, iddb and the packetiser on IMC-B were restarted. This fixed the problem.
- On doy 281, the Cryosat's Launch being confirmed, INT\_OR\_0221 was performed by the Spacon. INTEGRAL spacecraft was set into Safe configuration before LOS with REDU at 07:33Z. At 14:33Z, AOS occurred with DSS16 and the spacecraft was set back in its nominal configuration. Slews 03640068 to 03640083 were lost due to Ground Stations outage. AOCS recovery was performed and slew 03640084 went from the timeline. Consequently pointings 03640068 to 0640083 were lost.
- On DoY 281 at 16:34Z, no TPF update was generated for the slew 03640085 that hence was updated manually. The problem occurred again after mapping at 17:30Z, and no update was generated for slew 03640087. Consequently, slew 03640087 was sent manually in advance at 17:52Z and the update was OK for slew 03640088 that went from the Timeline.
- On DoY 282 at 06:06Z "imca, TPKT, Warning, Packet time in future, using frame ERT instead of Packet OBT" as well as "imca, TPKT, 6939 missing source packets" were reported in the Event Logger. However the time correlator was Valid and Accurate. the update of the parameter occurrence time (JS0001) was also being produced. After investigation for R. Southworth, the problem was probably caused by a buffered JEM-X2 packet being downlinked when the BandWidth was assigned to JEM-X2 in PST. Note that in reality no packets were missed, the above error was caused simply by packets being received out of sequence.
- On DoY 282 at 11:54Z a short data gap in Online Timely VC0 was reported from RED1-IP, as well as bad frames.
- On Doy 283 at 12:03Z, the FDS failed to update slew 03650055. A mapping was performed and the slew was updated manually.

- On DoY 284 at 18:45Z, the FDS failed to update slew 03650103. A mapping was performed but the attitude verification showed that there were not enough valid stars in the field of View. The update for this slew failed and the slew was lost. Slew 0360104 was performed manually in advance, at 19:30Z. The automatic update for slew 03650105 was uplinked in advance as well at 19:44Z. This slew went from the timeline at 20:28Z. This is the 3<sup>rd</sup> occurrence in the reporting period, the problem is under investigation by FD.
- On DoY 284 at 19:46Z the station hand-over Redu to Goldstone was delayed because of a problem to obtain Bitlock. The TC link was eventually operational at 20:01Z.
- On DoY 284 at 23:37Z all TM links from DSS16 dropped. At 23:44Z the TC link was aborted and reconnected at 00:01Z on DoY 285 by GFCC. At 00:04Z TM link VC7 online complete was back but VC0 still dropped. Consequently the timeline was stopped. At 00:51Z all links were back from DSS16. The anomaly was logged by JPL as DR #G106161. After check with Flight Dynamics, it was decided the current attitude was valid for the Perigee Pass and the slew 03650111 was not recovered.
- On DoY 285 at 06:57Z few second data gap in TM VC0 was reported from REDU.
- On DoY 285 at 10:10Z CCC stopped all applications on ISDS-A and B in order to reboot the firewall. The TM distribution to ISDC / IFRD was stopped. The reboot was performed at 10:17Z, at 10:19Z TM VC7 was back, ISDC was reconnected and ISDS-A restarted.
- On DoY 285 at 12:44Z, the RMU calibration failed several times in a row. This is due to a problem with the pitch channel threshold on FDS. Actually the pitch has been drifting and the threshold has been exceeded. After investigation Flight Dynamics decided to increase the limit (to 100 as/sec) and to keep monitoring the pitch channel. The problem was hence fixed, RMU calibration performed successfully.
- On DoY 286 at 10:38Z, a data gap on TM VC0 was reported from REDU as well as a few Reed Solomon alarms. At the same time bad frames were received.
- On DoY 287 at 04:40Z "TMDS main, idda, Warning, Error while decoding frame, small drop in bad frames" was reported.
- On DoY 287 at 10:04Z, loss of TM link in VC0 and VC7 from REDU was reported. Links were back at 10:06Z. This was likely due to the power supply problem that occurred at the same time at the Ground Station.

There were no new anomaly reports entered into the ARTS system this week:

| AR id      | Date Created | Subject                                                              | Segment | Status |
|------------|--------------|----------------------------------------------------------------------|---------|--------|
| INT_2798   | 2005-10-11   | Static PTV for commands on ASTACK not updated when ASTACK is stopped | IMCS    | Open   |
| INT_2799   | 2005-10-11   | Executed time-tagged commands flagged as deleted in TC History       | IMCS    | Open   |
| INT_SC-129 | 2005-10-11   | IBIS: VETO VDM 09 High Voltage break down to ~550V                   | Payload | Open   |

## 7 Future Milestones

A patch of the IMCS is planned for October/November, which should fix a couple of problems.

DSS-16 is to be decommissioned, and replaced by DSS-27, the testing of which was performed this week.

## 8 Appendix

The appendix includes various detailed information.

### 8.1 Overview of Revolutions

#### Revolution 365

The observations in revolution 365 began with a grid observation of the Scutum Arm lasting ~35.5 hours, followed by a hexagonal dithering observation of the Galactic Bulge region (RA 17:45:36.00; DEC -28:55:60.0) lasting ~3.5 hours. A Crab payload calibration was then performed, consisting of:

- on-axis staring observation of the Crab (RA 05:34:31.97; DEC +22:00:52.1) lasting ~5.5 hours. During this observation both JEM-X units were in Data Taking mode, with several different configurations (high voltage settings and TM format) as described in OCR-200 and the TM allocation was IBIS 129; SPI 81; JEM-X1 15; JEM-X2 15; OMC 5;
- raster dithering observation centred on the Crab (RA 05:34:31.97; DEC +22:00:52.1), performed for the remaining ~13.5 hours of observation time.

Throughout these observations SPI, IBIS, and OMC were in their nominal science modes. For all observations other than the Crab on-axis staring, JEM-X1 was in its nominal Data Taking mode and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5. JEM-X2 was in Setup mode with HV on for the first two observations and was in Safe mode for the last (Crab raster dithering) observation. At 2005-10-11T22:44:31Z, after radiation belt entry, the JEM-X2 DFEE was switched off.

#### Revolution 366

The observations in revolution 366 consisted of a hexagonal dithering observation of the Galactic Bulge region (RA 17:45:36.00; DEC -28:55:60.0) lasting ~3.5 hours, followed by a raster dithering observation of SS433 (RA 19:11:49.56; DEC +04:58:57.6), performed for the remaining ~57.5 hours of observation time.

Throughout these observations all instruments were in their nominal science modes, except for JEM-X2 for which the DFEE was off, 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

|                          |          |   |                          |
|--------------------------|----------|---|--------------------------|
| 2005-09-24T02:27:26.000Z | 159.2919 | F | Automatic TM processing. |
| 2005-09-24T07:27:34.000Z | 159.2661 | F | Automatic TM processing. |
| 2005-09-27T02:04:37.000Z | 159.2414 | F | Automatic TM processing. |
| 2005-09-27T07:14:14.000Z | 159.2233 | F | Automatic TM processing. |

|                          |          |   |                          |
|--------------------------|----------|---|--------------------------|
| 2005-09-30T02:03:41.000Z | 159.2068 | F | Automatic TM processing. |
| 2005-09-30T07:02:37.000Z | 159.1865 | F | Automatic TM processing. |
| 2005-10-03T06:45:57.000Z | 159.1593 | F | Automatic TM processing. |
| 2005-10-06T01:37:15.000Z | 159.1429 | F | Automatic TM processing. |
| 2005-10-06T06:31:40.000Z | 159.1287 | F | Automatic TM processing. |
| 2005-10-08T06:32:50.000Z | 159.0960 | F | Automatic TM processing. |
| 2005-10-08T15:33:23.000Z | 159.0645 | F | Automatic TM processing. |
| 2005-10-09T01:22:44.000Z | 159.0533 | F | Automatic TM processing. |
| 2005-10-09T06:21:08.000Z | 158.9711 | F | Automatic TM processing. |
| 2005-10-11T23:17:55.000Z | 158.9196 | F | Automatic TM processing. |
| 2005-10-12T06:04:36.000Z | 158.9160 | F | Automatic TM processing. |

This report was generated Fri Oct 14 08:00:29 GMT 2005

### 8.3 Detailed Satellite Information

This section contains some detailed information concerning the various subsystems of the satellite and instruments.

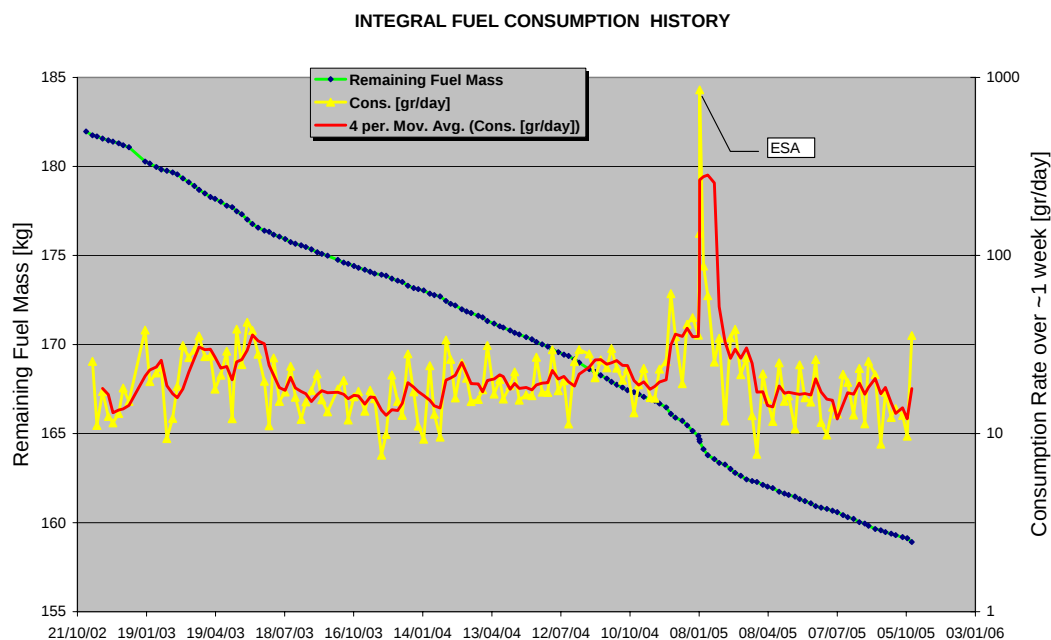
#### 8.3.1 AOCS SUMMARY OPERATIONS REPORT, 08/10/2005 – 14/10/2005

AOCS operations were executed from the Automatic Timeline.

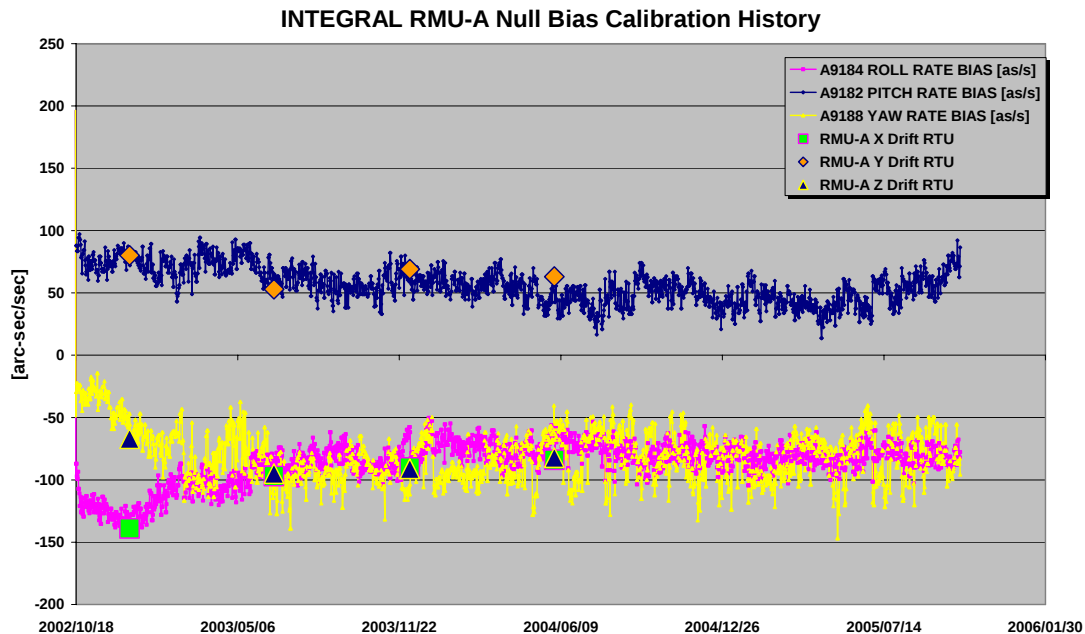
During this period, 94 Open Loop Slews, 106 Closed Loop Slews and 6 Momentum Bias were executed (TL + manual recovery). 20 slews (11 CSL, 9 OSL) were not executed from the Timeline during this period, due to Cryosat launch, problem on FDS and DSS16 station.

This is equivalent to a  $\sim 9.2\%$  of the total number of slews planned (217).

The fuel consumption over the period between 01/11/2002 and 12/10/2005 is reported in the plot below.



The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 16/10/2005 is reported in the plot below.



From End of July 2005 the drift on pitch channel shown a variation towards higher values.

The drift measured values are approaching the ones measured at the begin of the mission (about 90 arcs/s)

#### 08/10/05 (Day of Year 281, Revolution 364)

**Slews missed from the Timeline:** due to the Cryosat Launch, the expected REDU pass in rev 364 from 07:33z to 19:30z was not performed. To cover part of this period an extended Goldstone support was scheduled from 14:33z to 02:09z. For all the outage period the attitude of the S/C was that for PID 03640067 (valid until 2005-10-12T04:23:44Z) and the wheels speeds set to the safe values

RW2 ~ 1999 rpm  
 RW3 ~ 1982 rpm  
 RW4 ~ -1987 rpm

by a manual RWB performed before LOS REDU.

The AOCS s/s was disabled in TL at 06:23z.

At AOS TC Goldstone (14:35z) , in order to reconfigure at the AOCS s/s, a manual recovery was then performed to attitude of PID 03640083 and a manual RWB was

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executed to rejoin the speeds profiles. The next slew (CSL) for PID 03640084 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 15:52z.

At 16:16z the FDS failed to generate the update for slew ID 03640085 (reason still TBC, investigation on-going): the slew for PID 03640085 was manually updated and executed from the Timeline.

At 17:26z the FDS failed to generate the update for slew (OSL) ID 03640087 (reason still TBC, investigation on-going). The AOCS s/s was disabled in TL at 17:43z.

A manual recovery was then performed to attitude of PID 03640087. The next slew (OSL) for PID 03640088 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 18:10z..

The following slews were not executed from TL due to the Cryosat lunch and while recovering the AOCS s/s: 03630068 (CSL)-69(OSL)-70(CSL)-71(OSL)-72(CSL)-73(OSL)-74(OSL)-75(OSL)-76(OSL)-77(CSL)-78(CSL)-79(OSL)-80(CSL)-1(CSL)-82(CSL)-83(CSL)-87(CSL).

#### **09/10/05 (Day of Year 282, Revolution 364-365)**

Nothing to report.

#### **10/10/05 (Day of Year 283, Revolution 365)**

**FDS failed slew update:** at 12:03z the FDS failed to generate the update for slew ID 03650055, as evidenced from the attitude log file 0365\_0055.attd\_log not complete in the last part. The origin of the problem is likely an overload of the FDS ws(sun125) at the moment of the attitude reconstruction process, due to parallel tasks execution. The slew for PID 03650055 was manually updated and executed from the Timeline.

No impact on TL reported.

#### **11/10/05 (Day of Year 284, Revolution 365)**

**Slews missed from the Timeline:** at 18:45z the FDS failed to generate the update for slew ID 03650103. The origin of the problem is likely due to the poor number of stars present in the STR FOV, not enough for running the attitude reconstruction process. After several attempts to perform a manual update, the slew ID 03650103 failed release and the AOCS s/s disabled in TL at 18:55z

A manual recovery was then performed to the attitude of PID 03650104. The next slew (CSL) for PID 03650105 was manually updated and executed from the Timeline.

The following slews were not executed from TL while recovering the AOCS s/s: 03650103 (OSL)-104(CSL)

## 12/10/05 (Day of Year 285, Revolution 365-366)

**Slew missed from the Timeline:** Due to a problem on DSS16 station (drop in TM\TC links), the slew ID 03650111(CSL) failed release and the AOCS s/s disabled in TL on DoY 284 (11/10/2005) at 23:44z.

After consultation with on-call SOE and FD on-call, was decided to not perform any manual recovery, skipping the planned RWB (null bias) and CGS at the end of rev 365. The attitude reached at that time was ('perigee safe attitude'):

RA = 18:40:00.00  
DEC = -10:00:00.0  
POS = 263:57:26.1

with no constraints violation until 2005-10-15T04:12:27Z.

The guide star picked was Mi 7.15 at CCD location [19455, -1568]

The AOCS s/s was re-enabled in TL at AOS REDU for rev 366 at 05:27z. No manual CGS was required as FD on-call confirmed the validity of the current guide star for the planned RWB at the beginning of rev 366.

The following slew was not executed from TL while recovering the AOCS s/s: 03650111(OSL).

**FDS failed to generate RMU-A drift update due to higher value on pitch channel:** at 12:44z the FDS failed several times to generate the TPF for RMU-A drift update. The origin of the problem was an higher value of the calculated drift on pitch channel that exceeded the relevant threshold (upper hard limit = 88 , calculated value = 92.320) set in FDS. Based on the trend on pitch channel since June 2005 the hard limit was set to 100. The RMU-A drift update was successfully generated and uplinked at 14:17z.

Investigation are on-going to clarify if any potential failure is present on the pitch channel of the RMU-A unit. Even if the SUM states in chapter 4.4.1.6.5 <<if the drift is greater than 0.4°/sec for any axis or if the output is considerably noisier than the previous one then the cold redundant RMU is declared not health>> , the correct values to be considered as trigger of potential problems is 0.1°/s that is the values used in the simulations for evaluating the ESAM performances, as confirmed by the prime contractor. At the moment the RMU pitch drift is ~ 0.026°/s so well below the mentioned threshold.

Hereafter follow the considerations of the prime contractor Alcatel Alenia Spazio (mail from M. Montagna on 13/10/2005) on this issue:

*-From End of July the drift of pitch channels shows a variation towards higher values even if the average does not show a behaviour completely different from other period*

*The drift measured values are approaching the ones measured at the begin of the mission (about 90 arcs/s);*

*-The last sample considered (12/10/2005 17:17:23 value is 92.16) shows a jump (less than 20 arcs/s) with respect to the previous sample but in the same order of magnitude of the other computed values;*

*-Analysing the difference between a sample and the previous one, no evident variations are present on pitch channel;*

*-No anomalous drift jumps are seen, no clear degradations are identified*

*Based on the above considerations, a change of the up-to-now observed behaviour of the drift of the pitch RMU channel, seems present. Such a change has to be confirmed in the next calibrations update.*

*At the moment the sensor works as specified and therefore it is not a critical element. A potential problem is the sudden change of the drift i.e jumps in the drift updated values. This problem up to now was never observed.*

No impact on TL reported.

#### **13/10/05 (Day of Year 286, Revolution 366)**

Nothing to report.

#### **14/10/05 (Day of Year 287 Revolution 366)**

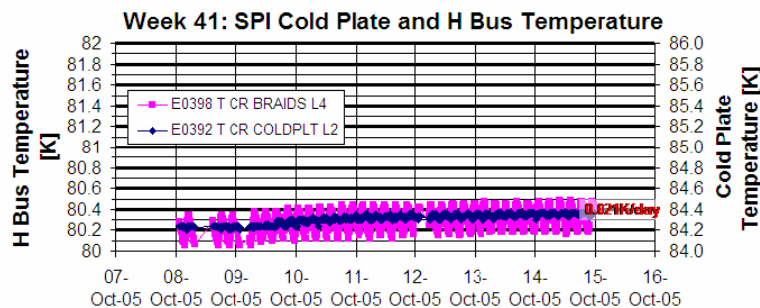
Nothing to report.

### **8.3.2 SPI Operations**

#### **Stirling compressors and Cryostat:**

The performance of the compressors is nominal. The cold plate temperature was maintained at 85K $\pm$ 1K showing the usual positive drift with the expected slope.

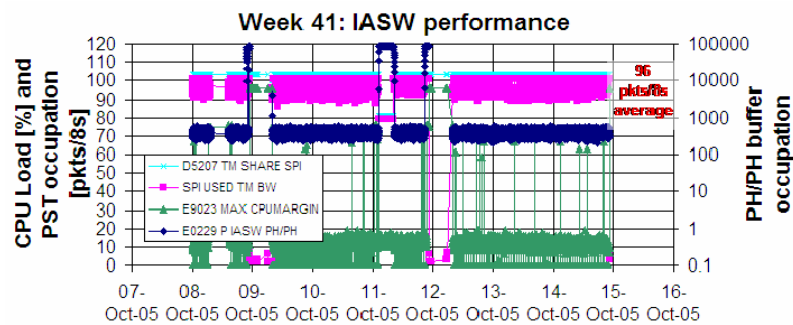
The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.



#### **DPE & IASW:**

The IASW performance is nominal.

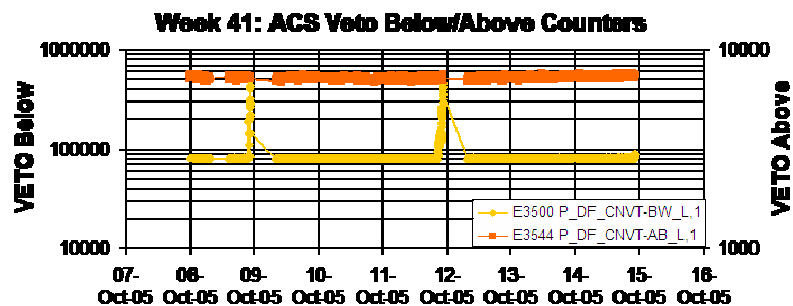
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



#### ACS:

The performance of the ACS is nominal.

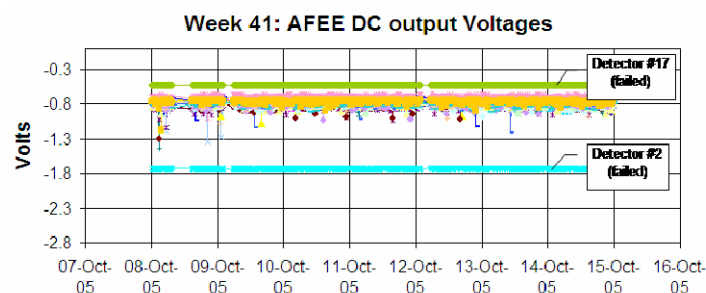
The following plot shows the ACS overall count rate evolution during the reporting period.



#### AFEE and Germanium Detectors:

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

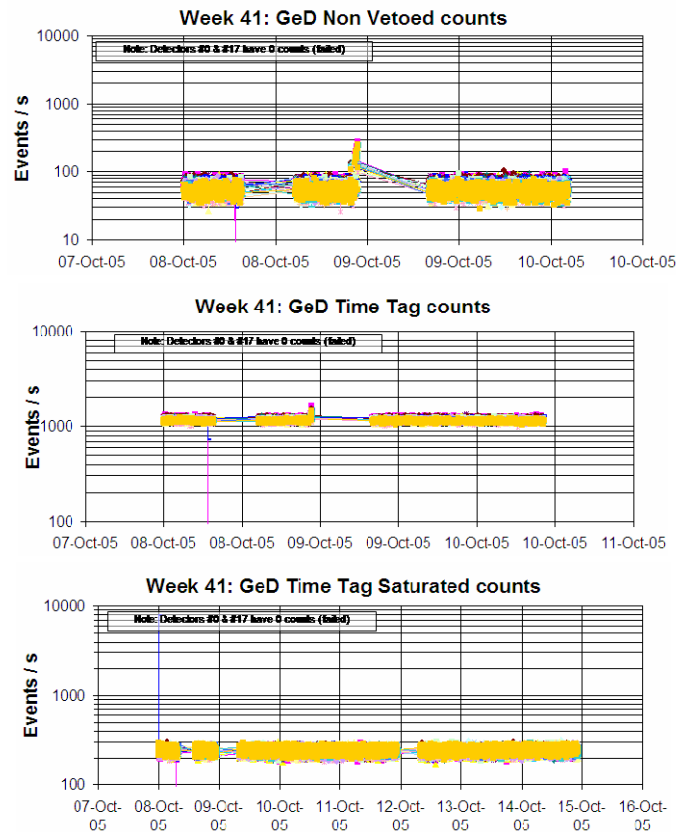
The following plot shows the dc voltage offset of the detector channels during the reporting period.



#### DFEE:

The performance of the unit is nominal.

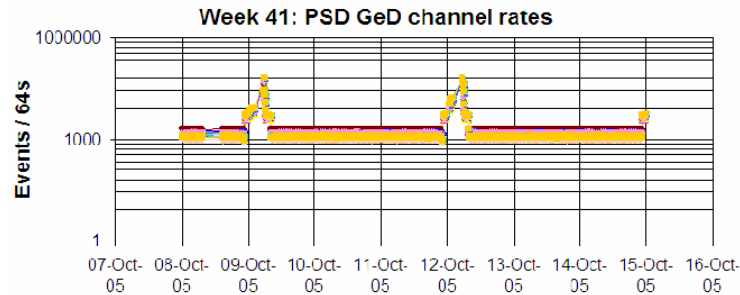
The following plots show the count rates of the detectors during the reporting period (due to problems in the data retrieval tool, some gaps could be present).



## PSD:

The performance of the unit is nominal.

The following plots show the PSD channel rates during the reporting period.



## SPI EVENTS LOG

NOTE: The events log is extracted from the revolution pass summaries (courtesy of the Integral Analysts).

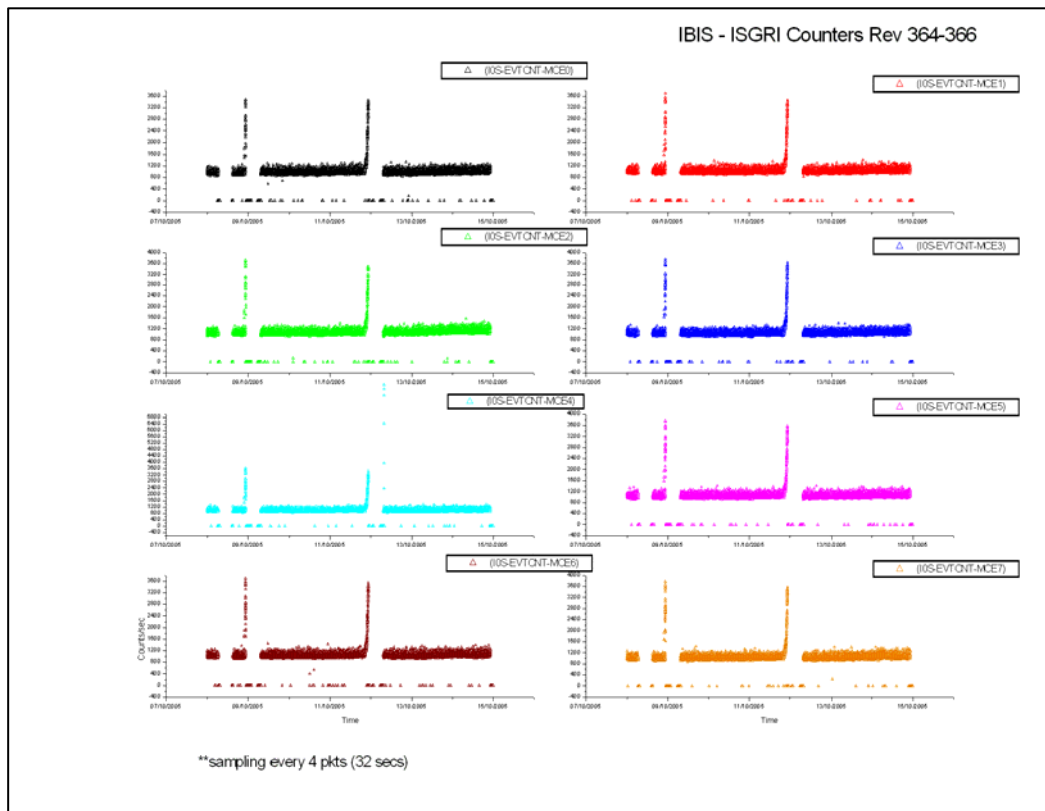
| DOY Time    | Event                                                                                                                                                                  |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 281 / 22:32 | TM E3500 "P_DF_CNVT-BW_L,1" OOL Alarm High.                                                                                                                            |
| 281 / 22:44 | TM E3500 "P_DF_CNVT-BW_L,1", G6062 "V1S-BOT-COUNT", G6063 "V1S-LAT-COUNT" back into limits.                                                                            |
| 284 / 08:59 | OEM: "SPI1 CONSTRAINT DPE CULPR"<br>OEM: "SPI1 SW ERROR"<br>> Not a problem: SPI is normally issuing this message during "high radiation event" like Solar flare, GRB. |
| 284 / 15:47 | TC EU9050 "DUMP MEMORY" uplinked upon request of the Instrument SOE.                                                                                                   |

|                    |                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 284 / 20:40        | TM E3500 "P_DF_CNVT-BW_L,1" OOL Alarm High.                                                                                                                 |
| 284 / 22:34        | After Radiation Belt Entry:<br>TM E3500 "P_DF_CNVT-BW_L,1" Back in Limits<br>TM G2013 "IOS-EVTCNT-MCE0" and the others of the same family back into limits. |
| 286<br>13:23-13:35 | TM E3259 "S AS HV-ST L63" OOL violating the fix check at 2: "CORRECT VAL" with the value 0: "PARAM > SPEC" and back into limits.                            |

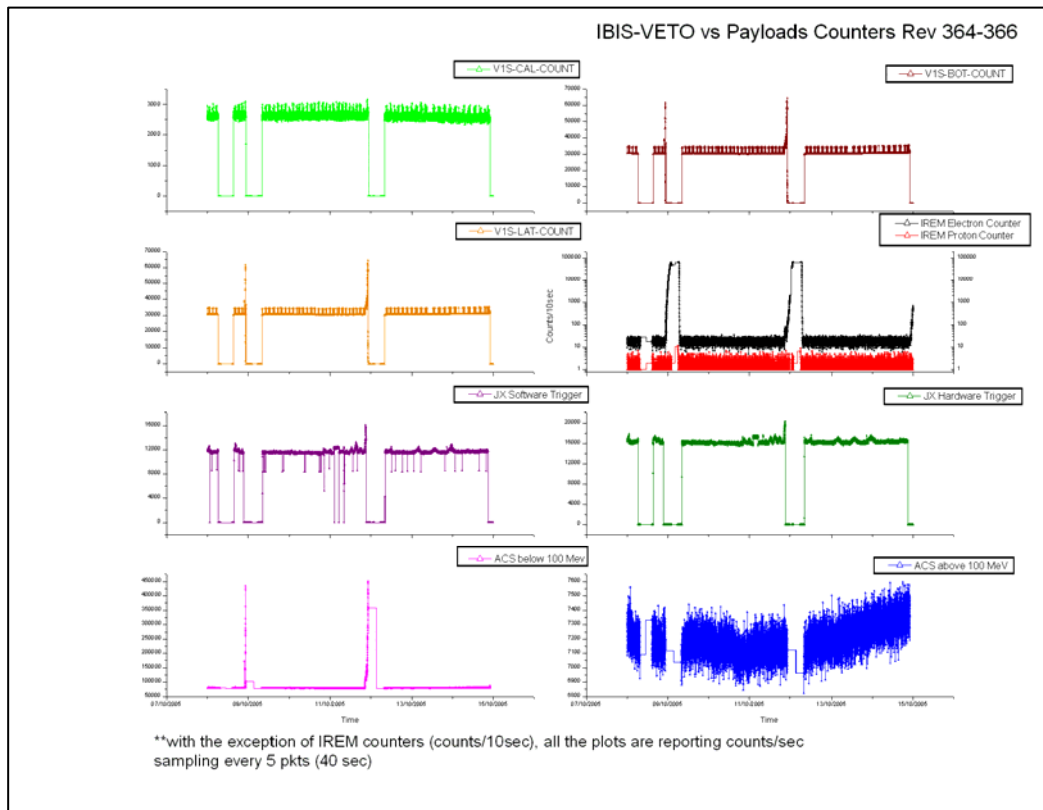
### 8.3.3 IBIS Operations

#### IBIS Event Counters Plots.

#### ISGRI Counters:

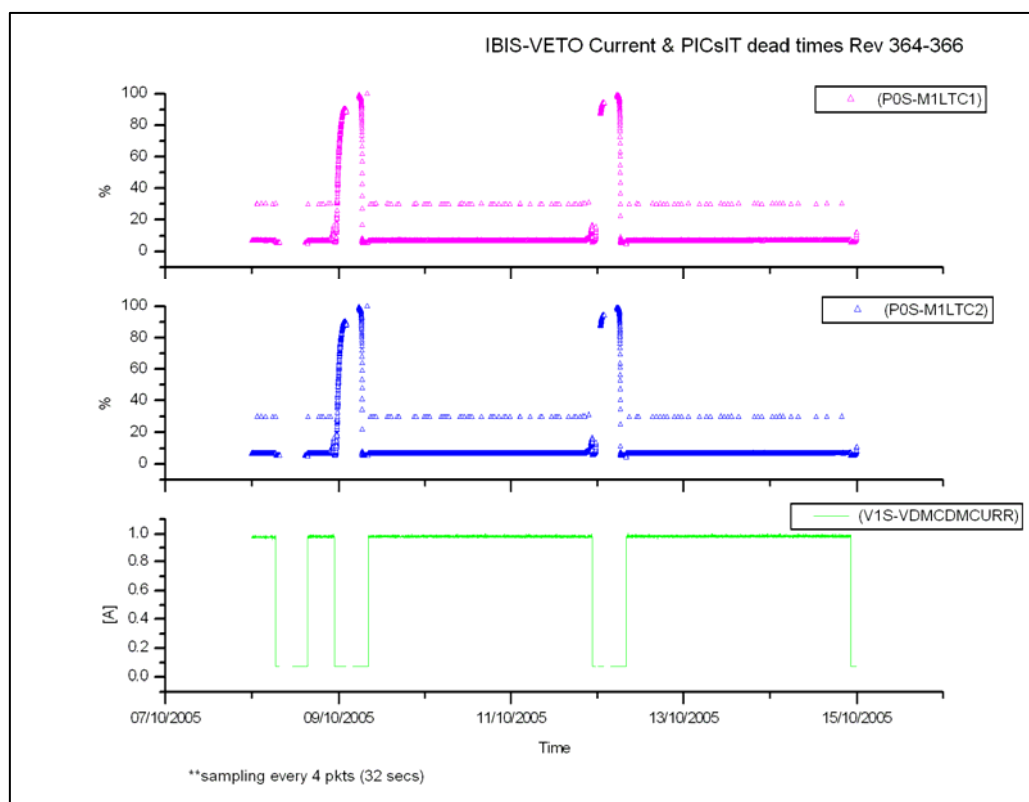


## VETO vs Payloads Counters:

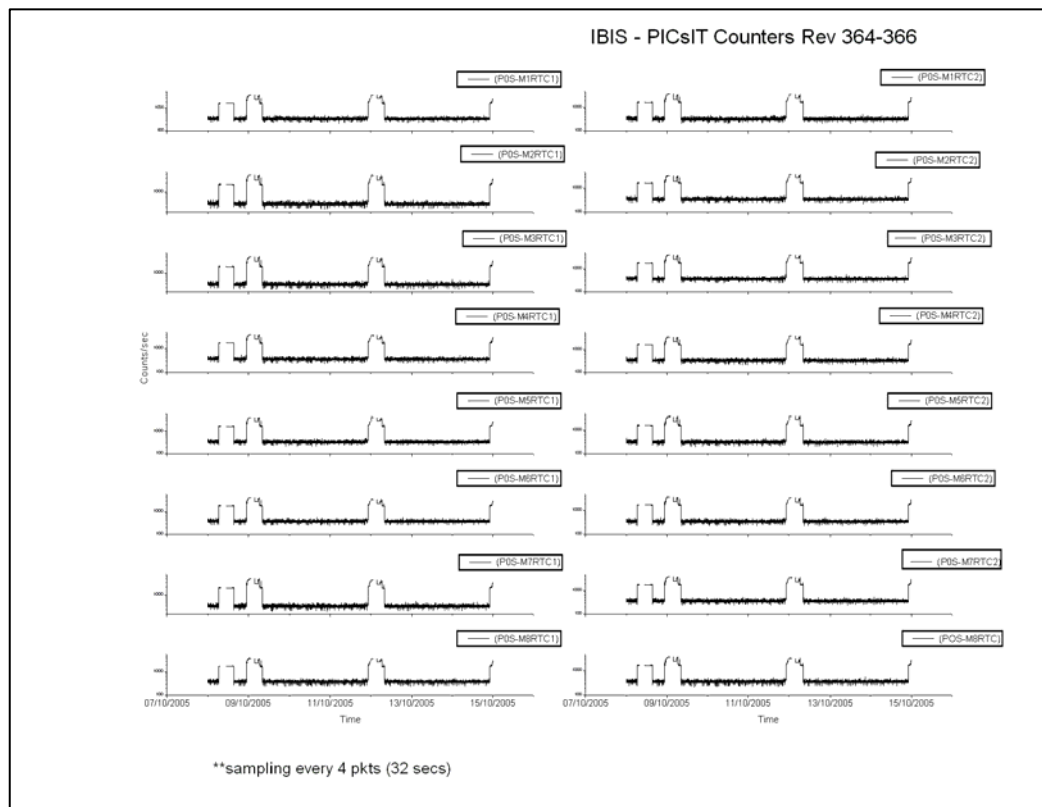


The week was characterised by low radiation.

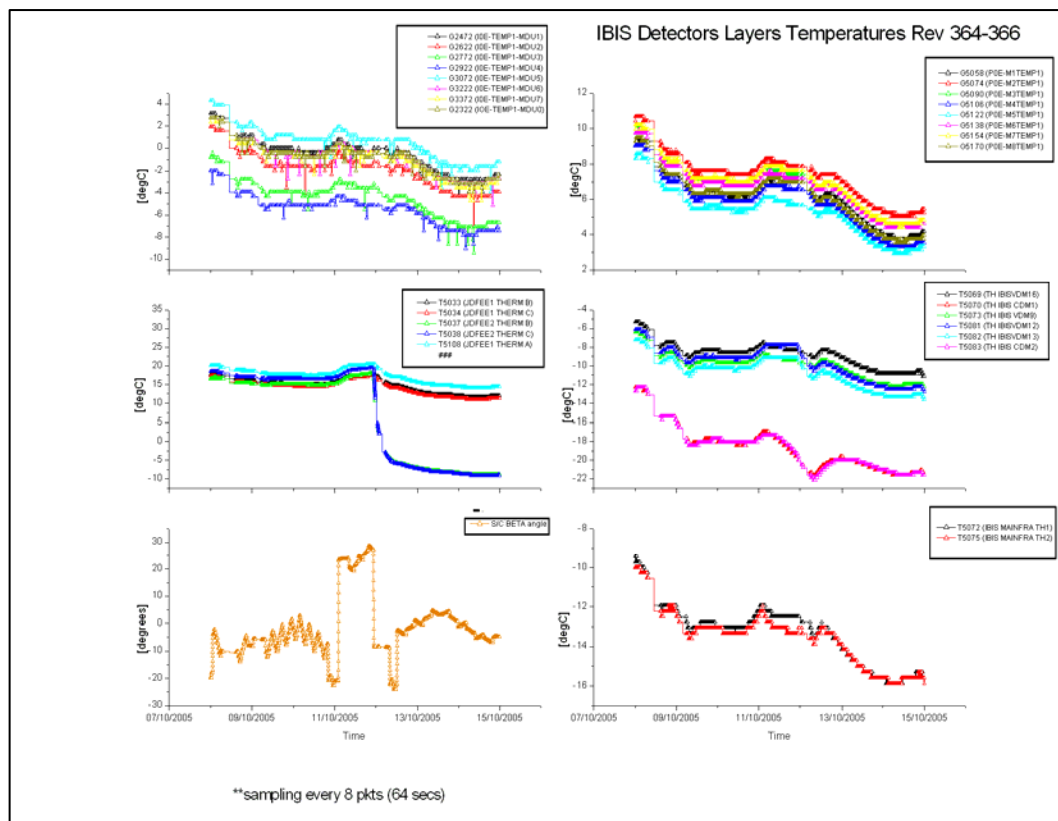
## VETO Current:



## PICsIT Counters:



## IBIS Detectors Layers Temperatures:



It can be noted on the temperature plot that T5038 (JDFEE 2 thermistor C) features a drop on the 11<sup>th</sup>. Actually this is because JEM-X2 DFEE was ON from October 6<sup>th</sup> for the CRAB calibration, and then it was switched back OFF on the 11<sup>th</sup>.

### **IBIS daily report:**

#### **DoY 2005.281 (08/10/2005):**

At 06:31Z, following INT\_OR\_0221 (Loss of Redu due to CRYOSAT), IBIS was switched to Safe mode with FCP\_IBIS1\_0801. IBIS was disabled in the timeline at 06:23Z.

From 07:33Z to 14:33Z, no TM/ TC link was ON due to Cryosat launch using REDU. At 15:13Z, IBIS was set back into Scientific Standard mode with FCP\_IBIS1\_0803 and with GESTAN02 at 15:23Z. IBIS was enabled in the timeline at 15:52Z. Consequently, TM G8015 was reported OOL high between 06:32Z and 15:21Z.

At 15:38Z TM parameter G2056 (I0E-OVDWPXADD-M4) failed SCC and back. According to I-OVF-1 no action was taken.

Between 22:24Z and 22:43Z TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) went OOL High. Between 22:35Z and 22:43Z TM family G2013 (I0S-EVTCNT-MCEi) went OOL High.

According to V-BOT, V-LAT and I-CNT-1, as this happened while approaching radiation belts, these counters were monitored and no other action was taken.

At 22:46Z TM parameter G8015 (28V PMT set by IASW) went OOL High with the value 29.4V. It went back inside limits on DoY 282 at 08:13Z. As this happened inside the radiation belts, according to V-VLT-1 no action was taken.

#### **DoY 2005.282 (09/10/2005):**

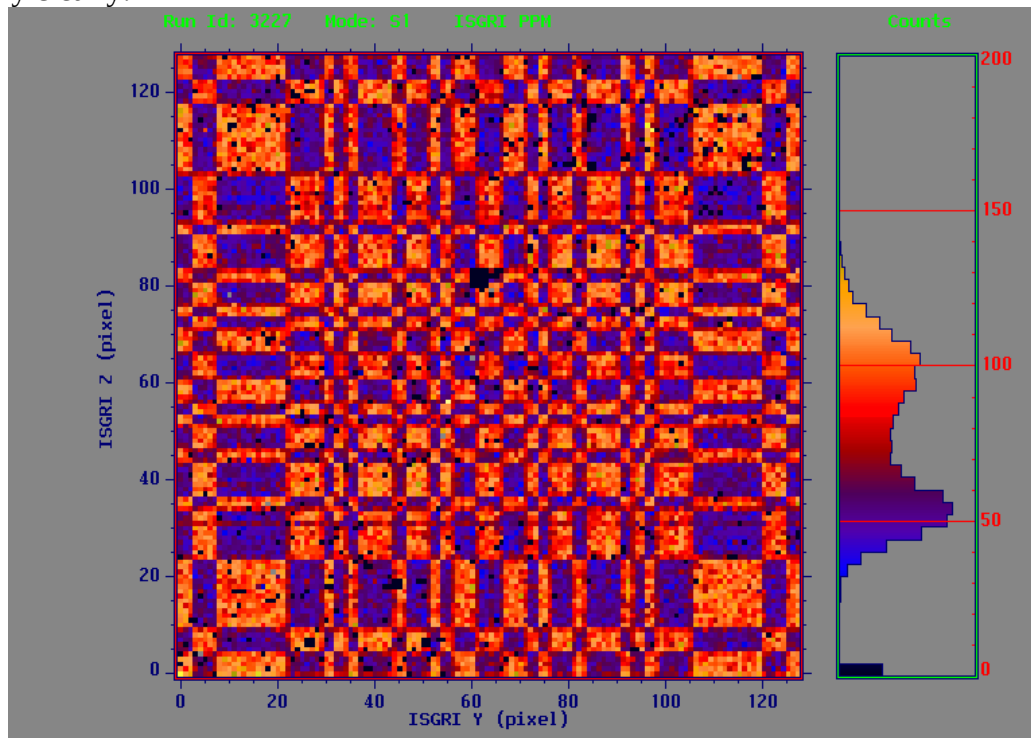
Between 00:20Z and 06:30Z TM parameters of family G5002 (P0S-MiRTC1) were toggling OOL High. As this happened inside radiation belts, according to P-CNT-1 no action was taken.

At 07:58Z TM parameter G2070 (I0E-OVFWPXADD-M5) failed SCC. According to reaction I-OVF-1, as this happened inside radiation belts, no action was taken.

#### **DoY 2005.284 (11/10/2005): CRAB calibration**

The CRAB calibration took place in revolution 365 on DoY 2005.284 (11/10/2005). No specific configuration was required by IBIS PIs during this calibration.

For example, during this calibration, ISGRI data (S1) shows the coded mask pattern very clearly:



#### **DoY 2005.284 (11/10/2005):**

At 21:37Z TM parameter G8080 (S1S-VS HBRA-RT) went OOL high and back. This happened again regularly until 22:34Z. According to H-OVF-2 as this happened while approaching radiation belts, no action was taken.

From 21:59Z to 22:34Z, TM family G2013 (I0S-EVNCNT-MCEi), TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were toggling OOL. According to V-BOT, V-LAT and I-CNT-1, as this happened while approaching radiation belts, these counters were monitored and no other action was taken.

At 22:34Z TM parameter G8015 (28V PMT set by IASW) went OOL High with the value 29.4V. It went back inside limits on DoY 285 at 08:01Z. As this happened inside the radiation belts, according to V-VLT-1 no action was taken.

#### **DoY 2005.285 (12/10/2005):**

From 00:51Z to 01:20Z, TM parameters G5018 (P0S-M4 RTC2) and G5022 (P0S-M5 RTC1) were toggling OOL High. As this happened inside radiation belts, according to P-CNT-1 no action was taken.

At 07:25Z TM parameter G2098 (I0E-OVFWPXADD-M7) failed SCC. At 07:43Z TM parameter G2056 (I0E-OVFWPXADD-M4) failed SCC. According to reaction I-OVF-1, as this happened inside radiation belts, no action was taken.

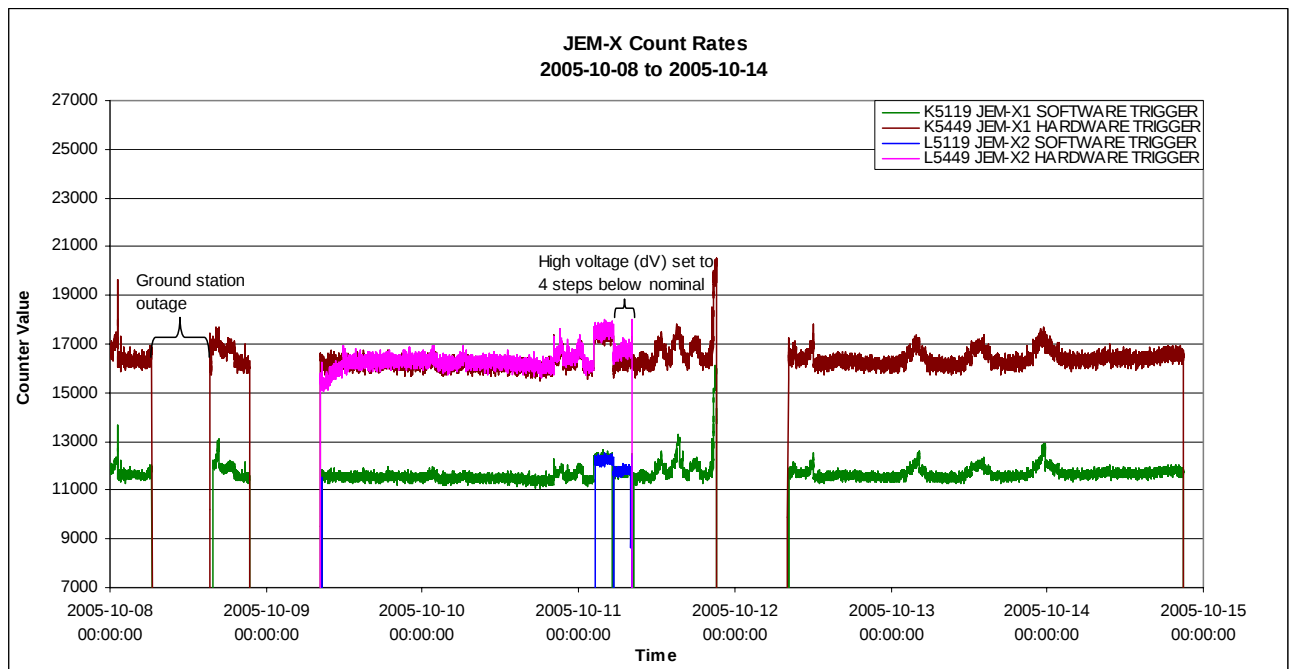
## DoY 2005.287 (14/10/2005):

At 22:22Z TM parameter G8015 (28V PMT set by IASW) went OOL High with the value 29.4V. As this happened at radiation belts entry, according to V-VLT-1 no action was taken.

### 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>.



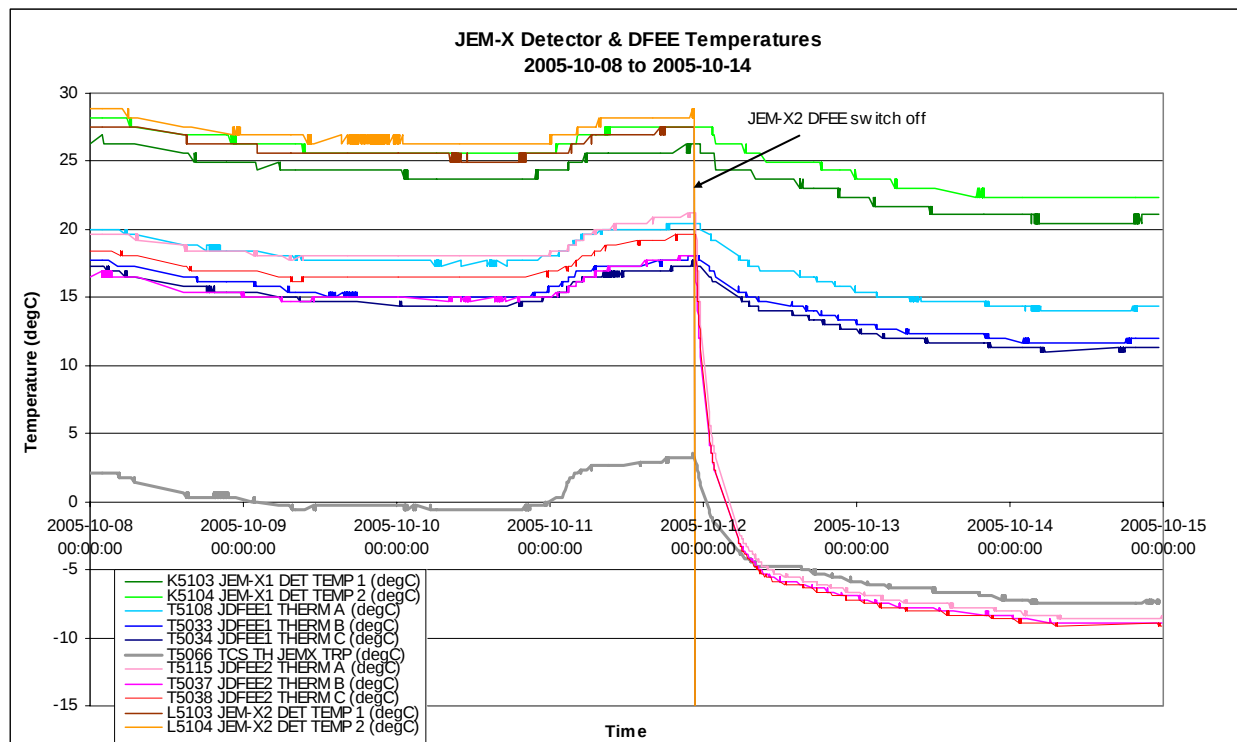
#### 8.3.4.2 JEM-X Temperatures

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<sup>2</sup>.

The effect of the switch-off of the JEM-X2 DFEE on 2005-10-11 is evident. The JEM-X1 temperatures decreased by ~5 degC and those of JEM-X2 by ~25 degC.

<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.

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



### 8.3.4.3 JEM-X Daily Report

#### 2005-10-08 (DOY 281, Rev 364)

In line with INT\_OR\_0221, due to a ground station outage as a result of the CRYOSAT launch, commanding to JEM-X1 was disabled from the Timeline at 06:23Z and JEM-X1 was commanded to Safe mode via FCP\_JEM1\_0040 at 06:29:19Z. Once coverage was regained, JEM-X1 was recovered to Data Taking mode as follows:

- 15:08:43Z FCP\_JEM1\_0041 JEMX1 TRANSITION TO SETUP
- 15:10:57Z FCP\_JEM1\_1010 JEMX1 CONFIGURATION SETTING FOR SCIENCE OPS
- 15:48:00Z ED KEDATA02 uplinked to put JEM-X1 in Data Taking mode with the planned observation parameters for the ongoing observation.

Commanding to JEM-X1 from the Timeline was then re-enabled and JEM-X1 operations continued nominally.

#### 2005-10-09 (DOY 282, Rev 364-365)

In line with OCR-200 and INT\_OR\_0222, JEM-X2 was activated via the Timeline at the start of revolution 365 in order to allow the gain to stabilise before the upcoming Crab calibration observation. At 08:32:11Z, after the JEM-X2 anode calibration and nominal HV activation had been completed via the Timeline, FCP\_JEM2\_0041 was executed to put JEM-X2 in Setup mode. This was in order to prevent saturation of the

buffer while the TM allocation to JEM-X2 was 1 packet/cycle. JEM-X2 remained in Setup mode with the high voltage on for the rest of the day.

#### **2005-10-10 (DOY 283, Rev 365)**

JEM-X2 remained in Setup mode with the high voltage on throughout the day. (JEM-X1 operations were nominal.)

#### **2005-10-11 (DOY 284, Rev 365)**

In line with OCR-200 (Special JEM-X operations during the October 2005 Crab Calibration) and INT\_OR\_0222, both JEM-X units were set to Data Taking (FULL IMAGING) with nominal HV via the Timeline at 02:29:08Z (start of the Crab on-axis staring). The following manual operations were then performed to achieve the other desired configurations:

- At 05:16:33Z JEM-X1 and JEM-X2 were commanded to Setup mode via FCP\_JEM1/2\_0041.
- At 05:17:28Z FCP\_JEM1/2\_0032 executed to reduce the JEM-X1 and JEM-X2 microstrip gas gain voltage to nominal HV minus 4 raw (i.e. 72 raw for JEM-X1, 70 raw for JEM-X2).
- At 05:20:33Z both units were returned to Data Taking (FULL IMAGING) via FCP\_JEM1/2\_0044 and the second Crab on-axis staring (with nominal HV - 4 raw) started.
- At 08:07:13Z JEM-X1 and JEM-X2 were commanded to Setup mode via FCP\_JEM1/2\_0041.
- At 08:07:43Z FCP\_JEM1/2\_0032 executed to set the microstrip gas gain voltages back to nominal (i.e. 76 raw for JEM-X1, 74 raw for JEM-X2).
- At 08:11:13Z both units were commanded to Data Taking (TEST) via FCP\_JEM1/2\_0044.
- At 08:17:35Z the slew away from the Crab on-axis pointing started from the Timeline and JEM-X2 was then commanded back to Safe mode via FCP\_JEM2\_0040 at 08:18:00Z.

At 08:32:49Z the ED KEDATA02 was uplinked from the Timeline, setting JEM-X1 back to Data Taking (FULL IMAGING).

At 22:40:09Z, after radiation belt entry of revolution 365, FCP\_JEM2\_9010 JEMX2 DFEE SWITCH OFF was started. The JEM-X2 DFEE was switched off at 22:44:31Z.

#### **2005-10-12 (DOY 285, Rev 365-366) to 2005-10-14 (DOY 287, Rev 366)**

Nothing to report.

### **8.3.5 OMC Operations**

#### **2005-10-08 (DoY 281, Rev 364)**

At 06:30:00Z OMC was switched to SAFE mode in preparation for the ground station outage owing to the upcoming Cryosat launch. It was recovered back to Stand-by at 15:07:52Z, and was again in Normal mode at 16:13:12Z (slew ID 03640084), after the AOCS had been recovered and commanding to the AOCS and OMC from the

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Date : 17/10/05

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Timeline was re-enabled. The impact was the loss of pointings 03640068 through to 03640083 inclusive.

### **2005-10-11 (DoY 284, Rev 365)**

At 02:18Z, and again at 02:21Z, attempts were made by ISDC to switch OMC into TRIGGER mode. These failed due to OMC being in Stand-by mode at that time, no pointings were scheduled in the mission plan at this time. The impact was OMC did not switch to TRIGGER mode. The OEMs produced at that time were:

|                       |                       |      |          |     |       |        |   |  |
|-----------------------|-----------------------|------|----------|-----|-------|--------|---|--|
| 2005.284.02.18.14.153 | 2005.284.02.18.18.009 | 1792 | RealTime | 131 | TC    | REJECT |   |  |
| REJECTED TC1          |                       |      | 0        | 0   | 65535 | PR     | N |  |
| E                     | E                     |      |          |     |       |        |   |  |
| 2005.284.02.21.12.154 | 2005.284.02.21.21.848 | 1792 | RealTime | 131 | TC    | REJECT |   |  |
| REJECTED TC1          |                       |      | 0        | 0   | 65535 | PR     | N |  |
| E                     | E                     |      |          |     |       |        |   |  |

Which correspond to the 2 failed M1329 (IMAGING BX) commands sent by ISDC.

At 18:45Z, due to a paucity of stars in the Star Tracker Field of View, the Flight Dynamics Attitude Update S/W failed after slew ID 03650102. After a manual recovery to the attitude of pointing 03650104, performed at 19:33Z, the Timeline was rejoined at 20:08Z. The impact was the loss of pointing 03650103 and the following commands being rejected:

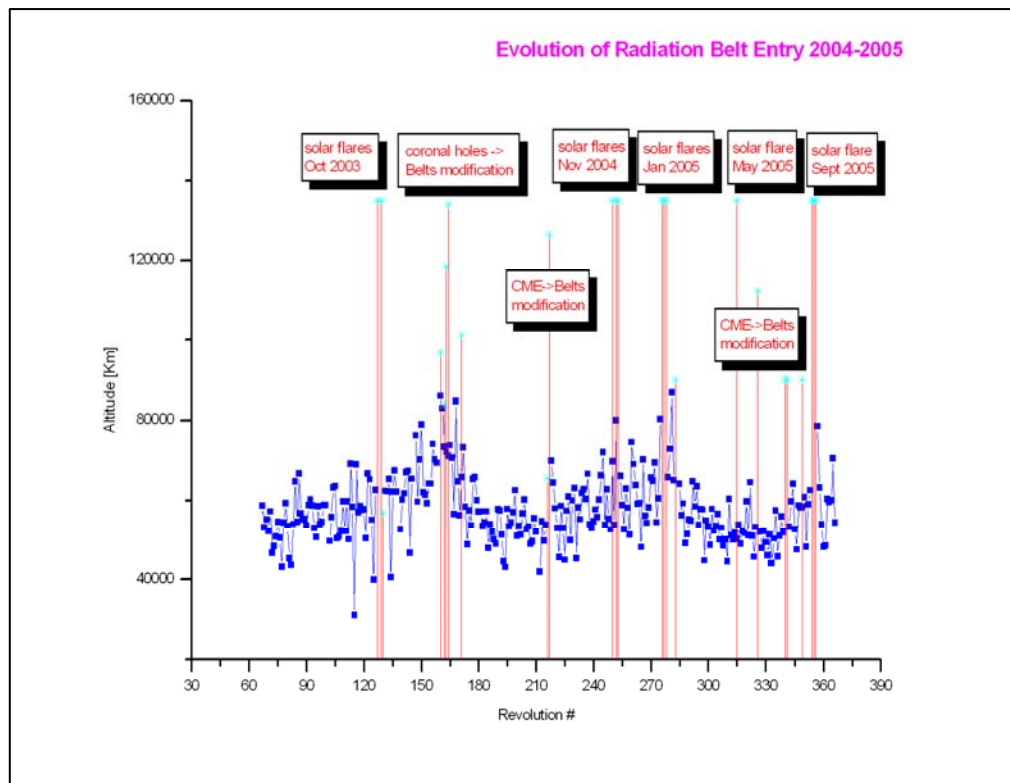
|                       |                       |      |          |     |       |        |   |  |
|-----------------------|-----------------------|------|----------|-----|-------|--------|---|--|
| 2005.284.19.12.14.940 | 2005.284.19.12.17.604 | 1792 | RealTime | 131 | TC    | REJECT |   |  |
| REJECTED TC1          |                       |      | 0        | 0   | 65535 | PR     | N |  |
| E                     | E                     |      |          |     |       |        |   |  |
| 2005.284.19.12.20.940 | 2005.284.19.12.26.515 | 1792 | RealTime | 131 | TC    | REJECT |   |  |
| REJECTED TC1          |                       |      | 0        | 0   | 65535 | PR     | N |  |
| E                     | E                     |      |          |     |       |        |   |  |

which correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) for that pointing.

On DoY 281 at 22:46:25Z, DoY 284 at 22:34:09Z and DoY 287 at 22:22:17Z OMC was switched by the Timeline to SAFE mode, at the nominal time.

### **8.3.6 IREM Operations**

#### **Radiation Belts Entry**



### IREM daily report

Nothing to report

### Electron Belts

| REV | S/C BCPKT (electron)            | Electron CUT-OFF<br>Observed Entry/Exit | Observed Entry/Exit<br>Altitude [Km] | Electron CUT-OFF<br>Predicted Entry/Exit | Predicted<br>Entry/Exit<br>Altitude [Km] |
|-----|---------------------------------|-----------------------------------------|--------------------------------------|------------------------------------------|------------------------------------------|
| 364 | RAD_ENTR R 2005-10-08T22:46:24Z | 2005-10-08 22:41:44                     | 60013.2                              | 2005-10-08 23:42:24                      | 52727                                    |
| 365 | RAD_EXIT R 2005-10-09T08:01:45Z | 2005-10-09 06:56:48                     | >>24927.4                            | 2005-10-09 07:02:24                      | 30667                                    |
| 365 | RAD_ENTR R 2005-10-11T22:34:01Z | 2005-10-11 21:00:00                     | 70626.2                              | 2005-10-11 23:29:54                      | 52637                                    |
| 366 | RAD_EXIT R 2005-10-12T07:48:57Z | 2005-10-12 06:48:00                     | >>24921.6                            | 2005-10-12 06:49:54                      | 30839                                    |
| 366 | RAD_ENTR R 2005-10-14T22:22:09Z | 2005-10-14 23:02:56                     | 54411.6                              | 2005-10-04 23:19:54                      | 52454                                    |

### Reference

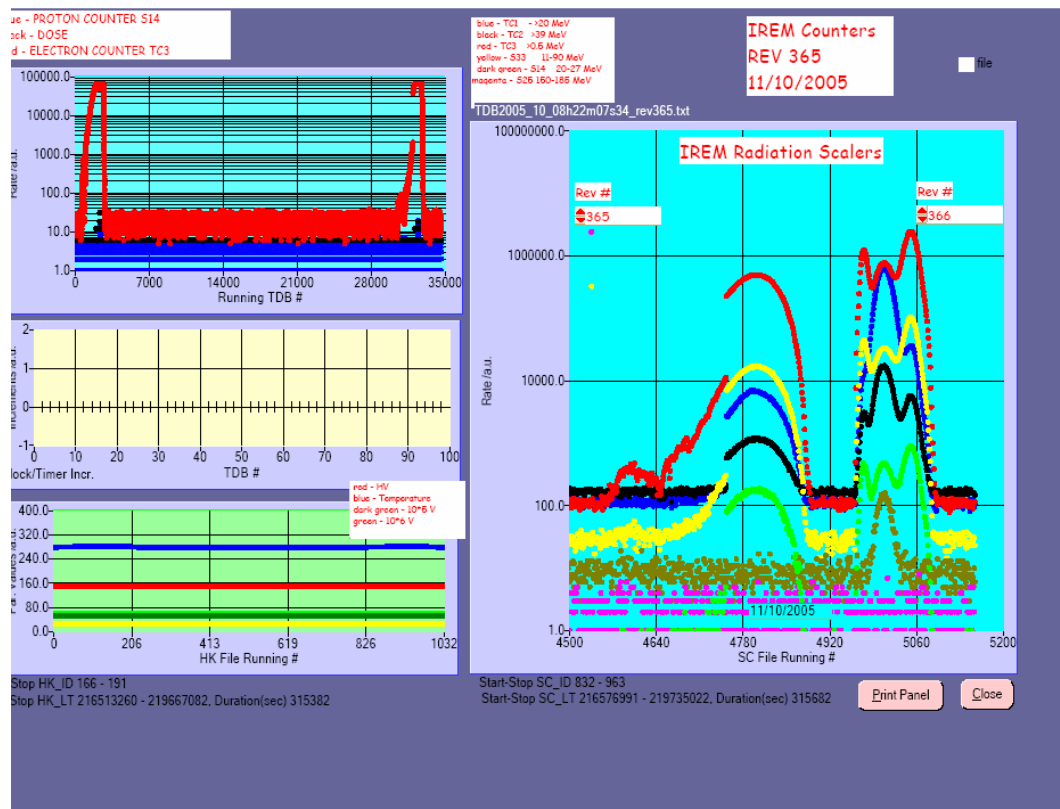
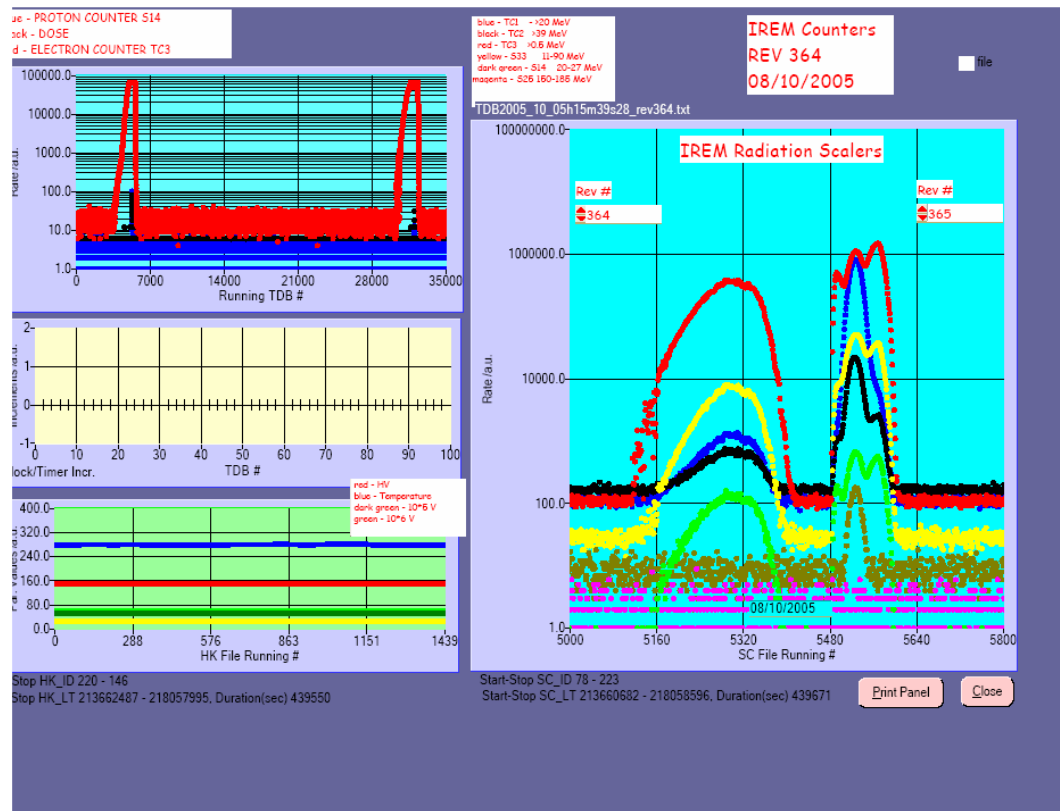
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

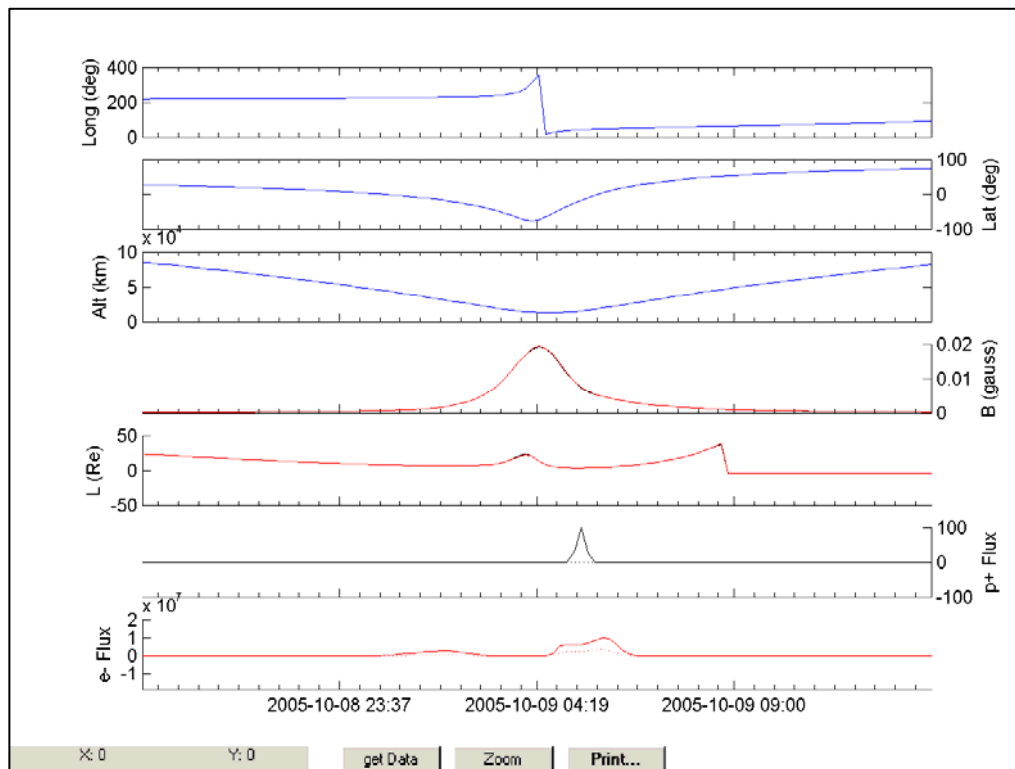
High Radiation

## IREM radiation counters:

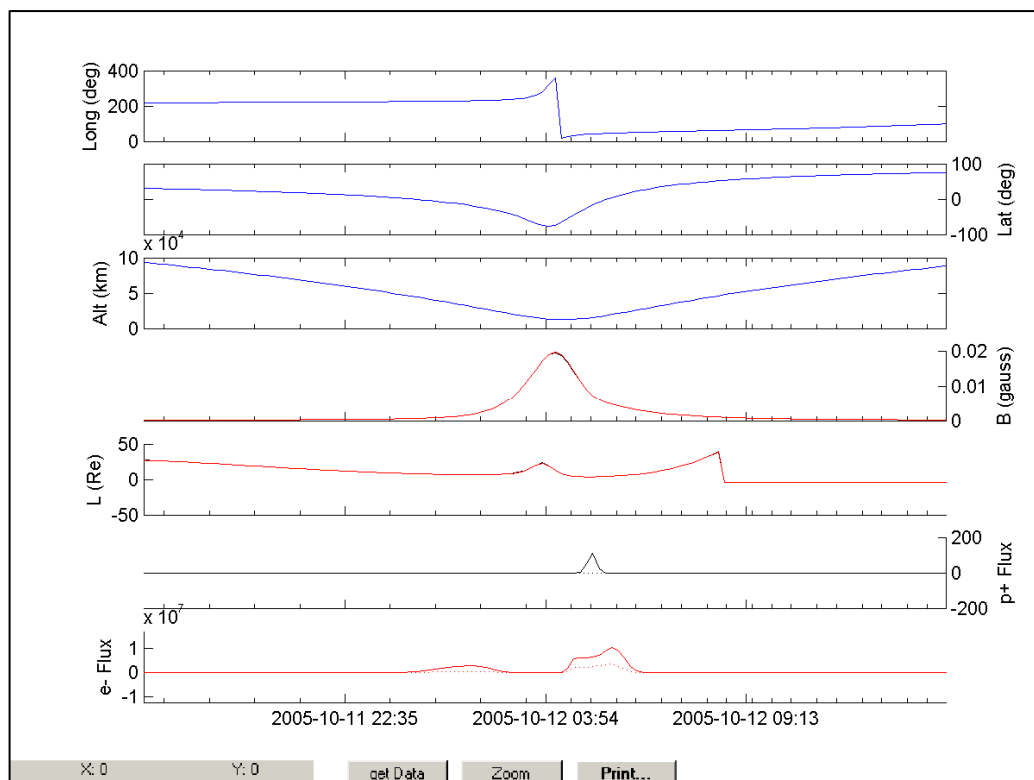


# IREM Predicted Radiation Belt Passages:

Rev 364:



Rev 365:



### SEC-GOES Observed Particles Fluxes:

