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

# INTEGRAL
# Mission Report

**INT-MOC-SYS-RP-1001-OPS-OF**

**No. 191**
**Week 20**

**22.05.06**

**Routine Phase**

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# 1 General

The Flight Control Team at MOC has compiled this report with some input provided by the Flight Dynamics Team, ISOC and ISDC.

It addresses the activities from 13.05.06 until 19.05.06 (both dates inclusive) and covers the revolutions 438 and 439.

# 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 raster dithers of GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9) and Cygnus X-3 (RA 20:32:25.50, DEC +40:57:27.7), which was a Target of Opportunity, and an engineering calibration pointing.

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

# 3 Satellite Status

## 3.1 Platform

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

### *3.1.1 AOCS*

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

The Eclipse season continued with the 5$^{th}$ and 6$^{th}$ eclipse passages on 15-18 May 2006.The eclipse passages were nominal from an AOCS point of view.

As part of the AOCS routine activities for the eclipse season, were verified the load of the TT sequence to re-enable the IMU Auto Switch-Off function in the ACC and the Eclipse ACC\FDE\FCE timers.

2 slews were lost during the observation period.

The fuel consumption over the period between 12/05/2006 and 16/05/2006 was 0.1732 kg. The remaining propellant is in the order of 154.3832 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

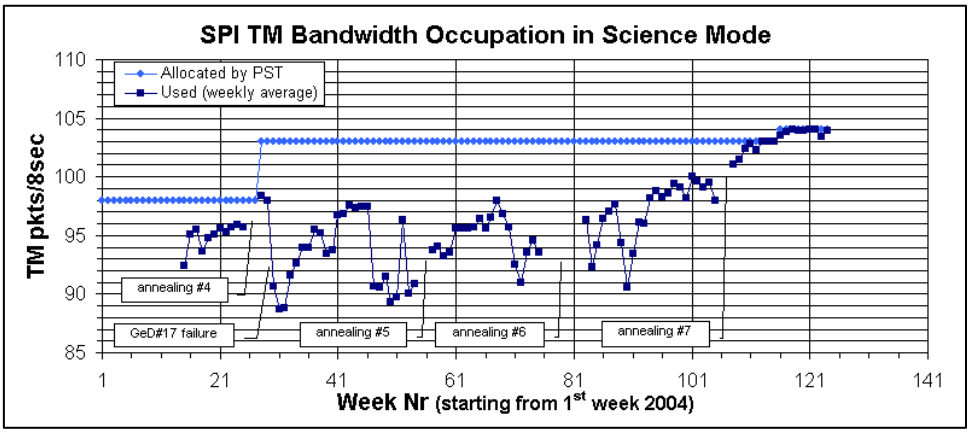
Following the 7th annealing, ended on 24th January, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #15, which is showing since 09.02.2006 a slightly degraded energy resolution. Detector #2 is failed since 06.12.2003, detector #17 since 17.07.2004.

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 of 104 pkts/cycle and the average telemetry occupation was 103.9 pkts/cycle. The telemetry downlink of SPI has therefore reached the saturation.

The Stirling compressors work nominally, maintaining the Germanium detectors at 85K +/-1K.

On the 3rd May the eclipse season has started and will last till 24th May. The instrument has so far behaved nominally at each post-eclipse re-activation. Some out of limit (OOL) on the temperatures appeared as expected.

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.*

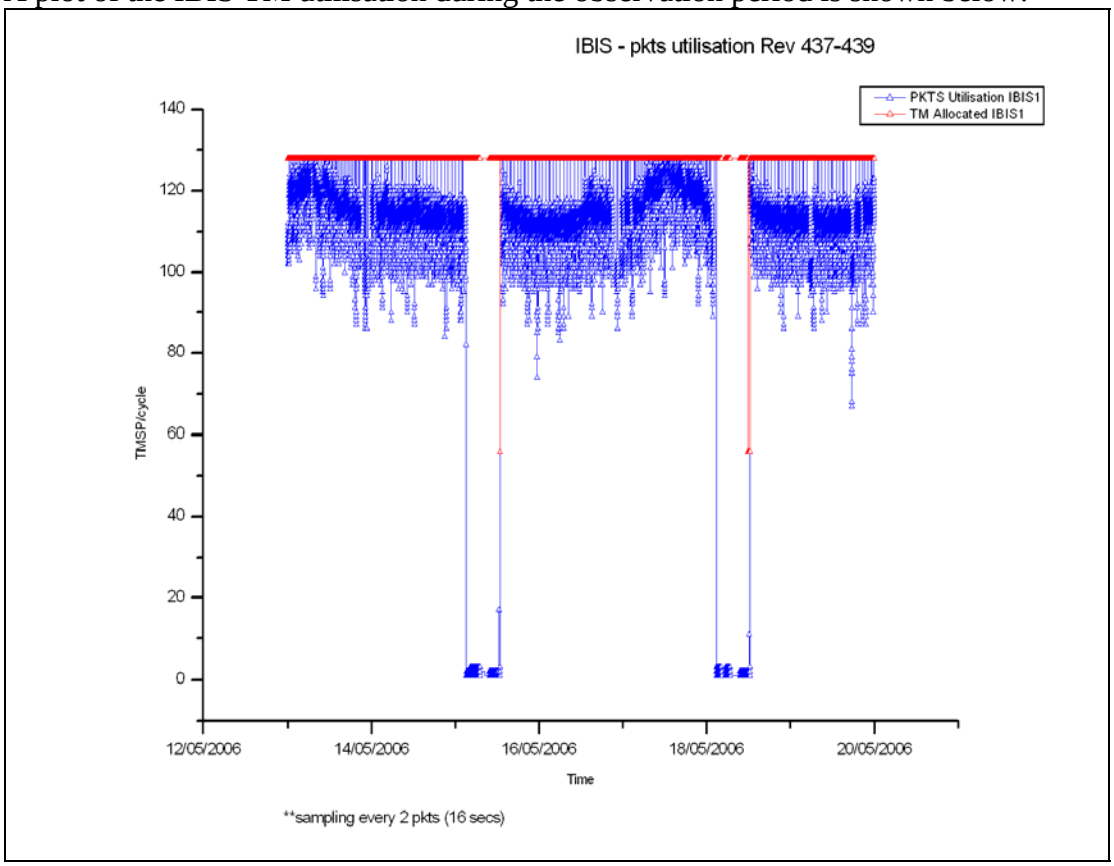
### 3.2.2 IBIS

The Overall status of the unit is nominal.

The summer eclipse season started on 2006-05-03. The reconfiguration of IBIS after each eclipse exit was successful.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 114.68 TMPS/cycle, up 1.77 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.

JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle during science observations and JEM-X2 was dormant (DFEE OFF) with a TM allocation of 1 packet/cycle.

*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, 169 out of the 171 planned science pointings for OMC were executed nominally, 2 were lost.

*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 low solar activity.

Sunspot 880 disappeared at the beginning of the observation period. The rest of the week was very quiet as the sun was blank.

*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, although 2 pointings were lost. There were a few other minor problems with ground stations, and the links with ISDC, but these had no impact. The overall performance was nearly 100%.

## 4.1 Mission Operations Centre

The performance of the MOC was excellent this week. The overall performance was nearly 100%.

## 4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week 2 pointings were lost after a failed attempt, due to a communciations problems, to get data from Redu. The DSS-27 pass at the end of revolution 438 was delayed by 1 hour and 20 minutes due to missing STIMs, and there were a few instances of bad frames and TM drops from both Redu and DSS-27, but these had no impact on the mission. The overall performance though was well above the 95% requirement.

## 4.3 Science Ground Segment

### *4.3.1 ISOC*

1. Mission planning
PSF for revolution 446 to 448 were received late on Friday and therefore not processed this week. Another ToO request was received this week. Since it was requested to start this observation as quickly as possible, ISOC made a partial replanning of the ongoing revolution 438. As a consequence of this activity also revolution 439 and 440 had to be replanned. Normal mission planning for revolutions 441 to 444 were performed and corresponding data sent to MOC and ISDC.

2. Observation status
ECS for revolution 426 was received. The corresponding OCS's have been sent to ISDC. No extra time was credited.

3. ISOC science data archive
The data ingestion had to be temporarily stopped due to an unexpected change at ISDC. This caused the available disk space to be filled up. Modifications to the publications database to allow source names to be stored have been agreed. The publications database will be merged into the ISDA by Autumn 2006.

4. ISOC system
The ISOC system version 12.3 has been used without modifications.

5. AO 4
The technical evaluation has been timely completed. The results are being compiled for transmission to the TAC members.

6. AO 5
This AO will start in August 2007. In order to obtain proposals from the science community for the new (from AO4) feature called Key Programmes there will be an extra call for proposals late this year. Planning and responsibility split between ISOC and the Project Scientist is now agreed.

7. Problems
No new problems encountered

### *4.3.2 ISDC*

Status of ISDC observation processing on 22/05/2006:

- Latest Standard Analysis completed: observation 03200280002 (SGR1900+14, Revolution 423) on 11/05/2006

- Latest products archived: observation 03200280002 (SGR1900+14, Revolution 423) on 17/05/2006

- Latest observation products sent to the observer: observation 03297000006 (SN1006, Revolutions 404 - 407) on 08/05/2006

# 5 Special Events

# 6 Anomalies

The following problem impacted the operations this week:

- On DoY 137, at 02:35, there was a drop in TM from Redu, after an attempt to connect TMP Redu in data-flow. The connection failed due to a communications problem. A recovery was performed, and the Timeline rejoined at 03:41. The impact was the loss of pointings 04380040 & 04380041.

The following anomaly report was entered into the ARTS system this week:

| AR id | Date Created | Subject | Segment | Status |
|---|---|---|---|---|
| INT-2851 | 19/05/2006 | TDRS Fast and Fast Eng. - Status parameters have incorrect Time Stamp. | IMCS | Pending |

# 7 Future Milestones

On the 3rd May the summer eclipse season begins, which continues until the 24th May when. There are a total of 8 eclipses.

A new imcs release will be installed in June. This release will be based on SCOS 2000 3.1 patch M04, to bring the system in-line with that used by XMM.

# 8 Appendix

The appendix includes various detailed information.

## 8.1 Overview of Revolutions

**Revolution 438**

The observations in revolution 438 began with a raster dither of GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9) which lasted ~31.4 hours. This was followed by an engineering pointing (RA 11:40:00.00, DEC +30:00:00.0) lasting ~15 minutes. Finally, a raster dither of Cygnus X-3 (RA 20:32:25.50, DEC +40:57:27.7), a Target of Opportunity was performed for ~23.9 hours, which lasted until the end of the revolution.

**Revolution 439**

The observations in revolution 439 consisted of a raster dither of GRO J0852-4642 (RA 08:51:38.31, DEC -46:41:50.9) which lasted ~57.9 hours, which lasted the entire revolution.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2 for which the DFEE was off, and the TM allocation was IBIS 128; SPI 104; JEM-X1 8; JEM-X2 1; OMC 5.

## 8.2 Consumables

### *8.2.1 Detailed Fuel Book-keeping*

```
2006-05-06T23:42:55.000Z     154.6849    F   Automatic TM processing.
2006-05-07T21:58:57.000Z     154.6653    F   Automatic TM processing.
2006-05-09T01:47:16.000Z     154.6475    F   Automatic TM processing.
2006-05-09T11:47:57.000Z     154.6241    F   Automatic TM processing.
2006-05-09T20:15:10.000Z     154.5924    F   Automatic TM processing.
2006-05-10T22:06:48.000Z     154.5754    F   Automatic TM processing.
2006-05-12T04:48:20.000Z     154.5564    F   Automatic TM processing.
2006-05-12T11:33:56.000Z     154.5110    F   Automatic TM processing.
2006-05-12T13:32:53.000Z     154.5030    F   Automatic TM processing.
2006-05-12T15:51:33.000Z     154.4757    F   Automatic TM processing.
2006-05-13T23:11:36.000Z     154.4757    F   Automatic TM processing.
2006-05-14T01:20:24.000Z     154.4637    F   Automatic TM processing.
2006-05-15T04:36:27.000Z     154.4561    F   Automatic TM processing.
2006-05-16T21:25:52.000Z     154.4297    F   Automatic TM processing.
2006-05-16T22:53:12.000Z     154.3832    F   Automatic TM processing.

This report was generated Fri May 19 08:00:29 GMT 2006
```

## 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, 13/05/2006 – 19/05/2006*

AOCS operations were executed from the Automatic Timeline.

During this period, 72 Open Loop Slews, 108 Closed Loop Slews and 6 Momentum Biases were executed (due to the combination of orbit control strategy and ToO).

2 slews (CSL, OSL) were lost during the observation period.

This is equivalent to a 1.1 % of the total number of slews planned (182).

The AOCS eclipse operations were nominal. For the 5th and 6th eclipse passages, the ACC\FDE\FCE Eclipse Timers and the Time-Tagged sequence to re-enable the IMU Auto Switch-Off function of the ACC were loaded from the Timeline and the pre-eclipse IMU health checks was performed at the planned times. Some information regarding the eclipse times and IMU usage up to this stage of the eclipse season are provided below:

| AOCS Eclipse Times | | | | | | | | | | | | | | | Summer 2006 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | LOS | AOS | ACC Eclipse Imminent | Eclipse Start | | | | | | Eclipse End | | | | | Eclipse Duration |
| | | | | ACC | FDE | FCE | Penumbra | FSS Sun Out | Umbra | Umbra | FSS Sun In | Penumbra | FDE/FCE | ACC | |
| 2006-05-03 | 08:22:00 | 11:05:00 | 06:23:04 | 07:05:03 | 07:15:46 | 07:16:30 | 07:22:44 | 07:26:44 | 07:27:43 | 07:51:26 | 07:52:31 | 07:55:51 | 08:01:26 | 08:05:32 | 0:33:07 |
| 2006-05-06 | 08:17:00 | 10:44:00 | 05:56:17 | 06:38:06 | 06:49:31 | 06:50:15 | 06:55:57 | 06:58:05 | 06:58:32 | 07:50:24 | 07:50:52 | 07:52:29 | 07:58:39 | 08:02:00 | 0:56:32 |
| 2006-05-09 | 07:55:00 | 10:30:00 | 05:36:12 | 06:18:21 | 06:27:47 | 06:28:31 | 06:35:52 | 06:38:10 | 06:38:03 | 07:39:55 | 07:40:44 | 07:41:33 | 07:46:27 | 07:51:24 | 1:05:41 |
| 2006-05-12 | 07:19:00 | 10:15:00 | 05:20:06 | 06:02:05 | 06:13:21 | 06:14:05 | 06:19:46 | 06:22:24 | 06:21:45 | 07:26:15 | 07:27:26 | 07:27:44 | 07:34:13 | 07:37:25 | 1:07:58 |
| 2006-05-15 | 07:14:00 | 09:54:00 | 05:09:32 | 05:51:38 | 06:01:18 | 06:02:02 | 06:09:12 | 06:10:46 | 06:11:07 | 07:13:13 | 07:13:24 | 07:14:40 | 07:19:14 | 07:24:30 | 1:05:28 |
| 2006-05-18 | 06:54:00 | 09:38:00 | 05:02:22 | 05:44:23 | 05:55:58 | 05:56:42 | 06:02:02 | 06:03:37 | 06:04:03 | 06:59:11 | 06:59:23 | 07:00:44 | 07:07:18 | 07:10:25 | 0:58:42 |
| 2006-05-21 | 06:28:00 | 09:24:00 | 04:58:17 | 05:40:22 | 05:51:02 | 05:51:46 | 05:57:57 | 05:59:47 | 06:00:19 | 06:42:46 | 06:43:04 | 06:44:41 | 06:50:38 | 06:54:28 | 0:46:44 |

| IMU Usage during Eclipse Season | | | | | | Summer 2006 |
|---|---|---|---|---|---|---|
| IMU On | IMU Off | From Health Check | | From Auto Calibration | On Time | Accumulated On Time |
| | | Noise Roll [as/s] | Drift Roll [as/s] | Drift Roll [as/s] | | |
| 2006-05-03 04:32:40 | 2006-05-03 08:07:51 | 0.1877 | 0.2750 | 0.2561 | 3:35:11 | 3:35:11 |
| 2006-05-06 03:55:06 | 2006-05-06 08:04:18 | 0.1941 | 0.2635 | 0.2515 | 4:09:12 | 7:44:23 |
| 2006-05-09 03:45:29 | 2006-05-09 07:53:33 | 0.2404 | 0.2567 | 0.2779 | 4:08:04 | 11:52:27 |
| 2006-05-12 03:02:01 | 2006-05-12 07:39:44 | 0.2105 | 0.2350 | 0.2137 | 4:37:43 | 16:30:10 |
| 2006-05-15 02:33:10 | 2006-05-15 07:26:23 | 0.2088 | 0.2263 | 0.2013 | 4:53:13 | 21:23:23 |
| 2006-05-18 03:13:27 | 2006-05-18 07:12:45 | 0.1913 | 0.3017 | 0.3373 | 3:59:18 | 25:22:41 |
| 2006-05-21 02:17:31 | 2006-05-21 06:56:40 | 0.2270 | 0.1617 | 0.1367 | 4:39:09 | 30:01:50 |

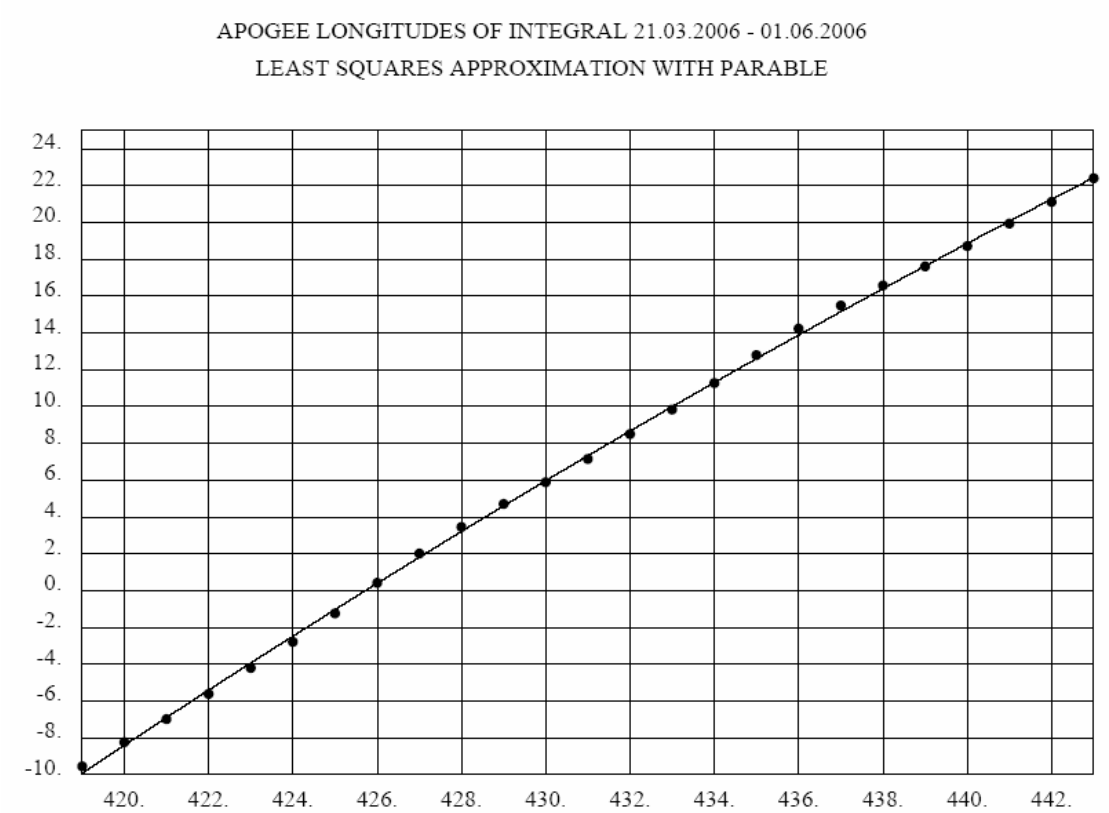
## Orbit Control

The following table shows the shortening of the necessary Goldstone pass:

| Orbit number | Apogee passage date | Time from LOS Redu to 40000 km altitude |
|---|---|---|
| 362 | 2005/10/01 | 284 min |
| 372 | 2005/10/31 | 268 min |
| 382 | 2005/11/30 | 244 min |
| 393 | 2006/01/02 | 213 min |
| 402 | 2006/01/29 | 188 min |
| 412 | 2006/02/28 | 159 min |
| 422 | 2006/03/30 | 122 min |
| 433 | 2006/05/01 | 80 min |
| 443 | 2006/05/31 | 46 min |

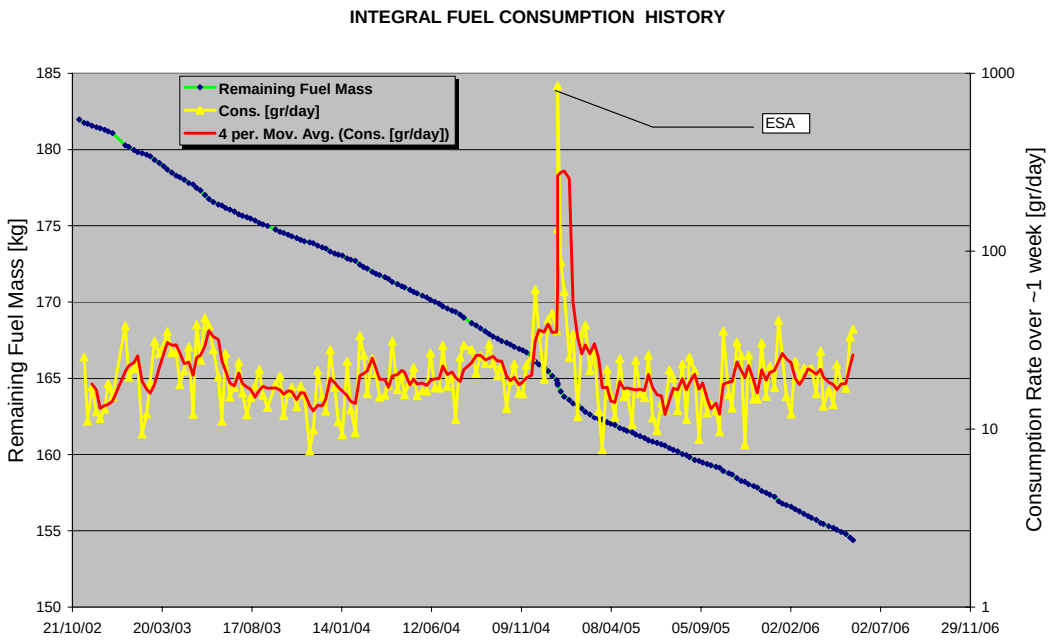
From orbit 460 and onwards Redu will give coverage down to 40000 km altitude.

The attached plot shows the apogee longitude of Integral as a function of the orbit number. From this, an estimate of the rate of semi-major axis increase of about 800m per orbital revolution can be made.

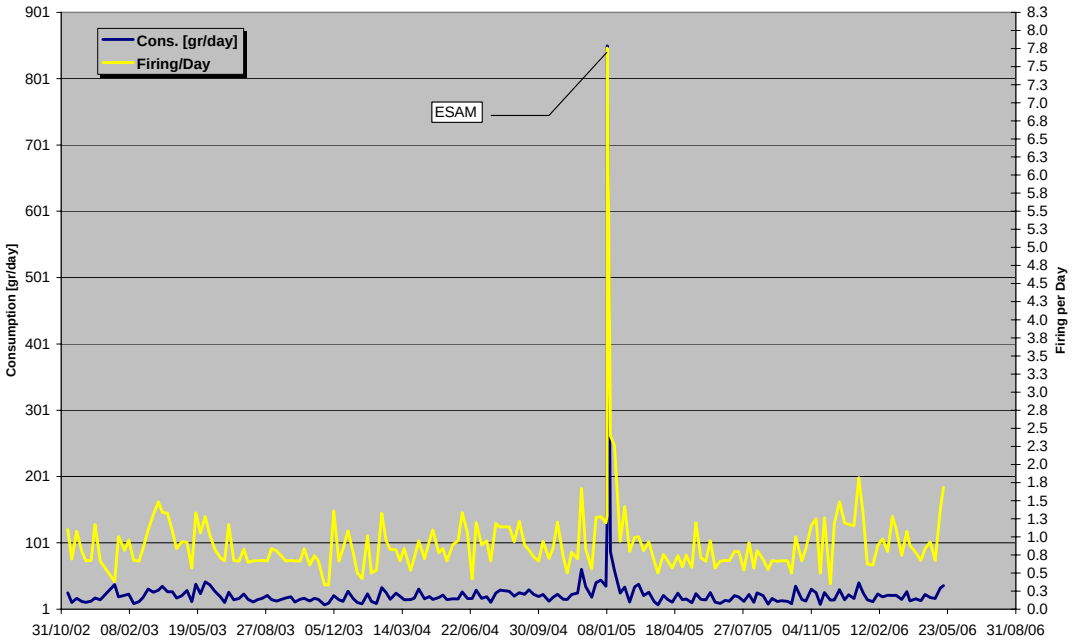



## Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 16/05/2006 is reported in the plot below.

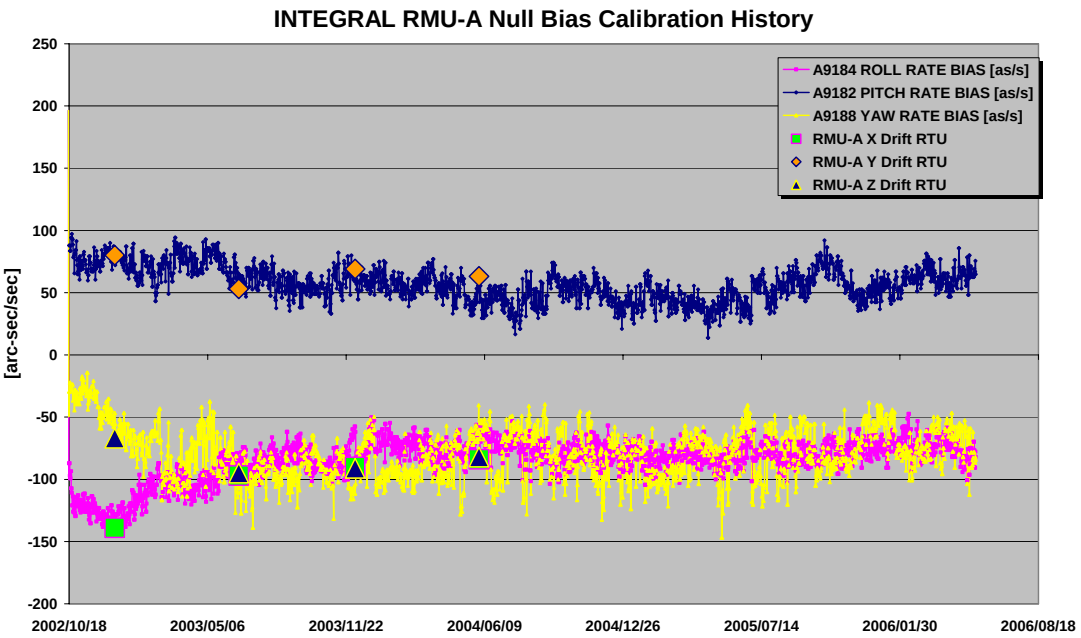



The firing\day over the period between 01/11/2002 and 16/05/2006 is reported in the plot below.

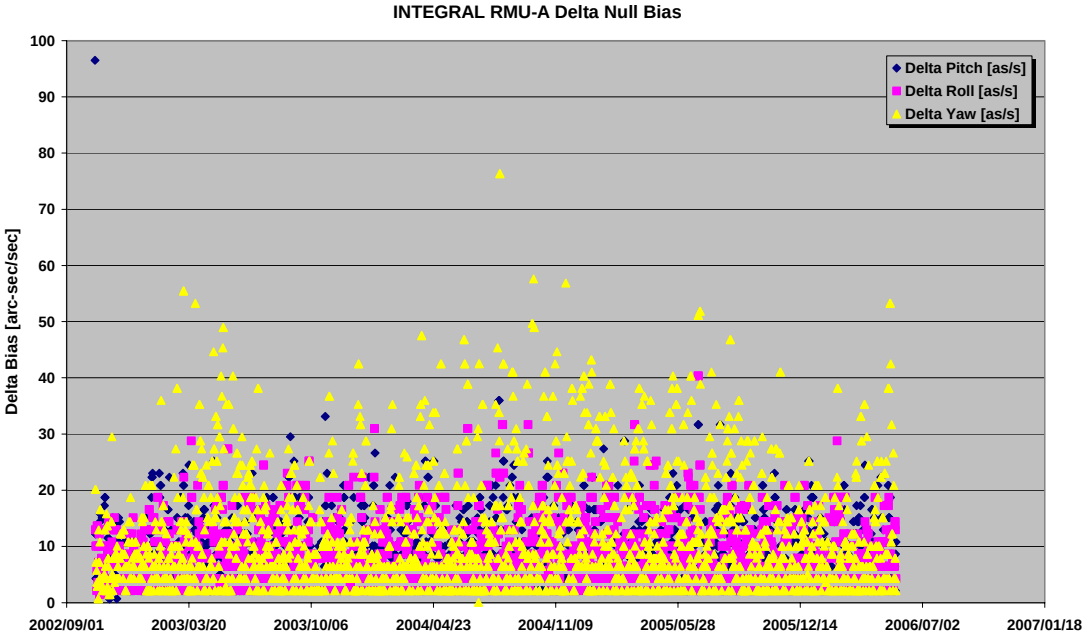



## The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 19/05/2006 is reported in the plot below.




The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 19/05/2006 is reported in the plot below.




**13/05/06 (Day of Year 133, Revolution 437)**

**ACC reports continuous Pitch threshold exceeded:** at 20:33z, at the end of slew ID 04370055, the ACC pitch threshold was exceeded by causing the continuous generation of the OEM APID 640 ID 49 <<ACC PITCH ERROR OOL>>: the guide star was ID 3578-1715 and Mi 8.4 at CCD location [-976 , -7686]. A dim star neighbor ID 3578-2104 {Mi 8.3 at CCD location [ -1018 , -7700]}was in the STR FOV at about 1 arcmin away from the guide star, making difficult the determination of the baricentre of the system due to the oscillation of the tracked guide star between two positions separated by ~160 CCD units. This jump in position was reported in TM and triggered the generation of OEM ID 49 for all the duration of the PID 04370055.

No action was taken, the problem disappeared with the starting for slew 04370056.

No impact on TL and no impact on the OTF.

**14/05/06 (Day of Year 134, Revolution 437)**

Nothing to report

**15/05/06 (Day of Year 135, Revolution 437-438)**

The eclipse operations were nominal from the AOCS point of view. A summary of the second eclipse passage during rev 437 is given below:

**AOCS ECLIPSE MONITORING**
**Summer 2006**

| | |
|---|---|
| **Revolution:** | **437** |
| **Date:** | **15/05/2006** |
| **DoY:** | **135** |

| | | | |
|---|---|---|---|
| **Penumbra Start:** | 15/05/2006 06:09:12 | **LOS:** | 15/05/2006 07:14:00 |
| **Umbra Start:** | 15/05/2006 06:11:07 | **AOS:** | 15/05/2006 09:54:00 |
| **Umbra End:** | 15/05/2006 07:13:13 | | |
| **Penumbra End:** | 15/05/2006 07:14:40 | | |
| **Eclipse Duration:** | 1:05:28 | | |
| **Eclipse Duration [sec]:** | 3928 | | |

| | |
|---|---|
| **IMU Health Check Start** | 15/05/2006 02:30:00 |
| **Eclipse Imminent Flag** | 15/05/2006 05:09:32 |
| **ACC IMU AutoCal Start** | 15/05/2006 05:23:58 |
| **ACC IMU AutoCal End** | 15/05/2006 05:43:58 |

| | |
|---|---|
| **Sun out of FSS FoV** | 15/05/2006 06:10:46 |
| **Sun back in FSS FoV** | 15/05/2006 07:13:24 |

| **Eclipse Timers** | **From Loaded Timers** | | **Actual From Telemetry** | | **UM [sec]** | **LSB [sec]** |
|---|---|---|---|---|---|---|
| | **Absolute** | **WRT Pen. Start [sec]** | **Absolute** | **WRT Pen. Start [sec]** | | |
| **ACC Eclipse Start** | 15/05/2006 05:51:38 | -1054.00 | 15/05/2006 05:51:37 | -1055.00 | **-1064** | |
| **FDE Eclipse Start** | 15/05/2006 06:01:18 | -474.00 | 15/05/2006 06:02:53 | -379.00 | **-404** | **176** |
| **FCE Eclipse Start** | 15/05/2006 06:02:02 | -430.00 | 15/05/2006 06:03:37 | -335.00 | **-360** | **176** |
| | **From Loaded Timers** | | **Actual From Telemetry** | | **UM [sec]** | **LSB [sec]** |
| | **Absolute** | **WRT Pen. End [sec]** | **Absolute** | **WRT Pen. End [sec]** | | |
| **FCE Eclipse End** | 15/05/2006 07:19:14 | 274 | | | **360** | **176** |
| **FDE Eclipse End** | 15/05/2006 07:19:14 | 274 | | | **360** | **176** |
| **ACC Eclipse End** | 15/05/2006 07:24:30 | 590 | 15/05/2006 07:24:29 | 589.00 | **578** | |

| **IMU** | **Uplink** | **Execution** | **WRT Penumbra End [sec]** |
|---|---|---|---|
| **IMU Auto Off Enable** | 12/05/2006 11:14:37 | 15/05/2006 07:26:23 | 703 |
| **IMU On** | 15/05/2006 02:33:10 | **IMU H/C Noise Roll [as/s]** | 0.2088 |
| **IMU Off** | 15/05/2006 07:26:23 | **IMU H/C Drift Roll [as/s]** | 0.2263 |
| **IMU On Time** | 4:53:13 | **IMU Auto Cal Drift Roll [as/s]** | 0.2013 |

## 16/05/06 (Day of Year 136, Revolution 438)

**FDS failed slew update:** At 11:17z the update of the first slew of the revolution failed due to a problem on FDS job update task.

The update of the slew ID 04380001 was manually performed at 11:22z.

No impact on TL.

## 17/05/06 (Day of Year 137, Revolution 438)

**REDU station power outage:** at 02:40z due to a power outage on REDU station the AOCS s/s was disabled in TL.

As soon VILSPA 2 station become available, a manual recovery was performed from attitude of PID 04380039 to the attitude of PID 04380041. The update for the slew ID 04380042, was manually performed at 03:30z and the AOCS s/s re-enabled in TL at 03:41z.

The following slews were not executed from TL: 04380040(CSL)-04380041(OSL)

## 18/05/06 (Day of Year 138, Revolution 438-439)

The eclipse operations were nominal from the AOCS point of view. A summary of the third eclipse passage during rev 438 is given below:

**AOCS ECLIPSE MONITORING**
**Summer 2006**

| | |
|---|---|
| **Revolution:** | **438** |
| **Date:** | **18/05/2006** |
| **DoY:** | **138** |

| | | | |
|---|---|---|---|
| **Penumbra Start:** | 18/05/2006 06:02:02 | **LOS:** | 18/05/2006 06:54:00 |
| **Umbra Start:** | 18/05/2006 06:04:03 | **AOS:** | 18/05/2006 09:38:00 |
| **Umbra End:** | 18/05/2006 06:59:11 | | |
| **Penumbra End:** | 18/05/2006 07:00:44 | | |
| **Eclipse Duration:** | 0:58:42 | | |
| **Eclipse Duration [sec]:** | 3522 | | |

| | |
|---|---|
| **IMU Health Check Start** | 18/05/2006 03:08:00 |
| **Eclipse Imminent Flag** | 18/05/2006 05:02:22 |
| **ACC IMU AutoCal Start** | 18/05/2006 05:16:48 |
| **ACC IMU AutoCal End** | 18/05/2006 05:36:48 |

| | |
|---|---|
| **Sun out of FSS FoV** | 18/05/2006 06:03:37 |
| **Sun back in FSS FoV** | 18/05/2006 06:59:23 |

| **Eclipse Timers** | **From Loaded Timers** | | **Actual From Telemetry** | | **UM [sec]** | **LSB [sec]** |
|---|---|---|---|---|---|---|
| | **Absolute** | **WRT Pen. Start [sec]** | **Absolute** | **WRT Pen. Start [sec]** | | |
| **ACC Eclipse Start** | 18/05/2006 05:44:23 | -1059.00 | 18/05/2006 05:44:29 | -1053.00 | **-1064** | |
| **FDE Eclipse Start** | 18/05/2006 05:55:58 | -364.00 | 18/05/2006 05:55:37 | -385.00 | **-404** | **176** |
| **FCE Eclipse Start** | 18/05/2006 05:56:42 | -320.00 | 18/05/2006 05:56:25 | -337.00 | **-360** | **176** |
| | **From Loaded Timers** | | **Actual From Telemetry** | | **UM [sec]** | **LSB [sec]** |
| | **Absolute** | **WRT Pen. End [sec]** | **Absolute** | **WRT Pen. End [sec]** | | |
| **FCE Eclipse End** | 18/05/2006 07:07:18 | 394 | | | **360** | **176** |
| **FDE Eclipse End** | 18/05/2006 07:07:18 | 394 | | | **360** | **176** |
| **ACC Eclipse End** | 18/05/2006 07:10:25 | 581 | 18/05/2006 07:10:31 | 587.00 | **578** | |

| **IMU** | **Uplink** | **Execution** | **WRT Penumbra End [sec]** |
|---|---|---|---|
| **IMU Auto Off Enable** | 15/05/2006 10:57:39 | 18/05/2006 07:12:26 | 702 |
| **IMU On** | 18/05/2006 03:13:27 | **IMU H/C Noise Roll [as/s]** | 0.1913 |
| **IMU Off** | 18/05/2006 07:12:45 | **IMU H/C Drift Roll [as/s]** | 0.3017 |
| **IMU On Time** | 3:59:18 | **IMU Auto Cal Drift Roll [as/s]** | 0.3373 |

**DSS27 reported problem at station handover:** at 04:12z due to a problem on DSS27 station the last CGS (change of guide star) sequence failed release from TL.

After consultation with the AOCS SOE and FD on-call, was decide to end the revolution without recovering the CGS and using as guide star for the perigee passage the current one.

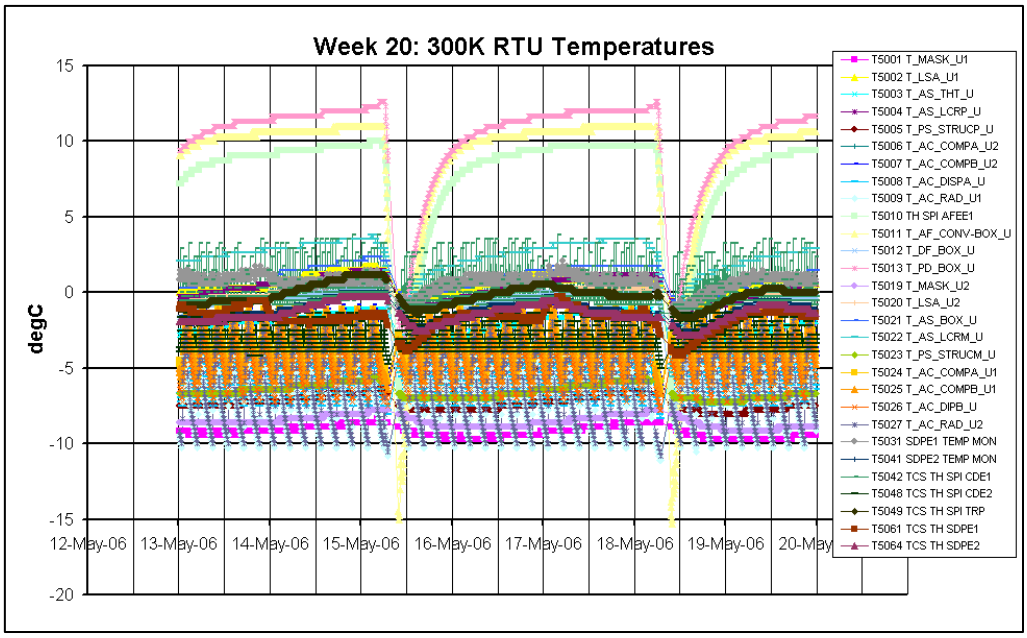
No impact on TL.

**19/05/06 (Day of Year 139, Revolution 439)**

Nothing to report.

### *8.3.2 SPI Operations*

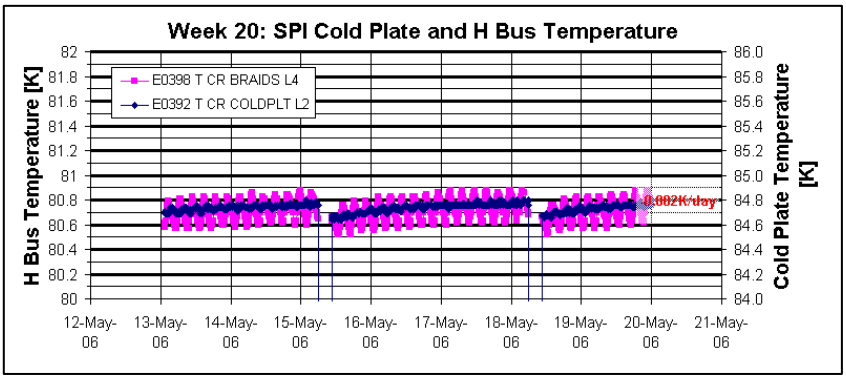
**Unit Temperatures:**
All the equipment temperatures are inside the operational limits. The following plot shows their evolution along the reporting period (due to data retrieval problems some gaps could be present).




**Stirling Compressors and Cryostat:**

The performance of the compressors is nominal. The cold plate temperature was maintained at 85K+/-1K showing the expected positive drift.

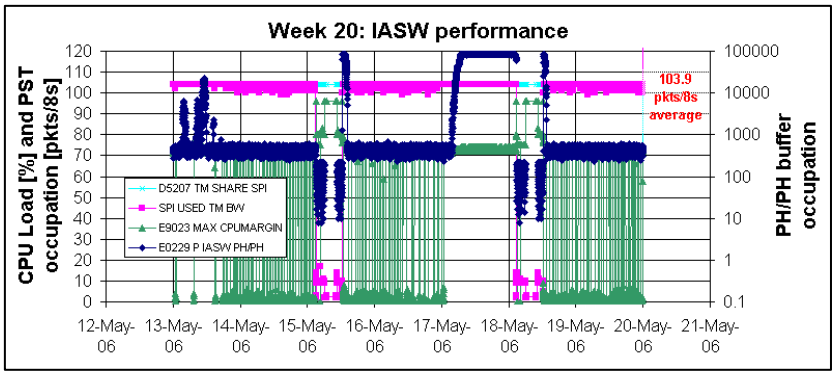
The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.




**DPE & IASW:**

The IASW performance is nominal. The current IASW version installed is 432.

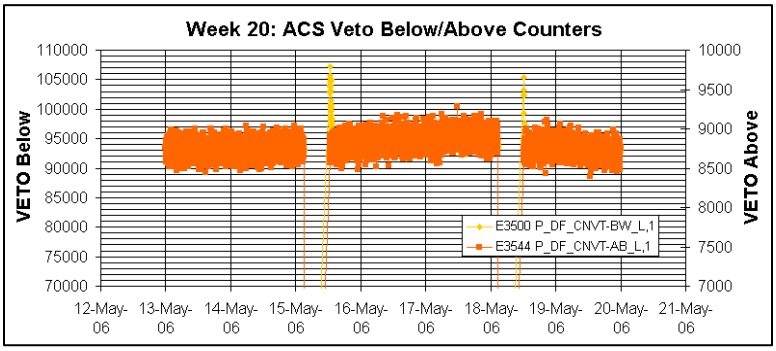
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



**ACS:**

The performance of the ACS is nominal.

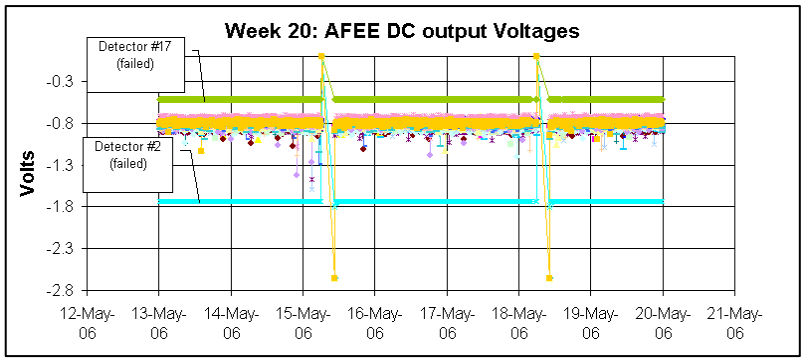
The following plot shows the ACS overall count rate evolution during the reporting period.




**AFEE:**

The performance of the AFEE and the detectors is nominal, except for detector #15, which shows a degraded energy resolution and for this works with a reduced bias of 3Kv (anomaly INT_SC-140).

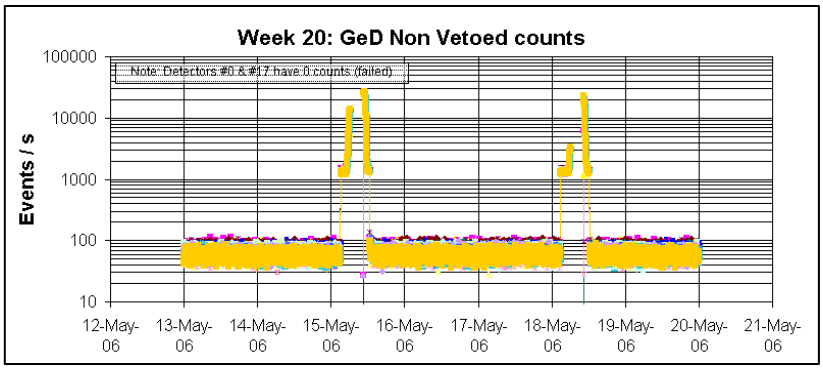
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.

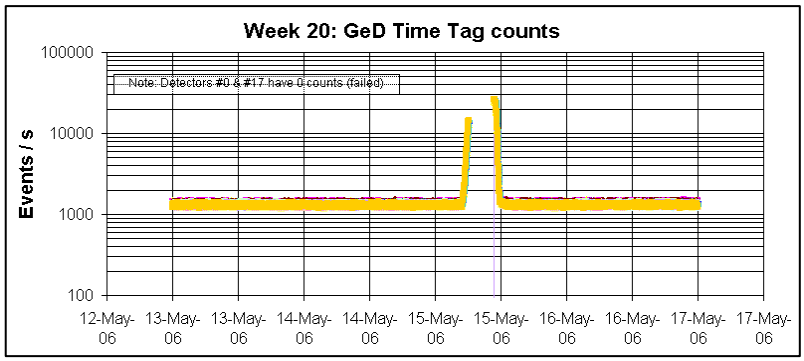


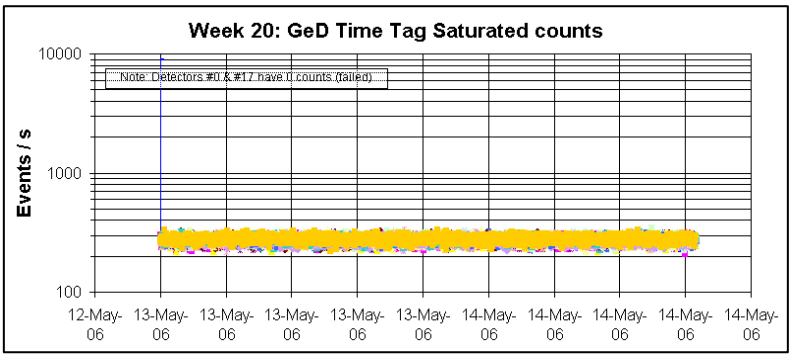

**DFEE:**

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 (due to data retrieval problems, some gaps could be present).



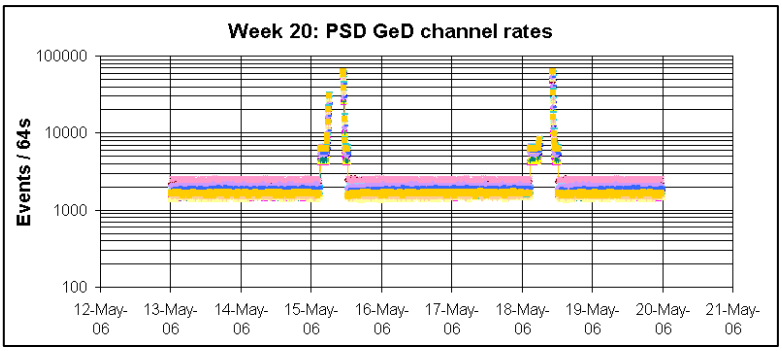




**PSD:**

The performance of the unit is nominal.

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




**SPI Event Log:**

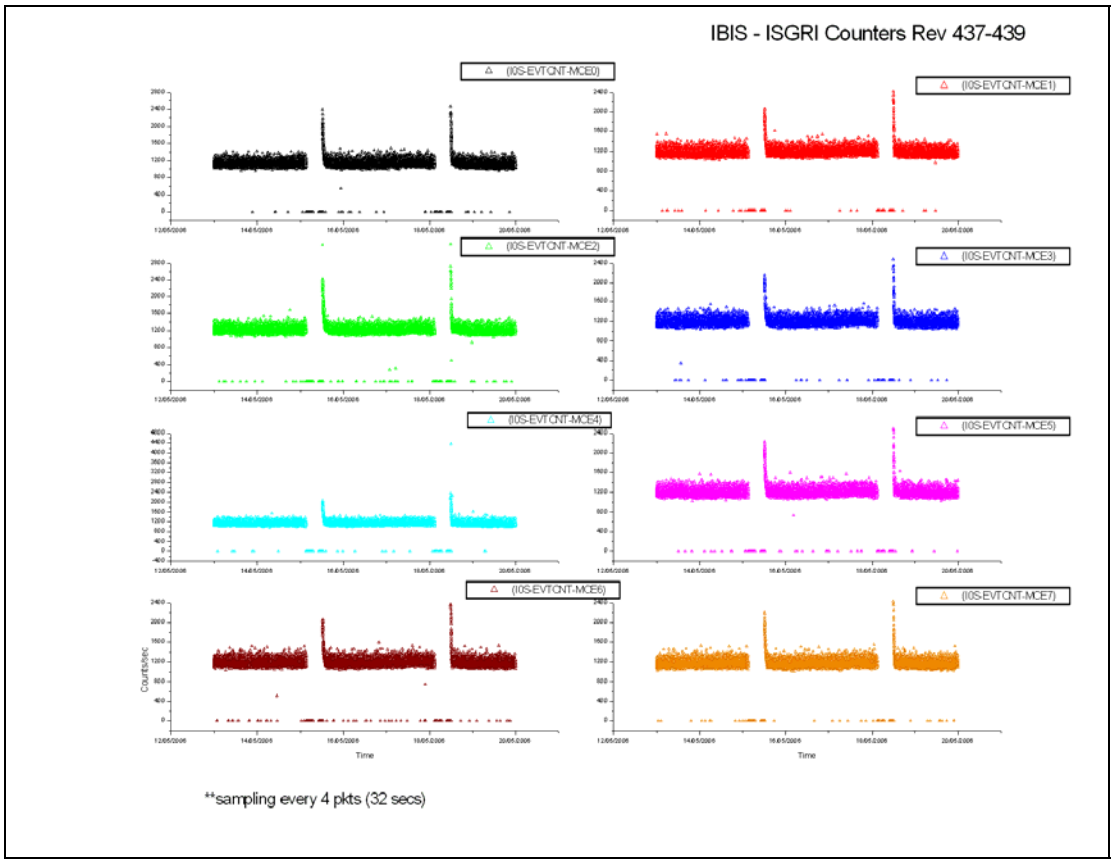
The following event log has been extracted from the revolution pass summary.

| Time | 8.4 Description | Analysis |
|---|---|---|
| 135 – 06:00 | TM: E4009 OOL | Alert indicatin HSL error on DFEE. One off event. |
| 135 – 11:10 | EV: SPI1 LSL Error | Expected at post eclipse reactivation |
| 135 – 12:36 | TM: E3500 OOL | Expected at Belts entry/exit |
| 136 – 10:38 | TM: E2116 OOL | Expected during eclipse season |
| 138 – 03:36 | TM: E2116 OOL | Expected during eclipse season |
| 138 – 10:20 | EV: SPI1 LSL Error | Expected at post eclipse reactivation |
| 139 – 06:52 | EV: SPI1 Spectra Compression Overflow | One off event |
| 139 – 06:59 | EV: SPI1 Spectra Compression Not Completed | One off event |

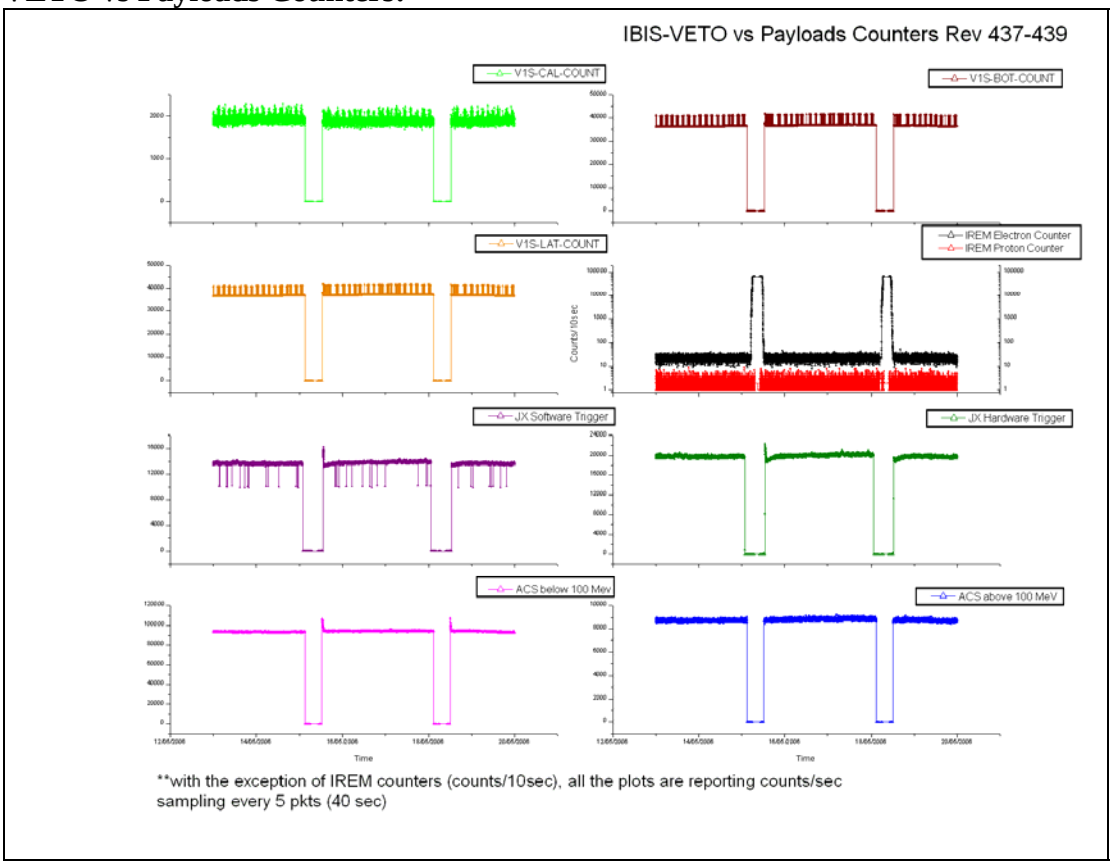
### *8.4.1 IBIS Operations*

**<u>IBIS Event Counters Plots.</u>**

**ISGRI Counters:**

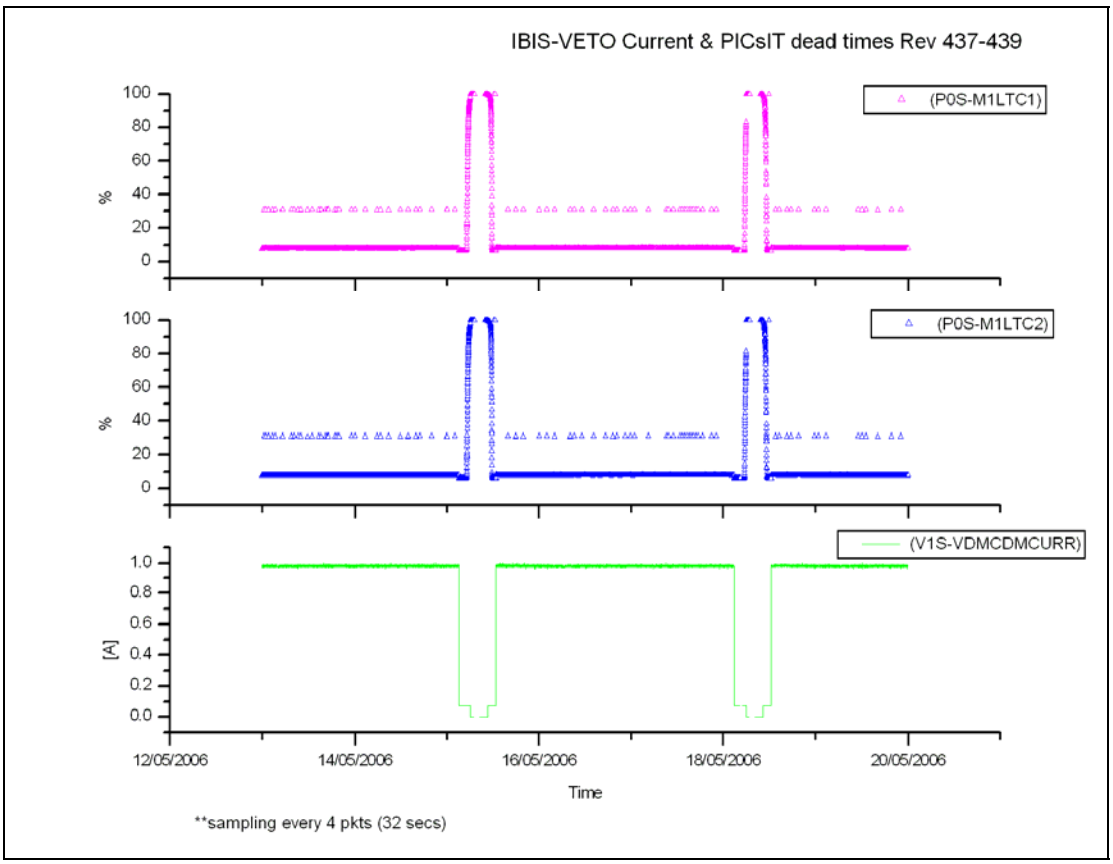


**VETO vs Payloads Counters:**

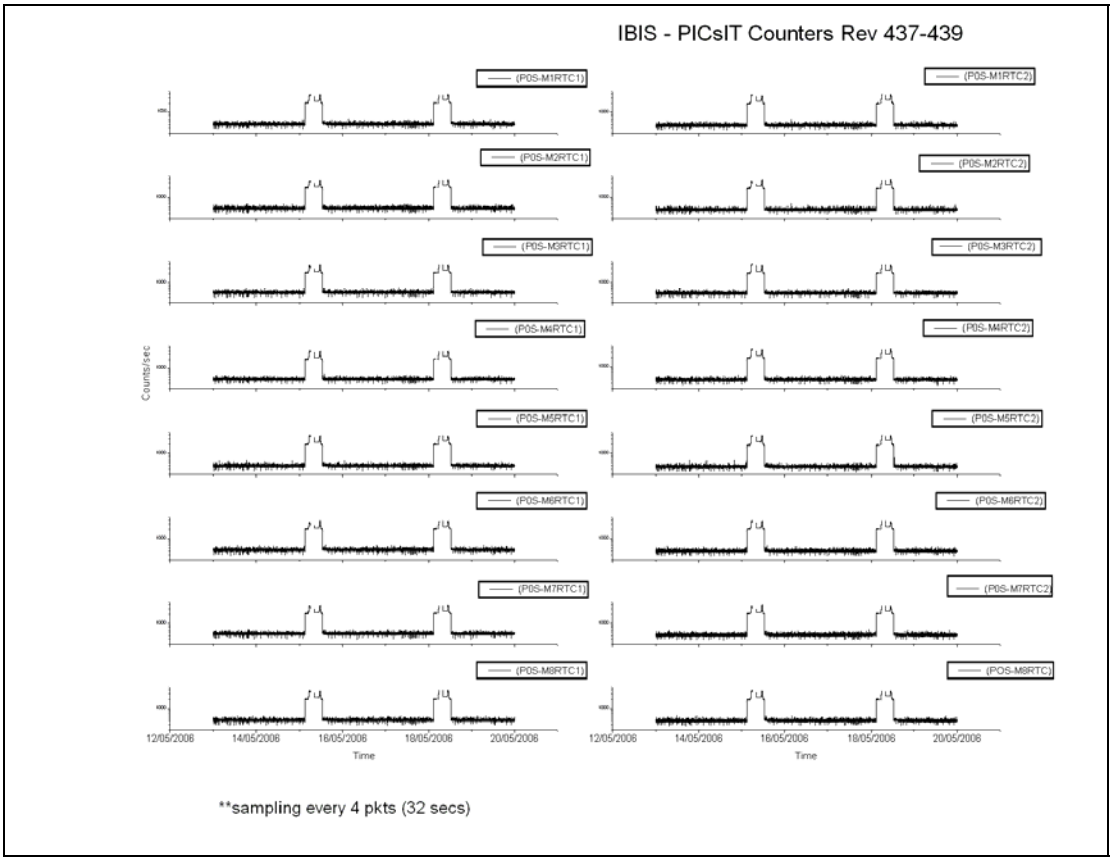



The week was characterised by low radiation.

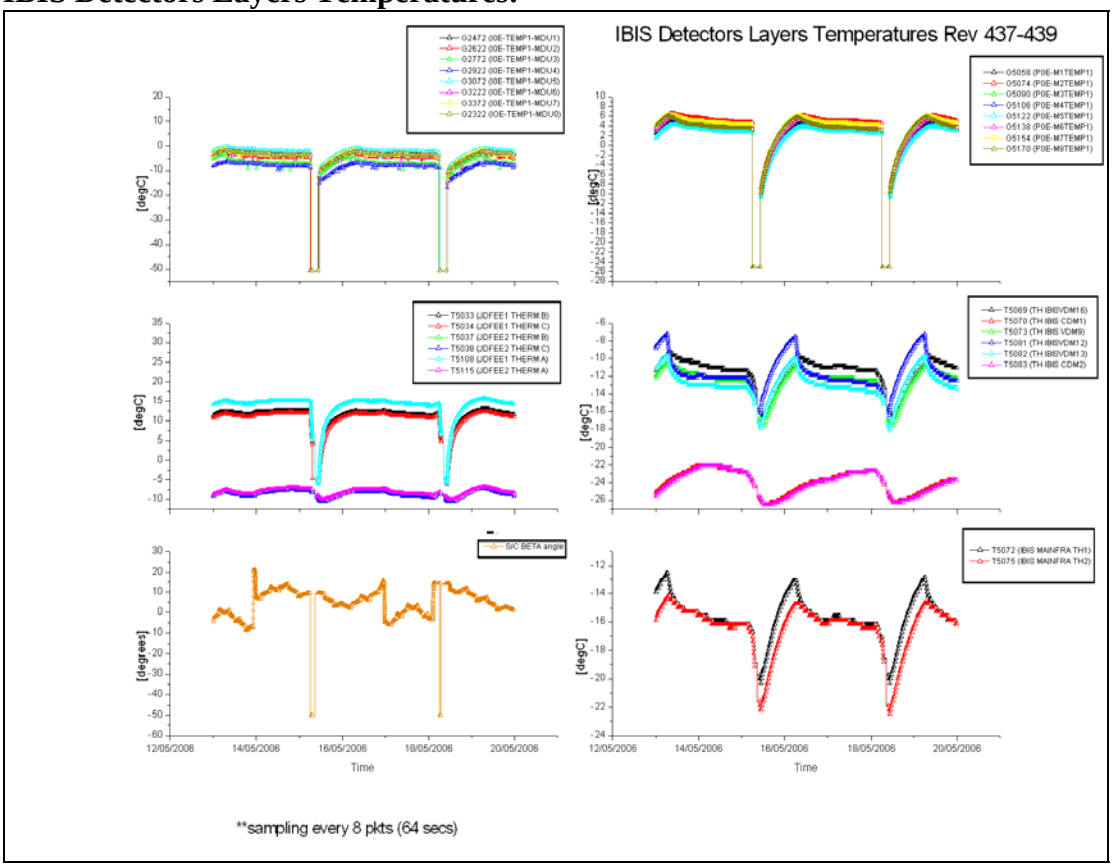
**VETO Current:**



## PICsIT Counters:




## IBIS Detectors Layers Temperatures:



**IBIS daily report**

**DoY 2006.135 (15/05/2006):**

At 03:07Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 12:49Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

TM parameters from G5002 (P0S-MiRTC1) and G5003 (P0S-MiRTC2) families were toggling OOL High while the spacecraft was in Radiation Belts. According to reaction P-CNT-1, no action was taken.

At 12:12Z TM parameters G2028 (I0E-OVFWPXADD-M2), G2070 (I0E-OVFWPXADD-M5) and G2098 (I0E-OVFWPXADD-M7) failed SCC and back. According to I-OVF-1, no action was taken.

At 12:16Z TM parameter G2041 (I0S-EVTCNT-MCE2) went OOL high and back. As this happened at the exit of belts when the background was peculiarly high, according to I-CNT-1, no action was taken.

**DoY 2006.138 (18/05/2006):**

At 02:51Z, TM parameter G8015 was reported Out Of Limit high. It went back inside limit at 12:32Z. As this happened inside the radiation belts (following VETO Stand-By mode), according to V-VLT-1 no action was taken.

At 11:55Z TM family G2000 (I0E-OVFWPXADD-Mi) failed SCC and back. According to I-OVF-1, no action was taken.

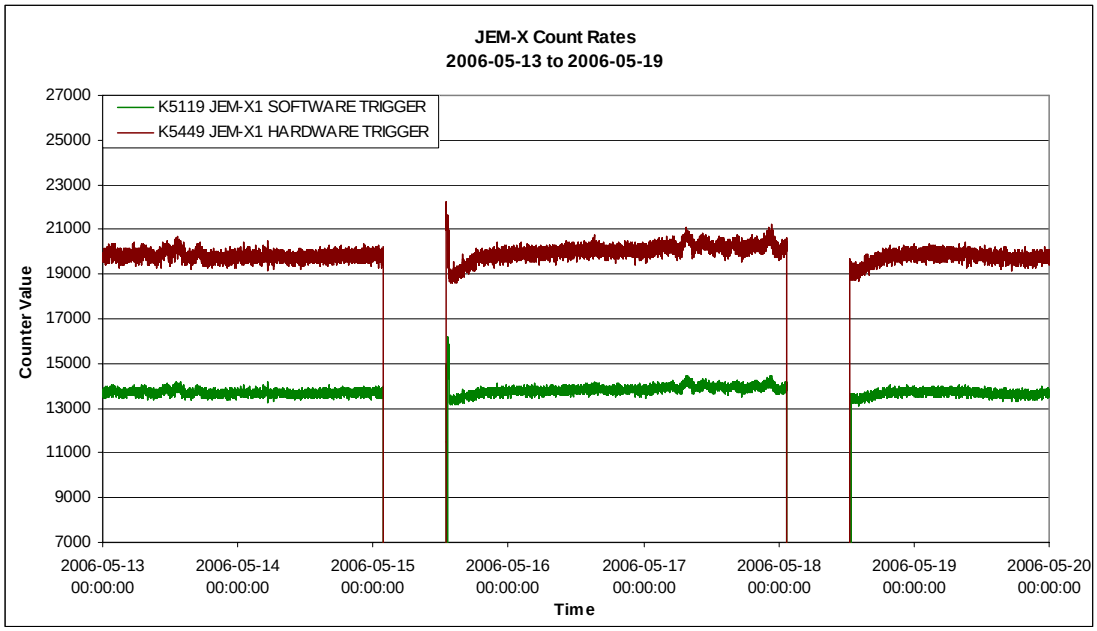
At 11:59Z TM family G2013 (I0S-EVTCNT-MCEi) went OOL high and back. As this happened at the exit of belts when the background was peculiarly high, according to I-CNT-1, no action was taken.

### *8.4.2 JEM-X Operations*

#### 8.3.4.1 JEM-X Count Rates

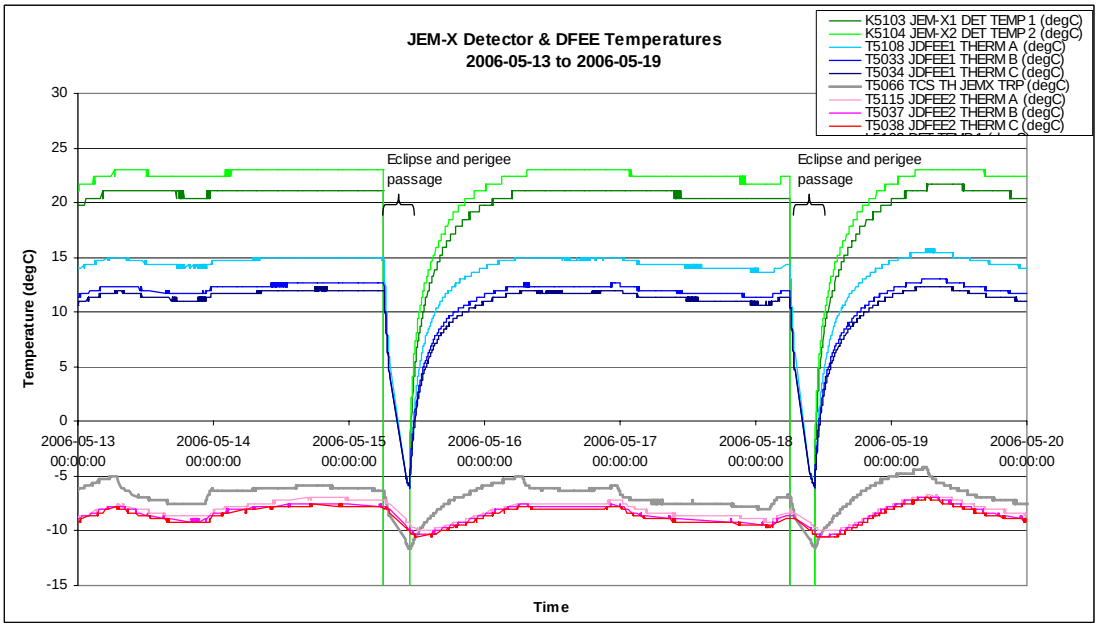
JEM-X count rates over the reporting period are displayed in the following graph[1].

[1] 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

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].




### 8.3.4.3 JEM-X Daily Report

**2006-05-13 (DOY 133, Rev 437) to 2006-05-19 (DOY 139, Rev 439)**

Nothing to report

[2] Data sampled (1 frame in 8)

### *8.4.3 OMC Operations*

**2006-05-13 (DOY 133, Rev 437) to 2006-05-16 (DOY 136, Rev 438)**

Nothing to report

**2006-05-17 (DOY 137, Rev 438)**

At 02:35, the TM from Redu dropped. A recovery was performed, and the Timeline rejoined at 03:41. The impact was the loss of pointings 04380040 & 04380041. It was at this time that the following commands were rejected:

```
 2006.137.03.17.33.333   2006.137.03.17.40.667   1792   RealTime   131     TC REJECT
REJECTED TC1                                                      0       0    65535
PR    N     E   E
 2006.137.03.17.26.958   2006.137.03.17.32.593   1792   RealTime   131     TC REJECT
REJECTED TC1                                                      0       0    65535
PR    N     E   E
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for pointing 04380041.

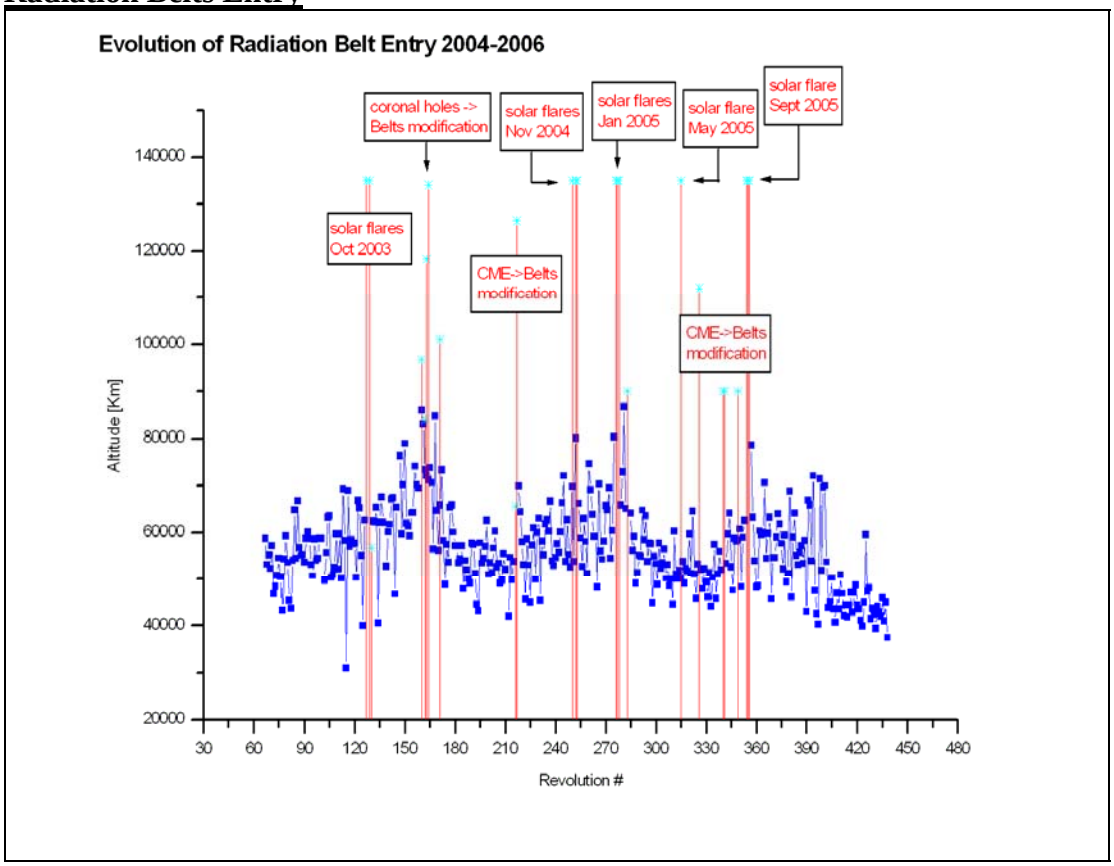
**2006-05-18 (DOY 138, Rev 438) to 2006-05-19 (DOY 139, Rev 439)**

Nothing to report

On DoY 135 at 03:07:07 and DoY 138 at 02:51:23 OMC was switched by the Timeline to SAFE mode, at the nominal time.

### *8.4.4 IREM Operations*

**Radiation Belts Entry**




**IREM daily report**

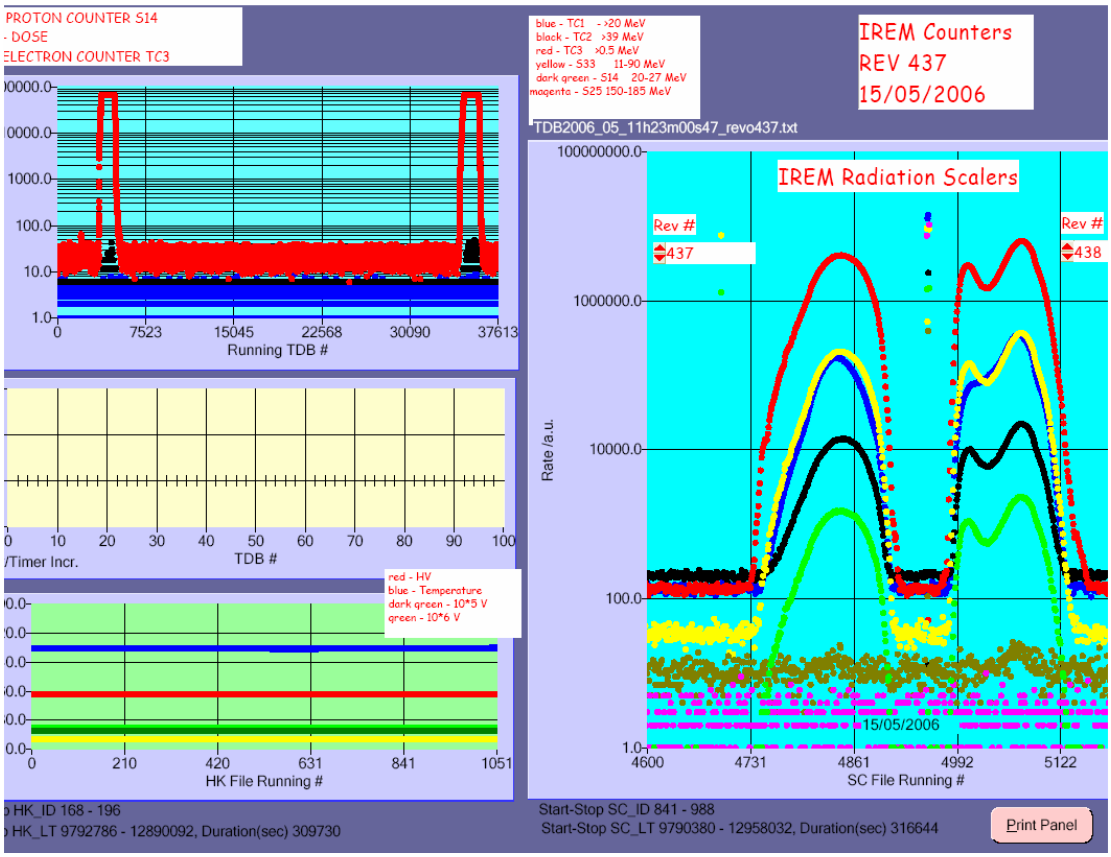
Nothing to report

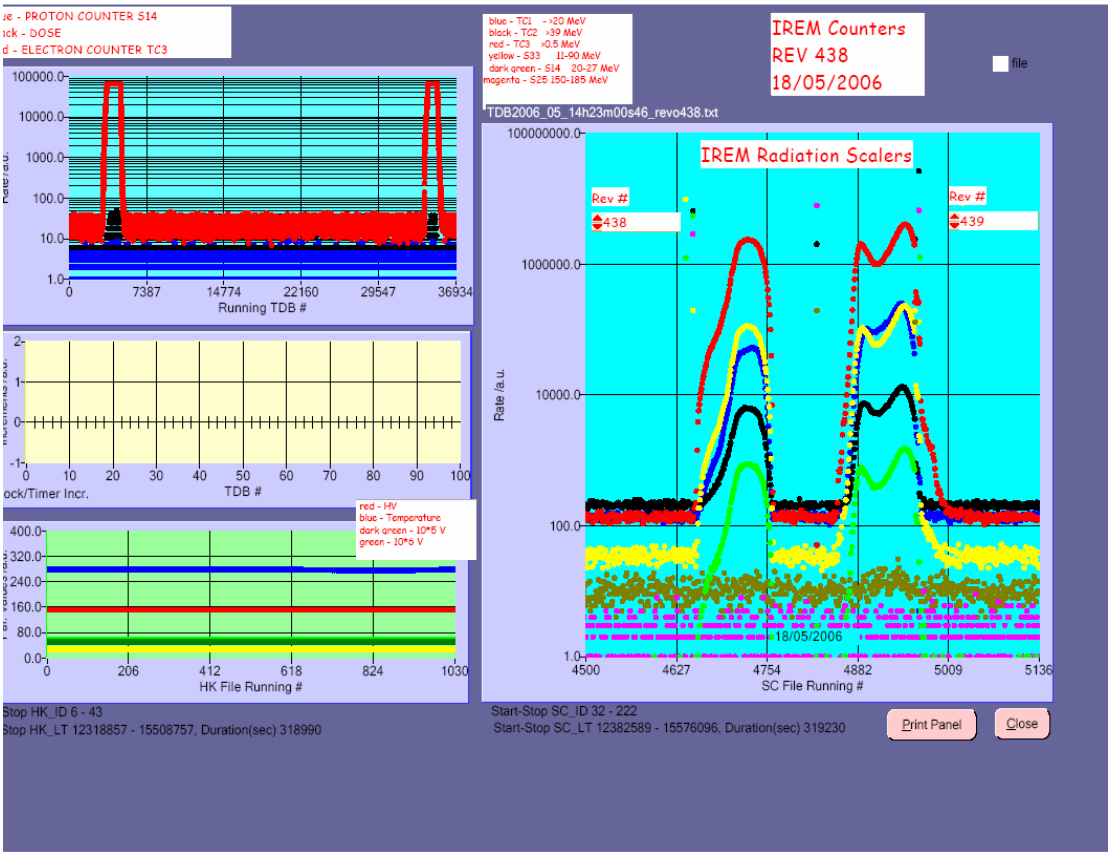
**Electron Belts**

| REV | S/C BCPKT (electron) | Electron CUT-OFF Observed Entry/Exit | Observed Entry/Exit Altitude [Km] | Electron CUT-OFF Predicted Entry/Exit | Predicted Entry/Exit Altitude [Km] |
|---|---|---|---|---|---|
| 437 | RAD_ENTR R 2006-05-15T03:07:02Z | 2006-05-15 05:00:34 | 44969.7 | 2006-05-15 04:37:54 | 47656 |
| 438 | RAD_EXIT R 2006-05-15T12:26:39Z | 2006-05-15 12:04:18 | >>31293.1 | 2006-05-15 11:57:54 | 36037 |
| 438 | RAD_ENTR R 2006-05-18T02:51:11Z | 2006-05-18 05:30:26 | >37517.5 | 2006-05-18 04:16:09 | 48629 |
| 439 | RAD_EXIT R 2006-05-18T12:10:14Z | 2006-05-18 11:49:30 | <37510.4 | 2006-05-18 11:46:09 | 36554 |

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

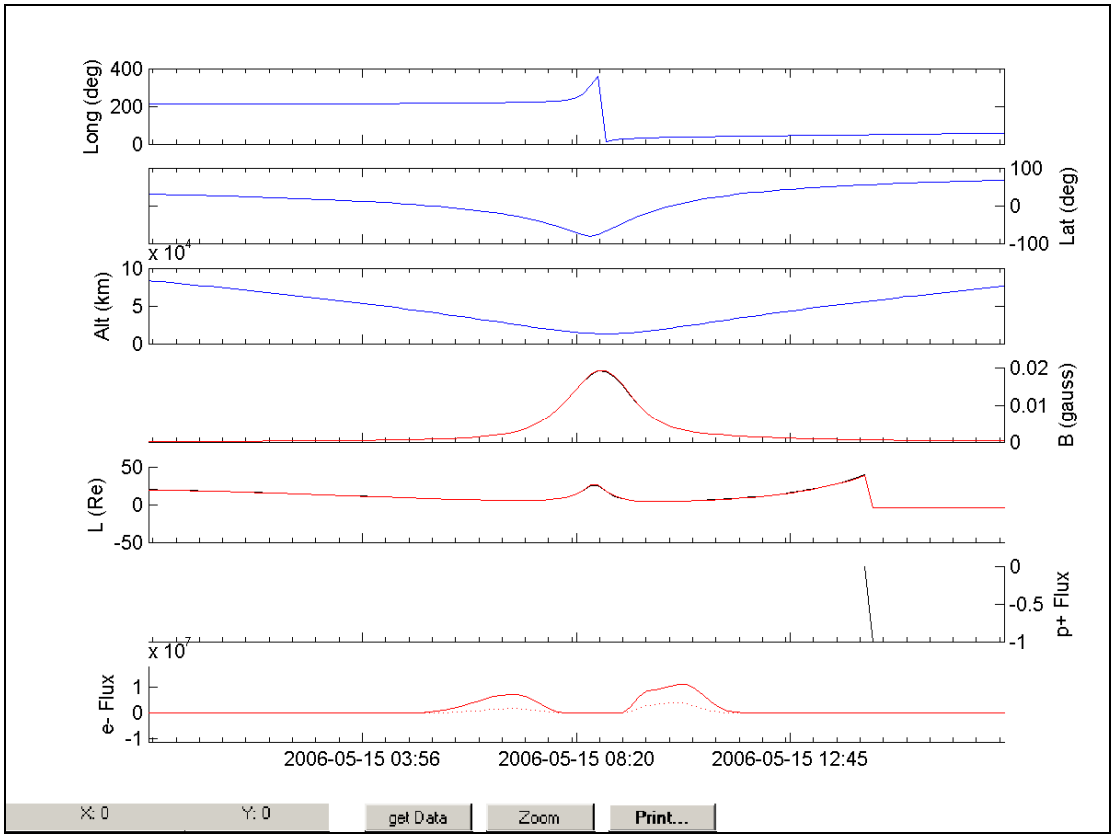
## IREM radiation counters:



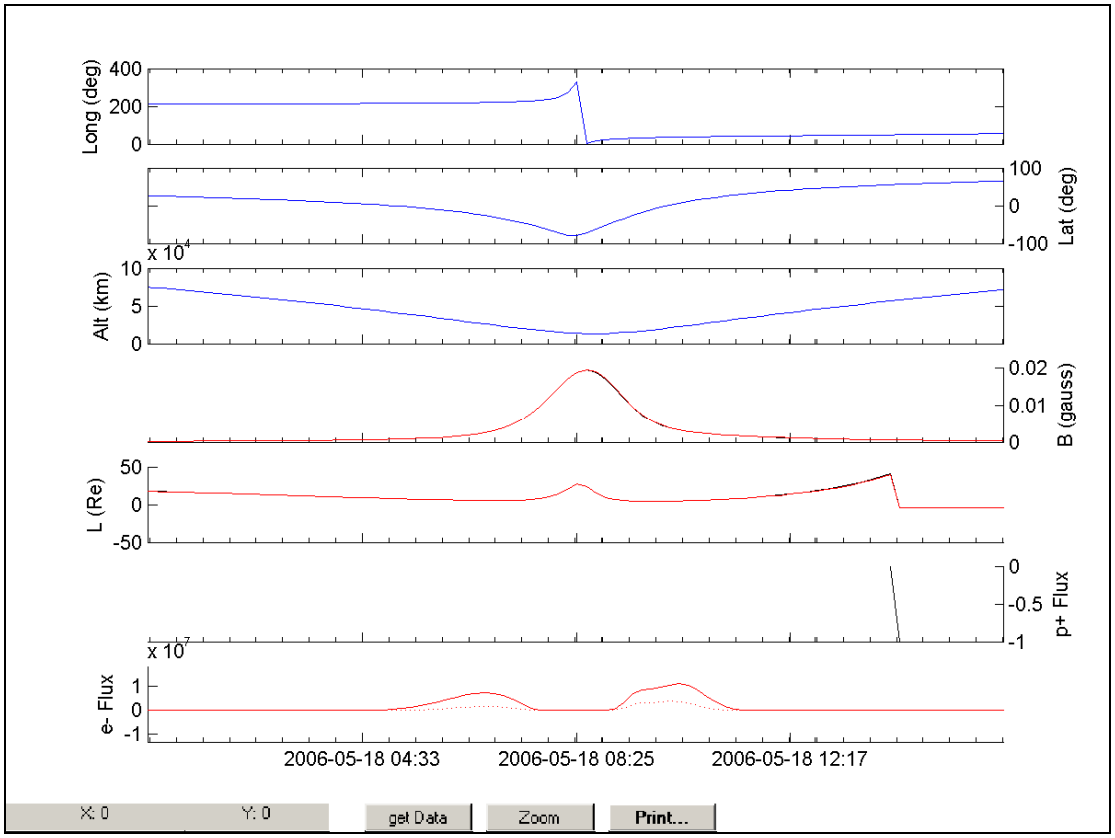



## IREM Predicted Radiation Belt Passages:

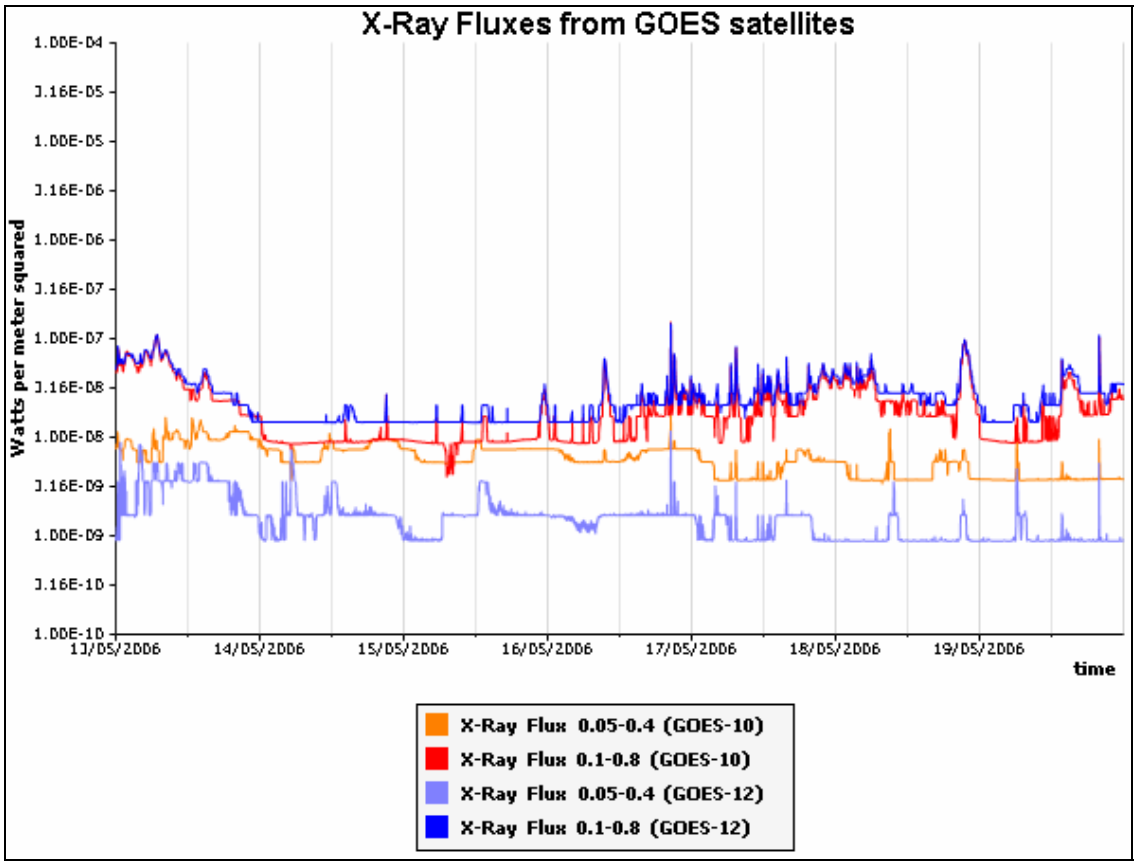
Rev 437



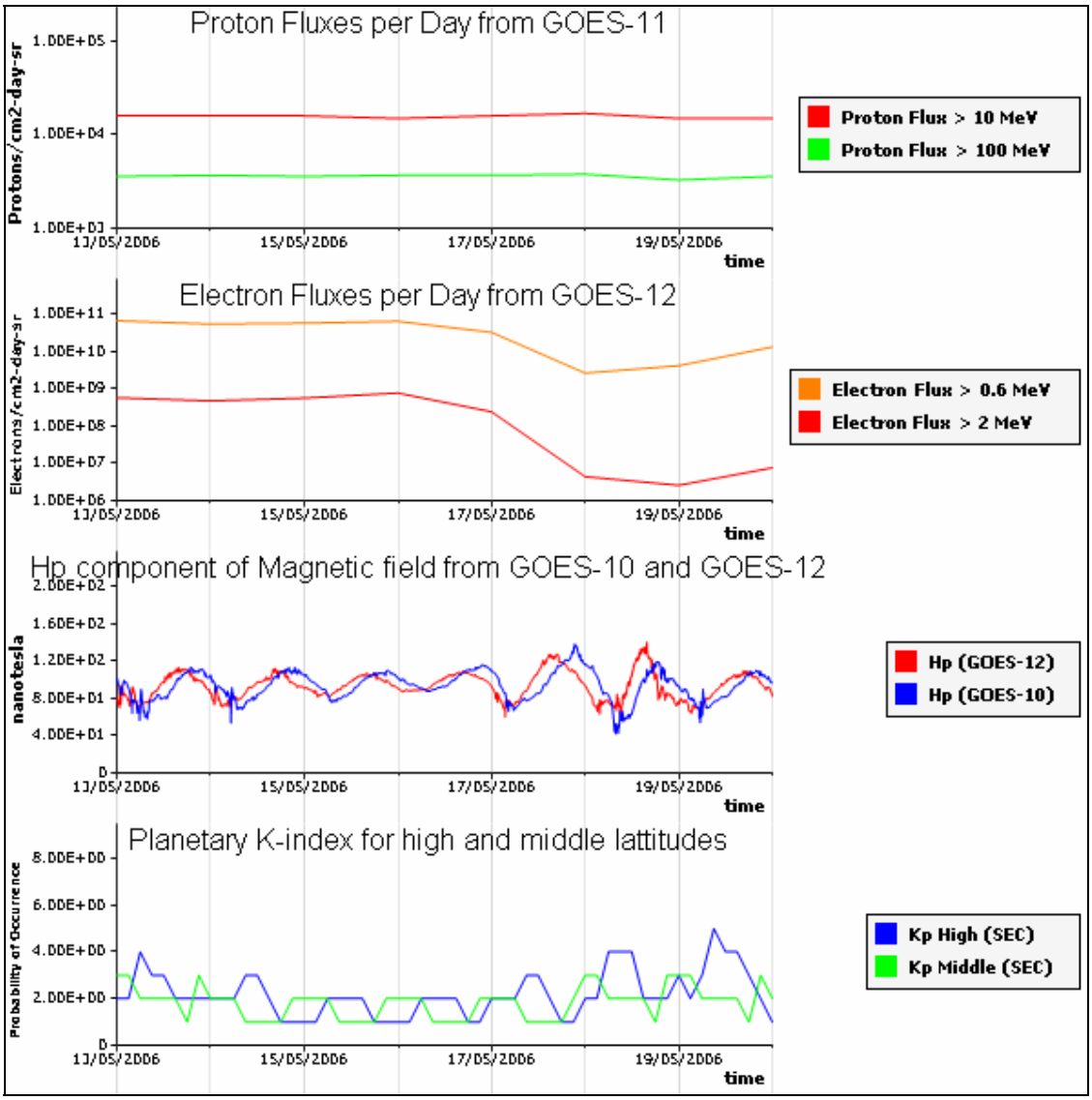

Rev 438



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




X-Ray fluxes start to be significant over $10^{-5}$W/m$^2$ (corresponding to M-class flares). Above $10^{-4}$W/m$^2$, they correspond to strong X-class flares.




Proton and electron flux are rather low, reporting no high radiation background.
Hp component of the Geomagnetic Field is essentially parallel to the Earth's rotation axis. A drop near 0 nT is associated with a significant variation in the magnetic field.
Kp index is based on ground magnetometers. Kp >=5 features storm-level geomagnetic activity.