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

INTEGRAL
Mission Report

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

No. 219
Week 48

04.12.06

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 25.11.06 until 01.12.06 (both dates inclusive) and covers the revolutions 503, 504 and 505.

2 Summary of Activities

The operations were performed according to the planning inputs from ISOC combined with some manual commanding by MOC.

The targets of these revolutions consisted of several raster dithers of the Galactic Plane Region 3 and an OMC Flat Field calibration, a staring observation at an attitude of (RA 23:43:36.00, DEC -06:12:00.0).

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

Following the FSS/STR calibration and the S/C Inertia calibration, as part of the AOCS periodic calibrations in synch with the end of the Eclipse 2006 winter season, the FSS-A coefficients, S/C Inertia Matrix, RWs Decoupling Matrix and RWs Inertias were updated during rev 504.

No slews were missed during the observation period.

The fuel consumption over the period between 25/11/2006 and 29/11/2006 was 0.0603 Kg. The remaining propellant is in the order of 149.6942 Kg.

Note: Some more information concerning the AOCS operations and the fuel budget is provided in the Appendix.

3.1.2 Power

The EPS is working nominally, available power from the arrays is of the order of 2100W.

3.1.3 Thermal

The thermal control of the satellite is working well. The temperatures are currently all within the specified operational limits.

3.1.4 OBDH

The OBDH subsystem is working flawlessly. No on-board communications problem has been identified.

3.1.5 RFS

The RF subsystem is working properly. The link margin is sufficient to ensure proper TM reception and execution of commands with the ranging channel enabled.

3.2 Payload

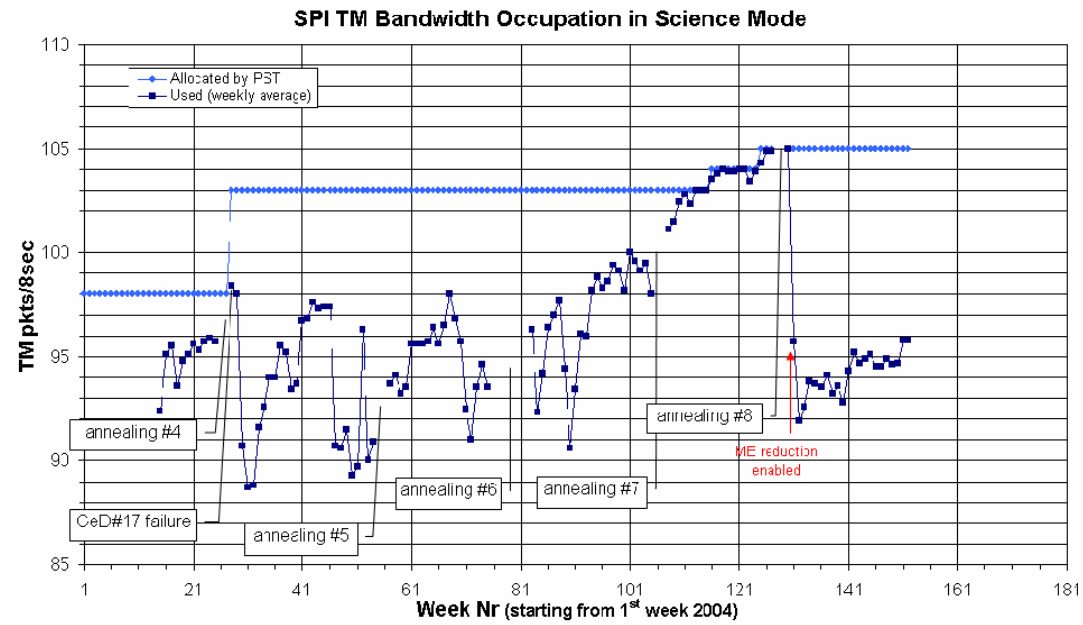
3.2.1 SPI

Following the 8th annealing, which ended on 26th June, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detectors #4 and #12 which are showing a slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with this annealing. Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

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

During science operations, the instrument was kept in photon-by-photon mode with spectra TM enabled. The assigned TM bandwidth in the science observation windows was 105 packets/cycle, except between 2006-11-29T05:58:27Z and 2006-11-29T11:01:04Z (OMC Flat Field Calibration), when the allocated TM bandwidth was 85 packets/cycle. The average telemetry occupation when the allocation was 105 packets/cycle was 95.8 packets/cycle.

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



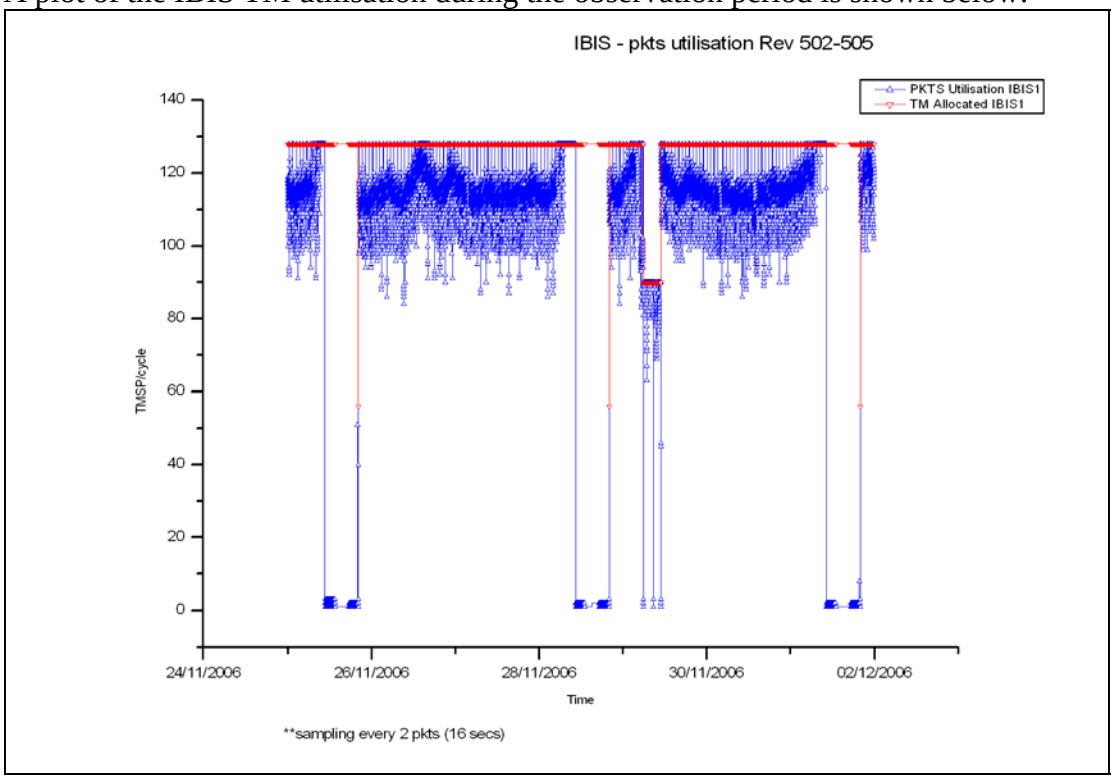
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. However it was 90 TMPS/cycle on 29/11/2006 between 05:58Z and 11:01Z due to an OMC Flat Field Calibration. The IBIS mean bandwidth utilisation during the observation period was 114.75 TMPS/cycle, down 1.35 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. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

JEM-X1 made three autonomous transitions to Safe mode, triggered by the Software Ratemeter, during the reporting period as follows:

- ~1 hour earlier than planned before radiation belt entry of revolution 502;
- ~2 hours earlier than planned before radiation belt entry of revolution 503;
- ~30 minutes earlier than planned before radiation belt entry of revolution 504.

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, all of the 128 planned science pointings for OMC were executed nominally, none were lost.

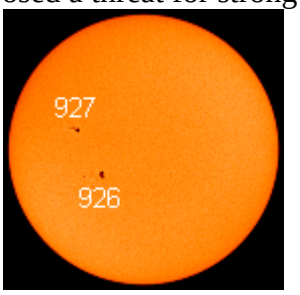
Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity
The observation period was characterised by low solar activity.

On 25/11/2006 the sun was blank.
On 26/11/2006, sunspot 926 and on 28/11/2006 sunspot 927 appeared. They remain on the sun surface until the end of the observation period (see picture below of the sun on 01/12/2006). None of them posed a threat for strong solar flare.



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 excellent this week. No slews were lost. The overall performance was nearly 100%.

4.1 Mission Operations Centre

The performance of the MOC was excellent this week, with no problems reported. The overall performance was nearly 100%.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week. There were, however, a 2 occassions where small TM drops from Redu, without impact. 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 511. Observations have been planned up to revolution 509.

TSF's up to revolution 507 have been received.

2. Observation status

No new ECS have been received this week.

3. ISOC Science Data Archive

The beta2 release is being tested by ISOC scientists, but some further improvements are required before the next release.

The new visualization tool, now named INVITE, will be part of this release.

4. ISOC system

ISOC system v14.0 is being installed on the test system and will be tested the following week. A test machine with the Red Hat Linux environment has been set up.

5. Problems

None

4.3.2 ISDC

Status of ISDC observation processing on 04/12/2006:

- Latest Standard Analysis completed: observation 04200870001 (Ginga 1826-24, Revolution 495) on 23/11/2006.

- Latest products archived: observation 04200240001 (PKS 0537-286, Revolution 493-494) on 24/11/2006.

- Latest observation products sent to the observer: observation 04200340009 (Gamma Ray Source 1915+105, Revolution 495) on 23/11/2006.

5 Special Events

6 Anomalies

There were no problems reported that impacted operations.

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

7 Future Milestones

On DoY 338 (04/12/2006) the 9th SPI Annealing process begins. It is scheduled to coninue until DoY 356 (22/12/2006)

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 503

The observations in revolution 503 consisted entirely of a raster dither of the Galactic Plane Region 3, lasting ~58.9 hours.

Revolution 504

The observations in revolution 504 began with a raster dither of the Galactic Plane Region 3, lasting ~7.9 hours. This was followed by an OMC Flat Field calibration, which was a staring observation at an attitude of (RA 23:43:36.00, DEC -06:12:00.0), lasting ~3.4 hours. Finally another raster dither of the Galactic Plane Region 3 was performed, which lasted ~45.1 hours until the end of the revolution.

Revolution 505

The observations in revolution 505 consisted entirely of a raster dither of the Galactic Plane Region 3, lasting ~58.9 hours.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5, except from 2006-11-29T05:58:27Z to 2006-11-29T11:01:04Z during the OMC Flat-Field calibration when it is IBIS 90; SPI 85; JEM-X1 8; JEM-X2 0; OMC 63.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2006-11-11T14:33:56.000Z     149.9342    F   Automatic TM processing.
2006-11-13T13:31:21.000Z     149.9147    F   Automatic TM processing.
2006-11-13T20:29:30.000Z     149.8839    F   Automatic TM processing.
2006-11-15T04:36:05.000Z     149.8689    F   Automatic TM processing.
2006-11-16T13:26:09.000Z     149.8529    F   Automatic TM processing.
2006-11-16T19:51:29.000Z     149.8508    F   Automatic TM processing.
2006-11-18T05:06:13.000Z     149.8073    F   Automatic TM processing.
2006-11-19T18:37:53.000Z     149.8039    F   Automatic TM processing.
2006-11-21T04:25:00.000Z     149.7865    F   Automatic TM processing.
2006-11-22T18:26:32.000Z     149.7801    F   Automatic TM processing.
2006-11-24T04:50:12.000Z     149.7545    F   Automatic TM processing.
2006-11-25T18:12:56.000Z     149.7504    F   Automatic TM processing.
2006-11-27T03:56:51.000Z     149.7281    F   Automatic TM processing.
2006-11-28T18:02:55.000Z     149.7250    F   Automatic TM processing.
2006-11-29T04:29:12.000Z     149.6942    F   Automatic TM processing.

This report was generated  Fri Dec 1 08:00:32 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, 25/11/2006 – 01/12/2006

AOCS operations were executed from the Automatic Timeline.

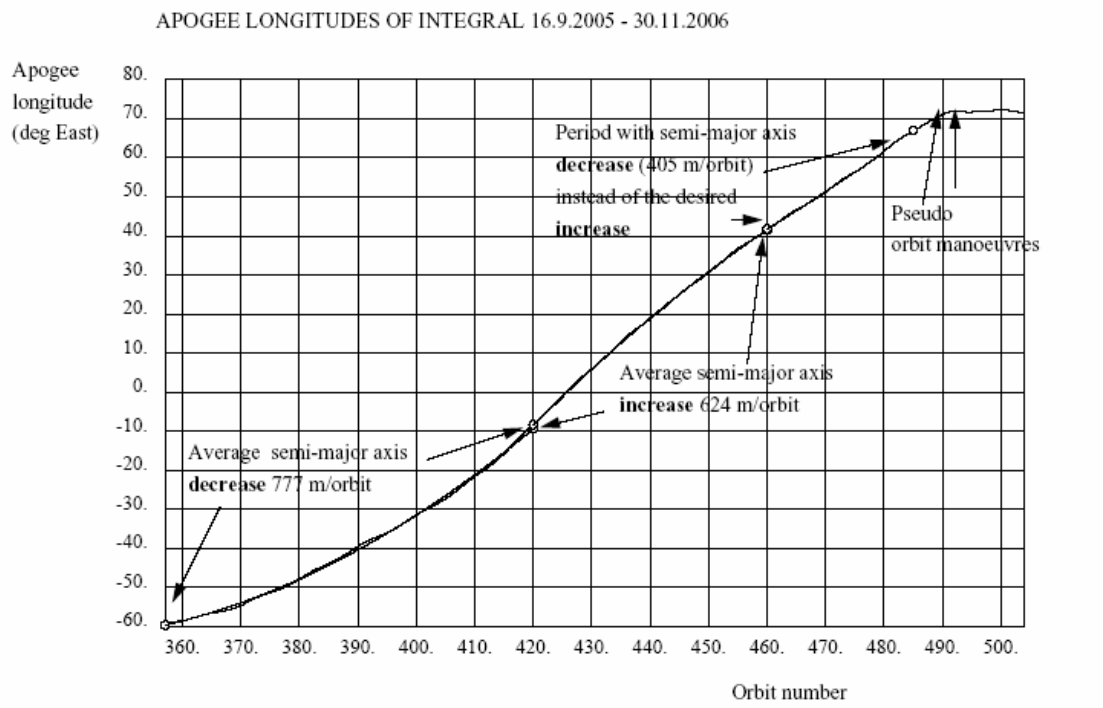
During this period, 44 Open Loop Slews, 95 Closed Loop Slews and 5 Momentum Biases were executed.

Following the FSS/STR misalignment calibration and the S/C Inertia calibration, as part of the AOCS periodic calibrations in synch with the end of the Eclipse 2006 winter season, the FSS-A coefficients (A9-A10 only), S/C Inertia Matrix, RWs Decoupling Matrix and RWs Inertias were updated during rev 504.

No slews were missed from the TL during the observation period.

Orbit Control

The attached plot shows the apogee longitude of Integral (in deg East) as a function of the orbit number for the period September 2005 - October 2006.



From September 2005 to March 2006 the momentum dumping manoeuvres were systematically executed in attitudes/at epochs to lower the orbit in order to initiate an eastward drift. The average semi-major axis decrease in this period was 777 m/orbit.

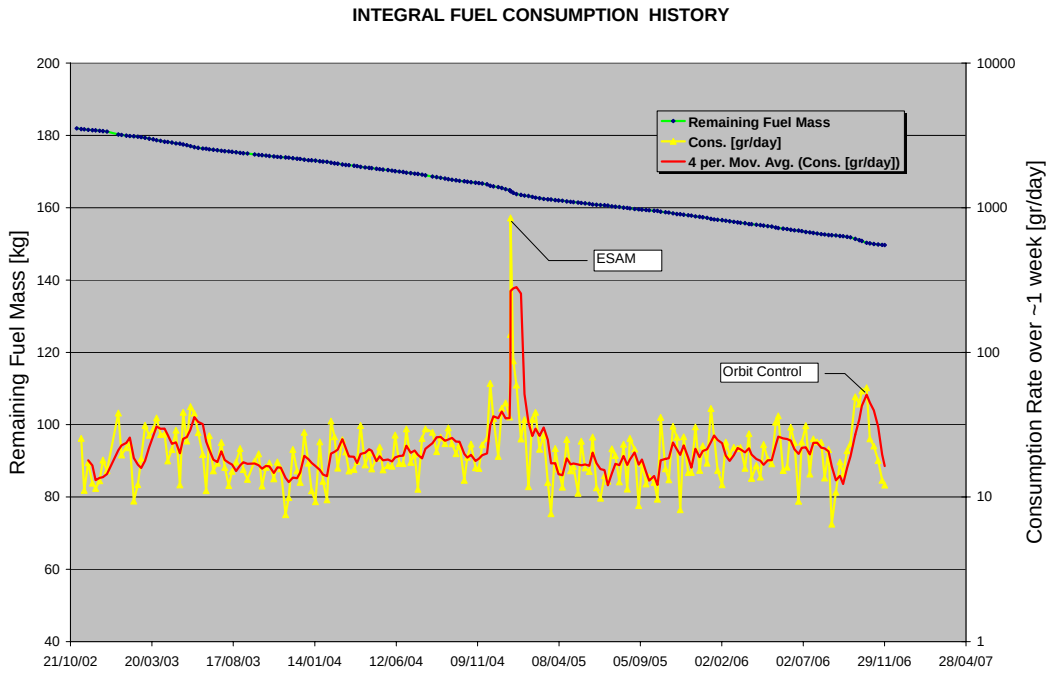
From March 2006 and onwards the momentum dumping manoeuvres should have been systematically executed in attitudes/at epochs to raise the orbit in order to decrease the eastward drift. Up to July this was successful, the average semi-major axis increase in this period was 624 m/orbit. After July this was no more the case , the average effect of the momentum dumping was an orbit lowering with on the average 404 m/orbit instead of the desired raising. Because of this, several "pseudo orbit

manoeuvres" were executed in October 2006. These "pseudo orbit manoeuvres" were momentum dumping manoeuvres artificially made large, by aiming for large reaction wheel rate changes rather then small ones, when in attitudes/epochs for which corresponding orbital effects were advantageous for the orbit control.

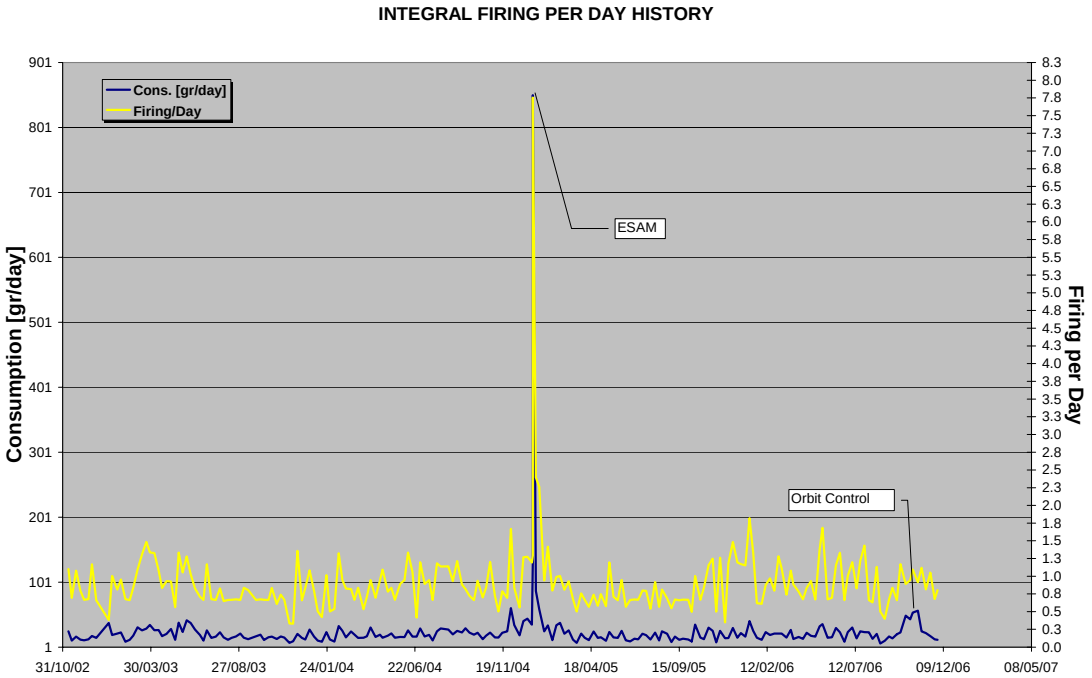
Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 29/11/2006 is reported in the plot below.

The large fuel consumption observed in the months was due to the combination of the strategy to perform artificial large momentum dump manoeuvres when the pointing is suitable for orbit control and the starting of the eclipse season.

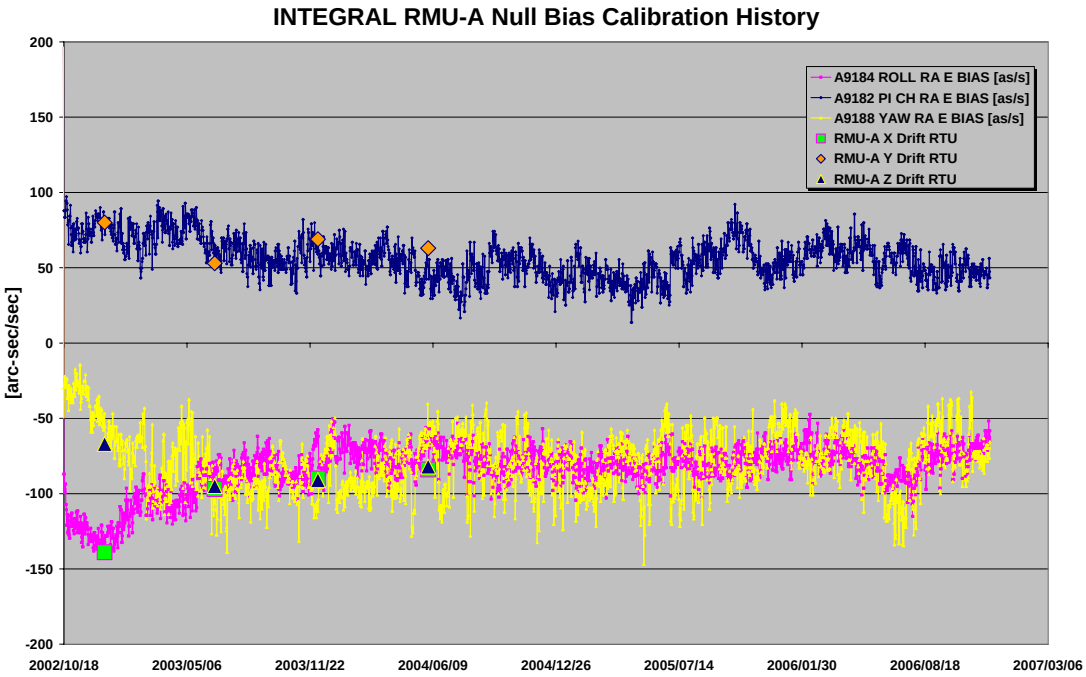


The firing\day over the period between 01/11/2002 and 29/11/2006 is reported in the plot below.

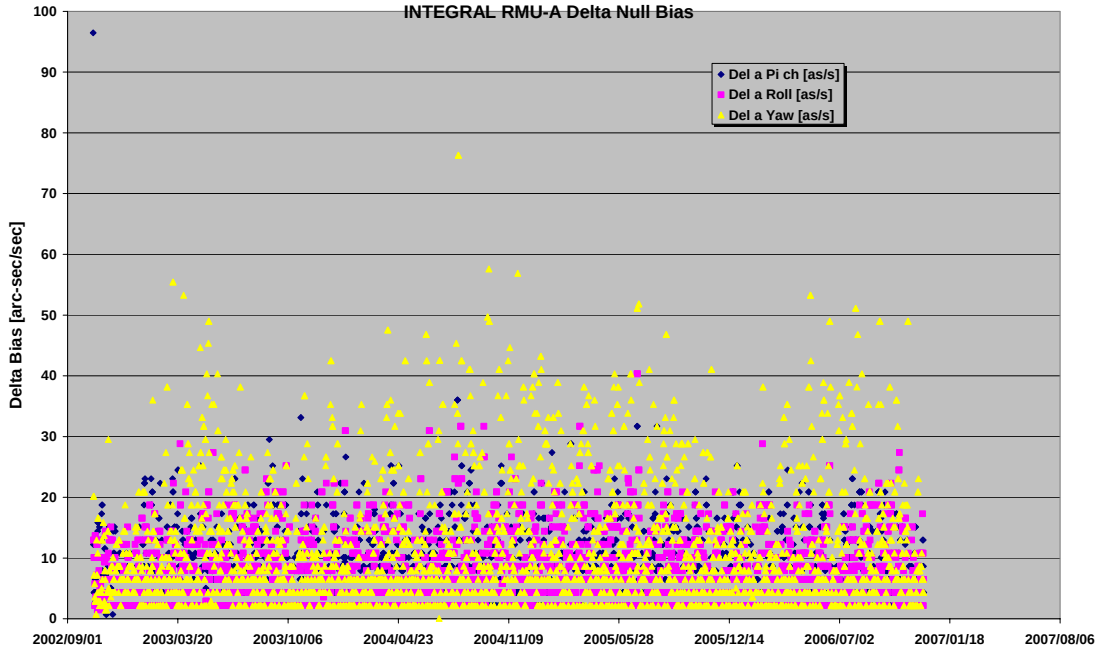


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 01/12/2006 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 01/12/2006 is reported in the plot below



25/11/06 (Day of Year 329, Revolution 502-503)

Nothing to report.

26/11/06 (Day of Year 330, Revolution 503)

Nothing to report.

27/11/06 (Day of Year 331, Revolution 503)

Nothing to report.

28/11/06 (Day of Year 332, Revolution 503-504)

Nothing to report.

29/11/06 (Day of Year 333, Revolution 504)

Nothing to report.

30/11/06 (Day of Year 334, Revolution 504)

Update FSS coefficients after FSS/STR misalignment calibration: following the FSS/STR misalignment calibration, the FSS coefficients (A9-A10 only) were updated during revolution 504, at 13:12z.

The roll step change was for A9 ~11.6 arcsec and in total (considering contribution from A9+A10) ~44.4 arcsec.

Below are reported the update on-board values in radians/sec (values provided by FD team)

```
AEFSA_00 S
          M F  22
2006-12-01T15:00:00Z
2006-12-01T15:00:00Z
AAAA1
FSS_A1   R -0.1191590E+01           D FSS-A transfer function parameter A1
FSS_A2   R 0.3635371E-04            D FSS-A transfer function parameter A2
FSS_A3   R 0.1200000E-04            D FSS-A transfer function parameter A3
FSS_A4   R 0.6135914E-02            D FSS-A transfer function parameter A4
FSS_A5   R -0.1745329E+01           D FSS-A transfer function parameter A5
FSS_A6   R 0.4100000E-04            D FSS-A transfer function parameter A6
FSS_A7   R 0.1227185E-01            D FSS-A transfer function parameter A7
FSS_A8   R 0.1518436E+01            D FSS-A transfer function parameter A8
FSS_A9   R 0.3192367E-03            D FSS-A transfer function parameter A9
FSS_A10  R 0.5208499E-02            D FSS-A transfer function parameter A10
FSS_A11  R -0.5277391E-02           D FSS-A transfer function parameter A11
FSS_B1   R -0.1191421E+01           D FSS-A transfer function parameter B1
FSS_B2   R 0.3633825E-04            D FSS-A transfer function parameter B2
FSS_B3   R 0.1170000E-03            D FSS-A transfer function parameter B3
FSS_B4   R 0.6135914E-02            D FSS-A transfer function parameter B4
FSS_B5   R 0.2076942E+01            D FSS-A transfer function parameter B5
FSS_B6   R 0.3600000E-04            D FSS-A transfer function parameter B6
FSS_B7   R 0.1227185E-01            D FSS-A transfer function parameter B7
FSS_B8   R -0.1186824E+01           D FSS-A transfer function parameter B8
FSS_B9   R -0.4061129E-03           D FSS-A transfer function parameter B9
FSS_B10  R 0.2353649E-02            D FSS-A transfer function parameter B10
FSS_B11  R -0.1129655E-02           D FSS-A transfer function parameter B
```

01/11/06 (Day of Year 335, Revolution 504-505)

Update S\C Inertia Matrix, RWs Decoupling Matrix and RWs Inertias: following the Inertia calibration in synch with the end of the Eclipse 2006 winter season, the S\C Inertia matrix, RWs decoupling matrix and RWs Inertias were updated at the end of rev 504 at 09:30z, as follows (values provided by FD team):

S\C Inertia Matrix

```
AESCI_00 S
          M F   6
2006-12-01T15:00:00Z
2006-12-01T15:00:00Z
AAAA1
IXX      R 0.6173980E+04        Kgm2 D S/C inertia Ixx
IYY      R 0.8161320E+04        Kgm2 D S/C inertia Iyy
IZZ      R 0.8307730E+04        Kgm2 D S/C inertia Izz
IXY      R 0.3642100E+02        Kgm2 D S/C inertia Ixy
IXZ      R -0.1615930E+03       Kgm2 D S/C inertia Ixz
IYZ      R 0.1452590E+02        Kgm2 D S/C inertia I
```

RWs Decoupling Matrix

```
AEDCM_00 S
          M F  96
2006-12-01T15:00:00Z
2006-12-01T15:00:00Z
AAAA1
ABW_1_R1 R 0.0000000E+00            D body to wheel [1,roll]
ABW_1_P1 R 0.0000000E+00            D body to wheel [1,pitch]
ABW_1_Y1 R 0.0000000E+00            D body to wheel [1,yaw]
ABW_2_R1 R -0.7078940E+00           D body to wheel [1,roll]
ABW_2_P1 R -0.7057481E+00           D body to wheel [1,pitch]
ABW_2_Y1 R 0.7067821E+00            D body to wheel [1,yaw]
ABW_3_R1 R -0.1412619E+01           D body to wheel [1,roll]
ABW_3_P1 R 0.5999032E-02            D body to wheel [1,pitch]
ABW_3_Y1 R 0.2626078E-02            D body to wheel [1,yaw]
ABW_4_R1 R 0.7116438E+00            D body to wheel [1,roll]
ABW_4_P1 R 0.7049382E+00            D body to wheel [1,pitch]
ABW_4_Y1 R 0.7049511E+00            D body to wheel [1,yaw]
BWB_1_R1 R 0.0000000E+00            D wheel to body [1,roll]
BWB_1_P1 R 0.0000000E+00            D wheel to body [1,pitch]
BWB_1_Y1 R 0.0000000E+00            D wheel to body [1,yaw]
```

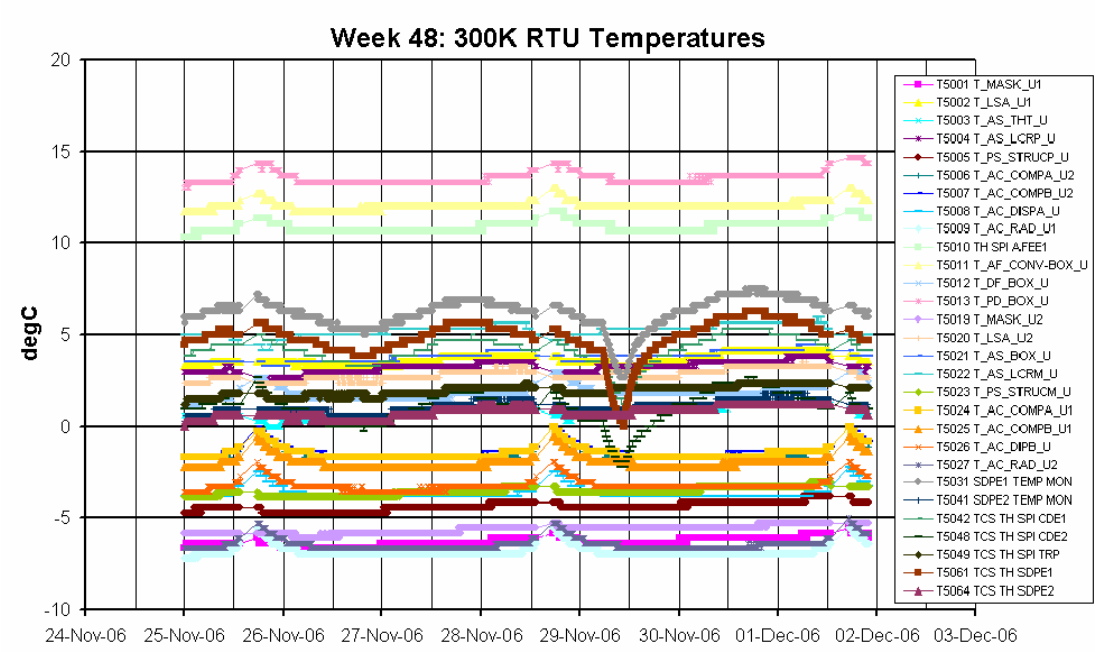
```
BWB_2_R1 R -0.1683229E-02          D wheel to body [1,roll]
BWB_2_P1 R -0.7062621E+00          D wheel to body [1,pitch]
BWB_2_Y1 R 0.7079484E+00           D wheel to body [1,yaw]
BWB_3_R1 R -0.7048886E+00          D wheel to body [1,roll]
BWB_3_P1 R 0.7093144E+00           D wheel to body [1,pitch]
BWB_3_Y1 R 0.2279236E-02           D wheel to body [1,yaw]
BWB_4_R1 R 0.4313446E-02           D wheel to body [1,roll]
BWB_4_P1 R 0.7054542E+00           D wheel to body [1,pitch]
BWB_4_Y1 R 0.7087424E+00           D wheel to body [1,yaw]
ABW_1_R2 R 0.7110499E+00           D body to wheel [2,roll]
ABW_1_P2 R 0.7089330E+00           D body to wheel [2,pitch]
ABW_1_Y2 R -0.7106540E+00          D body to wheel [2,yaw]
ABW_2_R2 R 0.0000000E+00           D body to wheel [2,roll]
ABW_2_P2 R 0.0000000E+00           D body to wheel [2,pitch]
ABW_2_Y2 R 0.0000000E+00           D body to wheel [2,yaw]
ABW_3_R2 R -0.7079978E+00          D body to wheel [2,roll]
ABW_3_P2 R 0.7087942E+00           D body to wheel [2,pitch]
ABW_3_Y2 R -0.7005008E+00          D body to wheel [2,yaw]
ABW_4_R2 R -0.3130636E-02          D body to wheel [2,roll]
ABW_4_P2 R -0.8296440E-02          D body to wheel [2,pitch]
ABW_4_Y2 R 0.1419226E+01           D body to wheel [2,yaw]
BWB_1_R2 R 0.7046694E+00           D wheel to body [2,roll]
BWB_1_P2 R 0.7095129E+00           D wheel to body [2,pitch]
BWB_1_Y2 R 0.5702047E-02           D wheel to body [2,yaw]
BWB_2_R2 R 0.0000000E+00           D wheel to body [2,roll]
BWB_2_P2 R 0.0000000E+00           D wheel to body [2,pitch]
BWB_2_Y2 R 0.0000000E+00           D wheel to body [2,yaw]
BWB_3_R2 R -0.7047488E+00          D wheel to body [2,roll]
BWB_3_P2 R 0.7094522E+00           D wheel to body [2,pitch]
BWB_3_Y2 R 0.2592691E-02           D wheel to body [2,yaw]
BWB_4_R2 R 0.5002019E-02           D wheel to body [2,roll]
BWB_4_P2 R 0.7054478E+00           D wheel to body [2,pitch]
BWB_4_Y2 R 0.7087442E+00           D wheel to body [2,yaw]
ABW_1_R3 R 0.1425131E+01           D body to wheel [3,roll]
ABW_1_P3 R -0.5951566E-02          D body to wheel [3,pitch]
ABW_1_Y3 R -0.4134091E-02          D body to wheel [3,yaw]
ABW_2_R3 R 0.7109272E+00           D body to wheel [3,roll]
ABW_2_P3 R -0.7117269E+00          D body to wheel [3,pitch]
ABW_2_Y3 R 0.7033992E+00           D body to wheel [3,yaw]
ABW_3_R3 R 0.0000000E+00           D body to wheel [3,roll]
ABW_3_P3 R 0.0000000E+00           D body to wheel [3,pitch]
ABW_3_Y3 R 0.0000000E+00           D body to wheel [3,yaw]
ABW_4_R3 R -0.7216561E+00          D body to wheel [3,roll]
ABW_4_P3 R 0.7110373E+00           D body to wheel [3,pitch]
ABW_4_Y3 R 0.7083092E+00           D body to wheel [3,yaw]
BWB_1_R3 R 0.7046694E+00           D wheel to body [3,roll]
BWB_1_P3 R 0.7095129E+00           D wheel to body [3,pitch]
BWB_1_Y3 R 0.5702047E-02           D wheel to body [3,yaw]
BWB_2_R3 R -0.8953778E-03          D wheel to body [3,roll]
BWB_2_P3 R -0.7062021E+00          D wheel to body [3,pitch]
BWB_2_Y3 R 0.7080098E+00           D wheel to body [3,yaw]
BWB_3_R3 R 0.0000000E+00           D wheel to body [3,roll]
BWB_3_P3 R 0.0000000E+00           D wheel to body [3,pitch]
BWB_3_Y3 R 0.0000000E+00           D wheel to body [3,yaw]
BWB_4_R3 R 0.5002019E-02           D wheel to body [3,roll]
BWB_4_P3 R 0.7054478E+00           D wheel to body [3,pitch]
BWB_4_Y3 R 0.7087442E+00           D wheel to body [3,yaw]
ABW_1_R4 R 0.7079386E+00           D body to wheel [4,roll]
ABW_1_P4 R 0.7006879E+00           D body to wheel [4,pitch]
ABW_1_Y4 R 0.6997942E+00           D body to wheel [4,yaw]
ABW_2_R4 R -0.3097530E-02          D body to wheel [4,roll]
ABW_2_P4 R -0.8208707E-02          D body to wheel [4,pitch]
ABW_2_Y4 R 0.1404218E+01           D body to wheel [4,yaw]
ABW_3_R4 R -0.7110825E+00          D body to wheel [4,roll]
ABW_3_P4 R 0.7006193E+00           D body to wheel [4,pitch]
ABW_3_Y4 R 0.6979312E+00           D body to wheel [4,yaw]
ABW_4_R4 R 0.0000000E+00           D body to wheel [4,roll]
ABW_4_P4 R 0.0000000E+00           D body to wheel [4,pitch]
ABW_4_Y4 R 0.0000000E+00           D body to wheel [4,yaw]
BWB_1_R4 R 0.7046694E+00           D wheel to body [4,roll]
BWB_1_P4 R 0.7095129E+00           D wheel to body [4,pitch]
BWB_1_Y4 R 0.5702047E-02           D wheel to body [4,yaw]
BWB_2_R4 R -0.8953778E-03          D wheel to body [4,roll]
BWB_2_P4 R -0.7062021E+00          D wheel to body [4,pitch]
BWB_2_Y4 R 0.7080098E+00           D wheel to body [4,yaw]
BWB_3_R4 R -0.7047488E+00          D wheel to body [4,roll]
BWB_3_P4 R 0.7094522E+00           D wheel to body [4,pitch]
BWB_3_Y4 R 0.2592691E-02           D wheel to body [4,yaw]
BWB_4_R4 R 0.0000000E+00           D wheel to body [4,roll]
BWB_4_P4 R 0.0000000E+00           D wheel to body [4,pitch]
BWB_4_Y4 R 0.0000000E+00           D wheel to body [4,ya
```

RWs Inertias

```
AERWI_00 S
          M F   4
2006-12-01T15:00:00Z
2006-12-01T15:00:00Z
AAAA1
RW_INE_1 R 0.9600000E-01        Kgm2 D wheel 1 inertia
RW_INE_2 R 0.9775760E-01        Kgm2 D wheel 2 inertia
RW_INE_3 R 0.9718200E-01        Kgm2 D wheel 3 inertia
RW_INE_4 R 0.9777640E-01        Kgm2 D wheel 4 inertia
```

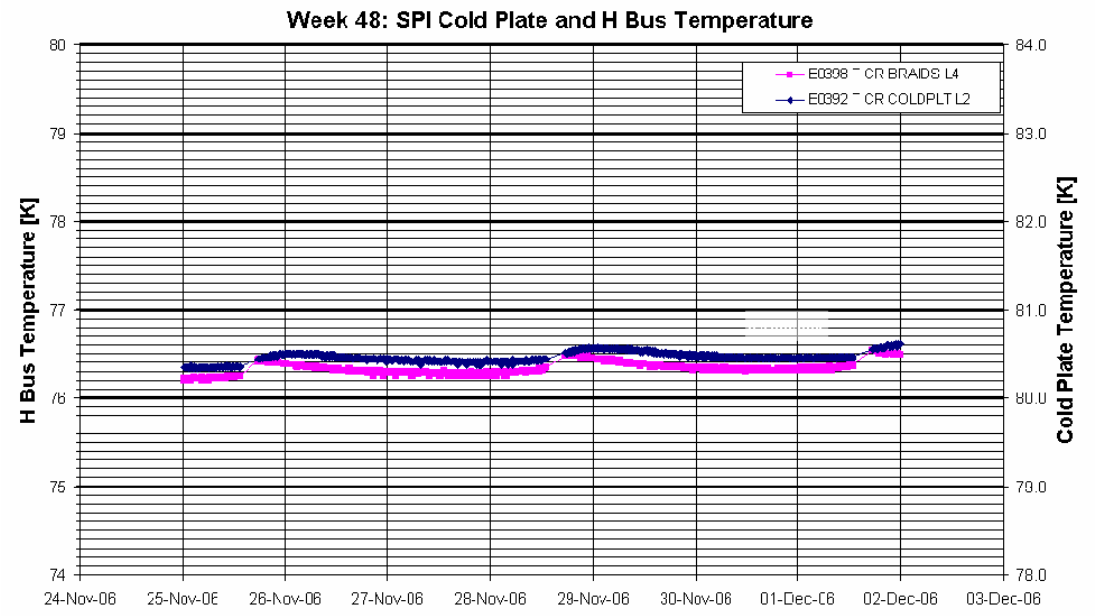
8.3.2 SPI Operations

Unit Temperatures: All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period:



Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range to 80K +/-1K. The temperature was basically steady, with a small increase around the perigee passages.

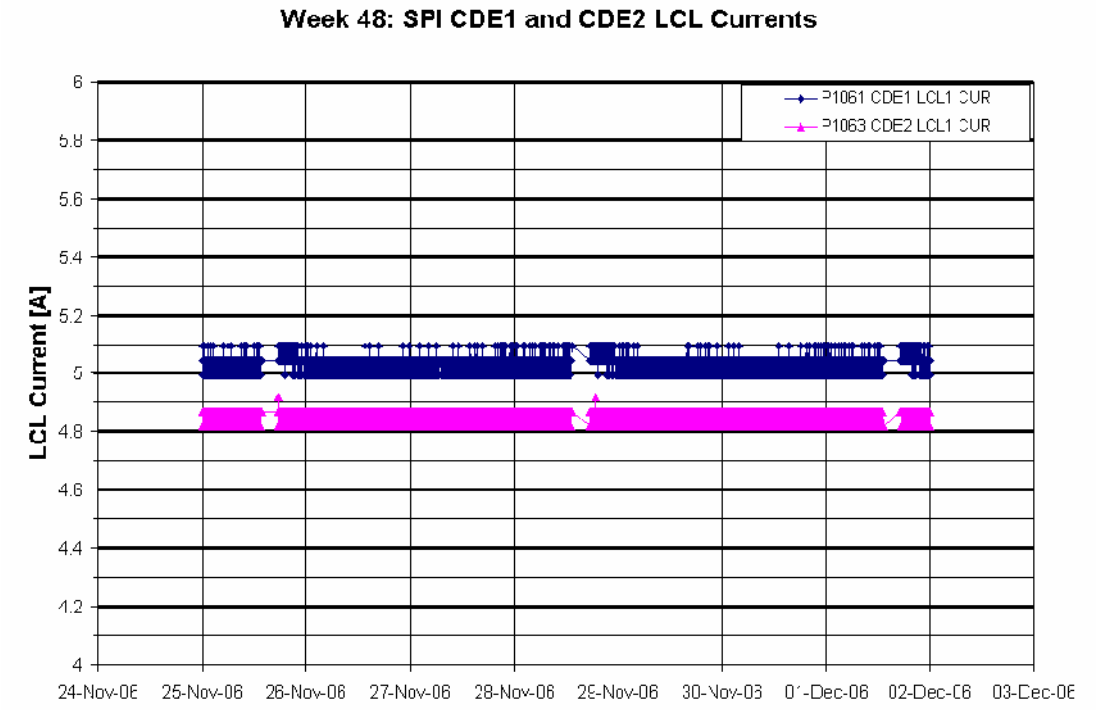
The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



The stroke of all four compressors is currently set to 41. The average LCL currents of the CDEs over the week were:

- Average CDE1 LCL Current = 5.04A
- Average CDE2 LCL Current = 4.84A

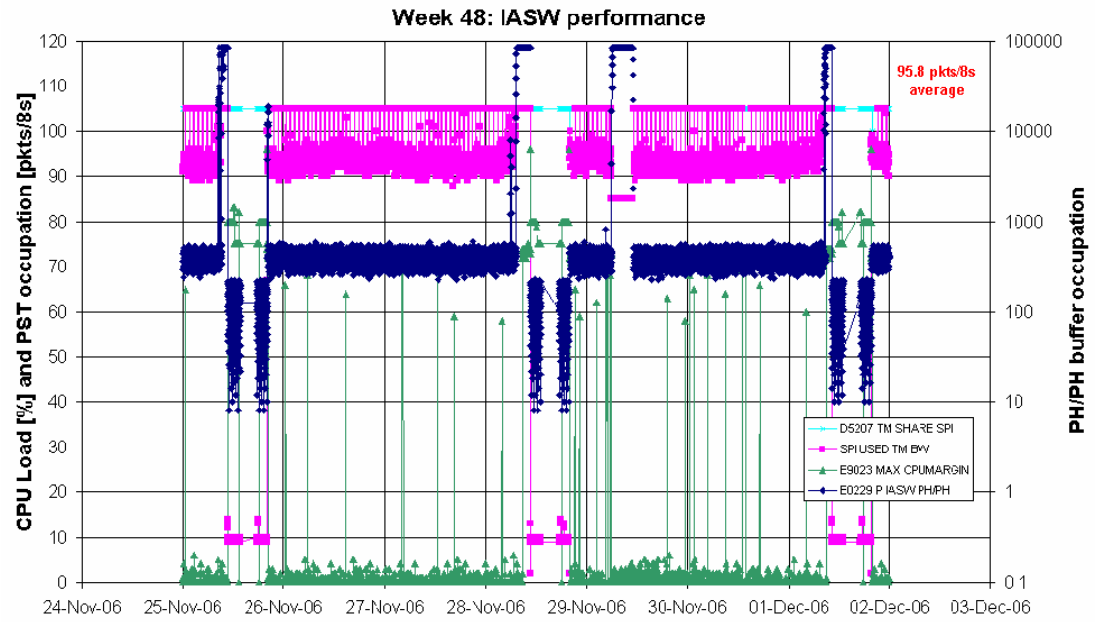
The following plot shows the evolution of the CDE currents during the reporting period.



DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432. The average TM bandwidth occupation of SPI was 95.8 packets/cycle over the science window, when the TM allocation was 105

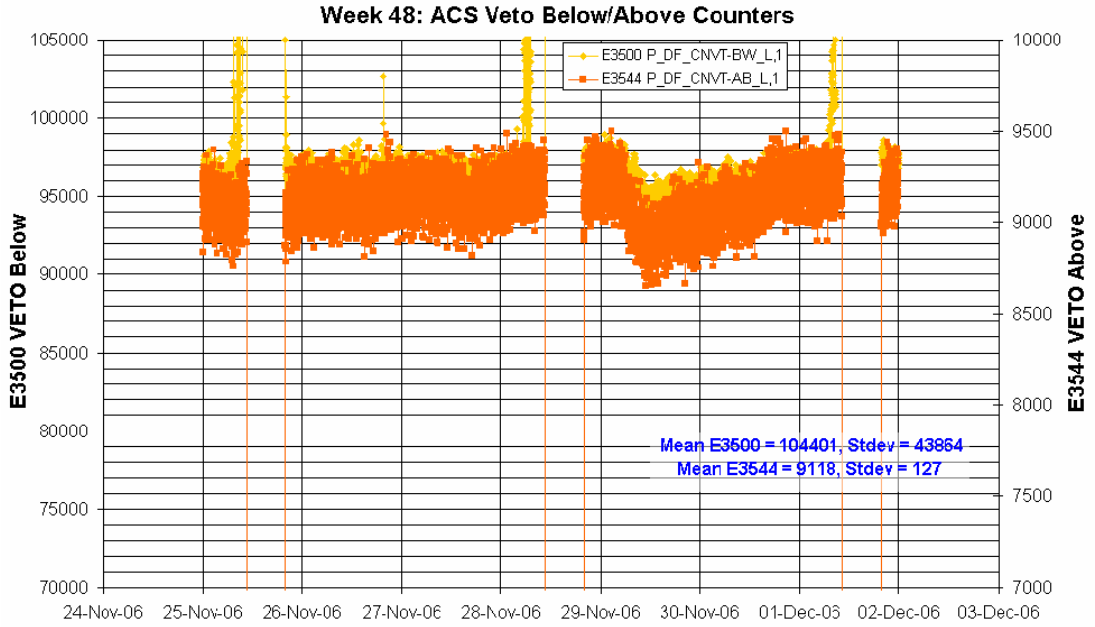
packets/cycle. The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.

Note that between 2006-11-29T05:58:27Z and 2006-11-29T11:01:04Z the allocated TM bandwidth was 85 packets/cycle due to an OMC Flat Field Calibration.



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

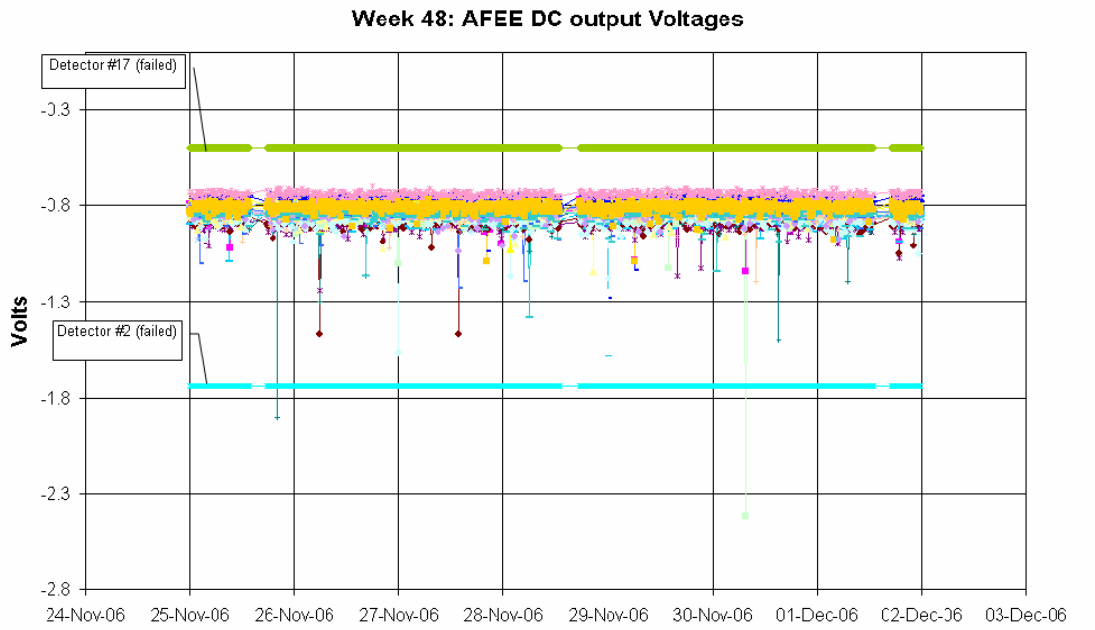
The following plot shows the ACS overall count rate evolution during the reporting period:



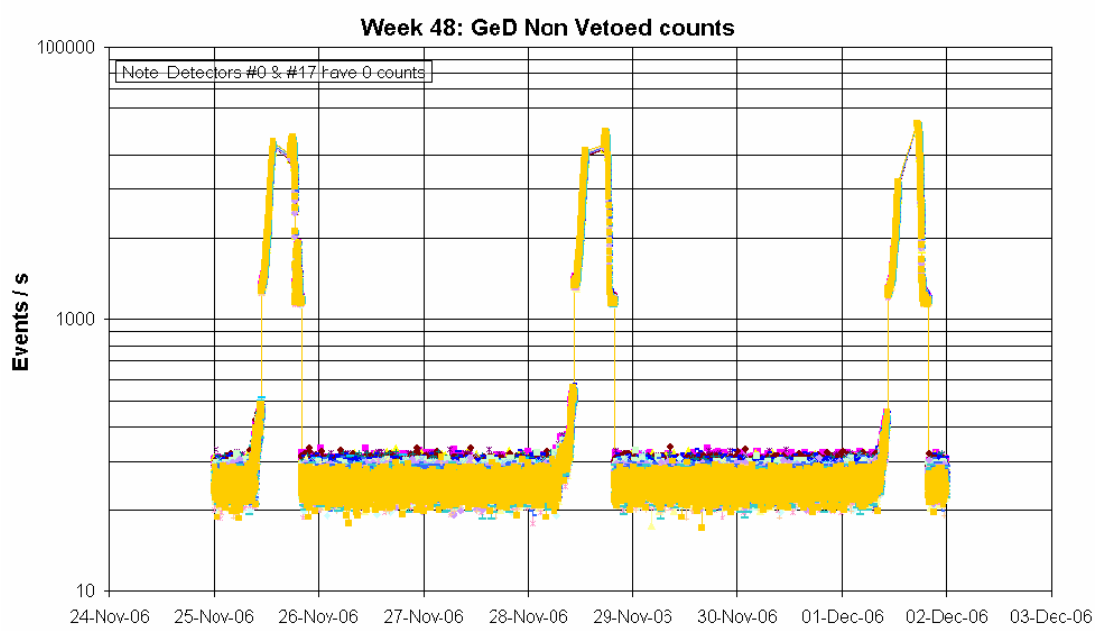
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detectors #4 and #12 which are showing a

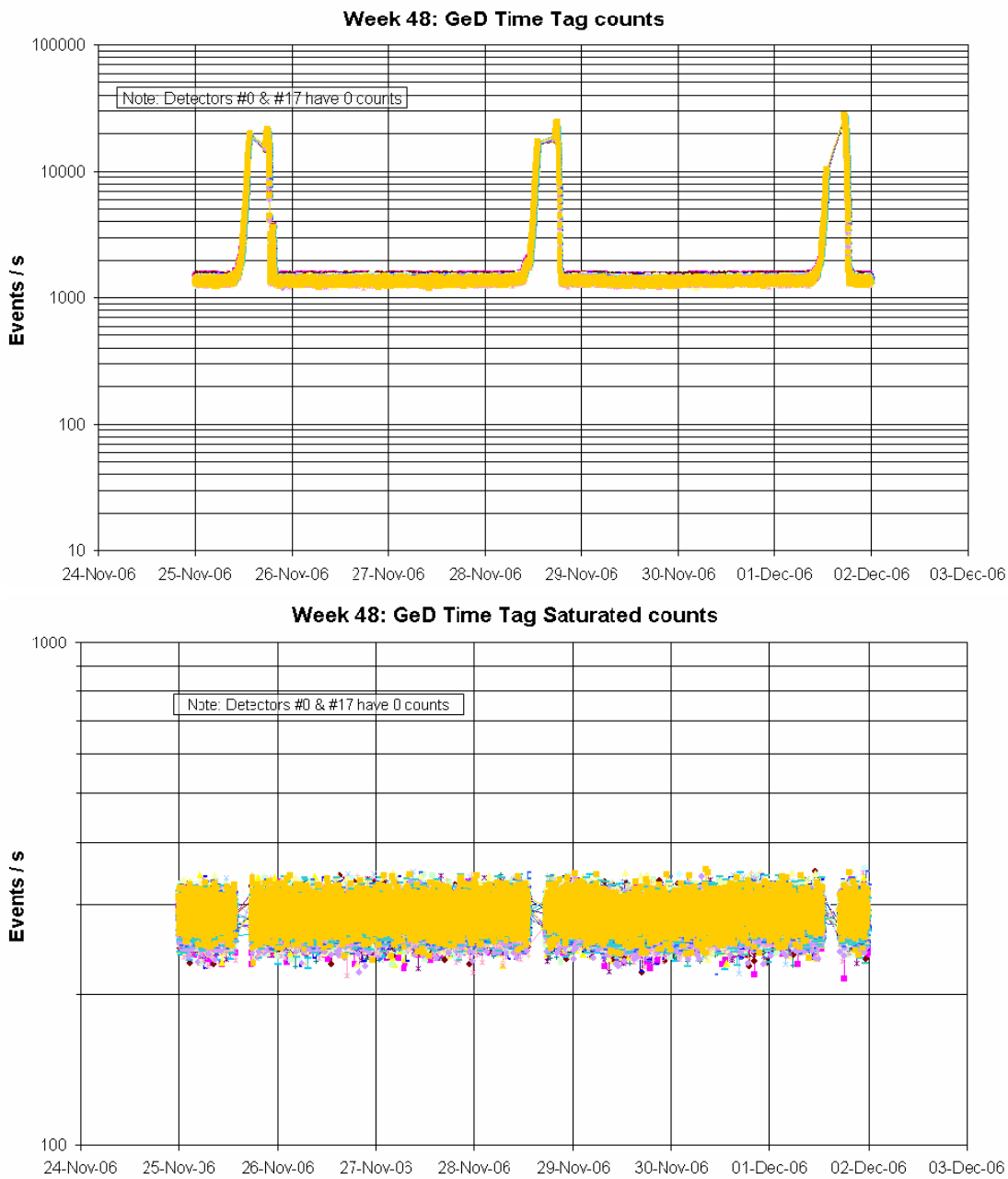
slightly degraded energy resolution. The energy resolution of GeD#15 was recovered with the last annealing.

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

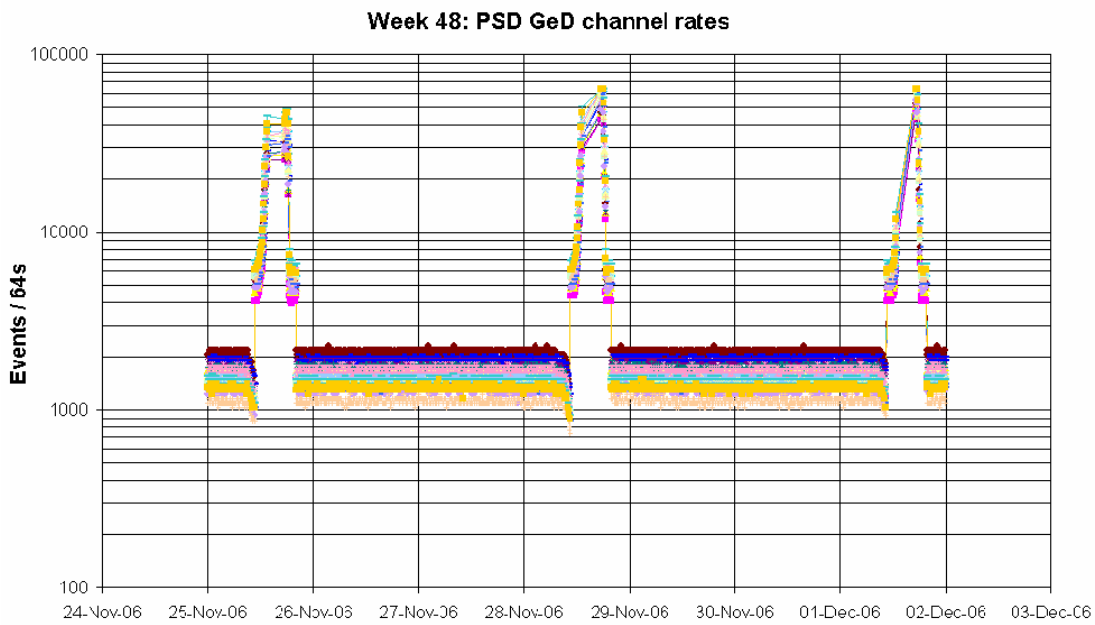


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD: The health of the unit is nominal. The following plot shows the PSD channel rates during the reporting period.



Event Log:

The following non-nominal events occurred on SPI during the reporting period:

- On 2006-11-25 at 08:24:32Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~2 hours 20 minutes before radiation belt entry of revolution 502. No action was taken.
- On 2006-11-28 at 05:46:40Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was almost 5 hours before radiation belt entry of revolution 503. No action was taken.
- On 2006-11-28 at 10:29:19Z `OEM 1024 ID 229 EXCEPTION SPI1 PARTIAL FLAG OVERFLOW` was received. This was just before radiation belt entry of revolution 503. As this was a single occurrence, no action was taken.
- On 2006-11-28 at 12:50:59Z the TM parameter E4009 S DF HSLERR L went OOL High (value = 1) indicating that the number of erroneous HSL transfers in the previous second exceeded the threshold. It returned within limits at 12:51:07Z. This was just before LOS of revolution 503.
- On 2006-11-29 between 11:13:42Z and 11:14:47Z, 17 occurrences of the following pair of OEMs were received:

```
APID 1024  ID   224     EXCEPTION   SPI1 SW ERROR
      FIX6     0
      E9079    MESS CLASS           1
      E9080    MESS ID              224
      E9777    FAULTY TASK ID       3
      FIX16    0
 APID 1024  ID    7    EXCEPTION   SPI1 CONSTRAINT DPE CULPR
      E9073    TASK ID 6            IASW TASK 3
      E9079    MESS CLASS           1
      E9080    MESS ID              7
      E9076    OUT RANGE VALUE      4097
      E9067    LOGICAL ADDRESS      11637
```

indicating a problem with the Spectra Transmitter task. This was in the first science pointing after the OMC Flat Field Calibration, ~10 minutes after the TM allocation had been changed from 85 packets/cycle back to 105

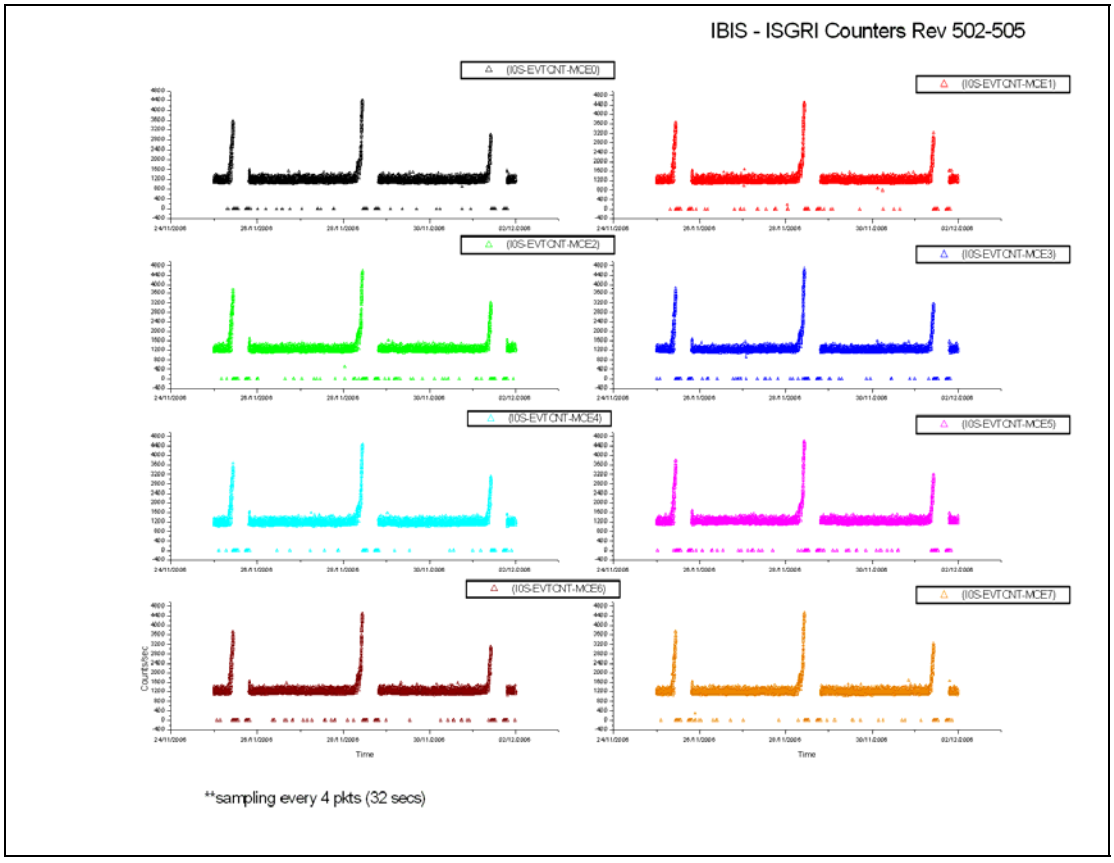
packets/cycle. It is usual to get these OEMs in this situation and they stopped of their own accord.

- On 2006-11-30 at 07:41:45 Z TM parameter E0359 U AF DCOUTPT L9 went OOL Low (value = -2.4128V). This is the Detector #9 DC output voltage. It returned within limits when the next packet was received at 07:52:25Z.
- On 2006-12-01 at 08:19:04 Z the TM parameter E3500 P_DF_CNVT-BW_L starting going OOL High. This was ~2 hours before radiation belt entry of revolution 504. No action was taken.
- On 2006-12-01 at 17:16:03Z the TM parameter E4009 S DF HSLERR L went OOL High (value = 1) indicating that the number of erroneous HSL transfers in the previous second exceeded the threshold. It returned within limits at 17:16:11Z. This was at AOS of revolution 505.
- TM parameter E2116 T AS PSAC L2 (Plastic Scintillator temperature) went OOL Low several times during the week. No action was taken as this is a known and recurring problem due to this thermistor being unreliable. The limit conditions for this parameter will be updated in the next IODB release.

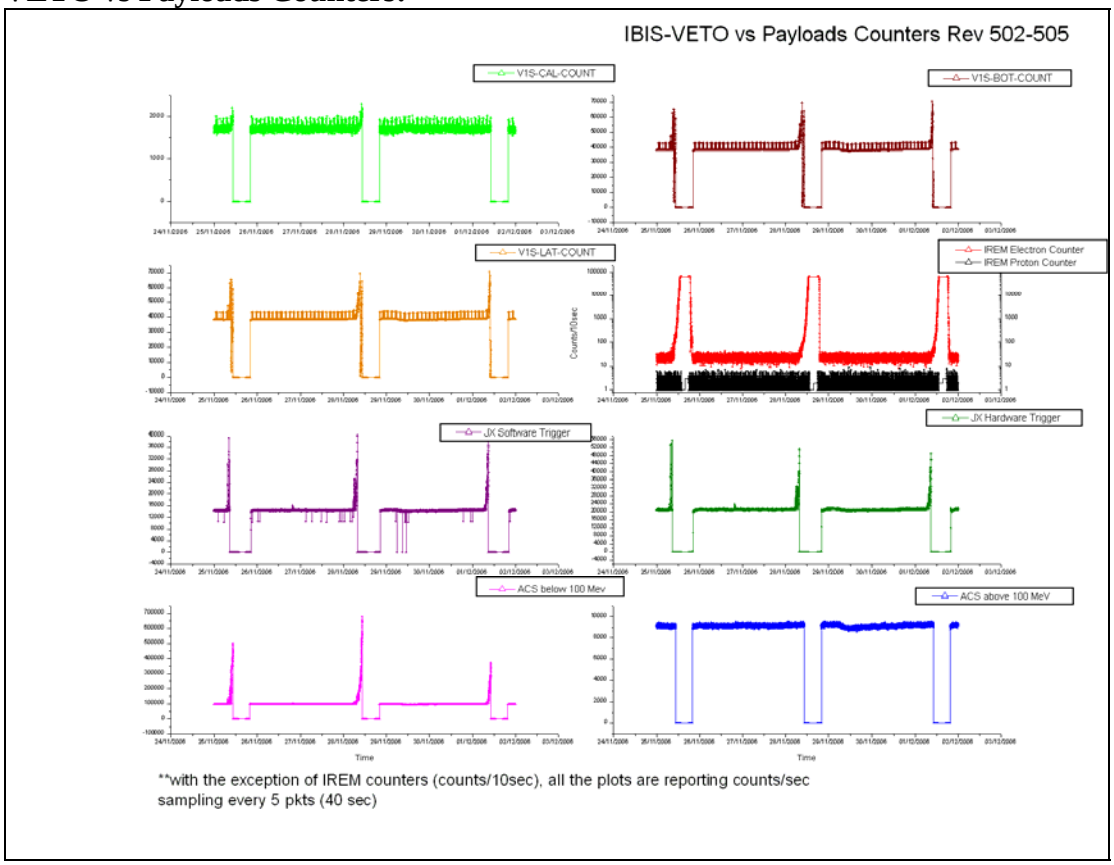
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

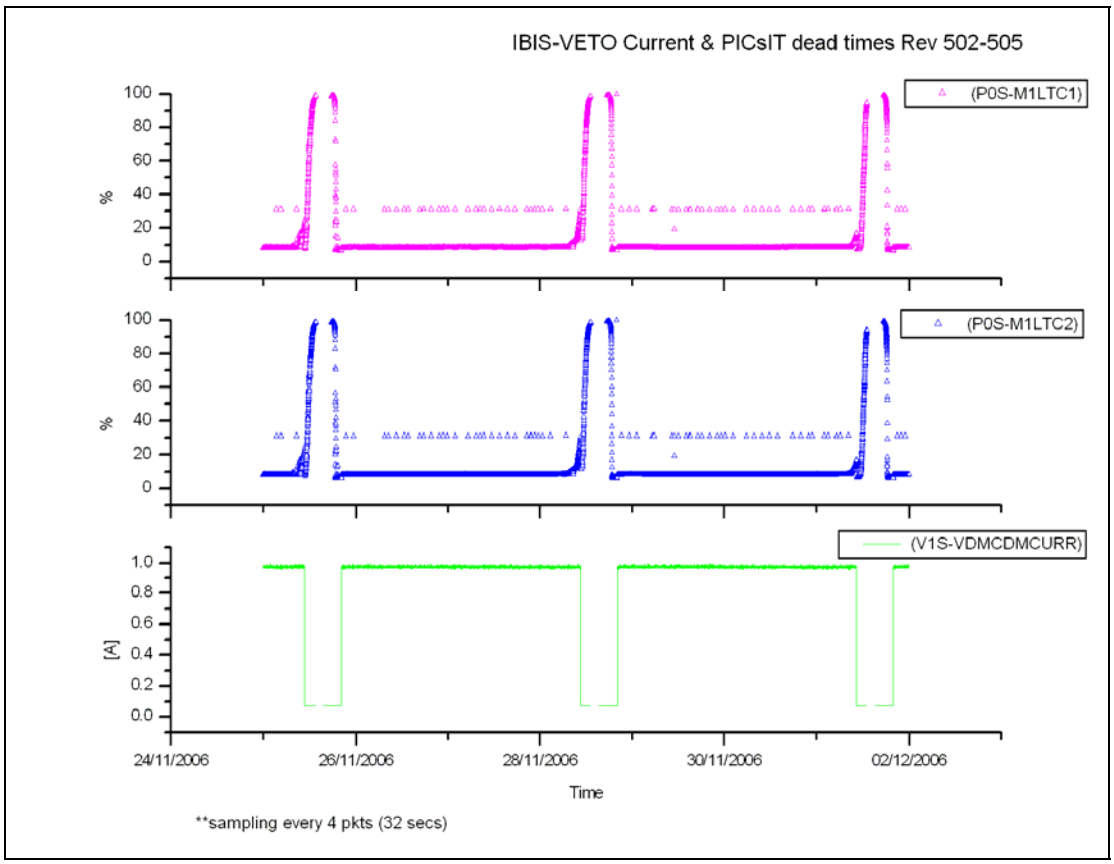


VETO vs Payloads Counters:

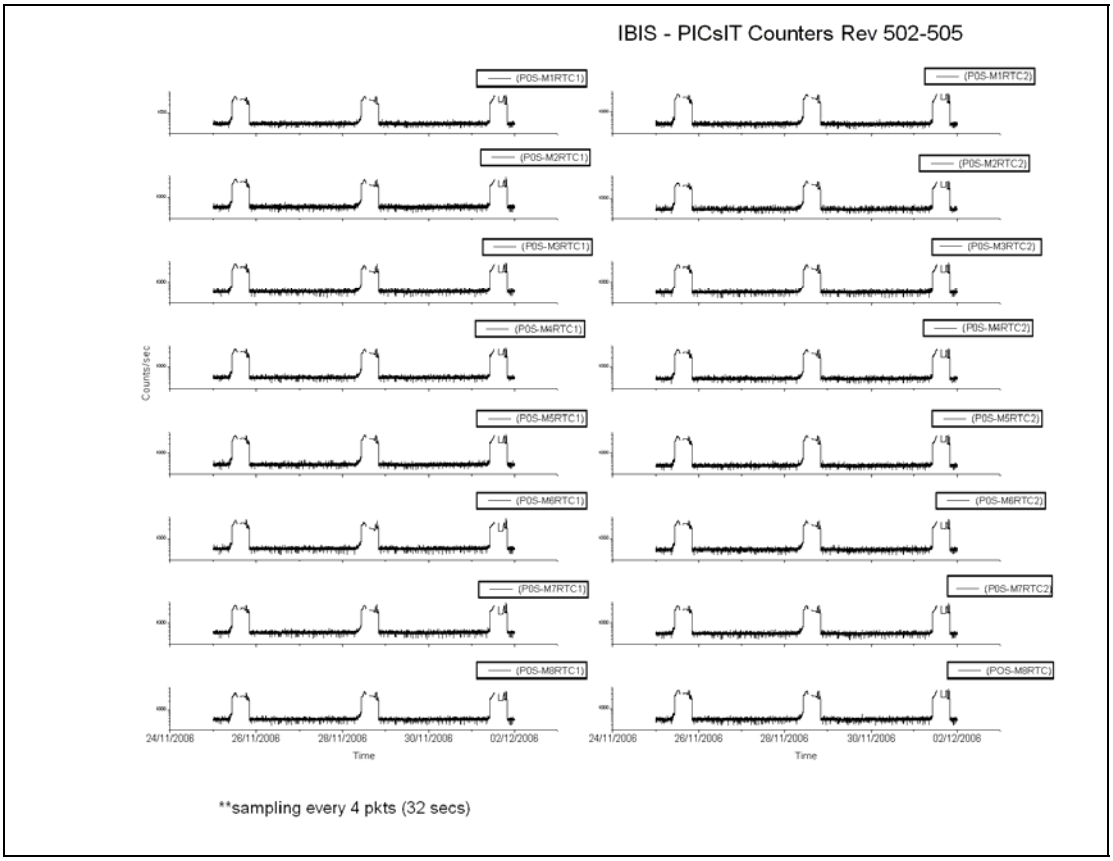


The week was characterised by low radiation.

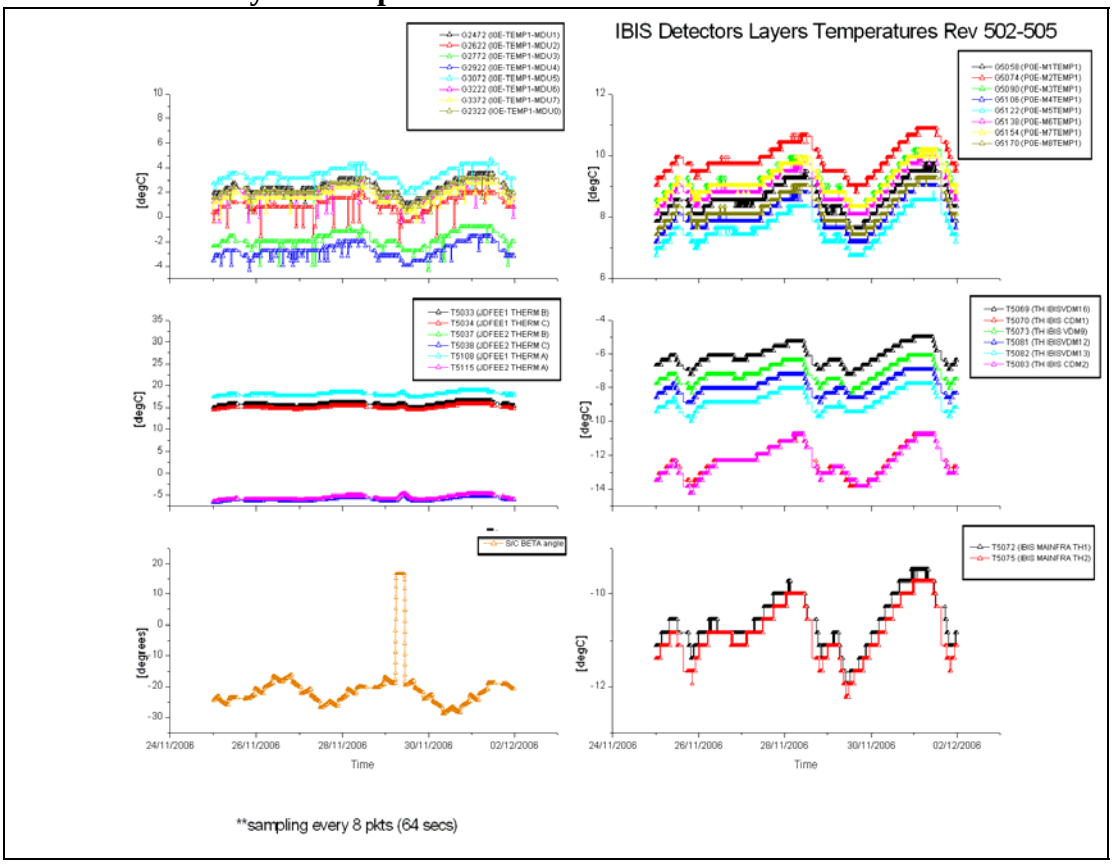
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), families G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2), families G2014 (I0E-OVFWPXADD-Mi) were reported at Radiation Belts passage.

DoY 2006.329 (25/11/20006):

At 07:35Z TM parameter G8080 went OOL High. It kept toggling until Radiation Belts entry at 10:44Z. According to H-OVF-2, no action was taken.

At 08:40Z TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were reported Out Of Limit high due to high radiation when approaching the Radiation Belts. The values kept increasing until 09:41Z when the counters wrapped around and were reported Out Of Limits Low. According to V-BOT-1 and V-LAT-1 no action was taken. At 10:44Z VETO went into Stand-By mode as automatic reaction to Broadcast Packet at Belts Entry.

At 09:28Z, TM family G2013 (I0S-EVTCNT-MCEi) went OOL High and kept toggling until 10:44Z when IBIS went automatically into Stand-By mode due Radiation Belts entry. According to I-CNT-1, no action was taken.

DoY 2006.332 (28/11/20006):

At 07:43Z TM parameter G8080 went OOL High. It kept toggling until Radiation Belts entry at 10:34Z. According to H-OVF-2, no action was taken.

At 08:06Z TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were reported Out Of Limit high due to high radiation when approaching the Radiation Belts. The values kept increasing until 09:15Z when the counters wrapped around and were reported Out Of Limits Low. According to V-BOT-1 and V-LAT-1 no action was taken. At 10:34Z VETO went into Stand-By mode as automatic reaction to Broadcast Packet at Belts Entry.

At 09:27Z, TM family G2013 (I0S-EVTCNT-MCEi) went OOL High and kept toggling until 10:34Z when IBIS went automatically into Stand-By mode due Radiation Belts entry. According to I-CNT-1, no action was taken.

DoY 2006.335 (01/12/20006):

At 09:11Z TM parameter G8080 went OOL High. It kept toggling until Radiation Belts entry at 10:44Z. According to H-OVF-2, no action was taken.

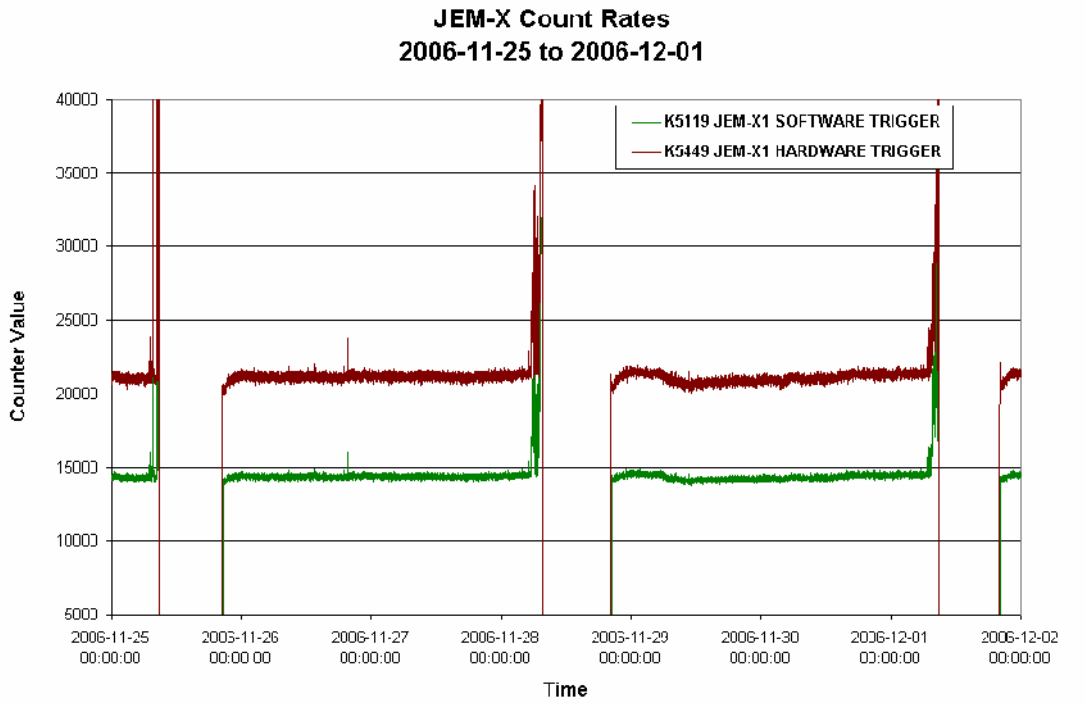
At 09:13Z TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) were reported Out Of Limit high due to high radiation when approaching the Radiation Belts. The values kept increasing until 09:54Z when the counters wrapped around and were reported Out Of Limits Low. According to V-BOT-1 and V-LAT-1 no action was taken. At 10:22Z VETO went into Stand-By mode as automatic reaction to Broadcast Packet at Belts Entry.

At 09:33Z, TM family G2013 (I0S-EVTCNT-MCEi) went OOL High and kept toggling until 10:22Z when IBIS went automatically into Stand-By mode due Radiation Belts entry. According to I-CNT-1, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

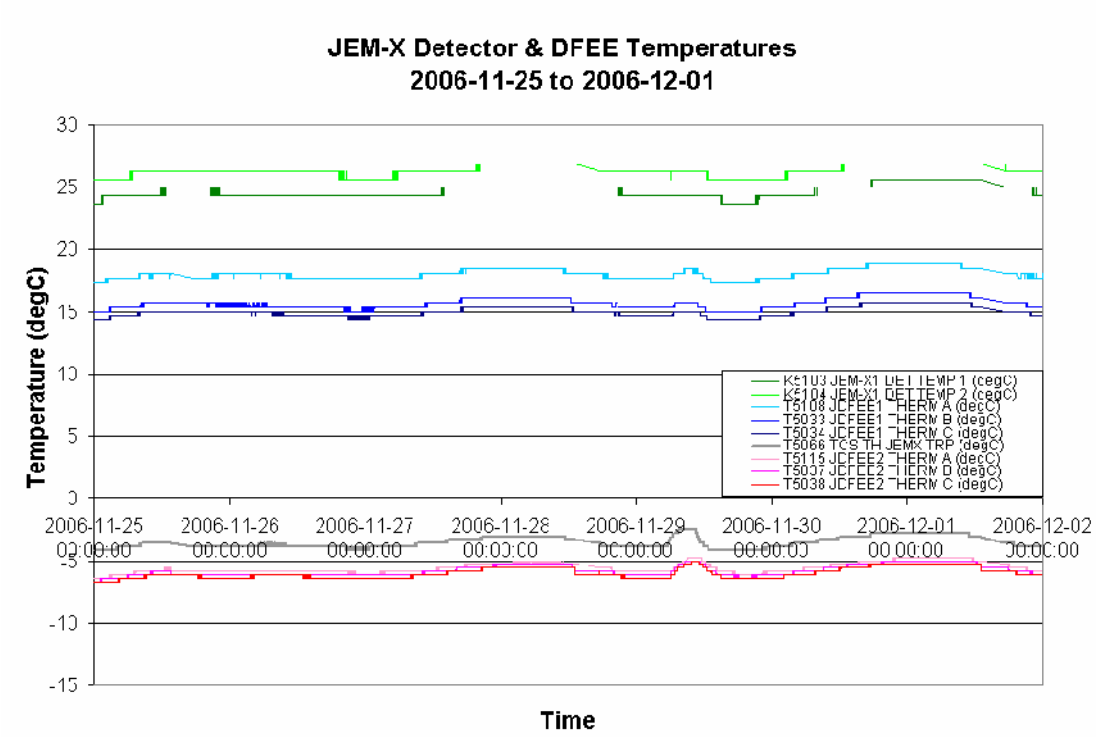
JEM-X count rates over the reporting period are displayed in the following graph[1].



JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph[2].

[1] Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.
[2] Data sampled (1 frame in 8)



JEM-X Daily Report

2006-11-25 (DOY 329, Rev 502-503)

Due to high background radiation conditions before the expected radiation belt entry of revolution 502, at 07:33:39Z the TM parameter K5449 HARDWARE TRIGGER began to go Out of Limits High. At 07:38:11Z K5136 BUFFER LOSS started toggling OOL High and at 08:22:19Z K5119 SOFTWARE TRIGGER also began to go OOL High. At 08:40:39Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Software Ratemeter. This was ~1 hour before the planned transition to Safe mode before radiation belt entry. OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) was received at this time, as the TM parameter K5462 DFEE STATE IASW was reporting state Setup while K5022 DFEE STATUS was Safe.

At 08:44:44Z FCP_JEM1_0040 was executed, setting K5462 DFEE STATE IASW to Safe as well and OEM 254 ERROR OFF was received.

JEM-X1 operations continued nominally.

2006-11-26 (DOY 330, Rev 503) to 2006-11-27 (DOY 331, Rev 503)

JEM-X operations executed nominally.

2006-11-28 (DOY 332, Rev 503-504)

Due to high background radiation conditions before the expected radiation belt entry of revolution 503, at 05:59:07Z the TM parameter K5449 HARDWARE TRIGGER began to go Out of Limits High. At 07:38:27Z K5119 SOFTWARE TRIGGER also

went OOL High and at 07:39:55Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Software Ratemeter. This was ~2 hours before the planned transition to Safe mode before radiation belt entry. OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) was received at this time, followed immediately by OEM 254 ERROR OFF, as both TM parameters K5462 DFEE STATE IASW and K5022 DFEE STATUS were reporting state Safe.

JEM-X1 operations continued nominally.

2006-11-29 (DOY 333, Rev 504) to 2006-11-30 (DOY 334, Rev 504)

JEM-X operations executed nominally.

2006-12-01 (DOY 335, Rev 504-505)

Due to high background radiation conditions before the expected radiation belt entry of revolution 504, at 08:08:36Z the TM parameter K5449 HARDWARE TRIGGER began to go Out of Limits High and from 08:13:00Z to 08:14:12Z K5136 BUFFER LOSS was OOL High. At 08:45:00Z K5119 SOFTWARE TRIGGER also began to toggle OOL High and at 08:57:40Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Software Ratemeter. This was ~30 minutes before the planned transition to Safe mode before radiation belt entry. Two occurrences of OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) were received at this time, as the TM parameter K5462 DFEE STATE IASW was reporting state Setup while K5022 DFEE STATUS was Safe.

At 09:26:35Z the ED KESAFE02 was executed from the Timeline, setting K5462 DFEE STATE IASW to Safe as well and OEM 254 ERROR OFF was received.

JEM-X1 operations continued nominally.

8.3.5 OMC Operations

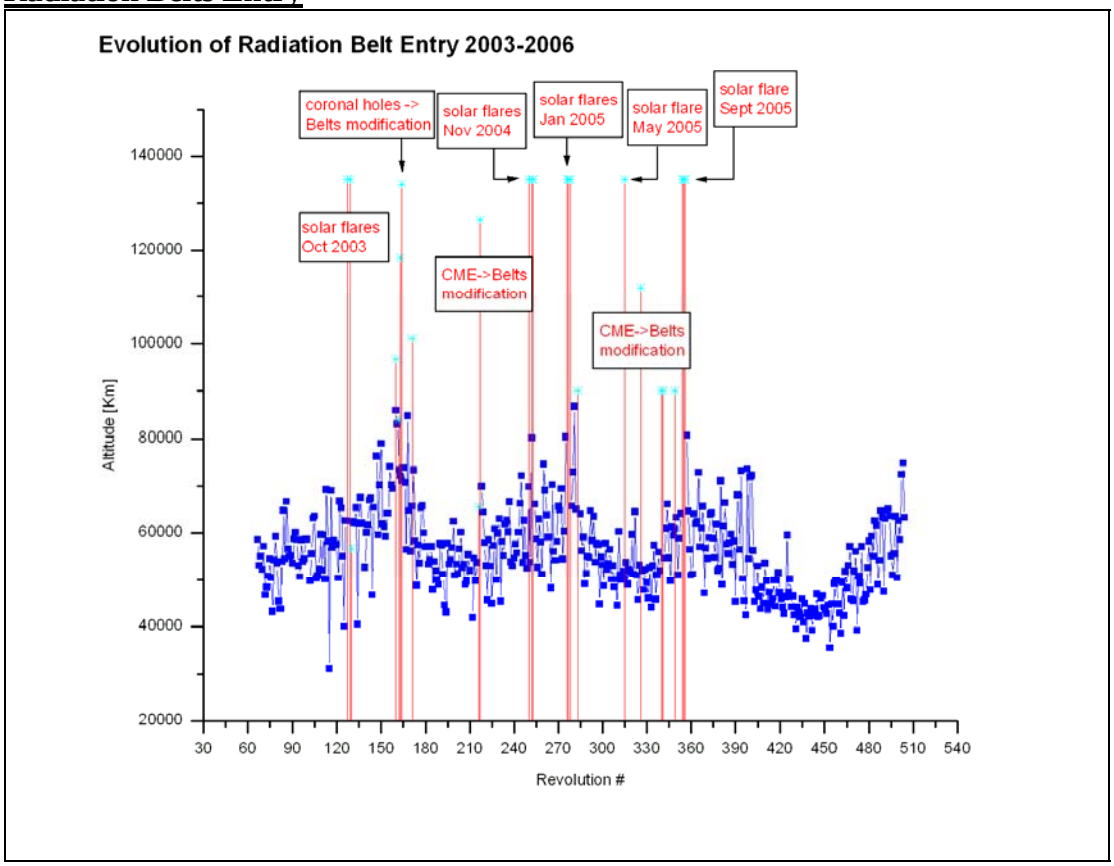
2006-11-25 (DOY 329, Rev 502) to 2006-12-01 (DOY 335, Rev 505)

Nothing to report

On DoY 329 at 10:44:53, DoY 332 at 10:34:38 and DoY 335 at 10:22:30 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

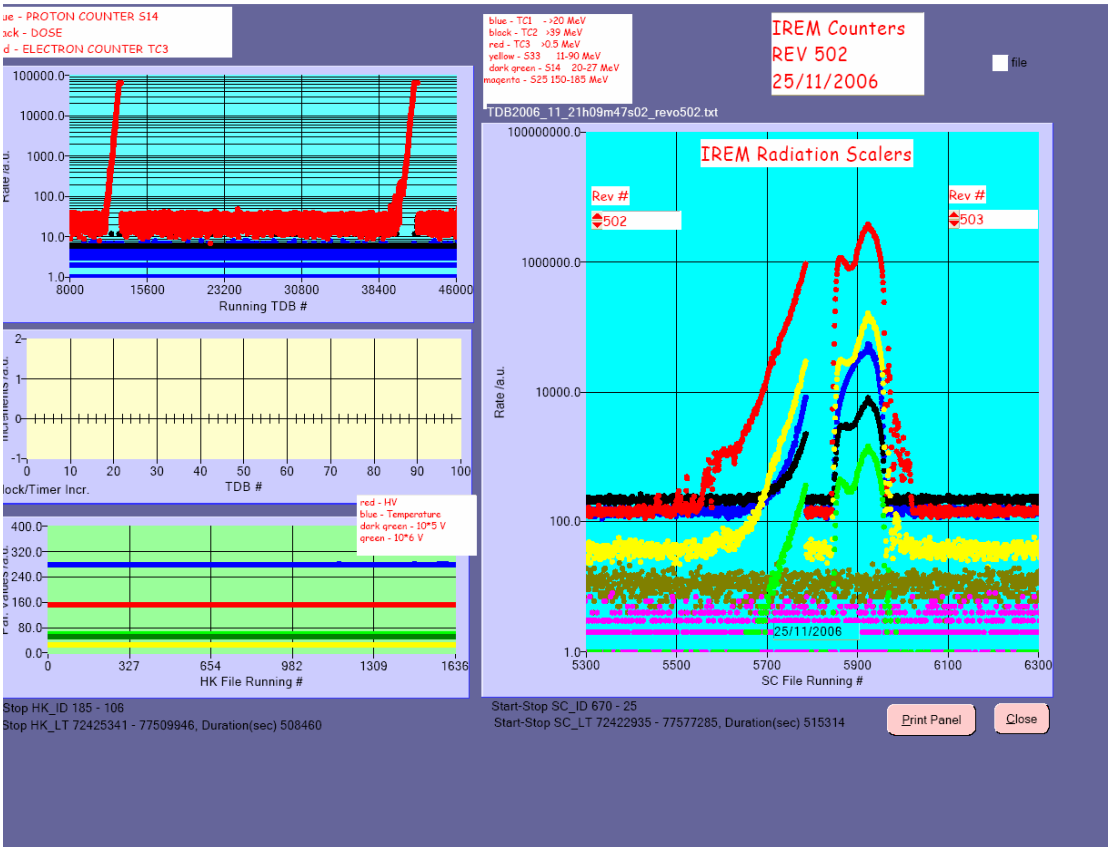
Nothing to report

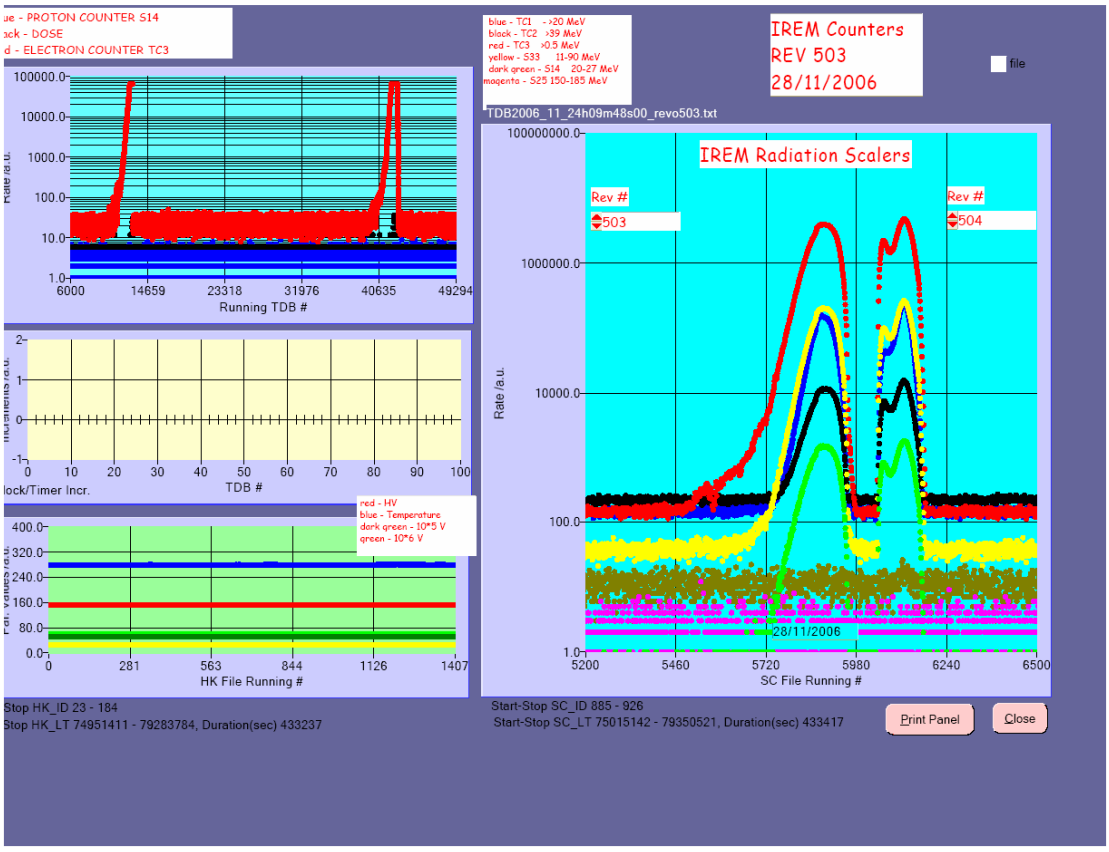
Electron Belts

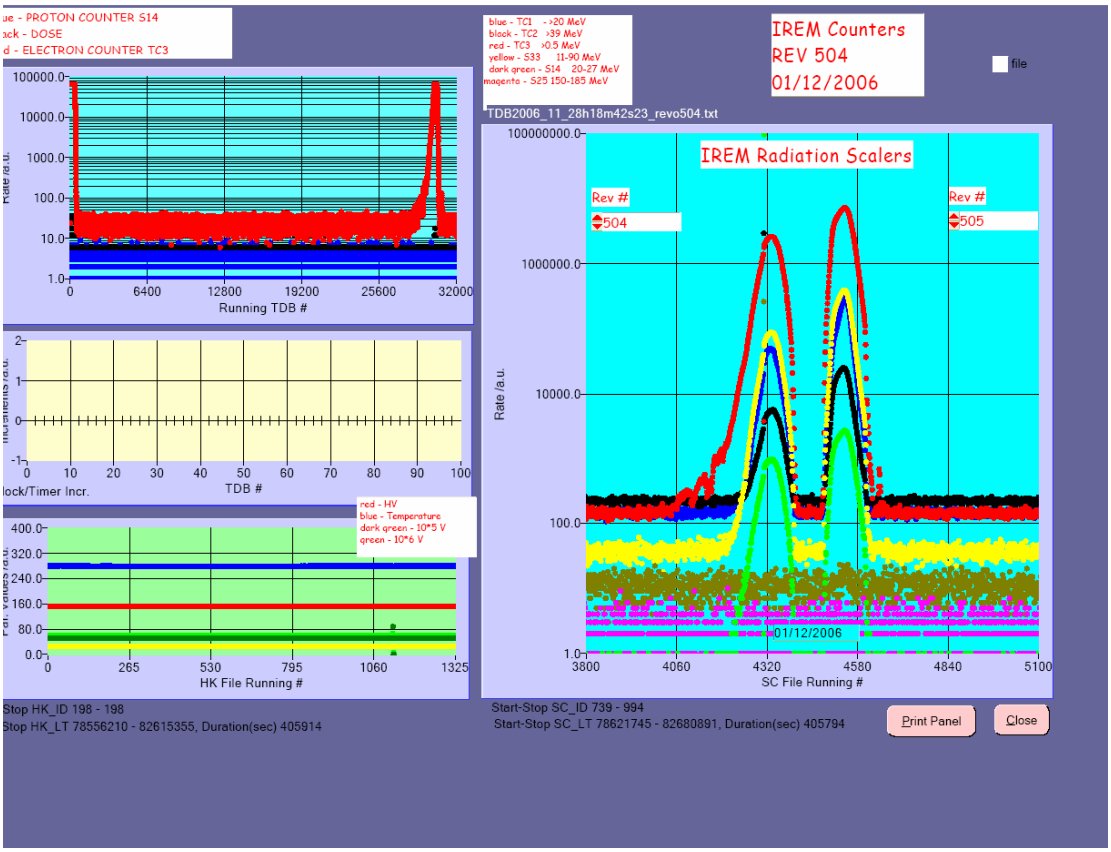
REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
502	RAD_ENTR R 2006-11-25T10:44:45Z	2006-11-25 08:23:24	72446.0	2006-11-25 11:31:32	49615
503	RAD_EXIT R 2006-11-25T20:05:20Z	2006-11-25 19:36:04	<<47079.0	2006-11-25 19:41:32	41635
503	RAD_ENTR R 2006-11-28T10:34:32Z	2006-11-28 07:56:36	74834.3	2006-11-28 11:18:49	49831
504	RAD_EXIT R 2006-11-28T19:55:05Z	2006-11-28 18:49:40	<<47052.5	2006-11-28 19:28:49	41387
504	RAD_ENTR R 2006-12-01T10:22:23Z	2006-12-01 09:28:12	63377.4	2006-12-01 11:08:49	49375
505	RAD_EXIT R 2006-12-01T19:43:27Z	2006-12-01 19:01:24	<<47024.1	2006-12-01 19:18:49	41823

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:

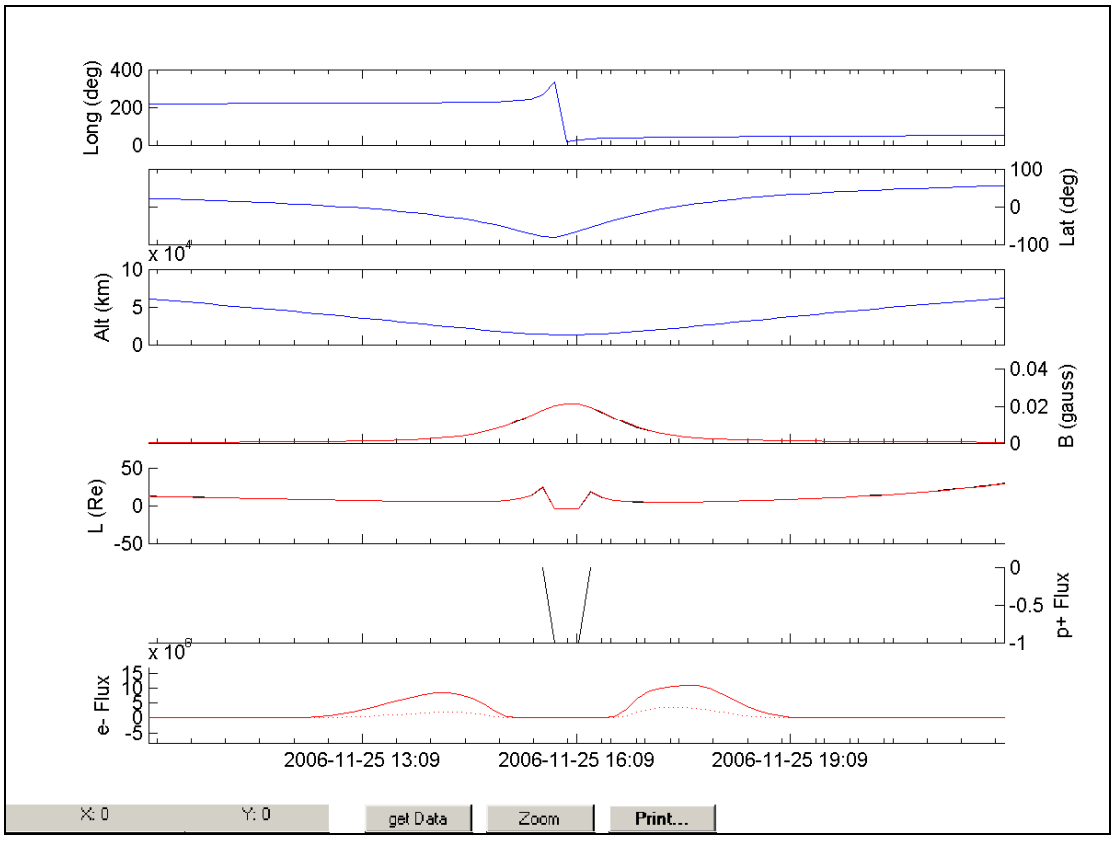




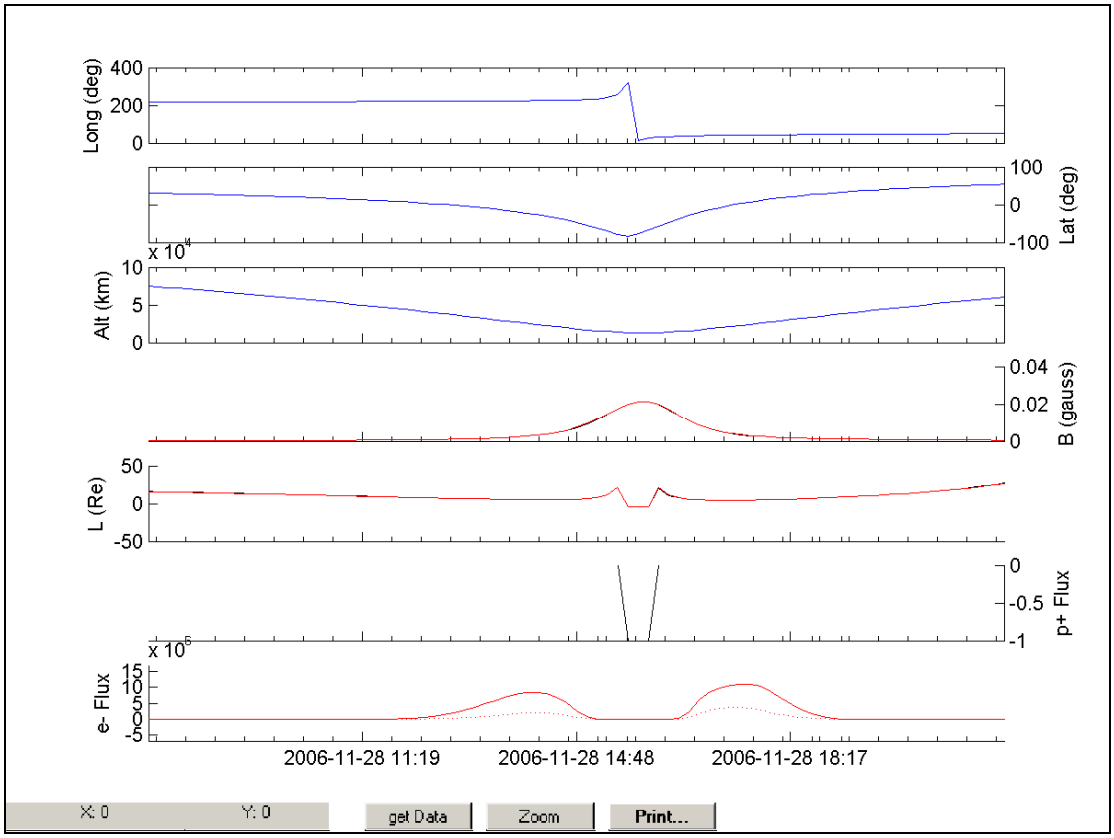


IREM Predicted Radiation Belt Passages

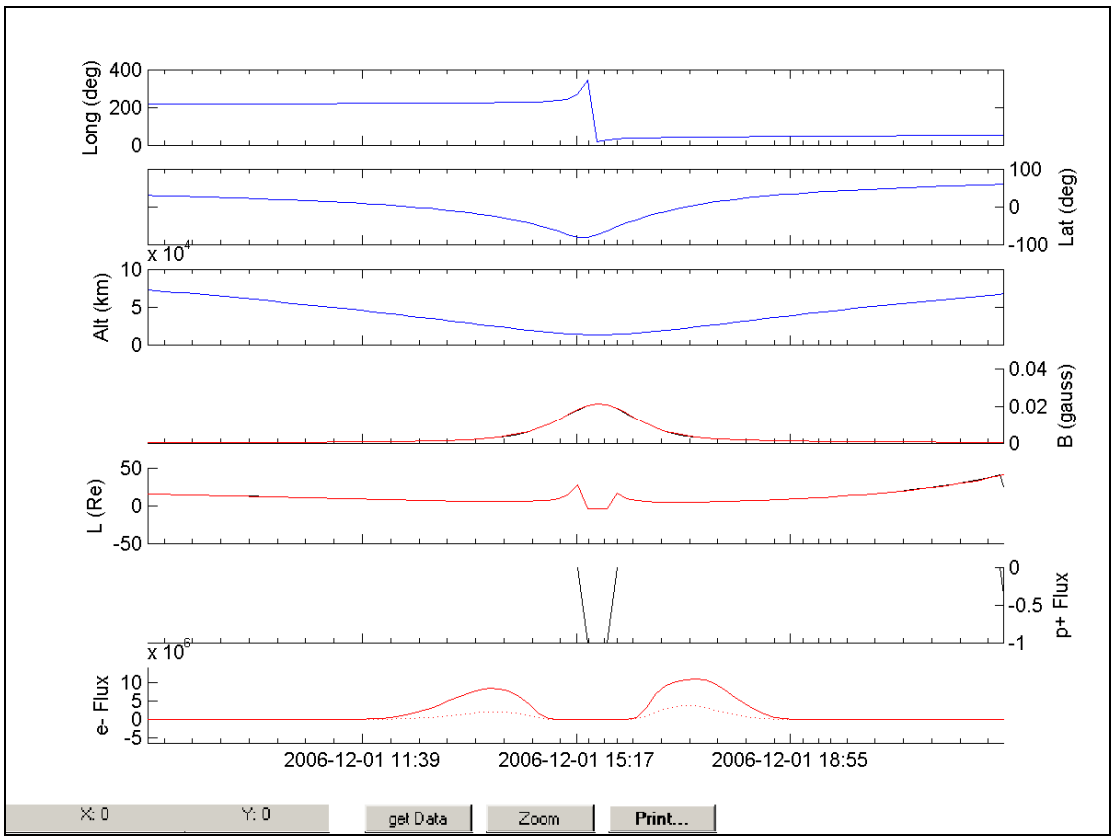
Rev 502



Rev 503



Rev 504



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

The plots are missing due to problems with the SEIS tool.