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

INTEGRAL
Mission Report

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

No. 244
Week 21

29.05.07

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 19.05.07 until 25.05.07 (both dates inclusive) and covers the revolutions 562 and 563.

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 a Fine Sun Sensor & Star TRacker misalignment, plus Sun Acquisition Sensor calibration (RA 21:40:00.00, DEC +53:00:00.0), two hexagonal dithers of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6) and a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7).

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.

Four slews were missed from TL during the observation period, due to problems with the ground stations.

The fuel consumption over the period between 19/05/2007 and 25/05/2007 was 0.1371 Kg. The remaining propellant is in the order of 146.3172 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

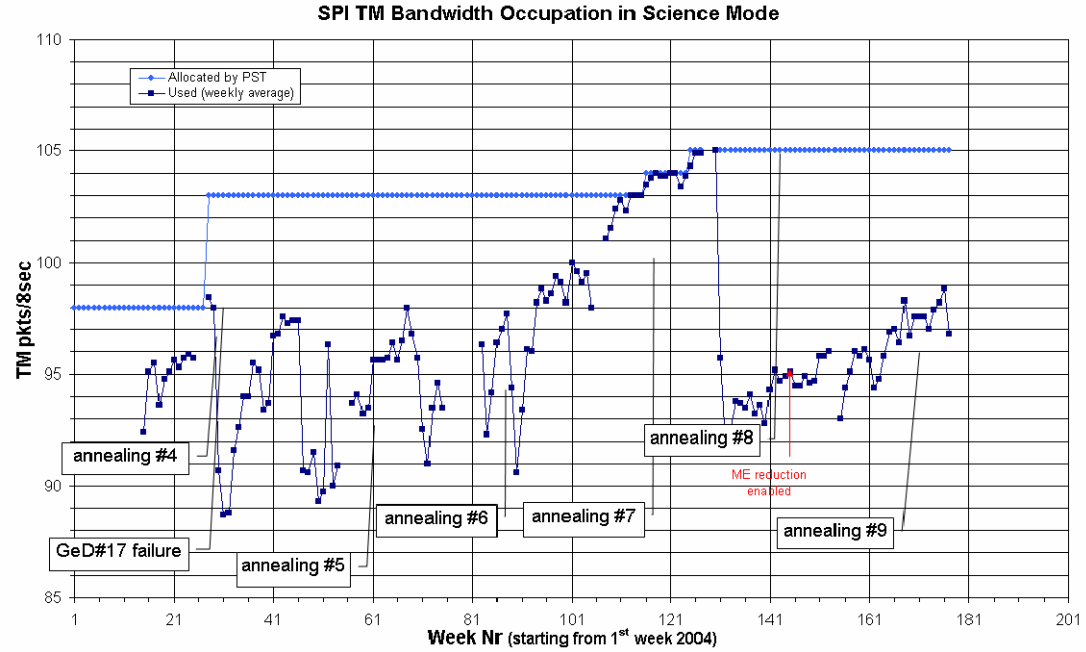
3.2.1 SPI

Following the 9th annealing, which ended on 22nd December, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). The energy resolution of GeD#4 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. The stroke of all four compressors has remained at 41 since 2007-05-10 at 07:33Z.

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. The average telemetry occupation when the TM allocation was 105 packets/cycle was 96.8 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.

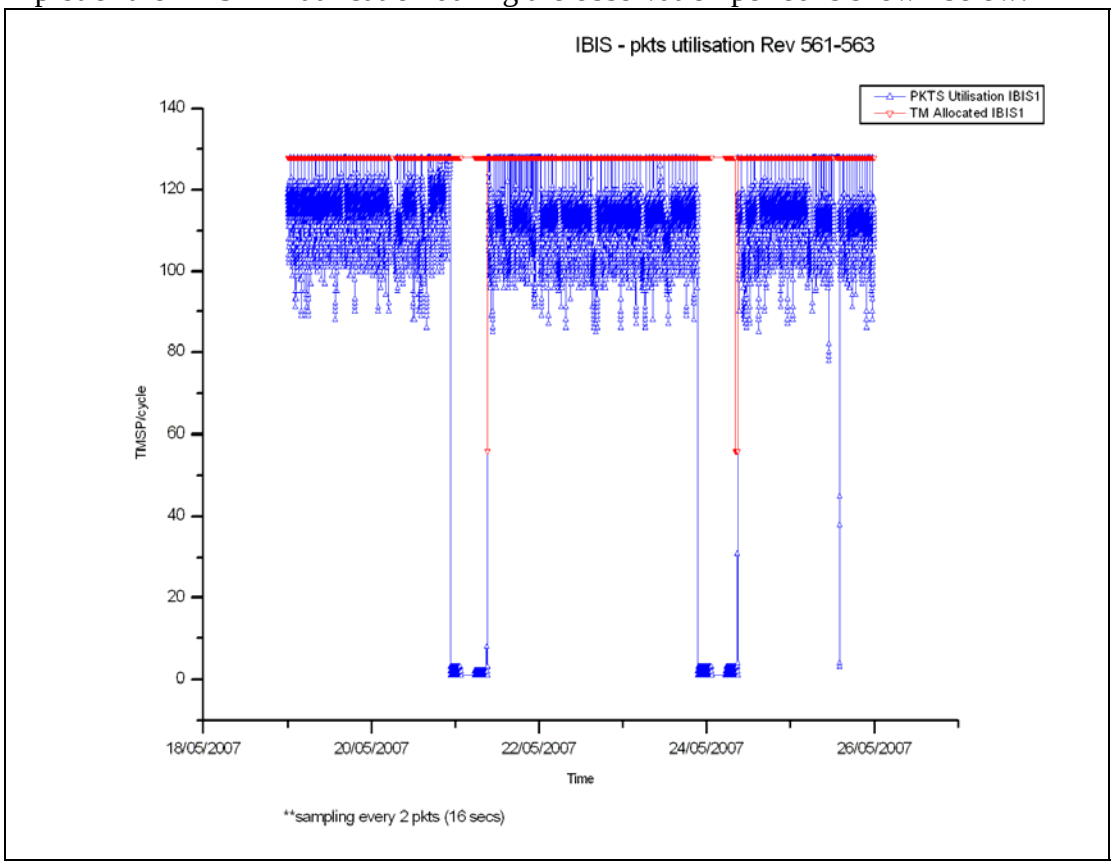
3.2.2 IBIS

The overall status of the unit is nominal.

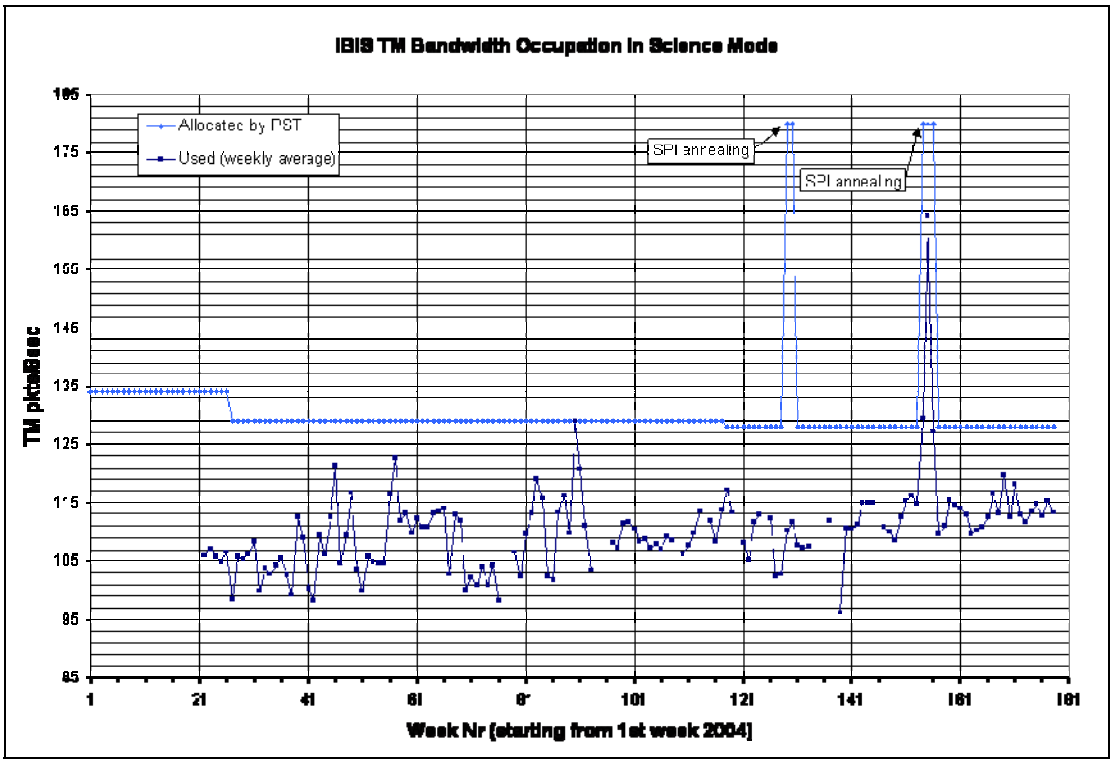
On 23/05/2007 at 21:33Z, the IREM SEU #48 occurred forcing IBIS into a Safe mode. As this happened 1hour before Belts entry, no recovery was performed on the instrument.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 113.30 TMPS/cycle, down 1.77 on last week.

A plot of the IBIS TM utilisation during the observation period is shown below:



A plot of the IBIS weekly bandwidth utilisation since 2004 is shown below:



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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle during science observations. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

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, 142 of the 150 planned science pointings for OMC were executed nominally, 6 were lost and 2 were shortened.

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.

On 2007-05-23 at 21:33Z the IREM reset #48 occurred. The unit was recovered as per procedure at 23.28Z.

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

Most of the week, sunspot 956 was present on the surface of the Sun. It posed threat for M-class solar flares on 19/05/2007, and then it was decaying. From 22/05/2007 it posed no more threat.
On 25/05/2007, 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 good this week. Four pointings were lost to ground problems. However, the overall performance was still over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was very good this week. No problems were reported. The overall performance was well over the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was not very good this week. There were, however, 3 occasions of data drops from Redu, all without impact, 8 occasions of data drops from DSS-24, including a whole pass, which resulted in the loss of 2 pointings, and 5 occasions from DSS-27, which resulted in the loss of 2 further pointings as well as the OMC component of a third. The overall performance was still over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs are available up to revolution 571. Observations have been planned and send to MOC for revolutions 565 up to and including revolution 569. SPI annealing starts in 565 and all observations have been planned with TM allocations similar to those used during previous annealings.

TSFs up to revolution 565 have been received.

2. Observation status

ECS files have been received up to revolution 556, with revolution 552 still missing; ECS files have been processed up to revolution 554 (except 552, see above).

3. ISOC Science Data Archive

The Archive Team (AT) is losing both database experts at the same time in a short time, i.e., next week. This will undoubtedly cause some problems, but there is no easy way out.

4. ISOC system

Version 14.5.2 was formally released the week before, but for technical reasons the operational system was rolled back to 14.5. Work is still ongoing on V15, but de-scoped at last CCB (due to unforeseen extra work) with follow-up releases 15.1 and 15.2 already scoped for nearer future.

5. Problems

No problems, except for loss of database experts in the AT.

4.3.2 ISDC

Status of ISDC observation processing on 28/05/2007:

- Latest Standard Analysis completed: observation 04200160003 (SGR1806-20, Revolution 547) on 20/05/2007.

- Latest products archived: observation 04200080003 (Orion OB1, Revolution 548 & 551) on 20/05/2007.

- Latest observation products sent to the observer: observation 04200340020 (GRS 1915+105, Revolution 551) on 18/05/2007.

5 Special Events

6 Anomalies

The following problems were reported that impacted operations:

- On DoY 140, at 06:10, after the handover from Redu, there was no TM or TC from DSS-24. After some confusion over station availability, the links were switched back to Redu, and a recovery performed. The Timeline was rejoined at 07:46. The impact was the loss of pointing 05610045 & 05610046.
- On DoY 141, at 12:24, a brief TM drop from DSS-27 caused the OMC commands for pointing 05620005 to fail. The impact was the loss of that pointing for the OMC instrument only. The corresponding DR# is N104354.
- On DoY 145, at 12:36, the loss of TM & TC from DSS-27 caused the Timeline to be suspended. At 13:11, the links were switched to Redu, and a recovery performed. The Timeline was rejoined at 13:47. The impact was the loss of pointings 05630029 & 05630030.

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

AR id	Date Created	Subject	Segment	Status
INT_SC-190	31/05/2007	IREM Anomaly: Reset of IREM_CSCI S/W #48, 23/05/2007	Payload	Open

7 Future Milestones

The following activities are foreseen in the next few weeks.

- Periodic Thruster Torque rescaling 24th July 2007 Rev. 583
- On Board Clock wrap around due in Rev. 585.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 562

The observations in revolution 562 began with a Fine Sun Sensor & Star TRacker misalignment, plus Sun Acquisition Sensor calibration, which was a custom pointing at attitude (RA 21:40:00.00, DEC +53:00:00.0), lasting ~12.6 hours. It continued with a hexagonal dither of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6), lasting ~41.7 hours, until the end of the revolution.

Revolution 563

The observations in revolution 563 began with a hexagonal dither of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6), lasting ~18.9 hours. They continued with a raster dither of the Galactic Plane Region 4 (RA 21:44:04.54, DEC +53:09:58.7), lasting ~35.1 hours, until the end of the revolution.

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.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2007-05-06T08:03:16.000Z     146.6771    F   Automatic TM processing.
2007-05-06T16:14:21.000Z     146.6410    F   Automatic TM processing.
2007-05-09T07:38:43.000Z     146.6192    F   Automatic TM processing.
2007-05-09T10:32:20.000Z     146.5987    F   Automatic TM processing.
2007-05-10T22:14:07.000Z     146.5616    F   Automatic TM processing.
2007-05-12T06:56:59.000Z     146.5438    F   Automatic TM processing.
2007-05-12T15:49:32.000Z     146.5271    F   Automatic TM processing.
2007-05-15T06:44:42.000Z     146.4902    F   Automatic TM processing.
2007-05-16T16:15:02.000Z     146.4690    F   Automatic TM processing.
2007-05-18T06:30:34.000Z     146.4543    F   Automatic TM processing.
2007-05-19T16:21:01.000Z     146.4186    F   Automatic TM processing.
2007-05-21T06:19:55.000Z     146.3921    F   Automatic TM processing.
2007-05-21T23:44:52.000Z     146.3551    F   Automatic TM processing.
2007-05-24T06:05:14.000Z     146.3398    F   Automatic TM processing.
2007-05-25T06:35:41.000Z     146.3172    F   Automatic TM processing.

This report was generated  Fri May 25 08:00:23 GMT 2007
```

8.3 Detailed Satellite Information

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

8.3.1 AOCS SUMMARY OPERATIONS REPORT, 19/05/2007 –25/05/2007

AOCS operations were executed from the Automatic Timeline.

During this period, 72 Open Loop Slews, 84 Closed Loop Slews and 5 Momentum Biases were executed.

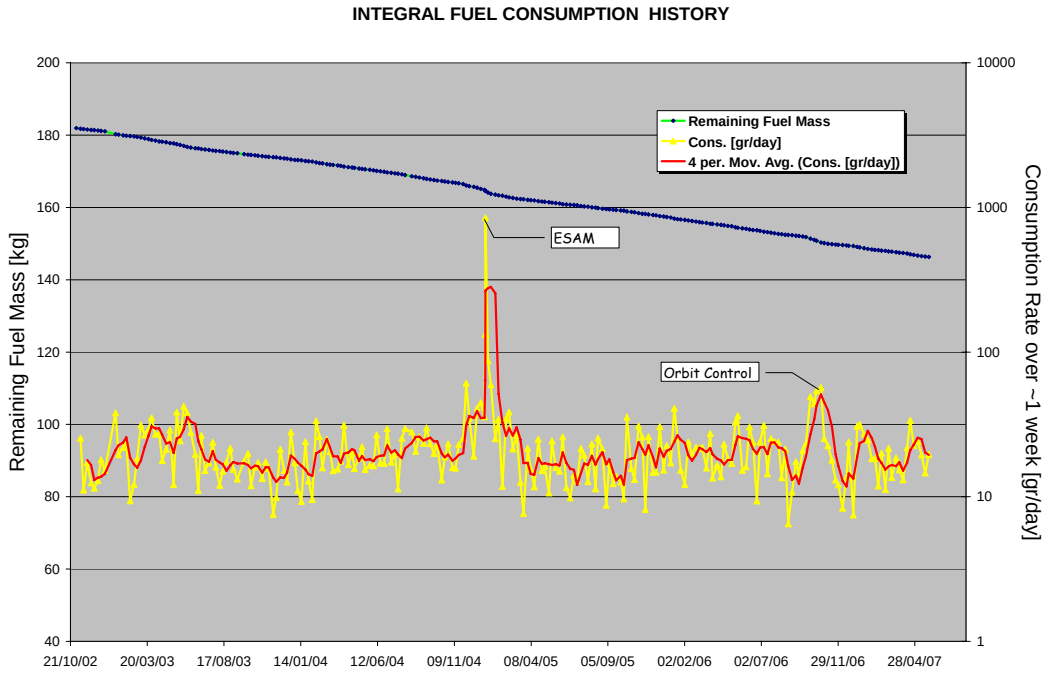
4 (CSL) slews were missed from TL, during the observation period, due to problems with the ground stations, slew IDs 05610046, 05610047, 05630029 & 05630030.

Orbit Control

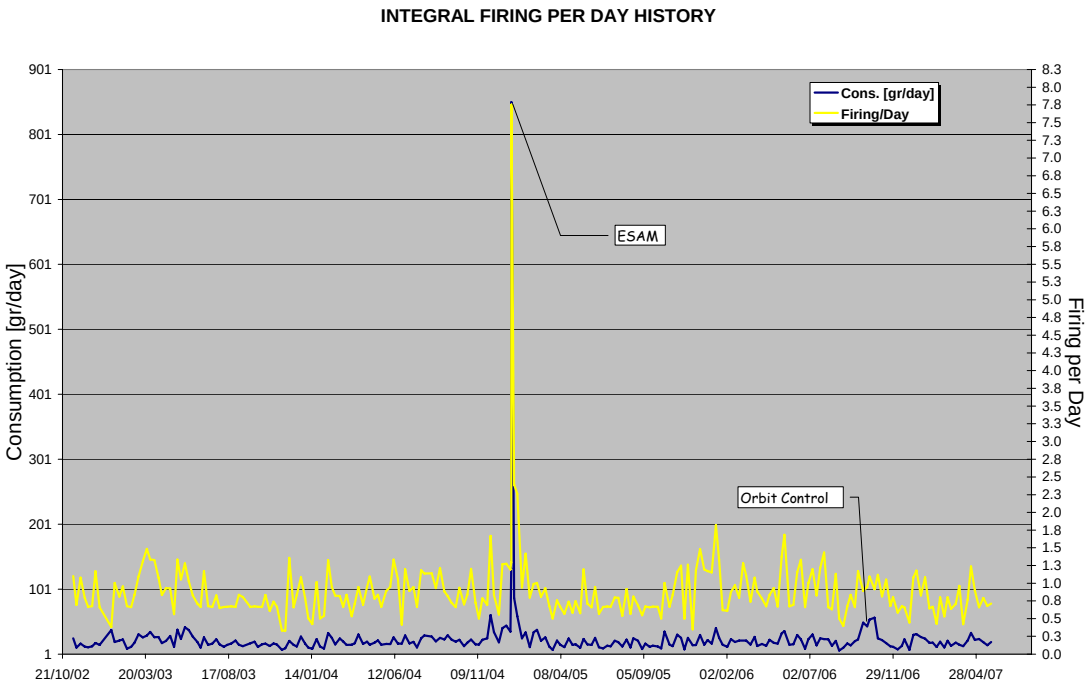
No update.

Fuel consumption

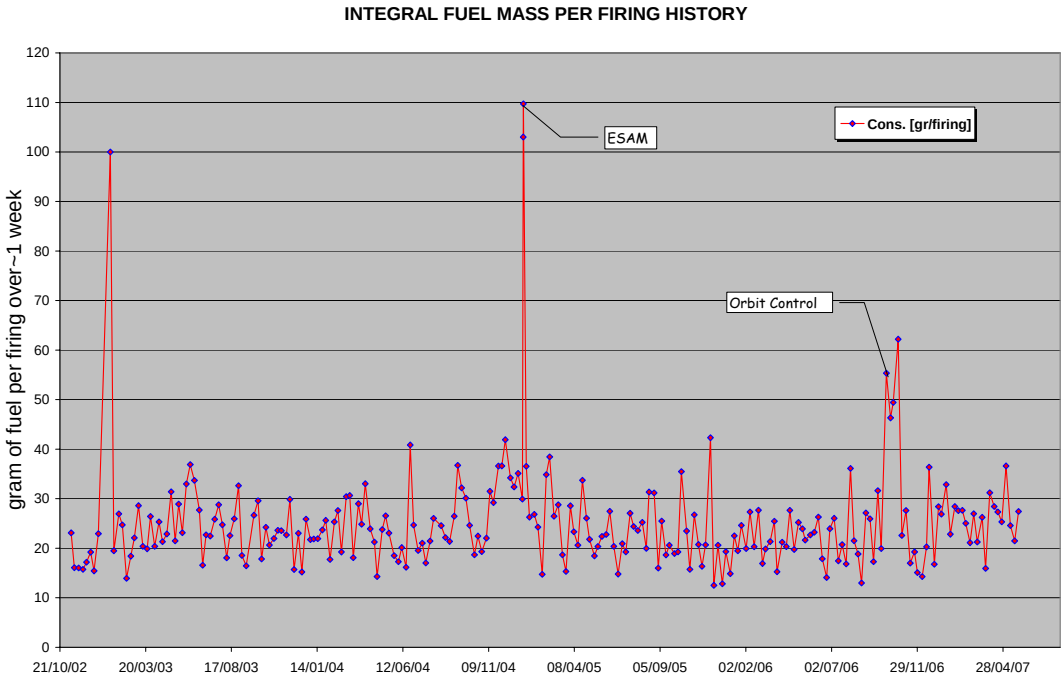
The fuel consumption (total, grams per day) over the period between 01/11/2002 and 25/05/2007 is reported in the plot below.



The firing per day over the period between 01/11/2002 and 25/05/2007 is reported in the plot below.

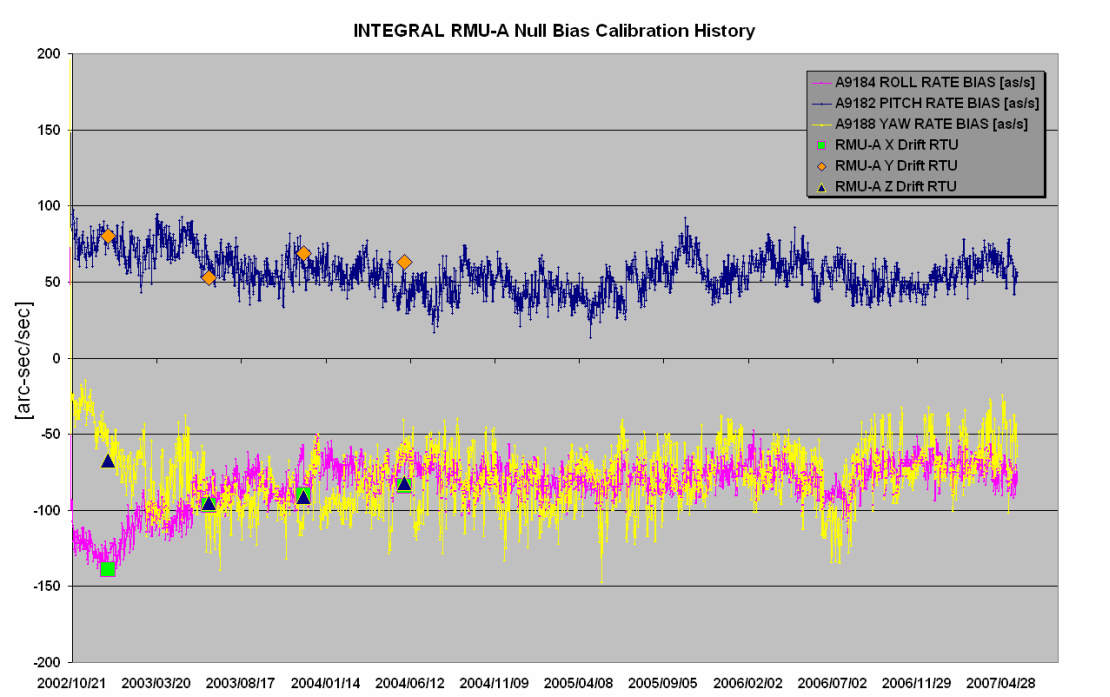


The fuel per firing over the period between 01/11/2002 and 25/05/2007 is reported in the plot below.

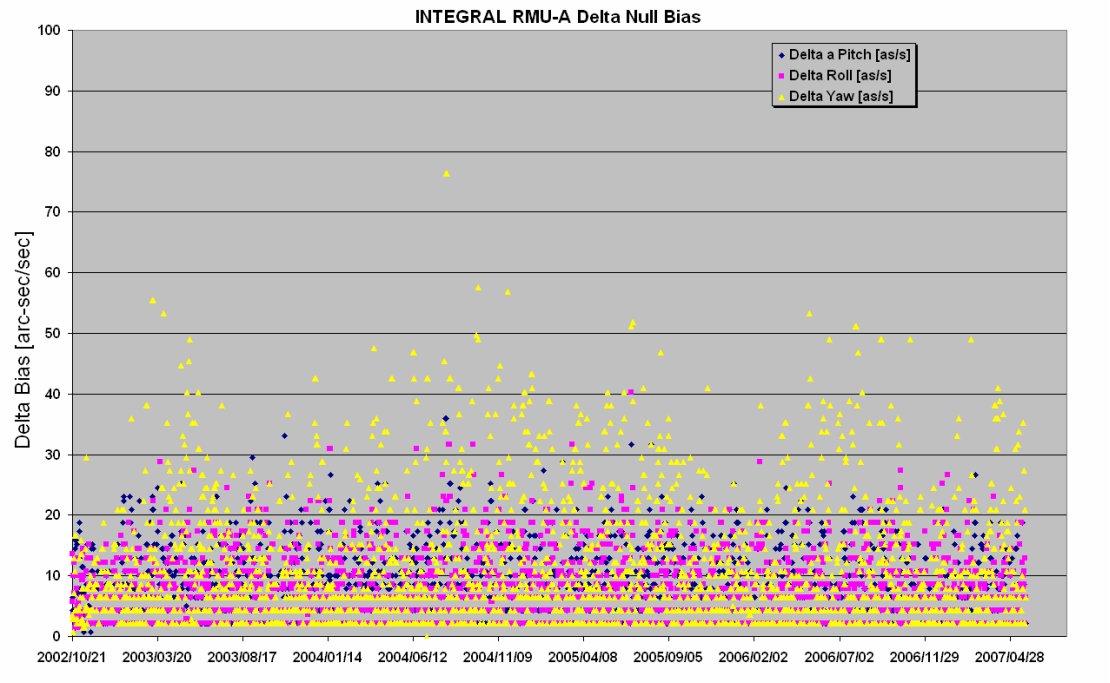


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 25/05/2007 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 25/05/2007 is reported in the plot below



19/05/2007 (Day of Year 139, Revolution 561)

FDS failed slew update: at 01:58z and 09:09z the FDS failed to update the slew IDs 05610019 & 05610026 respectively. FDS reported an error during the update process: no suitable guide star was found for the attitude determination processes and OSL generation.

A new mapping was manually commanded but the manual update process failed execution again for the above reason.

Following the recommendations from FD-on call, the following slew (both OSL) IDs 05610019 & 05610026 were left to execute without update.

No impact on TL.

20/05/2007 (Day of Year 140, Revolution 561)

Ground Station unavailable: At 06:10z, after the handover, the Timeline was stopped as there was no TM or TC from DSS-24. At 07:01z, the links were reinserted with Redu, and a recovery started. The initial attempt failed, as the Spacon recovery tool was started from the wrong machine. At 07:46, the recovery was complete and the Timeline rejoined.

The impact was the loss of slew IDs 05610045 and 05610046 (both CSL).

Attitude Determination failed: At 12:31z, the update for slew ID 05610052 failed as the only available star within the FOV was already used as a guide star. A change of guide star was performed and a manual mapping executed. There was no impact.

21/05/2007 (Day of Year 141, Revolution 561-562)

FSS/STR misalignment calibration: from 09:45z to 23:37z, a FSS/STR misalignment calibration was successfully performed. The results are given below:

The evaluated jump, due to the new coefficients, was for A9 ~17.00 arcsec, and for B9 ~8.25 arcsec.

Below is the history of the FSS\STR misalignment calibrations (source FD, unit in arcsec).

Run Time	Rev	STR FSS	X	FSS_A9	FSS_A10	FSS_A11	FSS_B9	FSS_B10	FSS_B11
2002/10/17 06:13:26	0001	B	B	-84.8915860	994.2814731	1314.6779504	241.1955221	-792.7915340	253.2583531
2002/10/17 06:13:26	0001	B	A	-147.8659203	1109.3069289	915.3724221	416.2208104	390.3899050	-218.3484613
2002/10/17 06:13:26	0001	A	B	21.7121809	1021.6044798	1540.3543536	136.7246130	-819.8011812	478.7101635
2002/10/17 06:13:26	0001	A	A	-41.3633903	1136.4981023	1141.0882898	309.1626097	363.7598917	7.1161076
2002/10/17 11:57:44	0001	A	A	-10.8869311	1136.4981023	1141.0882898	-48.3742459	363.7598917	7.1161076
2002/10/18 14:43:28	0001	A	A X	-740.7515156	0.0000000	0.0000000	-62.8992210	0.0000000	0.0000000
2002/10/22 10:26:13	0002	A	A X	43.1044362	0.0000000	0.0000000	-60.6765982	0.0000000	0.0000000
2002/10/22 10:41:00	0002	A	A X	31.8405075	0.0000000	0.0000000	-58.4412611	0.0000000	0.0000000
2002/10/22 10:46:35	0002	A	A X	31.9534536	0.0000000	0.0000000	-58.8179047	0.0000000	0.0000000
2002/10/23 12:06:48	0002	A	A X	-575.7521936	0.0000000	0.0000000	-34.1473518	0.0000000	0.0000000
2002/10/24 13:47:47	0003	A	A X	-32.5119135	0.0000000	0.0000000	-73.1585486	0.0000000	0.0000000
2002/11/05 13:37:43	0006	A	A X	67.3772442	1112.4864143	-1250.3529891	-120.1829934	435.0625162	60.2756867

```
2002/11/08 12:33:15      0006   A   A   X       35.1912362   1149.3875188  -1299.6735440   -
106.6436234    278.5268629    185.2164330
2002/11/08 12:54:28      0006   A   A   X       36.9314406   1129.9547571  -1329.5944015    -
85.0549459    346.9477086    -25.0110177
2002/11/05 14:00:57      0006   A   A           67.2067387   1131.9618229  -1250.8956817   -
120.4780133    440.9895417     60.8631778
2003/04/04 08:12:00      0056   A   A           28.0672800   1123.3090000  -1250.8956817   -
120.4780133    440.9895417     60.8631778
2003/07/23 12:17:34      0094   A   A   X       83.5374642   1144.9283240  -1290.1598577   -
130.3447117   -181.2657279    173.0711922
2003/07/23 12:26:45      0094   A   A   X       81.4133068   1147.8046516  -1267.0171462   -
126.3265407    -58.8911287    100.5747445
2004/01/15 08:10:37      0153   A   A   X       85.6545484   1106.1829781  -1051.4112289   -
107.3048338    339.9810564     60.2342427
2004/01/15 10:28:50      0153   A   A           80.0550152   1113.7525865  -1074.7285836   -
107.3517385    342.7773785     58.3454333
2004/01/15 12:05:43      0153   A   A   X       87.2218057   1107.2949504  -1061.0560000   -
107.7683725    349.3284022     64.5234373
2004/06/30 15:52:53      0209   A   A           95.2633969   1145.6387404  -1262.1608365   -
128.2915442    -43.0931566    135.4295645
2004/12/20 14:38:46      0267   A   A   X       84.3454103   1118.4758548  -1190.1861634    -
68.3442729    309.2098324    -74.9239762
2005/06/13 18:24:54      0325   A   A           82.1816238   1144.1981013  -1167.4243763    -
97.9780532    152.8463212    138.0643852
2005/12/07 08:41:53      0384   A   A           84.4927225   1099.6985619  -1163.7823475    -
90.8341826    137.6103579    138.9746936
2006/06/12 11:15:35      0446   A   A           77.4808554   1139.8464017  -1088.5359566    -
83.7667989    485.4745256   -233.0083358
2007/05/23 15:10:53      0562   A   A   X       90.5828768   1109.8847271  -1216.8602529    -
83.6458334    472.2202624   -228.0845332
2007/05/23 15:31:26      0562   A   A           94.4878817   1101.8788735  -1159.5501879    -
75.5200185    338.2001088    -80.0475894
```

22/05/2007 (Day of Year 142, Revolution 562)

FDS failed slew update: at 09:54z & 16:55z the FDS failed to update the slew IDs 05620035 & 05620041 respectively. FDS reported an error during the update process: no suitable guide stars were found for the attitude determination process and OSL generation.

A new mapping was manually commanded but the manual update process failed execution again for the above reason.

Following the recommendations from FD-on call, the following slews (both OSL) ID 05620035 & 05620041 were left to execute without update.

No impact on TL on either occasion.

23/05/2007 (Day of Year 143, Revolution 562)

FDS failed slew update: at 00:05z the FDS failed to update the slew ID 05620048. FDS reported an error during the update process: no suitable guide star was found for the attitude determination process and OSL generation.

A new mapping was manually commanded but the manual update process failed execution again for the above reason.

Following the recommendations from FD-on call, the next slew (OSL) ID 05620048 was left to execute without update.

No impact on TL.

24/05/2007 (Day of Year 144, Revolution 562-563)

FDS failed slew update: at 18:50z the FDS failed to update the slew ID 05630011. FDS reported an error during the update process: no suitable guide star was found for the attitude determination process and OSL generation.

A new mapping was manually commanded but the manual update process failed execution again for the above reason.

Following the recommendations from FD-on call, the next slew (OSL) ID 05630011 was left to execute without update.

No impact on TL.

25/05/2007 (Day of Year 145, Revolution 563)

FDS failed slew update: at 02:01z the FDS failed to update the slew ID 05630018. FDS reported an error during the update process: no suitable guide star was found for the attitude determination process and OSL generation.

A new mapping was manually commanded but the manual update process failed execution again for the above reason.

Following the recommendations from FD-on call, the next slew (OSL) ID 05630018 was left to execute without update.

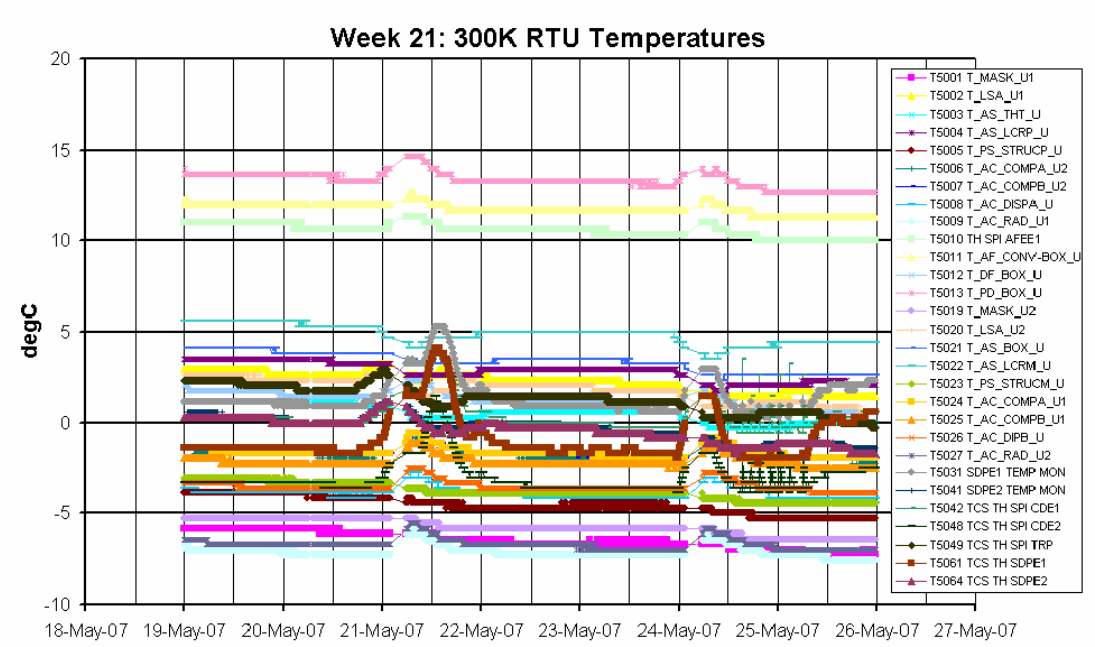
No impact on TL.

Ground Station unavailable: At 12:36z, the Timeline was stopped as there was no TM or TC from DSS-27. At 13:11z, the links were reinserted with Redu, and a recovery started. At 13:47, the recovery was complete and the Timeline rejoined.

The impact was the loss of slews 05630029 and 05630030 (both CSL).

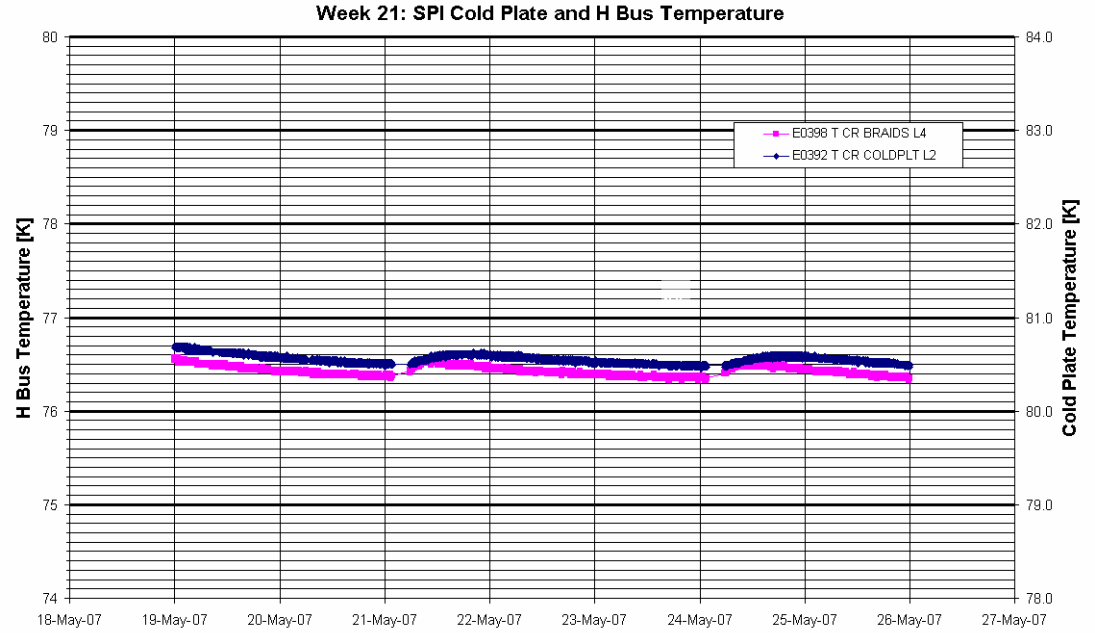
8.3.2 SPI Operations

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



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

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

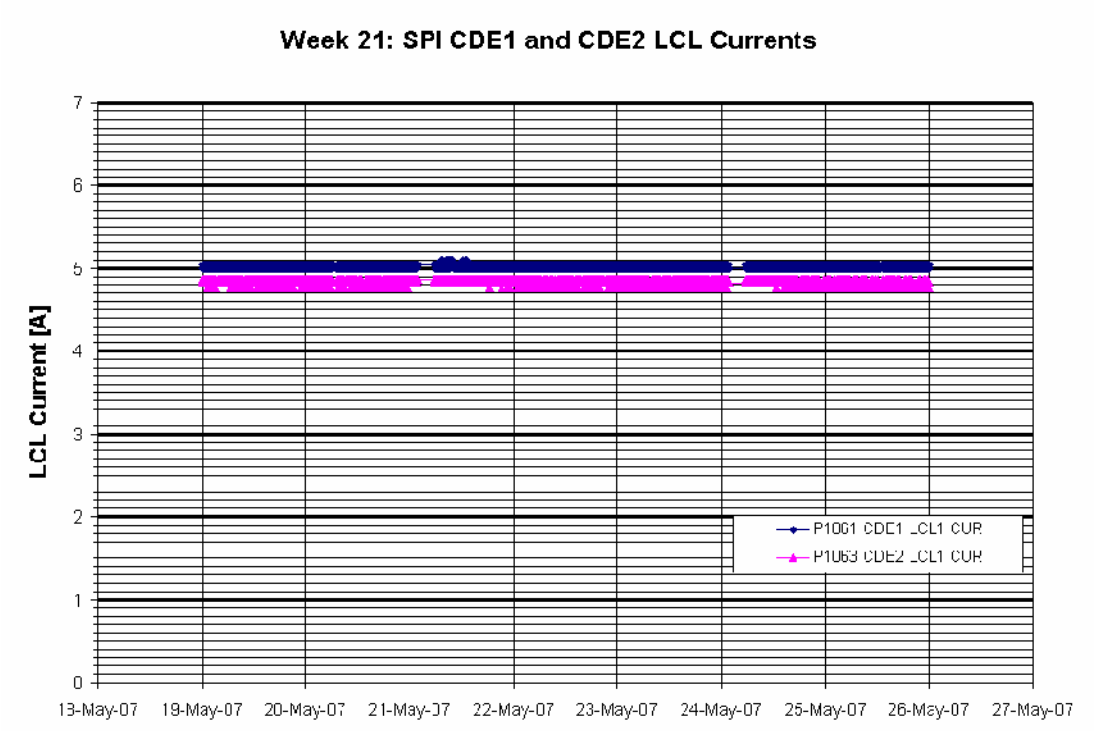


The stroke of all four compressors has remained at 41 since 2007-05-10 at 07:33Z.

The average LCL currents of the CDEs over the week were:

- Average CDE1 LCL Current = 5.02A
- Average CDE2 LCL Current = 4.82A

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



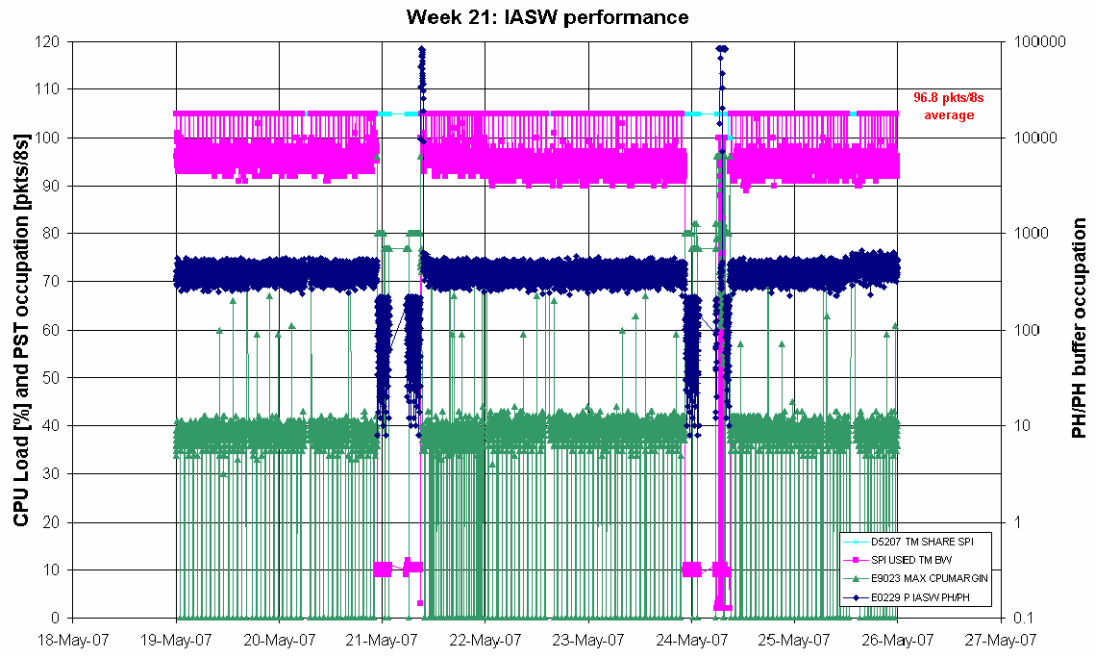
DPE & IASW: The DPE health and IASW performance is nominal. The IASW version installed is v433 patch #1. The spectra scaling factor was set to 9/19 SE throughout the week.

On 2007-05-24 between 05:48Z and 08:01Z, in line with OCR-225 and INT_OPS_0288, the on-board reclassification of OEM 243 as Exception type and a test of SPI science mode inside the belts was performed (following the end of the eclipse season, and the IODB update to reclassify OEM 243 as Exception type on the MCS). The test of science mode inside the belts was performed to verify the filtering of OEM 243 with IASW 433 patch #1. The operations and tests were successful, with only one OEM 243 being generated and this being correctly classified as Exception type:

```
2007.144.06.36.46.667   2007.144.06.36.55.774   1024   RealTime   243
EXCEPTION   SPI1 SPECTRA BUILDING NOT COMPLETED
      FIX6                                          0
      E9079          MESS CLASS                     1
      E9080          MESS ID                        243
      E9780          DETECTOR ID                    0
      FIX16                                         0
```

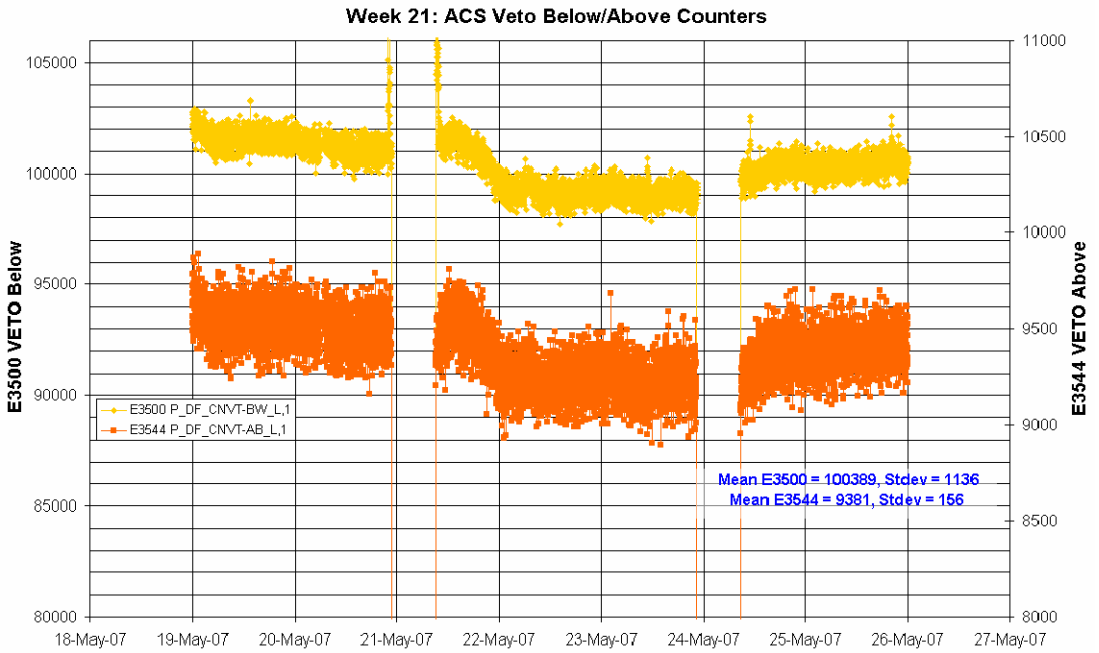
However, during the pointing in which this OEM was generated, three OEM APID 1024 ID 10 ANOMALY SPI1 PERIODIC TASK OVERRUN were generated from TASK ID 6. This is being investigated and a further test of OEM 243 generation will be performed after the camera switch-on following the next annealing.

The average TM bandwidth occupation of SPI was 96.8 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.



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

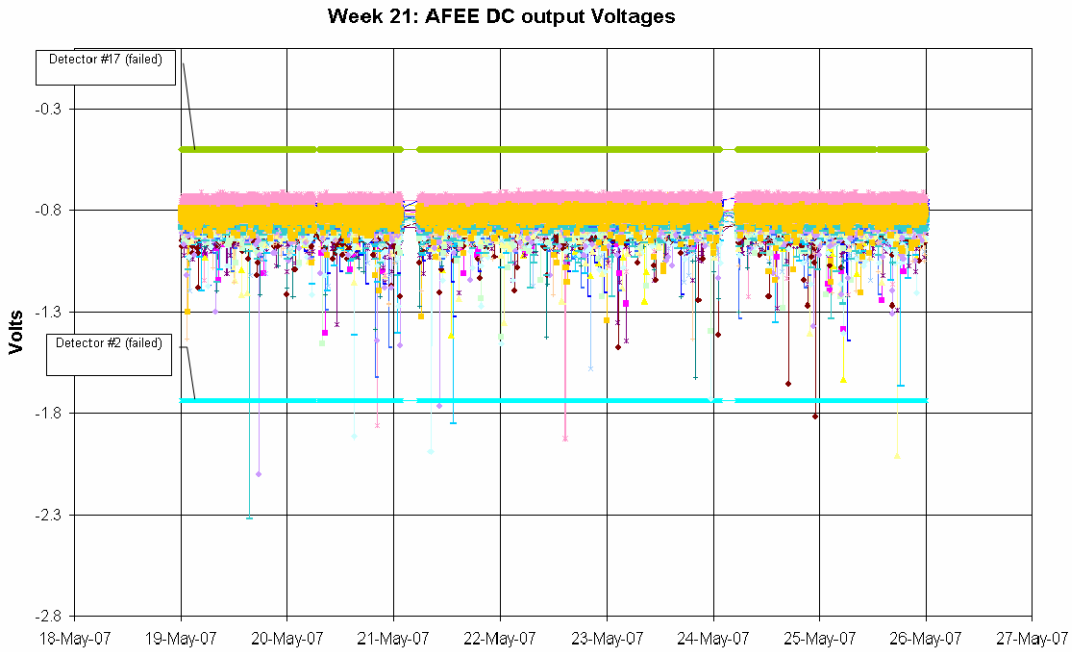
The following plot shows the ACS overall count rate evolution during the reporting period. Note that the scale of the plot is different to previously (shifted towards higher counts):



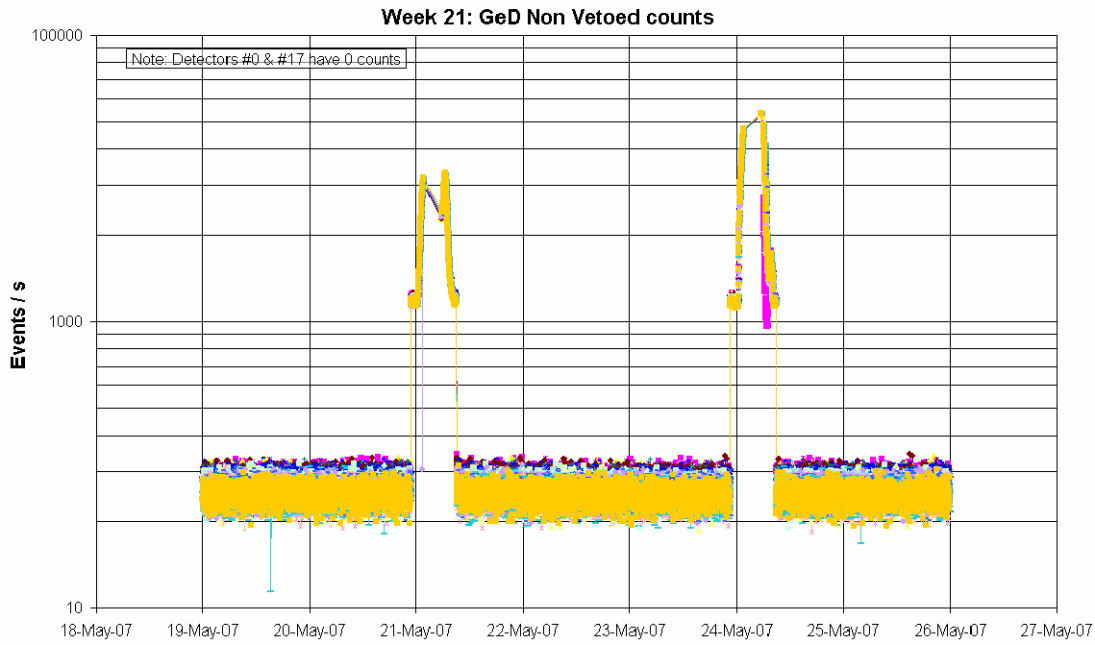
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution. The energy resolution of GeD#4 was recovered with the last annealing.

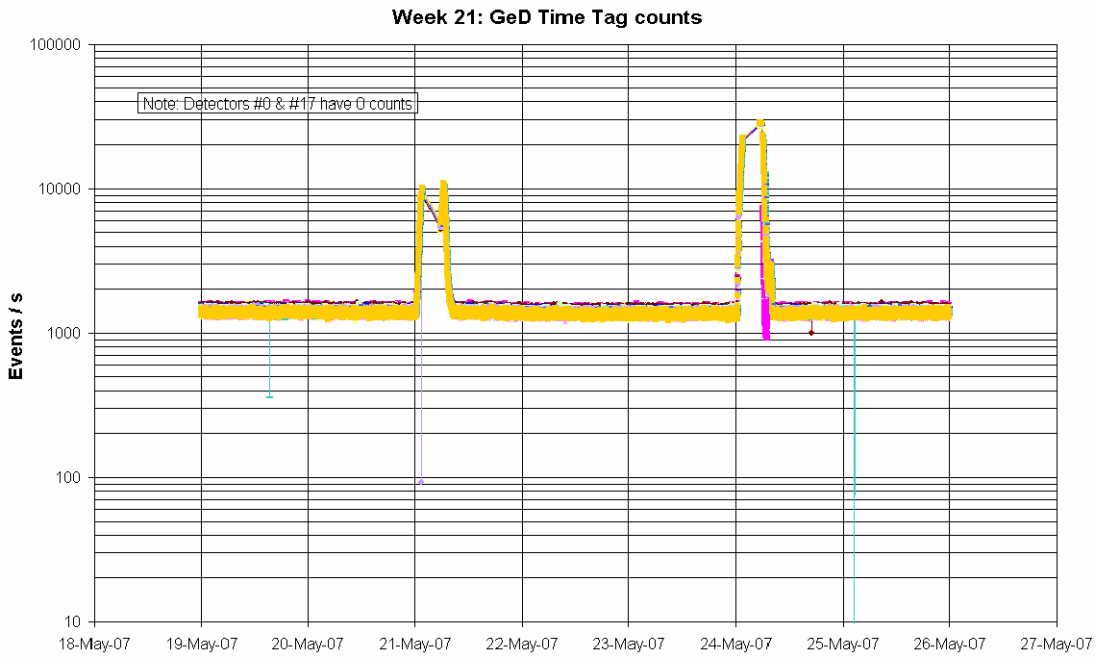
The GeD#12 HV remained at 3.5kV throughout the reporting period.

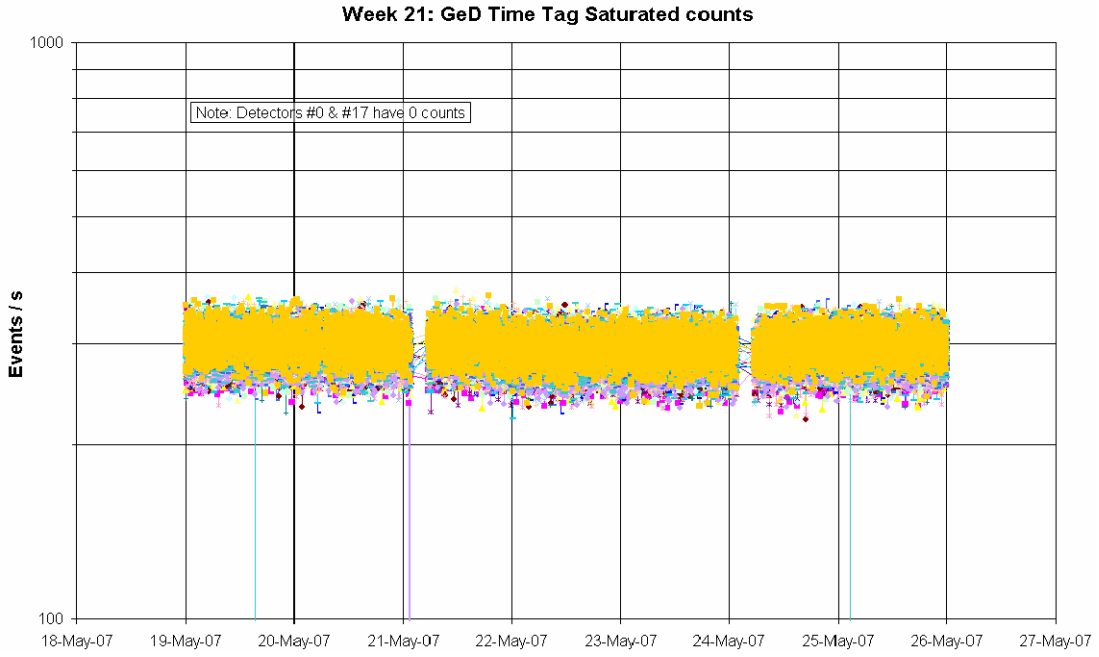
The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004.



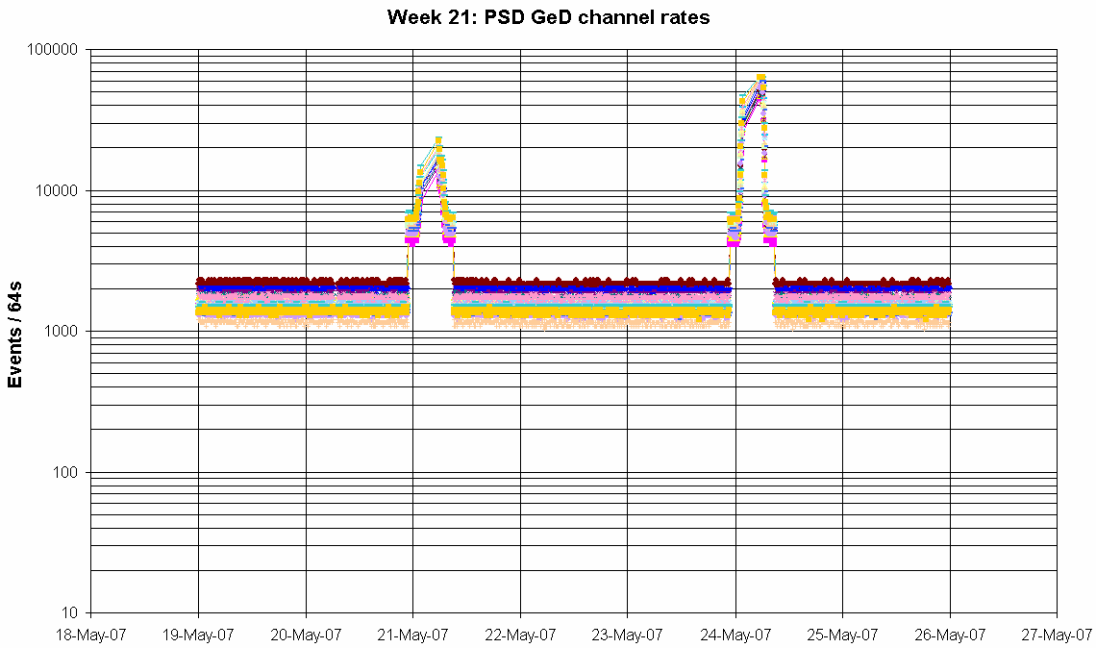
DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.







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:

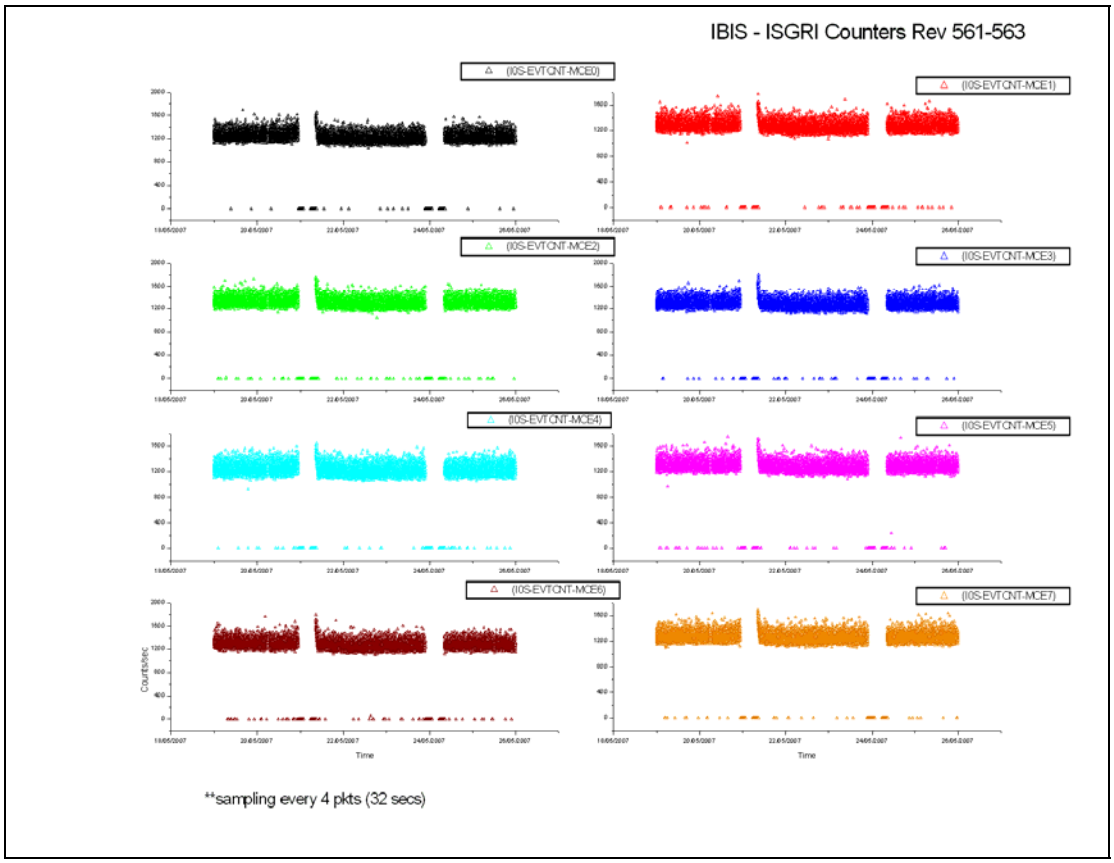
- On 2007-05-21 at 06:03:43Z OEM APID 1024 ID 1 EXCEPTION SPI1 FIXED POINT OVERFLOW was received. This was during the AOS_CHK window of revolution 562, when the time verification TC was sent. This OEM is sometimes received when this TC is sent and no action was taken.
- On 2007-05-21 at 09:09:54Z TM parameters E3981 to E3984 (Cold box temperatures); E3986 (DFEE box temperature); E3988 (PSD box temperature); E3991 (VCU temperature); E3992 and E3996 (Heat pipe temperatures) and E3995 (AFEE power supply board temperature) went OOL with value 0. These are all in the packet SPID 60602. This was at radiation belt exit of revolution 562 and they returned within limits when the next (periodic) packet was received at 09:20:34Z
- On 2007-05-21 at 09:10:41Z TM parameter E3500 started toggling OOL High. This was at radiation belt exit of revolution 562 and no action was taken as this parameter returned within limits at 09:34:57Z.
- On 2007-05-24 from 05:26:30Z to 05:44:20Z TM parameter E4009 went OOL High a couple of times indicating errors on the HSL. It returned within limits of its own accord and no action was taken.
- On 2007-05-24 at 06:31:02Z TM parameters E3182 and E2368 went OOL (PARAM > SPEC). These are the FEE temperature status #18 and FEE analogue status -5 V #18 respectively. They returned within limits at 06:33:54Z.
- On 2007-05-24 at 15:11:22Z TM parameter E3236 went OOL (PARAM > SPEC). This is the FEE temperature status #72. It returned within limits when the next packet was received at 15:22:02Z.
- On 2007-05-24 at 19:40:36Z TM parameters E1296 (ISB response parity error) and E1297 (FEE Configuration error) went OOL (value = ERROR

STATE). No action was taken as they returned within limits at the next TM cycle (at 19:40:44Z). In addition, at 19:40:33Z the ACS count-rate parameters E3500 and E3544 went to zero for 1 TM cycle (returning to nominal values at 19:40:41Z). This is not visible on the ACS count rate plot above due to sampling however it is visible in the plot of SPI ACS counts in the IBIS section of this report. This drop in the count rates to zero is likely due to the ACS communications bus problems indicated by the OOLs on E1296 and E1297.

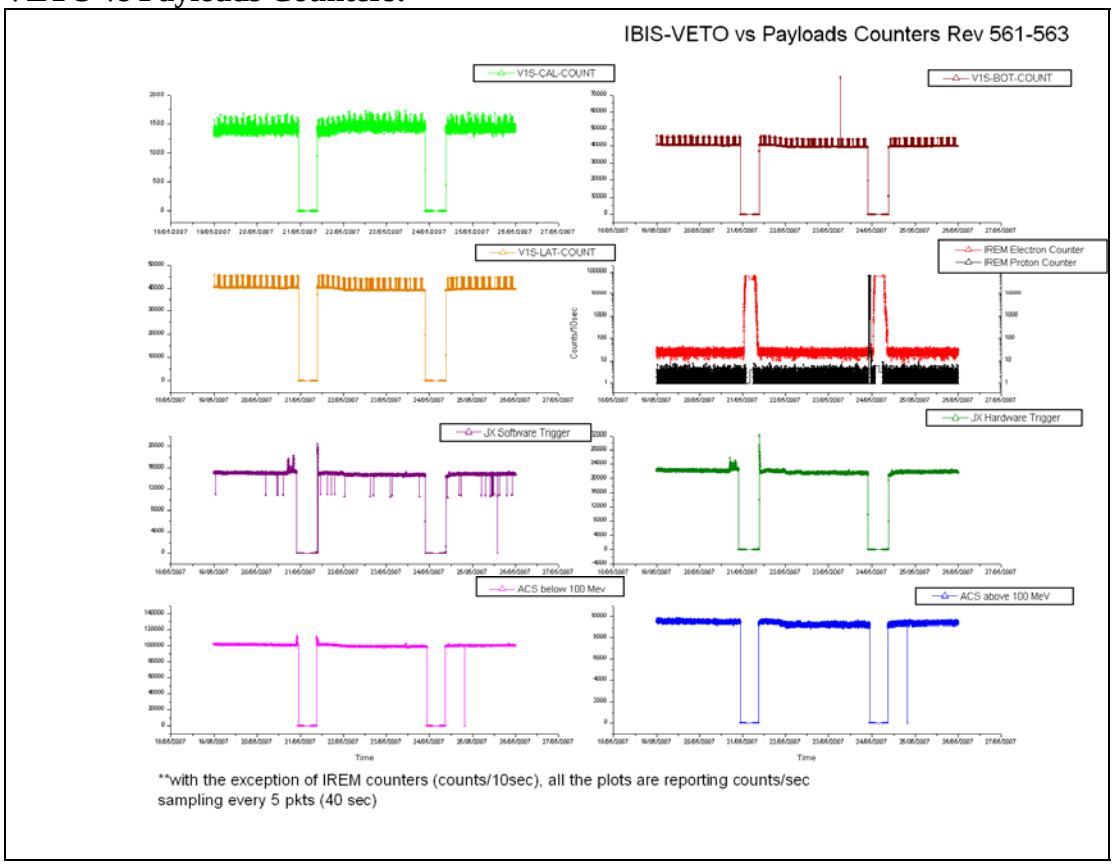
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

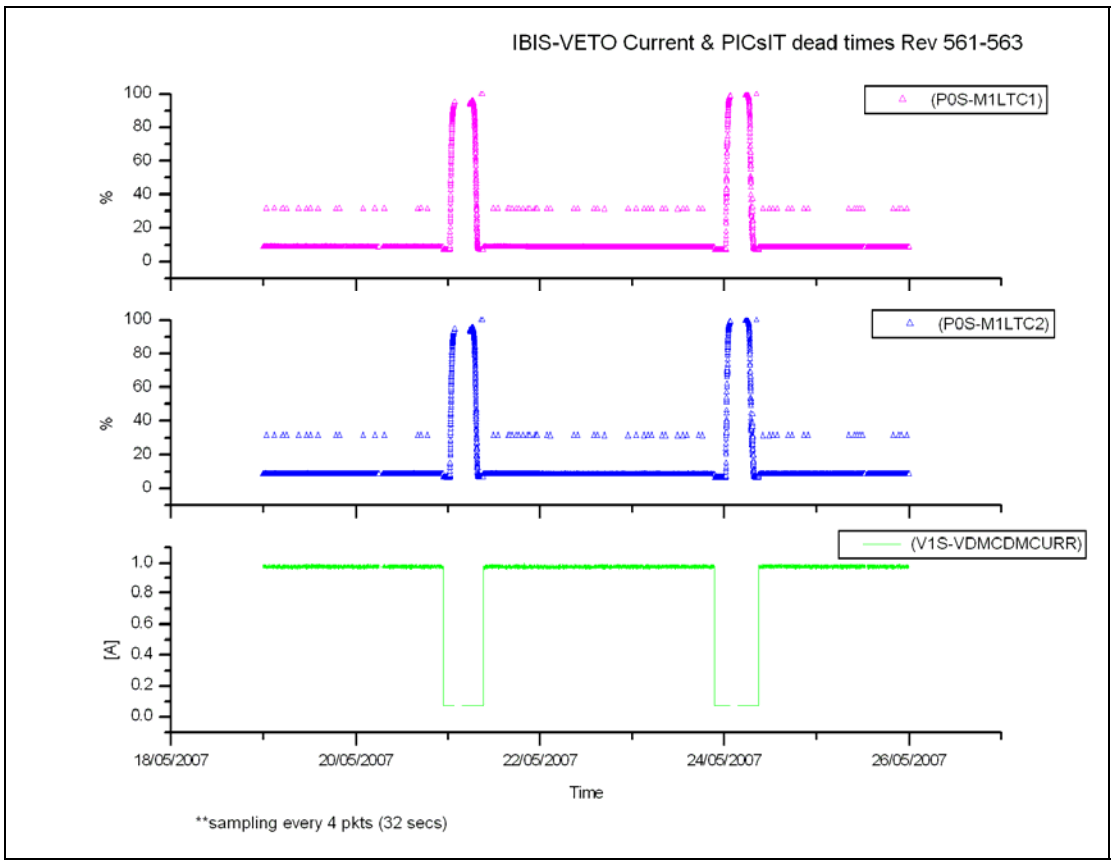


VETO vs Payloads Counters:

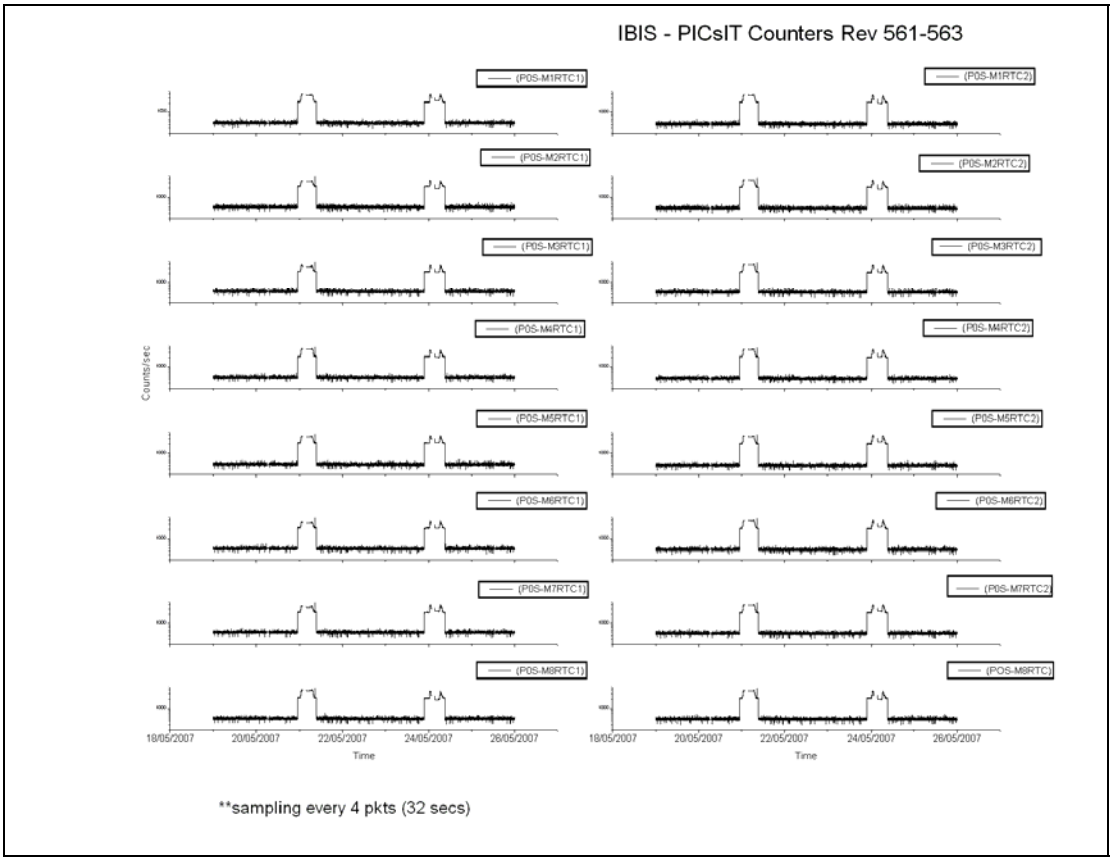


The week was characterised by low radiation.

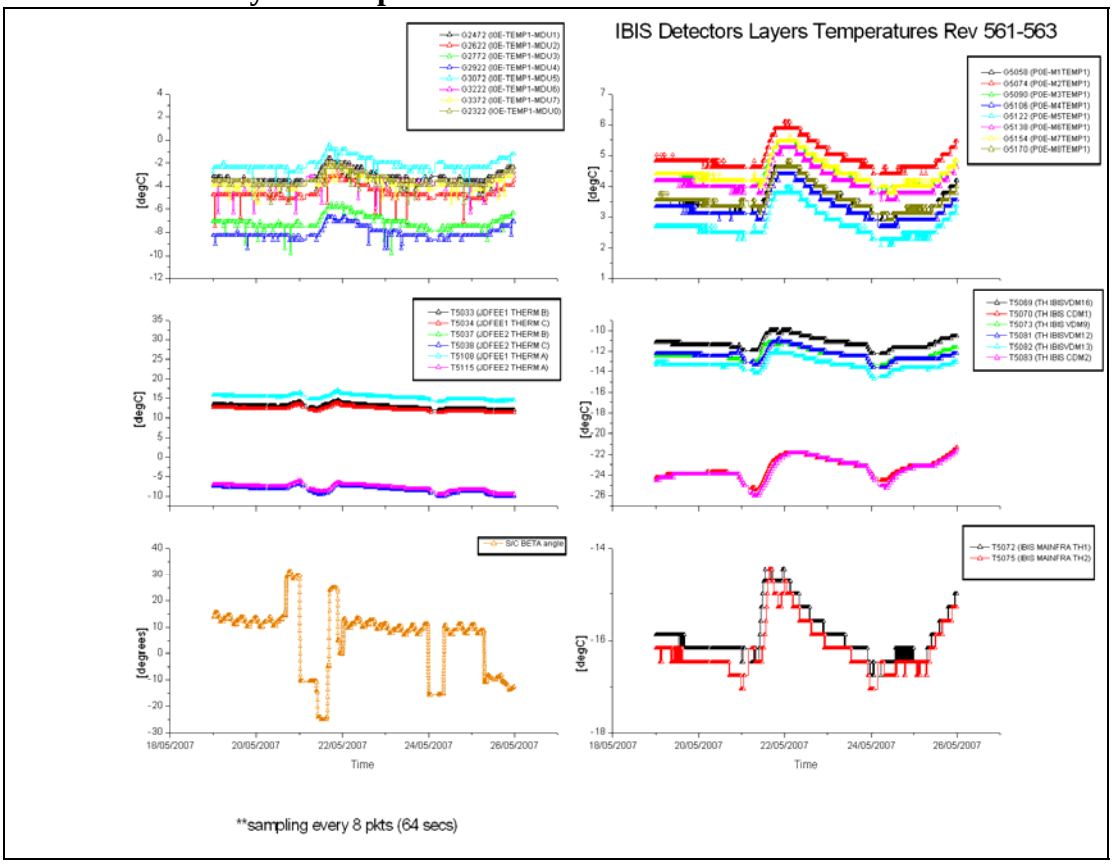
VETO Current:



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.

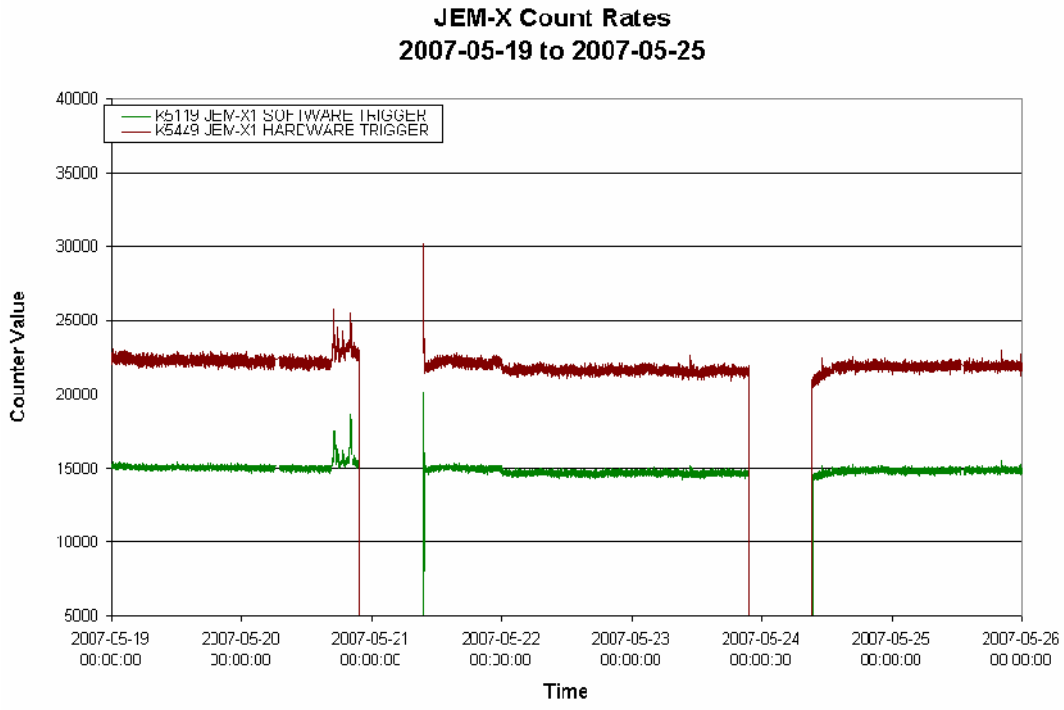
DoY 2007.143 (23/05/2007):

At 21:33SZ, the IREM SEU #48 occurred forcing IBIS into a Safe configuration. The unit was not recovered as the Radiation Belts Entry time was planned in the timeline at 22:33Z.
IBIS was reconfigured as per timeline at belts exit.

8.3.4 JEM-X Operations

JEM-X Count Rates

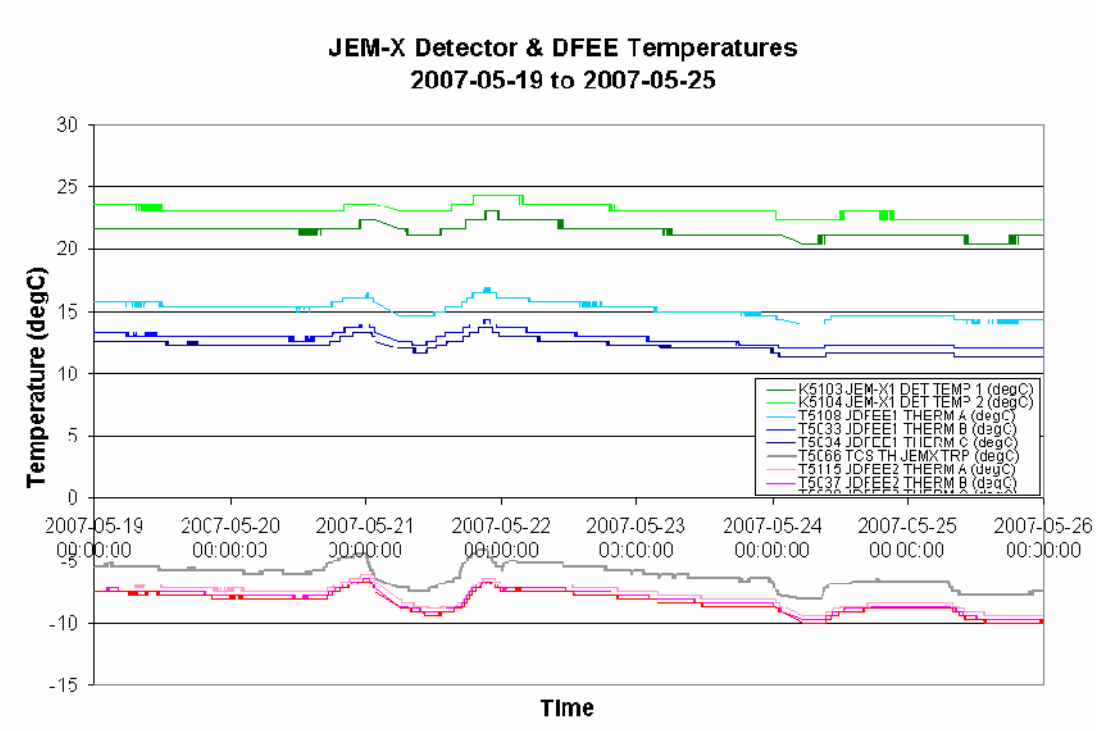
JEM-X count rates over the reporting period are displayed in the following graph[1].



JEM-X Temperatures

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

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



JEM-X Daily Report

2007-05-19 (DOY 139, Rev 561) to 2007-05-20 (DOY 140, Rev 561)

JEM-X1 operations executed nominally.

2007-05-21 (DOY 141, Rev 561-562)

At 09:31:09Z K5449 HARDWARE TRIGGER went OOL Warning High and in the next TM cycle K5136 BUFFER LOSS also went OOL High (value = 128). This was shortly after radiation belt exit and no action was taken as both parameters returned within limits at 09:31:49Z.

2007-05-22 (DOY 142, Rev 562)

JEM-X1 operations executed nominally.

2007-05-23 (DOY 143, Rev 562)

At 21:34:04Z an IREM SW reset (see INT_SC-190) caused the IREM RMC parameters K5315-K5317 to go OOL high (value = 65535). This did not affect JEM-X1 as the JEM-X reactions to IREM are disabled.

2007-05-24 (DOY 144, Rev 562-563) to 2007-05-25 (DOY 145, Rev 563)

JEM-X1 operations executed nominally.

8.3.5 OMC Operations

2007-05-19 (DOY 139, Rev 561)

Nothing to report

2007-05-20 (DOY 140, Rev 561)

At 06:10, problems with DSS-24 prevented the handover. A misunderstanding about station availability led to a delay in returning to Redu. A recovery was performed and the Timeline rejoined at 07:38. The impact was the loss of pointings 05610045 and 05610046. It was at this time the following commands were rejected:

```
2007.140.07.19.18.078   2007.140.07.19.28.338   1792   RealTime   131     TC REJECT
REJECTED TC1                                             0       0    65535   PR    N
E   E
2007.140.07.19.24.078   2007.140.07.19.28.376   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 05610046.

2007-05-21 (DOY 141, Rev 562)

At 12:24, due to a brief TM drop from DSS27, the OMC commands failed to uplink due to the PTV check. The impact was the loss of pointing 05620005.

2007-05-22 (DOY 142, Rev 562)

At 13:55, due to a brief TM drop from DSS-24, the OMC commands for pointing 05620038 failed release. They were sent manually at 13:58 without impact.

2007-05-23 (DOY 143, Rev 562)

At 21:33:59, an IREM SEU (#48) caused OMC to switch to SAFE mode. The impact was pointing 05620067 was shortened from a scheduled duration of 6386 to 304 seconds.

2007-05-24 (DOY 144, Rev 563)

Before the recovery from the IREM SEU in the previous revolution could be completed, the following commands were rejected:

```
2007.144.09.04.11.918   2007.144.09.04.16.372   1792   RealTime   131     TC REJECT
REJECTED TC1                                             0       0    65535   PR    N
E   E
2007.144.09.04.18.293   2007.144.09.04.24.404   1792   RealTime   131     TC REJECT
REJECTED TC1                                             0       0    65535   PR    N
E   E
2007.144.10.06.42.920   2007.144.10.06.48.481   1792   RealTime   131     TC REJECT
REJECTED TC1                                             0       0    65535   PR    N
E   E
2007.144.10.06.48.920   2007.144.10.06.56.397   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 05630002 & 05630003. At 11:07, the commands for pointing

05630003 were manually sent. The overall impact was the loss of pointing 05630002 and a shortening in the duration of pointing 05630003 from a scheduled 3572 to 2164 seconds.

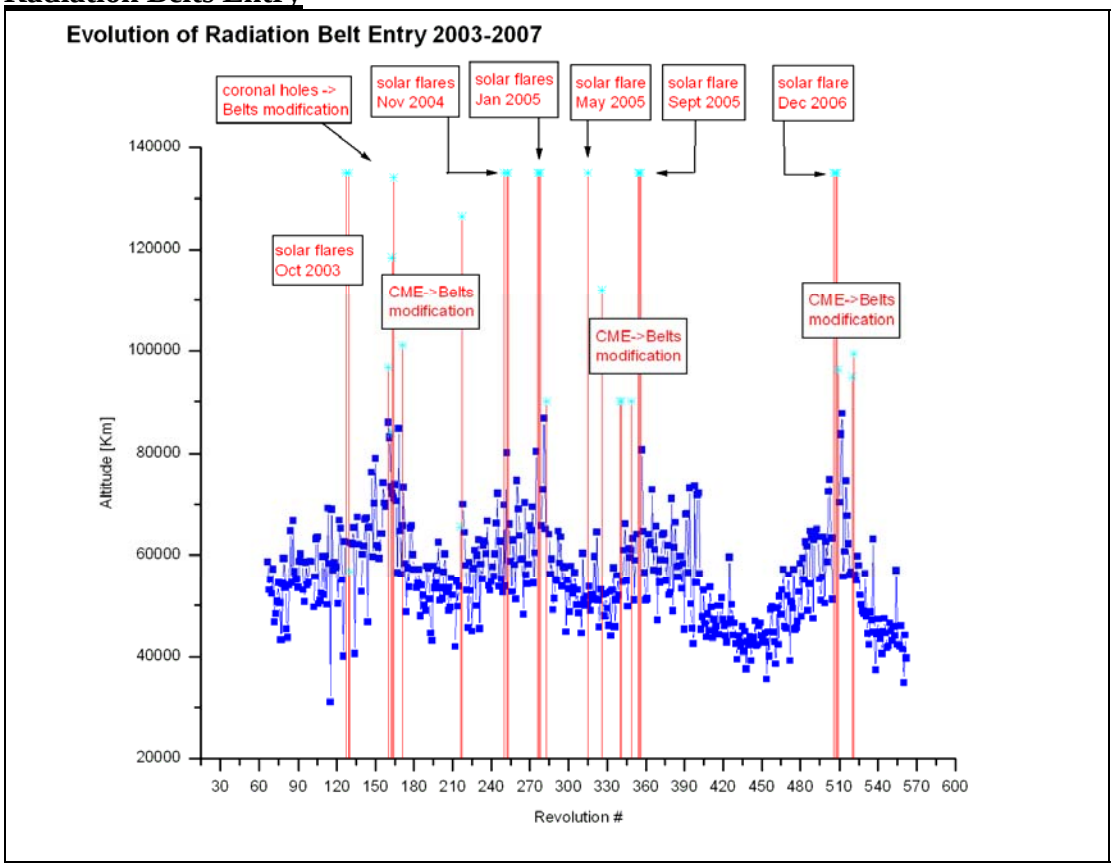
2007-05-25 (DOY 145, Rev 563)

At 12:36, due to antenna problems at DSS-27, the Timeline was stopped. At 13:03, a handover was executed to Redu, and a recovery performed. The Timeline was rejoined at 13:47. The impact was that pointings 05630029 & 05630030 were lost.

On DoY 140 at 22:46:55 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

DoY 2007.143 (23/05/2007):

At 21:33Z, a local reset of the IREM CSCI S/W (SEU #48) occurred as previously the status of the unit, before the anomalies, was nominal, here is a summary:

1) The temperatures were nominal
2) The LCL current was nominal

3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits
4) The anomaly occurred at 2007.143.21.33Z at 62972.0km. The unit had performed an automatic transition to Standard Mode (ie. no block counter increasing, all the TM words= FFFF hex); just before the anomaly, radiation counters reported nominal values considering the position of the S/C along the orbit
5) The recovery of the unit started at 22:05Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly showed a value of BCC0 HEX = 48320 DEC = 1011110011000000, i.e the Checksum Failure flag shows YES. The unit was still reporting the status as if it was in Integral mode with counting ON, accumulation ON and checksum failure flag ON. This value of the status word is assumed to be an old one written by the S/W at the moment of the anomaly.
6) A dump of all the registers gave a status word BC80 HEX = 48256 DEC = 1011110010000000, ie. the unit was still reporting the status as if it was in Integral mode but the Checksum Failure flag was this time OFF and the checksum counter in the register number 3 incremented by 1 unit.
7) The patch was performed successfully with the correct re-starting of the S/W following procedure FCP_RM_0081. The operation was completed at 23:25Z.

The IREM automatic transition to Standard Mode affected the instruments by forcing them to automatically enter Safe configuration, except for SPI and JEM-X whose automatisms are disabled according to the PIs request.
OMC and IBIS were not recovered as the Belts entry time was planned in the timeline at 22:33Z.

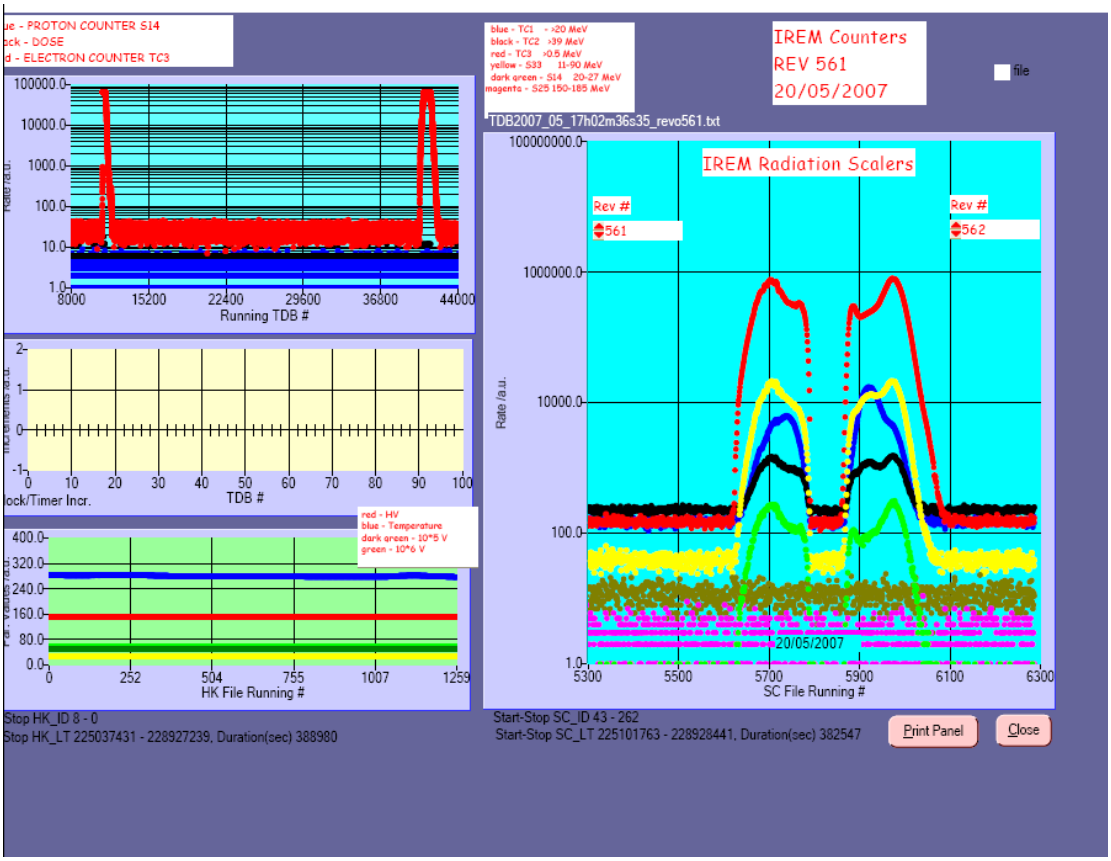
The cause of these S/W resets is still under investigation, but it is apparently due to the unit's memory device that is sensitive to radiation.

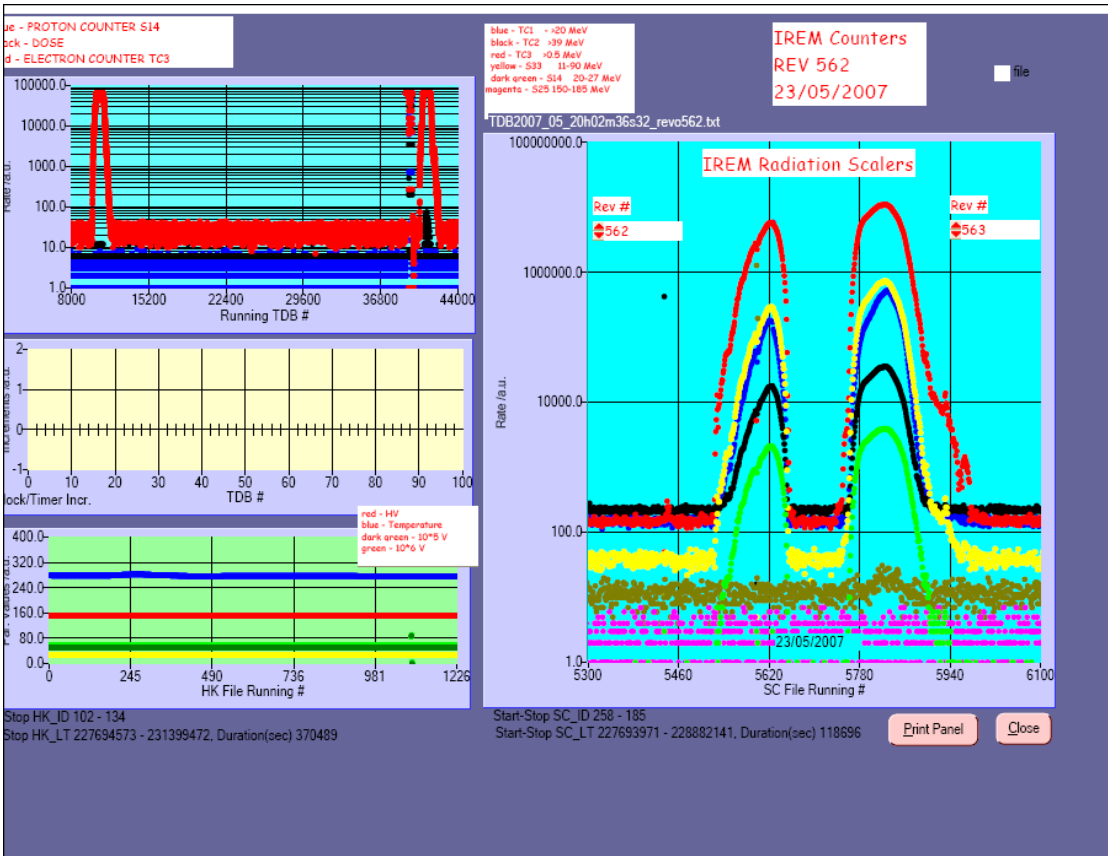
Electron Belts

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]
561	RAD_ENTR R 2007-05-20T22:46:47Z	2007-05-21 00:12:28	44186.5	2007-05-20 23:52:29	46794
562	RAD_EXIT R 2007-05-21T09:01:59Z	2007-05-21 07:53:16	<<54900.3	2007-05-21 07:52:29	43466
562	RAD_ENTR R 2007-05-23T22:34:04Z	2007-05-24 00:25:33	39652.5	2007-05-23 23:39:32	46957
563	RAD_EXIT R 2007-05-24T08:49:18Z	2007-05-24 08:15:25	<49761.9	2007-05-24 07:39:32	43245

Reference
High radiation
Very small error vs reference (less than 10 minutes)
Small error vs reference (between 10 and 30 minutes)
Large error vs reference (more than 30 minutes)

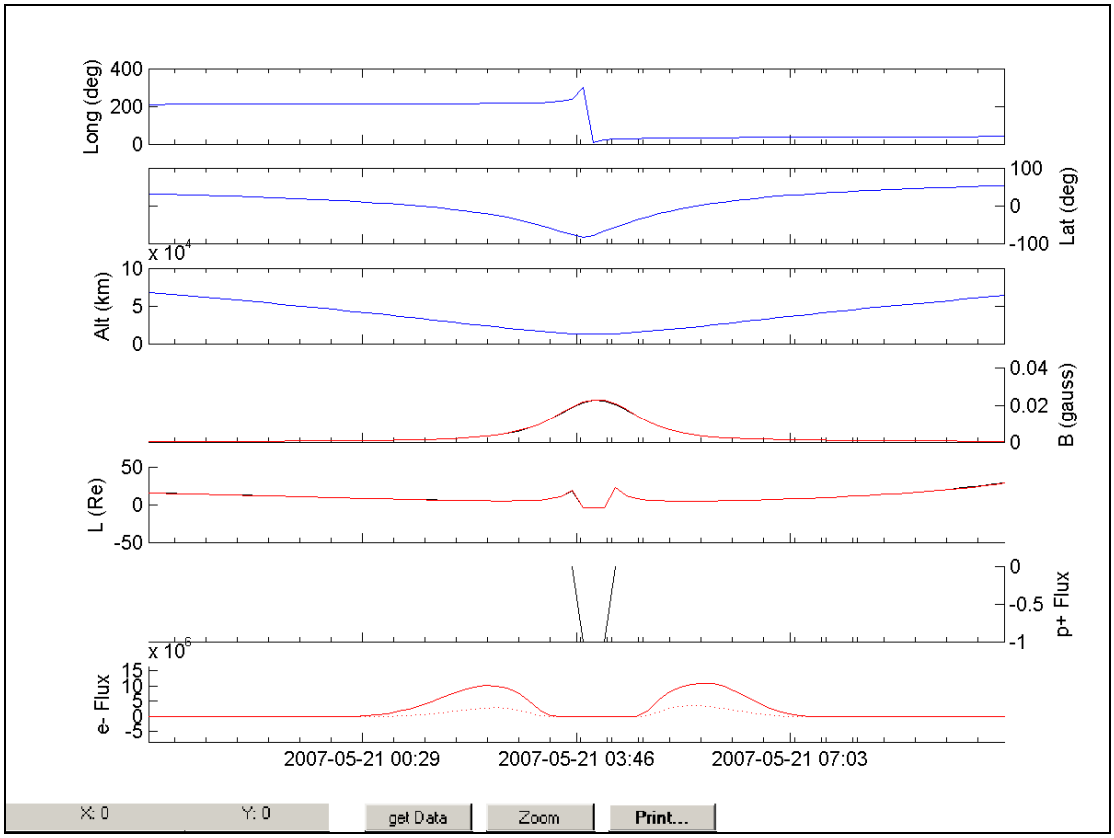
IREM radiation counters:



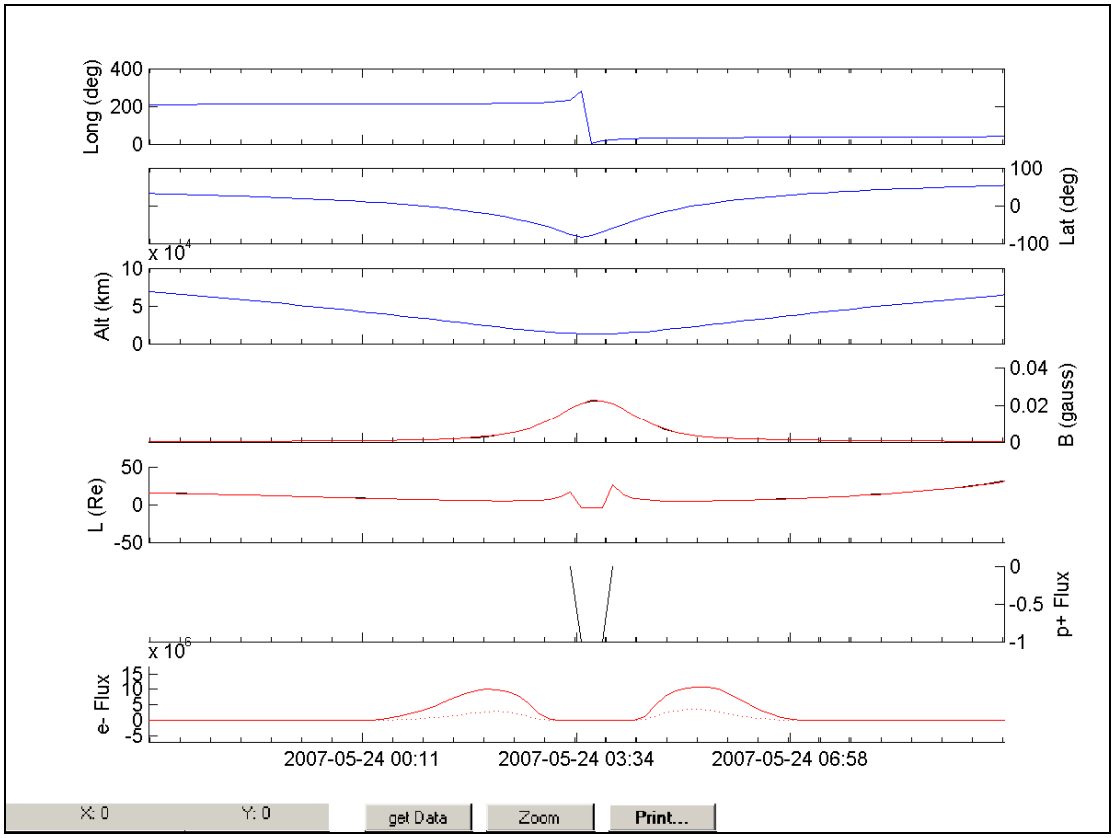


IREM Predicted Radiation Belt Passages

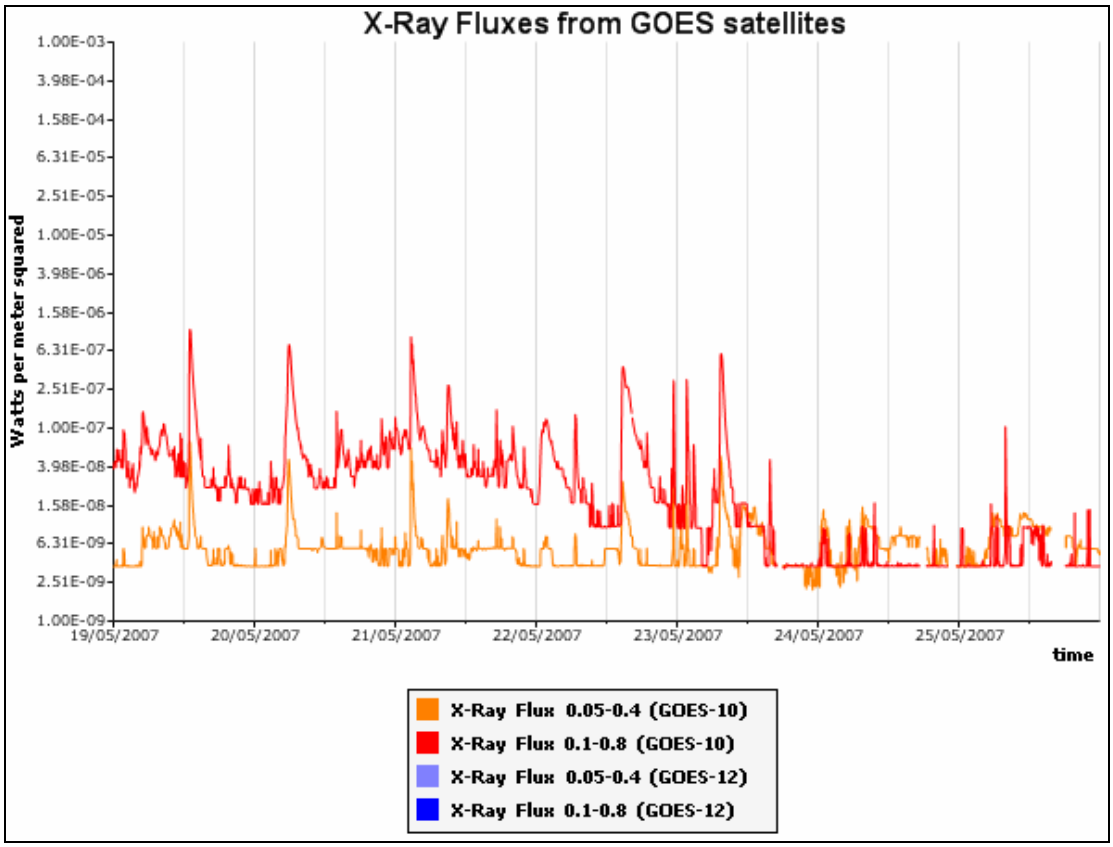
Rev 561



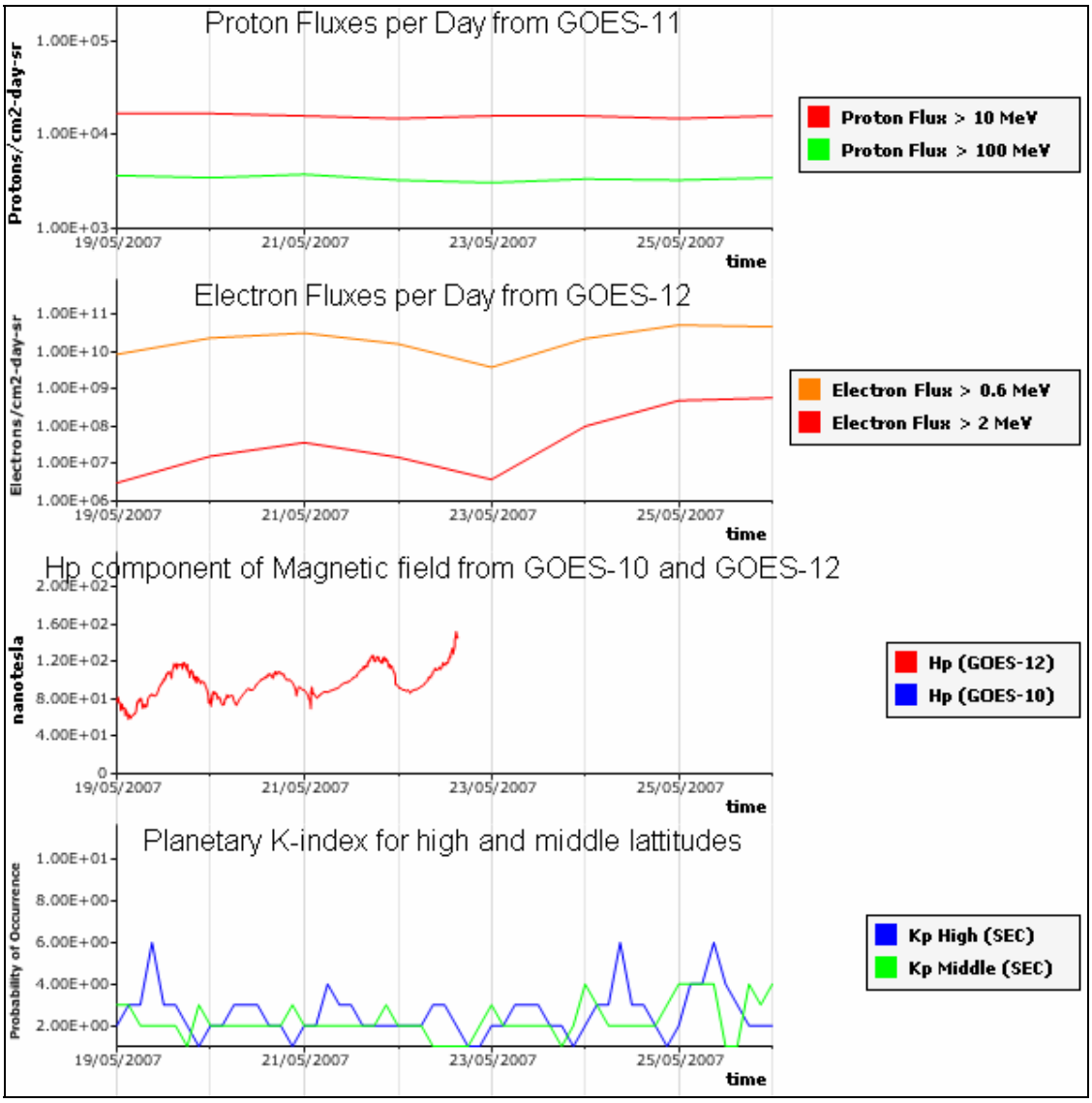
Rev 562



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 reporting low radiation background this week.
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.