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

INTEGRAL
Mission Report

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

No. 094
Week 29

12.07.04

Routine Phase

Prepared by: M. Walker (OPS-OFO)

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1 General

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

It addresses the activities from 03.07.04 until 09.07.04 (both dates inclusive) and covers the revolutions 211 & 212.

2 Summary of Activities

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

The target of these revolutions was Cygnus X (RA 20:33:10.00; DEC +41:12:00.0). The activities consisted of raster dithering observations.

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

The FSS-A parameters were updated with the results of the FSS-STR Misalignment calibration that was performed on 30/06/2004.

One slew was executed manually and a corrective one was missed in revolution 211. The reason was that the Automatic Job Scheduler task of the Flight Dynamics System was not restarted after a maintenance activity in the control room.

An undetected False Event on the STR caused the flickering of the Pointing Bit on DoY 185. This was not seen at Broadcast Packet level.

The fuel consumption over the period between 02/07/2004 and 09/07/2004 was 0.137 kg. The remaining propellant is in the order of 169.577 Kg on the 9th of July.

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

3.1.2 Power

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

3.1.3 Thermal

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

3.1.4 OBDH

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

3.1.5 RFS

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

3.2 Payload

3.2.1 SPI

The overall status of the instrument is nominal.

During the reporting period the instrument was in photon-by-photon mode with spectra TM enabled, an assigned TM bandwidth in the science windows of 103 pkts/cycle and an actual average occupation of 98.4 pkts/cycle (about +2.5 pkts w.r.t. the values recorded before the annealing in June).

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

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

3.2.2 IBIS

The overall status of the unit is Nominal.

During the reporting period the PST Allocation to IBIS was 129 TMSP / Cycle, the mean IBIS Bandwidth usage was 105.6 TMSP / Cycle.

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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

JEM-X1 was operated in Data Taking mode during science observations, with a TM allocation of 8 packets/cycle and JEM-X2 was dormant 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.

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

There were 140 OMC pointings executed nominally, 1 was 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 characterized by moderate solar activity.

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

4 Ground Facilities

The performance of the Operational ground facilities was very good this week, well above the system performance requirements, only 1 pointing was lost.

4.1 Mission Operations Centre

The performance of the MOC was good in the reporting period. A problem to the automatic job scheduler within the FDS led to the loss of 2 slews, which impacted one pointing.

4.2 Ground Stations & Network

The performance of the ground stations and Network was excellent this week. There no problems reported at all. The performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning
PSF's: Received up to rev. 222
POS and POD generated: up to rev 221
TSF's: Received up to rev 215

No ToO request received. No re-planning performed this week.

2. Observation status
No new ECS's received.

3. ISOC science archive
No new data received this week.

4. ISOC system
The ISOC system version 10.4 patch 5 is still in use.

5. Problems
No new problem.

6. ISOC move to ESAC / VILSPA
A meeting took place this week with the network and hardware responsibles in ESAC. The main topics were:
- Detailed review of hardware configuration and utilisation. Purchase orders can now be raised.
- Oracle installation and licenses required.
- External access requirements to the ISOC system components in ESAC.
- ISOC Configuration control in ESAC
- Test approach
No major problem has been identified.

4.3.2 ISDC

Status of ISDC observation processing on 12/07/2004:

- Latest Standard Analysis completed: observation 01202520005 (GRS 1915+105, Revolution 193) on 07/07/2004

- Latest products archived: 01201570003 (Cygnus X, Revolution 190-191) on 14/06/2004

- Latest observation products sent to the observer: observation 01201570003 (Cygnus X, Revolution 190-191) on 17/06/2004

5 Special Events

The IP migration tests relevant to the link to Redu are ongoing.

6 Anomalies

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

- On DoY 186 at 19:56 the nctrs-b died, at first GFCC reported that it was not possible to restart, but eventually at 20:36, it was back. The impact was a loss of redundancy in the mean time, but no data was lost.
- On DoY 187 at 00:33, there was an error sending data to the isds, at 00:34 TM was flowing again.
- Later, at 15:00, TLM parameter E0392 went OOL, but did not appear in the OOL display until TMSPACON was used to set a constant and force an update.
- At 16:10, a problem with the automatic job scheduler led to the AOCS sub-system being disabled, the recovery was not completed until 16:56, the impact was that pointing 02110004 was lost.
- At 18:27, the TMD application on idda reported a problem with the archiver applications. At 16:38, the HFARET task was re-started curing the problem.
- On DoY 188, at 07:56, the HFARET task had again stopped working, at 08:10 it was restarted.
- On DoY 189, at 06:36, the nctrs-a froze. Network restarted it, without further problems.
- Later, at 12:57, the HFARET task on IDDA died, and was restarted at 13:23. Tests were being carried out on the TDRS at the time.

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

AR id	Date Occurrence	Subject	Segment	Status
INT_SC-86	07/07/2004	IBIS/VETO SW anomaly: lateral counter not possible to be defined	Payload	Open
INT-2613	07/07/2004	TDRS request from 2003 DOY 188 till 2004 DOY 187 crashed HFARet	IMCS	Pending
INT-2614	12/07/2004	DoY 184 TM & TC Link Lost From Redu	ESA Stations	Pending

7 Future Milestones

The acceptance testing of the new IMCS release based on the Evolution infrastructure will start end of July.
A first IP migration test involving the Redu station is planned for 20 July. The operational use is postponed to the October / November time frame.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolutions 211 & 212
In revolutions 211 & 212 an amalgamated raster dithering observation of Cygnus X (RA 20:33:10.00; DEC +41:12:00.0) was performed throughout the available observation time (~61.5 hours in each revolution).

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

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2004-06-24T21:32:59.000Z     169.8868    F   Automatic TM processing.
2004-06-26T10:01:58.000Z     169.8671    F   Automatic TM processing.
2004-06-26T15:47:11.000Z     169.8559    F   Automatic TM processing.
2004-06-28T02:11:06.000Z     169.8362    F   Automatic TM processing.
2004-06-29T09:49:18.000Z     169.7957    F   Automatic TM processing.
2004-06-29T15:09:18.000Z     169.7787    F   Automatic TM processing.
2004-06-29T17:59:18.000Z     169.7558    F   Automatic TM processing.
2004-06-30T17:48:25.000Z     169.7141    F   Automatic TM processing.
2004-07-02T09:35:49.000Z     169.7009    F   Automatic TM processing.
2004-07-02T14:54:37.000Z     169.6618    F   Automatic TM processing.
2004-07-02T23:38:06.000Z     169.6487    F   Automatic TM processing.
2004-07-04T01:33:05.000Z     169.6237    F   Automatic TM processing.
2004-07-05T09:22:52.000Z     169.5980    F   Automatic TM processing.
2004-07-07T00:41:36.000Z     169.5929    F   Automatic TM processing.
2004-07-08T14:26:20.000Z     169.5773    F   Automatic TM processing.

This report was generated  Fri Jul 9 08:00:18 GMT 2004
```

8.3 Detailed Satellite Information

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

8.3.1 AOCS Summary Operations Report 03/07/2004-09/07/2004

AOCS operations were executed from the Automatic Timeline.

During this period, 50 Open Loop Slews, 99 Closed Loop Slews and 5 Momentum Bias were executed. Two slews were missed or executed manually. This is equivalent to a 1.3%.

03/07/04 (Day of Year 185, Revolution 210)

Flickering of the Pointing Bit due to Yaw Error: At 08:57:40, an undetected False Event on the STR caused a jump of [-58, -307] CCD units in the position of the Guide Star. The error in yaw was more than the OTF threshold for this axis and caused the

flickering of the Pointing Bit. This was not seen at BCP level. The 8.35 Mi Guide Star, which was picked by the ACC after an Open Loop Slew, was located at [5861, 7886]. The S/C was at an altitude of about 128400 km.

04/07/04 (Day of Year 186, Revolution 210)

Nothing to report.

05/07/04 (Day of Year 187, Revolution 210-211)

Slew missed from the Timeline due to a problem in the FDS: The power safety checks of the control room that were performed during the perigee pass required all the workstations to be powered down. After restart of the workstations and tasks, the Automatic Job Scheduler task of the FDS was not restarted. The update of the first slew of the revolution was therefore not generated. The Timeline should have been stopped before the start of the slew, but this was not done and the first slew executed with the Timeline default values. The second slew, which was a corrective Open Loop Slew also executed without being updated (basically an empty slew). The Timeline was stopped before the execution of the third slew. FD discovered the source of the problem and restarted the Job Scheduler task. The Timeline Recovery Tool was then used to perform a manual slew to the attitude of PID 0211003. Slew 0211004 was a corrective Close Loop Slew, which was skipped. Slew 02110005 was executed from the Timeline after being manually updated.

06/07/04 (Day of Year 188, Revolution 211)

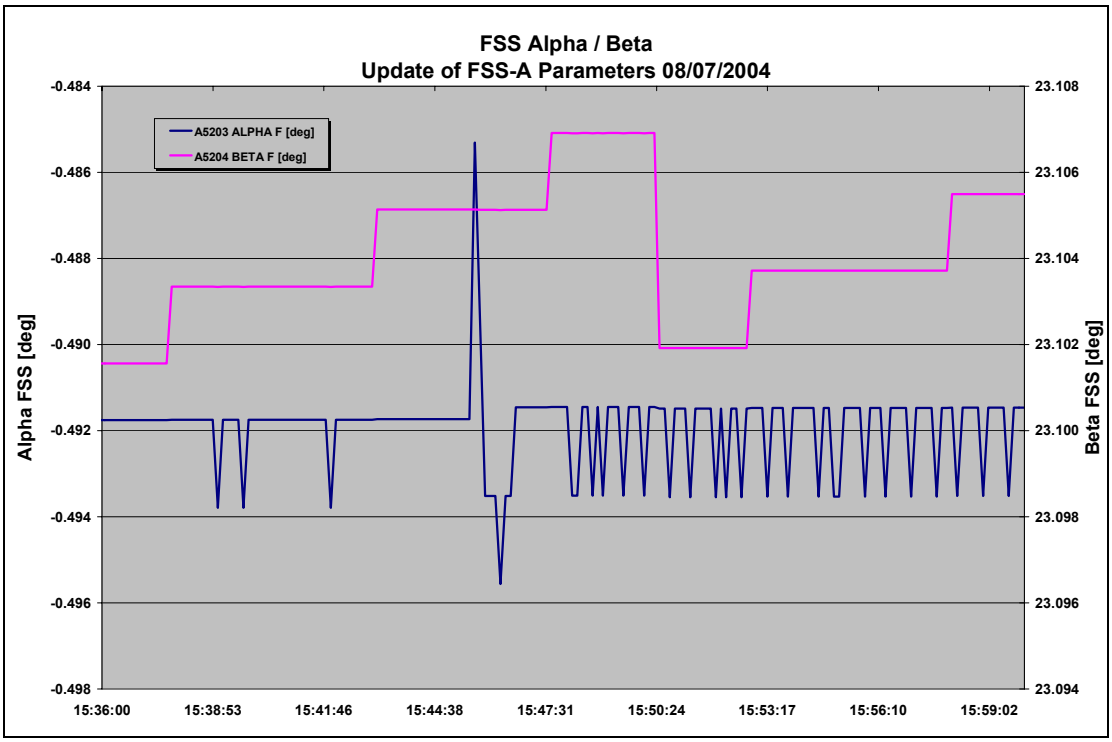
Nothing to report.

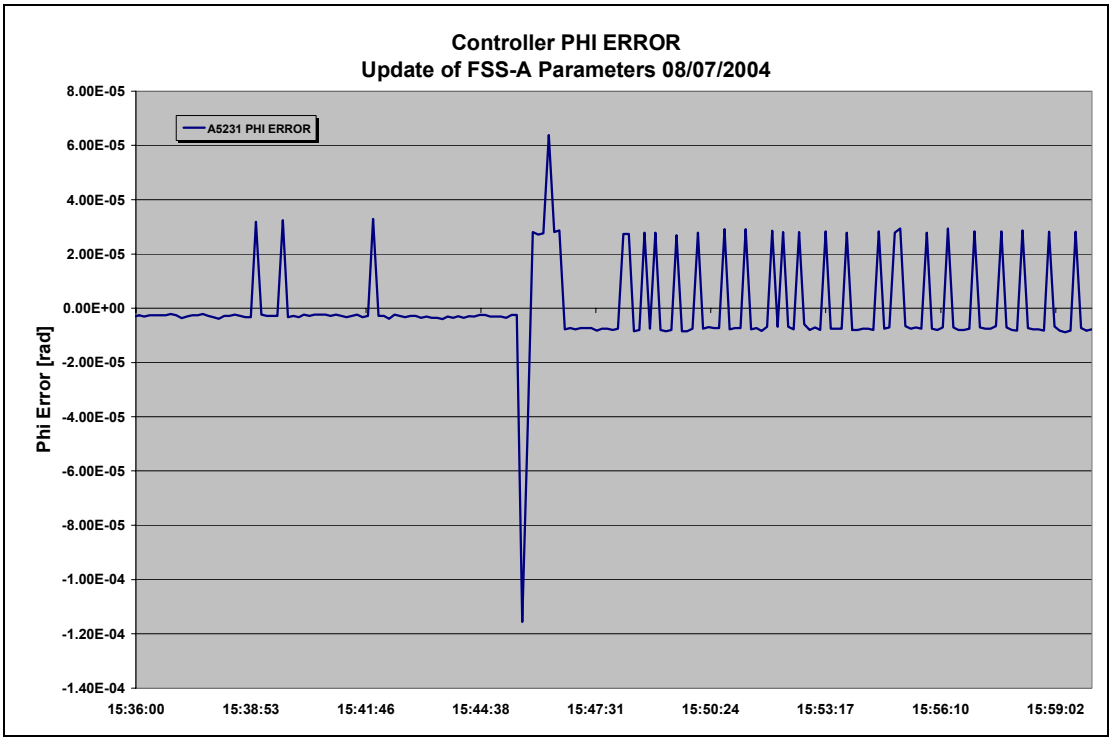
07/07/04 (Day of Year 189, Revolution 211)

Nothing to report.

08/07/04 (Day of Year 190, Revolution 211-212)

Update of the FSS-A parameters: The FSS-A parameters were updated with the results of the FSS-STR Misalignment calibration that was executed on 30/06/2004. The uplink was completed at 15:51, at the beginning of revolution 212 and before the start of the observations, thus no science pointings were affected by the step change in roll. The expected step change in roll was +0.25 arc-minutes. The FSS Alpha and Beta readings at the time of the update as well as the controller Phi Error are shown in the following plots:





09/07/04 (Day of Year 191, Revolution 212)

Nothing to report.

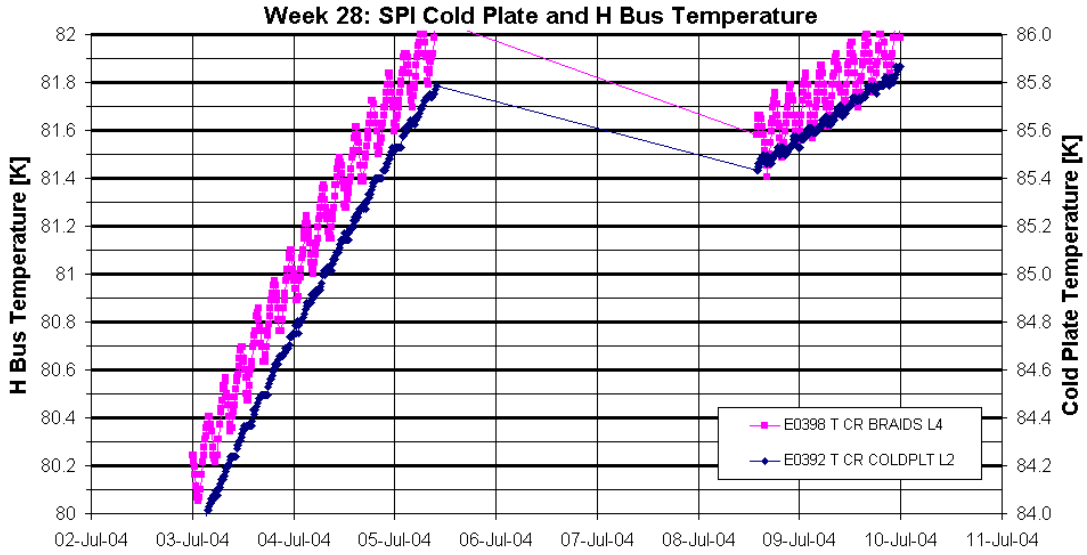
8.3.2 SPI Operations

Cryo-cooler / Detector Cold-Plate:

The performance of the cryo-cooler is nominal.

The cold plate temperature is leveled off and maintained at 85K+/-1K. Within this range the temperature showed a notable positive drift, which was expected after the annealing operations. Within the reporting period the stroke amplitude was adjusted from 4x34dec to 4x35dec (on DoY 187 at 16:17z)

The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period (a TM archive data gap is present between 5th and 8th July).

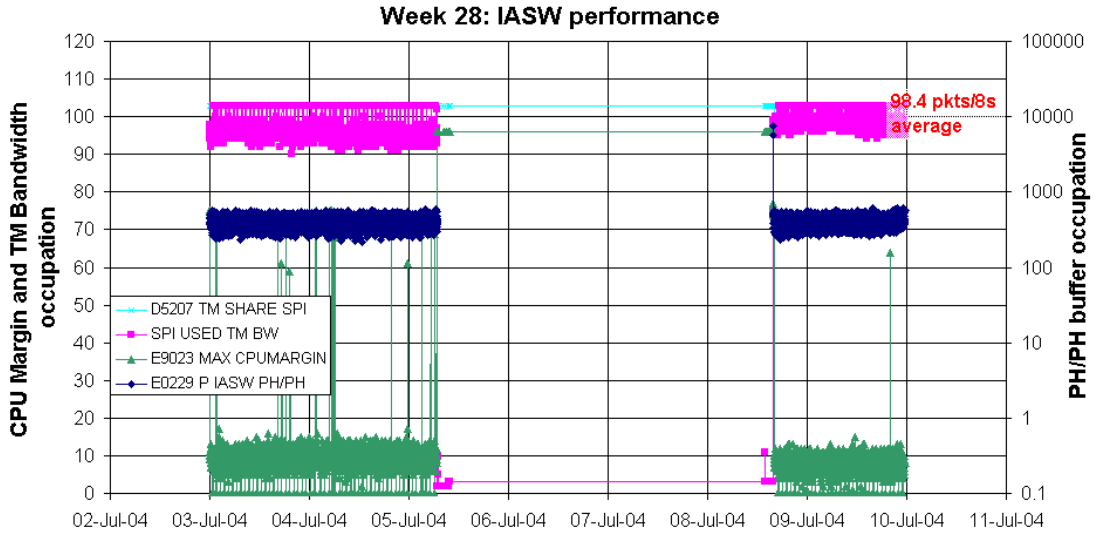


IASW/DPE:

The performance of the IASW/DPE is nominal.

The average TM bandwidth occupation was 98.4 pkts/cycle in the science windows. This figure is about +2.5 pkts w.r.t. the latest recorded value before the annealing in June.

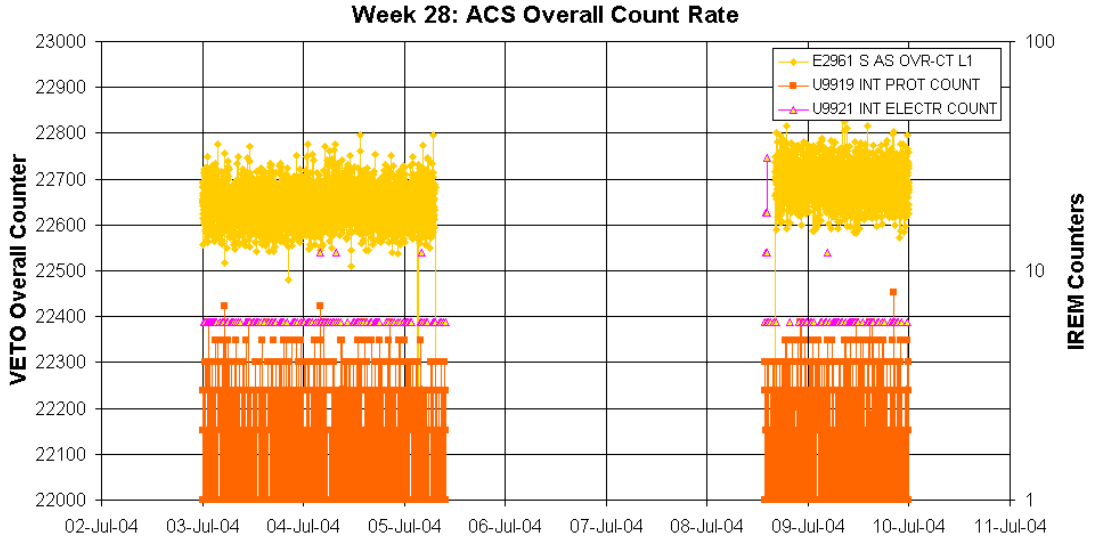
The following diagram shows the IASW performance in terms of TM bandwidth and event buffer occupation during the reporting period (a TM archive data gap is present between 5th and 8th July).



ACS:

The performance of the ACS is nominal.

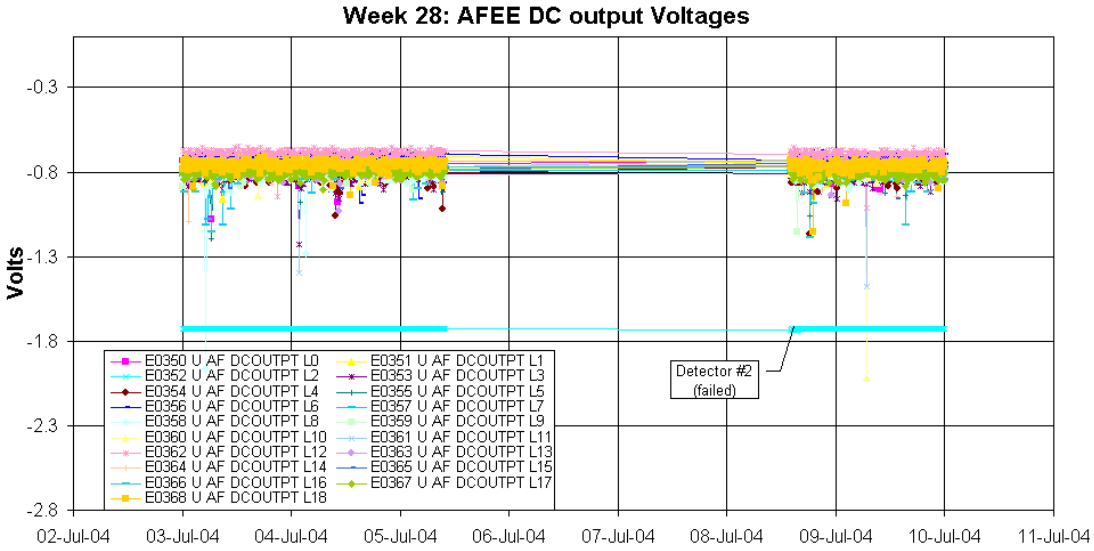
The following plot shows the ACS overall count rate evolution during the reporting period (a TM archive data gap is present between 5th and 8th July).



AFEE:

The performance of the detectors is nominal except for the detector #2 failed since 06.12.2003 (see anomaly report INT_SC-72).

The AFEE dc output signals are here after plotted during the reporting period (a TM archive data gap is present between 5th and 8th July).

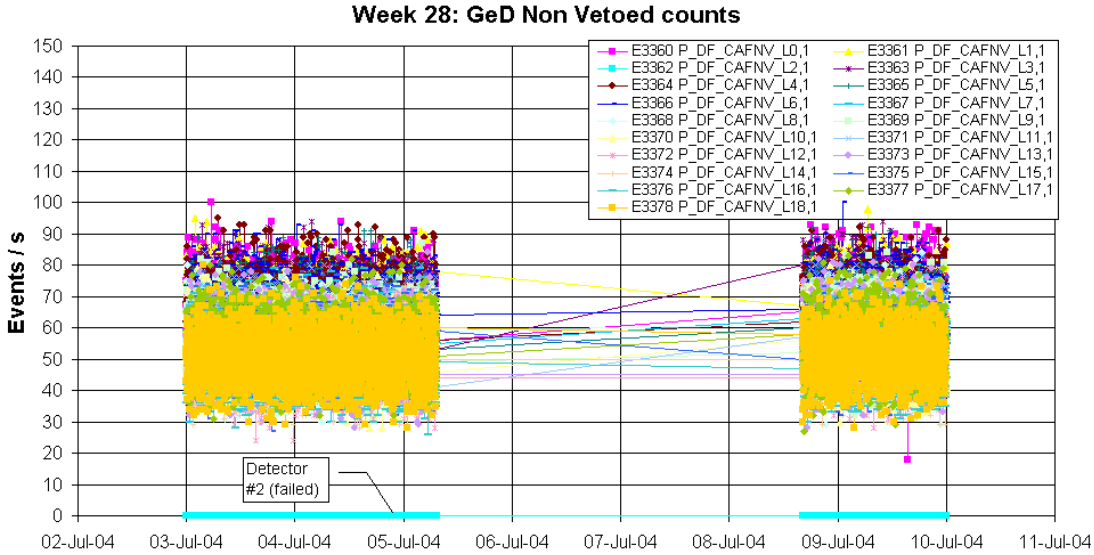


DFEE:

The performance of the unit is nominal.

The following plot shows the GeD Non Vetoed event rates processed by the DFEE during the reporting period (a TM archive data gap is present between 5th and 8th July).

The count rate of each detector is within the expected range, except for the failed detector #2.



PSD:

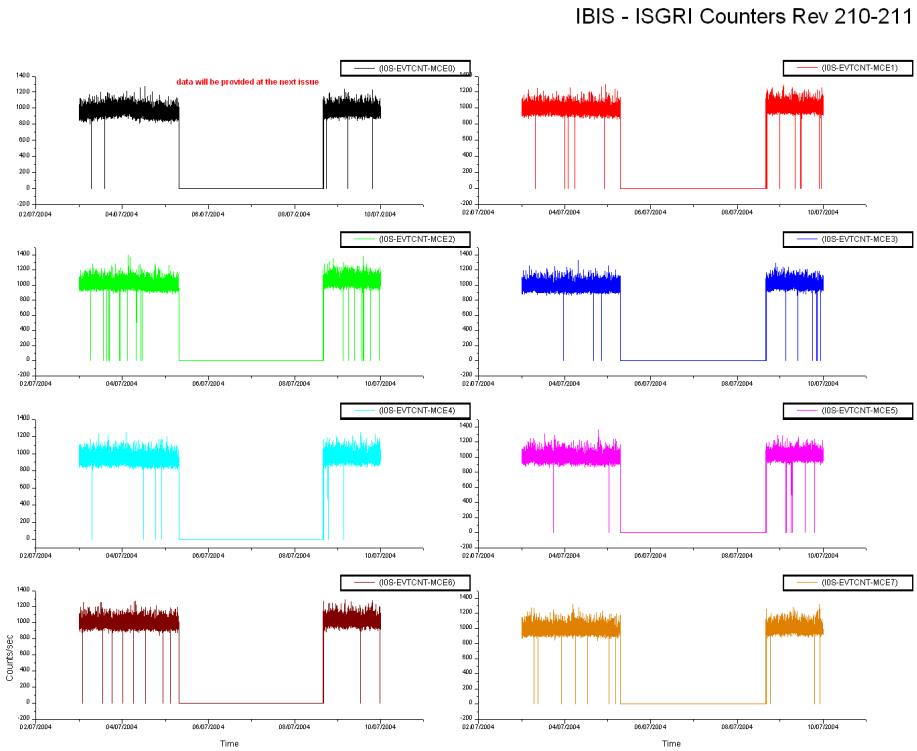
The performance of the unit is nominal.

Nothing to report.

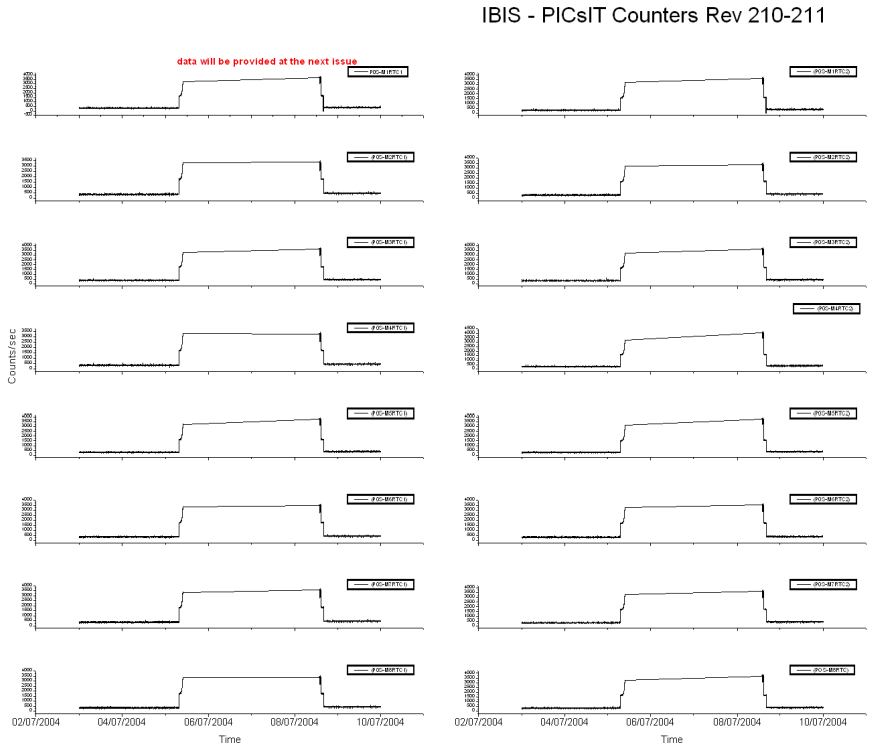
8.3.3 IBIS Operations

IBIS Event Counters Plots.

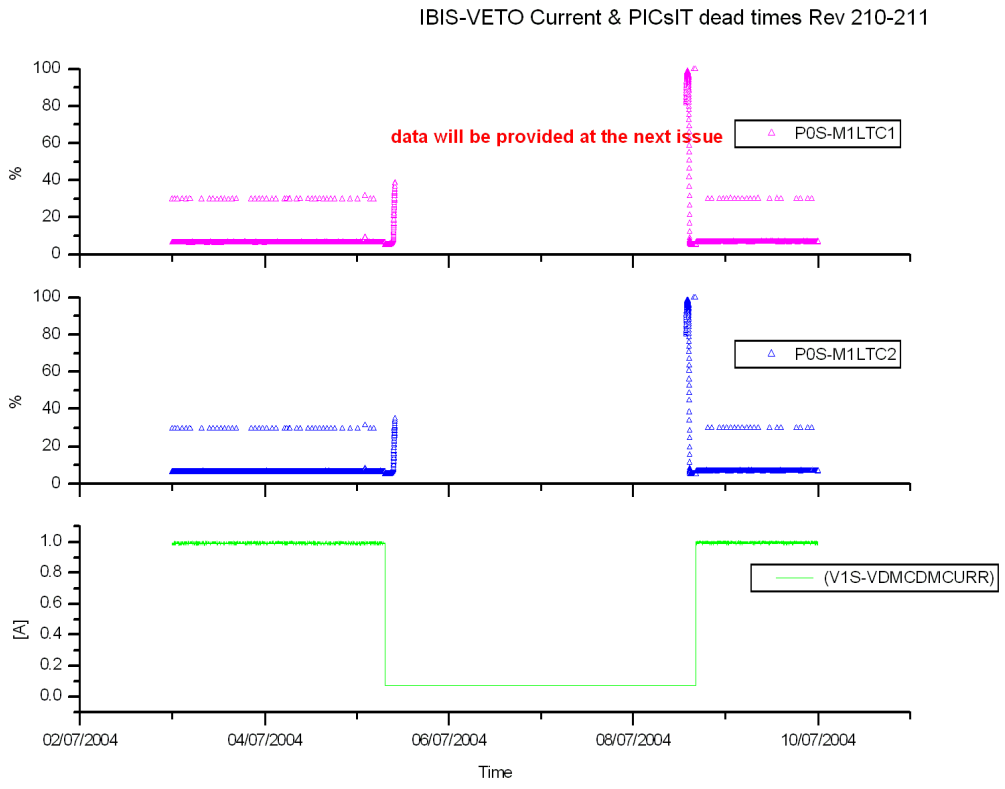
ISGRI Counters:



Picsit Counters:

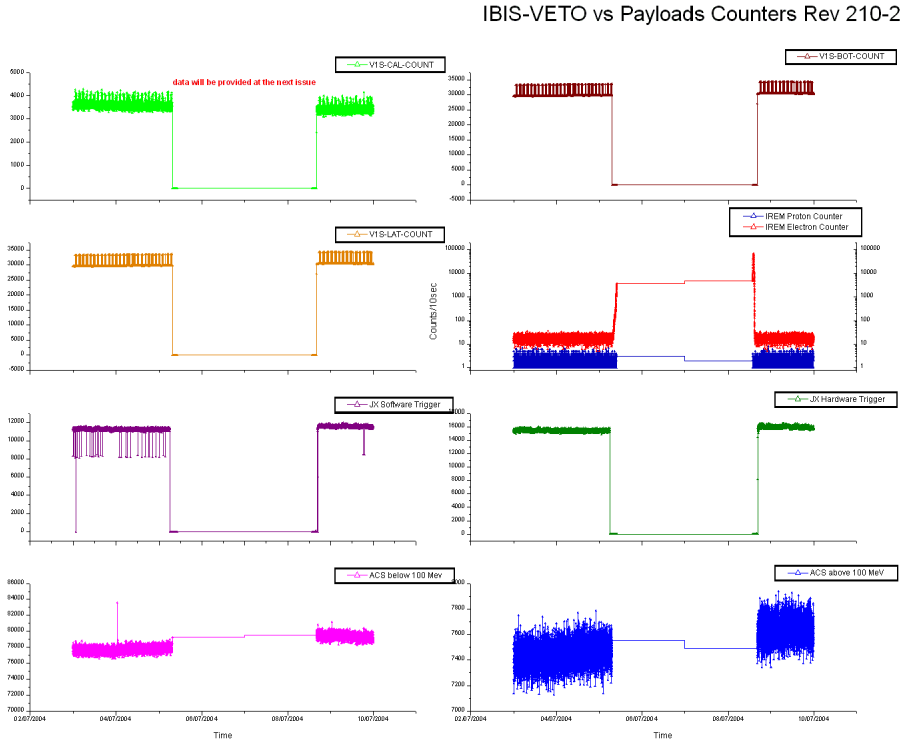


Veto Current:



VETO vs Payloads Counters

The comparison between the count-rates reported by VETO, the SPI-ACS, the IREM counters and JEM-X hardware/software triggers, gives in general an indication of a weak increasing of the environmental background (protons and heavy ions) across the rev 210 and 211: this is shown by the following plot, in which all the on-board sources mentioned are considered.



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

IBIS daily report

DoY 2004.185 (03/07/04)

Nothing to report.

DoY 2004.186 (04/07/04)

A problem was reported with the PICsIT detector modules. The sequence of the events was:

1) At 02:07Z the SCC failed for the TM_para family G5068 (semimodules FIFO error flag)
2) After 2 minutes the SCC returned within limits

This behaviour, previously seen, is likely to be due to a loss of synchronisation between the HEPI and the PICsIT modules and which is cleared autonomously by the unit. No action was taken as suggested by the recovery action P-FIF-1 reported in the Payloads Contingency Recovery Document.

At 06:36Z the SCC filed for the TM parameter G2000 (Overflow of the noisy pixel address buffer in MCE0) after few TM cycles the parameter returned within limits and no further action was taken.

DoY 2004.187 (05/07/04) to 2004.191 (09/07/04)

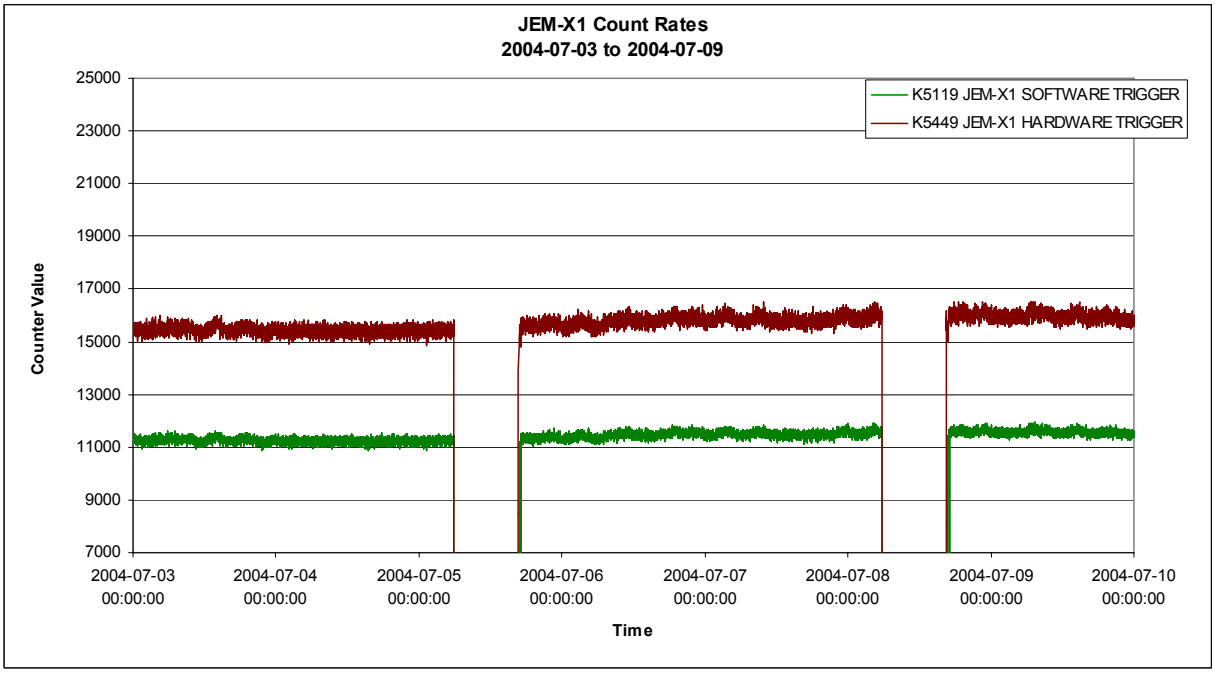
Nothing to report.

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

8.3.4.1 JEM-X Count Rates

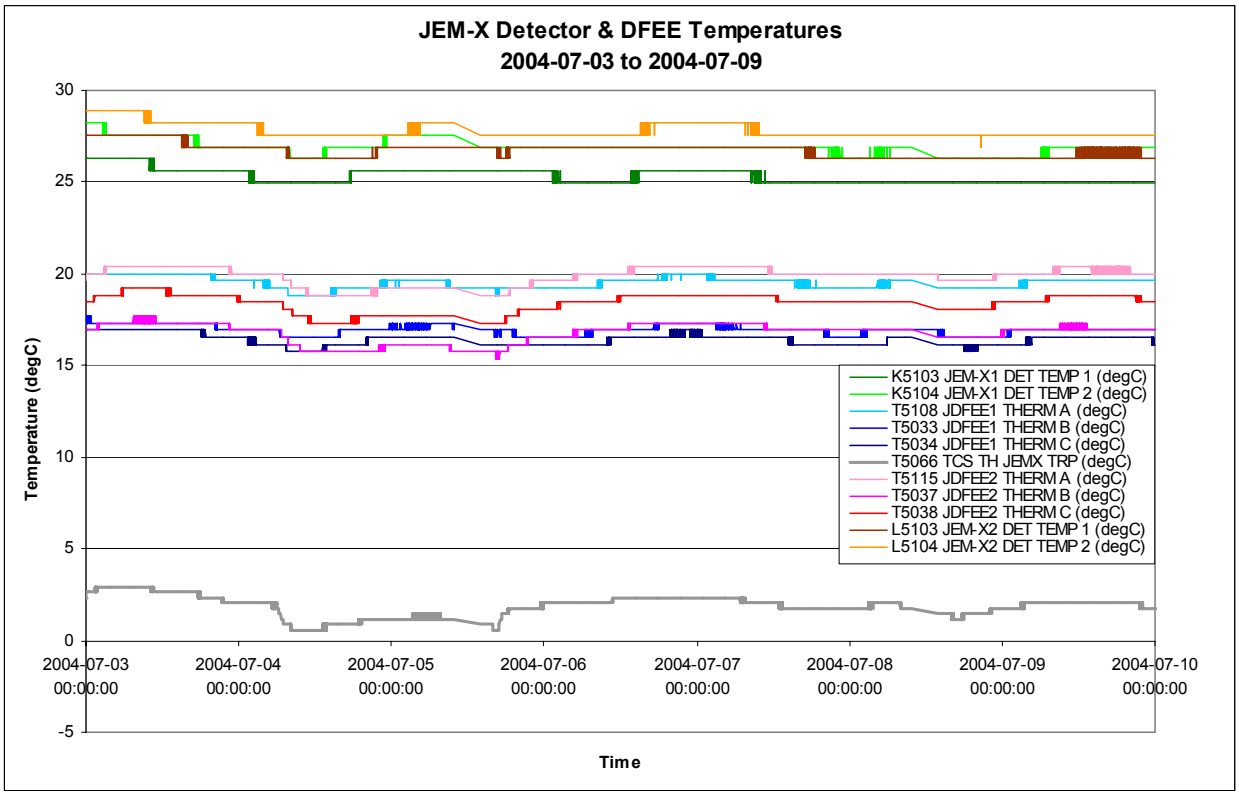
JEM-X count rates over the reporting period are displayed in the following graph[1].



8.3.4.2 JEM-X Temperatures

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

[1] JEM-X1 Data sampled (1 frame in 4) and data for both units smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.
[2] Data sampled (1 frame in 8)



8.3.4.3 JEM-X Daily Report

2004-07-03 (DOY 185, Rev 210) to 2004-07-09 (DOY 191, Rev 212)

Nothing to report.

8.3.5 OMC Operations

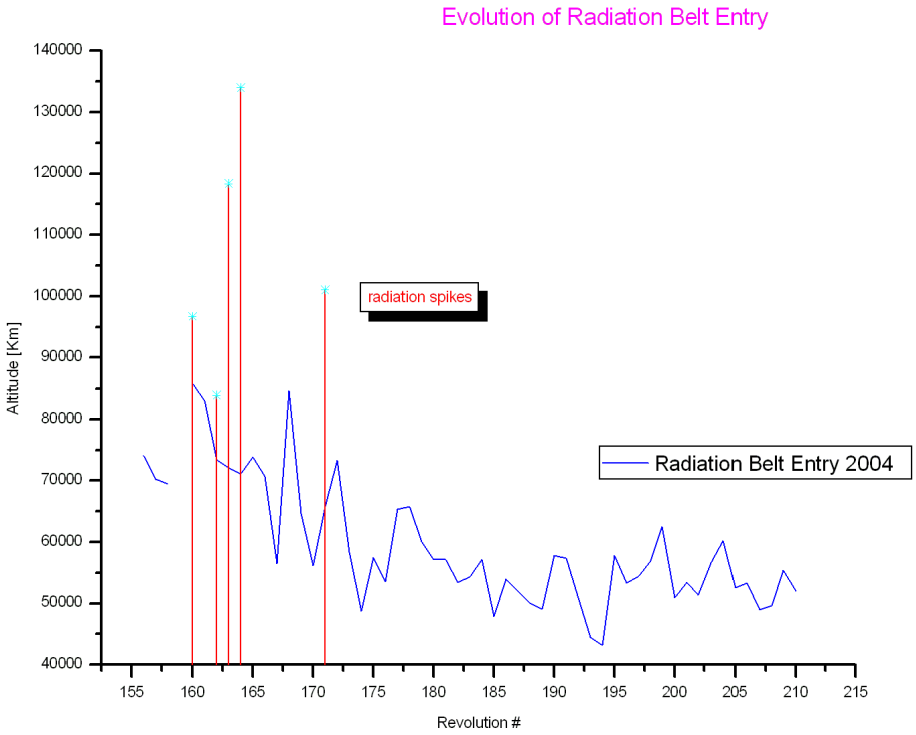
On DoY 187, at 16:10, a problem with the automatic job scheduler caused pointing 02110004 to be lost.

No commands were rejected this week.

On DoY 187 at 07:17:29 and DoY 190 at 07:05:34, OMC was switched by the Timeline to SAFE mode, at the nominal times.

8.3.6 IREM Operations

Radiation Belts Entry

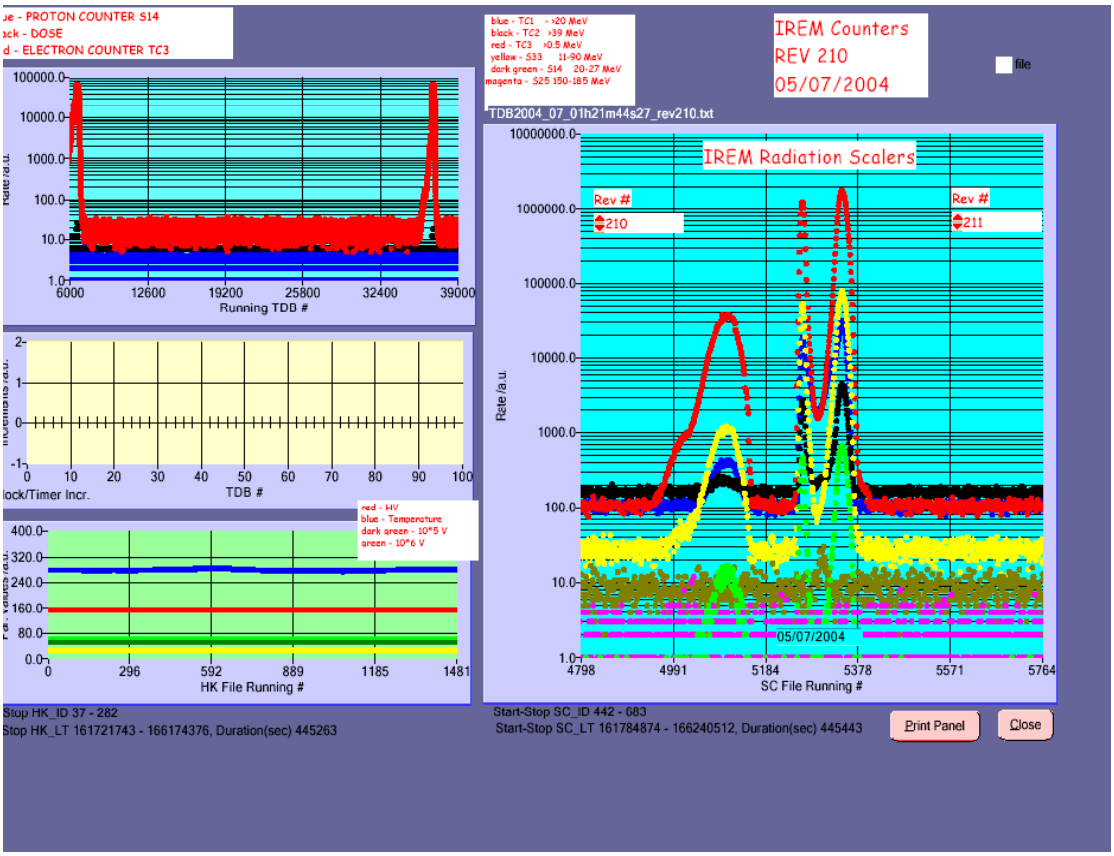


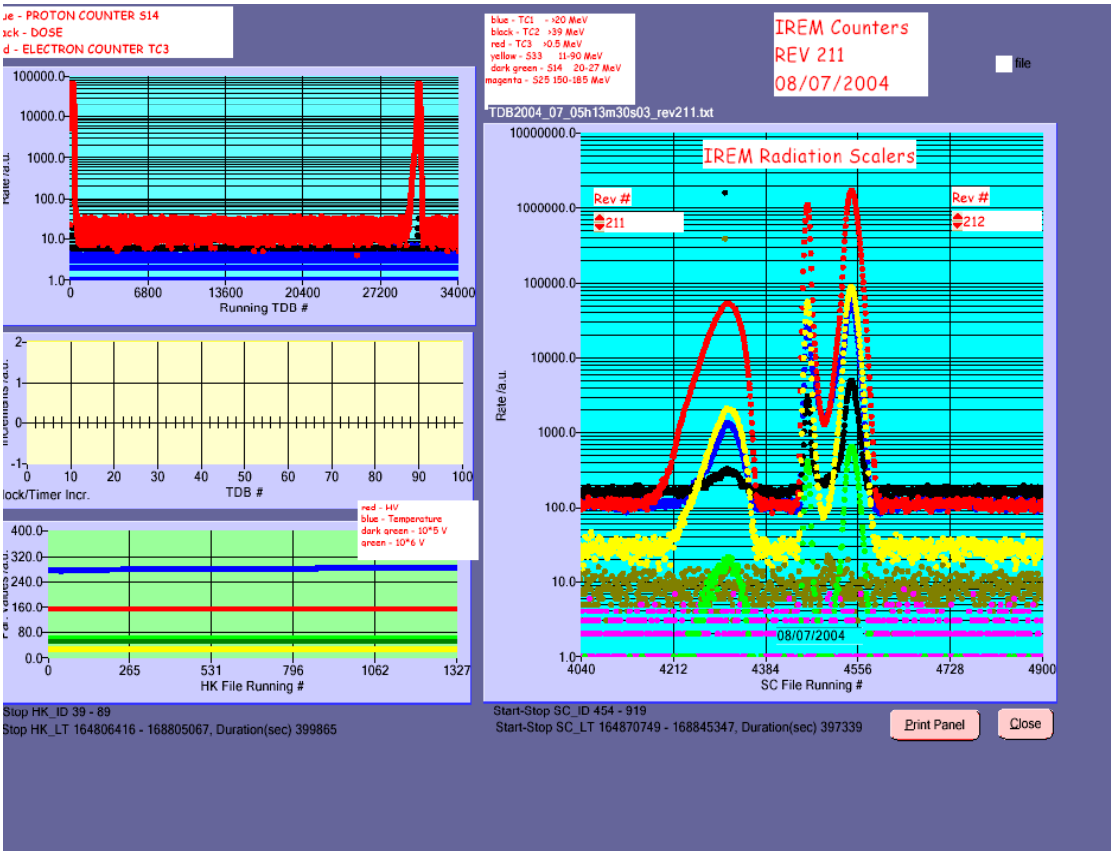
Due to unavailability of data the table of Belts Entry\Exit will be provided to the next issue

IREM daily report

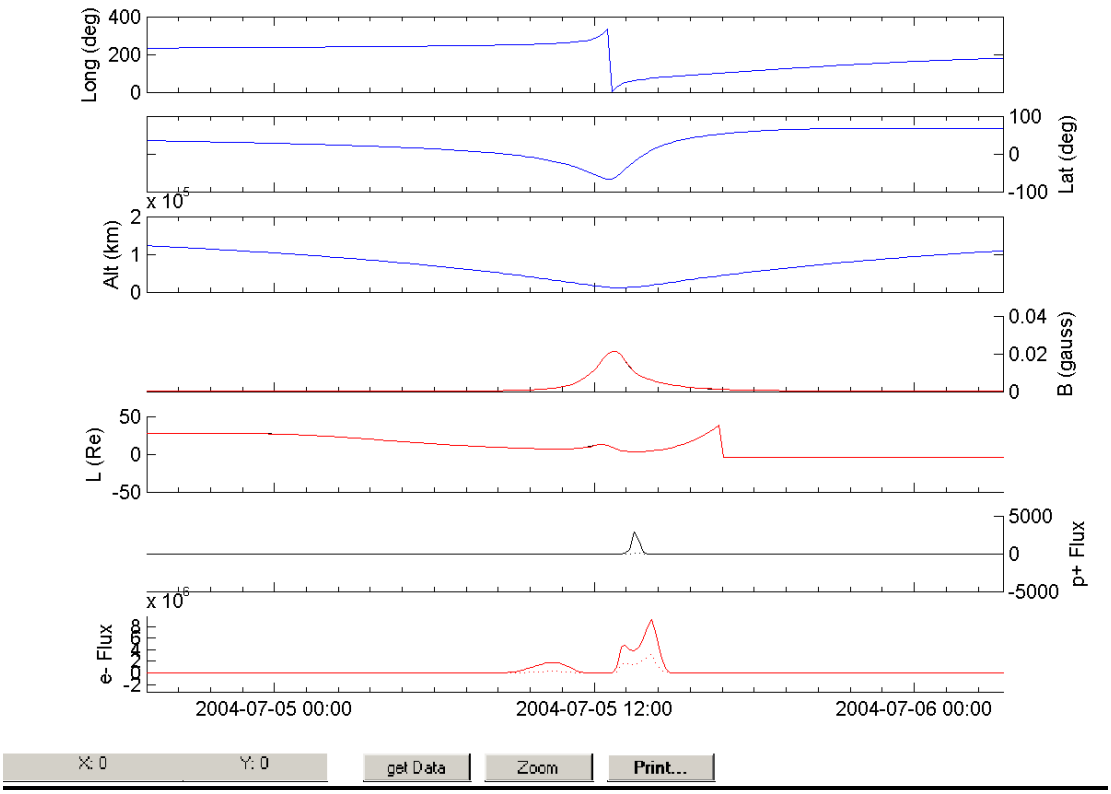
Nothing to report.

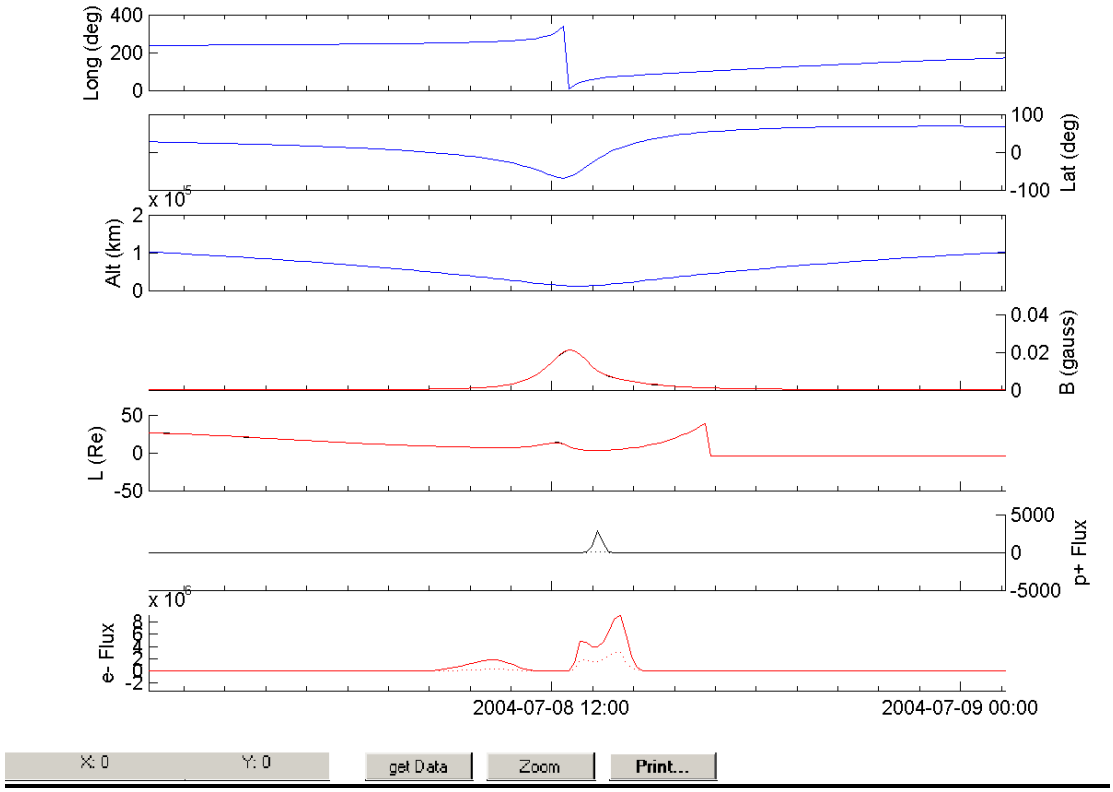
IREM radiation counters



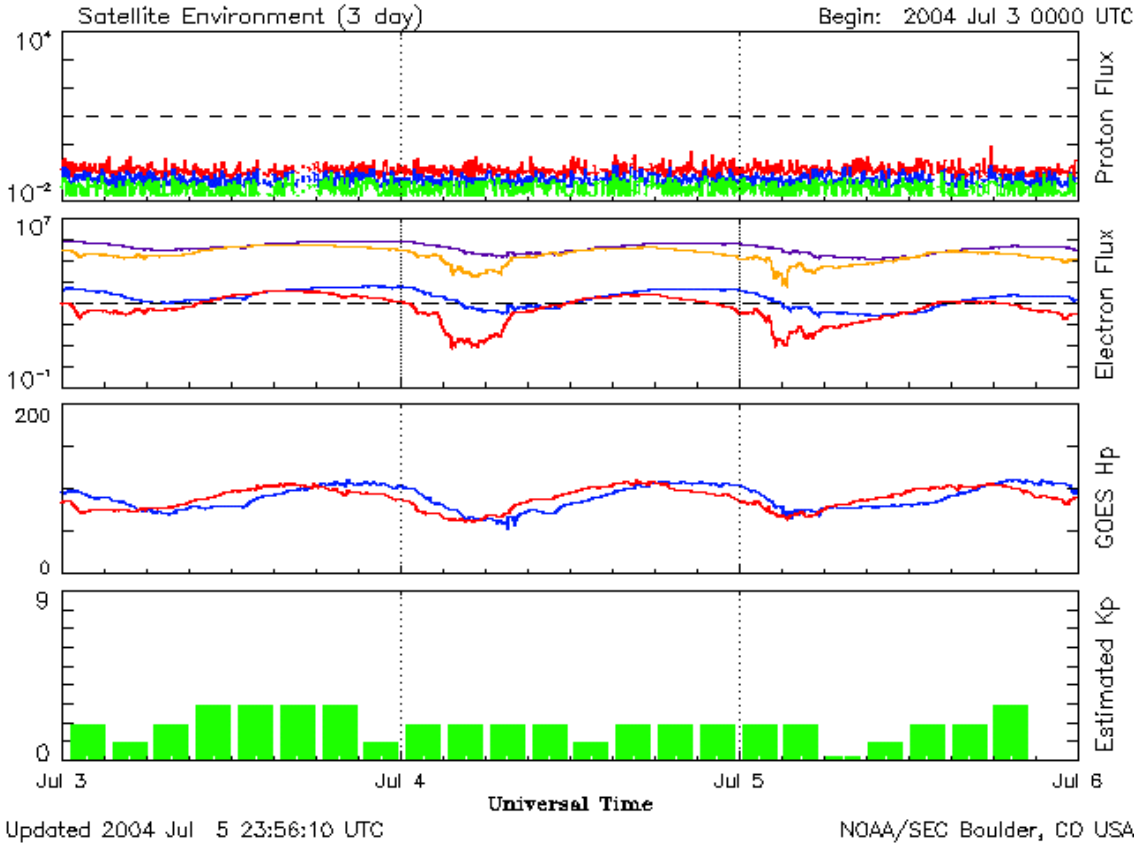


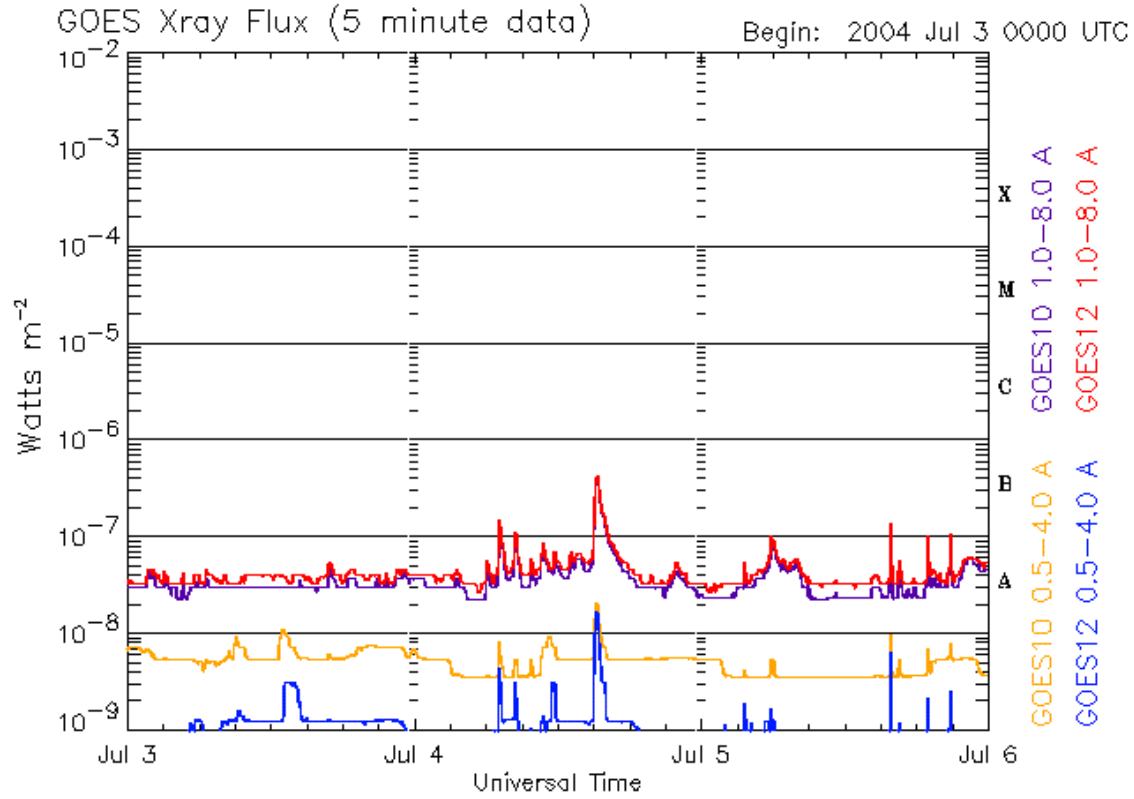
IREM Predicted Radiation Counters.

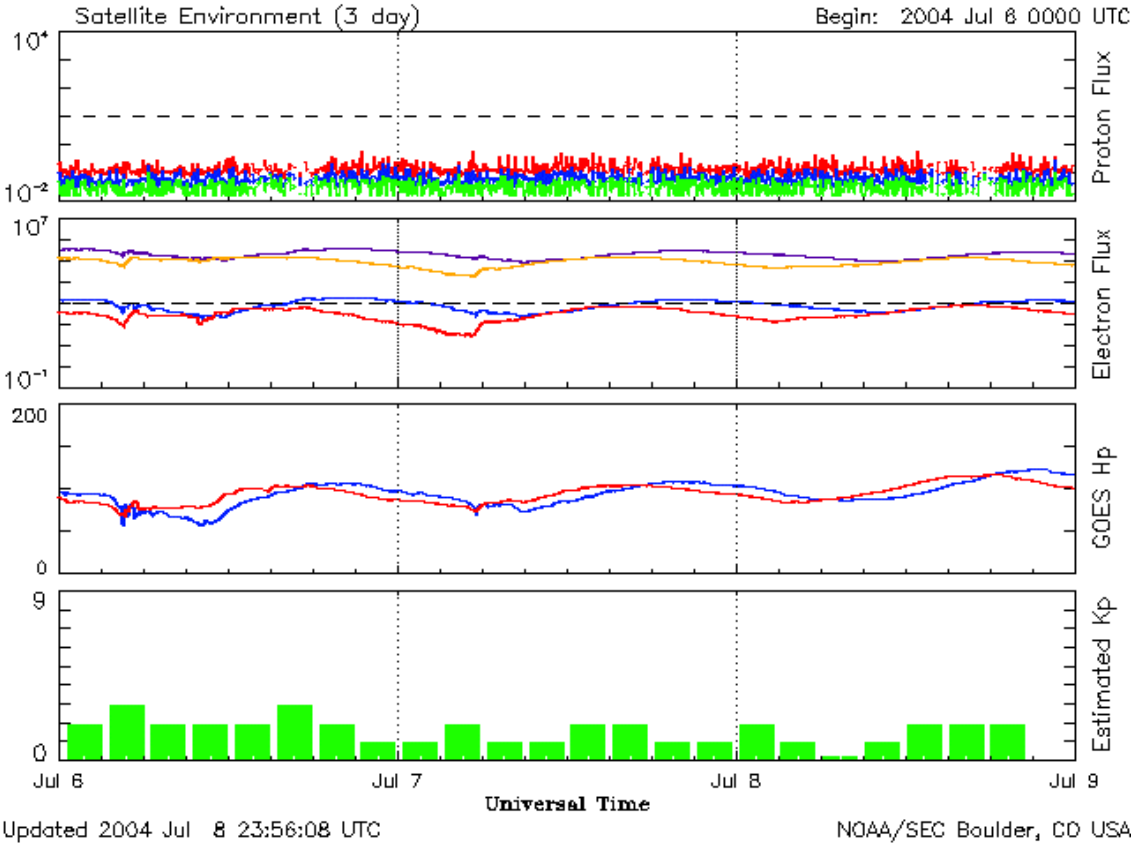


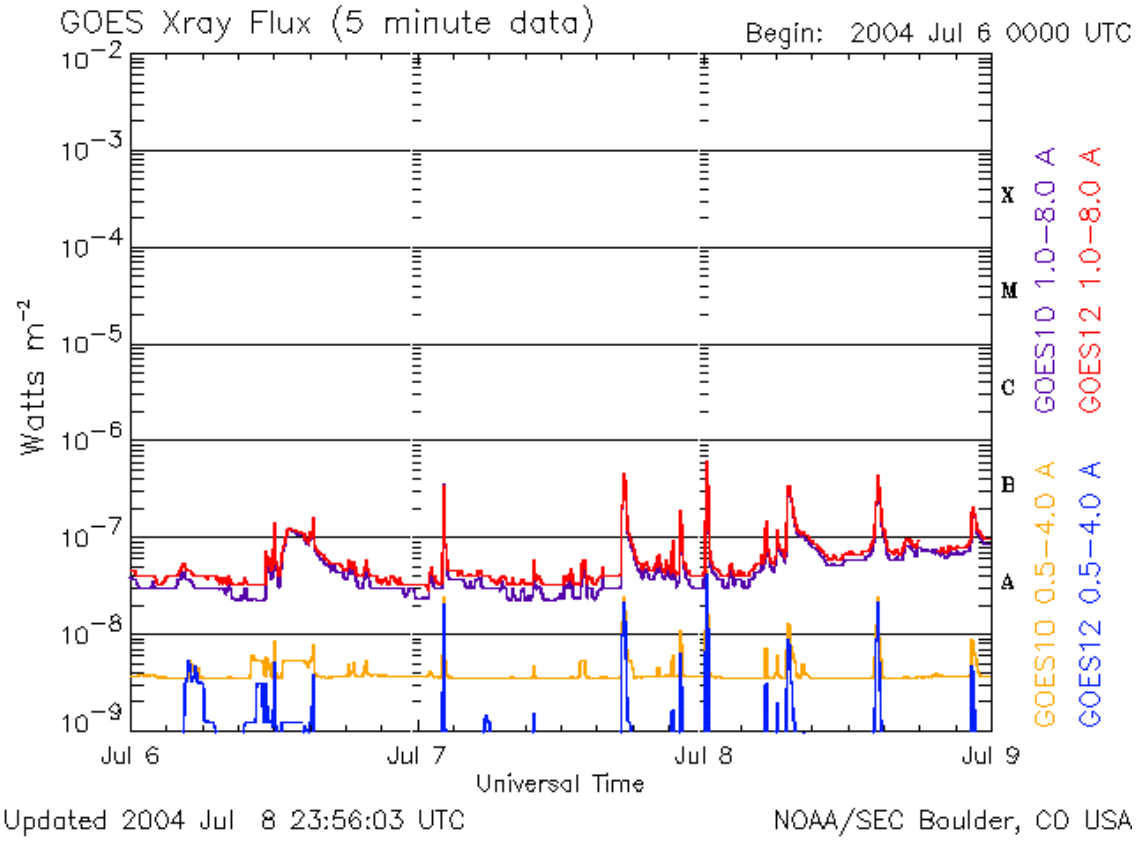


SEC-GOES Observed Particles Fluxes.




GOES Xray Flux (5 minute data)
Begin: 2004 Jul 3 0000 UTC
Watts m-2
X
M
C
B
A
GOES10 1.0-8.0 A
GOES12 1.0-8.0 A
GOES10 0.5-4.0 A
GOES12 0.5-4.0 A
Jul 3
Jul 4
Jul 5
Jul 6
Universal Time
Updated 2004 Jul 5 23:56:04 UTC
NOAA/SEC Boulder, CO USA


Satellite Environment (3 day)
Begin: 2004 Jul 6 0000 UTC
Proton Flux
Electron Flux
GOES Hp
Estimated Kp
Jul 6
Jul 7
Jul 8
Jul 9
Universal Time
Updated 2004 Jul 8 23:56:08 UTC
NOAA/SEC Boulder, CO USA


GOES Xray Flux (5 minute data)
Begin: 2004 Jul 6 0000 UTC
Watts m-2
10-2
10-3
10-4
10-5
10-6
10-7
10-8
10-9
X
M
C
B
A
GOES10 1.0-8.0 A
GOES12 1.0-8.0 A
GOES10 0.5-4.0 A
GOES12 0.5-4.0 A
Jul 6
Jul 7
Jul 8
Jul 9
Universal Time
Updated 2004 Jul 8 23:56:03 UTC
NOAA/SEC Boulder, CO USA