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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 091
Week 26
21.06.04
Routine Phase

Prepared by: R. Southworth (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 12.06.04 until 18.06.04 (both dates inclusive) and covers the revolutions 203, 204 & 205.

2 Summary of Activities

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

The targets of these revolutions were NGC 5548 (RA 14:17:59.65; DEC +25:08:13.4) and Abell 2256 (RA 17:03:58.30; DEC +78:38:30.9). The activities consisted of raster dithering observations. In addition, SPI annealing operations were performed.

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

The eclipse passages were completely nominal from an AOCS point of view.

Two slews were missed from the Timeline in revolution 203. The reason was a false Static PTV no-go condition on an AOCS command.

The fuel consumption over the period between 11/06/2004 and 18/06/2004 was 0.129 kg. The remaining propellant is in the order of 170.009 Kg on the 18th of June.

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.

During the reporting period Integral passed through eclipses 4 and 5 of the summer eclipse season:

A summary of the eclipses is provided in the following table:

Eclipse	Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit	Total Duration	Umbra duration
4	14/06/04	11:53:00	11:55:03	13:01:35	13:03:04	1:10:04	1:08:35

Eclipse	Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit	Total Duration	Umbra duration
5	17/06/04	11:43:44	11:45:45	12:49:35	12:51:02	1:07:18	1:05:51

A summary of the batteries discharge and recharge capacities is provided in the following table:

Eclipse	DOD1 (Ah)	DOD2 (Ah)	EOC Time		Recharge Duration		Recharged Capacity	
			Batt 1	Batt 2	Batt 1	Batt 2	Batt 1 (Ah)	Batt 2 (Ah)
4	6.59	6.52	16:58:31	16:56:31	3:55:27	3:53:27	7.14	7.06
5	5.93	5.86	16:22:31	16:20:39	3:31:29	3:29:37	6.42	6.35

As these eclipses all took place entirely outside ground station coverage, no direct monitoring of batteries behaviour during eclipse was possible. However all indications from on-board stored data (ECD and OBM) are that the behaviour was nominal.

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 98 pkts/cycle and an actual average occupation of 95.9 pkts/cycle (+0.2 pkts w.r.t. previous week).

The procedure to start the 4th annealing of the Germanium detectors was executed on 17th June at rev. 204 critical altitude descending crossing, between 08:00-10:30z. The annealing temperature (104degC) was reached as planned on 19th June at ~01:00z. A special configuration was also loaded on-board, keeping the instrument in photon-by-photon mode in order to monitor the faulty detector GeD#2 during the whole annealing period.

Until annealing start, the cryocooler was working well, maintaining the temperature within 85+/-1K. At annealing start, the cooler was shut down as per procedure. An annealing summary timeline is published in this report, under the future activities section.

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 134TMSP / Cycle
The mean IBIS BW usage was 104.93 TMSP / Cycle (previous week was 105.70).
Except during the OMC FFC when the TM allocation was 90 TMSP / Cycle and the mean BW usage was 77.7 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. JEM-X2 was dormant with a TM allocation of 1 packet/cycle.

On 2004-06-12 at 20:35Z an IREM S/W reset caused JEM-X1 to transition to Safe mode. The unit was recovered to Data Taking, without IREM protection, at 22:38Z. It then operated as such until 2004-06-13 at 03:07Z, when IREM was recovered and all the IREM RMC protections were re-enabled.

Further information on the JEM-X operations can be found in the Appendix Section 8.3.4.

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 this period OMC operations were performed by the automatic Timeline. Flat Field and Dark Current Calibrations were performed from 2004-06-14T05:38:00Z to 2004-06-14T09:01:30Z, during which OMC had a TM allocation of 63 packets/cycle. Otherwise the TM allocation to OMC was 5 packets/cycle during science operations.

During this period, 3 of the 172 planned science pointings for OMC were missed: pointing 02030033 was missed due to an IREM S/W crash on 2004-06-12 and pointings 02030066-02030067 were missed due to a TC in a slew sequence failing PTV on 2004-06-13.

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.

Reported on DoY 2004.164.20.35Z an automatic reset of the IREM S/W (SEU #12) that had impact on the instruments forcing them to SAFE Configuration. After the Payloads reconfiguration, the unit was successfully recovered and currently no degradation of the performances is reported.

Solar Activity

The observation period was characterized by moderate solar activity with a X-flare class M1 during the day 13/06/04 .

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 in general good this week, well above the system performance requirements.

4.1 Mission Operations Centre

The performance of the MOC was in general good in the reporting period, there were a few minor problems that were easily resolved.

4.2 Ground Stations & Network

The performance of the ground stations and Network was in general good this week. Poor communications with DSS-16 caused a couple of minor problems. 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. 213

POS and POD generated: up to rev 209 (no change)

TSF's: Received up to rev 208

No ToO request received. No replanning performed this week. The proposal data base is being updated to use the modified telemetry allocation with the associated IBIS configuration change. This work need to be completed before rev 210 can be planned.

2. Observation status

ECS's up to rev 199 have now been received. Rev 168,189 and 197 are missing.

Corresponding OCS sent. No extra time credited.

3. ISOC science archive

No new data received this week. The web browser version 1.1 has now finished the beta testing and is being installed in ISOC.

4. ISOC system

The ISOC system version 10.4.4 is still in use.

5. Problems

No new problem.

4.3.2 ISDC

Status of ISDC observation processing on 21/06/2004:

- Latest Standard Analysis completed: observation 01201570003 (Cygnus X, Revolution 190-191) on 12/06/2004

- 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

SPI Annealing – see 8.3.2

6 Anomalies

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

- On DOY 165 at 19.37z an AOCS command was not released due to incorrect static PTV condition, in fact the the PTV condition was OK and the command should have been released. This is a known IMCS problem which happens occasionally. 2 timeline slews were lost due to this problem.
- On DOY 167 at 09.38z the Flight Dynamics System stopped receiving TM, at 10.25 the IFTS_FDS instance was restarted and the problem was cleared.
- On DOY 168 at 07.53z there were problems establishing the VC-7 TM link to DSS116 after the Handover. The link was finally established at 07.57z.
- Later at 10.26z the TC links to DSS16 were lost, they were re-established at 10.29z without impact.
- On DOY 169 All links to DSS16 were lost for a period of 1 minute, probably due to a router problem. This problem had no impact.
- Later at 1020z TM was lost for a period of 2minutes from DSS16, again there was no impact.

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

AR id	Date Occurrence	Subject	Segment	Status
INT-SC-83	08/06/2004	IREM Anomaly, Reset of CSCI S/W #12 – 12/06/2004	Payload	Pending

7 Future Milestones

The Summer Eclipse season is on-going, eclipses are scheduled for:

Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit
2004/06/20	11:36:14	11:38:19	12:35:16	12:36:49
2004/06/23	11:32:15	11:34:34	12:19:52	12:21:41
2004/06/26	11:32:46	11:36:24	11:59:55	12:03:04

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 204

In revolution 204 a raster dithering observation of NGC 5548 (RA 14:17:59.65; DEC +25:08:13.4) was performed throughout the available observation time (~59 hours).

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 134; SPI 98; JEM-X1 8; JEM-X2 1; OMC 5.

Revolution 205

In revolution 205 an amalgamated raster dithering observation of the galaxy cluster Abell 2256 (RA 17:03:58.30; DEC +78:38:30.9) was performed throughout the available observation time (~62 hours).

Throughout this observation IBIS, JEM-X1 and OMC were in their nominal science modes, JEM-X2 was in Safe mode and SPI was undergoing annealing. The TM allocation during this observation was IBIS 134; SPI 98; JEM-X1 8; JEM-X2 1; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2004-06-06T02:12:36.000Z	170.2593	F	Automatic TM processing.
2004-06-07T03:08:54.000Z	170.2460	F	Automatic TM processing.
2004-06-08T08:56:58.000Z	170.2180	F	Automatic TM processing.
2004-06-08T17:37:54.000Z	170.1974	F	Automatic TM processing.
2004-06-09T01:59:23.000Z	170.1846	F	Automatic TM processing.
2004-06-09T05:45:48.000Z	170.1498	F	Automatic TM processing.
2004-06-10T03:24:22.000Z	170.1384	F	Automatic TM processing.
2004-06-11T10:34:41.000Z	170.1182	F	Automatic TM processing.
2004-06-11T17:17:46.000Z	170.1102	F	Automatic TM processing.
2004-06-12T01:40:11.000Z	170.0993	F	Automatic TM processing.
2004-06-13T02:44:21.000Z	170.0911	F	Automatic TM processing.
2004-06-14T10:24:24.000Z	170.0471	F	Automatic TM processing.
2004-06-14T17:06:01.000Z	170.0434	F	Automatic TM processing.
2004-06-16T02:42:05.000Z	170.0215	F	Automatic TM processing.
2004-06-17T16:49:29.000Z	170.0093	F	Automatic TM processing.

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 12/06/2004-18/06/2004

AOCS operations were executed from the Automatic Timeline.

During this period, 76 Open Loop Slews, 107 Closed Loop Slews and 6 Momentum Bias were executed. 2 slews were missed or executed manually. This is equivalent to a 1.1%.

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

AOCS Eclipse Times											Summer 2004					
Date	LOS	AOS	ACC Eclipse Imminent	Eclipse Start						Eclipse End					Eclipse Duration	
				ACC	FDE	FCE	Penumbra	FSS Sun Out	Umbra	Umbra	FSS Sun In	Penumbra	FDE/FCE	ACC		
2004-06-05	12:18:43	16:31:03	11:39:19	12:21:18	12:32:08	12:32:52	12:38:59	12:42:36	12:43:26	13:13:44	13:14:33	13:17:34	13:23:40	13:27:13	0:38:35	
2004-06-08	12:06:19	16:21:15	11:18:06	12:00:14	12:10:32	12:11:16	12:17:46	12:20:01	12:20:23	13:15:23	13:15:47	13:17:24	13:22:36	13:27:14	0:59:38	
2004-06-11	11:53:50	16:03:15	11:04:18	11:46:18	11:56:00	11:56:44	12:03:58	12:05:53	12:06:09	13:10:29	13:10:50	13:12:08	13:16:52	13:21:50	1:08:10	
2004-06-14	11:39:27	15:51:03	10:53:03	11:35:14	11:44:49	11:45:33	11:52:43	11:54:40	11:54:44	13:01:16	13:01:46	13:02:45	13:07:53	13:12:40	1:10:02	
2004-06-17	11:26:28	15:35:29	10:43:31	11:25:36	11:35:00	11:35:44	11:43:11	11:45:19	11:45:12	12:49:00	12:49:47	12:50:29	12:55:08	13:00:16	1:07:18	

IMU Usage during Eclipse Season						Summer 2004	
IMU On	IMU Off	From Health Check		From Auto Calibration	On Time	Accumulated On Time	
		Noise Roll [as/s]	Drift Roll [as/s]	Drift Roll [as/s]			
2004-06-05 07:54:32	2004-06-05 13:29:34	0.1920	0.2305	0.2725	5:35:02	5:35:02	
2004-06-08 08:16:42	2004-06-08 13:29:24	0.1928	0.0839	0.1378	5:12:42	10:47:44	
2004-06-11 08:28:19	2004-06-11 13:24:08	0.1989	0.2500	0.2155	4:55:49	15:43:33	
2004-06-14 08:40:08	2004-06-14 13:14:45	0.2243	0.2163	0.1670	4:34:37	20:18:10	
2004-06-17 08:13:32	2004-06-17 13:02:29	0.2391	0.2825	0.2420	4:48:57	25:07:07	

12/06/04 (Day of Year 164, Revolution 203)

Nothing to report.

13/06/04 (Day of Year 165, Revolution 203)

Slew sequence failed due to a false PTV no-go: At 19:37, the command to start the Guide Star failed uplink because the Static PTV on this TC was no-go, although from the TM it was clear that the on-board condition for the uplink of the command was ok. This is a known IMCS problem, which occasionally happens. With the failure of this TC, the sequence of Close Loop Slew 02030066 was interrupted and the slew was missed from the Timeline. To rejoin the Timeline, a manual Open Loop Slew was performed to the attitude of PID 02030067. The Autostack task was then restarted and the next slew in the Timeline was updated afterwards. PIDs 02030066 and 02030067 were affected.

14/06/04 (Day of Year 166, Revolution 203-204)

Nothing to report.

15/06/04 (Day of Year 167, Revolution 204)

Nothing to report.

16/06/04 (Day of Year 168, Revolution 204)

Nothing to report.

17/06/04 (Day of Year 169, Revolution 204-205)

Nothing to report.

18/06/04 (Day of Year 170, Revolution 205)

Nothing to report.

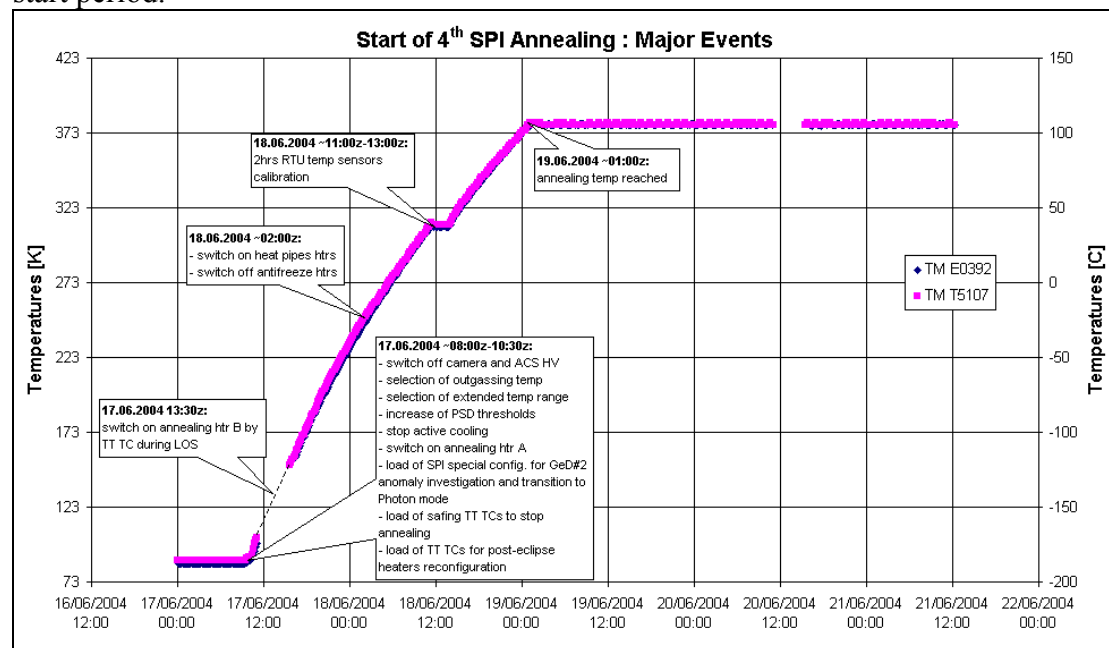
8.3.2 SPI Operations

Cryocooler / Detector Cold-Plate:

The performance of the cryocooler is nominal.

The cold plate temperature is leveled off at around 85.2K until annealing start. At annealing start, the cooler was shut down as foreseen by the annealing procedure.

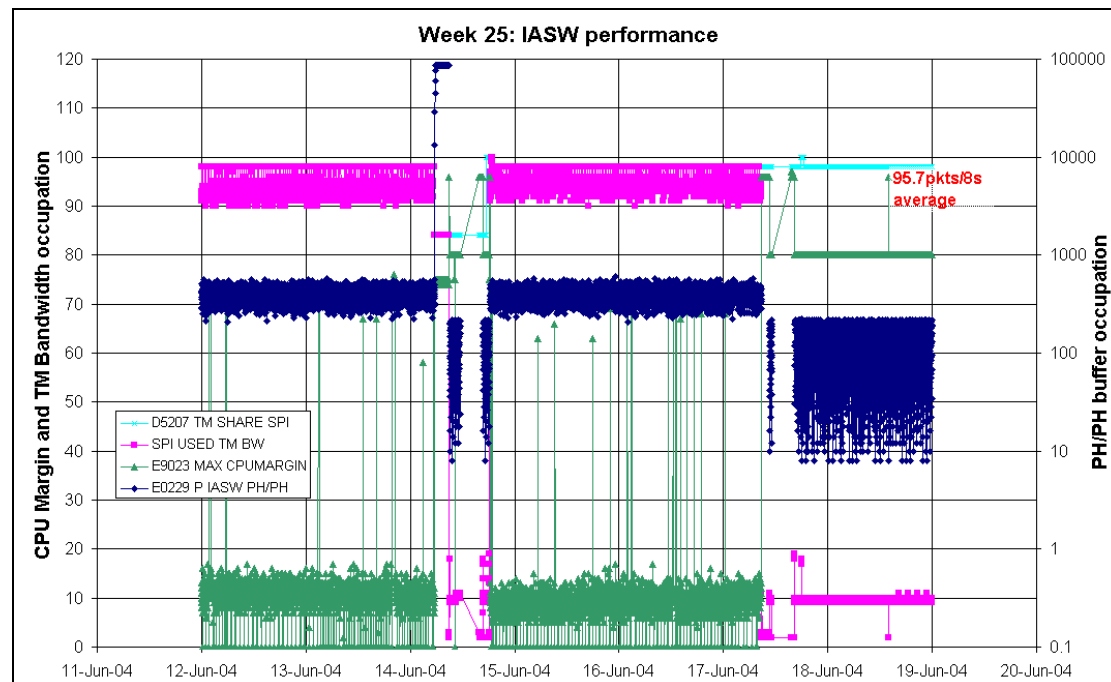
The following plot shows the detectors cold-plate temperature covering the annealing start period.



IASW/DPE:

The performance of the IASW/DPE is nominal. The average TM bandwidth occupation was 95.9 pkts/cycle in the science windows (+0.2 pkts w.r.t. previous week).

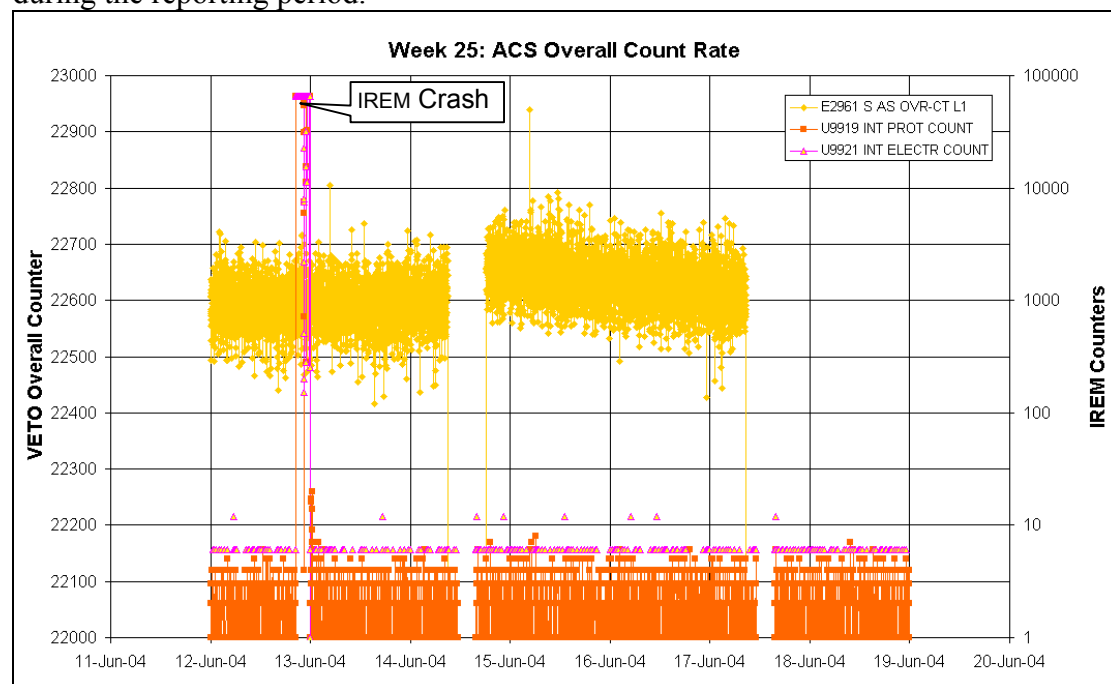
The following diagram shows the IASW performance in terms of TM bandwidth and event buffer occupation during the reporting period.



ACS:

The performance of the ACS is nominal. The ACS PMT HV power supplies were switched off at annealing start-up as foreseen by the annealing procedure.

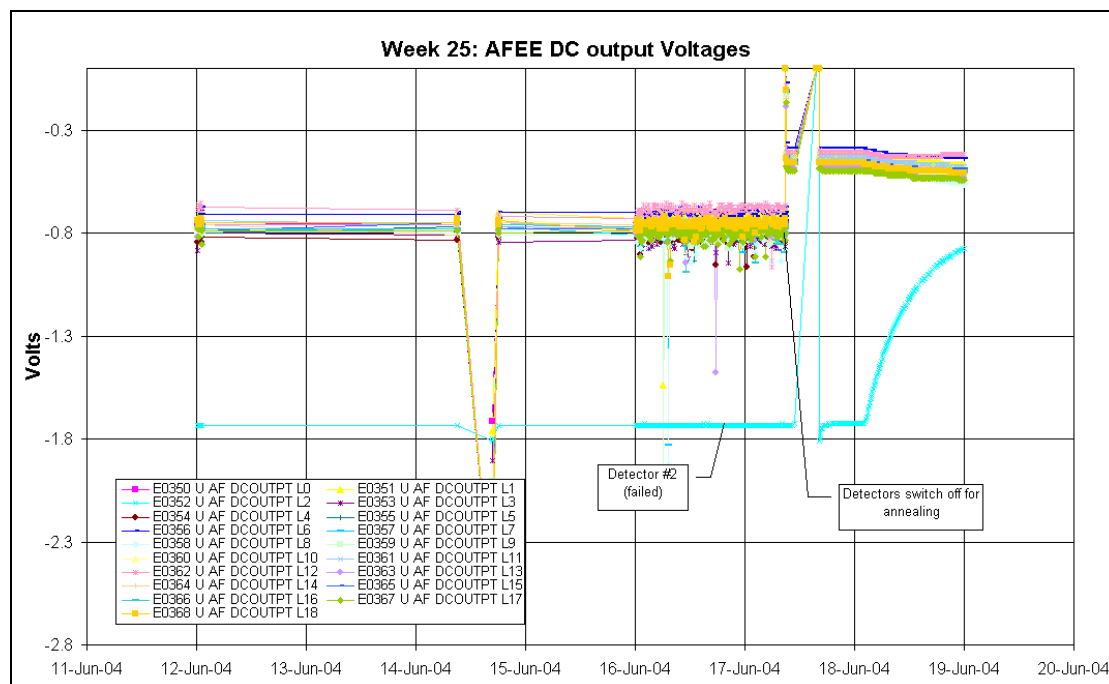
The following plot shows the ACS overall counts and IREM counters evolution during the reporting period.



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 detector HV power supplies were switched off at annealing start-up as foreseen by the annealing procedure.

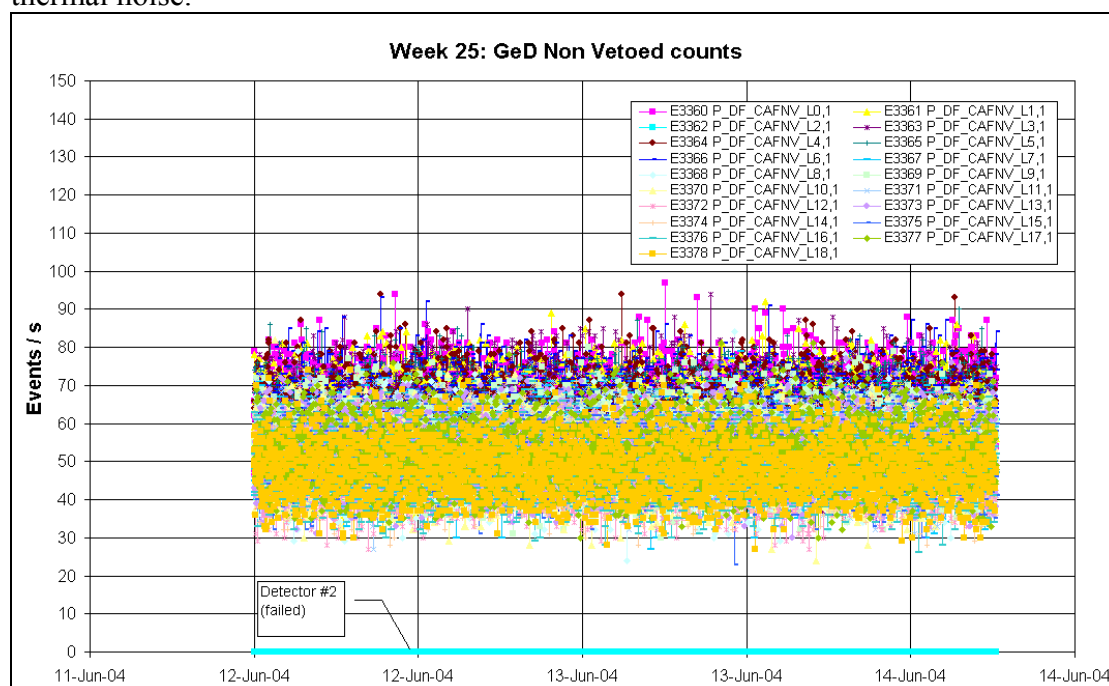
The AFEE dc output signals are here after plotted during the reporting period.



DFEE:

The following plot shows the GeD Non Vetoed event rates processed by the DFEE during the reporting period. The count rate of each detector is within the expected range, except for the failed detector #2.

During the annealing cycle warm phase, the DFEE is configured in such a way to have all detectors masked except for GeD#2 channel; Single Event acquisition is enabled while Multiple Events, PSD Events and Spectra acquisition are disabled. With this configuration the instrument has been put in photon-by-photon mode to be able to catch any signal from this channel - faulty since 06.12.2003 - triggered by thermal noise.



PSD:

The performance of the unit is nominal.
 Nothing to report.

Future Activities:

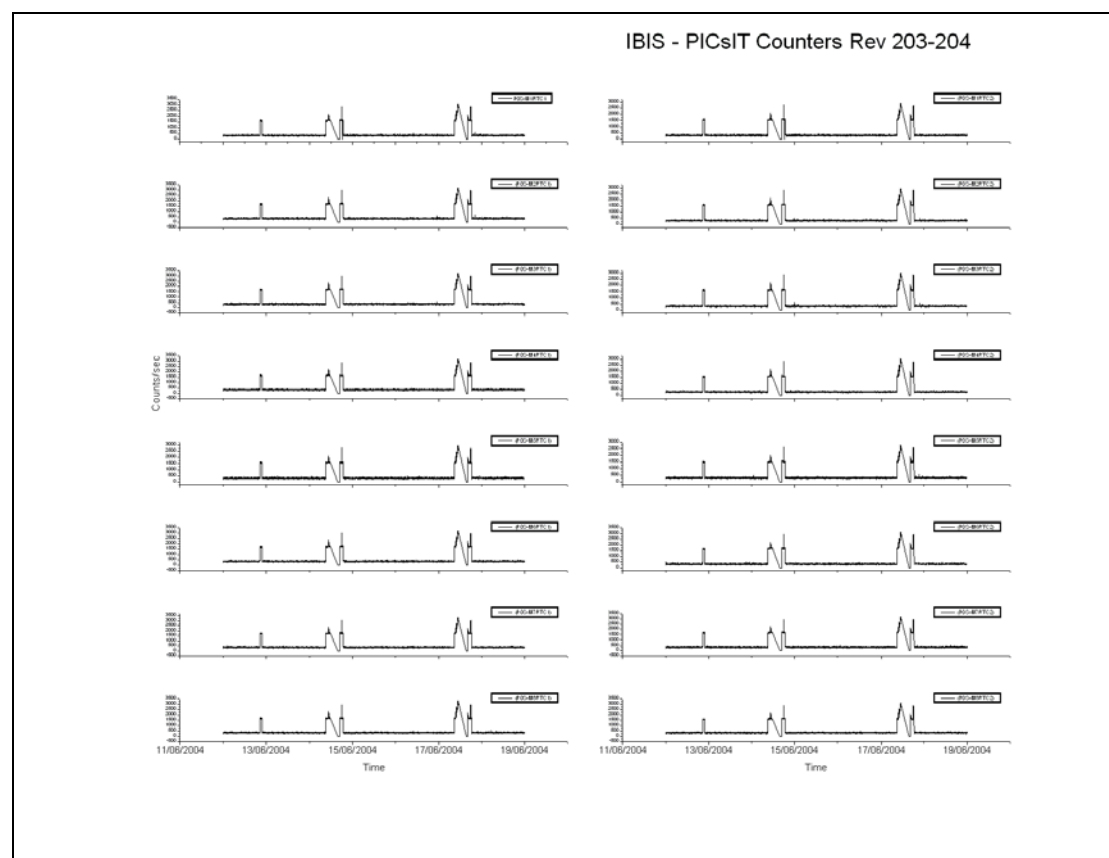
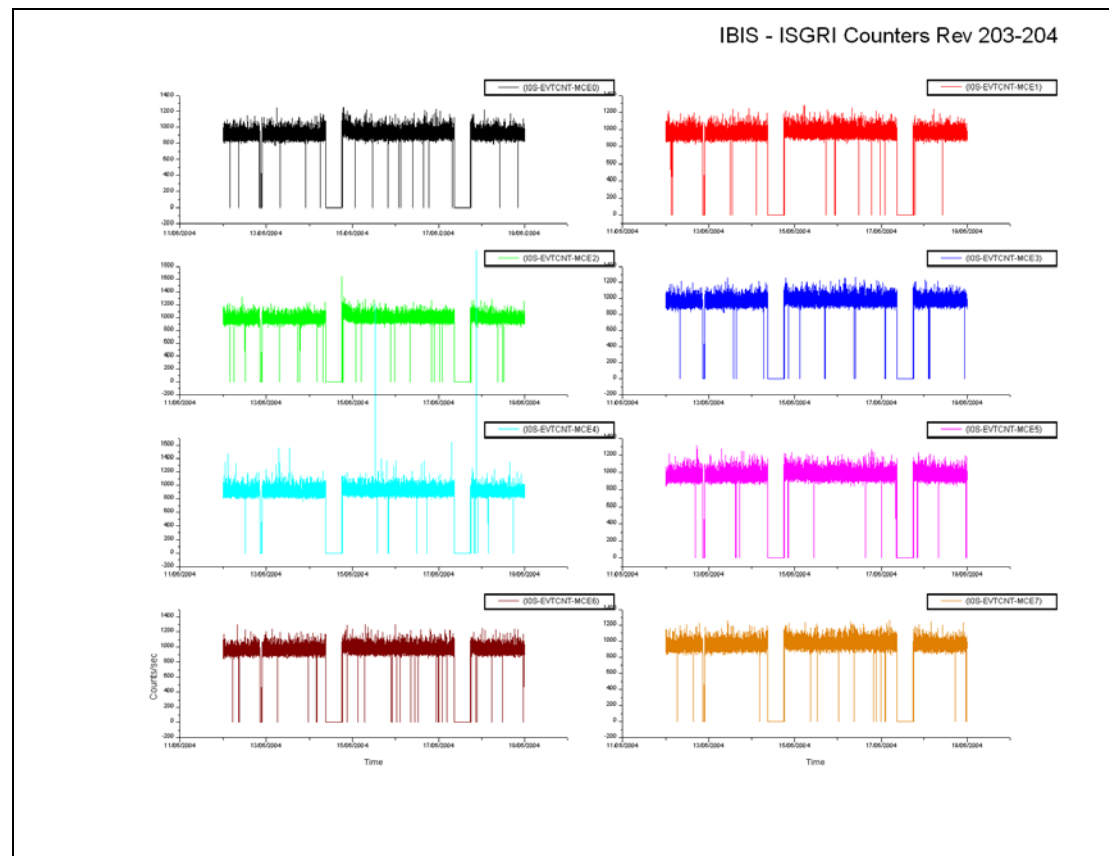
The 4th SPI annealing has started on 17th June as planned and will last until 2nd July (revs 204 to 209). The annealing timeline includes 121hours annealing time at 104degC, a few additional tests to calibrate the ACS, investigate the background of the camera saturating events, align the ACS veto pulse with the camera time tag events. During the warm phase, the instrument will also be maintained in photon-by-photon mode to catch any signal from GeD#2 channel - faulty since 06.12.2003 - triggered by thermal noise.

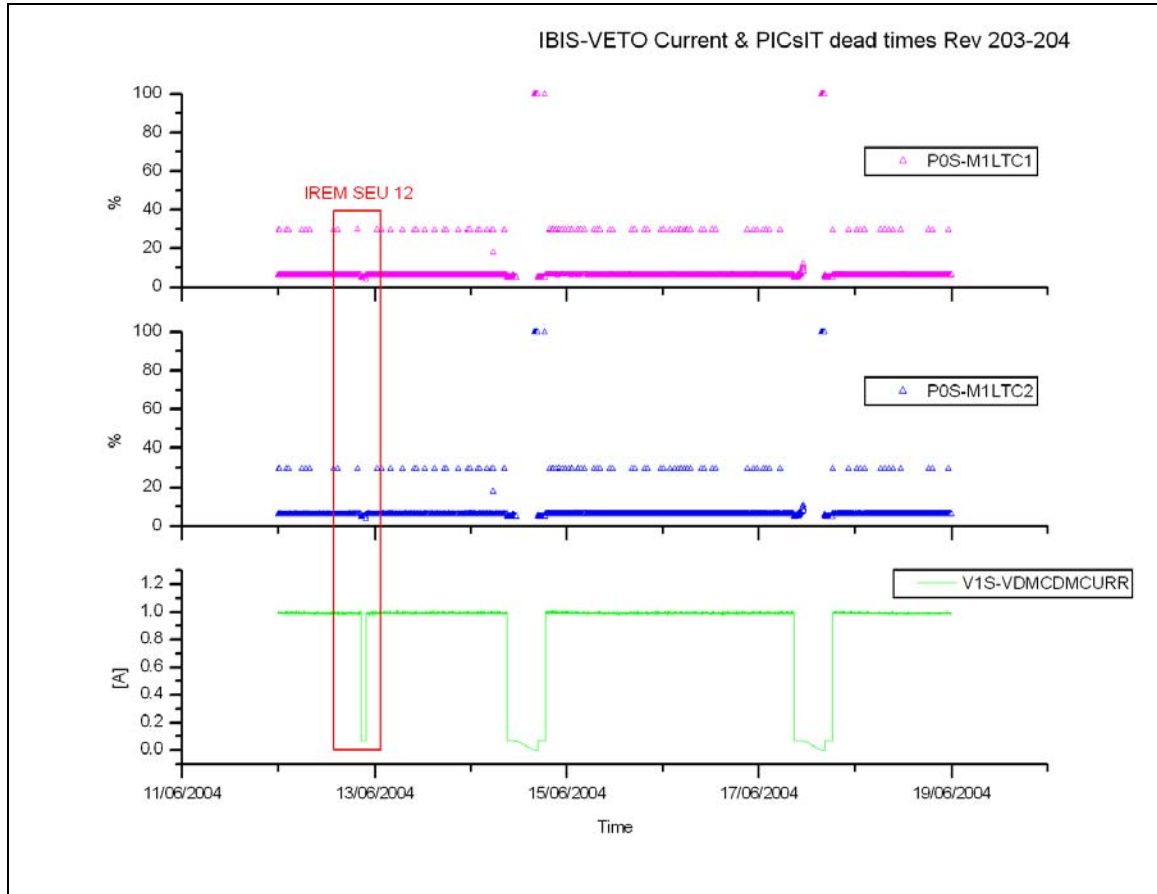
Here follows the summary view of the updated timeline:

3rd SPI Annealing - revs 132-136																										
ID	Task Name	Duration	Start	Resource Names	Jun '04							21 Jun '04							28 Jun '04							05
					un	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo
4	Start SPI Annealing	2.58 hrs	17 Jun 08:53	PST[20 pkts]	n 08:53																					
21	Warm up to Annealing Temperature	37.55 hrs	17 Jun 10:56	PST[20 pkts]	n 10:56																					
28	Annealing at 104degC	121 hrs	19 Jun 00:29	PST[20 pkts]	19 Jun 00:29																					
43	Stop SPI Annealing - Passive Cooling	68.52 hrs	24 Jun 01:29	PST[20 pkts]																						
53	Start Active Cooling	118.26 hrs	26 Jun 22:00	PST[20 pkts]																						
68	Active Cooling Fine Tuning	72.2 hrs	01 Jul 20:16	PST[20 pkts]																						
75	ACS Switch-on and Calibration	7.8 hrs	29 Jun 17:02	PST[98 pkts]																						
80	Camera Switch on & Performance Tests	18.4 hrs	30 Jun 11:36	PST[98 pkts]																						
90	Saturating Events Background Test	7 hrs	01 Jul 06:00	PST[98 pkts]																						
94	Time Tag Alignment Test	2.01 hrs	01 Jul 13:00	PST[98 pkts]																						
102	SPI POS Observations	62.6 hrs	02 Jul 16:46	PST[98 pkts]																						

8.3.3 IBIS Operations

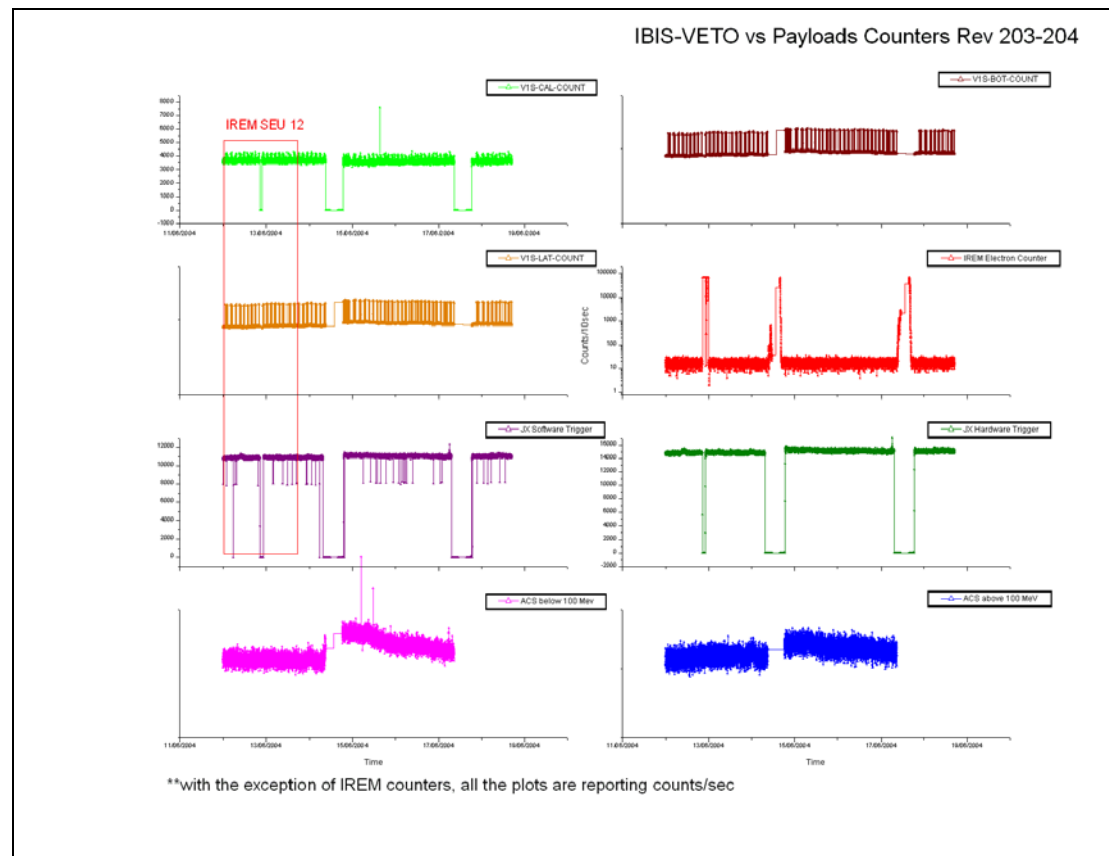
IBIS Event Counters Plots.





VETO vs Payloads Counters

The comparison between the count-rates reported by VETO, the SPI-ACS and JEM-X hardware/software triggers, gives in general an indication of stabilization of the environmental background (protons and heavy ions) apart a short increasing at the beginning of Rev 204 reported only by the SPI ACS s/s : this is shown by the following plot, in which all the on-board sources mentioned are considered.



IBIS daily report

DOY 2004.164 (12/06/04)

Reported at 20:35Z the IREM automatic transition to Standard Mode (reset of the CSCI sw). The anomaly did affect the instruments status via BCP because the S/C was in observation and forced the automatic transition of IBIS to Stand-By with all the High Voltages and Biases OFF.

The recovery of the unit was completed at 21:53Z (see IREM report for the details).

DOY 2004.165 (13/06/04)

Nothing to report

DOY 2004.166 (14/06/04)

Nothing to report.

DOY 2004.167 (15/06/04)

Reported at 12:35Z the TM parameter G2056 (IOE-OVFWPXADD-M4) failing the SCC. This parameter is reporting the dynamic status of the noisy pixels for the module 4. After few TM cycles the parameter went back in limit and no further action was taken.

DOY 2004.168 (16/06/04)

Reported at 12:17Z the TM parameter G2056 (IOE-OVFWPXADD-M4) failing the SCC. This parameter is reporting the dynamic status of the noisy pixels for the module 4. After few TM cycle the parameter went back in limit and no further action was taken.

DOY 2004.169 (17/06/04)

Nothing to report.

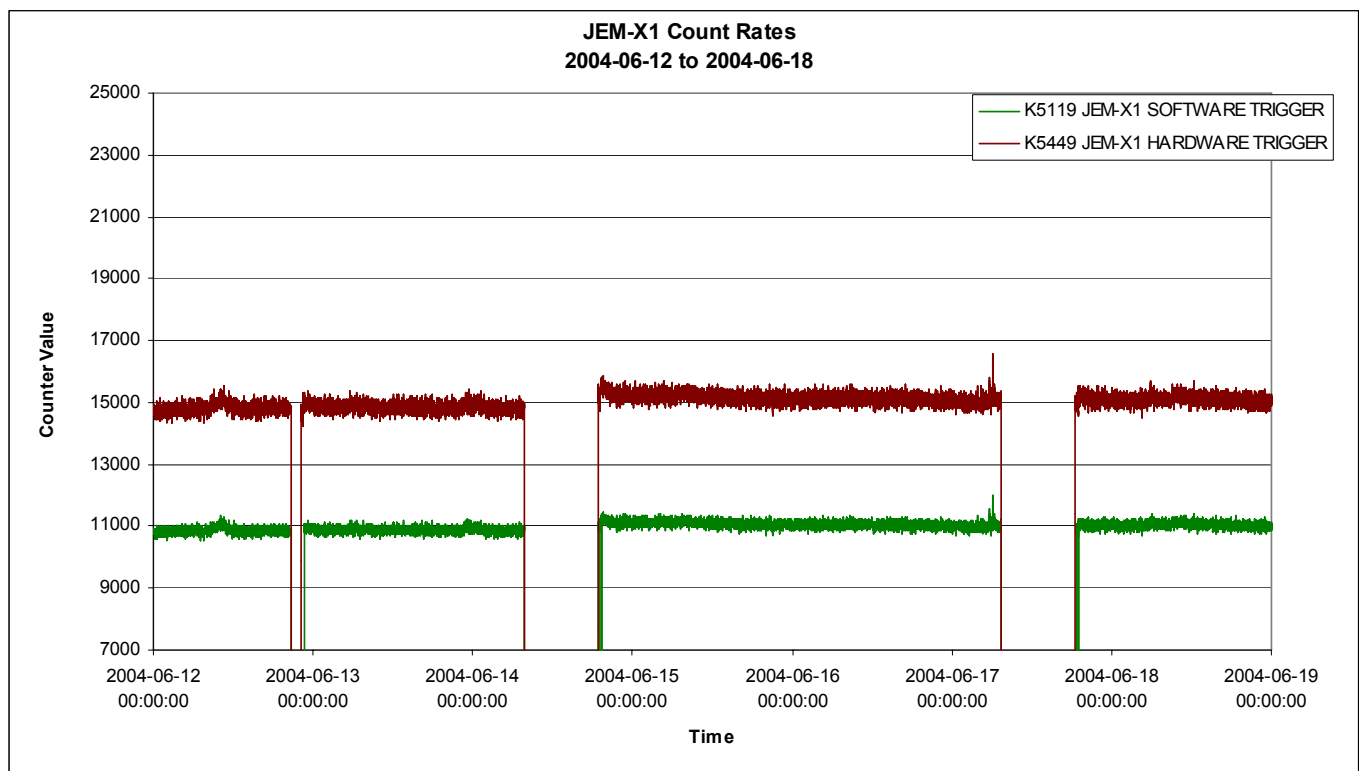
DOY 2004.170 (18/06/04)

Nothing to report

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

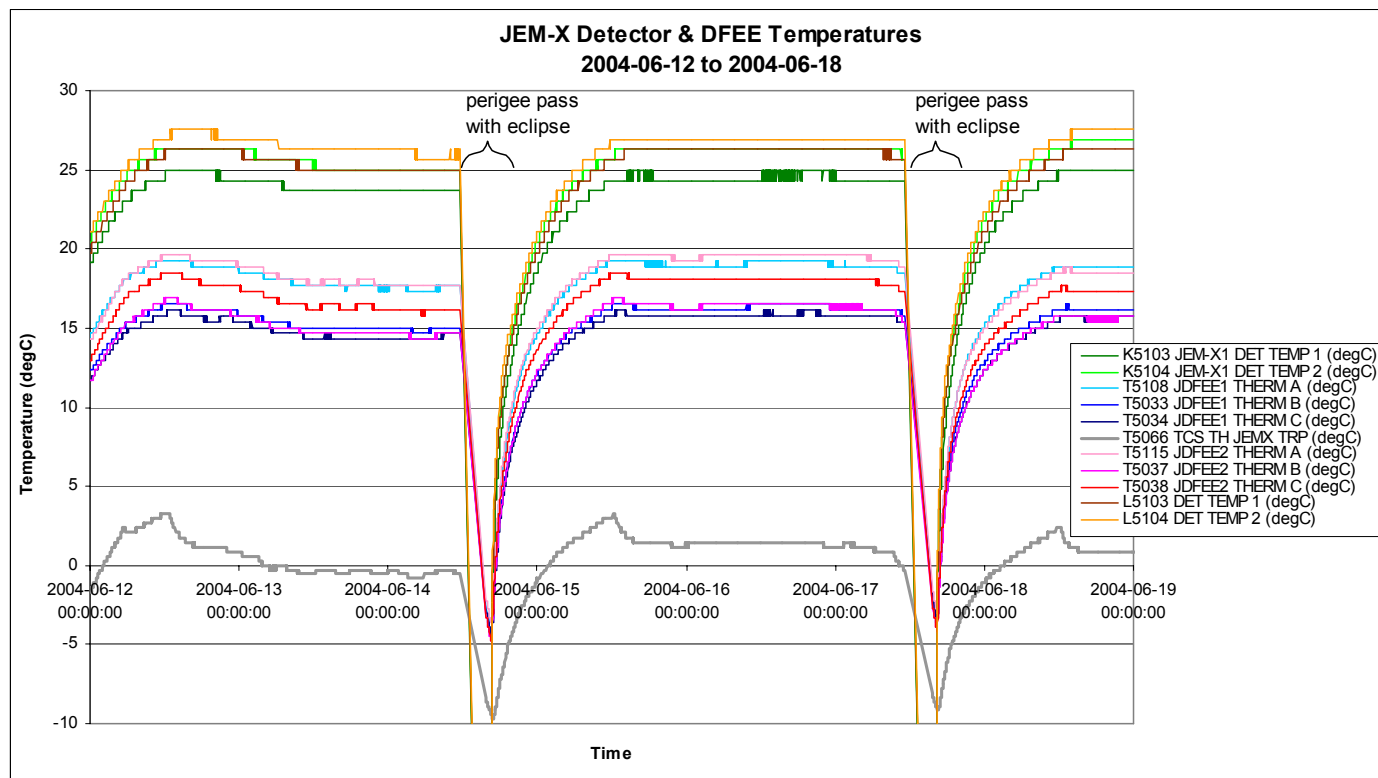
JEM-X1 count rates over the reporting period are displayed in the following graph¹.



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

8.3.4.2 JEM-X Temperatures

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 units².



8.3.4.3 JEM-X Daily Reports.

2004-06-12 (DOY 164, Rev 203)

At 20:35Z an IREM S/W reset (SEU # 12) occurred, with all radiation monitor counters from IREM (TM parameters K/L5315-K/L5317) giving a value of 65535, causing JEM-X1 to transition to Safe mode, issuing OEM 231 JEM-X1 AUTO EVENT 1. Commanding to both JEM-X units was then disabled from the automatic Timeline.

As part of the instruments' recovery procedure in case of an IREM S/W reset, procedure FCP_DHS_1301 was executed to set the broadcast packet DRMC flag to DISREGARD at 21:08Z. JEM-X1 then transitioned to Setup mode and issued OEM 233 JEM-X1 AUTO EVENT 3.

The reconfiguration of JEM-X1 for the resumption of science activities was started at 22:06Z, with the procedure FCP_JEM1_1010, followed by procedure FCP_JEM1_0044. JEM-X1 was commanded back to Data Taking at 22:38Z.

² Data sampled (1 frame in 8)

At 22:44Z FCP_JEM1_0120 was executed to set the JEM-X1 broadcast packet overrides for the IREM Radiation Monitor Count flags (TM parameters K5474 to K5476) to DISABLED. At 23:43Z commanding to both JEM-X units from the automatic Timeline was then re-enabled.

JEM-X1 was thus operated in Data Taking mode without IREM protection until after IREM had been recovered, on 2004-06-13.

2004-06-13 (DOY 165, Rev 203)

At 02:41Z, once IREM had been recovered, FCP_DHS_1301 was executed to set the broadcast packet DRMC flag back to REGARD. At 03:07Z the JEM-X1 RMC flags were set back to ENABLED by procedure FCP_JEM1_0120.

JEM-X1 operations then continued nominally.

2004-06-14 (DOY 166, Rev 203-204) to 2004-06-18 (DOY 170, Rev 205)

Nothing to report

8.3.5 OMC Operations

2004-06-12 (DOY 164, Rev 203)

At 20:35Z an IREM S/W reset (SEU # 12) occurred, causing OMC to transition to Safe mode and commanding to OMC was then disabled from the automatic Timeline. Pointing ID 02030033 was thus missed.

As part of the instruments' recovery procedure in case of an IREM S/W reset, procedure FCP_DHS_1301 was executed to set the broadcast packet DRMC flag to DISREGARD at 21:08Z.

At 21:34Z the procedure FCP_OMC_0041 OMC Exit From Safe Mode was executed. OMC returned to Science Normal mode at 21:42Z when the set of OMC Imaging EDs for Pointing 02030034, which had been scheduled in the Timeline starting at 21:40:23Z, were uplinked manually.

OMC commanding from the automatic Timeline was then re-enabled and OMC was operated in Science mode without IREM protection until after IREM had been recovered, on 2004-06-13.

2004-06-13 (DOY 165, Rev 203)

At 02:41Z, once IREM had been recovered, FCP_DHS_1301 was executed to set the broadcast packet DRMC flag back to REGARD. OMC operations continued nominally.

Due to a PTV failure of a TC for Slew ID 02030066, this slew and associated OMC imaging EDs, starting at 19:41:03Z, were missed. The Timeline was recovered

with a manual slew to the attitude of Pointing 02030067, with the OMC imaging EDs for Pointing 02030067 also being missed. Once the attitude of Pointing 02030067 had been reached, the Timeline commands for Slew ID 02030068 were updated and this slew, along with the OMC imaging EDs for Pointing 02030068, were executed from the Timeline. OMC operations then continued nominally.

2004-06-14 (DOY 166, Rev 203-204)

Execution of OMC Flat Field and Dark Current calibrations:

From 05:38:00Z to 09:01:30Z OMC performed a series of Flat Field Calibrations and a Dark Current Calibration at an attitude of (RA 07:05:36.00; DEC -75:11:60.0) with a TM allocation of 63 packets/cycle.

2004-06-15 (DOY 167, Rev 204)

Nothing to report

2004-06-16 (DOY 168, Rev 204)

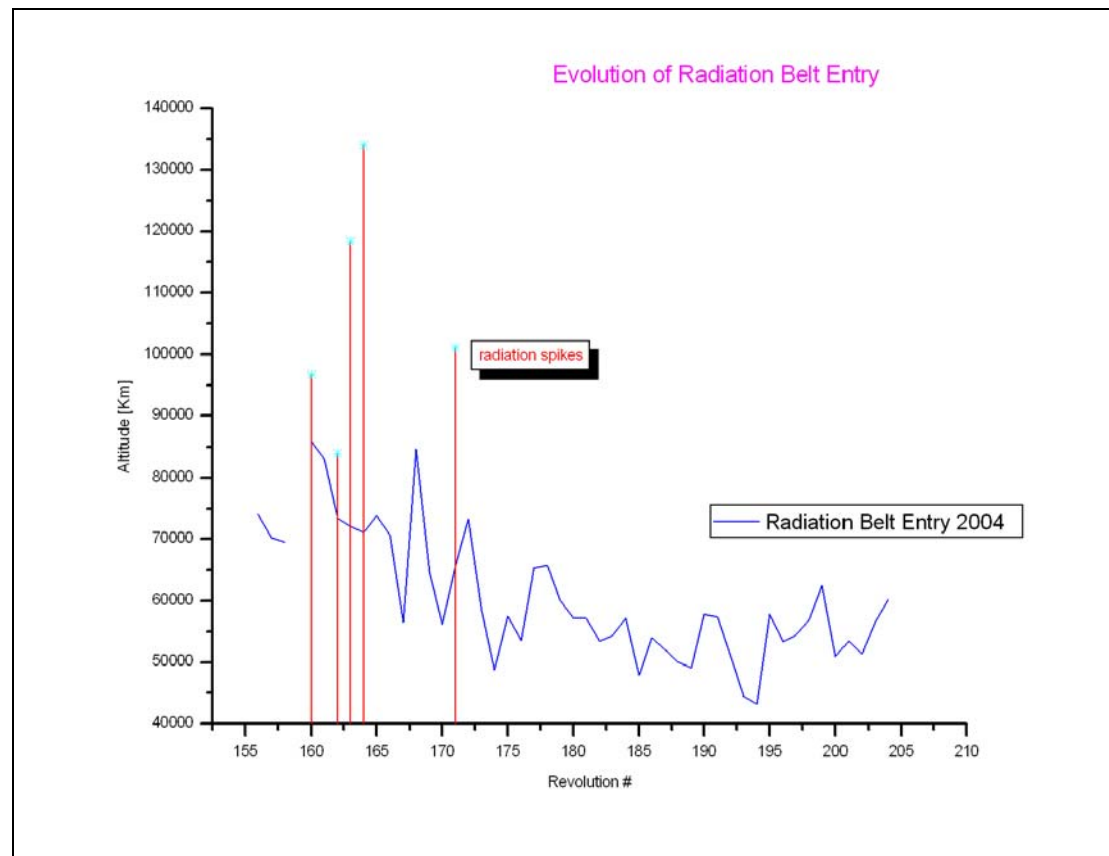
At 14:45Z a soft OOL was received on the TM parameter T5016 OMC LENS TEMP1. This parameter had returned within limits by 14:50Z and no action was taken.

2004-06-17 (DOY 169, Rev 204-205) to 2004-06-18 (DOY 170, Rev 205)

Nothing to report

8.3.6 IREM Operations

Radiation Belts Entry



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]
203	RAD_EXIT R 2004-06-11T18:22	11/06/2004 17:05	>26536	11-Jun-2004 16:58	26506
203	RAD_ENTR R 2004-06-14T09:02	14/06/2004 09:25	56655	14-Jun-2004 09:38	55063
204	RAD_EXIT R 2004-06-14T18:09	14/06/2004 16:29	23166	14-Jun-2004 16:48	27025
204	RAD_ENTR R 2004-06-17T08:47	17/06/2004 09:03	60239	17-Jun-2004 09:14	54223
205	RAD_EXIT R 2004-06-17T17:54	17/06/2004 16:41	28209	17-Jun-2004 16:24	27926

Reference

Small error vs reference

Large error vs reference

Radiation Spike

Proton Belts

REV		Proton CUT-OFF Predicted Entry/Exit	ALT[Km] predicted
203	PROTON_RAD_ENTR	14-Jun-2004 15:18	13356
203	PROTON_RAD_EXIT	14-Jun-2004 15:28	14481
204	PROTON_RAD_ENTR	17-Jun-2004 14:44	12989
204	PROTON_RAD_EXIT	17-Jun-2004 15:04	15227

IREM daily report

DOY 2004.164 (12/06/04)

Reported at 20:35Z the local reset of the IREM CSCI S/W (SEU #12): as in the past (see anomalies on 16/12/2002 ,01/01/2003, 03/06/03, 11/07/03, 19/07/03, 5/08/03, 24/08/03, 26/12/03, 13/05/04, 16/05/04, 09/06/04) the status of the unit, before the occurrence of the anomaly, was nominal, here is the summary:

- 1) temperatures nominal;
- 2) LCL current nominal;
- 3) last HK before the anomaly reported HV , 5V, 6V voltages inside limits;
- 4) the anomaly occurred at~147867 Km and the unit performed an automatic transition to Standard Mode (i.e. no block counter increasing, all the TM words= FFFF hex); Just before the anomaly, the radiation counters reported nominal values, considering the position of the S/C along the orbit
- 5) the recovery of the unit started at 20:41Z using the procedure CRP_SYS_2570. The dump of the status word reported the value 'BC80' hex=

```
1
0
1
1
1
1
1
0
0
0
1
0      Checksum Failure OFF
0
0
0
0
0
0
0'
```

i.e. with the checksum failure flag OFF . Looking at the checksum failure counter in the register bank # 3, it resulted incremented of 1 unit.

- 6) The patch was performed successfully with the correct re-starting of the S/W. The operation was completed at 23:54Z.

The IREM automatic transition to Standard Mode (reset of the CSCI sw) did affect the instruments status via BCP because the S/C was in observation and forced the

automatic transition of the payloads (OMC, IBIS and JEM-X1) to "SAFE" configuration, with the exception of SPI (automatism disabled, upon request of SPI PIs).

The recovery of the payloads was performed as follows:

- OMC, JEM-X and IBIS re-enabled in the automatic scheduling system at 23:43Z

The cause of this S/W reset is apparently due to an upset of the unit's memory device, as it was already in the past: an external single ionising radiation (probably an heavy ion/cosmic radiation) produced a burst of hole-electron pair large enough to cause a bit status change in the IREM memory (due to the reported susceptibility of this device to the high energetic particles): this event detected by the checksum control logic, triggered the reset of the CSCI S/W.

It is interesting to notice that:

- **this is the fourth of a series of consecutive SEUs grouped in shorter time period (13/05-12/06)**

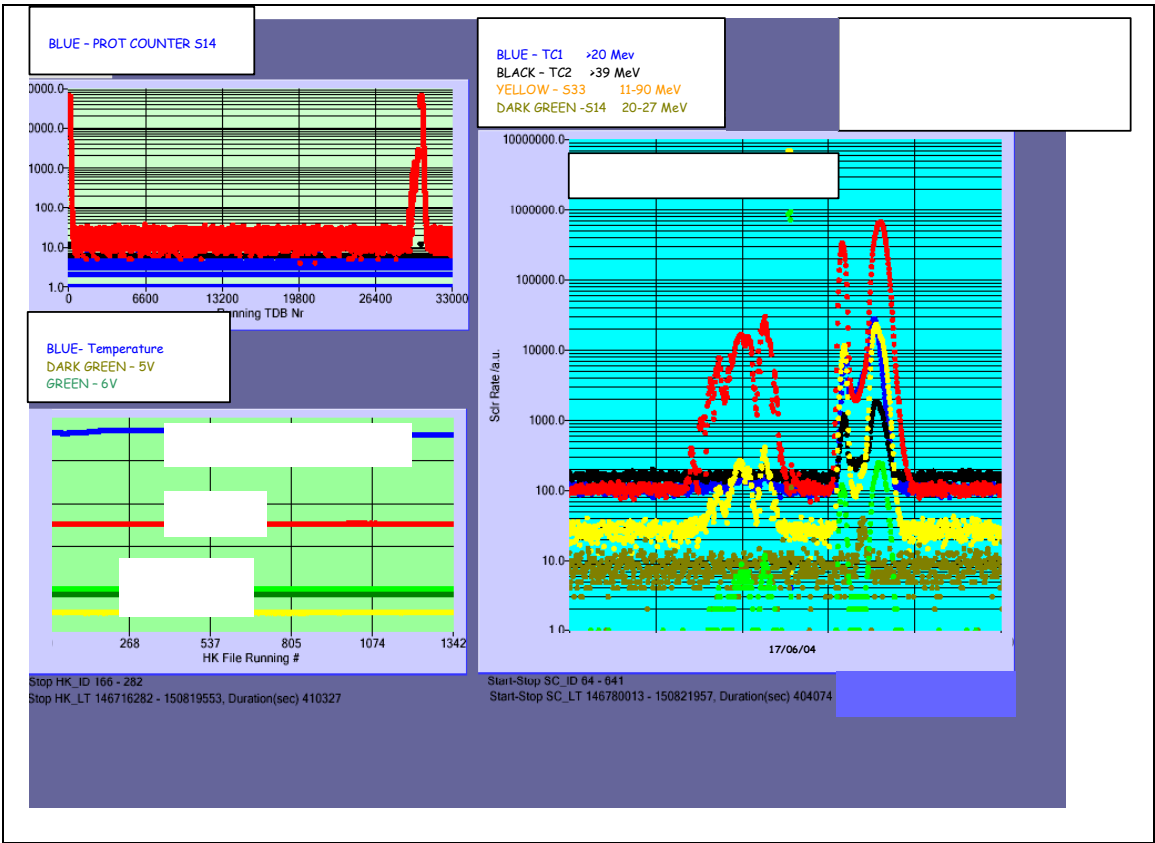
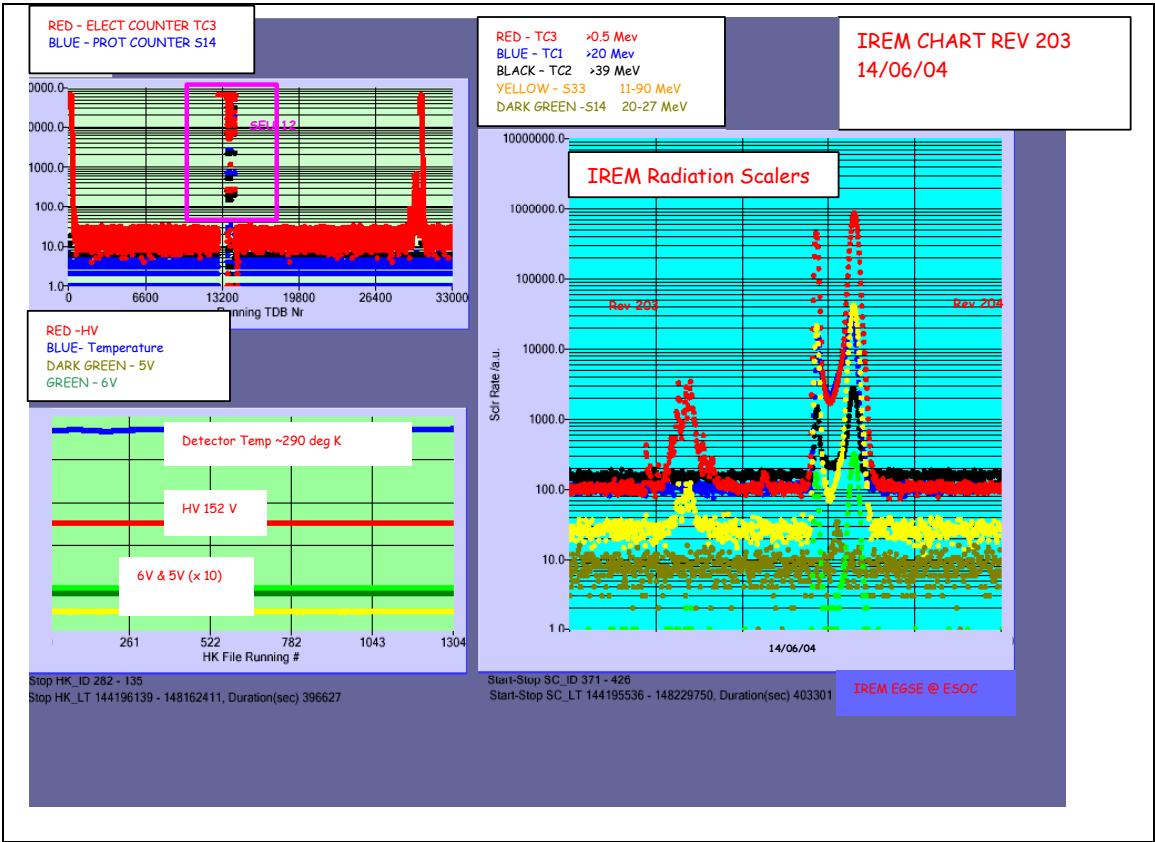
Due to the need to recover the unit as soon, following the previos agreement with IREM PIs, the dump of the complete memory was not executed.

After the patch, IREM has been verified with different scalers and with the Ground Link ON/OFF function (see Transfer Data Block attached). The final setting of the unit is:

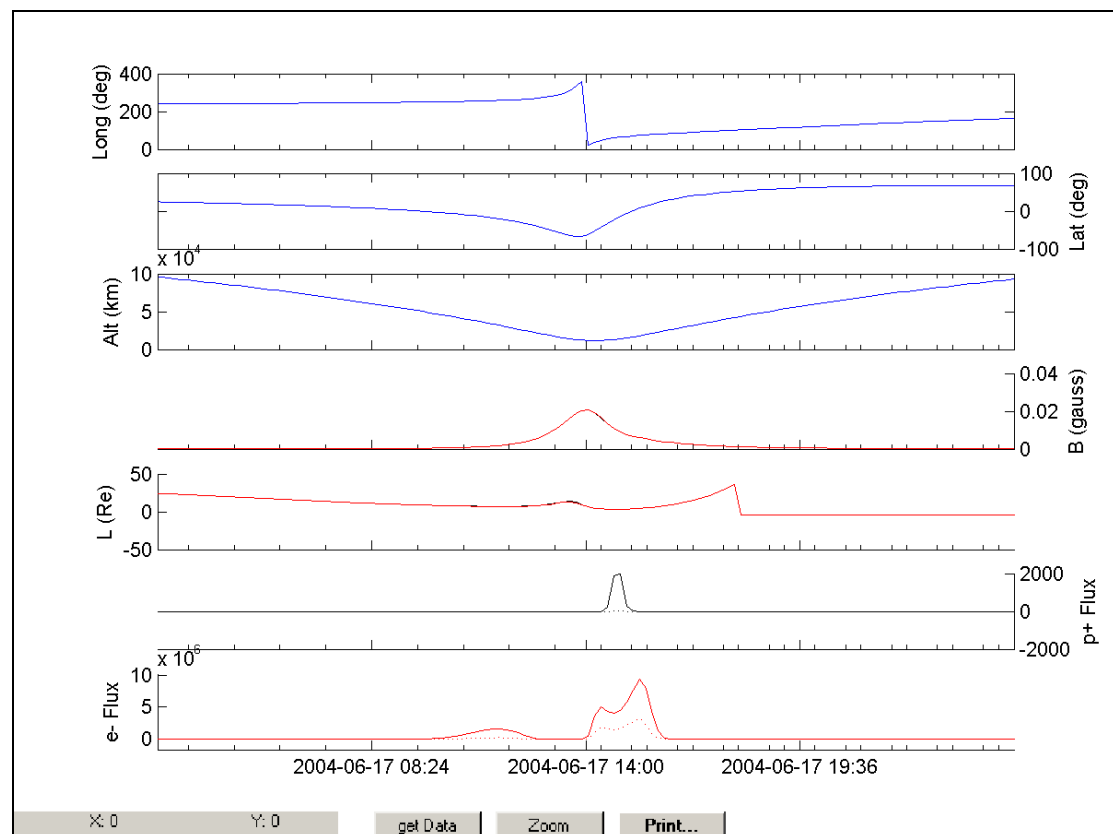
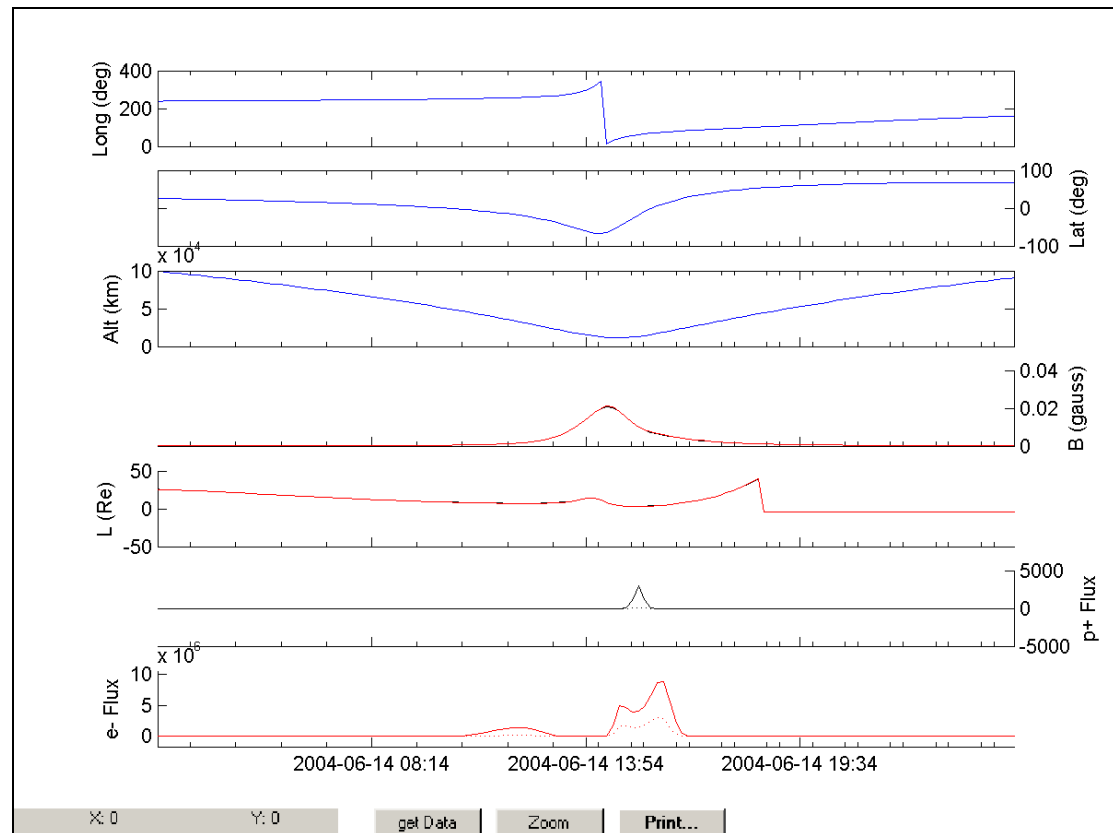
- accumulation time 60 sec
- HK files every 5 SCI files
- TC3 scaler for the electron counter
- S14 scaler for the proton counter

The unit was monitored for few hours, as suggested in the CRP, and the DRMC flag in the BCP re-enabled at 00.43Z.

IREM radiation counters



IREM Predicted Radiation Counters.



SEC-GOES Observed Particles Fluxes.

