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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 090
Week 25
14.06.04
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 05.06.04 until 11.06.04 (both dates inclusive) and covers the revolutions 201, 202 & 203.

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 the galactic plane, Carina (RA 10:36:31.39; DEC -58:21:54.7), 0919-54 + 0921-630 (RA 09:21:30.72; DEC -59:15:02.4) and an OMC Flat Field target (RA 07:05:36.00; DEC -75:11:60.0). The activities consisted of GPS, raster dithering and staring observations. In addition, OMC Flat Field and Dark Current Calibrations 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 season started with the first eclipse passage on 05/06/2004, DoY 157. The eclipse passages were completely nominal from an AOCS point of view.

One slew was missed in revolution 201, due to a temporary drop in the TC link.

The fuel consumption over the period between 04/06/2004 and 11/06/2004 was 0.161 kg. The remaining propellant is in the order of 170.138 Kg on the 11th of June.

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 the first 3 eclipses 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
1	05/06/04	12:38:59	12:43:24	13:13:45	13:17:32	0:38:33	0:34:46
2	08/06/04	12:17:48	12:20:25	13:15:25	13:17:27	0:59:39	0:57:37

Eclipse	Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit	Total Duration	Umbra duration
3	11/06/04	12:04:02	12:06:13	13:10:33	13:12:12	1:08:10	1:06:31

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)
1	3.05	3.02	15:04:06	15:03:10	1:46:34	1:45:38	3.31	3.27
2	5.42	5.36	16:30:14	16:28:38	3:12:47	3:11:11	5.87	5.81
3	6.50	6.43	17:04:14	17:02:14	3:52:02	3:50:02	7.04	6.97

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 4th annealing of the Germanium detectors will start on 17th June at rev. 204 critical altitude descending crossing. A summary timeline is published in this report, under the future activities section.

The cryocooler 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 134TMSP / Cycle
The mean IBIS BW usage was 105.7 TMSP / Cycle (previous week was 107.08).

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 2004-06-09 at 13:27Z an IREM S/W reset caused JEM-X1 to transition to Safe mode. The unit was recovered to Data Taking, without IREM protection, at 16:05Z. It then operated as such until 22:25Z, 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 the reporting period the OMC operations were performed from the Automatic Timeline, with the TM allocation to OMC of 5 packets/cycle.

There were 138 OMC pointings executed manually, 1 was lost.

A reset of the IREM CSCSI S/W on DoY 161 interrupted the Timeline driven operations of OMC for about two hours.

The instrument operations and status were completely nominal during the eclipse passages.

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 2004.161.at 13.27Z an automatic reset of the IREM S/W (SEU #11) that had impact on the instruments forcing them to SAFE Configuration occurred. 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 low 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 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: communication problems with the isds and low swap space effects 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 on one occasions caused the loss of 1 pointing. 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. 209 (no change)
- POS and POD generated: up to rev 208
- TSF's: Received up to rev 205

One ToO request received and accepted for execution in rev 207. No replanning performed.

OMC flat field calibration is planned for rev 203.

SPI annealing will start at the end of rev 204.

In rev 208 both JEM-X's will be used to check the status of JEM-X 2.

2. Observation status

ECS for revolution up to 191 received except 168, 186,188 and 189 which are still pending. No extra time granted.

3. ISOC science archive

Science window data received up to rev 258. Data ingested in ISOC archive.
Quotation requested for hardware extension for phase 2.

4. ISOC system

The ISOC system version 10.4 was patched to 10.4.2 to overcome a problem detected by the POS checker.

5. Problems

The Vacancy Notices regarding replacement scientists mentioned last week are now published. No new problem.

6. Telemetry allocation

The SPI telemetry utilisation is now closely monitored. It is not expected that the SPI usage will reach the ceiling before the annealing starts during next week. The IBIS team has provided an input that reduces their telemetry usage. This configuration change and associated telemetry reallocation is planned to be implemented after the SPI annealing.

4.3.2 ISDC

Status of ISDC observation processing on 14/06/2004:

- 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 02201120002 (IC443, Revolution 184) on 11/06/2004

5 Special Events

None.

6 Anomalies

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

- On DOY 158 at 18.05z TC R1310 failed release, investigation revealed the following:

In the EPOS for revolution 201 the EDs REANTX02 and REANTP02 were placed to move the RF Switch. these EDs contain VC-7 EDs to move the RF switch, currently we are using VC-0 for commanding. Revolutions prior to 201 used the VC-0 EDs to move the RF switch.

The reason that the VC-7 EDs were placed in revolution 201 EPOS (and subsequent EPOS's) is that before launch we told FD that we would cycle the RF switch in use every 100 revolutions. Revolution 201 corresponds to the 2nd cycle.

Due to the change in TM bit rate the distribution of CLCWs in VC-0 TM frames changed, at low bit rate the distribution was close to an even mix of VC-0 and VC-7 CLCWs, this meant that the commanding mode could be swapped between VC-0 and VC-7 without constraints.

Since the change to higher TM bit rate it has been impossible to achieve such an even mix of CLCWs, depending upon the phase of the RTC at which we switch to higher TM bit rate and the distribution of VC-0 frames in the downlink the ratio is skewed heavily in favour of either VC-0 or VC-7 CLCWs. Since the addition of the extra SPI HK packets, this has become even more extreme.

It should be noted that this constraint only exists when using Goldstone, here the CLCW loop is closed on the IMCS and the CLCW is extracted from VC-0 TM frames only. Under REDU coverage all frames are processed at the ground station.

Before using EDs with VC-7 TCs we need to adjust the CLCW ratio in VC-0 TM in favour of VC-7 CLCWs, to do this we need to switch between low and high bit rate until a suitable ratio is obtained. It is expected that this operation will be carried out after the eclipse season is over.

- On DOY 159 at 08.43 A Double TM Stream was received from DSS16 following Handover from REDU.
- On DOY 160 between 09.01 and 09.05 the TC Link to DSS16 was lost, the slew to pointing 02010066 was missed.
- On DOY 162 some bad TM Frames were received at REDU between 12.21 and 13.44, and again at 20.00.

The following new anomaly reports into the ARTS system.

AR id	Date Occurrence	Subject	Segment	Status
INT-2606	08/06/2004	INCTRA Swap Space	NCTRS	Pending
INT-2607	08/06/2004	INCTRB Swap Space	NCTRS	Pending
INT-2608	09/06/2004	TDRS: Incomplete Retrievals when retrieving parameters contained in more than 1 packet.	IMCS	Open

7 Future Milestones

The 4th SPI annealing will start on 17th June 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 to catch any signal from GeD#2 channel - faulty since 06.12.2003 - triggered by thermal noise.

A summary of the updated timeline is shown below:

3rd SPI Annealing - revs 132-136																										
ID	Task Name	Duration	Start	Resource Names	Jun '04							21 Jun '04							28 Jun '04							05
					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]							24 Jun 01:29															
53	Start Active Cooling	118.26 hrs	26 Jun 22:00	PST[20 pkts]									26 Jun 22:00													
68	Active Cooling Fine Tuning	72.2 hrs	01 Jul 20:16	PST[20 pkts]														01 Jul 20:16								
75	ACS Switch-on and Calibration	7.8 hrs	29 Jun 17:02	PST[98 pkts]														29 Jun 17:02								
80	Camera Switch on & Performance Tests	18.4 hrs	30 Jun 11:36	PST[98 pkts]														30 Jun 11:36								
90	Saturating Events Background Test	7 hrs	01 Jul 06:00	PST[98 pkts]														01 Jul 06:00								
94	Time Tag Alignment Test	2.01 hrs	01 Jul 13:00	PST[98 pkts]														01 Jul 13:00								
102	SPI POS Observations	62.6 hrs	02 Jul 16:46	PST[98 pkts]														02 Jul 16:46								

We are currently in the Summer eclipse season, the dates and times of upcoming eclipses are as follows:

Date	Penumbra Entry	Umbra Entry	Umbra Exit	Penumbra Exit
2004/06/14	11:52:50	11:54:52	13:01:25	13:02:54
2004/06/17	11:43:28	11:45:28	12:49:17	12:50:44
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 201

The observations in revolution 201 consisted of 14 pointings of a GPS lasting ~9.5 hours followed by an amalgamated raster dithering observation of Carina (RA 10:36:31.39; DEC - 58:21:54.7), which was performed for the remaining ~50 hours of observation time.

Throughout these observations 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 202

The observations in revolution 202 consisted of 15 pointings of a GPS lasting ~10 hours followed by an amalgamated raster dithering observation of Carina (RA 10:36:31.39; DEC - 58:21:54.7), which was performed for the remaining ~48 hours of observation time.

Throughout these observations 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 203

The observations in revolution 203 consisted of the following:

- 15 pointings of a GPS lasting ~10 hours;
- Amalgamated raster dithering observation of Carina (RA 10:36:31.39; DEC -58:21:54.7) lasting ~21 hours;
- Raster dithering observation of 0919-54 + 0921-630 (RA 09:21:30.72; DEC -59:15:02.4) lasting ~25 hours;
- Staring observation at the OMC Flat Field target (RA 07:05:36.00; DEC -75:11:60.0) for the remaining ~3.5 hours of observation time, during which OMC Flat Field and Dark Current Calibrations were performed.

Throughout these observations SPI, IBIS and JEM-X1 were in their nominal science modes and JEM-X2 was in Safe mode. During the OMC Flat Field observation, OMC was in FF Calibration and then DC Calibration modes and the TM allocation was IBIS 90; SPI 84; JEM-X1 8; JEM-X2 1; OMC 63. Throughout the other observations OMC was in Science Normal mode and the TM allocation was IBIS 134; SPI 98; JEM-X1 8; JEM-X2 1; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2004-05-21T18:38:04.000Z	170.5566	F	Automatic TM processing.
2004-05-23T04:29:52.000Z	170.5357	F	Automatic TM processing.
2004-05-24T12:28:27.000Z	170.4700	F	Automatic TM processing.
2004-05-24T18:23:00.000Z	170.4637	F	Automatic TM processing.
2004-05-25T01:51:25.000Z	170.4514	F	Automatic TM processing.
2004-05-26T04:49:04.000Z	170.4431	F	Automatic TM processing.
2004-05-27T12:11:31.000Z	170.4313	F	Automatic TM processing.
2004-05-27T18:07:56.000Z	170.4201	F	Automatic TM processing.
2004-05-29T03:58:55.000Z	170.3991	F	Automatic TM processing.
2004-05-30T11:56:35.000Z	170.3778	F	Automatic TM processing.
2004-05-30T17:49:16.000Z	170.3594	F	Automatic TM processing.
2004-06-01T04:39:04.000Z	170.3404	F	Automatic TM processing.
2004-06-02T11:46:03.000Z	170.3224	F	Automatic TM processing.
2004-06-02T17:49:40.000Z	170.3135	F	Automatic TM processing.
2004-06-04T03:26:47.000Z	170.2993	F	Automatic TM processing.

This report was generated Fri Jun 4 08:00:15 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 Operations

AOCS operations were executed from the Automatic Timeline.

During this period, 54 Open Loop Slews, 96 Closed Loop Slews and 10 Momentum Bias were executed. 1 slew was executed manually. This is equivalent to a 0.7%.

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:

Doc. Title : INTEGRAL Mission Report # 89
 Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
 Date : 07/06/04

Issue : 1
 Rev. : 0
 Page : 11

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

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	

05/06/04 (Day of Year 157, Revolution 200-201)

Nothing to report.

06/06/04 (Day of Year 158, Revolution 201)

Nothing to report.

07/06/04 (Day of Year 159, Revolution 201)

Nothing to report.

08/06/04 (Day of Year 160, Revolution 201-202)

Slew missed due to loss of TC link (Goldstone, DSS-16): At 09:01 the TC link from DSS-16 dropped because of a problem at the station (DR#: G104485). This was in the middle of the Reaction Wheel Bias sequence. The bias itself was finished and the ACC was already in TCM Stage-6 (wheel control). However, the commands to reconfigure the ACC back to IPS were missed from the timeline. After re-establishment of the TC link at 09:05, the ACC had to be manually configured to IPS before continuing with the Timeline. This interruption resulted in the missing of slew 02010066 from the Timeline. To rejoin the operations, a manual Open Loop Slew was then performed to the attitude of PID 02010066. The next slew was executed from the Timeline.

09/06/04 (Day of Year 161, Revolution 202)

Nothing to report.

10/06/04 (Day of Year 162, Revolution 202)

Nothing to report.

11/06/04 (Day of Year 163, Revolution 202-203)

Nothing to report.

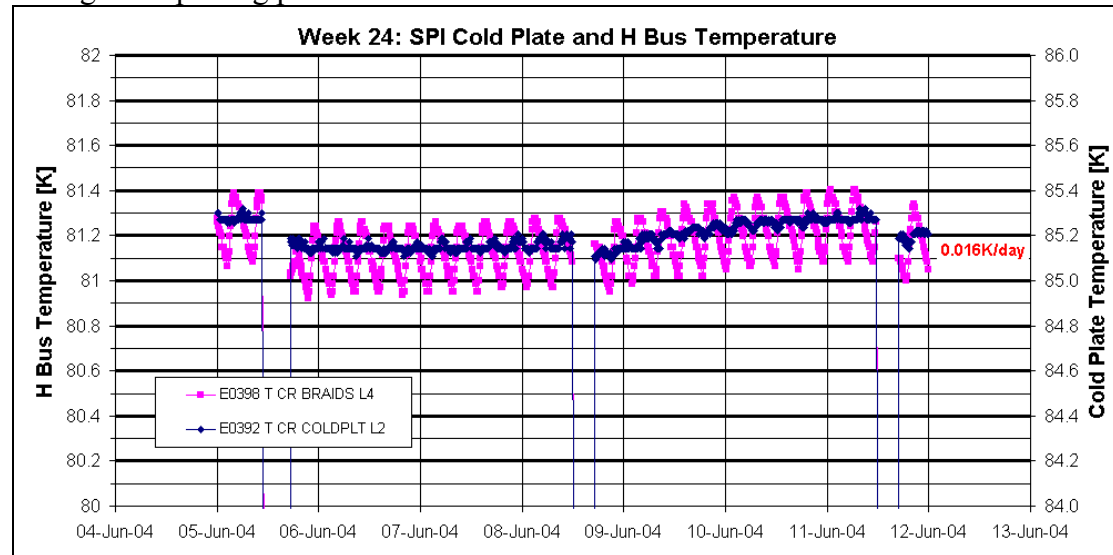
8.3.2 SPI Operations

Cryocooler / Detector Cold-Plate:

The performance of the cryocooler is nominal.

The cold plate temperature is leveled off at around 85.2K with an average drift over the whole week of +0.016K/day, which is well within the expected range.

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

As the occupation is approaching the maximum allocated bandwidth (98 pkts/cycle), the disabling of the PSD pulse shape sample downlink is being considered as a recovery step to gain (reduce) about one pkt/cycle.

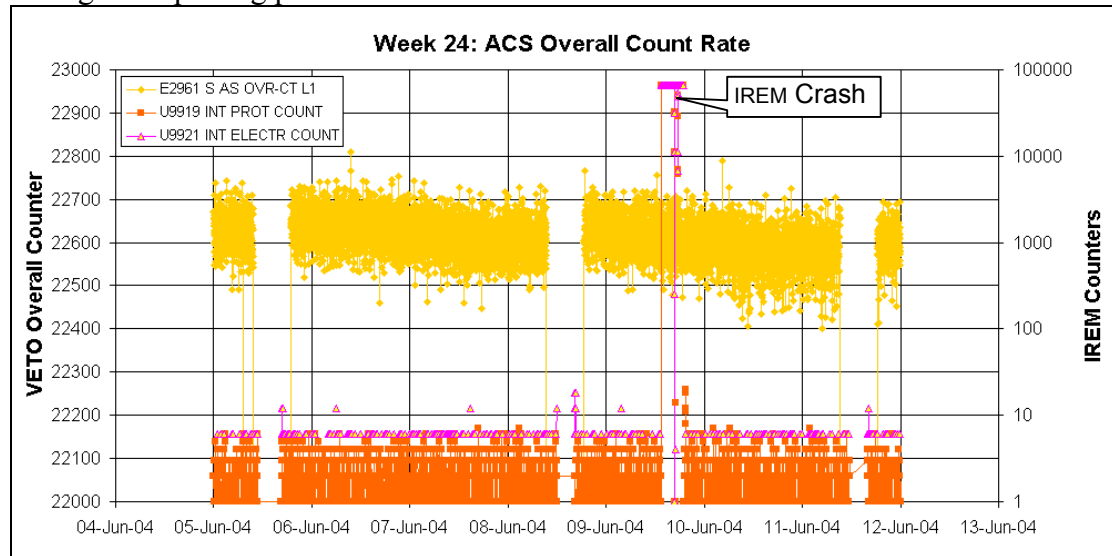
The following diagram shows the IASW performance in terms of TM bandwidth and event buffer occupation during the reporting period.



ACS:

The performance of the ACS is nominal.

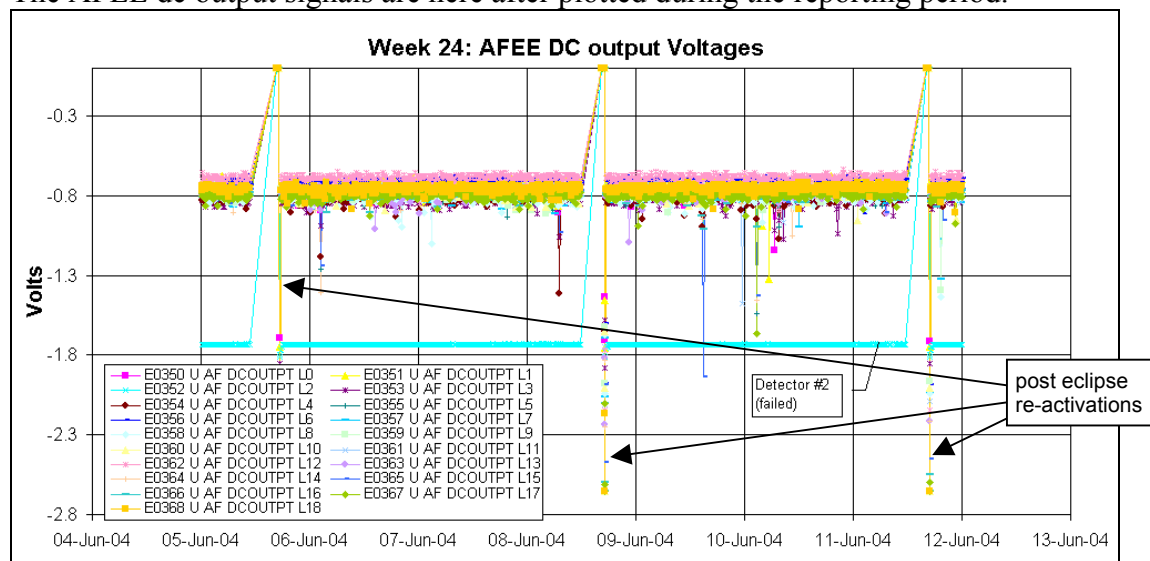
The following plot shows the ACS overall counts and IREM counters evolution during the reporting period.



AFEE:

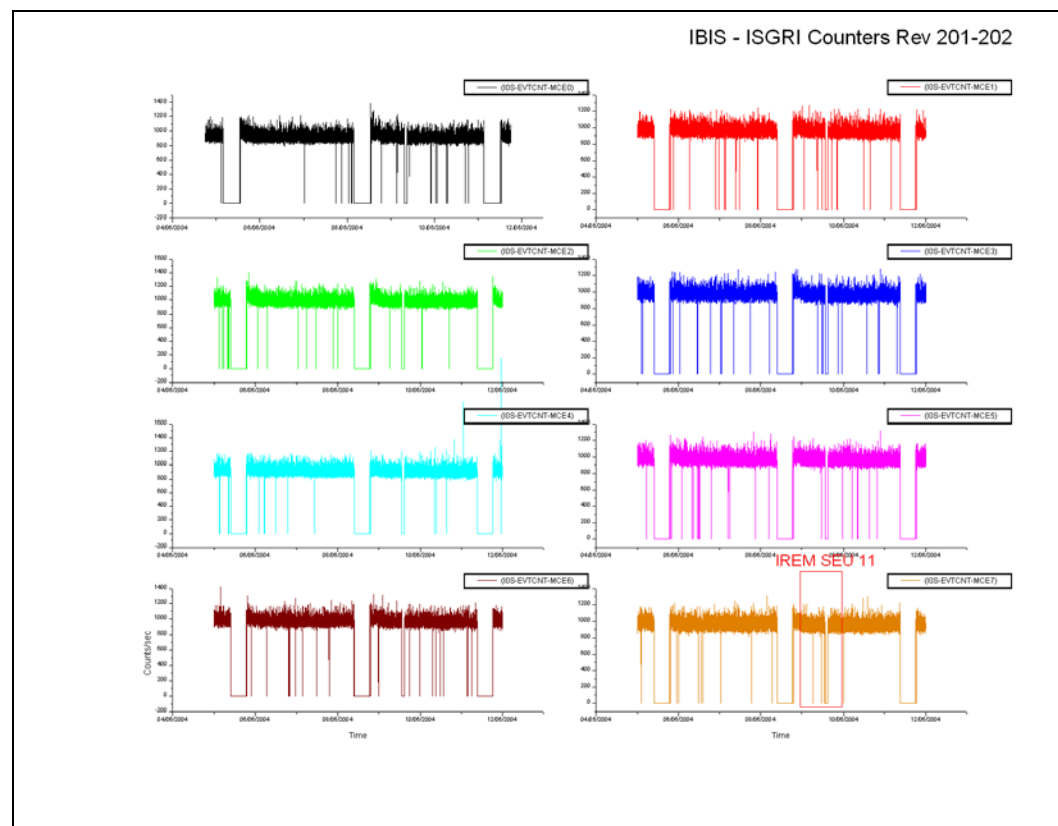
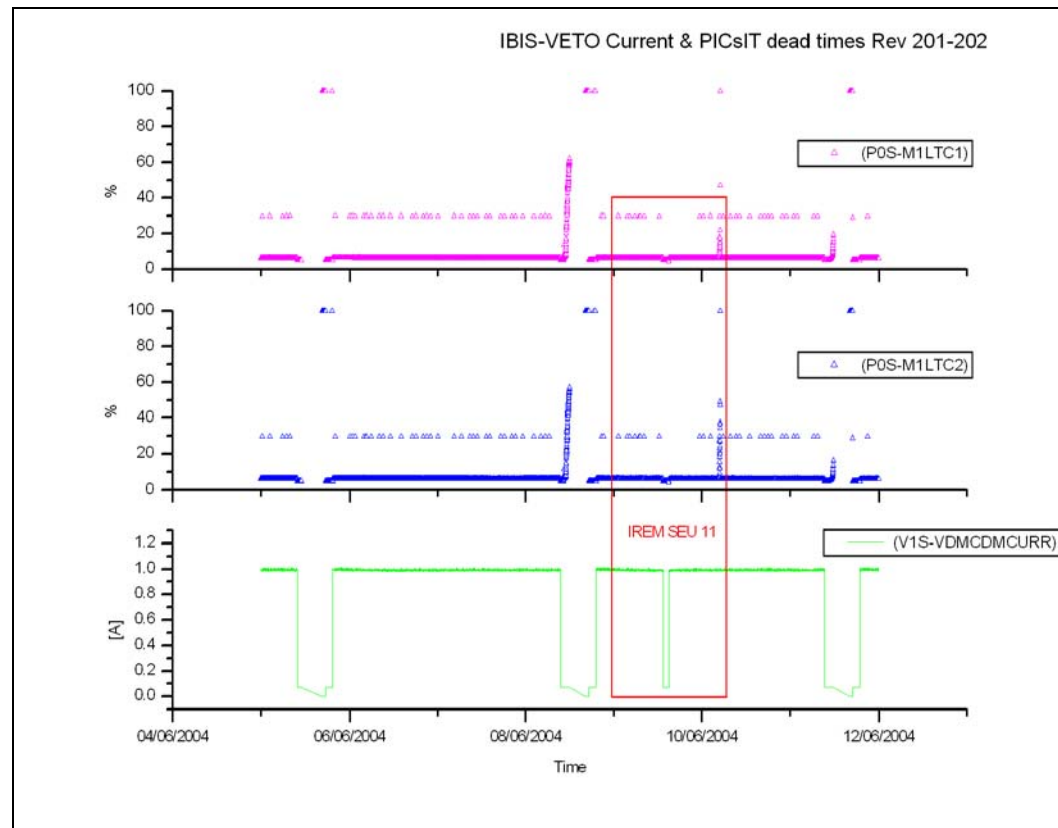
The performance of the detectors is nominal except for the detector #2 failed since 06.12.2003 (see anomaly report INT_SC-72).

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

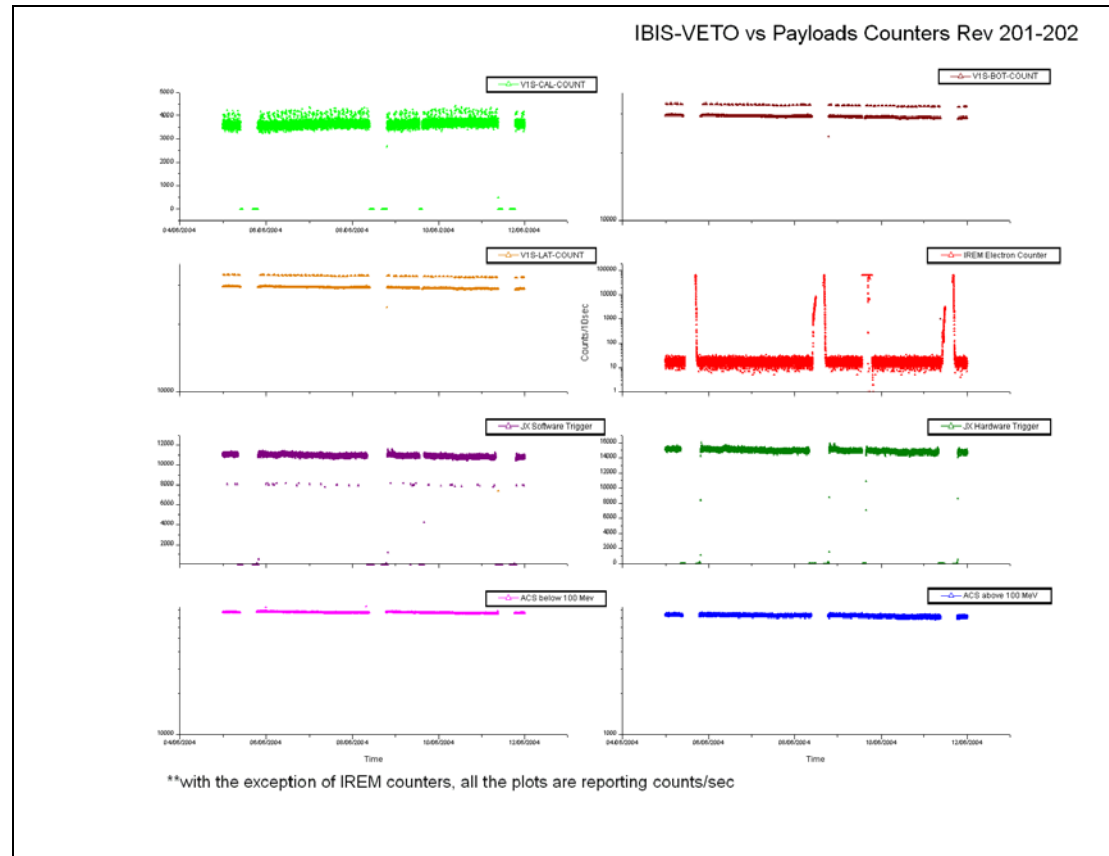


8.3.3 IBIS Operations

IBIS Event Counters Plots.



The comparison between the count-rates reported by VETO, the SPI-ACS and JEM-X hardware/software triggers, gives an indication of stabilization and slow reduction of the environmental background (protons and heavy ions): this is shown by the following plot, in which all the on-board sources mentioned are considered.



IBIS Daily Report.

DOY 2004.157 (05/06/04)

The Radiation Belts entry for rev 200 (09:43Z) evidenced no anomaly/misbehaviours of the instrument, confirming the healthy status of the unit.

DOY 2004.158 (06/06/04)

Nothing to report

DOY 2004.159 (07/06/04)

Nothing to report.

DOY 2004.160 (08/06/04)

Nothing to report.

DOY 2004.161 (09/06/04)

Corrected the IBIS configuration , in the definition of the TM thresholds, as requested by IBIS PIs, the analysis of the pkt produced on-board, evidenced an old setting for the pkts TM thresholds.

IBIS was configured to the correct values during slew 02020019 starting on DoY 161.07.52Z.

G8617	S1E-HI THR S1	36
G8618	S1E-LO THR S1	16
G8621	S1E-HI THR S2	37
G8622	S1E-LO THR S2	10
G8629	S1E-HI THR S4A	36
G8630	S1E-LO THR S4A	16
G8633	S1E-HI THR S4B	36
G8634	S1E-LO THR S4B	16
G8641	S1E-HI THR S3A	40
G8642	S1E-LO THR S3A	34
G8645	S1E-HI THR S3B	41
G8646	S1E-LO THR S3B	35
G8649	S1E-HI THR S8	42
G8650	S1E-LO THR S8	39

The activity was completed at 08:11Z.

Reported at 13:27Z 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 21:09Z (see IREM report for the details).

DOY 2004.162 (10/06/04)

Reported at 04:48Z

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

- 1) at 4:48Z SCC failed for the TM_para family G5068 (semimodules FIFO error flag)
- 2) after 4 minutes the SCC went back in limits, at the same time the PICsIT Real Time counters slowly went to zero counts and the Live Time Counters (dead time) increased progressively until 100%;
- 3) at 4:57Z all the PICsIT Real Time counters went out of limits (0 cts/sec);
- 4) at 5:01Z received the OEM APID 1280 ID 132 CLASS 0 <<IBIS IASW HEPI RESYNCH>> flagging an HEPI resynchronization.
- 5) after the generation of the OEM above the PICsIT Real Time went back in limits.

This behaviour, observed already in the past, is likely due to a loss of synchronization between the HEPI and the PICsIT modules and 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.

Reported at 15:39Z by the MOC operator a problem downloading the IBIS histograms: after confirmation by ISDC was executed the procedure FCP_IBIS1_0312 as for OR_INT_0109. in order to re-start the histogram downloading task.

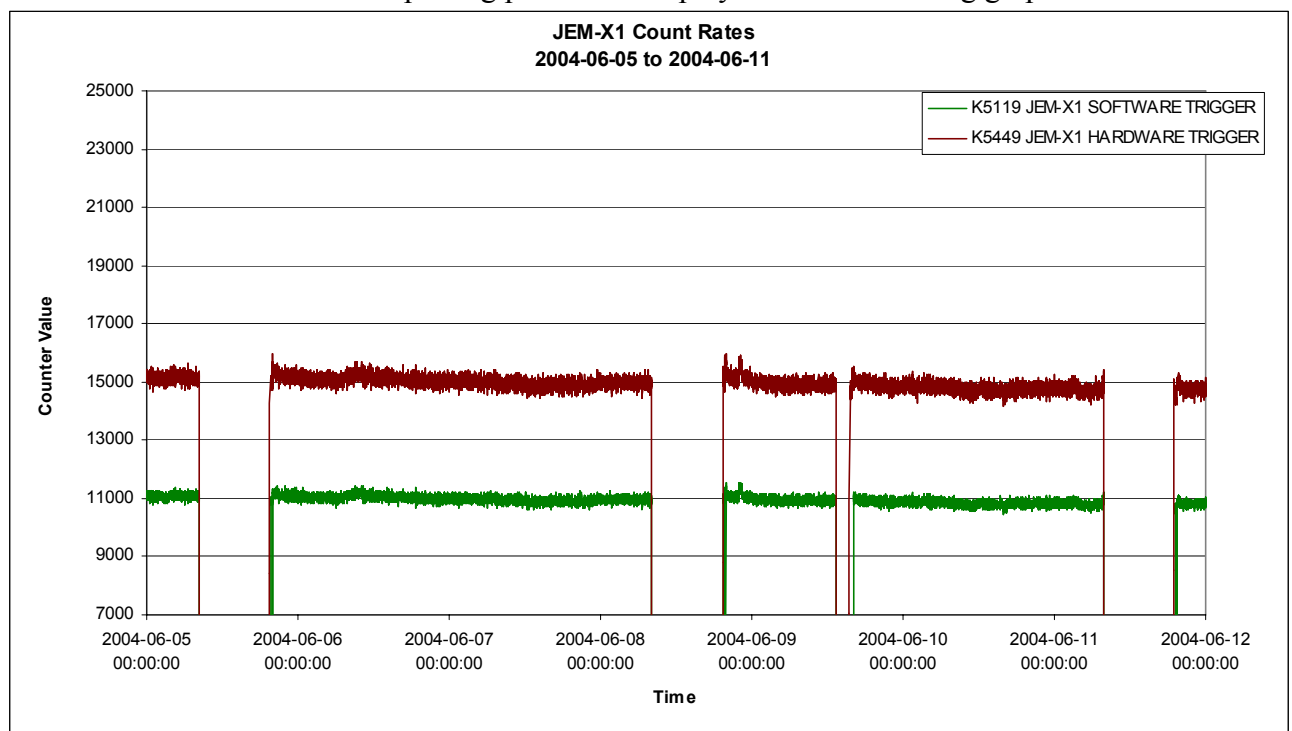
DOY 2004.163 (12/06/04)

Nothing to report

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

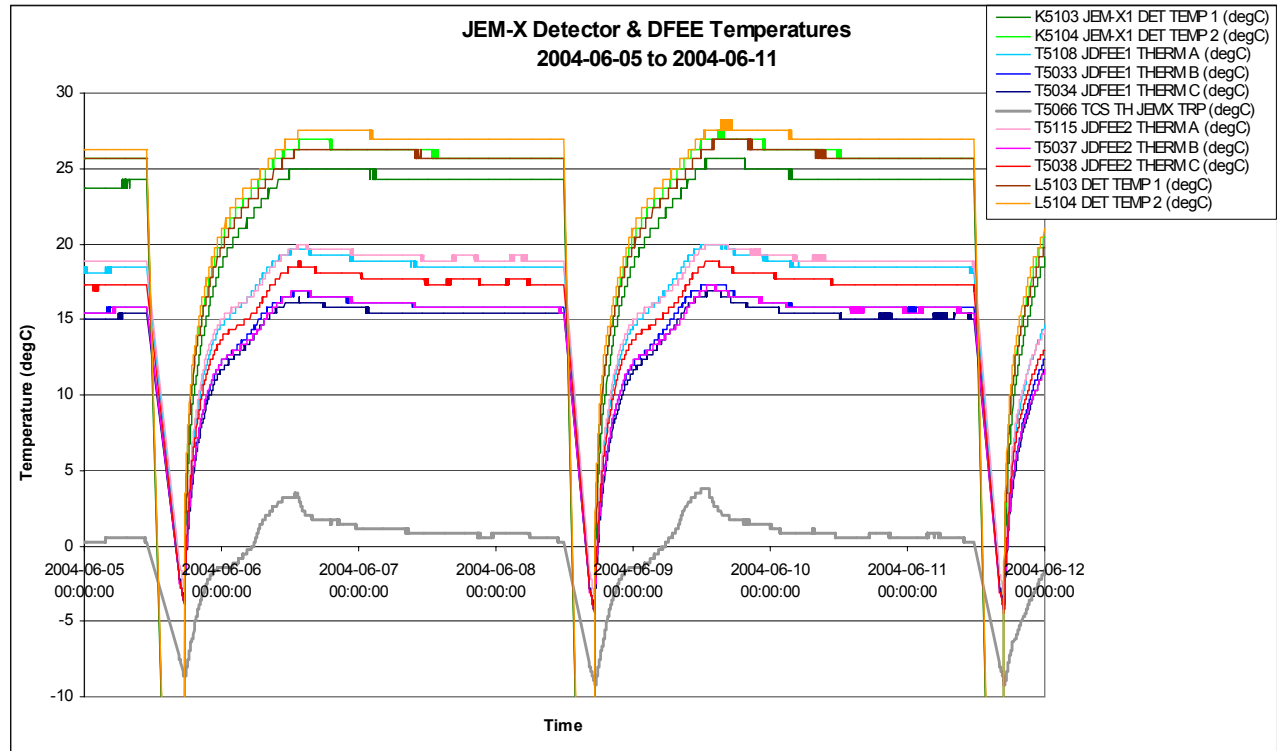
JEM-X1 count rates over the reporting period are displayed in the following graph¹.



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.



8.3.4.1 JEM-X Daily Reports.

2004-06-05 (DOY 157, Rev 200-201)

The first eclipse in the fourth eclipse season occurred at the end of revolution 200, outside of coverage. The post-eclipse reconfiguration of both JEM-X units at the start of revolution 201 was nominal. The thermal recovery of the units following eclipse can be seen in the plot in Section 8.3.4.2.

2004-06-06 (DOY 158, Rev 201) to 2004-06-08 (DOY 160, Rev 201-202)

Nothing to report

2004-06-09 (DOY 161, Rev 202)

At 13:27Z an IREM S/W reset (SEU # 11) 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

² Data sampled (1 frame in 8)

EVENT 1. Commanding to JEM-X1 from the automatic Timeline was disabled at 13:54Z.

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 14:13Z. JEM-X1 then transitioned to Setup mode and issued OEM 233 JEM-X1 AUTO EVENT 3.

The reconfiguration of JEM-X1 for resumption of science activities was started at 15:24Z, with the procedure FCP_JEM1_1010, followed by procedure FCP_JEM1_0044. JEM-X1 was commanded back to Data Taking at 16:05Z.

At 16:15Z 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 and commanding to JEM-X1 from the automatic Timeline was then re-enabled.

At 21:57Z, once IREM had been recovered, FCP_DHS_1301 was executed to set the broadcast packet DRMC flag back to REGARD. At 22:25Z the JEM-X1 RMC flags were set back to ENABLED by procedure FCP_JEM1_0120.

JEM-X1 operations then continued nominally.

2004-06-10 (DOY 162, Rev 202) to 2004-06-11 (DOY 163, Rev 202-203)

Nothing to report

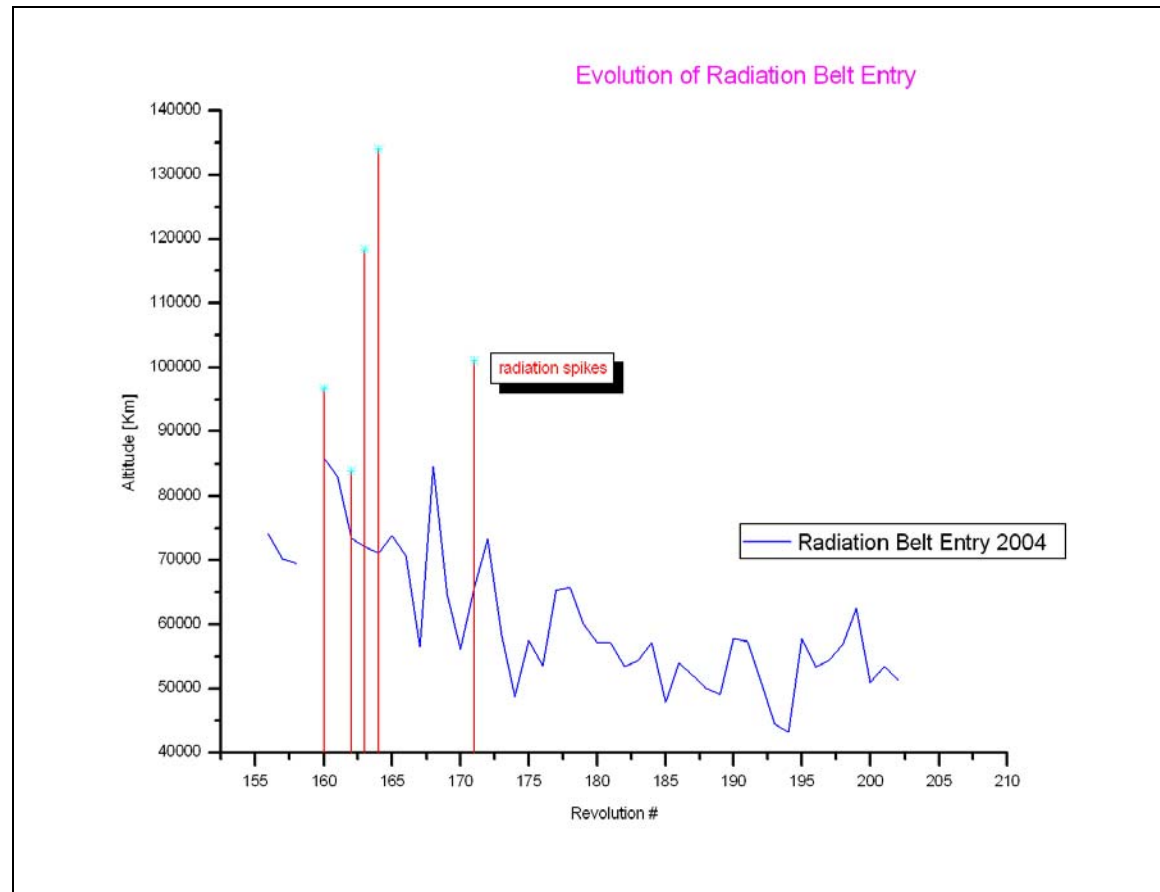
8.3.5 OMC Operations

On DoY 160, at 09:01, the TC link dropped due to a problem at DSS-16 and resulted in the missing of slew 02010066 and therefore the loss of pointing 02010066.

On DoY 161, at 13:27, another reset of the IREM CSCSI S/W occurred and caused transition of OMC mode to SAFE. The recovery action started with isolating IREM from the instruments by setting the DRMC flag to DISREGARD and then reactivating the instruments. OMC was commanded out of SAFE mode at 14:29 and its Timeline driven operations were resumed with the start of PID 02020027.

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]
200	RAD_ENTR R 2004-06-05T09:42	Lost of data due to DSS16 problem		05-Jun-2004 10:25	54434
201	RAD_EXIT R 2004-06-05T18:49	05/06/2004 17:22	>24848	05-Jun-2004 17:35	27876
201	RAD_ENTR R 2004-06-08T09:29	08/06/2004 10:17	53430	08-Jun-2004 10:08	54670
202	RAD_EXIT R 2004-06-08T18:35	08/06/2004 17:18	<28225	08-Jun-2004 17:18	27663
202	RAD_ENTR R 2004-06-11T09:16	11/06/2004 10:19	51341	11-Jun-2004 09:58	54237

Reference

Small error vs reference

Large error vs reference

Radiation Spike

Proton Belts

REV		Proton CUT-OFF Predicted Entry/Exit	ALT[Km] predicted
200	PROTON_RAD_ENTR	02-Jun-2004 16:10	12775
200	PROTON_RAD_EXIT	02-Jun-2004 16:30	15010
201	PROTON_RAD_ENTR	05-Jun-2004 15:55	12814
201	PROTON_RAD_EXIT	05-Jun-2004 16:15	15069
202	PROTON_RAD_ENTR	08-Jun-2004 15:38	12602
202	PROTON_RAD_EXIT	08-Jun-2004 15:58	14827

IREM daily report

DOY 2004.161 (09/06/04)

Reported at 13:27Z the local reset of the IREM CSCI S/W (SEU #11): 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) 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~135207 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 13:54Z 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
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 18:30Z.

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 re-enabled in the automatic scheduling system at 16:19Z
- JEM-X1 re-enabled at 16:19Z
- IBIS re-enabled at 21:09Z

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 third of a series of consecutive SEUs grouped in shorter time period (13/05-09/06)

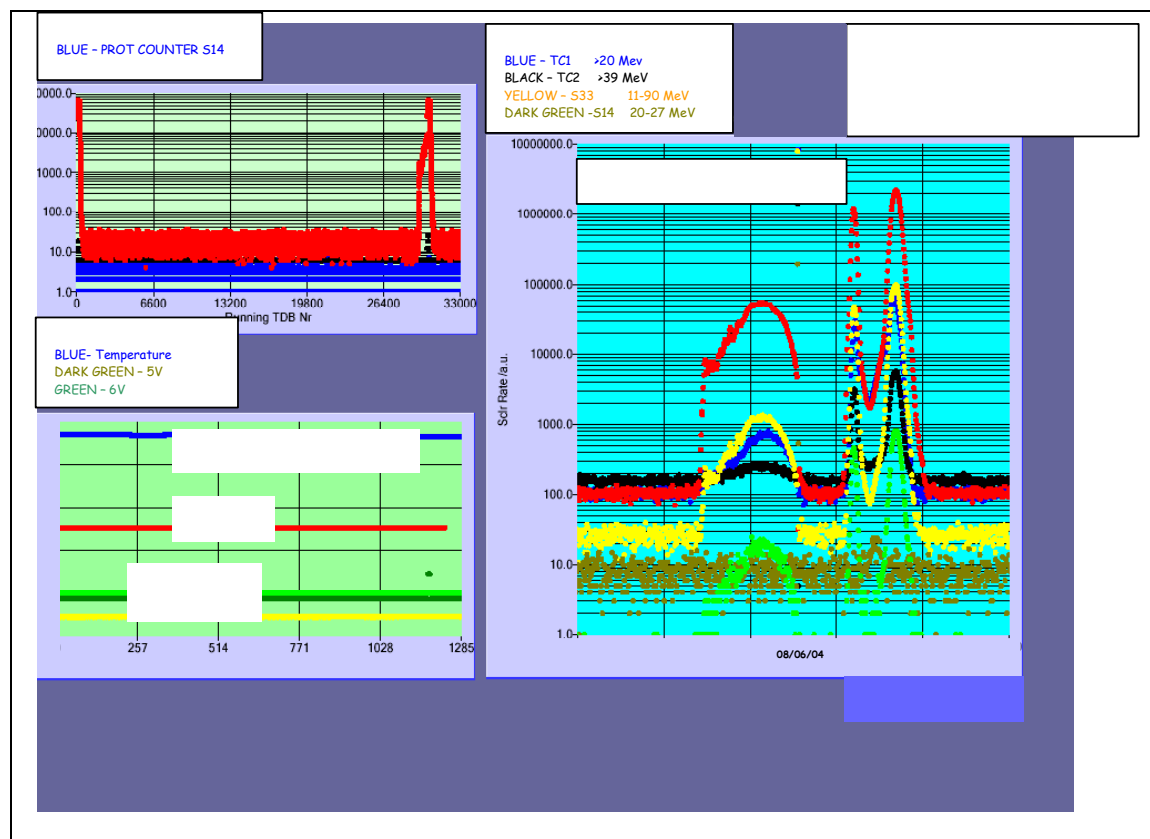
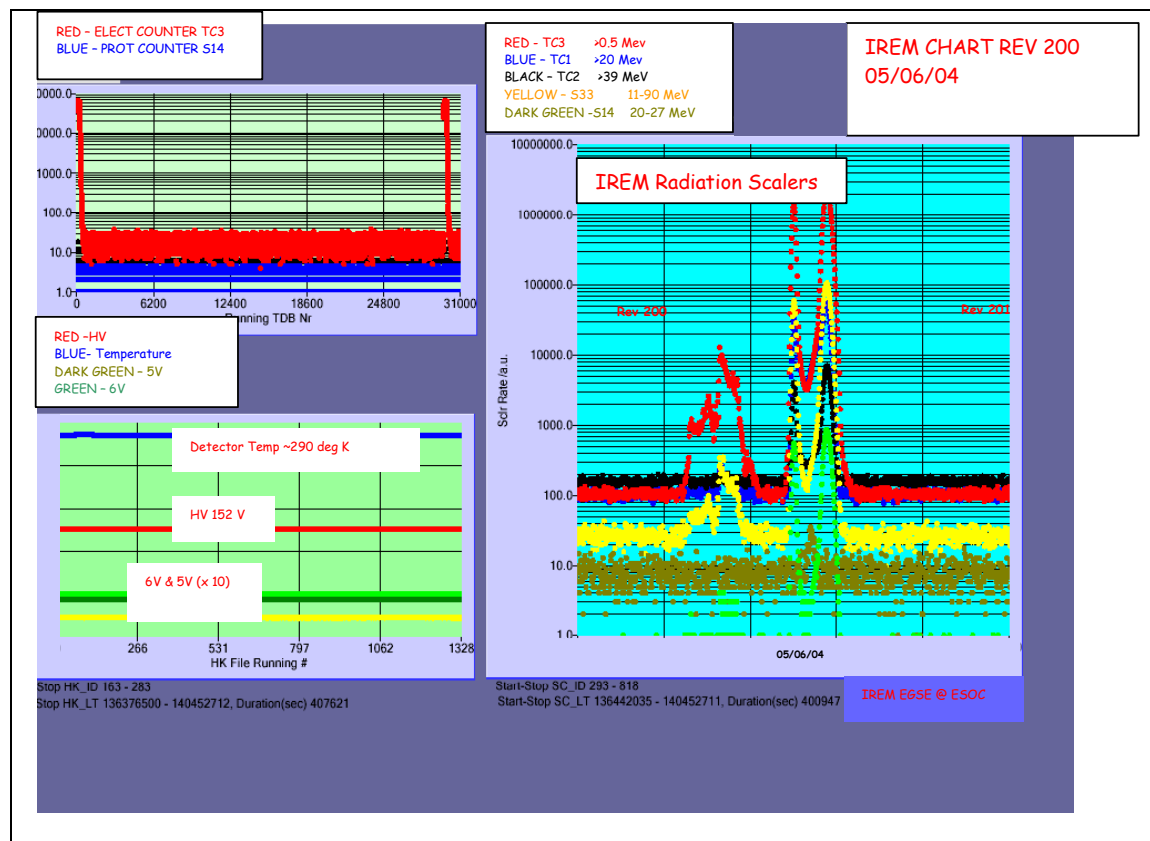
Due to the need to recover the unit as soon, following the previous agreement with IREM PIs, the dump of the complete memory was not executed.

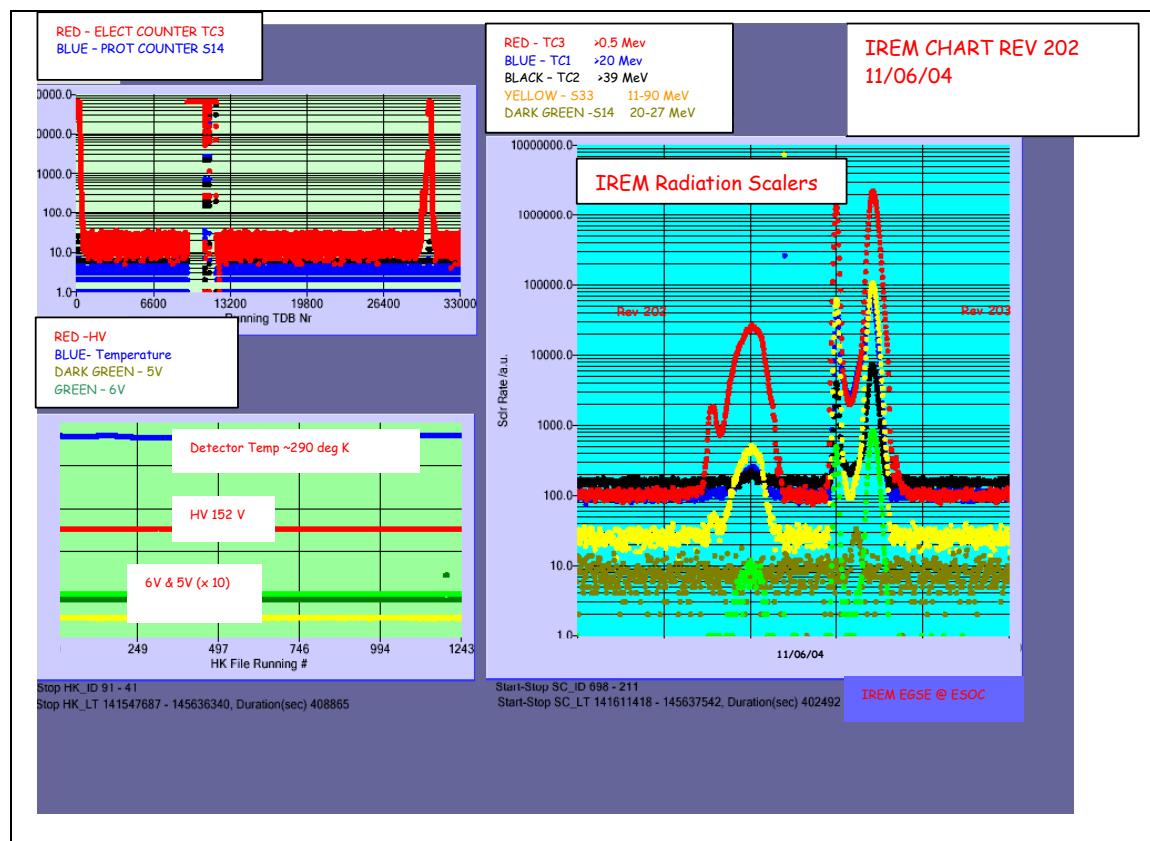
After the patch, IREM has been verified with different scalers and with the Ground Link ON/OFF function (see Transfer Data Block attached). The final setting of the unit is:

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

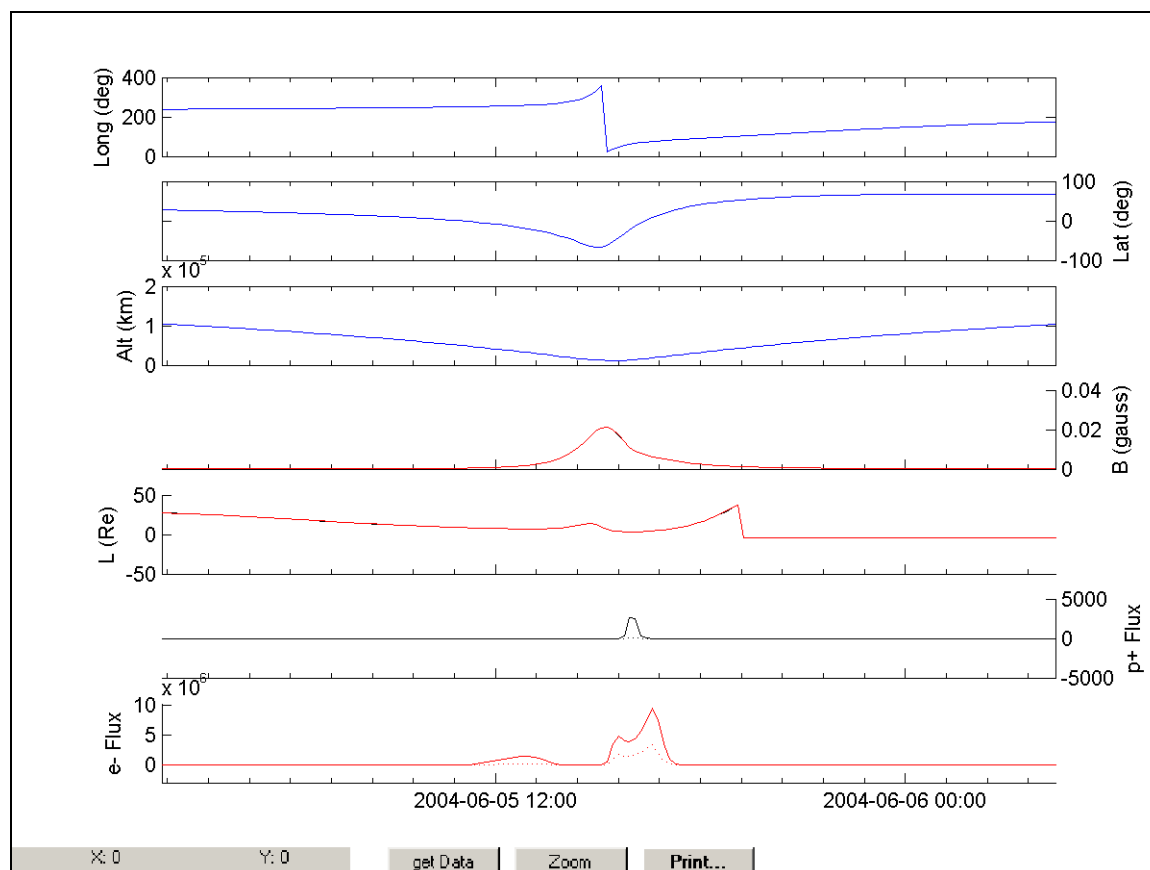
The unit was monitored for few hours, as suggested in the CRP, and the DRMC flag in the BCP re-enabled at 21.57Z.

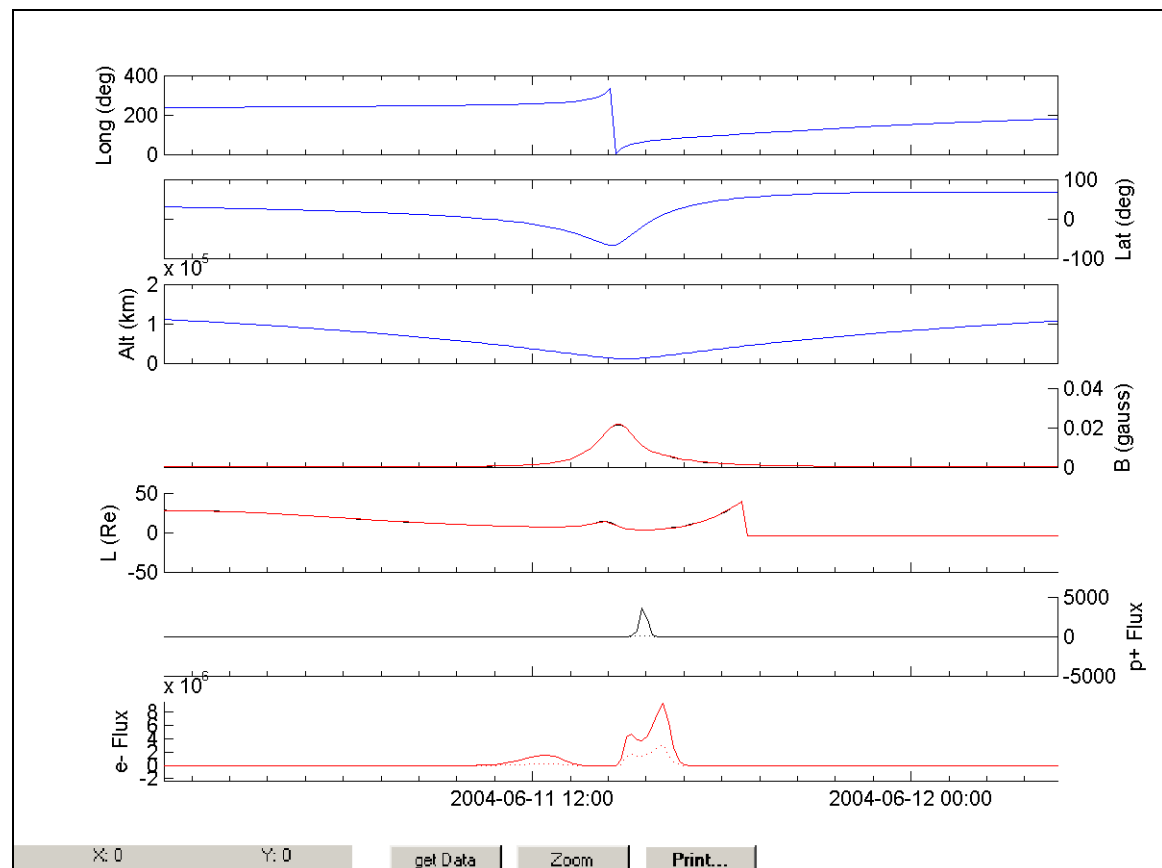
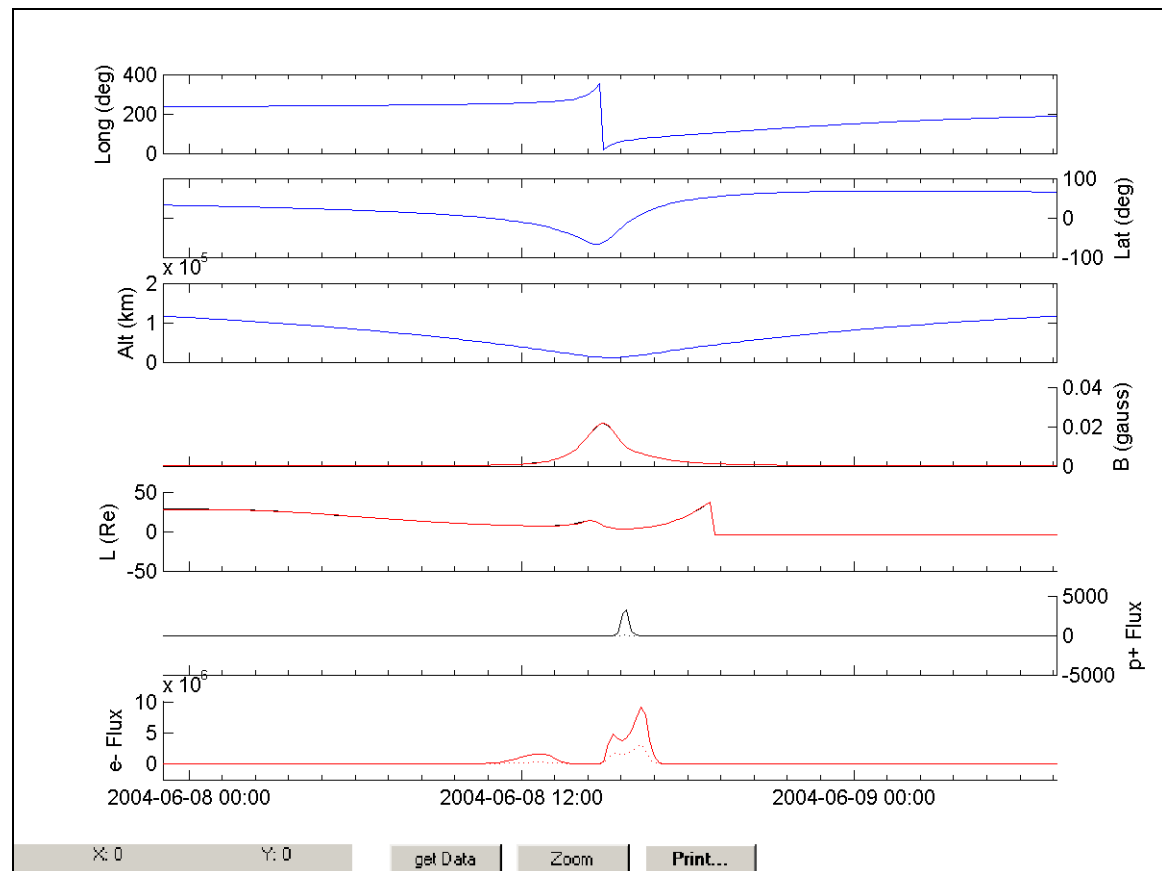
IREM Radiation Counters.





IREM Predicted Radiation Counters.





SEC-GOES Observed Particles Fluxes.

