

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 103
Week 37
13.09.04
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 04.09.04 until 10.09.04 (both dates inclusive) and covers the revolutions 232 & 233.

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 and the Galactic Centre. The activities consisted of GPS and GCDE 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 guide star was released/lost two times, causing the drop of the OTF during two pointings.

The STR 1750 Fault occurred 3 times in revolution 233 on 10/09/2004. The faults happened during the mappings in which the guide star image was in the same Elementary search Window as the image of an extended celestial object (Jewel Box cluster in one case) or the image of a bright object (Beta Centauri in two cases).

The fuel consumption over the period between 03/09/2004 and 10/09/2004 was 0.185 kg. The remaining propellant is in the order of 168.086 Kg on the 10th of September.

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

After the failure of Germanium Detector#17, on 17th July, the overall status of the instrument in this week is nominal, except for the PSD (Pulse Shape Discriminator), which was still occasionally affected by the anomaly of zero counts on all channel rates. A recovery procedure was also attempted the previous week but, apparently, without any result.

The instrument was, however, maintained 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 95.5 pkts/cycle.

Substantial progress was made in the investigations of another PSD anomaly (transition to Stand-by mode, halting SPI auto-reconfiguration sequence) thanks to the help of Cnes/Cesr.

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

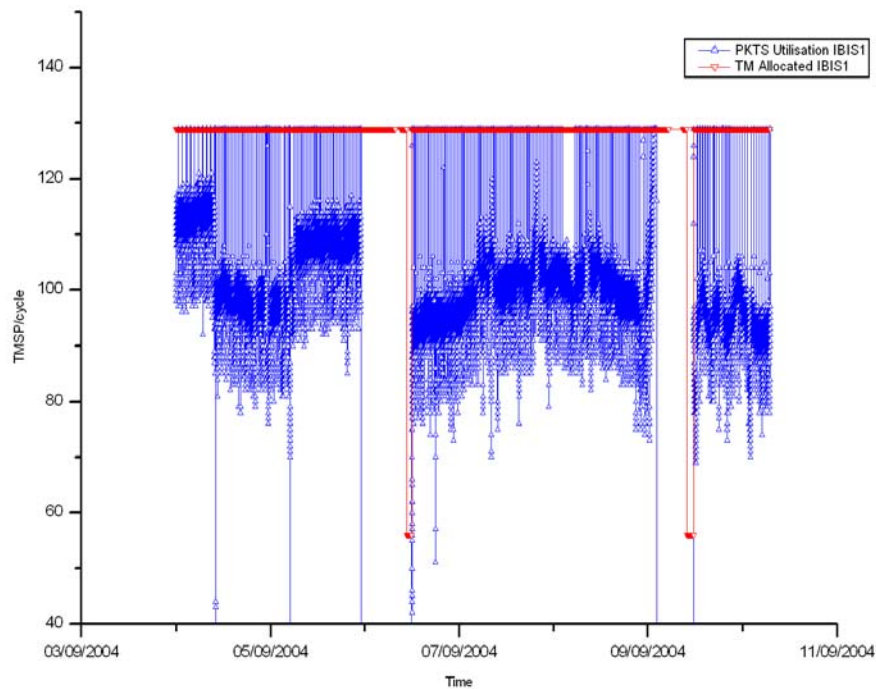
Note: Some more information concerning the SPI operations is provided in the Appendix.

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 102.5 TMSP / Cycle, down 3.0 TMSP from last week. A plot of the TM utilisation during the observation period is shown below:

IBIS - pkts utilisation Rev 231-232



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 remained dormant (DFEE OFF), with a TM allocation of 1 packet/cycle.

Due to an IREM S/W reset (see AR INT_SC-93), JEM-X1 science operations were interrupted between 2004-09-10T15:28Z (JEM-X1 to transition to Safe mode) and 2004-09-10T16:40Z (JEM-X1 recovered to Data Taking mode). JEM-X1 was then operated in Data Taking mode without IREM protection from 2004-09-10T16:40Z to 2004-09-10T21:25Z, when IREM was recovered and all the IREM RMC protections for JEM-X1 were re-enabled.

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 243 OMC pointings executed nominally, 1 was interrupted.

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 DoY 254 at 15.28.36z an automatic reset of IREM S/W (SEU#13) that impacted the other instruments forcing them to Safe Configuration. After the Payload reconfiguration, the unit was successfully recovered and currently no degradation of the performances is noted.

Solar Activity

The solar activity during the observation period was low. The Radiation Belt structures are finally re-assuming their original shape after the influence of the recent solar activity. The Belt passage inner parts show the Integral orbit typical footprint, but the outer regions still display strong oscillations.

No major event was reported during the observation period.

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 excellent this week, well above the system performance requirements, no pointings were lost due to ground problems.

4.1 Mission Operations Centre

There was nothing significant to report.

4.2 Ground Stations & Network

The performance of the ground stations and Network was excellent this week. A DSS-16 pass was given up to support the Genesis mission this week, which was replaced by a TM only DSS-15 pass and later a TM & TC pass from Perth ground-station in Australia. The timeline was reorganised to reflect this, and no data was lost. The overall performance was nearly 100%.

4.3 Science Ground Segment

4.3.1 ISOC

1. AO-3

An internal review was held, to confirm the readiness of ISOC for the release of the new Announcement of Opportunity. The necessary updated documentation and

software tools (especially PGT) will be made publicly available on September 13th, as according to plan. More details are in the latest ISOC newsletter.

2. Mission planning

PSFs: complete up to revolution 236.

POS and POD: also up to revolution 236.

TSFs: complete up to revolution 235.

3. Observation status

New ECSs have been received for revolutions 218 to 222 inclusive. OCSs are up-to-date. An ISOC/ISDC telecon took place on September 9th, to review the observation status.

4. ISOC science data archive

Nothing to report.

5. ISOC system

The ISOC system version 10.5.0 is still in use. A new version 10.5.1 will start being used on September 13th, to coincide with the AO-3 release. The main change is to PGT, and there are no changes with any impact on the files exchanged with MOC or ISDC. This is NOT yet the system, which will support the customized dither patterns for Crab calibration. (That will be 10.6.)

6. Problems

With reference to a problem reported last week concerning a wrong value for IBIS parameter G8602, the POS/POD for revolutions 233/234/235 were regenerated and have already been turned around into corrected TSFs. The problem is thus solved, but the reason for its occurrence is still under investigation by ISOC.

4.3.2 ISDC

Status of ISDC observation processing on 13/09/2004:

- Latest Standard Analysis completed: observation 02201450003 (Mkn 590, Revolution 208) on 28/08/2004

- Latest products archived: observation 02201450003 (Mkn 590, Revolution 208) on 31/08/2004

- Latest observation products sent to the observer: observation 02297000010 (Abell 2256, Revolution 205-206) on 11/09/2004

5 Special Events

6 Anomalies

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

- On DoY 250, around 16:00, the NCTRS-A was occasionally showing 'yellow', with the EVTLOG task consuming up to 80% of the cpu, Sustaining Engineering stopped and restarted the task clearing the problem, there was no impact.
- On DoY 251, at 08:52, the TC link from Redu dropped. The TMP was stopped and re-started, clearing the problem, there was no impact.
- On DoY 253, at 20:34, the TM & TC links with Redu dropped, they were reconnected at 20:37 without impact.
- On DoY 254, at 06:53, there was an STR 1750 fault, see AOCS report for details.
- Later, at 08:53, the IDDA was in a yellow state, with MADDSBTMARmain consuming 20% of the cpu, the system recovered autonomously without impact
- At 11:05, there was another STR 1750 fault, again see AOCS report for details.

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

AR id	Date Occurrence	Subject	Segment	Status
INT_SC-91	01/09/2004	PSD in Stand-by at belts exit halts SPI automatic reconfiguration	Payload	Open
INT-2638	03/09/2004	Incorrect IBIS parameter in ICP for revolution 232	ISOC	Open
INT-2639	03/09/2004	Antenna switch scheduling in EPOS does not consider TM-only coverage	FDS	Pending
INT-2640	06/09/2004	Delayed TC packet Transfer Response (CLCW) Message from Perth.	ESA Stations	Pending
INT-2641	06/09/2004	TM Drop from Goldstone On DoY 246	NASA Station	Pending

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 232

In revolution 232 a GCDE observation was performed throughout the available observation time (~62 hours).

Revolution 233

The observations in revolution 233 consisted of a GPS lasting ~19.5 hours, followed by a GCDE, performed for the remaining ~42 hours of observation time.

Throughout these observations all instruments were in their nominal science modes, except JEM-X2 for which the DFEE remained off, 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

2004-08-28T10:30:14.000Z	168.4380	F	Automatic TM processing.
2004-08-28T19:22:47.000Z	168.4165	F	Automatic TM processing.
2004-08-29T09:40:08.000Z	168.3890	F	Automatic TM processing.
2004-08-30T08:19:54.000Z	168.3613	F	Automatic TM processing.
2004-08-30T09:46:51.000Z	168.3421	F	Automatic TM processing.
2004-08-31T04:05:00.000Z	168.3079	F	Automatic TM processing.
2004-08-31T10:13:01.000Z	168.2929	F	Automatic TM processing.
2004-09-01T20:40:41.000Z	168.2713	F	Automatic TM processing.
2004-09-03T10:01:17.000Z	168.2553	F	Automatic TM processing.
2004-09-04T20:15:36.000Z	168.2395	F	Automatic TM processing.
2004-09-06T09:47:49.000Z	168.2265	F	Automatic TM processing.
2004-09-07T20:04:57.000Z	168.1787	F	Automatic TM processing.
2004-09-09T04:43:00.000Z	168.1143	F	Automatic TM processing.
2004-09-09T09:33:08.000Z	168.1131	F	Automatic TM processing.
2004-09-09T18:47:17.000Z	168.0861	F	Automatic TM processing.

This report was generated Fri Sep 10 08:00:19 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 04/09/2004-10/09/2004

AOCS operations were executed from the Automatic Timeline.

During this period, 146 Open Loop Slews, 110 Closed Loop Slews and 7 Momentum Bias were executed. No slews were missed or executed manually.

04/09/04 (Day of Year 248, Revolution 231)

Loss of Guide Star: At 22:55:20, the magnitude 8.3 guide star was lost because it was very close to the Z edge of the STR FoV, [16239, -21996]. The star was picked by the ACC after an open loop slew. An automatic mapping was done and a new guide was picked, but the OTF remained low for the rest of PID 02310048.

05/09/04 (Day of Year 249, Revolution 231)

Nothing to report.

06/09/04 (Day of Year 250, Revolution 231-232)

Nothing to report.

07/09/04 (Day of Year 251, Revolution 232)

Nothing to report.

08/09/04 (Day of Year 252, Revolution 232)

Guide star released by the STR SEU Filter of the ACC: At 08:26:41, the number of detected false events on the STR exceeded the SEU Filter threshold and the guide star was released. The magnitude 8.4 star was picked by the ACC after an open loop slew and was located at [-14767, -21777]. The OTF remained low for the rest of PID 02320081.

09/09/04 (Day of Year 253, Revolution 232-233)

Nothing to report.

10/09/04 (Day of Year 254, Revolution 233)

STR 1750 Fault, caused by extended celestial object: A STR 1750 fault occurred during the first mapping after the start of slew 02330031. With the start of this slew, the guide star left the STR FoV and a new guide star was acquired in Elementary Search Window #4. This ESW also contained the image of the open cluster NGC 4755 (Jewel Box). During the mapping process, when the ESW with the guide star and the extended object was being processed, the 1750 Fault occurred and the mapping terminated. This had no impact, as it was during an open loop slew.

STR 1750 Fault, caused by bright object: At the end of open loop slew 02330039 the magnitude 6.75 guide star was located at [683, -3386], ESW #1. This ESW also contained the image of Beta Centauri with magnitude 0.6. The combination of the bright object and the guide star in the same ESW caused the 1750 fault during the first mapping after the end of the slew, and termination of the mapping. This corrupt mapping could not be used by the FDS for attitude determination and the update of the next slew failed. The mapping, which was successfully performed automatically right after the fault, could not be used for attitude determination as well. The reason

was that the start time of the mapping was exactly the same as the end time of the failed mapping, in which case the FDS gets confused and cannot pick the correct mapping data. Another mapping was commanded from ground, during which the fault occurred again: the mapping terminated and another automatic mapping was performed successfully. So it ended up in the same situation as before: the start time of the complete mapping being the same as the end time of the corrupt mapping, and the FDS was not able to process the data. At the end it was decided to let the next open loop slew ($\sim 4^\circ$ amplitude) to execute with the Timeline default values to get out of the situation. The end effect was that the OTF remained low during PID 02330039.

Unstable guide star position, flickering of the Pointing-Bit: At the end of open loop slew 02330054 the guide star picked by the ACC was #8707-01348 with magnitude 8.15 at CCD position [1932, 8361]. The CCD images of two nearby stars:

- #8707-01021, magnitude 9.09 at an offset of 1.5 arc-minutes
- #8707-01018, magnitude 9.31 at an offset of 1.8 arc-minutes

caused instability in the position of the guide star, as seen by the STR. From 19:06:47 to 19:32:16, shortly before the guide star was changed for the upcoming close loop slew, many Pitch and Yaw Error messages were generated. The errors, however, did not cause the drop of the OTF in BCP.

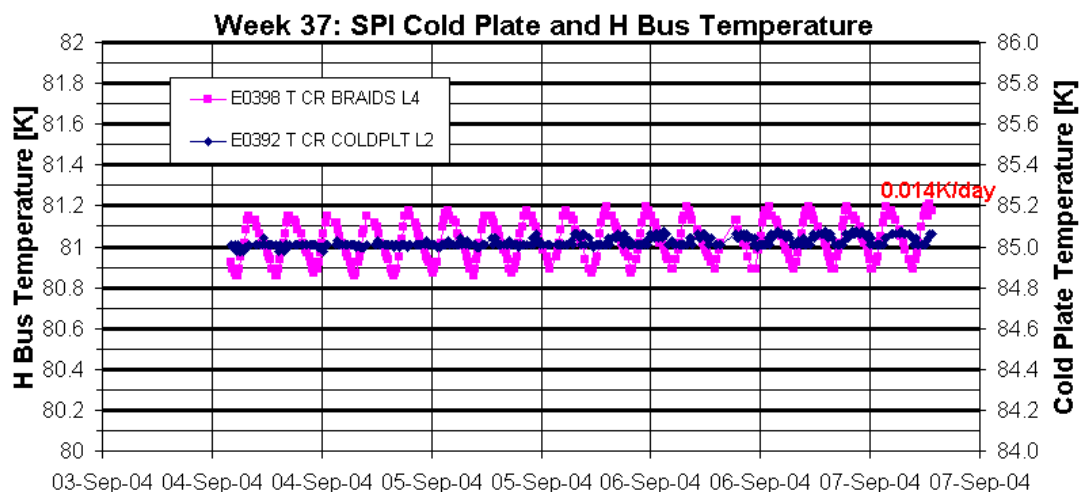
8.3.2 SPI Operations

Cryo-cooler / Detector Cold-Plate:

The performance of the cryo-cooler is nominal.

The cold plate temperature was maintained at 85K $\pm$ 1K with the expected small positive drift.

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



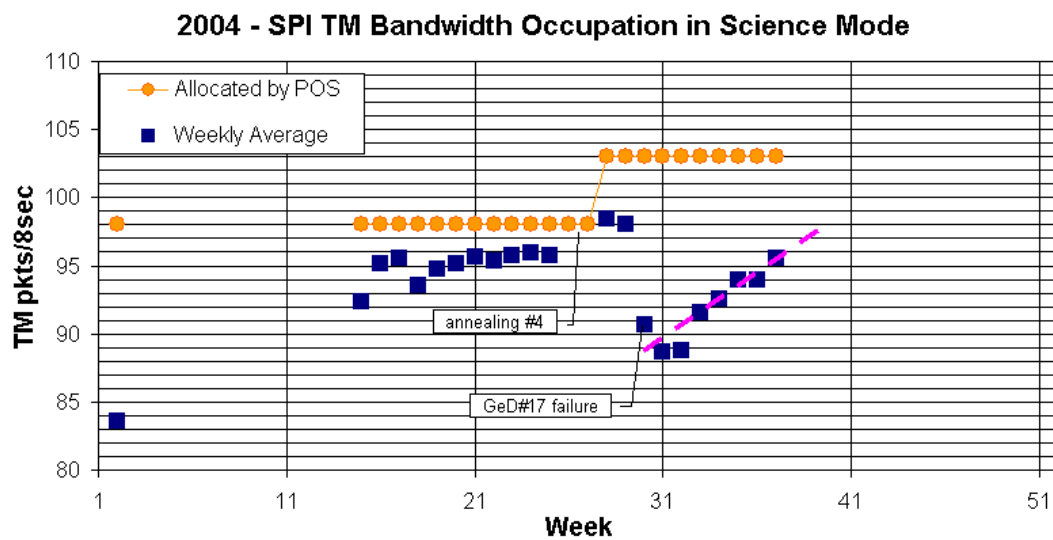
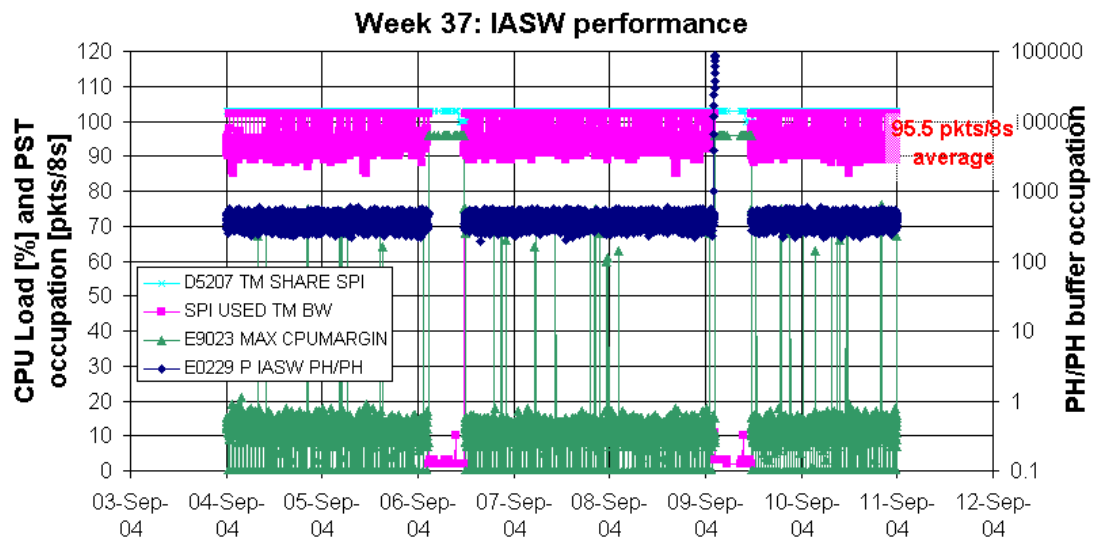
IASW/DPE:

The performance of the IASW/DPE is nominal.

The average TM bandwidth occupation was 95.5 pkts/cycle in the science windows.

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

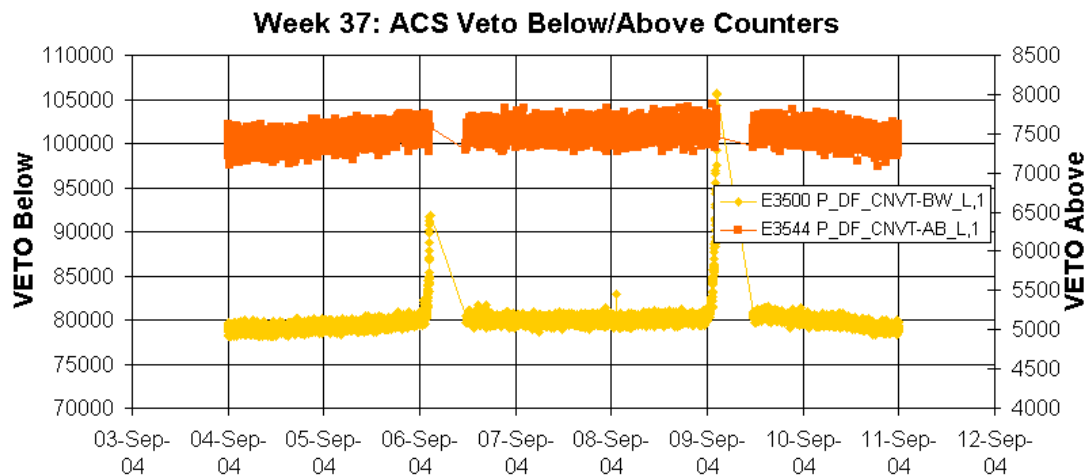
The following plot shows the trend of the occupied bandwidth, since beginning of 2004.



ACS:

The performance of the ACS is nominal.

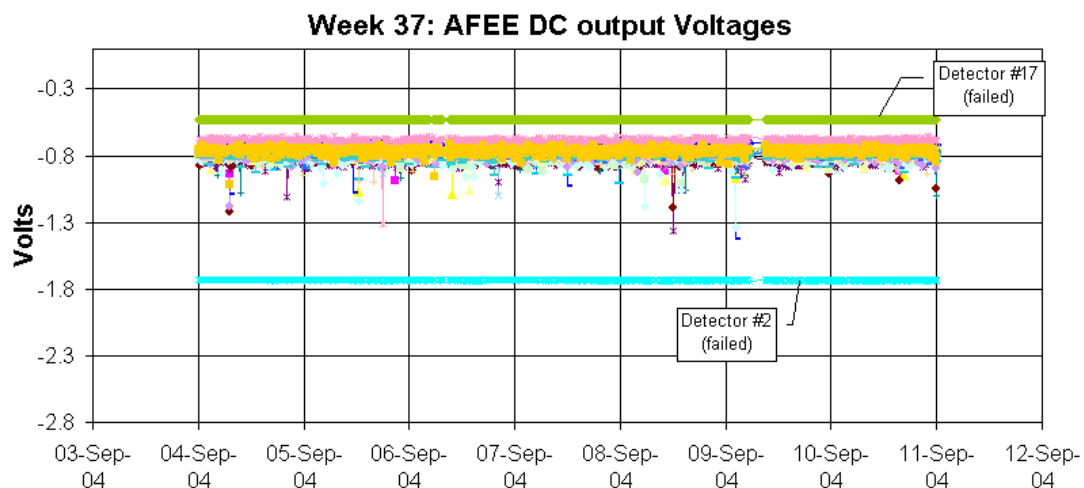
The following plot shows the ACS overall count rate evolution during the reporting period.



AFEE:

The performance of the detectors is nominal except for the detector #2, failed since 06.12.2003, and detector #17, failed since 17.07.2004.

The following plot shows the AFEE dc output signals during the reporting period.

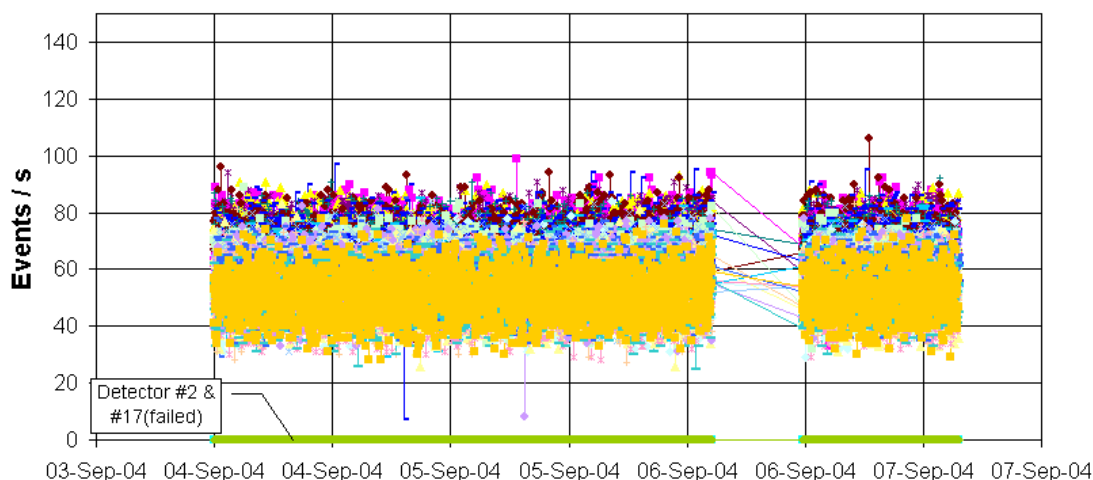


DFEE:

The performance of the unit is nominal.

The following plot shows the Non Vetoed event rates - i.e. the rate of the events acquired and transmitted to ground through the science telemetry - 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 and #17.

Week 37: GeD Non Vetoed counts



PSD:

The performance of the unit is nominal, though the malfunction of all PSD channel rates dropping to zero counts for a few minutes reproduced itself four times.

The anomaly affected only the PSD locally as the GeD count rates measured by the DFEE (see above) were still nominal; also the dc output voltage showed a nominal pattern during the malfunction.

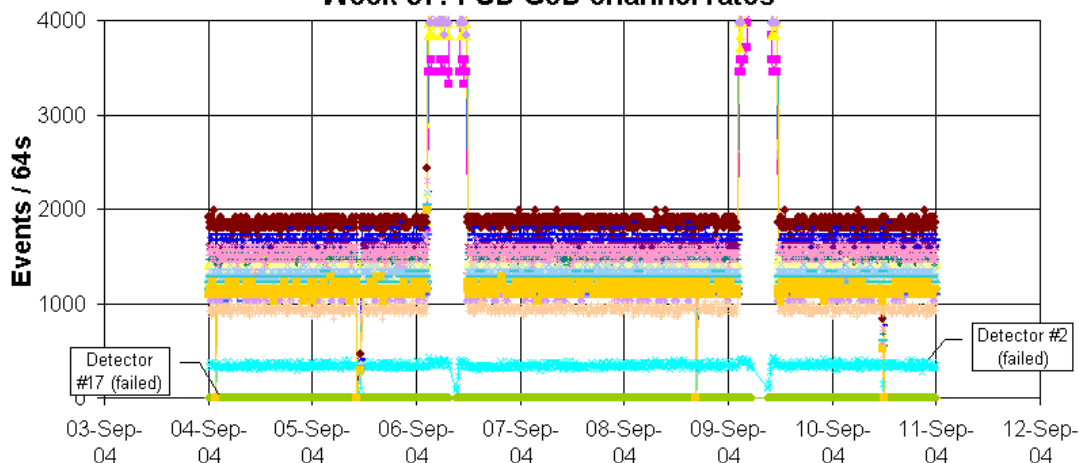
This anomaly was first recorded the day after the GeD#17 failure and present explanations correlate it to this failure (more details can be found in the anomaly report AR INT_SC-90)..

A recovery procedure was attempted on 03.09.2004 at 11.35z by disabling the GeD#17 input signal to the PSD but, apparently, without any result, as this week the malfunction re-appeared in the same way as in the previous weeks.

Substantial progress was made in the investigations of another anomaly of the PSD, found in Stand-by mode, halting SPI auto-reconfiguration sequence, on 19th August at 12:59z (see AR INT_SC-91). Thanks to the help of Cnes/Cesr it was possible to understand that this was a consequence of a sudden reset of the unit. The causes of such a reset are still unknown and under discussion.

The following plot shows the PSD channel rates during the reporting period.

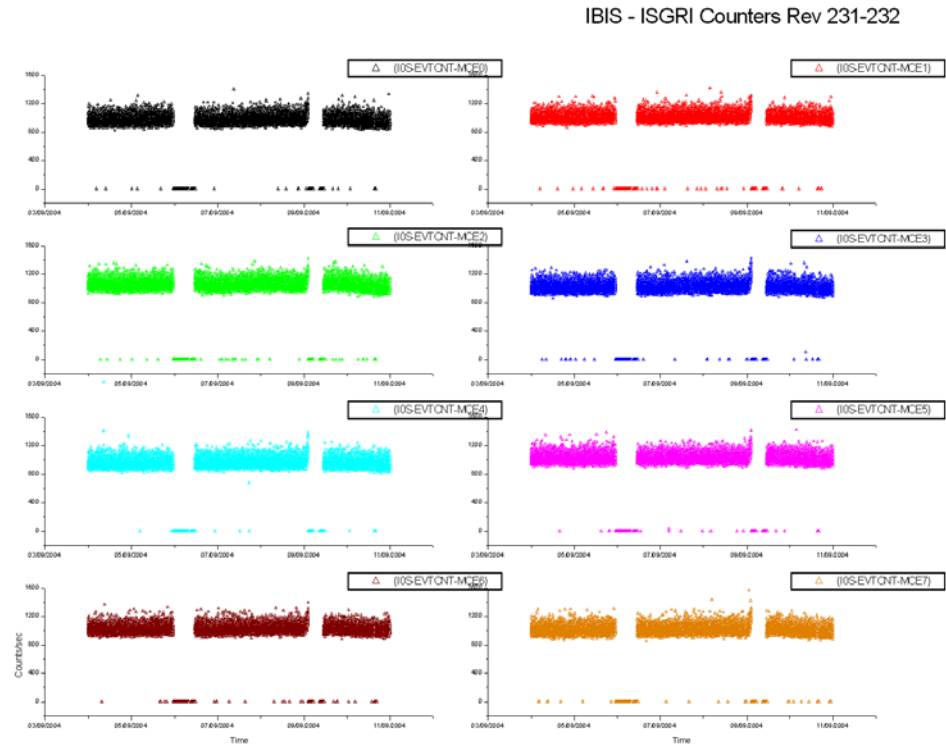
Week 37: PSD GeD channel rates



8.3.3 IBIS Operations

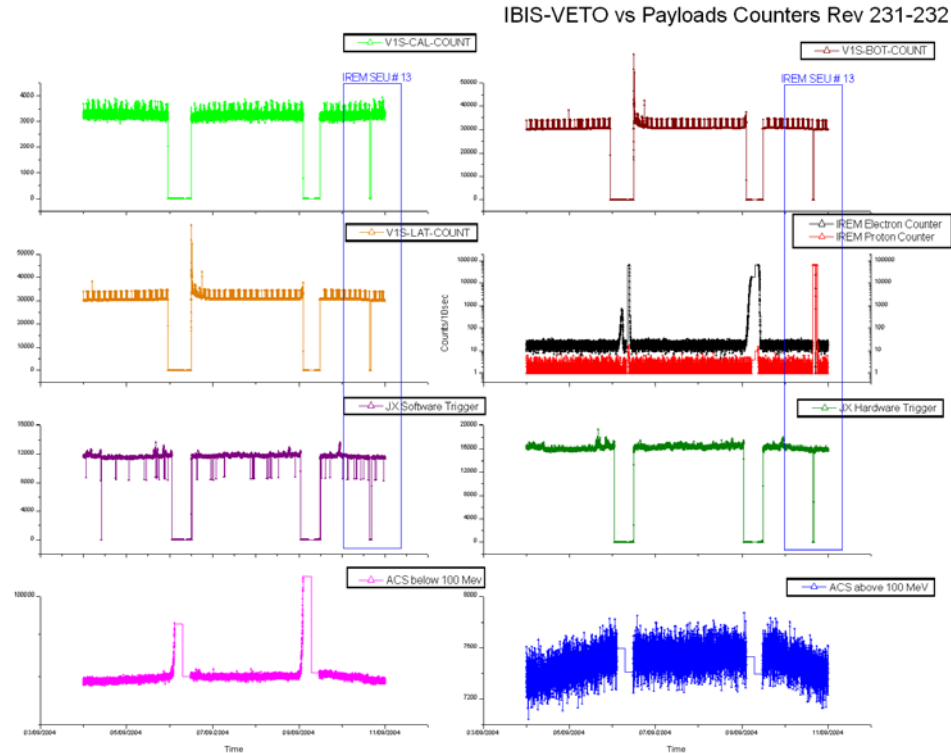
IBIS Event Counters Plots.

ISGRI Counters:



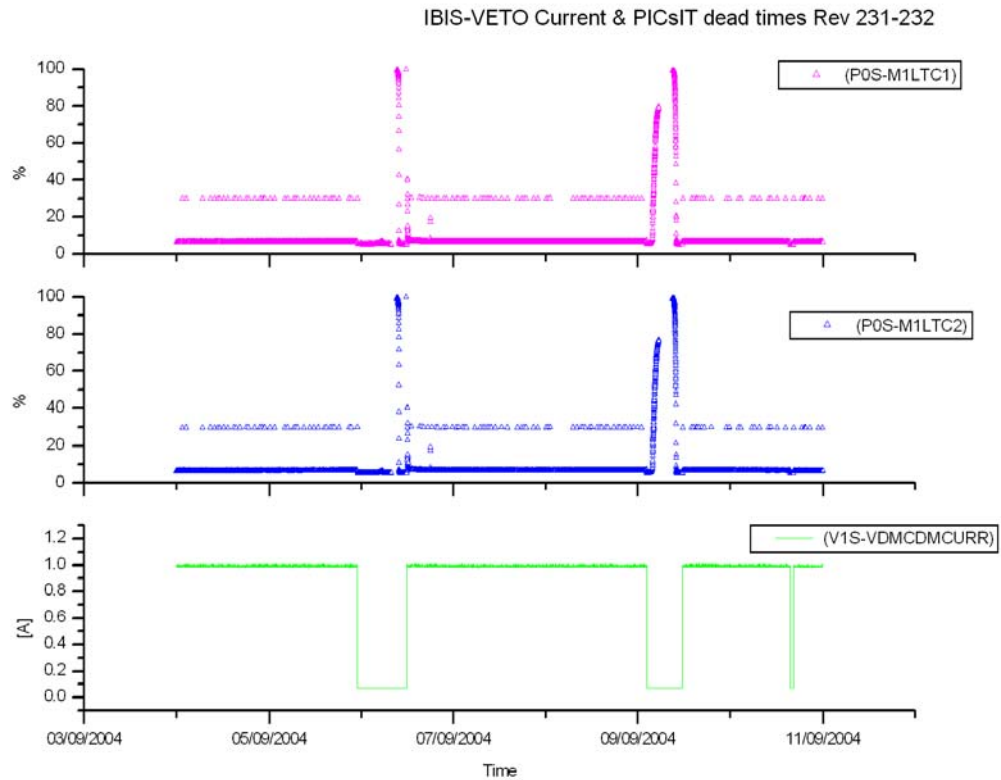
VETO vs Payloads Counters:

A comparison between the count-rates reported by VETO, the SPI-ACS, the IREM counters and JEM-X hardware/software triggers, show a stabilisation of the radiation background. Some irregularities were again observed in the JEM-X count-rates due probably to specific observation plan.

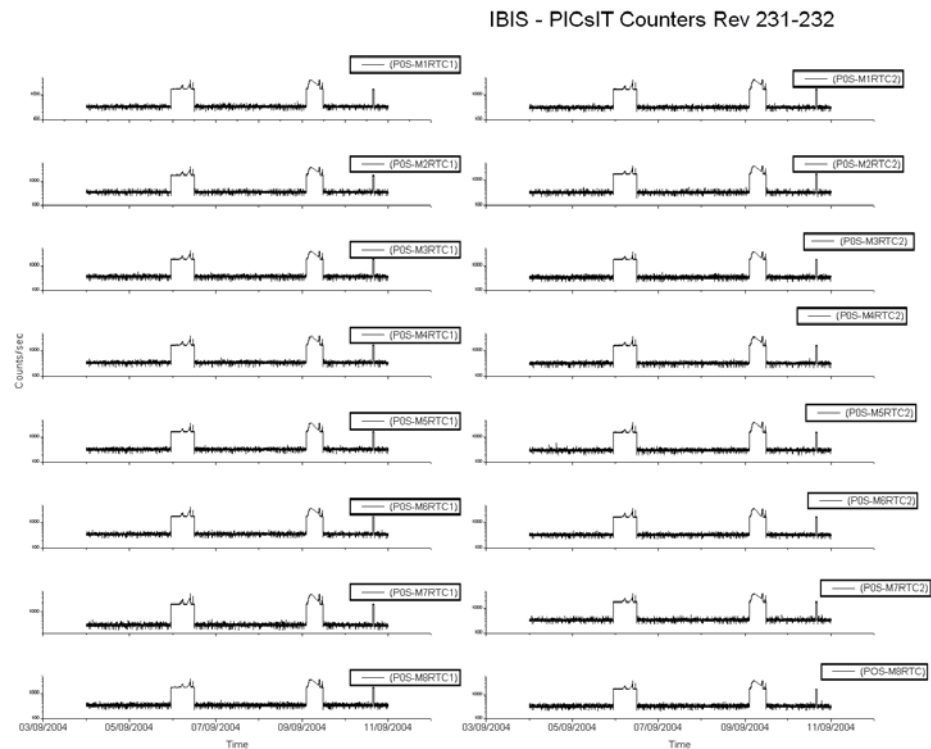


**with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec

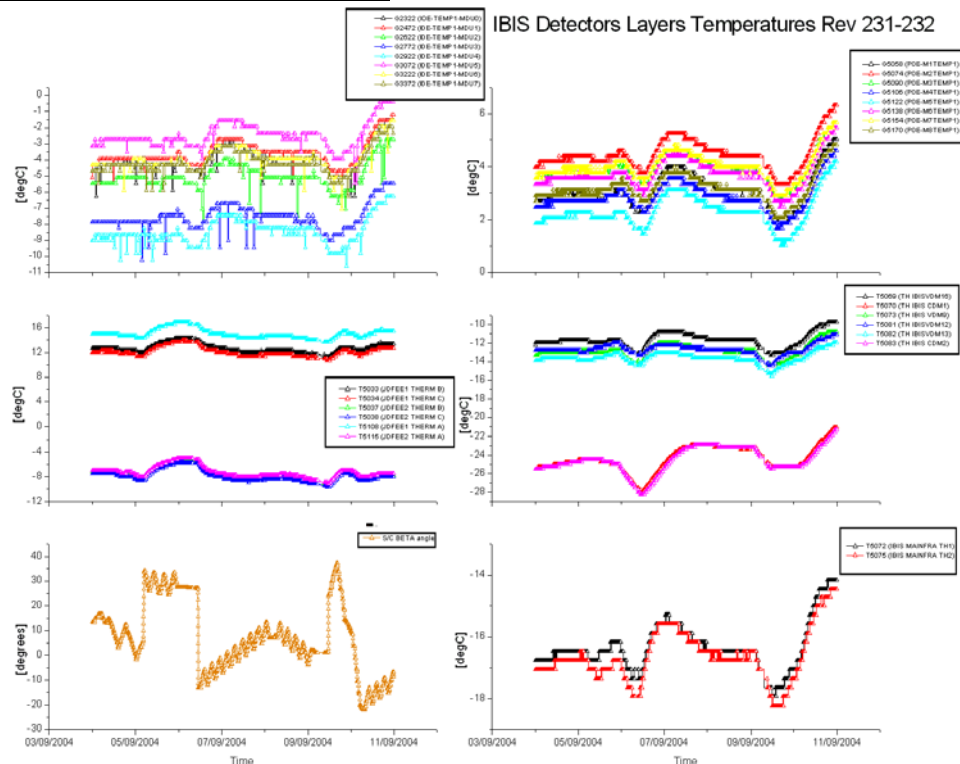
Veto Current:



Picsit Counters



IBIS Detectors Layers Temperatures



IBIS daily report

DoY 2004.248 (04/09/04)

Nothing to report.

DoY 2004.249 (05/09/04)

At 23:00Z the unit performed the transition to Safe condition (as per FCP_IBIS1_0801) due to the loss of nominal Goldstone support at the end of revolution 231. The unit was manually configured to Safe Mode ~3.5 hours before entering the radiation Belts to assure the correct deactivation of the detector High-voltages should an IDPE1 failure occur at Belt Entry.

DoY 2004.250 (06/09/04)

At 14:28Z reported from ISDC some IBIS alarms regarding the IBIS-VETO counters and temperatures. No evidence of these alarm condition was found at MOC, all the parameters were nominal. After discussion with ISDC, it looked to be a problem at ISDC due to possible old limits for the parameters mentioned above not yet updated.

At 20:36Z the VETO calibration counter (G6061) went in and out of limits (alarm low) for few TM cycles. During the event, a slight modification of the VETO total current and VEB LCL current (over the LSB) was observed. No action was taken as. This unexpected behaviour has been previously observed and an anomaly report generated (ref ARTS INT_SC-92). Investigations are on-going on the PI side.

DoY 2004.251 (07/09/04)

Nothing to report.

DoY 2004.252 (08/09/04)

Nothing to report.

DoY 2004.253 (09/09/04)

Nothing to report.

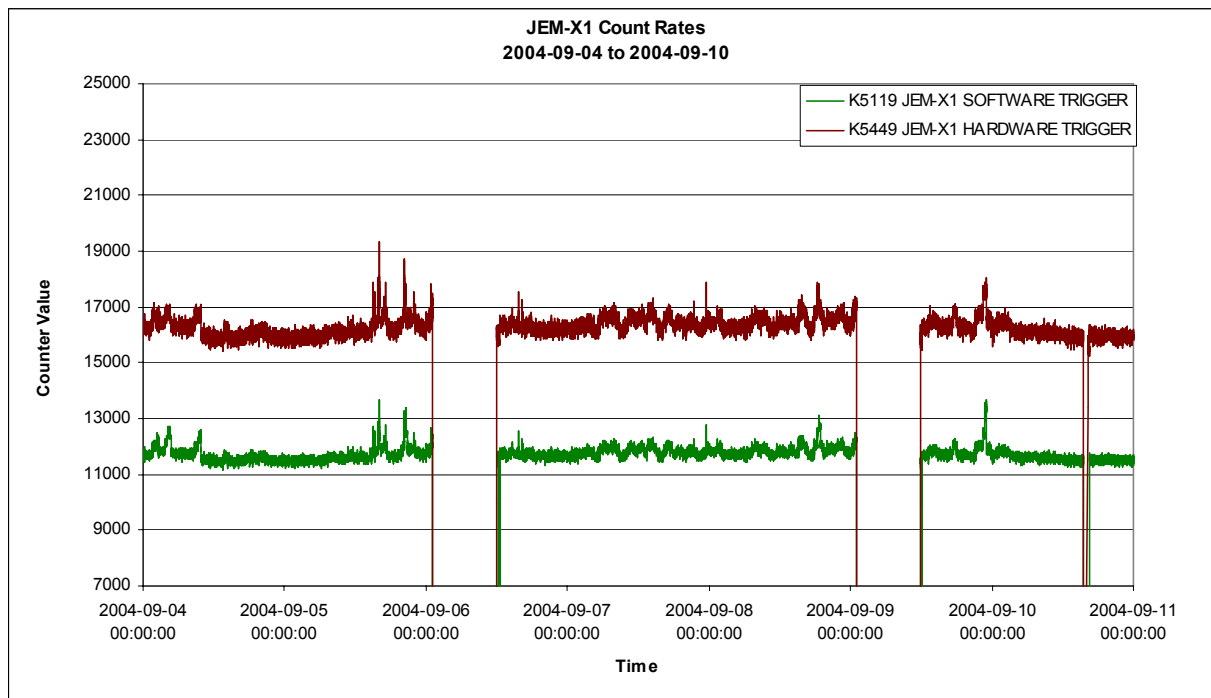
DoY 2004.254 (10/09/04)

At 15:28Z IREM performed an automatic transition to Standard Mode (reset of the CSCI S/W, SEU number 13). The anomaly affected the instrument statuses via the BCPKT forcing the automatic transition of IBIS to Stand-By with the VETO High Voltages and ISGRI Biases OFF. The recovery of the unit was completed at 16:27Z (see IREM report for the details).

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

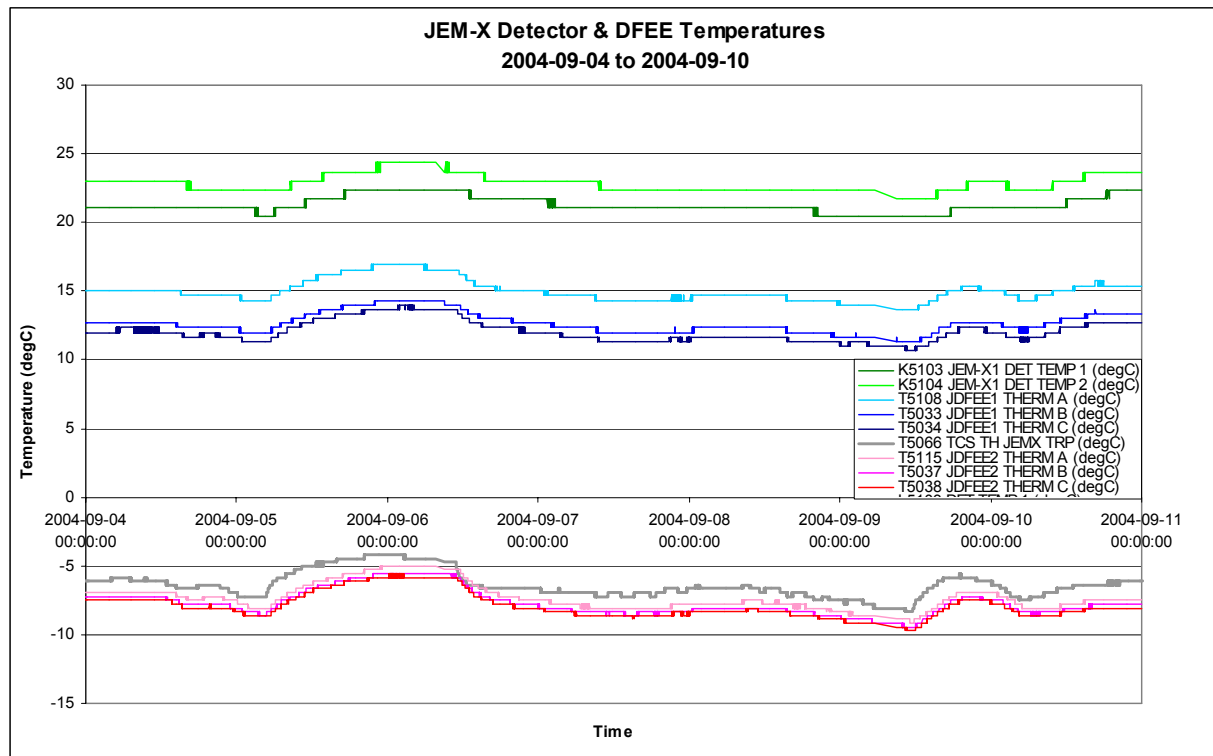
JEM-X count rates over the reporting period are displayed in the following graph¹.



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

JEM-X detector and DFEE temperatures over the reporting period are displayed in the following graph, along with the temperature on the detector bench between the two units².



8.3.4.3 JEM-X Daily Report

2004-09-04 (DoY 248, Rev 231)

Nothing to report

2004-09-05 (DoY 249, Rev 231)

Due to the loss of the nominal Goldstone support and the end of revolution 231, and the consequent TM-only coverage during the time when JEM-X1 would nominally be commanded into Safe mode before radiation belt entry, JEM-X1 was commanded to Safe mode via time-tagged TC before radiation belt entry of this revolution. Thus, in line with INT_OR_0169, procedure FCP_JEM1_0040 JEMX1 Transition to SAFE was executed at 22:10Z (before loss of TC coverage from Redu), with the execution time of TC K0008 set to 2004-09-06T01:12:11Z, i.e. 1 second after the scheduled uplink time of the ED KESAFE01 in the Timeline.

2004-09-06 (DoY 250, Rev 231-232)

² Data sampled (1 frame in 8)

The time-tagged TC K0008 uploaded on the previous day was executed successfully at 01:12:11Z, to put JEM-X1 in Safe mode before radiation belt entry of revolution 231.

2004-09-07 (DoY 251, Rev 232) to 2004-09-09 (DoY 253, Rev 232-233)

Nothing to report

2004-09-10 (DoY 254, Rev 233)

At 15:28Z an IREM S/W reset (# 13, ref: AR INT_SC-93) occurred, with all radiation monitor counters from IREM (TM parameters K5315-K5317) giving a value of 65535, causing JEM-X1 to transition to Safe mode, issuing OEM 231 JEM-X1 AUTO EVENT 1. Commanding to JEM-X1 was then disabled from the automatic Timeline at 15:32Z.

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 15:45Z. 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 16:03Z, with the procedure FCP_JEM1_1010, followed by procedure FCP_JEM1_0044. JEM-X1 was commanded back to Data Taking at 16:40Z and commanding to JEM-X1 from the automatic Timeline was then re-enabled.

At 16:44Z 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.

JEM-X1 was thus operated in Data Taking mode without IREM protection until IREM had been recovered and the IREM count rates had been monitored for ~2 hours to check their stability. Then, at 21:00Z FCP_DHS_1301 was executed to set the broadcast packet DRMC flag back to REGARD. At 21:25Z the JEM-X1 RMC flags were set back to ENABLED by procedure FCP_JEM1_0120.

JEM-X1 operations then continued nominally.

8.3.5 OMC Operations

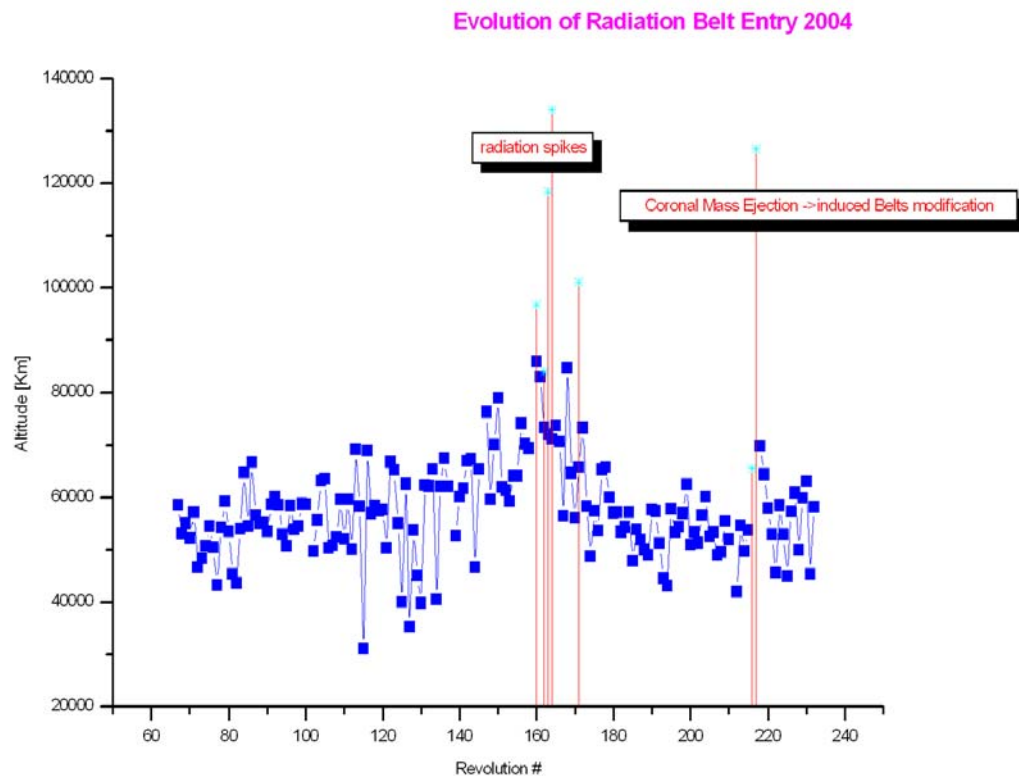
On DoY 254, at 15:28, there was an IREM SEU, (see IREM report for details), OMC was autonomously switched to SAFE mode at 15:28:49. It was recovered at 15:56:26, and was again collecting science data at 15:58:33. The impact was pointing 02330047 was cut short.

No commands were rejected this week.

On DoY 250 at 02:34:36 and DoY 253 at 02:20:43, OMC was switched by the Timeline to SAFE mode, at the nominal times.

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]
231	RAD_ENTR R 2004-09-06T02:34:15Z	2004-09-06 04:16:43	45396.7	2004-09-06 03:23:34	53788.26
232	RAD_EXIT R 2004-09-06T11:39:51Z	2004-09-06 10:04:04	23150.1	2004-09-06 10:23:34	27065.85
232	RAD_ENTR R 2004-09-09T02:20:22Z	2004-09-09 02:38:52	58210.5	2004-09-09 03:15:40	53237.42
233	RAD_EXIT R 2004-09-09T11:26:09Z	2004-09-09 10:10:44	27579.2	2004-09-09 10:15:40	27758.64

Reference

Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

Radiation Spike

Proton Belts

REV		Proton CUT-OFF Predicted Entry/Exit	ALT[Km] predicted
231	PROTON_RAD_ENTR	2004-09-06 08:53:34	13239
232	PROTON_RAD_EXT	2004-09-06 09:13:34	15715
232	PROTON_RAD_ENTR	2004-09-09 08:35:40	12652
233	PROTON_RAD_EXT	2004-09-09 08:55:40	14901

IREM daily report

DoY 2004.254 (10/09/04)

At 15:28Z a local reset of the IREM CSCI S/W (SEU #13) was performed: as previously (see anomalies on 16/12/02, 01/01/03, 03/06/03, 11/07/03, 19/07/03, 05/08/03, 24/08/03, 26/12/03, 13/05/04, 16/05/04, 09/06/04, 12/06/04) the status of the unit, before the occurrence of the anomaly, was nominal, here is a summary:

- 1) Temperatures nominal
- 2) LCL current nominal
- 3) Last HK before the anomaly HV, 5V and 6V voltages inside limits
- 4) The anomaly occurred at 2004.254.15.28.36z at 149723 km and the unit 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 15:32z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly shown a value of BCC0 HEX = 48320 DEC = 1011110011000000, ie. 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) Dumping all the register banks 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 OFF and the checksum counter in the register number 3 incremented of 1 unit.
- 7) The patch was performed successfully with the correct re-starting of the S/W. The operation was completed at 18.21Z.

The IREM automatic transition to Standard Mode affected the other instruments as it forced them to enter Safe mode, except for SPI whose automatism is disabled according to SPI PIs request.

The recovery of the payloads was performed as follows:

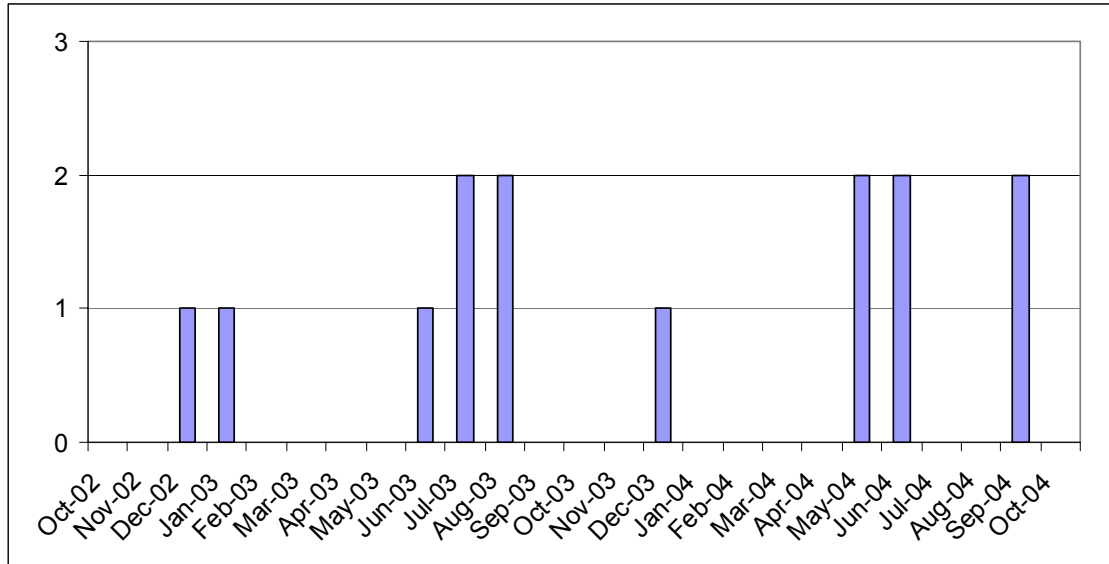
- OMC re-enabled in the automatic scheduling system at 15:58Z
- JEM-X re-enabled at 16:41Z
- IBIS re-enabled at 16:26Z

The cause of this S/W reset is still under investigation at MOC, different causes were considered but currently no conclusion is available.

The anomaly is probably due to the unit's memory device, which (tested in UCL-Belgium and BNL-USA) is sensitive to heavy particles but the origin of these

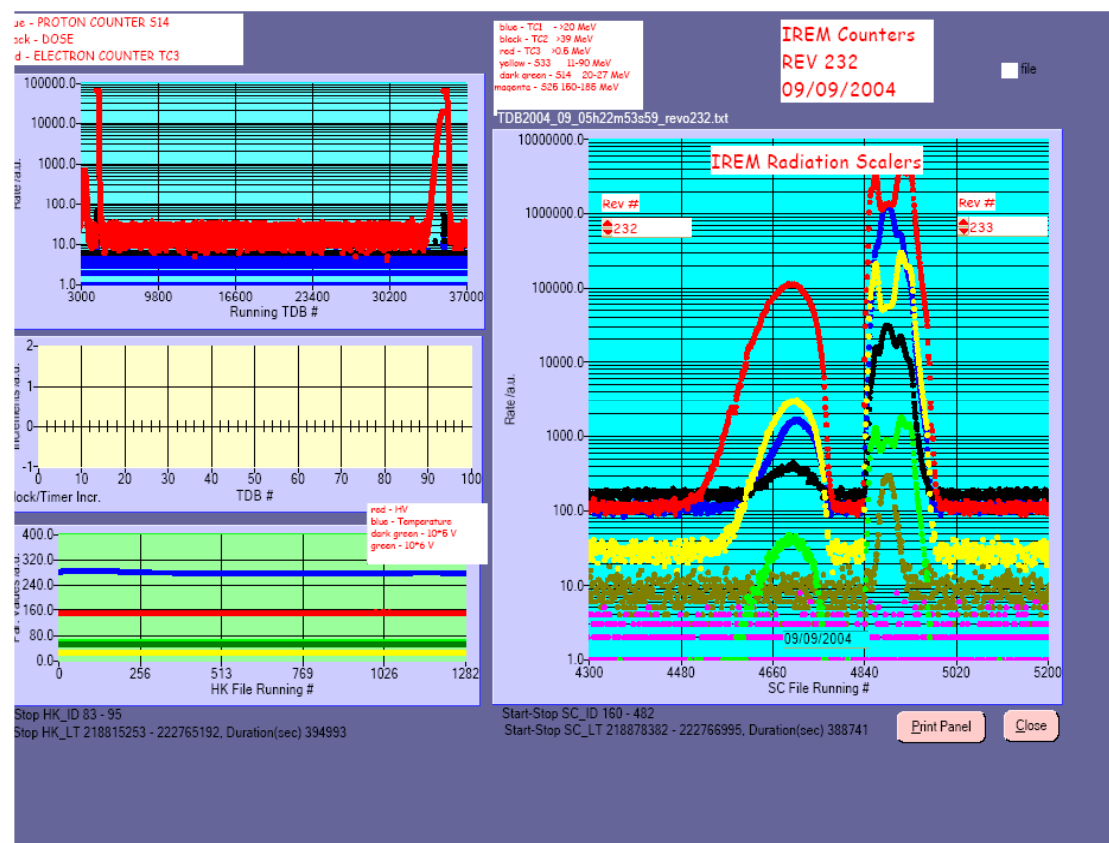
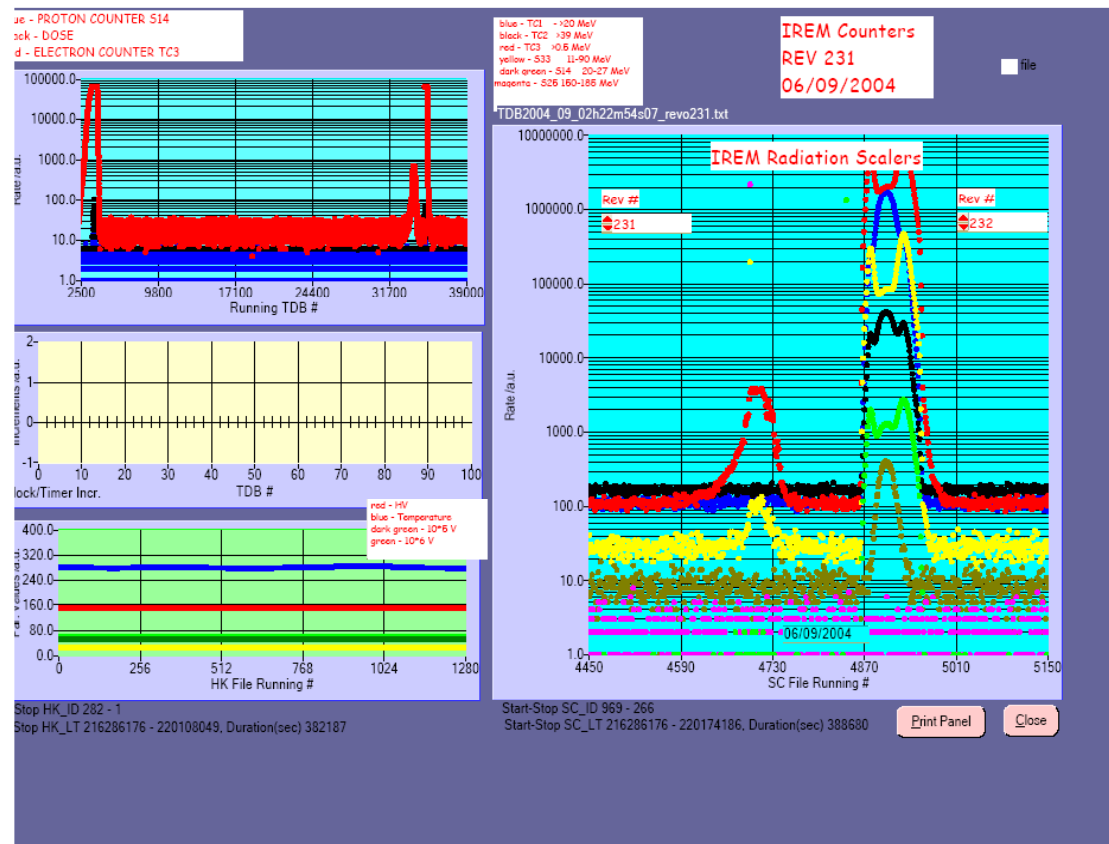
particles (Galactic Cosmic Rays?) and the periodic occurrences of these SEU events are still to be understood. A plot extracted from MOC TN showing the periodical nature of the IREM S/W resets is given below: (y-axis the number of anomalies, x-axis time from the launch)

IREM SEU occurrence

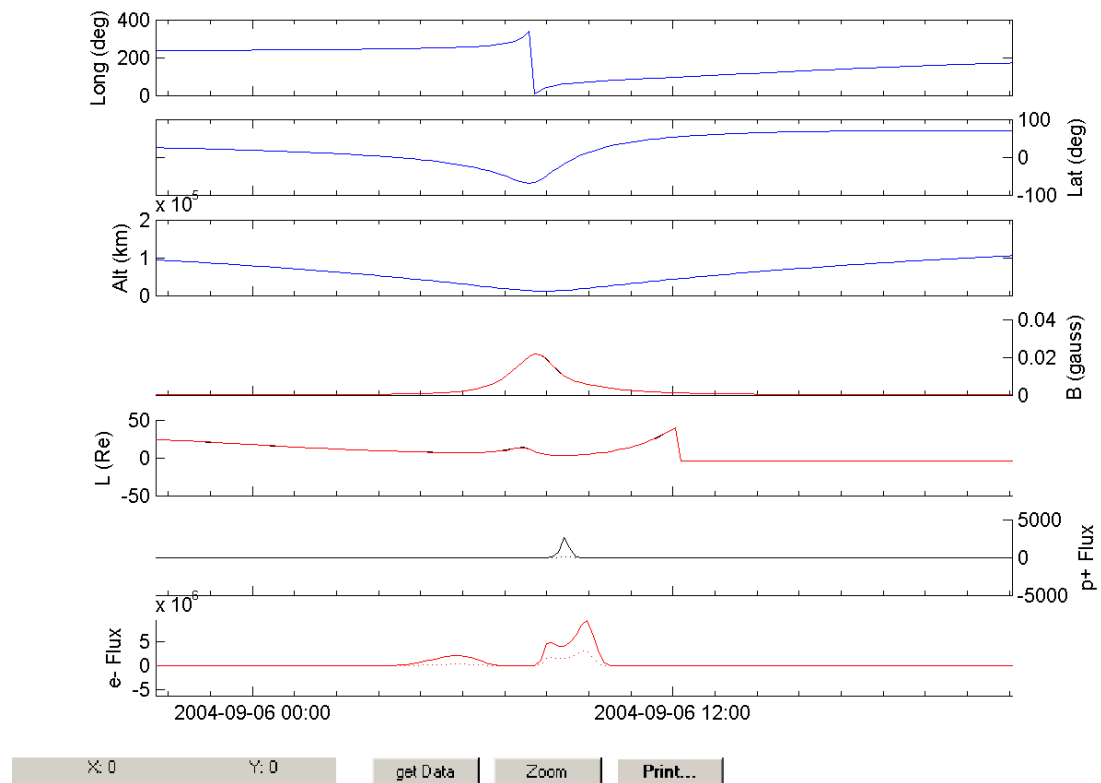


It is interesting to note that this event is the first of a presumed IREM SEU winter season, since the last series of anomalies reports 4 SEU in May and June 2004.

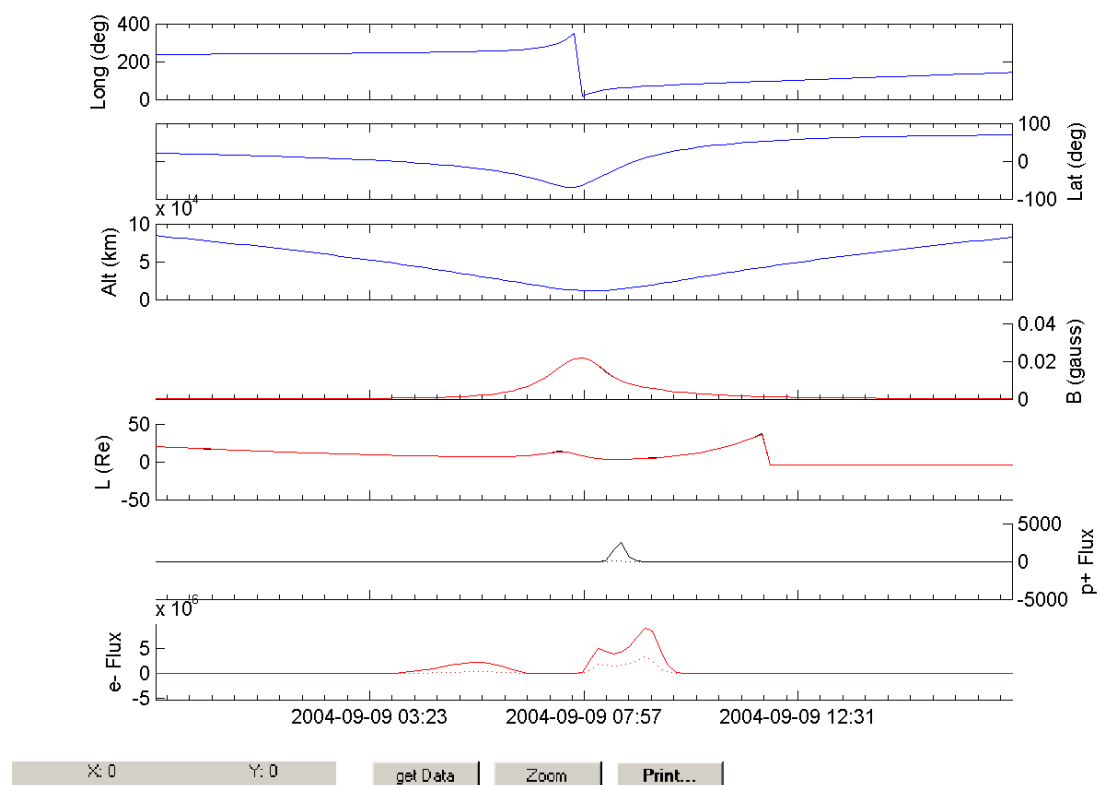
IREM radiation counters



IREM Predicted Radiation Belt Passages.Rev 231



Rev 232



SEC-GOES Observed Particles Fluxes.

