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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 128
Week 09
07.03.05
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 26.02.05 until 04.03.05 (both dates inclusive) and covers the revolutions 290, 291 & 292.

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 bulge region (RA 17:45:36.00; DEC -28:55:60.0); the Target of Opportunity GRO J1655-40 (RA 16:54:0.14; DEC -39:50:44.9); the galactic disk l<0 (RA 16:18:32.00; DEC -50:22:26.0); the galactic plane and PSR B1509-58 (RA 15:13:55.62; DEC -59:08:09.0). The activities consisted of raster and hexagonal dithering as well as GPS 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.

13 slews (6 CSL, 7 OSL) were missed from the Timeline during this period due a problems on IMCS, TPF generation from FD system and at REDU & Vilspa-2 stations (see anomaly report section for details).

The fuel consumption over the period between 23/02/2005 and 03/03/2005 was 0.1588 kg. The remaining propellant is in the order of 162.6321 Kg.

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

3.1.2 Power

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

3.1.3 Thermal

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

3.1.4 OBDH

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

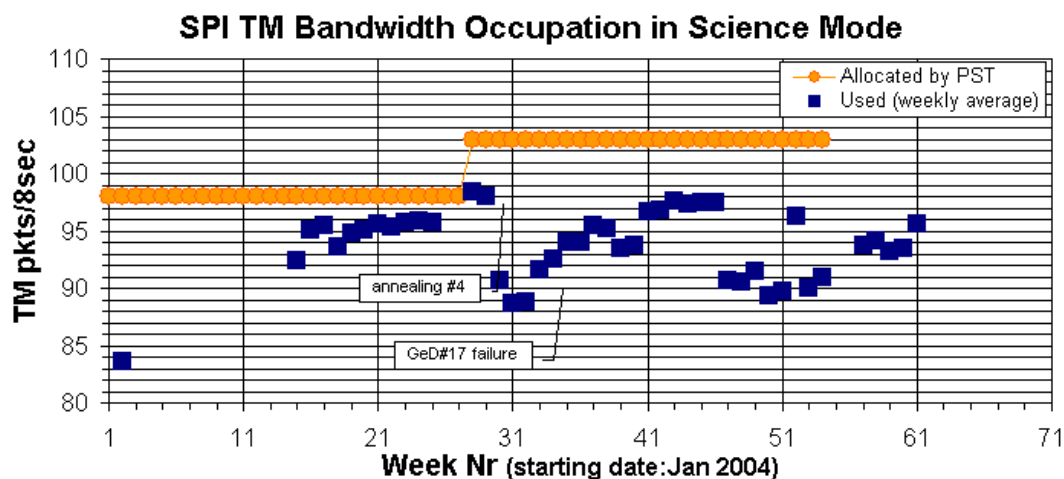
3.2 Payload

3.2.1 SPI

The overall status of the instrument in this week is nominal except for a malfunction detected at belts entry of rev.290, where the ACS HV did not switch unexpectedly. The switch off had to be forced manually from ground.

On request of the PI, the PSD input channels #2 and #17 (faulty detectors) have been disabled (OCR-190 executed at belts entry of rev.290), trying to cure the channel rates blocking malfunction. Since the disabling, the malfunction did not appear again. However, due to the apparent random nature of it, a longer monitoring period is needed prior to draw conclusions.

During the reporting period, the instrument has been kept in photon-by-photon mode, with spectra TM enabled, an assigned TM bandwidth in the science observation windows of 103 pkts/cycle and an actual occupation of 95.6 pkts/cycle average. The Stirling compressors are working well, maintaining the detector cold-plate temperature within 85+/-1K.



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

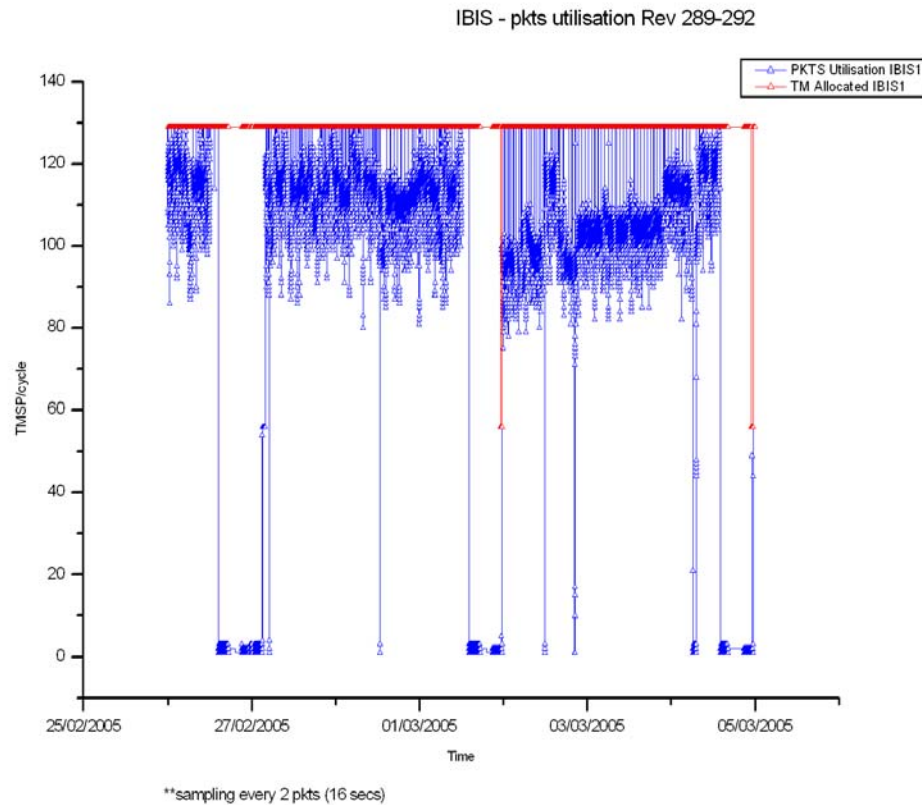
3.2.2 IBIS

The Overall status of the unit is Nominal.

The week was characterised by low solar activity.

During the reporting period the PST allocation to IBIS was most of the time 129 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 110.9 TMPS/cycle, down 1.4 on last week.

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



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

3.2.3 JEM-X

The status of both JEM-X units is nominal.

JEM-X operations were performed by the automatic Timeline.

JEM-X1 was operated in Data Taking mode 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.

INT_OR_0189 was executed at the start of each revolution to reset the JEM-X1 Broadcast Packet override flags for IREM to DISABLED following the anode calibration ED KEACAL01 in the Timeline.

Due to high background radiation conditions, JEM-X1 made two autonomous transitions to Safe mode in this reporting period, triggered on both occasions by the unit's Software Trigger, as follows:

- On 2005-02-26 at 12:16Z. This was ~50 minutes before it was due to be commanded to Safe mode before radiation belt entry of revolution 289.
- On 2005-03-01 at 12:22Z. This was ~30 minutes before it was due to be commanded to Safe mode before radiation belt entry of revolution 290.

Due to problems with the control system, the Timeline was stopped at the start of revolution 290 and the activation of JEM-X1 was therefore delayed and performed manually. JEM-X1 began science observations about 3 hours later than planned.

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 134 OMC pointings executed nominally, 1 was delayed by 10 minutes, another by 20 minutes, 1 was interrupted by an IREM SEU, and 9 were lost.

Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.

3.2.5 IREM

The overall status of the unit is nominal.

On DoY 063, at 06:24:44Z, during revolution 291, an automatic reset of IREM S/W (SEU#21) occurred. The impact was that OMC and IBIS were forced to Safe Configuration.

After the Payload reconfiguration, the unit was successfully recovered and currently no degradation of the performance is reported.

Solar Activity

The observation period was characterised 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 not so good this week, below the system performance requirements, 9 science pointings and 4 engineering pointings were lost, and 2 science pointings were delayed due to ground problems.

4.1 Mission Operations Centre

The performance of the MOC was not so good this week, a problem during the archive split caused the loss of the imcs a-chain over the week-end. 7 pointings were lost. An operator error delayed a pointing, and a FD problem caused the loss of 2 more pointings.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. A TCE problem at Redu caused the loss of 3 pointings, and a TMP overflow at Vilspa caused the loss of another and a delay in the subsequent pointings were the most significant events. The overall performance was still over the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

During this week only routine mission planning has been performed. No ToO received. PSF's up to rev 297 have been received. All these revolutions have been planned. Up to rev 296 has been sent to MOC. TSF for rev 291 was received.

2. Observation status

No new ECS's received this week.

3. ISOC science data archive

No report this week.

4. ISOC system

Version 10.7.3 is still in use. No major problems reported.

5. ISOC move

A second batch of computers and office equipment was received in ESAC. Unpacking and installation is expected to start this week.

6. Problems

The problem reported last weeks with unavailable science staff in ISOC is still not yet formally resolved Very little progress achieved to resolve the problem.

4.3.2 ISDC

Status of ISDC observation processing on 07/03/2005:

- Latest Standard Analysis completed: observation 02201460002 (3C273, Revolution 268) on 04/03/2005

- Latest products archived: observation 02201460001 (3C273, Revolution 267) on 13/02/2005

- Latest observation products sent to the observer: observation 02297000015 (Abell 2256, Revolution 257) on 20/02/2005

5 Special Events

6 Anomalies

There were a number of problems that impacted the operations:

- On DoY 057, at 07:39, there was a drop in the VC0 TM link from Vilspa, there was no impact.
- At 12:23, the AOCS was erroneously disabled, the impact was a 10 minute delay in the start of pointing 02890063.
- At 14:03, there were continuous error messages on the b-chain: TMDSMain, iddb, error, log, link MADDS-ISDS Disconnected TMDSMain, iddb Warning, Software, illegal data event from isds TelemetryLink.
- At 21:52 & 21:54, 2 OBDH commands failed completion, this initiated a sequence of problems with the commanding, which was finally overcome at 23:59, by switching to the imcs b-chain. The timeline was eventually rejoined at 02:14. The cause of the problem was a wrongly configured archive split. The system remained running on the b-chain until 11:14 on day 059. The impact was the loss of pointings 02900001 to 02900007.
- On DoY 058, at 07:02, a fileclean was run on MADDS-B on iddb, as the unit was in a yellow state, owing to low disk space. This caused a delay in the uplink of the PSTREQ sequence. There was no impact.
- At 18:29, an AOCS command failed release causing the timeline to be interrupted. The problem was traced to the TCE at Redu. At 19:18, the links were restored using Vilspa. The timeline was rejoined around 20:00. The impact was that pointings 02900033, 02900034 & 02900035 were lost.
- On DoY 059, at 20:45, the iddb was in a yellow state, with the consolidator showing 5GB of free space.
- On DoY 060, at 11:04, the broadcast packet G2 command failed release due to the on-going station handover. It was sent manually at 11:19 without impact.
- On DoY 061, at 13:02, a TMP over-flow at Vilspa causes an AOCS command to fail. The impact was the loss of pointing 02900022, and a 20 minute delay in the start of pointing 02900023.
- On DoY 062, at 02:20, the iddb was in a yellow state, with low available disk space. The fileclean routine was started to clear the problem, there was no impact.
- At 12:52, bad frames were received from Vilspa, the TMP was swapped as a precaution, but the probable cause was snow on the antenna.
- On DoY 063, at 01:18, the iddb was in a yellow state, with low available disk space. The fileclean routine was started to clear the problem, there was no impact.
- At 12:56, CCC reported a drop on the X25 line, but no effect was seen in the imcs.
- At 14:03, the VC0 TM link with DSS-16 briefly dropped, there was no impact.
- At 21:34, the FD tool fails to produce the IPF for slew 02920001. The AOCS commanding was disabled, and not recovered until 00:22. The impact was slews 02920001, 02920002 and 02920003 were missed. (The last of these was passed midnight, and falls into next week).

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

AR id	Date Created	Subject	Segment	Status
INT_SC-114	04/03/2005	IREM Anomaly: Reset of IREM_CSCI S/W #21, 04/03/2005	Payload	Open
INT-2705	28/02/2005	IFTS instance IMC does not deliver products to instance MAB	IMCS	Closed
INT-2706	01/03/2005	Drop in TM VC-0 at VIL2	ESA Stations	Pending
INT-2707	01/03/2005	After routine archive split A-Chain not operational	IMCS	Closed
INT-2708	01/03/2005	TC failure on REDU	ESA Stations	Pending
INT-2709	03/03/2005	Late G/S handover at Goldstone	NASA Stations	Closed

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 290

The activities in revolution 290 consisted of a hexagonal dithering observation of the galactic bulge region (RA 17:45:36.00; DEC -28:55:60.0) lasting ~3.5 hours, followed by a raster dithering observation of the Target of Opportunity GRO J1655-40 (RA 16:54:0.14; DEC -39:50:44.9) lasting ~31.5 hours. An amalgamated raster dithering observation of the galactic disk $l < 0$ (RA 16:18:32.00; DEC -50:22:26.0) was then performed for the remaining ~24.5 hours of observation time.

Revolution 291

The activities in revolution 291 began with 16 pointings of a GPS lasting ~11.5 hours, followed by a hexagonal dithering observation of the galactic bulge region (RA 17:45:36.00; DEC -28:55:60.0) lasting ~3.5 hours. A raster dithering observation of PSR B1509-58 (RA 15:13:55.62; DEC -59:08:09.0) lasting ~29.5 hours was then performed, followed by an amalgamated raster dithering observation of the galactic disk $l < 0$ (RA 16:18:32.00; DEC -50:22:26.0), performed for the remaining ~15.5 hours of observation time.

Revolution 292

The activities in revolution 292 began with 23 pointings of a GPS lasting ~16 hours, followed by a hexagonal dithering observation of the galactic bulge region (RA 17:45:36.00; DEC -28:55:60.0) lasting ~3.5 hours. An amalgamated raster dithering observation of the galactic disk $l < 0$ (RA 16:18:32.00; DEC -50:22:26.0) was then performed for the remaining ~40 hours of observation time.

Throughout these observations all instruments were in their nominal science modes, except for 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

2005-02-14T22:48:23.000Z	163.1208	F	Automatic TM processing.
2005-02-15T07:40:57.000Z	163.0638	F	Automatic TM processing.
2005-02-17T22:34:07.000Z	163.0214	F	Automatic TM processing.
2005-02-19T09:01:47.000Z	162.9700	F	Automatic TM processing.
2005-02-20T22:28:30.000Z	162.9494	F	Automatic TM processing.
2005-02-21T06:17:11.000Z	162.9080	F	Automatic TM processing.
2005-02-22T08:28:26.000Z	162.8591	F	Automatic TM processing.
2005-02-23T17:27:49.000Z	162.8084	F	Automatic TM processing.
2005-02-23T22:14:54.000Z	162.7909	F	Automatic TM processing.
2005-02-25T08:19:53.000Z	162.7694	F	Automatic TM processing.
2005-02-27T02:21:58.000Z	162.7460	F	Automatic TM processing.
2005-02-28T08:01:05.000Z	162.7320	F	Automatic TM processing.
2005-03-01T16:38:04.000Z	162.6647	F	Automatic TM processing.

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2005-03-01T21:48:45.000Z 162.6546 F Automatic TM processing.
2005-03-03T08:12:40.000Z 162.6321 F Automatic TM processing.

This report was generated Fri Mar 4 08:00:22 GMT 2005

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 26/02/2005-04/03/2005

AOCS operations were executed from the Automatic Timeline.

During this period, 76 Open Loop Slews, 108 Closed Loop Slews and 8 Momentum Bias were executed. 13 slews were not executed due problems on IMCS, TPF generation from FD system and at REDU & Vilspa-2 stations. This is equivalent to a ~ 7.6 %.

26/02/05 (Day of Year 057, Revolution 289-290)

Slew missed from the Timeline: Due to problems in different areas of the IMCS (see details in anomaly report section) after AOS REDU, the first AOCS activity at the beginning of rev 290 (Reaction Wheel Bias) failed execution. Consequently the AOCS s/s was disabled in TL at 21:58z and manually recovered along the following day (DoY 58). The slew ID 02900001 (OSL) was not executed.

27/02/05 (Day of Year 058, Revolution 290)

Slews missed from the Timeline: Due to problems in different areas of the IMCS (see details in anomaly report section), the slews ID 02900002(OSL)-3(OSL)-4(CSL)-5(CSL)-6(OSL)-7(CSL) were not executed. A manual recovery was performed to the attitude of PID 02900007. The next slew (CSL) for PID 02900008 was manually updated and executed from the Timeline. The AOCS was re-enabled in TL at 02:40z.

Slews missed from the Timeline: Due to problems on REDU station (TCE1-2 problems, see details in anomaly report section), the slews ID 0290033(CSL)-34(OSL)-35(OSL) were not executed and the AOCS s/s disabled in TL at 18:34z. A manual recovery was performed to the attitude of PID 02900035. The next slew (CSL) for PID 02900036 was manually updated at 20:10z and executed from the Timeline.

28/02/05 (Day of Year 059, Revolution 290)

STR 1750 processor faults: an STR 1750 processor fault occurred during the execution of the tranquilization phase for RWB. The sequence of the events was the following:

07:57:38z Momentum Dump end
08:00:58z ACC FCV LCL OFF

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08:06:40z Mapping Start
08:06:57z Mapping End prematurely
08:06:57z IMU ON
08:06:57z New Mapping start and new guide start picked
08:07:49z Mapping End
08:11:01z ACC Mode change to IPS
08:11:01z IMU OFF

The attitude for PID 54, before the RWB, is reported below:

PID	AR	DEC	POS
02900054	16:53:15	-42:44:35	097:36:31

The fault, which occurred during the tranquilization phase after the momentum dump, resulted in the abortion of the on-going mapping (duration shortened) and start of a new mapping.

The guide star (ID 7876-2597) at moment of the fault was magnitude 6.5 at CCD location [-4484, 9385]. The new guide (ID 7875-256) star picked after the mapping was magnitude 7.5 at CCD location [7207, -7210].

The IMU was switched ON as expected and set back to OFF as soon the automatic mode transition to IPS occurred (IMU on time ~ 04 mins 03 secs). According to the Star Catalogue, one extended objects, the diffuse Nebula NGC 6231 was in the STR FoV at the time of the fault. This object is considerably large (max diameter of ~ 900 arcsec) and quite rich of stars. This probably, as it was last week, could have caused the fault.

No slews were missed and no operational impacts reported.

01/03/05 (Day of Year 060, Revolution 290)

Nothing to report.

02/03/05 (Day of Year 061, Revolution 291)

Slews missed from the Timeline: Due to a problem on Vilspa-2 station (TMP overflow), the slews ID 02910022(CSL)-23(CSL) were not executed and the AOCS s/s disabled in TL at 13:05z. A manual recovery was then performed to the attitude of PID 02910023. The next slew (CSL) for PID 02910024 was manually updated and executed from the Timeline. The AOCS s/s was re-enabled in TL at 13:58z.

03/03/05 (Day of Year 062, Revolution 291)

Nothing to report

04/03/05 (Day of Year 063, Revolution 291-292)

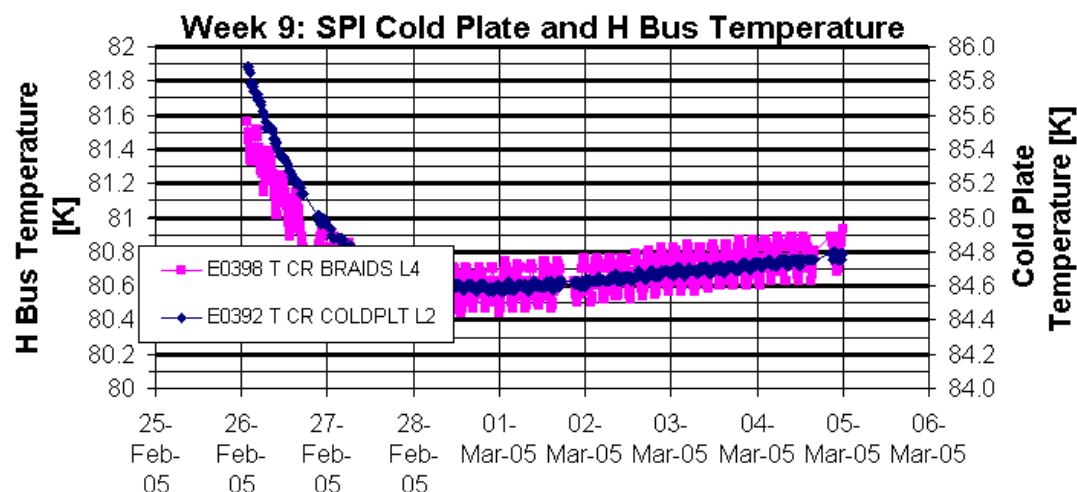
Slews missed from the Timeline: Due to a problem on FD system (failed TPF generation), the slews ID 02920001(OSL)-02(OSL) were not executed and the AOCS s/s disabled in TL at 22:39z. A manual recovery was then performed to the attitude of PID 02920003, which falls under next week's report. The next slew (OSL) for PID 02920004 was manually updated and executed from the Timeline. The AOCS s/s was re-enabled in TL on DoY 64 at 00:22z.

8.3.2 SPI Operations

Stirling compressors and Cryostat:

The performance of the compressors is nominal. On The stroke had to be adjusted from 4x36 to 4x37dec to compensate the drift of the past weeks. The cold plate temperature was maintained at 85K $\pm$ 1K over the reporting period, showing the positive drift expected after the annealing cycle.

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

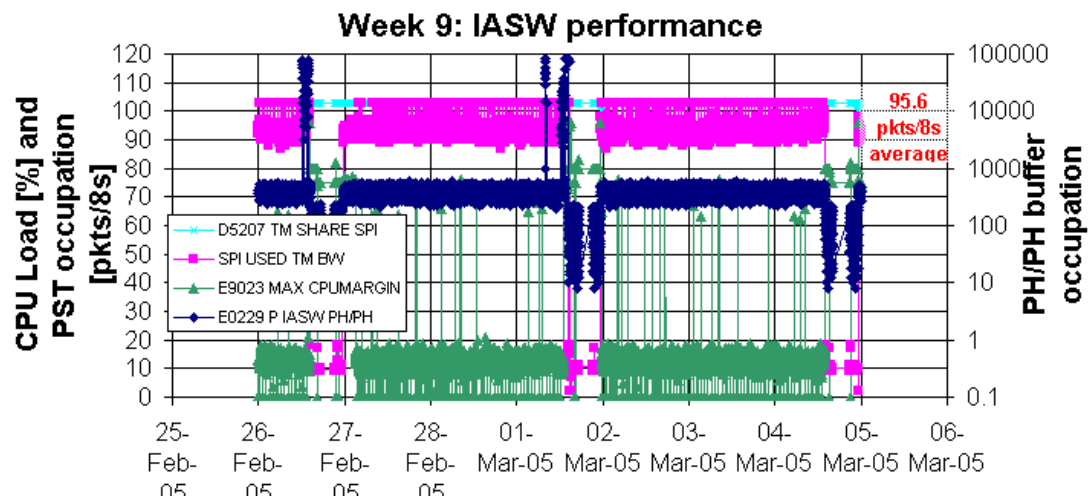


DPE & IASW:

The IASW performance is nominal. The PST TM bandwidth allocation was 103 pkts/cycle in the science windows; the actual TM bandwidth usage is :
 103 pkts/cycle peak;
 95.6 pkts/cycle average in science mode.

The SPI team is currently analysing the IASW code, investigating on the TM leakage anomaly INT_SC-107. As a temporary workaround to the malfunction, the SPACON uplink at every beginning of rev. a new PST rearranged such to avoid the problem. The malfunction of the missed ACS HV switch off at belts entry of rev.290 is being discussed with the PI to first identify if it is actually a IASW problem.

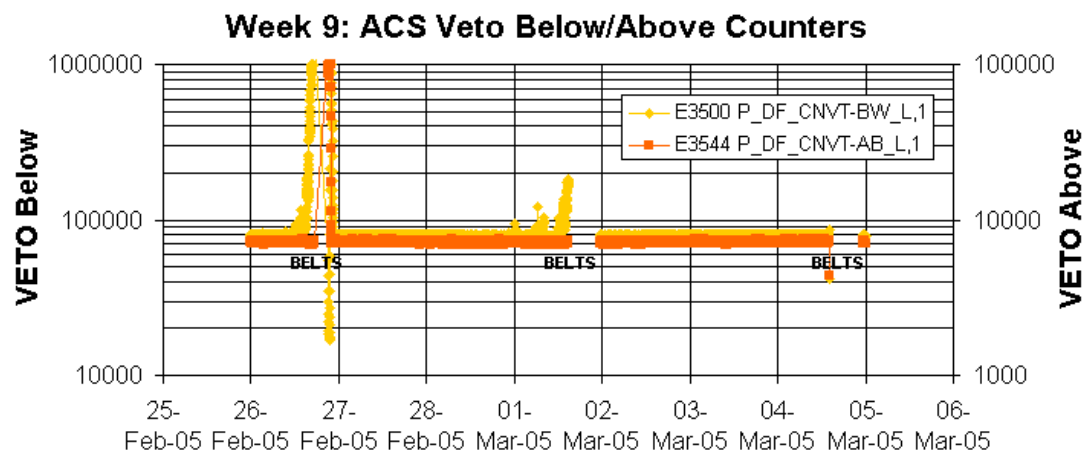
The following diagram shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal except for a malfunction detected at belts entry of rev.290, where the ACS HV did not switch unexpectedly. The switch off had to be forced manually from ground.

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

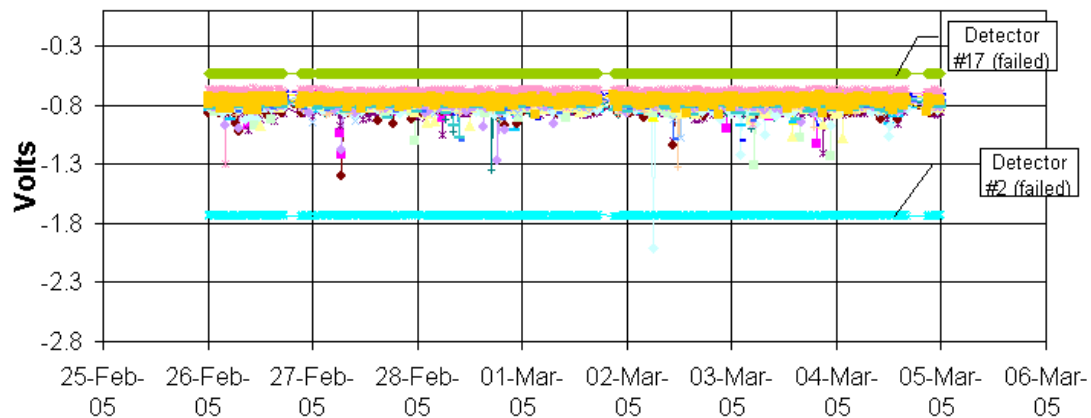


AFEE and Germanium Detectors:

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.

Week 9: AFEE DC output Voltages

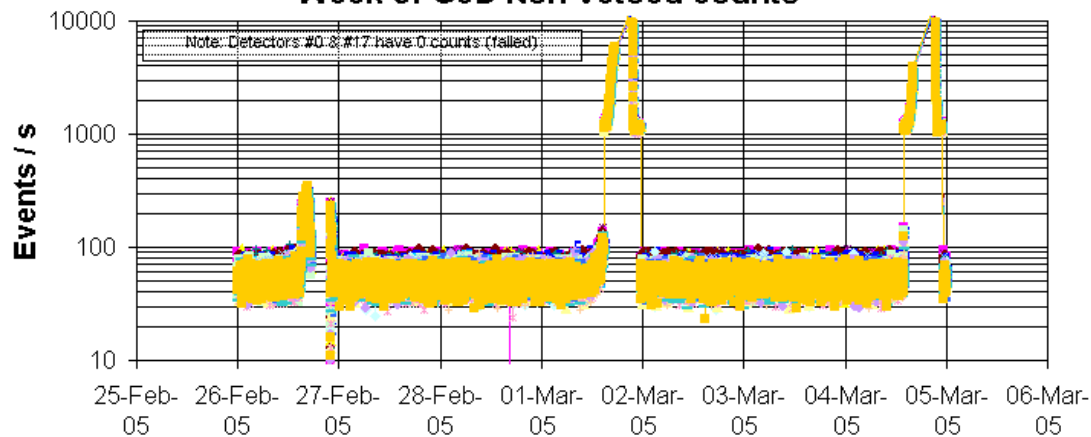


DFEE:

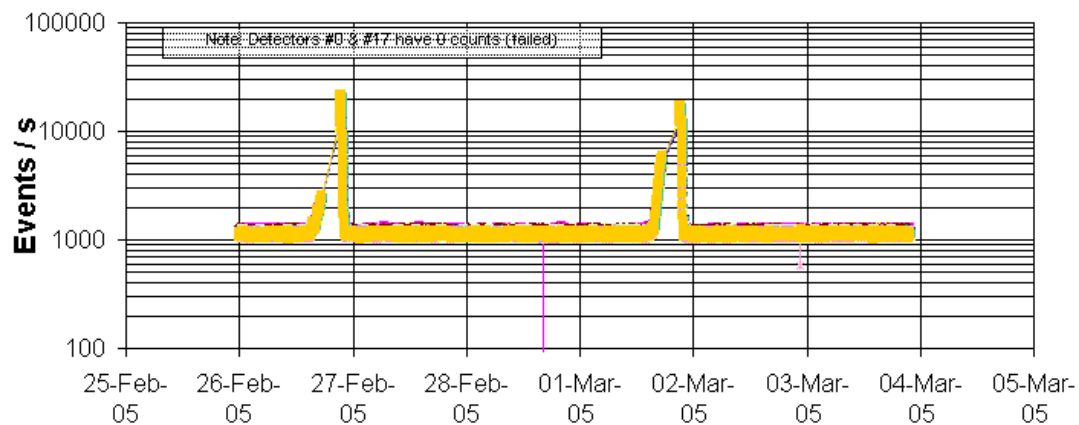
The performance of the unit is nominal.

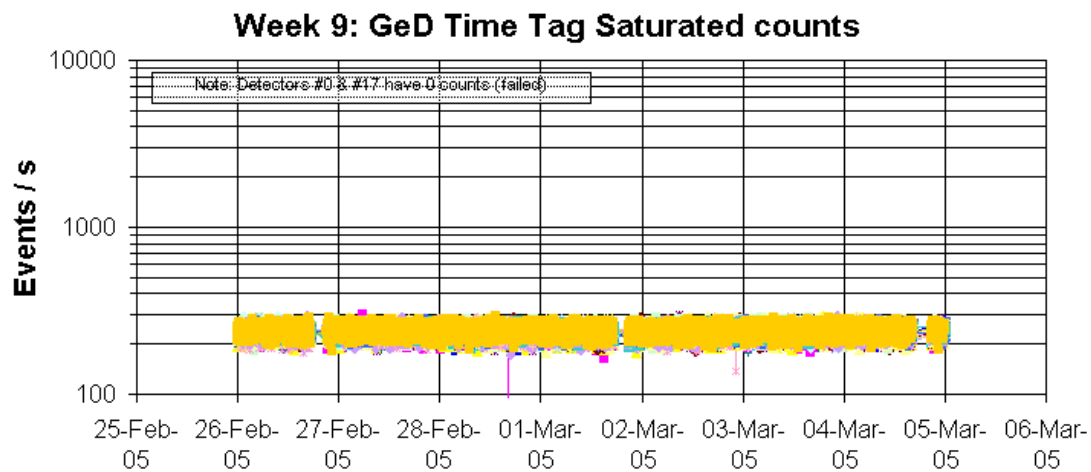
The following plot shows the Non Vetoed event rates, processed by the DFEE during the reporting period. The count rate of each detector is within the expected range, except for the failed detector #2 and #17.

Week 9: GeD Non Vetoed counts



Week 9: GeD Time Tag counts



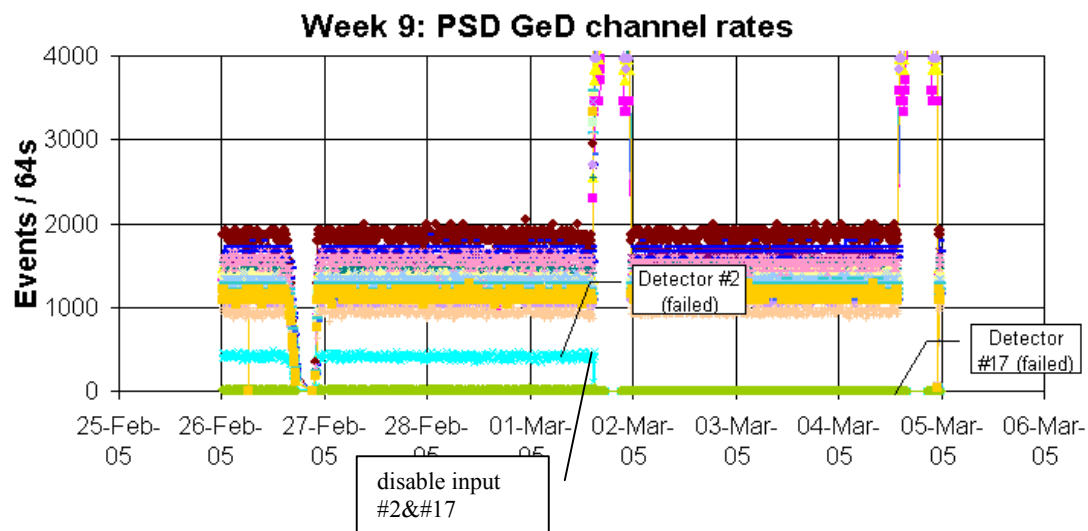


PSD:

The performance of the unit is nominal.

The malfunction of the channel rates blanking occurred again this week (see AR INT_SC-90 for a detailed description of the anomaly). On request of the PI, the input channels #2 and #17 (faulty detectors) have been disabled (OCR-190 executed at belts entry of rev.290), trying to cure the malfunction. Since the disabling, the malfunction did not appear again. However, due to the random nature of it, a longer monitoring period is needed prior to draw conclusions.

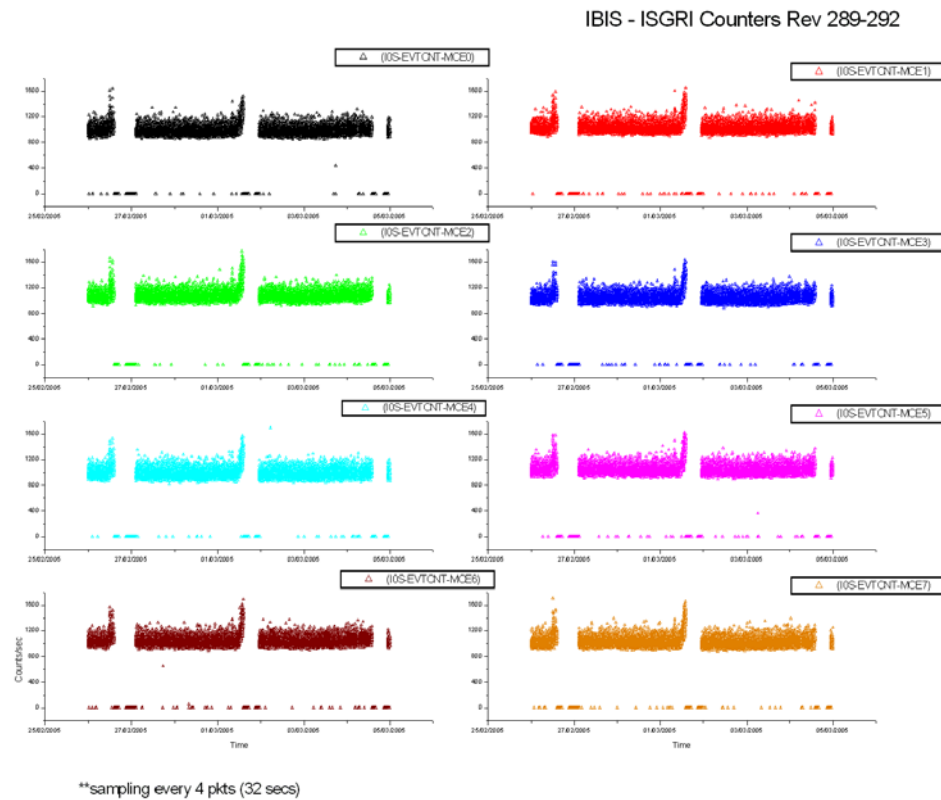
The following plot shows the PSD channel rates during the reporting period.



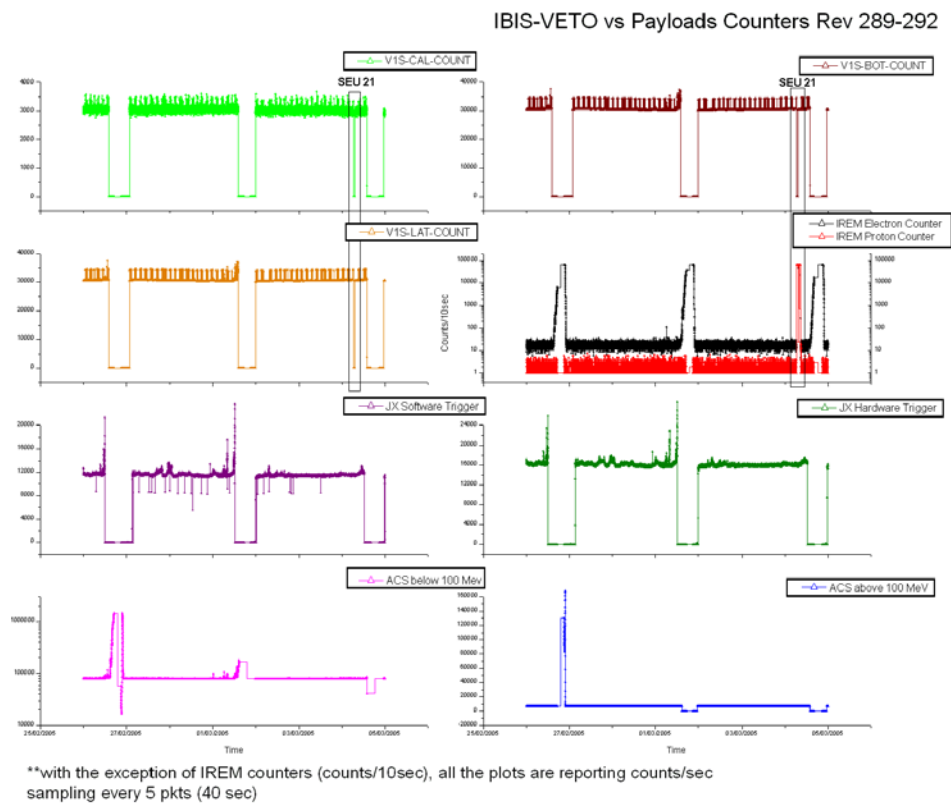
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

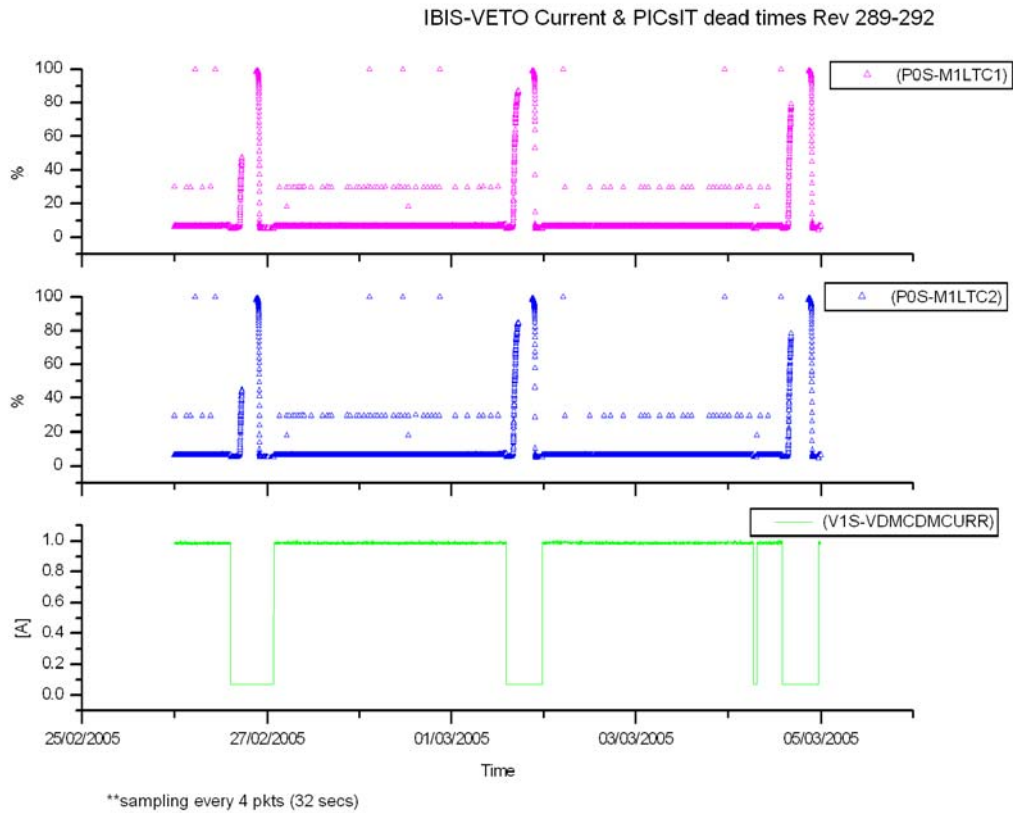


VETO vs Payloads Counters

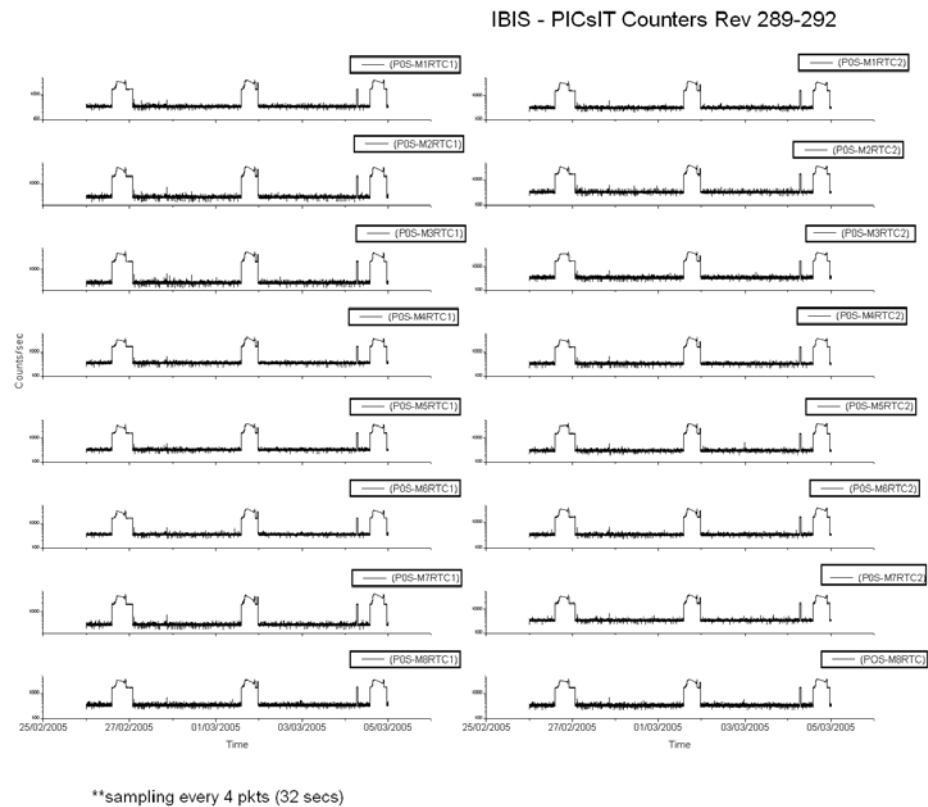


The week was characterised by low solar activity.

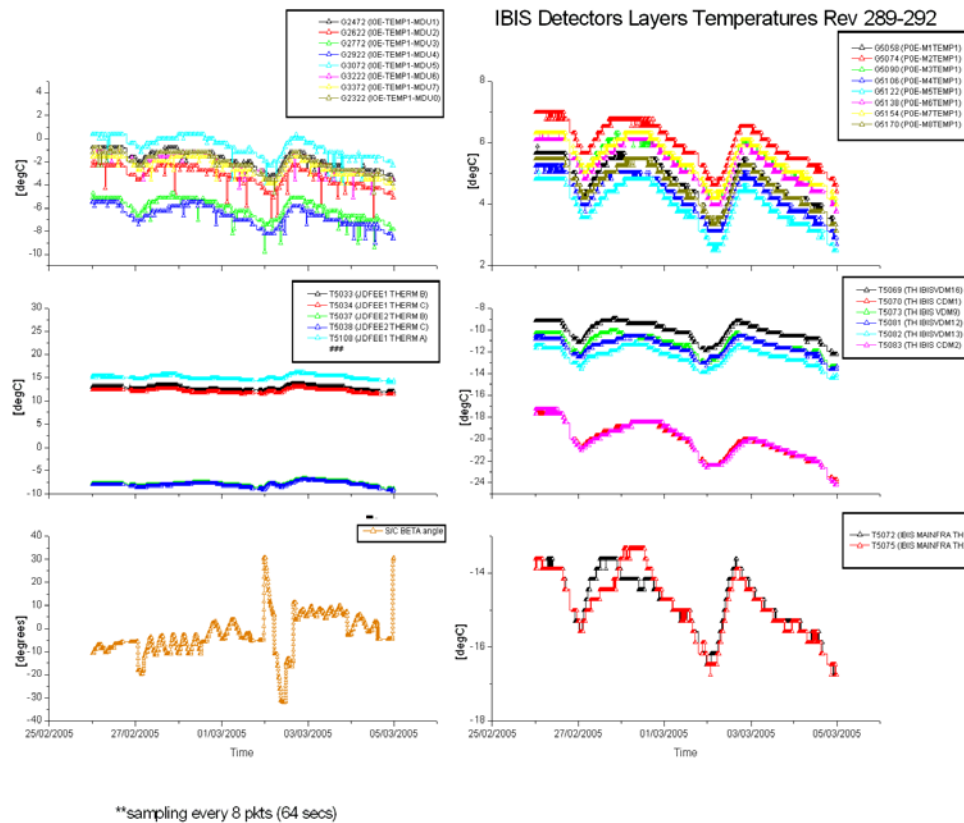
Veto Current:



Picsit Counters



IBIS Detectors Layers Temperatures



IBIS daily report DoY 2005.057 (26/02/2005)

Due to problems with the A-chain, IBIS CTX Table uplink failed at 23:31Z.

DoY 2005.058 (27/02/2005)

Due to problems with the A-chain, IBIS Event Designators were delayed and uplinked as follows:

at 01:06Z CTX Tables,
 at 01:24Z GEBENT02,
 at 01:45Z GEBEXT01,
 at 02:34Z GEISCL03,
 at 03:03Z GESTAN02.

IBIS was enabled in the timeline at 03:03Z.

DoY 2005.060 (01/03/2005)

At 21:15Z TM parameter G8015 (S1E-A2 PMT V) went out of limit 'high' with the value of 29.4V (limit value). It went back inside limit at 23:40Z. As this happened inside radiation belts, according to V-VLT-1 no action was taken.

DoY 2005.061 (02/03/2005)

As no histograms were downloaded, the sequence GS0312 from INT_OR_0109 was uplinked at 20:30Z, and the TC G0129 (IBIS to Scientific Standard) was sent at 20:42Z. The recovery was successful, and the download of histograms back to nominal.

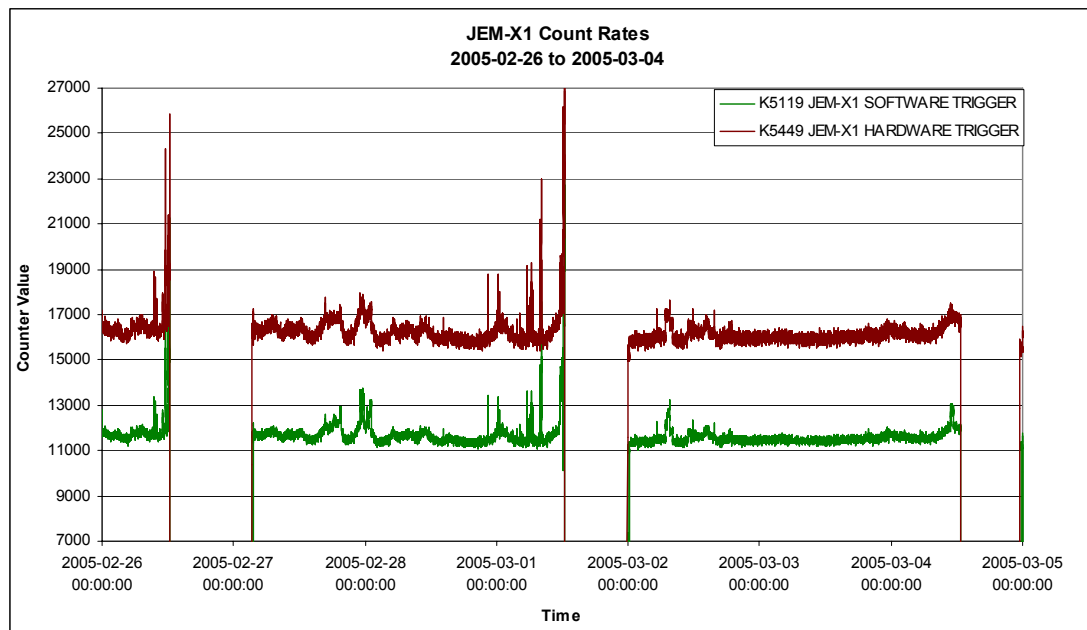
DoY 2005.063 (04/03/2005)

At 06:24Z an IREM SW failure (SEU #21) forced IBIS to Stand-by mode. Following procedure FCP_IBIS1_0803, IBIS exited this Safe configuration at 07:05Z and went back to Scientific Standard mode at 07:23Z thanks to TC G0129.

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.

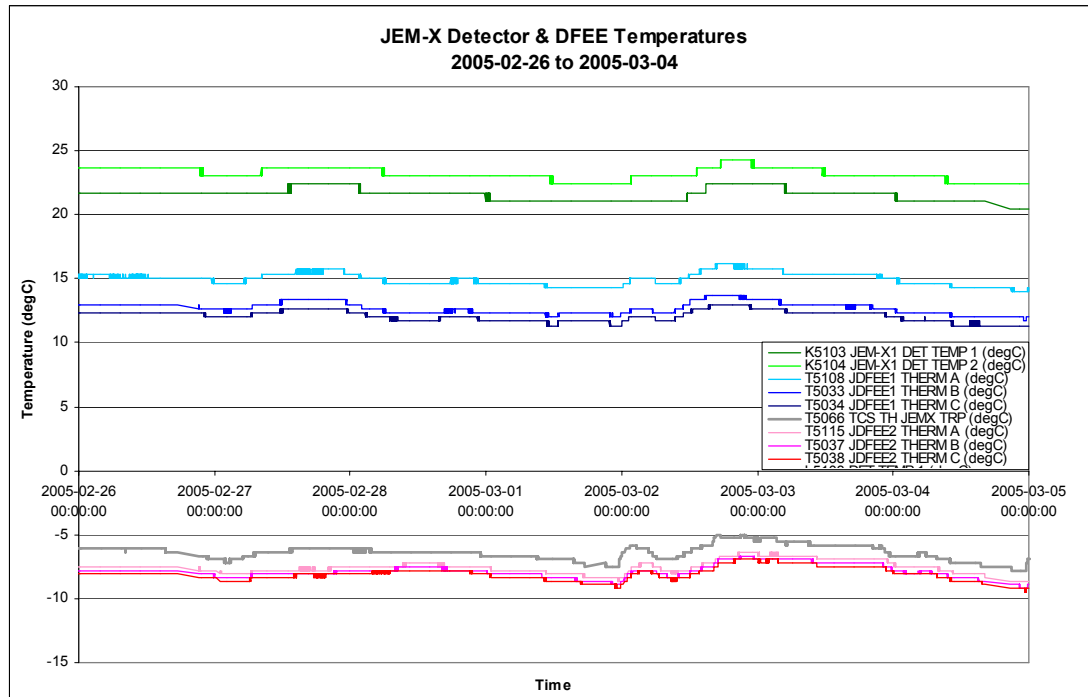


8.3.4.2 JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph².

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

² Data sampled (1 frame in 8)



8.3.4.3 JEM-X Daily Report

2005-02-26 (DOY 057, Rev 289-290)

At 11:31:15Z the parameter K5136 BUFFER LOSS went out of limits High (value=145), and then returned within limits at 11:31:39Z.

At 12:15:31Z K5119 SOFTWARE TRIGGER went out of limits Warning High (value = 21253) and at 12:15:55Z it exceeded the Safe threshold for JEM-X1, causing JEM-X1 to make an autonomous transition to Safe mode. The TM parameter K5462 DFEE STATE IASW reported Safe on one occurrence and then began to report state Setup and thus there were two occurrences of the OEM 189 JEM-X1 PROB DFEE 9. This was ~50 minutes before JEM-X1 was planned to be commanded to Safe mode before radiation belt entry of revolution 289.

Commanding to JEM-X1 from the Timeline was disabled at 12:24Z. At 12:42Z FCP_JEM1_0040 was executed to command JEM-X1 to Safe mode, thereby setting K5462 DFEE STATE IASW to Safe as well and thus OEM 254 ERROR OFF was received.

At the start of revolution 290, due to a problem with the IMCS, commanding from the Timeline was not possible and the Timeline was stopped. Therefore, the JEM-X1 activation EDs in the Timeline were missed.

2005-02-27 (DOY 058, Rev 290)

Once operations had moved to the backup IMCS, manual recovery of the Timeline was started. JEM-X1 was thus activated manually as follows:

- At 00:50Z the ED KEACAL01 to perform the Anode Electronic Calibration was re-uplinked.
- At 01:01Z FCP_JEM1_0120 was executed to disable the JEM-X1 reactions to the IREM count rates in the Broadcast Packet as per INT_OR_0189.
- At 03:07Z the ED KEACT_03 to activate the JEM-X1 high voltage and configure JEM-X1 for science operations was re-uplinked.
- At 03:43Z (by which time the AOCS had been recovered and the Timeline restarted) commanding to JEM-X1 from the Timeline was re-enabled.

JEM-X1 operations then continued nominally.

2005-02-28 (DOY 059, Rev 290)

Nothing to report

2005-03-01 (DOY 060, Rev 290-291)

At 06:15:55Z the TM parameter K5317 RAD MONITOR 3 (IREM electron counter) went out of limits High (value = 110) and then returned within limits at 06:16:19Z.

At 08:04:43Z the parameter K5119 SOFTWARE TRIGGER went out of limits Warning High (value = 20218) for 1 TM cycle.

At 12:17:55Z K5119 SOFTWARE TRIGGER went out of limits Warning High again and then fluctuated in and out of limits until 12:22:35Z, when it exceeded the Safe threshold for JEM-X1, causing JEM-X1 to make an autonomous transition to Safe mode. The TM parameter K5462 DFEE STATE IASW reported Safe on one occurrence and then began to report state Setup and thus there were two occurrences of the OEM 189 JEM-X1 PROB DFEE 9.

At 12:52:08Z, the ED KESAFE01, scheduled to put JEM-X1 in Safe mode before radiation belt entry of revolution 290, was executed from the Timeline. This set K5462 DFEE STATE IASW to Safe as well and thus OEM 254 ERROR OFF was received.

At the start of revolution 291, at 23:30.13Z, FCP_JEM1_0120 was executed to disable the JEM-X1 reactions to the IREM count rates in the Broadcast Packet as per INT_OR_0189.

2005-03-02 (DOY 061, Rev 291) to 2005-03-03 (DOY 062, Rev 291)

Nothing to report

2005-03-04 (DOY 063, Rev 291-292)

At 06:24:43Z, due to an IREM S/W reset, all RMC parameters K5315- K5317 went out of limits (value= 65535). However, JEM-X1 operations were not affected as the JEM-X1 reactions to the IREM RMC parameters are currently disabled.

At the start of revolution 292, at 23.03.53Z, FCP_JEM1_0120 was executed to disable the JEM-X1 reactions to the IREM count rates in the Broadcast Packet as per INT_OR_0189.

8.3.5 OMC Operations

On DoY 057, at 12:23, the AOCS was erroneously disabled, the impact was a 10 minute delay in the start of pointing 02890063.

From 21:52 until the timeline was rejoined at 02:14, an imcs problem interrupted operations. The impact was the loss of pointings 02900004 to 02900007.

On DoY 058, at 18:29, an AOCS command failed release. Problems with the TCE2 in Redu necessitated a switch to Vilspa. The system was recovered around 20:00, the impact was that pointings 02900033, 02900034 & 02900035 were lost. It was at this time the following commands were rejected:

```
2005.058.19.44.49.550 2005.058.19.44.38.093 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=60,IM A M9068=1 FIX2=0 M9069=795
2005.058.19.44.41.876 2005.058.19.44.31.347 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=130,RESET IM M9068=1 FIX2=0
M9069=794
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for pointing 02900035.

On DoY 061, at 13:02, a problem at the ground station prevented the uplink of an AOCS command. The impact was the loss of pointings 02910022 and a 20 minute delay in the start of pointing 02910023 (which was manually started at 13:56). It was at this time the following commands were rejected:

```
2005.061.13.36.57.833 2005.061.13.36.50.475 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=60,IM A M9068=1 FIX2=0 M9069=474
2005.061.13.36.57.759 2005.061.13.36.44.725 1792 Real Time Rejection 131
REJECTED TC1
FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=130,RESET IM M9068=1 FIX2=0
M9069=473
```

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for pointing 02910023.

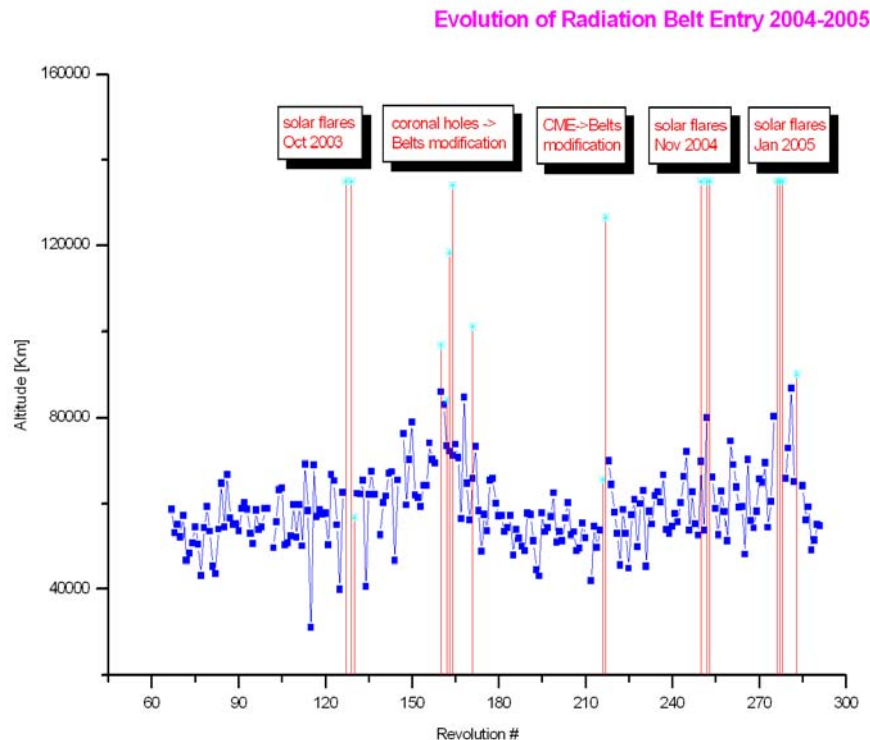
On DoY 063, at 06:24:58, an IREM SEU caused the unit to switch to SAFE mode (See IREM section for details). OMC was returned to Stand-by at 06:58:34, the impact was the interruption of pointing 02910067 after about 898 seconds from a scheduled duration of 3581 seconds.

At 21:34, the FD tool failed to produce the IPF for slew 02920001. This caused the loss of pointings 02920002 and 02920003 (which fell after midnight).

On DoY 057 at 14:29:47, DoY 060 at 14:15:16 and DoY 063 at 14:01:07, OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

DoY 2005.063 (04/03/05)

At 06:24Z a local reset of the IREM CSCI S/W (SEU #21) occurred: as before (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, 10/09/04, 14/09/04, 28/10/04, 06/11/04, 01/12/04, 11/12/04, 30/01/05, 11/02/05) 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) The last HK before the anomaly HV, 5V and 6V voltages inside limits
- 4) The anomaly occurred at 2005.063.06.24.44z at 104510 km. 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 06:51Z, 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 registers bank give 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 is now 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 09:10Z.

The IREM automatic transition to Standard Mode affected the instruments, forcing them to automatically enter Safe configuration, except for SPI and JEM-X where automatisms are disabled according to the PIs request.

The recovery of the payloads was performed as follows:

- IBIS re-enabled at 07:23Z
- OMC re-enabled at 06:59Z

The cause of this S/W reset is still under investigation, but it is apparently due to the unit's memory device, which is sensitive to ionising radiation.

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
289	RAD_ENTR R 2005-02-26T14:29:26Z	2005-02-26 15:37:08	51421.9	2005-02-26 15:16:26	53570.73
290	RAD_EXIT R 2005-02-26T23:38:57Z	2005-02-26 22:11:16	<26526.1	2005-02-26 22:26:26	28645.55
290	RAD_ENTR R 2005-03-01T14:14:57Z	2005-03-01 14:50:52	55118.1	2005-03-01 15:11:49	52411.22
291	RAD_EXIT R 2005-03-01T23:24:55Z	2005-03-01 21:54:28	>24870.0	2005-03-01 22:11:49	28321.84
291	RAD_ENTR R 2005-03-04T14:00:46Z	2005-03-04 14:35:48	>54823.8	2005-03-04 14:51:49	53393.18
292	RAD_EXIT R 2005-03-04T23:10:34Z	2005-03-04 21:51:32	>>24867.6	2005-03-04 22:01:49	28805.32

Reference

Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

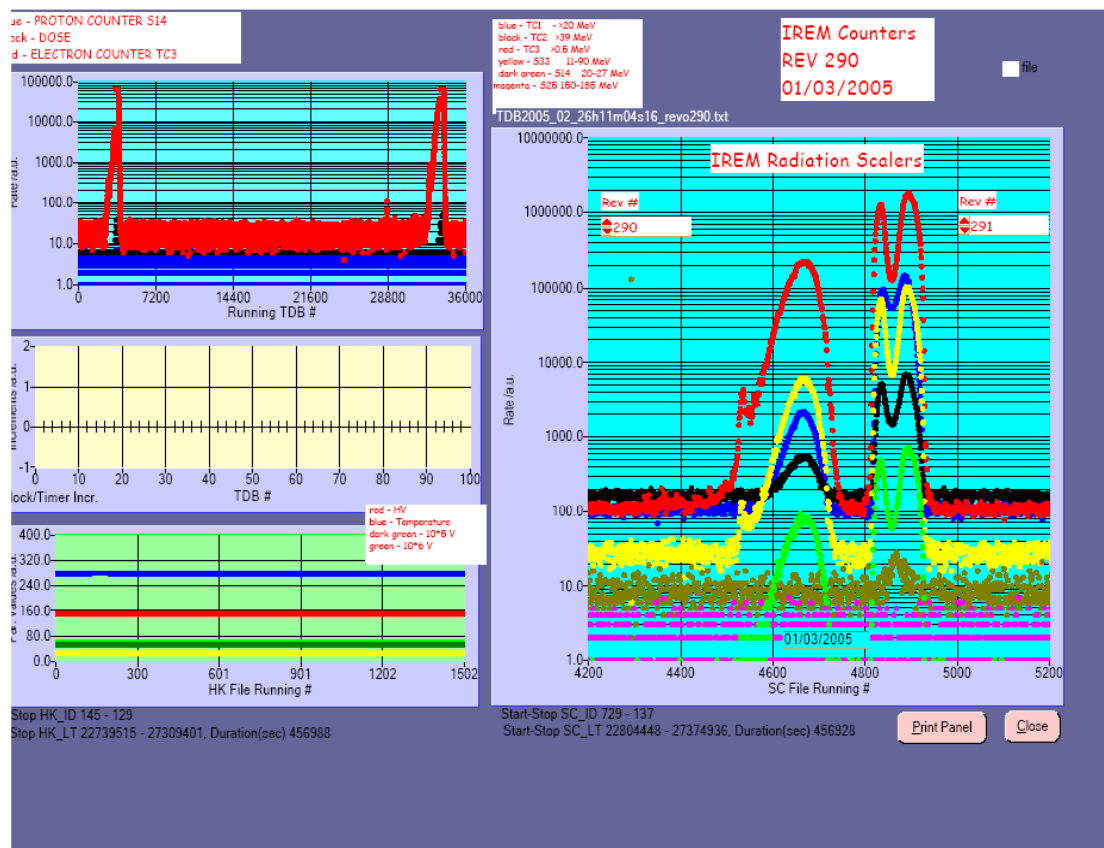
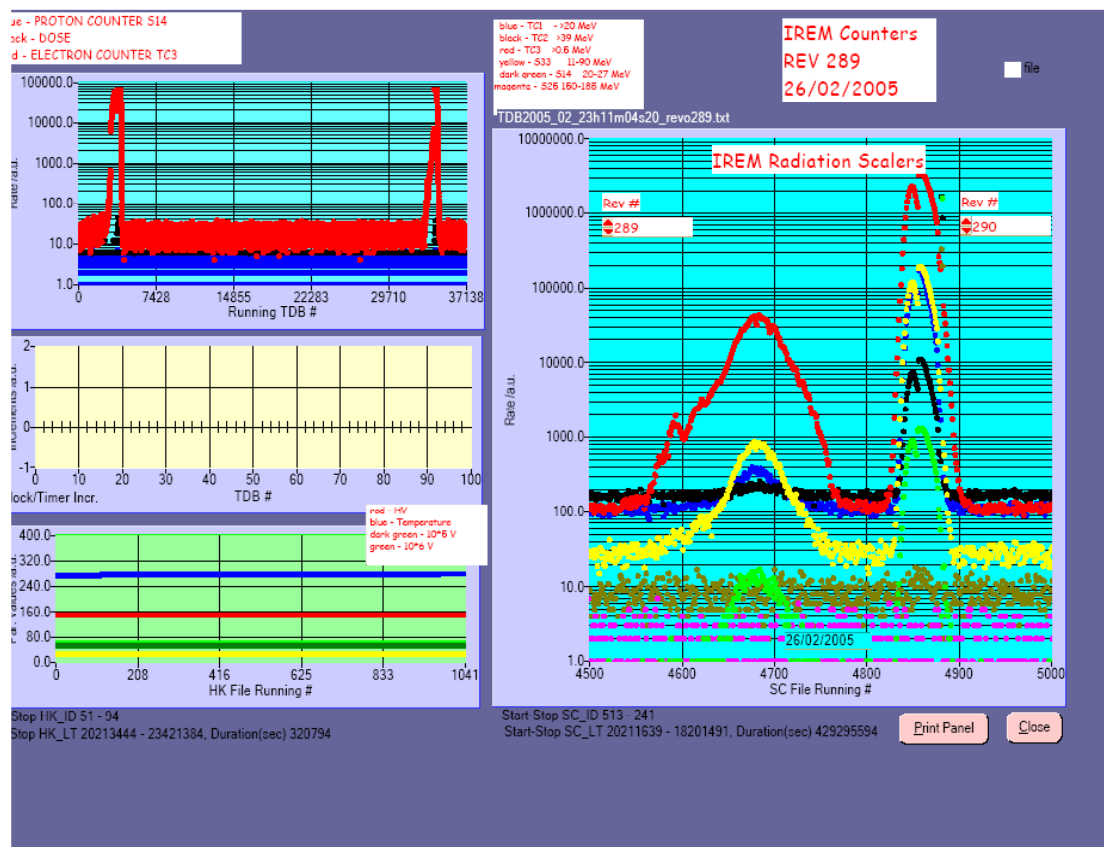
Large error vs reference (more than 30 minutes)

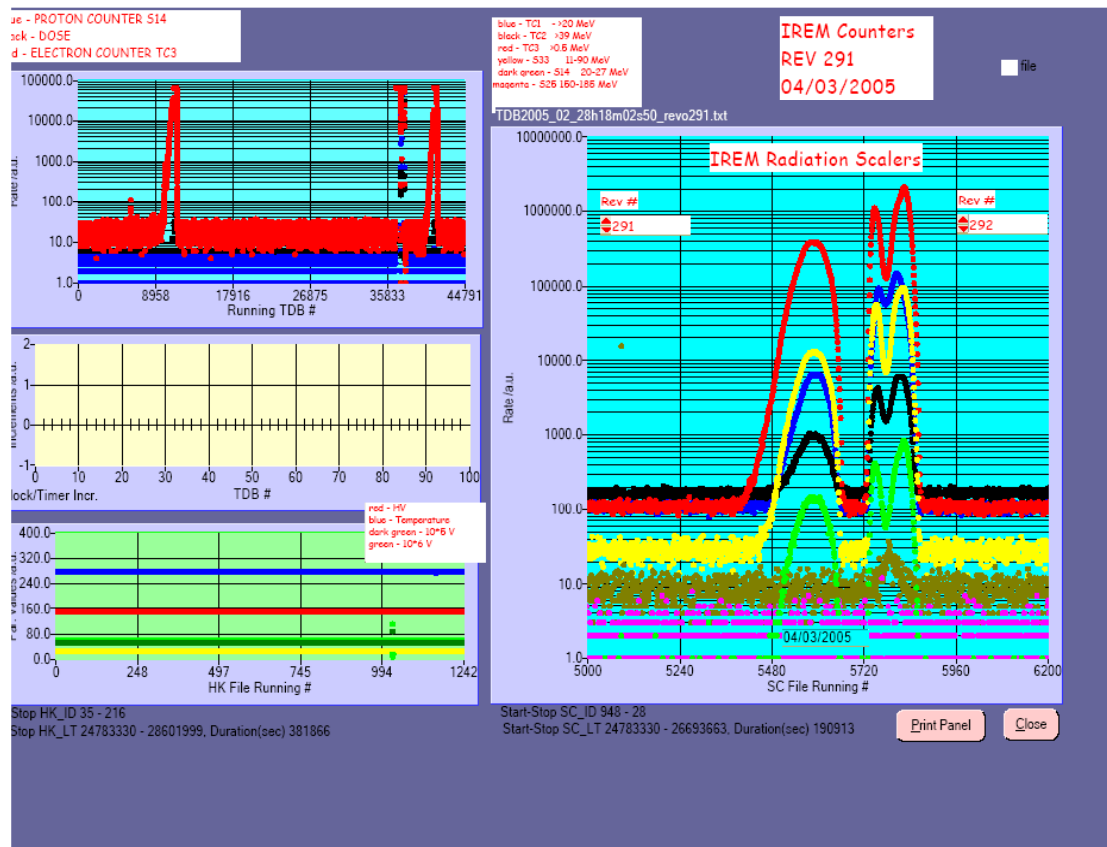
Radiation Spike

Proton Belts

The flux of protons >8MEV computed by RadMon, did not exceed the threshold. Therefore, no predicted proton cut-off is provided for this week.

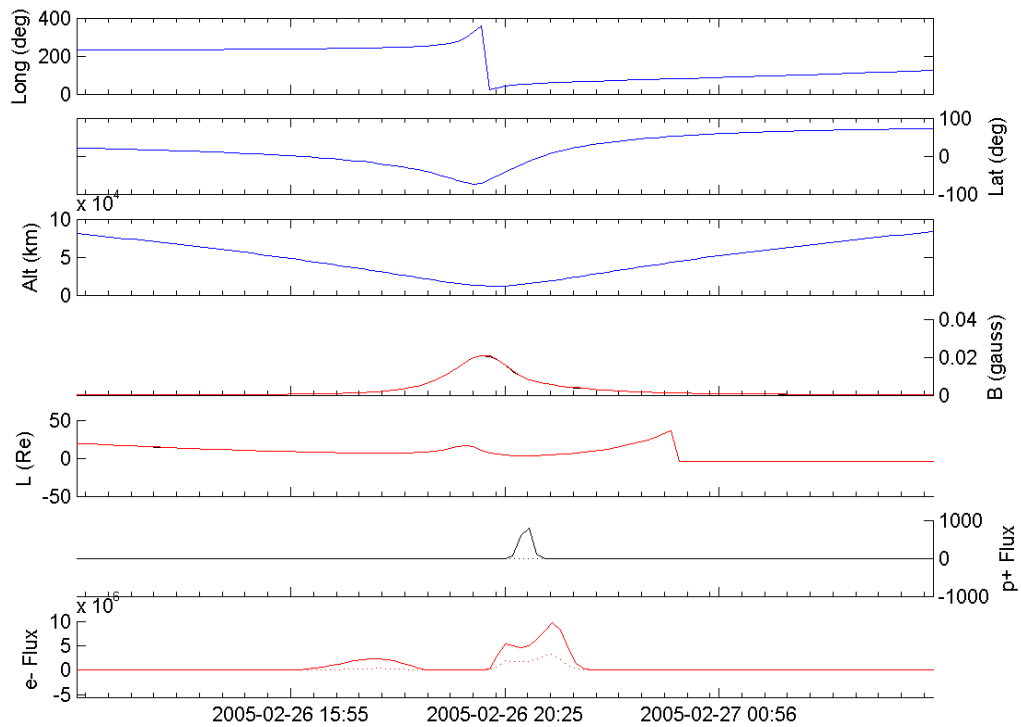
IREM radiation counters



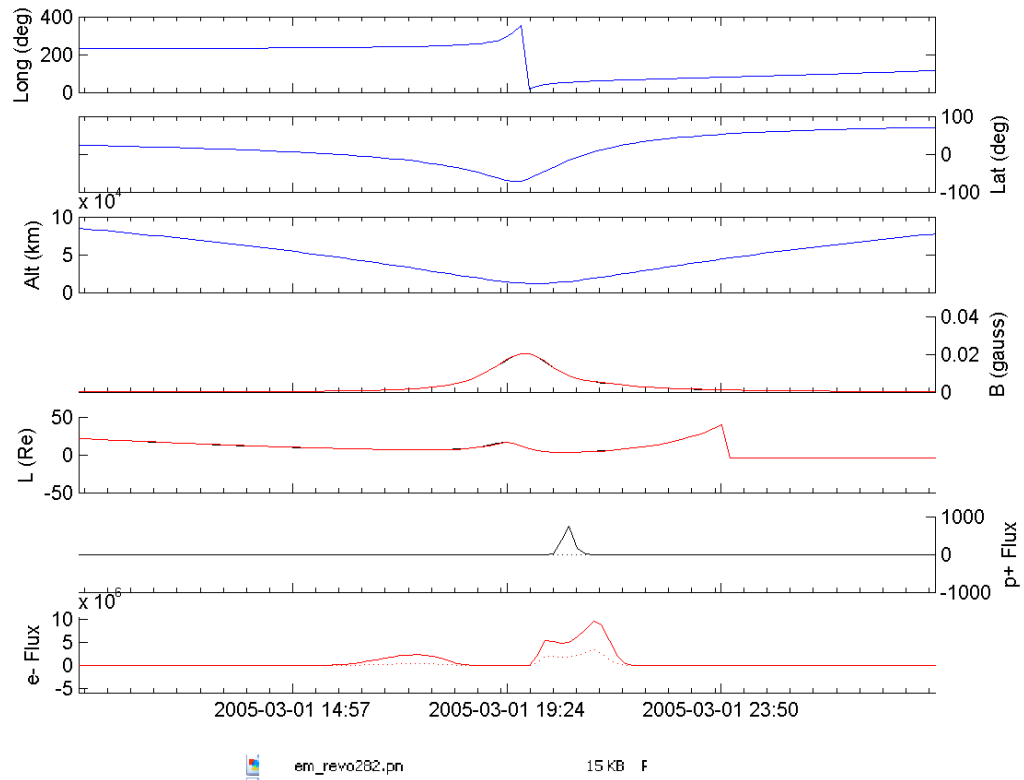


IREM Predicted Radiation Belt Passages.

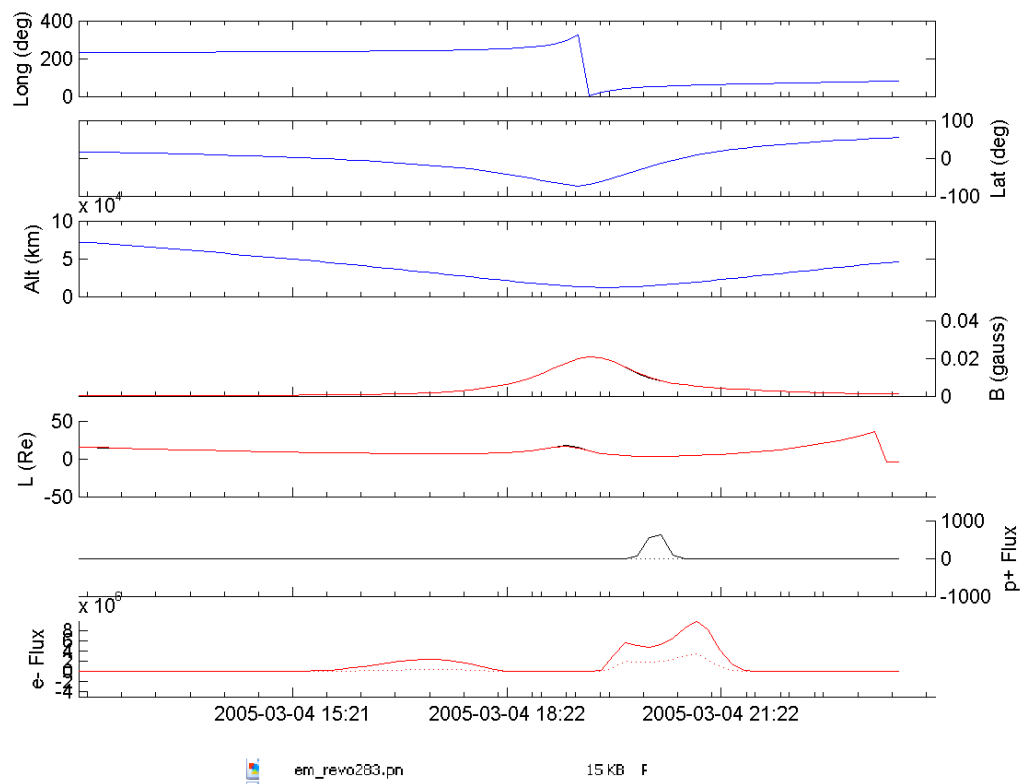
Rev 289



Rev 290



Rev 291



SEC-GOES Observed Particles Fluxes.

