

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 157
Week 38
26.09.05
Routine Phase

Prepared by: M. Walker (OPS-OFO)

LIST OF CONTENTS

1	General.....	3
2	Summary of Activities.....	3
3	Satellite Status.....	3
3.1	Platform.....	3
3.1.1	AOCS.....	3
3.1.2	Power.....	3
3.1.3	Thermal.....	3
3.1.4	OBDH.....	4
3.1.5	RFS.....	4
3.2	Payload.....	4
3.2.1	SPI.....	4
3.2.2	IBIS.....	4
3.2.3	JEM-X.....	5
3.2.4	OMC.....	6
3.2.5	IREM.....	6
4	Ground Facilities.....	6
4.1	Mission Operations Centre.....	7
4.2	Ground Stations & Network.....	7
4.3	Science Ground Segment.....	7
4.3.1	ISOC.....	7
4.3.2	ISDC.....	8
5	Special Events.....	8
6	Anomalies.....	8
7	Future Milestones.....	10
8	Appendix.....	11
8.1	Overview of Revolutions.....	11
8.2	Consumables.....	11
8.2.1	Detailed Fuel Book-keeping.....	11
8.3	Detailed Satellite Information.....	12
8.3.1	AOCS SUMMARY OPERATIONS REPORT, 17/09/2005 – 23/09/2005.....	12
8.3.2	SPI Operations.....	14
8.3.3	IBIS Operations.....	16
8.3.4	JEM-X Operations.....	20
8.3.5	OMC Operations.....	26
8.3.6	IREM Operations.....	27

DISTRIBUTION LIST

Addressees	Copy	Addressees	Copy
D/OPS		ESA HQ	
G. Winters D/OPS	1	D. Southwood D/SCI	1
W. Frank OPS-O	1		
A. Smith OPS-OF	1	ESTEC	
J. F. Kaufeler OPS-G	1	J. Louet SCI-P	1
N. Bobrinsky OPS-ON	1	A. Gimenez-Canete SCI-S	1
R. Münch OPS-GF	1		
		ESTEC / PG	
M. Schmidt	1	G. Sarri	1
R. Southworth	1		
F. Di Marco	1		
F. Cordero	1		
M. Walker	1		
P. Lippi	1	ESTEC/RSSD	
R. Lemme	1	M. Kessler SCI-SD	1
S. Fahmy	1	C. Winkler	1
SPACONs	1	A. Parmar	1
O. Bergogne	1	L. Hansson	1
I. Bayliss	1	E. Kuulkers	1
G. Di Girolamo	1		
F. Dreger	1		
G. Gienger	1	ESTEC/SCI-A	
S. Pallaschke	1	Nicola Rando	1
W. Hell	1		
K.J. Schulz	1	ISDC	
M.A. Larsen	1	T. Courvoisier	1
K. Capelle	1	R. Walter	1
M. Butkovic	1	N. Mowlavi	1
D. Heinzer	1	ISDC Shift Team	1
		D. Texier	1
Shift - Coord	1		
Scheduling Office	1	ALENIA	
T. Beck	1	M. Montagna	1
J. Wardill	1	F. Ravera	1
M. Unal	1		
P. Maldari	1	PI / Instrument Teams	
		J. P. Roques – SPI	1
Redu		G. La Rosa – IBIS	1
B. Demellenne	1	P. Ubertini – IBIS	1
		S. Brandt – JEM X	1
Vilspa		E. De Miguel - OMC	1
P. Kretschmar	1	W. Hajdas – IREM	1
		JPL / Goldstone	
		D. Holmes	1
		J. Valencia	1

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 17.09.05 until 23.09.05 (both dates inclusive) and covers the revolutions 358 and 359.

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 a Galactic Latitude Scan; the Galactic Bulge region (RA 17:45:36.00; DEC -28:55:60.0); an OMC Flat Field target (RA 17:12:48.00; DEC -06:24:00.0) and the Galactic Centre field (RA 17:45:40.00; DEC -29:00:28.0). The activities consisted of raster and hexagonal dithering, staring and Galactic Latitude Scan 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.

8 slews (4 CSL, 4 OSL) were not executed from the Timeline during this period, due to problem on IMCS.

The fuel consumption over the period between 01/09/2005 and 21/09/2005 was 0.0824 kg. The remaining propellant is in the order of 159.3000 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

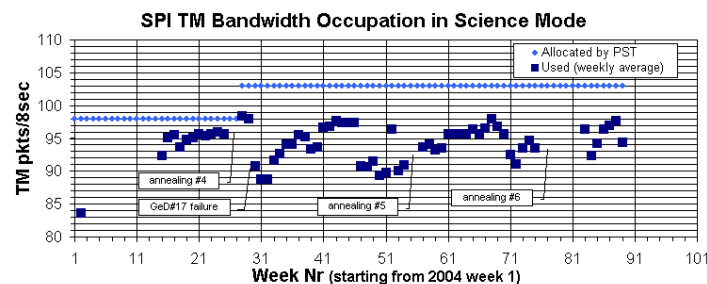
3.2.1 SPI

The overall status of the instrument is nominal.

During science operations, the instrument was 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 average occupation of 90.6 pkts/cycle.

The Stirling compressors are working well, maintaining the detector cold-plate temperature within 85+/-1K.

The following plot shows the TM bandwidth occupation information.



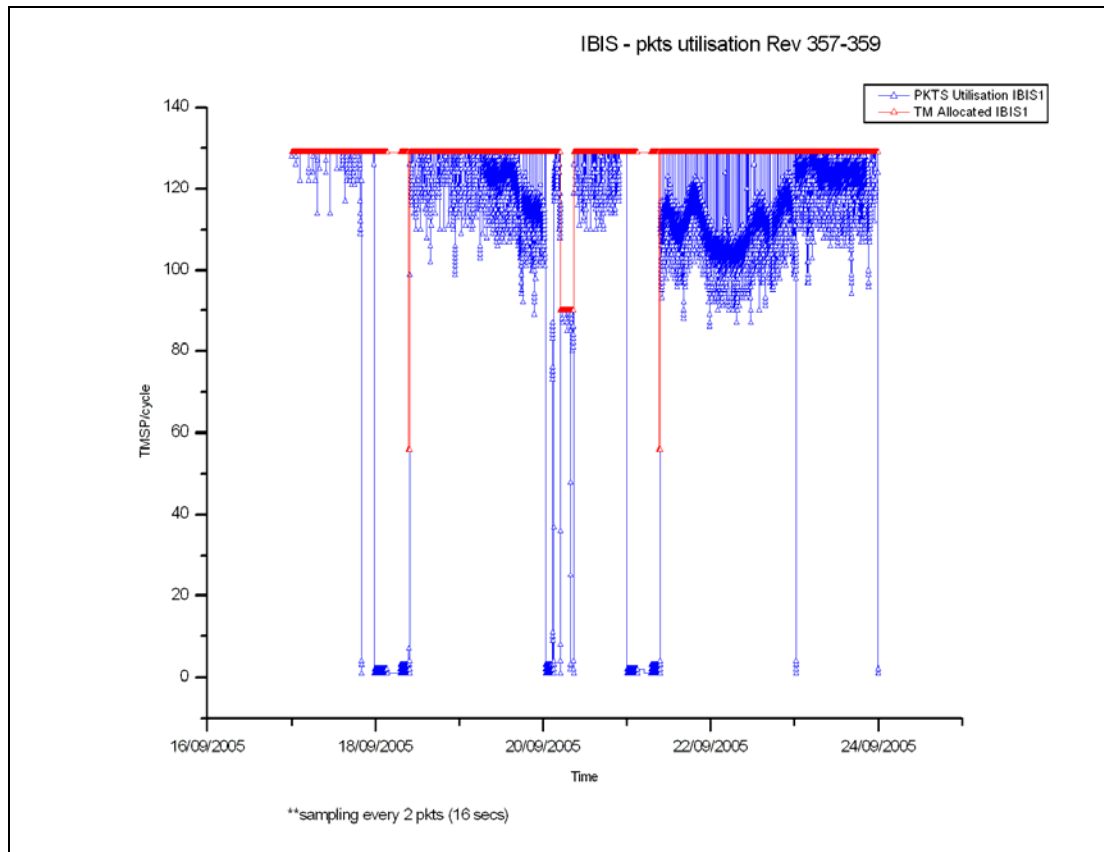
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The Overall status of the unit is Nominal.

During the reporting period, the PST allocation to IBIS was most of the time 129 TMPS/cycle. However it was 90 TMPS/cycle between DoY 2005.263 at 05:04:06Z and 08:53:10Z due to an OMC Calibration. The IBIS mean bandwidth utilisation during the observation period was 120.8 TMPS/cycle, down 8.17 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 and JEM-X2 was dormant (DFEE OFF) with a TM allocation of 1 packet/cycle.

On 2005-09-17 at 22:56:54Z JEM-X1 made an autonomous transition to Safe mode, triggered by the unit's Software Trigger. This was just a few minutes before it was due to be commanded to Safe mode before radiation belt entry of revolution 357.

On 2005-09-19 at 02:29:18Z, during part of a Galactic Latitude Scan observation in which higher than normal count rates were being received (~22000cnts/8secs cf ~11000 cnts/8secs), JEM-X1 made a further autonomous transition to Safe mode, triggered by the Software Trigger. It was recovered to Data Taking mode at 05:02:16Z. Then, following consultation with the PI, the SW Trigger Limit was increased from 25000 to 40000 from 08:06Z for the remainder of the revolution (being reset by the ED KESAFE02 on 2005-09-20 at 22:46:41Z).

In line with OCR 198 (Increase SW Trigger Limit to 40000 for Galactic Latitude Scans), the JEM-X1 SW Trigger Limit was changed from 25000 to 40000 for

exposures 03590001 and 03590002 (i.e. from 2005-09-21T09:56Z to 2005-09-23T00:40Z).

On 2005-09-23 at 10:54:45Z a spurious switch-off of the JEM-X1 DFEE (i.e. spurious status change of JEM-X1 DFEE LCL to OPEN) occurred. This anomaly is reported in AR INT_SC-128. JEM-X1 was recovered to Data Taking mode at 13:00:31Z.

In addition, several Out of Limits were received on the TM parameters K5136 BUFFER LOSS and K5119 SOFTWARE TRIGGER throughout the week.

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.

OMC operations were performed by the automatic Timeline. OMC was operated in Science Normal mode during science observations, with a TM allocation of 5 packets/cycle, except from DoY263 at 05:03:40 to 08:52:56, during the Flat Field and Dark Current calibrations when the allocation was 63 packets/cycle.

During this reporting period, 229 of the 240 planned science pointings for OMC were executed nominally, 5 were lost due to an IREM SEU, 1 was delayed by and 5 lost to commanding problems.

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 2005.263 (20/09/2005) at 00:46Z the 27th IREM SEU occurred. The unit was completely recovered and re-enabled in Timeline at 08:33Z.

Solar Activity

The observation period was characterised by low solar activity.

Sunspot 798 had disappeared to the Western limb at the beginning of the week. After this, the sun remained quiet during the whole 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 very good this week, 249 slews were executed correctly, 8 were missed. There were problems with the Command Verifier, which impacted operations. There were also minor problems with the ground

stations, which had no science impact. The overall performance was well above the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was very good this week, there are still problems with the command verifier task, which caused the loss of a couple of pointings, also on a couple of occasions, pointings were lost to PTV problems or command verification, which could have their roots with the Verifier, or missing packets. The overall performance was well above the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was very good this week although there were several minor problems with the links to Redu. DSS-16 also had problems with bit-lock, however none of these led to loss of science data. The overall performance though was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSF's up to revolution 367 have been received. Planning has been performed up to rev 364. The reason for not planning any further is because a final agreement and implementation details of calibration observations using the CRAB is still outstanding. This calibration is intended to be performed in revolution 365. The agreement and final details are now agreed and the relevant observations will be implemented early next week. No re-planning has been done and no ToO request was received. An updated long term plan has been put on the ISOC web pages. TSF's up to revolution 361 have been received.

2. Observation status

ECS's for revolutions 349 to 351 have been received. OCS's for these revolutions plus the late arrivals have been generated and sent. There is potentially extra time to be credited to two observations since there has been losses of ISGRI data.

3. ISOC science data archive

The generation of images and icons at observation level has progressed satisfactorily. More than 80% of all data was available by end of this week. This has been a critical task because of the demo set up at the XMM-Newton and ADASS conferences both in El Escorial, Spain. Future upgrades of the ISDA and the time schedule for delivery has been established.

4. ISOC system

A version 11.1 of the ISOC system has been used. No problems encountered.

5. AO 4 preparation

The new Time Allocation Committee (TAC), containing a mixture of old and new persons, is now nominated and agreed. Consequently also the date for the TAC meeting date has been agreed. This date drives the whole preparation schedule including the dates for the actual proposal submission.

5. Problems

The problem reported last week concerning discrepancy between the constraint checking in ISOC and MOC is still under investigation. As mentioned above it is less critical at the moment since we are performing observations in other area of the sky.

4.3.2 ISDC

Status of ISDC observation processing on 26/09/2005:

- Latest Standard Analysis completed: observation 03200410002 (Her X-1, Revolution 341-342) on 09/09/2005
- Latest products archived: observation 03200410002 (Her X-1, Revolution 341-342) on 12/09/2005
- Latest observation products sent to the observer: observation 03201020003 (Crux Arm, Revolution 330) on 08/09/2005

5 Special Events

None

6 Anomalies

There were a number of problems that impacted the operations:

- On DoY 260, at 04:54, there was an event log message: 'Error imca'- Time Correlator coupling not valid', there was no impact.
- At 13:26, when an attempt was made to clear the filter in the TMPH (packet history), the task crashed, and the icon in the application launcher went red, there was no impact. At the same time, in the event log, a message 'PDSserEV, imca, information, log, rcvData: Packet Source on fd101 disconnected irregularly' was seen.
- At 21:21, both the automatic and manual stacks indicated no TM flow, although nctrs-a indicated the TM from Redu was present. This was traced to Network having opened a link too early to DSS-24 in dataflow, the problem was immediately corrected without impact.
- On DoY 261, at 12:20, 80 on-line complete bad TM frames were received from Redu. The timing coincided with the on-board antenna swap. There was no impact.
- At 23:39, and again on DoY 262 at 17:03, the sun129 icon on the global MMI went yellow due to cpu overload. The MCCM MMI was restarted, clearing the problem each time, there was no impact.
- On DoY 263, at 10:55, in the imca event log, the messages: 'Data Gap on TM link VC0', was observed, there was no impact.
- From 14:26 to 14:29, the TM link with Redu dropped, a possible cause was Firewall reboot, which was ongoing at the time, there was no impact.
- At 17:55, the Command Verifier died. It was restarted at 17:57, this caused the TC A3129, Start Slew Manoeuvre to fail release. A manual recovery was

performed to the attitude of pointing 03580095. The impact was the loss of pointings 03580093, 03580094.

- At 21:55, the TC A3171 'RP Small Offset', had an unverified termination, this caused the following command: A7213 'Reset TIM Accum' to fail uplink. At 22:43, a manual recovery was performed to the attitude of pointing 03580101, with the Timeline being recovered at 22:50. The impact was the loss of pointings 03580100 & 03580101.
- On DoY 264, at 02:48, at the end of the pass the TC U4921 'INT GND Link Off' failed completion, however it was executed, there was no impact.
- At 09:19, in the imca event log, the message: 'NCDUadmin: First Data received on Bad Frame Link', followed by 1 bad frame, there was no impact.
- At 09:28, the TC A3085 had an unverified termination, there was no impact.
- On DoY 265, at 10:13, the TC A3189 'Start Guide Star' failed release due to the dynamic PTV, at 10:24, a manual slew was performed to the attitude of pointing 03590042. The impact was about a 12 minute delay in the start of pointing 03590042.
- At 12:05, the TC A8119 had an unknown CEV, this was followed by command A3161 failing release. A manual recovery was performed at 12:28 to the attitude for pointing 03590046. The impact was the loss of pointing 03590045.
- At 15:17, there was an FD error, 'Failed to Determine a good attitude', the AOCS sub-system was disabled, and a manual start mapping performed. This was completed by 15:42, in time for the next slew at 15:44, there was no impact.
- On DoY 266, at 20:47, there was a drop in TM from Redu. At 20:48, the TM was back, but both the Auto- and Manual stacks were indicating no TM. At 20:50, the links were removed, and manually re-inserted clearing the problem, there was no impact.
- At 21:06, after the handover from Redu to DSS-16, all TC & TM links were showing green on the nctrs-a & b, however all the Auto- and Manual stacks were indicating 'no groundstation' and then 'no bitlock'. After a resweep, all Auto- and Manual stacks showed no bit-lock. Then at around 21:18, the problem disappeared without any interference. The impact was that the ED DEBPG200 was missed and had to be manually uplinked, there was no science data lost.

The following anomaly reports were entered into the ARTS system this week:

AR id	Date Created	Subject	Segment	Status
INT_SC-127	20/09/2005	IREM Anomaly: Reset of IREM_CSCI S/W #27, 20/09/2005	Payload	Open
INT-2791	20/09/2005	TMPH (Packet History Display) application crashed	IMCS	Pending
INT_SC-128	23/09/2005	JEM-X1 DFEE Spurious Switch Off	Payload	Open
INT-2792	23/09/2005	Archive import on idda + realtime commanding crashed CPD	IMCS	Closed
INT-2793	23/09/2005	Archive import on idda caused invalid time correlation from TCO	IMCS	Closed

INT-2794	28/09/2005	IMCA PDSserverTM cannot store packets on 113 archive	IMCS	Pending
INT-2795	28/09/2005	Backup SODAserver on sun127 not operational	IMCS	Pending

7 Future Milestones

Change of communication protocol to ESA Station from X25 to TCP IP: The testing has been performed. The release is not yet operational because an upgrade of the communications set-up is required.

Another patch of the IMCS is planned for September/October, which should fix a couple of problems.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 358

The observations in revolution 358 began with a Galactic Latitude scan lasting ~38 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 staring observation at an OMC Flat Field target (RA 17:12:48.00; DEC -06:24:00.0) lasting ~3.5 hours was then performed, during which OMC Flat Field and Dark Current Calibrations were executed. A raster dithering observation of the Galactic Centre field (RA 17:45:40.00; DEC -29:00:28.0) was then performed for the remaining ~15 hours of observation time.

Throughout these observations SPI, IBIS and JEM-X1 were in their nominal science modes and the JEM-X2 DFEE remained off. During the OMC Flat Field observation OMC was in FFCalibration followed by DCCalibration mode and the TM allocation was IBIS 90; SPI 84; JEM-X1 8; JEM-X2 1; OMC 63. For the other observations OMC was in Science Normal mode and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5.

Revolution 359

The observations in revolution 359 began with a Galactic Latitude scan lasting ~38.5 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 the Galactic Centre field (RA 17:45:40.00; DEC -29:00:28.0) was then performed for the remaining ~19 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

2005-08-31T09:06:33.000Z	159.5876	F	Automatic TM processing.
2005-09-01T19:58:04.000Z	159.5775	F	Automatic TM processing.
2005-09-03T08:51:20.000Z	159.5643	F	Automatic TM processing.
2005-09-04T18:54:20.000Z	159.5491	F	Automatic TM processing.
2005-09-06T08:40:32.000Z	159.5366	F	Automatic TM processing.
2005-09-07T19:01:31.000Z	159.4756	F	Automatic TM processing.
2005-09-09T08:28:55.000Z	159.4656	F	Automatic TM processing.
2005-09-10T18:46:11.000Z	159.4584	F	Automatic TM processing.
2005-09-12T03:19:10.000Z	159.4436	F	Automatic TM processing.
2005-09-12T08:17:59.000Z	159.4162	F	Automatic TM processing.
2005-09-15T08:38:31.000Z	159.3824	F	Automatic TM processing.
2005-09-18T02:43:27.000Z	159.3733	F	Automatic TM processing.
2005-09-18T07:53:51.000Z	159.3490	F	Automatic TM processing.
2005-09-21T02:29:58.000Z	159.3366	F	Automatic TM processing.

2005-09-21T07:44:15.000Z 159.3000 F Automatic TM processing.

This report was generated Fri Sep 23 08:00:42 GMT 2005

8.3 Detailed Satellite Information

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

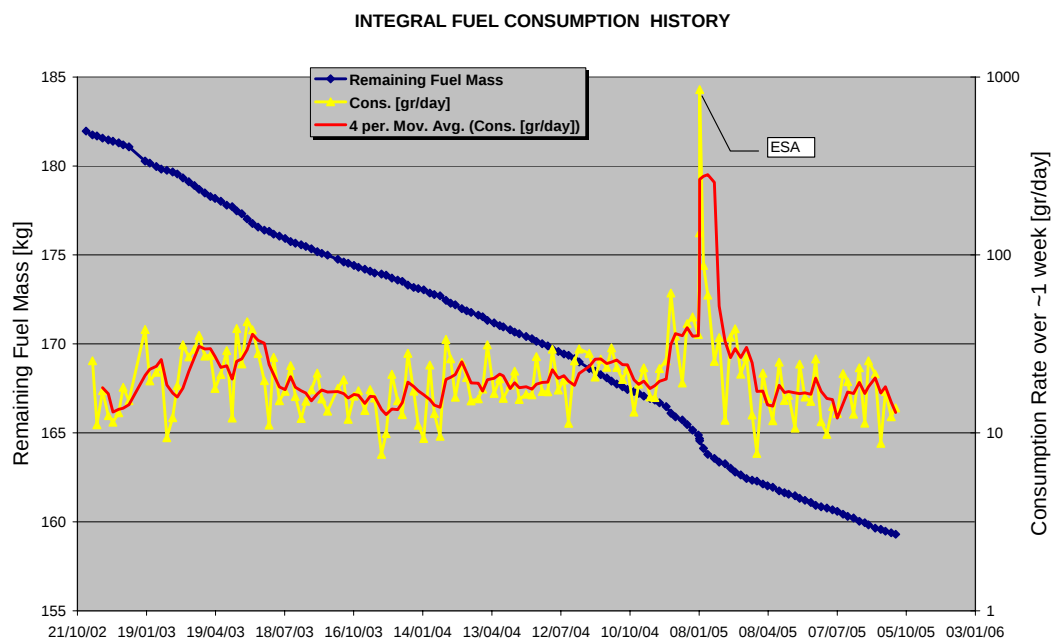
8.3.1 AOCS SUMMARY OPERATIONS REPORT, 17/09/2005 – 23/09/2005

AOCS operations were executed from the Automatic Timeline.

During this period, 107 Open Loop Slews, 142 Closed Loop Slews and 4 Momentum Bias were executed (TL + manual recovery). 8 slews (4 CSL, 4 OSL) were not executed from the Timeline during this period, due to problem on different tasks of IMCS.

This is equivalent to a ~3.2 % of the total number of slews planned (253).

The fuel consumption over the period between 01/11/2002 and 21/09/2005 is reported in the plot below.



17/09/05 (Day of Year 260, Revolution 357)

Nothing to report

18/09/05 (Day of Year 261, Revolution 357-358)

Nothing to report

19/09/05 (Day of Year 262, Revolution 358)

Nothing to report.

20/09/05 (Day of Year 263, Revolution 358)

Slews missed from the Timeline: Due to a problem on IMCS (CMD verifier task), the slew ID 03580093(OSL) failed release and the AOCS s/s disabled in TL at 18:08z.

A manual recovery was then performed to the attitude of PID 03580095. The next slew (CSL) for PID 03580096 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 19:02z.

The following slews were not executed from TL while recovering the AOCS s/s: 03580093(OSL)-94(OSL)-95(OSL).

Slews missed from the Timeline: Due to a problem still under investigation (at moment not possible to access to the TC history archive), the slew ID 03580100(CSL) failed release and the AOCS s/s disabled in TL at 21:55z.

A manual recovery was then performed to the attitude of PID 03580101. The next slew (CSL) for PID 03580102 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 22:50z.

The following slews were not executed from TL while recovering the AOCS s/s: 03580100(CSL)-101(CSL).

21/09/05 (Day of Year 264, Revolution 358-359)

Nothing to report.

22/09/05 (Day of Year 265, Revolution 359)

Slew missed from the Timeline: Due to a problem on IMCS (CPD task), the slew ID 03590042(CSL) failed release and the AOCS s/s disabled in TL at 10:13z.

A manual recovery was then performed to the attitude of PID 03590042. The next slew (CSL) for PID 03590043 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 10:40z.

The following slew was not executed from TL while recovering the AOCS s/s: 03590042(CSL).

Slews missed from the Timeline: Due to a problem on IMCS (TCO task, time correlation invalid), the slew ID 03590045(CSL) failed release and the AOCS s/s disabled in TL at 12:06z.

A manual recovery was then performed to the attitude of PID 03590046. The next slew (OSL) for PID 03590047 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 15:20z.

The following slews were not executed from TL while recovering the AOCS s/s: 03590045(CSL)-46(OSL).

FDS failed to determine attitude: reported a problem on FDS likely triggered by a parallel offline activity on IMCS LTA: the FDS failed to determine the attitude for PID 03590050 and consequently the generation of the update for slew ID 03590051(CSL).

The AOCS s/s was disabled in TL at 15:20z.

A manual recovery was then performed and the next slew (CSL) for PID 03590051 was manually updated and executed from the Timeline.

The AOCS s/s was re-enabled in TL at 15:42z.

No impact reported on TL.

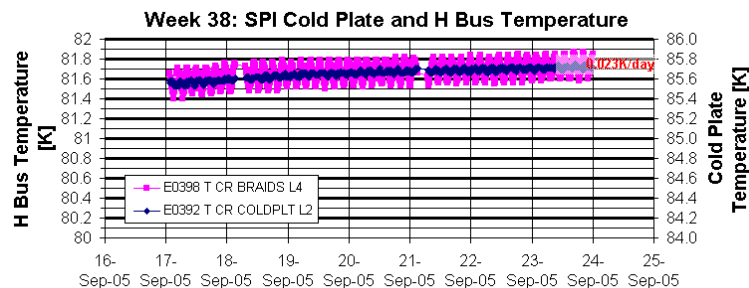
23/09/05 (Day of Year 266, Revolution 359)

Nothing to report.

8.3.2 SPI Operations

Stirling compressors and Cryostat:

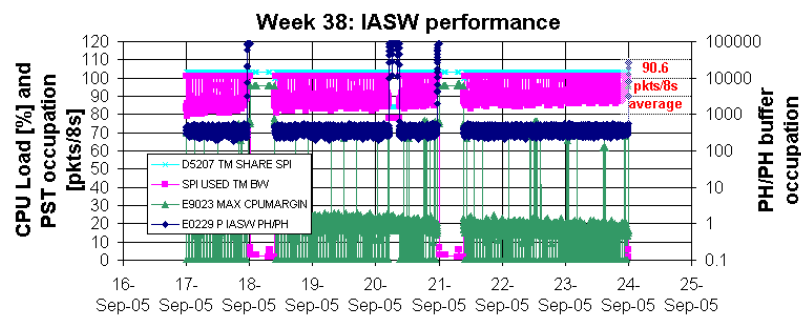
The performance of the compressors is nominal. The cold plate temperature was maintained at 85K $\pm$ 1K showing the usual positive drift with the expected slope. The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period.



DPE & IASW:

The IASW performance is nominal.

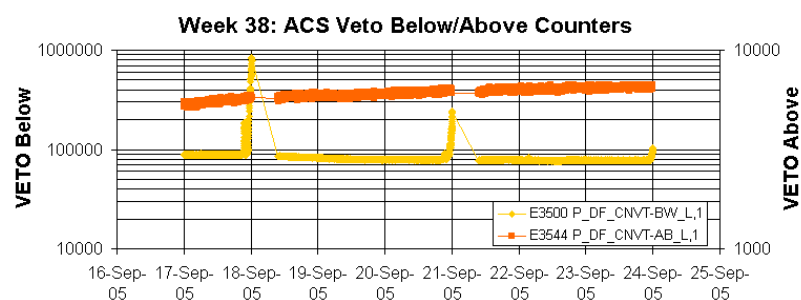
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

The performance of the ACS is nominal.

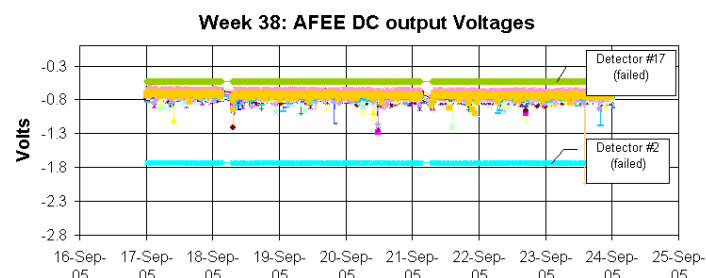
The following plot shows the ACS overall count rate evolution during the reporting period.



AFEE and Germanium Detectors:

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

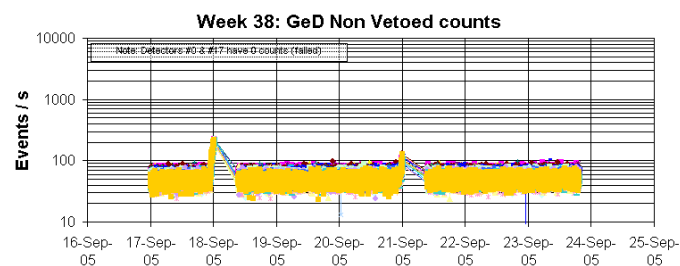
The following plot shows the dc voltage offset of the detector channels during the reporting period.

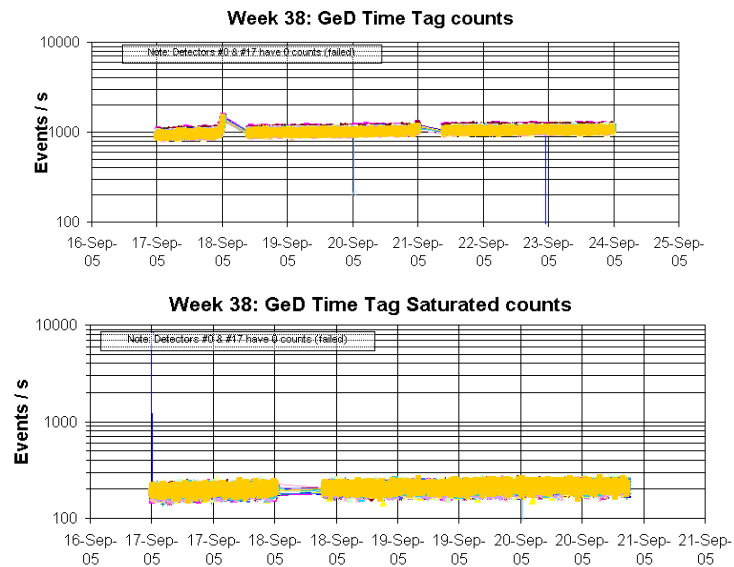


DFEE:

The performance of the unit is nominal.

The following plots show the count rates of the detectors during the reporting period (due to problems in the data retrieval tool, some gaps could be present).

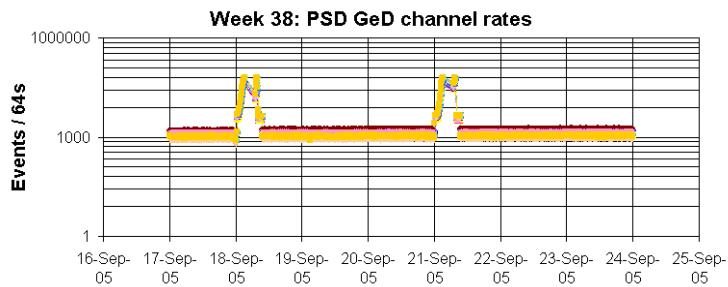




PSD:

The performance of the unit is nominal.

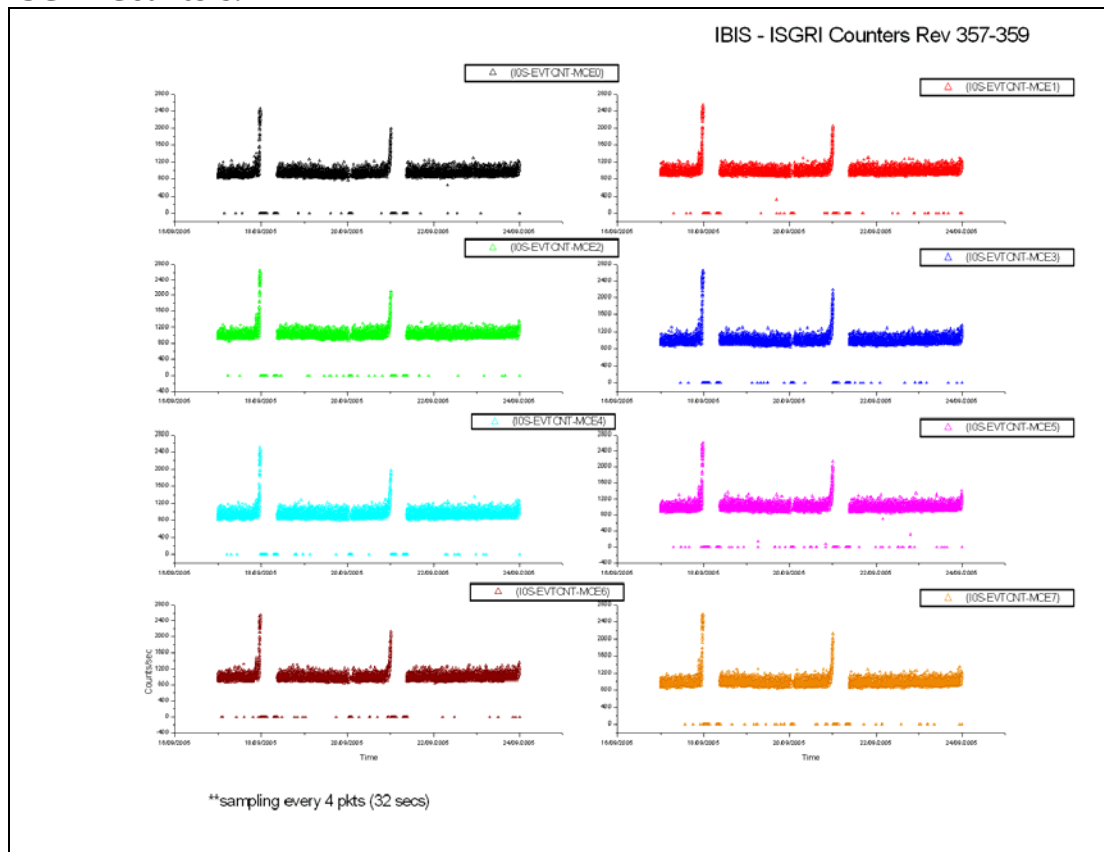
The following plots show the PSD channel rates during the reporting period.



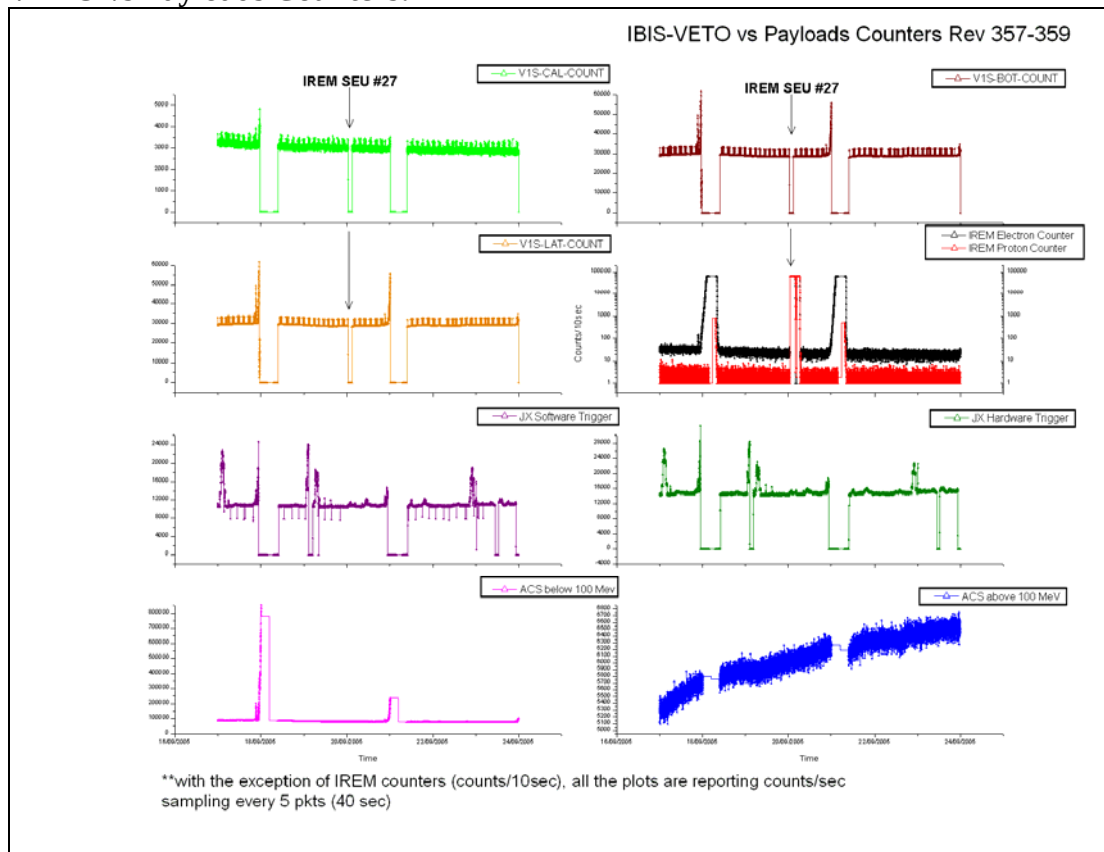
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

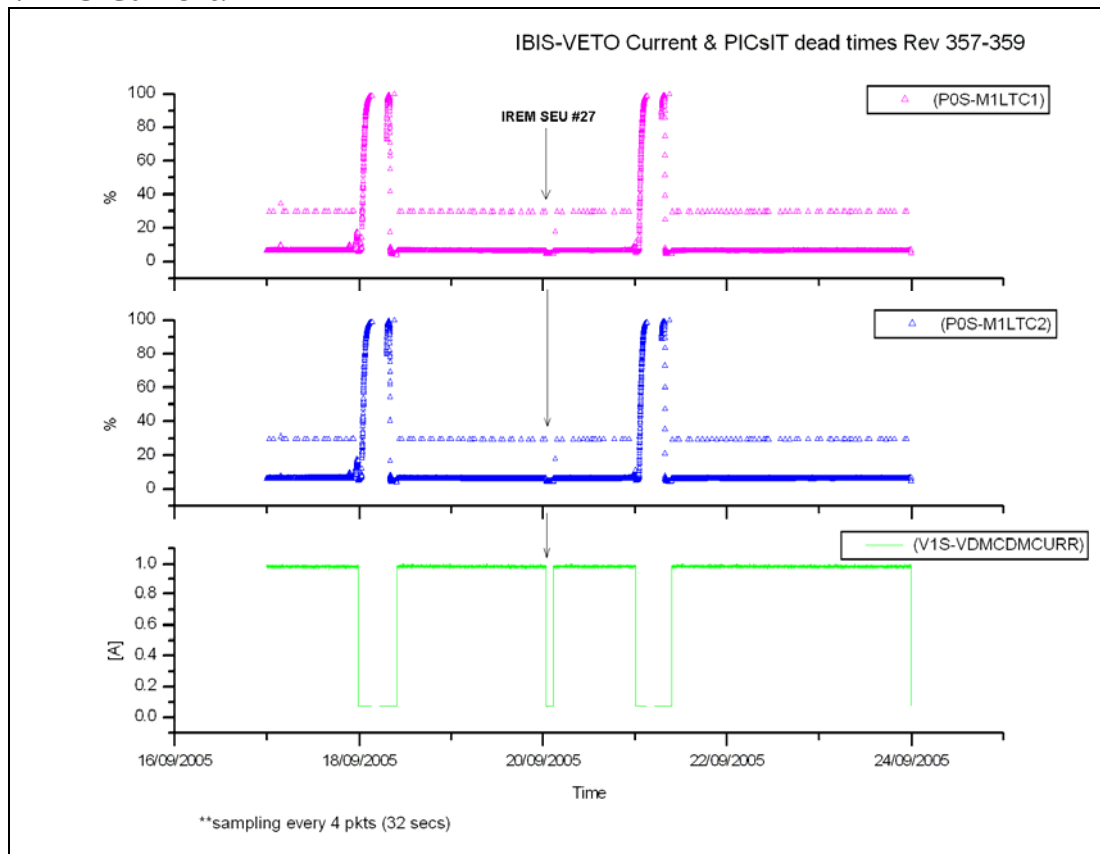


VETO vs Payloads Counters:

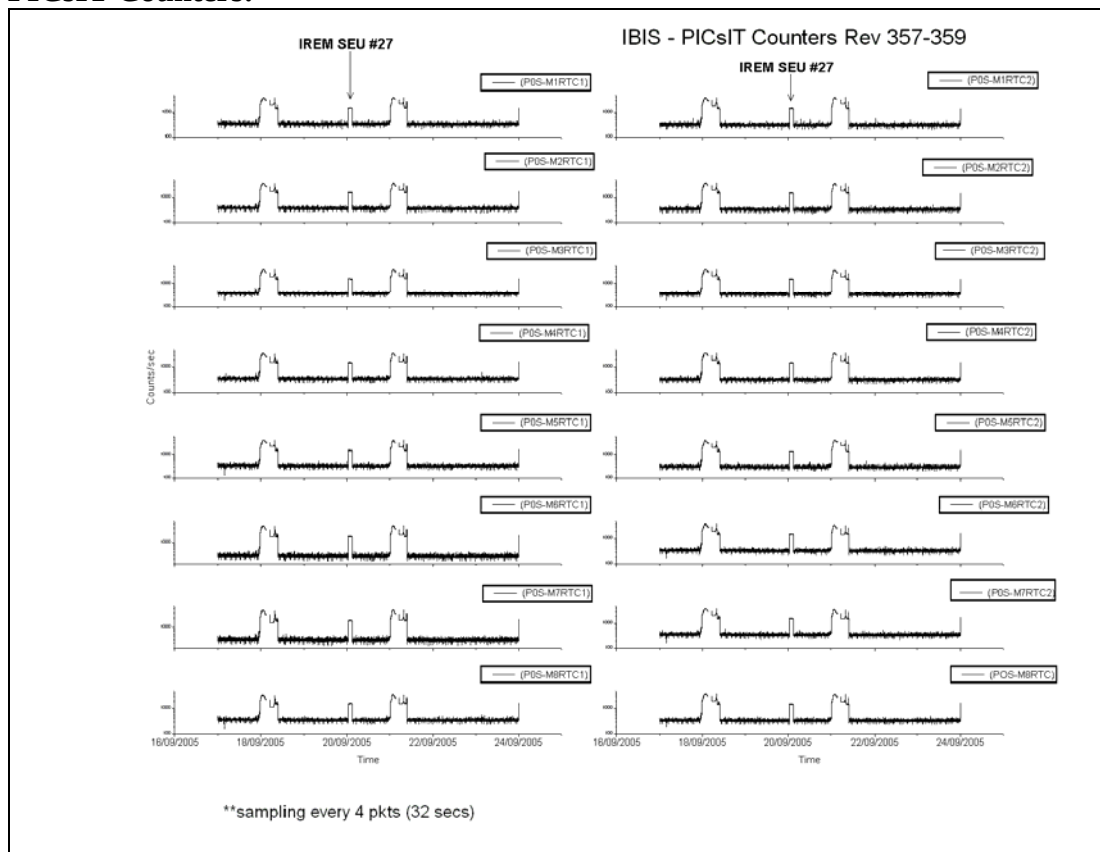


The week was characterised by low radiation.

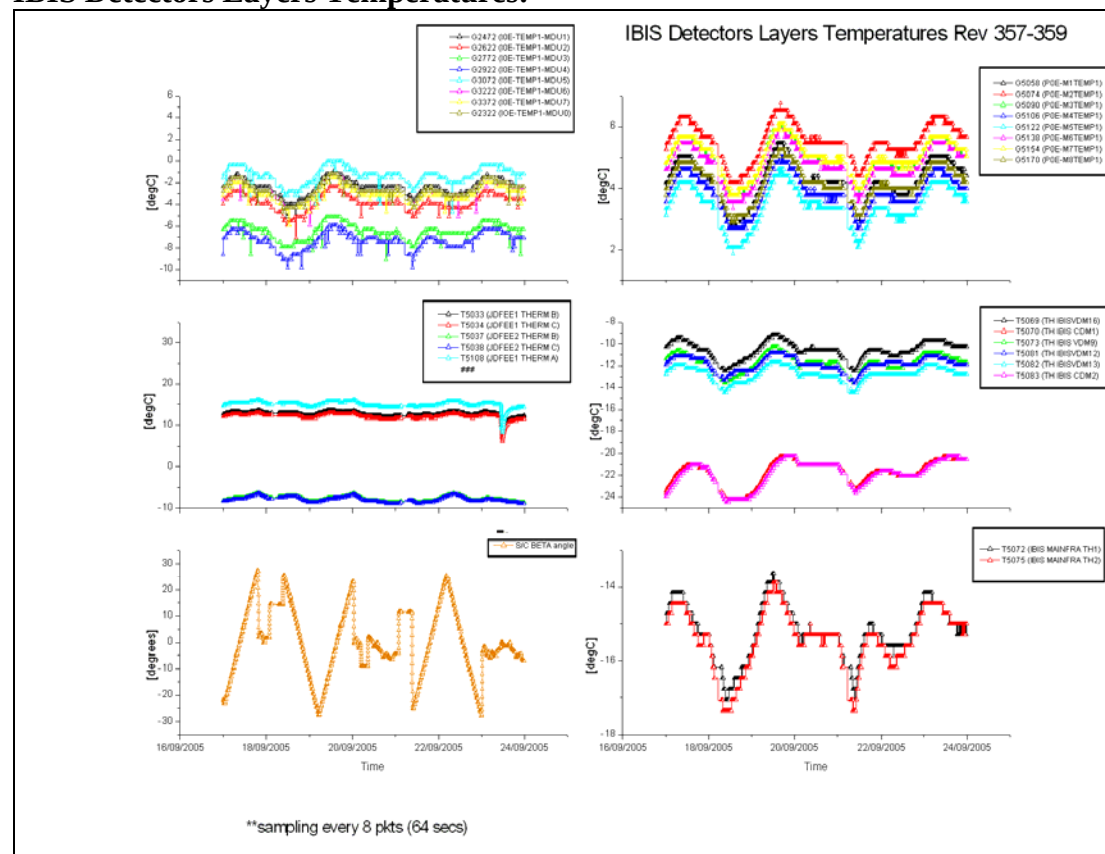
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report

DoY 2005.260 (17/09/2005)

At 03:41Z, TM family G5068 (POS_MiF1ERRF) failed SCC. According to reaction P-FIF-1, no action was taken.

At 23:42Z, IBIS entered the Radiation Belts in advance on BCPKT time (DoY 2005.260 at 00:22Z) due to the modification of the belts with the recent solar flare at the beginning of the month.

DoY 2005.263 (20/09/2005)

At 00:46Z an IREM SW failure (SEU #27) forced IBIS to Stand-by mode. Following procedure FCP_IBIS1_0803, IBIS exited this Safe configuration and went back to Scientific Standard mode at 03:14Z.

DoY 2005.264 (21/09/2005)

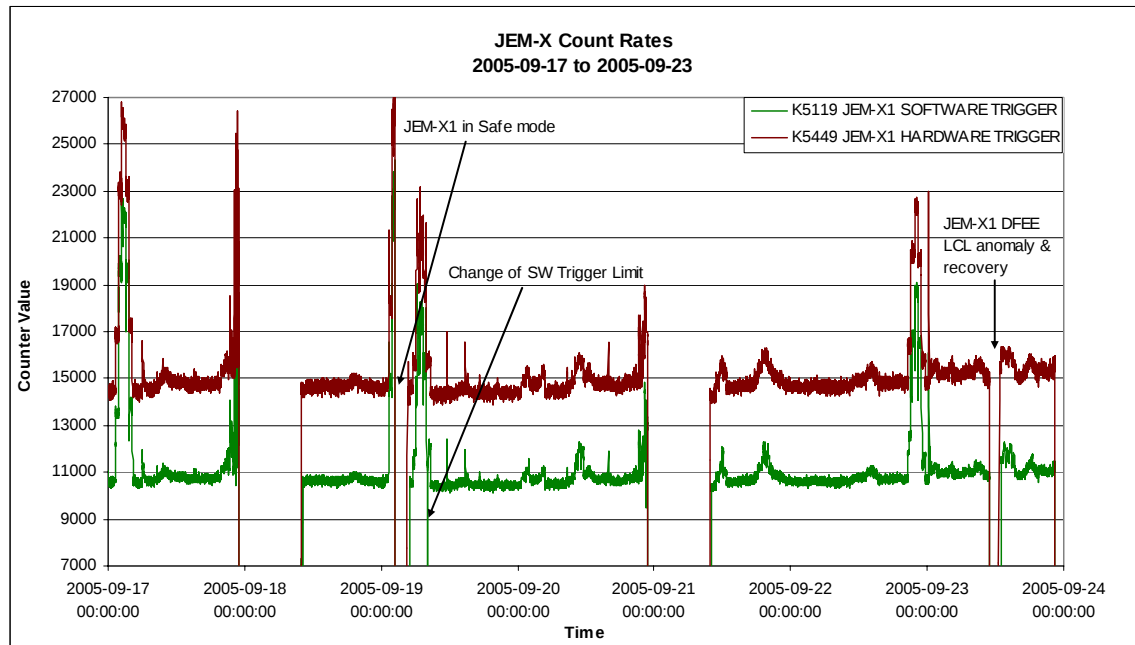
At 00:07Z, TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT) went OOL high. According to V-BOT-1 and V-LAT-1, no action was taken as the S/C was approaching perigee and radiations were high due to belts modification with the recent solar flare.

At 00:10Z, TM parameter G8015 (28V PMT set by IASW) went OOL High with the value 29.4V. As this happened at belt entry, according to V-VLT-1 no action was taken.

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.

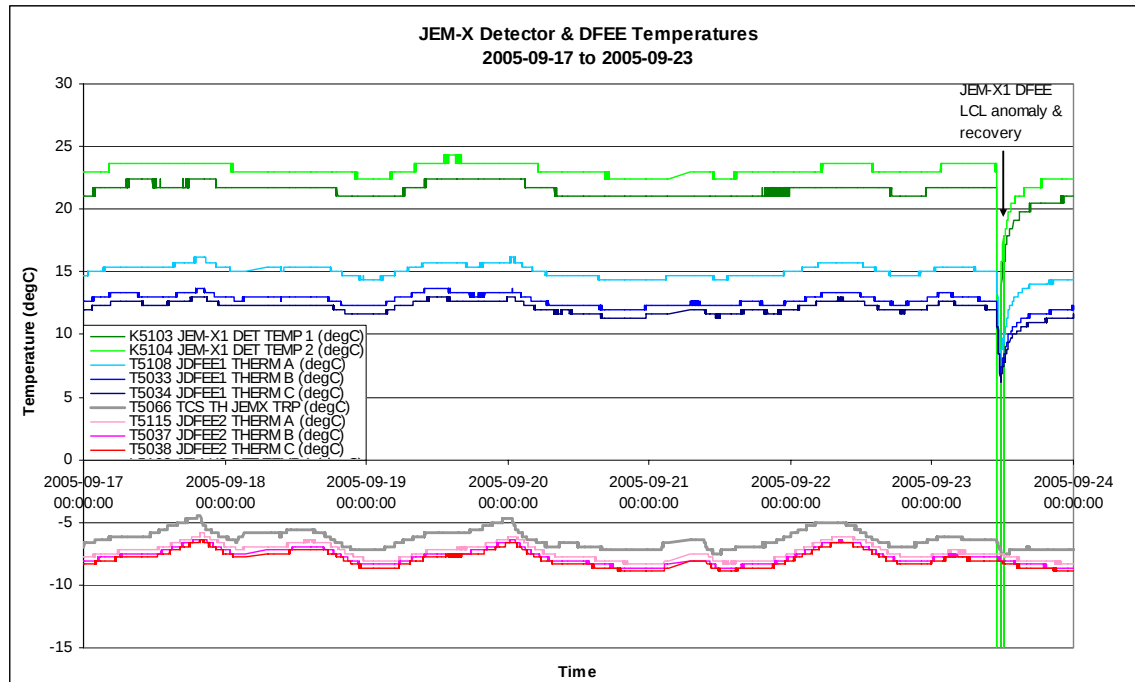


8.3.4.2 JEM-X Temperatures

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

2005-09-17 (DOY 260, Rev 357)

The TM parameter K5136 BUFFER LOSS went Out of Limits High on several occasions as follows:

- at 01:51:49Z (value = 684), returning within limits at 01:52:53Z
- at 02:28:45Z (value = 2152), returning within limits at 02:29:41Z
- at 03:05:41Z (value = 725), returning within limits at 03:06:45Z

In addition, from 01:52:45Z to 03:36:13Z the TM parameter K5119 SOFTWARE TRIGGER was fluctuating around the Warning High limit.

At 21:23:02Z the TM parameter K5317 RAD MONITOR 3 (Electron counter) went Out of Limits High (value = 96) and then began to fluctuate in and out of limits. At 22:56:38Z TM parameter K5119 SOFTWARE TRIGGER also went Out of Limits High (value = 21535) and at 22:56:54Z 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 transitioned to state Setup and thus OEM 189 JEM-X1 PROB DFEE 9 was received. This was just a few minutes before JEM-X1 was due to be commanded to Safe mode by the ED KESAFE02 (scheduled at 22:58:51Z) before radiation belt entry of revolution 357. This ED was allowed to run from the Timeline, thereby commanding JEM-X1 to Safe mode and setting K5462 DFEE STATE IASW to Safe as well. At this time OEM 254 ERROR OFF was received.

2005-09-18 (DOY 261, Rev 357-358)

Nothing to report

2005-09-19 (DOY 262, Rev 358)

The TM parameter K5136 BUFFER LOSS went Out of Limits High on several occasions as follows:

- at 01:17:42Z (value = 213), returning within limits at 01:18:06Z
- at 01:53:50Z (value = 1546), returning within limits at 01:54:46Z

At 01:54:38Z, at the start of pointing ID 03580028, the TM parameter K5119 SOFTWARE TRIGGER went Out of Limits High (value = 20530) and remained at a value of ~22000 throughout the pointing. At 02:29:18Z, during the slew to the next pointing, the Software Trigger (K5119) 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 transitioned to state Safe for 1 TM cycle and then went to state Setup and thus two occurrences of OEM 189 JEM-X1 PROB DFEE 9 were received. At 02:43:15Z FCP_JEM1_0040 was executed to command JEM-X1 to Safe mode and OEM 254 ERROR OFF was received. Commanding to JEM-X1 from the Timeline was then disabled.

Observing that the IREM counters remained low, and there were no solar flare alerts, JEM-X1 was reactivated after a couple of hours, as follows:

- 04:21:05Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP
- 04:31:30Z FCP_JEM1_1010 JEM-X1 Configuration Setting for Science Ops started
- 05:02:16Z FCP_JEM1_0044 executed to return JEM-X1 to Data Taking mode and commanding to JEM-X1 from the Timeline was then re-enabled.

At 06:49:02Z the TM parameter K5136 BUFFER LOSS went Out of Limits High (value = 649), returning within limits at 06:50:06Z. In addition, at 06:49:58Z and again at 07:51:26Z K5119 SOFTWARE TRIGGER went Out of Limits High for 1 TM cycle.

Following discussion with the JEM-X PI, the SW Trigger Limit for JEM-X1 was then increased from 25000 to 40000 in order to avoid an unnecessary transition of JEM-X1 to Safe mode, due to the fact that higher than normal counts were being obtained from the source being observed. This was performed as follows:

- 08:04:02Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP
- 08:06:23Z FCP_JEM1_0070 to set DFEE SW Integer parameter 84 to 40000
- 08:08:16Z FCP_JEM1_0044 JEM-X1 DATA TAKING

It was verified that the planned observation parameters were the same for all observations in the revolution and commanding to JEM-X1 from the Timeline was then disabled such that the SW Trigger Limit remained at 40000.

At 14:49:18Z the TM parameter K5136 BUFFER LOSS went Out of Limits High again (value = 1640) for 1 TM cycle.

2005-09-20 (DOY 263, Rev 358)

At 00:46Z an IREM SEU occurred (see IREM section) and thus the TM parameters K5315-K5317 all went OOL (value = 65535) but this did not affect JEM-X1 as the JEM-X1 reactions to the IREM counters are disabled.

Commanding to JEM-X1 from the Timeline was re-enabled at 12:18Z. The first commanding to JEM-X1 from the Timeline was then the ED KESAFE02 at 22:46:41Z to put JEM-X1 in Safe mode before radiation belt entry and reset the SW Trigger Limit to 25000.

2005-09-21 (DOY 264, Rev 358-359)

In line with OCR 198 (Increase SW Trigger Limit to 40000 for Galactic Latitude Scans), the JEM-X1 SW Trigger Limit (controlled by SW Integer parameter 84) was changed from 25000 to 40000 for the first two exposures in revolution 359, in which higher than normal count rates were expected. The operations were performed according to INT_OR_0220 as follows:

- At 09:55Z, after the last TC of the ED KEHVAC01, commanding to JEM-X1 from the Timeline was disabled.
- At 09:55:10Z procedure FCP_JEM1_0041 was executed to put JEM-X1 in Setup mode
- At 09:56:13Z procedure FCP_JEM1_0070 was executed, setting the parameters of TC K0014 as follows:
K0014
K0013 = 84 RAW DEC
K0014 = 40000 RAW DEC
- At 09:57:35Z procedure FCP_JEM1_0044 was executed to return JEM-X1 to Data Taking mode, with the planned observation parameters for the ongoing observation.

Commanding to JEM-X1 remained disabled to avoid resetting the SW Trigger Limit back to 25000 during this observation (Galactic Latitude Scan).

2005-09-22 (DOY 265, Rev 359)

Commanding to JEM-X1 remained disabled throughout the day to ensure that the SW Trigger Limit remained at 40000 during the ongoing Galactic Latitude Scan observation.

At 21:49:50Z the TM parameter K5136 BUFFER LOSS went Out of Limits High (value = 387), returning within limits at 21:51:04Z.

2005-09-23 (DOY 266, Rev 359)

At 00:19:18Z the TM parameter K5136 BUFFER LOSS went Out of Limits High (value = 218), returning within limits at 00:20:06Z.

In line with OCR 198 (and INT_OR_0220) commanding to JEM-X1 from the Timeline was re-enabled at 00:15:10Z, after the end of Exposure 03590002. The ED KEDATA02 up-linked from the Timeline at 00:39:34Z thus reset the SW Trigger Limit to 25000.

At 10:54:45Z a spurious switch-off of the JEM-X1 DFEE, i.e. spurious status change of JEM-X1 DFEE LCL to OPEN, occurred (see AR INT_SC-128). The symptoms were as follows:

The following values were reported in TM:

- K5022 DFEE STATUS and K5462 DFEE STATE IASW = DFEE OFF
- K5381 ACT SHUTDOWN LEV and K5382 WAN SHUTDOWN LEV = UNEXP LV OFF
- P2106 LCL STA JEM-X1 A = OPEN [0], with this parameter appearing Out of Limit, Status Consistency Check FAIL
- P2004 LCL CUR JEM-X1 A = 0V

The following OEMs were received:

```
2005.266.10.54.54.428    2005.266.10.54.58.433    1536 Real Time    169
EVENT      JEM-X1 LSL PROBLEM 9
  FIX6                                9
  K9079                                MESS CLASS    0
  K9080                                MESS ID      169
  K5412                                WORD OF COMMAND 18193
  K5413                                WORD OF ANSWER 0
```

>> Indicating a time out error on the Low Speed Line, i.e. the DPE could not communicate with the DFEE.

```
2005.266.10.55.00.803    2005.266.10.55.05.694    1536 Real Time    231
EVENT      JEM-X1 AUTO EVENT 1
  FIX6                                1
  K9079                                MESS CLASS    0
  K9080                                MESS ID      231
  K5419                                ACTUAL LEVEL   NORMAL
  K5420                                TARGET LEVEL   UNEXP
```

>> Indicating a transition of the Shutdown Level from NORMAL to UNEXP LV OFF

All the TM parameters from the DFEE were invalid, i.e. no data was being received from the DFEE.

The status of other spacecraft subsystems was nominal and no external events (eclipse, DNEL, PPDU (S/E) sequence) had occurred.

Recovery

Considering the above symptoms, it was concluded that a spurious status change of the JEM-X1 DFEE LCL had occurred (either due to Single Event Upset or an over-current on the LCL). Therefore the recovery was performed, starting at 11:36:32Z, according to CRP_JEM1_5050 JEMX1 RECOVERY FROM A SPURIOUS DFEE SWITCH OFF. The first step of this procedure was to command the JDFEE1 LCL ON, at which point the following OEM was received:

```
2005.266.11.36.53.179    2005.266.11.36.58.249    1536 Real Time    254
EVENT      ERROR OFF
  FIX6                                0
  K9079                                MESS CLASS    0
  K9080                                MESS ID      254
```

Doc. Title : INTEGRAL Mission Report #157
Doc. Ref. : INT-MOC-SYS-RP-1001-OPS-OF
Date : 26/09/05

Issue : 1
Rev. : 0
Page : 25

K5408	ERROR OFF	LSL
FIX16		0

>>Indicating the LSL error reported by the OEM ID 169 was recovered.

At the stage of loading the context from the DPE to the DFEE, the CRC check failed as expected (because the CRCs had not been saved prior to DFEE switch off), with the following OEM being issued:

2005.266.11.41.00.679	2005.266.11.41.06.316	1536	Real Time	191
EVENT	JEM-X1 PROB DFEE 11			
FIX6				11
K9079	MESS CLASS			0
K9080	MESS ID			191
FIX16				15
FIX16				0

>>Indicating failure of all 4 CRCs

In addition the following OEM was received:

2005.266.11.41.00.679	2005.266.11.41.06.343	1536	Real Time	211
EXCEPTION	JEM-X1 IASW PROB 1			
FIX6				1
K9079	MESS CLASS			1
K9080	MESS ID			211
K5265	TASK ID			2
FIX16				0

>>Indicating an exception in IASW task 2 (Task TC)

Following consultation with the JEM-X PI, it was decided to proceed with the recovery procedure and that this IASW exception was probably related to the failed loading of the context from the DPE to the DFEE.

The recovery then proceeded nominally, with the following procedures being executed as part of CRP_JEM1_5050:

- 12:03:01Z FCP_JEM1_9010 JEMX1 DFEE SWITCH OFF
- 12:08:25Z FCP_JEM1_0021 JEMX1 DFEE ACTIVATION

The JEM-X1 DFEE was activated and the context restored without any alarms or errors.

Before activating the JEM-X1 high voltage (i.e. between steps 6 and 7 of CRP_JEM1_5050), a dump of the DFEE memory area 9000HEX to DC00HEX was performed for offline verification as follows:

- 12:22:44Z FCP_JEM1_0040 JEMX1 TRANSITION TO SAFE
- 12:24:00Z FCP_JEM1_0045 JEMX1 TRANSITION TO MEMORY MAINTENANCE
- 12:25:43Z FCP_JEM1_0051 JEMX1 DFEE MEMORY DUMP
- 12:29:28Z FCP_JEM1_0040 JEMX1 TRANSITION TO SAFE
- 12:30:25Z FCP_JEM1_0041 JEMX1 TRANSITION TO SETUP

JEM-X1 was then activated as follows:

- 12:31:19Z FCP_JEM1_1010 JEMX1 CONFIGURATION SETTING FOR SCIENCE OPS
- 13:00:31Z FCP_JEM1_0044 JEMX1 DATA TAKING

The status of JEM-X1 following the recovery appeared nominal, with no Out of Limits and nominal values of the count rates. JEM-X1 operations then continued nominally.

8.3.5 OMC Operations

2005-09-20 (DoY 263, Rev 358)

At 00:45:59, an IREM SEU forced OMC to SAFE mode. The unit was recovered manually to stand-by at 03:19:19, at the instant of the SEU, there was no on-going OMC pointing, the impact was the loss of pointings 03580065 to 03580069.

From 05:03:12 to 07:55:13 a Flat Field Calibration was successfully conducted. This was immediately followed by a successful Dark Current calibration until 08:52:56

At 17:55, the Command Verifier died. It was restarted at 17:57, this caused an AOCS to fail release. A manual recovery was performed to the attitude of pointing 03580095. The impact was the loss of pointings 03580093, 03580094. It was at this time the following commands were rejected:

2005.263.18.27.51.159	2005.263.18.28.01.619	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								
2005.263.18.27.57.034	2005.263.18.28.01.646	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								

Which correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) for pointing 03580094.

At 21:55, a problem with AOCS commanding caused the loss of pointings 03580100 & 03580101. It was at this time the following commands were rejected:

2005.263.21.56.23.166	2005.263.21.56.34.233	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								
2005.263.21.56.28.291	2005.263.21.56.34.256	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								

Which correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) for pointing 03580100.

2005-09-22 (DoY 265, Rev 359)

At 10:13, an AOCS command failed release, a immediate recovery was performed. The impact was about a 12 minute delay in the start of pointing 03590042.

At 12:05, a problem with AOCS commanding caused the loss of pointing 03590045. It was at this time the following commands were rejected:

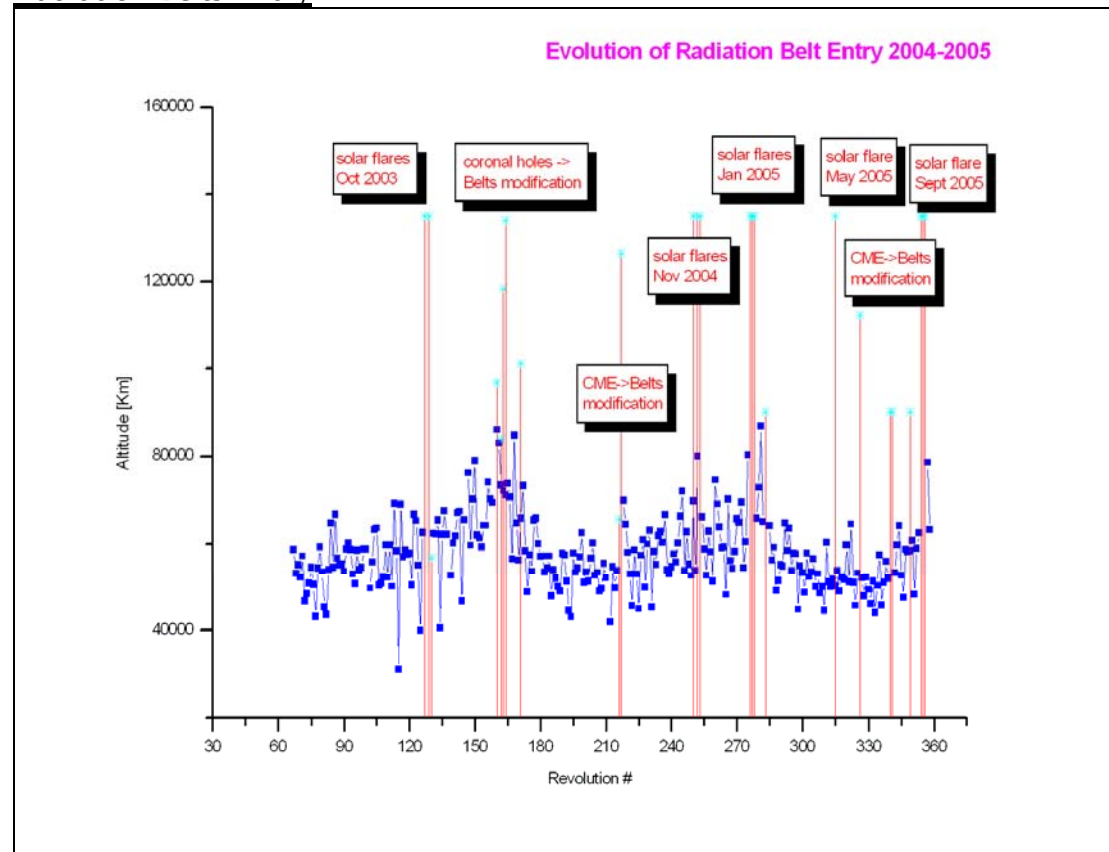
2005.265.12.07.59.236	2005.265.12.08.09.571	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								
2005.265.12.08.05.236	2005.265.12.08.09.576	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E E								

Which correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) for pointing 03590045.

On DoY 264 at 00:10:16 and DoY 266 at 23:56:40 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 2005.263 (20/09/2005)

At 00:46Z a local reset of the IREM CSCI S/W (SEU #27) occurred: 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, 10/09/04, 14/09/04, 28/10/04, 06/11/04, 01/12/04, 11/12/04, 30/01/05, 11/02/05, 04/03/05, 11/05/05, 17/05/05, 15/06/05, 30/07/05, 07/09/05) the status of the unit, before the anomaly, was nominal, here is a summary:

- 1) The temperatures were nominal
- 2) The LCL current was nominal
- 3) The last HK before the anomaly showed HV, 5V and 6V voltages inside limits
- 4) The anomaly occurred at 2005.263.00.46.00 at 146566.6 km when 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 01:20Z using procedure CRP_SYS_2570. The first dump of the status word after the anomaly showed 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) A dump of all the registers gave a status word BC80 HEX = 48256 DEC = 1011110011000000, ie. the unit was still reporting the status as if it was in Integral mode but the checksum failure flag was this time OFF and the checksum counter in the register number 3 incremented by 1 unit.

7) The patch was performed successfully with the correct re-starting of the S/W. The operation was completed at 06:56Z.

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

The recovery of the payload was performed with IBIS re-enabled at 03:14Z, and OMC at 03:20Z.

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

DoY 2005.264 (21/09/2005)

At 02:48Z TC U4921 (INT GND LINK OFF) failed completion. The execution of the TC was verified against the relevant TM parameter using the monitoring task and no further action was taken.

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]
357	RAD_ENTR R 2005-09-18T00:22:12Z	2005-09-17 21:39:04	78608.4	2005-09-18 01:19:29	52259
358	RAD_EXIT R 2005-09-18T09:35:18Z	2005-09-18 08:48:00	<<38480.7	2005-09-18 08:29:29	29844
358	RAD_ENTR R 2005-09-21T00:10:10Z	2005-09-20 23:47:44	63249.7	2005-09-21 01:04:14	52739
359	RAD_EXIT R 2005-09-21T09:24:06Z	2005-09-21 08:25:04	>>26530.9	2005-09-21 08:24:14	30764

Reference

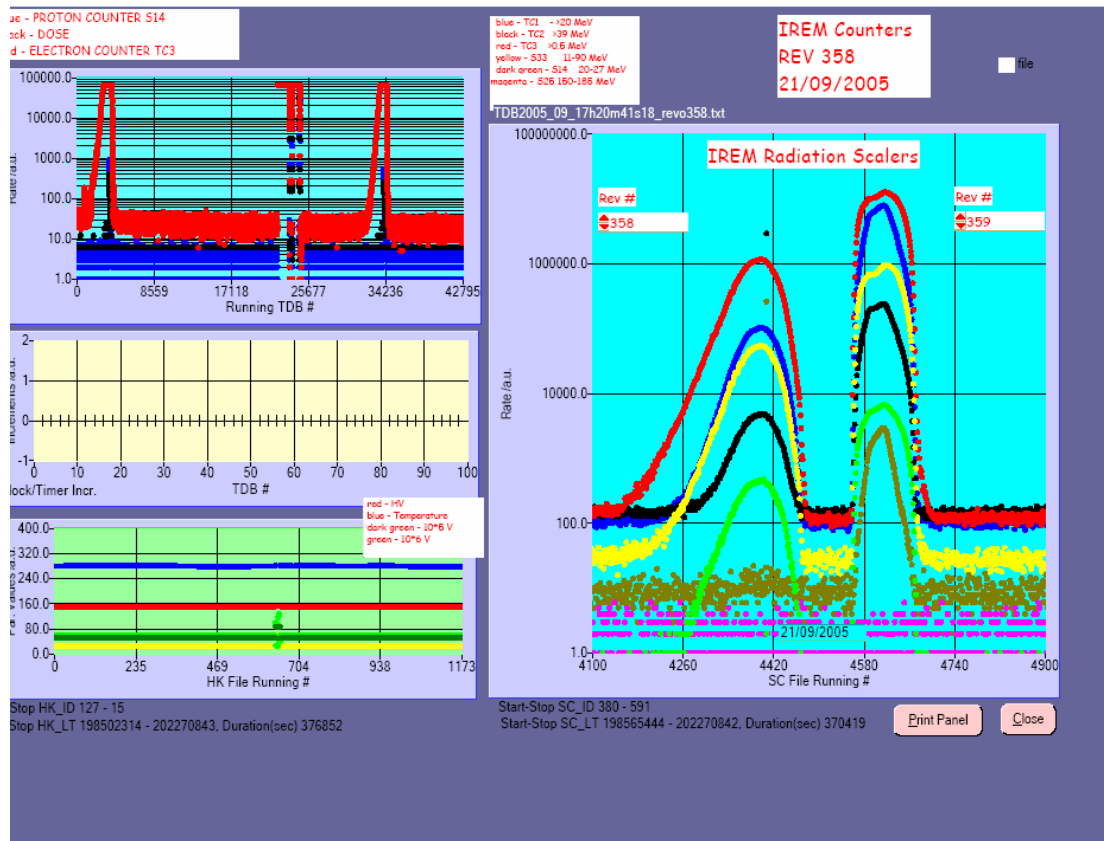
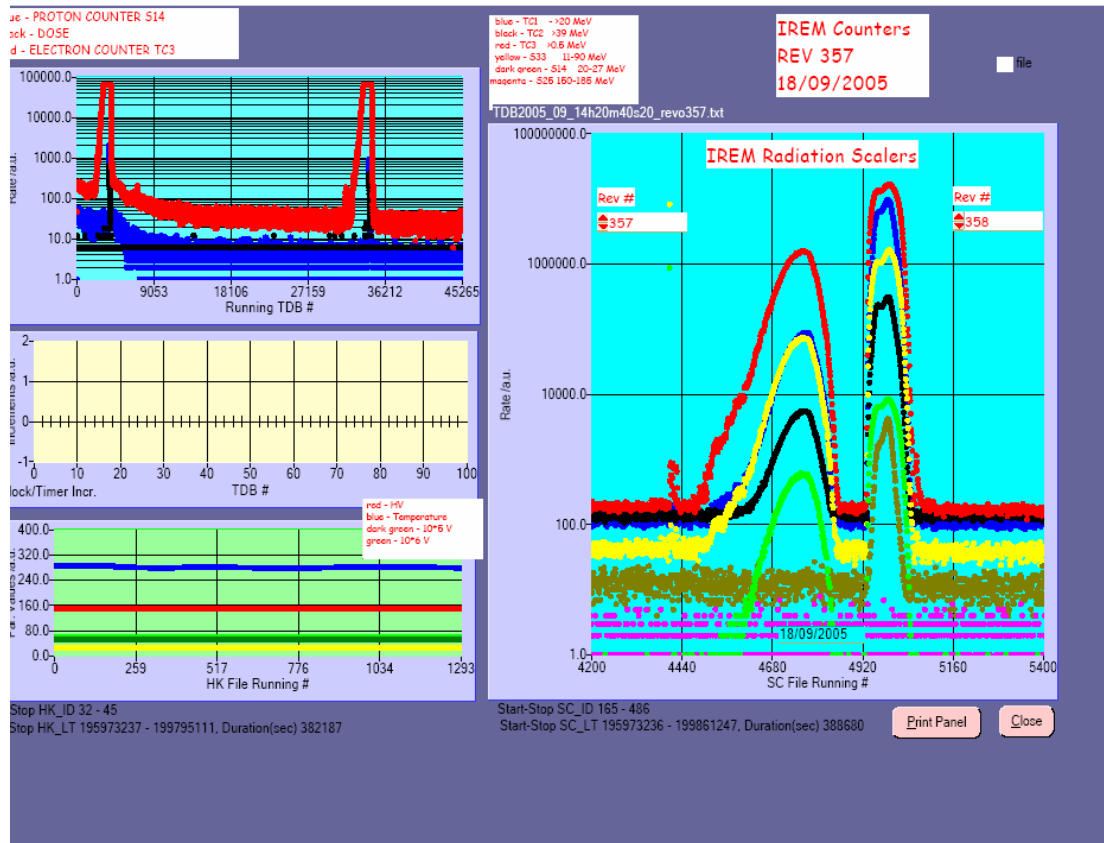
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

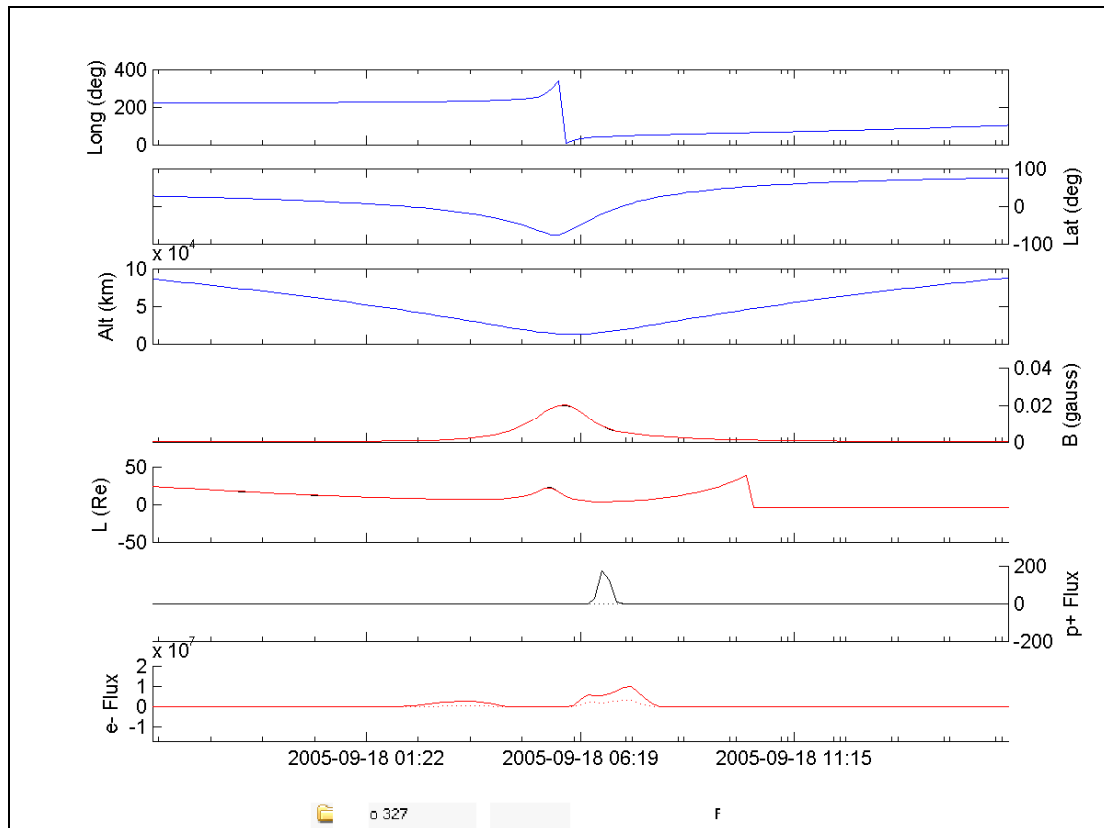
Radiation Spike

IREM radiation counters:

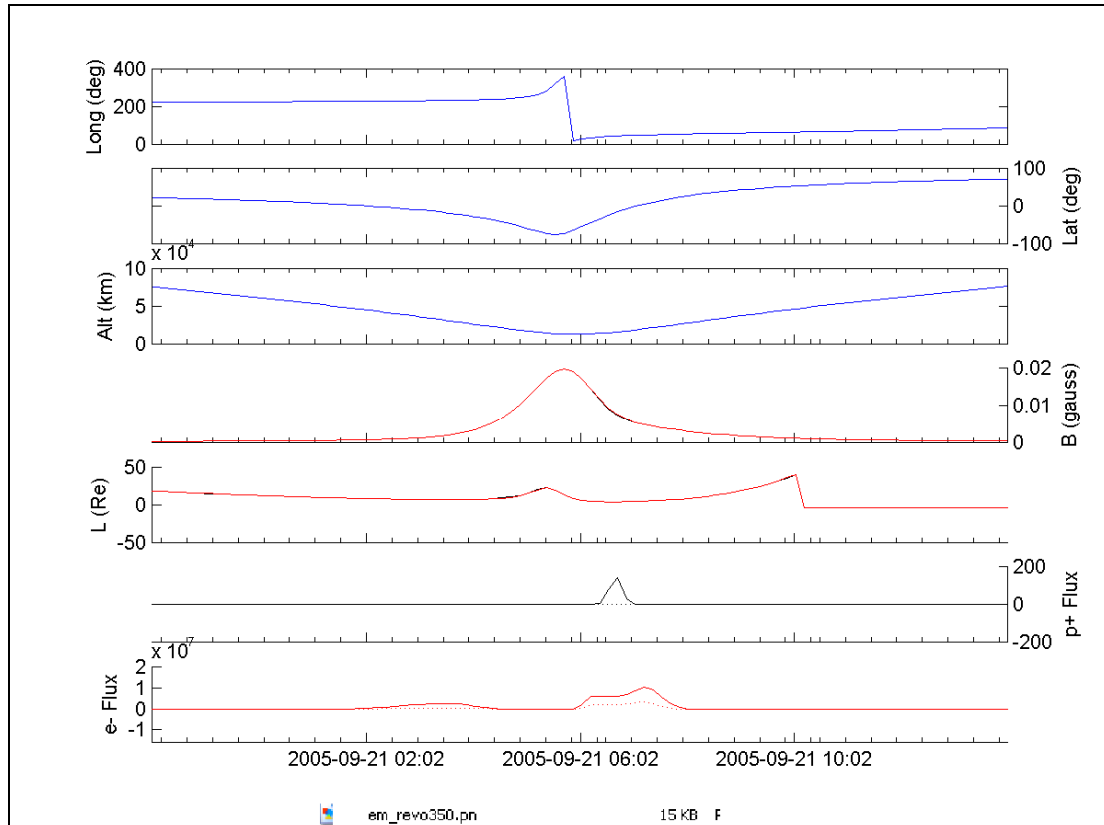


IREM Predicted Radiation Belt Passages:

Rev 357



Rev 358



SEC-GOES Observed Particles Fluxes:

