

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 063
Week 49
08.12.03
Routine Phase

Prepared by: M. Walker (TOS-OFI)

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	4
3.1.3	Thermal.....	4
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	6
3.2.4	OMC.....	6
3.2.5	IREM	7
4	Ground Facilities.....	7
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.....	10
8.1	Overview of Revolutions	10
8.2	Consumables	11
8.2.1	Detailed Fuel Book-keeping.....	11
8.3	Detailed Satellite Information	11
8.3.1	AOCS Operations	11
Calculated by FD:		16
Calculated by FD:		16
8.3.2	SPI Operations.....	17
8.3.3	IBIS Operations.....	19
8.3.4	JEM-X Operations.....	19
8.3.5	OMC Operations	20
8.3.6	IREM Operations	21

DISTRIBUTION LIST

Addressees	Copy	Addressees	Copy
D/TOS		ESA HQ	
G. Winters D/TOS	1	D. Southwood D/SCI	1
W. Frank TOS-O	1		
A. Smith TOS-OF	1	ESTEC	
J. F. Kaufeler TOS-G	1	J. Louet SCI-P	1
N. Bobrinsky TOS-ON	1	A. Gimenez-Canete SCI-S	1
R. Münch TOS-GF	1		
		ESTEC / PG	
M. Schmidt	1	K. Clausen	1
R. Southworth	1	P. Jensen	1
F. Di Marco	1	P. Strada	1
F. Cordero	1	G. Sarri	1
M. Walker	1	R. Carli	
M. Rezazad	1		
J. Houser	1	ESTEC/RSSD	
P. Lippi	1	M. Kessler SCI-SD	1
SPACONs	1	C. Winkler	1
S. Fahmy	1	A. Parmar	1
		R. Much	1
I. Bayliss	1	L. Hansson	1
G. Di Girolamo	1	R. Kuulkers	1
F. Dreger	1		
G. Gienger	1	ESTEC/SCI-A	
S. Pallaschke	1	Nicola Rando	1
W. Hell	1		
K. Capelle	1	ISDC	
M. Butkovic	1	T. Courvoisier	1
D. Heinzer	1	R. Walter	1
A. Pena	1	N. Mowlavi	1
Shift - Coord	1	ISDC Shift Team	1
Scheduling Office	1	D. Texier	1
T. Beck	1		
B. Smeds		ALENIA	
S. Scaglioni	1	C. Cassi	1
J. Wardill	1	F. Ravera	1
Redu		PI / Instrument Teams	
B. Demellenne	1	C. Larigauderie – SPI	1
		G. La Rosa – IBIS	1
		S. Brandt – JEM X	1
		E. De Miguel - OMC	1
		W. Hajdas – IREM	1
		JPL / Goldstone	
		D. Holmes	1
		J. Green	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 29.11.03 until 05.12.03 (both dates inclusive) and covers the revolutions 138 & 139.

2 Summary of Activities

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

The target of these revolutions was the Vela region, with dithering observations centered at (RA 08:27:54.70; DEC -46:18:18.4) and (RA 09:02:6.86; DEC -40:33:07.2). The activities consisted of raster and hexagonal dithering observations. In addition, the periodic Thruster Calibration was 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.

12 Pointings were lost during revolution 138 due to problems at MOC. One more pointing was lost during revolution 139, caused by a failure at the Ground Station.

There was a Star Tracker 1750 Processor Fault, caused by a bright object in the STR FoV. This resulted in loss of OTF at the beginning of pointing 01390067.

As part of the winter eclipse season AOCS calibrations, the Periodic Thruster Calibration, IMU1/IMU2 calibration and the RMU-B health check were performed during this time.

The fuel consumption over the period between 27/11/2003 and 05/12/2003 was 0.157kg, 0.0586 kg of which is the contribution of the thruster calibration and the two associated Reaction Wheel biases that were performed on 03/12/2003 (0.0205 kg of fuel was consumed during the calibration firings). The remaining propellant is in the order of 173.70 Kg on the 5th of December.

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

3.1.2 Power

The power subsystem is working as specified. The available power from the arrays is in the order of **2200W**.

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 identified.

3.1.5 RFS

The RF subsystem is working properly. There are some Reed Solomon errors for a couple of weeks. A preliminary investigation shows that these problems occur around Apogee when in a certain Azimuth range. This seems to indicate that the link margin is limited. It is currently not clear whether this is a temporary or a permanent problem. If the problem remains further investigations will be performed including a switch-over to the redundant transmitter to check that there is no degradation of the prime transmitter. Shadow tracking from VILSPA is ongoing to provide an independent assessment of the link budget and to exclude any possible Ground segment mis-configuration in REDU.

3.2 Payload

3.2.1 SPI

The overall status of the instrument is nominal.

The 3rd annealing cycle of the SPI Germanium detectors was completed at the end of November, the camera switched on at 117K and the normal science operations resumed after leveling off at the temperature of 85K. The stabilization of the Cold Plate temperature is still on-going and the drift observed is in the order of the last annealing in July (see details).

The DPE is running with the new IASW S/W release 4.3.0 and the performances are good. The TM bandwidth assigned to SPI was 98 pkts/cycle.

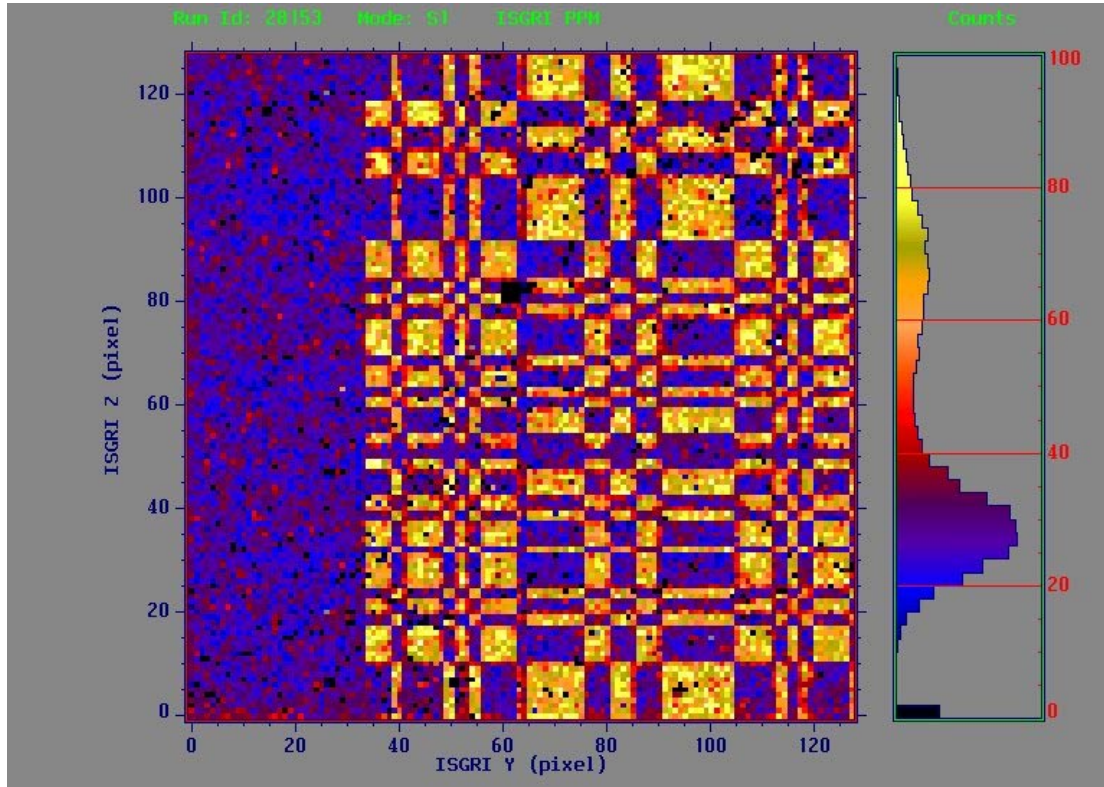
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The status of the unit is Nominal.

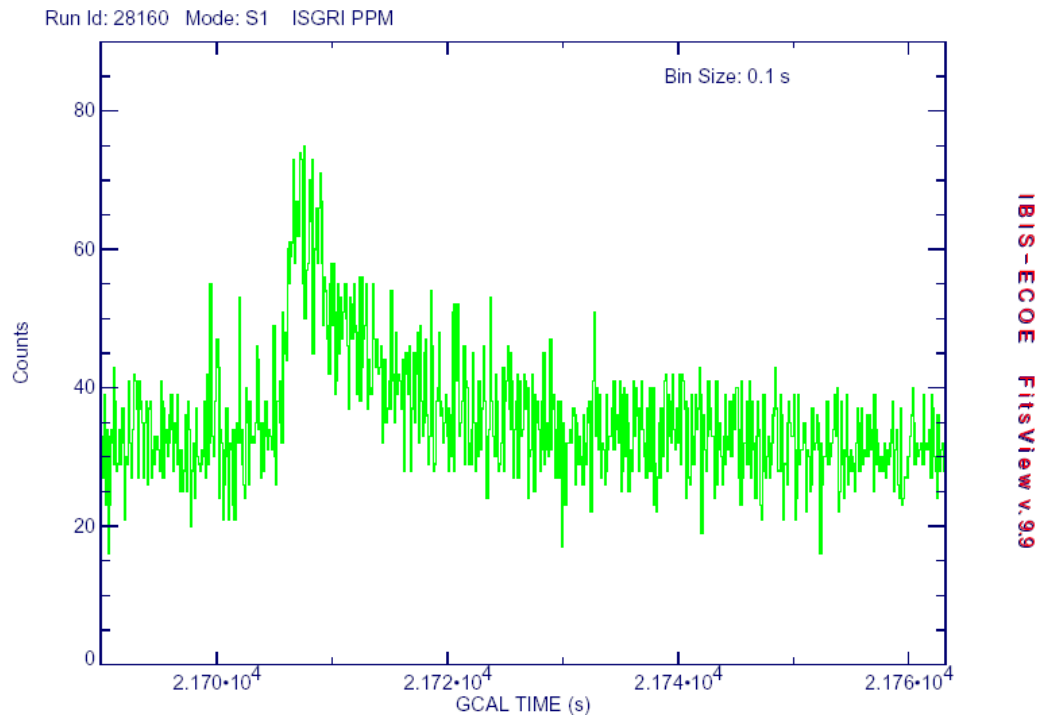
The TM bandwidth assigned to IBIS was 134 pkts/8sec. The detectors are continuing the recovering of the nominal count-rates after the high radiation event of last month. No occurrence of anomalous OEM generation (ID 183-184-179-180, Class 2) was

reported after the VETO S/W patch. A moderate solar activity was registered during revolution 138 (see IREM report). During revolution 137 a transient source was observed in the VELA region, the relevant mask shadow-gram, as recorded by the IBIS ECOE at ESOC is shown below:



During the revolution 139 a GRB was observed in the border of the IBIS field of view: the estimated flux was around 3 Crab (~ 1000 cts/sec). The event as recorded by the ISGRI detectors, is shown below.

/data/archive/erdf/science/2816/moc28160_031203_165703_S1_.fits
 ISGRI PHA (chan): [20.0000 120.000];



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.

During this period JEM-X1 was dormant with a TM allocation of 1 packet/cycle. JEM-X2 operations were performed by the automatic Timeline, with a TM allocation of 8 packets/cycle during science observations.

Due to high radiation levels as reported by IREM, JEM-X2 made an autonomous transition to Safe mode at 2003-12-02T15:24Z. The unit was recovered back to Data Taking by 2003-12-03T14:13Z.

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 during normal science operations.

There were 233 pointings executed, with 24 missed.

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

3.2.5 IREM

The status of the unit is Nominal.

The observation period was characterized by moderate solar activity during revolution 138 before Radiation Belts Entry (see details).

4 Ground Facilities

The performance of the Operational ground facilities was in general good in the reporting period. The system requirements were met but there were a couple of anomalies that impacted the operations..

4.1 Mission Operations Centre

The performance of the MOC was generally good in the reporting period. However a number of incidents occurred which impacted the execution of the timeline, these are detailed in section 6.

4.2 Ground Stations & Network

As mentioned above there were several problems related to the ground stations. A number of minor TM drops / bad frames / Reed-Solomon errors occurred. A detailed list of the anomalies is provided in section 6.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

Short term PSF: Received up to rev. 145

Long term PSF: up to rev. 164

POS and POD generated: up to rev 143

TSF: Up to rev 141.

Rev 138 was replanned due to a TOO. This was done as RPOS, i.e. replanning of an already started schedule. The replanning had to be repeated e.g. because of a change of pointing coordinates. This replanning was really challenging requiring lots of checking and some manual editing of the POS on both ISOC and MOC side since the original revolution was scheduled using the old ISOC system 9 and the replanning was performed using the new version 10. Rev 142 and 143 was also replanned due to reception of new PSF's from MOC with corrected eclipse information.

Rev 144 will contain OMC calibrations to avoid having to perform this task during the Christmas period.

2. Observation status

ECS's for rev's 123 to 126 received. Still missing one rev, 81. Corresponding OCS's generated and sent to ISDC. No extra time credited due to too much missing data. Contacts with ISDC indicates that the processing problem of rev 81 is now being resolved.

3. ISOC science archive

No archive data received from ISDC. Version 1 of the science archive delivered and installed in ISOC.

4. System

The migration to the ISOC system version 10 is now completed. This system is in operational use since mid of last week. This system has been used to generate POS's and ICP's from rev 139 plus replanning of rev 138.

5. Problems

none

6. AO 2 preparation

Amalgamation has been performed. Iterations with Project Scientist and PI's is in progress. A list of all AO 2 targets published on the ISOC web page.

4.3.2 ISDC

On 09/12/2003, the status of ISDC observation processing is :

- Latest Standard Analysis completed: observation 01297000015 (SgrA*, Revolution 113-115) on 05/12/2003
- Latest products archived: observation 01297000015 (SgrA*, Revolution 113-115) on 08/12/2003
- Latest observation products sent to the observer : observation 01202130001 (Galactic Center, Revolution 104-107) on 19/11/2003

5 Special Events

The AOCS calibrations in preparation of the next Eclipse season have been performed.

6 Anomalies

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

- Early on DoY 333, there were continuous warning messages on the event logger for CCOM_WRITE: Cannot broadcast to client.

- On DoY 333 at 05:17, there were some Reed Solomon alarms at Redu, the total number of bad frames was 17.
- On DoY 334, at 16:07, the TC & TLM from Redu was lost, the reason given by GFCC at the time was 'a hit on the line'. Subsequent to this, there were problems transferring the new TPF, which necessitated a reboot of the IMCA, a further restart of the IFTS-2/FDS was necessary before the TPFs finally arrived at 17:36. The impact was pointings 01380016 through to 01380020 were lost, with 01380021 performed manually (late).
- On DoY 334, at 19:26, the AOCS command A3169 erroneously failed release, (false static PTV), this caused the loss of pointing 01380022. Repeated problems with AOCS commands failing release caused the loss of pointings 01380023 to 01380028 inclusive. A restart of SUN 122 seemed to correct the problem, pointings 01380029 onwards were performed nominally.
- On DoY 335 at 05:15, the lines to Redu dropped, at 05:19, the ISDN line was up, with no apparent impact.
- On DoY 335, at 23:21, the command A2562 failed release due to the late completion of the previous command, the impact was the next slew 01380073 had to be performed manually.
- On DoY 336 at 13:12, the IDDA was showing red, due to the TMD-B task was not running. This task (MADDS-B), together with the IDDA were both restarted. At 13:29, the TMD-B task crashed, causing the archiving to stop, while the task was restarted. No impact.
- On DoY 336 at 17:03, Closed loop slew 01380106 was executed with default parameters due to a problem with the TPF, which was not applied.
- On DoY 336 at 22:15, IDDA on Sun129, was showing Red. CCC reported that all tasks were 'up'. The IDDA was restarted during the following perigee.
- Later, at 22:27, the IMCA was showing 'yellow', with the CMDReleaser using 43% of the CPU.
- On DoY 337 at 00:00, the IMCA was showing green, but 7 minutes later, it was back to yellow, with the CMD release using 44% of the CPU.
- On DoY 337, at 03:45, the NCTRA was showing 'yellow' on Sun129.
- On DoY 338, at 04:29, the IDDA was showing 'yellow' on Sun129, due to low disk space, which was corrected by an archive split on DoY 340.
- On DoY 338, at 17:32, the link from ISDS to ISDC was briefly disconnected, it was re-connected at 17:38, no impact.
- Later, at 19:49, there was no bit lock after the station handover to DSS-16, the TCP there was rebooted twice, and at 20:04, the links were back, there was a warning of possible RFI, the corresponding DR# is G-103793. The impact was the pointing 01390056 was lost, and 01390057 executed manually.
- From 21:05 to 23:24, there were repeated lost packets due to RFI, which eventually caused a star mapping to fail, preventing the update of a TPF. The mapping and TPF generation were performed manually.
- At 23:33 it was noted that there had been errors sending data to the ISDS since 23:15, CCC rebooted ISDS & IFRD, and at 23:58, the TM was flowing again.
- On DoY 339, at 02:12, Reed Solomon errors were reported at Redu.
- At 04:50, ISDC reported that no OLF files had been received since 23:50, the previous day, after restarting IFTS-MOC on IDDA, and the IFTS-SDS on ISDS-A, the files were again flowing at 06:09.
- At 10:44 and again at 11:47, the FD update TPFs were not delivered, CCC restarted the IFTS-MCS instance on IMCA at 11:47, curing the problem.
- At 21:29, shortly before radiation belt entry, verification of commands D5005 and A7213 timed out, probably due to some missed TM packets, no impact.

The following new anomaly reports have been entered into the Anomaly Reporting and Tracking System:

AR id	Date Occurrence	Subject	Segment	Status
INT-2533	05/12/2003	Error sending data to ISDS	IMCS	Open
INT-2532	05/12/2003	Telemetry drops from DSS-16 due to RFI DR-Nr: G-103795	NASA Station	Open

INT-2531	04/12/2003	No bit lock from DSS-16 DR: G-103793	NASA Station	Open
INT-2530	05/12/2003	manual update with TPF not working	IMCS	Open
INT-2529	02/12/2003	Command failed release	IMCS	Open
INT-2528	02/12/2003	Leased line to REDU lost	COMMS	Open
INT-2527	02/12/2003	Command failure due to static PTV	IMCS	Open
INT-2526	30/11/2003	TM + TC Lost	ESA Stations	Open
INT-2525	30/11/2003	No Bitlock Alarms From REDU	ESA Stations	Open
INT-2524	30/11/2003	No TPF Update Generated	FDS	Open

7 Future Milestones

- Eclipse season starts on 12/12/2003, there will be 9 eclipses, with a maximum duration of 55 min. on 27/12/2003.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 138

The observations in revolution 138 consisted of a raster dithering observation of the Vela region (RA 08:27:54.70; DEC -46:18:18.4) lasting 57.5 hours, followed by a hexagonal dithering observation of the Vela region (RA 09:02:6.86; DEC -40:33:07.2) performed for the remaining ~4 hours of observation time. This last exposure was originally planned to be a raster dithering but was changed to a hexagonal dithering in an RPOS received from ISOC.

Throughout these observations, all instruments were planned to be in their nominal science modes, except for JEM-X1, which was to remain in Safe mode. However, due to high background radiation levels, JEM-X2 and OMC were in Safe mode during the last exposure. The TM allocation throughout these observations was 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC.

Revolution 139

The observations in revolution 139 consisted of a raster dithering observation of the Vela region (RA 08:27:54.70; DEC -46:18:18.4). The first exposure lasted 30 minutes, following which the observation was interrupted for 6 hours (between 2003-12-03T08:42:42Z and 2003-12-03T14:42:42Z) for the periodic Thruster Calibration. The observation was then resumed and was performed for the remaining ~55 hours of observation time.

Throughout this observation, all instruments were planned to be in their nominal science modes, except for JEM-X1, which was to remain in Safe mode. However, due to high background radiation levels, JEM-X2 was in Safe mode during the first

Doc. Title : INTEGRAL Mission Report # 63
Doc. Ref. : INT-MOC-SYS-RP-1001-TOS-OF
Date : 08/12/03

Issue : 1
Rev. : 0
Page : 11

exposure. The TM allocation throughout this observation was 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2003-11-17T10:51:25.000Z	173.9430	F	Manual Processing of 0133_0513_M.RWB
2003-11-18T06:20:23.000Z	173.9170	F	Automatic TM processing.
2003-11-21T06:23:51.000Z	173.8970	F	Automatic TM processing.
2003-11-23T23:30:30.000Z	173.8735	F	Automatic TM processing.
2003-11-27T06:57:10.000Z	173.8600	F	Automatic TM processing.
2003-11-27T09:18:39.000Z	173.8460	F	Manual Processing of 0137_0505_M.RWB
2003-11-28T16:00:02.000Z	173.8290	F	Automatic TM processing.
2003-11-30T05:38:46.000Z	173.8250	F	Automatic TM processing.
2003-12-01T16:14:17.000Z	173.8064	F	Automatic TM processing.
2003-12-02T18:02:12.000Z	173.7915	F	Automatic TM processing.
2003-12-03T05:32:21.000Z	173.7807	F	Automatic TM processing.
2003-12-03T08:53:42.000Z	173.7635	F	Automatic TM processing.
2003-12-03T12:45:00.000Z	173.7430	F	After thruster torque calibration
2003-12-03T14:11:42.000Z	173.7221	F	Automatic TM processing.
2003-12-04T15:43:21.000Z	173.7029	F	Automatic TM processing.

This report was generated Fri Dec 5 08:00:09 GMT 2003

8.3 Detailed Satellite Information

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

8.3.1 AOCS Operations

AOCS operations were executed from the Automatic Timeline.

During this period, 26 Open Loop Slews, 229 Closed Loop Slews and 7 Momentum Bias were executed. 13 slews were missed or executed manually. This is equivalent to a 5.1%.

29/11/03 (Day of Year 333, Revolution 137)

Nothing to report.

30/11/03 (Day of Year 334, Revolution 137-138)

Slews/Pointings 01380016 to 01380020 lost due to loss of TM/TC line from Redu and problems at MOC: At 16:07, TM and TC links from the Redu ground station were lost due to what is described as “a hit on the line”. Commanding to AOCS from the Autostack was then disabled and slew 01380016 was lost. The backup line (ISDN line) was put in and TM/TC were re-established by 16:12. Next, a mapping was commanded and the Timeline recovery tool was used to generate a manual slew to the

next pointing, but then the INTEGRAL File Transfer System failed to send the slew TPF to IMCS. A restart of the MCS instance of IFTS was requested but for some reason/problems the restart procedure caused the IMCS-A to crash. After restarting IMCS-A, a manual slew was generated to rejoin the Timeline, but the IFTS failed to transfer the TPF again. A restart of the FDS instance of the IFTS was then performed, which cured the file transfer problem. These problems caused also the loss of Pointings 01380017 to and including 01380020. Then a manual Open Loop Slew and a manual corrective Close Loop Slew were done to the attitude of pointing 01380021. The attitude of the pointing was reached before the planned time in the Timeline. Therefore, this pointing was not affected except for OMC, because the imaging commands were not uplinked due to a false Static PTV no-go condition (see below).

Slews/Pointings 01380022 to 01380028 lost due to false Static PTV no-go, caused by workstation problem: During restart of the IMCS, all the MCS applications running on the workstations should be stopped and then started again after completion of the IMCS restart. Unexpected behaviour of the system has been observed when this is not done, one of which is a false Static PTV no-go condition on some commands. This was overlooked during the above mentioned IMCS restart and caused the loss of more slews (the problem was only affecting the running Autostack and not the Manual Stack on the same Workstation):

- At 19:26 command to start the offset slew failed release due to false PTV condition and slew 01380022 was lost.
- Problem was diagnosed as an isolated case of false PTV failure, which happens from time to time. A manual slew was done to the attitude of pointing 01380023, which was reached at 20:03:17, after the planned time in the Timeline. Parameters of the next slew were then manually updated.
- At 20:29 command to start the offset slew failed release again due to false PTV condition and slew 01380024 was lost.
- At 20:44 the Autostack task on the workstation was stopped, exited and the task was restarted. Then the Timeline was reloaded. This is known to clear the PTV problem in most cases.
- A manual slew was performed to the attitude of Pointing 01380026, and the parameters for the next slew were updated.
- At 22:02 command to start the Guide Star from the Close Loop Slew sequence failed uplink, once more due to false static PTV no-go. Slew 01380027 was lost.
- The Time line was then loaded on the Autostack running on another Workstation, and the SPACON Workstation was completely rebooted.
- At 22:28 manual slew performed to the attitude of pointing 01380028.
- The Autostack was started on the SPACON Workstation and the Timeline was loaded. The parameters of the next slew were then updated manually.
- Slew 01380029 was executed from the Timeline.

Slews 01380022 to and including 01380028 were lost.

01/12/03 (Day of Year 335, Revolution 138)

Nothing to report.

02/12/03 (Day of Year 336, Revolution 138)

Close Loop Slew 01380106 performed with default values: Because of a re-planning in the revolution, the running Timeline was aborted and a new version of the Timeline (ver. 05) was loaded at 16:47. Up to this point, the normal process had been to update the next AOCS activity in the newly loaded Timeline by manually applying the relevant TPF, which was already on the IMCS. For an unknown reason this update did not work this time and Close Loop Slew 01380106 was performed with the Timeline-default values. The error in the performed slew was negligible. Further tests showed that this process is not currently working. The last time when a TPF was manually applied to the Timeline was on 18/10/2003 (DoY 291) at 23:02:49. At that time the process worked correctly (see ARTS Entry INT-2530). Instructions are given to the SPACONS to use the Flight Dynamics system to update the AOCS activities in the Timeline, until the problem is understood and removed.

03/12/03 (Day of Year 337, Revolution 138-139)

Periodic Thruster Calibration on RCS-A: In conjunction with the winter eclipse season, the Periodic Thruster Calibration was performed on RCS-A according to the following schedule (based on EPOS of revolution 139, version 08):

Time		Event	Execution
2003/12/03 08:42:42		Satellite Engineering Window Open	
2003/12/03 08:42:42		Change of Guide Star (FCP_AOC_0529)	Timeline
2003/12/03 08:47:42		Reaction Wheel Bias to set the wheel speeds at 2000, 2000 and -2000 rpm (FCP_AOC_0510). RWB ends at 09:09:42.	Timeline
2003/06/13 09:00:00		FD and FCT support present	
2003/12/03 09:10:23		Close Loop Slew to the attitude (same attitude) for thruster calibration (FCP_AOC_0520)	Timeline
2003/06/13 09:30:00		Start of Manual Thruster Calibration Operations	
Manual Thruster Calibration Operations Reference: INT-PR-MMB-0005, OO_017	09:30:00	30 minutes of RW data collection to estimate the external torques. - If required by FD, update of the Thruster Torque Reciprocals and FCE PWM (RCA) will be done during this time (FCP_AOC_1520). RCA TPF required from FD.	Manual
	10:00:00	First execution of the RCS_A thruster firing sequence (FCP_AOC_1520). The Input to this sequence is the thruster on time, which should be provided by the FD. Execution duration is 34 minutes.	Manual
	10:34:00	30 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques.	
	11:04:00	Second execution of the RCS_A thruster firing sequence (FCP_AOC_1520). Execution duration is 34 minutes.	Manual
	11:38:00	30 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques.	
	12:08:00	Third execution of the RCS_A thruster firing sequence (FCP_AOC_1520). Execution duration is 34 minutes.	Manual
	12:42:00	30 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques.	
2003/06/13 13:12:00		End of Manual Thruster Calibration Operations	
		Spare time	
2003/12/03 14:00:42		Change of Guide Star (FCP_AOC_0529)	Timeline

2003/12/03 14:05:42	Reaction Wheel Bias (FCP_AOC_0510) to set the wheel speed back to those in the planned profile. RWB ends at 14:27:42.	Timeline
2003/12/03 14:28:23	Corrective Close Loop Slew to the science attitude (FCP_AOC_0518)	Timeline
2003/06/13 14:42:42	Satellite Engineering Window close	

04/12/03 (Day of Year 338, Revolution 139)

Slew/Pointing lost due to Ground Station problem (Goldstone DSS-16): After station handover from Redu to Goldstone at 19:47, the TM/TC links could not be established due to a problem with the TCP at the station. The Timeline was stopped and slew 01390056 was lost. After two reboots of the TCP, the links were established. Then a manual slew was performed to the attitude of pointing 01390057. The attitude was reached at 20:24:48. Pointing 57 was not affected.

05/12/03 (Day of Year 339, Revolution 139)

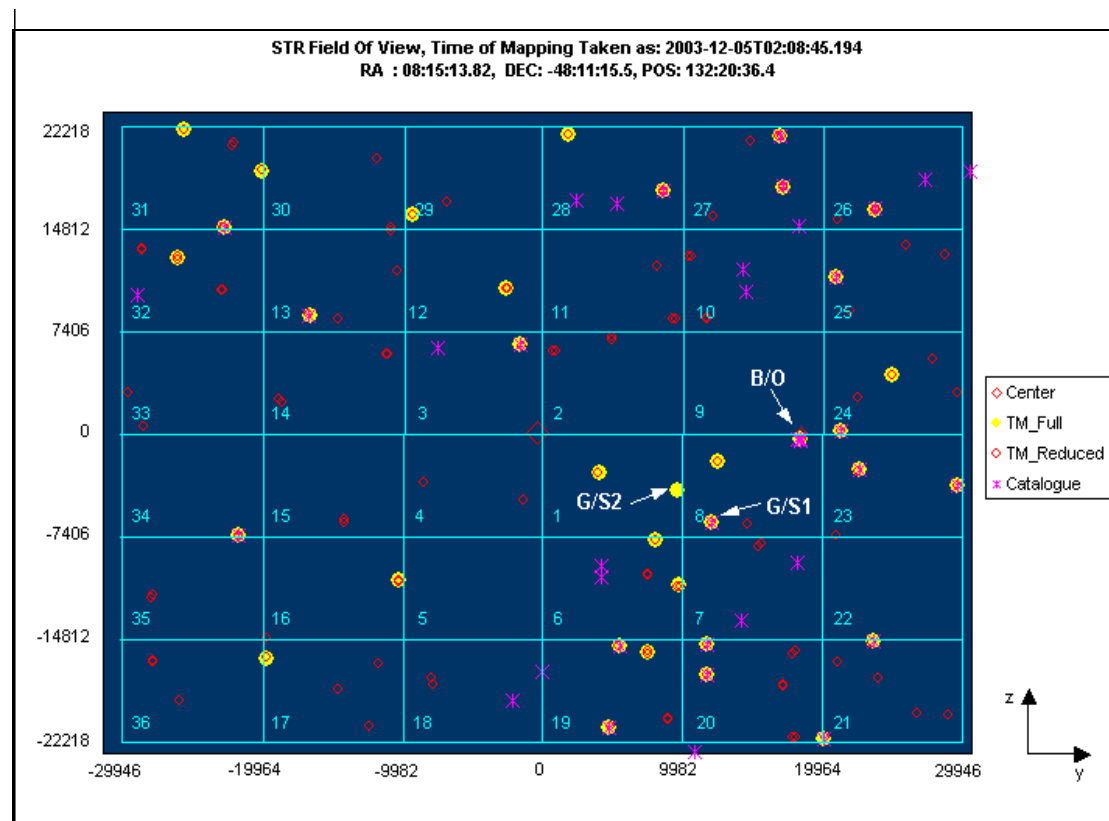
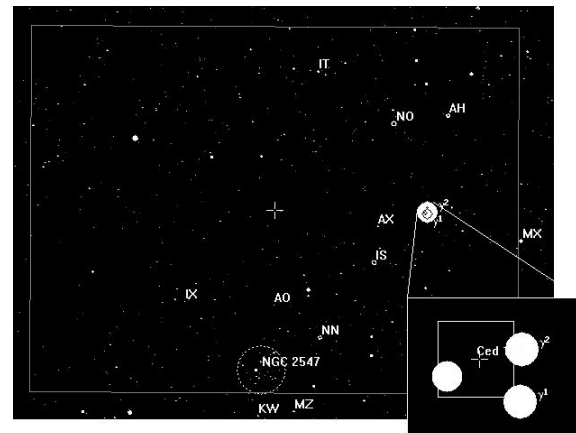
Star Tracker 1750 Processor Fault caused by Bright Object: At 02:08:19 a STR 1750 Fault occurred during the mapping that was commanded from the Timeline after Close Loop Slew 01390067. Two more consecutive mappings also terminated due to the fault. Finally a fourth mapping was commanded by the ACC during which the fault did not occur and a new Guide was picked.

- 02:08:06.586: Mapping start G/S: (12373, -6486) TYCHO# 8140-06536-1, 5.7mag, ESW 8
- 02:08:19.688: 1750 Fault, mapping interrupted, G/S lost. However, the FDS could use this mapping for the update of the next slew.
- 02:08:19.700: Mapping Start
- 02:08:22.193: New G/S found: (9923, -4175) TYCHO# 8140-04503-1, 8.3mag, ESW 1, very close to border of ESW 8
- 02:08:30.692: 1750 Fault, mapping interrupted while processing ESW 8
- 02:08:30.704: Mapping start
- 02:08:33.193: G/S found: (9928, -4177) TYCHO# 8140-04503-1, 8.3mag, ESW 1, very close to border of ESW 8
- 02:08:42.692: 1750 Fault, mapping interrupted while processing ESW 8
- 02:08:42.704: Mapping start
- 02:08:45.193: G/S found: (9935, -4178) TYCHO# 8140-04503-1, 8.3mag, ESW 1, very close to border of ESW 8
- 02:09:42.192: Mapping completed normally.

At 02:21:17, after IMU switch-off, the SPACON commanded a mapping to do a manual update of the next slew after the loss of the Guide Star. This mapping again triggered a series of 1750 faults in three successive mappings. The fourth mapping was done normally and the same Guide Star was selected again: (9932, -4178) TYCHO# 8140-04503-1, 8.3mag. The effect was that the OTF was Not REACHED during Pointing 01390067.

Below is the reconstruction of the STR FoV at the time of the mapping that started at 02:08:42.

- G/S1: (12392, -6489), TYCHO# 8140-06536-1, 5.7mag
- G/S2: (9935, -4178), TYCHO# 8140-04503-1, 8.3mag
- And the Bright Object (B/O) with CCD coordinates (18774, -407) and magnitude 1.8, is the image of the following objects:
 - TYCHO# 8140-06533-1, 1.75 mag
 - TYCHO# 8140-06535-1, 7.72 mag
 - TYCHO# 8140-06534-1, 4.64 mag
 - Diffuse Nebula Ced 104



IMU1/IMU2 health and calibration and RMU-B health check: In conjunction with the winter eclipse season the IMU1 and IMU2 health check and calibration was performed. RMU-B health check was done in parallel. Here are the times and the results:

Time z	IMU1 IMU2 Health-Check / Calibration and RMU-B Health Check 05/12/2003 (DoY 339)	
07:30	Disable ACC Autonomous IMU Switch Off, FCP-AOC-1051	Step 1, IMU1

07:34:41 07:36:48	IMU1 Switch On, FCP-AOC-1600 RMU-B switch On, FCP-AOC-1902	
07:40 07:45	Set IMU Selection ACC: IMU1 on Roll, IMU1 on Yaw, FCP-AOC-1050 FDE: IMU1-X on Roll, IMU1-Z on Yaw, FCP-AOC-1218	
	Allow IMU warm-up time	PID 01390078
08:33:12 08:34:12	Reset IAAD Accumulators, FCP-AOC-1210 Reset FCE RMU Integrators, FCP-AOC-1254 Perform IMU-1 Drift and Noise evaluation, FCP-AOC-0523 step 8	
08:33:12 to 08:58:40	24 minutes of data collection From TM: IMU1 Noise Roll = 0.1879 as/s IMU1 Drift Roll = 0.1756 as/s IMU1 Noise Yaw = 0.0479 as/s IMU1 Drift Yaw = 0.1299 as/s Calculated by FD: => 0.1761 as/s => 0.1147 as/s	Stable pointing: PID 01390079 Start of Slew 01390080: 08:58:40
09:07	Deselect IMU1 from ACC Word B, FCP-AOC-1050	
09:09	Deselect IMU1 from FDE, FCP-AOC-1218	
09:11:35	Switch Off IMU1, FCP-AOC-1601	
09:20 09:55:22	Re-enable ACC Autonomous IMU Switch Off, FCP-AOC-0526 RMU-B switch Off, FCP-AOC-1903	
Wait min. 2 hours for thermal stabilisation after IMU1 Switch Off		
11:45	Disable ACC Autonomous IMU Switch Off, FCP-AOC-1051	Step 2, IMU2
11:49:44	IMU2 Switch On, FCP-AOC-1602	
11:55 12:00	Set IMU Selection ACC: IMU2 on Roll, IMU2 on Yaw, FCP-AOC-1050 FDE: IMU2-X on Roll, IMU2-Z on Yaw, FCP-AOC-1218	
	Allow IMU warm-up time	PID 01390086
12:46:20	Reset IAAD Accumulators, FCP-AOC-1210 Perform IMU-2 Drift and Noise evaluation, FCP-AOC-1635 step 8	
12:46:20 to 13:13:04	26 minutes of data collection From TM: IMU2 Noise Roll = 0.1879 as/s IMU2 Drift Roll = 0.2582 as/s IMU2 Noise Yaw = 0.0560 as/s IMU2 Drift Yaw = 0.0724 as/s Calculated by FD: => 0.2512 as/s => 0.0702 as/s	Stable pointing: PID 01390087 Start of Slew 01390088: 13:13:04
13:24	Deselect IMU2 from ACC Word B, FCP-AOC-1050	
13:27	Deselect IMU2 from FDE, FCP-AOC-1218	
13:31:22	Switch Off IMU2, FCP-AOC-1603	
13:37	Re-enable ACC Autonomous IMU Switch Off, FCP-AOC-0526	

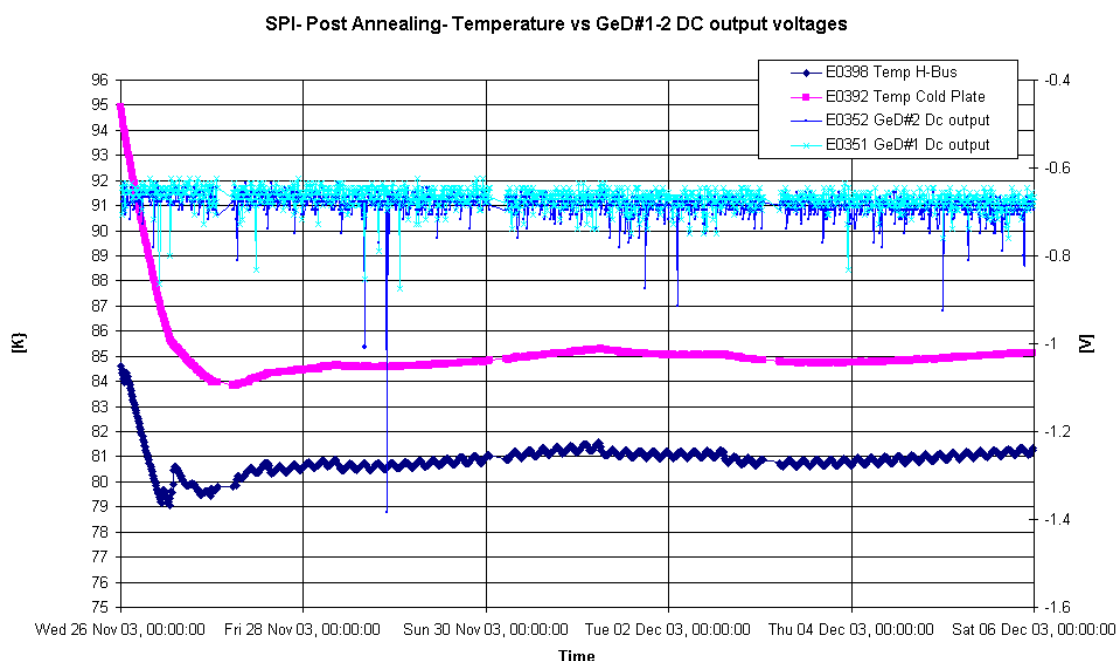
Close Loop Slew performed with default parameters: After Close Loop Slew 01390083, the FDS did not generate the update for Close Loop Slew 01390084. The default slew parameters were however the correct ones. The problem was caused when the Timeline for revolution 139 was manually modified to insert the slews and Reaction Wheel Bias Manoeuvres for the Thruster calibration. Apparently this had caused duplicate job IDs in the FDS and resulted in the stopping of generation of jobs after the job for slew 01390083. The missing jobs were then generated and the next updates were performed nominally. Flight Dynamics is looking into the possibility of putting an automatic check in place to verify the generated jobs against the expected ones.

8.3.2 SPI Operations

Cryocooler:

After the completion of the planned annealing cycle and the subsequent cryocooler start-up in the previous weeks, the observation period was characterized by the fine tuning of the detectors camera temperature.

In this phase the cryocooler was commanded to maintain 85 K within a band of ± 0.9 K. The plot below summarizes the information on the Cold Plate Temperatures and the DC output voltages for GeD # 1 and #2. The estimated Cold Plate temperature drift was ~ 0.24 K/day at the end of the observation period.



The commanded strokes are summarized as follows:

On DoY 335, at 05.59 the SPI compressor strokes for the CDE1: the sections A+B were set to the value 36

On DoY 336, at 14.26 the SPI compressor stroke for the CDE2: the sections C+D were set to the value 36

IASW/DPE:

IASW release 4.3.0

On DoY 334, at 07.30 many occurrences of the following two OEMs, just after the Belts exit were reported:

OEM APID 1024 ID 4 Class 2 <<SPI1 CSSW INT ER BUF OVER >>

OEM APID 1024 ID 3 Class 3 <<SPI1 TC REP TC SBFULL >>

This OEM s are generated from the CSSW, and are flagging a condition of internal buffer overrun with rejection of the last report TC due to sub-buffer full. Apparently the reason lay in the ED EEORTM01 forcing the update of SPI TM parameters by commanding reports after Belts Exit.

2003-11-30T07:30:03Z ED EEORTM01 /* SPI OR Telemetry Reporting (EEORTM01)

The condition was autonomously cleared by the SW, and no further action was taken.

On DoY 337 at 07.22 many occurrences of the following OEMs, just after the Belts exit were reported:

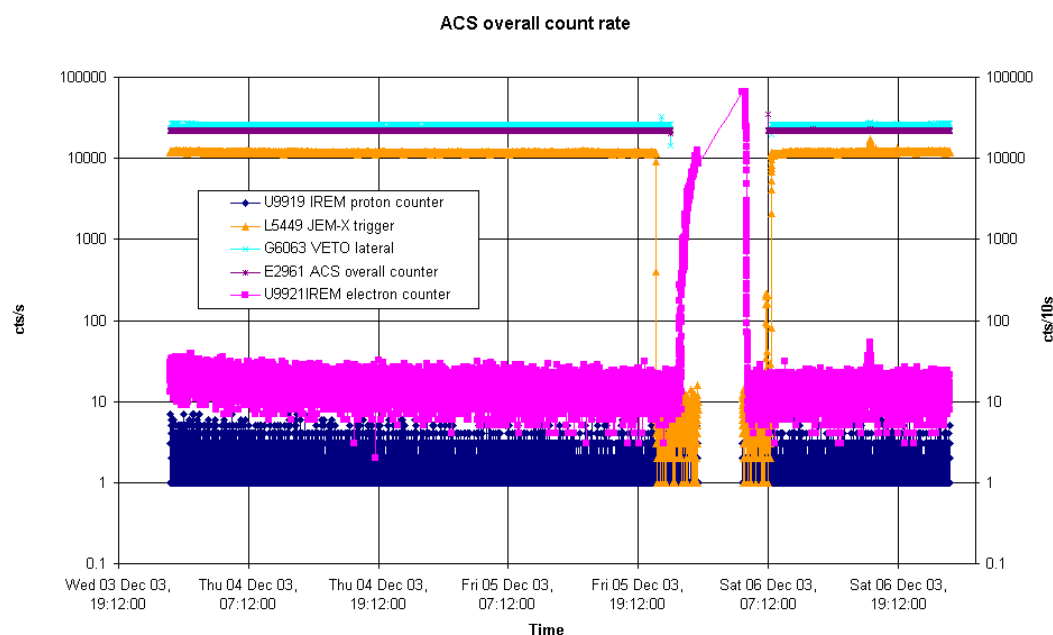
OEM APID 1024 ID 4 Class 1<<SPI1 CSSW INT ER BUF OVER>>

This OEM s is generated from the CSSW, and flags a condition of internal buffer overrun. The reason was, as for the event on DoY 334, due to the forced on-board reporting. The condition was autonomously cleared by the SW, and no further action was taken.

ACS:

On DoY 337 at 07.25 the parameter E1293 (S AS OBT STL) reported OOL for few TM cycles: this parameter flags the OBT synchronization loss 0 when the ACS Gamma Start Time cmd is received 134 minutes after last ACS Gamma Start Time cmd. No further action was taken.

The following plot shows the ACS overall count rate evolution until the end of the observation period:



AFEE:

Nothing to report

DFEE:

Nothing to report

PSD:

On DoY 337 at 16.27Z the TM_parameter P2016 (LCL CUR PSD A) reported OOL Soft High (=0.441 A) for few TM cycles. No further action was taken.

8.3.3 IBIS Operations

On DoY 333, at 20:06Z the CCCF was enabled, following the OR-109, to fix a problem with the downloading of IBIS Histograms: the problem apparently was generated by a station handover at 17:54Z. Investigations are on-going at ESOC.

At 22:20Z the VETO parameters G6062 and G6063 in SOFT HIGH limit were reported, 10 minutes before the expected Critical Altitude Descending (22:30Z). No action was taken apart monitoring the evolution of the parameters.

8.3.4 JEM-X Operations

2003-11-29, DOY 333, Rev 137

Nothing to report

2003-11-30, DOY 334, Rev 137-138

Nothing to report

2003-12-01, DOY 335, Rev 138

Nothing to report

2003-12-02, DOY 336, Rev 138

At 15:24Z the following radiation monitoring parameters from IREM went Out of Limits:

K5317 RAD MONITOR 3 (Electron Counter), value = 66

L5317 RAD MONITOR 3 (Electron Counter), value = 66,

causing JEM-X2 to transition to Safe mode autonomously at this time (issuing OEM 231 JEM-X2 AUTO EVENT 1).

At 15:39Z commanding to JEM-X2 from the Timeline was disabled and JEM-X2 remained in Safe mode for the rest of this day.

At 22:29Z commanding to JEM-X2 from the Timeline was re-enabled (this was after the last command scheduled to JEM-X2 in the Timeline).

2003-12-03, DOY 337, Rev 138-139

The anode electronic calibration at the start of revolution 139 was performed at the scheduled time from the Timeline. However, the commands in the JEM-X2 high voltage activation and Data Taking EDs scheduled in the Timeline (between 07.32Z and 08.42Z) failed release as JEM-X2 was still in Safe mode due to high radiation.

At 10:09Z JEM-X2 performed an autonomous recovery to Setup mode (issuing OEM 233 JEM-X2 AUTO EVENT 3) after the IREM RMCR values had remained below the JEM-X2 thresholds for exiting from Safe mode for more than 10 minutes.

As the periodic Thruster Calibration was still ongoing at this point, the recovery of JEM-X2 was delayed until after completion of the Thruster Calibration.

At 13:43Z the procedure FCP_JEM2_1010 (JEM-X2 Configuration Setting for Science Ops) was executed. At 14:13Z JEM-X2 was then commanded back to Data Taking mode by the procedure FCP_JEM2_0044 (taking the observation parameters which had been scheduled for this observation in the Timeline from the first LEDATA01 ED).

Commanding to JEM-X2 by the automatic Timeline was then enabled at 14:20Z and JEM-X2 operations continued nominally.

2003-12-04, DOY 338, Rev 139

Nothing to report

2003-12-05, DOY 339, Rev 139

Nothing to report

8.3.5 OMC Operations

On DoY 333 at 22:30:24, OMC switched to SAFE as commanded from the automatic Timeline.

On DoY 334, at 16.15.29, 16.15.37, 17.19.13, and 17.19.21, commands were rejected, this was due to the problems with the links with Redu, and then with commands failing release from Sun122. Pointings 01380016 through to 01380028 were lost. Pointing 01380027 was indicated in the OEM log as having 'executed', but there were 81 CENT CYCLE OEMs afterwards.

On DoY 335, at 04:32, the following OEMs were received:

2003.335.04.32.49.645 2003.335.04.32.42.703

```
1792 Real Time Exception 7 OMC CONSTRAINT D
M9073=4, IASW TASK 4 M9079=1 M9080=7 M9076=33 M9067=20216
2003.335.04.32.49.694 2003.335.04.32.42.703
1792 Real Time Anomaly 5 OMC CSSW INT ER
FIX6=0 M9079=2 M9080=5 M9074=4 M9067=5531
```

This corresponds to just after the start of pointing 01380039, there appears to have been no further effect, and the pointing proceeded nominally.

On DoY 336, at 15:35, OMC went into SAFE mode due to high radiation. It was not switched back into science until 07:49, the following day, the impact was pointings 01380103 was cut short, and 01380104 till 01380114, which was the end of the revolution were lost.

On DoY 338, at 20:01, pointing 01390056 was lost due to ground station problems, the following one was manually executed at the nominal time.

On DoY 339, at 20:06, a manoeuvre was performed using default parameters, there appears to have been no effect on the subsequent pointing (01390084).

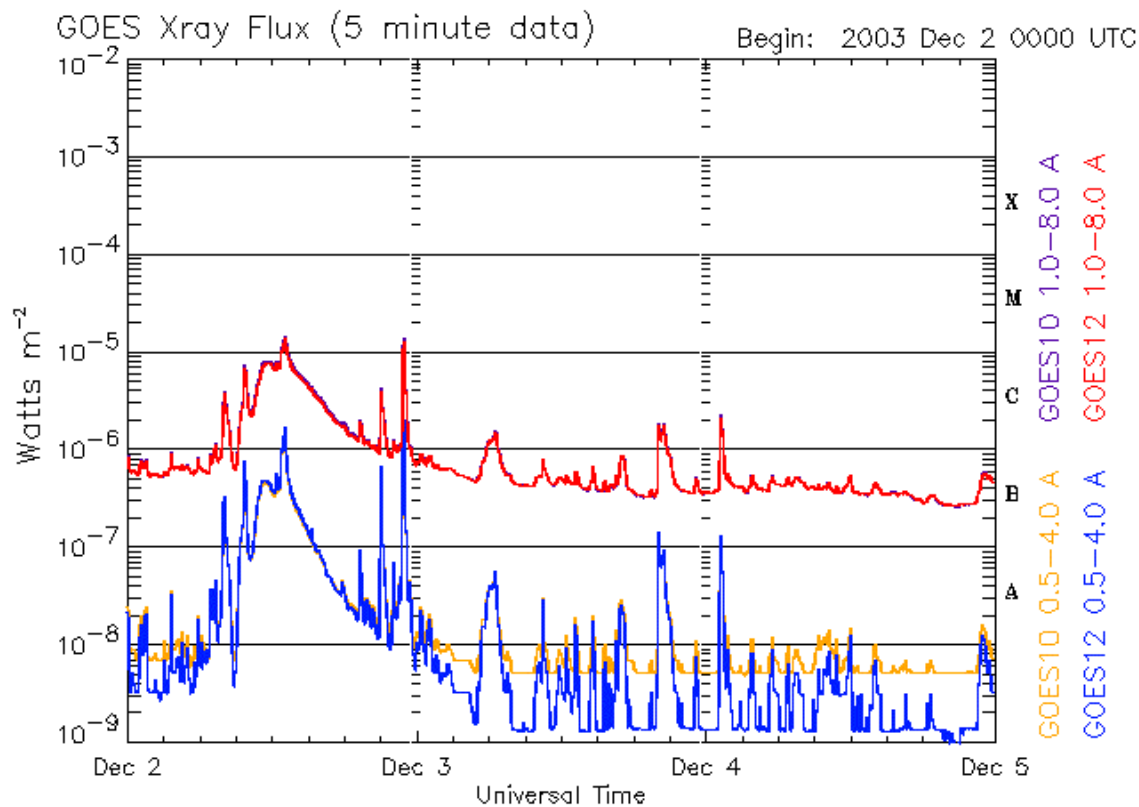
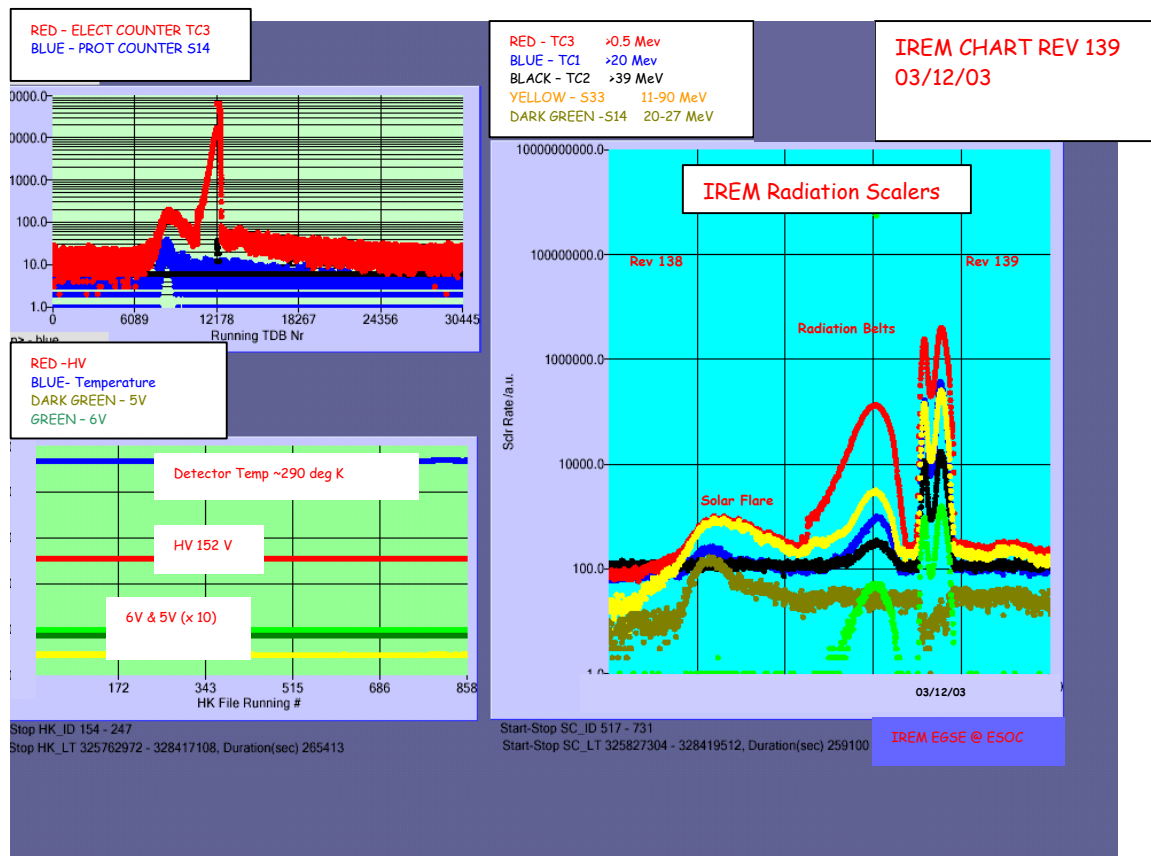
On DoY 339, at 22:13:03 OMC switched to SAFE as commanded from the automatic Timeline.

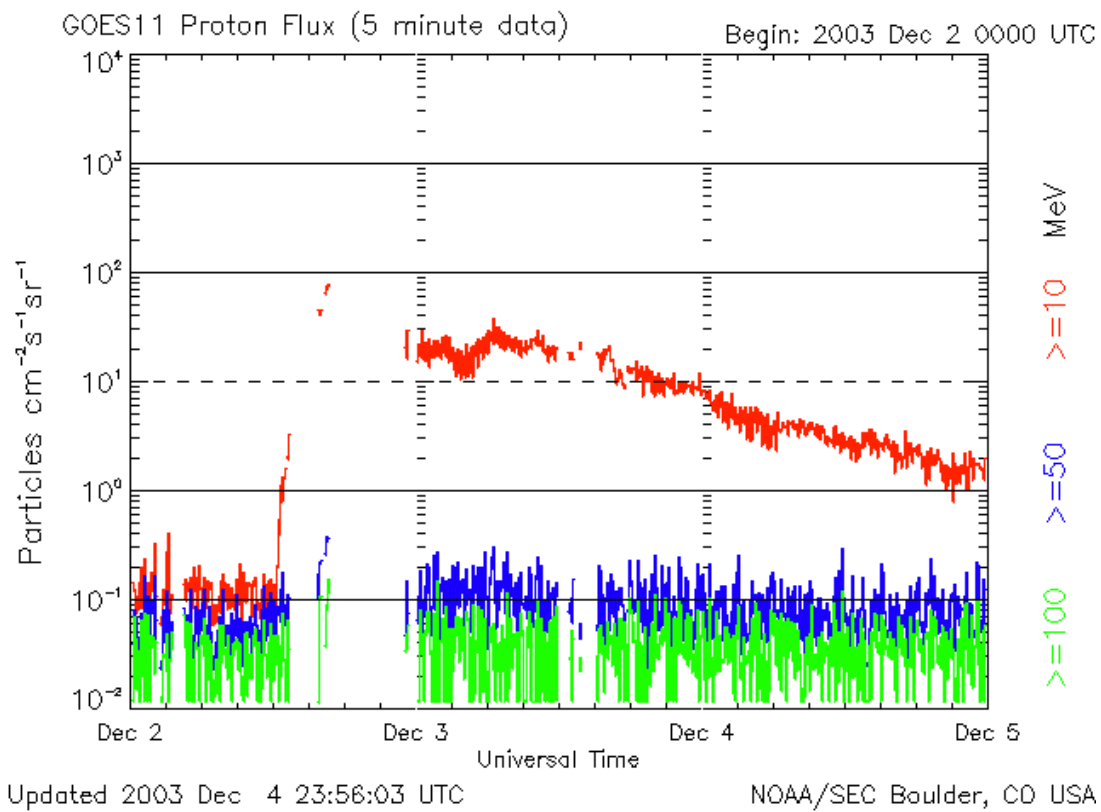
8.3.6 IREM Operations

On DoY 336, at the end of revolution 138 moderate proton and X-ray fluxes from the Sun were reported, as confirmed by the following NOAA/SEC warning:

SUMMARY: Proton Event 10MeV Integral Flux exceeded 10pfu
Begin Time: **2003 Dec 02 1505 UTC**
Maximum Time: 2003 Dec 02 1820 UTC
End Time: **2003 Dec 04 0000 UTC**
Maximum 10MeV Flux: 88 pfu

The plots of the IREM count-rates during the event (re 138) together with the GOES 11-12 X-ray and Proton fluxes, are shown below:





The evolution of the IREM counters from rev 136->140 are shown below. There is evidence of modification in the Radiation Belts structure, due to the solar activity

