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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 061
Week 47
24.11.03
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 15.11.03 until 21.11.03 (both dates inclusive) and covers the revolutions 133 & 134.

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 0716+714 (RA 07:21:53.45; DEC +71:20:36.4)¹, X1916-053 (RA 19:18:48.01; DEC -05:14:08.6), an OMC Flat Field target (RA 21:57:60.00; DEC -51:17:60.0), MR 2251-178 (RA 22:54:5.91; DEC -17:34:54.3) and GRS 1915+105 (RA 19:15:11.50; DEC +10:56:44.0). The planned activities consisted of staring as well as raster and hexagonal dithering observations. In addition, special instrument operations were performed, including SPI annealing and IASW update, OMC Flat Field and Dark Current Calibrations and a JEM-X2 calibration source engineering session.

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.

Five consecutive slews/pointings were lost during revolution 133, because the planned pass could not be supported by Goldstone, due to ground station problems. Also in the same revolution, three slews and a Reaction Wheel Bias were done manually. The problem started with the FDS failing to deliver the slew update to the IMCS due to a bug in a new piece of software. The effect was 26 minutes delay in achieving the

¹ amalgamated with observations of mkn3 and mkn6

attitude of PID 01330054. The delay however, was mostly caused by a mismatch between the settings in the FDS and an AOCS FOP procedure. The AOCS procedure was later updated with the latest recommendations.

The Guide Star was released twice at the beginning of revolution 133 caused by the high rate of SEUs on the STR. Also at the beginning of revolution 134, a surge in the proton flux caused the loss of Guide Star two times and prevented the STR to acquire any star for about 4 minutes.

In preparation for the lunar eclipse on 24/11/2003, an IMU-1/IMU-2 health-check and calibration was performed and the onboard AMD thresholds were set to their Eclipse Season values.

The fuel consumption over the period between 14/11/2003 and 21/11/2003 was 0.068Kg. The remaining propellant is in the order of 173.92 Kg on the 21st of November.

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 RF

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.

3.2 Payload

3.2.1 SPI

The overall status of the instrument is nominal.

During the reporting period, the 3rd annealing cycle of the SPI Germanium detectors was in progress according to the plans: the five days of annealing at 104degC was completed and followed by the passive cooling phase, at the end of which the cryo-cooler was successfully re-started.

A new software version of the DPE was successfully patched and preliminarily tested with hot detectors during the passive cooling phase.

The completion of the 3rd Ge detectors annealing is foreseen on 27th November.

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 VETO S/W update was performed successfully on 21/11/03 (see detailed part). The TM bandwidth assigned to IBIS was 164 pkts/8sec with some changing to 134 due to coincident SPI activities. For all the observation period the unit was in SCI Standard Mode. The unit detectors are progressively recovering the nominal count-rates after the high radiation event (see IBIS S1 plots in the detailed part).

The TM bandwidth has been fixed to 164 pkts/8sec in order to cope with the increased background, avoiding saturation of the bandwidth with consequent gap in the scientific data production.

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 16 packets/cycle during science observations, except for the period 2003-11-20T06:41:01Z to 2003-11-20T13:03:45Z (SPI IASW update), during which the TM allocation to JEM-X2 was 8 packets/cycle.

A JEM-X2 calibration source engineering session (OCR # 159) was performed from 2003-11-20T13:05:00Z to 2003-11-20T17:27:44Z (Pointing ID 01340011).

Due to high background radiation levels as reported by the IREM radiation monitor counters, JEM-X2 made one autonomous transition to Safe mode and therefore was not in its planned observation mode during the following time period:

- 2003-11-21T22:47Z to end of reporting period.

Note: Some more information concerning the JEM-X operations is provided in the Appendix.

3.2.4 OMC

The status of OMC is nominal.

During this period OMC operations were performed from the automatic Timeline, with the TM allocation to OMC of 5 packets/cycle during normal science operations.

A total of 51 images were captured during this period, with 5 missed due to a ground station mishap and 1 late pointing due to an AOCS problem.

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

3.2.5 IREM

The status of the unit is Nominal.

The observation period was characterized by the long tail (especially in revolution 134-135) of the exceptional solar activity that effected the Earth in the period end of October-beginning of November. Some peaks of activity and an increase of the background at the end of rev 134 were reported.

The major effect observed is the modification of the Radiation Belts in shape and population. The outer part (ions + electrons) was impacted by the solar wind on the geomagnetic field, while the inner part (protons) changed the typical slope (due to the peculiar INTEGRAL orbit).

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

4 Ground Facilities

The performance of the Operational ground facilities was in general good in the reporting period. The main problems were caused by anomalies related to the ground stations.

4.1 Mission Operations Centre

The performance of the MOC was good in the reporting period. There were only a few minor that did not impact the execution of the Timeline.

4.2 Ground Stations & Network

As mentioned above there were several problems related to the ground stations. A pass over the Goldstone was lost this week, due to an antenna problem. In addition the TM/TC links were impacted by Radio Frequency interferences that effected the data reception at Goldstone, and by some Reed-Solomon errors at Redu.

4.3 Science Ground Segment

4.3.1 ISOC

This report covers to end of week 47.

1. Mission planning

Short term PSF: Received up to rev. 140

Long term PSF: up to rev. 150

POS and POD generated: up to rev 140

TSF: Up to rev 136.

No replanning this week. Planning and strategy for the transition period to AO 2 and the time thereafter discussed and agreed with Project Scientist.

2. Observation status

ECS's for rev's 84 and 119 - 122 received. Missing on rev, 81. Corresponding OCS's generated and sent to ISDC. No extra time credited due to too much missing data.

3. ISOC science archive

No archive data received from ISDC. Preparation in VILSPA of final delivery of version 1. Delivery now planned no later than week 48.

4. System

The ISOC operational system continues to be very stable. The new ISOC system version 10 has undergone debugging and retesting this week. Slight delay in start of operational use has occurred. Forecast is the retesting is completed early next week.

5. Problems

none

6. AO 2 preparation

All TAC panels have now entered the results in the proposal data base. All PI's where there were changes to their proposals have been informed. Amalgamation is planned for next week. For this exercise the new ISOC system is planned to be used.

Updating of the proposal data base with the results of the TAC process has started. Output from two out of four panels entered. Once all panel results are entered amalgamation can be started.

4.3.2 ISDC

On 26/11/2003, the status of ISDC observation processing is:

- Latest Standard Analysis completed: observation 01202130004 (Galactic Center, Revolution 111-113) on 22/11/2003
- Latest products archived: observation 01200160003 (SGR1806-20, Revolution 108-110) on 17/11/2003
- Latest observation products sent to the observer : observation 01202130001 (Galactic Center, Revolution 104-107) on 19/11/2003

5 Special Events

Nothing to report

6 Anomalies

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

On DoY 319, from 01:07 to 01:09, TLM from DSS-16 was lost due to RFI. The corresponding DR# is G103689, no impact.

On DoY 320, at 02:57, there was a brief drop in TLM from Redu, coupled with Reed-Solomon alarms, no impact.

Also on DoY 320, starting at the beginning of the scheduled DSS-16 pass at 20:50, TLM could not be acquired, until the end of the Redu pass at 22:14, contact was maintained, but there was no further TLM or TC until the start of the Redu pass at 02:01 on the following day, the corresponding DR# is G103690. The impact was pointings 01330039 through to 01330043 were all lost.

On DoY 321, from 04:22 to 05:02 there were Repeated Reed-Solomon errors from Redu, no impact.

On DoY 323, at 04:51, there were errors sending data to the ISDS, the data was finally flowing again at 05:50, when the link to ISDC was restored.

On DoY 323, at 21:09, there was a late handover from Redu to DSS-16. The TCP was rebooted, and at 21:26, the TC link was complete.

On DoY 325, at 05:36 it was observed the Retrieval HFA EV task was not running on IMCA, this was restarted, later at 05:45, the same was observed on IMCB, and also restarted.

At 08:06, the HFA retrieval task died on the IMCA, this caused all the clients to disconnect. The task was immediately restarted, later at 08:25, 08:26, & 08:38, the same task was restarted on IMCB & IDDB, IDDA, & IMCA respectively.

8.1 Overview of Revolutions

Revolution 133

The first observation in revolution 133 was a raster dithering observation of 0716+714 (RA 07:21:53.45; DEC +71:20:36.4), amalgamated with observations of mkn3 (RA 06:15:36.30; DEC +71:02:15.1) and mkn6 (RA 06:52:12.25; DEC +74:25:37.5), which was performed for ~47 hours. This was followed by a staring observation of X1916-053 (RA 19:18:48.01; DEC -05:14:08.6), performed for the remaining ~11 hours of observation time.

Throughout these observations, SPI was in Configuration mode and was undergoing annealing, JEM-X1 remained in Safe mode and IBIS, JEM-X2 and OMC were in their nominal science modes. The TM allocation was 164 IBIS, 5 SPI, 1 JEM-X1, 16 JEM-X2, 5 OMC.

Revolution 134

The observations in revolution 134 were as follows:

- Staring observation of X1916-053 (RA 19:18:48.01; DEC -05:14:08.6) lasting ~51 hours. For the first 46 hours of this observation the TM allocation was 164 IBIS, 5 SPI, 1 JEM-X1, 16 JEM-X2, 5 OMC. For the last 5 hours of this observation, during which time an update of the SPI IASW was performed, the TM allocation was 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC.
- Staring observation at the OMC Flat Field target (RA 21:57:60.00; DEC -51:17:60.0) lasting 4.5 hours. During this time, OMC Flat Field and Dark Current Calibrations were performed. In addition, JEM-X2 was in Data Taking with a special configuration as described in OCR# 159. The TM allocation was 164 IBIS, 5 SPI, 1 JEM-X1, 16 JEM-X2, 60 OMC.
- Staring observation of MR 2251-178 (RA 22:54:5.91; DEC -17:34:54.3) for the remaining 5 hours of observation time. During this observation the TM allocation was 164 IBIS, 5 SPI, 1 JEM-X1, 16 JEM-X2, 5 OMC.

Throughout these observations, SPI was undergoing passive cooling and was in Configuration mode for most of the revolution (i.e. except when undergoing tests related to the IASW update). IBIS was in Standard mode throughout these observations. JEM-X2 and OMC were in their nominal science modes except where stated above (during the OMC Flat Field observation). JEM-X1 remained in Safe mode throughout this revolution.

Revolution 135

The observations in revolution 135 consisted of a staring observation of MR 2251-178 (RA 22:54:5.91; DEC -17:34:54.3) lasting ~30.5 hours, followed by a hexagonal dithering observation of GRS 1915+105 (RA 19:15:11.50; DEC +10:56:44.0), performed for the remaining ~30 hours of observation time.

Throughout these observations, SPI was in Configuration mode and was undergoing active cooling, JEM-X1 remained in Safe mode and IBIS, JEM-X2 and OMC were in

their nominal science modes. The TM allocation was 164 IBIS, 5 SPI, 1 JEM-X1, 16 JEM-X2, 5 OMC.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

The latest entries in the history file for INTEGRAL

2003-10-28T00:33:29.000Z	174.2498	F	Automatic TM processing.
2003-10-28T07:18:18.000Z	174.2291	F	Automatic TM processing.
2003-10-30T12:46:07.000Z	174.1999	F	Automatic TM processing.
2003-11-01T09:50:52.000Z	174.1850	F	Automatic TM processing.
2003-11-01T12:04:12.000Z	174.1420	F	Automatic TM processing.
2003-11-03T06:55:38.000Z	174.1230	F	Automatic TM processing.
2003-11-05T22:11:12.000Z	174.1048	F	Automatic TM processing.
2003-11-06T06:48:01.000Z	174.0819	F	Automatic TM processing.
2003-11-07T17:22:21.000Z	174.0727	F	Automatic TM processing.
2003-11-09T06:46:41.000Z	174.0543	F	Automatic TM processing.
2003-11-10T08:38:27.000Z	174.0111	F	Automatic TM processing.
2003-11-12T06:40:00.000Z	173.9877	F	Automatic TM processing.
2003-11-15T06:31:20.000Z	173.9656	F	Automatic TM processing.
2003-11-18T06:20:23.000Z	173.9400	F	Automatic TM processing.
2003-11-21T06:23:51.000Z	173.9197	F	Automatic TM processing.

This report was generated Fri Nov 21 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, 22 Open Loop Slews, 51 Closed Loop Slews and 4 Momentum Bias were executed. 8 slews were missed or executed manually. This is equivalent to about 10%. The main reason for the high number of lost slews is the loss of a complete Goldstone pass.

15/11/03 (Day of Year 319, Revolution 132-133)

Guide Star released by the STR SEU Filter of the ACC: At 05:56:33, the Guide Star with CCD coordinates (-3920, 8969) and magnitude 7.45 was released by the STR SEU Filter of the ACC when the number of detected False Events exceeded the filter threshold. IMU-1 was switched on by the ACC for control on the Yaw axis and an automatic mapping was performed. The same star was selected again as the Guide Star during this mapping. At 06:06:33, after being on for 10 minutes and not being used for control, IMU-1 was switched off by the ACC. Three seconds later, at

06:06:36, the Guide Star was released once more by the SEU Filter: this time the False Event – (-4025, 8859) 6.95Mi – was taken as the Guide star in one cycle, during the next cycle the real Guide Star was detected as False Event, on which the Star Status latched, finally the SEU Filter threshold was exceeded and the Guide was released. IMU-1 was switched on again and a mapping was commanded during which a new star was picked: (-9636, -7590) 6.25 Mi. The altitude was around 16000 km. The event had no impact on science observations.

Failure of IMU Self Test on Gyro Sensor and Electronics Temperatures during Switch-On of IMU1 by the ACC: In the above mentioned sequence of events, The first IMU1 switch-on was completely nominal and all the Monitoring Functions, reflected in the Long and Short Status Words were as expected. However, during the second switch-on, which happened 3 seconds after IMU power-off, the monitoring checks reported “INVALID [1]” on the status of the built-in tests performed on the temperatures of IMU1 Head and Electronics. Consequently, the Composite Initial Status (status of the Start-Up Test) of the Short Status Word also reported “INVALID [1]”. The actual values of the temperatures from TM were nominal, within the operating range: Gyro Sensor temperature was 55.67 °C and the Electronics temperature was 19.26 °C (see ARTS entry INT-SC-0069). The matter was discussed through ALENIA Spazio with the IMU provider, SAGEM SA. MOC was later informed that the reason for the failure was that the gyro sensor temperature at start-up was above the +55 °C threshold for the starting phase. Apparently, if at start-up the gyro sensor temperature is at its operating level, the start-up test on this temperature reports INVALID (bit D5 of the composite_temp_status is set to 1) and as a consequence the status of the Start-Up test also reports INVALID (bit D0 of the composite_init_status is set to 1).

16/11/03 (Day of Year 320, Revolution 133)

Slews lost due to Ground Station problem (Goldstone, DSS-16): Goldstone DSS-16 could not support the INTEGRAL pass (20:53 to 02:35) due to a TCP failure and then a configuration problem (see ARTS entry INT-2514). The result was that slews/pointings 01330039 to and including 01330043 were missed. After start of REDU coverage at 20:53, manual slew was performed to the attitude of pointing 01330044. This attitude was reached at 02:58:26. Pointing 01330044 was therefore not affected by the event.

17/11/03 (Day of Year 321, Revolution 133)

Delay in achieving the attitude of PID 01330054: Due to a problem in the Flight Dynamics System, the file for updating the parameters of Open-Loop slew 01330051 was not delivered to the IMCS and the slew was performed with its default values. This was the first slew in the set of manoeuvres to move to the starting attitude of Exposure 01330005. AOCS commanding from the Timeline was then disabled and the manual recovery was started by the FD on-call support by manually performing Close-Loop slew 01330052. A Reaction Wheel Bias was required at this stage. The TPF to perform it was provided by FD but its uplink was prevented because the Guide Star position was violating the RWB requirements according to the respective AOCS FOP procedure. It became clear then that the requirements were relaxed in the FD

system based on the recommendations of Technical Note INT-TN-ASU-PL-004, Iss. 1.0, dated 03/12/2002. These recommendations were however not implemented in the FOP procedure. This mismatch and the discussions caused more delay in the recovery operations. Finally the RWB was performed and the attitude of pointing 01330054 was achieved at 11:46:06 by an Open-Loop slew and a corrective Close-Loop slew. The effect was that the Staring observation started with a delay of about 26 minutes. The AOCS FOP procedure for RWB was then updated with the recommendations of the TN, to match the settings in the FDS.

Health Check performed on IMU-1: After the IMU-1 anomaly on DoY 319, it was decided to switch-on the unit and to perform a health check on it. Starting at 17:30, the IMU health check was performed on IMU1 by:

Switching on IMU1

Selecting IMU1 Roll and Yaw channels in ACC Word B

Performing a status check and allowing 20 minutes for warm-up

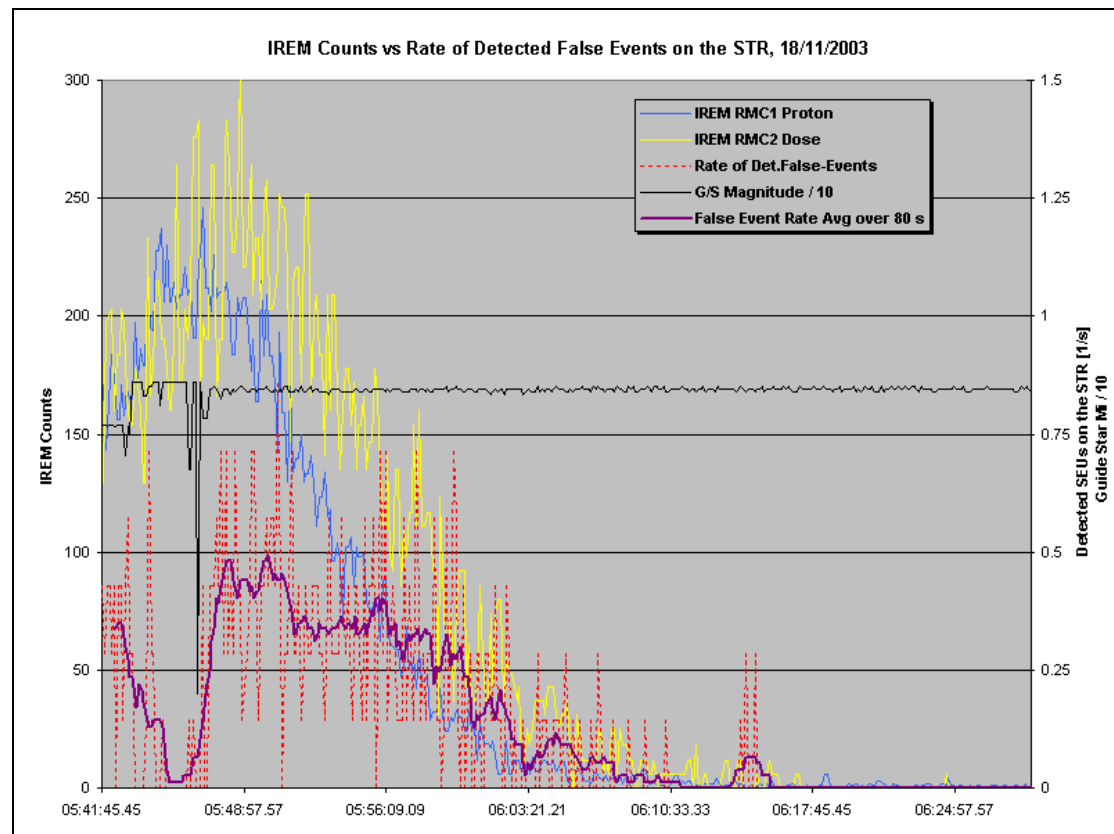
Performing a Noise and Drift evaluation on both IMU channels

Deselecting IMU1 from ACC and switching it off

All the monitoring checks at start-up and during the health-check were nominal this time and the noise and drift values were well within the limits. IMU-1 was on for 2360 seconds from this health check.

18/11/03 (Day of Year 322, Revolution 133-134)

Loss of Guide Star due to sudden rise in proton flux: Around the first AOS of revolution 134, a sudden surge in the proton flux caused problems on the STR. At 05:37:25 the STR SEU Filter released the Guide star when the filter threshold was exceeded by the number of detected False Events. At LOS, this 7.65 Mi star was located at CCD (17682, 10274). The STR then acquired another star: (8553, 3947), 7.7 Mi. This star was released again at 05:43:15. From this time until 05:47:13 the STR was not able to lock on any star due to the high rate of SEUs. In the time span between 05:37:25 to 05:47:13, the SEU Filter threshold was exceeded 12 times. The following plot shows the RMC 1 and 2 from IREM versus the rate of detected False Events on the STR during this period. The detected False Event rate is based on the number of reported False Events in 16 ACC cycles (8 seconds). The Average rate is the average False Event rate over approximately 80 seconds.



At the end, the STR picked another star with magnitude 8.45 located at CCD (8073, 7459). The altitude was about 14700 km.

19/11/03 (Day of Year 323, Revolution 134)

IMU-1/IMU-2 Health-Check and Calibration: In preparation of the upcoming lunar eclipse, a health check and calibration was performed on IMU-1 and IMU-2:

Time z	IMU1 and IMU2 Health-Check and Calibration performed on 19/11/2003 (DoY 323), Prior to the Lunar Eclipse on 24/11/2003	
10:51	Disable ACC Autonomous IMU Switch Off	Step 1, IMU1
11:04:17	IMU1 Switch On	
11:17:40	Set IMU Selection	
11:23:34	ACC: IMU1 on Roll, IMU1 on Yaw FDE: IMU1-X on Roll, IMU1-Z on Yaw	
	Allow warm-up time	
11:50:02	Reset IAAD Accumulators	
11:50:02 to 12:32:45	40 minutes of data collection From TM: IMU1 Noise Roll = 0.1795 as/s IMU1 Drift Roll = 0.1375 as/s IMU1 Noise Yaw = 0.0638 as/s IMU1 Drift Yaw = 0.1550 as/s	Calculated by FD => 0.1360 as/s => 0.1479 as/s
12:32:45	Deselect IMU1 from ACC Word B	Stable pointing
12:36:10	Deselect IMU1 from FDE	
12:41:59	Switch Off IMU1	
12:45	Re-enable ACC Autonomous IMU Switch Off	

	Wait 2 hours for thermal stabilisation after IMU1 Switch Off	
14:42	Disable ACC Autonomous IMU Switch Off	Step 2, IMU2
15:06:54	IMU2 Switch On	
15:13:29 15:17:06	Set IMU Selection ACC: IMU2 on Roll, IMU2 on Yaw FDE: IMU2-X on Roll, IMU2-Z on Yaw	
	Allow warm-up time	
15:36:40	Reset IAAD Accumulators	
15:36:40 to 16:04:30	28 minutes of data collection From TM: IMU2 Noise Roll = 0.2036 as/s IMU2 Drift Roll = 0.2452 as/s IMU2 Noise Yaw = 0.0426 as/s IMU2 Drift Yaw = -0.0383 as/s	Calculated by FD => 0.2198 as/s => -0.0348 as/s Stable pointing
16:04:30	Deselect IMU2 from ACC Word B	
16:08:08	Deselect IMU2 from FDE	
16:11:35	Switch Off IMU2	
16:15	Re-enable ACC Autonomous IMU Switch Off	

Since the Drift and Noise levels were low, the ACC drift values were not updated. Another IMU calibration will anyhow be performed prior to the upcoming winter eclipse season.

20/11/03 (Day of Year 324, Revolution 134)

Nothing to report.

21/11/03 (Day of Year 325, Revolution 134-135)

Setting of AMD Thresholds to their Eclipse Season values: In preparation for the upcoming lunar eclipse, the AMD thresholds were set to their eclipse season values:

Thresholds from INT-MA-AI-0001, 5.3.2.4.2.2, and INT-PR-MMB-0005 page 5-9, modified as per new AMD Threshold agreement for the eclipse season.							
Wheel Inertia:							
RW#1:	0.096	Kgm**2					
RW#2:	0.09768	Kgm**2					
RW#3:	0.09729	Kgm**2					
RW#4:	0.09763	Kgm**2					
Eclipse Season:							
	Subset 1		Subset 2				
WSMAX	39.5	Nms	35.9	Nms			
WSMIN	1.2	Nms	4.8	Nms			
WSMAX	To Uplink:				In rpm:		
	X1		X2		X1	X2	
RW#1:	411.4583	rd/s	373.9583	rd/s	3929	3571	
RW#2:	404.3817	rd/s	367.5266	rd/s	3862	3510	
RW#3:	406.0027	rd/s	368.9999	rd/s	3877	3524	
RW#4:	404.5888	rd/s	367.7148	rd/s	3864	3511	

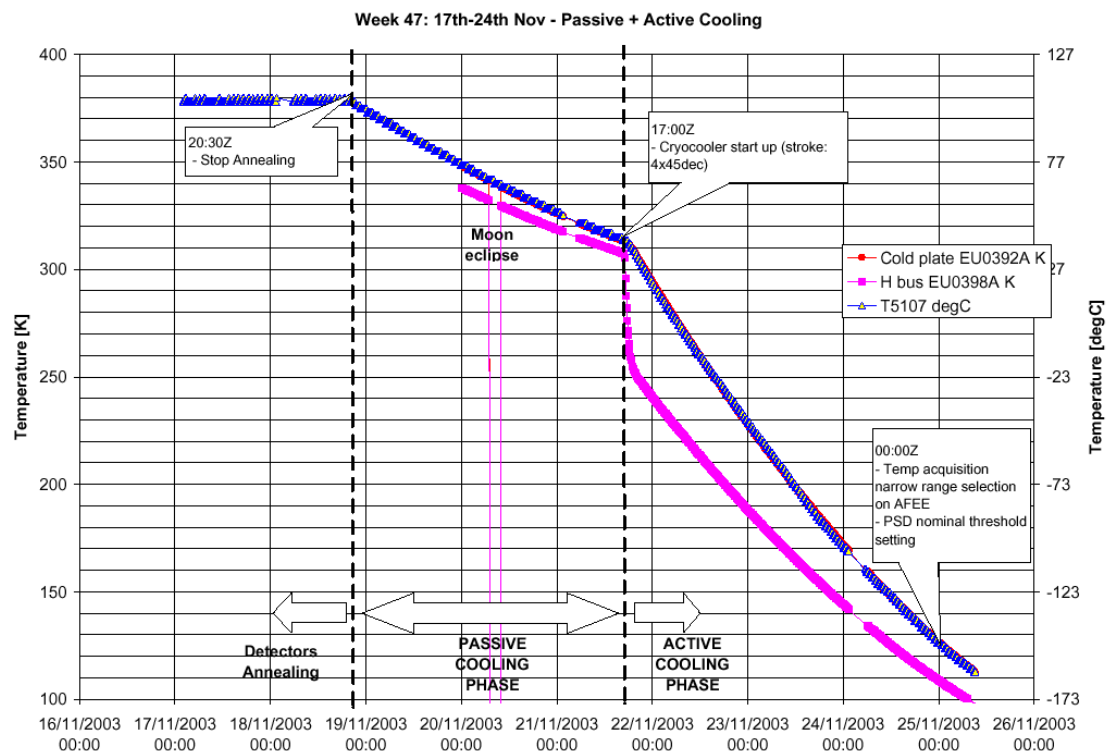
WSMIN	To Uplink:				In rpm:	
	X1		X2		X1	X2
RW#1:	12.5	rd/s	50	rd/s	119	477
RW#2:	12.28501	rd/s	49.14005	rd/s	117	469
RW#3:	12.33426	rd/s	49.33703	rd/s	118	471
RW#4:	12.2913	rd/s	49.16522	rd/s	117	469

8.3.2 SPI Operations

Cryocooler / GeD cold-plate:

During the reporting period, the cold plate temperature was maintained at 104degC up to the completion of the planned 126hrs annealing duration. The passive cooling phase was then started, followed by the active cooling one at the succesful re-start of the cryocooler. The achievement of 85K is foreseen on 26th November.

The major events are summarized in the following plot.



IASW/DPE:

During the passive cooling phase, on 20th November, a new release of the DPE software (IASW release nr. 4.3.0) was successfully patched on-board the DPE memory and the instrument re-started.

A series of tests were also successfully performed to preliminary validate the patch and the on-ground TM/TC database and procedures. The actual in-flight validation of the new features introduced by the IASW 4.3.0 is scheduled by next week.

During the radiation belts passage between revolution 135 and 136, where the moon eclipse was expected, a new event designator (ED) was used, to configure SPI in

photon mode inside the belts, to downlink the science housekeeping telemetry. This additional telemetry allows an earlier assessment of the subassembly health after the reactivation post eclipse.

ACS:

The ACS High Voltage power supplies were switched off at the annealing start-up. It was again switched on after the moon eclipse, at the exit of the radiation belts of rev.136.

During the moon eclipse, in order to be sure that the ACS was switched off, time tag commands were used to switch off the PDU LCLs supplying power to ACS.

AFEE:

The detector High Voltage power supplies were switched off at the annealing start-up. During the moon eclipse, in order to be sure that the AFEE was switched off, time tag commands were used to switch off the PDU LCLs supplying power to AFEE.

DFEE:

During the moon eclipse, in order to be sure that the DFEE was switched off, time tag commands were used to switch off the PDU LCLs supplying power to DFEE.

PSD:

At annealing start-up, the event trigger threshold was increased to avoid the potential crash of the PSD computer due to the higher number of noise triggers when the detector temperature is heated up for annealing.

The threshold will be then reset to the nominal value when the cold-plate reaches 127K.

8.3.3 IBIS Operations

On DoY 319 (15/11/03), there were a few reports during the Belt passage of the OEM APID 1280 ID 167 Class 2 <<IBIS1 PICsIT NOISY SEMIMODULE SIGNALLING>> due to the PICsIT detectors being ON without the VETO anticoincidence system, as it required by PIs.

At 08:12, the TM para G2071 was reported OOL (SCC). The parameter flagged an overflow of the noisy pixel address in MDU5. The parameter went back in limits in the following TM cycle therefore no further action was taken.

At 13:16, the OEM ID 180 Class 2 <<IBIS1 VETO COUNTER LATERAL EXCEEDS ALERT VALUE>> was reported. The relevant TM_para G6063 showed values inside limits after few TM cycles and therefore the problem was disregarded, as suggested by the nominal reaction to this OEM.

On DoY 321 (17/11/03), at 22.36, the VETO lateral and Bottom counter reported OOLs. The relevant TM_paras G6062-63 showed values inside limits after few TM cycles and therefore no further action was taken.

The alarm coincided with the approach of the Radiation Belts.

At 22:50, the automatic transition of IBIS to Stand-By due to the on-board radiation automatism triggered by IREM counters. The Nominal radiation Belts entry was expected at 23:12 as reported in the BCPKT.

On DoY 322 (18/11/03), there were a few reported during the Belt passage of the OEM APID 1280 ID 167 Class 2 <<IBIS1 PICsIT NOISY SEMIMODULE SIGNALLING>> due to the PICsIT detectors being ON without the VETO anticoincidence system, as it required by PIs.

At 20:12, the OEM ID 180 Class 2 <<IBIS1 VETO COUNTER LATERAL EXCEEDS ALERT VALUE>> was reported. The relevant TM_para G6063 showed values inside limits after few TM cycles and therefore the problem was disregarded, as suggested by the nominal reaction to this OEM.

On DoY 323 (19/11/03), at 03:03, the OEM ID 180 Class 2 <<IBIS1 VETO COUNTER LATERAL EXCEEDS ALERT VALUE>> was reported. The relevant TM_para G6063 showed values inside limits after few TM cycles and therefore the problem was disregarded, as suggested by the nominal reaction to this OEM.

On DoY 324 (20/11/03), at 12:52, 15:25, & 16:54 the OEM ID 183 Class 2 <<IBIS1 VETO +5V VOLTAGE OUT OF RANGE>> was reported. The relevant TM_para G6106 showed values inside limits and therefore the problem was disregarded, as suggested by the nominal reaction to this OEM (FDIR doc). This problem was fixed with the VETO S/W patch.

On DoY 325 (21/11/03) during the Belt passage, there were a few reported of the OEM APID 1280 ID 167 Class 2 <<IBIS1 PICsIT NOISY SEMIMODULE SIGNALLING>> due to the PICsIT detectors being ON without the VETO anticoincidence system, as it required by PIs.

At 06:31 the VETO VECU1 S/W patch was performed by executing OR-111. The activity was completed, as planned, below radiation belts with no impact on the scientific observation. The selected time window for the patch uplink and comparison started at the opening of the SATENG window (just after the completion of ISGRI CTX uplink)

2003-11-21T06:31 SATENG_OPEN

and terminated before setting the VETO High Voltages ON (ED GEBEXT)
(after Belts Exit)

2003-11-21T08:10

The reference image used for the patch was "IIMG_B_VET_1281_49856_F_V_003_001_0.INT", as provided by IBIS PI.

The unit was under monitoring until the end of rev 135. It is expected that there will be no more occurrences of "anomalous" OEM generation, see details below:

OEM ID 183 Class 2 <<IBIS1 VETO +5V VOLTAGE OUT OF RANGE>>

OEM ID 184 Class 2 <<IBIS1 VETO +28V VDM/CDM VOLTAGE OUT OF RANGE>>

OEM ID 180 Class 2 <<IBIS1 VETO COUNTER LATERAL EXCEEDS ALERT VALUE>>

OEM ID 179 Class 2 <<IBIS1 VETO COUNTER BOTTOM EXCEEDS ALERT VALUE>>

Performed at 15:14 the IBIS configuration for the incoming Lunar Eclipse by executing the OR-112.

The IBIS Instrument was commanded manually into its eclipse configuration before the earliest possible time for the ECL(s/e) transition. The IBIS Eclipse configuration was reached by executing the command sequence GC0060, built of commands identical to the part of the PPDU ECL(s/e) PROM sequences applicable to the unit and relevant Heaters.

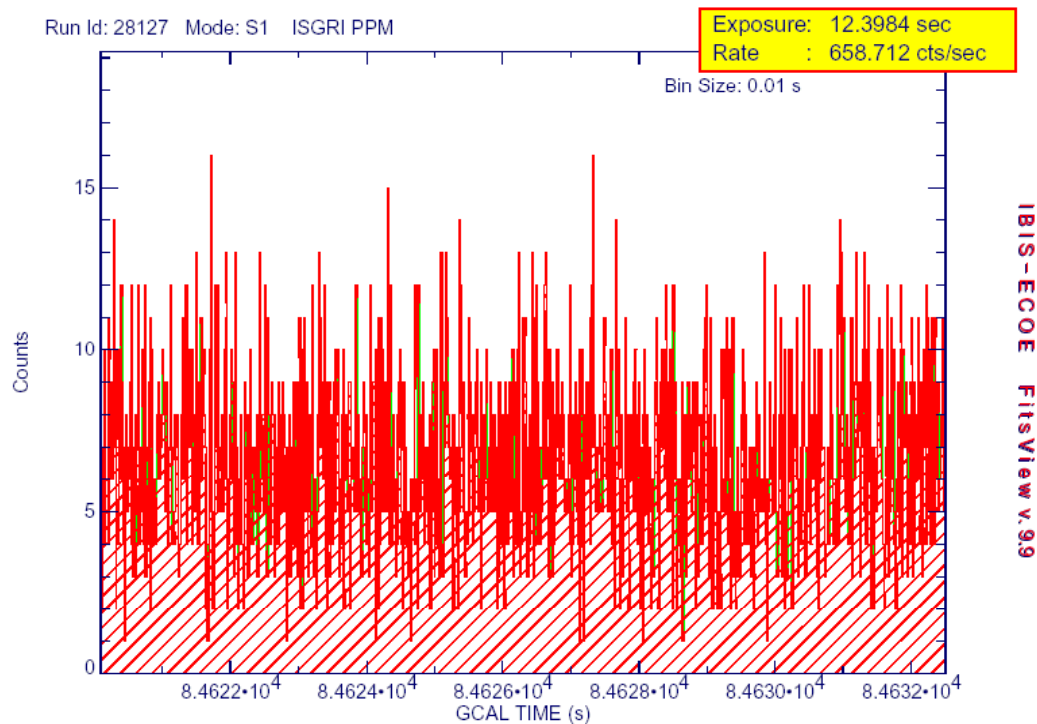
The time-tagged commands to place IBIS in its eclipse configuration were executed at 2003-11-24T03.05.

The IBIS Instrument was commanded manually into its sunlight configuration after the latest possible time for the ECL(e/s) transition. The IBIS Post-Eclipse configuration was reached by executing the sequence GC0062, built of commands identical to the part of the PPDU ECL(s/e) PROM sequence applicable to the relevant Heaters.

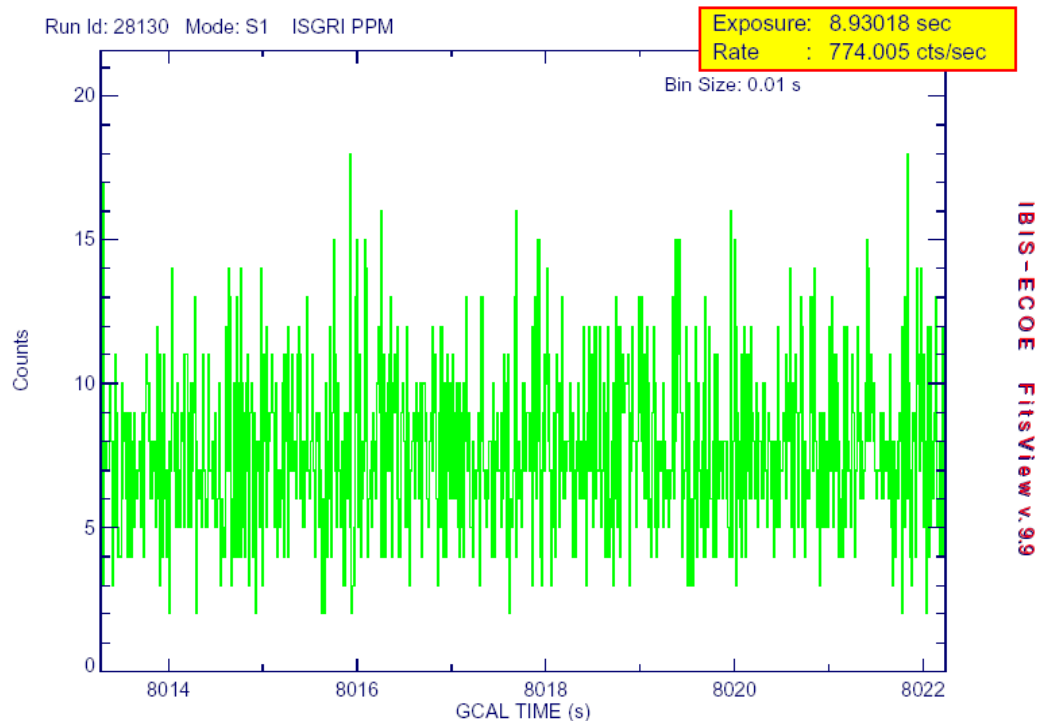
The time-tagged commands to place IBIS in its post-eclipse configuration must be executed at 2003-11-24T03:22.

The recovery of the IBIS detector performance is progressing, the evolution of the IBIS/ISGRI count-rates (S1), as recorded by the IBIS ECOE at ESOC, for the observation period, is shown below:

/data/archive/erdf/science/2812/moc28127_031119_091830_S1_.fits



/data/archive/erdf/science/2813/moc28130_031120_084037_S1_.fits



8.3.4 JEM-X Operations

2003-11-15, DOY 319, Rev 132-133

Nothing to report

2003-11-16, DOY 320, Rev 133

Due to the loss of a Goldstone pass, the Timeline was stopped at 21:54Z and LOS_TM occurred at 22:14Z. JEM-X2 went into the ground station outage period in Data Taking mode.

2003-11-17, DOY 321, Rev 133

AOS_TM occurred at 02:02Z, with JEM-X2 coming out of the ground station outage period in a nominal status and still in Data Taking mode. The Timeline was restarted at 02:43Z and CCCFs were enabled such that the CCCF_ED LEDATA01 was executed from the Timeline at 02:59Z to ensure the correct configuration of JEM-X2 for the resumption of science observations.

2003-11-18, DOY 322, Rev 133-134

Nothing to report

2003-11-19, DOY 323, Rev 134

Nothing to report

2003-11-20, DOY 324, Rev 134

In line with OCR # 159 (and INT_OR_0114) the following procedures were executed:

At 12:52Z: FCP_JEM2_0041 to put JEM-X2 in Setup mode

At 12:53Z: FCP_JEM2_0071 to report current DFEE Integer parameters (value of parameter LU8064 64LOLIM_LOSRC was 774 dec)

At 12:54Z: FCP_JEM2_0070 executed once with the following parameter values for TC L0014:

L0013 = 64 dec

L0014 = 1023 dec

At 13:04Z JEM-X2 was put back in Data Taking via the ED LEDATA01 in the Timeline.

At 17:43Z: FCP_JEM2_0041 to put JEM-X2 in Setup mode, followed by FCP_JEM2_0070 executed once with the following parameter values for TC L0014:

L0013 = 64 dec

L0014 = 774 dec

At 17:54Z JEM-X2 was put back in Data Taking via the ED LEDATA01 in the Timeline.

2003-11-21, DOY 325, Rev 134-135

At 16:07Z the following Time-tagged TCs were uplinked, in accordance with INT_OR_0112, to ensure that the DFEE of both JEM-X units would be switched off before the earliest time of a possible PPDU ECL(S/E) transition during the upcoming lunar eclipse (penumbra only):

TC P4016 JEM-X1 Detector Line A Off (step 4 of procedure FCP_JEM1_9010) with execution time 2003-11-24T03:03:00Z.

TC P4004 JEM-X2 Detector Line A Off (step 4 of procedure FCP_JEM2_9010) with execution time 2003-11-24T03:04:00Z.

This is the DFEE status assumed by the post-eclipse reactivation EDs KECLEX01 and LECLEX01 executed from the Timeline.

At 22:47Z 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).

JEM-X2 remained in Safe mode for the rest of this day.

8.3.5 OMC Operations

There were no interruptions this week due to radiation, but 5 science pointings were lost due to the complete loss of a DSS-16 pass from DoY 320 at 22:14 to DoY 321 at 02:01. The lost pointings were 01330039, to 01330043.

Pointing 01330054 was executed approximately 26 minutes later than scheduled due to an AOCs problem, see section 8.3.1.

OMC was commanded from the timeline into SAFE mode on DoY 321 at 23:12:38, and on DoY 324 at 23:02:25.

On DoY 324 from 16:54 to 17:17, the Fast Monitoring test (OCR #156) was successfully performed.

8.3.6 IREM Operations

Plots of the IREM count rates for the Belts passage in revs 132->133->134->135 are shown below. There are still indications of the effects of the last solar activity on the structure of the Radiation Belts.

