

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 015
Weeks 53/2002-01/2003
13.01.03
PV-Routine Phase

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1 General

This report comprises inputs from various teams involved in the operations:

- ☐ Flight Control Team,
- ☐ Flight Dynamics Team (Fuel book-keeping)

This report addresses the activities from 27.12.02 until 02.01.03 (both dates inclusive). It covers the revolutions 24 (final part), 25, 26 and the initial part of 27.

During the reporting period, the operations have been affected in quite a few occasions by ground problems (NCTRS, stations, communications, control system).

From the S/C side, the IREM anomaly that sets the unit in Standard Mode has happened again, forcing the instruments in safe mode. Also during this week, the guide star was lost twice due to the SEU Filter intervention.

During this week the first eclipse season started without any particular problem.

2 Summary of Activities

The operations were performed according to the planning inputs provided by ISOC.

The targets of the revolutions were Cygnus X-1, the Galactic Plane, MR 2251-178 and SN 1987-A. The observations included a raster, a hexagonal dither pattern, and the first GPS (Galactic Plane Survey) observation of the mission.

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. The eclipse season has started without causing problems. An unexpected behaviour has been observed concerning the way the End Of Charge Timer has to be programmed.

3.1.1 AOCS

The overall performance of the AOCS subsystem was good. The main points to mention are the loss of the guide star in two occasions due to the SEU Filter, and the flicker of the OTF (13 times due to roll at the end of open loop slews, and 3 times due to undetected false events in the STR).

The AOCS operations were nevertheless affected many times by different ground segment problems, which caused 21 pointings not being acquired in a nominal way.

The fuel consumption over the last 7 days was 0.27 Kg. This consumption is higher than average, and due in part to the very tight wheel momentum constraints during the eclipse season. The remaining propellant is in the order of 180.2 Kg on the 1st of January.

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 is in the order of 2380 W as since the beginning of the mission, i.e. no degradation has been identified so far. The performance of the subsystem during the eclipse and recharge period is nominal.

Note: Some more information concerning the platform operations for the start of the eclipse season is provided in the Appendix.

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.

3.1.5 RF

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

The behaviour of the payload has been nominal, with the exception of a reoccurrence of the IREM anomaly, which forced three instruments (IBIS, JEM-X2 and OMC) into safe mode. In this week the strategy to minimise the degradation of JEM-X has been implemented in the automatic timeline. For the next period this means keeping JEM-X1 in safe mode.

3.2.1 SPI

Nominal operations performed according to the timeline.

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

3.2.2 IBIS

Nominal operations performed by the timeline.

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

3.2.3 JEM-X

The operations with a single JEM-X (JEM-X2) have started from the timeline.

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

3.2.4 OMC

The OMC is working nominally. The OMC imaging activities are operated from the automatic Timeline.

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

3.2.5 IREM

The "SEU" anomaly re-occurred in the rev 26, on DOY 2003.001.04.16z. The unit went spontaneously in "Standard Mode" forcing the payloads (except SPI) in "safe" configuration.

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

4 Ground Facilities

The overall performance of the ground segment was not very satisfactory during this week. Problems mainly in the NCTRS, Communications and Goldstone areas affected frequently the operations.

4.1 Mission Operations Centre

The failure of the ESOC communications node 801, several problems with the NCTRS related with CPU consumption, and a crash of the Autostack (the task that handles the automatic timeline) affected the operations in several occasions.

4.2 Ground Stations & Network

The behavior of the network was good, with the exception of some Goldstone problems that affected the timeline execution. It has also been noticed that there are frequent very short TM drops (normally a single frame) when the Goldstone station is used. An investigation is ongoing to find out where are the frames lost.

4.3 Science Ground Segment

4.3.1 ISOC

No ISOC Input has been provided

4.3.2 ISDC

No ISDC Input has been provided

5 Special Events

The main events in this period were the start of the first eclipse season, and the start of the Routine Phase of the mission.

6 Anomalies

A list of the pending anomalies is presented in the Appendix.

In this period the IREM anomaly has re-occurred, and the guide star has been lost twice due to the SEU filter.

There were again a few problems at the MOC that impacted the operations, most of them re-occurrences of known problems. For details see the detailed sections of the Appendix.

7 Future Milestones

Nothing to report.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Rev25

Initially the pointing on Empty Field 2 was continued at the start of this revolution with the TM allocation 59 SPI, 122 IBIS, 4 JEM-X1, 5 JEM-X2, 5 OMC. Following this, starting at around 21:00Z on 2002-12-27, an OMC Flat Field Calibration was performed. A TM allocation of 39 SPI, 113 IBIS, 4 JEM-X1, 5 JEM-X2, 34 OMC was used for this OMC Calibration, reverting to 59 SPI, 122 IBIS, 3 JEM-X1, 6 JEM-X2, 5 OMC afterwards.

On 2002-12-28 the first GPS was performed (slew to the first target of the GPS starting at 2002-12-28T11:20:10Z). After a few pointings of this GPS, a raster pattern centred 9.65deg off Cygnus-X1 was performed for the rest of the revolution.

Rev26

This was the first revolution of the eclipse season. In addition, it was the first revolution in which JEM-X1 was not used. Therefore no JEM-X1 EDs were included in the Timeline, except for that to reconfigure the instrument post eclipse. The PST was changed such that the number of fixed (HK) TM packets for each JEM-X was reduced from 3 to 1 (thus 174 rather than 170 variable TM packets available to the instruments). The TM allocation was maintained at 59 SPI, 122 IBIS, 1 JEM-X1, 8 JEM-X2, 5 OMC throughout the revolution.

A GPS was performed at the start of the revolution, consisting of 11 pointings. A raster dither pattern, centred around the source MR 2251-178 (RA 22:54:05.91; DEC -17:35:54.30), was repeated for the remainder of the revolution.

Rev27

A hexagonal dither pattern was performed around SN 1987A (RA 05:35:28.26; DEC -69:16:13.0) throughout revolution 27.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

This is an automatic report from the FDS history file for INTEGRAL

2002-12-24T06:29:53.000Z	180.4871	F	Automatic TM processing.
2002-12-25T16:26:44.000Z	180.4691	F	Automatic TM processing.
2002-12-27T06:28:40.000Z	180.4425	F	Automatic TM processing.
2002-12-28T11:03:31.000Z	180.3810	F	Automatic TM processing.
2002-12-28T16:36:03.000Z	180.3727	F	Automatic TM processing.
2002-12-30T06:35:59.000Z	180.3436	F	Automatic TM processing.
2002-12-30T16:59:20.000Z	180.2842	F	Automatic TM processing.

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2002-12-30T18:03:20.000Z	180.2444	F	Automatic TM processing.
2002-12-30T19:38:16.000Z	180.2324	F	Automatic TM processing.
2003-01-01T07:01:08.000Z	180.2147	F	Automatic TM processing.

This report was generated at Wed Jan 1 08:00:08 GMT 2003

Note: The 4.24kg pressurant has now been removed from the fuel-book - the above list shows ONLY the remaining propellant

8.3 Detailed Satellite Information

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

8.3.1 PLATFORM

27/12/2002 (DOY 361)

Timeline operations:

Execution of the EDs in the first "NEXT_ECLIPSE" window, this is where all time-tagged commands and AOCS eclipse timers are loaded for the next eclipse passage.

Two sequences were observed to have an incorrect Interlock scope, the consequence of this was that the Timeline stopped twice, the 1st time a number of time-tagged TCs were missed and had to be reuplinked manually, the 2nd time the start of a slew was missed, the slew was recovered using the FD Recover Schedule tool. ARs 2164, 2165 were raised.

The following manual operations were carried out:

Load of MRU Timer Threshold (FCP_EPS_1261) for first eclipse. After loading the timer, the values observed in TM did not correspond to the values reported in the Users Manual. ALENIA have been asked to confirm that the problem is purely a documentation problem, AR 2166 was raised.

Enable MRU Timer Automatic mode (FCP_EPS_1261) for eclipse season. This FCP was executed when the MRU Timer was still counting following the previous threshold update. This caused the batteries to enter Full charge mode, this feature of the MRU Timer circuit was not previously known. the situation was recovered by enabling EOC again, the ECD S/W then commanded Trickle charge nominally. MRU timer automatic mode was then reselected once the MRU timer had expired. AR 2167 is applicable.

The OBM tables for the eclipse season were loaded and enabled (FCP_DHS_1232).

The new SECL table was loaded and enabled (FCP_DHS_1373).

30/12/2002 (DOY 364)

Eclipse passage:

Eclipse #1 of the current eclipse season.

Penumbra Duration: 24m 31s

Umbra Duration: 20m 57s

ECD measured DOD Battery 1 8.4% (2.02Ah)

ECD measured DOD Battery 1 8.3% (2.00Ah)

Recharge time battery 1 1h 16m

Recharge time battery 2 1h 17m

Both the eclipse passage and recharge executed nominally, a small increase in the battery internal temperatures towards the end of the recharge period indicates that both batteries were fully recharged.

During the eclipse both battery terminal and cell group voltages were OOL HL, ALENIA have been requested to approve an adjustment of the limits in the ODB - following confirmation that the voltages were indeed nominal.

Timeline Operations:

Execution of the EDs in the first "POST_ECLIPSE" window, this is where the Instruments are reactivated following the eclipse passage.

Manual Operations:

The MRU Timer threshold was updated in preparation for the next eclipse (FCP_EPS_1261).

02/01/2003 (DOY 002)

Eclipse passage:

Eclipse #2 of the current eclipse season.

Penumbra Duration: 35m 26s

Umbra Duration: 32m 48s

ECD measured DOD Battery 1 13.3% (3.18Ah)

ECD measured DOD Battery 1 13.1% (3.15Ah)

Recharge time battery 1 2h 0m

Recharge time battery 2 1h 59m

Both the eclipse passage and recharge executed nominally, a small increase in the battery internal temperatures towards the end of the recharge period indicates that both batteries were fully recharged.

During the eclipse both battery terminal and cell group voltages were OOL HL, ALENIA have been requested to approve an adjustment of the limits in the ODB - following confirmation that the voltages were indeed nominal.

8.3.2 AOCS SUMMARY OPERATIONS REPORT 27/12/2002-02/01/2003

AOCS operations were executed from the Automatic Timeline. During this week the eclipse season proper started. The behaviour of the AOCS was nominal during the eclipse.

During this week the guide star was lost twice due to the SEU Filter.

During this period, 72 Open Loop Slews, 93 Closed Loop Slews and 11 Momentum Bias were executed.

The OTF as reported by the AOCS has flickered in 16 occasions, 13 due to the incorrect handling of the roll error at the end of the slew for the OTF calculation, and 3 due to undetected false events in the STR CCD.

Due mainly to ground segment problems, 22 pointings were not acquired as expected in the automatic timeline. This corresponds approximately to a 13%.

27/12/2002 (Day of Year 361, Revolution 24-25)

Load of eclipse timers by the timeline failed: Due to a wrongly defined interlock in one OBDH command sequence needed for the eclipse season, the whole timeline was interlocked, and this made the load of the AOCS eclipse timers fail (among other commands). The eclipse timer TPF's were generated using the FDS, and uplinked manually.

Uplink of slew failed: For the same problem as above, in a different TC sequence, the uplink of the slew to failed. Due to this problem the attitude for pointing 00250001 was acquired manually and not via the automatic timeline.

28/12/2002 (Day of Year 362, Revolution 25)

AOCS Operations stopped due to NCTRS problem: At 20:30 an NCTRS problem caused a loss of TM in the control system. Due to this the uplink of the timeline commands failed, and pointings 00250039 and 00250040 were lost, requiring to perform the recovery of the schedule.

Slew missed due to NCTRS problem: Due to the problems experienced in this day, the NCTRS-A had to be rebooted. Although the operation was performed during a TC gap, the TC capability could not be re-established on time, and the uplink of the slew 00250044 failed. Recover schedule was needed.

29/12/2002 (Day of Year 363, Revolution 25)

Guide Star released by SEU Filter: At 02:50:37 the SEU Filter was triggered, releasing the guide star, powering on the IMU and commanding a new mapping. A new guide star was found immediately. Since the problem occurred just before a Closed Loop Slew, after the change of guide star, the slew was performed with the wrong guide star, leading to a wrong attitude. Due to this problem the OTF went to False before the end of the pointing 00250047, and the attitude for 00250048 was wrong. Thanks to the update in realtime of the slew parameters, the situation was recovered with the next pointing. The magnitude of the loss star was 8.0, and the coordinates (-16952, -193).

Slew missed due to DSS-16 TC problem: The uplink of the slew 00250070 failed due a TC problem with the ground station (Goldstone DSS-16). The schedule was recovered, and slew 00250071 was performed nominally from the timeline.

Timeline interrupted due to loss of TM (NCTRS): At 19:15 the TM from NCTRS-A was lost. A reconfiguration to the B chain was performed. As a result of this problem, pointings 00250074, 00250075 and 00250076 were not done from the timeline.

SSL not enabled due to Autostack crash: At 23:09 the Autostack (the task that handles the automatic timeline) crashed. The impact from the AOCS point of view is that the ED to enable the SSL at the end of the slew to 00750078 was not uplinked, and the OTF stayed low during this pointing. Note that this pointing was just an intermediate attitude after the open loop slew to the perigee passage, before the corrective slew.

30/12/2002 (Day of Year 364, Revolution 26)

At the beginning of the revolution, the first eclipse of the eclipse season took place. AOCS behaviour was nominal.

Guide Star released by SEU Filter: At 10:21:27 the SEU Filter threshold was exceeded, and the guide star released, and the IMU powered on. A new guide star was immediately found. The timeline was left running, since the next operation was an open loop slew. The impact of the problem is that the OTF went and remained low for the duration of the pointing after this problem. The pointing ID was 00260004. The magnitude of the star was 7.50, and the coordinates (-5270, -4144).

Timeline interrupted due to loss of TM/TC (NCTRS): Due to an NCTRS problem, TM/TC was lost during 16 minutes. As a result, a RWB operation was lost. The AOCS operations were disabled from the timeline, and recover schedule run manually. The timeline was re-joined at 17:54. Pointings 00260013 and 00260014 were not executed from the timeline.

Slew missed due to FDS not updating the parameters: After the previous problem, a RWB was executed nominally from the timeline, but the FDS failed to update the open loop slew scheduled after the bias (00260015). Due to this the AOCS subsystem was disabled from the timeline, and the slew executed manually. The slew to 00260016 could also not be executed from the timeline. The situation was recovered and pointing 00260017 was executed nominally.

31/12/2002 (Day of Year 365, Revolution 26)

Timeline interrupted due to loss of TM/TC (Goldstone DSS-16): At 23:35 TM and TC was lost from Goldstone, and was not recovered for the remainder of the pass. The recovery was performed after AOS Redu (00:30). In terms of pointings, the slew 00260058 was performed from the timeline, but the pointing TM was not acquired. Pointings 00260059 and 00260060 were also lost. Nominal operations were performed again with 00260061.

01/12/2003 (Day of Year 001 2003, Revolution 26)

AOCS Commanding interrupted due to command verification failure: At 19:07 one of the commands of the special Ping Pong filter sequence needed for the eclipse season slew failed Dynamic Pre-Transmission Validation. The reason was that the time defined in between commands in this sequence (10 seconds) is a bit tight when onboard acceptance verification (AD protocol) is used with Goldstone, and occasionally it can fail. Since the impact of this failure was not fully understood in realtime, the AOCS subsystem was disabled from the timeline. Due to this, the slew 00260087 was missed, and the schedule had to be recovered. The slew 00260088 was also not performed from the timeline, which was rejoined at 19:56. To avoid this problem in the future, the DB has been modified to increase the time in between commands in this sequence to 15 seconds.

02/12/2003 (Day of Year 002, Revolution 27)

Slew missed due to timeline interlocked: The slew 00270002 was not uplinked. The reason was the same wrongly defined interlock in one OBDH command sequence that already caused problems on the 27th of December. Operational instructions to avoid the problem had been issued, but unfortunately were not followed properly. This slew was a corrective slew after a relatively long open loop slew, and it was followed by a RWB. The attitude determination showed that the corrective slew was not needed, and the problem had no further impact.

In order to avoid any further occurrence of this problem, the DB has been modified to correct the offending sequence.

Slew missed due to communications node problem: At 13:12 TM and TC links with Redu were lost. The reason was a failure in an ESOC communications node (node 801). Due to this slew 00270011 was missed. The schedule was recovered, and the next slew executed nominally from the timeline.

8.3.3 IBIS Operations

Status Nominal, on going the routine phase.

Reported the OEM ID 131 and 133 Class 2 <<IBIS IASW HSL/LSL TRANSFER FAIL REPORT>> with an average rate of 2/day, due to communications problems affecting the DPE/HEPI and the peripherals through the high speed line and low speed line. The problem is known to IBIS team and investigation are on-going in order to fix it.

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Requested by IBIS PI to kill PICsIT pixel (y=0,z=53) in PDM #5 (CR PI-OPS-213) at 2002.362.19:41z. Saved PlcSIT CTX by using FCP_IBIS1_0261 in order to keep on board the modification on the status of the killed pixel.

Requested by IBIS PI the execution of the PI-OPS-210 (VETO division factor set to 16) for the complete duration of the Eclipse season. The CR is applied as soon as the IBIS_CAL window is open. The modification will be implemented in the ED GECLEX02 starting from Rev 29.

On DOY 2003.001.04.16z IBIS went in Stand-By (safe configuration) triggered by internal automatism: this was due to an anomaly originated on IREM. The unit has been recovered at 2003.001.05.50.

On DOY 2003.001.07.24 received the following OEM
APID 1280 ID 131 Class 1 << IBIS1 IASW HEPI DATA INCLUDES TIME OVERRUN>>
APID 1280 ID 132 Class 0 << HEPI RESYNCHRONISED>>
due to a synch problem between the event preprocessor and the peripherals. No action was taken accordingly to reaction suggested by the IBIS UM.

The anomalies noticed in the past for VETO VDM # 4 and 12 did not occur again.

8.3.4 SPI Operations

Status Nominal, on going the routine phase.

Occasionally TM_para E3824 (U PD 5V+DIG L) and E1495 (S PD PROG-ER L) in OOL just for few packets.

Manual commanding was requested to set the SPI configuration:

- Rev 25 set the configuration of the events download in agreement with the requested PST (OR 16);
- Rev 26 set the configuration for the 1st revolution of the Eclipse season, the radiation belt automatism was disabled in order not to cool down the AFEE LVPS after the Eclipse passage. At the radiation Belt exit the automatism was re-enabled (OR 14);
- Rev 27 set the configuration for the 2nd revolution of the Eclipse season (OR 14);

On DOY 2003.001.04.16z an anomaly originated on IREM forced all the payloads, except SPI , in safe configuration: currently SPI has no automatic reaction to IREM counters enabled so no reconfiguration was needed for the unit. The SPI subsystem was re-enabled in the automatic timeline at 2003.001.05.03.

On DOY 2003.002.08:05 z a not expected PST (for SPI 36 pkt instead of 59 pkt) was loaded on board. After ISDC request on 2003.002.16.07z the expected PST was uplinked and the payloads recovered to the nominal condition.

8.3.5 JEM-X Operations

OVERVIEW

From revolution 26 onwards only JEM-X2 will perform data taking operations and JEM-X1 will remain in SETUP or SAFE mode with the voltages Off. Also from revolution 26 JEM-X will not be commanded to SAFE, 90 minutes before the critical instrument descent altitude.

On 1-Jan-2003 (DOY 001) at 04:16:00, JEM-X2 went to SAFE mode because of an IREM failure. JEM-X was recovered from this failure and rejoined with the timeline while investigations on IREM were ongoing.

DETAILS

27-Dec-2002, DOY 361, Revolution 25

- 11:24:00, Time-tag commands were uplinked to put JEMX1 and JEMX2 in SAFE mode at 90 minutes before Rev 25 BCP radiation belt entry time.

29-Dec-2002, DOY 363, Revolution 25

- 21:16:00, JEMX1 to SAFE by time-tag TC
- 21:16:10, JEMX2 to SAFE by time-tag TC

30-Dec-2002, DOY 364, Revolution 26

- From revolution 26 onwards (until further decision from PI) only JEM-X2 will perform data taking operations. JEM-X1 will remain in SAFE or SETUP mode with the voltages OFF. This is done by exclusion of JEM-X1 EDs KEACAL01, KEHVON01 and KEHVAJ01 from the automatic timeline. Only one PST window is currently assigned to JEM-X1 while 8 PST windows are assigned to JEM-X2. A new PST is defined to make the 9 PST windows that are no longer used by JEM-X, available to other instruments. For more details on the changes to JEM-X operations concept refer to INT-MOC-SYS-TN-1016-TOS-OF.
- From revolution 26 onwards, JEM-X is no longer put to SAFE mode by time-tag TCs at 90 minutes before the BCP Radiation Belt Start Time. JEM-X will switch to SAFE mode by the onboard automatism at the BCP Radiation Belt Start Time (critical instrument descend altitude).

01-Jan-2003, DOY 001, Revolution 26

- 04:16:00, An IREM failure distributed radiation counts of FFFF [Hex] via the BCP, which caused transition of JEM-X2 to SAFE mode (JEM-X1 was already in SAFE). To recover JEM-X2, the following steps were taken:
 1. Set the BCP DRMC flag to DISREGARD
 2. Execute FCP_JEM2_0120 "JEMX2 SET BCP OVERRIDES" with RMC1, RMC2 and RMC3 set to DISABLE.
 3. Execute FCP_JEM2_1010 "JEMX2 CONFIGURATION SETTING FOR SCIENCE OPS" to reactivate the high-voltages to the nominal values.
 4. Enable the next CCCF in the timeline to restart JEM-X2 data taking operations.
 5. Set the BCP DRMC flag back to REGARD after IREM is recovered to INTEGRAL Mode.
 6. Wait 30 minutes and execute FCP_JEM2_0120 "JEMX2 SET BCP OVERRIDES" with RMC1, RMC2 and RMC3 set to ENABLE.

The JEM-X BCP Override flags are used to overcome a shortcoming of the IASW. Refer to INTEGRAL Mission Report #13, Sect 8.3.4, 16-Dec-2002, DOY 350, Revolution 21.

8.3.6 OMC Operations

OVERVIEW

During the reporting period, OMC timeline-driven operations were interrupted several times due to different problems, which caused the missing of slews and pointings. Each time OMC nominal operations were restarted after the recovery of the schedule.

On 1-Jan-2003 (DOY 001) at 04:16:00, OMC went to SAFE mode because of an IREM failure. OMC was recovered from this failure and rejoined with the timeline while investigations on IREM were ongoing.

In revolution 25 a set of timeline-driven OMC Flat-Field and Dark-Current calibrations were performed. The calibrations started at 361.20.53.23 and ended at 362.10.23.48.

DETAILS

27-Dec-2002, DOY 361, Revolution 25

- 20:53:23, Start of OMC calibration operations

28-Dec-2002, DOY 362, Revolution 25

- 10:23:48, End of OMC calibration operations
- 20:43:00, Due to loss of TM, slews 00250039 and 00250040 and the corresponding pointings, were missed. The schedule was recovered for slew 00250041 and OMC restarted normal operations from pointing 41.
- 23:49:00, Due to late establishment of the TC link, slew 00250044 was missed. The schedule was recovered for slew 00250045 and OMC restarted normal operations from pointing 00250045.

29-Dec-2002, DOY 363, Revolution 25

- 17:14:00, Slews 00250070 and 00250071 were missed. The schedule was recovered for slew 00250072 and OMC restarted from pointing 00250072.

30-Dec-2002, DOY 364, Revolution 26

- 18:17:00, Slews 00260015 and 00260016 were missed because the FD system failed to generate the TPF required for update of Open-Loop Slew 00260015. The schedule was recovered for slew 00260017.

01-Jan-2003, DOY 001, Revolution 26

- 04:16:00, an IREM failure caused distribution of FFFF [Hex] count-rates to the instruments, which caused OMC transition to SAFE mode. The BCP DRMC flag was set to DISREGARD and the OMC SAFE-OFF TC was sent at 05:01:49 to recover the mode to STANDBY.
- 05:40:06, OMC restarted science operations at pointing 00260067. In the meantime investigations were made on IREM and it was set back to INTEGRAL Mode. The BCP DRMC flag was set back to REGARD at 10:42:00.

- 19:07:00, Because of PTV failure on an AOCS command, slews 0026000087 and 00260088 were missed. The schedule was recovered for slew 00260089 and at pointing 00260089 OMC operations restarted.

02-Jan-2003, DOY 002, Revolution 27

- Due to loss of TM/TC (problem on a Communication Node) slews 00270010 and 00270011 were missed. The schedule was recovered for slew 00270012 and OMC restarted operations at pointing 00270012.

8.3.7 IREM Operations

An anomaly (SEU) occurred in the rev 26.

On DOY 2003.001.04.16z , the unit went spontaneously in "Standard Mode" forcing the payloads (except SPI) in "safe" configuration.

The failure analysis reported:

- 1) temperatures nominal
- 2) LCL current nominal
- 3) last HK before the anomaly showed that HV, 5V and 6V were nominal
- 4) the anomaly occurred at 2003.001.04.16z and from the received TM IREM looked like in Standard Mode (i.e. no block counter increasing, all the words FFFF)
- 5) the first dump of the status word ,after the anomaly, by TC U4904 (parameter =0) showed the value 48320 Dec = '1011110011000000', i.e. the unit was reporting a status as in Integral mode with counting ON accumulation ON and the checksum failure flag ON. This value of the status word was an old one written by the sw at moment of anomaly .
- 6) dumping all the registers bank by TC U4904 (parameter = 1) has been noticed, as in the anomaly before, a different value of the status word: 48256 Dec = '1011110010000000' , i.e. still the unit was reporting the status as in Integral mode with the checksum failure flag OFF and the checksum failure counter in the register number 3 incremented of 1 unit. The new value of the status word was the most fresh one written by the sw in the register.
- 7) a second single dump of the status word showed the value 48256 Dec in coincidence with the value got dumping all the registers bank (i.e. no checksum failure flag is anymore present)

In conclusion the unit has been affected by an SEU, as already occurred in Rev 21. This external event has determined a bit flipping in the IREM RAM, triggering a reaction of the sw checksum failure control logic and as last consequence the local reset of the unit.

As memory of the occurred problem, the checksum failure counter was incremented by 1 unit.

The recovery was performed and the unit monitored for about 3 hours. After that period the DRMC flag has been re-enabled.

Currently the status of the unit is nominal.

The IREM PI investigations are still on-going and is under discussion to perform both protons and heavy ions testing.

8.4 List of anomalies since Launch

The following table presents the list of all identified anomalies that have been registered since Launch and that are still pending.

ARid	Date Occurrence	Subject	Segment	Element	Status
INT - 002003	19/10/2002	Command failure from TCE2 at Redu1.	Ground	ESA Sta.	Pending
INT - 002007	22/10/2002	Command sequence TENPE_00 is incorrect.	Space	Procedures	Pending
INT - 002010	22/10/2002	Time correlation not applied correctly to time parameters in TM type 8 reports.	Ground	IMCS	Pending
INT - 002018	22/10/2002	Loss of TM and TC with Goldstone.	Ground	NASA Sta.	Pending
INT - 002024	28/10/2002	OEM: SPI1 Fixed print overflow	Space	SPI	Pending
INT - 002058	06/11/2002	Telemetry Play Back Failed	Ground	NASA Sta.	Pending
INT - 002048	08/11/2002	TM Data Retrieval Jobs not executed	Ground	IMCS	Pending
INT - 002055	09/11/2002	IBIS VETO anomalous count rates.	Space	IBIS	Pending
INT - 002061	12/11/2002	TM Desktop performance collapses when de-selecting supercommutated procesing.	Ground	IMCS	Pending
INT - 002062	13/11/2002	Static PTV wrongly handled by IMCS when commands are copied	Ground	IMCS	Pending
INT - 002066	13/11/2002	Data routing to ISDS	Ground	I/F to SGS	Pending
INT - 002082	13/11/2002	TM packet production lower than allocation.	Space	SPI	Pending
INT - 002070	14/11/2002	TDRS: data Rerievals cancelled	Ground	IMCS	Pending
INT - 002078	14/11/2002	Antenna Tracking Problems	Ground	ESA Sta.	Pending
INT - 002079	14/11/2002	Timing Problem with Telecommands	Ground	ESA Sta.	Pending
INT - 002083	16/11/2002	SPI DPE Crash	Space	SPI	Pending
INT - 002091	18/11/2002	A-Chain Frozen	Ground	IMCS	Pending
INT - 002092	19/11/2002	Load-Dump comparison uses also non-released load commands	Ground	IMCS	Pending
INT - 002093	19/11/2002	Incorrect MOUT in POS/EPOS/TSF	Ground	ISOC	Pending
INT - 002094	19/11/2002	TDRS does not work with supercommutated parameters	Ground	IMCS	Pending
INT - 002095	19/11/2002	TDRS incomplete retrievals.	Ground	IMCS	Pending

INT - 002096	19/11/2002	Retrieval from the stations	Ground	IMCS	Pending
INT - 002097	19/11/2002	Unexpected dithering process when SPI spectra accumulation = 0	Space	SPI	Pending
INT - 002098	19/11/2002	FEE 3 has 2 occurrences of 3 status parameters OOL	Space	SPI	Pending
INT - 002099	20/11/2002	SPI1 periodic task overrun	Space	SPI	Pending
INT - 002107	21/11/2002	TDRS produces gaps in the retrieval, that don't correspond to gaps in the archive	Ground	IMCS	Pending
INT - 002118	25/11/2002	Autostack crashed	Ground	IMCS	Pending
INT - 002121	26/11/2002	ISGRI countrates increase up to 8000 counts/sec in one module	Space	IBIS	Pending
INT - 002116	27/11/2002	SPI Spectra process / cycle stopped	Ground	ISOC	Pending
INT - 002117	27/11/2002	Command releaser failed	Ground	IMCS	Pending
INT - 002124	29/11/2002	Telemetry Drops from GoldStone	Ground	NASA Stat	Pending
INT - 002125	29/11/2002	Data loss between IMCS and ISDC	Ground	I/F to SGS	Pending
INT - 002128	01/12/2002	Wheel Speed monitor crashed	Ground	FDS	Pending
INT - 002122	02/12/2002	IBIS VDM4 HV broke down	Space	IBIS	Pending
INT - 002127	02/12/2002	Telemetry loss from REDU	Ground	ESA Stat	Pending