

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 016
Week 02 2003
13.01.03
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 03.01.03 until 09.01.03 (both dates inclusive). It covers the revolutions 27 (partially), 28 and 29 (partially). The period was smooth from the S/C side, but operations were impacted by ground problems on several occasions.

2 Summary of Activities

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

The targets of the revolutions were SN 1987-A (observed via a dither pattern), and 3C 273 (observed with a raster pattern).

Note: Some further information concerning the activities is provided in the Appendix.

3 Satellite Status

3.1 Platform

3.1.1 AOCS

The overall performance of the AOCS subsystem was good, nevertheless the AOCS operations were heavily affected by ground segment problems, and approximately 10% of the scheduled pointings could not be executed according to the timeline.

Another point to mention is that in one particular attitude that was visited often during this period, the guide star picked up by the ACC is a diffuse nebula, and this caused frequent flickering of the OTF for these pointings, as well as relatively poor attitude information in the attitude history file.

The fuel consumption over the last 7 days was 0.22 Kg. This consumption is higher than average, and due in part to the very tight wheel momentum constraints during the eclipse season (that were relaxed after this week). The remaining propellant is in the order of 179.94 Kg on the 8th 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 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.

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

Operations with a single JEM-X (JEM-X2) are ongoing.

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 status of IREM has been nominal during this week.

4 Ground Facilities

Ground segment problems caused a few big interruptions of the operations during this week. Although it is not always easy to determine the impact, from the point of view of the pointings acquired 21 scheduled pointings could not be acquired in a nominal way (via the automatic timeline). Problems were mainly in the stations and in the communications area. In particular a full Goldstone pass was virtually unusable for science.

4.1 Mission Operations Centre

Another failure of the ESOC communications node 801, a problem in the Autostack with the realtime update of the slew parameters, and an operational mistake have been the MOC incidents affecting the operations during this week.

In order to correct these problems the communications node has been replaced, investigations on the Autostack problem are in progress, and the reason for the operational mistake has been clarified and the way to avoid emphasised to the operators.

4.2 Ground Stations & Network

The first pass performed on DSS-24 after a long maintenance period was not successful. Due to configuration problems on the station the TC link could not be established until very late. A TM drop from DSS-16 on a different day caused also the interruption of the timeline. The Redu station was also not problem free during the week, a fuse blew on the S band equipment, and this caused the interruption of the operations.

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

6 Anomalies

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

There were again a few problems with the ground segment 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

Rev27 – 29

A hexagonal dither pattern was performed around SN 1987A (RA 05:35:28.26; DEC - 69:16:13.0) throughout revolution 27. A few pointings from this hexagonal dither pattern were also performed at the start of revolution 28. Following this a raster pattern was performed in revolution 28 around 3C 273 (RA 12:29:06.7; DEC 02:03:07.2) for almost 2 days. The hexagonal dither around SN 1987A was then resumed and this was repeated for the rest of revolution 28 and throughout revolution 29. All instruments, except for JEM-X1 which is currently not used, were in their nominal science modes.

The TM allocation was maintained at 59 SPI, 122 IBIS, 1 JEM-X1, 8 JEM-X2, 5 OMC for all science observations in these revolutions.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

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

2003-01-02T06:25:11.000Z	180.1551	F	Automatic TM processing.
2003-01-02T08:53:51.000Z	180.1206	F	Automatic TM processing.
2003-01-02T10:19:43.000Z	180.1097	F	Automatic TM processing.
2003-01-03T16:14:50.000Z	180.0926	F	Automatic TM processing.
2003-01-05T06:12:06.000Z	180.0796	F	Automatic TM processing.
2003-01-05T10:06:30.000Z	180.0555	F	Automatic TM processing.
2003-01-05T11:23:11.000Z	180.0224	F	Automatic TM processing.
2003-01-07T02:35:14.000Z	179.9983	F	Automatic TM processing.
2003-01-07T03:58:43.000Z	179.9604	F	Automatic TM processing.
2003-01-08T06:07:09.000Z	179.9398	F	Automatic TM processing.

This report was generated at Wed Jan 8 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 PLATFORM

05/01/2003 (DOY 005)

Eclipse passage:

Eclipse #3 of the current eclipse season.

Penumbra Duration: 43m 01s

Umbra Duration: 40m 48s

ECD measured DOD Battery 1 17.0% (4.07Ah)

ECD measured DOD Battery 1 16.8% (4.03Ah)

Recharge time battery 1 2h 34m

Recharge time battery 2 2h 32m

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.

08/01/2003 (DOY 008)

Eclipse passage:

Eclipse #4 of the current eclipse season.

Total Eclipse Duration: 48m 44s

Umbra Duration: 46m 38s

ECD measured DOD Battery 1 19.25% (4.62Ah)

ECD measured DOD Battery 1 19.08% (4.58Ah)

Recharge time battery 1 2h 55m

Recharge time battery 2 2h 54m

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.

10/11/2003 (DOY 010)

Manual Operations:

According to Industry inputs the ECD K-factor was reduced from an Engineering value of 1.14 to 1.075 for both batteries, this value is more suitable for the current working temperature of the batteries which is about 0 degrees (FCP_DHS_1325 / FCP_DHS-1326).

8.3.2 AOCS SUMMARY OPERATIONS REPORT 03/01/2003-09/01/2003

AOCS operations were executed from the Automatic Timeline. During this period, 63 Open Loop Slews, 144 Closed Loop Slews and 9 Momentum Bias were executed. 21 pointings were missed due to non-AOCS problems, this is about 10 % of the total scheduled ones.

The OTF as reported by the AOCS has flickered in 482 occasions. The main reason for this high number is that for one point of the dither around SN 1987A, the guide star happens to be a diffuse nebula. This problem seems not to have an easy solution, since the attitude has to be acquired via open loop slew, and this is the object that is first found during the mapping, and for this reason it is chosen by the STR as a guide. The affected attitude is:

05:35:28.26

/* RA of X axis

-69:16:13.0

/* Declination of X axis

In 23 occasions, the flicker of the OTF was due to the incorrect handling of the roll error at the end of the slew for the OTF calculation.

03/01/2003 (Day of Year 003, Revolution 27)

Uplink of slew failed due to TM loss (DSS-16): At 23:38 the TM from Goldstone (DSS-16) dropped. Due to this the uplink of slews 00270062 and 00270063 could not be done from the timeline. The schedule was recovered manually, and 00270064 was performed nominally from the timeline. As a result of the same problem, an RMU calibration that was also scheduled in this period had to be done manually.

04/01/2003 (Day of Year 004, Revolution 27)

Slew parameters not updated by the FDS: The TPF for the realtime update of slew 00270077 was not produced by the FDS. The timeline was left running anyway, and the slew was performed without problems. The next slew was updated OK.

05/01/2003 (Day of Year 005, Revolution 28)

AOCS Timeline operations stopped due to mistake: At 15:54 the AOCS daily maintenance procedure was performed by the Spacon, not noticing that at the same time the timeline was commanding the AOCS subsystem. Due to this, the same command was sent almost at the same time from the autostack and the manual stack (the Enable PP Filter command). This did not cause any problem onboard, but made the Command Execution Verification fail in the control system. Due to this problem, the AOCS subsystem commanding was interlocked, and the commands for the slew 00280009 failed. The schedule was recovered manually, and the first pointing performed nominally from the timeline was 00280013.

06/01/2003 (Day of Year 006, Revolution 28)

Slews missed due to control system problem: The update of the slew parameters for 002841 failed, the TPF was rejected by the autostack. Inspection of the file did not show any mistake in it. After some investigations, it was found that the problem was local to the autostack task, that had to be restarted. Due to this problem, slews 00280041, 00280042 were missed, and the schedule recover manually.

AOCS Operations missed due to ground station problems (DSS-24 + DSS-16): At the time of the station handover from Redu to Goldstone (DSS-24), it was impossible to connect the command link due to a configuration problem at the station. Once this problem was fixed, the station (both DSS-16 and DSS-24) had problems related with high winds. Due to these problems, the Goldstone pass was mostly unusable, and pointings 00280049 to 00280056 (included) were missed.

07/01/2003 (Day of Year 007, Revolution 28)

AOCS Operation interrupted due to ESOC communications problem: At 09:42 the TM and TC links to Redu were lost. The reason was a failure of the communications node 801 at ESOC. As a result the slew to 00280071 was lost, and the schedule had to be recovered manually. Slews 00280072 and 00280073 were also missed.

08/01/2003 (Day of Year 008, Revolution 29)

Operations interrupted by ground station problem (Redu): At 23:06 the TM/TC was lost. The reason was a failure on the station (a fuse in the S-Band equipment blew). Due to this problem slews 00290024 and 00290025 were missed, and the schedule had to be recovered manually.

09/01/2003 (Day of Year 009, Revolution 29)

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.

Received on DOY 2003.003.12.38z OEM APID 1280 ID 179 Class 1 flagging << IBIS1 VETO BOTTOM COUNTER EXCEED ALERT VALUE>>.

No corispondence was found in the relevant telemetry G6062(as suggested by IBIS UM) of this high count rate for the VETO bottom counter.

Received on DOY 2003.004.23.13z OEM APID 1280 ID 167 Class 2 flagging << IBIS1 PICsIT NOISY SEMIMODULE>>: the OEM was generated inside the radiation belt by one of the two PICsIT detector modules left ON. The generation of this OEM it is considered by IBIS PIs as possible event due to the current set configuration.

Received on DOY 2003.006.18z OEM APID 1280 ID 167 Class 2 flagging << IBIS1 PICsIT NOISY SEMIMODULE>>, outside of the radiation belts.

Requested by IBIS PI to kill PICsIT pixel (y=24,z=14) in semimodule 1 of PDM #8 (CR PI-OPS-213) at 2002.006.18.22.02z.

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. From Rev 29 this setting will be automatic executed with ED GECLEX02. As well since Rev 29 the new calibration curve requested by CR 210 will be implemented.

8.3.4 SPI Operations

Status Nominal, routine phase ongoing. SPI in Photon/Photon.

Cryocooler performance: The cold plate temperature slow positive drift is still present.

Some manual commanding was requested to set the SPI configuration:

- Rev 28 set the configuration for the 3rd revolution of the Eclipse season (OR 14);
- Rev 29 set the configuration for the 3rd revolution of the Eclipse season (OR 14);

On DOY 2003.005.05.21z and 2003.008.05.09z the ED EEORTM01 was scheduled by the automatic timeline in the AOS_CHK window occurring inside the eclipse : as a consequence the commands failed execution on-board because the SPI sub-assemblies were off. This is not a problem for SPI since the commands are just to report status TM. Nevertheless the ED should not be scheduled during eclipse and possible solutions must be found in the timeline generation sw (discussion with Flight Dynamics & Mission Planning).

On DOY 2003.004.22.00 during the execution of the OR 14 at rad belt entry of rev.27, the uplink of the TPF ES1700_IASW-PAR_disbelts_0001.TPF failed. The problem was tracked to a recent improper maintenance of the files on the operational network. The file was in fact found empty.

As a consequence the SPI LVPSs were not turned on at eclipse exit in rev.28 and the temperatures of the PA dropped to warning levels. The LVPSs were turned on at rad belt exit and the temperature re-entered the limits soon after. No consequence on the SPI health, though the observation results occurred early after rad belt exit might have been affected by the non-stable thermal environment.

8.3.5 JEM-X Operations

OVERVIEW

During the reporting period, JEM-X1 was always in SAFE mode and JEM-X2 operations were nominally driven by the automatic timeline.

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.

DETAILS

03-Jan-2003, DOY 003, Revolution 27

- 23:49:00, Drops in TM caused the failure of AOCS commands and resulted in missing slews 00270062 and 00270063. Schedule was recovered for slew 00270064.

05-Jan-2003, DOY 005, Revolution 28

- 15:54:00, Failure in release of AOCS commands and the recovery actions resulted in missing of slews 0028009 to 0028011 inclusive. The schedule was recovered for slew 0028012.

06-Jan-2003, DOY 006, Revolution 28

- 18:05:00, Because of problems in establishing the TM/TC link with Goldstone G/S at the beginning of the station handover and the subsequent drops in TM, slews 00280049 to 00280056 inclusive were missed. Schedule was recovered for slew 00280057.

07-Jan-2003, DOY 007, Revolution 28

- 09:42:00, Problems on a communication node caused the loss of TM/TC. Slews 00280071 and 00280072 were missed and the schedule was recovered for slew 00280073.

08-Jan-2003, DOY 008, Revolution 29

- 23:06:00, Equipment failures in Redu G/S resulted in loss of TM/TC links and missing of slews 00290024 and 00290025. Schedule was recovered for slew 00290026.

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
INT - 002129	03/12/2002	VC-7 data loss	Ground	ESA Stat	Pending
INT - 002130	04/12/2002	Reaction Wheel Task Stopped	Ground	FDS	Pending
INT - 002131	04/12/2002	Lost TC capability via GoldStone(Dss-16)	Ground	NASA Stat	Pending
INT - 002132	05/12/2002	TM/TC loss via REDU	Ground	ESA Stat	Pending
INT - 002133	05/12/2002	Loss of Frames	Ground	IMCS	Pending
INT - 002135	06/12/2002	Inconsistency in Pointing ID vs Slew ID found in POS for revolutions 17 and 18	Ground	ISOC	Pending
INT - 002136	06/12/2002	Invalid PST of SPI in Oper Mode	Ground	ISOC	Pending
INT - 002137	08/12/2002	Handover to DSS-16 delayed due to hardware problems	Ground	NASA Stat	Pending
INT - 002138	09/12/2002	Command failure	Ground	IMCS	Pending
INT - 002139	09/12/2002	Attitude determination Failed	Ground	FDS	Pending
INT - 002141	10/12/2002	TPF failed to load	Ground	IMCS	Pending
INT - 002142	11/12/2002	TDRS Time Interval Setting	Ground	IMCS	Pending
INT - 002144	15/12/2002	Command verifier failed	Ground	IMCS	Pending
INT - 002145	15/12/2002	Commands failing PTV for no reason	Ground	IMCS	Pending

INT - 002143	16/12/2002	Lost commanding via REDU	Ground	ESA Stat	Pending
INT - 002147	16/12/2002	Lost Telecommanding via REDU	Ground	ESA Stat	Pending
INT - 002146	17/12/2002	Late telemetry from REDU	Ground	ESA Stat	Pending
INT - 002149	17/12/2002	OBQD giving wrong results	Ground	IMCS	Pending
INT - 002150	17/12/2002	TM drop via REDU	Ground	ESA Stat	Pending
INT - 002151	17/12/2002	ISDS-ISDC Disconnected	Ground	I/F to SGS	Pending
INT - 002152	18/12/2002	NCTRS-A required resetting	Ground	NCTRS	Pending
INT - 002153	19/12/2002	RWS Plot Stopped	Ground	FDS	Pending
INT - 002154	19/12/2002	Drops in link to ISDC	Ground	I/F to SGS	Pending
INT - 002155	19/12/2002	Star Tracker false events	Ground	Spacecraft	Pending
INT - 002157	20/12/2002	Lost VC-7 from NCTRS	Space	NCTRS	Pending
INT - 002158	20/12/2002	Telemetry drop for both Redu and GoldStone	Ground	Spacecraft	Pending
INT - 002159	21/12/2002	Ranging Failure via REDU	Space	ESA St.	Pending
INT - 002160	21/12/2002	Interruption of TC link	Ground	ESA St.	Pending
INT - 002161	21/12/2002	TPF was not produced	Ground	FDS	Pending
INT - 002162	22/12/2002	Late AOS via GoldStone	Ground	NASA St.	Pending
INT - 002164	27/12/2002	ED DEBWLO00 has incorrect Interlock conditions	Ground	ODB	Pending
INT - 002165	27/12/2002	ED EEHTF_02 has incorrect IL	Ground	ODB	Pending
INT - 002166	27/12/2002	TC P2431 and P2931 have incorrect CEV.	Ground	ODB	Pending
INT - 002167	02/01/2003	MRU Resumes Battery full Charge Mode when EOC Timer Automatic Mode is Selected.	Ground	Spacecraft	Pending
INT - 002168	03/01/2003	PSTREQs no longer included in the CCCF	Ground	ISOC	Pending
INT - 002169	03/01/2003	IREM sw local resets due to SEU (twice)	Space	IREM	Pending
INT - 002170	03/01/2003	IBIS: VETO VDM 4 & 12 HVs break down	Space	IBIS	Pending