

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 055
Week 41
13.10.03
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 04.10.03 until 10.10.03 (both dates inclusive) and covers the revolutions 119, 120 & 121.

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 the Galactic Centre. The activities performed consisted of GCDE observations.

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 unexpected behaviour / malfunction was identified.

3.1.1 AOCS

The AOCS operations were performed smoothly from the timeline during this period.

The only problem was that a Close-Loop Slew failed execution because the Star Tracker could not locate the commanded guide star. The problem was probably due to a dim close by star, which caused the guide star not to be selected during the Search/Track process.

The fuel consumption over the period between 02/10/2003 and 10/10/2003 was 0.071Kg. The remaining propellant is in the order of 174.53 Kg on the 10th of October.

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 **2250W**. This means that there is no noticeable degradation of the solar arrays since launch.

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.

An operation to change the ratio of VC-0 and VC-7 CLCWs in VC-0 TM frames was performed on 7/10/2003. This operation simply consisted of switching between low and high bit telemetry rate until a suitable distribution was found.

At the 4th switch to high bit rate a ratio of about 45 / 55 was achieved, from tests performed with the EM it seems that this ratio is the closest possible ratio to 50 / 50 which can be obtained. The maximum number of concurrent CLCWs observed for a single Telecommanding Virtual Channel was 3, the maximum delay between 2 CLCWs for the same VC was 7 seconds.

During subsequent Science operations this ratio fell to about 40 / 60, probably due to the different distribution of VC-0 TM frames during the TM cycle. During slews it was noted that the ratio changed again, falling as low as 22 / 78, probably due again to a change in the distribution of VC-0 TM frames once the OTF flag goes low in the Broadcast packet.

In an attempt to achieve a better ratio it was decided to repeat the exercise on 10/10/2003, this time aiming for a ratio of 55 to 45 outside the Science window. At the 2nd switch to high bit rate a ratio of about 55 / 45 was achieved.

Again this ratio changed once science operations started, falling to about 55 / 55. During slews, the overall ratio remained at about 45 / 55, but with more short term variations in the ratio

As this ratio seems to be suitable (although not perfect) for both VC-0 and VC-7 telecommanding, it was decided to remain with this ratio initially. This ratio has been in use for 3 days at the time of writing with no problems observed.

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

3.2.1 SPI

The overall status of the instrument is nominal.

During the reporting period the instrument was in photon-by-photon mode with spectra TM enabled and an assigned TM bandwidth in the science windows of 98 pkts/cycle.

The cryo-cooler is working well, the stroke had to be adjusted to keep the temperature within 85+/-1K.

The Project Scientist decided the date for 3rd Ge detectors annealing cycle, to take place from rev.129 to 133 (starting on 3rd 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 TM bandwidth assigned to IBIS is 134 pkts/8sec.

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

3.2.4 OMC

The status of OMC is nominal.

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

A total of 253 images were captured during this period, with one lost 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.

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

4 Ground Facilities

The main problems this week, as previous weeks, concern the consolidator, and the link to the ISDC. There was also a minor double bit-rate problem with the VC7 TLM, and an instance of 10 bad TLM frames from Redu.

4.1 Mission Operations Centre

On DoY 283, a minor event with a sequence of error messages from sun123 was reported. See problem reports below.

4.2 Ground Stations & Network

See above.

4.3 Science Ground Segment

4.3.1 ISOC

This report covers to end of week 41.

1. Planning.

Short term PSF: up to rev. 132 received from MOC

Long term PSF: up to rev. 146

POS and POD generated: up to rev 132 and sent to MOC and ISDC

TSF: up to rev 123 received from MOC

Rev 129 was replanned to accommodate an observation with later visibility constraints. This revolution is still reserved for SPI annealing if agreed to perform this activity. Long term plan up to end of AO 1, i.e. rev 143 (16 December) performed. This plan includes the ISWT wish to spend remaining core program time for pointed observations on the VELA region.

2. Observation status

ECS's for rev's 105 and 107 received from ISDC. Corresponding OCS sent to ISDC .
Rev 106 awaiting resolution of a problem detected in ISDC.

3. ISOC science archive

An updated version of the Web browser developed by the VILSPA archive team received for further testing in ISOC

4. System

The system performance is very stable. No system update or patch performed

5. Problems

none

4.3.2 ISDC

On 14/10/2003, the status of ISDC observation processing is:

- Latest Standard Analysis completed: observation 01201020004 (Cygnus X-1, Revolution 79-80) on 13/10/2003
- Latest products archived: observation 0120284001 (Sco X-1, Revolution 97) on 29/09/2003
- Latest observation products sent to the observer : observation 01202840001 (Sco X-1, Revolution 97) on 01/10/2003

5 Special Events

Nothing to report

6 Anomalies

A list of the pending anomalies since Launch is presented in the Appendix. New anomalies raised during the past week are listed below:

On DoY 279, at 21:00, the imca indicated swap space was low, IFTS 5 was restarted, then IFTS 6, then IFTS 5 again, without success, then at 01:12, the following day, the swap space automatically recovered.

On DoY 280, at 12:26, VC0 TLM dropped, when playback started, at 12:29, the playback was aborted and the TLM returned. The drop was due to the wrong TMP being used, there was no impact.

On DoY 281, there were repeated occasions of single TLM frames being lost at the start of a TLM playback.

On DoY 282 at 05:06 a double rate of VC7 TLM was being supplied by DSS-16. Network reported they couldn't disconnect the link, at 05:22, there was a handover to Redu solving the problem, no impact.

Later that day immediately after the handover back to DSS-16 at 21:39, the double VC7 TLM started again. At 21:55 Network restarted the NCTRS-A, but it wasn't until 22:51, that the problem ceased, apparently autonomously.

At 23:02, there was a drop in VC0 & VC7 TLM, at 23:09, Network closed and re-opened the connection, restoring the double TLM problem. At 23:51, the double TLM problem autonomously ceased.

On DoY 283 at 12:34, there were 10 bad TLM frames from Redu.

On the same day at 19:12, there was a bunch of error messages on sun123: GetBlockAddress, error block number out of range.

Arid	Date Occurrence	Subject	Segment	Status
INT - 002477	06/10/2003	Telemetry loss from REDU due to NCTRS configuration	Ground	NCTRS
INT - 002478	06/10/2003	Telemetry loss from REDU due to Reed Solomon Alarms	Ground	ESA Sta.
INT - 002479	06/10/2003	Telemetry loss from DSS-16 DR G103429	Ground	NASA Sta.

7 Future Milestones

The 3rd SPI annealing will start on 3rd November, see section 8.3.2 for details.

On the 17th of October, Integral will celebrate its first year in orbit.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 119

In revolution 119, GCDE observations were performed for the entire duration of observation time (~62 hours).

Revolution 120

In revolution 120, GCDE observations were performed for the entire duration of observation time (~62 hours).

Revolution 121

In revolution 121, GCDE observations were performed for the entire duration of observation time (~62 hours).

Throughout these revolutions all instruments were in their nominal science modes, except for JEM-X1, which remained in Safe mode, and the TM allocation was 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

The latest entries in the history file for INTEGRAL

2003-09-17T21:04:37.000Z	174.9049	F	Automatic TM processing.
2003-09-19T09:48:09.000Z	174.8878	F	Automatic TM processing.
2003-09-20T20:59:41.000Z	174.8198	F	Automatic TM processing.
2003-09-22T09:35:13.000Z	174.8150	F	Automatic TM processing.
2003-09-23T20:44:37.000Z	174.7867	F	Automatic TM processing.
2003-09-25T09:23:37.000Z	174.7532	F	Automatic TM processing.
2003-09-26T19:53:48.000Z	174.7378	F	Automatic TM processing.
2003-09-28T09:08:48.000Z	174.7331	F	Automatic TM processing.
2003-09-29T19:37:15.000Z	174.6779	F	Automatic TM processing.
2003-10-01T08:58:47.000Z	174.6181	F	Automatic TM processing.
2003-10-02T19:36:59.000Z	174.6053	F	Automatic TM processing.
2003-10-04T08:41:58.000Z	174.5895	F	Automatic TM processing.
2003-10-05T19:08:42.000Z	174.5730	F	Automatic TM processing.
2003-10-07T08:31:01.000Z	174.5628	F	Automatic TM processing.
2003-10-08T19:12:57.000Z	174.5340	F	Automatic TM processing.

This report was generated Fri Oct 10 08:00:14 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, 115 Open Loop Slews, 152 Closed Loop Slews and 5 Momentum Bias were executed. 2 slews were missed or executed manually. This is equivalent to a 0.75%.

04/10/03 (Day of Year 277, Revolution 118-119)

Nothing to report.

05/10/03 (Day of Year 278, Revolution 119)

Nothing to report.

06/10/03 (Day of Year 279, Revolution 119)

Slew missed because the STR could not locate the commanded Guide Star:

Close-Loop Slew 0119-0100 failed execution because the Star Tracker could not locate the guide star, which was commanded for the slew. According to the Mission Star Catalogue Extract, this magnitude 7.9 star, with Tycho number 7431-00004-1, was expected to be seen at STR CCD coordinates (13192, -17806). The star was also not reported (even as reduced accuracy) in the mapping based on which the parameters for slew 0119_0100 were updated. This star has a dim companion of visual magnitude 11.13 at an offset of ~1.7 arc-minutes (RA: -99", DEC: 20.5"). This companion, if sensed by the STR, could result in the failure of the clustering algorithm and therefore release of both stars during the Search-and-Track process. If it is confirmed by Flight Dynamics that the problem was due to the companion, then this guide star should be disabled in the mission star catalogue to prevent similar problems in the future.

To recover the schedule, the FDS timeline recovery tool was used to manually slew to the attitude of pointing 0119-0101 and then to update the parameters of slew 0119-0102.

07/10/03 (Day of Year 280, Revolution 119-120)

Nothing to report.

08/10/03 (Day of Year 281, Revolution 120)

Nothing to report.

09/10/03 (Day of Year 282, Revolution 120)

Nothing to report.

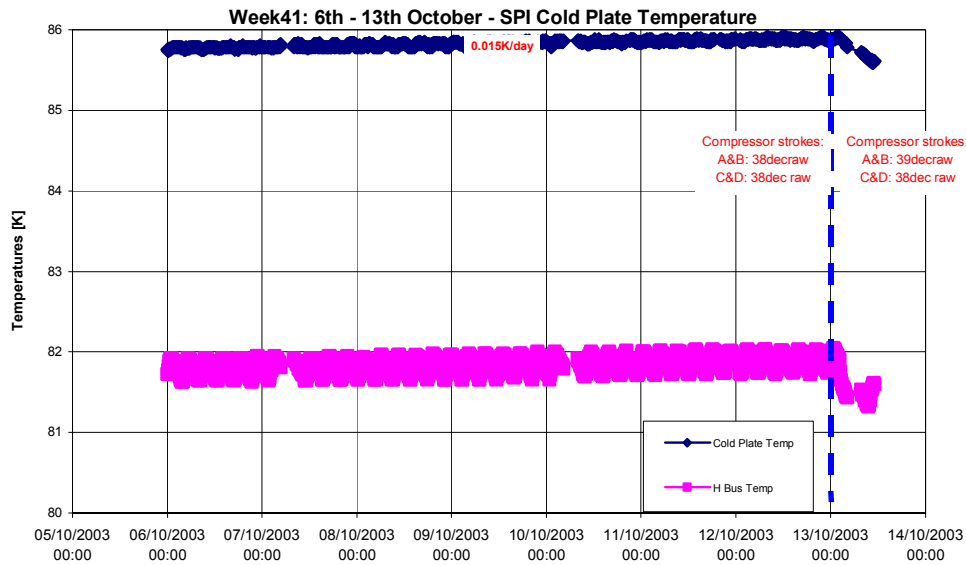
10/10/03 (Day of Year 283, Revolution 120-121)

Nothing to report.

8.3.2 SPI Operations

Cryo-cooler:

As a consequence of the slow positive drift accumulated in the last month, during the reporting period the temperature of the Ge detector cold plate finally exceeded the upper warning limit at 85.9K. The stroke of the compressor A&B was therefore increased by 1 LSB on compressors A&B (now at 39dec raw, while C&D are still at 38dec raw), 13th October at 02:12z. Eventually the temperature returned below 85.9K. Before the stroke change, the drift rate was of ~0.015K/day, well within the expected range.



IASW/DPE:

The problem reported last week about the DPE exception OEMs (CSSW “SPI CONSTRAINT DPE CULPR” and IASW “SW ERROR”) was logged as an additional occurrence of the anomaly INT_SC-63, which first happened on 2003.242 (30th August 2003) at 20:15:30z.

ACS:

The anomalous spike in the count rate recorded two weeks ago (on 29/09/2003 at 09:00z) was finally explained by the ACS experts (MPE – Garching) as part of the responses to be expected to the radiation environment. It was excluded as an indicator of any forthcoming technical problem on-board.

The following plot shows the ACS count rate during the last week.

8.3.3 IBIS Operations

DOY 2003.281 (08/10)

Reported three times (11:31, 14:39, 22:04Z)
the OEM ID 179 Class 2 <<IBIS1 VETO COUNTER BOTTOM EXCEEDS ALERT
VALUE>>. The relevant TM_para G6062 reported values inside limits therefore the
problem has been disregarded, as suggested by the nominal reaction to this OEM.

DOY 2003.282 (09/10)

Reported at 01:58Z
the OEM ID 179 Class 2 <<IBIS1 VETO COUNTER BOTTOM EXCEEDS ALERT
VALUE>>. The relevant TM_para G6062 reported values inside limits therefore the
problem has been disregarded, as suggested by the nominal reaction to this OEM.

Reported at 04:52Z
the OEM ID 183 Class 2 <<IBIS1 VETO +5V VOLTAGE OUT OF RANGE>>. The
relevant TM_para G6106 reported values inside limits and therefore the problem has
been disregarded, as suggested by the nominal reaction to this OEM (FDIR doc).

DOY 2003.283 (10/10)

Reported (few) during Belt passages the OEM APID 1280 ID 167 Class 2 <<IBIS1
PICsIT NOISY SEMIMODULE SIGNALLING>> due to the fact that the PICsIT
detectors are ON without the VETO anticoincidence system, as it required by PIs. The
Noisy semimodules were PDM6-SM2, PDM6-SM1, PDM7-SM2 and PDM8-SM2.

8.3.4 JEM-X Operations

Nothing to report.

8.3.5 OMC Operations

On DoY 279 at 16:57 two commands were rejected, this was due to the missed
pointing 01190100. The following pointing was completed manually.

There were 3 occurrences of the OEM pair:

1792	Real Time Anomaly	5	OMC CSSW INT ER
1792	Real Time Exception	7	OMC CONSTRAINT D

The first on DoY 279 at 13:17, the second on DoY 281 at 08:30, and the third later
that day at 15:26. On each case the region being observed was in the same crowded
part of the sky. The cause was put down to “too many windows overlapping”. When
this happens OMCAS stops handling the science data, waiting for a transition to
Stand-by to clear up the collapse. This is a known problem whose solution would
require a better selection of targets by the OMC ground Pointing SW.

8.3.6 IREM Operations

The plots of the IREM count rates and statuses for the Belts passage in rev 119-120-121, as recorded by the IREM EGSE at ESOC are shown below.

