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

INTEGRAL
Mission Report

INT-MOC-SYS-RP-1001-TOS-OF

No. 042
Week 28

14.07.03

Routine Phase

Prepared by: M. Walker (TOS-OFI)

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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.

It addresses the activities from 05.07.03 until 11.07.03 (both dates inclusive) and covers the revolutions 88 to 90.

The summer eclipse season is proceeding nominally.

2 Summary of Activities

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

The targets of these revolutions were the Centaurus-Circinus region (RA 13:52:17.00; DEC -62:02:01.8) and NGC 4418 (RA 12:26:54.60; DEC -00:52:40.0), which was amalgamated with observations of 3C 273 and GRS1227+025. The activities performed consisted of raster dithering 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 from the timeline during this period.

There was a loss of Guide Star after an Open Loop slew during revolution 88, which resulted in the loss of the On-Target Flag during the pointing after the slew and also a Roll Error in the succeeding slew.

Two slews were missed during this period due to ground station problems that caused interruptions in the TM/TC links.

The fuel consumption over the period between 04/07/2003 and 11/07/2003 was 0.112Kg. The remaining propellant is in the order of 176.058 Kg on the 11th of July.

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 **2230W**. This means that there is no noticeable degradation of the solar arrays since launch.

09/07/2003 (DOY 190)

Eclipse passage:
Eclipse #6 of the current eclipse season.
Total Eclipse Duration: 1h 02m 05s
Umbra Duration: 0h 58m 59s
ECD measured DOD Battery 1 25.29% (6.07Ah)
ECD measured DOD Battery 2 25.04% (6.01Ah)
(Note DOD calculation assumes nominal battery capacity rating of 24Ah)
Recharge time battery 1 3h 36m
Recharge time battery 2 3h 34m
The eclipse passage was completely outside ground coverage, all indications (ECD and OBM TM / OEMs) are that this operation executed nominally. The last 1hour 15minutes of battery recharge occurred after AOS REDU, the observed part of the battery recharge was nominal.

12/07/2003 (DOY 193)

Eclipse passage:
Eclipse #7 of the current eclipse season.
Total Eclipse Duration: 0h 54m 36s
Umbra Duration: 0h 51m 17s
ECD measured DOD Battery 1 21.42% (5.14Ah)
ECD measured DOD Battery 2 21.21% (5.09Ah)
(Note DOD calculation assumes nominal battery capacity rating of 24Ah)
Recharge time battery 1 3h 3m
Recharge time battery 2 3h 1m
The eclipse passage was completely outside ground coverage, all indications (ECD and OBM TM / OEMs) are that this operation executed nominally. The last 50 minutes of battery recharge occurred after AOS REDU, the observed part of the battery recharge was nominal.

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. 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 status is nominal.

The instrument is operating in photon-by-photon mode with Spectra telemetry disabled. The TM bandwidth assigned to SPI was 98 pkts/cycle for the reported period.
The Cryo-cooler is working nominally maintaining 85K temperature in the detector cold plate, after last week's stroke adjustment.
The instrument management at belt entry/exit and in the eclipse passages is done via the automatic timeline and is working well.
A detailed timeline for the 2nd SPI annealing has been produced and is shown in the Appendix.

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

During the reporting period, JEM-X2 operations were executed from the Automatic Timeline and JEM-X1 was dormant.

JEMX operations were interrupted twice during the week, once due to a planned ground station outage, and once due to an erroneous high radiation reading from IREM, which triggered an instrument SAFE mode.

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

3.2.4 OMC

During the reporting period, OMC operations were interrupted four times. Twice due to unplanned ground station interruptions, once due to a planned ground station outage, and once due to an erroneous high radiation reading from IREM, which triggered an instrument SAFE mode. A total of 128 image acquisitions were performed, 11 were missed.

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

3.2.5 IREM

The status of the unit is nominal, apart from an incident on DoY 192, when the unit anomalously reported high radiation levels causing the other instruments (except SPI) to slip into SAFE mode.

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

4 Ground Facilities

The problems during this week were mainly a planned outage of the Goldstone DSS-16 antenna, and a couple of short interruptions on DSS-16 and Redu. Despite this, the overall performance of the ground segment was acceptable, with 93% of pointings achieved (98.7 % if the ones lost due to the planned outage are not included).

4.1 Mission Operations Centre

There were no problems concerning the performance of the IMCS reported this week.

4.2 Ground Stations & Network

During this week, there were the following problems related to the ground stations:

- On DoY 186 at 07:33 the TLM from DSS-16 was interrupted, three minutes later, the timeline stopped. The TLM returned at 07:38, but it wasn't until 08:35 that the timeline could be restarted. The impact was that slew 00880061 was lost, and 00880062 performed manually.
- On DoY 189, the Goldstone pass was dropped due to the DSS-16 being committed for the MER 2 launch. The impact science data between 05:36 and 13:00. Slews 00880035 to 00880041 were lost.
- On DoY 190, slew 00900001 was performed late due to a power glitch at Redu, resulting in a shortened, effectively lost pointing.

- On DoY 191 at 14:01 Network reported problems on TMP1 at Redu, shortly afterwards the AD service terminated. At 14:05 the TC link was recovered, the impact was that slew 00900023 was lost, with 00900024 recovered manually.
- On DoY 192, at 11:30 (half an hour after AOS), there was a 4 second drop in VC7 TLM from Redu. There was no impact.

4.3 Science Ground Segment

4.3.1 ISOC

No ISOC Input has been provided

4.3.2 ISDC

On DoY 188 at 12:30 ISDC reported they were not receiving the auxiliary files. The IFTS on ISDA was restarted. At 12:43 ISDC confirm that the auxiliary files are now being received.

5 Special Events

None.

6 Anomalies

The problems related to the ground segment are already mentioned in chapter 4.

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

ARid	Date Occurrence	Subject	Segment	Element	Status
INT - 002381	2003/07/04	All TLM links on NCTRS-A dropped out	Ground	NCTRS	Pending
INT - 002382	2003/07/05	Telemetry Drops from Goldstone DR:G102997	Ground	NASA Sta.	Pending
INT - 002383	2003/07/09	Antenna stopped at REDU	Ground	ESA Sta.	Pending

7 Future Milestones

The second SPI annealing activities will start on the 15th of July.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 88
Revolution 88 consisted of a raster dithering observation of eta-Carinae (RA 10:45:3.60; DEC -59:41:03.0) lasting ~27 hours, followed by a raster dithering observation of the Vela region (RA 08:52:45.57; DEC -44:35:07.2) which was performed for the remaining ~33 hours of observation time.

Revolution 89
Revolution 89 began with an amalgamated raster dithering observation of the Centaurus-Circinus region (RA 13:52:17.00; DEC -62:02:01.8) lasting about 1 hour.

This was followed by a raster dithering observation of NGC 4418 (RA 12:26:54.60; DEC -00:52:40.0), which was amalgamated with observations of 3C 273 (RA 12:29:6.70; DEC +02:03:09.0) and GRS1227+025 (RA 12:30:24.00; DEC +02:15:00.0). This was planned to be performed for ~56 hours, however it was interrupted for approximately 7hrs30mins (on 2003-07-08 between 05:36Z and ~13:00Z), during which time the instruments were put in their safe modes manually due to a Ground Station outage.

Outside of this time period, all instruments were in their nominal science modes during the observations, 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.

Revolution 90
Revolution 90 began with a raster dithering observation of NGC 4418 (RA 12:26:54.60; DEC -00:52:40.0), which was amalgamated with observations of 3C 273 (RA 12:29:6.70; DEC +02:03:09.0) and GRS1227+025 (RA 12:30:24.00; DEC +02:15:00.0). This lasted ~17 hours and was followed by an amalgamated raster dithering observation of the Centaurus-Circinus region (RA 13:52:17.00; DEC -62:02:01.8) lasting about 42 hours.

Throughout these observations, 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

```
2003-06-24T17:06:11.000Z     176.3576    F   Automatic TM processing.
2003-06-26T02:45:34.000Z     176.3446    F   Automatic TM processing.
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2003-06-27T16:53:55.000Z     176.3294    F   Automatic TM processing.
2003-06-28T01:39:24.000Z     176.3012    F   Automatic TM processing.
2003-06-29T03:14:14.000Z     176.2810    F   Automatic TM processing.
2003-06-30T16:38:26.000Z     176.2441    F   Automatic TM processing.
2003-07-01T02:02:03.000Z     176.2270    F   Automatic TM processing.
2003-07-01T04:29:23.000Z     176.2072    F   Automatic TM processing.
2003-07-02T02:39:17.000Z     176.1975    F   Automatic TM processing.
2003-07-03T16:26:49.000Z     176.1705    F   Automatic TM processing.
2003-07-06T08:08:47.000Z     176.1257    F   Automatic TM processing.
2003-07-06T16:05:44.000Z     176.1101    F   Automatic TM processing.
2003-07-09T15:52:55.000Z     176.0947    F   Automatic TM processing.
2003-07-10T11:22:33.000Z     176.0757    F   Automatic TM processing.
2003-07-11T02:09:30.000Z     176.0582    F   Automatic TM processing.

This report was generated  Fri Jul 11 08:00:14 GMT 2003
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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, 42 Open Loop Slews, 101 Closed Loop Slews and 5 Momentum Bias were executed. 2 slews were lost or executed manually. This is equivalent to a 1.3% (this does not include the slews lost to the planned DSS-16 outage in support of MER 2 launch).

05/07/03 (Day of Year 186, Revolution 88)

Loss of Guide Star after an Open Loop Slew: At 13:08:06, at the beginning of pointing 00880066 and during the first mapping after the Open Slew end, the Star Tracker lost the dim guide star that was automatically picked by the ACC. The lost guide star was of magnitude 8.5 and had CCD coordinates (-6813, 22087). The attitude reconstruction to update the parameters for the next slew was done before the loss of guide star. This resulted in a discrepancy of about 60 arc-seconds between the Flight Dynamics System assumed roll angle and the Fine Sun Sensor readout after the loss of guide star. An error of about 122 arc-seconds in roll was also introduced into the system due to the fact that the Sun Steering Law remained disabled between the time the Guide Star was lost and the time when slew 00880067 started. This total discrepancy between the FSS readouts and the FDS assumed roll angles resulted in a Roll Error of about 182 arc-seconds at the end of Open Loop Slew 00880067. The end effect of this was that the OTF went low at the beginning of pointing 00880067 and remained “NOT REACHED” throughout this pointing. At the beginning of pointing 00880067 there was a flicker in the Pointing Bit due to the Roll Error, which was not seen at BCP OTF level.

06/07/03 (Day of Year 187, Revolution 88-89)

Nothing to report.

07/07/03 (Day of Year 188, Revolution 89)

Nothing to Report.

08/07/03 (Day of Year 189, Revolution 89)

Nothing to report.

09/07/03 (Day of Year 190, Revolution 89-90)

Slew lost due to Ground Station Problem (REDU G/S): At 17:35, a problem with the antenna at the REDU G/S (apparently the antenna had suddenly gone to "Stop Mode") caused a drop in telemetry and consequently stopping of the timeline. The result was that slew 00900001 was missed. After reestablishment of the link, the timeline recovery tool was used to manually slew to the attitude of pointing 00900001 and to manually update the parameters of the next slew.

10/07/03 (Day of Year 191, Revolution 90)

Slew lost due problems with TMP1 (REDU G/S): At 14:01, what was reported as "problems with TMP1" caused termination of the AD service and stopping of commanding. Slew 00900023 was missed because of this failure. After reestablishment of the TC link, the timeline recovery tool was used to manually slew to the attitude of pointing 00900024 in advance. The attitude of pointing 00900024 was reached at 14:28:59 instead of the originally planned time of 15:07:51. Then the parameters of slew 00900024 were manually updated. The result was that slew 00900024 was performed from the timeline basically as a Close Loop Slew to the same attitude.

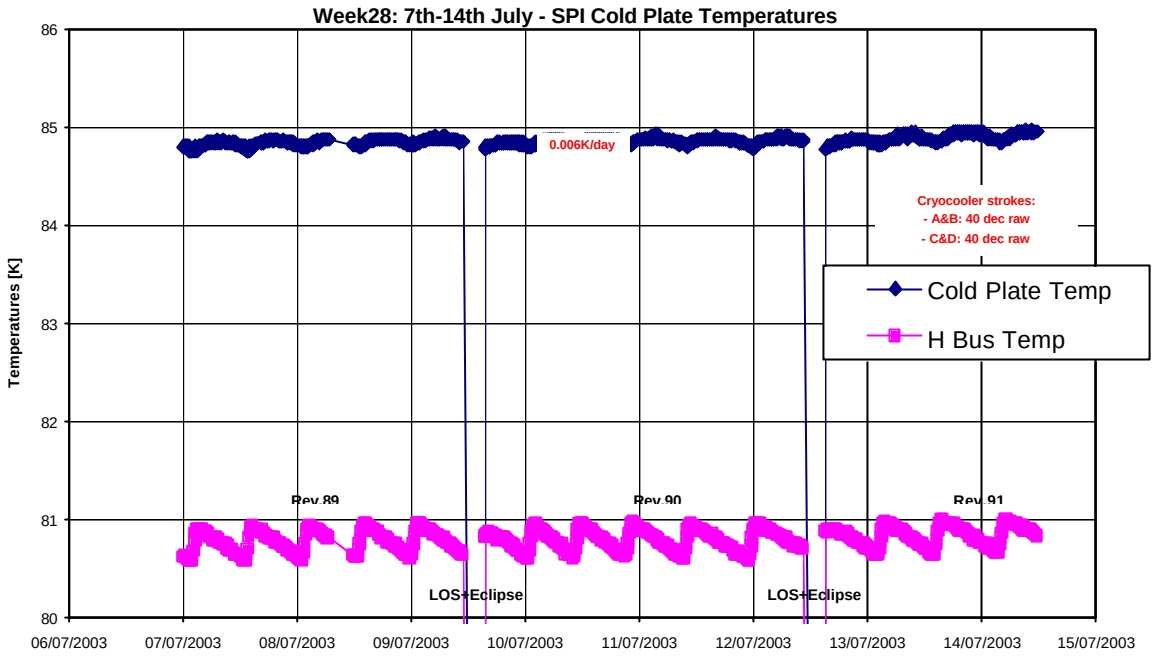
11/07/03 (Day of Year 192, Revolution 90)

Nothing to Report.

8.3.2 SPI Operations

Cryo-cooler:

The stroke of the compressors A&B was increased by 1LSB on 7th July. After 1 day transient, the cold plate temperature stabilized at around 84.8K and restarted its positive drift at a rate of 0.006K/day.

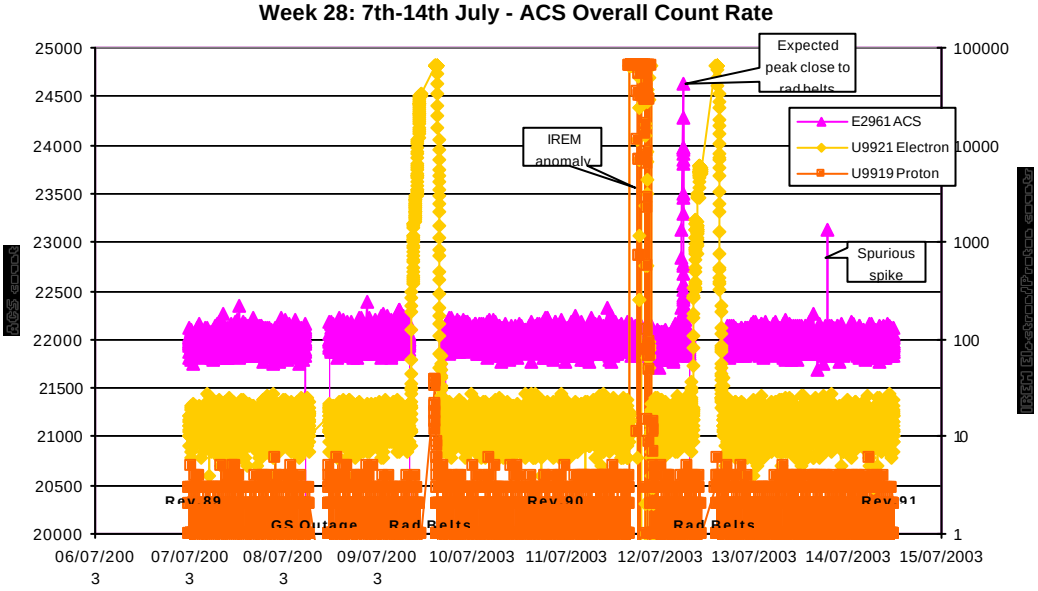


IASW/DPE:

The SPI team recently reported a new anomaly in the TM: some packets downlinked are duplicated (same header and same body content) after a certain time. The anomaly is likely located in the ground segment and took place on a few occasions. Investigations are on-going at MOC. An AR will be opened.

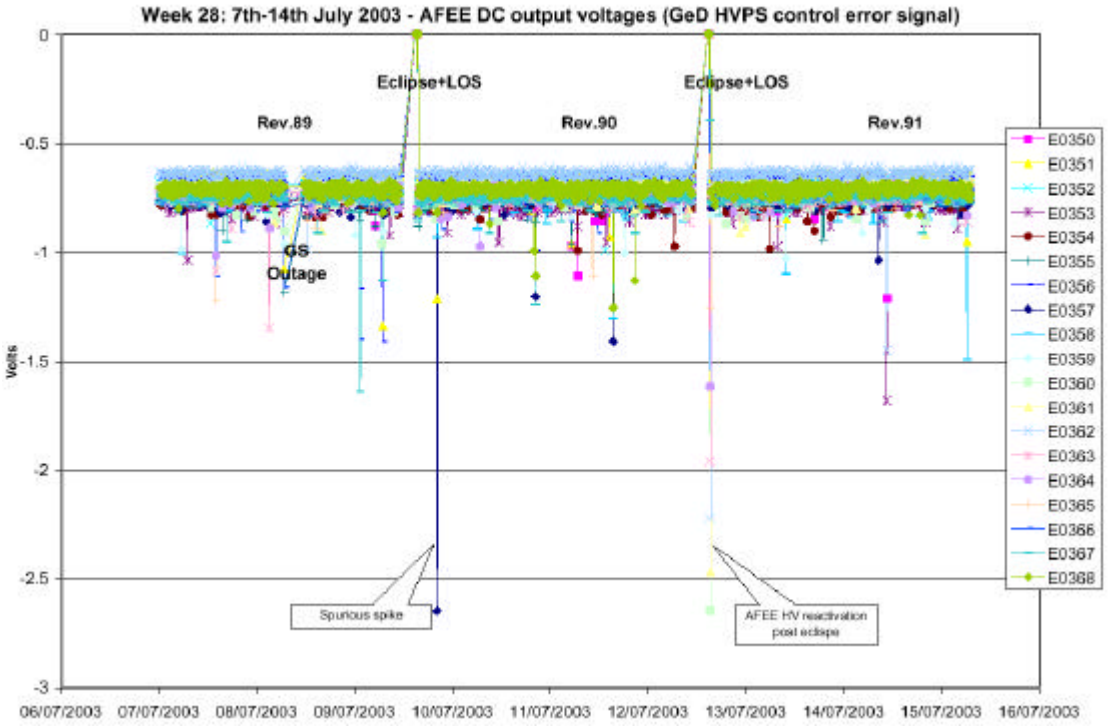
ACS:

The overall ACS count rate during the reporting period is shown below (sampling at 1/80s) together with the IREM proton/electron count. A spurious peak, which could not be correlated to the radiation environment, occurred in rev.91.



AFEE :

As expected, most of AFEE temperatures showed Out-Of-Limit for a few hours after reactivation post eclipse. The behaviour was as expected and considered nominal.
The AFEE dc output signal is shown below for the reporting period. These signals are the HV power supply control error and it is a measure of the health status of the Ge detectors HV section. The negative peaks just after the eclipses are nominal and due to the HV reactivation process post eclipse.
During the reporting period, a remarkable peak, which caused an Alarm OOL, was detected far away from the eclipse and was probably due to heavy ionising particles hitting the detector #8. The phenomenon has already occurred in the past and it is of no concern if the signal recovers in the expected range within a few minutes.



DFEE, PSD:

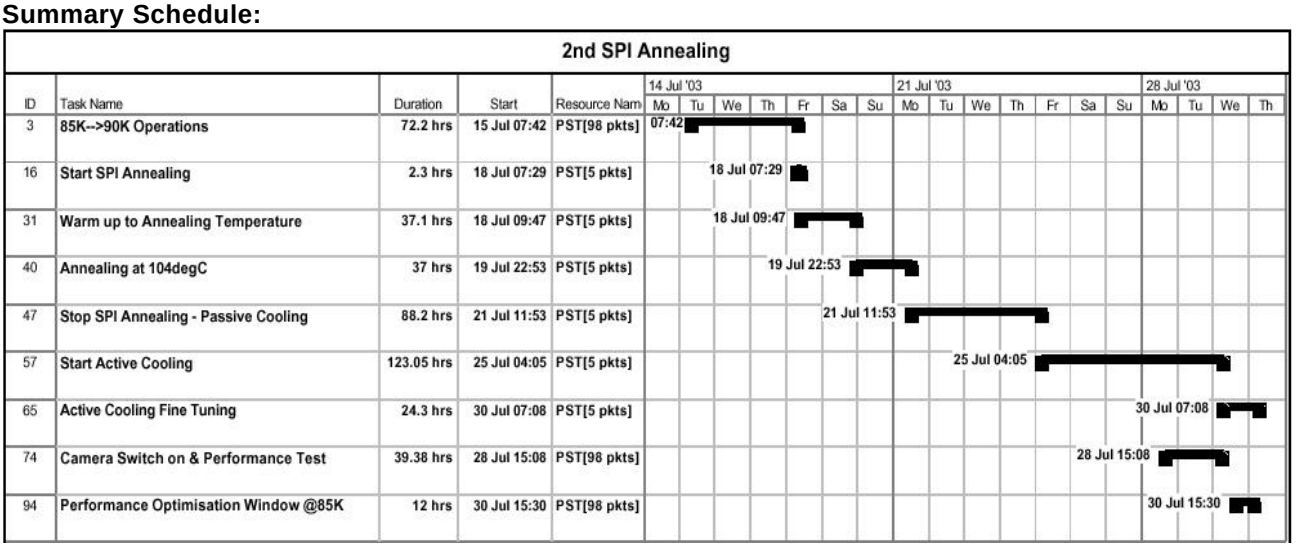
Nothing to report

Detailed Timeline of the 2nd SPI Annealing :

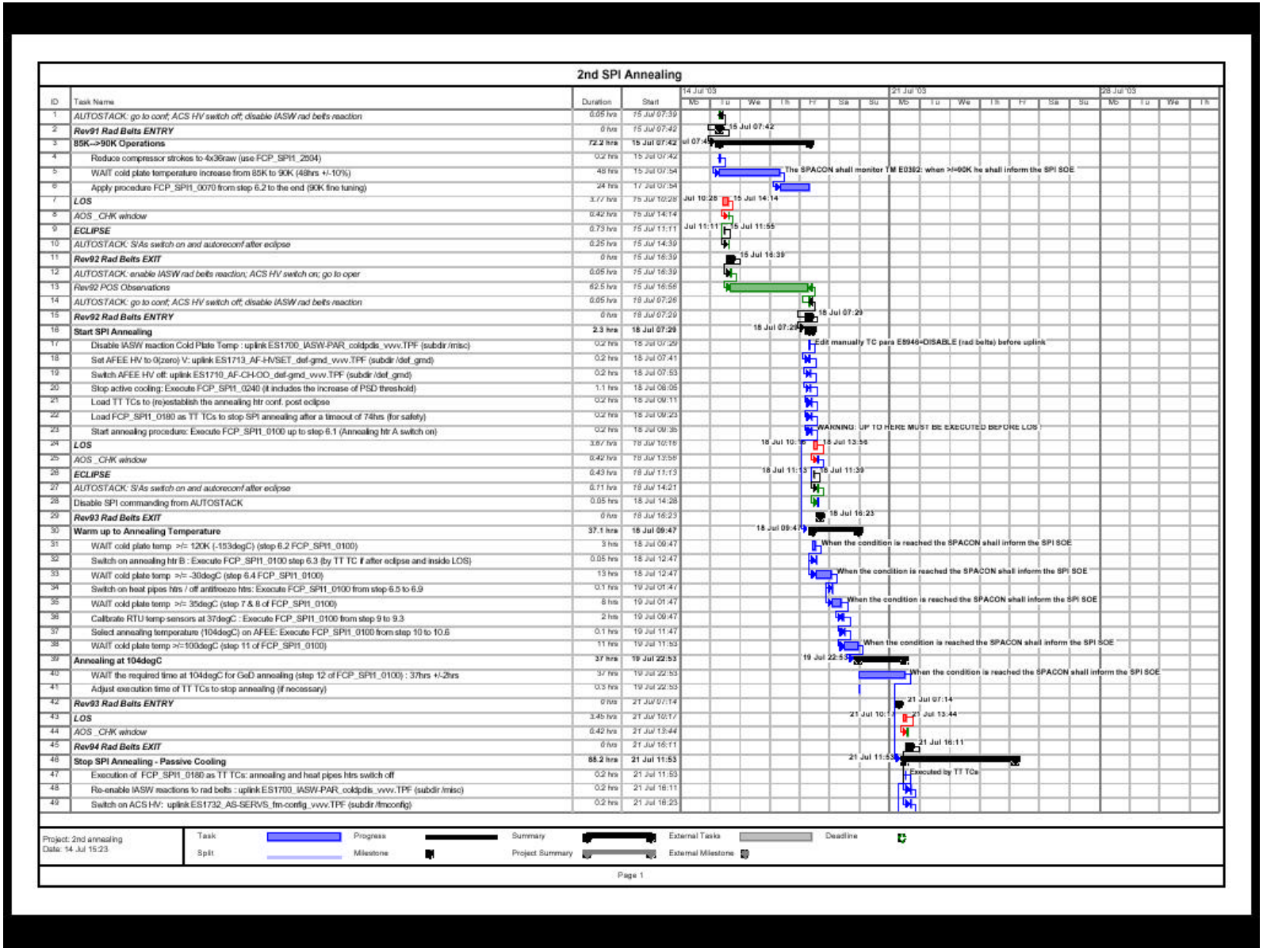
An Operational Request (INT_OR)0085) was issued internally to brief the FCT about the SPI special ops taking place in the following 3 weeks, starting on 15th July – ending on 31st July, in which the 2nd SPI annealing is planned.
The summary schedule & detailed timeline for such SPI special ops has been produced and here attached.

The actual annealing operations will start on 18th July at the rad belts entry of rev.92 and will terminate by 30th July at rad belts exit of rev.97.
The annealing ops will be however preceded by a revolution in which the cold plate temperature is changed from 85K → 90K. This will be commanded at the rad belt entry of rev.91 on 15th July. It will take about 48hrs to reach 90K.
The annealing ops will be then followed by a revolution in which the initial 12 hrs of the science window could be affected by manual commanding of the SPI (between 30th and 31st July in rev.97). Such ops will be requested in real time by the SPI PI here at MOC to finalize the tuning of the instrument post annealing.

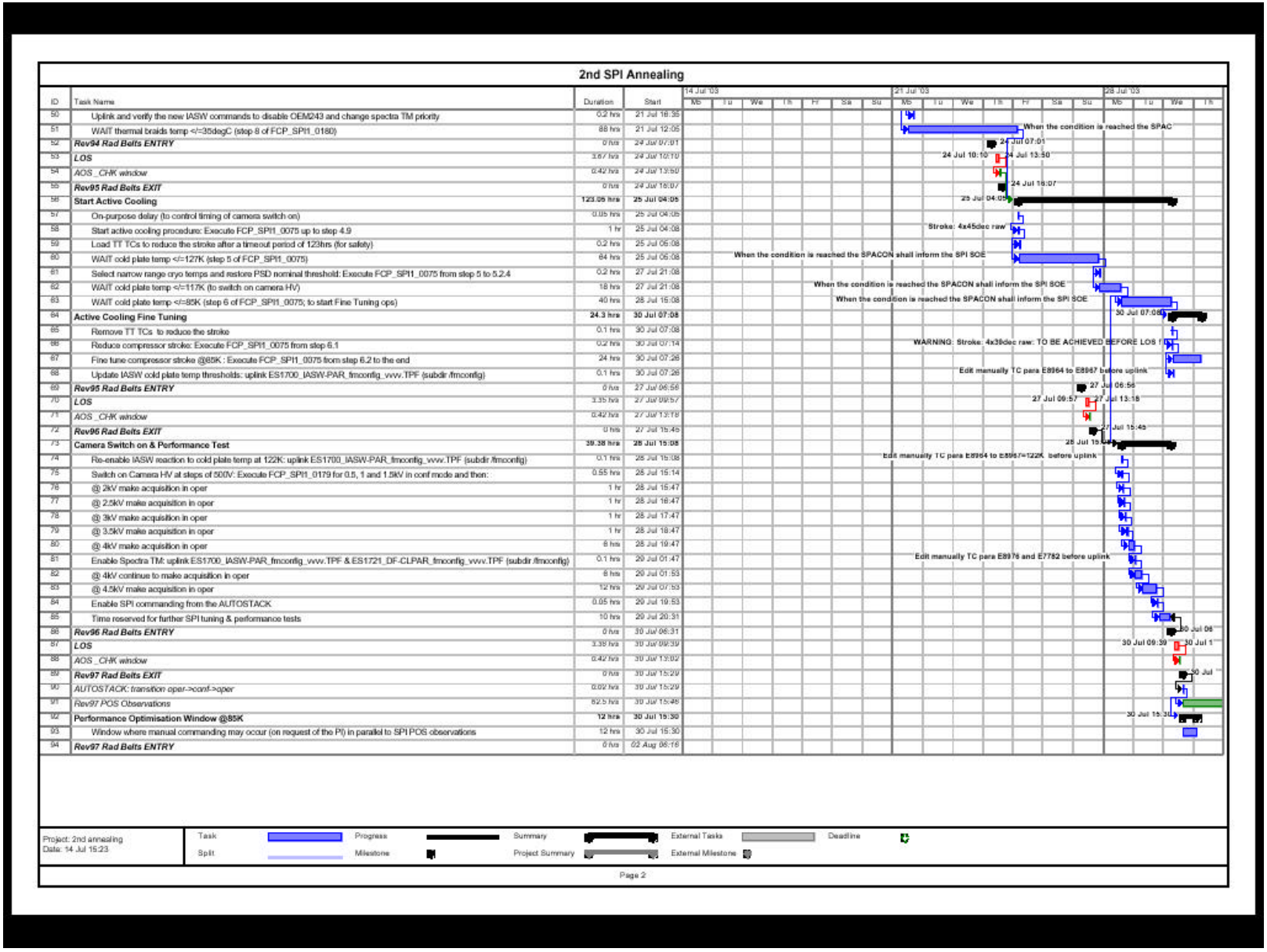
Summary Schedule:



Detailed Timeline:
See the next two pages.



ID	Task Name	Duration	Start
1	*AUTOSTACK: go to conf; ACS HV switch off; disable IASW rad belts reaction*	0.05 hrs	15 Jul 07:39
2	***Rev91 Rad Belts ENTRY***	0 hrs	15 Jul 07:42
3	**85K-->90K Operations**	72.2 hrs	15 Jul 07:42
4	Reduce compressor strokes to 4x36raw (use FCP_SPI1_2504)	0.2 hrs	15 Jul 07:42
5	WAIT cold plate temperature increase from 85K to 90K (48hrs +/-10%)	48 hrs	15 Jul 07:54
6	Apply procedure FCP_SPI1_0070 from step 6.2 to the end (90K fine tuning)	24 hrs	17 Jul 07:54
7	***LOS***	3.77 hrs	18 Jul 10:28
8	*AOS _CHK window*	0.42 hrs	18 Jul 14:14
9	***ECLIPSE***	0.73 hrs	18 Jul 11:11
10	*AUTOSTACK: S/As switch on and autoreconf after eclipse*	0.25 hrs	18 Jul 14:39
11	***Rev92 Rad Belts EXIT***	0 hrs	18 Jul 16:39
12	*AUTOSTACK: enable IASW rad belts reaction; ACS HV switch on; go to oper*	0.05 hrs	18 Jul 16:39
13	*Rev92 POS Observations*	62.5 hrs	18 Jul 16:56
14	*AUTOSTACK: go to conf; ACS HV switch off; disable IASW rad belts reaction*	0.05 hrs	18 Jul 07:26
15	***Rev92 Rad Belts ENTRY***	0 hrs	18 Jul 07:29
16	**Start SPI Annealing**	2.3 hrs	18 Jul 07:29
17	Disable IASW reaction Cold Plate Temp : uplink ES1700_IASW-PAR_coldpdis_vvv.TPF (subdir /misc)	0.2 hrs	18 Jul 07:29
18	Set AFEE HV to 0(zero) V: uplink ES1713_AF-HVSET_def-gmd_vvv.TPF (subdir /def_gmd)	0.2 hrs	18 Jul 07:41
19	Switch AFEE HV off: uplink ES1710_AF-CH-OO_def-gmd_vvv.TPF (subdir /def_gmd)	0.2 hrs	18 Jul 07:53
20	Stop active cooling: Execute FCP_SPI1_0240 (it includes the increase of PSD threshold)	1.1 hrs	18 Jul 08:05
21	Load TT TCs to (re)establish the annealing htr conf. post eclipse	0.2 hrs	18 Jul 09:11
22	Load FCP_SPI1_0180 as TT TCs to stop SPI annealing after a timeout of 74hrs (for safety)	0.2 hrs	18 Jul 09:23
23	Start annealing procedure: Execute FCP_SPI1_0100 up to step 6.1 (Annealing htr A switch on)	0.2 hrs	18 Jul 09:35
24	***LOS***	3.67 hrs	18 Jul 10:15
25	*AOS _CHK window*	0.42 hrs	18 Jul 13:58
26	***ECLIPSE***	0.43 hrs	18 Jul 11:13
27	*AUTOSTACK: S/As switch on and autoreconf after eclipse*	0.71 hrs	18 Jul 14:21
28	Disable SPI commanding from AUTOSTACK	0.05 hrs	18 Jul 14:28
29	***Rev93 Rad Belts EXIT***	0 hrs	18 Jul 16:23
30	**Warm up to Annealing Temperature**	37.1 hrs	18 Jul 09:47
31	WAIT cold plate temp >/= 120K (-153degC) (step 6.2 FCP_SPI1_0100)	3 hrs	18 Jul 09:47
32	Switch on annealing htr B : Execute FCP_SPI1_0100 step 6.3 (by TT TC if after eclipse and inside LOS)	0.05 hrs	18 Jul 12:47
33	WAIT cold plate temp >/= -30degC (step 6.4 FCP_SPI1_0100)	13 hrs	18 Jul 12:47
34	Switch on heat pipes htrs / off antifreeze htrs: Execute FCP_SPI1_0100 from step 6.5 to 6.9	0.1 hrs	19 Jul 01:47
35	WAIT cold plate temp >/= 35degC (step 7 & 8 of FCP_SPI1_0100)	8 hrs	19 Jul 01:47
36	Calibrate RTU temp sensors at 37degC : Execute FCP_SPI1_0100 from step 9 to 9.3	2 hrs	19 Jul 09:47
37	Select annealing temperature (104degC) on AFEE: Execute FCP_SPI1_0100 from step 10 to 10.6	0.1 hrs	19 Jul 11:47
38	WAIT cold plate temp >/=100degC (step 11 of FCP_SPI1_0100)	11 hrs	19 Jul 11:53
39	**Annealing at 104degC**	37 hrs	19 Jul 22:53
40	WAIT the required time at 104degC for GeD annealing (step 12 of FCP_SPI1_0100) : 37hrs +/-2hrs	37 hrs	19 Jul 22:53
41	Adjust execution time of TT TCs to stop annealing (if necessary)	0.3 hrs	19 Jul 22:53
42	***Rev93 Rad Belts ENTRY***	0 hrs	21 Jul 07:14
43	***LOS***	3.45 hrs	21 Jul 10:17
44	*AOS _CHK window*	0.42 hrs	21 Jul 13:44
45	***Rev94 Rad Belts EXIT***	0 hrs	21 Jul 16:11
46	**Stop SPI Annealing - Passive Cooling**	88.2 hrs	21 Jul 11:53
47	Execution of FCP_SPI1_0180 as TT TCs: annealing and heat pipes htrs switch off	0.2 hrs	21 Jul 11:53
48	Re-enable IASW reactions to rad belts : uplink ES1700_IASW-PAR_coldpdis_vvv.TPF (subdir /misc)	0.2 hrs	21 Jul 16:11
49	Switch on ACS HV: uplink ES1732_AS-SERVS_fm-config_vvv.TPF (subdir /fmconfig)	0.2 hrs	21 Jul 16:23


2nd SPI Annealing
ID
Task Name
Duration
Start
14 Jul '03
21 Jul '03
28 Jul '03
50 Uplink and verify the new IASW commands to disable OEM243 and change spectra TM priority 0.2 hrs 21 Jul 18:35
51 WAIT thermal braids temp </=35degC (step 8 of FCP_SPI1_0180) 88 hrs 21 Jul 12:05
52 Rev94 Rad Belts ENTRY 0 hrs 24 Jul 07:01
53 LOS 3.67 hrs 24 Jul 10:10
54 AOS _CHK window 0.42 hrs 24 Jul 13:50
55 Rev95 Rad Belts EXIT 0 hrs 24 Jul 16:07
56 Start Active Cooling 123.05 hrs 25 Jul 04:05
57 On-purpose delay (to control timing of camera switch on) 0.05 hrs 25 Jul 04:05
58 Start active cooling procedure: Execute FCP_SPI1_0075 up to step 4.9 1 hr 25 Jul 04:08
59 Load TT TCs to reduce the stroke after a timeout period of 123hrs (for safety) 0.2 hrs 25 Jul 05:08
60 WAIT cold plate temp </=127K (step 5 of FCP_SPI1_0075) 84 hrs 25 Jul 05:08
61 Select narrow range cryo temps and restore PSD nominal threshold: Execute FCP_SPI1_0075 from step 5 to 5.2.4 0.2 hrs 27 Jul 21:08
62 WAIT cold plate temp </=117K (to switch on camera HV) 18 hrs 27 Jul 21:08
63 WAIT cold plate temp </=85K (step 6 of FCP_SPI1_0075; to start Fine Tuning ops) 40 hrs 28 Jul 15:08
64 Active Cooling Fine Tuning 24.3 hrs 30 Jul 07:08
65 Remove TT TCs to reduce the stroke 0.1 hrs 30 Jul 07:08
66 Reduce compressor stroke: Execute FCP_SPI1_0075 from step 6.1 0.2 hrs 30 Jul 07:14
67 Fine tune compressor stroke @85K : Execute FCP_SPI1_0075 from step 6.2 to the end 24 hrs 30 Jul 07:28
68 Update IASW cold plate temp thresholds: uplink ES1700_IASW-PAR_fmconfig_vvv.TPF (subdir /fmconfig) 0.1 hrs 30 Jul 07:28
69 Rev95 Rad Belts ENTRY 0 hrs 27 Jul 06:56
70 LOS 3.35 hrs 27 Jul 09:57
71 AOS _CHK window 0.42 hrs 27 Jul 13:18
72 Rev96 Rad Belts EXIT 0 hrs 27 Jul 15:45
73 Camera Switch on & Performance Test 39.38 hrs 28 Jul 15:08
74 Re-enable IASW reaction to cold plate temp at 122K: uplink ES1700_IASW-PAR_fmconfig_vvv.TPF (subdir /fmconfig) 0.1 hrs 28 Jul 15:08
75 Switch on Camera HV at steps of 500V: Execute FCP_SPI1_0179 for 0.5, 1 and 1.5kV in conf mode and then: 0.55 hrs 28 Jul 15:14
76 @ 2kV make acquisition in oper 1 hr 28 Jul 15:47
77 @ 2.5kV make acquisition in oper 1 hr 28 Jul 16:47
78 @ 3kV make acquisition in oper 1 hr 28 Jul 17:47
79 @ 3.5kV make acquisition in oper 1 hr 28 Jul 18:47
80 @ 4kV make acquisition in oper 8 hrs 28 Jul 19:47
81 Enable Spectra TM: uplink ES1700_IASW-PAR_fmconfig_vvv.TPF & ES1721_DF-CLPAR_fmconfig_vvv.TPF (subdir /fmconfig) 0.1 hrs 29 Jul 01:47
82 @ 4kV continue to make acquisition in oper 8 hrs 29 Jul 01:53
83 @ 4.5kV make acquisition in oper 12 hrs 29 Jul 07:53
84 Enable SPI commanding from the AUTOSTACK 0.05 hrs 29 Jul 19:53
85 Time reserved for further SPI tuning & performance tests 10 hrs 29 Jul 20:31
86 Rev96 Rad Belts ENTRY 0 hrs 30 Jul 06:31
87 LOS 3.35 hrs 30 Jul 09:39
88 AOS _CHK window 0.42 hrs 30 Jul 13:02
89 Rev97 Rad Belts EXIT 0 hrs 30 Jul 15:29
90 AUTOSTACK: transition oper->conf->oper 0.02 hrs 30 Jul 15:29
91 Rev97 POS Observations 82.5 hrs 30 Jul 15:48
92 Performance Optimisation Window @85K 12 hrs 30 Jul 15:30
93 Window where manual commanding may occur (on request of the PI) in parallel to SPI POS observations 12 hrs 30 Jul 15:30
94 Rev97 Rad Belts ENTRY 0 hrs 02 Aug 06:16
When the condition is reached the SPAC
24 Jul 07:01
24 Jul 10:10
24 Jul 13:50
24 Jul 16:07
25 Jul 04:05
Stroke: 4x45dec raw
When the condition is reached the SPACON shall inform the SPI SOE
When the condition is reached the SPACON shall inform the SPI SOE
When the condition is reached the SPACON shall inform the SPI SOE
30 Jul 07:08
WARNING: Stroke: 4x39dec raw: TO BE ACHIEVED BEFORE LOS !!
Edit manually TC para E8964 to E8967 before uplink
27 Jul 06:56
27 Jul 09:57
27 Jul 13:18
27 Jul 15:45
28 Jul 15:08
Edit manually TC para E8964 to E8967=122K before uplink
Edit manually TC para E8976 and E7782 before uplink
30 Jul 06
30 Jul 09:39
30 Jul 1
30 Jul
30 Jul 15:30
Project: 2nd annealing
Date: 14 Jul 15:23
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline
Page 2

8.3.3 IBIS Operations

There were a few reports during the Belt passages of the OEM ID 167 Class 2<<IBIS1 PICsIT NOISY SEMIMODULE>> caused by the PICsIT detectors being ON without the VETO anticoincidence system, as required by PIs.

On **DoY 2003.192 (11/07)** at 15.33Z there was a problem with IBIS Histogram production. Both Standard Hist and Calibration Hist processes were stopped. ISDC was informed and the recovery action consisted of forcing the last Hist accumulated on board by using the TC_sequence GEHSDL01 and GS0303.

At 16.33Z, an automatic transition to Stand-by, caused by an anomaly on IREM that forced the reaction of the on board automatism (see IREM report for details).
The Unit was recovered at 17.51Z.

8.3.4 JEM-X Operations

05/07/2003, DOY 186, Revolution 88
Nothing to report

06/07/2003, DOY 187, Revolution 88-89
Nothing to report

07/07/2003, DOY 188, Revolution 89
Nothing to report

08/07/2003, DOY 189, Revolution 89
A planned ground station outage, which for JEMX began when the instrument was put into SAFE mode at 05:44, and ended when the instrument was back in DATA TAKING at 13:10.

09/07/2003, DOY 190, Revolution 89-90
Nothing to report

10/07/2003, DOY 191, Revolution 90
Nothing to report

11/07/2003, DOY 192, Revolution 90
At 16:33 JEM-X, together with the other instruments went into SAFE mode following erroneous radiation levels reported by IREM. It was finally re-enabled at 18:43.

8.3.5 OMC Operations

During this period 11 out of the 139 originally planned OMC image acquisitions were missed.

05/07/2003, DOY 186, Revolution 88
An unplanned TLM and TC drop from the ground station caused the Timeline to be stopped from 07:36 to 08:35, pointing 00880061 was lost.

06/07/2003, DOY 187, Revolution 88-89
Nothing to report

07/07/2003, DOY 188, Revolution 89
Nothing to report

08/07/2003, DOY 189, Revolution 89
A planned ground station outage, resulted in 7 pointings being lost, 00890035 to 00890041.

09/07/2003, DOY 190, Revolution 89-90
At 17:34, a drop in TLM/TC at Redu, caused by a local power failure, caused slew 00900001 to be up-linked late, the pointing was effectively lost.

10/07/2003, DOY 191, Revolution 90
At 14:01, for 4 minutes the TLM was lost causing slew 00900023 to be missed. Two telecommands were rejected during this time

```
2003.191.14.06.36.116 2003.191.14.06.27.536   1792  Real Time Rejection 131
REJECTED TC1
       FIX2=0 M5010=6,NORMAL M9079=3 M9080=131 M5001=60,IM A M9068=1 FIX2=0 M9069=588
2003.191.14.06.27.708 2003.191.14.06.21.661   1792  Real Time Rejection 131
REJECTED TC1
       FIX2=0  M5010=6,NORMAL  M9079=3  M9080=131  M5001=130,RESET  IM  M9068=1  FIX2=0
M9069=587
```

11/07/2003, DOY 192, Revolution 90
At 16:33 OMC, together with the other instruments went into SAFE mode following erroneous radiation levels reported by IREM. It was finally re-enabled at 17:36. The impact was that pointing 00900048 was lost.

8.3.6 IREM Operations

On DoY 2003.192, at 16.33Z the unit had a local reset of the IREM CSCI SW: as in the past (see anomalies on 16/12/2002, 01/01/2003 and 03/06/2003) the status of the unit was nominal, hereafter follows the summary:

1) temperatures nominal;

2) LCL current nominal;

3) The last HK before the anomaly reported HV , 5V, 6V voltages inside limits;

4) The anomaly occurred at 2003.192.16.33Z (a few minutes before pointing 009000048) the unit performed an automatic transition to Standard Mode (i.e. no block counter increasing, all the TM words= FFFF hex);

5) The first dump of the status word after the anomaly reported the value '48320' Dec =' BCC0' hex =

'1 Ground Link On
0
1 Accumulation ON
1 Counting ON
1 Integral Mode
1
0
0
1 HV ON
1 Checksum failure ON
0
0
0
0
0
0'

i.e. the unit reported a status word as Integral mode with counting ON, accumulation ON and the checksum failure flag ON. It was assumed, as in the past, that the value of the status word was that one written/requested by the S/W at moment of anomaly;

6) Dumping the complete register bank, the unit reported, as in the past, a different value of the status word: '48256' Dec = ' BC80' hex=

'1
0
1
1
1
1
0
0
1
0 Checksum Failure OFF
0
0
0
0
0
0'

i.e. The unit was still reporting the status word as Integral mode BUT with the checksum failure flag OFF . Inspecting the checksum failure counter in the register bank # 3, it had incremented by 1, (the past value was 3 due to the previous three SEUs).

The IREM automatic transition to Standard Mode (reset of the CSCI S/W) affected the instruments status via BCP: at the same time of the IREM anomaly, OMC, JEM-X2 and IBIS went in safe mode activated by internal automatism (due to the value

'FFFF' of the radiation counters). SPI did not react, as the internal automatism is not enabled, as requested by SPI PIs.

The cause of this S/W reset was probably due to a SEU, as already seen in the past. An external single ionising radiation (probably an heavy ion/cosmic radiation) produced a burst of hole-electron pair large enough to cause a bit status change in the IREM memory. This event was detected by the checksum control logic that triggered the reset of the CSCI S/W.

The recovery of the unit started around 18.57Z including the uplink of the IREM patch (counters rescaling factor). The DRMC flag was disabled and the patch was successfully up-linked; a dump of the memory patch was performed, see below.

The reconfiguration of the instruments was completed as follows:
OMC at 17.36Z
IBIS at 17.51Z
JEM-X2 at 18.43

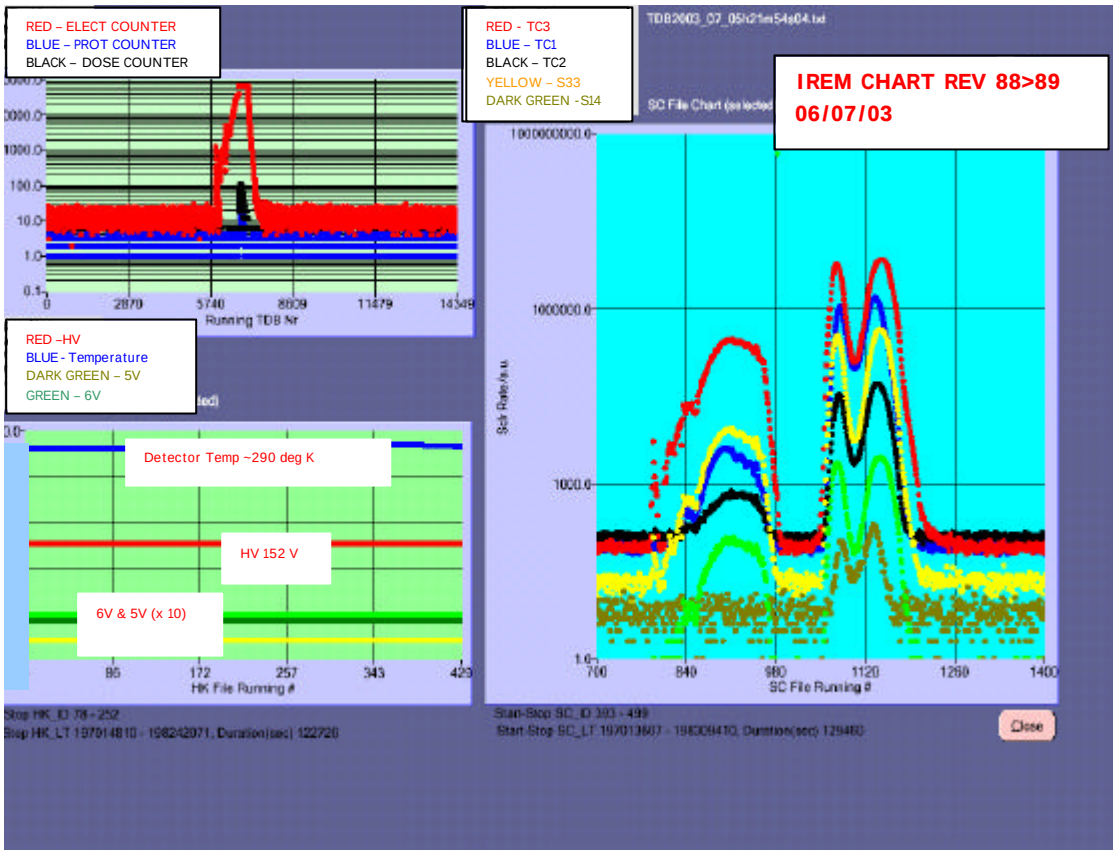
All the payloads were re-configured before pointing 00900050.

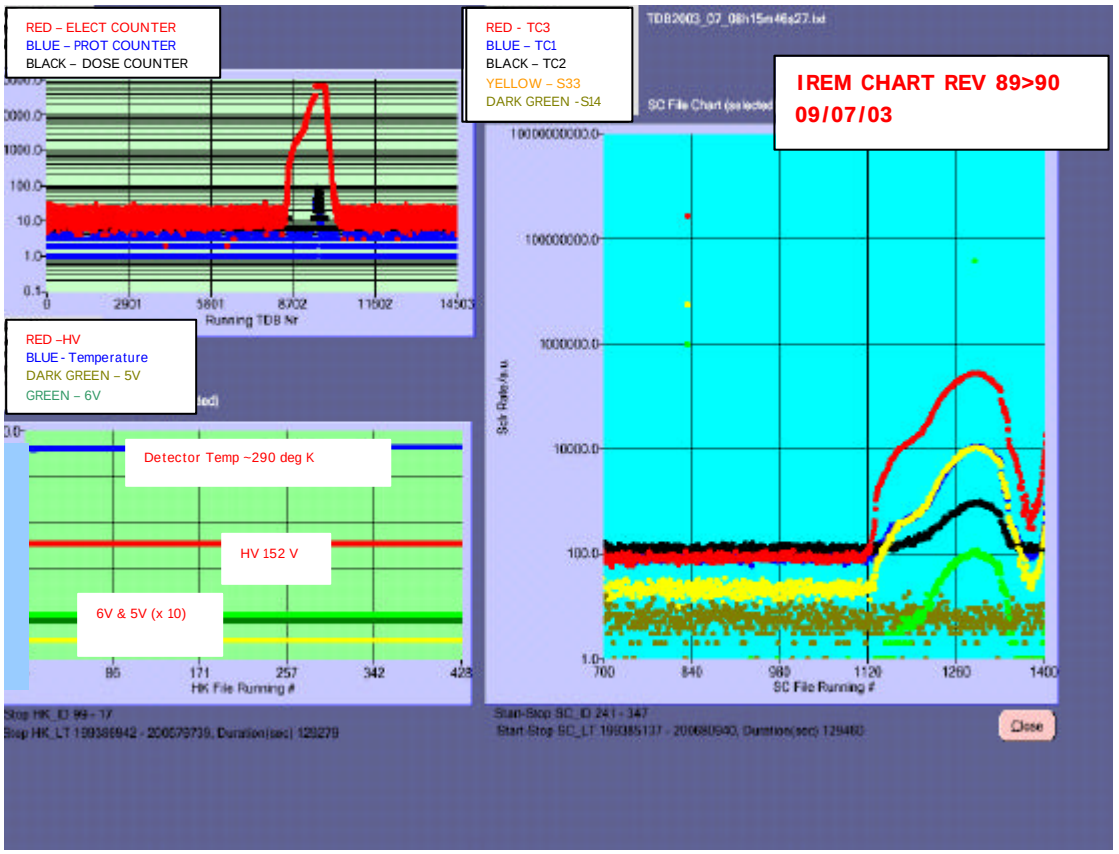
After the patch, IREM was verified with different scalers and with the Ground Link ON/OFF function (see Transfer Data Blocks attached). The final setting of the unit is:

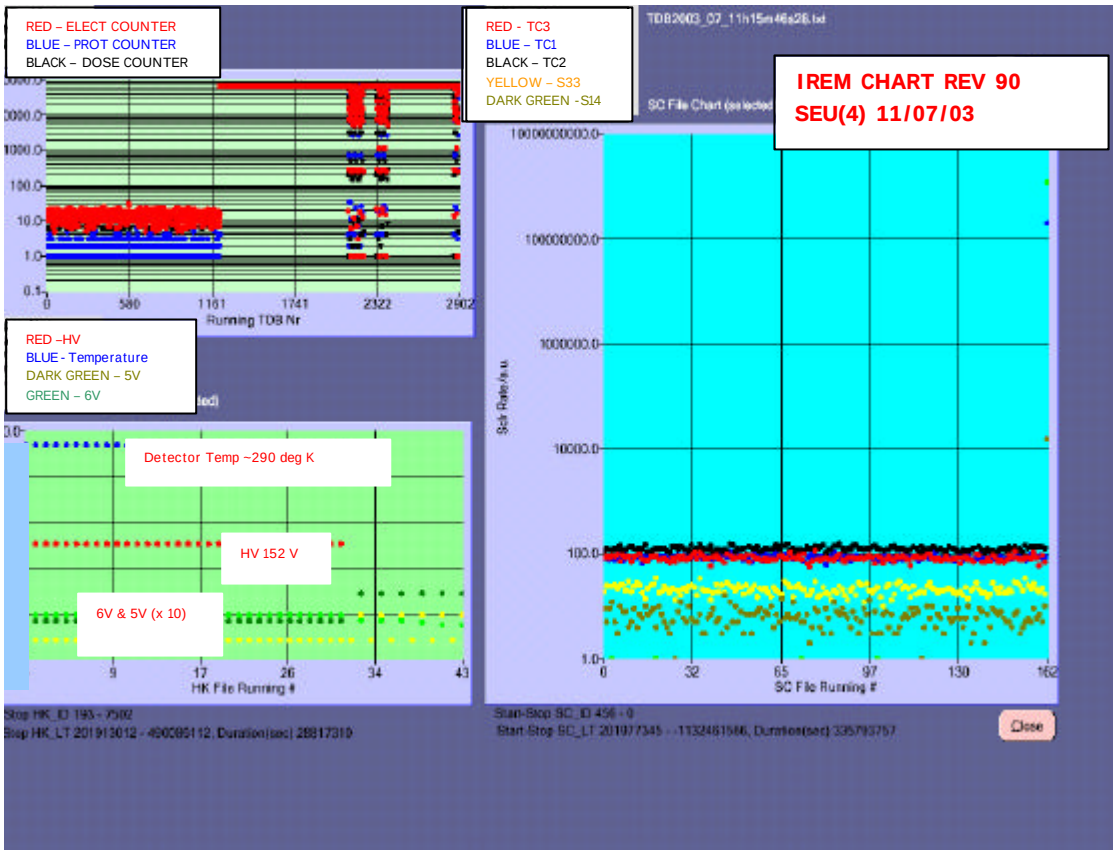
- accumulation time 60 sec
- HK files every 5 SCI files
- TC3 scaler for the electron counter
- S14 scaler for the proton counter

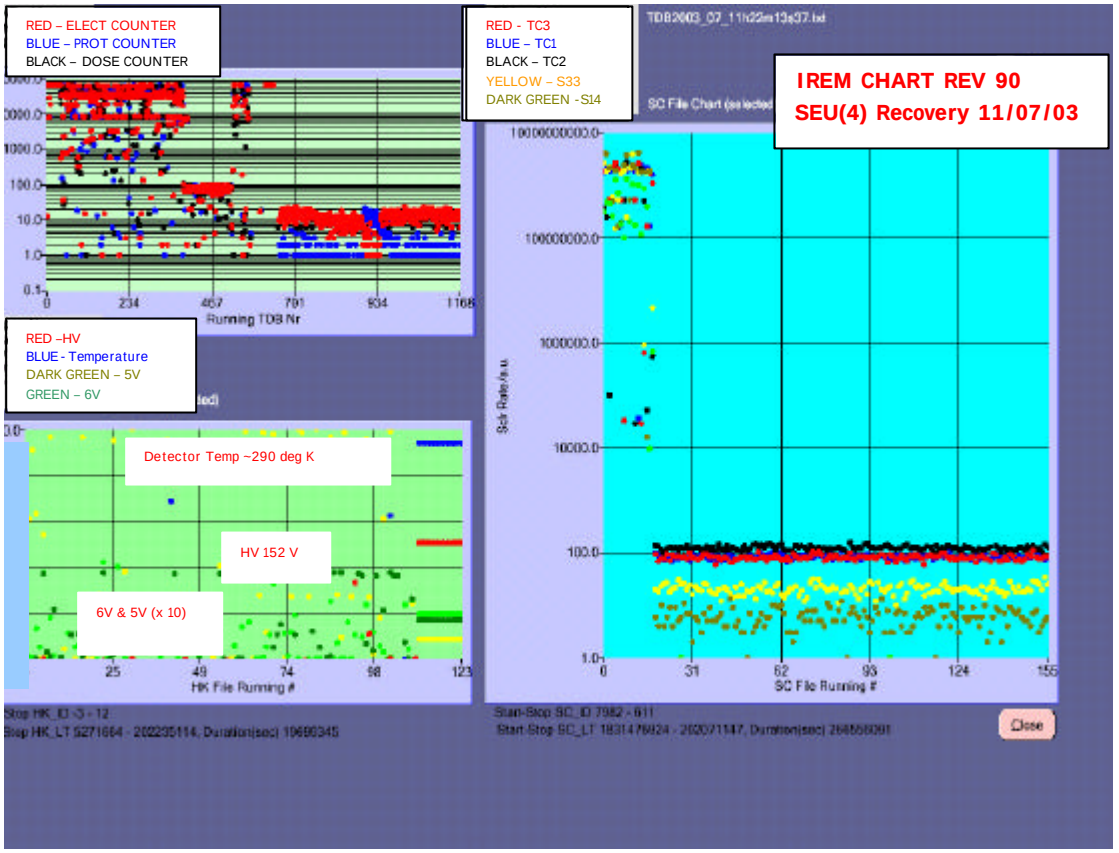
The DRMC flag in the BCP was re-enabled on DoY 2003.193. After the recovery the status of the unit is Nominal.

The following plots show the IREM count-rates for the radiation belts passages in rev 88, 89 and the moment of the IREM anomaly.


RED – ELECT COUNTER
BLUE – PROT COUNTER
BLACK – DOSE COUNTER
Running TDB Nr
RED –HV
BLUE - Temperature
DARK GREEN – 5V
GREEN – 6V
Detector Temp ~290 deg K
HV 152 V
6V & 5V (x 10)
HK File Running #
RED - TC3
BLUE – TC1
BLACK – TC2
YELLOW – S33
DARK GREEN -S14
IREM CHART REV 88>89
06/07/03
SC File Running #
Close


RED – ELECT COUNTER
BLUE – PROT COUNTER
BLACK – DOSE COUNTER
Running TDB Nr
RED –HV
BLUE - Temperature
DARK GREEN – 5V
GREEN – 6V
Detector Temp ~290 deg K
HV 152 V
6V & 5V (x 10)
HK File Running #
RED - TC3
BLUE – TC1
BLACK – TC2
YELLOW – S33
DARK GREEN -S14
IREM CHART REV 89>90
09/07/03
SC File Running #
Close


RED – ELECT COUNTER
BLUE – PROT COUNTER
BLACK – DOSE COUNTER
Running TDB Nr
RED - TC3
BLUE – TC1
BLACK – TC2
YELLOW – S33
DARK GREEN - S14
IREM CHART REV 90
SEU(4) 11/07/03
SC File Running #
RED –HV
BLUE - Temperature
DARK GREEN – 5V
GREEN – 6V
Detector Temp ~290 deg K
HV 152 V
6V & 5V (x 10)
HK File Running #
Close


RED – ELECT COUNTER
BLUE – PROT COUNTER
BLACK – DOSE COUNTER
Running TDB Nr
RED – HV
BLUE - Temperature
DARK GREEN – 5V
GREEN – 6V
Detector Temp ~290 deg K
HV 152 V
6V & 5V (x 10)
HK File Running #
RED - TC3
BLUE – TC1
BLACK – TC2
YELLOW – S33
DARK GREEN - S14
IREM CHART REV 90
SEU(4) Recovery 11/07/03
SC File Running #
Close

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. Though these Anomaly Reports still have a pending status most of the problems have been analysed and solutions or at least workarounds are already in place.

ARid	Date Occurrence	Subject	Segment	Element	Status
INT - 002010	2002/10/22	Time correlation not applied correctly to time parameters in TM type 8 reports.	Ground	IMCS	Pending
INT - 002066	2002/11/13	Data routing to ISDS	Ground	I/F to SGS	Pending
INT - 002082	2002/11/13	TM packet production lower than allocation.	Space	SPI	Pending
INT - 002094	2002/11/19	TDRS does not work with super-commutated parameters	Ground	IMCS	Pending
INT - 002142	2002/12/11	TDRS Time Interval Setting	Ground	IMCS	Pending
INT - 002145	2002/12/15	Commands failing PTV for no reason	Ground	IMCS	Pending
INT - 002212	2003/01/29	TDRS Interval-by-Interval TM Retrieval Problem	Ground	IMCS	Pending
INT - 002213	2003/01/29	SCOS 2000 Interval-by-Interval TM Retrieval Problem	Ground	IMCS	Pending
INT - 002217	2003/02/06	TC link drop	Ground	NASA Sta.	Pending
INT - 002219	2003/02/10	IBIS: PICsIT PDMs counters SET to 0 (twice) during nominal operation	Space	IBIS	Pending
INT - 002233	2003/02/24	Time Calibration not Coherent among Ground Stations	Ground		Pending
INT - 002234	2003/02/24	S2K unable to access READ ONLY disk in IDDA.	Ground	IMCS	Pending
INT - 002235	2003/02/25	Too narrow window for RMU cal in PSF of rev 49	Ground	I/F to SGS	Pending
INT - 002242	2003/03/02	TM &TC Drop on DSS 16	Ground	NASA Sta.	Pending
INT - 002246	2003/03/05	Loss of Telemetry from DSS16	Ground	NASA Sta.	Pending
INT - 002253	2003/03/10	RX1 and RX2 Locked at the same time	Ground	NASA Sta.	Pending
INT - 002255	2003/03/10	Late AOS at DSS-24	Ground	NASA Sta.	Pending
INT - 002256	2003/03/14	Late AOS at DSS-16	Ground	NASA Sta.	Pending
INT - 002257	2003/03/17	Late AOS at DSS-24	Ground	NASA Sta.	Pending
INT - 002259	2003/03/21	TDRS: Retrieval log is Meaningless.	Ground	IMCS	Pending

INT - 002260	2003/03/21	Monitoring task Printout, sample time	Ground	IMCS	Pending
INT - 002262	2003/03/21	TDRS: FEN Retrievals containing status parameters always fail.	Ground	IMCS	Pending
INT - 002267	2003/03/25	Drop in link from ISDS to ISDC	Ground	I/F to SGS	Pending
INT - 002273	2003/03/27	Drop in VC7 via REDU	Ground	ESA Sta.	Pending
INT - 002279	2003/03/29	Telemetry lost from DSS-16. DR N109197	Ground	NASA Sta.	Pending
INT - 002295	2003/04/15	Telemetry Drops from Goldstone	Ground	NASA Sta.	Pending
INT - 002298	2003/04/20	ISDS - ISDC link outage	Ground	I/F to SGS	Pending
INT - 002299	2003/04/21	Telemetry loss from DSS-24	Ground	NASA Sta.	Pending
INT - 002302	2003/04/24	Telemetry loss via DSS-16 due to RFI	Ground	NASA Sta.	Pending
INT - 002304	2003/04/26	IFTS MCS instance not working	Ground	IMCS	Pending
INT - 002305	2003/05/04	Telemetry Drops from Goldstone. DR GI02720	Ground	NASA Sta.	Pending
INT - 002308	2003/05/05	Loss of TM/TC link due to hit on line	Ground	COMMS	Pending
INT - 002307	2003/05/06	Wrong sign applied in the S/C delay in the correlator.	Ground	IMCS	Pending
INT - 002309	2003/05/06	Command release delayed	Ground	ESA Sta.	Pending
INT - 002311	2003/05/06	Drop in TM on MADDS-ISDSA link	Ground	ESA Sta.	Pending
INT - 002312	2003/05/06	Static PTV in "No Go" State for command A3189	Ground	IMCS	Pending
INT - 002318	2003/05/09	SUN workstation 128 rebooted itself.	Ground	IMCS	Pending
INT - 002314	2003/05/12	Wrong file displayed for Timeline Summary File	Ground	IMCS	Pending
INT - 002323	2003/05/19	Telemetry Drops from Goldstone (DR 109346)	Ground	NASA Sta.	Pending
INT - 002324	2003/05/19	Command A3084 not verified	Ground	IMCS	Pending
INT - 002326	2003/05/21	Hardware failure at DSS-16 during handover DR: GI02772	Ground	NASA Sta.	Pending
INT - 002329	2003/05/24	Late handover to DSS-16. DR: G102803	Ground	NASA Sta.	Pending
INT - 002327	2003/05/26	CLCW: change in ratio of the number of VC-0 / VC-7 CLCWs in VC-0 TM Frames	Space	Platform	Pending
INT - 002328	2003/05/27	TDRS queries for some SPI parameters fail before DOY 2003.034	Ground	IMCS	Pending
INT - 002330	2003/05/27	NCTRS CPU goes to 85% for a problem related with tracking data	Ground	NCTRS	Pending
INT - 002331	2003/05/27	Monitoring Task ASCII Printout, not in ASCII format	Ground	IMCS	Pending
INT - 002334	2003/05/30	Bad telemetry from Goldstone - DSS-16	Ground	NASA Sta.	Pending
INT - 002336	2003/06/02	VC-0 telemetry not being received from Goldstone	Ground	NASA Sta.	Pending
INT - 002333	2003/06/03	TM acquisition from MRU-B no longer possible.	Ground	Simulator	Pending

INT - 002337	2003/06/03	Late handover to DSS-16 due to uplink bind problem	Ground	NCTRS	Pending
INT - 002338	2003/06/03	Error sending data to consolidator (VC-7)	Ground	IMCS	Pending
INT - 002339	2003/06/05	IREM anomaly: SEU (#3)	Space	IREM	Pending
INT - 002340	2003/06/05	IBIS anomaly: Histogram production stopped due to coincidence of GSHF=1 with the start of S5 process	Space	IBIS	Pending
INT - 002341	2003/06/05	IBIS anomaly: Histogram production stopped due to the combination of PDUR setting with IASW observation duration calculation during long staring	Space	IBIS	Pending
INT - 002342	2003/06/05	Telemetry Drops from Goldstone DR: AR109393	Ground	NASA Sta.	Pending
INT - 002343	2003/06/07	Error sending data to ISDC	Ground	IMCS	Pending
INT - 002344	2003/06/08	Telemetry drops from REDU	Ground	ESA Sta.	Pending
INT - 002345	2003/06/09	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002350	2003/06/12	Telemetry Drop from GoldStone DR: G102867	Ground	NASA Sta.	Pending
INT - 002351	2003/06/12	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002352	2003/06/14	Late handover to DSS-16, DR G102878 and G102879	Ground	NASA Sta.	Pending
INT - 002353	2003/06/14	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002355	2003/06/17	VC7 Frames received with a wrong order by ISDC	Ground	ESA Sta.	Pending
INT - 002356	2003/06/19	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002357	2003/06/20	Error sending data to ISDS	Ground	IMCS	Pending
INT - 002358	2003/06/22	Error sending data to ISDC	Ground	IMCS	Pending
INT - 002359	2003/06/22	NCTRSA application restart	Ground	NCTRS	Pending
INT - 002360	2003/06/22	Loss of telemetry due to NCTRSA and IMCSA errors	Ground	NCTRS	Pending
INT - 002361	2003/06/23	Late handover to DSS-16, DR pending	Ground	NASA Sta.	Pending
INT - 002362	2003/06/23	NCTRSA application restart	Ground	NCTRS	Pending
INT - 002363	2003/06/23	Error sending data to ISDC	Ground	IMCS	Pending
INT - 002364	2003/06/24	NCTRSA application restart	Ground	NCTRS	Pending
INT - 002365	2003/06/24	Telemetry Drops from Goldstone. DR GI02942	Ground	NASA Sta.	Pending
INT - 002367	2003/06/25	SPI: Spikes in GeD count rates after HV switch on following 1st annealing	Space	SPI	Pending
INT - 002368	2003/06/25	IFTS Transfer on IMCS-A Failed	Ground	IMCS	Pending
INT - 002369	2003/06/26	Problems to establish VC0 and VC7 links on NCTRS-A	Ground	NCTRS	Pending
INT - 002370	2003/07/01	Static PTV conditions handled incorrectly.	Ground	IMCS	Pending
INT - 002373	2003/07/01	IFMS Hung up at REDU	Ground	ESA Sta.	Pending

INT - 002374	2003/07/01	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002371	2003/07/02	PSS data mixed with S/C telemetry on DOY 2003.090.17.26.01	Ground	Procedure	Pending
INT - 002375	2003/07/02	Error sending data to ISDS	Ground	IMCS	Pending
INT - 002376	2003/07/03	Unexpected behaviour of IMCA	Ground	IMCS	Pending
INT - 002377	2003/07/03	Telemetry drop from Redu	Ground	ESA Sta.	Pending
INT - 002378	2003/07/03	VC0 drop when adding bad-frames on NCTRS-A	Ground	NCTRS	Pending
INT - 002379	2003/07/03	ISDS to ISDC link drop messages	Ground	IMCS	Pending
INT - 002381	2003/07/04	All TLM links on NCTRS-A dropped out	Ground	NCTRS	Pending
INT - 002382	2003/07/05	Telemetry Drops from Goldstone DR:G102997	Ground	NASA Sta.	Pending
INT - 002383	2003/07/09	Antenna stopped at REDU	Ground	ESA Sta.	Pending