

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-OPS-OF
No. 227
Week 04
29.01.07
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 20.01.07 until 26.01.07 (both dates inclusive) and covers the revolutions 522 and 523.

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 consisted of a hexagonal dither of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6), an engineering pointing (thruster calibration) at the same attitude, 3 Galactic disk latitude scan at attitudes: (RA 14:48:02.40, DEC -61:49:12.0), (RA 14:25:43.20, DEC -62:55:48.0), (RA 14:23:48.00, DEC -58:45:00.0), and a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6).

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

3 Satellite Status

3.1 Platform

The performance of the platform was good. No new unexpected behaviour / malfunction was identified.

3.1.1 AOCS

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

The Thrusters calibration, in synch with the winter eclipse season, was successfully executed on 22/01/2007.

An update of the RCS-A Thruster Torque Reciprocals, PWM look-up table, AMD Thruster On Times and TIMs thresholds was performed during rev 523.

2 slews were missed during the observation period, due to problems with the generic telemetry processor task on FDS and problem on TM link with REDU station.

The fuel consumption over the period between 19/01/2007 and 25/01/2007 was 0.1826 Kg. The remaining propellant is in the order of 148.5444 Kg.

Note: Some more information concerning the AOCS operations and the fuel budget is provided in the Appendix.

3.1.2 Power

The EPS is working nominally, available power from the arrays is of the order of 2100W.

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 has been identified.

3.1.5 RFS

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

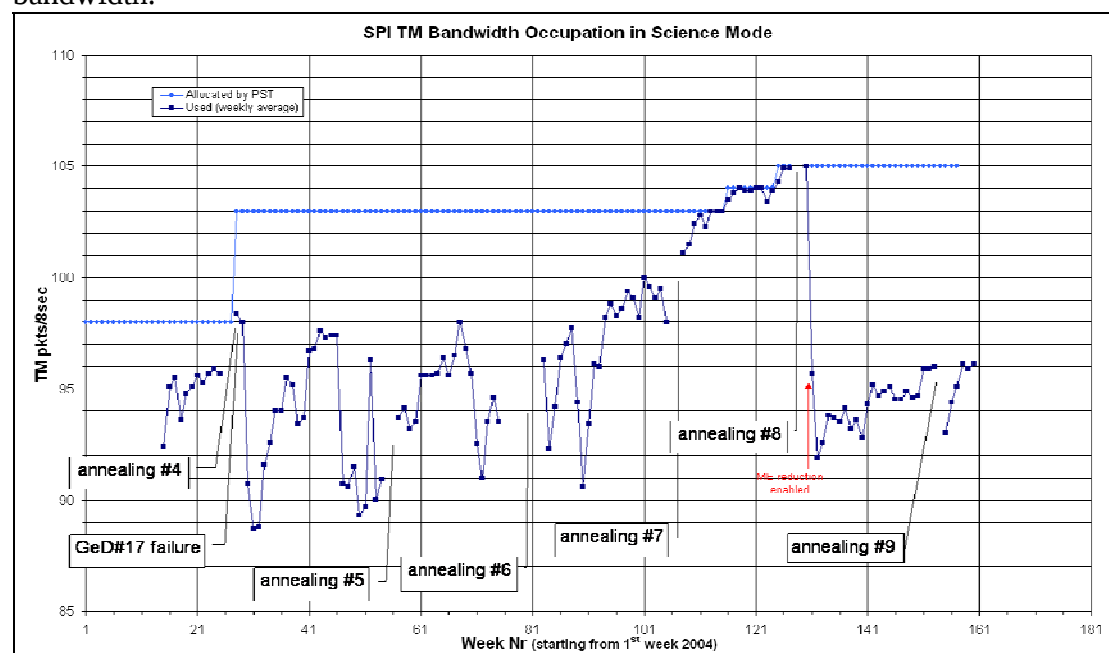
3.2.1 SPI

Following the 9th annealing, which ended on 22nd December, the overall status of the gamma-ray spectrometer is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution and is therefore operating at a lower HV setting of 3.5kV (instead of 4kV). The energy resolution of GeD#4 was recovered with this annealing. Detector #2 is failed since 06.12.2003 and detector #17 since 17.07.2004.

The Stirling compressors are working nominally, maintaining the Germanium detectors at 80 +/-1K. The stroke of all four compressors is 39 since 19.01.2007.

During science operations, the instrument was kept in photon-by-photon mode with spectra TM enabled. The assigned TM bandwidth in the science observation windows was 105 packets/cycle. The average telemetry occupation in the science window was 96.1 packets/cycle.

The following plot shows the assigned and the average occupation of the SPI TM bandwidth.



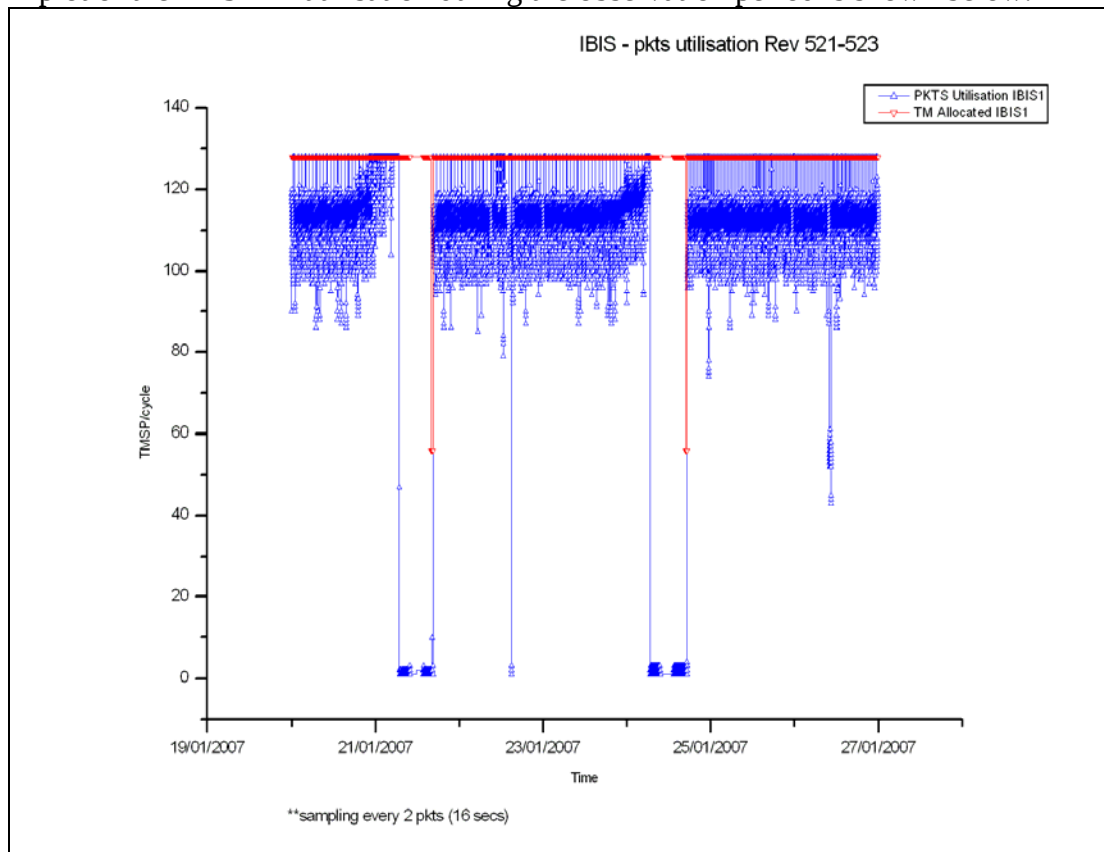
Note: Some more information concerning the SPI operations is provided in the Appendix.

3.2.2 IBIS

The overall status of the unit is nominal.

During the reporting period, the PST allocation to IBIS was 128 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period (when IBIS was in Science mode) was 113.95 TMPS/cycle, down 0.67 on last week.

A plot of the IBIS TM utilisation during the observation period is shown below:



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.

JEM-X operations were performed by the automatic Timeline.

JEM-X1 was operated in Data Taking mode with a TM allocation of 8 packets/cycle during science observations. JEM-X2 was dormant (DPE OFF) with no TM slots allocated.

Due to high background radiation conditions, JEM-X1 made an autonomous transition to Safe mode on 2007-01-18 at 04:12:49Z, ~2 hours before planned before radiation belt entry of revolution 520.

Further information on the JEM-X operations can be found in the Appendix Section 8.3.4.

3.2.4 OMC

The status of OMC is nominal.

OMC operations were performed by the automatic Timeline. OMC was operated in Science Normal mode during science observations, with a TM allocation of 5 packets/cycle.

During this reporting period, 176 of the 177 planned science pointings for OMC were executed nominally, 1 was lost.

Note: Some more information concerning the OMC operations is provided in the Appendix Section 8.3.5.

3.2.5 IREM

The overall status of the unit is nominal.

Solar Activity

The observation period was characterised by low solar activity.

Tiny sunspot 938 disappeared at the beginning of the week. From 21/01/2007 until the end of the observation period, fast growing sunspot 939 moved across the surface of the sun but posed no threat for a strong solar flare.

Reference: www.spaceweather.com

Note: Some more information concerning the IREM operations is provided in the Appendix Section 8.3.6.

4 Ground Facilities

The Operational ground facilities performance was good this week. 1 slew was lost due to ground problems. The overall performance was well over the 95% requirement.

4.1 Mission Operations Centre

The performance of the MOC was good this week. There were, however, several incidents of problems updating slews none of which had any impact. The overall performance was well above the 95% requirement.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There were, however, several occasions of small TM drops from Redu, one of which caused the loss of a pointing, and one occasion of data dropping from DSS24, without impact. There were two occasions of errors sending data to the isds, without impact. The overall performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning

PSFs are available up to revolution 529. Observations have been planned and files sent up to revolution 527. Further planning is waiting for the set up of an OMC FF observation in revolution 528.

TSF's up to revolution 522 have been received.

2. Observation status

ECS files have been received up to revolution 514 with revolution 513 missing.

3. ISOC Science Data Archive

An ISDA status meeting was held on 23 Jan during which the timetable for three planned archive releases in 2007 was agreed.

Publication data will be placed on ISOC web-page as an interim measure until the full inclusion in the archive, which was discussed in detail.

The 3rd ISGRI Source Catalogue is now accepted for publication, so the data will be delivered shortly and integrated into the archive.

4. ISOC system

The current version is 14.2.1 with fixes for the problem encountered last week while planning revolution 524 and a Web application error.

Version 14.3 with the updated PGT for AO-5 is expected to be ready for testing end of next week.

5. Problems

On 25 Jan, ESAC was without phone or external internet connectivity for some hours. The line to ESOC was unaffected by this.

4.3.2 ISDC

Status of ISDC observation processing on 29/01/2007:

- Latest Standard Analysis completed: observation 04200030001 (MCG -05-23-016, Revolution 508) on 12/01/2007.

- Latest products archived: observation 04200030001 (MCG -05-23-016, Revolution 508) on 12/01/2007.

- Latest observation products sent to the observer: observation 04200030001 (MCG -05-23-016, Revolution 508) on 22/01/2007.

5 Special Events

6 Anomalies

The following problems that impacted operations were reported:

- On DoY 022 at 14:02z due to a problem with the FD generic TM retrieval task (GTP), the update for slew ID 05229801 failed. A recovery was performed and the Timeline recovered at 15:05. The impact was the loss of pointing 05229801.
- On DoY 025, at 17:12, the TM links with Redu dropped causing the command sequence to fail release. A recovery was performed, and the Timeline rejoined at 17:38. The impact was the loss of pointing 05230043.

The following anomaly report was entered into the ARTS system this week:

AR id	Date Created	Subject	Segment	Status
INT-2897	22/01/2007	More problems with disabling sub-systems on the Autostack.	IMCS	Pending

7 Future Milestones

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 522

The observations in revolution 522 began with a hexagonal dither of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6), lasting ~15.9 hours. It continued with an engineering pointing (thruster calibration) at the same attitude, for ~6.0 hours. Finally the hexagonal dither of NGC 4151 (RA 12:10:32.60, DEC +39:24:20.6) was resumed for ~37.7 hours until the end of the revolution.

Revolution 523

The observations in revolution 523 began with a Galactic disk latitude scan, at attitude (RA 14:48:02.40, DEC -61:49:12.0), for ~8.8 hours. This was followed by another Galactic disk latitude scan, at attitude (RA 14:25:43.20, DEC -62:55:48.0), also for ~8.8 hours. The revolution continued with a further Galactic disk latitude scan, at attitude (RA 14:23:48.00, DEC -58:45:00.0), for ~17.1 hours. This was followed by a return to the first and second observations (RA 14:48:02.40, DEC -61:49:12.0) and (RA 14:25:43.20, DEC -62:55:48.0), for a further ~8.3 hours each. Finally, a raster dither of the Galactic Plane Region 2 (RA 14:08:36.11, DEC -61:30:20.6), lasting ~5.5 hours was performed until the end of the revolution.

Throughout this observation, all instruments were in their nominal science modes, except JEM-X2, which is switched off. The TM allocation was IBIS 128; SPI 105; JEM-X1 8; JEM-X2 0; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

2007-01-12T15:00:36.000Z	148.9189	F	Automatic TM processing.
2007-01-13T05:27:41.000Z	148.8958	F	Automatic TM processing.
2007-01-14T00:40:15.000Z	148.8601	F	Automatic TM processing.
2007-01-15T14:43:47.000Z	148.8404	F	Automatic TM processing.
2007-01-16T05:15:49.000Z	148.8040	F	Automatic TM processing.
2007-01-18T07:08:02.000Z	148.7579	F	Automatic TM processing.
2007-01-18T14:34:11.000Z	148.7270	F	Automatic TM processing.
2007-01-20T00:35:59.000Z	148.6979	F	Automatic TM processing.
2007-01-21T14:22:11.000Z	148.6816	F	Automatic TM processing.
2007-01-22T09:26:13.000Z	148.6488	F	Automatic TM processing.
2007-01-22T13:15:00.000Z	148.6277	F	After thruster torque calibration
2007-01-22T14:16:13.000Z	148.6052	F	Automatic TM processing.
2007-01-23T00:23:43.000Z	148.5834	F	Automatic TM processing.
2007-01-24T14:10:51.000Z	148.5718	F	Automatic TM processing.
2007-01-25T23:49:34.000Z	148.5444	F	Automatic TM processing.

This report was generated Fri Jan 26 08:00:30 GMT 2007

8.3 Detailed Satellite Information

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

8.3.1 AOCS SUMMARY OPERATIONS REPORT, 20/01/2007 – 26/01/2007

AOCS operations were executed from the Automatic Timeline.

During this period, 59 Open Loop Slews, 125 Closed Loop Slews and 7 Momentum Biases were executed.

1 slew (CSL) was missed from the TL during the observation period, due to the instability of the generic telemetry processor tasks (GTPs) on FDS. 1 slew (CSL) was missed due to problem on the TM link with REDU station.

Due to lost of guide star, the OTF was not reached during PID 05210062.

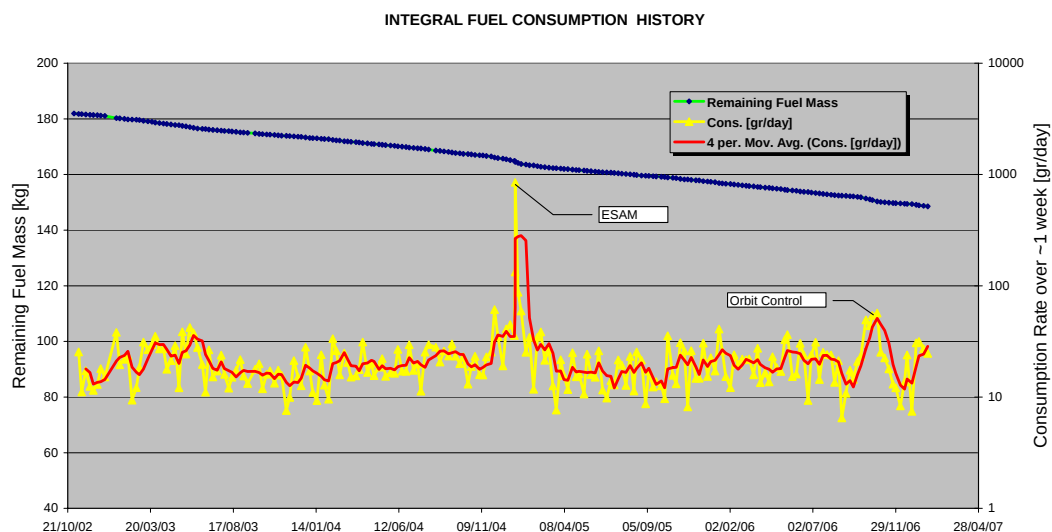
This is equivalent to a $\sim 1\%$ of the total number of slews (184)

Orbit Control

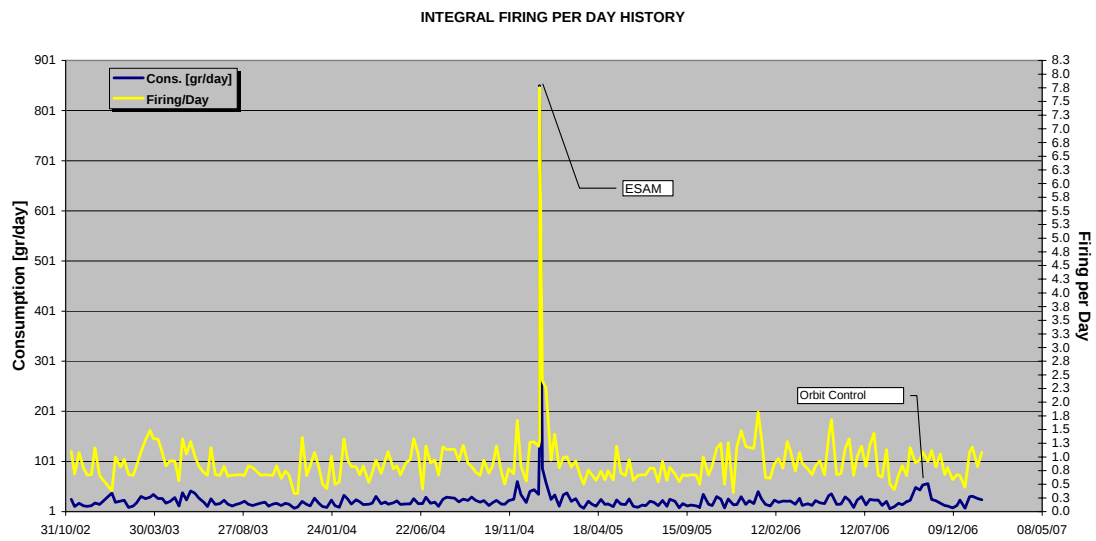
No update.

Fuel consumption

The fuel consumption (total, grams/day) over the period between 01/11/2002 and 25/01/2007 is reported in the plot below.

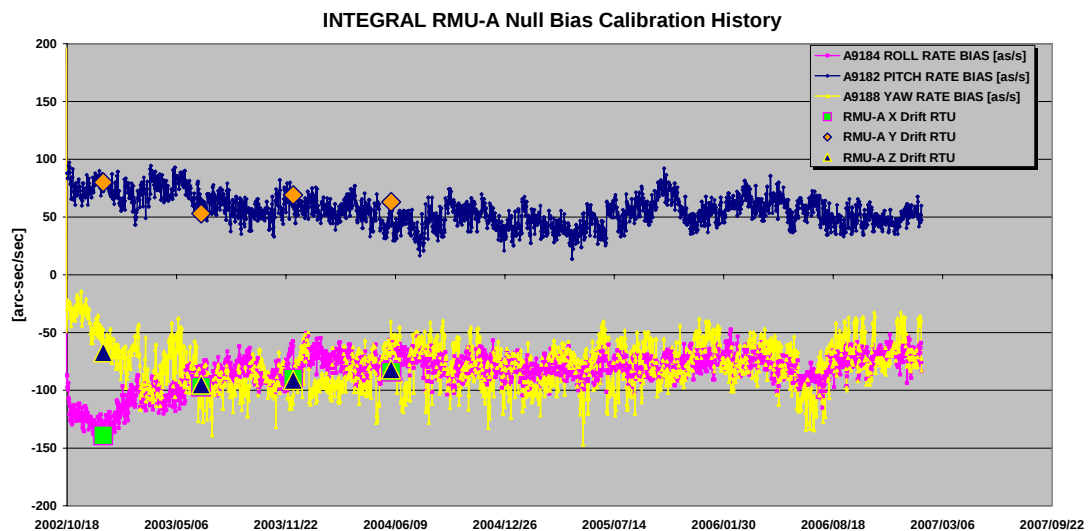


The firing\day over the period between 01/11/2002 and 25/01/2007 is reported in the plot below.

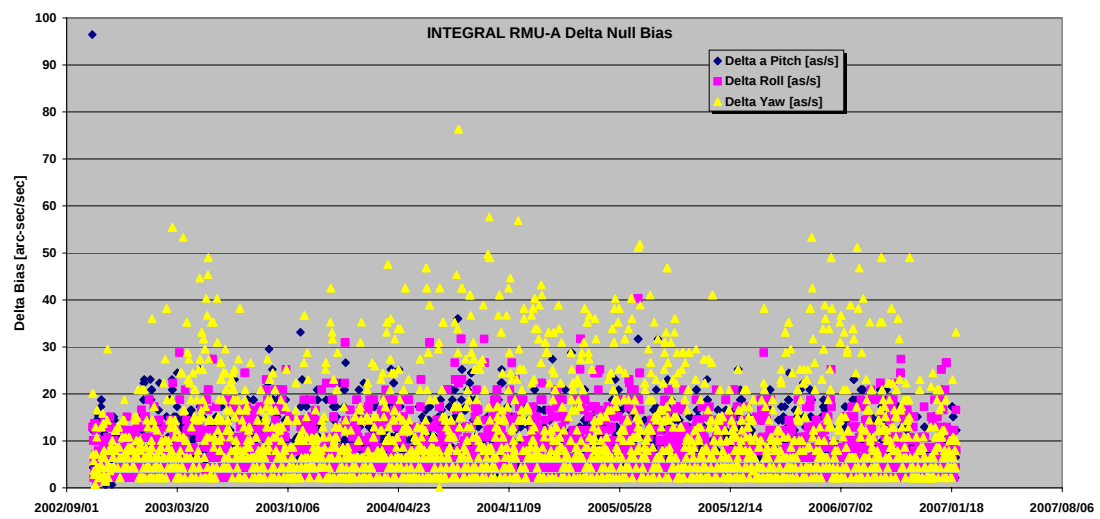


The RMU-A null bias calibration

The RMU-A null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 26/01/2007 is reported in the plot below.



The RMU-A delta null bias calibration history, on pitch, roll and yaw channel over the period between 01/11/2002 and 26/01/2007 is reported in the plot below



20/01/07 (Day of Year 020, Revolution 521)

FDS failed slew update: at 11:17z due to the particular attitude (sparse stellar field and STR limit $M_i < 8.5$, RA 12:11:19.52 DEC+38:45:24.4 POS 088:42:37.4), the FDS failed to update slew ID 05210046 (OSL)

The observation was performed in a sparse star field. The attitude determination could not find the required minimum number of 4 matching stars and therefore the attitude determination process was aborted.

The FD support was called in. An evaluation of the current attitude error, wheels speeds and next slew angular magnitude (< 2 deg), gave good indication to let the slew 5210046 running with the parameters as default in TL (i.e. without update).

The next slew ID 05210047 was automatically and correctly updated in the TL and no pointing was lost.

No impact reported in TL.

21/01/07 (Day of Year 021, Revolution 521-522)

FDS failed slew update: at 01:36z due to the particular attitude (sparse stellar field and STR limit $M_i < 8.5$, RA 12:05:02.25 DEC +39:23:12.2 POS 086:39:21.6), the FDS failed to update slew ID 05210060 (OSL)

The observation was performed in a sparse star field. The attitude determination could not find the required minimum number of 4 matching stars and therefore the attitude determination process was aborted.

The FD support was called in. An evaluation of the current attitude error, wheels speeds and next slew magnitude, gave good indication to let the slew 5210060 running with the parameters as default in TL (i.e. without update).

The next slew ID 05210061 was automatically and correctly updated in TL and no pointing was lost.

No impact reported in TL.

Lost of guide star: at 04:52:07z the guide star was lost during the PID 05210062. As automatic reaction the ACC switched ON the IMU 1 and an automatic mapping commanded.

The guide star was $M_i 7$ at CCD location [3310, -22178]. The new guide star picked after automatic mapping was $M_i 6.9$ at CCD location [1365, 5194].

A manual recovery was performed and the next slew ID 05210063 was manually updated in TL.

The reason of the lost of guide star is likely due to the presence of several extended objects (cluster of galaxies in UMa constellation) in the STR FOV.

No impact on TL, except the OTF was not reached during PID 05210062.

22/01/2007 (Day of Year 022, Revolution 522)

Thrusters Torque Calibration: the Thrusters calibration was executed according to EPOS 0522_06. The calibration was performed based on the following timeline:

Time	Event	Execution
2007-01-22T09:05:00Z	Engineering Window Open	Timeline
	<u>AOCS and FD engineers requested</u>	
2007-01-22T09:15:00Z	ED AECGS_00 Change of guide star before the execution of the RWB to meet the pointing requirements (FCP_AOC_0529)	Timeline
2007-01-22T09:20:00Z	ED AERWB_00 Reaction Wheel Bias Manoeuvre to set the wheel speeds at RW2=+2000 rpm, RW3=+2000 rpm, RW4=+2000 rpm (RW1 not used)	Timeline
	!Verify the automatic update of the next slew!	
2007-01-22T09:45:41Z	ED AECSL_00 Corrective Closed Loop Slew (FCP_AOC_0520) Verify SSL enabled. IF lost of guide star, re-enable SSL	Timeline
2007-01-22T09:51:49Z	ED AESAM_00 Mapping (FCP_AOC_0531)	Timeline
2007-01-22T10:10:00Z	Verify that the CGS has not the same star picked after CSL. ED AECGS_00 Change of guide star before the execution of the Thruster Calibration to meet the pointing requirements (FCP_AOC_0529) PT1= PT2= PT3= ALPHA= BETA= RW1=NU RW2= RW3= RW4=	Timeline
THRUSTER CALIBRATION Manual Thruster Calibration Operations Reference:INT-PR-MMB-0005, OO_017		
2007-01-22T10:20:00Z	Start of Manual Thruster Calibration Operations (FCP_AOC_1520)	
10:20:00Z	Reset the TIMs accumulators (step 1-3.1 FCP_AOC_1520) WAIT 20 minutes of RW data collection to estimate the external torques. Set FCV-A ON (step 3.2 FCP_AOC_1520)	

10:40:00Z	First execution of the RCS_A thruster calibration sequence (FCP_AOC_1520). On loading TC sequence AS0715, the input value for the formal parameter THR_TIME shall be 558 raw (equivalent to 136.152 msec, where the quoted figure is the output of FD estimates* rounded down to the nearest 244ms LSb.). NOTE: Sequence shall be uplinked with Interlock disabled NOTE: verify that the release time in the sequence is consistent with the procedure and <u>NO SET ASAP</u> NOTE: the IMCS will ask authorization before commanding having the TC_seq Hazardous TCs. NOTE: possible occurrence of OEM APID 640 Class 0 ID 48<<ROLL ERR>>, ID 49<<PITCH ERR>>, ID 50<<YAW ERR>>. Due to an over generation of OEMs, potential OOL A5702 (Mod 4096 counter) →download on board OEMs (TC A1091 A1092) Execution duration is ~34 minutes. * on the basis of estimated fuel mass and tank temperature on the 23/01/2007	Manual
11:14:00Z	WAIT 20 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques. Perform Manual Mapping, FCP_AOC_0531, and start Recovery Schedule Tool until attitude reconstruction process to generate the last ASF for ISDC. GUIDE STAR PT1= PT2= PT3= ALPHA= BETA= RW1=NU RW2= RW3= RW4=	Manual
11:34:00Z	Second execution of the RCS_A thruster calibration sequence (FCP_AOC_1520). On loading TC sequence AS0715, the input value for the formal parameter THR_TIME shall be 558 raw (equivalent to 136.152 msec, where the quoted figure is the output of FD estimates* rounded down to the nearest 244ms LSb.). NOTE: Sequence shall be uplinked with Interlock disabled NOTE: verify that the release time in the sequence is consistent with the procedure NOTE: possible occurrence of OEM APID 640 Class 0 ID 48<<ROLL ERR>>, ID 49<<PITCH ERR>>, ID 50<<YAW ERR>>. Execution duration is ~34 minutes.	Manual

12:08:00Z	WAIT 20 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques. Perform Manual Mapping, FCP_AOC_0531, and start Recovery Schedule Tool until attitude reconstruction process to generate the last ASF for ISDC. GUIDE STAR PT1= PT2= PT3= ALPHA= BETA= RW1=NU RW2= RW3= RW4=	Manual
12:28:00Z	Third execution of the RCS_A thruster calibration sequence (FCP_AOC_1520). On loading TC sequence AS0715, the input value for the formal parameter THR_TIME shall be 558 raw (equivalent to 136.152 msec, where the quoted figure is the output of FD estimates* rounded down to the nearest 244ms LSB.). NOTE: Sequence shall be uplinked with Interlock disabled NOTE: verify that the release time in the sequence is consistent with the procedure NOTE: possible occurrence of OEM APID 640 Class 0 ID 48<<ROLL ERR>>, ID 49<<PITCH ERR>>, ID 50<<YAW ERR>>. Execution duration is ~34 minutes.	Manual
13:02:00Z	WAIT 20 minutes for IPS settling and RW data collection to determine the post-settling wheel speeds and external torques. Perform Manual Mapping, FCP_AOC_0531, and start Recovery Schedule Tool until attitude reconstruction process to generate the last ASF for ISDC. GUIDE STAR PT1= PT2= PT3= ALPHA= BETA= RW1=NU RW2= RW3= RW4= Reset the TIMs accumulators Set FCV-A OFF	Manual
2007-01-22T13:22:00Z	End of Manual Thruster Calibration Operations	
	Spare time Verify that the guide star is still suitable for the incoming RWB activity	
2007-01-22T14:10:00Z	ED AERWB_00 Reaction Wheel Bias Manoeuvre to set the wheel speeds at RW2=+2844 rpm, RW3=+1485 rpm, RW4=+798 rpm (RW1 not used) Verify the automatic update of the next slew	Timeline
2007-01-22T14:35:41Z	ED AECSL_00 Corrective Closed Loop Slew to the science attitude (FCP_AOC_0518)	Timeline
2007-01-	ED AESAM_00	Timeline

22T14:41:49Z	Mapping (FCP_AOC_0531)	
2007-01- 22T15:00:41Z	Engineering Window close	Timeline

FDS failed slew update: at 14:02z due to the instability of the generic TM retrieval task (GTP) on FDS, the update for slew ID 05229801 failed and the slew failed release.

A manual recovery was then performed by updating the next slew ID 05220019, i.e. without performing any additional corrective slew: this was possible due to the very close attitude between PID 05229801 and PID 05220019. The following slew ID 05220020 was manually updated in TL.

The following slew was not executed from TL: 05229801(CSL).

23/01/2007 (Day of Year 023, Revolution 522)

FDS failed slew update: at 05:58z due to the particular attitude (sparse stellar field and STR limit $M_i < 8.5$, RA 12:15:09.33 DEC +36:26:03.1 POS 088:32:52.8), the FDS failed to update slew ID 05220034 (OSL).

The attitude determination could not find two matching stars. As a knock-on effect program used the previous mapping. This one, however, could not be related to the current pointing ID. The TPF generation was aborted.

The FD support was called in. An evaluation of the current attitude error, wheels speeds and next slew magnitude, gave good indication to let the slew 5220034 running with the parameters as default in TL (i.e. without update).

The next slew ID 05220035 was automatically and correctly updated in TL and no pointing was lost.

No impact reported in TL.

FDS failed slew update: at 13:08z due to the particular attitude (sparse stellar field and STR limit $M_i < 8.5$, RA 12:11:57 DEC +37:26:08 POS 087:01:17), the FDS failed to update slew ID 05220041 (CSL).

The observation was done in a sparse star field. The attitude determination could not find the required minimum number of 4 matching stars. The attitude determination was aborted.

The FD support was called in. An evaluation of the current attitude error (reached by a CSL), wheels speeds and next slew magnitude, gave good indication to let the slew 5220041 running with the parameters as default in TL (i.e. without update).

The next slew ID 05220042 was automatically and correctly updated in TL and no pointing was lost.

No impact reported in TL.

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24/01/2007 (Day of Year 024, Revolution 522-523)

Nothing to report

25/01/2007 (Day of Year 025, Revolution 523)

Update of RCS-A Thruster Torque Reciprocals, TIM Thresholds and AMD On Times: An update of the RCS branch A Thruster Torque Reciprocals and AMD Thruster On Times was performed during rev 523, based on the results of the RCS-A Thruster Calibration, executed on 22/01/2007.

THRUSTER IMPULSE MONITORS THRESHOLDS

RTIM: 6.50000 [52] raw
PTIM: 2.12500 [17] raw
YTIM: 33.90625 [1085] raw
TTIM: 432.0 [27] raw

Average Force Mag: 9.543 N

Thruster on-time: $1.3/9.543 = 0.136226$ s

Rounded down by 0.244ms LSB: 558 (raw) = 0.136152 s

on the basis of estimated (mid day 23/01/2007) fuel mass of 148.62 kg and tank pressure of 6.757 bar

Being TTIM threshold not changed wrt the re-scaling performed in Summer 2006, were updated only the values for PTIM, YTIM and RTIM.

RCS-A THRUSTER TORQUE RECIPROCAL

AERCA_00 S

M F 4

2007-01-27T11:54:00Z

2007-01-27T11:54:00Z

A

TORQ_X_A R 0.2600535E+00 1/Nm D Reciprocal Roll Torque (A)

TORQ_Y_A R 0.8493716E-01 1/Nm D Reciprocal Pitch Torque (A)

TORQ_Z_A R 0.7069507E-01 1/Nm D Reciprocal Yaw Torque (A)

PWM_TORQ R 7 D PWM Look Up Table

AMD ON TIMES

AEOTA_00 S

M F 32

2007-01-27T11:54:00Z

2007-01-27T11:54:00Z

A

MON_W1T1 R 0.6539200E-01 sec D AMD decrease on-time (W1,Th1)

MON_W1T2	R	0.2242360E+00	sec	D	AMD	decrease	on-time	(W1,Th2)
MON_W1T3	R	0.0000000E+00	sec	D	AMD	decrease	on-time	(W1,Th3)
MON_W1T4	R	0.2910920E+00	sec	D	AMD	decrease	on-time	(W1,Th4)
MON_W2T1	R	0.6026800E-01	sec	D	AMD	decrease	on-time	(W2,Th1)
MON_W2T2	R	0.1381040E+00	sec	D	AMD	decrease	on-time	(W2,Th2)
MON_W2T3	R	0.7612800E-01	sec	D	AMD	decrease	on-time	(W2,Th3)
MON_W2T4	R	0.0000000E+00	sec	D	AMD	decrease	on-time	(W2,Th4)
MON_W3T1	R	0.2942640E+00	sec	D	AMD	decrease	on-time	(W3,Th1)
MON_W3T2	R	0.0000000E+00	sec	D	AMD	decrease	on-time	(W3,Th2)
MON_W3T3	R	0.2278960E+00	sec	D	AMD	decrease	on-time	(W3,Th3)
MON_W3T4	R	0.6832000E-01	sec	D	AMD	decrease	on-time	(W3,Th4)
MON_W4T1	R	0.1320040E+00	sec	D	AMD	decrease	on-time	(W4,Th1)
MON_W4T2	R	0.6002400E-01	sec	D	AMD	decrease	on-time	(W4,Th2)
MON_W4T3	R	0.0000000E+00	sec	D	AMD	decrease	on-time	(W4,Th3)
MON_W4T4	R	0.6978400E-01	sec	D	AMD	decrease	on-time	(W4,Th4)
MOFFW1T1	R	0.2242360E+00	sec	D	AMD	increase	on-time	(W1,Th1)
MOFFW1T2	R	0.7954400E-01	sec	D	AMD	increase	on-time	(W1,Th2)
MOFFW1T3	R	0.3057320E+00	sec	D	AMD	increase	on-time	(W1,Th3)
MOFFW1T4	R	0.0000000E+00	sec	D	AMD	increase	on-time	(W1,Th4)
MOFFW2T1	R	0.7124800E-01	sec	D	AMD	increase	on-time	(W2,Th1)
MOFFW2T2	R	0.0000000E+00	sec	D	AMD	increase	on-time	(W2,Th2)
MOFFW2T3	R	0.6270800E-01	sec	D	AMD	increase	on-time	(W2,Th3)
MOFFW2T4	R	0.1322480E+00	sec	D	AMD	increase	on-time	(W2,Th4)
MOFFW3T1	R	0.0000000E+00	sec	D	AMD	increase	on-time	(W3,Th1)
MOFFW3T2	R	0.3086600E+00	sec	D	AMD	increase	on-time	(W3,Th2)
MOFFW3T3	R	0.8271600E-01	sec	D	AMD	increase	on-time	(W3,Th3)
MOFFW3T4	R	0.2276520E+00	sec	D	AMD	increase	on-time	(W3,Th4)
MOFFW4T1	R	0.0000000E+00	sec	D	AMD	increase	on-time	(W4,Th1)
MOFFW4T2	R	0.7832400E-01	sec	D	AMD	increase	on-time	(W4,Th2)
MOFFW4T3	R	0.1393240E+00	sec	D	AMD	increase	on-time	(W4,Th3)
MOFFW4T4	R	0.6270800E-01	sec	D	AMD	increase	on-time	(W4,Th4)

Problem on links to REDU: at 17:12z due to a problem on the TM link to REDU, the slew ID 05230043 failed release.

A manual recovery was then performed from attitude of PID 05230042 to the attitude of PID 05230043. The next slew ID 05230044 was manually updated in TL and the AOCS enabled in TL at 17:38z.

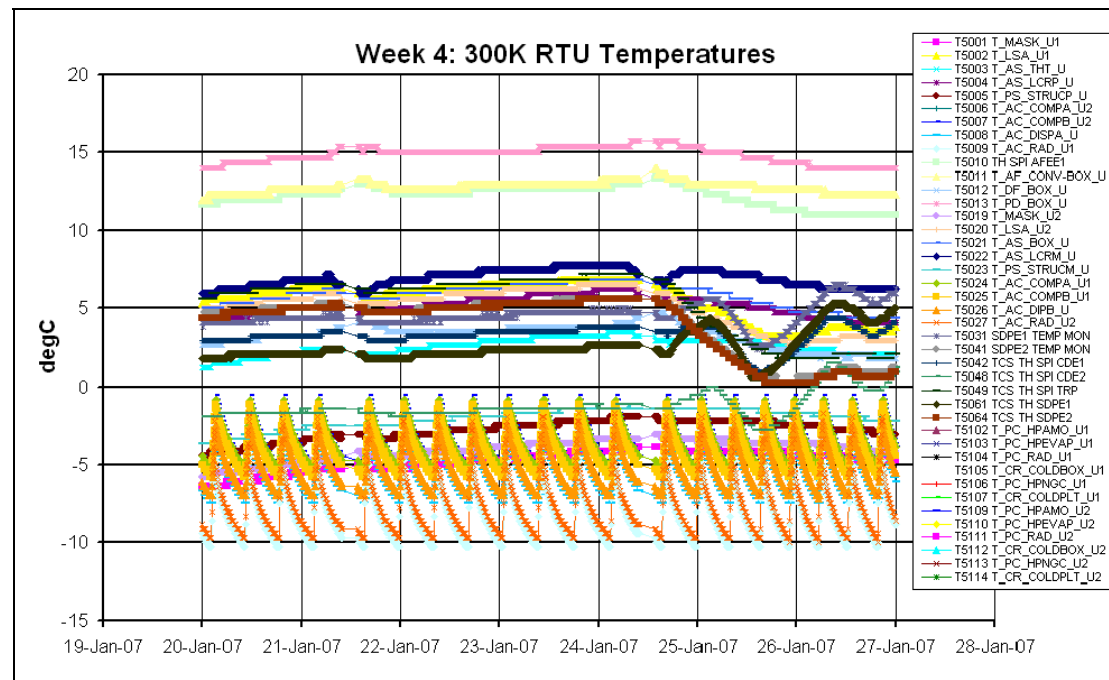
The following slew was not executed from TL: 05230043(CSL).

26/01/2007 (Day of Year 026, Revolution 523)

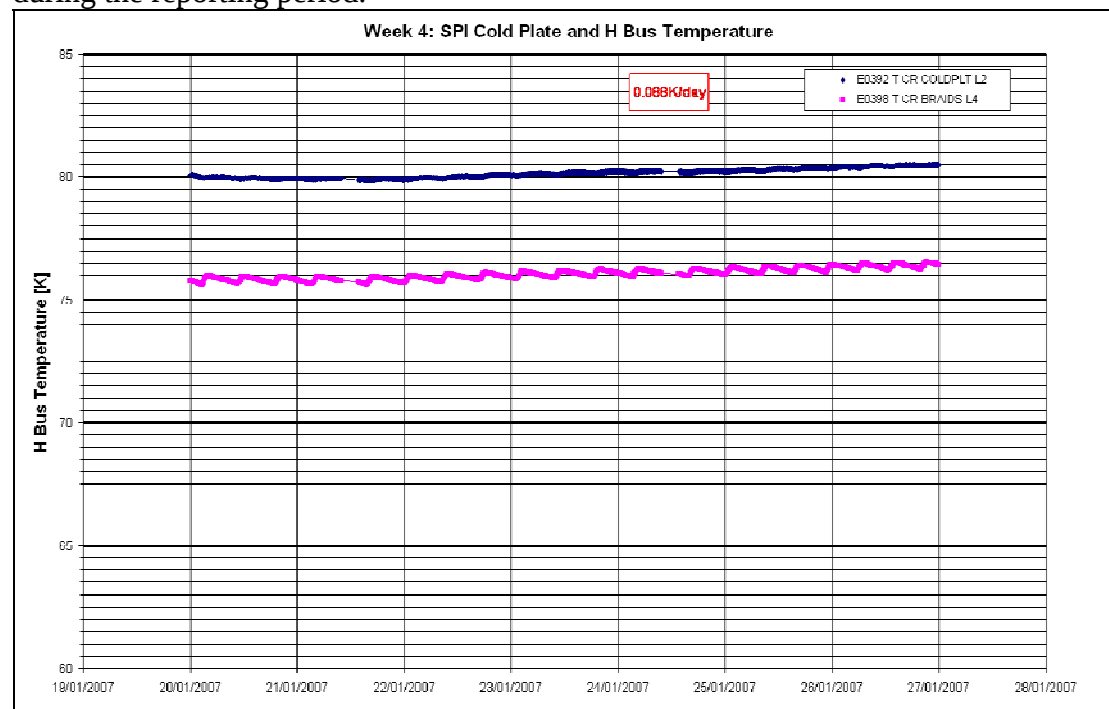
Nothing to report

8.3.2 SPI Operations

Unit Temperatures: All the equipment temperatures are inside the operational limits. The following plot shows their evolution during the reporting period:



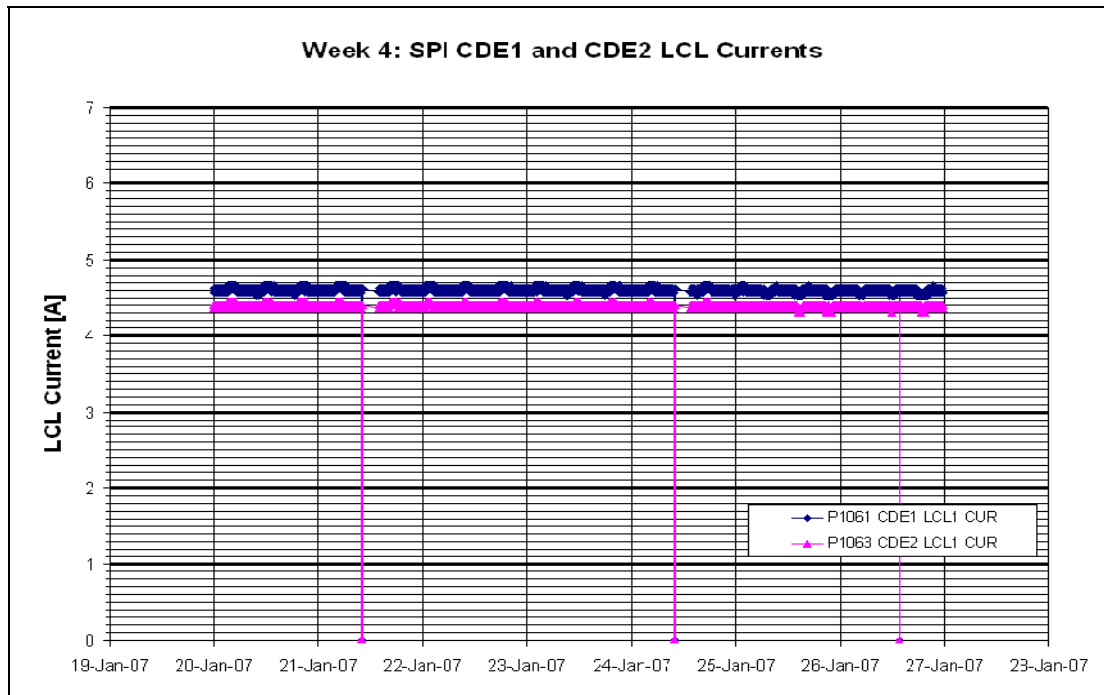
Stirling Compressors and Cryostat: The performance of the compressors is nominal. The cold plate temperature was maintained in the range to 80K +/-1K. The following plot shows the evolution of the cold plate and H bus temperatures during the reporting period.



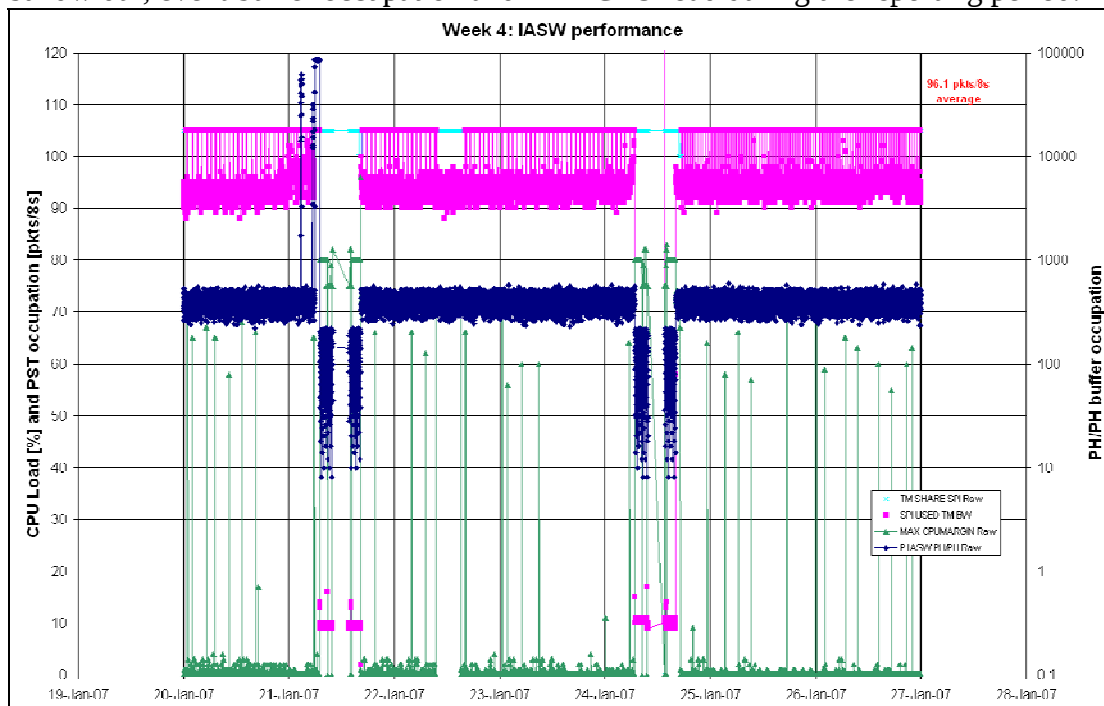
The stroke of all four compressors was set to 39 on 19-01-2007 and the average LCL currents of the CDEs over the week were:

- Average CDE1 LCL Current = 4.60A
- Average CDE2 LCL Current = 4.38A.

The following plot shows the evolution of the CDE currents during the reporting period.

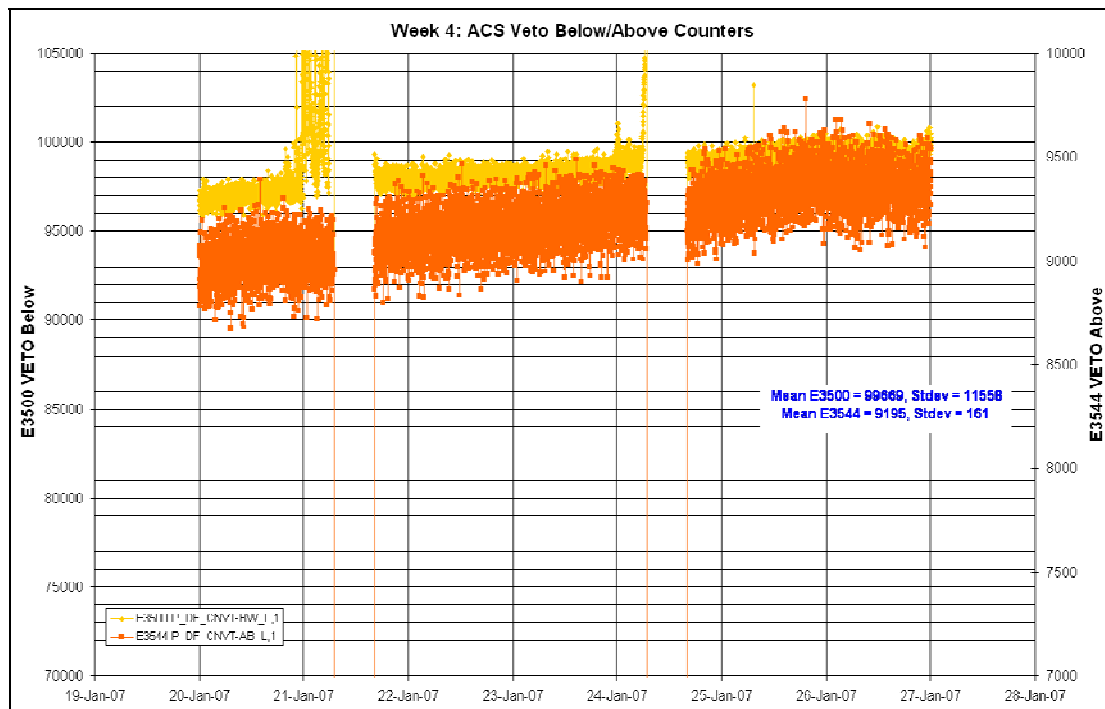


DPE & IASW: The DPE health and IASW performance is nominal. The current IASW version installed is 432. The average TM bandwidth occupation of SPI was 96.1 packets/cycle over the science window, when the TM allocation was 105 packets/cycle. The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS: The performance of the ACS is nominal, except for FEE 81 which remains switched off since the anomaly on 29/10/2006 (INT_SC-162). FEE #57 is also still OFF due to the anomaly on 5/8/2003 (INT_SC-61).

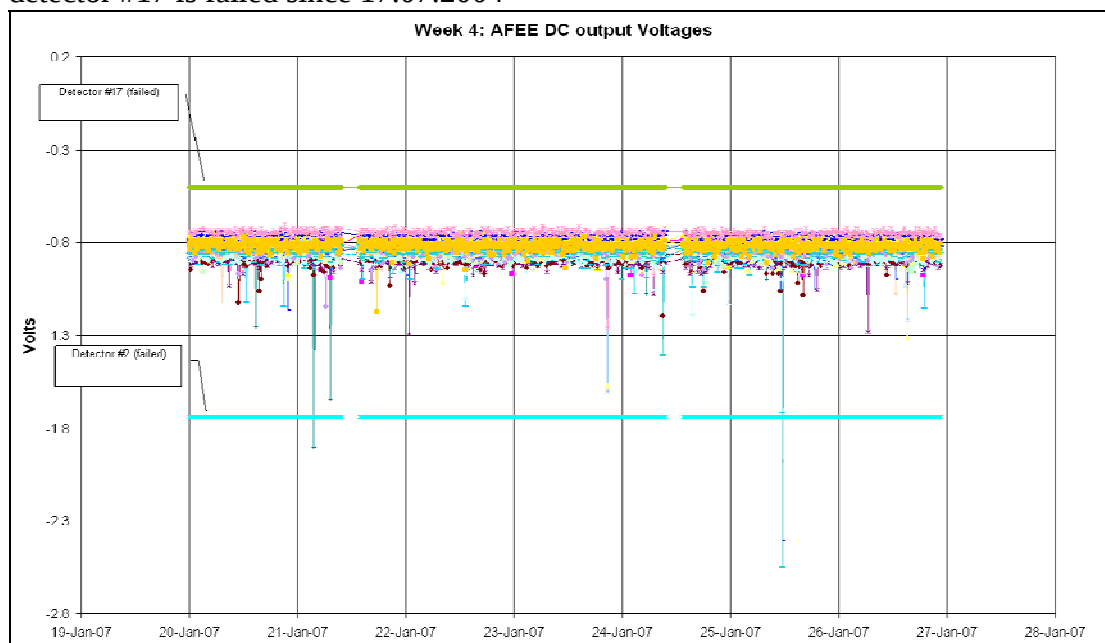
The following plot shows the ACS overall count rate evolution during the reporting period:



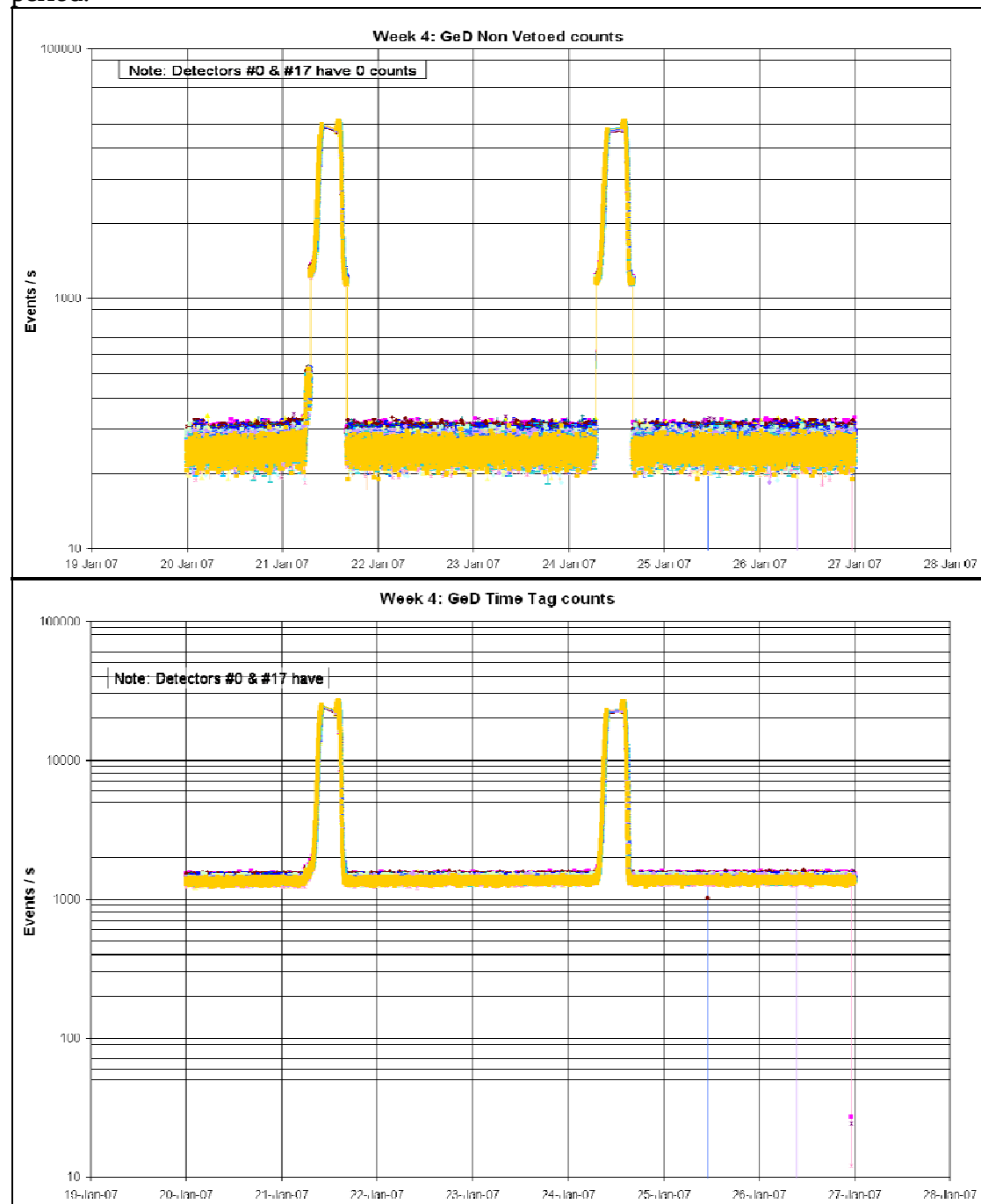
AFEE: The health of the AFEE is nominal. The performance of the AFEE and the detectors is nominal, except for the Ge detector #12 which is showing a slightly degraded energy resolution. The energy resolution of GeD#4 was recovered with the last annealing.

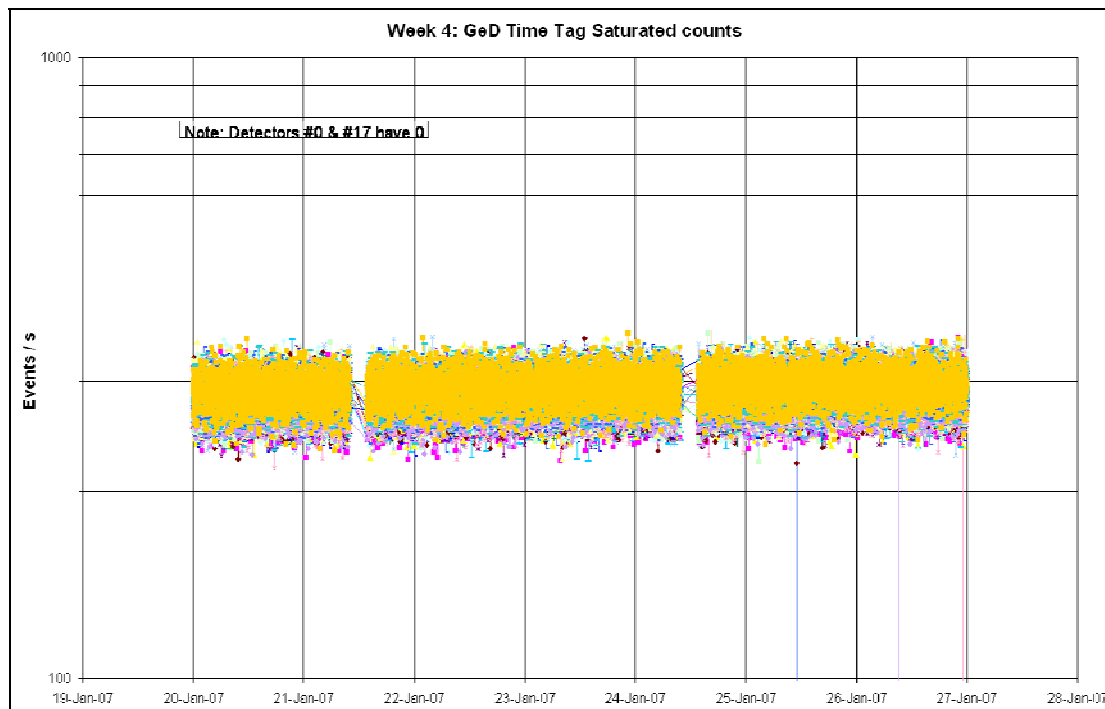
The GeD#12 HV remained at 3.5kV throughout the reporting period.

The following plot shows the dc voltage offset of the detector channels during the reporting period. The values are nominal. Detector #2 is failed since 06.12.2003 and detector #17 is failed since 17.07.2004

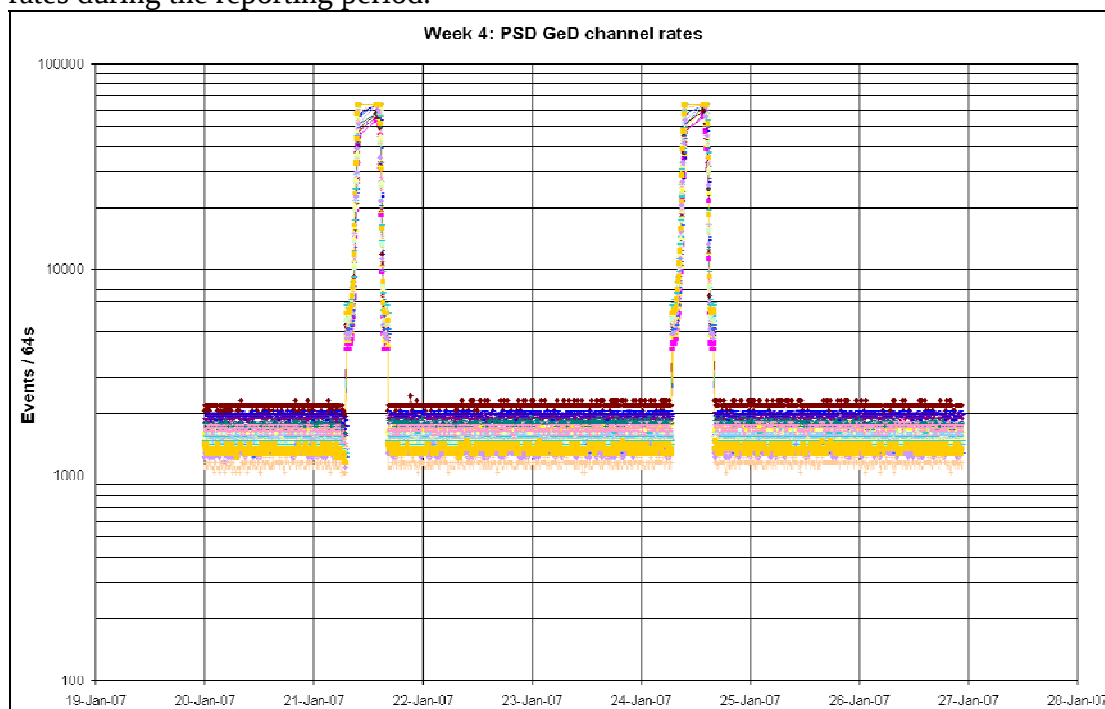


DFEE: The performance of the unit is nominal. The following plots show the Non Vetoed, Time Tag and Time Tag Saturated Event Count Rates during the reporting period.





PSD: The health of the unit is nominal. The following plot shows the PSD channel rates during the reporting period.



Event Log:

The following non-nominal OOLs and OEMs were received from SPI during the reporting period:

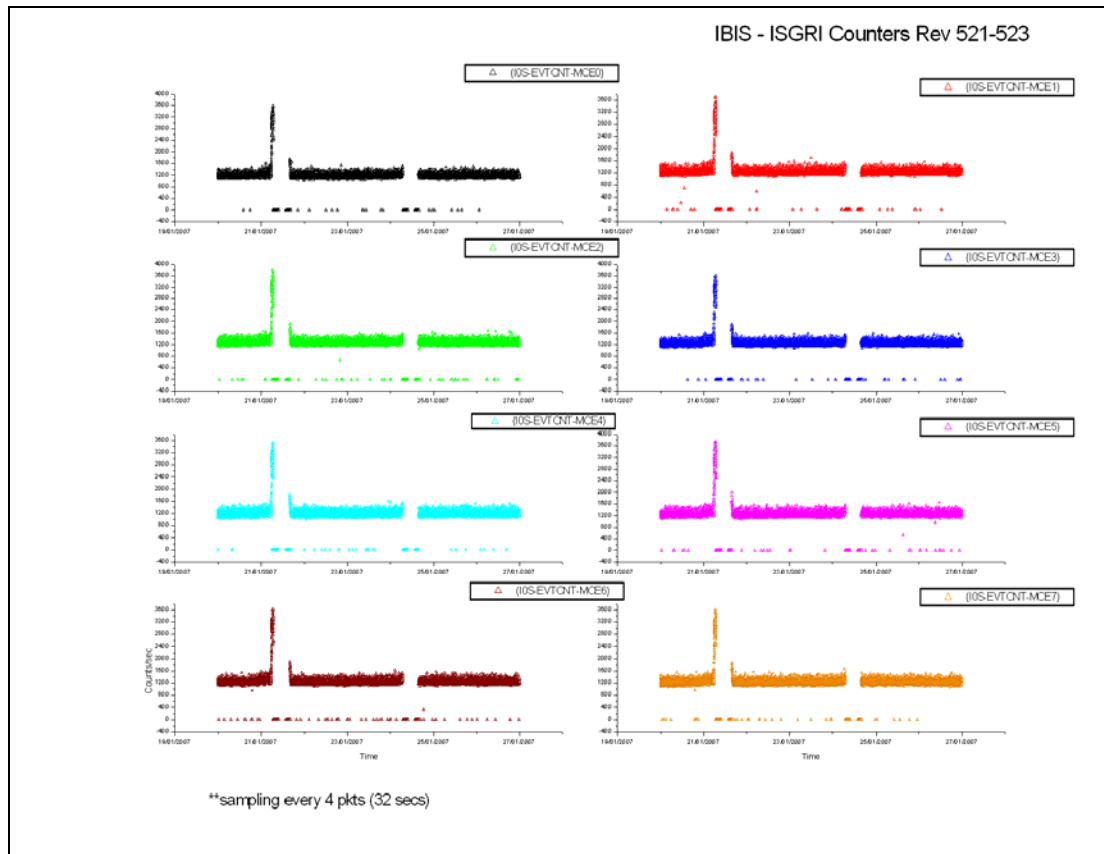
- On 2007-01-21 at 00:19Z TM parameter E3500 (P_DF_CNVT-BW_L) started going OOL High. It kept toggling from time to time until Radiation Belts entry at 07:01Z. No action was taken as this was due to the high radiation background as the S/C was approaching the Radiation Belts.

- On 2007-01-22 at 00:36Z TM parameter E3130 (S AS AN-5V L59) went OOL (value = PARAM > SPEC). This is the ACS FEE -5V analogue status #59. It went back in limit at 00:45Z and no action was taken.
- On 2007-01-24 at 06:25Z TM parameter E3500 (P_DF_CNVT-BW_L) started going OOL High. It kept toggling until Radiation Belts entry at 06:49Z. No action was taken as this was due to the high radiation background as the S/C was approaching the Radiation Belts.
- On 2007-01-24 at 06:49Z (Belts entry time), TM parameters E3195 (S AS TEMP L31), E2381 (S AS AN-5V L31) and E3234 (S AS TEMP L70) were reported OOL (value = PARAM > SPEC). They are the ACS FEE temperature status #31 and #70, and -5V analogue status #31. They went back in limit at the next TM cycle. Therefore no action was taken.
- On 2007-01-24 at 14:00Z and 14:10Z, TM parameter E4009 (S DF HSLERR L) was reported OOL. It flagged a DFEE error on the High Speed Line. As it returned within limits in the next TM cycle, no action was taken.
- On 2007-01-25 at 11:38Z TM parameters E0356 (U AF DCOUTPT L6) and E0366 (U AF DCOUTPT L16) were reported OOL Low-low. They flagged a low value for Detectors #6 and #16 in the average current (Digital Converter output voltage). As they came back inside limit in the next TM cycle, no action was taken.
- TM parameter E2116 T AS PSAC L2 (Plastic Scintillator temperature) went OOL Low several times during the week. No action was taken as this is a known and recurring problem due to this thermistor being unreliable.

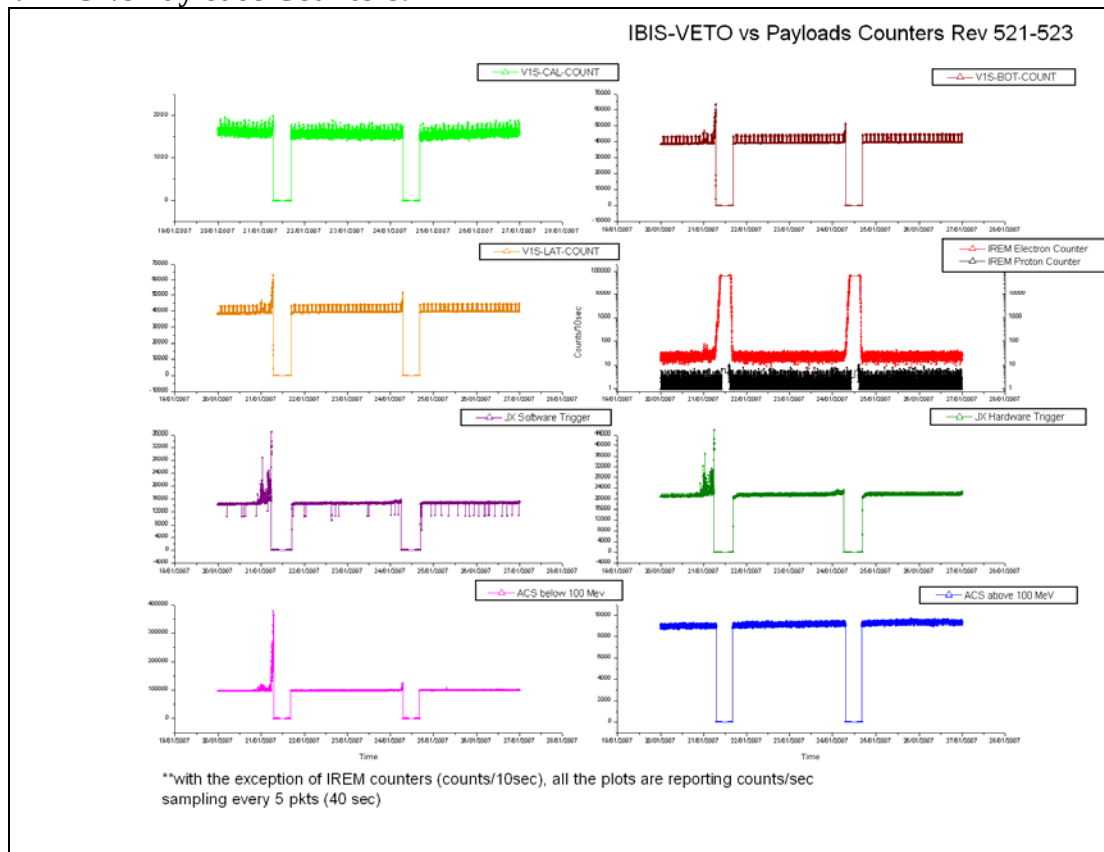
8.3.3 IBIS Operations

IBIS Event Counters Plots.

ISGRI Counters:

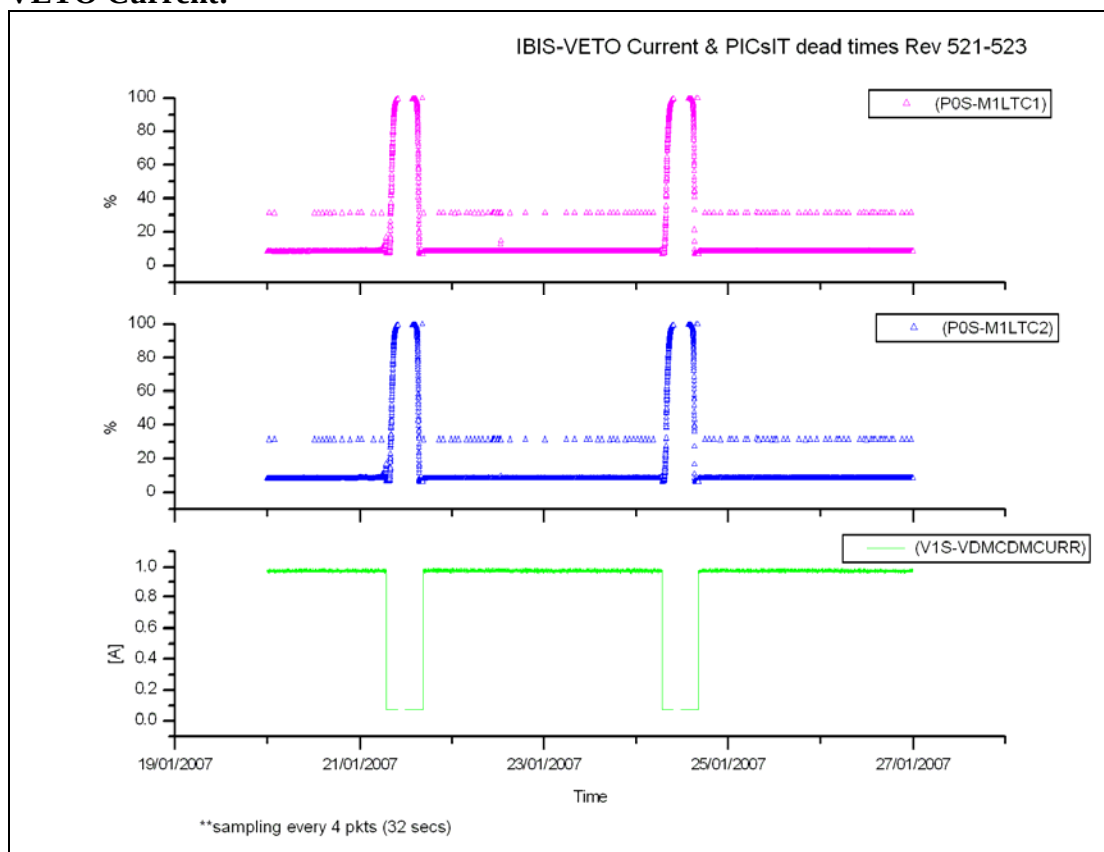


VETO vs Payloads Counters:

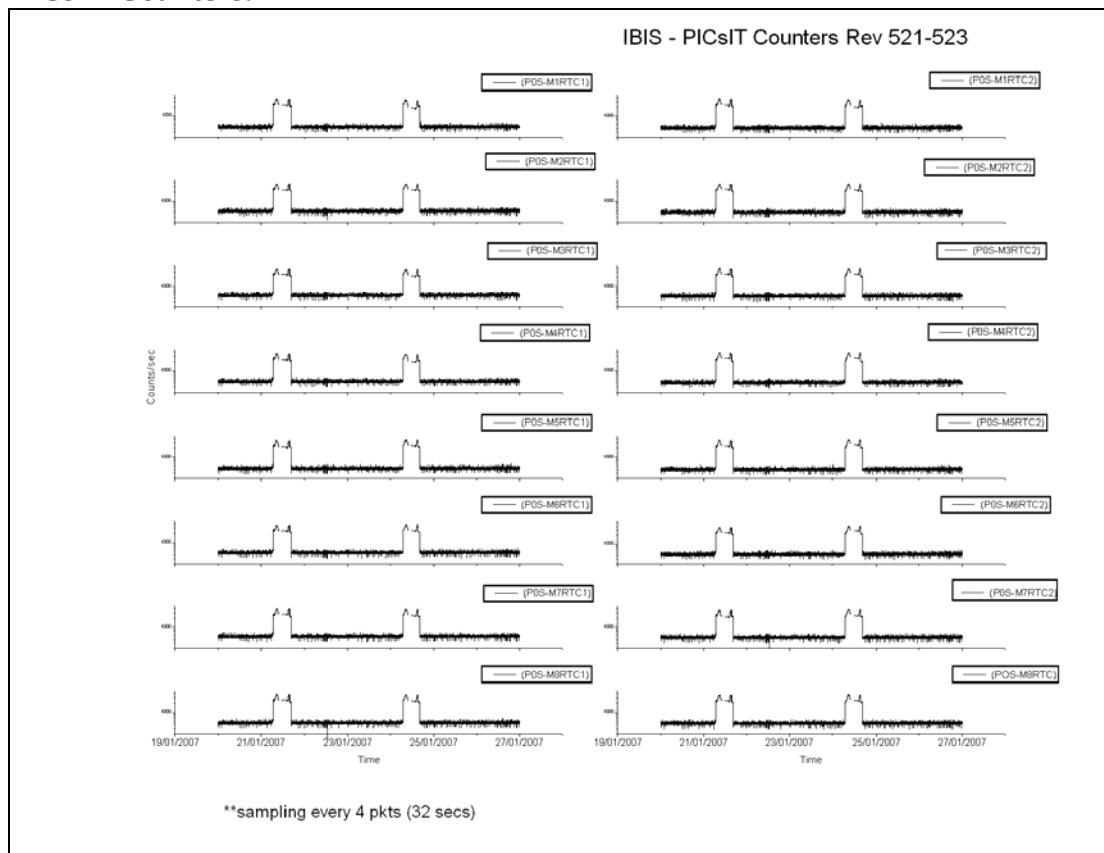


The week was characterised by low radiation.

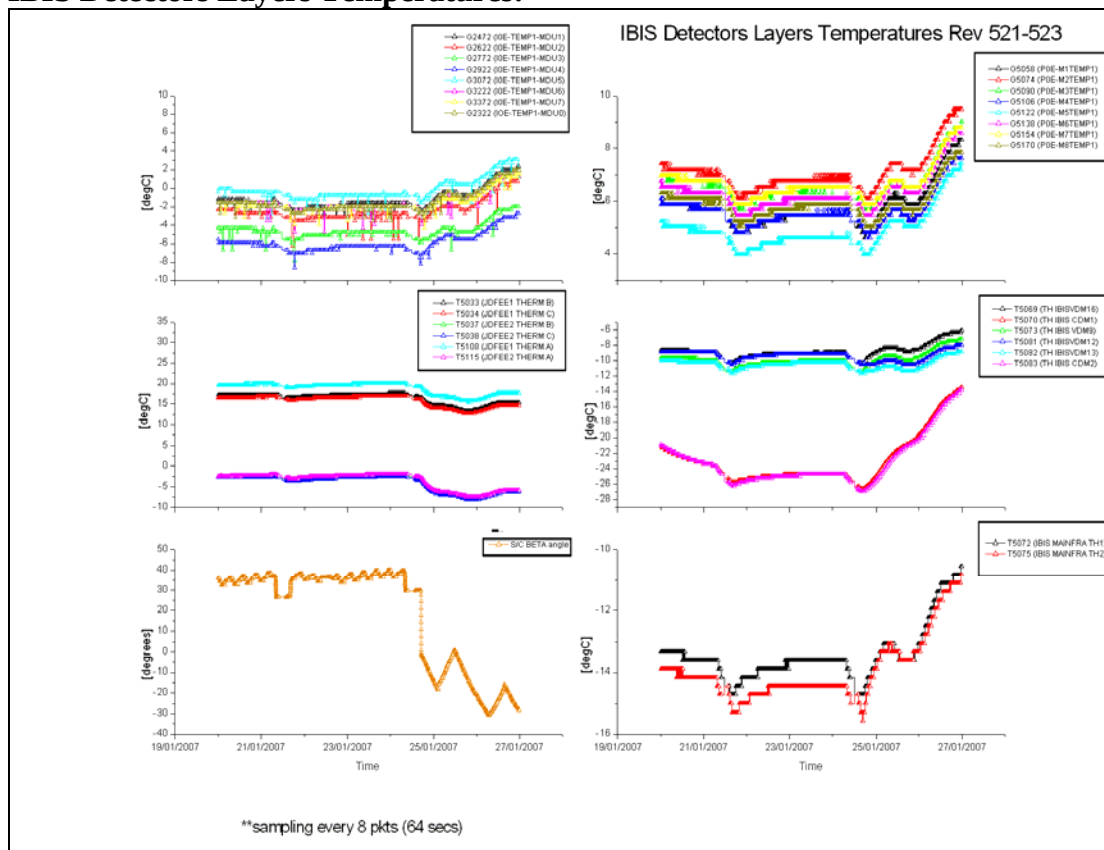
VETO Current:



PICsIT Counters:



IBIS Detectors Layers Temperatures:



IBIS daily report:

The usual Out Of Limits on TM parameter G8015 (S1E-A2_PMT_V), families G5002 (P0S-Mi_RTC1) and G5003 (P0S-Mi_RTC2), families G2014 (I0E-OVFWPXADD-Mi) were reported at Radiation Belts passage.

DoY 2007.021 (21/01/2007):

From 05:09Z TM parameter G8080 (S1E-VS_HBRA-RT) was toggling OOL High. At 05:59Z, TM parameters G6062 (V1S-BOT-COUNT) and G6063 (V1S-LAT-COUNT), and TM family G2013 (I0S-EVTCNT-MCEi) started toggling OOL High. All these events are related to high radiation as the S/C was approaching the Belts. No action was taken as per FDIR.

They all came back into nominal range at 06:54Z when IBIS went to Stand-By mode due to automatic reaction to high IREM counters.

The planned Belts entry in the timeline was at 07:00:42Z.

From 21/01/2007 00:38Z until the end of the reporting period (26/01/2007), TM parameter G6061 (V1S-CAL-COUNT) was reported toggling OOL low. This is due to the decay of the radioactive source in the VETO Calibration module. Therefore no action was taken.

DoY 2007.022 (22/01/2007):

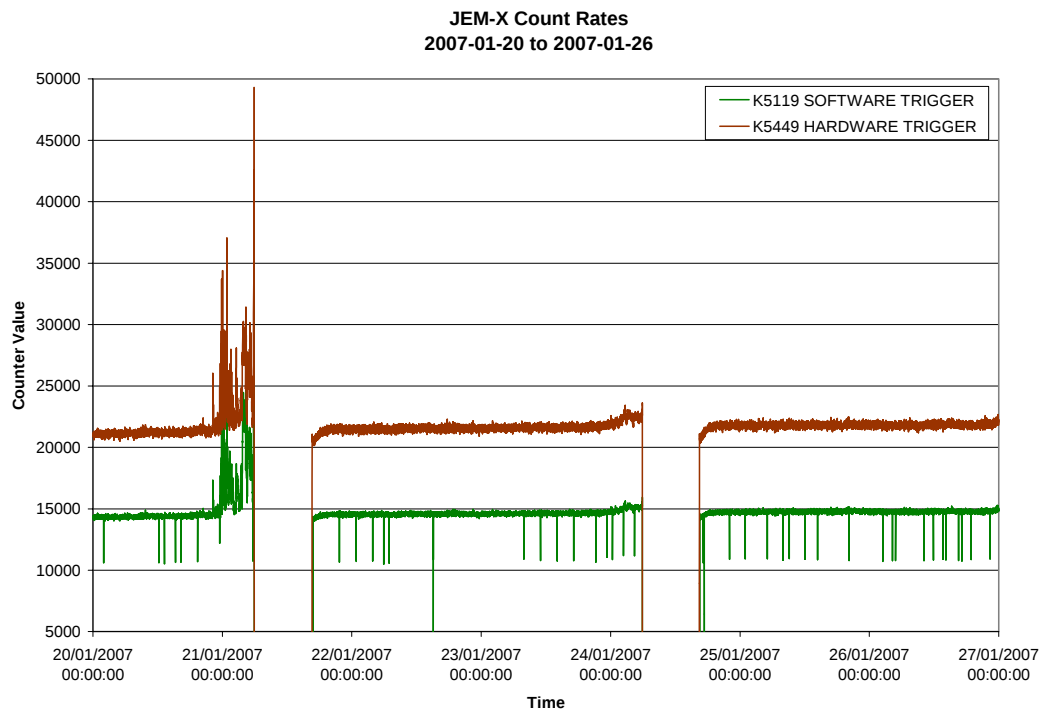
At 12:43Z parameters from TM families G5068 (P0S-MiF1ERRF) and G5072 (P0S-MiF2ERRF) were reported failing Status Consistency Check. As this lasted for 1 cycle only, according to P-FIF-1, no action was taken.

8.3.4 JEM-X Operations

JEM-X Count Rates

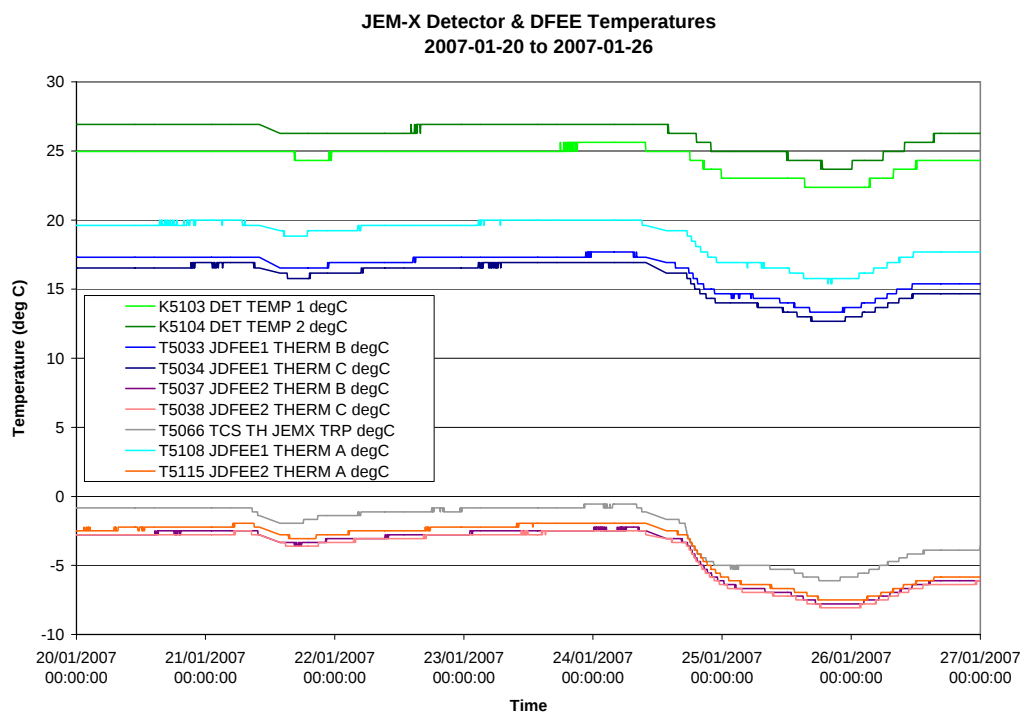
JEM-X count rates over the reporting period are displayed in the following graph¹.

¹ Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.



JEM-X Temperatures

JEM-X Detector and DFEE temperatures, along with the temperature on the detector bench between the two units, over the reporting period are displayed in the following graph².



² Data sampled (1 frame in 8)

JEM-X Daily Report

2007-01-20 (DOY 020, Rev 521)

JEM-X1 operations executed nominally.

2007-01-21 (DOY 021, Rev 521-522)

Due to high background radiation conditions, at 03:42:14Z K5136 BUFFER LOSS started toggling OOL High and at 03:54:22Z the TM parameter K5449 HARDWARE TRIGGER also started toggling OOL High. At 05:53:26Z K5119 SOFTWARE TRIGGER also began to toggle OOL High and at 05:54:21Z JEM-X1 made an autonomous transition to Safe mode, triggered by the Software Ratemeter. Two occurrences of OEM 189 JEM-X1 PROB DFEE 9 (Unexpected DFEE state reported in housekeeping) was received at this time, and the TM parameter K5462 DFEE STATE IASW was reporting state Setup while K5022 DFEE STATUS was Safe. The ED KESAFE02 was sent from the Timeline at 06:05:28Z, OEM 254 ERROR OFF was received at 06:05:34, and K5462 DFEE STATE IASW went to Safe at 06:06:30.

JEM-X1 operations continued nominally.

2007-01-22 (DOY 022, Rev 522) to 2007-01-26 (DOY 026, Rev 523)

JEM-X1 operations executed nominally.

8.3.5 OMC Operations

2007-01-20 (DoY 020, Rev 521) to 2007-01-24 (DoY 024, Rev 523)

Nothing to Report

2007-01-25 (DoY 025, Rev 523)

At 17:12, the TM links with Redu dropped causing the command sequence to fail release. A recovery was performed, and the Timeline rejoined at 17:38. The impact was the loss of pointing 05230043. It was at this time the following commands were rejected:

2007.025.17.17.07.071	2007.025.17.17.14.377	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E	E							
2007.025.17.17.13.196	2007.025.17.17.22.406	1792	RealTime	131	TC	REJECT		
REJECTED TC1			0	0	65535	PR	N	
E	E							

These correspond to the M1130 (RESET IM) and MU1310 (IMAGING-A) commands for that pointing.

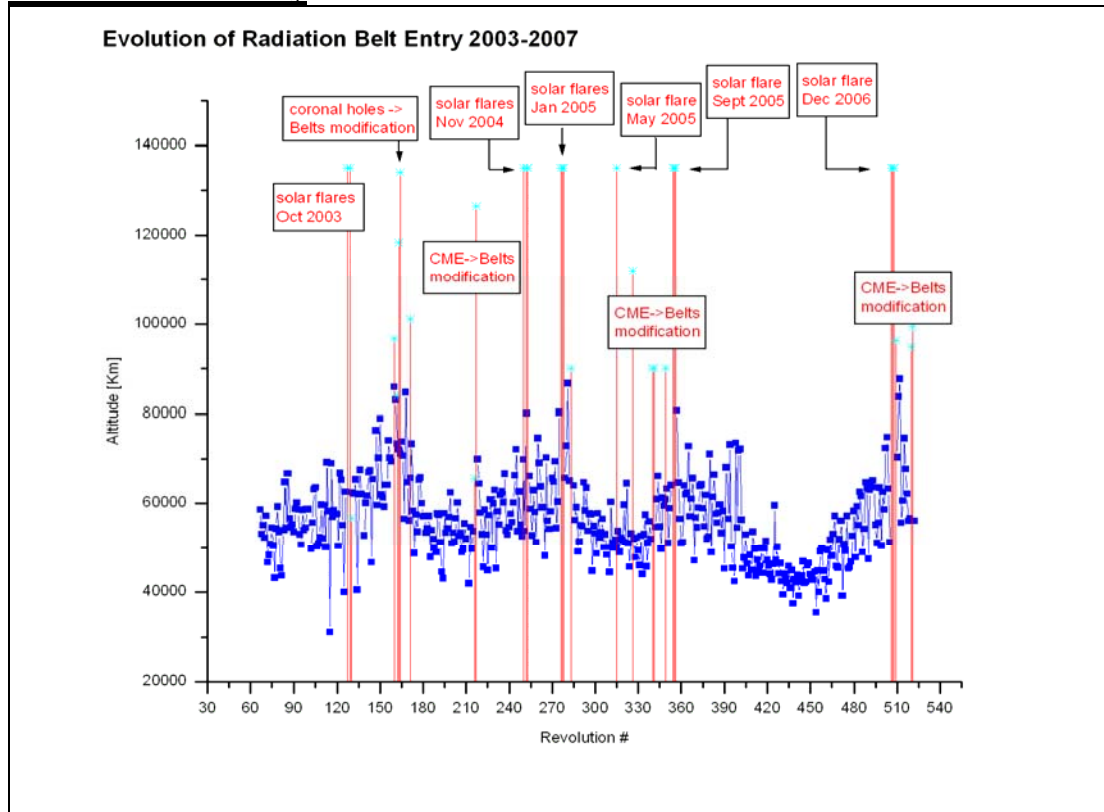
2007-01-26 (DoY 026, Rev 523)

Nothing to Report

On DoY 021 at 07:00:48 and DoY 024 at 06:49:20 OMC went to SAFE mode nominally, at the radiation belt entry time as set in the Broadcast Packet.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

Nothing to report

Electron Belts

REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
521	RAD_ENTR R 2007-01-21T07:00:42Z	2007-01-21 00:00:07	99355.7	2007-01-21 08:00:11	47711
522	RAD_EXIT R 2007-01-21T16:17:02Z	2007-01-21 15:40:31	<<42545.1	2007-01-21 15:50:11	41188
522	RAD_ENTR R 2007-01-24T06:49:12Z	2007-01-24 06:43:35	56086.1	2007-01-24 07:46:35	47959
523	RAD_EXIT R 2007-01-24T16:06:07Z	2007-01-24 15:27:43	>>28152.3	2007-01-24 15:46:35	42309

Reference

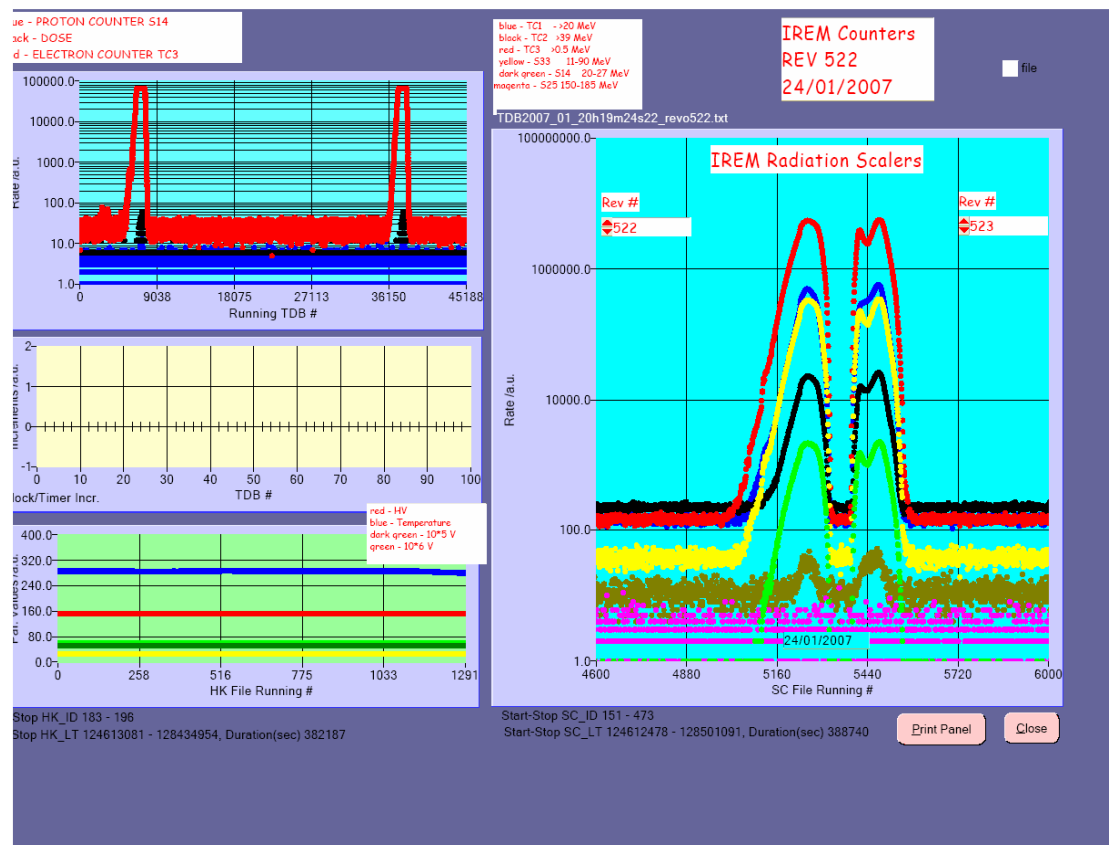
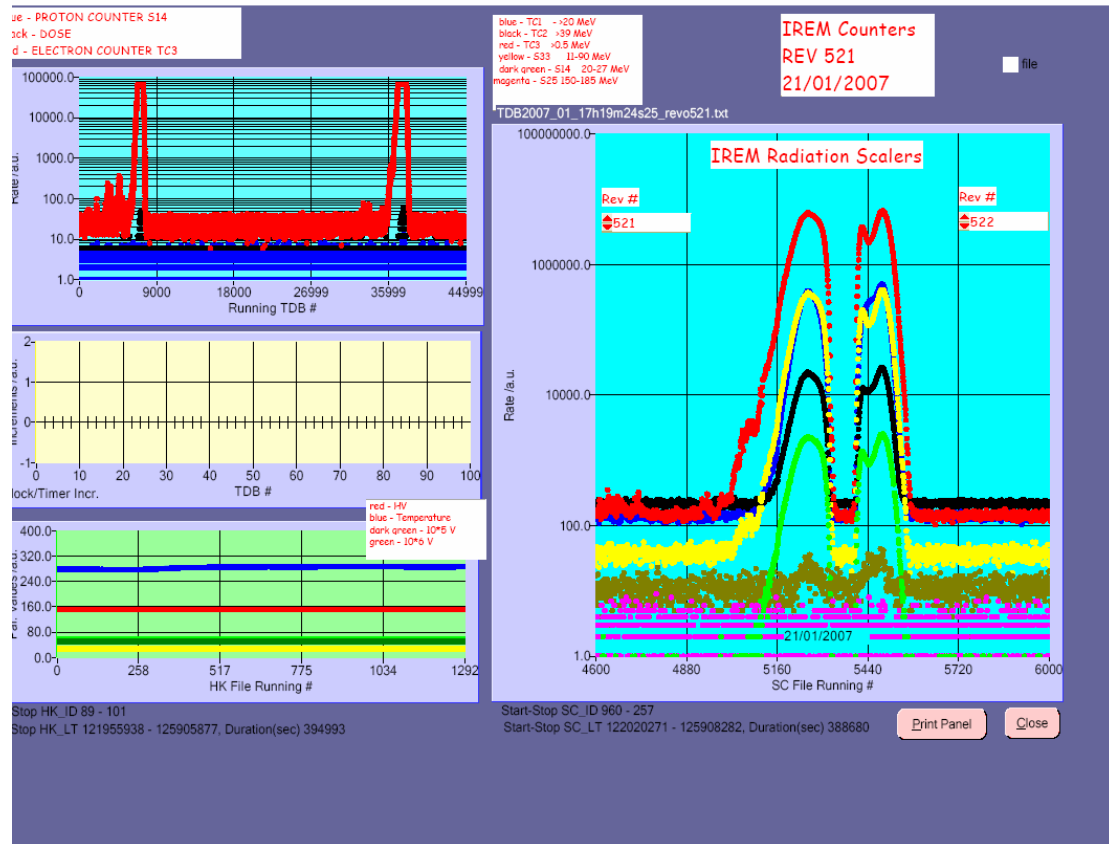
Very small error vs reference (less than 10 minutes)

Small error vs reference (between 10 and 30 minutes)

Large error vs reference (more than 30 minutes)

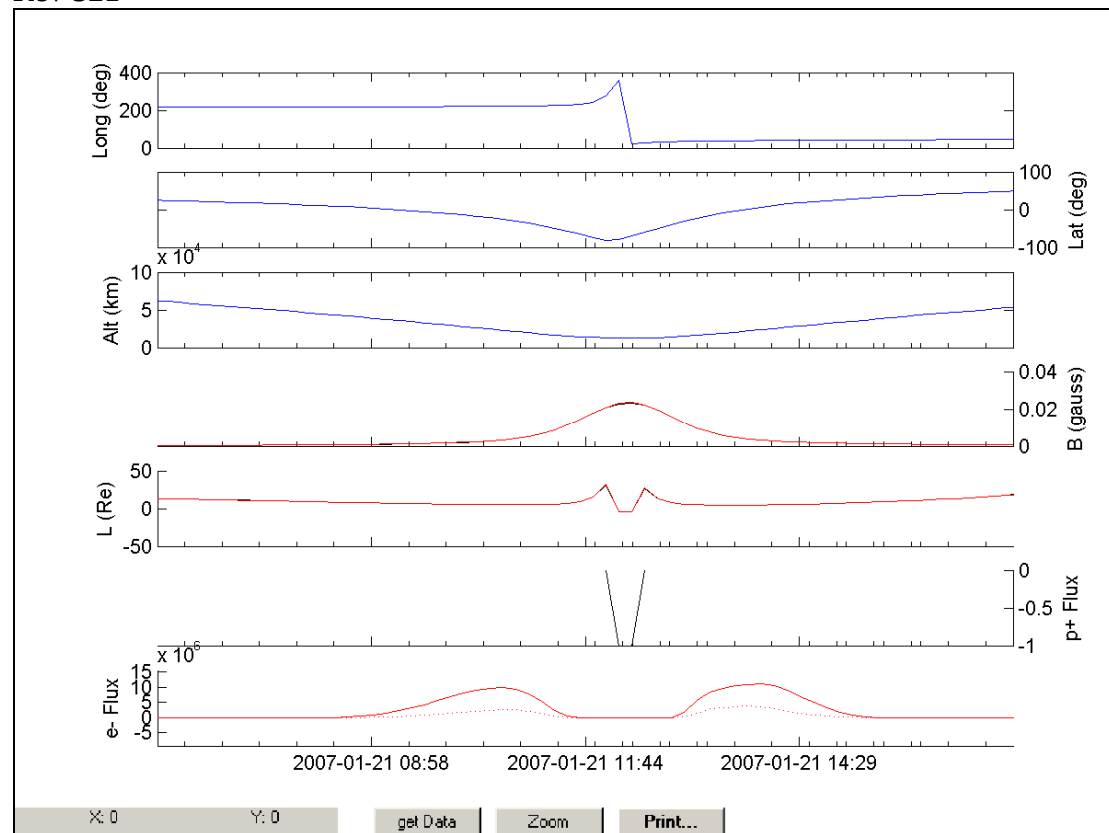
Radiation Spike

IREM radiation counters:

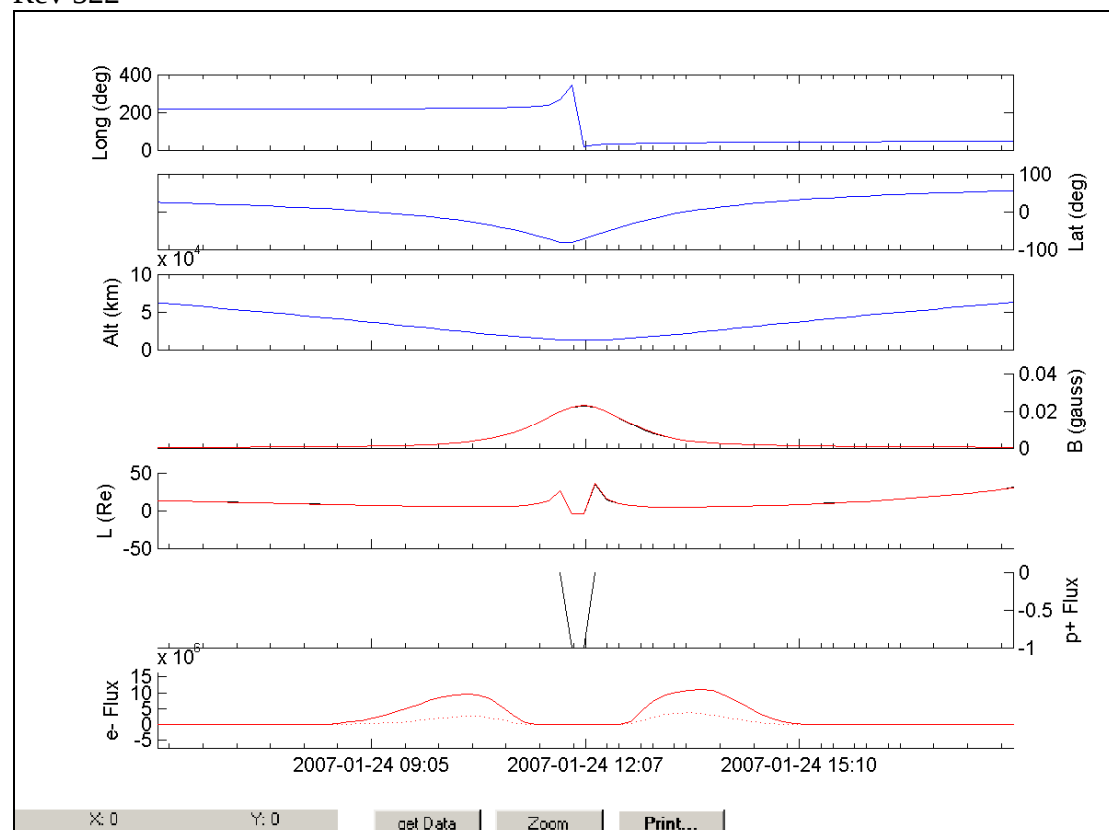


IREM Predicted Radiation Belt Passages

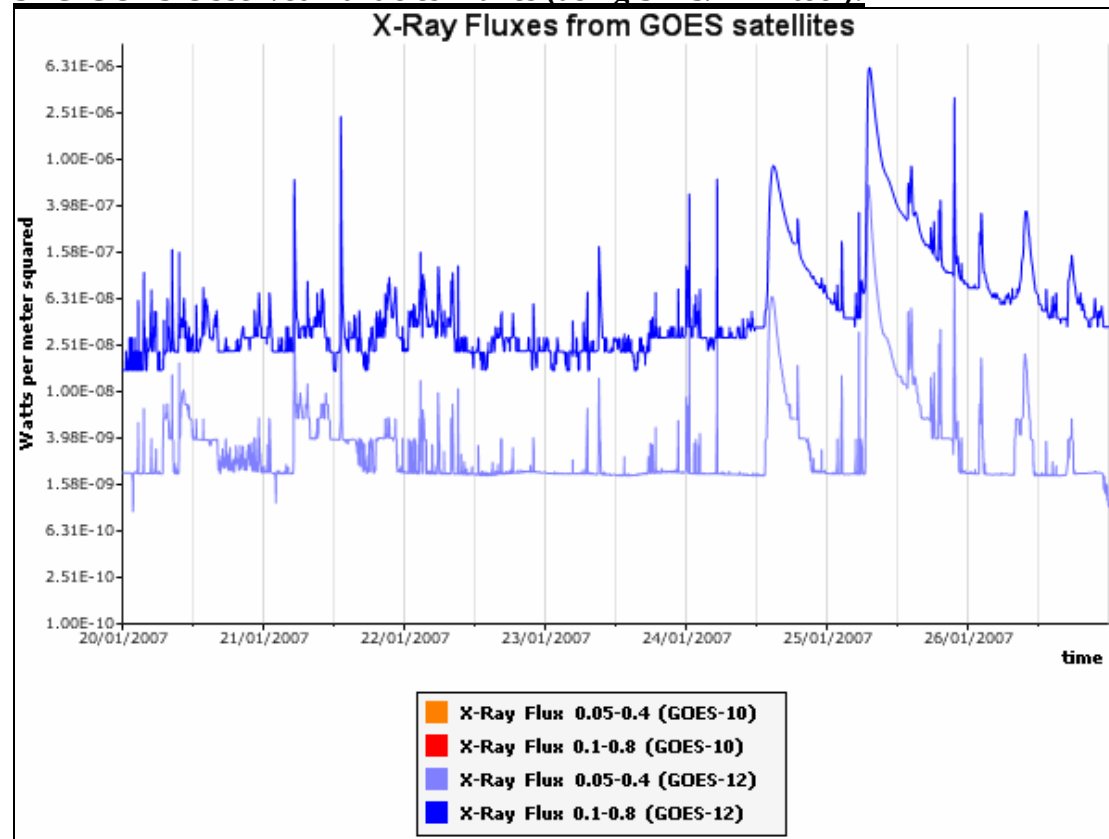
Rev 521



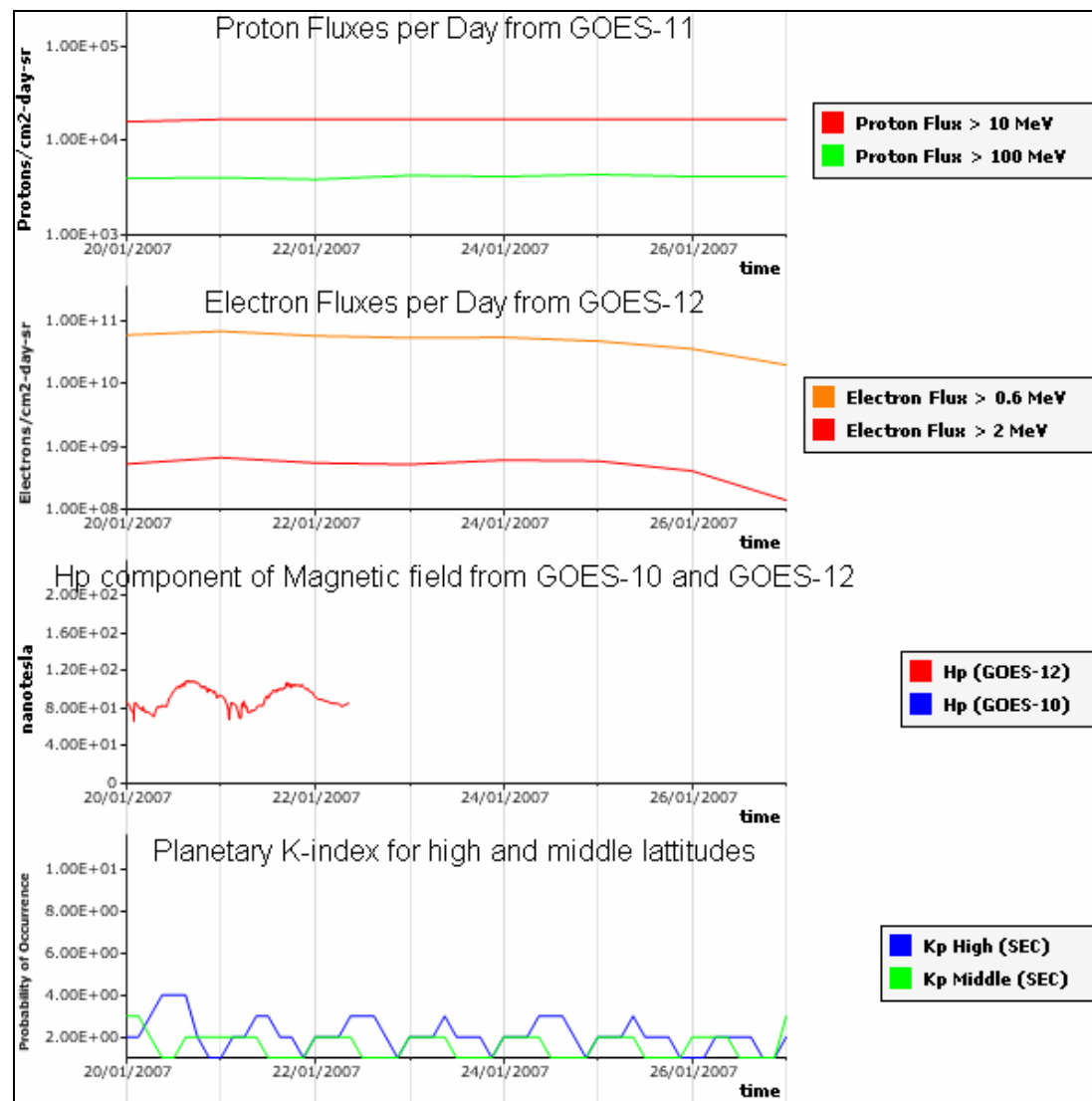
Rev 522



SEC-GOES Observed Particles Fluxes (using SEIS/RAT tool):



X-Ray fluxes start to be significant over 10^{-5} W/m^2 (corresponding to M-class flares). Above 10^{-4} W/m^2 , they correspond to strong X-class flares.



Proton and electron flux report low radiation background.

Hp component of the Geomagnetic Field is essentially parallel to the Earth's rotation axis. A drop near 0 nT is associated with a significant variation in the magnetic field. Kp index is based on ground magnetometers. Kp ≥ 5 features storm-level geomagnetic activity.