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

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 058
Week 44
06.11.03
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 25.10.03 until 31.10.03 (both dates inclusive) and covers the revolutions 126, 127 & 128.

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 IC443 (RA 06:17:39.50; DEC +22:23:41.0), the galactic plane and GRS 1915+105 (RA 19:15:11.50; DEC +10:56:44.0). The planned activities consisted of hexagonal dithering observations and a GPS. However, due to high radiation levels as a result of solar flares, a considerable proportion of the planned observations could not be performed.

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

During this period, the AOCS operations were heavily affected by the radiation background, which started to rise to very high levels from the beginning of revolution 127. After the radiation background reached levels that put all instruments in their safe modes and having seen high False Event rates on the STR, it was decided to completely stop the timeline when a safe attitude with a bright Guide Star of magnitude 2.56 was reached. The Timeline was stopped on 28/10/2003 at 13:52. Although unexpected, this bright star was lost two times due to high rates of detected False Events. Later in the revolution a special Close-Loop Slew was performed to put the bright Guide Star in the centre of the STR FoV (ESW #1). This would prevent the STR from picking a dim star in case the magnitude 2.56 star was lost again.

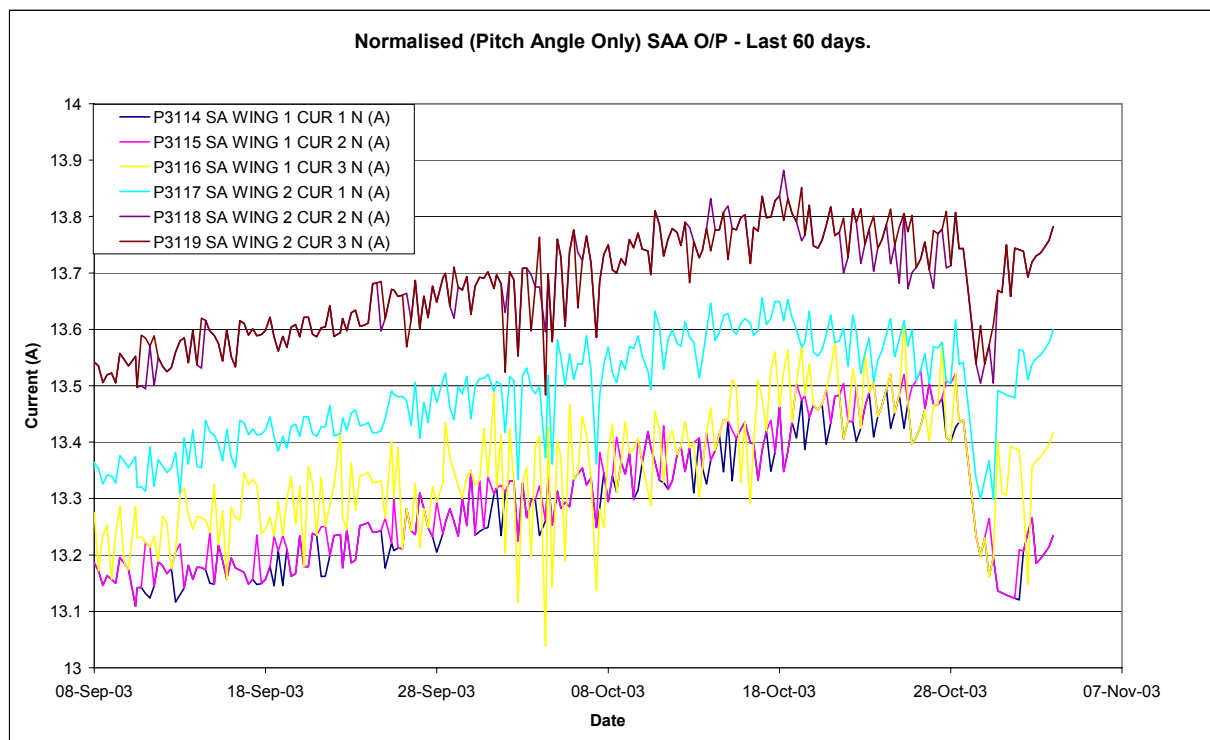
For the Perigee-Pass between revolutions 127 and 128, INTEGRAL was slewed to a safe attitude with another bright star of magnitude 2.65 in the centre of the STR FoV. This was different than the originally planned attitude for this Perigee-Passage.

The fuel consumption over the period between 24/10/2003 and 31/10/2003 was 0.11Kg. The remaining propellant is in the order of 174.2 Kg on the 31st 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**. There have been some effects during the last week due to the solar storms, which are currently on-going. A preliminary assessment of the solar arrays indicated a degradation of about 0.2 A. This is just a temporary figure because there are still fluctuations, see diagram. A final damage assessment will be performed when stable conditions are re-established.



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 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. Due to the strong solar activity, the instrument had to be put in a safe configuration in one occasion, coinciding with the high-energy proton radiation peak.

The cryo-cooler is working well, keeping the Ge detector cold plate temperature within 85+/-1K.

The 3rd Ge detectors annealing cycle has been postponed and is currently planned to take place from rev.132 to 136 (starting on 12th 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. The observation period was characterized by an exceptional solar activity, X-ray flares exceeding class X10 associated to strong Coronal Mass Ejection (see IREM report). Since DoY 299 (26/10/03) and for large part of the observation period the unit was set in Safe Mode.

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

However, due to high background radiation levels as a result of solar flares, JEM-X2 made two autonomous transitions to Safe mode, triggered on both occasions by the unit's software ratemeter. JEM-X2 therefore spent the following periods of time in Safe mode:

- 2003-1026T18:01Z to 2003-1027T16:36Z
- 2003-1028T11:02Z to end of reporting period

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

Further information on the radiation levels experienced during this period can be found in the IREM section of this report.

3.2.4 OMC

The status of OMC is nominal.

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

A total of 37 images were captured during this period, from DoY 301 at 11:56 till the end of the week, the instrument was in SAFE mode due to the high solar activity.

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

3.2.5 IREM

The status of the unit is Nominal. The observation period was characterized by an exceptional solar activity with major solar flares and associated Coronal Mass Ejections (CME):

- 1) flare class >X1 in the 26-27/10;
- 2) flare class > X10 on 28/10;
- 3) flare class X10 on 29/10.

During all the observation period the performance of the unit was excellent: no SEU was reported and no problem raised by the unit affecting the other s/s.

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

4 Ground Facilities

The performance of the ground segment was good in the reporting period. The problems regarding the data consolidation and the distribution of data to the ISDC have been fixed and do not impact anymore the operations.

It is not possible to provide meaningful quantitative performance figures for this week because the science operations were interrupted for most of the time due to the heavy solar storms.

4.1 Mission Operations Centre

As mentioned above the problems regarding the data consolidation and the distribution of the TM data to the ISDC have been fixed. A temporary fix is used on the operational system to ensure smooth operations. The final fix is currently been tested on the development system. It will be applied to the operational system within the next one to two weeks when the acceptance testing has been performed.

The generation of the Planning Skeleton Files (PSF) that are needed by the ISOC to perform the science planning is currently impacted by a bug in the Flight Dynamics System (FDS). The accuracy, e.g. regarding the timing of events, is not adequate for medium term PSF's. Hence PSF's are currently generated only for about 2 weeks into the future.

4.2 Ground Stations & Network

The performance of the Operational Network was good despite of some problems that impacted the operations, see section 6.

There were a couple of Reed Solomon errors mainly regarding the Redu station. It is currently been verified whether these errors are caused by seasonal atmospheric events.

4.3 Science Ground Segment

4.3.1 ISOC

This report covers to end of week 44.

1. Planning.

Short term PSF: up to rev. 139 received from MOC, no change from last week.
Expecting updated PSF's for rev 133 to 139

Long term PSF: up to rev. 148
POS and POD generated: up to rev 132, no change from last week
TSF: Up to rev 129.

Revs 130 was replanned, to correct incorrect parameter setting for an OMC flat field calibration observation. A replanned POS for rev 129 has also been submitted. This version is to be used in case no annealing takes place at that time.

2. Observation status

ECS's up to rev 118 received from ISDC. Still missing rev's 81,84 and 112. OCS sent to ISDC including processing up to rev 114.

3. ISOC science archive

Both science window data and science products up to around revolution 70 available in the ISOC science archive. New agreement with ISDC should ensure faster delivery to ISOC of tapes with science products

4. System

The system performance is very stable. Testing of ISOC system version 10 progressing nominally.

5. Problems

none

6. Miscellaneous

Preliminary results from the SPI cryo-cooler testing at ESTEC has produced enough confidence to recommend to go ahead with the upcoming SPI annealing. However this week has been severely impacted by the high solar activities. The decision to perform or not the SPI annealing as planned is now dependant on the solar activity considerations.

4.3.2 ISDC

On 05/11/2003, the status of ISDC observation processing is:

- Latest Standard Analysis completed: observation 01200160003 (SGR1806-20, Revolution 108-110) on 01/11/2003
- Latest products archived: observation 01201910001 (SN 2003gs type Ia, Revolution 98-99) on 29/10/2003
- Latest observation products sent to the observer: observation 01201140002 (IC 4329A, Revolution 104) on 31/10/2003

5 Special Events

The science operations have been heavily impacted by the solar storms.

6 Anomalies

New anomalies raised during the past week are listed below:

On DoY 299 at 18:51, and DoY 300 at 04:44, 05:41 and 06:01, there were Reed-Solomon alarms from Redu, no impact.

On DoY 302 between 22:29 and 22:36 there was no TLM or TC from DSS-16 due to high winds forcing the antenna to stow, there was no impact.

On DoY 303 at 19:55 there was a late Handover to DSS-16 again due to an antenna stow, caused by high winds. At 20:13, the antenna stowed again, VC0 TLM returned to Redu, at 20:50 there was LOS at Redu. TLM from DSS-16 was finally restored at 21:34, with TC following at 21:38. At 21:42, the antenna went to stow again, with winds at 100kph. At 00:05 the following day VC0 TLM was intermittently back, and was fully restored together with VC7 TLM at 00:23. THE TC was reconnected after a re-sweep at 00:28.

Arid	Date Occurrence	Subject	Segment	Status
INT - 002499	27/10/2003	Telemetry loss from DSS-16 due to RFI DR: G103560	Ground	NASA Sta.
INT - 002500	27/10/2003	Telemetry loss from DSS-16 DR G103558	Ground	NASA Sta.
INT - 002501	27/10/2003	Telemetry loss from DSS-16 DR G103577	Ground	NASA Sta.
INT - 002502	28/10/2003	Loss of TC and TM link due to X-25 link	Ground	COMMS

7 Future Milestones

Due to the current radiation environment, the installation of the next release of the OMCAS (Version 2.9) has been postponed to Wednesday 5th November.

The science planning for the next couple of revolutions will be modified in order to allow the PI teams to perform an assessment of the impacts of the high radiation on the performance of the instruments.

The new allocated revolutions for the 3rd SPI annealing are between 132 and 136. The detailed annealing timeline has been updated. The timeline includes 126hrs annealing time, the patch and in-flight validation of the IASW 4.3.0 and a few additional tests to investigate the FEE57 anomaly. The switch on temperature of the camera is still pending confirmation from the PS.

Here follows the summary view of the updated timeline:

3rd SPI Annealing - revs 132-136																									
ID	Task Name	Duration	Start	Resource Nam	10 Nov '03							17 Nov '03							24 Nov '03						
					Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
12	Start SPI Annealing	3 hrs	11 Nov 23:17	PST[5 pkts]																					
24	Warm up to Annealing Temperature	37.1 hrs	12 Nov 01:29	PST[5 pkts]																					
33	Annealing at 104degC	126 hrs	13 Nov 14:35	PST[5 pkts]																					
42	Stop SPI Annealing - Passive Cooling	68.52 hrs	18 Nov 20:35	PST[5 pkts]																					
46	Uplink IASW 4.3.0	4.01 hrs	19 Nov 08:36	PST[98 pkts]																					
68	Start Active Cooling	118.12 hrs	21 Nov 17:06	PST[5 pkts]																					
77	Active Cooling Fine Tuning	72.3 hrs	26 Nov 15:13	PST[5 pkts]																					
85	ACS and Camera Switch on & Performance Tests	5 hrs	25 Nov 06:42	PST[98 pkts]																					
94	IASW 4.3.0 In-flight Validation	6.97 hrs	25 Nov 11:42	PST[98 pkts]																					
119	ACS FEE57 Fault Identification Tests	3.91 hrs	26 Nov 07:40	PST[98 pkts]																					
136	SPI POS Observations	62.8 hrs	27 Nov 07:08	PST[98 pkts]																					

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 126

The planned observations in revolution 126 consisted of a hexagonal dithering observation of the supernova remnant IC443 (RA 06:17:39.50; DEC +22:23:41.0) for the entire duration of observation time (~60.5 hours). However, due to high radiation as a result of a solar flare, IBIS, JEM-X2 and OMC were in their safe modes for a considerable part of this revolution.

For this observation, 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.

Revolution 127

The planned observations in revolution 127 consisted of a hexagonal dithering observation of the supernova remnant IC443 (RA 06:17:39.50; DEC +22:23:41.0) for the entire duration of observation time (~60.5 hours).

All instruments were planned to be in their nominal science modes (except for JEM-X1 which was to remain in Safe mode) with a TM allocation of 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC. However, due to high radiation as a result of a solar flare, all instruments were in their safe modes for most of this revolution.

Revolution 128

The planned observations in revolution 128 consisted of a GPS for the first 28 hours followed by a hexagonal dithering observation of GRS 1915+105 (RA 19:15:11.50; DEC +10:56:44.0) for the remaining ~33 hours of observation time.

All instruments were planned to be in their nominal science modes (except for JEM-X1 which was to remain in Safe mode) with a TM allocation of 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC. However, due to high radiation as a result of a solar flare, the instruments were in their safe modes for a considerable part of this revolution.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

The latest entries in the history file for INTEGRAL

2003-10-10T08:21:57.000Z	174.5147	F	Automatic TM processing.
2003-10-11T18:47:04.000Z	174.4793	F	Automatic TM processing.
2003-10-13T08:14:28.000Z	174.4496	F	Automatic TM processing.
2003-10-14T18:50:48.000Z	174.4231	F	Automatic TM processing.
2003-10-16T08:03:00.000Z	174.4129	F	Automatic TM processing.
2003-10-17T18:23:11.000Z	174.3960	F	Automatic TM processing.
2003-10-19T01:07:54.000Z	174.3741	F	Automatic TM processing.
2003-10-19T07:54:03.000Z	174.3418	F	Automatic TM processing.
2003-10-22T00:57:46.000Z	174.3263	F	Automatic TM processing.
2003-10-22T07:41:23.000Z	174.3097	F	Automatic TM processing.
2003-10-25T00:59:22.000Z	174.2961	F	Automatic TM processing.
2003-10-25T07:30:34.000Z	174.2745	F	Automatic TM processing.
2003-10-28T00:33:29.000Z	174.2498	F	Automatic TM processing.
2003-10-28T07:18:18.000Z	174.2291	F	Automatic TM processing.
2003-10-30T12:46:07.000Z	174.1999	F	Automatic TM processing.

This report was generated Fri Oct 31 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 heavily affected by the very high radiation levels caused by the recent solar activity. Only 16 Open Loop Slews and 53 Close Loop Slews were performed from the Timeline. During the remaining time, INTEGRAL was dwelling in a safe attitude. 5 RWB were performed during this time. Only one of them was performed by the timeline. The other four were performed manually at the planned time in the Timeline.

25/10/03 (Day of Year 298, Revolution 125-126)

Loss of Guide Star Due to STR SEU Filter of the ACC: At 06:27:17, during the perigee passage between revolutions 125 and 126, the Star Tracker SEU Filter of the ACC released the Guide Star when the number of detected False Events exceeded the

filter threshold. At LOS the magnitude 7.00 Guide was at CCD (-14350, 912) and at AOS the new guide was at CCD (1153, -4211) with magnitude 7.8. This star was released again at 07:04:21 by the ACC STR SEU Filter but was picked once more during the automatic mapping.

Open-Loop Slew was performed with default values: Due to a problem with the INTEGRAL File Transfer System (IFTS) the TPF to update the parameters for slew 01260002 was not transferred from the FD system to the IMCS. Therefore, this slew was performed with the Timeline default parameters. The attitude error thus introduced caused the rejection of some science windows by OMC (OEM: Science Window Rejected). The IFTS task was then restarted to recover from the IFTS fault.

26/10/03 (Day of Year 299, Revolution 126)

Nothing to report.

27/10/03 (Day of Year 300, Revolution 126)

Failure of the STR Mapping sequence because of TM glitch and Controller error: at 03:38, when the STR Mapping sequence was being uplinked from the Timeline, a drop in the TM link from Goldstone DSS-16 caused the commands, which load and report the mapping parameters, to fail uplink. Just before the uplink time of the next command in the sequence, the TM link was reconnected and the controller mistakenly reset the command interlock on the control system. This caused the next command, which authorises the mapping, to be uplinked. However, since the mapping parameters were not loaded, the command was rejected onboard by the ACC and the BAD TC SEquence OEM was generated. The whole mapping sequence failed. Another mapping was then commanded manually, which was used by the FDS to update the parameters of the next slew.

28/10/03 (Day of Year 301, Revolution 126-127)

Loss of Guide Star Due to STR SEU Filter of the ACC: At 06:36:16, during the perigee passage between revolutions 126 and 127, the Star Tracker SEU Filter of the ACC released the Guide Star when the number of detected False Events exceeded the filter threshold. At LOS the magnitude 7.85 Guide was at CCD (12702, 13118) and at AOS the new guide was at CCD (-8842, -3044) with magnitude 8.05.

Timeline-driven operations halted because of the extremely high radiation levels: The increasingly high radiation levels, caused by the recent solar activities, which were being observed since the beginning of the revolution drove JEM-X and OMC to their SAFE modes at 11:02 and 11:56 respectively. IBIS was commanded to STANDBY at 12:18 and at 13:45 SPI was manually put to CONF mode with the ACS HV switched off. Acquiring no science data, it was then decided to completely stop the Timeline at an upcoming safe attitude with a bright star in the Star Tracker Field-of-View. The Timeline was stopped at 13:52 when the safe attitude with a bright Guide Star of magnitude 2.56 was reached. Although it was not expected to lose this bright star, a provisional Change-of-Guide-Star TPF was prepared by the Flight Dynamics team to pick and track the bright star again in case it was released or lost

due to False Events. This CGS TPF in fact came handy when the star was lost at 17:27:45 and then again at 18:26:05. In both cases the STR picked a magnitude 8.45 star after the loss of guide star. Each time the bright star was picked again using the CGS TPF.

This situation however gave us the opportunity to gather data from the Star Tracker in the presence of high proton flux. The STR was commanded to track four stars of different magnitudes in slots 2 to 5 for a period of about 24 hours. This data will be used in trying to establish a relation between the observed rate of False Events and the proton flux based on in-flight data, and then to compare it with the predictions of the MMB TN "The effect of STR SEUs on the INTEGRAL AOCS".

29/10/03 (Day of Year 302, Revolution 127)

Close-Loop Slew performed to put the bright Guide Star in the centre of the STR FoV: With no improvement in the radiation levels in sight, it was decided to perform a Close-Loop Slew to put the bright Guide Star in the first Elementary Search Window of the STR. This means that in case the bright star was lost, the STR would automatically pick and track it again. Since we were already tracking this star, a special Close-Loop Slew sequence (AECCS) was used. In contrary to the normal CLS sequence, the AECCS performs the slew using the actual Guide Star.

30/10/03 (Day of Year 303, Revolution 127)

Slew to a Perigee-Pass safe attitude: The originally planned Perigee-Pass attitude did not have a bright star that we could rely on. Therefore, another PP safe attitude with a star of magnitude 2.66 was determined and chosen by the FD team. An Open-Loop slew was then performed to this attitude, completed with a Close-Loop Slew that put the bright Guide Star in ESW #1.

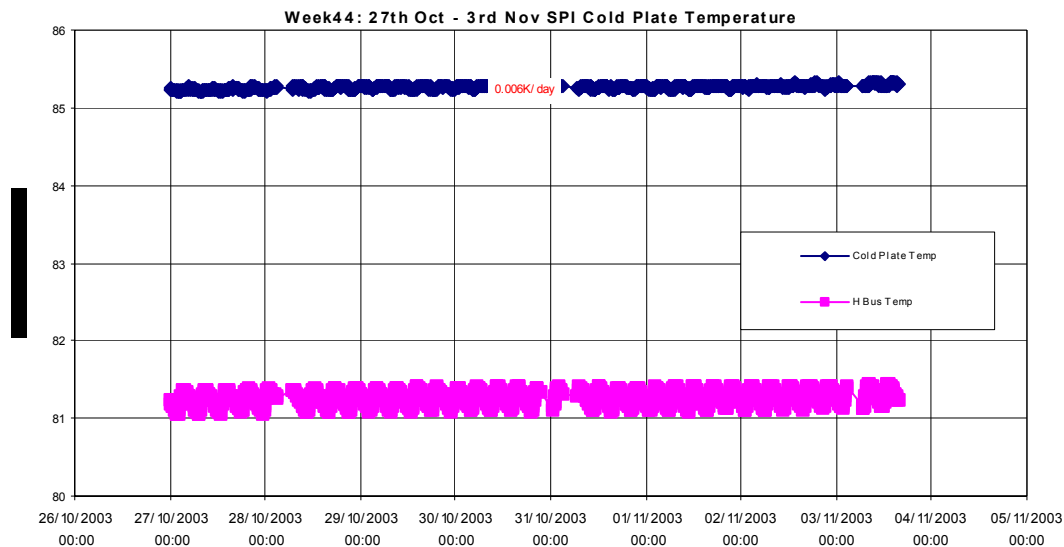
31/10/03 (Day of Year 304, Revolution 127-128)

Operations were still halted and the S/C remained dwelling in the Perigee-Pass attitude.

8.3.2 SPI Operations

Cryo-cooler:

The temperature is leveled at around 85.2K with a small positive drift of 0.006K/day, well within the expected range.



IASW/DPE:

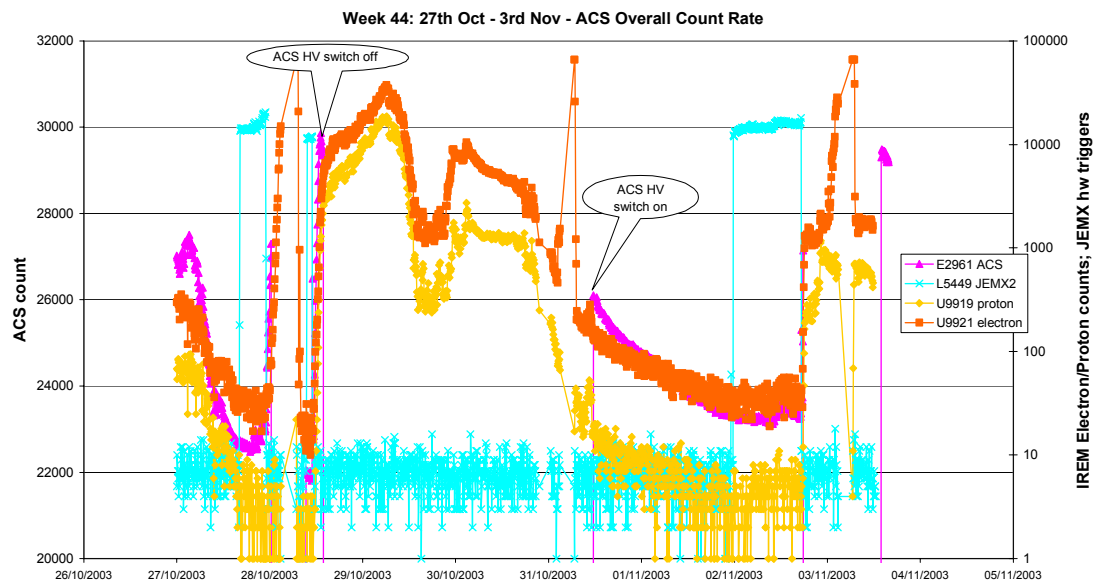
1) The new IASW 4.3.0 produced by CNES Toulouse has passed the reduced set of independent acceptance tests at MOC. New TPFs and OBSMS files for the filtering function parameters were sent by CNES and successfully and they are ready for uplink.

The DPE will be patched with the new IASW during the 3rd annealing cycle planned in November.

2) During the peaks of solar radiation, the IASW produced the OEM SPI PARTIAL FLAG OVERFLOW exception id 229 as a consequence of too many events in the DFEE buffer that could not be handled. The OEM was down-linked at high rate (8 each cycle) saturating the OEM display. The instrument was therefore put in configuration mode and the ACS HV switched off (DOY 301 at 13:30). The next day, on suggestion of the PI, a better configuration was commanded, with SPI in science mode down-linking extra housekeeping data on VC7, but with all event acquisitions disabled.

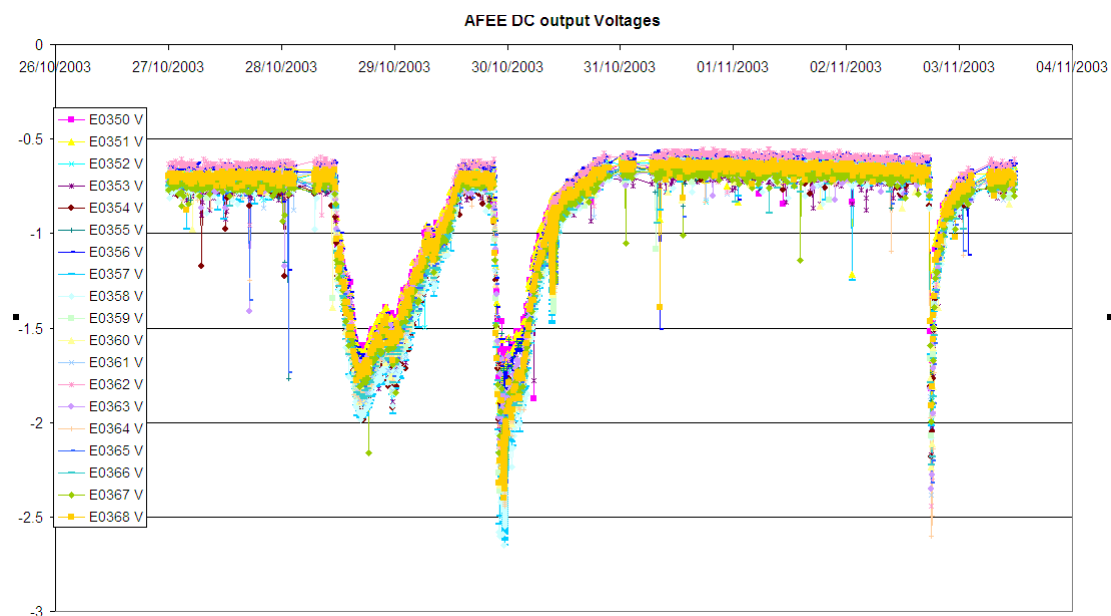
ACS:

The next figure is the plot of the ACS, IREM and JEMX2 count rates during the reporting period characterized by strong solar activity.



AFEE:

Due to the increased background of heavy ions, the high voltage polarising the 19 Ge detectors was characterised by an higher than usual error, generating in a couple of cases some temporary out of limit. The following plot shows the DC output voltage, measuring the error.



DFEE:

Nothing to report.

PSD:

Nothing to report.

8.3.3 IBIS Operations

On DOY 299 (26/10) at 17:59Z high radiation count-rates in all the VETO counters (lateral-bottom-calibration unit) were reported. The event was observed by IREM and was in coincidence with a solar X-flare exceeding X1 class (see IREM report).

The VETO calibration counter reported OOL (LOW LOW). The alarm was probably related to a problem in the Calibration unit Front End Electronic not able to follow the event when the count-rate is too high.

At 22:07, after consultation with the s/s SOE, an attempt to recover the situation was made according to the FDIR document:

- 1) transition of VETO to Stand-By;
- 2) wait for few minutes and transition of VETO back to Nominal.

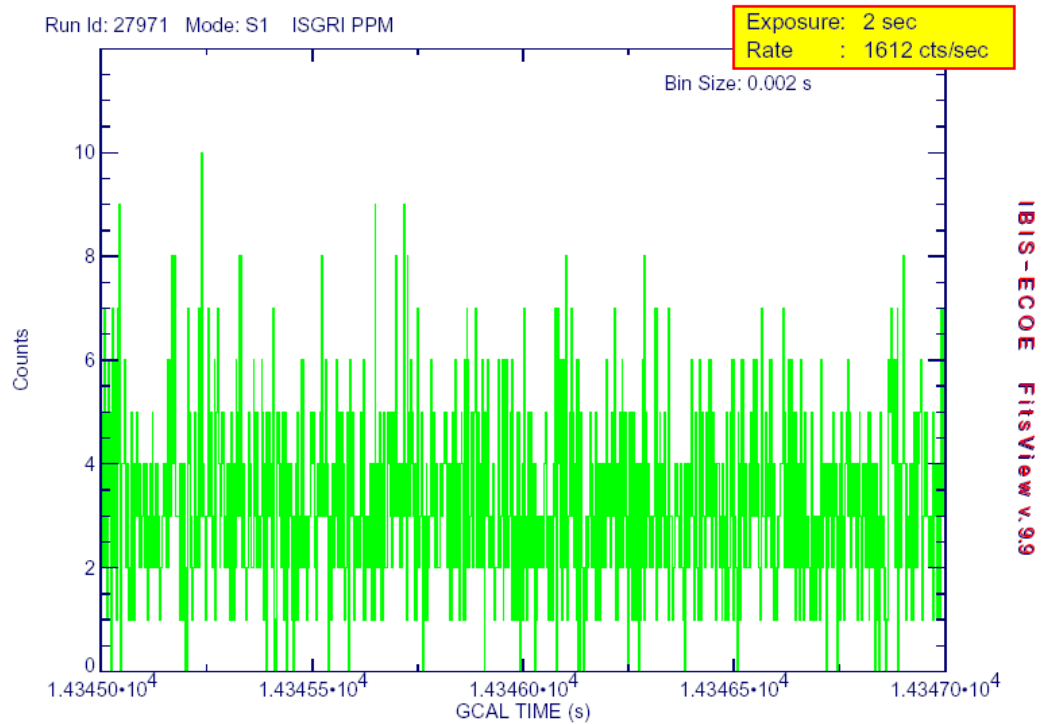
After the recovery the calibration unit counter still showed values to be OOL and the s/s SOE decided to switch IBIS to Safe mode, considering the increased radiation level (almost reaching the IBIS thresholds set for the IREM counters).

At 23:50 the IBIS s/s was disabled on the automatic timeline.

On DOY 300 (27/10) at 15:38Z the level of the electron and proton counters (as read by IREM) went below the thresholds set for JEM-X2 (proton < 2 cts/sec, electron < 6 cts/sec. Only at that point, due also to large fluctuation of the radiation levels, the s/s SOE decided to re-activate the IBIS unit.

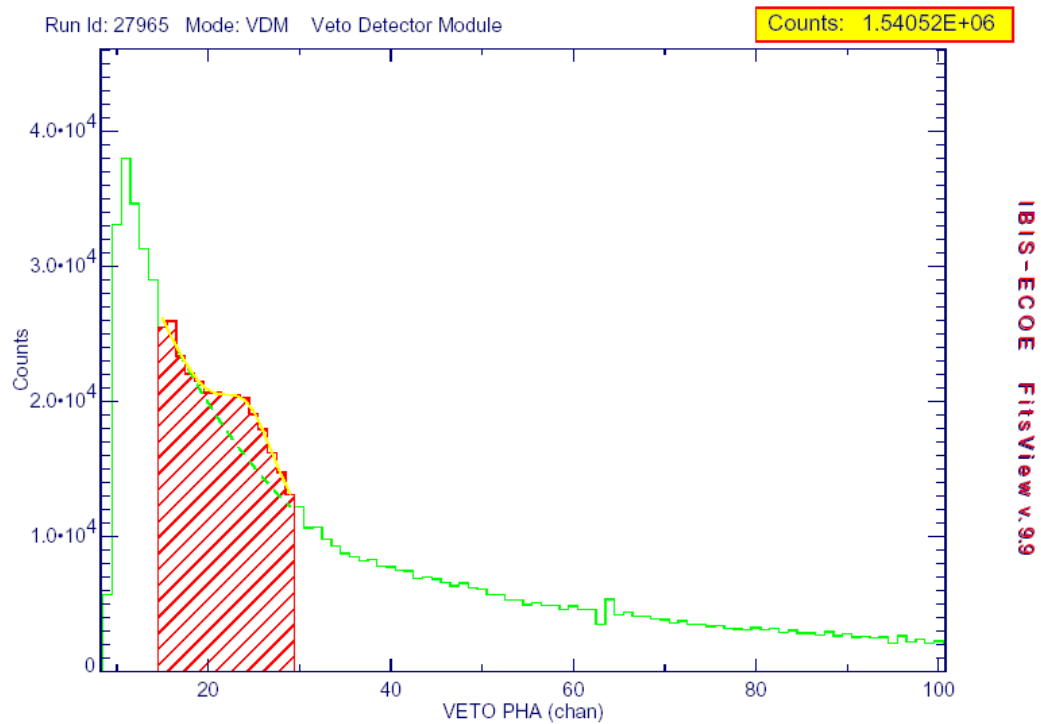
The reported ISGRI count-rates (S1), as recorded by the IBIS ECOE at ESOC are shown below.

/data/archive/erdf/science/2797/moc27971_031102_114928_S1_.fits

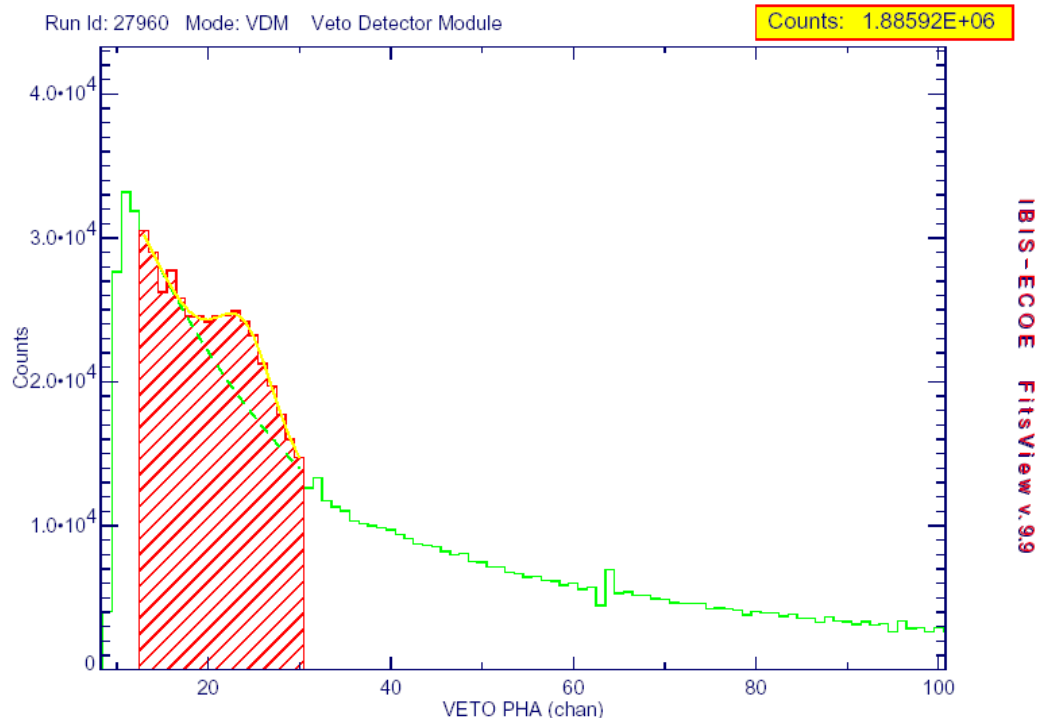


Plots of the VETO Spectra taken on 27/10/03 compared with those ones produced on 24/10/03 are shown below.

/data/archive/erdf/science/2796/moc27965_031027_201536_VDM_.fits



/data/archive/erdf/science/2796/moc27960_031024_223940_VDM_fits



On DOY 301 (28/10) there were a few reports 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.

At 11:00, high radiation count-rates in all the VETO counters (lateral-bottom-calibration) were reported. The event was observed by IREM and was in coincidence with a solar X-flare exceeding X10 class (see IREM report): the starting time of the event was 9:51 reaching a peak at 11:10.

At 11:02 the OEM ID 128 class 0 << VETO lateral Counter not possible to be defined>> was received. The reason of the generation was probably due to the high radiation environment, investigation with IBIS PIs is on-going.

At 11:25 the VETO calibration counter in OOL (LOW LOW) was reported. The alarm was probably related to a problem in the Calibration unit Front End Electronic not able to follow the event when the count-rate is too high.

At 12:18 after consultation with the s/s SOE the unit was set in Safe Mode and the IBIS s/s disabled in the automatic timeline.

Reported few times during the day the parameter G5079 (POE-M2ASICLINE) in OOL High (=2.605V). The OOL condition was lasting for few TM cycles and going back to the Nominal value. No further action was taken.

On DOY 302 (29/10), the unit remained in Safe Mode.

There were a few reports during the day of the parameter G5079 (POE-M2ASICLINE) in OOL High (=2.605V). The OOL condition was lasting for few TM cycles and going back to the Nominal value. No further action was taken.

At 09:20, the automatic activation via the SECL routine of the IBIS calibration unit heater to recover the parameter T5070 (thermistor of the calibration unit) inside the Nominal limit.

On DOY 2003.303 (30/10), the unit remained in Safe Mode.

There were a few reports during the day of the parameter G5079 (POE-M2ASICLINE) in OOL High (=2.605V). The OOL condition was lasting for few TM cycles and going back to the Nominal value. No further action was taken.

8.3.4 JEM-X Operations

2003-10-25, DOY 298, Rev 125-126

Nothing to report.

2003-10-26, DOY 299, Rev 126

At 17:58Z the parameter L5119 SOFTWARE TRIGGER went soft out of limits (value = 15106) and then at 18:01Z it went hard out of limits (value = 19100). This caused JEM-X2 to transition to Safe mode autonomously at 18:05Z.

The parameter L5462 DFEE STATE IASW reported state Safe (value = 1) on one occurrence but then reverted back to reporting state Set-up (value = 5), and there were two occurrences of the OEM189 JEM-X2 PROB DFEE 9 at 18:05Z. The status remained as such until 18:07Z, when the IREM electron counter parameters K5317 and L5317 RAD MONITOR 3 went out of limits (value = 68). At this time the parameter L5462 DFEE STATE IASW began to report state Safe (value = 1) and the following OEMs were issued:

OEM 231 JEM-X2 AUTO EVENT 1
OEM 254 ERROR OFF

At 18:15Z Timeline commanding to JEM-X2 was disabled.

JEM-X2 remained in Safe mode for the rest of this day.

2003-10-27, DOY 300, Rev 126

At 15:30Z JEM-X2 performed an autonomous recovery to Set-up mode (issuing OEM 233 JEM-X2 AUTO EVENT 3) and at 16:07Z the procedure FCP_JEM2_1010 JEM-X2 Configuration Setting for Science Ops was started (the IREM radiation counters had remained below the JEM-X2 threshold for about 1.5hours).

At 16:36Z JEM-X2 was put back into Data Taking mode by the procedure FCP_JEM2_0044 and at 16:38Z JEM-X2 commanding from the Autostack was re-enabled and JEM-X2 operations continued nominally.

The parameter L5119 went soft out of limits several times between 22:00Z and 23:00Z but JEM-X2 remained in Data Taking until 23:00Z, when it was commanded to Safe mode via the ED LESAFE01 in the Timeline.

2003-10-28, DOY 301, Rev 126-127

At 00:03Z, the first OOLs were received on parameters K5317 and L5317 RAD MONITOR 3 (value = 65) and JEM-X2 issued the OEM 231 JEM-X2 AUTO EVENT 1.

JEM-X2 operations commenced nominally via the automatic Timeline at the start of revolution 127 (high voltage adjustment and return to Data Taking completed at 10:37Z).

However, at 11:02Z the parameter L5119 SOFTWARE TRIGGER went soft out of limits (value = 18442) and then immediately hard out of limits (value = 24013). This caused an autonomous transition of JEM-X2 to Safe mode and commanding to JEM-X2 from the Timeline was disabled.

The parameter L5462 DFEE STATE IASW continued to report the state Set-up (value = 5), resulting the OEM 189 JEM-X2 PROB DFEE 9 at 11:03Z. The status of the unit remained like this until 11:43Z, when the IREM electron counter parameters K5317 and L5317 RAD MONITOR 3 went out of limits (value = 67). At this time the parameter L5462 DFEE STATE IASW began to report state Safe (value = 1) and the following OEMs were issued:

OEM 231 JEM-X2 AUTO EVENT 1
OEM 254 ERROR OFF

JEM-X2 remained in Safe mode for the rest of this day.

2003-10-29, DOY 302, Rev 127

JEM-X2 remained in Safe mode due to high radiation.

2003-10-30, DOY 303, Rev 127

JEM-X2 remained in Safe mode due to high radiation.

2003-10-31, DOY 304, Rev 127-128

JEM-X2 remained in Safe mode due to high radiation.

8.3.5 OMC Operations

On DoY 298 between 10:06:23 and 11:12:55 there were 27 OEMs indicating SCI WINDOW REJECTED. These were caused by the previous Open-Loop Slew being executed using default parameters, and was therefore slightly off target.

On DoY 298, at 00:23:24, OMC went to SAFE mode as commanded by the automatic Timeline.

On DoY 299, at 18:16:01 OMC went to SAFE mode, due to high radiation, and remained in SAFE mode until DoY 300 at 18:40:48, when it was put back into SCIENCE.

On DoY 301, at 00:21:00, OMC went to SAFE mode as commanded by the automatic Timeline.

From DoY 301 at 11:56:40, till the end of the week, the instrument remained in SAFE mode due to the high levels of radiation being experienced.

8.3.6 IREM Operations

On **DOY 299 (26/10)** at 18:00 the JEM-X2 automatic transition to SAFE Mode due to high radiation count was reported. The event was observed by IREM and was likely in coincidence with a solar flare X-ray class >1 with associated CME , as reported by NOAA bulletin, see below.

X-ray flare

SUMMARY: X-ray Event exceeded X1
Begin Time: 2003 Oct 26 1721 UTC
Maximum Time: 2003 Oct 26 1819 UTC
End Time: 2003 Oct 26 1921 UTC
X-ray Class: X1.2
Optical Class: 2n
Location: N05W33

On **DOY 301 (28/10)** at 11:00 the JEM-X2 automatic transition to SAFE Mode due to high radiation count was reported. The event was in coincidence with a solar flare X-ray class >10 with associated CME , as reported by NOAA bulletin, see below.

X-ray flare

SUMMARY: X-ray Event exceeded X10
Begin Time: 2003 Oct 28 0951 UTC
Maximum Time: 2003 Oct 28 1110 UTC
End Time: 2003 Oct 28 1124 UTC
X-ray Class: X18
Location: S16E07

Proton >100 MeV

ALERT: Proton Event 100MeV Integral Flux exceeded 1pfu

Doc. Title : INTEGRAL Mission Report # 58
Doc. Ref. : INT-MOC-SYS-RP-1001-TOS-OF
Date : 06/11/03

Issue : 1
Rev. : 0
Page : 22

Begin Time: 2003 Oct 28 1150 UTC

Proton >10 Mev

ALERT: Proton Event 10MeV Integral Flux exceeded 10pfu

Begin Time: 2003 Oct 28 1215 UTC

Radio Burst type IV (associated with Coronal Mass Ejection)

SUMMARY: 10cm Radio Burst

Begin Time: 2003 Oct 28 1014 UTC

Maximum Time: 2003 Oct 28 1114 UTC

End Time: 2003 Oct 28 1459 UTC

Duration: 285 minutes

Peak Flux: 13000 sfu

Latest Penticton Noon Flux: 257 sfu

On **DOY 302 (29/10)** around 21:00 high radiation count-rates were reported. The event was in coincidence with a solar flare X-ray class 10 with associated CME , as reported by NOAA bulletin, see below.

X-ray flare

SUMMARY: X-ray Event exceeded X10

Begin Time: 2003 Oct 29 2037 UTC

Maximum Time: 2003 Oct 29 2049 UTC

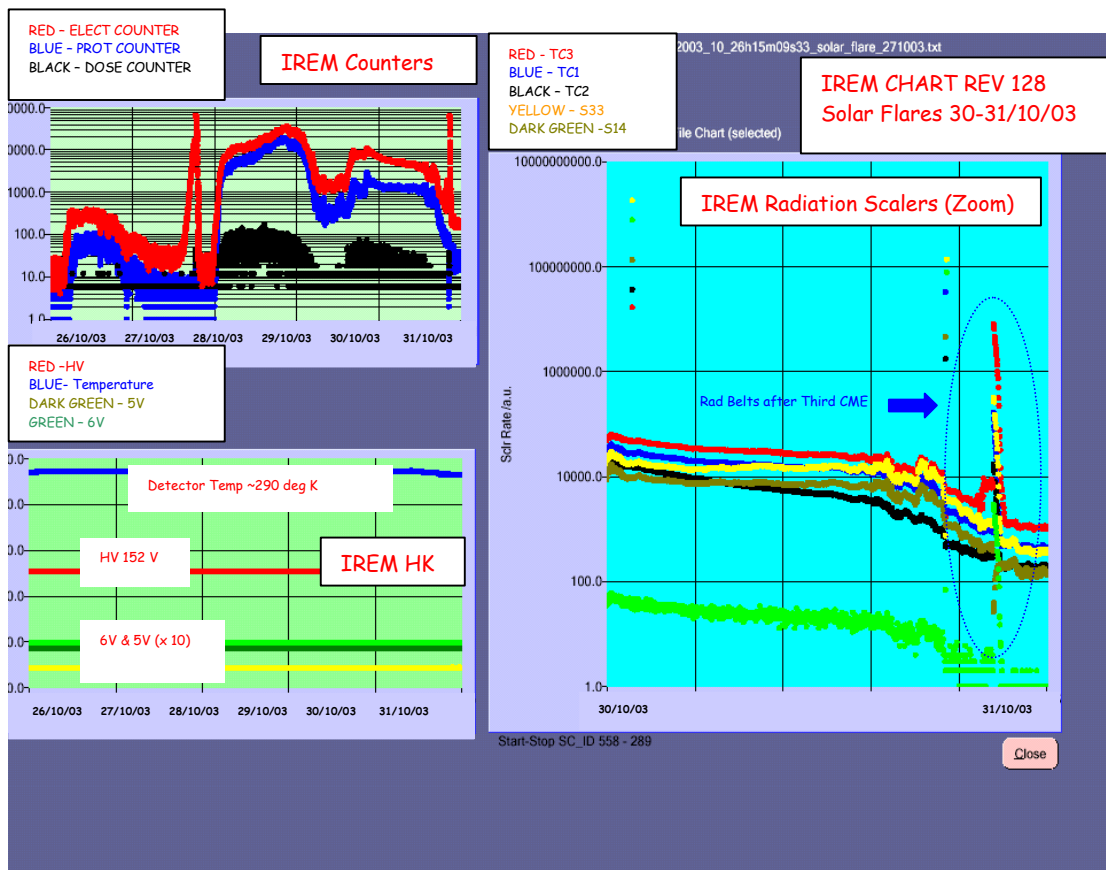
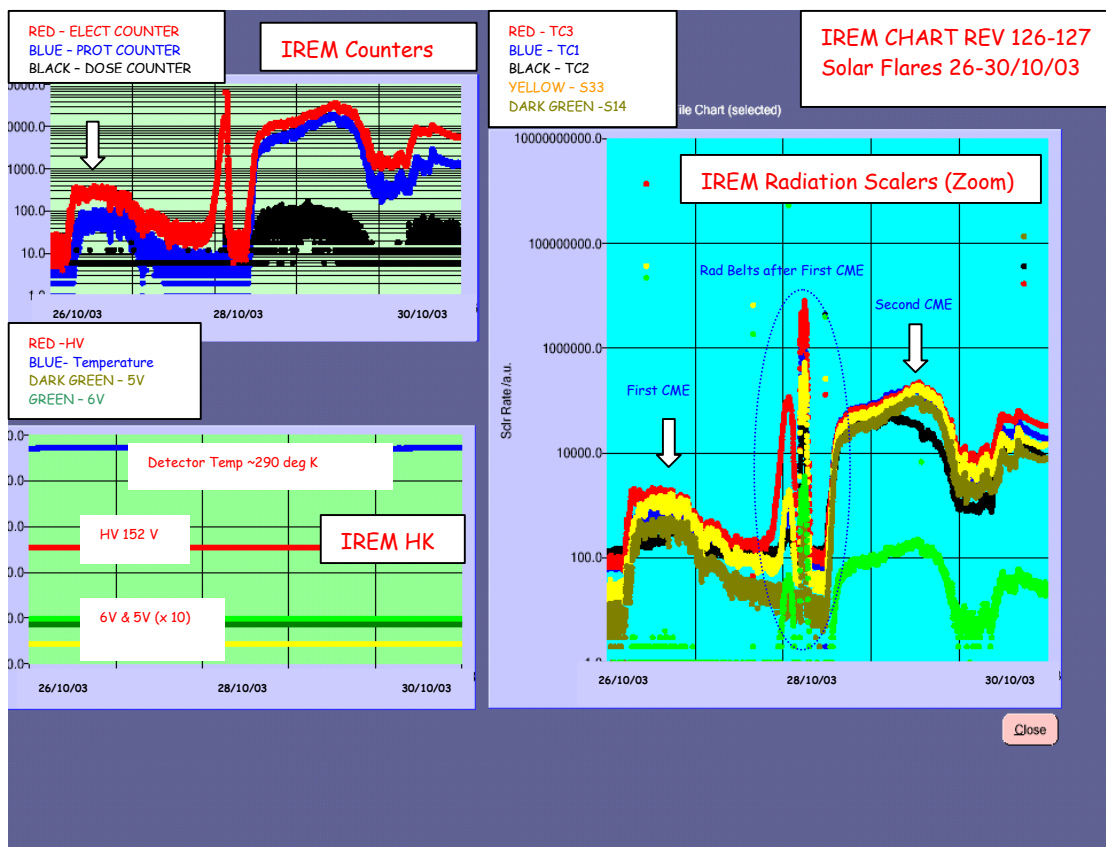
End Time: 2003 Oct 29 2101 UTC

X-ray Class: X10.0

Optical Class: 2b

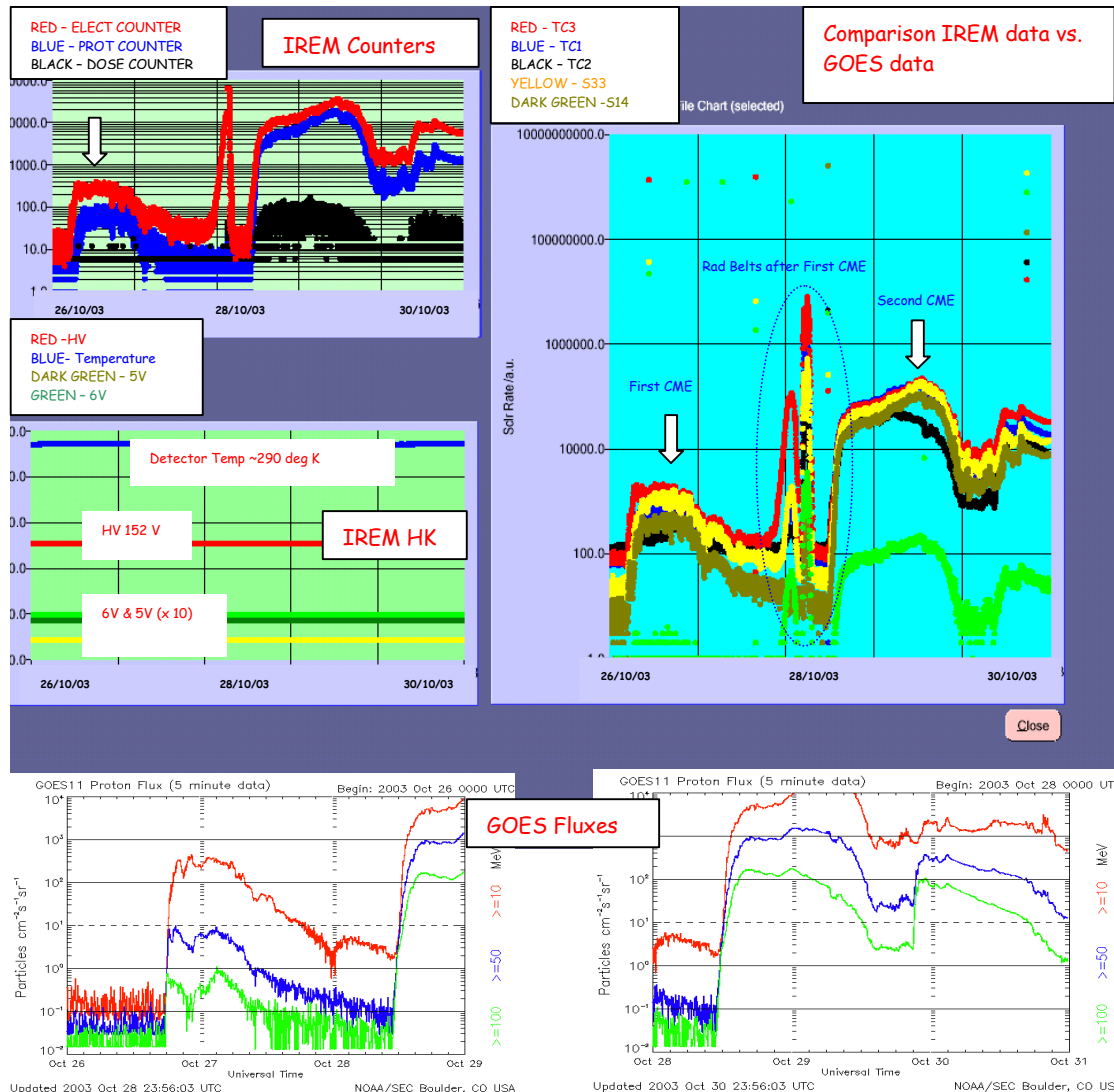
Location: S15W02

The evolution of the solar events (mainly the Coronal Mass Ejections) during the observation period as recorded by the IREM EGSE at ESOC for revolutions 126 and 127 are shown below.

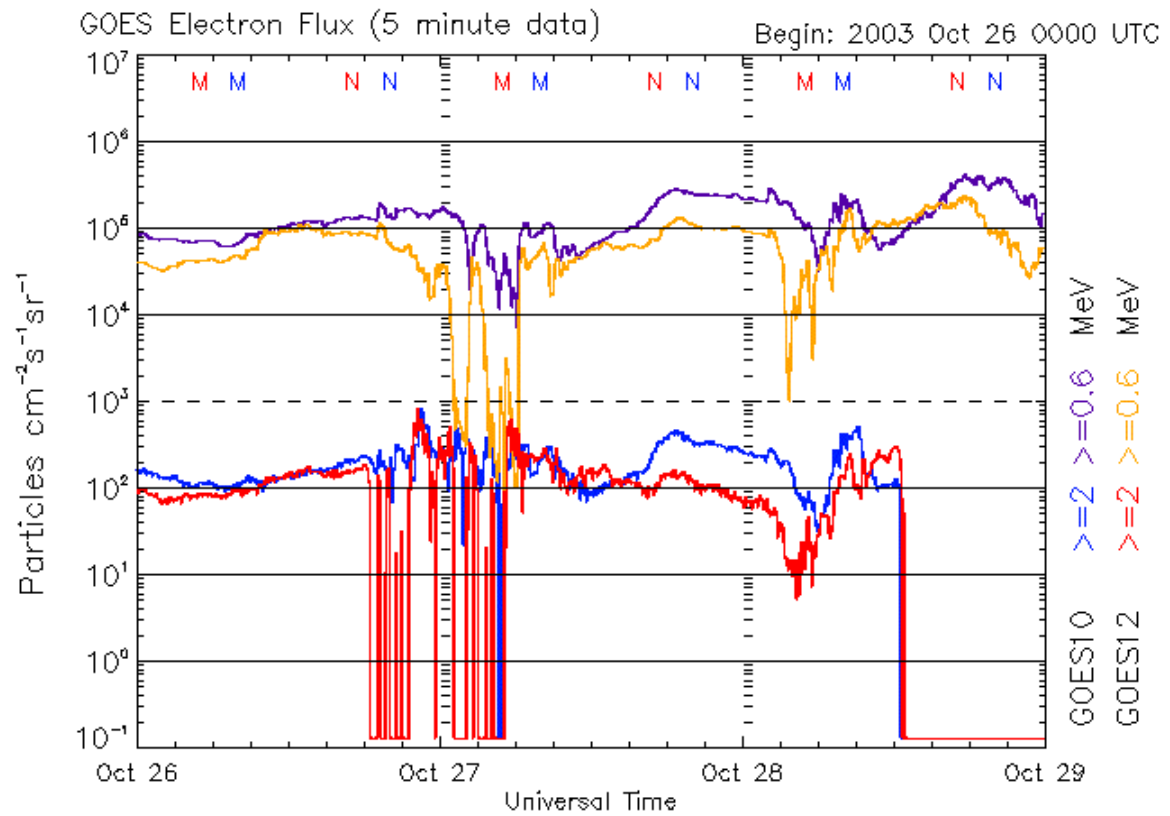


The excellent performance of the IREM unit is confirmed by the comparison with the GOES 10-11 data at Space Environment Centre-NOAA.

The proton counter (S14, from 20-27 MeV) and the "electron" counter (TC3, proton+electron from 0.5 MeV) shown a good agreement with the fluxes measured by the sensors on board the GOES S/C.

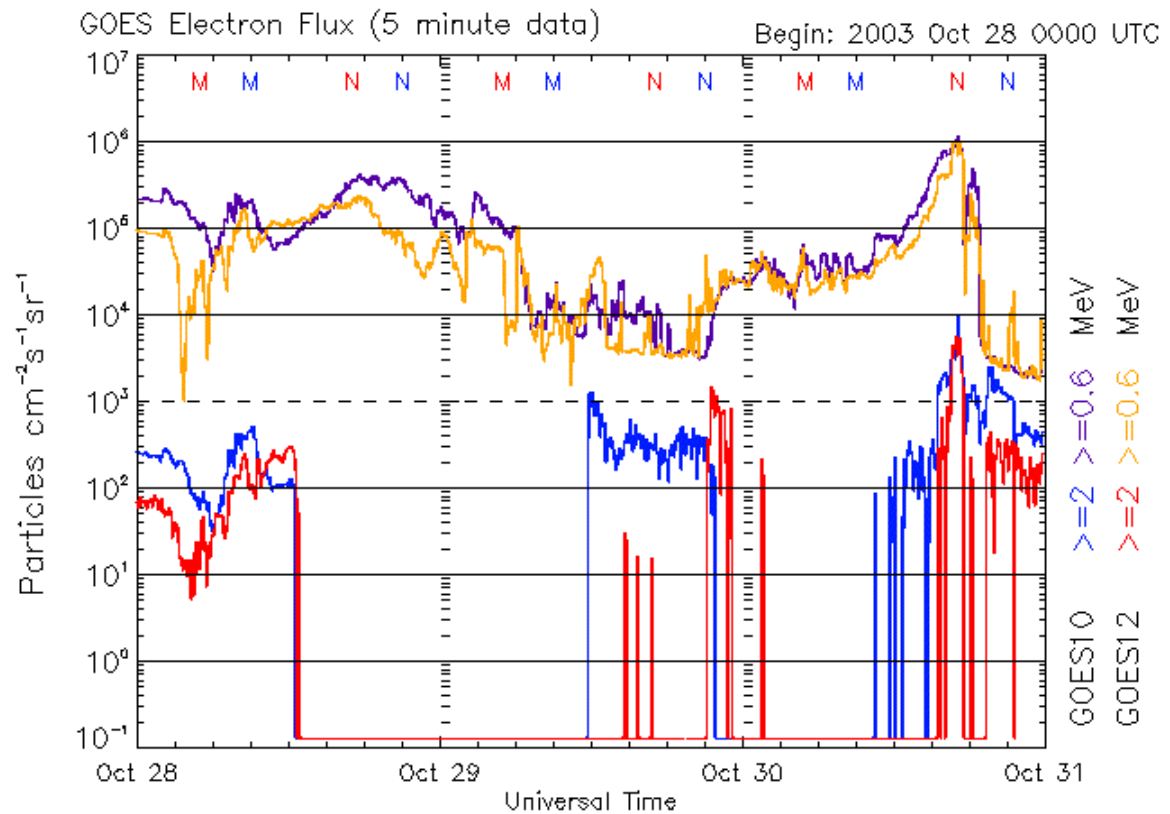


The evolutions of the three observed strong X-ray Flares and the Electron Flux as reported by SEC-NOAA are shown below:



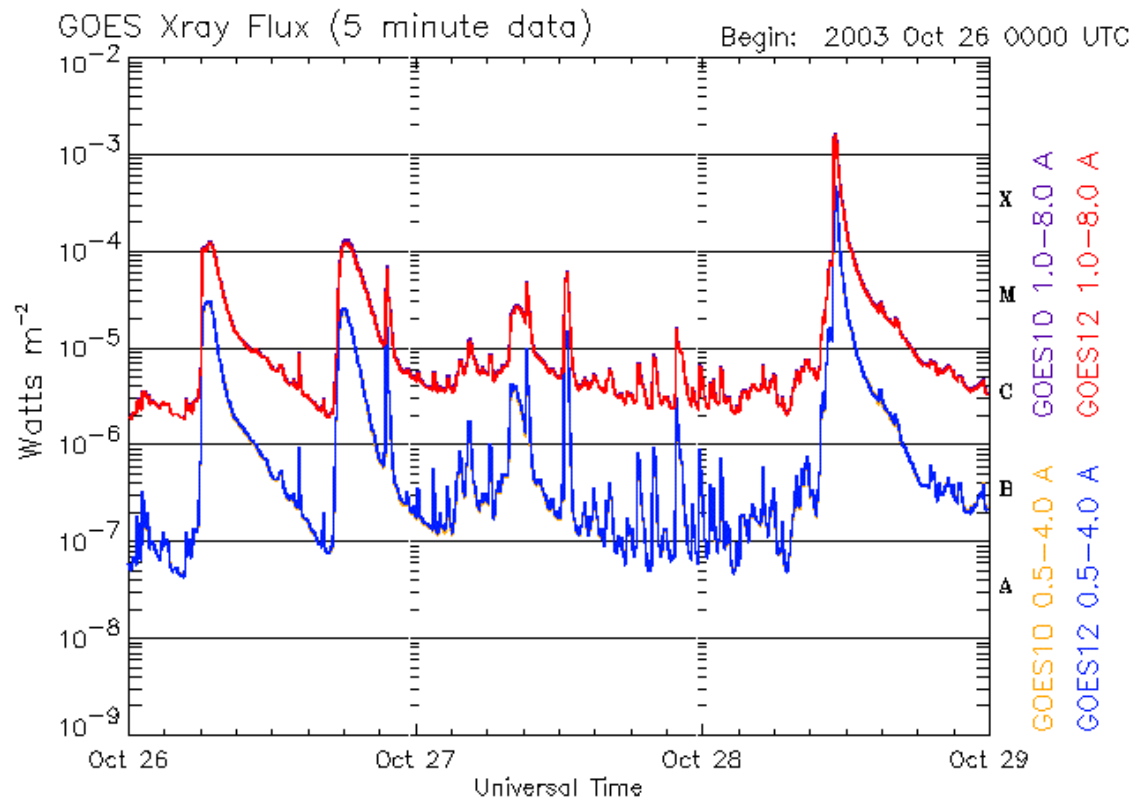
Updated 2003 Oct 28 23:56:04 UTC

NOAA/SEC Boulder, CO USA



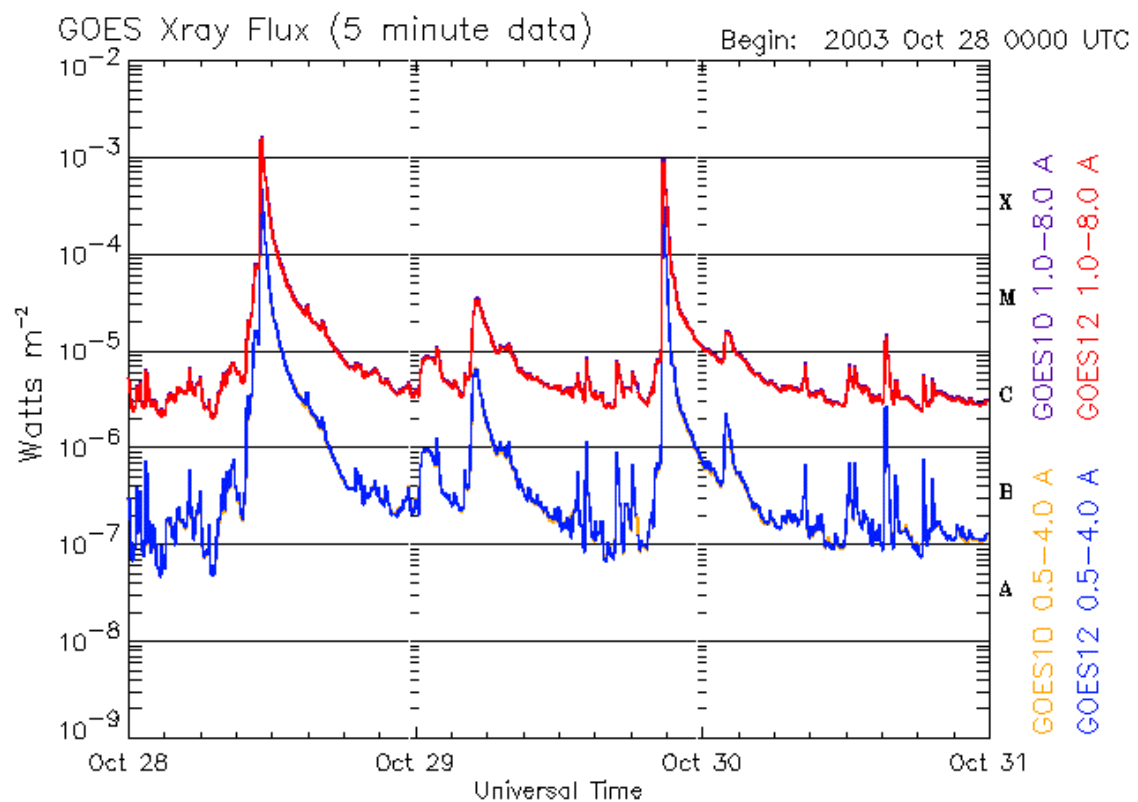
Updated 2003 Oct 30 23:56:04 UTC

NOAA/SEC Boulder, CO USA



Updated 2003 Oct 28 23:56:06 UTC

NOAA/SEC Boulder, CO USA



Updated 2003 Oct 30 23:56:05 UTC

NOAA/SEC Boulder, CO USA

The plots of the IREM count rates for the Belts passage in revs 125->126, 126->127 and 127-128 are reported in the plots above together with the part for the CMEs. At the moment there is no indication of the effect of the CMEs on the Radiation Belts. The only predictable effect could be a depletion of the outer Belts (mainly electrons) due to the "peeling" of the geomagnetic field by the Solar wind.