

INTEGRAL
Mission Report
INT-MOC-SYS-RP-1001-TOS-OF
No. 059
Week 45
10.11.03
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 01.11.03 until 07.11.03 (both dates inclusive) and covers the revolutions 129 & 130.

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 4U 0614+09 (RA 06:17:7.30; DEC +09:08:13.0) and the empty field (RA 22:15:13.10; DEC -02:03:59.4). The planned activities consisted of staring and raster dithering observations, as well as a JEM-X2 Diagnostic Data Dump. 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

The AOCS Timeline-driven operations, which were stopped on 28/10/2003 at 13:52 because of the very high radiation levels, were finally resumed on 01/11/2003 at 13:49, with the beginning of Exposure 01280007. From this time, all the AOCS operations were executed from the automatic Timeline.

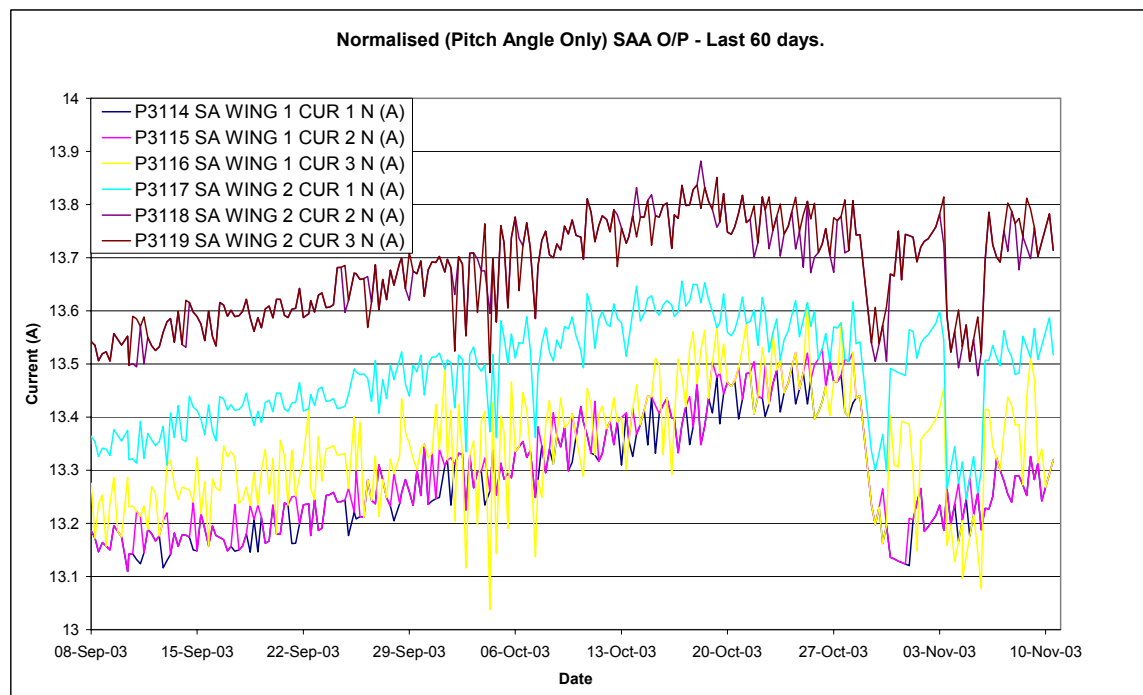
There were two cases of loss of Guide Star, caused by undetected False Events on the Star Tracker.

The fuel consumption over the period between 31/10/2003 and 07/11/2003 was 0.118Kg. The remaining propellant is in the order of 174.08 Kg on the 7th of November.

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 weeks due to the solar storms, which are currently on-going. A preliminary assessment of the solar arrays indicated a degradation of about 0.2 to 0.3A.



From the chart above the impact of the Solar storm starting on October 18th and the 2 heavy proton storms on 29th October and 3rd November can be seen.

Two rather peculiar features are that:

- The array sections (P3116, P3117, P3118, P3119) which were dumping current, (or were only partially connected to the Main Bus) appeared to be affected from the beginning of the storm on 18th October. The sections which were permanently connected, were much less affected until the heavy proton particle radiation on 29th October.
- Following the 2 periods of heavy proton particle radiation on 29th October and 3rd November the array sections (P3116, P3117, P3118, P3119) which were dumping current, (or were only partially connected to the Main Bus) appeared to recover. The other 2 sections output however remained depressed.

On DOY 307 at 07.29.55z the BCR2 status (P3005) in telemetry changed from ON to OFF, simultaneously the battery 2 (trickle) charge current fell to 0.0A.

The BCR was successfully switched back on at 07.52z, after switch on the correct Trickle charge current value was verified.

The Spacecraft was experiencing high Proton radiation at the time, due to a Solar flare and ascending passage through the radiation belts.

Anomaly Report INT_SC_68 applies

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 left in safe configuration for a few hours at the beginning of rev.129 (Monday 3rd Nov), after which the instrument could be fully operated in nominal configuration for the rest of the week.

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

The 3rd Ge detectors annealing cycle is planned to start on 11th November at 23:27 and end on 27th 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 the persistence of an exceptional solar activity, X-ray flares exceeding class X10 and associated to exceptional HALO Coronal Mass Ejection (see IREM report). For large part of the observation period the unit was set in Safe Mode. The first attempt to re-activate the unit was on 1-2/11/03 but due to re-starting solar activity the re-activation was only performed partially, giving only a preliminary assessment on the instrument functionality. The second attempt was on day 5-6/11/03 and an assessment of the instrument functionality and scientific performances was performed together with IBIS team at ESOC.

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 spent the majority of this week in Safe mode. Specifically, the unit was not in its planned observation mode during the following time periods:

- Start of reporting period to 2003-11-02T00:02Z
- 2003-11-02T17:18Z to 2003-11-07T16:46Z

The autonomous transition back to Safe mode on 2003-11-02 was triggered by the unit's software ratemeter.

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 50 images were captured during this period, but most of the week was spent in SAFE mode due to the high radiation being experienced.

The OMC On-Board S/W was updated this week from version 2.8 to version 2.9.

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 the persistence of an exceptional solar activity with major solar flares and associated Coronal Mass Ejections (CME):

- 1) flare class > X8 on 02/11/03;
- 2) flare class > X3 on 03/11/03;
- 3) flare class X17 on 04/11/03.

During all the observation period the performance of the unit was excellent.

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

4 Ground Facilities

There were only a few problems this week with the consolidator due to an incorrect back-up procedure, and none with the link to the ISDC, other events are listed below under anomalies.

4.1 Mission Operations Centre

The performance of the MOC was good in the reporting period. The final MOC configuration (H/W and S/W) that is needed to avoid the consolidator errors is currently been validated and will be implemented in the operational environment at the end of the month.

4.2 Ground Stations & Network

The performance of the operational network was in general OK in the reporting period. There were a couple of Reed Solomon errors related to Redu. These errors are currently under investigation to find out whether they are caused by seasonal effects or are caused by the station equipment. In addition there were a couple of Radio Interference (RFI) problems during Goldstone passes.

4.3 Science Ground Segment

4.3.1 ISOC

This report covers to end of week 45.

1. Planning.

Short term PSF: Updated PSF's received up to rev. 134

Long term PSF: up to rev. 148 (no change)

POS and POD generated: up to rev 133

TSF: Up to rev 131.

Due to the high solar activities it was decided to postpone the SPI annealing. It is now scheduled to start in rev 131 and last up to rev 134. In rev 134 there will also be an OMC flat field calibration. This week has therefore seen lots of replanning activities also including modifying observations in agreement with the PI's to be able to run observations in parallel to the SPI annealing. Rev's 131 to 133 were replanned several times.

2. Observation status

Missing ECS for rev 112 received from ISDC. The ECS's for rev's 81, 84 are still outstanding. OCS's sent to ISDC including processing up to rev 118 (except for missing rev's 81 and 84).

3. ISOC science archive

No archive data received from ISDC. Final iteration for first delivery of Web browser developed by Archive group in VILSPA has taken place this week.

4. System

The ISOC operational system continues to be very stable. Final acceptance testing of ISOC system version 10 started. In parallel also generation of some existing revolution schedules have been performed with the version 10 for test purposes

5. Problems

none

4.3.2 ISDC

On 11/11/2003, 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 01201140002 (IC 4329A, Revolution 104) 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 solar flares ceased during the reporting period and the radiation dropped below the critical threshold so that the instruments could be reactivated. Support was provided by the IBIS team to assess the performance of IBIS after the solar flares.

6 Anomalies

The problems relevant to the operations concerned mainly the support from the stations:

- On DoY 306, at 06:09, Network reported problems with ranging from Redu.
- Later, at 19:51, problems with the NCTRS-A meant that it could not 'bind', a swap was performed to NCTRS-B, the impact was Slew 01280076 was lost, with 01280077 manually recovered.
- On DoY 308, at 05:27, after a stop & start of the TMPs at Redu, the link test failed, Network reset the TM link, and at 05:29, the link test worked, there was no impact.
- Later, at 12:16, there were TM drops, due to the on-going playback, there was no impact.
- Still on DoY 308, at 21:20, there were TM drops due to Reed Solomon alarms at Redu, again, no impact.
- On DoY 309 at 02:48, there were Reed Solomon alarms from DSS-16. AOS Redu was brought forward to compensate, no impact.
- Later, at 05:31 and at 07:28, there were more Reed Solomon alarms, from Redu, no impact.
- On DoY 311, at 19:20, 19:26, 19:28, 19:30, 19:32, 19:33, and 19:38 there were more Reed Solomon alarms at Redu, after 19:40, the alarms were almost continuous until LOS at 21:30, no impact.
- At 21:51 there were packets lost from DSS-16, and at 22:01 and 22:05, the TM dropped, all events probably due to Radio Frequency Interference.
- At 22:23, an AOCS command failed, and from then until 23:45 when the Timeline was stopped, there were many TM drops due to the RFI. The impact was pointings 01300042 & 01300043 were missed, but these fall under the next week's report.

New anomalies raised during the past week are listed below:

Arid	Date Occurrence	Subject	Segment	Status
INT - 002505	05/11/2003	Telemetry loss from DSS-16 due to RFI	Ground	NASA Sta.
INT - 002506	11/11/2003	Telemetry loss from DSS-16 due to RFI DR: G103635	Ground	NASA Sta.
INT_SC - 68	03/11/2003	BCR2 Spurious Switch-off	Space	EPS

7 Future Milestones

The 3rd SPI annealing will start on 11th November at 23:27 and will last until 27th November (revs 132 and 136). The annealing 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 PS has confirmed the switch on temperature at 117K of the SPI camera.

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						
					Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su
2	Start SPI Annealing	2.9 hrs	11 Nov 23:27	PST[5 pkts]	v 23:27																				
12	Warm up to Annealing Temperature	37.1 hrs	12 Nov 01:27	PST[5 pkts]	v 01:27																				
21	Annealing at 104degC	126 hrs	13 Nov 14:33	PST[5 pkts]	13 Nov 14:33																				
30	Stop SPI Annealing - Passive Cooling	68.52 hrs	18 Nov 20:33	PST[5 pkts]								18 Nov 20:33													
34	Uplink IASW 4.3.0	4.01 hrs	20 Nov 09:04	PST[98 pkts]								20 Nov 09:04													
56	Start Active Cooling	118.12 hrs	21 Nov 17:04	PST[5 pkts]									21 Nov 17:04												
65	Active Cooling Fine Tuning	72.3 hrs	26 Nov 15:11	PST[5 pkts]															26 Nov 15:11						
76	ACS and Camera Switch on & Performance Tests	4 hrs	25 Nov 06:40	PST[98 pkts]															25 Nov 06:40						
85	IASW 4.3.0 In-flight Validation	7.57 hrs	25 Nov 10:40	PST[98 pkts]															25 Nov 10:40						
111	ACS FEE57 Fault Identification Tests	3.91 hrs	26 Nov 08:14	PST[98 pkts]															26 Nov 08:14						
128	SPI POS Observations	62.8 hrs	27 Nov 07:39	PST[98 pkts]																27 Nov 07:39					

The next Moon Eclipse will occur in the night to 24 November. The operations will be difficult because the Moon Eclipse will only cause a penumbra of about 50 % and it seems that the Instrument Application S/W of SPI and IBIS is not appropriate to handle a penumbra. The problem is that the Broadcast Packet will notify the occurrence of an Eclipse. However, the PDU sequence might not be triggered because the supplied power is above the critical threshold of about 50 % (6.7 A). The supplied power could be reduced by implementing a slew to a 30 degree Pitch angle, which should reduce the supplied power to about 6.15 A. However, since the operations are to be performed outside ground coverage and since the difference is marginal we decided to apply a different procedure. We will load commands in the on-board time tag queue that will switch off the SPI and IBIS units independently from the PDU sequence. This will ensure that IBIS and SPI will be in the relevant state during the Eclipse. We do not load these sequences for JEM-X and OMC because these instruments should be able to handle the situation. The problem is more difficult due to the fact that SPI will be in a special configuration due to the annealing process.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 129

The planned observation in revolution 129 was a staring observation of 4U 0614+09 (RA 06:17:7.30; DEC +09:08:13.0) 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 solar flares, all instruments except SPI were in their safe modes for most of this revolution.

Revolution 130

The first observation in revolution 130 was a 12 hour staring observation of an empty field (RA 22:15:13.10; DEC -02:03:59.4), during which a JEM-X2 Diagnostic Data Dump was planned. This was followed by a raster dithering observation centred on the same target and lasting 36 hours. Finally another staring observation, with a JEM-X2 Diagnostic, was performed at the above attitude for the remaining 14 hours of observation time.

The TM allocation throughout these observations was 134 IBIS, 98 SPI, 1 JEM-X1, 8 JEM-X2, 5 OMC. During the staring observations, JEM-X2 was planned to be in Diagnostic mode and otherwise all instruments were planned to be in their nominal science modes (except for JEM-X1 which was to remain in Safe mode). However, due to high radiation as a result of solar flares, all instruments except SPI were in their safe modes for part of this revolution.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

The latest entries in the history file for INTEGRAL

2003-10-17T18:23:11.000Z	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.
2003-11-01T09:50:52.000Z	174.1850	F	Automatic TM processing.
2003-11-01T12:04:12.000Z	174.1420	F	Automatic TM processing.
2003-11-03T06:55:38.000Z	174.1230	F	Automatic TM processing.
2003-11-05T22:11:12.000Z	174.1048	F	Automatic TM processing.
2003-11-06T06:48:01.000Z	174.0819	F	Automatic TM processing.

This report was generated Fri Nov 7 08:00:09 GMT 2003

8.3 Detailed Satellite Information

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

8.3.1 AOCs Operations

During this period and after resuming the Timeline from the start of Exposure 01280007, 14 Open Loop Slews, 75 Close Loop Slews and 4 RWB were performed from the automatic Timeline. 1 slew was missed. This is equivalent to 1.1%.

01/11/03 (Day of Year 305, Revolution 128)

Resumption of Timeline-driven operations: Timeline-driven AOCS operations, which were stopped since 28/10/2003 at 13:52 because of the high radiation levels, were finally resumed at 13:49. Starting at 09:21, all the necessary manual operations were performed to slew from the actual dwelling attitude to the attitude of pointing 01280045, the first pointing of Exposure 01280007. These manual activities were:

Reaction Wheel Bias

Open-Loop Slew to the attitude of pointing 01280045

Change of Guide Star

Another Reaction Wheel Bias to re-join the wheel speeds with the Timeline RW profile

Corrective Close-Loop Slew to the attitude of pointing 01280045

Update of parameters of slew 01280045 in the Timeline, which would basically be a Close-Loop Slew to the same attitude

The Automatic Timeline was restarted at 13:45 and slew 01280045 was executed from the Timeline.

02/11/03 (Day of Year 306, Revolution 128)

Loss of Guide-Star due to an undetected False Event: At 18:58:11 the ACC STR SEU Filter released the Guide Star, which was picked for the previous Close-Loop Slew:

18:58:06.727, Guide Star is located at (-8689, -17362) with magnitude 6.45.

18:58:07.227, an undetected False Event with a signal level to pass the Tracking Cycle Clustering/Thresholding analysis is taken as the Guide Star: (-8730, -17489) 6.35 Mi.

18:58:07.727, after the False Event disappears, the actual Guide Star is detected as False Event. The status of the star is latched to FALSE EVENT until the number of False Events exceeds the ACC STR SEU Filter Threshold.

18:58:11.727, the star is released and the automatic mapping picks a new guide: (15499, -14188) 7.15 Mi.

The effect was that the OTF remained low for the rest of pointing 01280075.

Slew missed due to a problem with establishing the link after station handover:

After station handover from Redu to Goldstone DSS-16 at 19:43, the TM link could not be established through NCTRS-A (NCTRS-A could not bind). Therefore, the Timeline was stopped and slew 01280076 was missed. After troubleshooting NCTRS-A and re-establishment of the links, an Open-Loop Slew was done manually to the attitude of pointing 01280077. This attitude was reached at 20:51:57, before the planned time in the Timeline. Pointing 77 was therefore not affected.

Loss of Guide Star due to an undetected False Event: At 22:40:42 the ACC STR SEU Filter released the Guide Star, which was picked for the upcoming Close-Loop Slew:

22:40:37.605, in the first cycle after Change-of-Guide-Star, performed as part of the Close-Loop slew sequence, Guide Star has coordinates (3864, 2838) and magnitude 6.65.

22:40:38.105, an undetected False Event is taken as G/S: (4205, 2933) 6.15 Mi. This also caused a Pitch Error OOL OEM because the jump in the star Y coordinate was more than the OTF threshold for pitch (36 seconds of arc).

22:40:38.606, after the False Event disappears, the actual Guide Star is detected as False Event. The status of the star is latched to FALSE EVENT until the number of False Events exceeds the ACC STR SEU Filter Threshold.

22:40:42.605, the star is released and a new mapping is commanded by the ACC. The same Guide Star was picked during this mapping and therefore the event did not affect the Close Loop Slew.

03/11/03 (Day of Year 307, Revolution 128-129)

Nothing to report.

04/11/03 (Day of Year 308, Revolution 129)

Nothing to report.

05/11/03 (Day of Year 309, Revolution 129)

Nothing to report.

06/11/03 (Day of Year 310, Revolution 129-130)

Nothing to report.

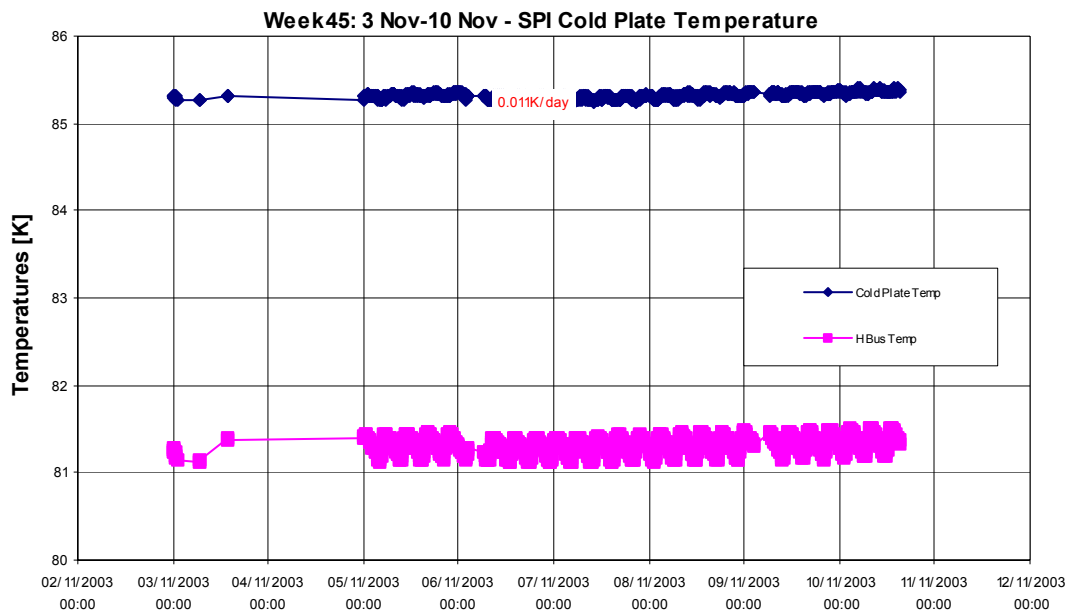
07/11/03 (Day of Year 311, Revolution 130)

Nothing to report.

8.3.2 SPI Operations

Cryo-cooler:

The temperature is leveled at around 85.3K with a small positive drift of 0.011K/day, well within the expected range.

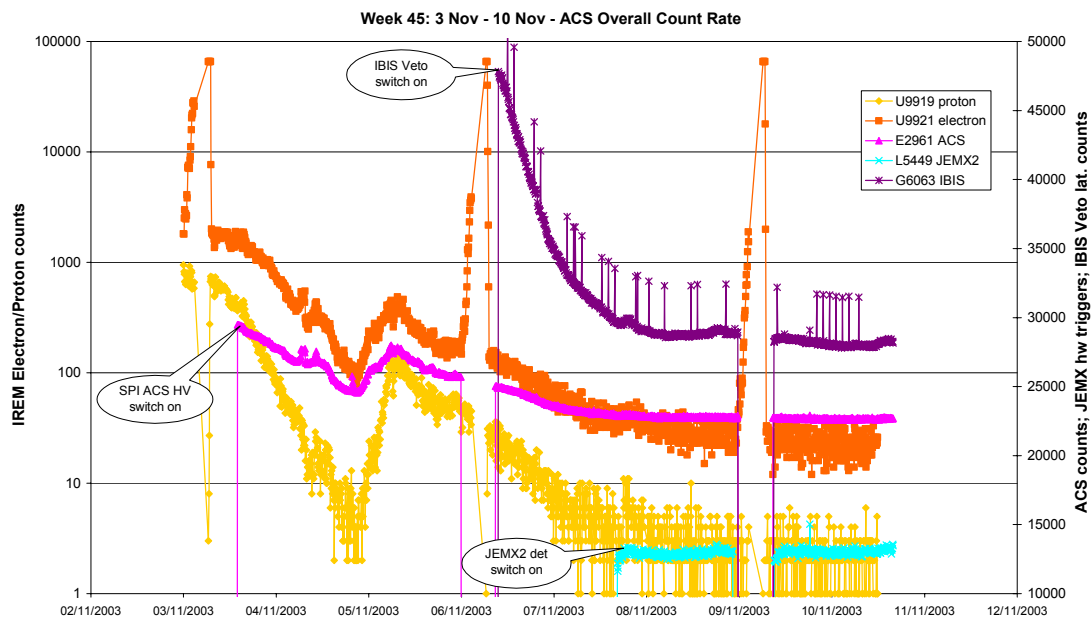


IASW/DPE:

Nothing to report

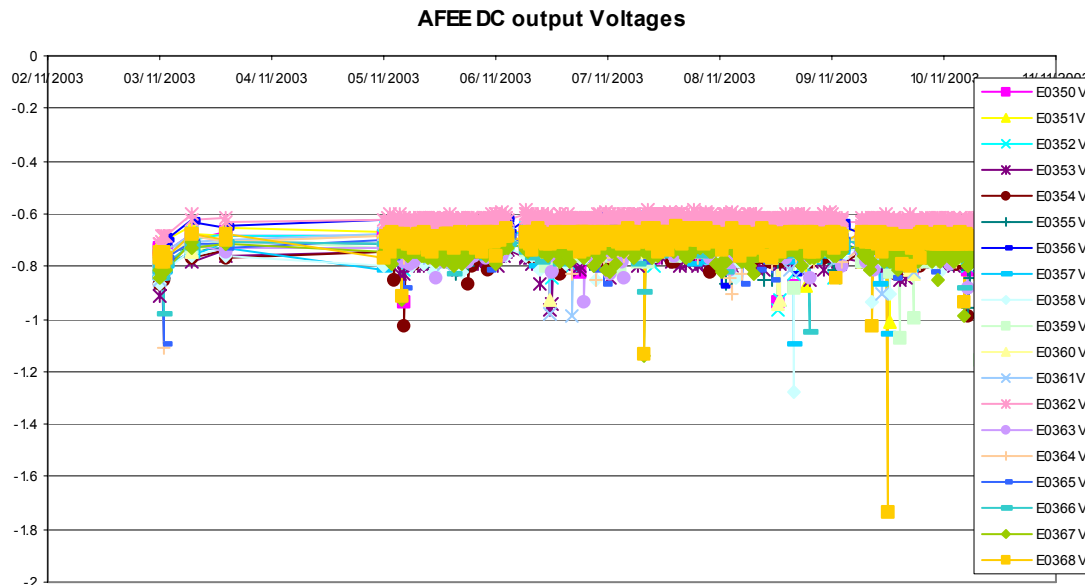
ACS:

The following figure is the plot of the ACS, IREM, JEMX2, IBIS Veto count rates during the reporting period. The ACS was turned on after a request from the SPI PI, when the high energy particle radiation level originating from the sun was observed to be decreasing.



AFEE :

The following plot shows the DC output voltages, measuring the control error of the GeD high voltage power supply. It shows that during the reporting period the radiation background of heavy ions has been below the threshold for which the voltage could be controlled at the desired value (4kV) at almost constant error.



DFEE:

Nothing to report.

PSD:

Nothing to report.

8.3.3 IBIS Operations

On DOY 305 (01/11/03), at 13:50Z the recovery of the unit after the solar event on 28/10/03 was started. The first s/s to be reconfigured was ISGRI. In agreement with IBIS team, a preliminary check on the ISGRI MCEs with biases set to 0 V was performed: the purpose of this check for evidence of any problem in the detector electronics before applying the nominal biases. The observed count rates were ~10/sec and the status of the MDUs nominal.

To configure the detector the CTX tables coming from rev 125, referring to a condition pre-solar activity were used.

At 14:40, a complete ISGRI calibration setting the final biases to -120 V was executed; during the entire solar activity, the ISGRI MDU temperatures were monitored and remained always around 0 deg C. The count-rates read in the HK1(triggers=raw) were in average about 900 cts/sec for each ISGRI module.

VETO was set in Nominal at the end of the ISGRI calibration and the VETO currents (VDM/CDM and tot) and high voltages were nominal.

The VETO count-rates observed after the transition to Nominal were $\sim 37000/\text{sec}$ (warning condition = $35000/\text{sec}$) against an averaged count of 24000 cts/sec in nominal condition. This was consistent with the observed IREM counters indicating a high background, which had not yet stabilised (the JEM-X threshold was still exceeded).

As requested by IBIS Team, an acquisition of ~ 1 hour in PPM to acquire more information on the PICsIT detector was performed: during the acquisition the ISGRI rise time was changed from 90 raw (5625 us) to 40 raw (2500 us) to cope with the high count rates.

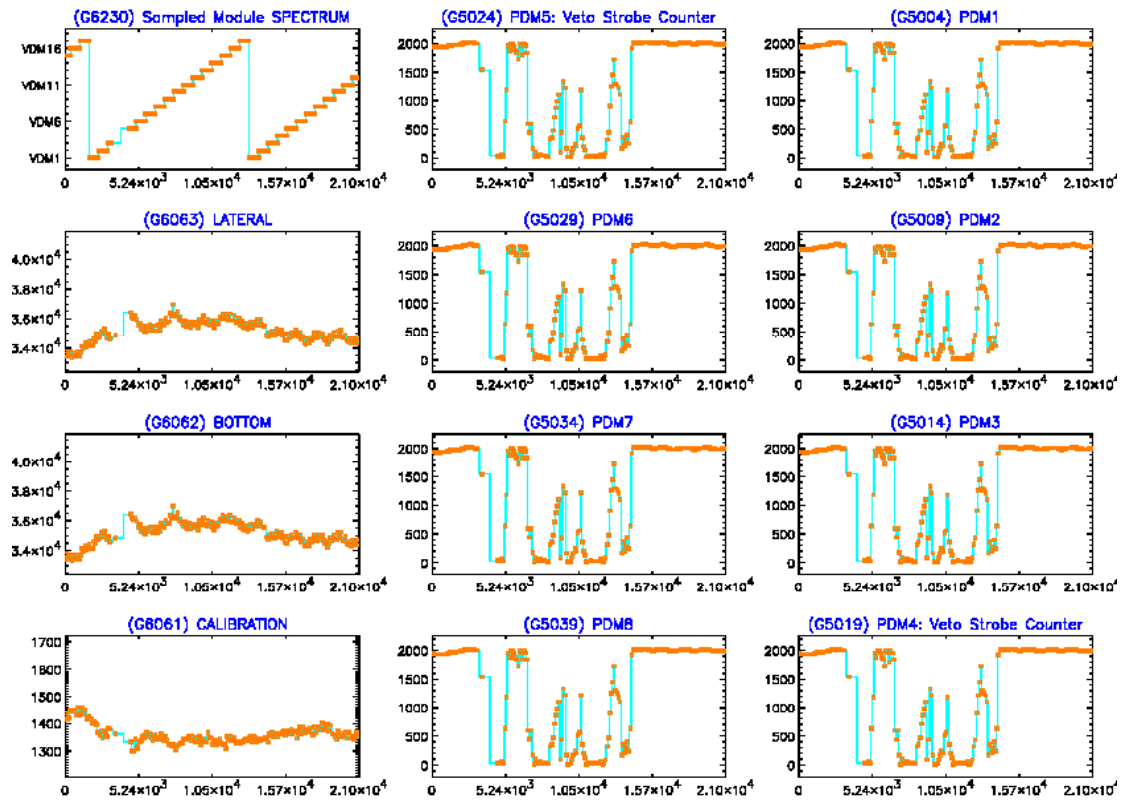
At 19.35 IBIS was set in Standard Mode using the settings from the automatic timeline. In SCI MODE some OOL in the VETO strobes distributed to PICsIT were observed.

To clarify these unexpected count-rates of the VETO strobes, IBIS was returned to safe Mode and after consultation with IBIS team was decided to resume the operations the following day.

On DOY 306 (02/11/03), at 09.44 the activity was resumed and VETO was put back in Nominal Mode. As suspected by G. La Rosa, the problem on the VETO strobes count-rates was due to a wrap-around of the counters inside the PICsIT modules: therefore whatever the division factor applied (currently set to 16), these parameters showed this unexpected behaviour, when the count-rates from VETO were greater than 32767. This theory was verified during the day when the VETO count-rates were over the critical value.

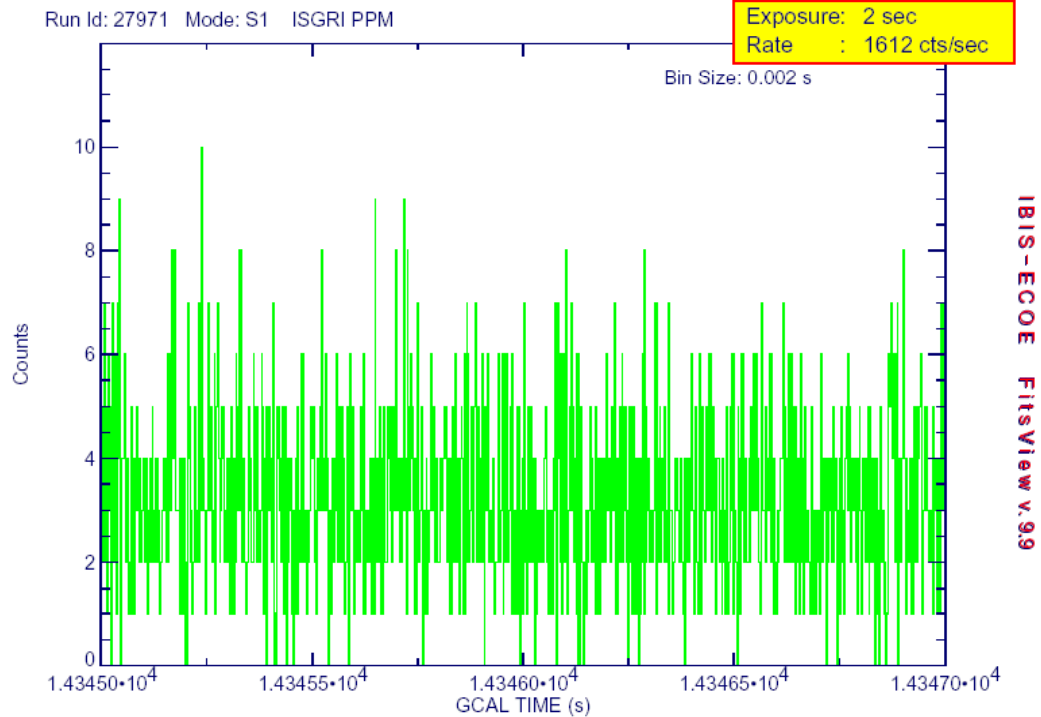
A plot of the observed strobes recycling and the ISGRI total count-rate ($\sim 1600 \text{ cts/sec}$) as derived from S1 packet is shown below.

Veto & Cal strobes



RUN ID: 27971; 27971;
 Start Time (OBT): 50574 s
 Time Unit = sec

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



At 10.15Z the recovery of the unit was completed and the s/s re-enabled in the timeline.

At 17:16, high radiation count-rates in the VETO Lateral and Bottom counters were reported. The event was observed by IREM and coincided with a solar X-flare exceeding class X>8 (see IREM report). The s/s SOE decided the instrument should be deactivated at 17:50 due to the on-going high solar activity.

At 18:06 the IBIS s/s was disabled in the automatic timeline.

On DOY 308 (04/11/03) at 04:00, repeated OEMs class 0 ID 128 << IBIS IASW VETO SWITCH OFF>> were reported. This was caused by the oscillation of the IREM counters above/below the thresholds set for IBIS. After consultation with the s/s SOE the problem was clarified as IASW feature. No further action was taken.

On DOY 310 (06/11/03), after the perigee passage for revolution 130 the level of the electron and proton counters (as read by IREM) went well below the thresholds set for IBIS, showing only small fluctuations. At that point the s/s SOE, in agreement with IBIS Team, decided to re-activate the IBIS unit.

At 09:55 to configure the detector the CTX tables from rev 125 were used, referring to a pre-solar activity condition. In agreement with the IBIS team, a preliminary check was performed on the ISGRI MCEs with biases set to 0 V: the purpose of this was to look for any evidence of a problem in the detector electronics before applying the nominal biases. The observed count rates were ~25/sec (explained by the high background) and the status of the MDUs nominal.

At 10:24 a complete ISGRI calibration setting the final biases to -120 V was executed.

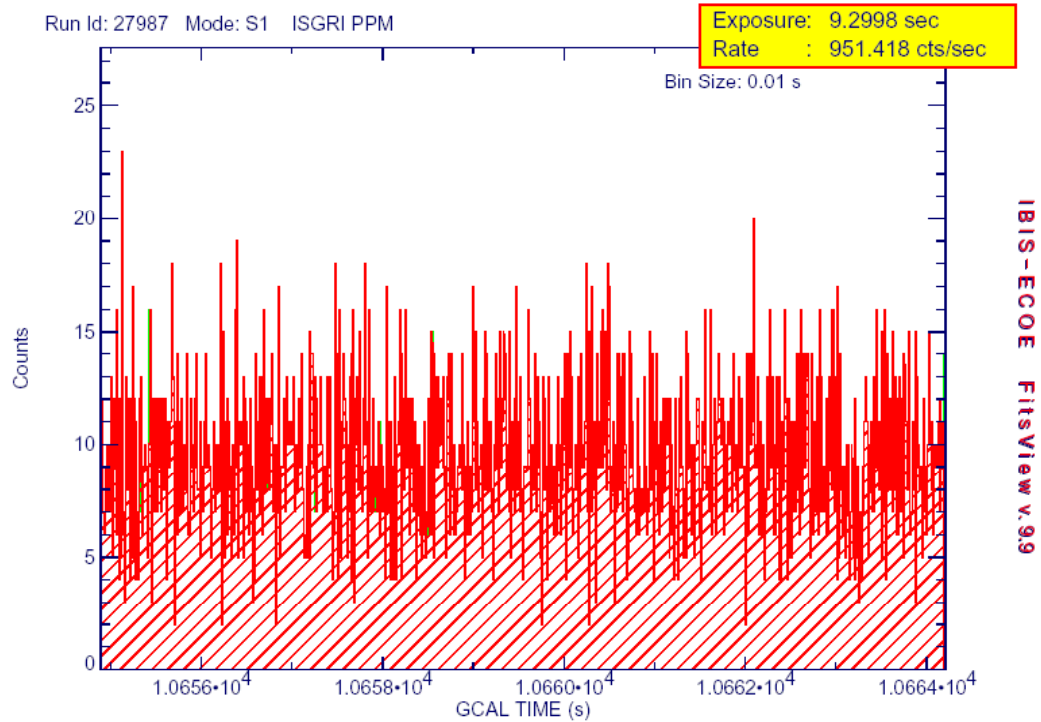
The VETO count-rates observed after the transition to Nominal were ~42000/sec (warning condition = 35000/sec) against an averaged count of 24000 cts/sec in the nominal condition.

This was consistent with the observed IREM counters indicating a high background, which had not yet stabilised.

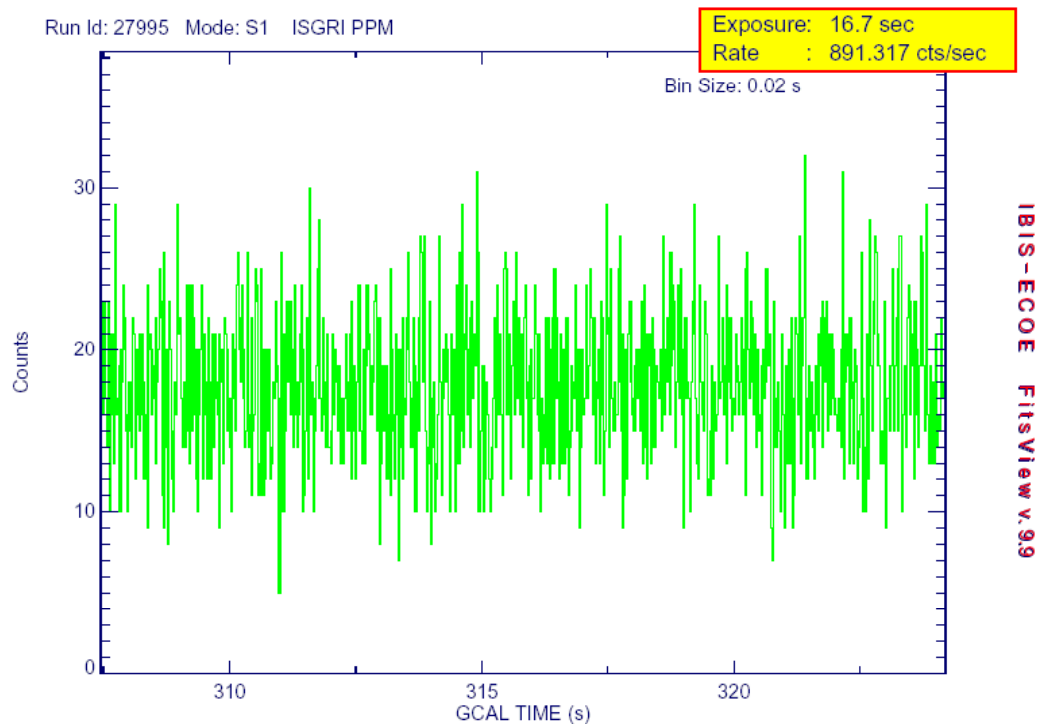
At 10:57 IBIS was set in Standard Mode using the settings from the automatic timeline, with the s/s in the automatic timeline left disabled. In collaboration with the IBIS team (G. La Rosa & A. Bazzano) the analysis of the detector spectra and count-rates giving a preliminary assessment of the detectors scientific performance was started.

The evolution of the ISGRI count-rates (S1), as recorded by the IBIS ECOE at ESOC, during the solar activity is shown below.

/data/archive/erdf/science/2798/moc27987_031110_101406_S1_.fits



/data/archive/erdf/science/2799/moc27995_031111_091109_S1_.fits



8.3.4 JEM-X Operations

2003-11-01, DOY 305, Rev 128

JEM-X2 began the reporting period in Safe mode due to high radiation.

At 20:32Z JEM-X2 performed an autonomous recovery to Setup mode (issuing OEM 233 JEM-X2 AUTO EVENT 3), as the IREM radiation monitor count rates had remained below the JEM-X2 thresholds for exiting from Safe mode for 10 minutes.

After JEM-X2 had remained in Setup mode (RMCR values had remained below the JEM-X2 thresholds) for over 2hours, the sequence LEACAL01 was uplinked at 23:08Z to perform the JEM-X2 Anode Electronic Calibration.

At 23:33Z the procedure FCP_JEM2_1010 JEM-X2 Configuration Setting for Science Ops was started.

2003-11-02, DOY 306, Rev 128

At 00:02Z JEM-X2 was put back into Data Taking mode by the procedure FCP_JEM2_0044 and at 00:09Z JEM-X2 commanding from the Autostack was re-enabled and JEM-X2 operations continued nominally.

At 17:13Z the parameter L5119 SOFTWARE TRIGGER went soft out of limits (value = 15300) and then at 17:16Z it went hard out of limits (value = 19047). This caused JEM-X2 to transition to Safe mode autonomously at 17:18Z.

The parameter L5462 DFEE STATE IASW reported state Safe (value = 1) on one occurrence but then reverted back to reporting state Setup (value = 5), and there were two occurrences of the OEM189 JEM-X2 PROB DFEE 9 at 17:18Z.

The status remained as such until 17:39Z, 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 18:06Z Timeline commanding to JEM-X2 was disabled.

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

2003-11-03, DOY 307, Rev 128-129

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

2003-11-04, DOY 308, Rev 129

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

2003-11-05, DOY 309, Rev 129

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

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2003-11-06, DOY 310, Rev 129-130

JEM-X2 remained in Safe mode due to high radiation. (Note that the Diagnostic Data Dump planned for this day could therefore not be performed.)

2003-11-07, DOY 311, Rev 130

At 15:03Z JEM-X2 performed an autonomous recovery to Setup mode (issuing OEM 233 JEM-X2 AUTO EVENT 3) after the IREM RMCR values had remained below the JEM-X2 thresholds for exiting from Safe mode for more than 10 minutes.

Once JEM-X2 had remained in Setup mode for an hour, an Anode Electronic Calibration was performed (ED LEACAL01 uplinked at 16:04Z).

At 16:16Z the procedure FCP_JEM2_1010 JEM-X2 Configuration Setting for Science Ops was started.

At 16:46Z JEM-X2 was put back into Data Taking mode by the procedure FCP_JEM2_0044 and JEM-X2 commanding from the Autostack was then re-enabled.

JEM-X2 operations continued nominally.

8.3.5 OMC Operations

After the high levels of radiation during the last week, the instrument was returned to SCIENCE mode on DoY 305 at 13:55, however, only 29 images could be acquired, before radiation forced the instrument back into SAFE mode on DoY 306 at 17:46

On DoY 309, with radiation levels still too high for science operations, it was decided to install the OMCAS version 2.9. The operation commenced at 08:49, with the suspension of the broadcast packet to OMC, and terminated at 11:15:37, when the restarted S/W was returned to the SAFE mode.

On DoY 311 at 08:02:17, the unit was returned to SCIENCE mode, and 21 further images were acquired, before the end of the reporting period.

Also, on DoY 311, a successful test of the modified S/W was performed at 14:01:53, when the OMC was switched using a remote command from IBAS to TRIGGER mode.

8.3.6 IREM Operations

On DOY 306 (02/11) at 17:18, JEM-X2 automatic transition to SAFE Mode due to high radiation count was reported. The event was observed by IREM, IBIS VETO Lateral and Bottom counters and probably coincided with a solar flare X-ray class >8 with associated CME , as reported by NOAA bulletin, see below.

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X-ray flare

SUMMARY: X-ray Event exceeded X1
Begin Time: 2003 Nov 02 1706 UTC
Maximum Time: 2003 Nov 02 1734 UTC
End Time: 2003 Nov 02 1739 UTC
X-ray Class: X8.3
Optical Class: 2b
Location: S14W56

On DOY 307 (03/11/03), at around 10:00 high radiation count-rates were reported. The event coincided with a solar flare X-ray class >3 with associated CME, as reported by NOAA bulletin, see below.

X-ray flare

SUMMARY: X-ray Event exceeded X1
Begin Time: 2003 Nov 03 0943 UTC
Maximum Time: 2003 Nov 03 0955 UTC
End Time: 2003 Nov 03 1019 UTC
X-ray Class: X3.9
Optical Class: 2f
Location: N08W77

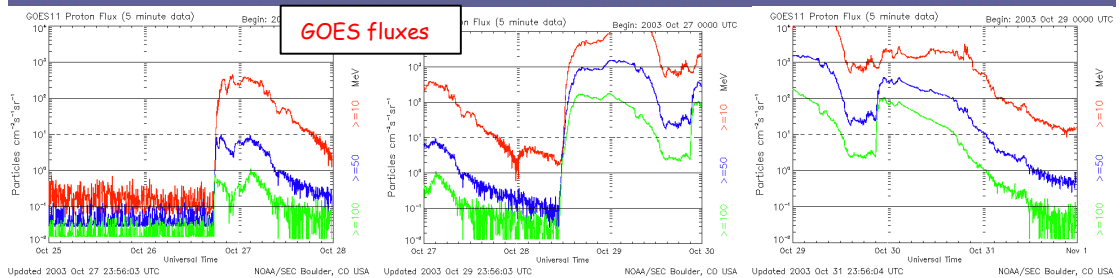
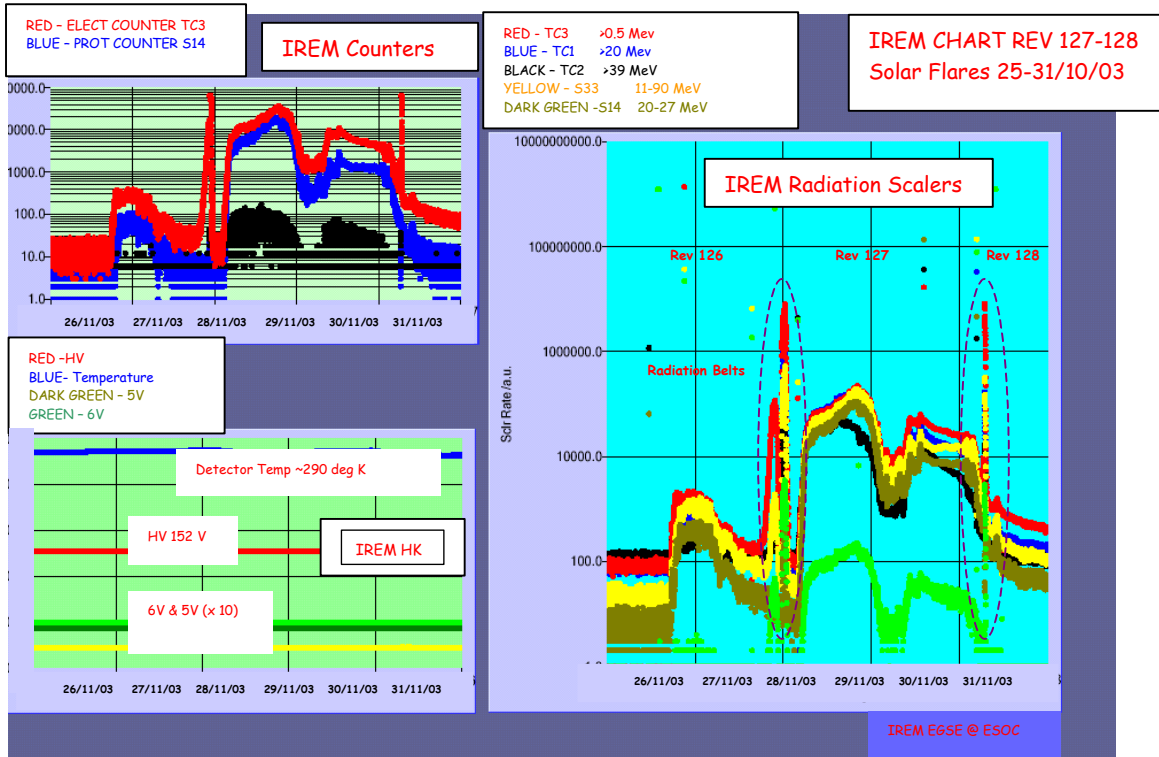
On DOY 308 (04/11/03), at around 20:00, very high radiation count-rates were reported. The event coincided with an exceptional X-ray event class 17 with associated HALO CME (those in the direction of the Earth), as reported by NOAA bulletin, see below.

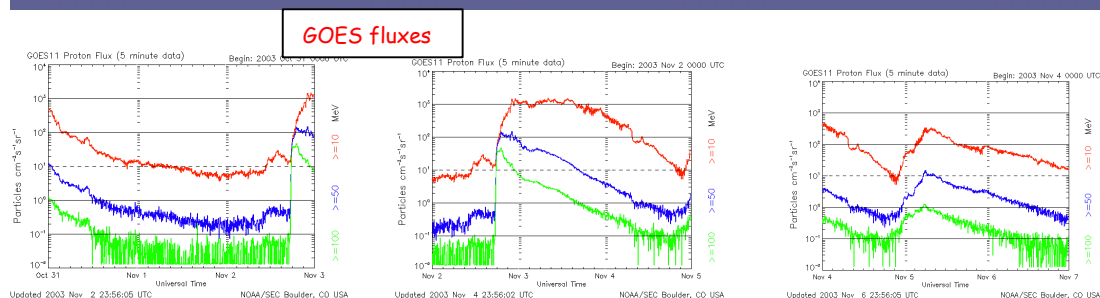
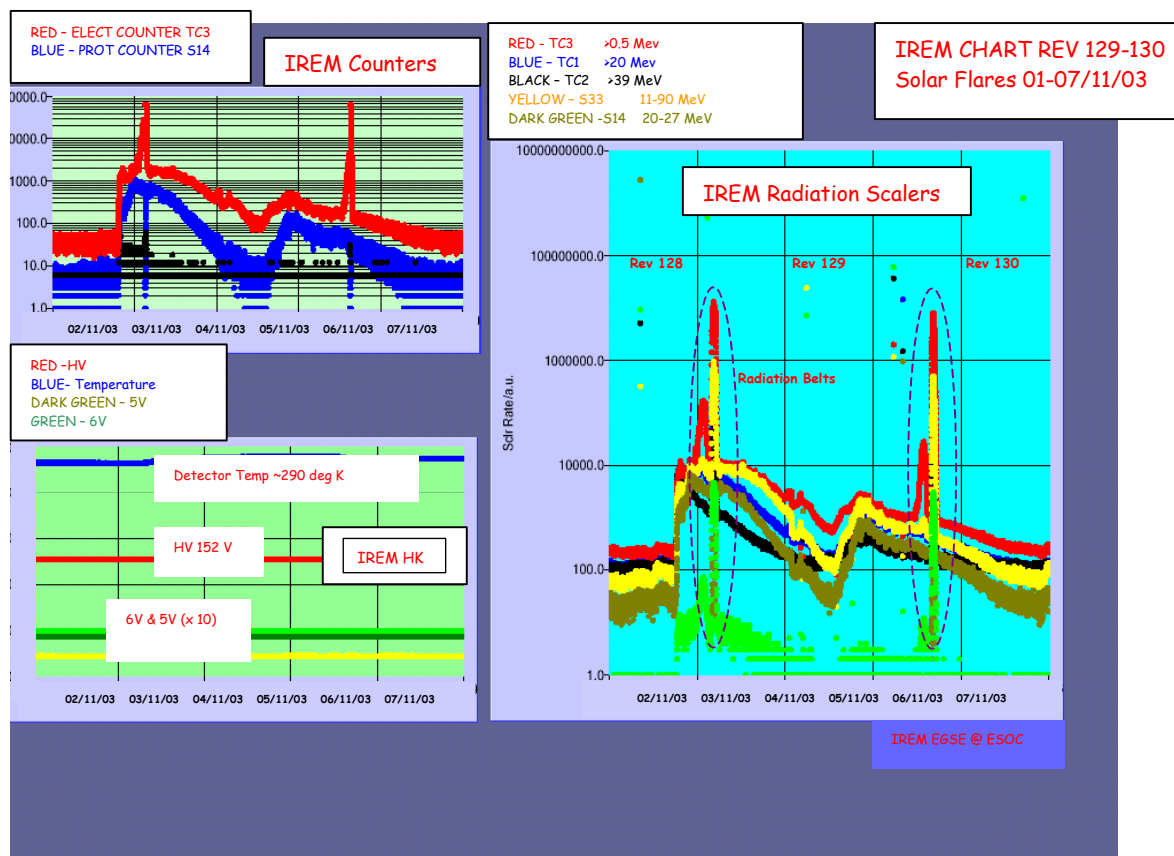
X-ray flare

SUMMARY: X-ray Event exceeded X10
Begin Time: 2003 Nov 04 1929 UTC
Maximum Time: 2003 Nov 04 1953 UTC
End Time: 2003 Nov 04 2006 UTC
X-ray Class: X17.0
Optical Class: 3b
Location: S19W83

<< Region 486 spawned an exceptional class X17+ solar flare at 19:44 UTC on 04 November. The event was located at S19W83. It saturated GOES x-ray sensors for 11 minutes and was associated with strong radio emissions across the spectrum. Strong Type II and Type IV radio sweeps were observed. The Type II had an estimated shock velocity of near 1,268 km/sec. SOHO scientists have determined that the coronal mass ejection associated with this CME was traveling near 2,381 km/sec. There is evidence for acceleration of the CME, so the final velocity will probably be somewhere near or above 2,400 km/sec. A FULL HALO coronal mass ejection has been observed with this event.>>

The evolution of the solar events (mainly the HALO Coronal Mass Ejections) during the observation period as recorded by the IREM EGSE at ESOC, are shown below.



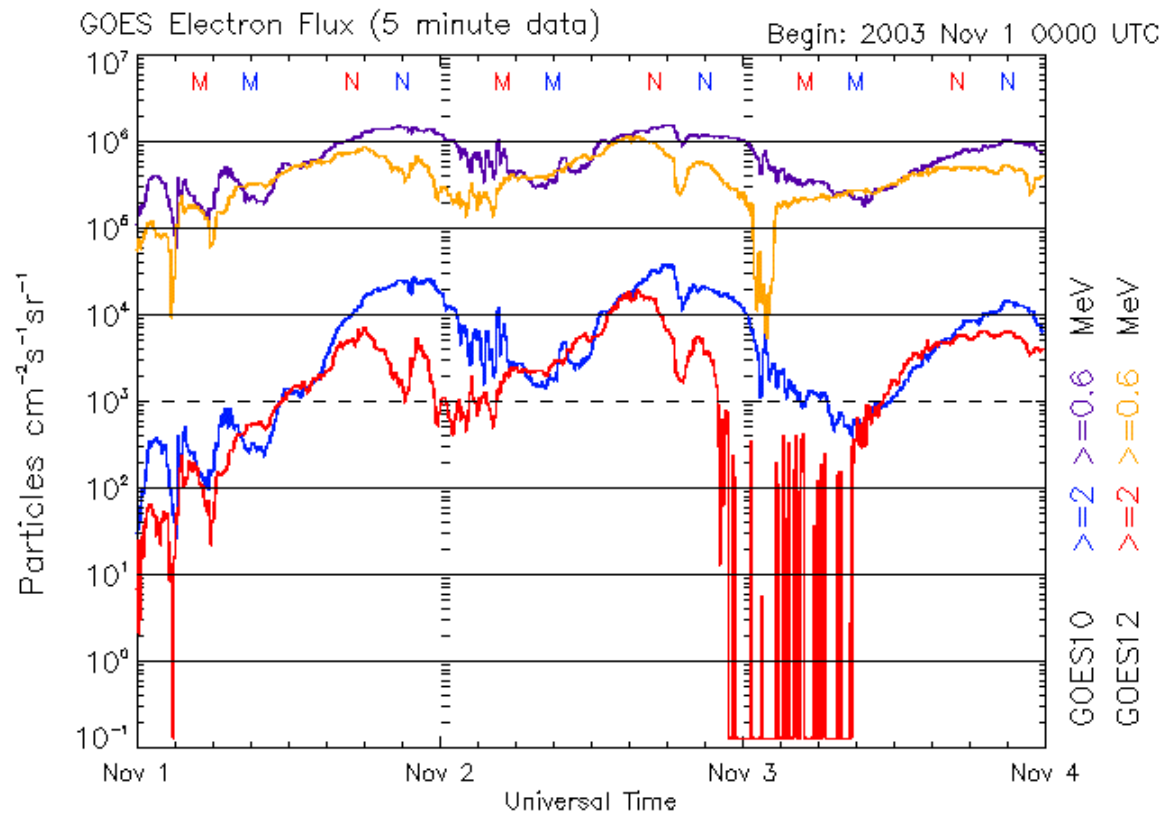


The excellent performance of the IREM unit is again confirmed by the comparison with the GOES 10-11 data at Space Environment Centre-NOAA.

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

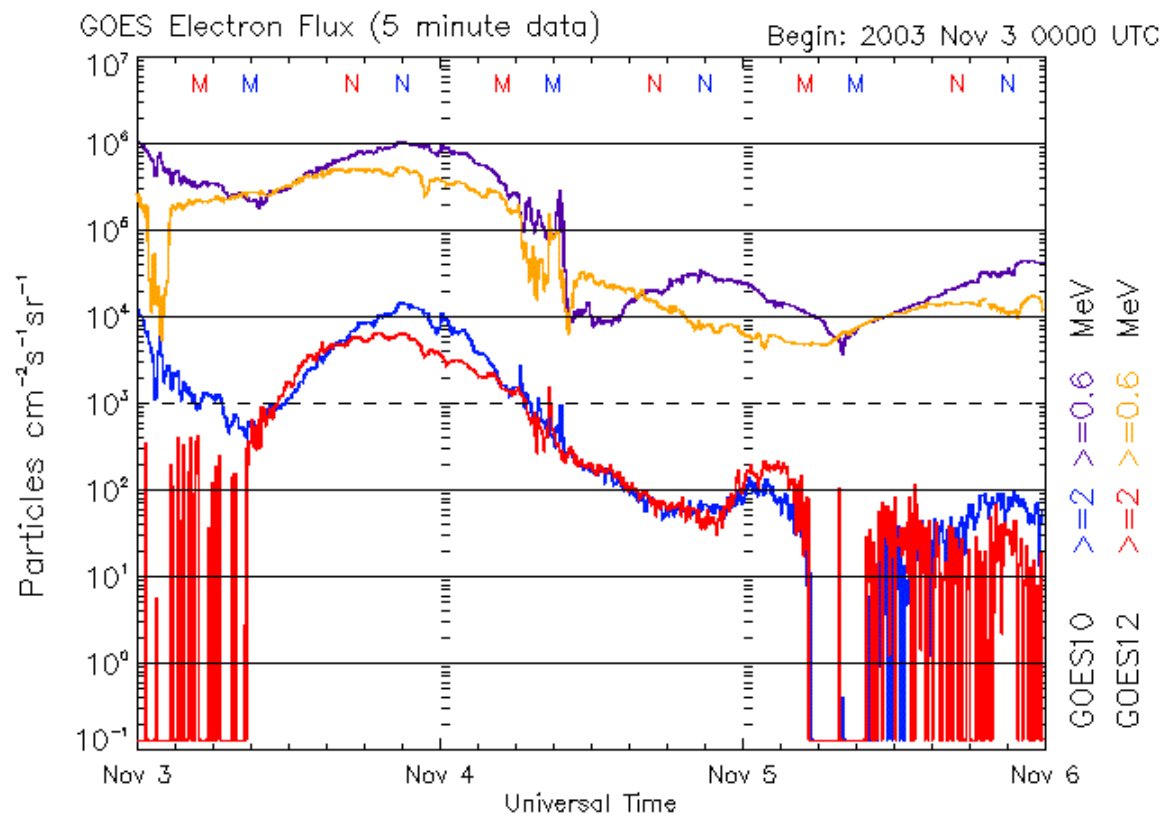
The plots of the IREM count rates for the Belts passage in revs 128->129 and 129-130 are reported in the plots above together with the part for the CMEs. For the moment the only indication on the effect of the CMEs on the Radiation Belts is a narrowing of the Electron part (outer part) due to the "peeling" operated on the geomagnetic field by the solar wind, while the proton (inner) does look, at moment, stable in the population.

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



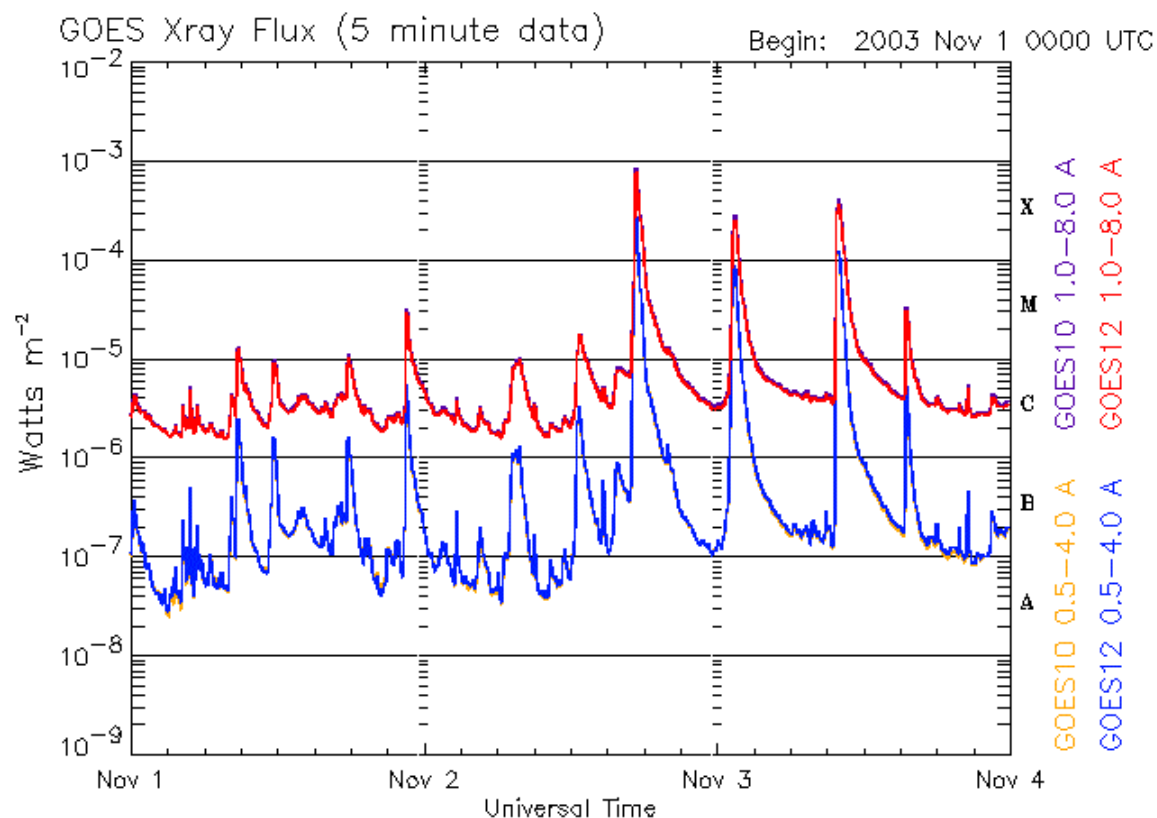
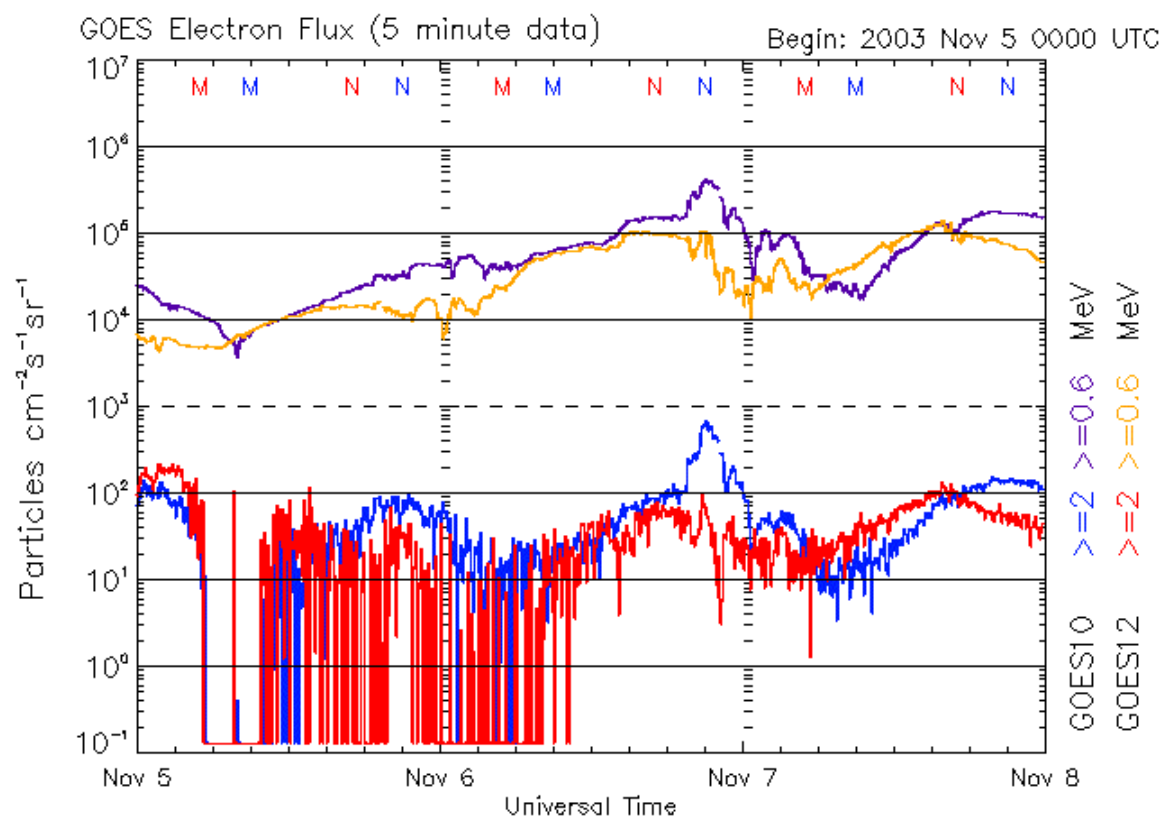
Updated 2003 Nov 3 23:56:05 UTC

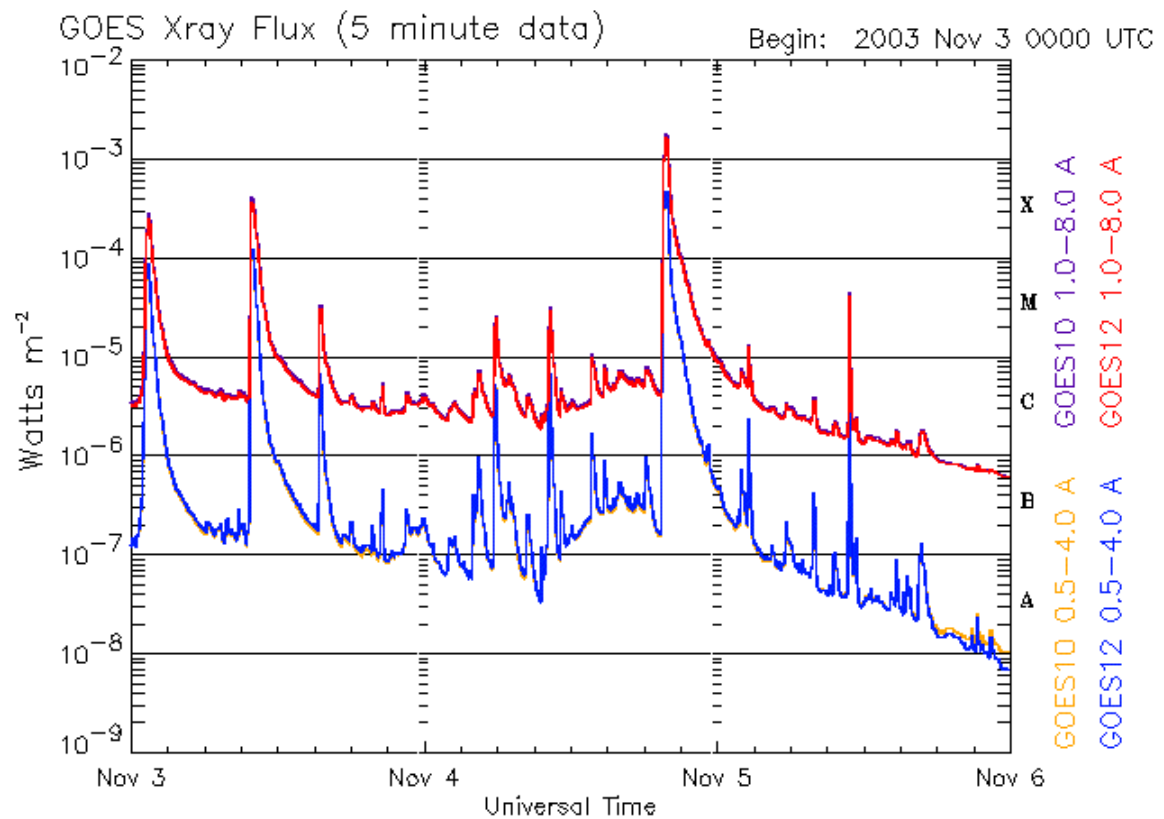
NOAA/SEC Boulder, CO USA



Updated 2003 Nov 5 23:56:02 UTC

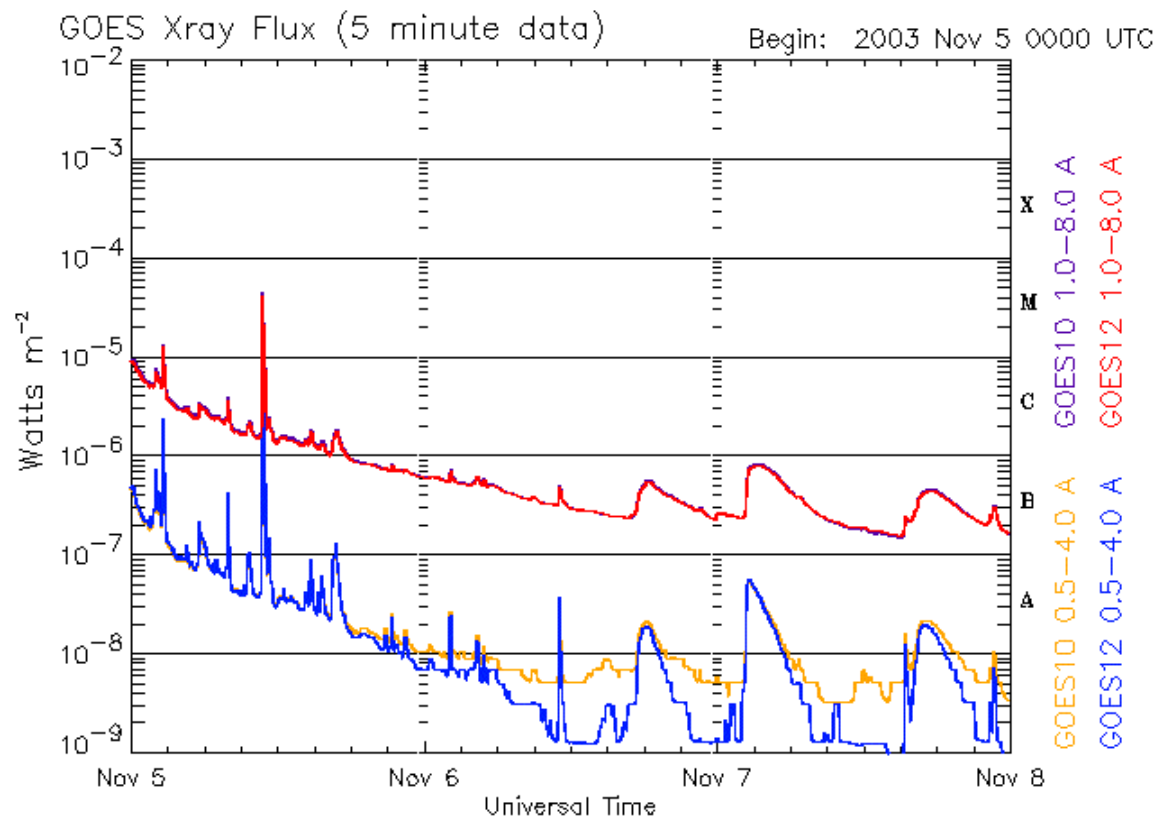
NOAA/SEC Boulder, CO USA





Updated 2003 Nov 5 23:56:06 UTC

NOAA/SEC Boulder, CO USA



Updated 2003 Nov 7 23:56:03 UTC

NOAA/SEC Boulder, CO USA