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

INTEGRAL
Mission Report

INT-MOC-SYS-RP-1001-OPS-OF

No. 140
Week 21

30.05.05

Routine Phase

Prepared by: M. Walker (OPS-OFO)

LIST OF CONTENTS

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B. Demelenne	1	P. Ubertini – IBIS	1
		S. Brandt – JEM X	1
Vilspa		E. De Miguel - OMC	1
P. Kretschmar	1	W. Hajdas – IREM	1
		JPL / Goldstone	
		D. Holmes	1
		J. Valencia	1

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 21.05.05 until 27.05.05 (both dates inclusive) and covers the revolutions 318, 319 & 320.

2 Summary of Activities

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

The targets of these revolutions were the Coma Cluster (RA +12:59:48.7; DEC +27:58:50.0); the Galactic Plane, an observation centred on Field 4 (RA 10:35:14.00; DEC +27:37:41.0); part of a survey of sky regions identified as not having been probed by Integral so far, and a Deep Extragalactic Survey. The activities consisted of raster (5x5) and rectangular (5x12) dithering and GPS observations.

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

3 Satellite Status

3.1 Platform

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

3.1.1 AOCS

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

The Eclipse season continued with eclipse passages on 21-24-27/05/2005, DOY 141-144-147. The eclipse passages were nominal from an AOCS point of view.

2 slews (CSL) were missed from the Timeline during this period, due to a problem on uplink interference during REDU pass.

The fuel consumption over the period between 19/05/2005 and 26/05/2005 was 0.1118 kg. The remaining propellant is in the order of 161.2043 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.

The 2nd, 3rd and 4th eclipses of the current eclipse season occurred during the reference period.

On 21/5/2005 Integral passed through eclipse #2 of the summer eclipse season. Eclipse #2 had a total duration of 55 minutes. The battery Depth of discharge was approximately 4.9Ah each and the battery recharge time was about 2 hours 50 minutes.

On 24/5/2005 Integral passed through eclipse #3 of the summer eclipse season. Eclipse #3 had a total duration of 1 hour, 6 minutes. The battery Depth of discharge was approximately 6.0Ah each and the battery recharge time was about 3 hours 35 minutes.

On 27/5/2005 Integral passed through eclipse #4 of the summer eclipse season. Eclipse #4 had a total duration of 1 hour, 10 minutes. The battery Depth of discharge was approximately 6.8Ah each and the battery recharge time was about 4 hours.

As all eclipses took place entirely outside ground station coverage, no direct monitoring of batteries behaviour during eclipse was possible. However all indications from on-board stored data (ECD and OBM) are that the behaviour was nominal.

3.1.3 Thermal

The thermal control of the satellite is working well. The temperatures are currently all within the specified operational limits.

3.1.4 OBDH

The OBDH subsystem is working flawlessly. No on-board communications problem was 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.

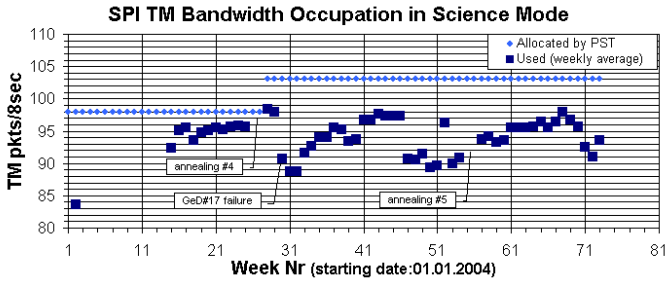
3.2 Payload

3.2.1 SPI

The overall status of the instrument in this week is nominal. The eclipse season, started on 18th May, has affected the overall instrument temperatures; in particular, the PSAC (Plastic Scintillator underneath the mask) temperature has exceeded the warning and hard limits.

During the reporting period, the instrument has been kept in photon-by-photon mode, with spectra TM enabled, an assigned TM bandwidth in the science observation windows of 103 pkts/cycle and an actual occupation of 93.5 pkts/cycle average.
A software patch to fix both the TM leakage malfunction and the missed belts entry ACS HV switch off malfunction (INT_SC-115) is ready: however due to an anomaly in the DPE used for ground testing, validation of the patch is on-hold. It will be resumed next week, thanks to the OMC PI, who kindly lent their DPE to SPI.

The Stirling compressors are working well, maintaining the detector cold-plate temperature within 85+/-1K.



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

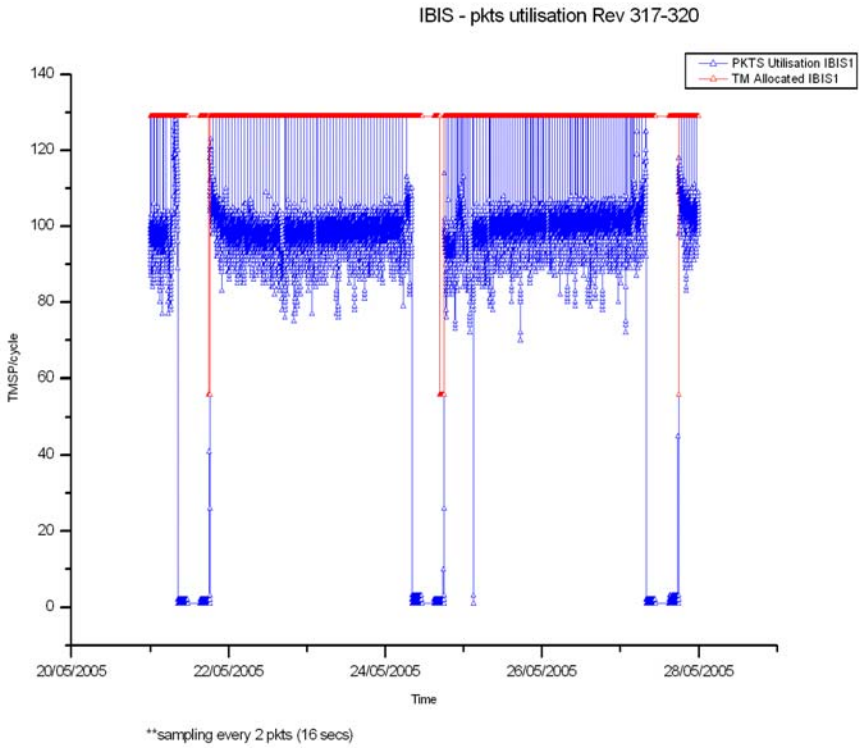
3.2.2 IBIS

The Overall status of the unit is Nominal.

The week was characterised by low solar activity. No anomalous or unexpected behaviour was reported during the 3 eclipses of this week.

During the reporting period the PST allocation to IBIS was most of the time 129 TMPS/cycle. The IBIS mean bandwidth utilisation during the observation period was 100.94 TMPS/cycle, down 3.05 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 during science observations with a TM allocation of 8 packets/cycle and JEM-X2 was dormant (DFEE OFF) with a TM allocation of 1 packet/cycle.

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, 152 pointings were executed nominally, 1 was impacted by, and 2 were lost due to Radio Frequency Interference at Redu.

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.

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

4 Ground Facilities

The performance of the Operational ground facilities was excellent this week, 165 slews were executed correctly, 2 were lost due to ground problems.

4.1 Mission Operations Centre

The performance of the MOC was excellent this week, with no pointings lost. There was a minor problem with the FD automatic updates, and CPU usage on sun124, neither of which impacted operations.

4.2 Ground Stations & Network

The performance of the ground stations and Network was good this week. There significant problems RFI at Redu that degraded one ponting, and lost two more. There were also some minor drops in TM from Redu & DSS-24, plus a loss of bit-lock from

DSS-24, but these problems did not have any impact. The overall performance was well above the 95% requirement.

4.3 Science Ground Segment

4.3.1 ISOC

1. Mission planning
PSF's for rev 328 have been received. Mission planning for the corresponding revolutions has been performed in ISOC. Up to rev 327 have been sent to MOC. Rev 328 is kept in ISOC until Monday when it will be sent after reconfiguration of the IFTS has been performed by MOC. This reconfiguration is necessary because of a system upgrade at MOC. The iteration of rev 325 with the AOCS calibration was not completed during the week (short week in ESOC) but good progress is made. No ToO request was received. Revolution 322 was regenerated in ISOC and resent to MOC to correct a incorrect instrument setting in a OMC FF calibration observation that will be carried out in that revolution. Also the iteration of revolution 325 has continued to get the correct pointings for the AOCS calibration planned for this revolution. This work is converging and should be concluded during next week. TSF for rev 320 and 321 were received.

2. Observation status
No new ECS received this week

3. ISOC science data archive
The beta version of ISDA version 2 was made available as planned. Testing of this version has started this week by ISOC scientists. No major problem has been detected up to now. At least five dat tapes from ISDC with "revision 2" data is on its way to ISOC.

4. ISOC system
The version 10.9.1 has been used this week without any problems.

5. Problems
none

4.3.2 ISDC

Status of ISDC observation processing on 30/05/2005:

- Latest Standard Analysis completed: observation 03201090019 (Gal. Bulge region, Revolution 306) on 28/05/2005

- Latest products archived: observation 03201090013 (Gal. Bulge region, Revolution 299) on 30/05/2005

- Latest observation products sent to the observer: observation 02201460002 (3C273, Revolution 268) on 15/04/2005

5 Special Events

6 Anomalies

There were a number of problems that impacted the operations:

- On DoY 141, at 10:05, there was a brief loss of VC7 TM from DSS-24, there was no impact.
- At 11:23, the antenna swap commands were manually sent, in case of problems with DSS-24, as the scheduled up-link time was 11:31:30, with EOT at 11:32.
- On DoY 142, at 12:44, the FD automatic update failed. The recovery tool was used to update the next slew. There was no impact.
- At 16:00, the bit-lock from Redu was dropping in and out every few seconds. At 16:01, auto-track was tried to see if that improved the situation. At 16:05, program-track + TCE1 were tried, without improvement. At 16:16, the timeline was stopped. At 16:19, the bit-lock seemed to have improved, but AGC still unstable. At 16:23, test commands were successfully sent, but the problem persisted. At 16:52, the links were removed, and reconnected using Vilspa, test commands were successfully sent at 16:55. The timeline was recovered at 17:43, the impact was the loss of TM during pointing 03180024, with pointings 03180025 and 03180026 lost. The links were eventually switched back to Redu at 20:26. The cause of the problem was likely to have been RFI.
- On DoY 144, from 05:39 to 05:42, there was no bit-lock from DSS24. There was no impact.
- On DoY 145, at 16:24, 8 bad frames were received from Redu, there was no impact.
- At 19:15, sun124 was showing yellow, due to high cpu usage, it was restarted, clearing the problem, there was no impact.

The following anomaly reports were entered into the ARTS system.

AR id	Date Created	Subject	Segment	Status
INT-2735	23/05/2005	TC drop (no bit-lock) at REDU station	ESA Stations	Pending
INT-2736	23/05/2005	Uplink Interference at REDU	ESA Stations	Pending

7 Future Milestones

The current Eclipse season started on 18th May.

Upgrade of the NCTRS (Network Controller and Telemetry Router System) for Integral to release 9.1.4. This will cure some known problems with the current release and is also compatible with TCP IP communications to ESA Stations as well as X25. The upgrade is currently planned to take place in June.

Upgrade of the IMCS, to use S2K release 3.1, a major update of the MCS is currently undergoing acceptance testing. A date for installation on the operational machines has not yet been decided.

Change of communication protocol to ESA Station from X25 to TCP IP, testing of this change will start in April. It will be used operationally only once testing is complete and the operational machines have been upgraded with the latest versions of the NCTRS and MCS.

8 Appendix

The appendix includes various detailed information.

8.1 Overview of Revolutions

Revolution 318

The observations in revolution 318 continued with raster dithering observations of the Coma Cluster (RA +12:59:48.7; DEC +27:58:50.0) lasting ~58.3 hours.

Revolution 319

The observations in revolution 319 began with 11 pointings of a GPS lasting ~8 hours, followed by a raster dithering observation of the Coma Cluster (RA 12:59:48.70; DEC +27:58:50.0) lasting ~5 hours. A raster dithering observation centred on (RA 10:35:14.00; DEC +27:37:41.0) was then performed for the remaining ~47 hours of observation time.

Revolution 320

The observations in revolution 320 consisted of a raster dithering observation centred at (RA 10:35:14.00; DEC +27:37:41.0) lasting ~11.5 hours, followed by a Deep Extragalactic Survey, performed for the remaining ~49.5 hours of observation time.

Throughout these observations all instruments were in their nominal science modes, except for JEM-X2 for which the DFEE was off, and the TM allocation was IBIS 129; SPI 103; JEM-X1 8; JEM-X2 1; OMC 5.

8.2 Consumables

8.2.1 Detailed Fuel Book-keeping

```
2005-05-10T06:58:17.000Z     161.4991    F   Automatic TM processing.
2005-05-12T16:35:59.000Z     161.4919    F   Automatic TM processing.
2005-05-13T04:51:13.000Z     161.4585    F   Automatic TM processing.
2005-05-13T12:33:45.000Z     161.4293    F   Automatic TM processing.
2005-05-15T16:36:23.000Z     161.4119    F   Automatic TM processing.
2005-05-17T02:33:14.000Z     161.3856    F   Automatic TM processing.
2005-05-18T10:13:17.000Z     161.3663    F   Automatic TM processing.
2005-05-18T16:53:58.000Z     161.3551    F   Automatic TM processing.
2005-05-19T01:23:35.000Z     161.3161    F   Automatic TM processing.
2005-05-21T16:41:58.000Z     161.3024    F   Automatic TM processing.
2005-05-23T03:00:01.000Z     161.2844    F   Automatic TM processing.
2005-05-24T16:29:02.000Z     161.2658    F   Automatic TM processing.
2005-05-25T00:58:47.000Z     161.2526    F   Automatic TM processing.
2005-05-25T02:05:43.000Z     161.2250    F   Automatic TM processing.
2005-05-26T02:12:26.000Z     161.2043    F   Automatic TM processing.

This report was generated Fri May 27 08:00:24 GMT 2005
```

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, 21/05/2005 - 27/05/2005

AOCS operations were executed from the Automatic Timeline.

During this period, 71 Open Loop Slews, 94 Closed Loop Slews and 8 Momentum Bias were executed. 2 slews were missed due to a problem on uplink interference during REDU pass. This is equivalent to a ~1.1 %.

The AOCS eclipse operations were nominal. For the 2nd, 3rd and 4th eclipse passage, the Eclipse Timers and the Time-Tagged sequence to re-enable the IMU Auto Switch-Off function of the ACC were loaded from the Timeline and the pre-eclipse IMU health checks were performed at the planned times. Some information regarding the eclipse times and IMU usage up to this stage of the eclipse season are provided below:

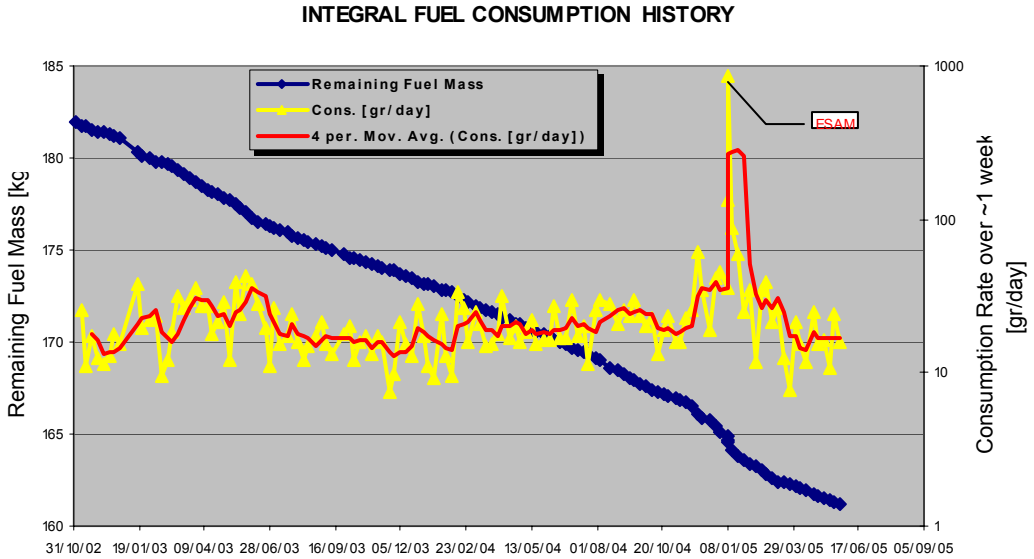
AOCS Eclipse Times — Summer 2005

Date	LOS	AOS	ACC Eclipse Imminent	Eclipse Start						Eclipse End					Eclipse Duration
				ACC	FDE	FCE	Penumbra	FSS Sun Out	Umbra	Umbra	FSS Sun In	Penumbra	FDE/FCE	ACC	
2005-05-18	11:36:00	15:29:00	10:43:59	11:26:02	11:35:53	11:36:37	11:43:39	11:51:24			11:59:31	12:06:40	12:11:17	12:16:25	0:23:01
2005-05-21	11:32:00	15:17:00	10:15:57	10:58:24	11:06:58	11:07:42	11:15:37	11:18:26	11:18:35	12:08:15	12:09:02	12:10:39	12:14:38	12:20:50	0:55:02
2005-05-24	11:18:00	15:03:00	09:59:13	10:41:54	10:50:33	10:51:17	10:58:53	11:01:15	11:01:15	12:03:23	12:04:04	12:05:11	12:09:57	12:15:34	1:06:18
2005-05-27	10:55:00	14:50:00	09:50:25	10:31:50	10:43:15	10:43:59	10:50:05	10:51:23	10:52:12	11:58:27	11:58:13	12:00:00	12:05:35	12:09:08	1:09:55

IMU Usage during Eclipse Season — Summer 2005

IMU On	IMU Off	From Health Check		From Auto Calibration	On Time	Accumulated On Time
		Noise Roll [as/s]	Drift Roll [as/s]	Drift Roll [as/s]		
2005-05-18 08:39:40	2005-05-18 12:18:40	0.1997	0.1579	0.1430	3:39:00	3:39:00
2005-05-21 08:05:31	2005-05-21 12:23:02	0.2124	0.2817	0.2901	4:17:31	7:56:31
2005-05-24 07:47:21	2005-05-24 12:17:47	0.2904	0.2772	0.2602	4:30:26	12:26:57
2005-05-27 07:37:09	2005-05-27 12:11:27	0.1852	0.1811	0.2119	4:34:18	17:01:15

The fuel consumption over the period between 01/11/2002 and 26/05/2005 is reported in the plot below.



21/05/05 (Day of Year 141, Revolution 317-318)

Nothing to report.

22/05/05 (Day of Year 142, Revolution 318)

Slews missed from the Timeline: Due to a problem on the uplink interference during REDU pass (AGC unstable), the slews ID 03180025(CSL)-26(CSL) were not executed and the AOCS s/s disabled in TL at 16:56z. A manual recovery was then performed to the attitude of PID 03180026. The next slew (OSL) for PID 03180027 was manually updated and executed from the Timeline. The AOCS s/s was re-enabled in TL at 17:43z.

23/05/05 (Day of Year 143, Revolution 318)

Nothing to report.

24/05/05 (Day of Year 144, Revolution 318-319)

Guide star released by the STR SEU Filter: At 17:21:28z, the SEU Filter threshold of the ACC was exceeded and the guide star released. The magnitude 8.3 guide star was located at CCD coordinates [2796, 11785]. A new guide star, Mi 8.2 at CCD location [8090, -796], was found in the first automatic mapping, which was kept afterwards.

25/05/05 (Day of Year 145, Revolution 319)

Nothing to report.

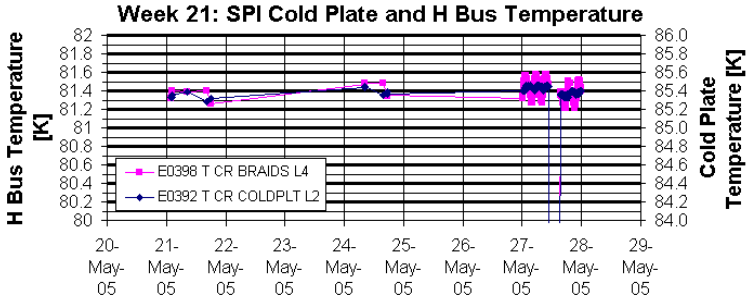
26/05/05 (Day of Year 146, Revolution 319)

Nothing to report.

27/05/05 (Day of Year 147, Revolution 319-320)
Nothing to report.

8.3.2 SPI Operations

Stirling compressors and Cryostat:
The performance of the compressors is nominal. The cold plate temperature was maintained at 85K+/-1K over the reporting period, showing the expected positive drift.
The following plot shows the evolution of the cold-plate and H bus temperatures during the reporting period (due to problems in the TM retrieval tool, the plot is affected by large gaps).



DPE & IASW:

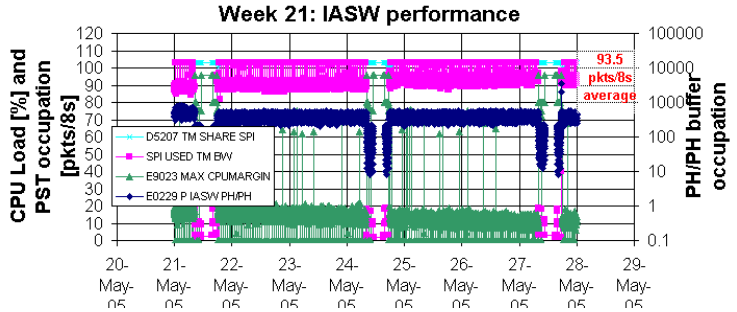
The IASW performance is nominal. The PST TM bandwidth allocation was 103 pkts/cycle in the science windows; the actual TM bandwidth usage is:

102-103 pkts/cycle peak (1 pkt/cycle is sometimes unused due to TM leakage anomaly);

93.5 pkts/cycle average in science mode, during observation periods

The temporary workaround to the TM leakage anomaly (AR INT_SC-107), applied at every revolution, has been resumed since 11th April. This allows the recovery of most of the unused TM packet slots in the PST.

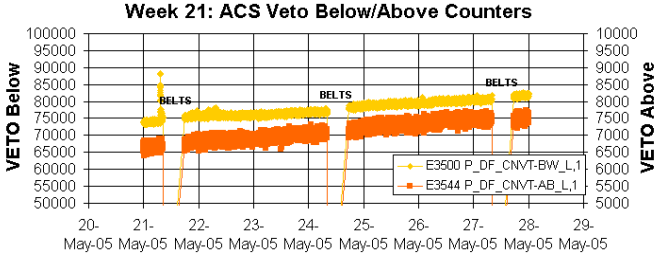
The following plot shows the IASW performance in terms of TM bandwidth, event buffer occupation and DPE CPU load during the reporting period.



ACS:

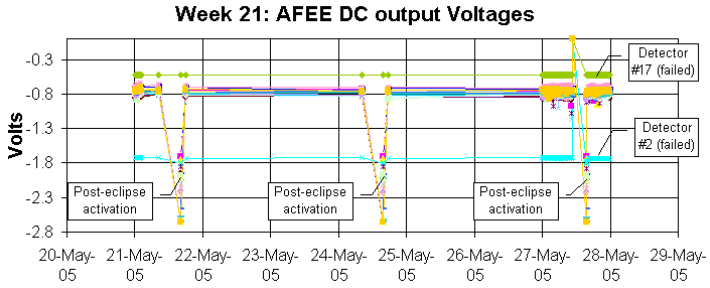
The performance of the ACS is nominal except for the PSAC thermal environment. It is since the 2nd-3rd eclipse passage of this eclipse season (started on 21st May) that E2116 is exceeding the low hard limit. The warning and sometime the hard limit have been exceeded also in the past eclipse seasons, however not such in a remarkable way and, especially, it was returning in limits after a few days. This time it looks stuck to a low temperature of -33degC. This could be due to the particular attitudes that we are currently flying, where SPI mask can be in shadow for long periods also after eclipse exit. The PI and the ACS expert have contacted to further analyse the problem.

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

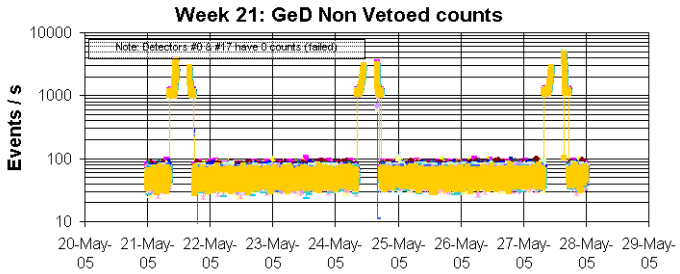


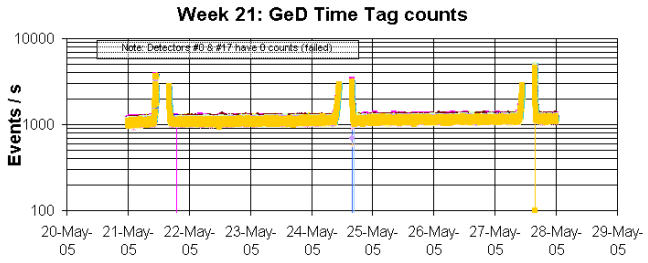
AFEE and Germanium Detectors:

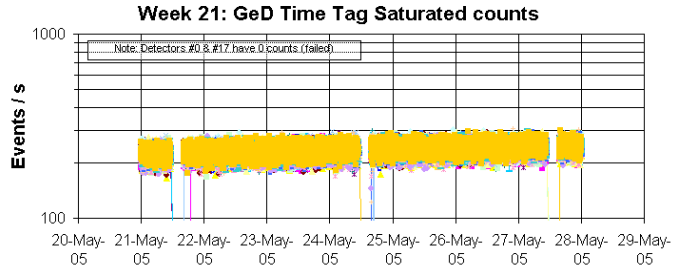
The performance of the detectors is nominal except for the detector #2, failed since 06.12.2003, and detector #17, failed since 17.07.2004.
The following plot shows the AFEE dc output signals during the reporting period (due to problems in the TM retrieval tool, the plot is affected by large gaps).



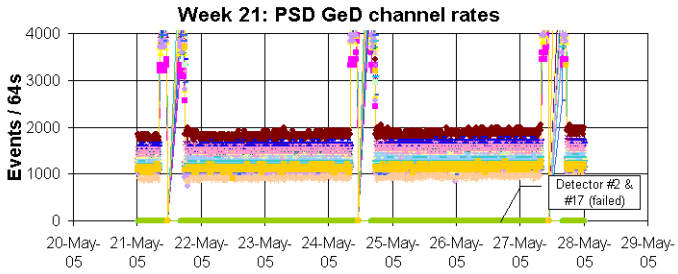
DFEE:
The performance of the unit is nominal.
The following plot shows the Non Vetoed event rates, processed by the DFEE during the reporting period. The count rate of each detector is within the expected range, except for the failed detector #2 and #17.







PSD:
The performance of the unit is nominal.
Following the execution of OCR#191 (PSD input channels #2 and #17 disable), the channel rates blocking malfunction did not appear again. It was therefore decided to keep this setting.
The following plot shows the PSD channel rates during the reporting period.



SPI DAILY EVENTS

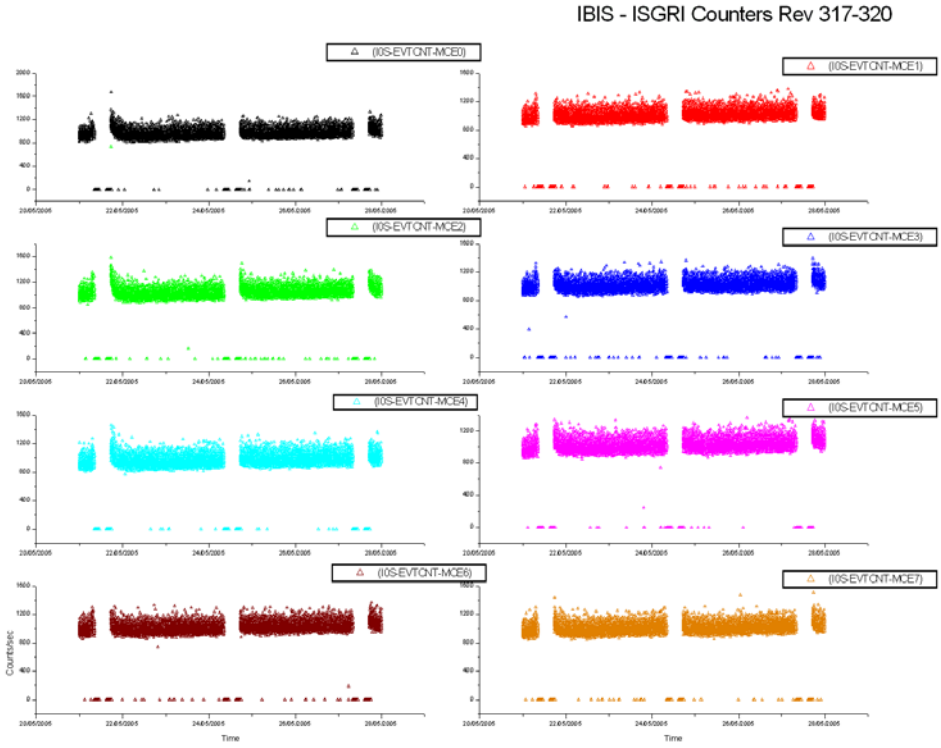
NOTE: The events log is extracted from the revolution pass summary.

DOY Time	Event
138 / 19:19	OEM: SPI1 LSL Error.
138 / 20:25	TM E0330 "T AF ADC L0"; E0336 "T AF ADC L6"; E0339 "T AF ADC L9"; E0341 "T AF ADC L11" back into limits.
From 138 / 21:51 To 140	Several occurrences of TM E2116 "T AS PSAC L2" OOL Warning Low at -18.51 and back into limits. / Both ACS heaters are on: T8507 =1; T8607 = 1. / Accordingly to ECP22 no action were required
141 / 17:51	TM P2014 "LCL CUR ACS-A" OOL Alarm High and back into limits. TM E2121 "I AS VCU-AC L" OOL Alarm High and back into limits.
From 141 / 17:51 To 143 / 05:50	Several occurrences of TM E2116 "T AS PSAC L2" OOL Warning Low at -18.51 and back into limits. / This is nominal until the execution of the TT TC T5036 "TSW ACS MSK-A ON" that was executed at: TBD
146 01:02-01:13	TM E0360 "U AF DCOUTPT L10" OOL Alarm Low and back into limits.

8.3.3 IBIS Operations

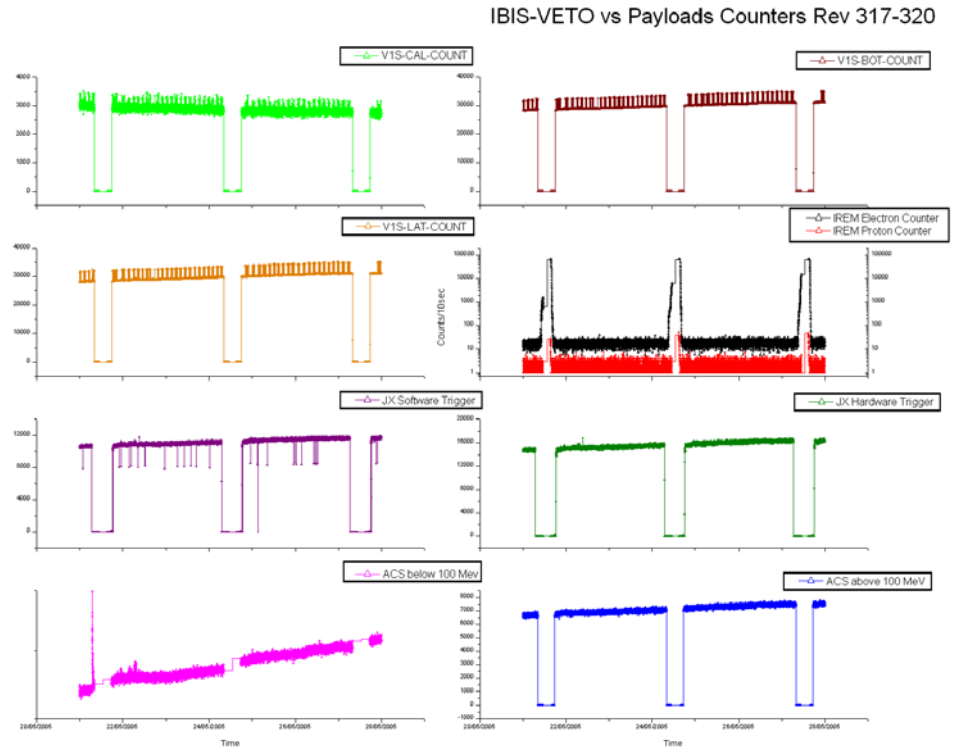
IBIS Events Counters Plots.

ISGRI Counters:



**sampling every 4 pkts (32 secs)

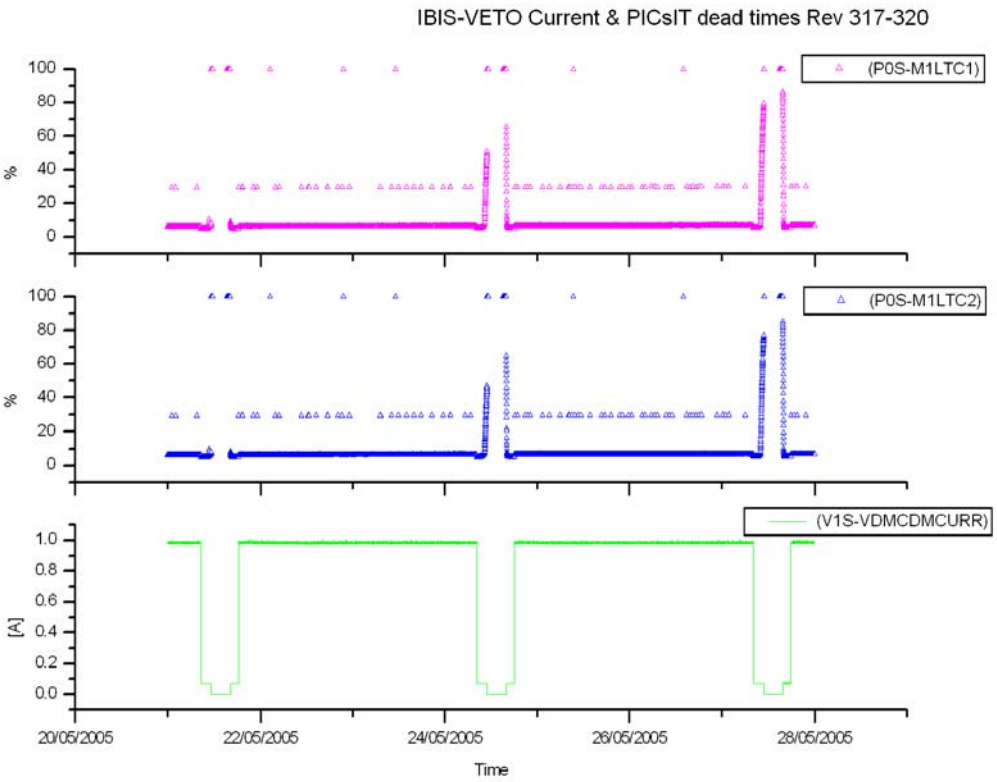
VETO vs Payloads Counters:



**with the exception of IREM counters (counts/10sec), all the plots are reporting counts/sec sampling every 5 pkts (40 sec)

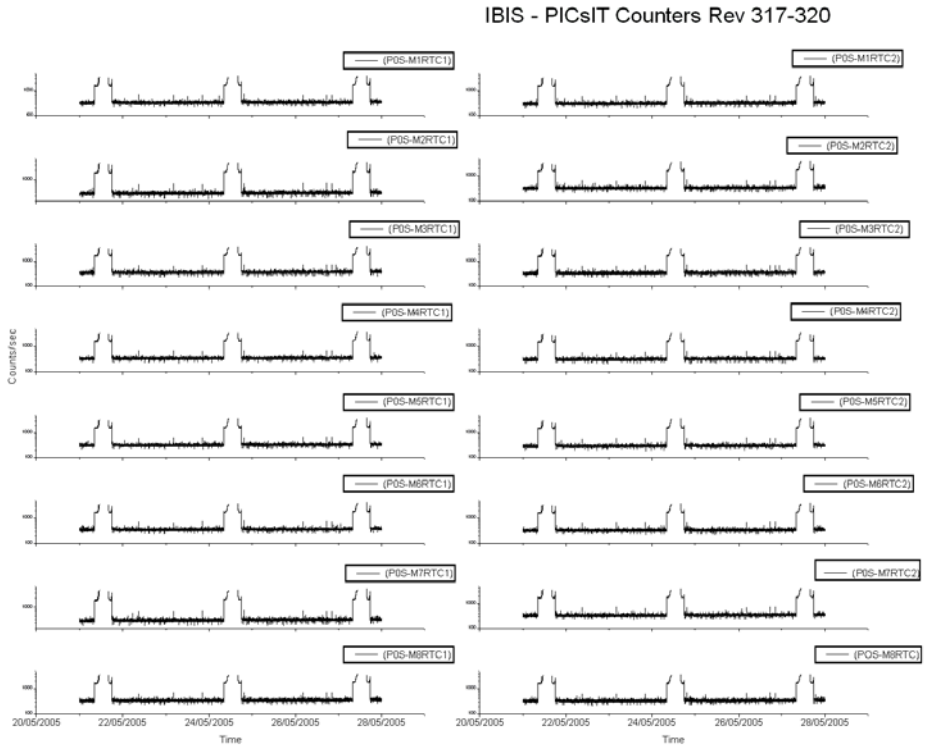
The week was characterised by low solar activity.

Veto Current:



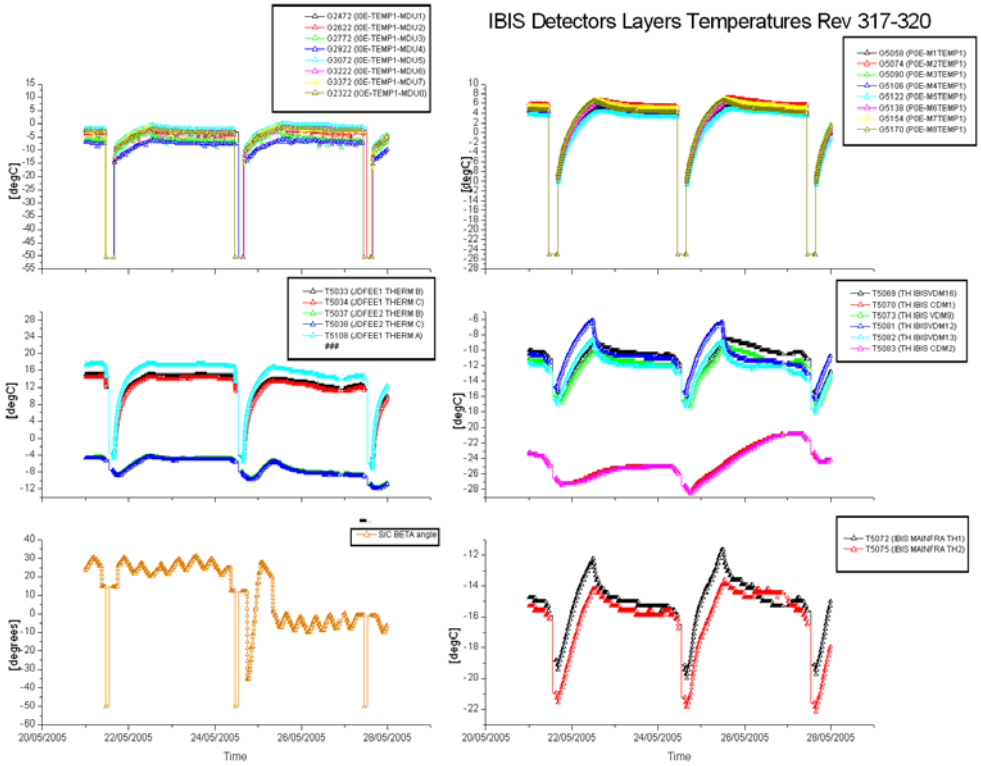
**sampling every 4 pkts (32 secs)

Picsit Counters:



**sampling every 4 pkts (32 secs)

IBIS Detectors Layer Temperatures:



**sampling every 8 pkts (64 secs)

IBIS daily report

DoY 2005.141 (21/05/2005)

At 08:28Z TM parameter G8015 (S1E-A2 PMT V) went out of limit 'high' with the value of 29.4V (limit value). It went back inside limit at 18:16Z (belt exit time).
As this happened close to the radiation belts, according to V-VLT-1 no action was taken.

DoY 2005.144 (24/05/2005)

At 08:14Z TM parameter G8015 (S1E-A2 PMT V) went out of limit 'high' with the value of 29.4V (limit value). It went back inside limit at 18:02Z (belt exit time).
As this happened close to the radiation belts, according to V-VLT-1 no action was taken.

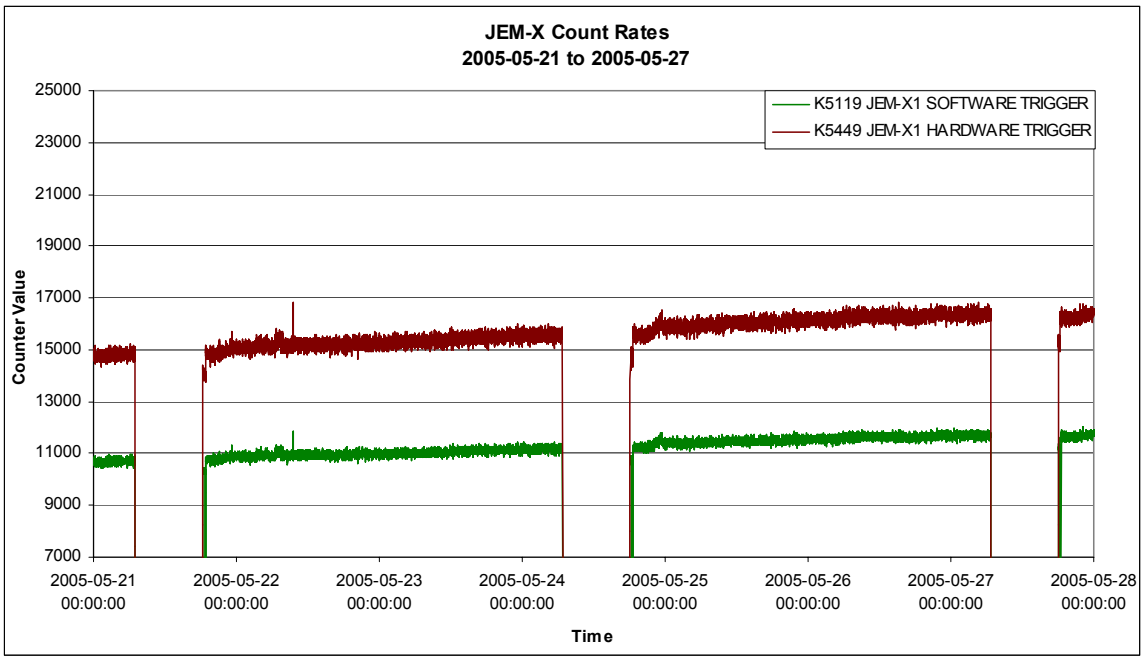
DoY 2005.147 (27/05/2005)

At 08:01Z TM parameter G8015 (S1E-A2 PMT V) went out of limit 'high' with the value of 29.4V (limit value). It went back inside limit at 17:49Z (belt exit time).
As this happened close to the radiation belts, according to V-VLT-1 no action was taken.

8.3.4 JEM-X Operations

8.3.4.1 JEM-X Count Rates

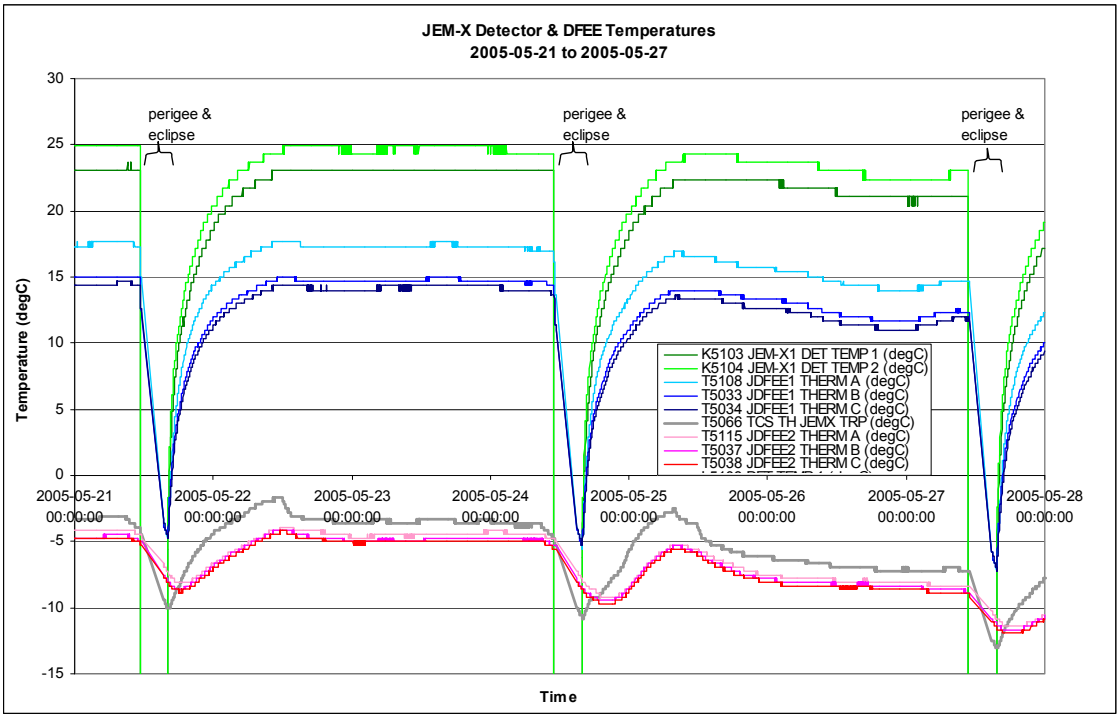
JEM-X count rates over the reporting period are displayed in the following graph[1].



8.3.4.2 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 graph[2].

[1] Data sampled (1 frame in 4) and smoothed to remove spikes in S/W Trigger due to flushing of buffer after slews.
[2] Data sampled (1 frame in 8)



8.3.4.3 JEM-X Daily Report

2005-05-21 (DOY 141, Rev 317-318) to 2005-05-27 (DOY 147, Rev 319-320)

Nothing to report

8.3.5 OMC Operations

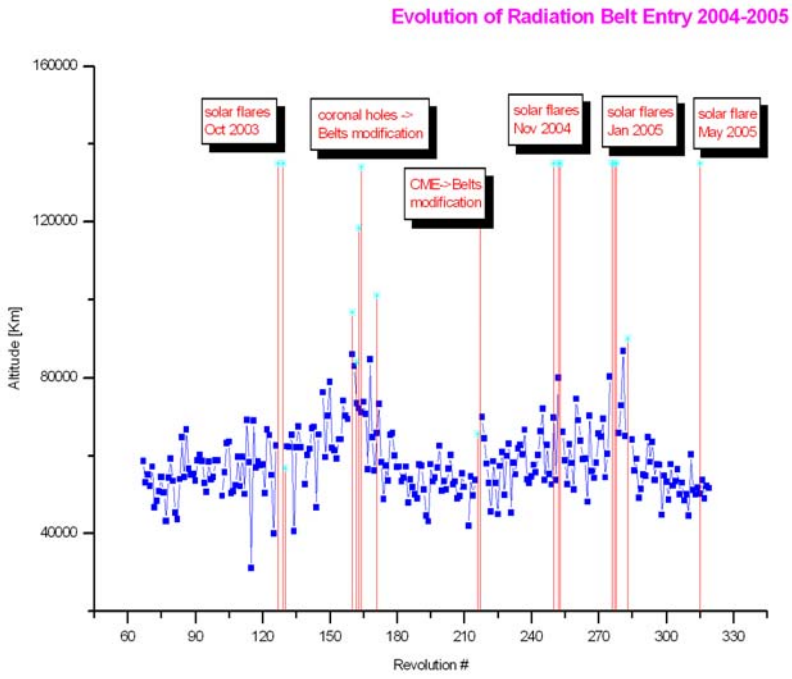
2005-05-22 (DoY 142, Rev 318)

From 16:00, to 17:43, RFI caused interruptions to the timeline. The impact was the loss of TM during pointing 03180024, with pointings 03180025 and 03180026 lost.

On DoY 141 at 08:28:44, DoY 144 at 08:14:32, and DoY 147 at 08:01:51 OMC was switched by the Timeline to SAFE mode, at the nominal time.

8.3.6 IREM Operations

Radiation Belts Entry



IREM daily report

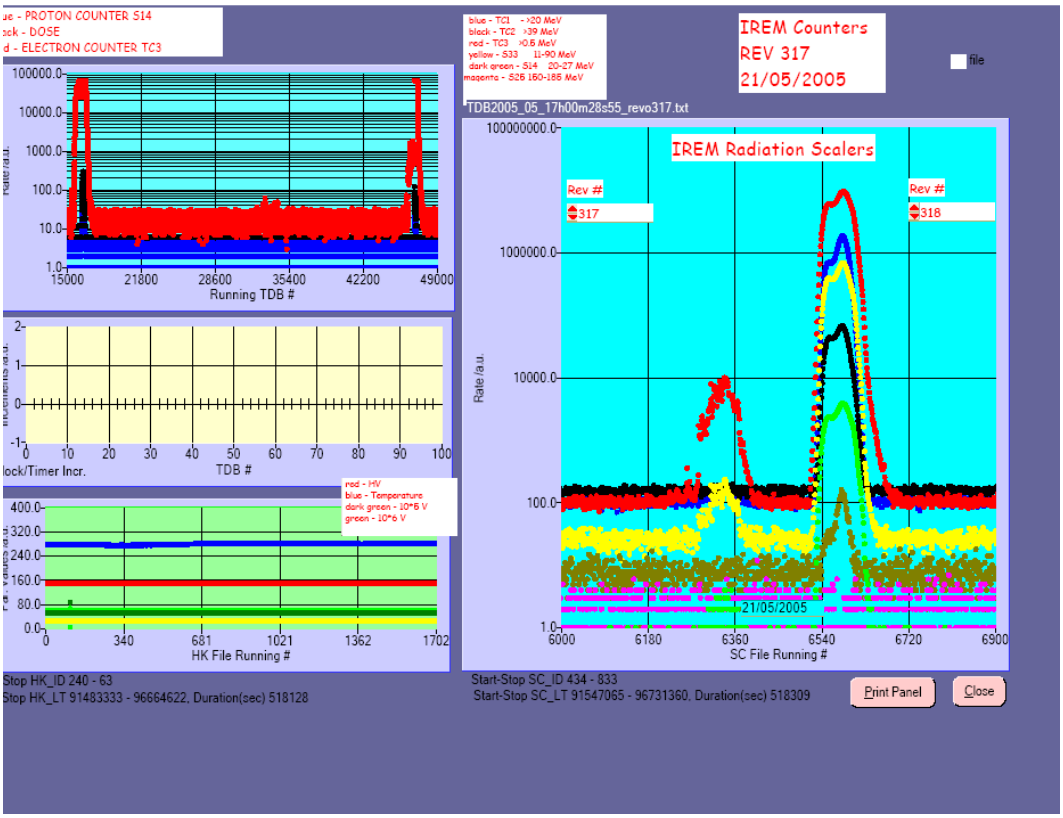
Nothing to report.

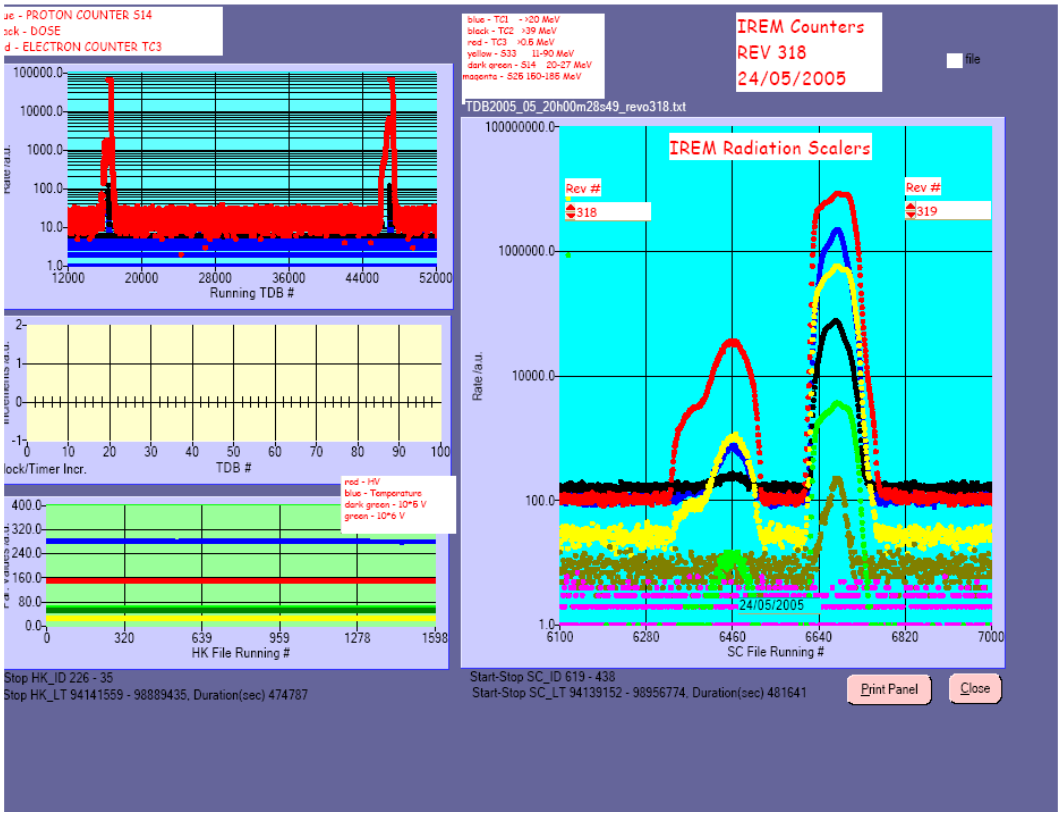
Electron Belts

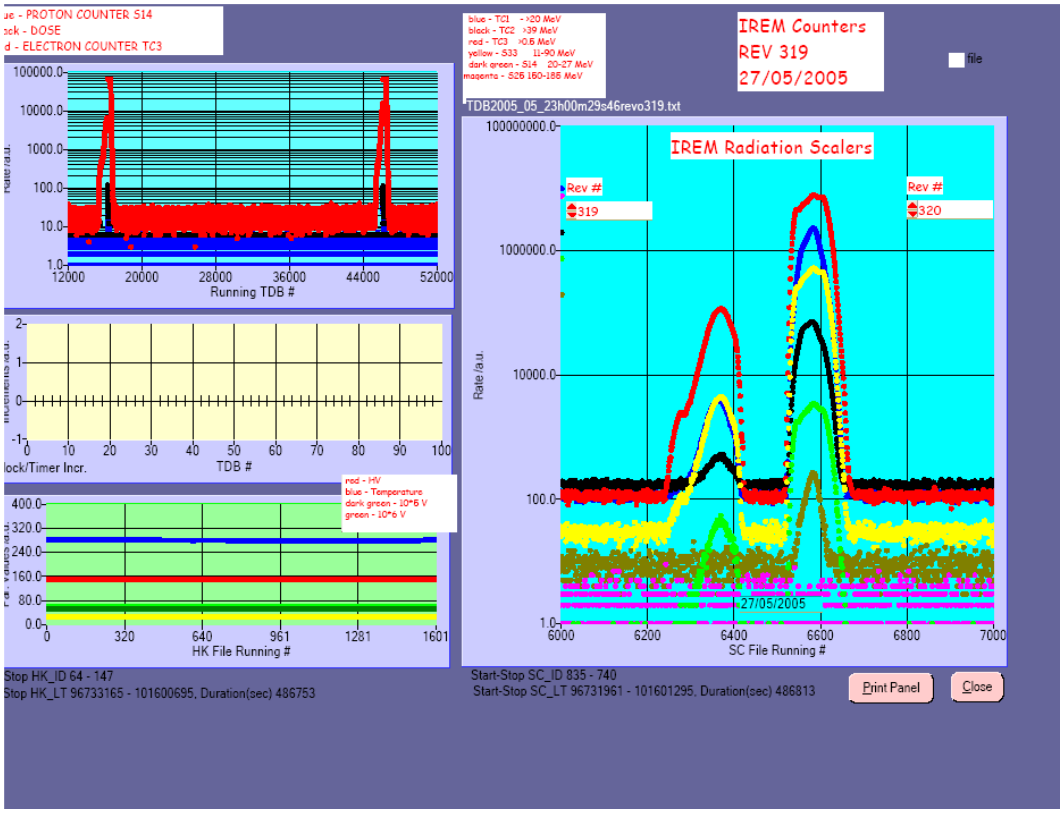
REV	S/C BCPKT (electron)	Electron CUT-OFF Observed Entry/Exit	Observed Entry/Exit Altitude [Km]	Electron CUT-OFF Predicted Entry/Exit	Predicted Entry/Exit Altitude [Km]
317	RAD_ENTR R 2005-05-21T08:28:29Z	2005-05-21 09:52:16	49060.3	2005-05-21 09:23:26	52683
318	RAD_EXIT R 2005-05-21T17:43:58Z	2005-05-21 16:45:04	<31361.4	2005-05-21 16:33:26	29094
318	RAD_ENTR R 2005-05-24T08:14:14Z	2005-05-24 09:14:33	52164.3	2005-05-24 09:05:39	53382
319	RAD_EXIT R 2005-05-24T17:29:56Z	2005-05-24 16:22:41	29757.0	2005-05-24 16:25:39	29828
319	RAD_ENTR R 2005-05-27T08:01:30Z	2005-05-27 09:09:45	<51689.8	2005-05-27 08:55:39	53531
320	RAD_EXIT R 2005-05-27T17:16:40Z	2005-05-27 16:08:25	29763.3	2005-05-27 16:15:39	29695

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:

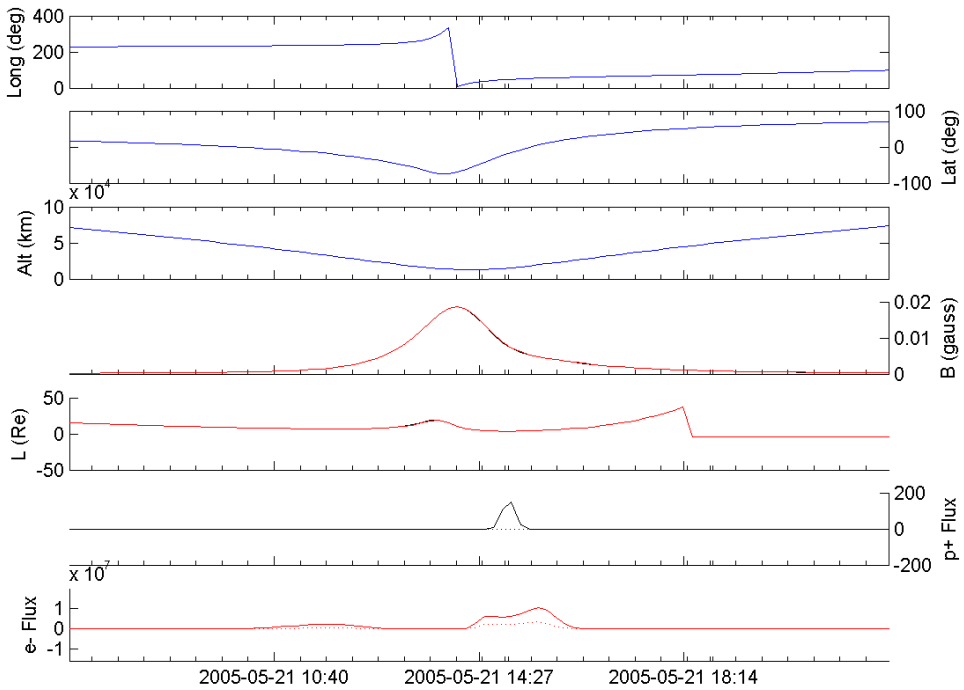




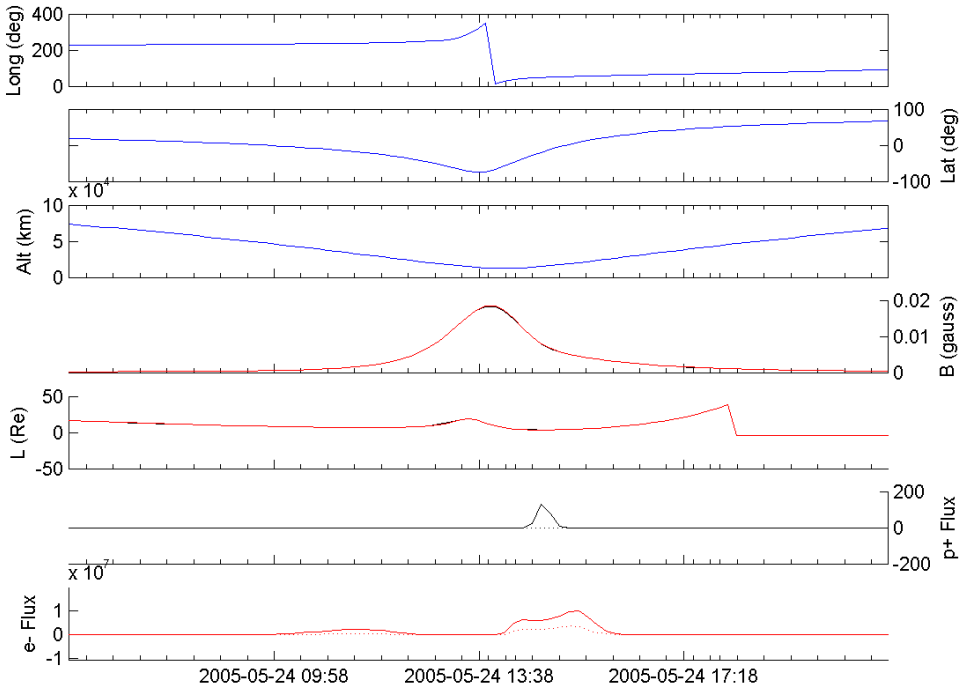


IREM Predicted Radiation Belt Passages:

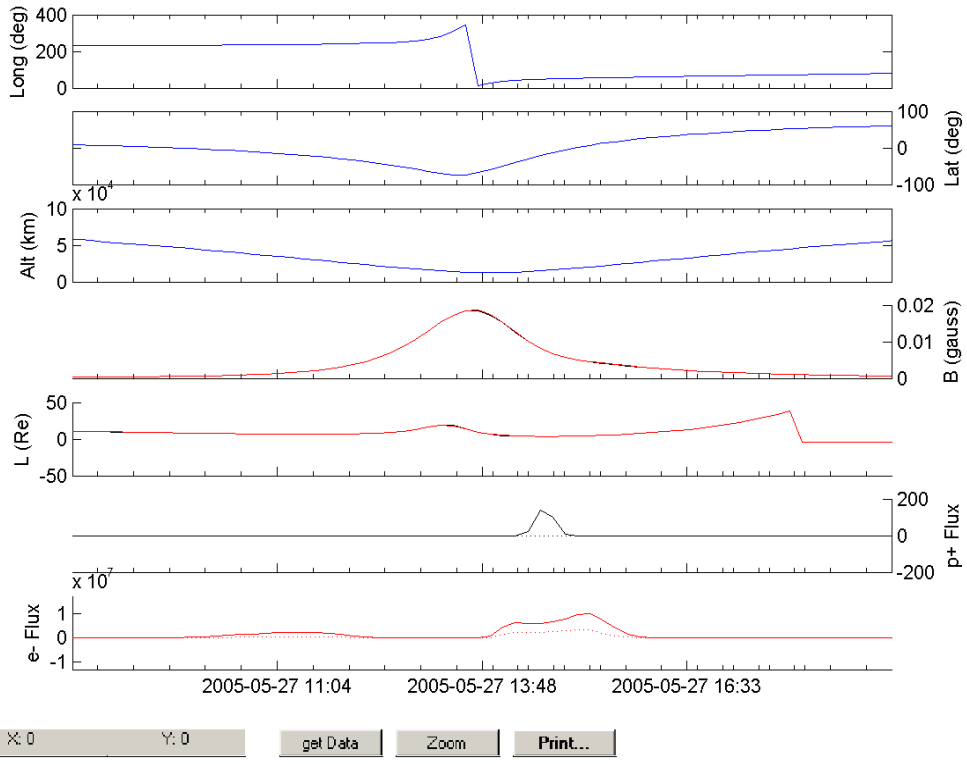
Rev 317



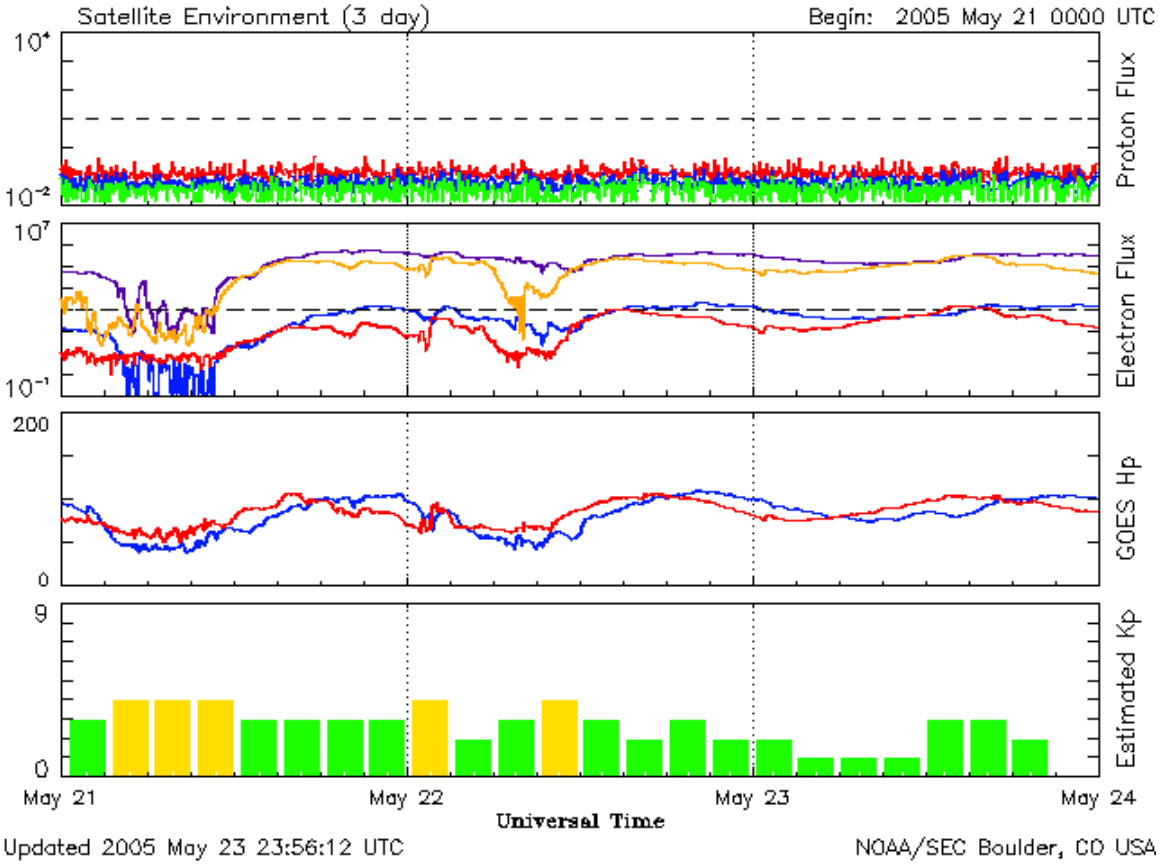
Rev 318

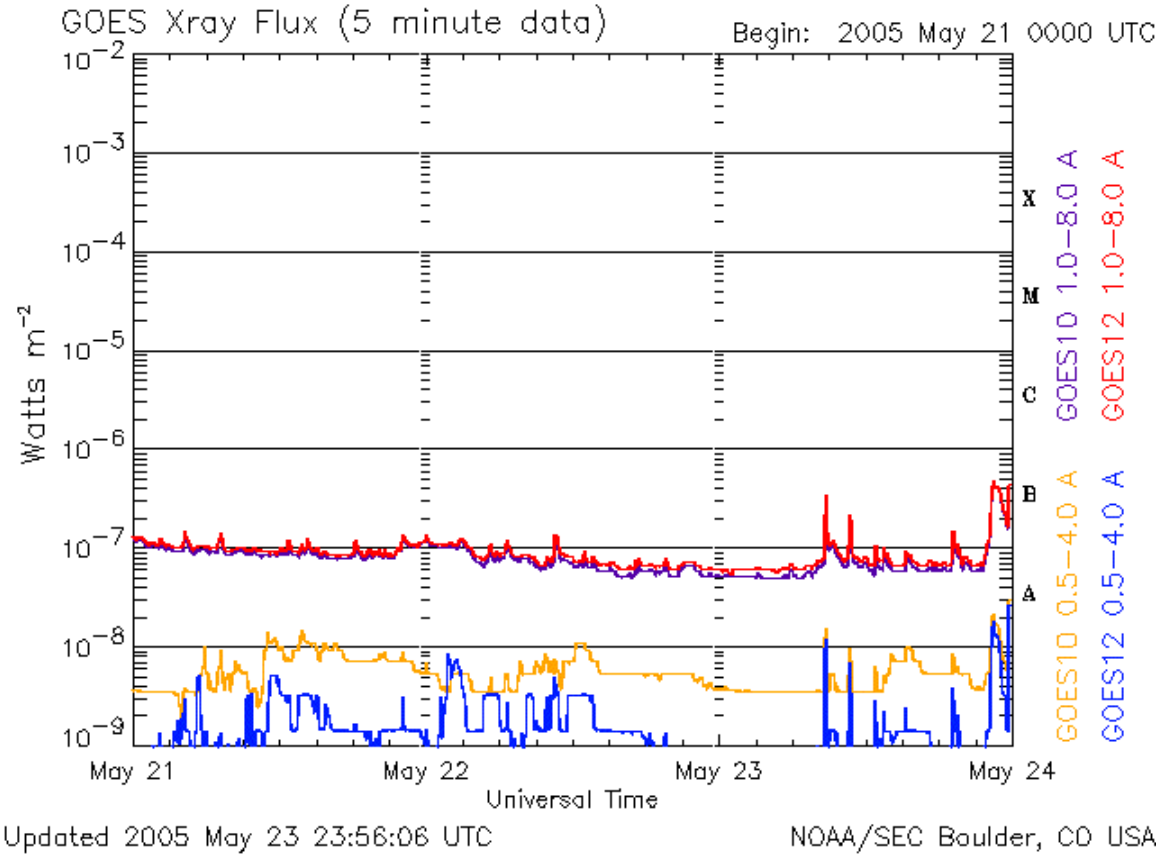


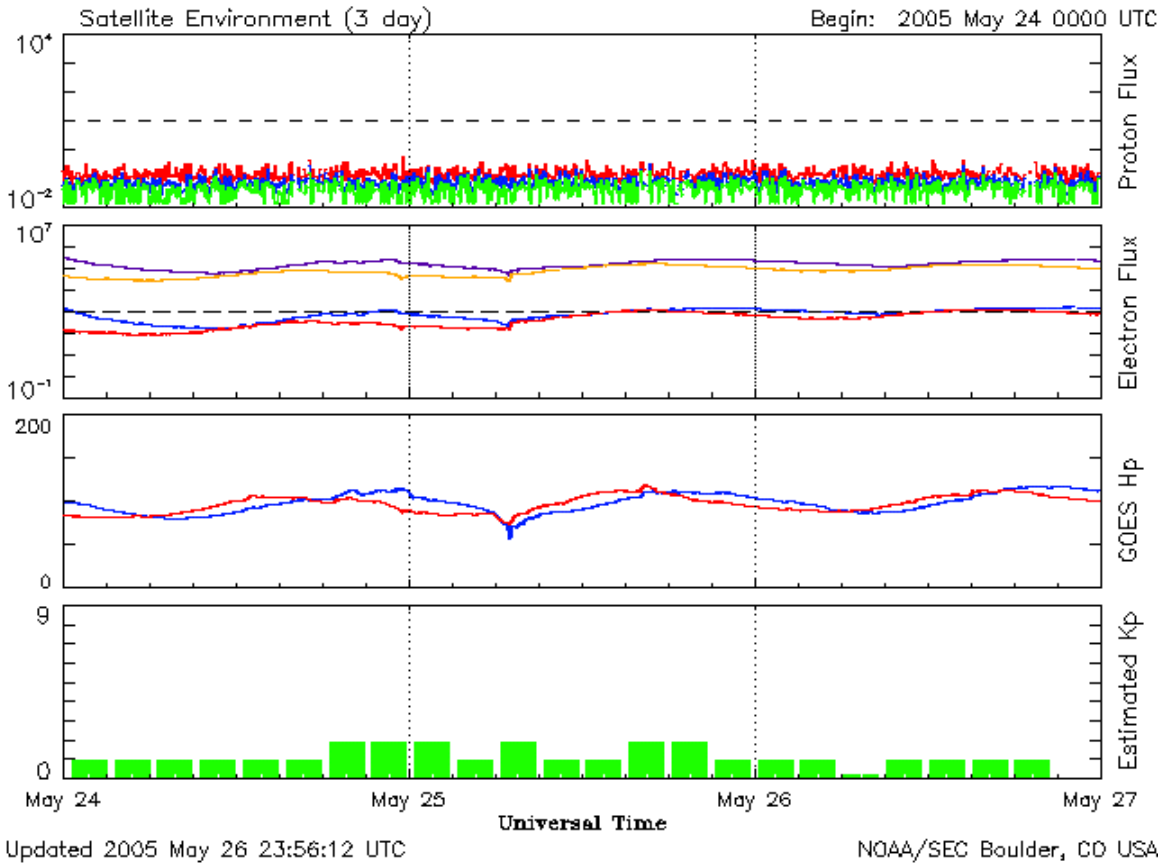
Rev 319

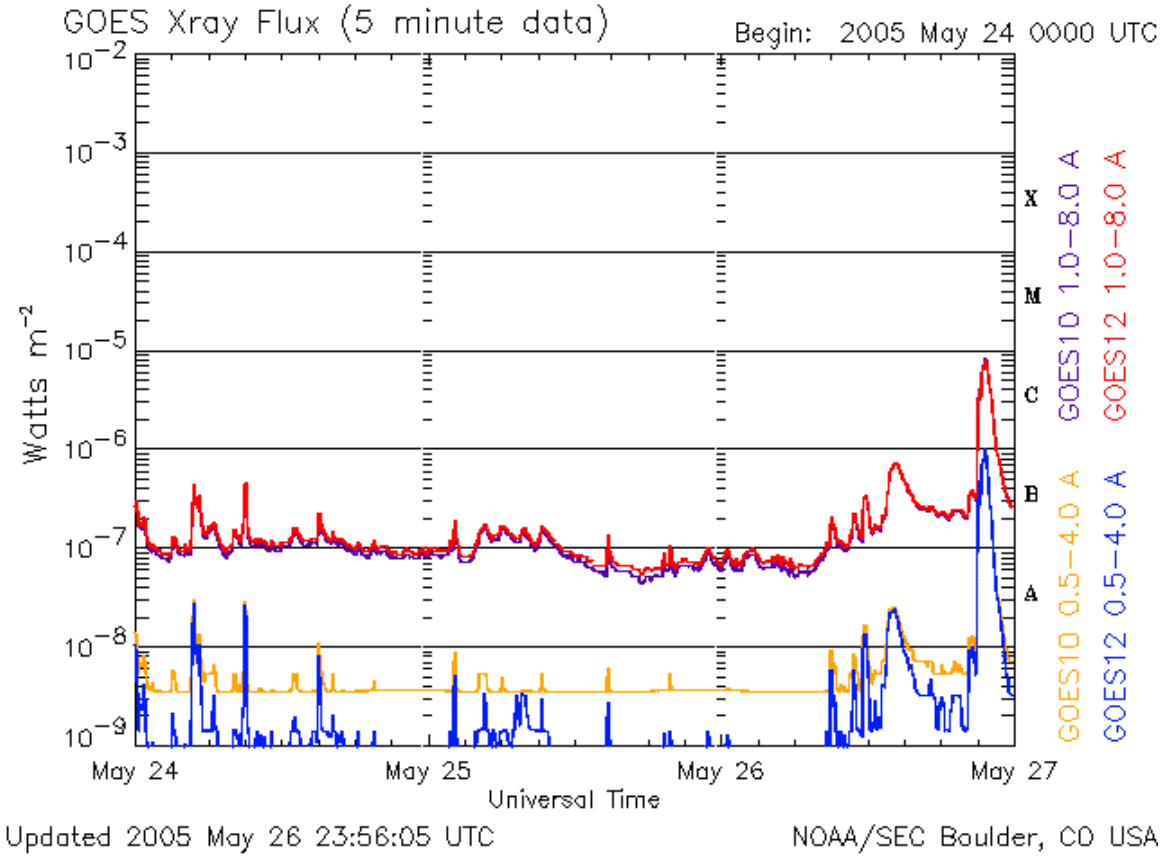


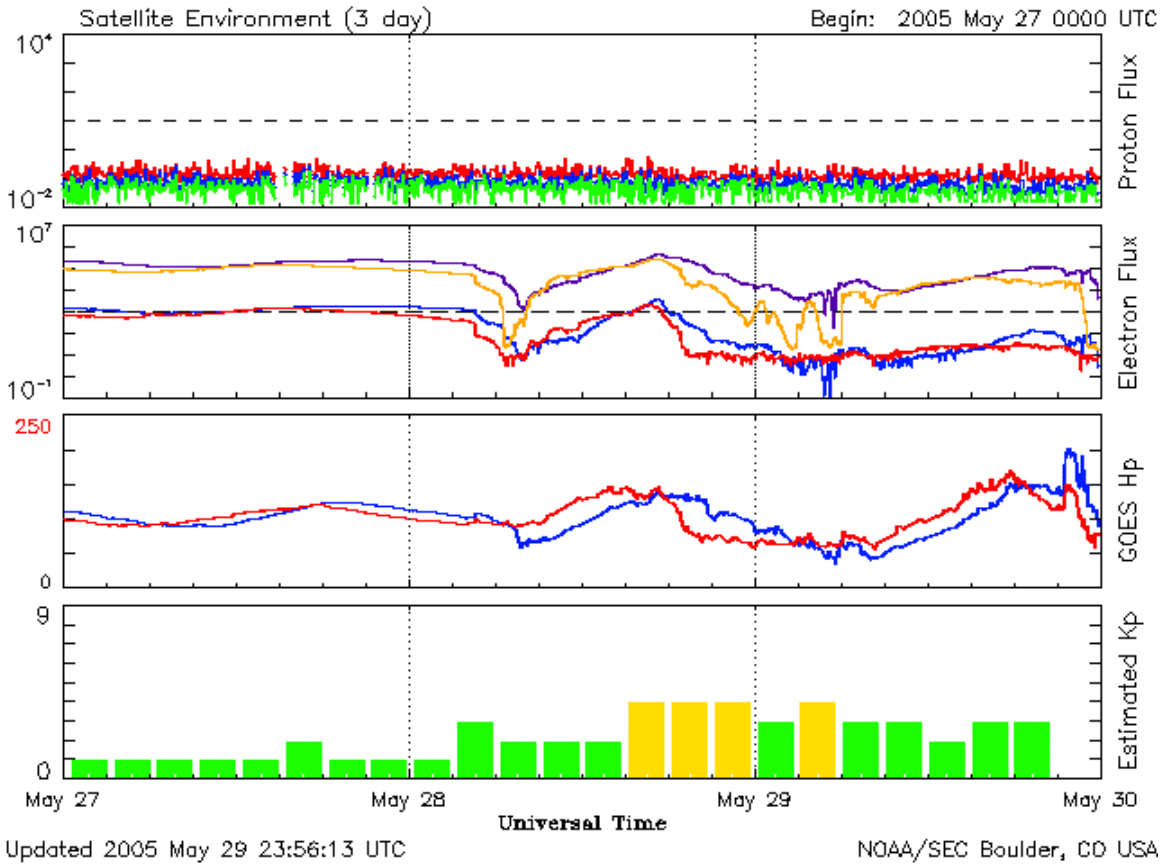
SEC-GOES Observed Particles Fluxes:

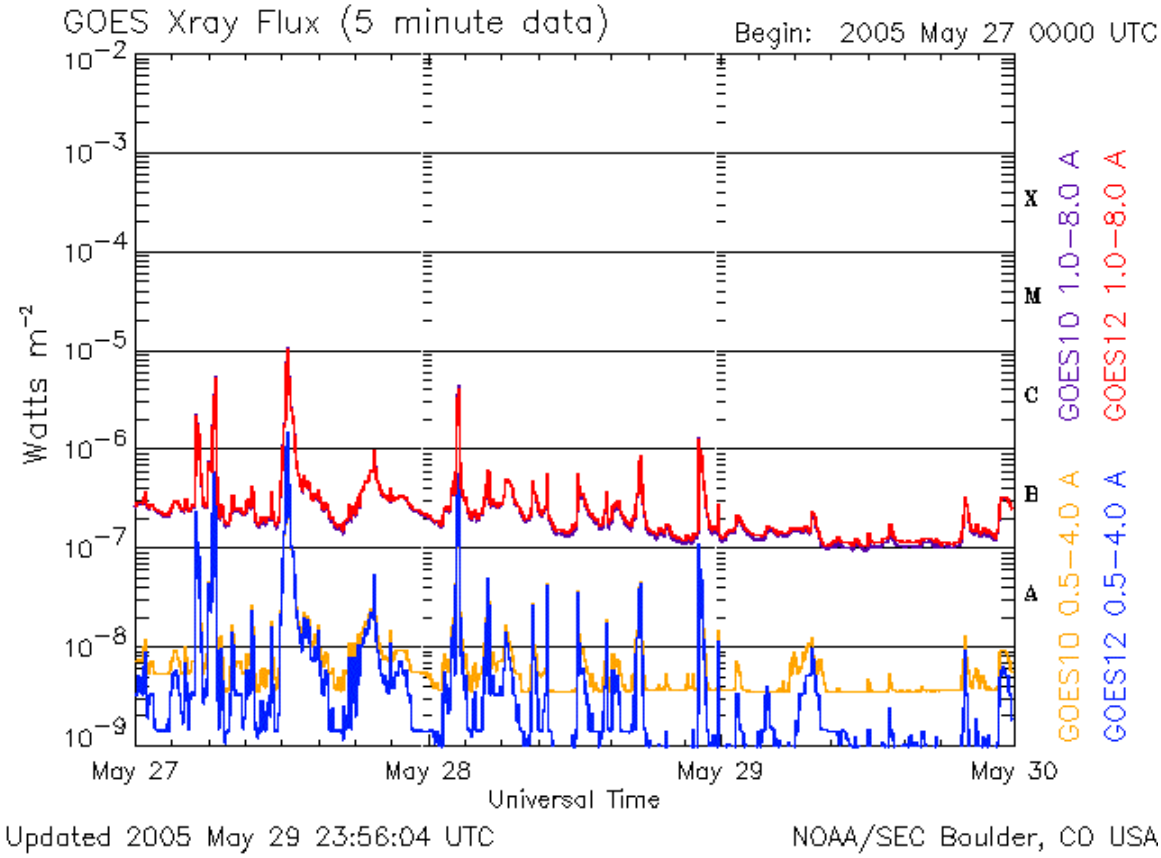





Satellite Environment (3 day)
Begin: 2005 May 24 0000 UTC
Proton Flux
Electron Flux
GOES Hp
Estimated Kp
May 24
May 25
May 26
May 27
Universal Time
Updated 2005 May 26 23:56:12 UTC
NOAA/SEC Boulder, CO USA


GOES Xray Flux (5 minute data)
Begin: 2005 May 24 0000 UTC
Watts m-2
GOES10 1.0–8.0 A
GOES12 1.0–8.0 A
GOES10 0.5–4.0 A
GOES12 0.5–4.0 A
X
M
C
B
A
May 24
May 25
May 26
May 27
Universal Time
Updated 2005 May 26 23:56:05 UTC
NOAA/SEC Boulder, CO USA


Satellite Environment (3 day)
Begin: 2005 May 27 0000 UTC
Proton Flux
Electron Flux
GOES Hp
Estimated Kp
May 27
May 28
May 29
May 30
Universal Time
Updated 2005 May 29 23:56:13 UTC
NOAA/SEC Boulder, CO USA


GOES Xray Flux (5 minute data)
Begin: 2005 May 27 0000 UTC
Watts m-2
GOES10 1.0–8.0 A
GOES12 1.0–8.0 A
GOES10 0.5–4.0 A
GOES12 0.5–4.0 A
X
M
C
B
A
May 27
May 28
May 29
May 30
Universal Time
Updated 2005 May 29 23:56:04 UTC
NOAA/SEC Boulder, CO USA