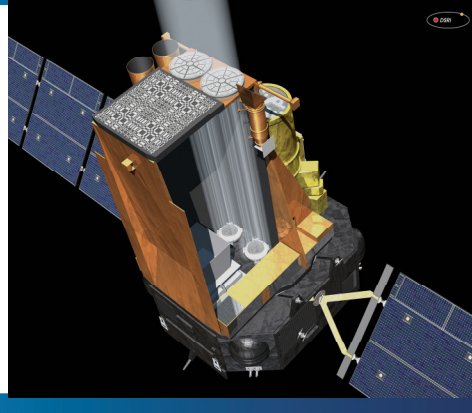


JEM-X Status

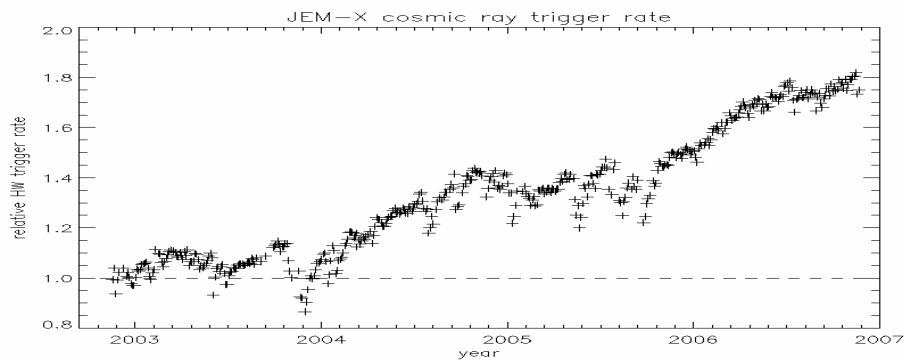
S. Brandt on behalf of the JEM-X team

DNSSC, November 2006



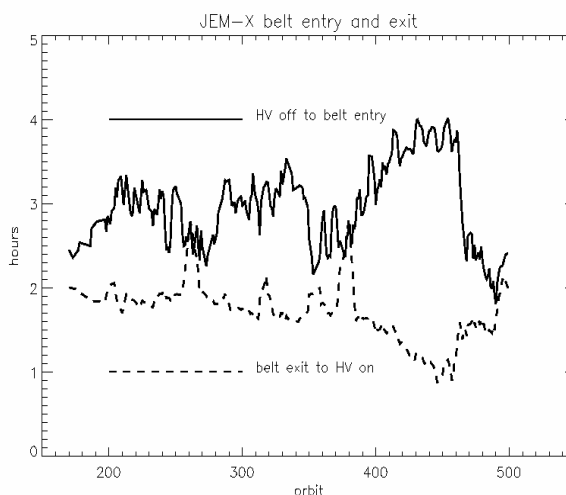
JEM-X/INTEGRAL Particle Background

- HW triggers have gone up by about 80% since launch (solar min)
- No impact on accepted events (TM load), as rejection criteria work well
- However, increases dead time, from ~12% to ~17%
- We may experience a higher rate of anode loss due to this (No/???)



Shift of activation and deactivation relative to orbit

- The activation of JEM-X has been moved by 0.5 hours to avoid high background at the beginning of each orbit
- HV-off has been moved by 1 hour
- The new time line better fits the current orbit-belt configuration

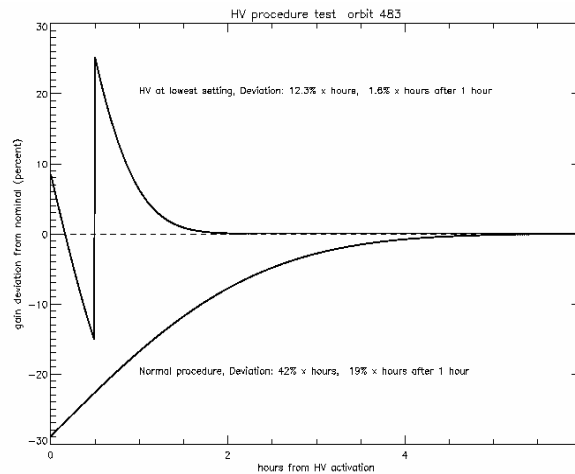


Performed calibrations and tests

- Crab calibration in orbit 483
- JEM-X1 at nominal HV to verify calibration.
- JEM-X2 activated with "old" selection criteria (as used prior to orbit 170). Test with 3 HV settings to determine electronic efficiency for this configuration.
- Test performed with JEM-X2 to determine effects of leaving HV at lowest level during radiation belt passage
- Test to validate the use of less than all four anode sections of the JEM-X detector

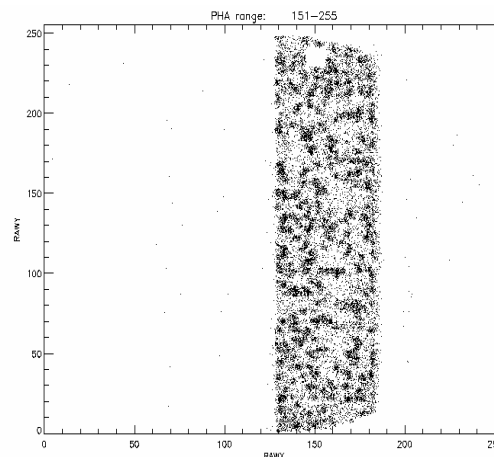
Test of HV activation procedure

- Leaving the HV at lowest setting.
- Pro:
 - Less deviation from nominal gain
- Contra:
 - 2 step activation procedure to control overshoot
 - Some risk with HV on during belt passage
 - Better gain corrected response available
- Conclusion: leave it as is (for now)



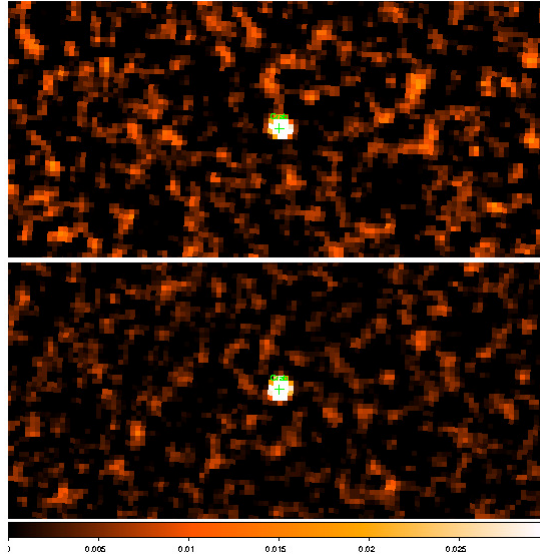
Test with only one anode section enabled

- JEM-X may operate with part of the detector enabled
- Purpose of test was to test this on a real source
- Mode may be considered:
 - In case of heavy hot-spot activity
 - For observing extremely bright sources (> 20 Crab)
- Use of data is (almost) straight forward (some edge effects to be expected)
- Conclusion: this mode may be used, if really needed



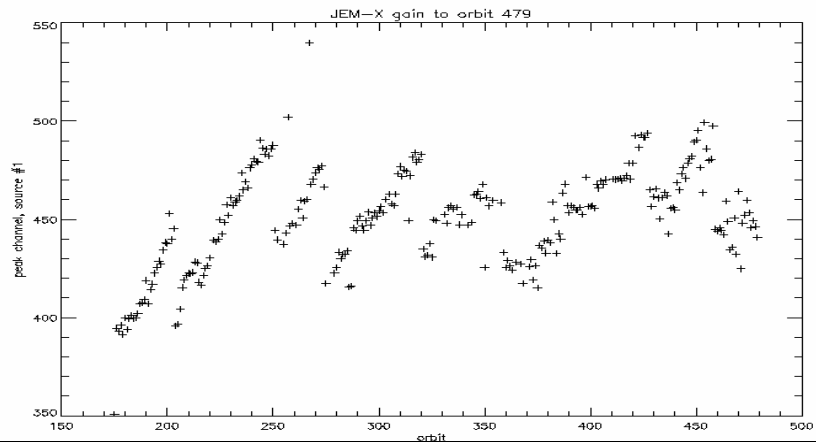
Anode section test

Figure shows zooms of sky images of two 1 ks observations with the Crab on-axis. Upper panel has only 1 anode section enabled, and the lower panel has all four section enabled. Scale is adjusted to show the increased statistical error in the upper image



JEM-X1 Gain History and Anode Loss

- JEM-X1 DV setting was most recently lowered in orbits 407 and 459
- 6 anode strips (of 256) lost in past year (51 anodes affected, 28 dead (4 prelaunch), 12 neighbor, 9 unstable or low)
- No obvious correlation between anode loss and gain



JEM-X gain - the Future

- ~1% increase per orbit relative to original gain
- Gain is reduced 12-14% (relative) per step of high voltage
- After 250 orbits of use gain has increased by factor of 3
- At the end of 2010 (and continued use) we will stand at a factor ~10
- We must foresee ~10 steps of HV reduction
- We also expect further changes of the spatial gain map
- Possibly (re)introduce more complicated HV activation procedure to counteract under-shoot and overshoot effects
- Gain variations due to temperature:
 - Was: 1% per degree
 - Is now: ~2.5% per degree

The future: Problems of Gain Correction

- Decay of calibration sources (Cd^{109} half-life 1.24 years and Fe^{55} 2.7 years)
- End of 2010 Cd sources will be reduced to 1.1% and Fe source to 13% of launch activity
- Currently Cd sources are around 1 c/s (or 15% of prelaunch)
- Solution:
 - combine several calibration spectra
 - Rely on "templates" for orbit (gain depends on HV history and temperature)
 - Use Xe line for gain correction



JEM-X Onboard SW

- DPE and DFEE software and hardware performs well
- Few cases of DFEE SW recovery (memory CRC error), when DFEE is switched off and on again in eclipse season (INT_SC-154)
- Caused by SEU or SW overwriting memory location (??)

JEM-X1 reported recovery problems

Revolution	Date	Segment
205	20-06 2004	B000-CFFF
206	23-06 2004	B000-CFFF
262	08-12 2004	B000-CFFF
316	18-05 2005	B000-CFFF
376	14-11 2005	B000-CFFF
492	26-10 2006	B000-CFFF



Conclusions

- JEM-X is stable (SW+HW)
 - Hot spot activity is low
 - Particle background is relatively high
 - Better understanding of sensitivity and resolution as function of gain is accumulating
 - ...all is well
-
- Overview of JEM-X count rates and gain per orbit is found at:
<http://www.spacecenter.dk/~sb/JEMX/HK.htm>