Technical University of Denmark

JEM-X Status, February 2009

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Gain evolution

- JEM-X1 DV setting was lowered in orbit 533 to DV=73, to DV=72 in orbit 623, and to DV=71 in orbit 747
- Next lowering is expected towards 2009 (if JEM-X1 is still the unit used)
- Gain dependence on detector temperature has increased from 1% per degree to almost 4% per degree
- This increased temperature dependence may force earlier lowering of DV

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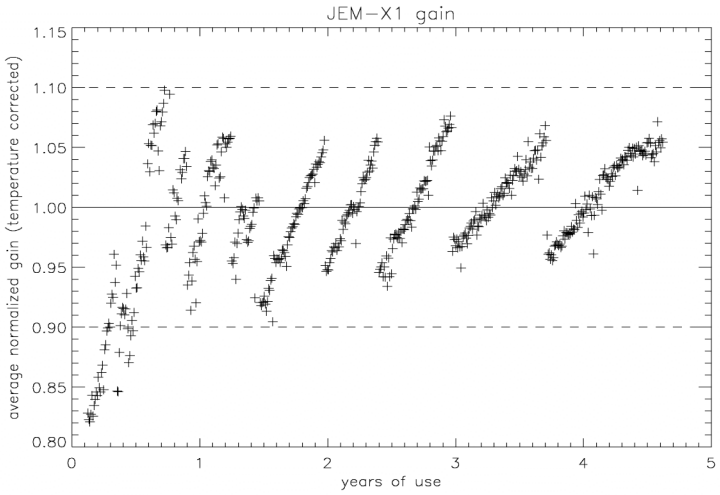
Gain evolution to orbit 735



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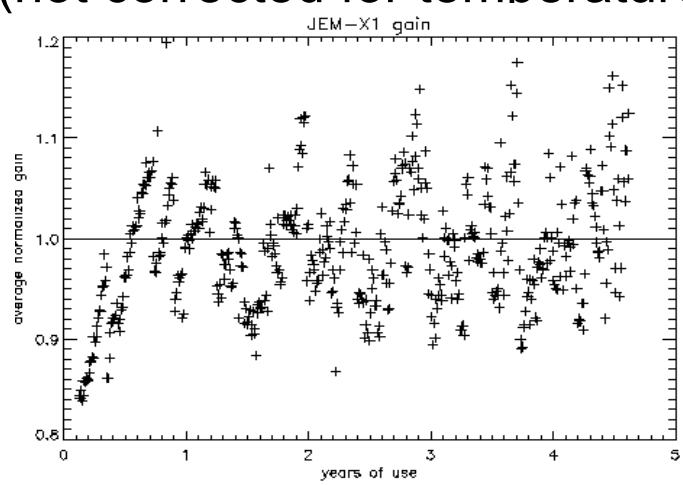
Gain evolution to orbit 735 (not corrected for temperature)



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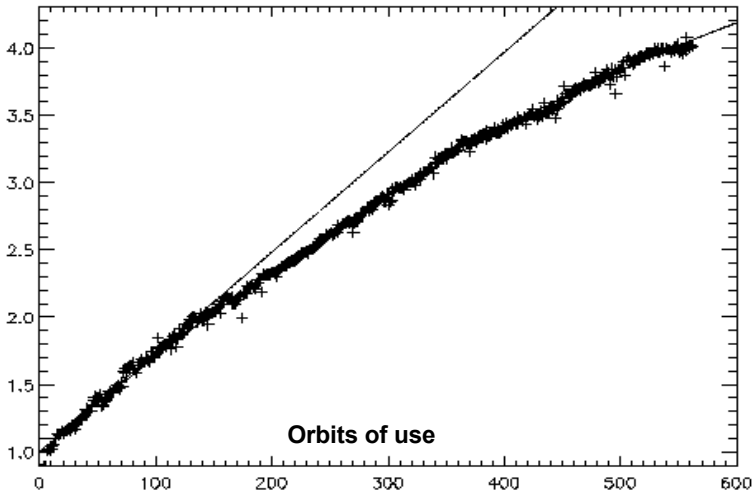
Total gain increase

• Increase is slowing down from 0.8% to 0.4% oer orbit

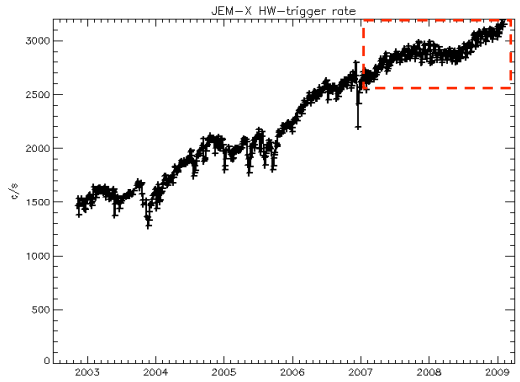


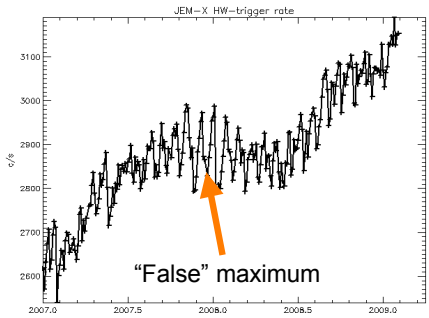
Anode status

- ~So far – on average 2-3% loss per year
- However, no loss during ~12 months period in 2007-08!!
- JEM-X1 (~550 orbits of use)
  - 56 of 256 anodes affected
    - 34 dead (4 pre-launch)
    - 14 neighbor
    - 11 unstable or low
- JEM-X2 (~175 orbits of use)
  - 51 of 256 anodes affected
    - 33 dead (9 pre-launch)
    - 15 neighbor
    - 3 unstable or low

JEM-X particle trigger rate

- New solar cycle has started in 2008, but solar activity is **VERY** low
  - But no serious decline in particle background yet
  - "False" maximum seen in the particle rate seen at the end of 2007
  - (Note that this is **not** the background rate in JEM-X science data)





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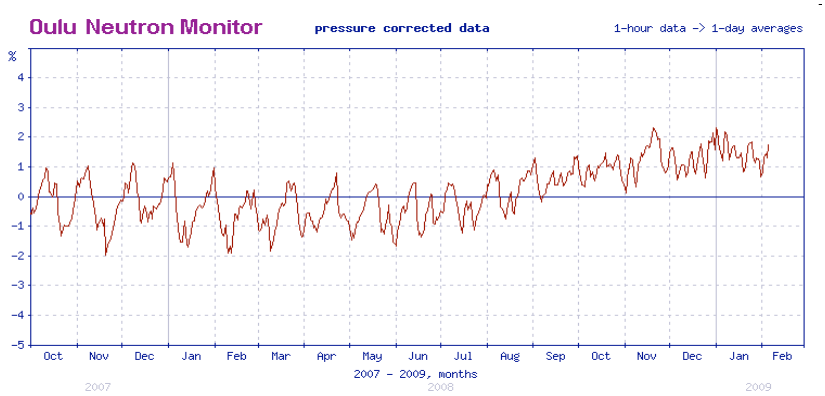
Oulu neutron monitor



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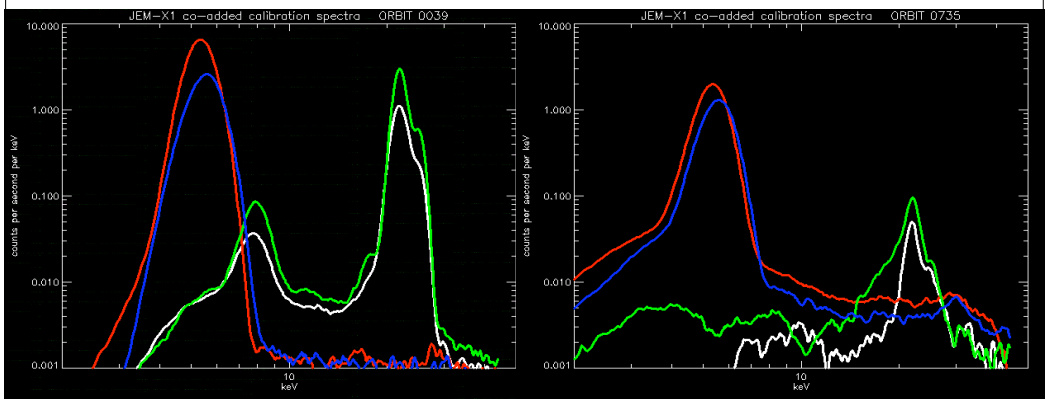
Calibration source decay

- Cd sources are down by a factor of ~28
- Fe sources are down by a factor of ~5



Switching from JEM-X1 to JEM-X2

- JEM-X1 has been the default instrument since rev. 170
  - JEM-X1 has operated 600+ revolutions
  - JEM-X2 has operated about 200 revolutions
- Consider switching at beginning of AO7
- Consider using both units when “the end is near”
  - Makes only sense when tm situation is improved to allow at least a 5+5 tm allocation

JEM-X issues

- Well known “restore of DFEE context” causing some problems during eclipse season
  - Dumping CRCs may pinpoint the problem area
- Will try to minimize DFEE off period during eclipse to avoid temperature effects on gain
- Electronic efficiency as function of gain is understood and measured
  - Full implementation in OSA 8 in the new version of j_ima_iros now being delivered to ISDC
- Calibration: Source detection limit is determined by systematics (detailed model of collimator and effects of lost anode strips)
  - Note that JEM-X is NOT a pixel detector

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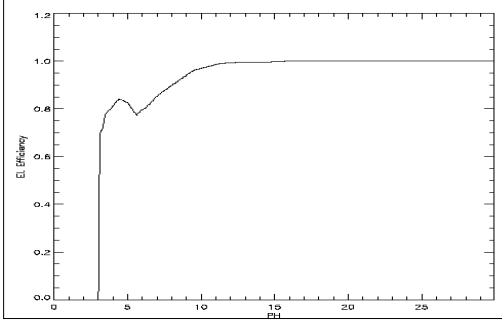
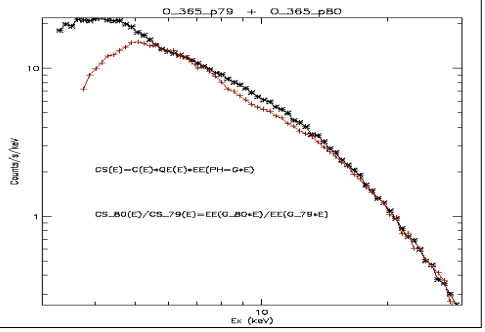
JEM-X electronic efficiency

- Electronic efficiency is function of PHA, not energy
- Crab count spectrum for two very different gain settings
  - Black – nominal
  - Red – 0.5 x nominal





JEM-X activation after eclipse

- JEM-X has lower gain when:
  - 1) HV has been switched off
  - 2) Detector is cold
- We see effects of 1) at start of each orbit
- We see both when DFEE is switched off in eclipse
- Minimize the second effect by making the DFEE off as short as possible

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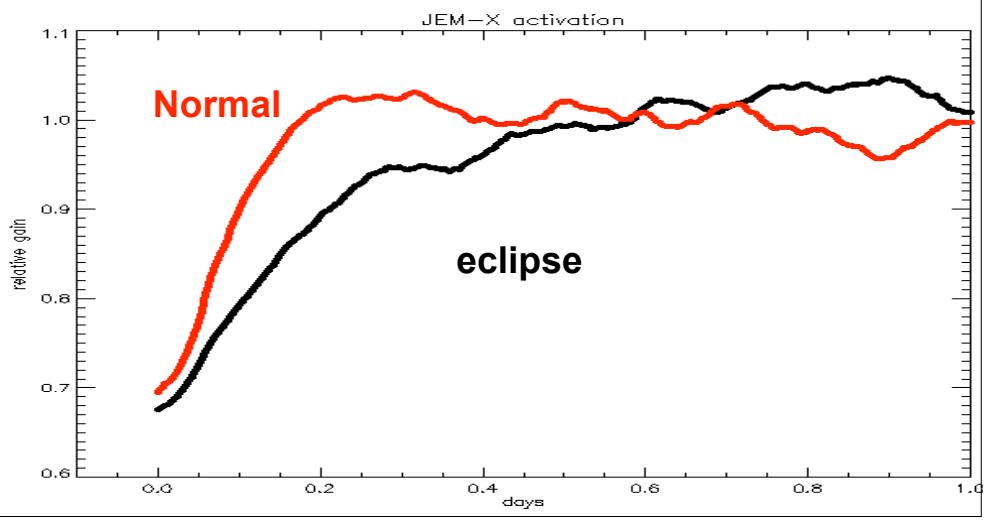
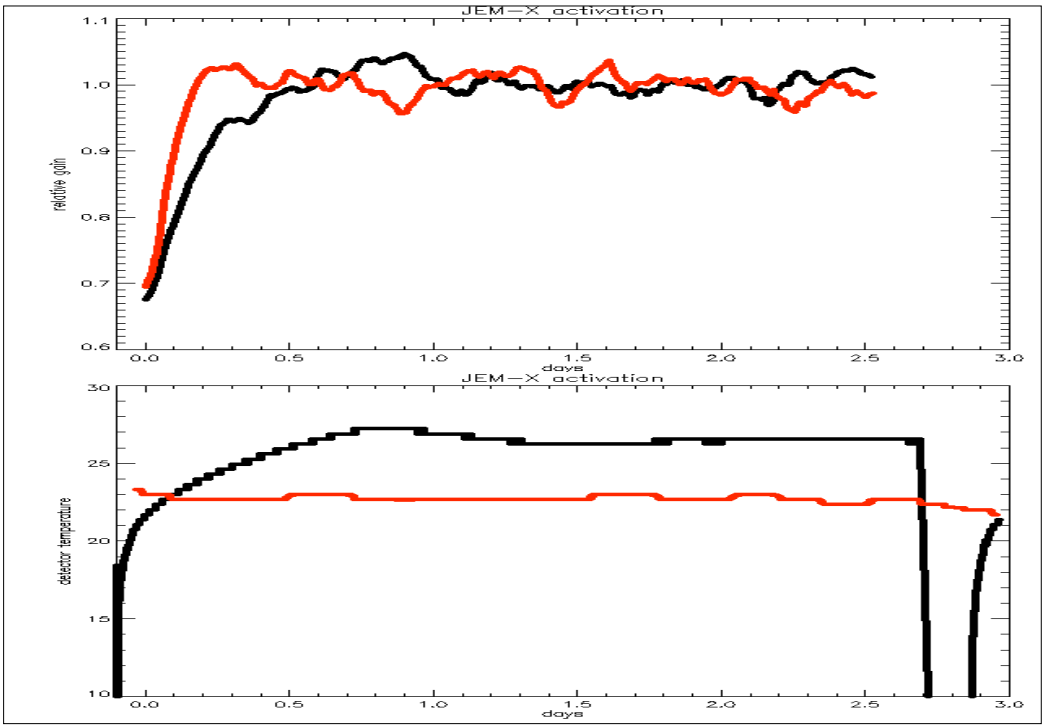
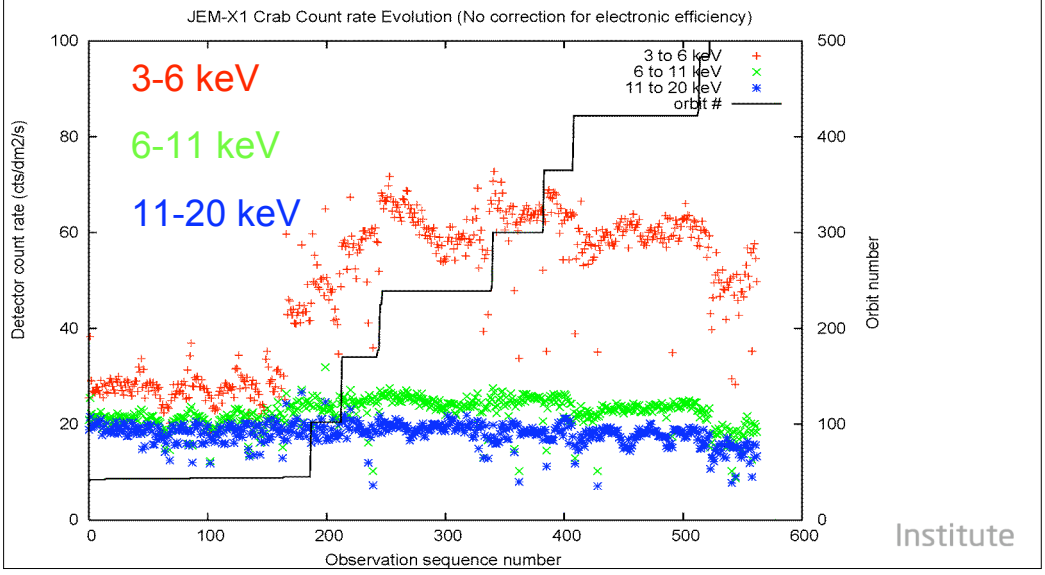
Gain during eclipse season





JEM-X1 Crab count rates

(no electronic efficiency correction)



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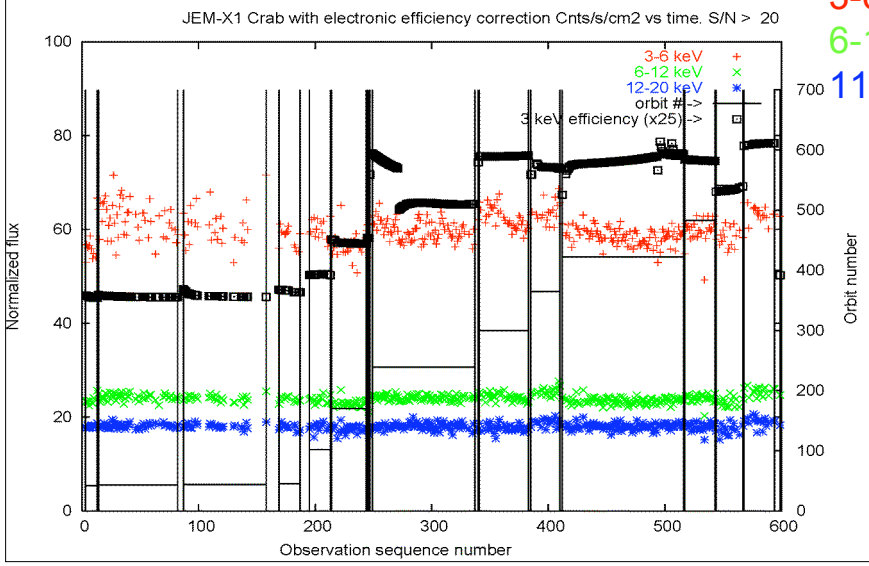
JEM-X1 Crab count rates

(including electronic efficiency correction)



3-6 keV
6-11 keV
11-20 keV

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Conclusion

- JEM-X is running smoothly
- Gain evolution is progressing (as expected)
  - Increased temperature sensitivity gave gain fitting a hard time in orbits with strong temperature variations
  - New version of j_cor_gain handles this much better
  - Switch from JEM-X1 to JEM-X2 is foreseen by start AO7 (late 2009) to even the “wear” on the detectors
- We expect/hope INTEGRAL to operate through 2012 (and longer?)

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