

Technical University of Denmark



JEM-X Status, December 2009

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National Space Institute

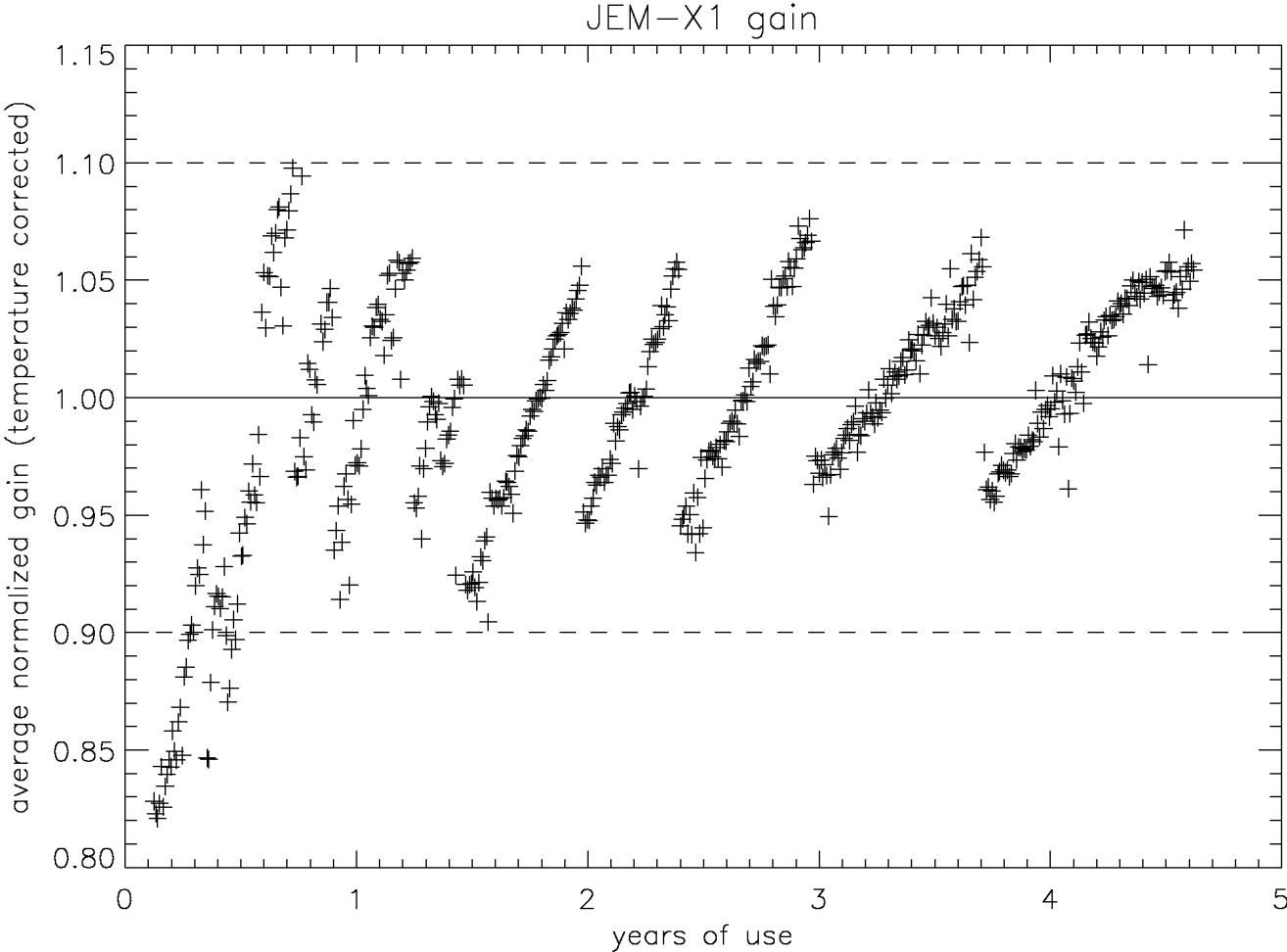
JEM-X2 new default unit

- Since revolution 856 (Oct 16, 2009) JEM-X2 is the default JEM-X unit
- JEM-X1 was used from rev. 170-855 and has now been used for 700+ revolutions (almost 6 years of use)
- JEM-X2 had been used for ~200 revolutions (350 revolutions left till end of 2012)
- Both units have been used for all Crab calibrations
- Most recently both units were used during SPI annealing, as TM allocation allowed
- When 6-8 TM packets more become available we will use both units

Gain evolution

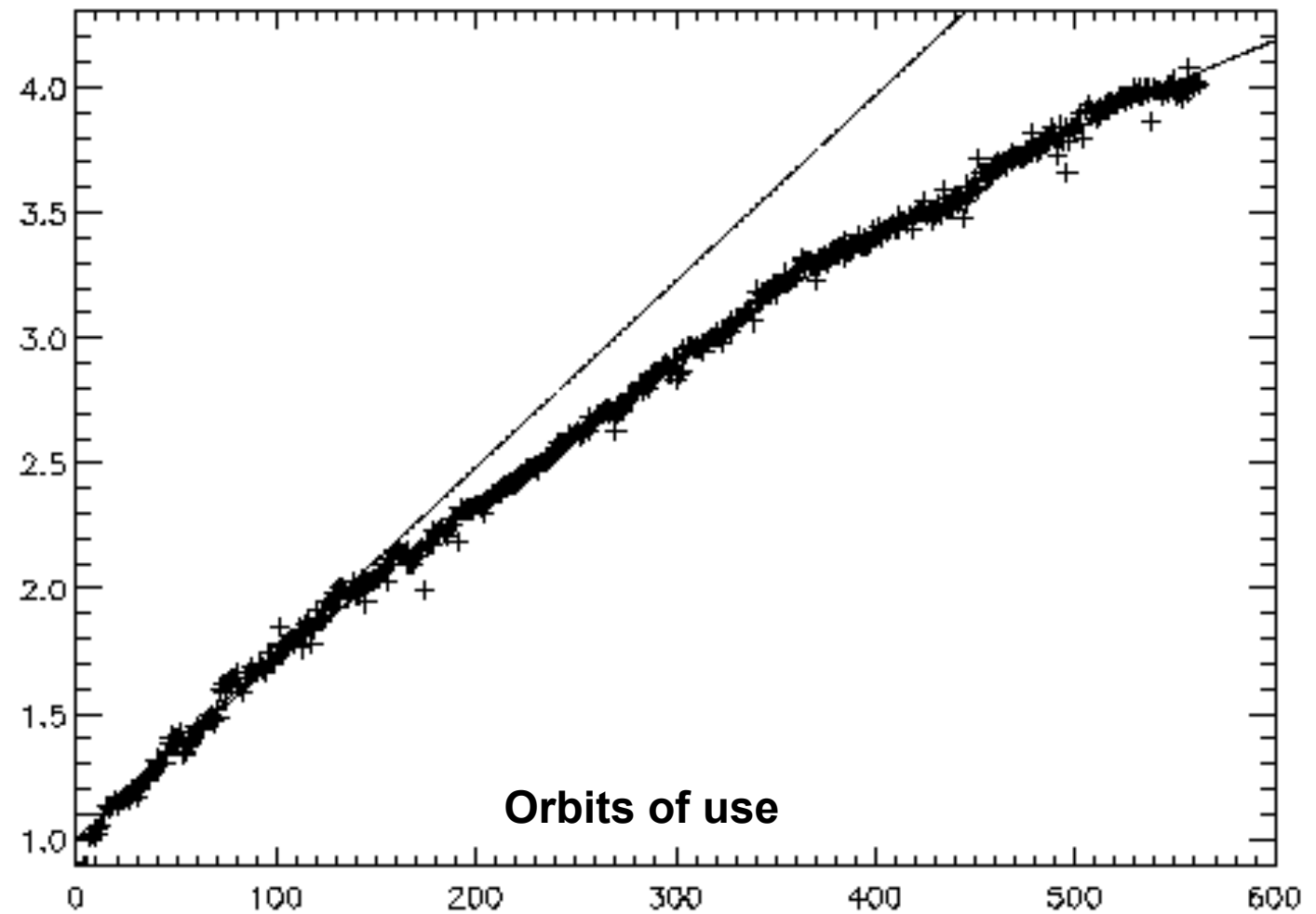
- JEM-X1 DV setting was lowered in orbit 747 to DV=71 (~710 Volts)
- When JEM-X1 started as default instrument in orbit 170, we had DV=81 (~810 Volts)
- Gain (at constant HV) has increased by a factor of ~4
- Gain dependence on detector temperature has increased from 1% per degree to ~4% per degree
- JEM-X2 DV setting is soon to be lowered, rev. 878

Gain evolution to orbit 735



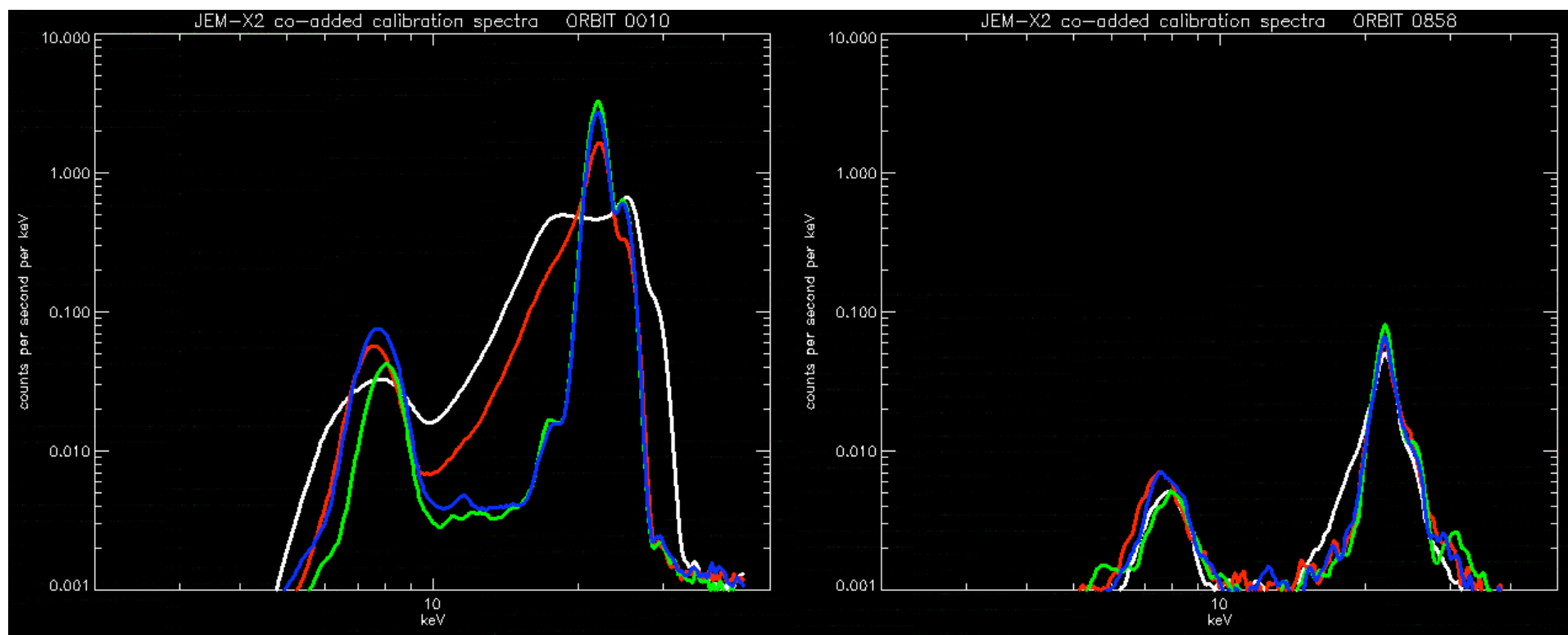
Total gain increase

- Increase is slowing down from 0.8% to 0.4% per orbit



JEM-X2 calibration spectra (rev. 10 and 858)

- JEM-X2 has 4 Cd sources, which down by a factor of ~ 30
- Calibration spectra are integrated over longer time to fit the line
- Xe fluorescent line from detector gas at 29.6 keV also used

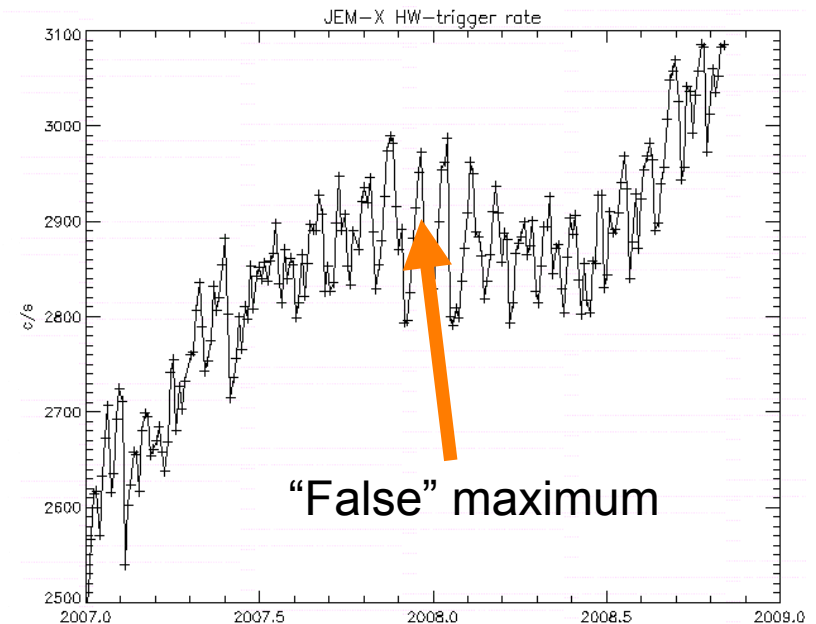
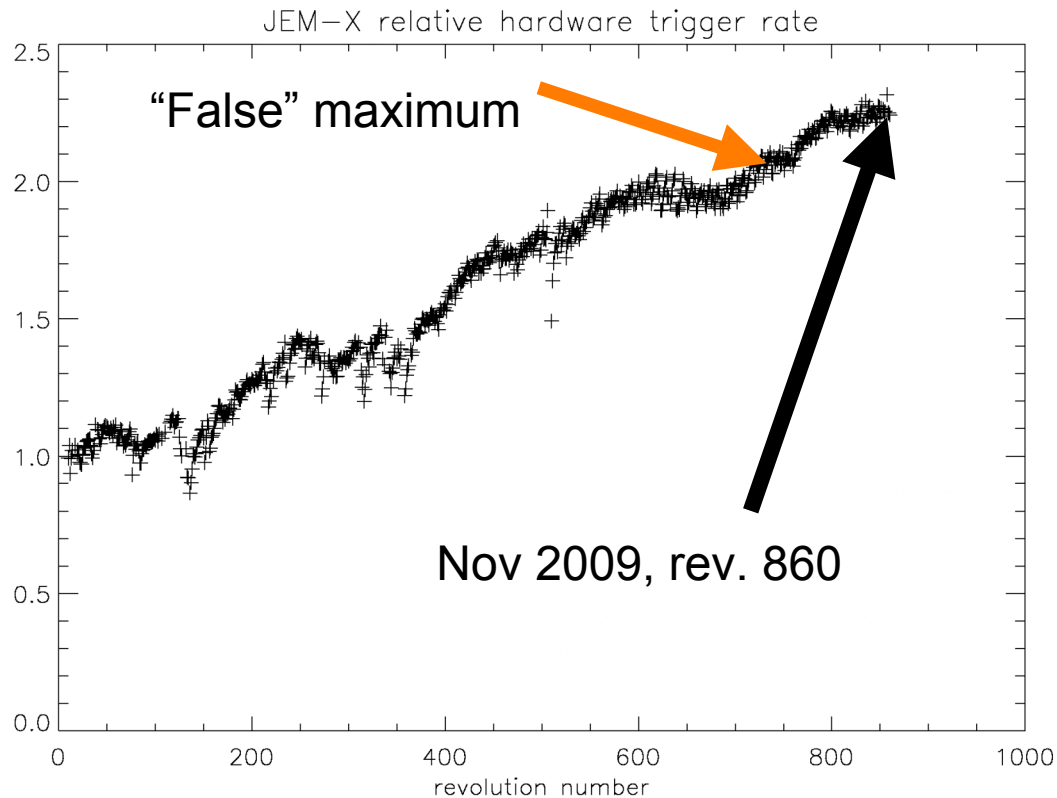


Anode status

- ~So far – on average 2-3% loss per year (256 anodes in total), but now about 1% per year
- However, no loss during ~12 months period in 2007-08
 - Two strips lost in 2008 and one recently in March 2009
- JEM-X1 (~700+ orbits of use)
 - 61 of 256 anodes affected (almost 25% of area)
 - 37 dead (4 pre-launch)
 - 13 neighbor
 - 11 unstable or low
- JEM-X2 (~200 orbits of use)
 - 51 of 256 anodes affected
 - 29 dead (9 pre-launch)
 - 16 neighbor
 - 11 unstable or low

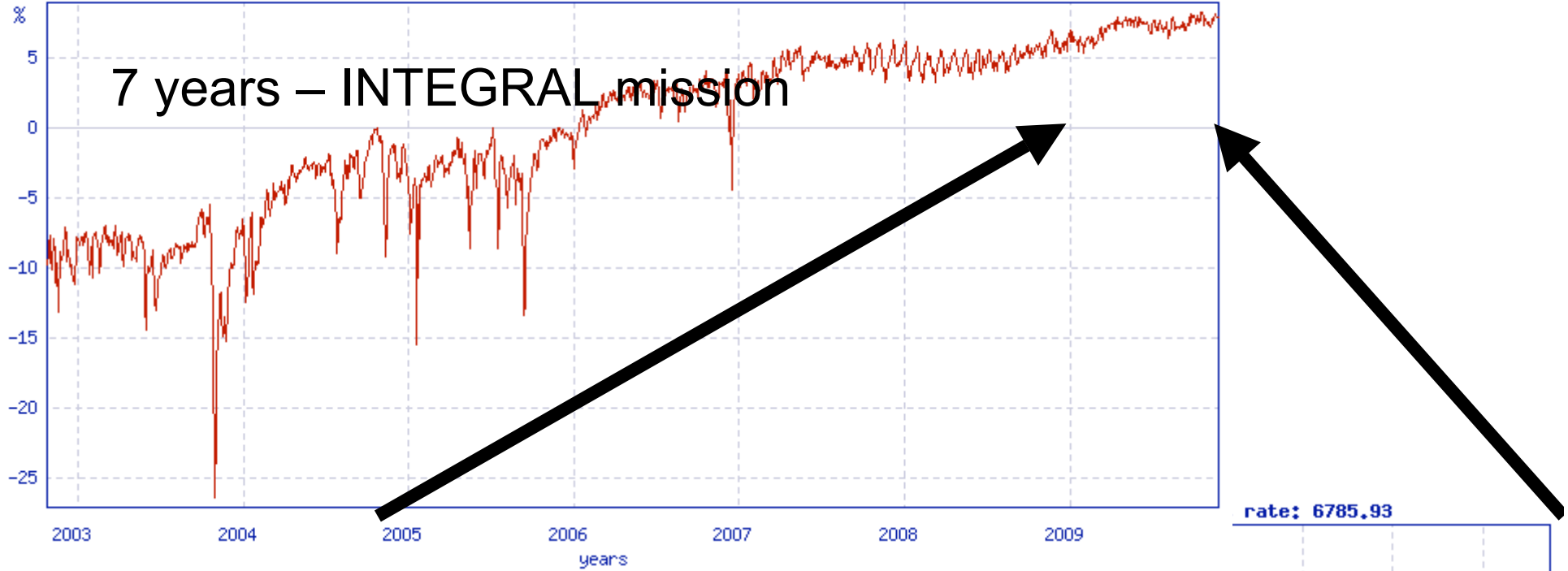
JEM-X particle trigger rate

- New solar cycle has started in 2008, but solar activity is still **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)
- Main effect of high particle is increased (from ~12% to ~22%) dead time, as the onboard processor is very busy rejecting particles (3000+ vs. 30 photons per sec)

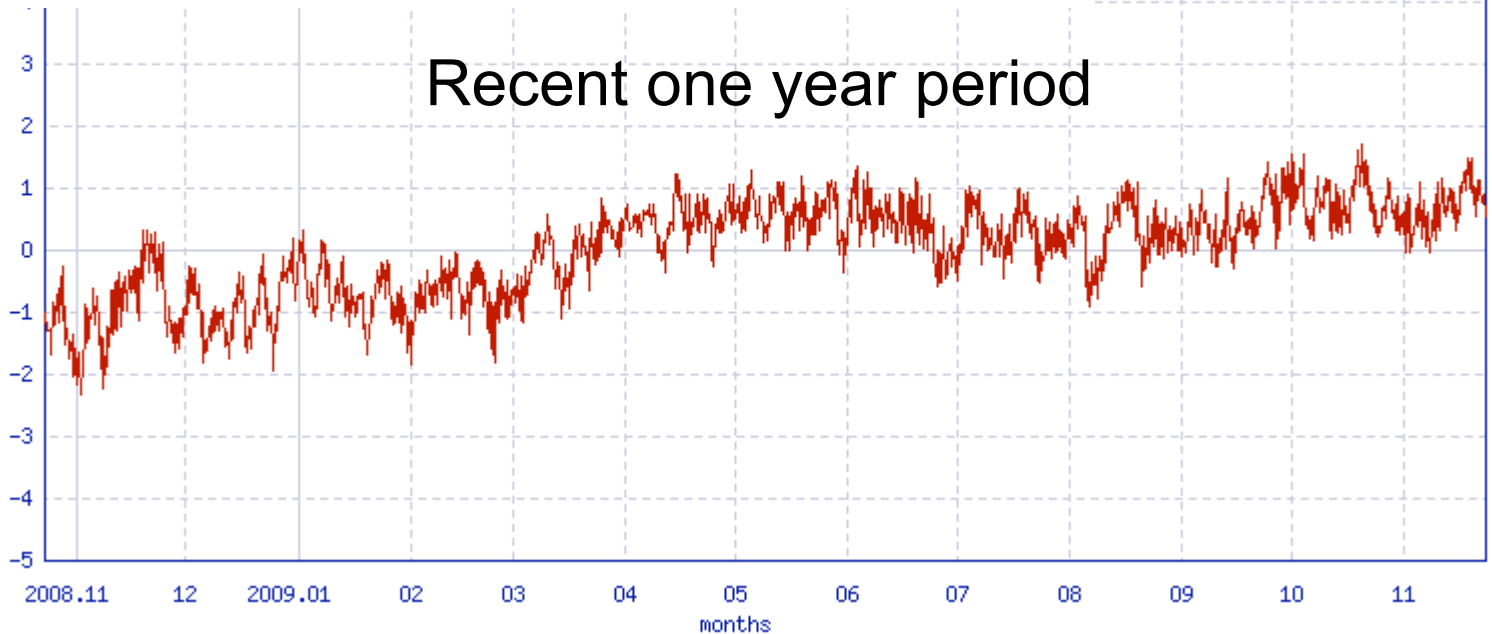


Oulu Neutron Monitor

2002-10-23 00:00 - 2009-11-23 23:59 UT. Resolution: 2880 mins. Average count rate: 6345,61



Still waiting for the cosmic ray flux to go down....



JEM-X IUG Mee

JEM-X software – OSA 8

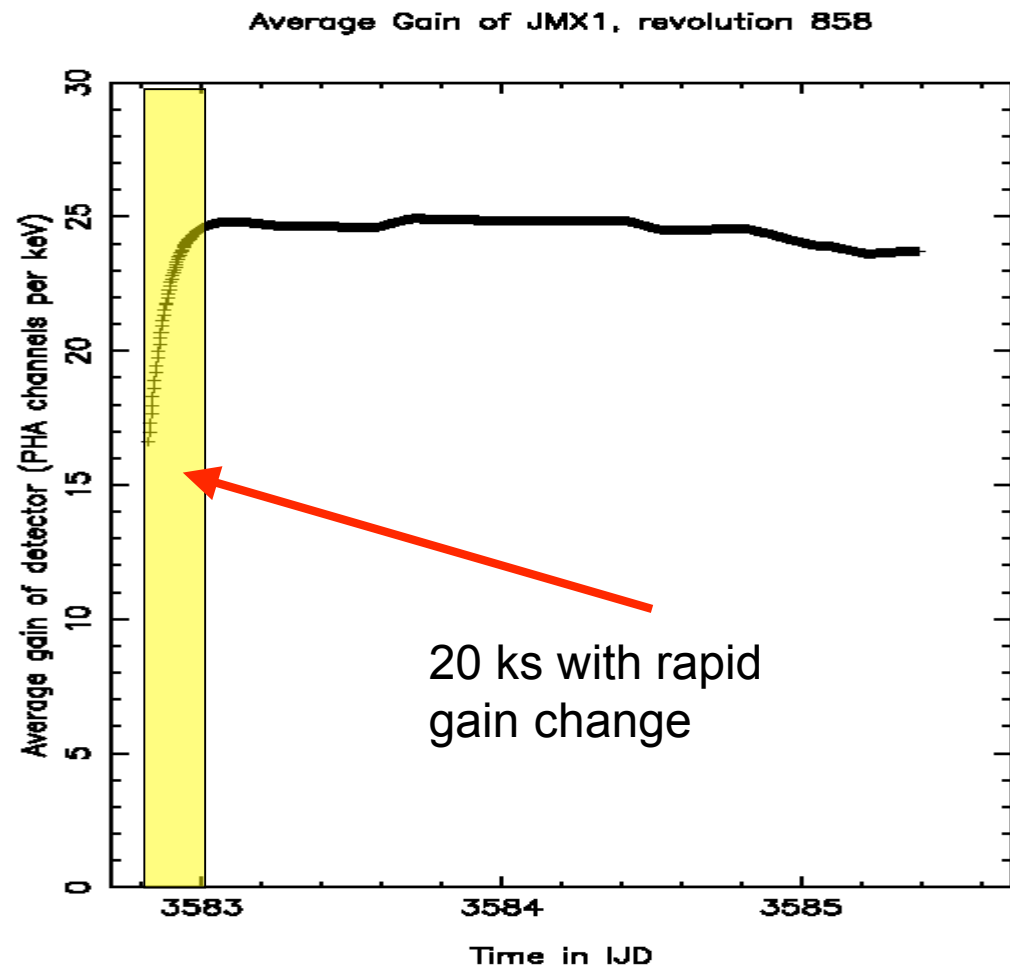
- OSA 8 includes new version of imaging sw, j_ima_iros
 - Electronic efficiency as function of gain implemented for better flux determination at low energy
 - Improved off-axis response corrections
 - Improved model of evolution of response over time
- OSA 8 also includes
 - Better gain fitting
 - Updated mosaic software
- Note: Source detection limit is determined by systematics (detailed model of collimator and effects of lost anode strips)

Calibration

- Circle of 4 degree off axis completed in 2 most recent Crab calibrations
 - Systematics in light curves on the order of 5% due to the collimator
- Next Crab calibration: Crab staring during start of orbit to check the gain correction and electronic efficiency after HV activation

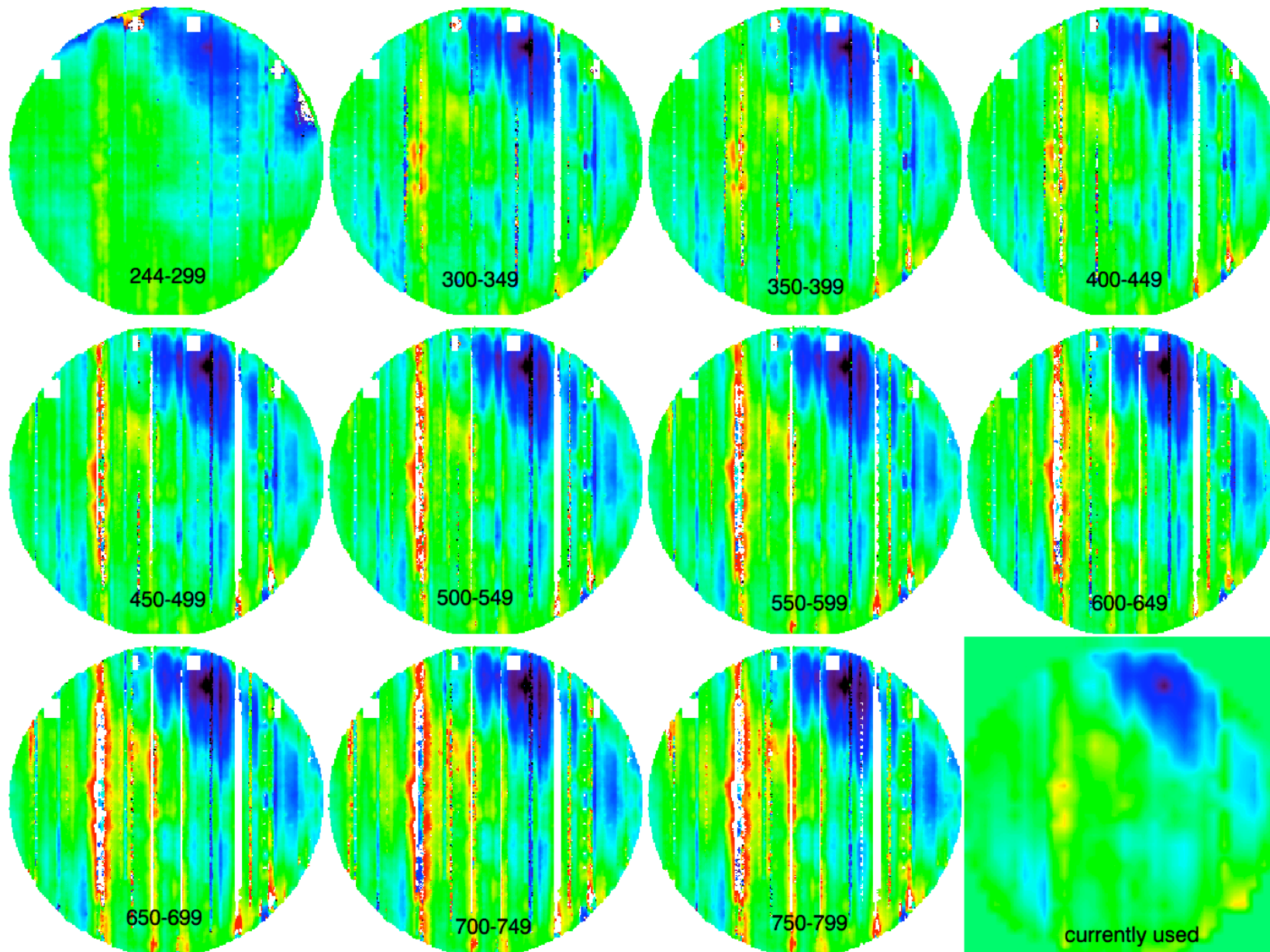
JEM-X1 gain during typical orbit

- Map response during rapid gain change at HV activation
- Effect in less "aged" JEM-X2 is less pronounced

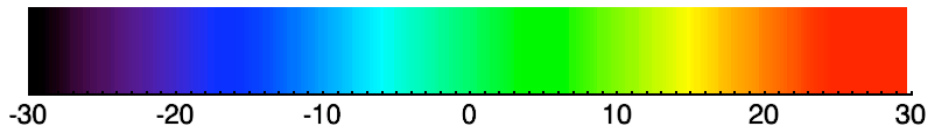


Spatial gain evolution

- The JEM-X MS plate is born with spatial gain variations
 - Mapped during ground calibration
- Gain evolution also involves spatial differences
 - Lost anodes affect the local gain
- Mapped by Xe line at 26.6 keV over 50 orbit intervals to be included in calibration to improve energy resolution



Gain correction to
be applied (%)



percent

ute

Conclusion

- JEM-X is running smoothly
- JEM-X is not expected to be affected by lowered perigee
- Gain evolution is progressing (as expected)
- Switch from JEM-X1 to JEM-X2 was implemented by start AO7 (Oct 2009) to even the “wear” on the detectors
- OSA 8 has improved flux stability
- Running both JEM-X units to improve statistics is desired when “the end” is near and TM allocation allows
- We expect JEM-X and INTEGRAL to operate through 2012 (and longer?)