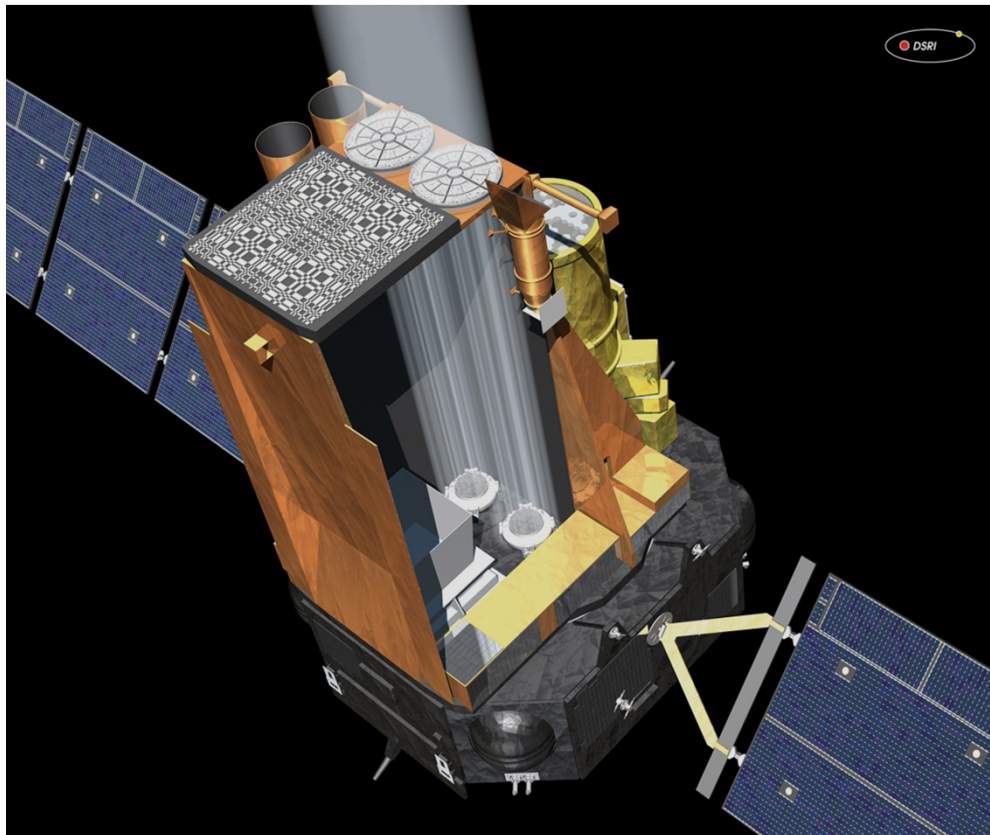


Technical University of Denmark



JEM-X Status, February 2015

Søren Brandt



 **DTU Space**
National Space Institute

Anode status

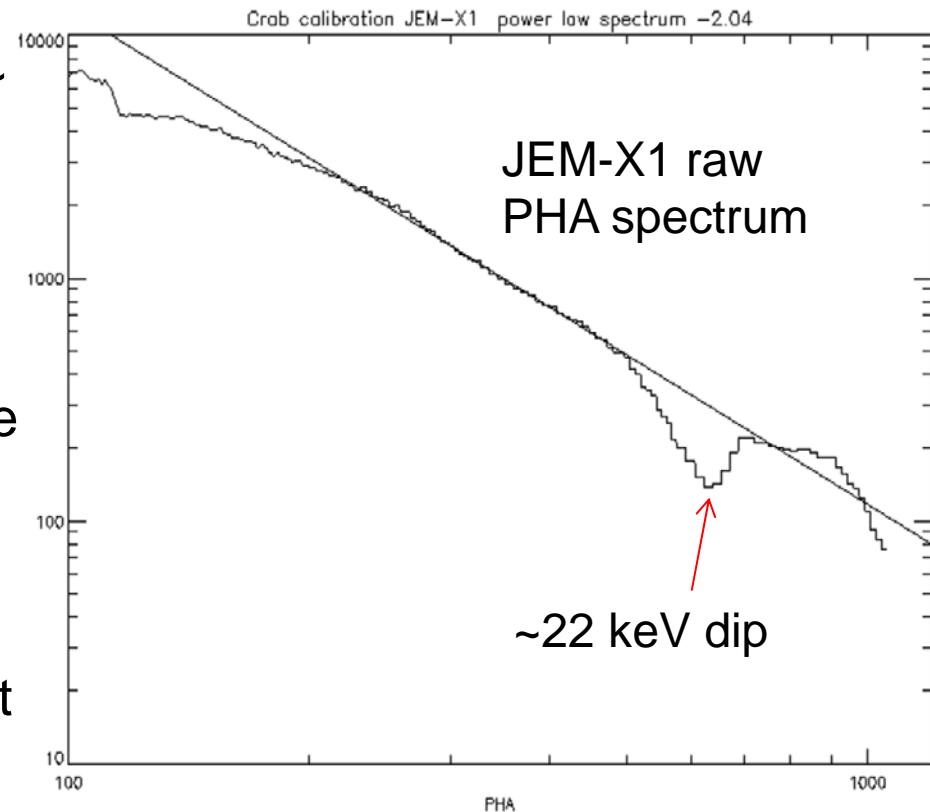
- Was on average ~2-3% loss per year (256 anodes in total), but now $\ll 1\%$ per year
- JEM-X1 (~1260 orbits of use)
 - 63 of 256 anodes affected (~25% of area)
 - 35 dead (4 pre-launch, latest loss in 2011)
 - 12 neighbor
 - 16 unstable or low
- JEM-X2 (~840 orbits of use)
 - 64 of 256 anodes affected (almost 25% of area)
 - 32 dead (9 pre-launch) (latest loss in Aug 2013)
 - 16 neighbor
 - 16 unstable or low

No anode loss in more than 3 years!

No anode loss in more than 2 years!

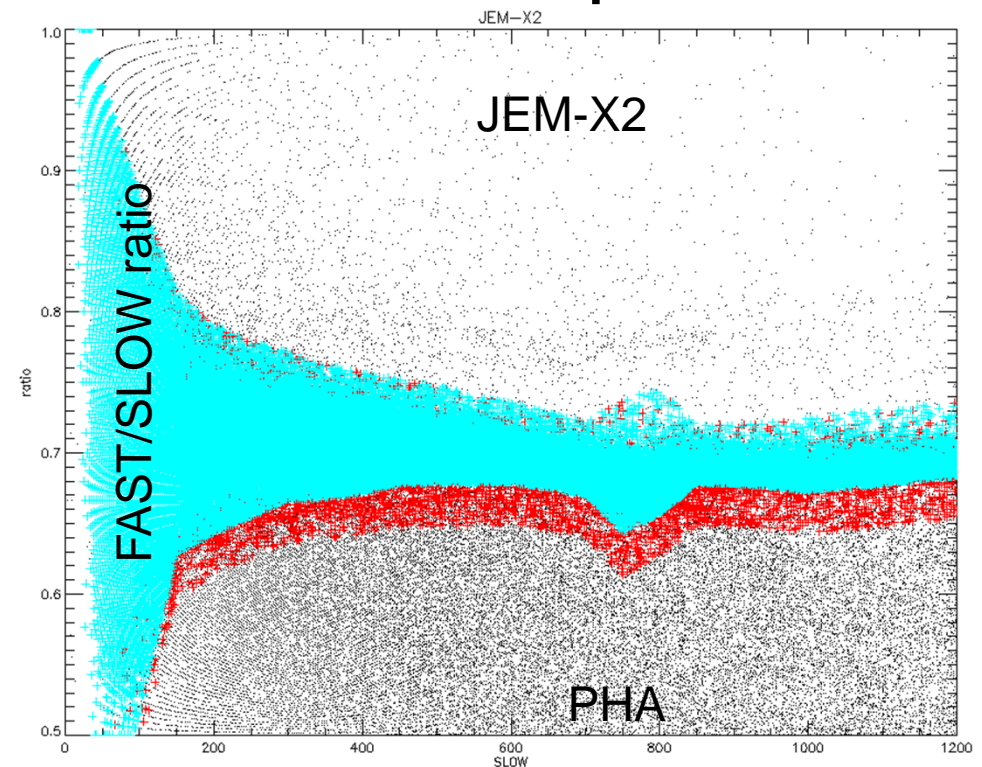
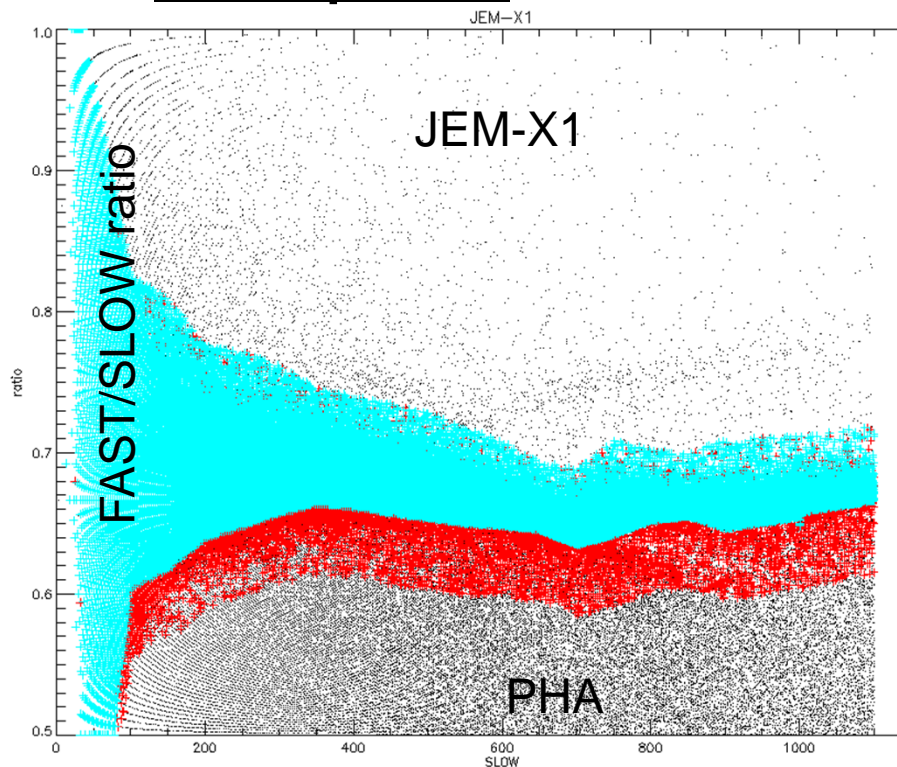
Update of particle rejection

- During Feb 2014 Crab calibration a spectral dip was observed at PHA ~ 600, ~22 keV in JEM-X1
- Gain was very high
- Change in “fast” amplifier response used in “ratio” criteria for particle rejection was identified as the cause
 - Some X-rays were rejected as particles
- Particle rejection parameter update was prepared (OCRs 354-355)
- Implemented in Crab calibration Oct 2014 (rev 1461)
 - Data with old and new parameters were acquired to allow forward and backward valid response files



“Opening” of JEM-X ratio rejection

- The band accepted events has been widened to avoid throwing out good events
- The price: slightly increased background
- The prize: better and more even response



Gain evolution

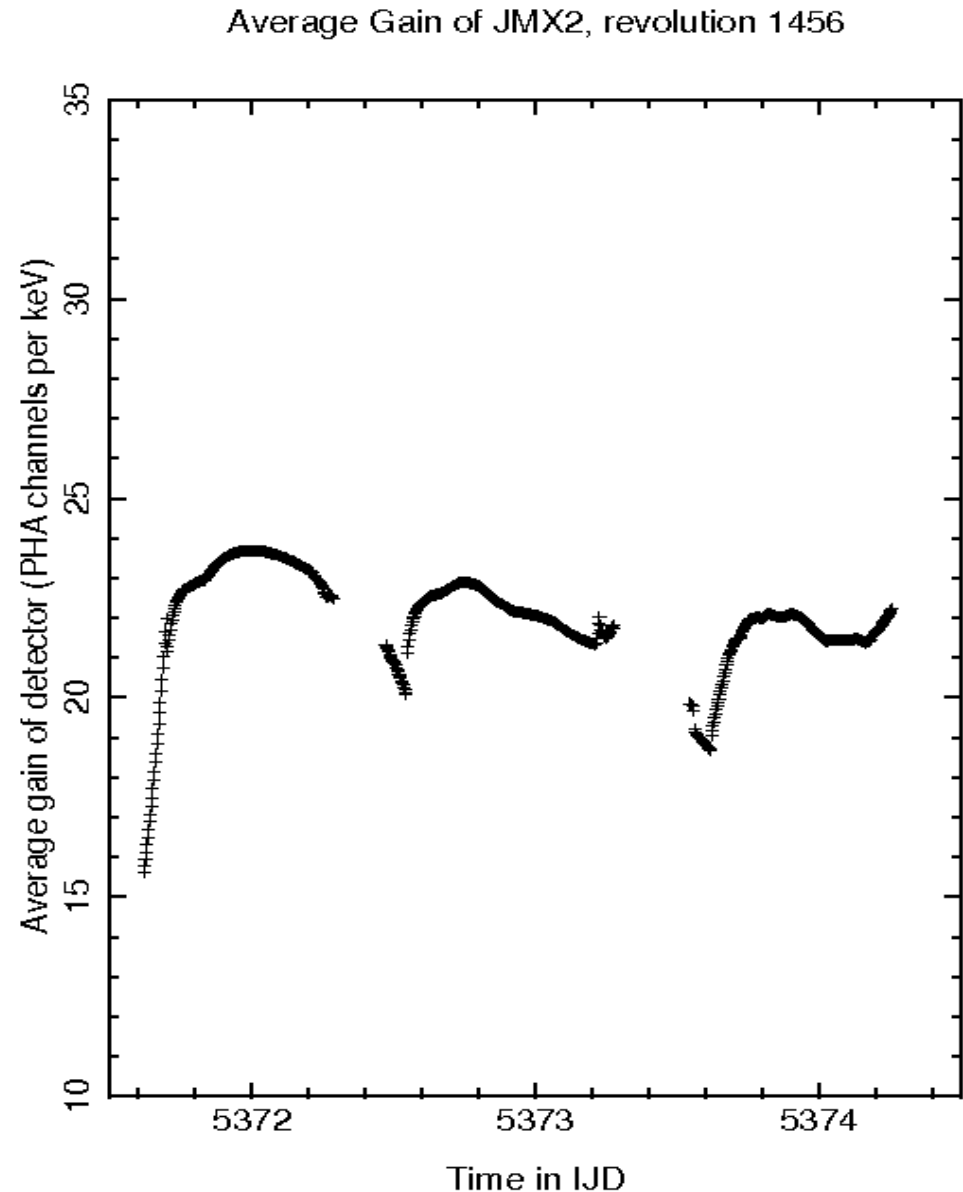
- JEM-X1 DV setting was lowered to DV=69 (~690V) in rev. 1010, Jan 20, 2011, and to DV=68 (~680V) in rev. 1089, Sep 13 2011, June 21 2012 DV=67 (~670V) in rev 1183, DV=66 (660V) in rev 1257, **in rev 1397, Mar 24 2014 DV=65 (660 V)**
- When JEM-X1 started as default instrument in orbit 170, we had DV=81 (~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 ~4-5% per degree
- JEM-X2 DV setting is was lowered to DV=70 in rev. 1010, to DV=69 in rev. 1089, DV=68 (~680V) in rev 1183, DV=67 (670V) in rev 1257, **in rev 1397, Mar 24 2014 DV=66 (660 V)**
- Gain evolution is caused by ion conducting glass substrate of the micro-strip plate

JEM-X Gain Calibration in OSA

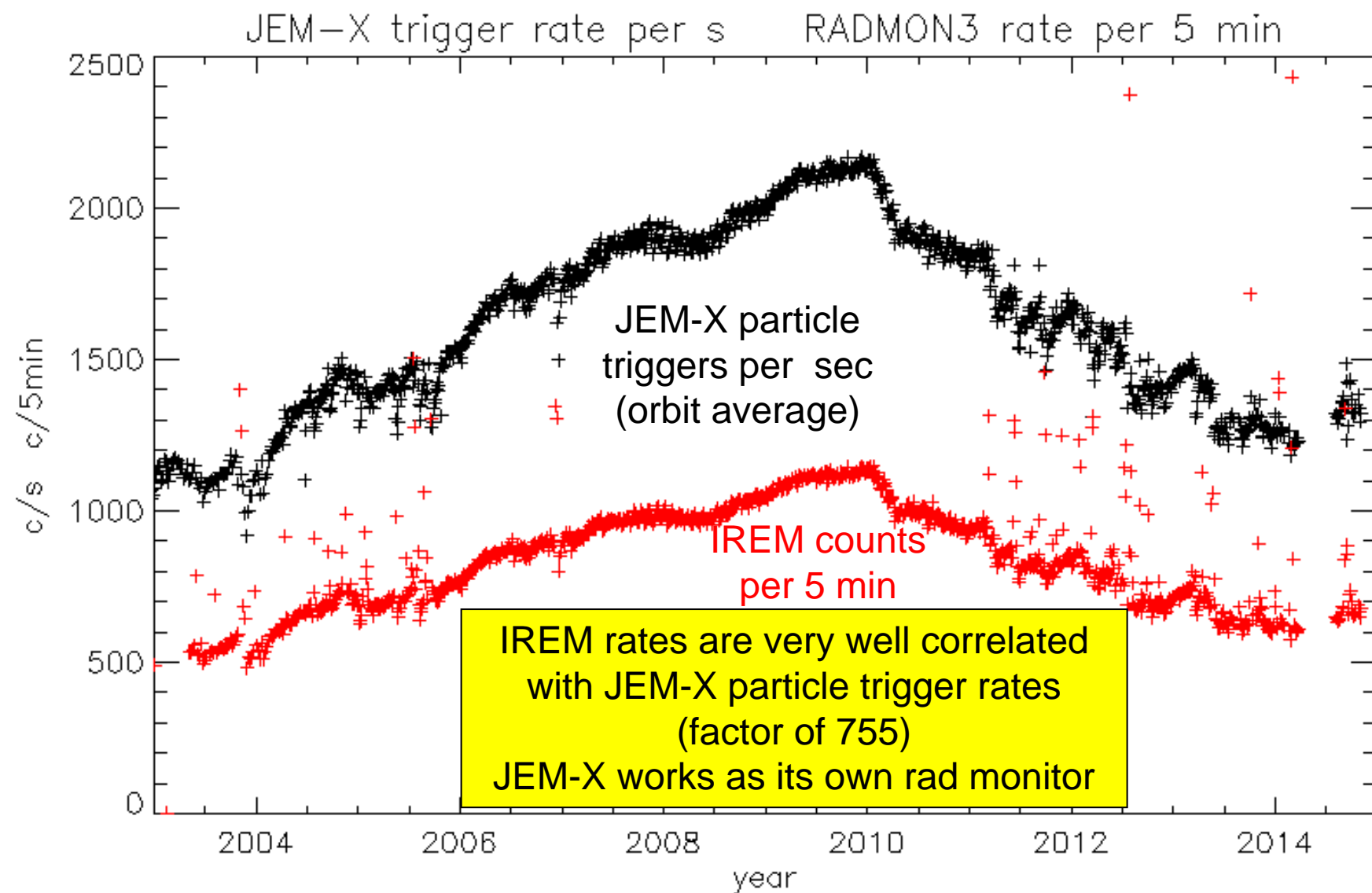
- Gain calibration requires continued efforts because of the decaying calibration sources
 - Further complicated by increased dependence on temperature = more variation over an orbit
- Calibration data must be collected in increasing time periods
- offline analysis of gain required to ensure correct results
 - However, usually automatic near-real time corrections are not too bad
- Calibration analysis is more difficult in orbits with grey filter
 - More TM has helped avoid grey filter “interruptions” in gain curves
 - But still periods of grey filter, also when background is high.
- Calibration provided by “Instrument Characteristics” tables delivered to ISDC for each revolution
- Eventually the gain calibration will rely only on the Xe fluorescence background line at 29.6 keV and temperature variation modeling
- Open issue with IMOD 23 tables (see Carlo’s presentation)

No HV off during telemetry outage

- OCR's 361-362 were raised to avoid JEM-X HV off during brief planned TM outages
- Instrument has very robust autonomous HV switch off
- IREM reaction is enabled during TM outages



IREM – JEM-X



Conclusion

- JEM-X is running smoothly
- Gain evolution is progressing (as expected)
- Gain fitting is becoming more challenging, as calibration sources decay and temperature dependence increases
- Amplifier response evolution is monitored
- Running both JEM-X1 and JEM-X2 was implemented in Oct 2010, as sufficient telemetry became available
 - Improved statistics and reduction of imaging systematics
 - Increased TM allocation in 2012 has reduced number of cases with grey filter and thus improved the stability of gain fitting
- Instrument Team is still intact – but also busy with other projects
 - Niels Lund and Carl Budtz-Jørgensen have emeritus status and additional retirements are expected
 - Updated LC SW still in the works .
- We expect JEM-X and to operate smoothly in the extensions 2015-2018 (and beyond... maybe not all the way to 2029 ☺)
 - Performance is monitored to ensure that running both units will not endanger the future use