Technical University of Denmark

JEM-X Status, May 2012

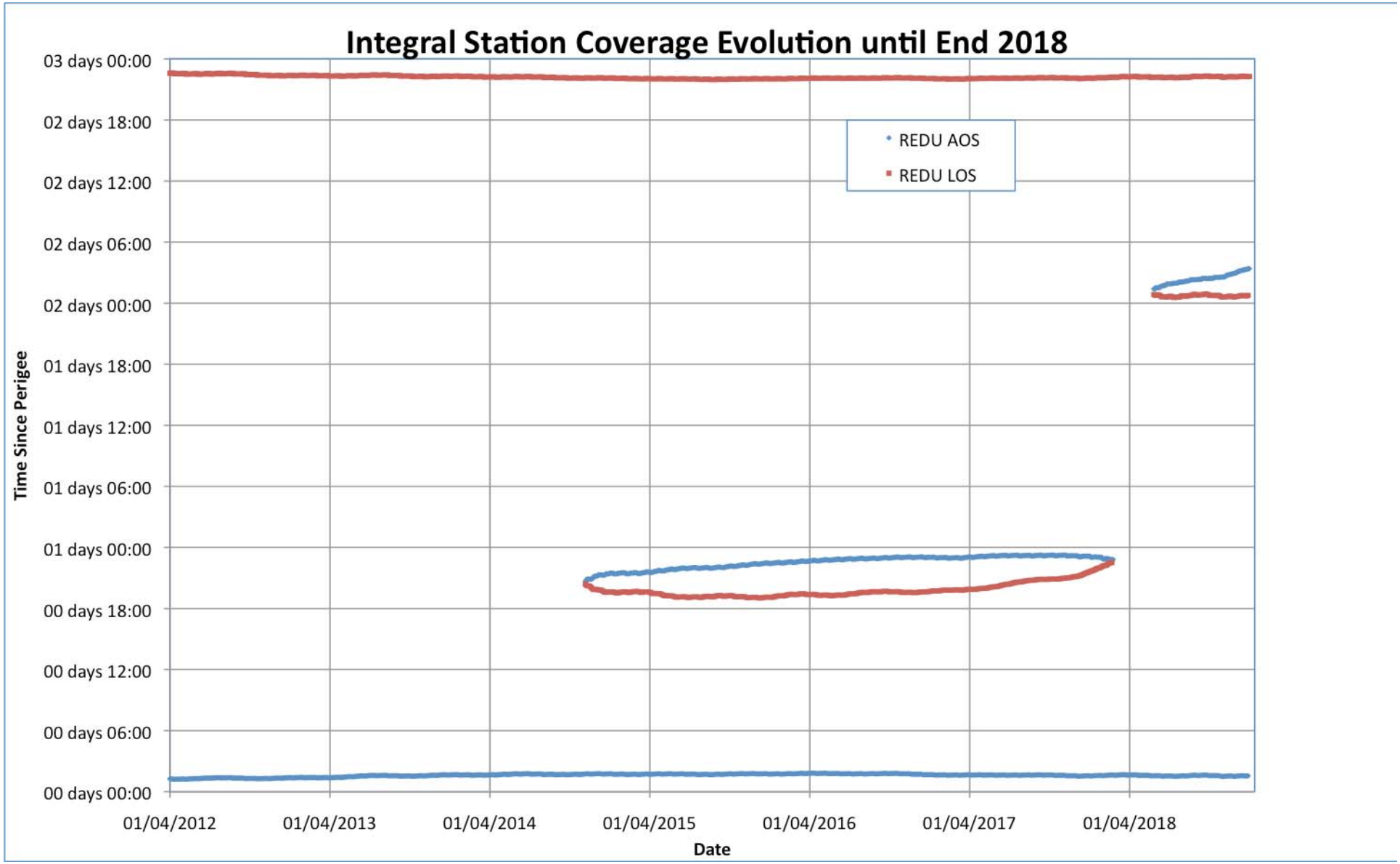
Søren Brandt

DTU Space
National Space Institute

INTEGRAL Status

- INTEGRAL is approved by ESA until the end of 2014
  - pending the “usual” review in 2012
  - INTEGRAL User Group will prepare extension request for 2015-16 at meeting June 20-22
  - Mission Extension Operational Review (MEOR) for all missions asking for extensions, June 28-29 in ESTEC
    - HST, INTEGRAL, XMM-Newton, (Planck), SOHO, Hinode, Rosetta, Cassini, Cluster, Mars Express

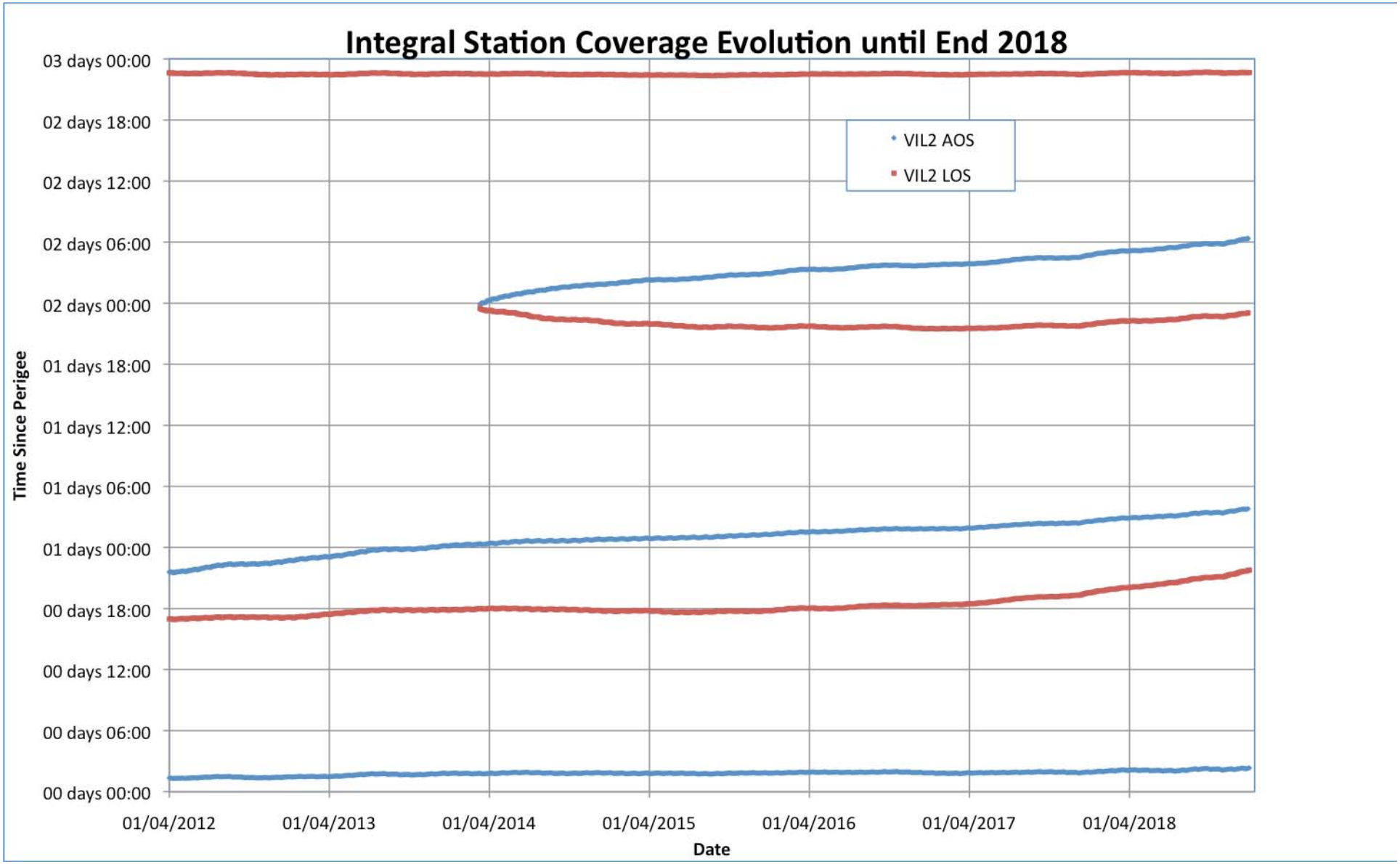
The Goldstone Hole



The Goldstone Hole (II)

- Lack of coverage will develop (~6 hours), where NASA contribution covered with Goldstone
- We most likely will activate instruments and accept missing coverage
- However, INTEGRAL may loose Redu (to Galileo) and then have to use VILSPA with more holes

The VILSPA Holes



the cosmic ray flux is relatively stable – we should be able to get more TM

Both JEM-X units default configuration

- JEM-X1 was used from rev. 170-855 and has now been used for ~925 revolutions (~8 years of use)
- During revolution 862-975 (Oct 16, 2009) JEM-X2 was the default JEM-X unit
- Since revolution 976 (Oct 10 2010) both JEM-X units have been used (8+8 tm packets allocation)
- JEM-X2 had been used for ~500 revolutions
- Both units have been used for all Crab calibrations
- Both units were used during SPI annealing, as TM allocation allowed
- S/N ratio improved by ~sqrt(2) with both units

JEM-X operations

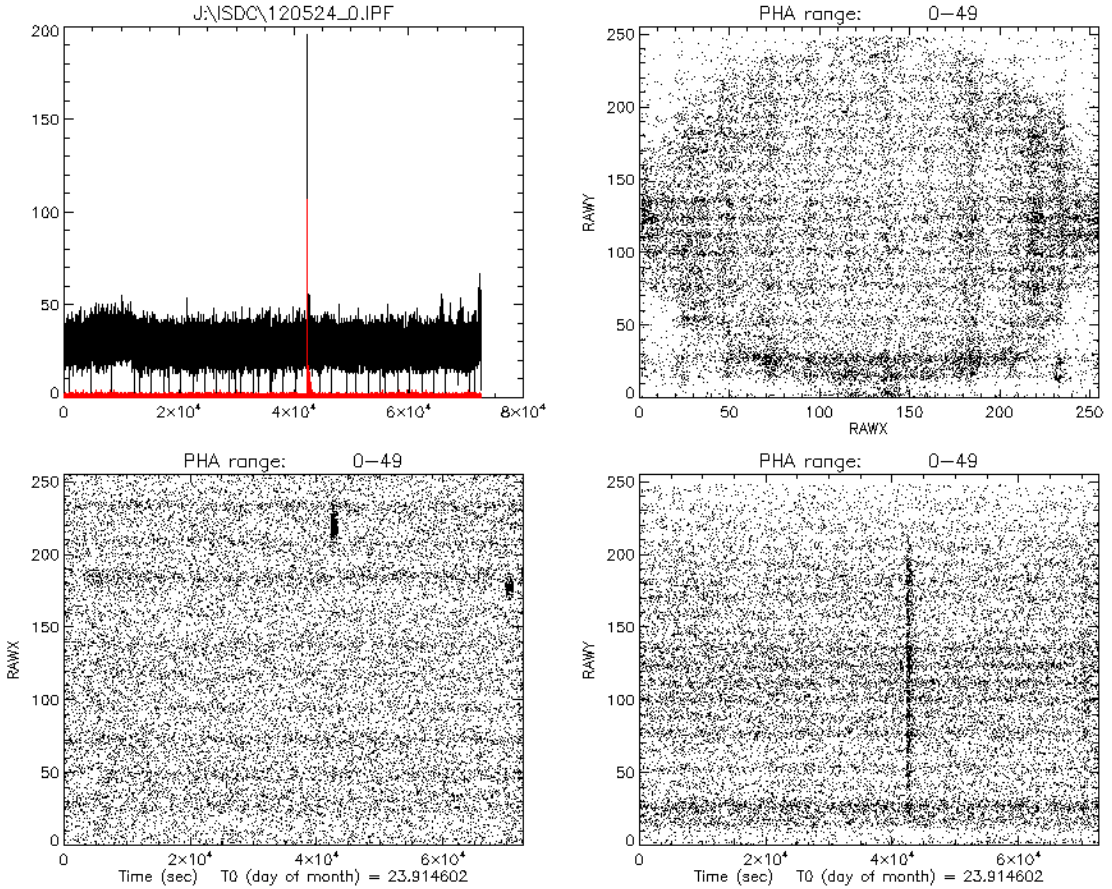
- JEM-X is running smoothly
- Only exception is the “eclipse recovery anomaly”
  - During eclipse the JEM-X DFEE is switched off
  - Sometimes the recovery of the DFEE memory configuration fails/stops with a CRC error reported
  - Troubleshooting has shown that there is no real error
  - A procedure to proceed with instrument activation without reboot has been implemented (to prevent loss of observing time)

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, one in 2009, one in 2010, two in 2011
- JEM-X1 (~925 orbits of use)
  - 64 of 256 anodes affected (almost 25% of area)
- JEM-X2 (~500 orbits of use)
  - 61 of 256 anodes affected (almost 24% of area)

Hot Spot Activity

- Occasionally a hot spot/stripe is seen in JEM-X2



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Gain evolution

- JEM-X1 DV setting was lowered in orbit 978 to DV=70 (~700 V), to DV=69 (690 V) in orbit 1010, and further to DV=68 (680 V) in orbit 1089
- 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 → very high gain during hot operations
- JEM-X2 DV setting is was lowered to DV=71 in rev. 967, to DV=70 in orbit 1010, to DV=69 in orbit 1089
- Gain evolution is caused by ion conducting glass substrate of the micro-strip plate

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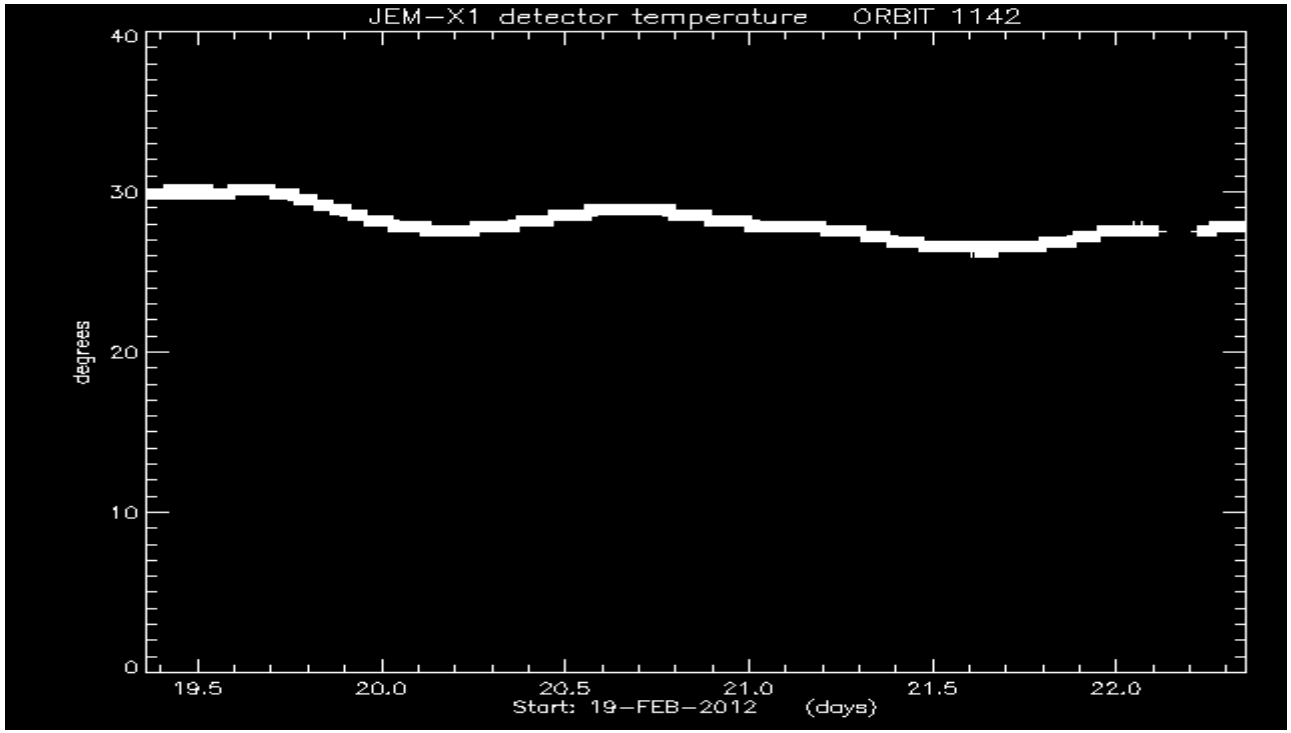
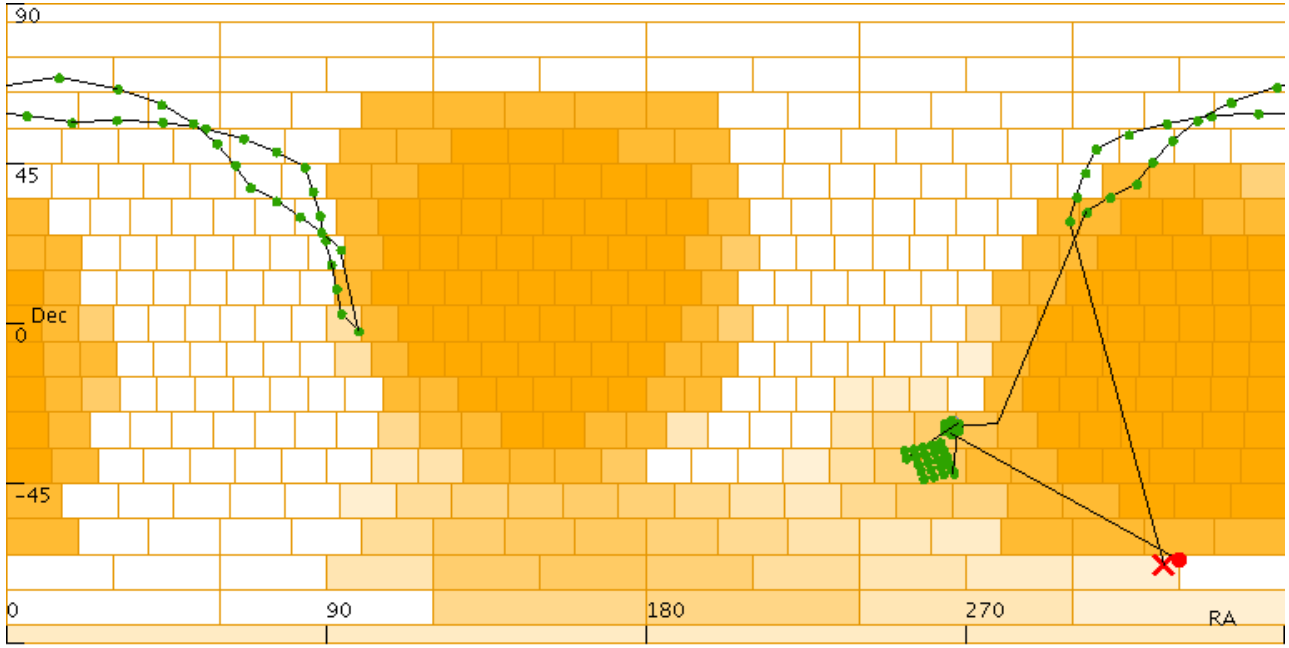
Gain dependence on temperature

- Gain varies as function of temperature
  - ~1%/°C pre-launch
  - JEM-X1 now: ~4%/°C
  - JEM-X2 now: ~3%/°C
- ~5°C amplitude
  - 20% gain variation
- Some survey observations introduce large temperature variations over an orbit

1141

- Example: Galactic Plane Scan observation





SkyMap for INTEGRAL revolution 1141 starting Thu Feb 16 04:41:21 GMT 2012 to Sun Feb 19 04:27:52 GMT 2012, POS version 4

JEM-X Gain calibration in OSA

- Gain calibration requires continued efforts because of the decaying calibration sources
- data must be collected in increasing time periods
- offline analysis of gain to ensure correct results
- Calibration provided by “Instrument Characteristics” tables delivered to ISDC for each revolution
- Eventually the gain calibration will rely on the Xe fluorescence background line at 29.6 keV

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Recent Crab Calibration

- Perform in revolution 1159
- JEM-X did only a standard 10 ks staring with Crab on-axis, no special settings

Conclusion

- JEM-X is running smoothly
- JEM-X is not 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
- Running both JEM-X1 and JEM-X2 was implemented in Oct 2010, as sufficient telemetry became available
  - Improved statistics and reduction of systematics
- Team is still intact
- We expect JEM-X and INTEGRAL to operate through 2014 (and longer?, next step is end of 2016)

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