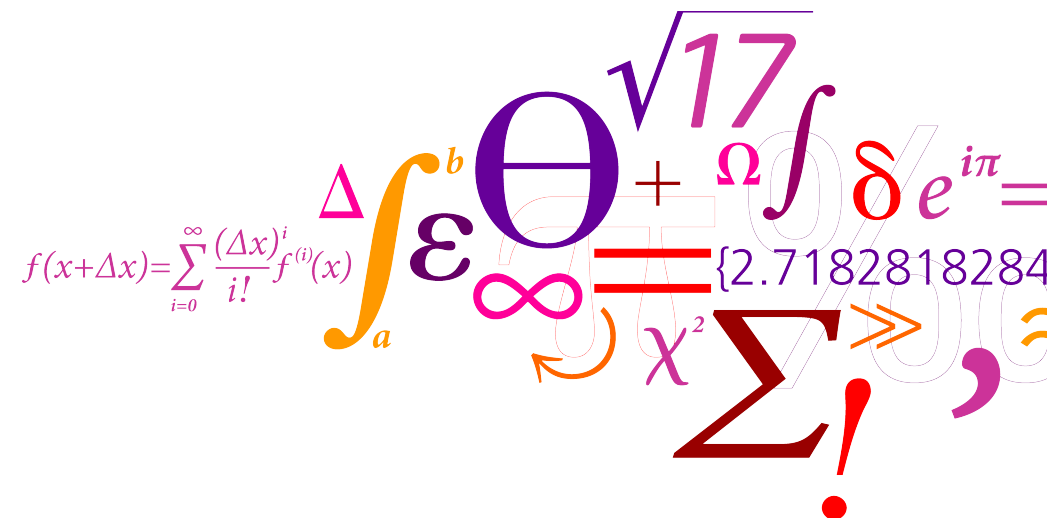# Crab intensity from JEM-X onboard INTEGRAL and a source of "deadtime"

Niels J. Westergaard
C. Budtz-Jørgensen
S. Brandt
C. A. Oxborrow

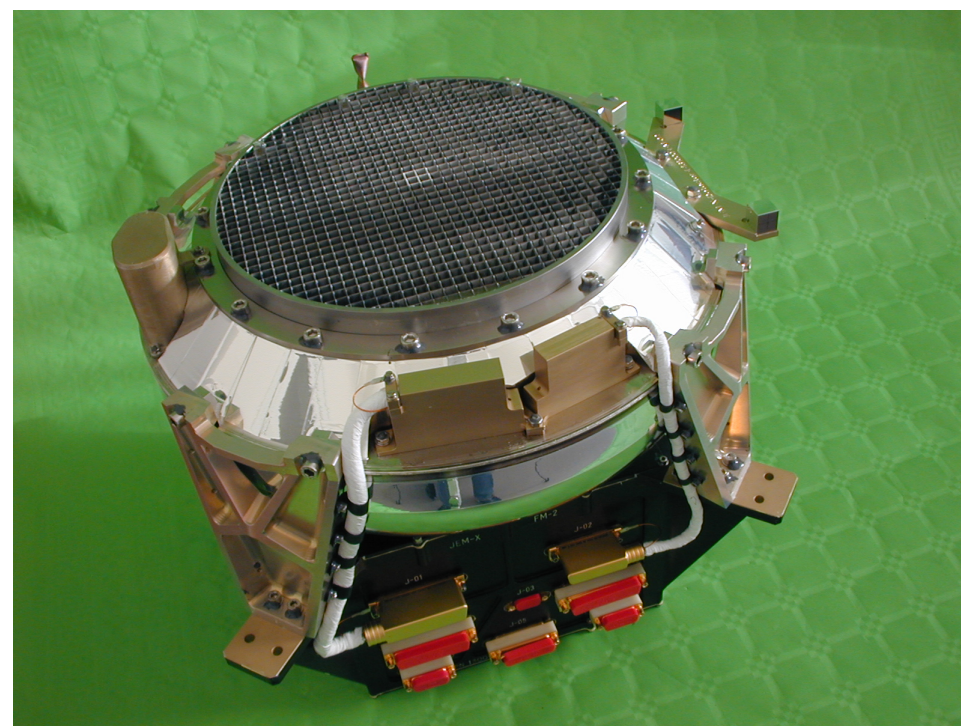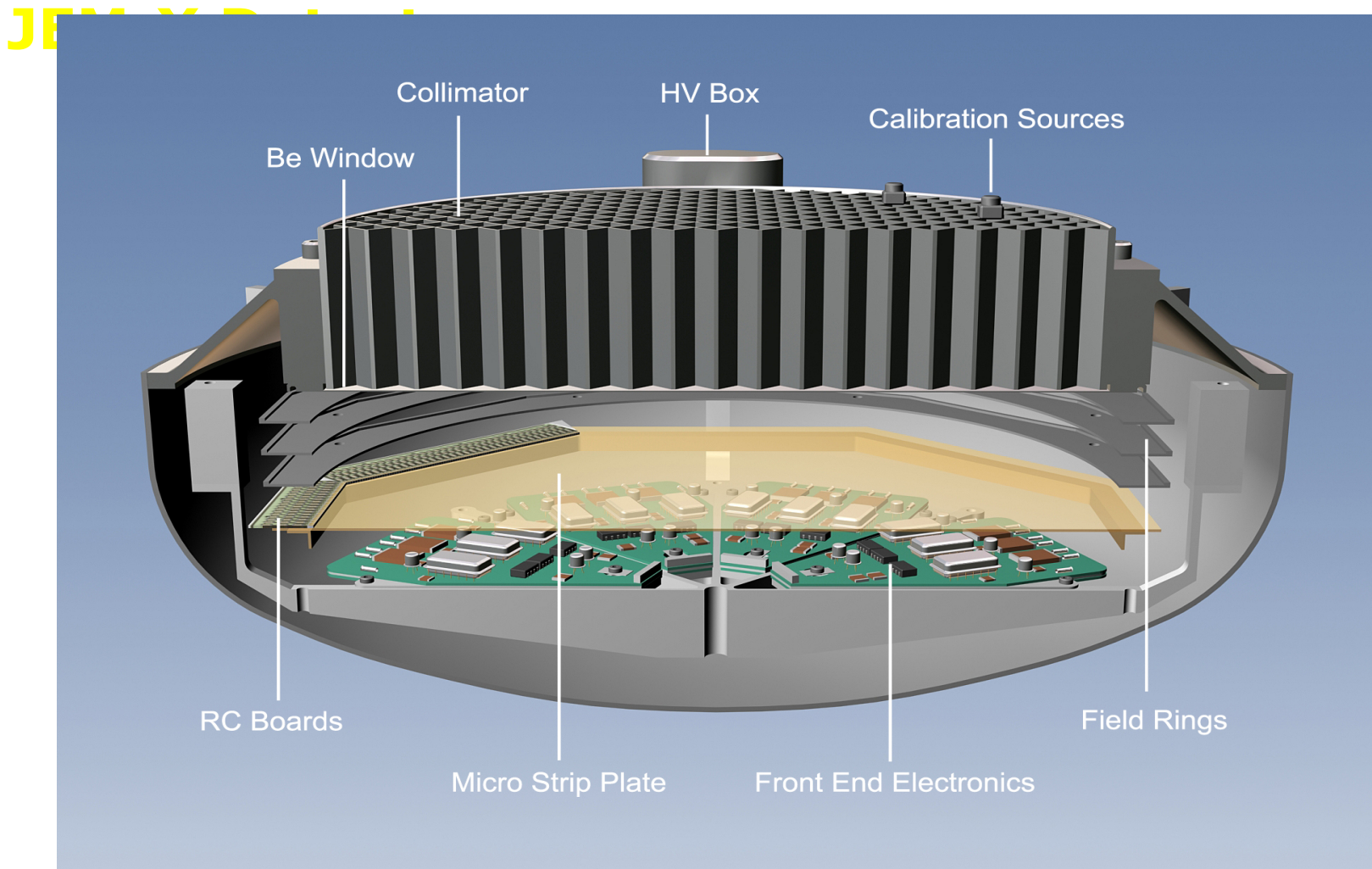Evolution in time connecting to particle background rate.

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$$f(x+\Delta x)=\sum_{i=0}^{\infty}\frac{(\Delta x)^i}{i!}f^{(i)}(x)$$

$\Delta \int_a^b \varepsilon \Theta^{\sqrt{17}} + \Omega \int \delta e^{i\pi} = \infty$ {2.7182818284 $\chi^2 \sum !$

JEM-X HARDWARE

Mask :   535 mm

Mask hex holes: 3 mm

Detector diam :   250 mm

Mask-Detector: 3401 mm

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JEM-X Detector

Collimator — HV Box — Calibration Sources — Be Window — RC Boards — Micro Strip Plate — Front End Electronics — Field Rings

The 10 micron anode strips are destroyed by heavy cosmic ray particles by ionization and subsequent spark.
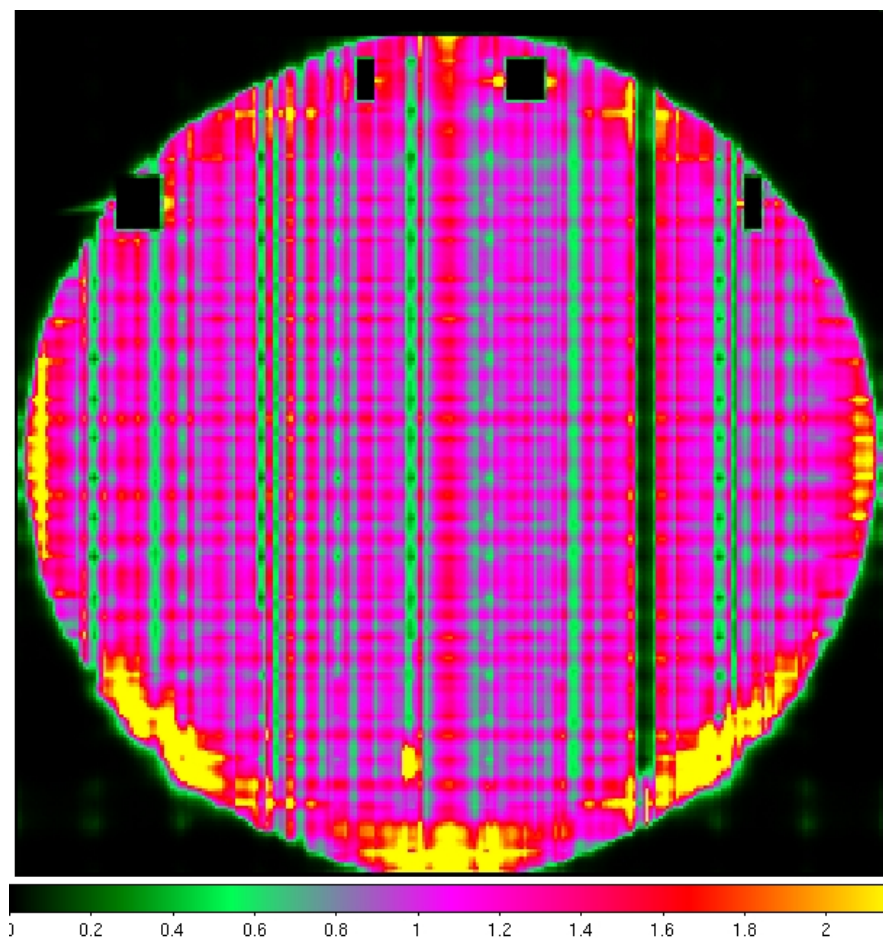
Hence the Crab has been used 'actively' for the calibration assuming stability.

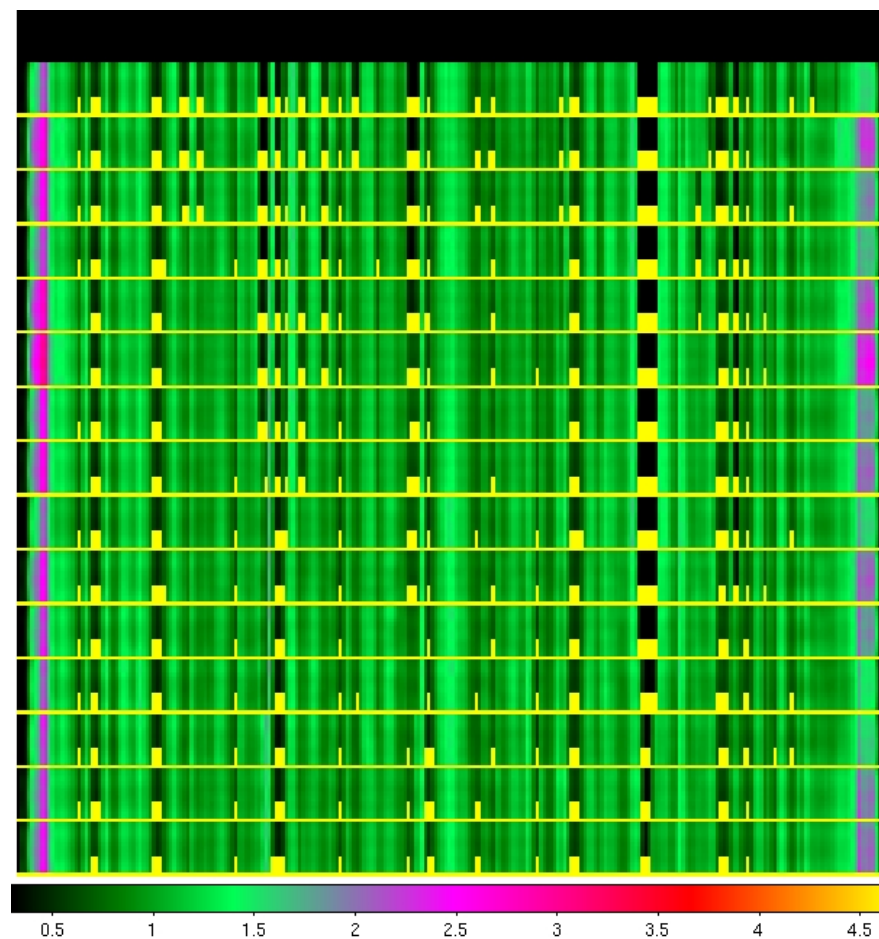INTEGRAL spends two times 3 days per year observing the Crab.

The standard analysis software (OSA, issued by ISDC) for JEM-X analysis has a correction for Crab intensity variations.
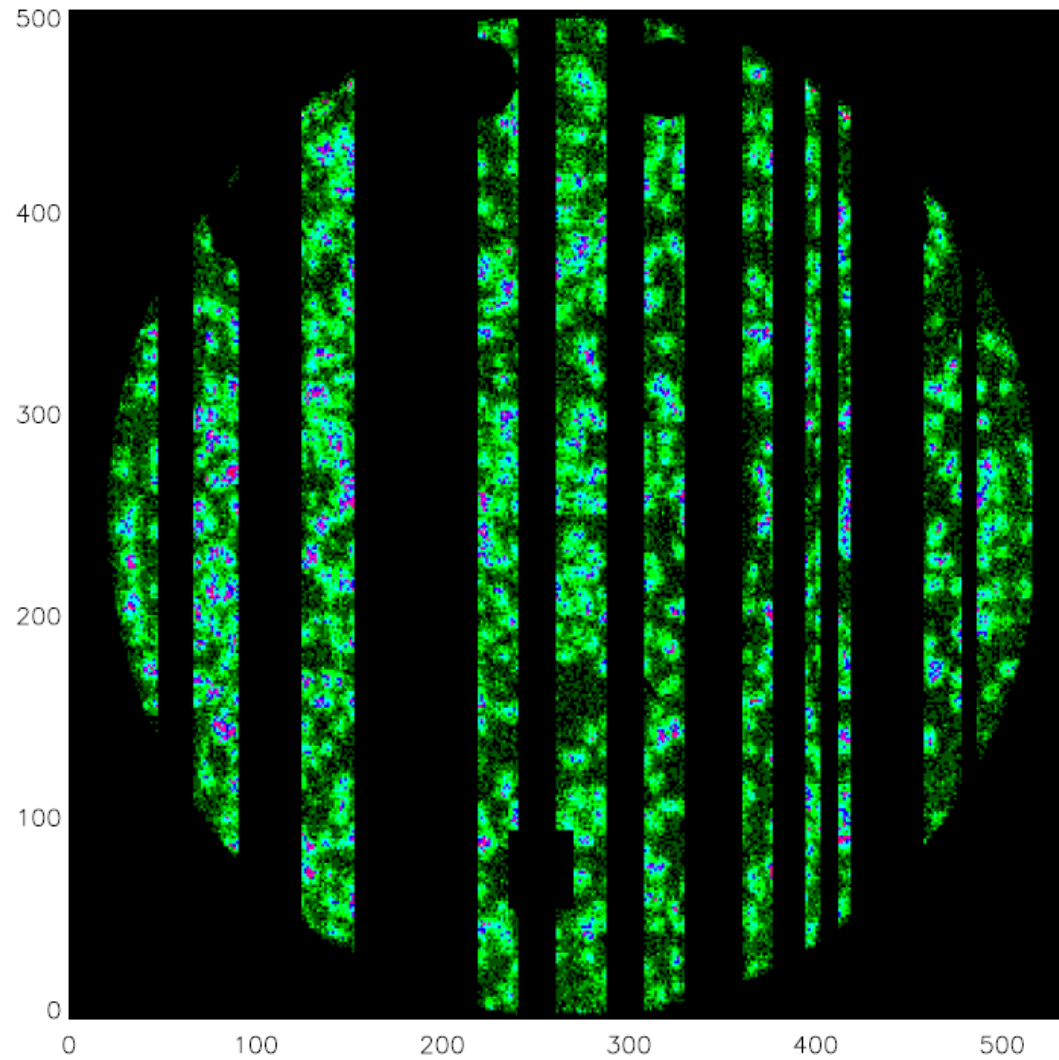
So where are we now?

JMX1 shadowgram revolutions
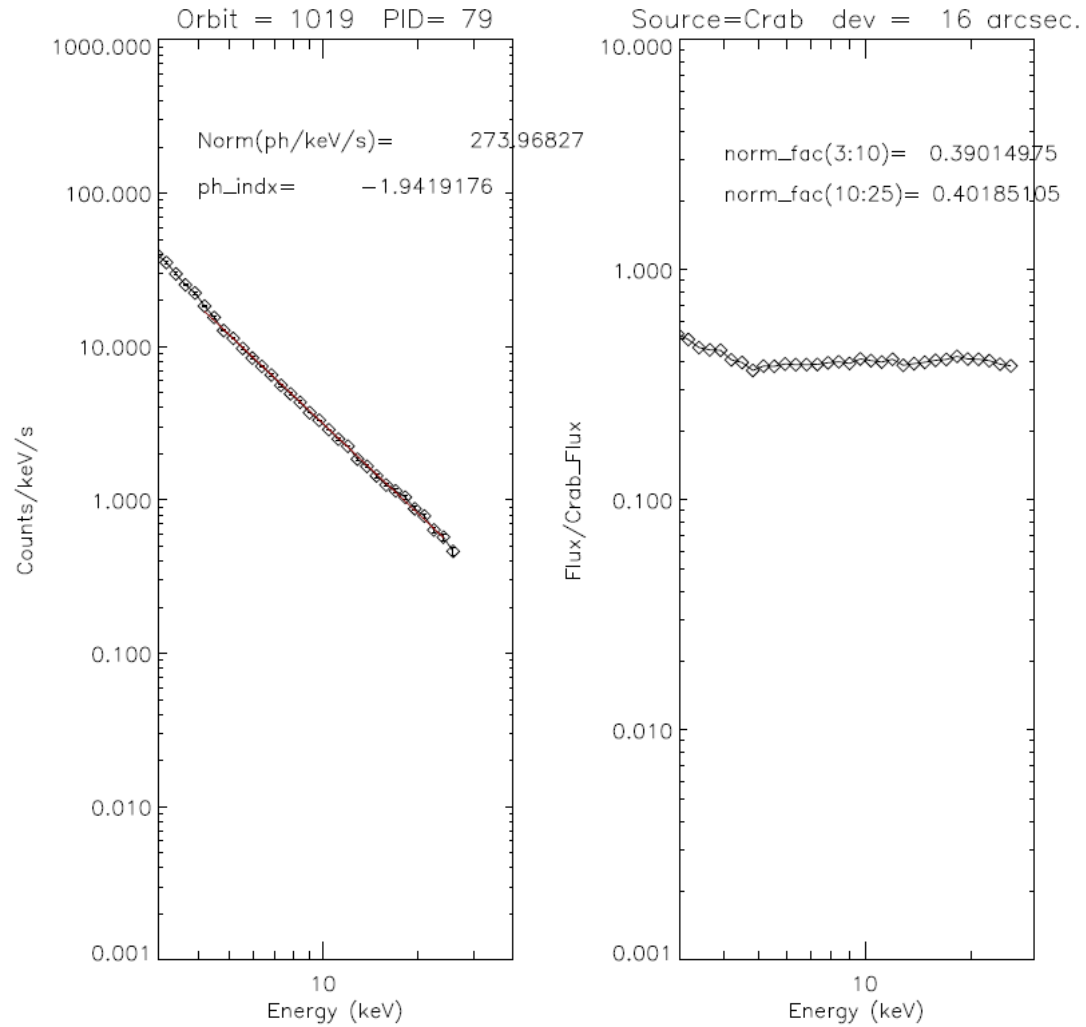# 311 – 497, 12 – 25 keV
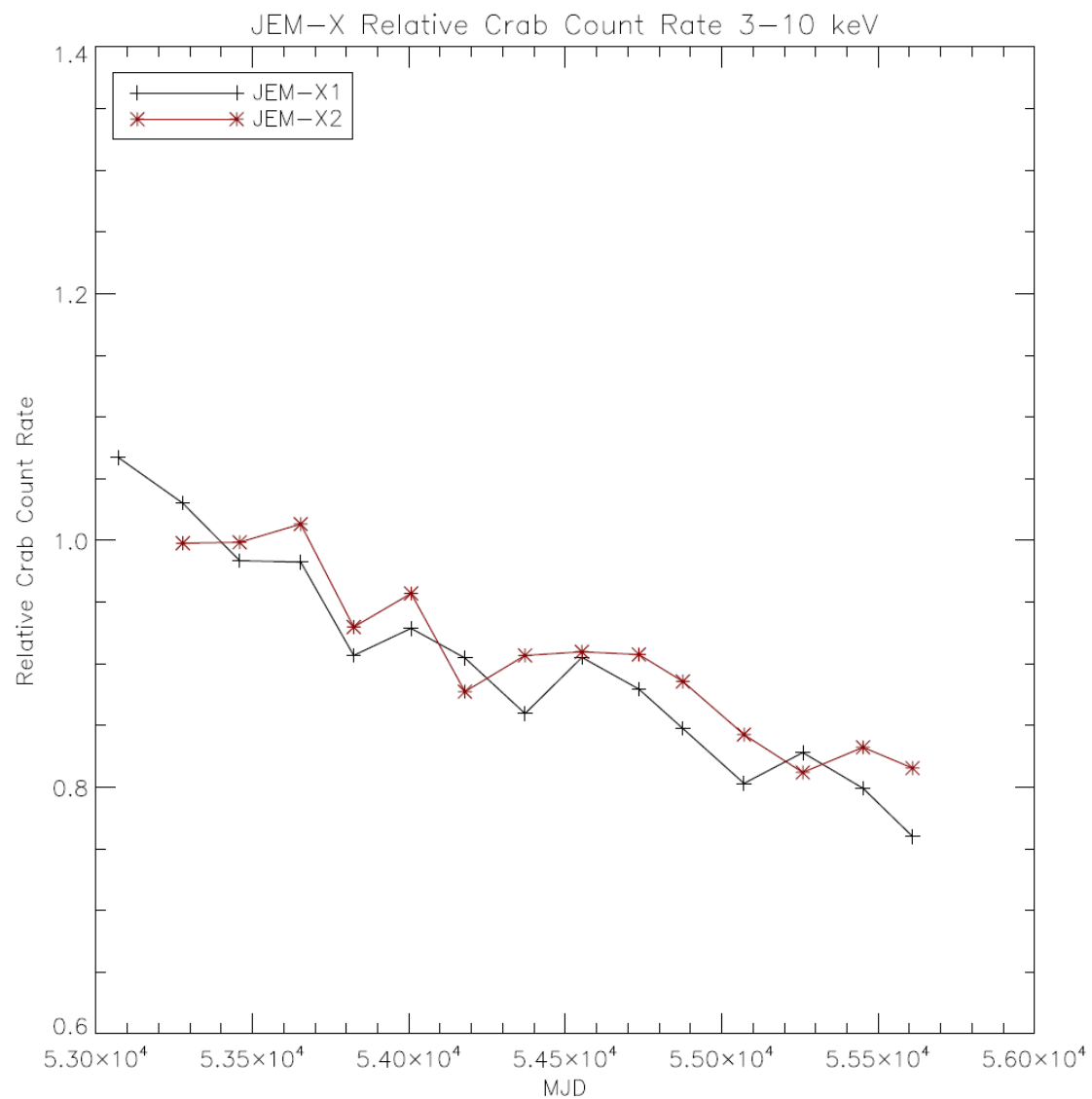
Progression of anode deterioration

JEM-X1 "Good" Regions

JEM-X1 Spectrum

JEM−X Relative Crab Count Rate 3−10 keV

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JEM-X Relative Crab Count Rate 10-25 keV

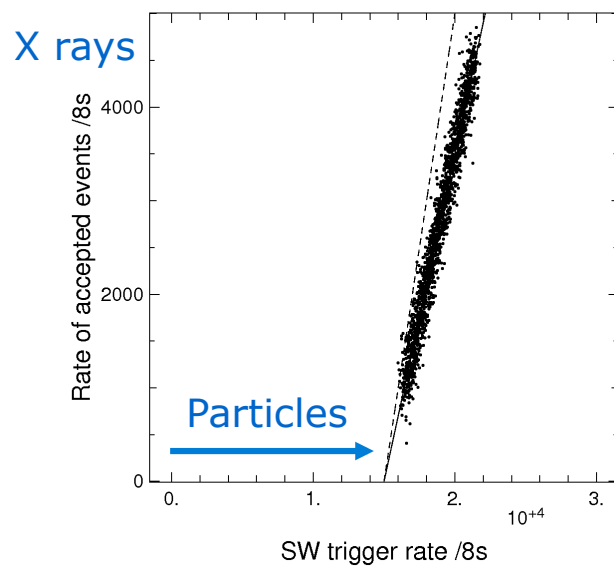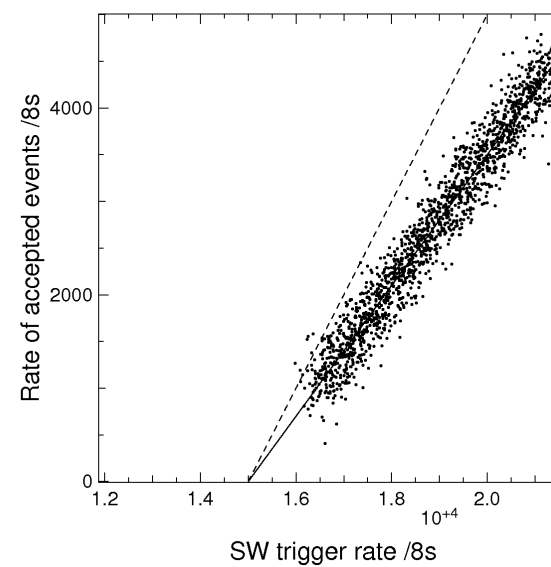**DTU Space, Technical University of Denmark**   IACHEC Meeting #6   2011-04-11
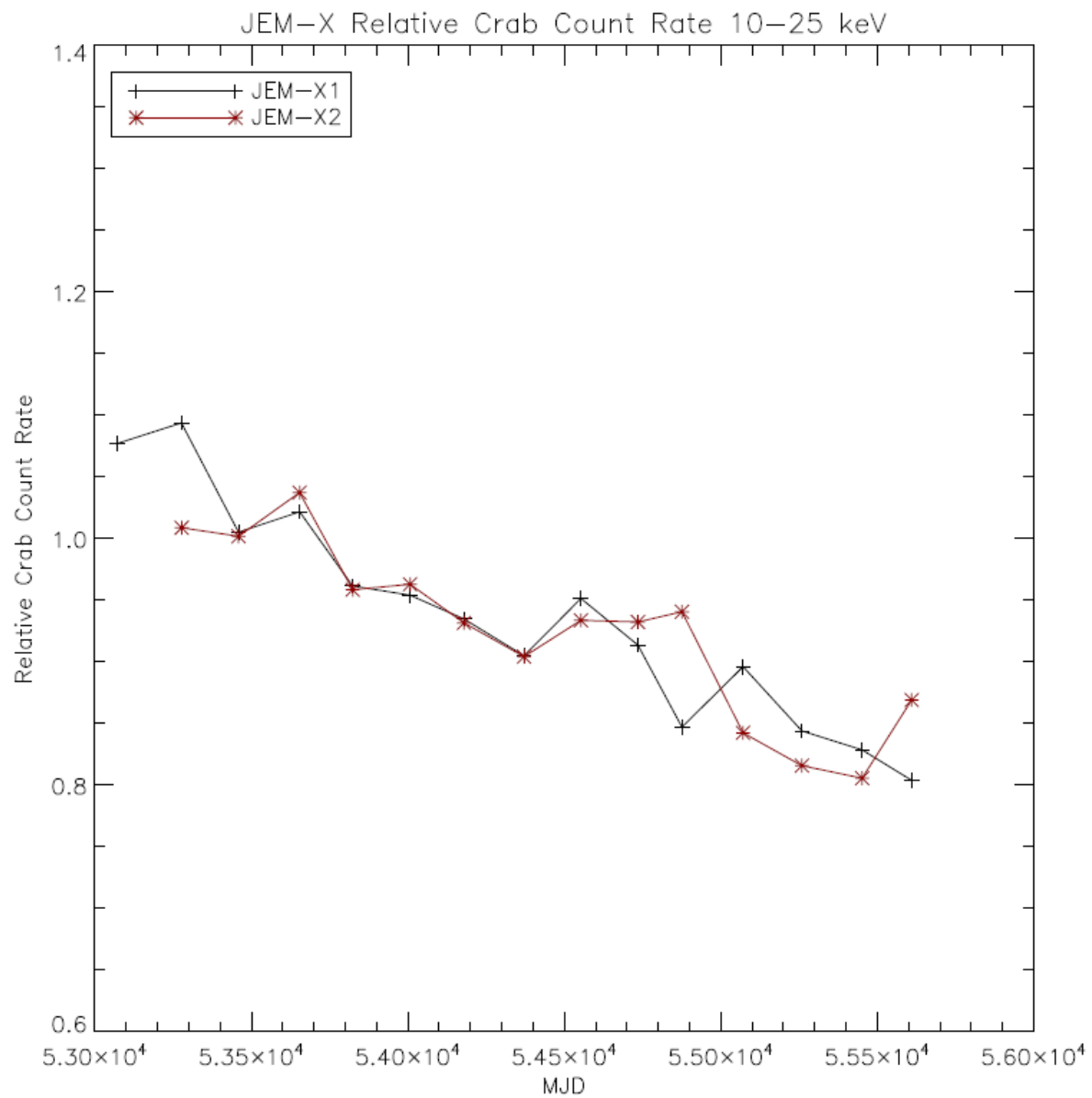
An unexpected feature has become visible – some counts seem to be lost, not only to dead-time effects

Schematic of snapshot in time

X rays

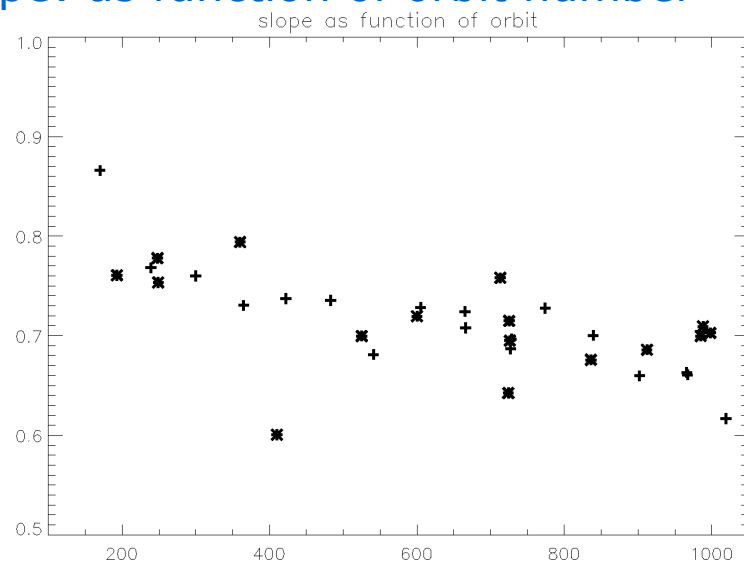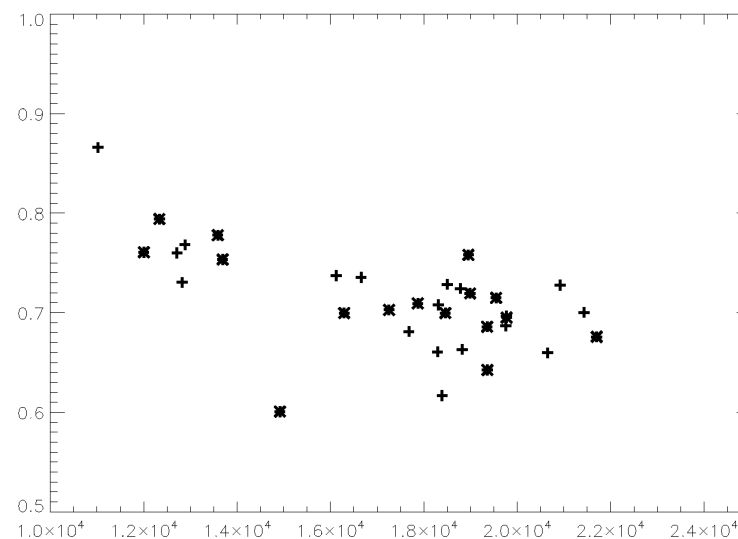Particles

Zoomed version

Particle count rate as function of INTEGRAL orbit number

background (cut) as function of orbit
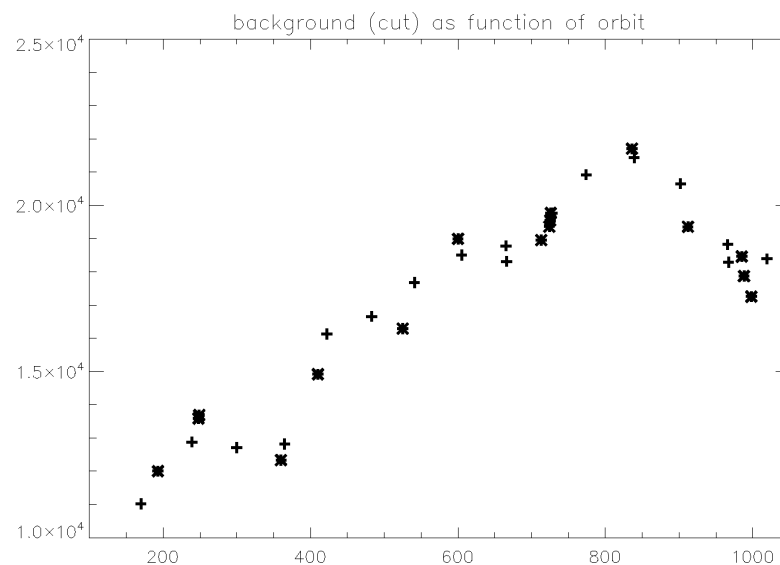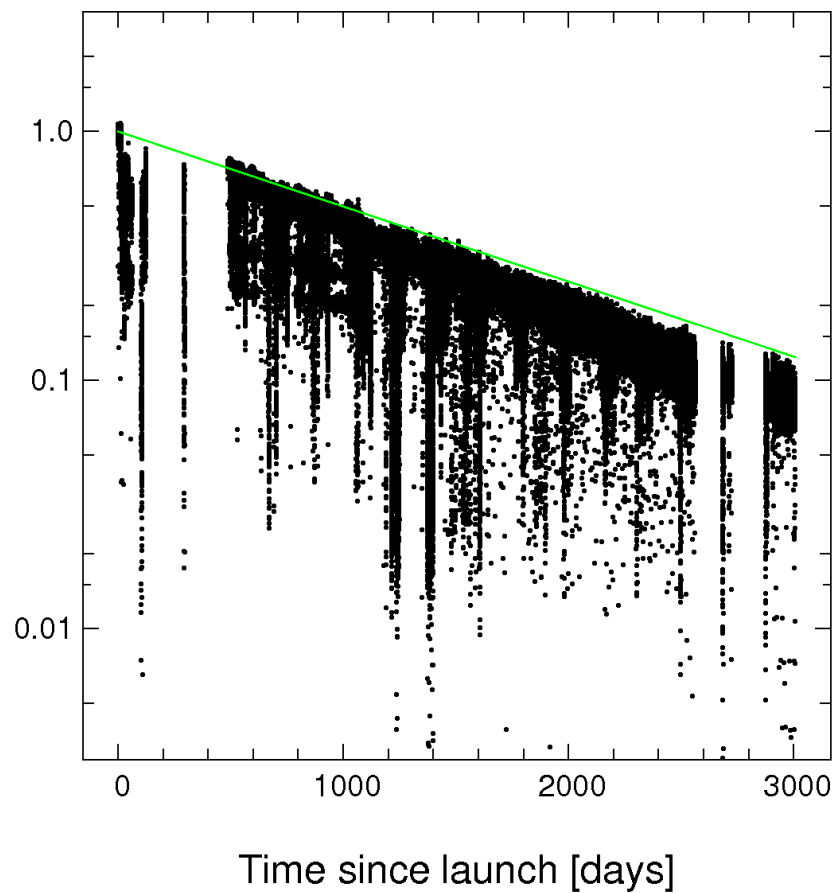
Slope: as function of orbit number

slope as function of orbit

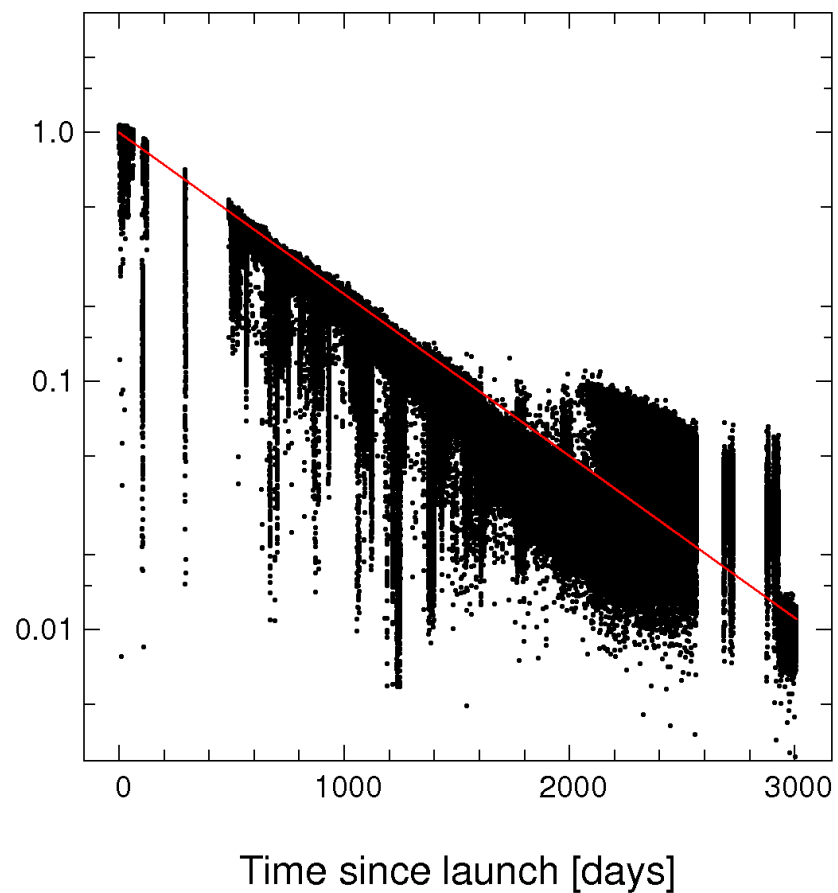## as function of background rate

JMX1 FRSS source #1 (^{55}Fe)

JMX1 FRSS source #2 (^{109}Cd)

Time since launch [days]
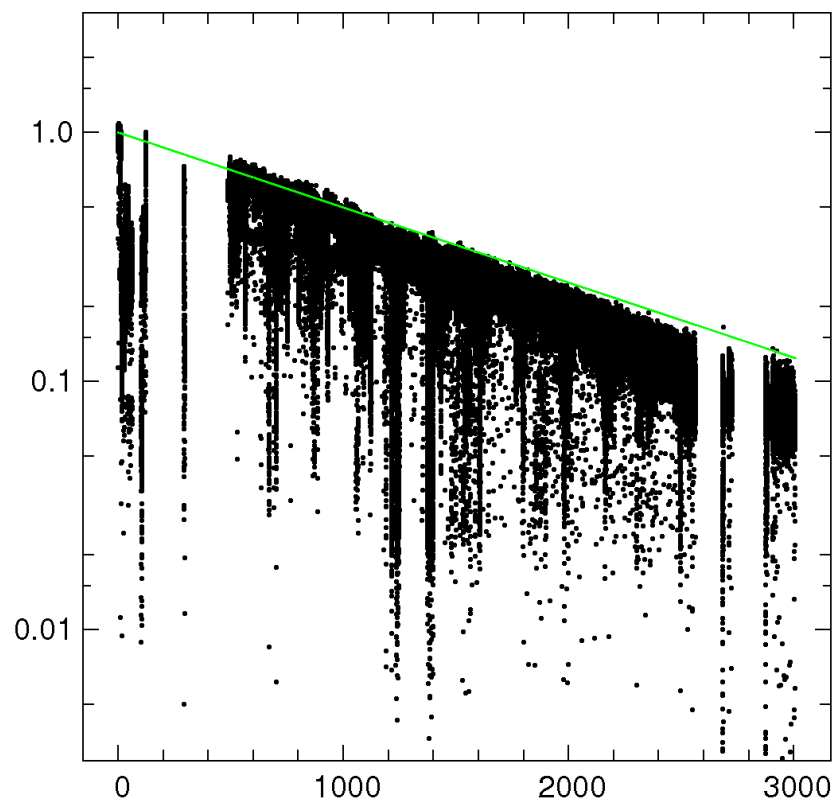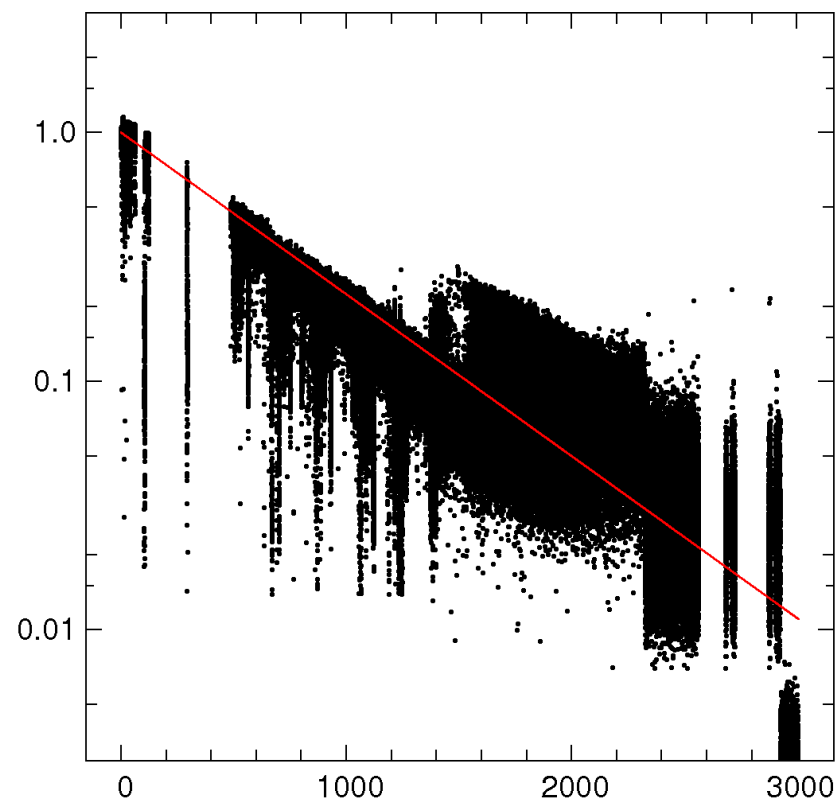
Time since launch [days]

JMX1 FRSS source #3 (^{55}Fe)

JMX1 FRSS source #4 (^{109}Cd)

Time since launch [days]

Time since launch [days]

JMX2 FRSS source #1 (^{109}Cd)
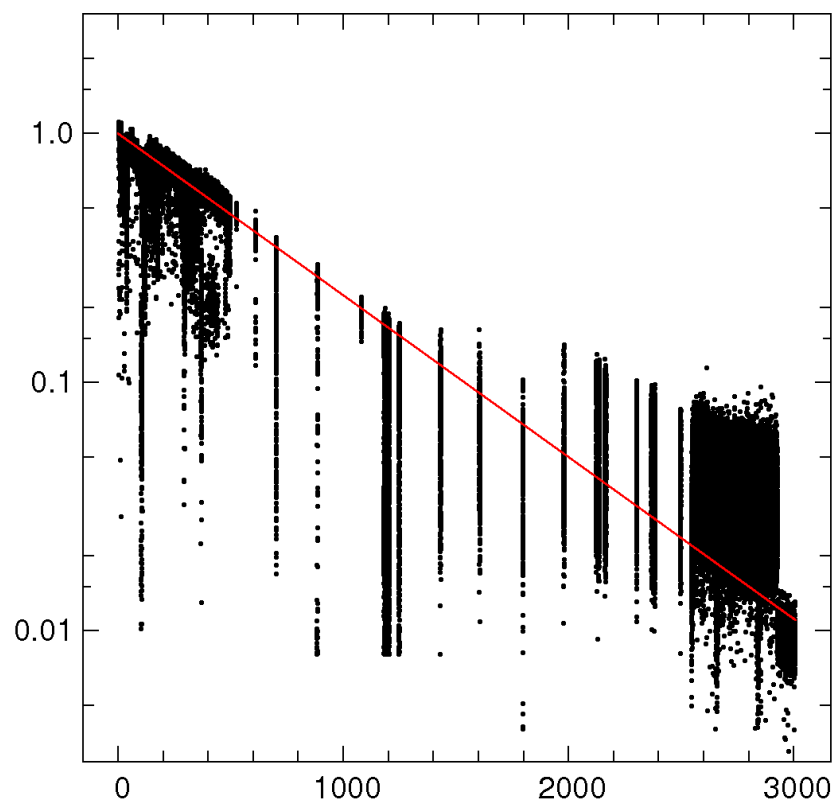
JMX2 FRSS source #2 (^{109}Cd)

Time since launch [days]
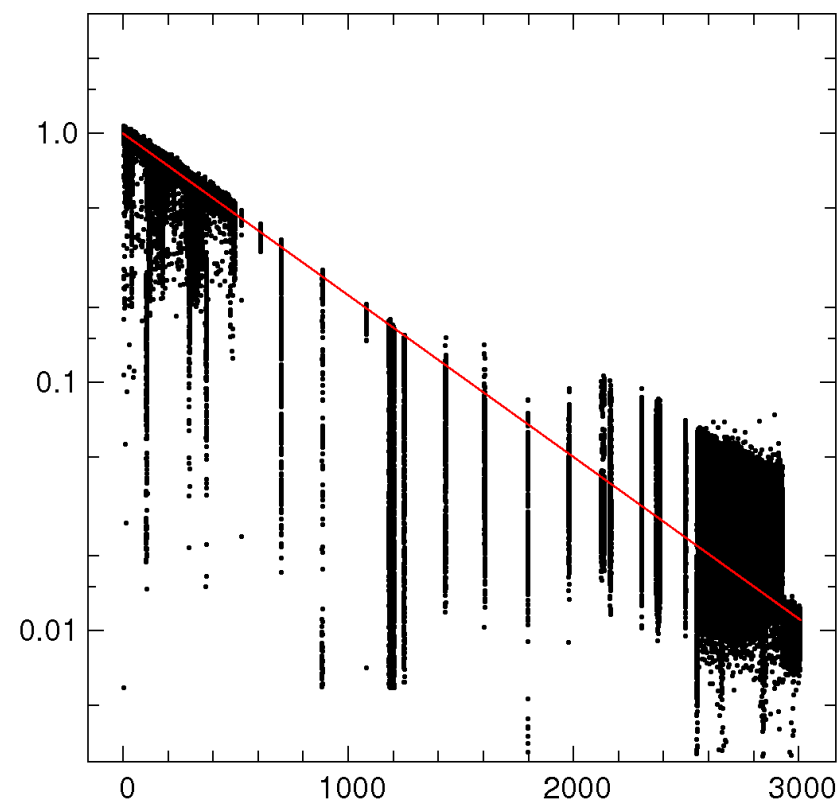
Time since launch [days]

JMX2 FRSS source #3 (^{109}Cd)

JMX2 FRSS source #4 (^{109}Cd)

Time since launch [days]

Time since launch [days]
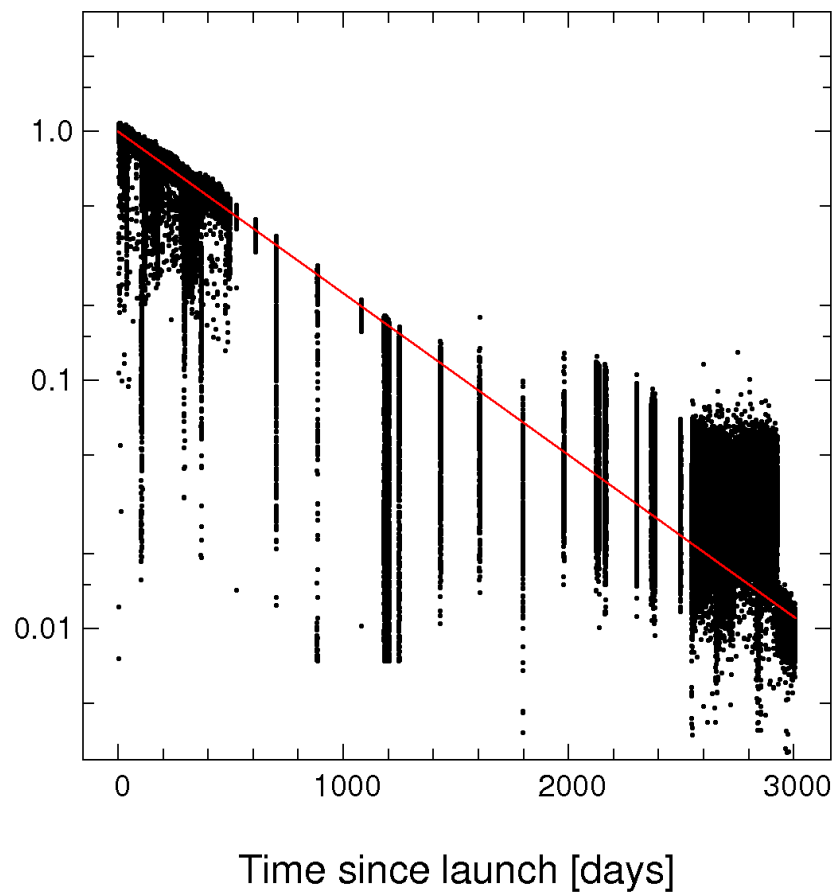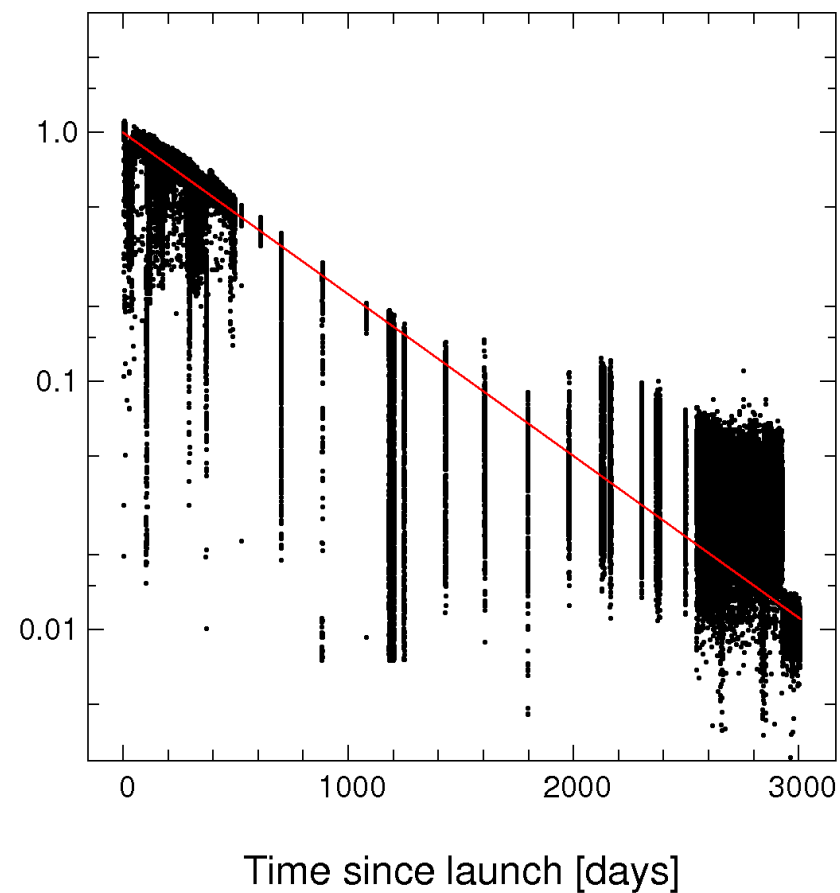
Conclusion:

An unexpected "deadtime" has been discovered.

Further analysis of the phenomenon will be initiated

Better calibration source count rate determination (runs for a long time)