XMM-Newton

Instrument Anomaly Tool

&

Cross-Calibration Tool

Marcus G. F. Kirsch

Situation now

- Any kind of strange instrument behaviour is reported by the INSCONS to the IDT
- Book keeping in minutes
- Sending information to PI via mail

. The mean values of the PN Q2 offset maps show a marked increase of 4-5 ADU since rev 604. The Q0 CCDs show a smaller increase in mean offset value of 2-3 ADU. In the Q1 and Q3 CCDs one can see a decrease of 1-2 ADU in the same period. This is reminiscent of the post Q2 current anomaly behaviour (September 2001, rev 325). Investigation of the Q2 current F1191 performed by Stephanie shows there is clearly a period between revolution 604 and revolution 609 where the current showed an increase of about 15 mA (from 310 mA to 325 mA). The Q2 current went back to its nominal value (~310 mA) in revolution 610. Investigation of post rev 609 offset maps underway. Problem is also under investigation at MPE / Tuebingen. (MS)
to be followed up with MPE by MS

. Also under investigation (triggered by MPE) the increased common mode variation seen in some PN offset maps. It seems to occur only in FF and mostly at the first observation of a revolution. A cause could be the enhanced radiation affecting these offsets, although the mechanism which would cause an increase in CM variation is not yet explained. There is not expected to be any impact on science quality as CM variations are corrected for by the on-board event median correction. (MS)
to be followed up with MPE by MS

. MOS2 SW background/noise gradient (BA)
MOS2 SW exposure (Obsid: 0644_0147860101)
There is a factor 2 in background level between the `left' and the `right'. low-energy pat0 only electronic noise.
It looks like the old problem of the MOS timing fixed-offset problems.
It's a one-off problem. Apparently this "noise" is removed efficiently by the SAS (to be checked), so virtually no impact on science data, but still it's puzzling why only this SW exposure was affected ... I'll keep that in the back of my mind. (BA)
- screened the last 50 revs and the "feature" is still there apparently randomly in ~20-30% of the exposures but a rather low level.
I haven't seen extreme example as in the past (see attached) and the occurrence rate seems also to go down, so could it cure by itself.
To me this is just another type of unpredictable electronic noise , vetoed efficiently by the SAS anyway (negative E3) , so not a big deal.
It affects only MOS2 in SW. (BA)

. On-going investigations on the MOS corrupted offsets, more occurrences have been found in the past. (BA)

. curious case of pn offset map loading: GD153 (WD)
not optical loading nor x-ray loading; possibly UV loading? (MS)

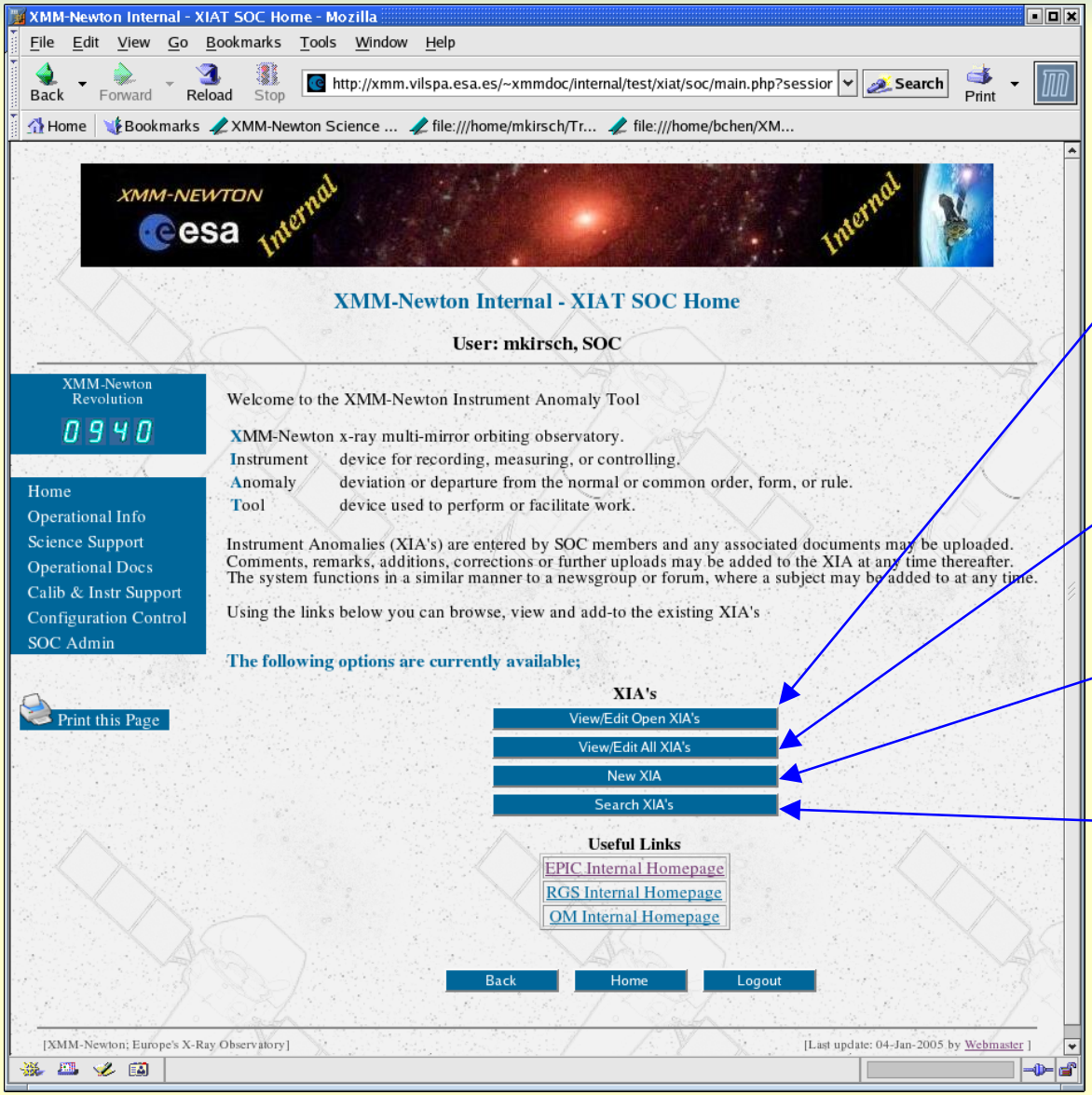
. PN diagonal structures for low energies. Happen to be perhaps at every first observation per rev. only in FF Mode. Could be a resonance or interference effect. Under Investigation in collaboration with MPE (MK)
some more analysis of pn noisy offsets: low E diagonal pattern in events image related to enhanced noise in pn offset maps (MS)

. investigations on MOS2 CCD5 low energy count rates (MST)
- identify the effectivity of detection algorithm for MOS2 CCD5 problem.
- investigations on MOS2 CCD5 ODF archive stopped due to processing time. Will be restarted when PPS is finished.
- search for correlations and triggers for MOS2 CCD5 problem.

XIAT

- WEB-Device for recording, measuring, or controlling deviation or departure from the normal or common order, form, or rule
- Instrument Anomalies (XIA's) are entered by SOC members (or external experts that have access to the internal pages)
- Any associated documents may be uploaded
- Comments, remarks, additions, corrections or further uploads may be added to the XIA at any time thereafter.
- The system functions in a similar manner to a newsgroup or forum, where a subject may be added to at any time.

XIAT



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home

view

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esa

XMM-Newton Internal - XIAT View Open

User: mkirsch, SOC

XMM-Newton Revolution 0940

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Print this Page

Click the XIA Title for full details

2nd One

2004/12/23 14:50:57	rbailey	more text here....
2004/12/23 14:53:16	rbailey	some added text some added text ....
2004/12/23 14:53:28	rbailey	here are some characters....

3rd One

2004/12/23 14:53:52	rbailey	some text here I feel....
2005/01/05 16:31:44	mkirsch	free too add some more....

CCD4 shows peak at 1000 eV

2005/01/04 09:59:33	mkirsch	CCD shows a strong peak in spektrm at 10....
2005/01/04 10:12:54	mkirsch	thats only a hot pixel. don\'t worry we ....
2005/01/04 10:22:31	rbailey	rod test text here....
2005/01/04 11:09:49	rbailey	some moetext from rod here....
2005/01/05 15:20:33	mkirsch	ewxecfr gtb gt t t vr....
2005/01/05 15:21:33	mkirsch	yuyfu....

hot column

2005/01/04 10:14:14	mkirsch	column 80 and 90 in pn are hot since rev....
2005/01/04 10:15:23	mkirsch	pn has only 64 columns and XMM is diving....

testentry

2005/01/05 11:18:07	mkirsch	asdasdsadasdasd....

Rod test 2345

2005/01/05 12:15:06	rbailey	text h ...

alian found in rev.9999

2005/01/05 16:33:58	mkirsch	image shows masked alien. ....

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Example entry

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XMM-Newton Internal - XIAT View Open

User: mkirsch, SOC

XMM-Newton Revolution

0940

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hot column

Instr=MOS1, Rev=555, ObsId=01234567

2005/01/04 10:14:14	mkirsch		column 80 and 90 in pn are hot since rev 4000
2005/01/04 10:15:23	mkirsch		pn has only 64 columns and XMM is diving in the pacific please submit a CRCRFTGETG to DG

Click Here to add a message or to close this XIA.

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back to view

Example uploaded file

EPIC

esa ESAC

alien.jpg (JPEG Image, 270x293 pixels) - Mozilla

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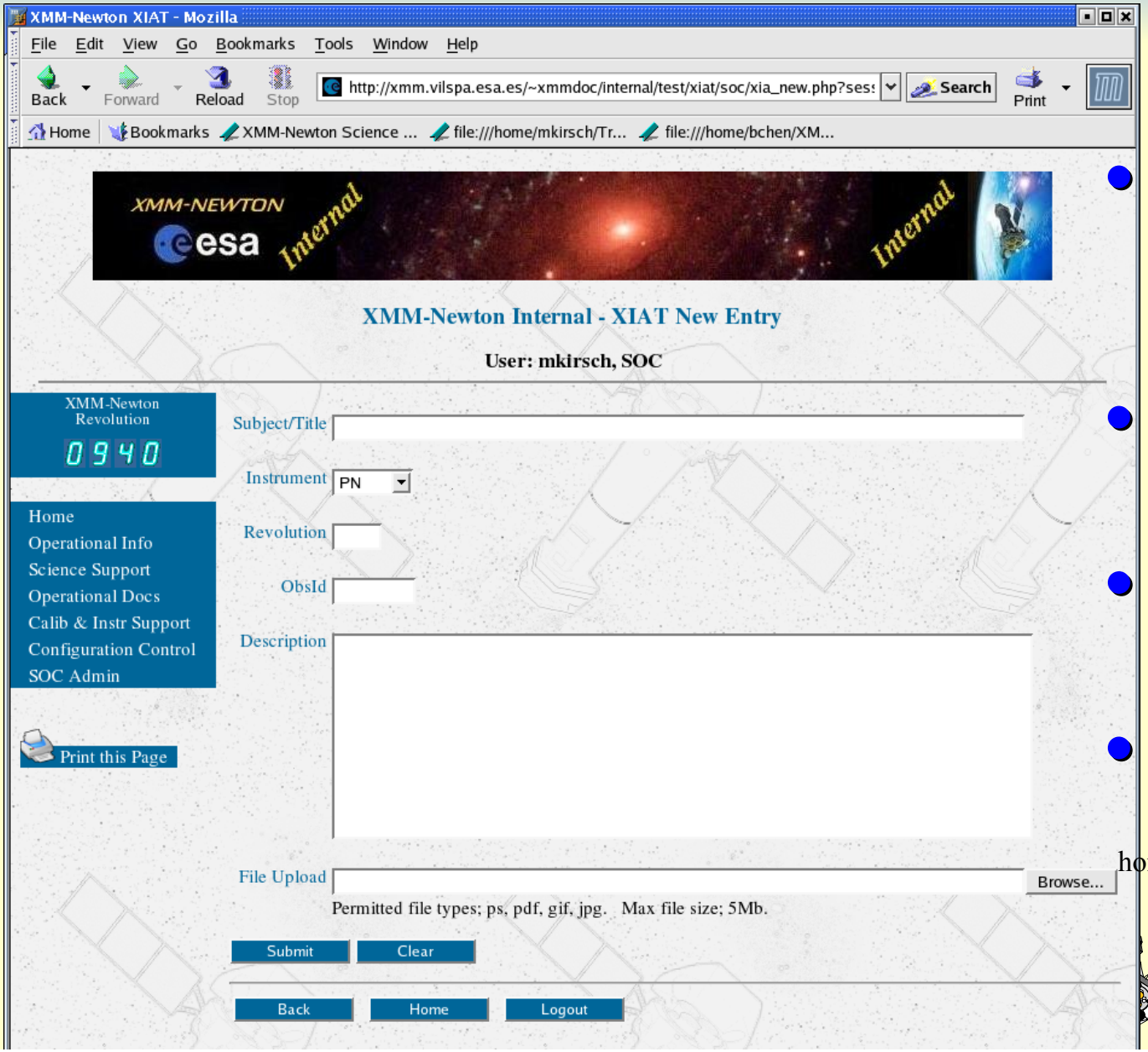
Home Bookmarks XMM-Newton Science ... file:///home/mkirsch/Tr... file:///home/bchen/XM...

You can upload : images, .ps files etc

back to view

New XIA



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- search

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search

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Home Bookmarks XMM-Newton Science ... file:///home/mkirsch/Tr... file:///home/bchen/XM...

XMM-NEWTON esa Internal Internal

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User: mkirsch, SOC

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Enter the text to search for;

Text ccd

Search Clear

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[XMM-Newton: Europe's X-Ray Observatory] [Last update: 20-Dec-2004 by Webmaster]

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- View all
- New entry
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home

Cross-Calibration tool

- The same tool will be available to discuss cross calibration results
- Slight modification needed to adjust to cross-cal needs
- Comments are welcome …

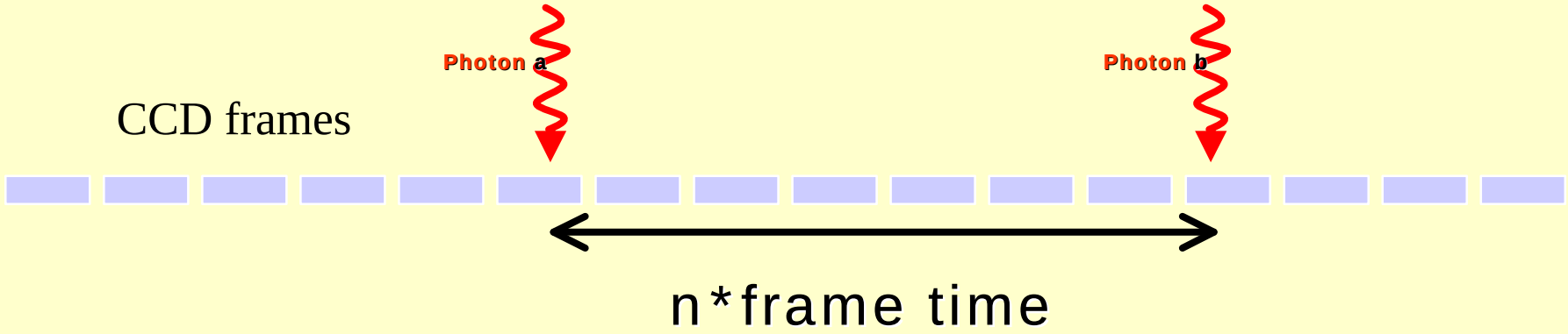
A time jump analysis on EPIC-pn with some side results

Marcus G. F. Kirsch
M.J. Freyberg, E. Kendziorra

menu

- Do we still have time jumps?
- How can we measure those?
- Can a time jump detection be implemented in a sort of routine check (Qcheck)?
- Are there time issues that we still do not understand ?

What is a time jump

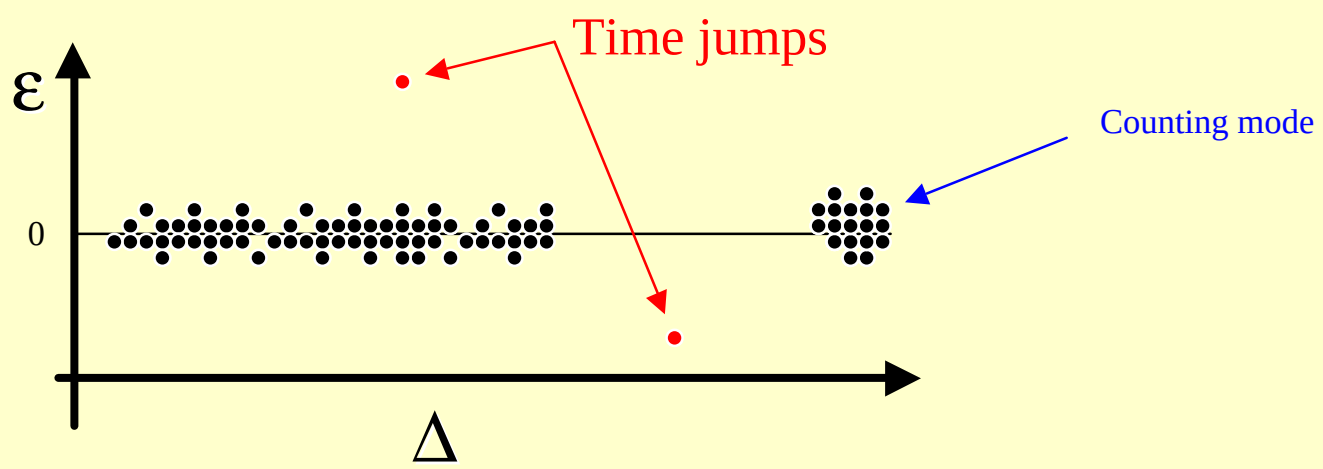


If the time difference between the two arrival times of photon a and photon b is not a multiple of the frame time

→ TIME JUMP

How to detect the jump

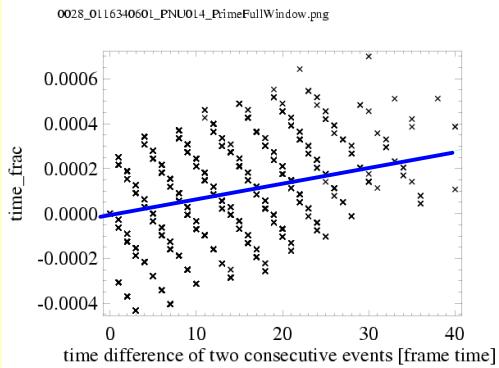
- Take all frame times in array: T
- Δ=(T(i+1)-T(i))/frametime
- ε=difference of Δ to next full frametime
- Plot $\varepsilon(\Delta)$
- If ε >tolerance →time jump

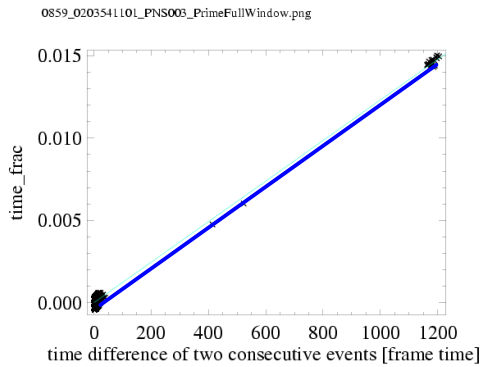


Mega processing

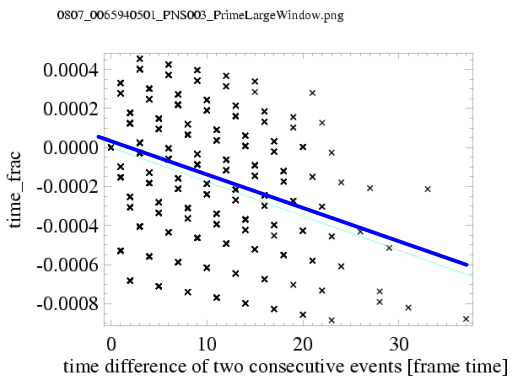
- Past: only known problem cases have been checked at MPE
- Now: processing of all public and non public available archive data at ESAC
- Some characteristic results:

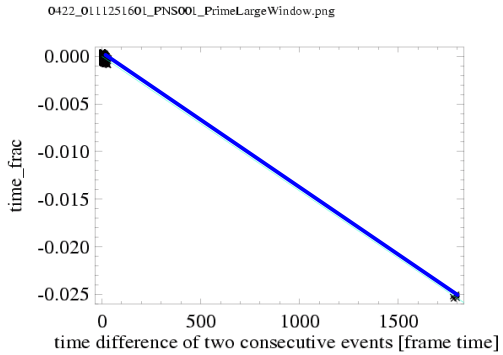
FF



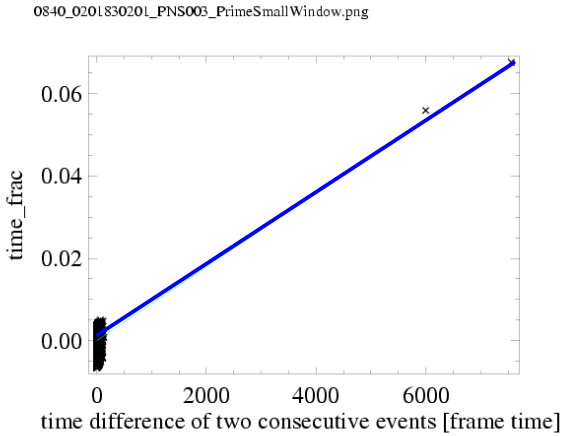


LW

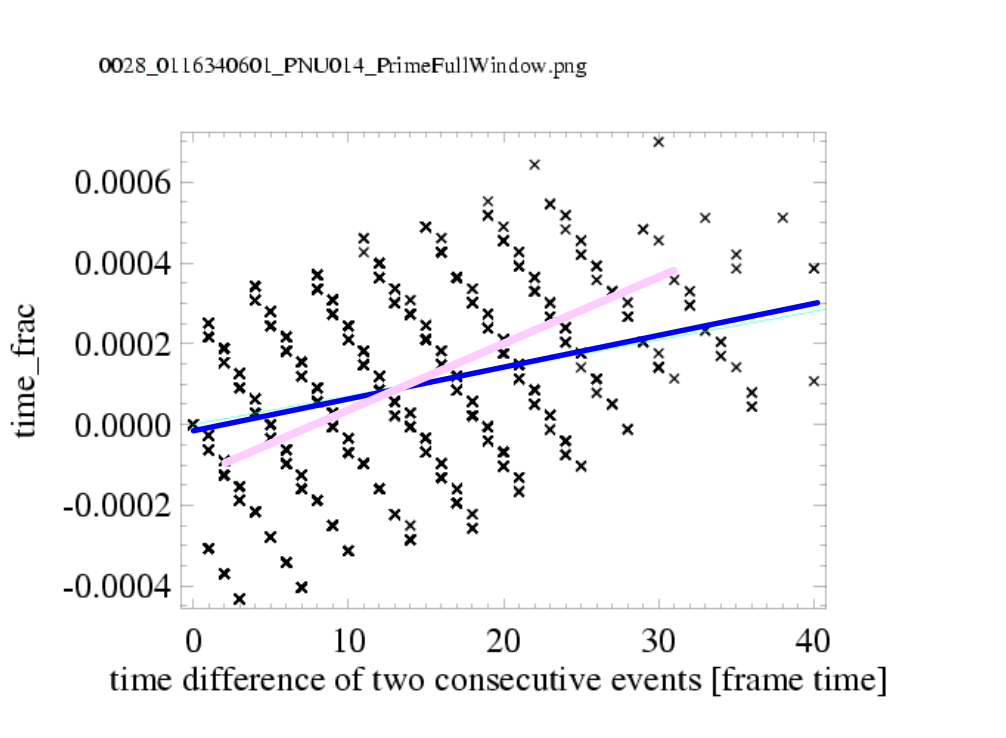




SW

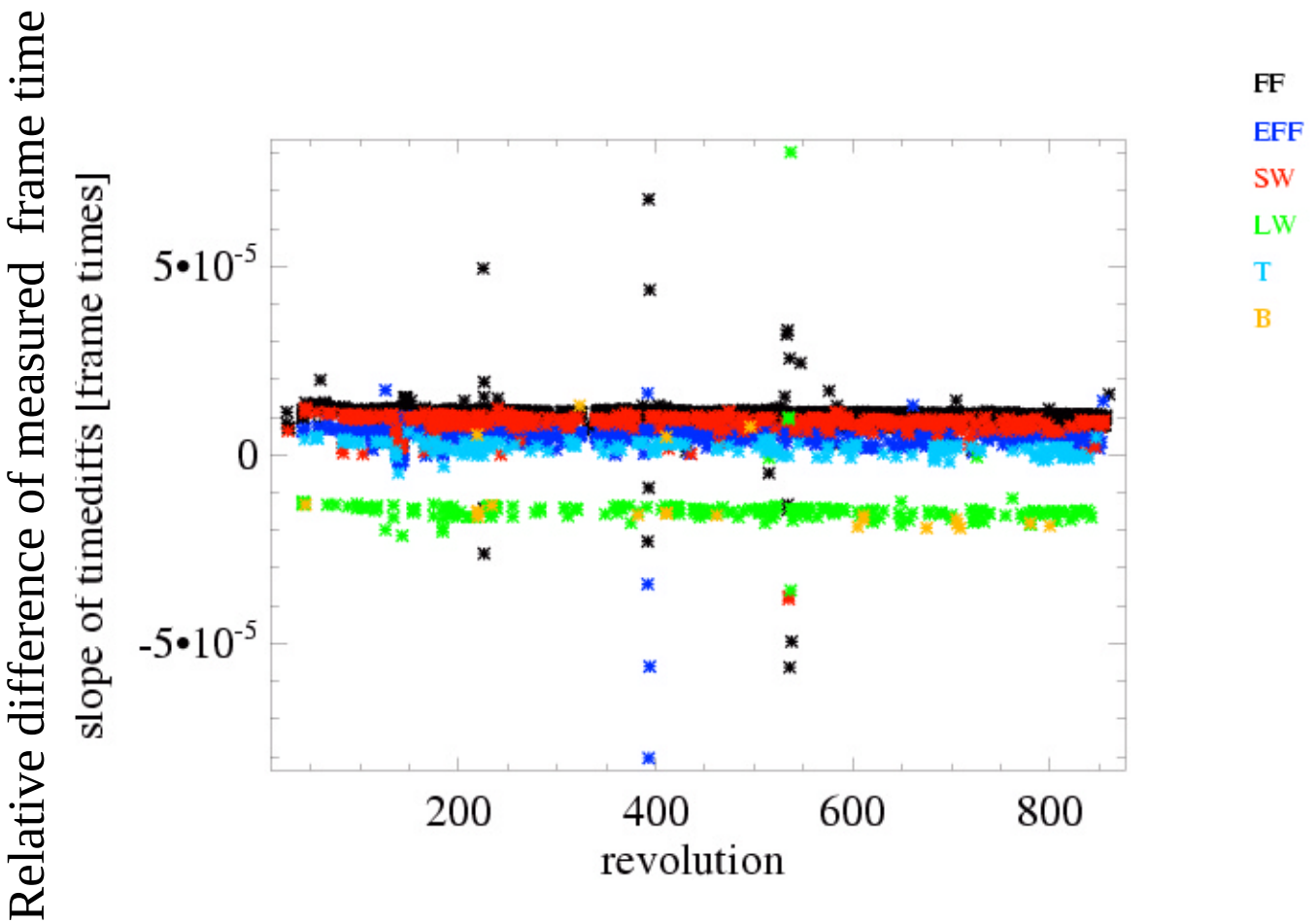


findings



- Slope:
  - Is the clock drifting?
  - Are the frame times correctly used?
- Diagonal patterns: numerical effects

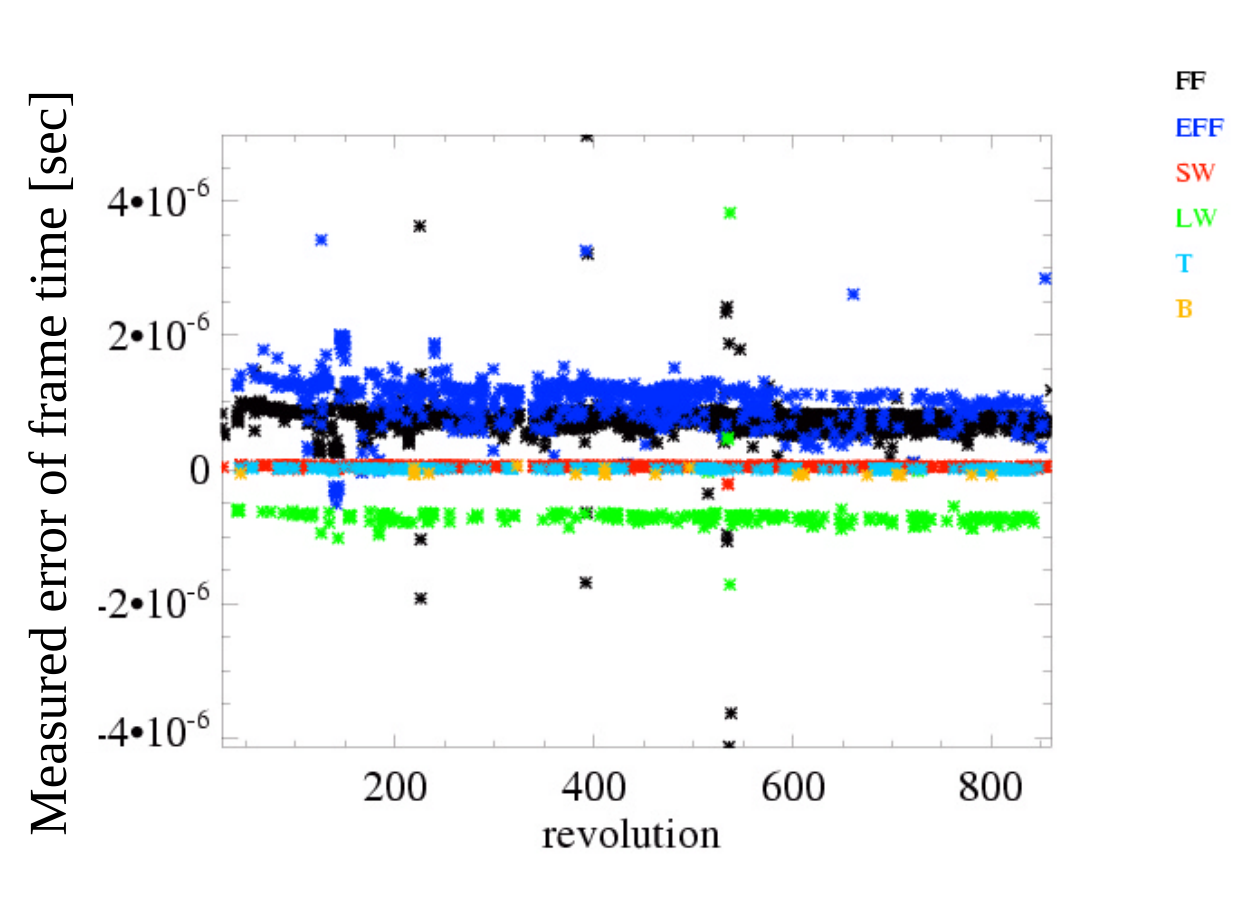
slopes for all ODF



- Different slopes for different modes
- LW similar to Burst –1E-5
- Rest similar around 1E-5
- Errors:
  - FF group: 1E-5 frametimes per frame
- Slight drift in frame times

→ **Oscillator stable, otherwise relative differences should show same shift**

resulting absolute error



- Burst, Timing and Small Window mode do show negligible absolute errors
- FF, eFF and LW show room for improvement

→ frame times are not fully correct
→ can be calibrated using the result of that analysis

→ Not critical for exposure time and timing

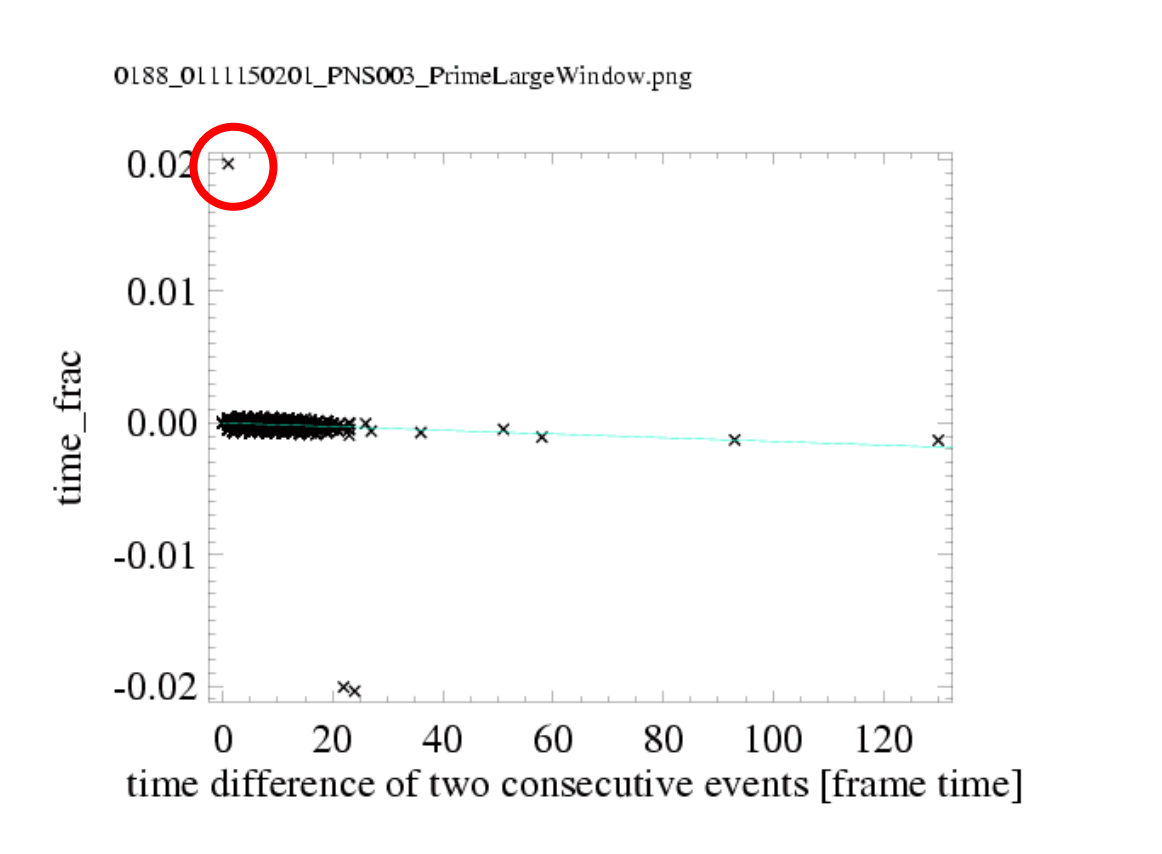
→ Analysis can be used to refine frame times with very high accuracy

Numeric effects

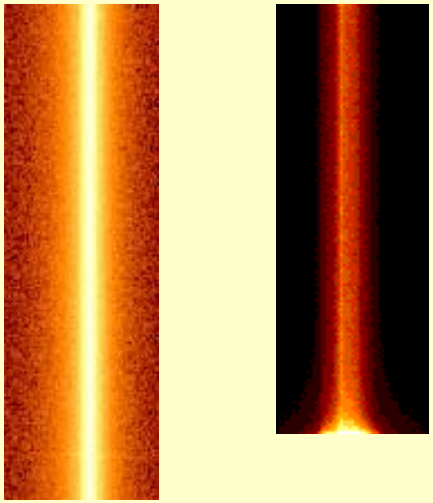
- mjf

How to proceed now

- Determine frametimes
- Repeat analysis with correct frametimes and search for time jumps



Correct treatment of fast mode ARFs

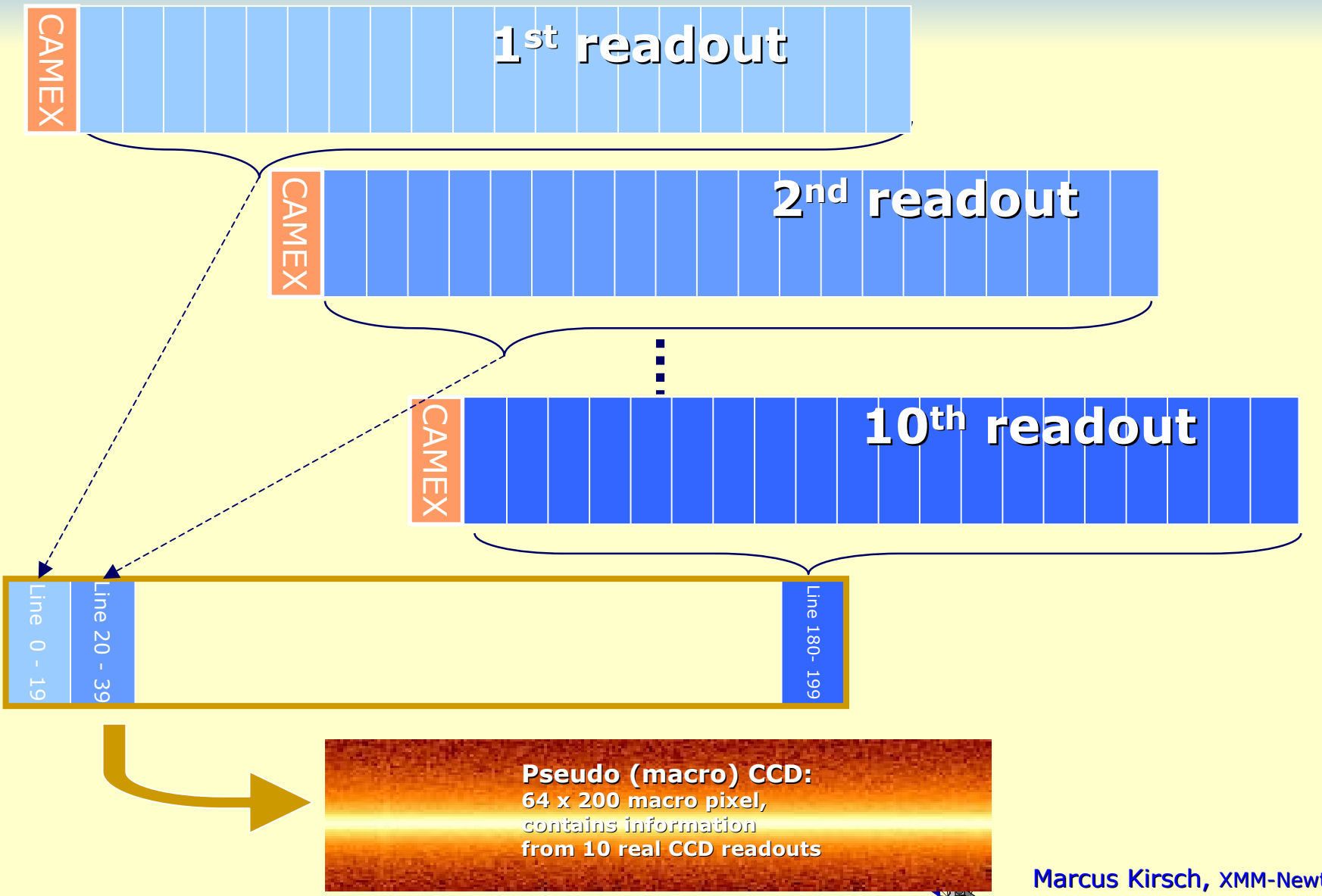


Marcus G. F. Kirsch, G. Schoenherr,
E. Kendziorra, M.J. Freyberg

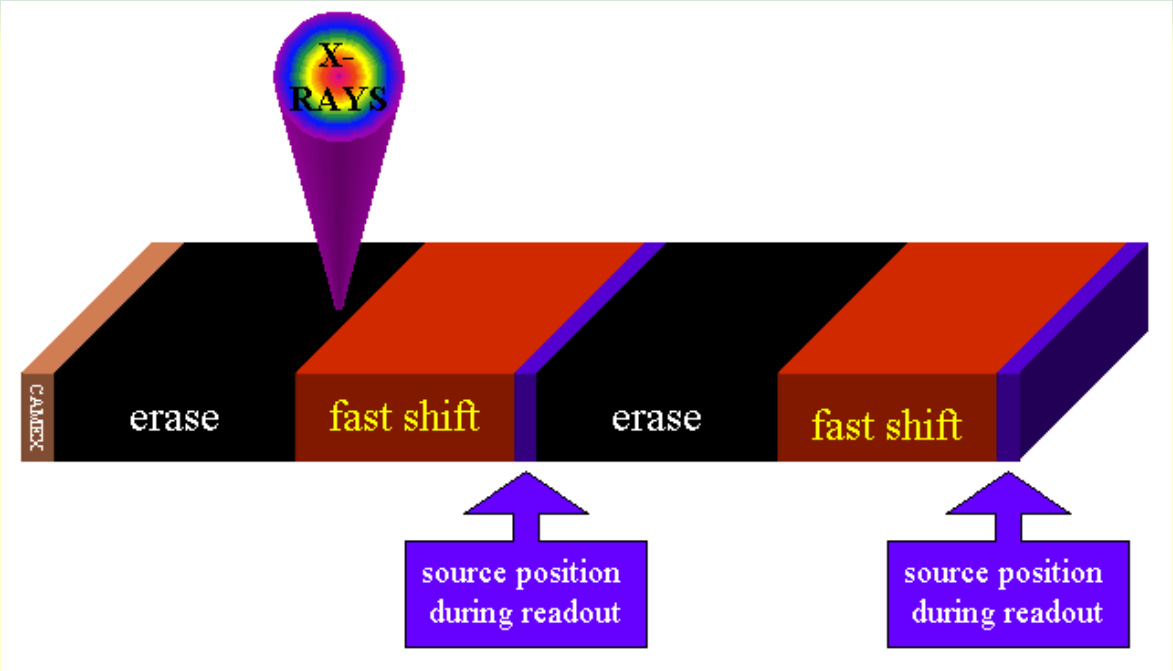
menu

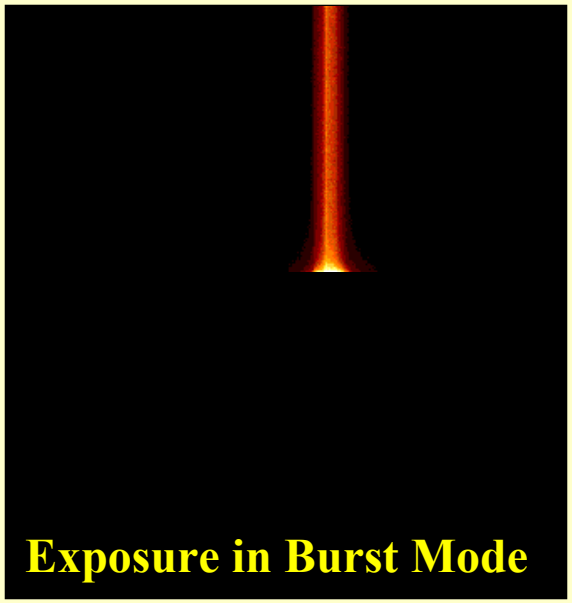
- recap fast mode operations
- Extraction region normalization treatment in fast modes
- arf generation window versus fast modes

CCD readout in Timing Mode



EPIC-pn Burst Mode

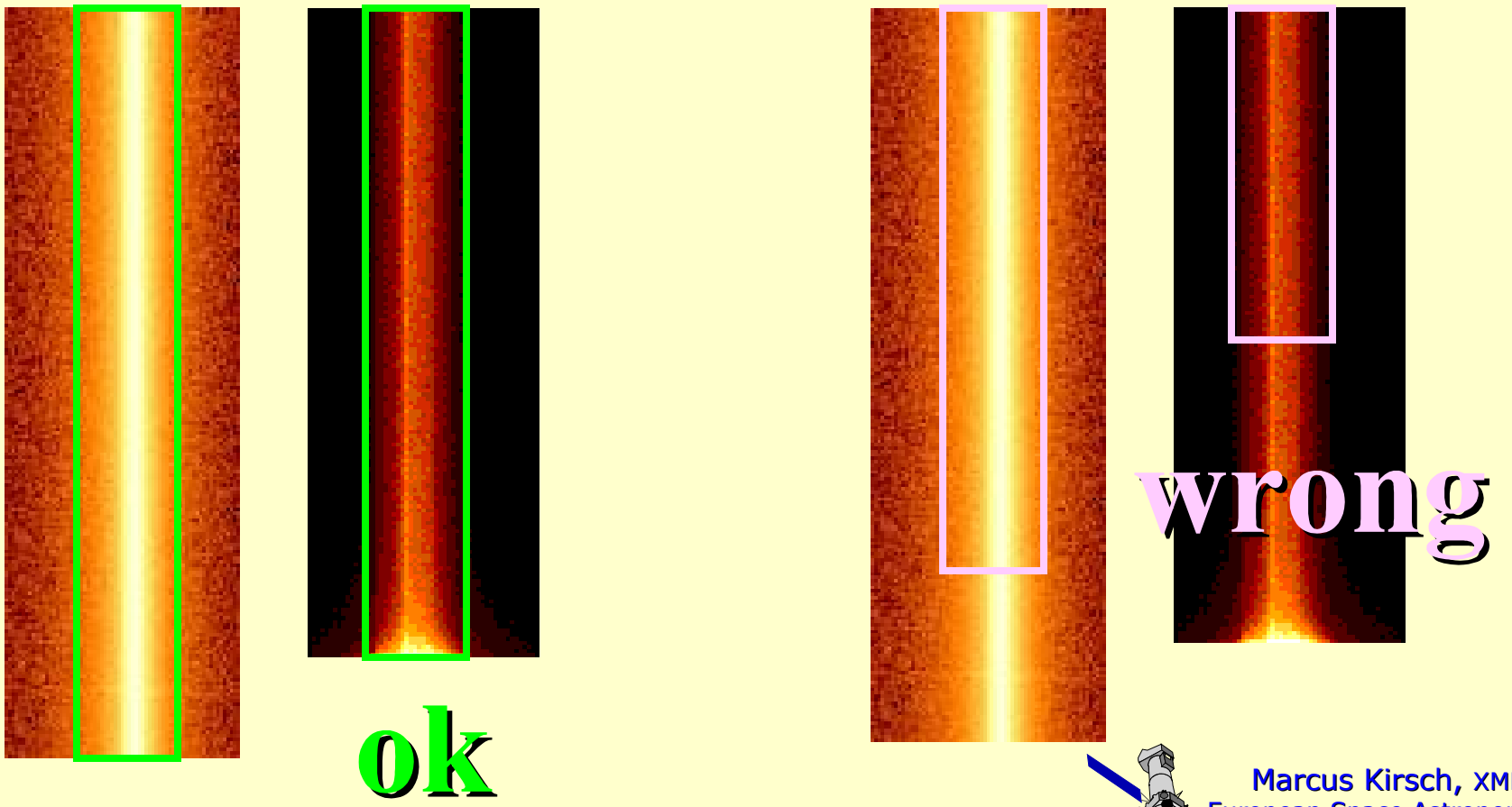




- Burst Mode
  - fast transfer of pixels under PSF
  - time resolution: 7 μs
  - life time only 3 %
  - Max. count rate (flux) point source [s^{-1}] ([mCrab]) : 60000 (6300)

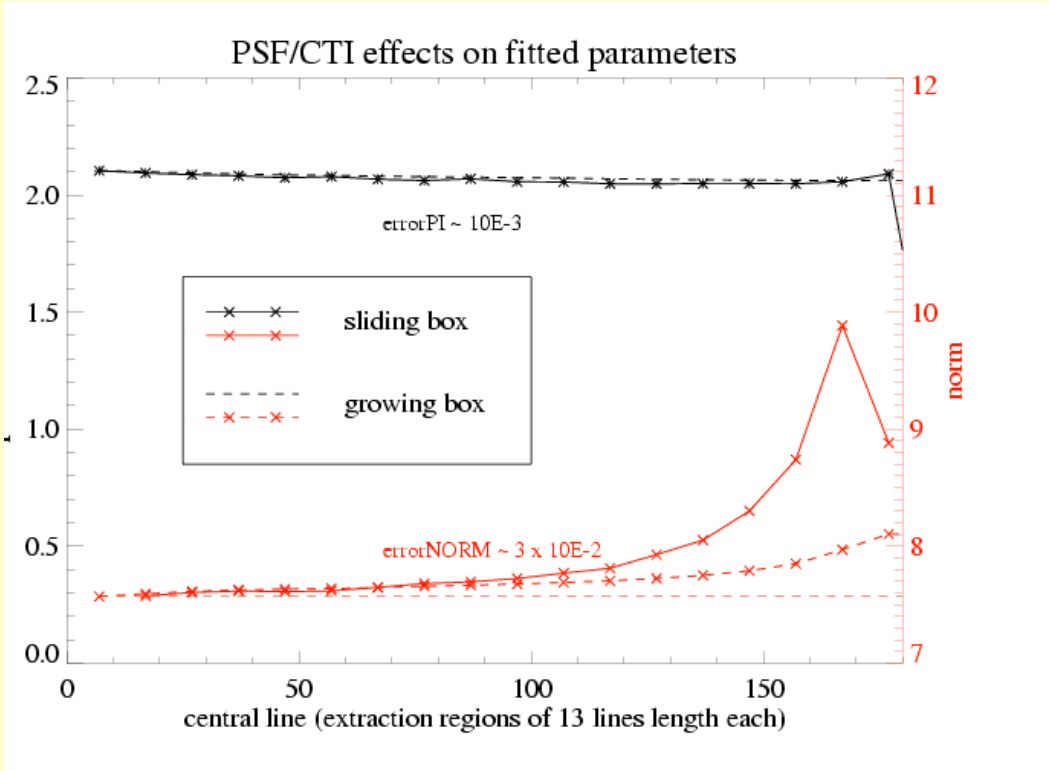
Normalization pre 6.1

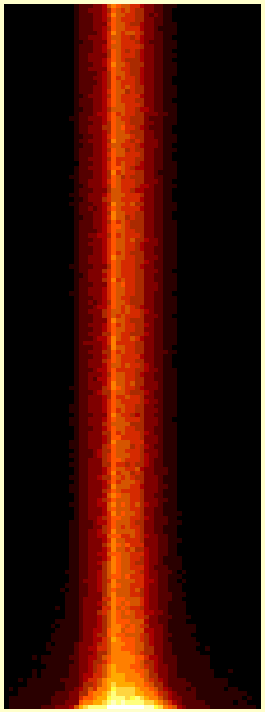
- Arfgen assumed an extraction region with Y-extent: 200(Timing), 180 (Burst)



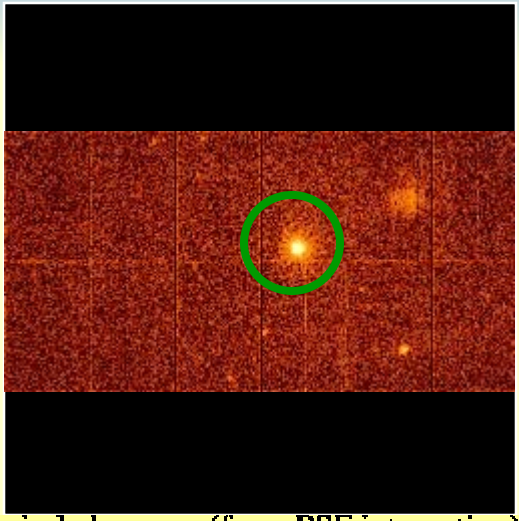
Normalization 6.1

- Arfgen now scales with extraction region Y-extent: Y/200(Timing), Y/180 (Burst)
- Timing mode trivial
- Burst mode complicated, because part of PSF is leaking into fast shift recorded events during slow read out

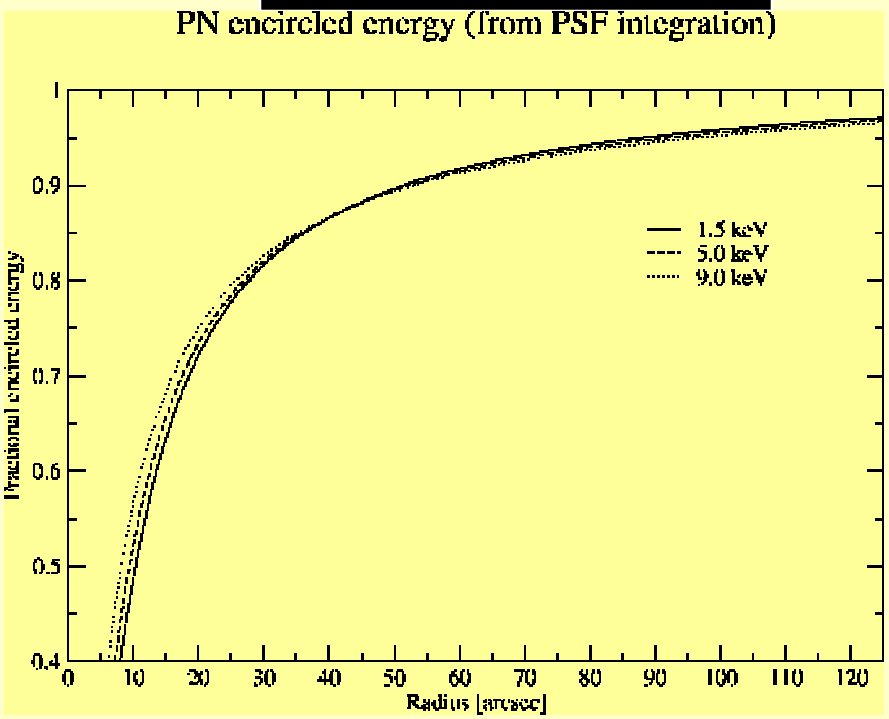


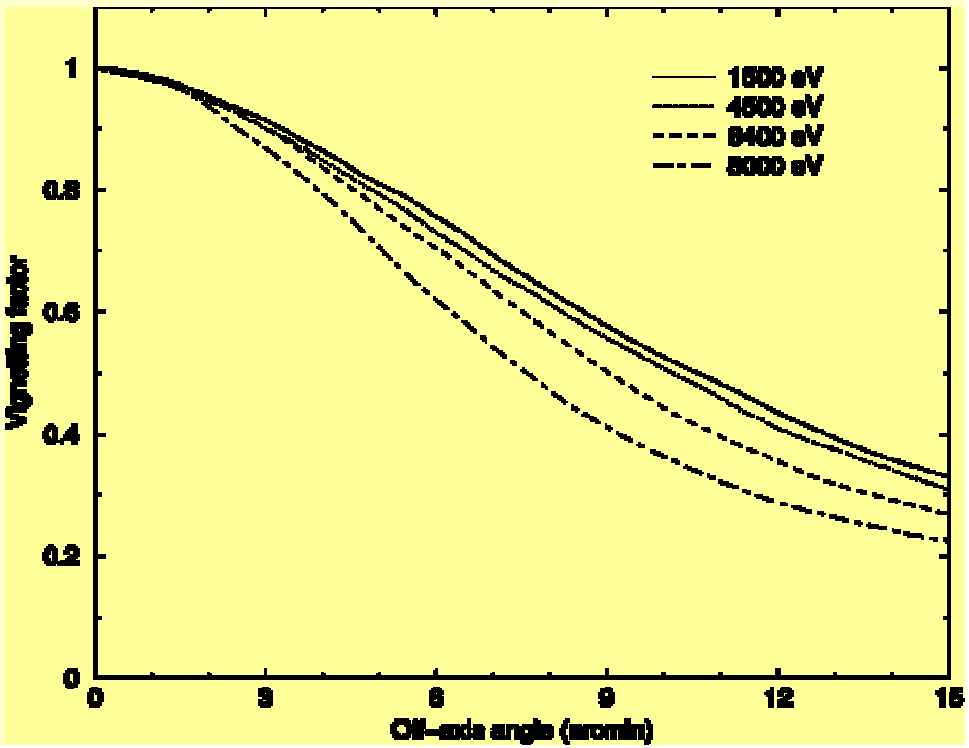


Situation for Window modes



- **Arfgen takes into account:**
  - **PSF**
  - **Vignetting**

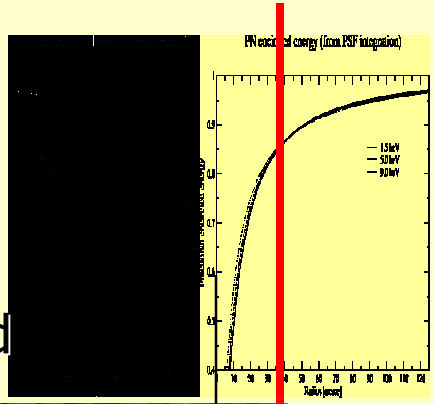


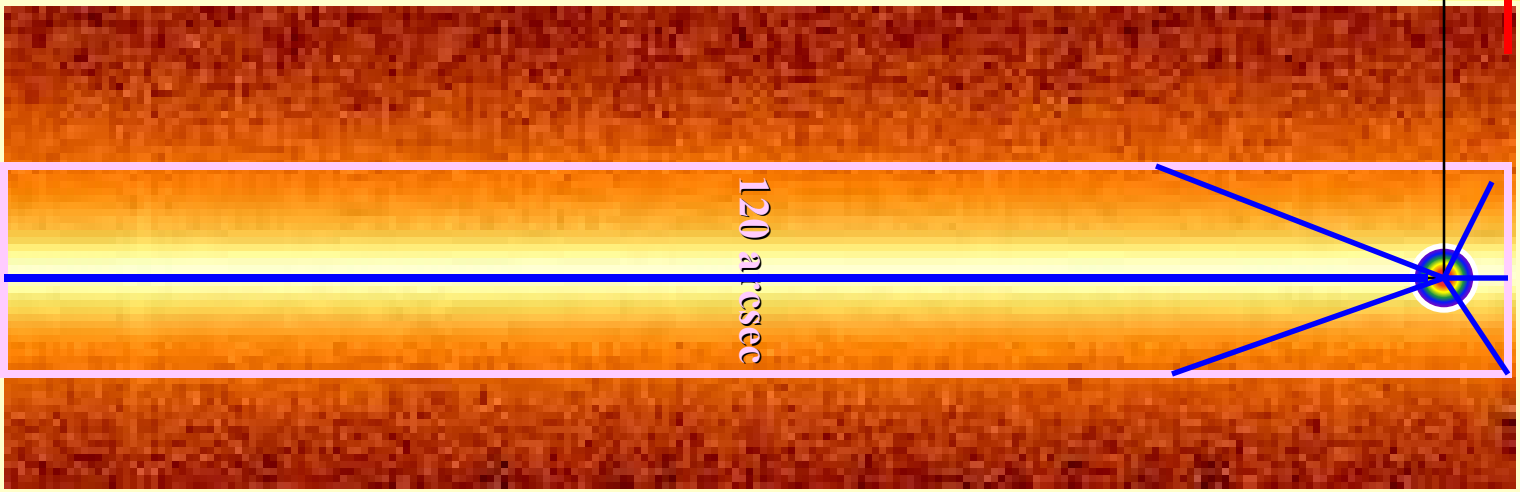


Fast modes 6.1

- Arfgen corrects for Y-extent of extraction region, but still not for PSF (and Vignetting→ straight forward)
- PSF:
  - X-direction normal PSF distribution
  - Y-direction:
    - Direction towards CAMEX 99.99 % PSF
    - Direction opposite CAMEX 85 % PSF

→2 dim PSF needs to be integrated not averaged





Summary status of the EPIC calibration

Marcus G. F. Kirsch

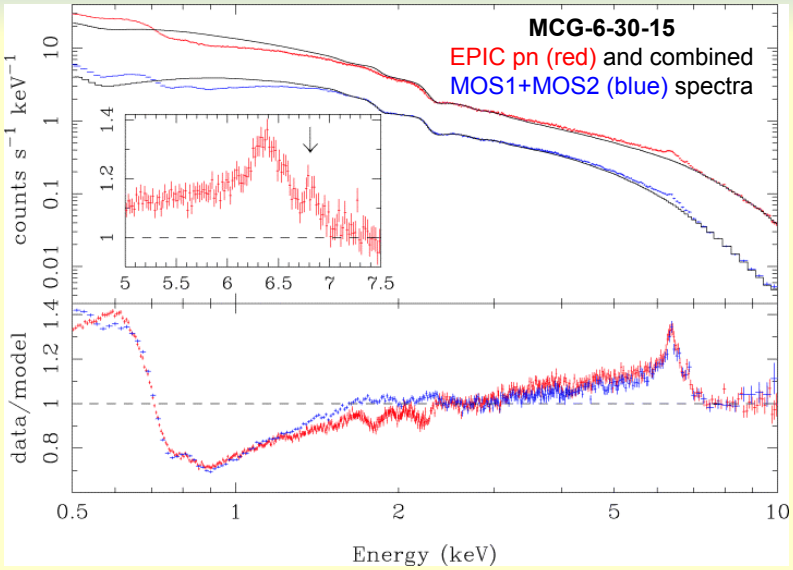
Mallorca, 03.02.2005

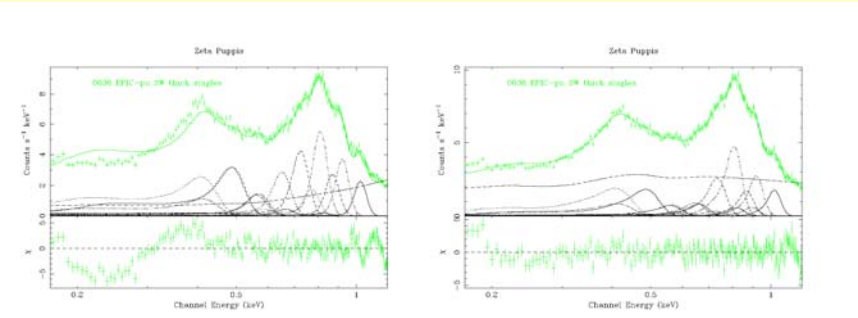
actions

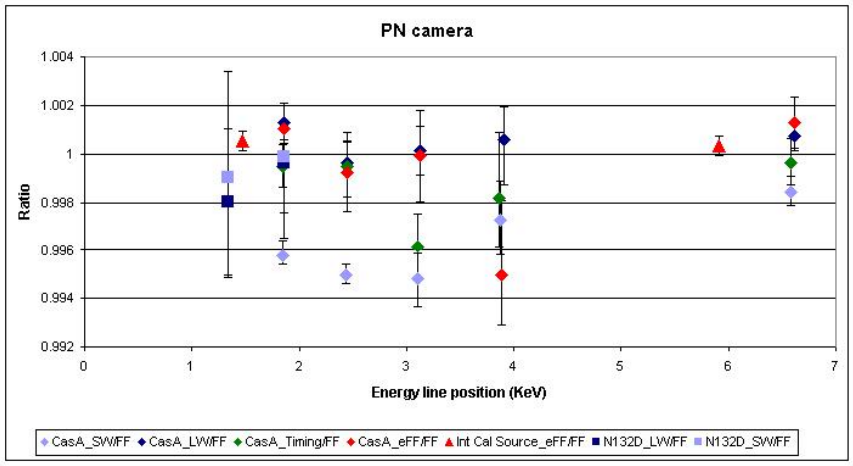
- AI_EPIC_14_1: Additional time column with other 0 point for ODF (RD, MK, MJF)
- AI_EPIC_14_2: update frame times according to analysis presented in 1.1 (MK)
- AI_EPIC_14_3: implement time jump in a qcheck type proceeding in the long term (MK)
- AI_EPIC_14_4: KD to provide new gain values for refinement of the column dep. pn gain correction (KD)
- AI_EPIC_14_5: MS to implement KDs values into CCF
- AI_EPIC_14_6: MK to put warning on energy accuracy in for doubles with input from KD
- AI_EPIC_14_7: open new NRCO for pn LW CTI determination with N132D, request low BG time (MK)
- AI_EPIC_14_8: SS to provide RS with newest RMF parameters to be implemented in CCF (SS, RS)

Solved topics

- New XRT3 EFF; improving gold edge
- pn SW CTI refined
- pn eFF CTI refined
- pn long term CTE refined
- pn redistribution back to ground values







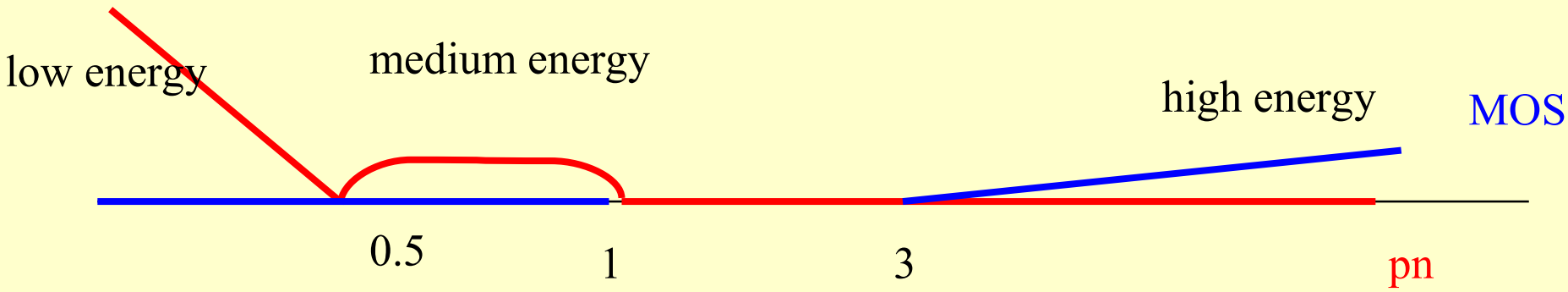
ongoing (rel. straight forward)

- Column dependent MOS CTI (Darren, Martin)
- PSF core with extra Gaussian (Andy)
- Astrometry residuals for Psi angle (Bruno)
- pn gain refinement for sp. Columns (Michael, Konrad)
- New MOS rmf (brings MOS up by 4 % in 400-800, still ~10 missing with regard to pn) (Steve)
- Pattern 31 to increase MOS QE (Andy)
- SCISIM evaluation (Marcus, Martin)
- pn time jump analysis and frame time refinement (Marcus)

Ongoing ("challenging")

- MOS patch (time, spatial dependent)
  - Time dependent flux decrease 0.4-0.8 keV
  - Low energy excess < 0.4 keV
- MOS2 CCD5 noise
- pn gives wrong NH / to much flux for RXJ1856
  → should we start to try a eff area fudge for low energies
- Upwards redistribution for very soft (extreme UV sources GD153)
- pn line position for doubles in shift direction (PATTERN 1 & 3)
- fast mode arfs

possible proceeding



- high energy:
  - look at Crab data with pn
  - If PI agrees with canonical one fix MOS high energy QE
- low energy:
  - Adjust pn effective area to get reasonable NH values
- medium energy:
  - ????

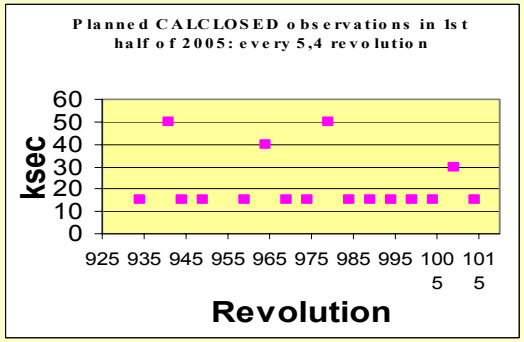
Long term EPIC in-orbit calibration plan

Marcus G. F. Kirsch

Current situation

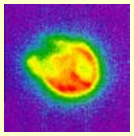
- CALCLOSED every 5.4 revs

550 ks ~ 2 % of XMM time

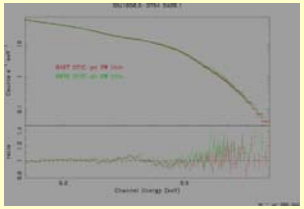


→ - gain monitoring
- CTI determination

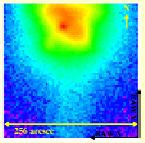
- Targetes:
  - 1E0102 (2/year 30 ks)
  - N132D (2/year 30 ks)
  - RXJ1856 (2/year 35 ks)
  - Crab (2/year 15 ks)
  - PKS2155 (1/year 30 ks)



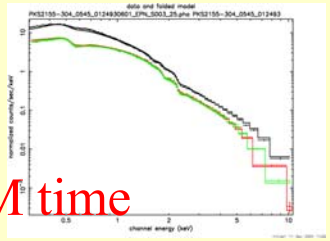
→ - gain monitoring
- CTI determination
- flux stability



→ - low energy flux stability



→ - timing



→ - Chandra cross cal

250 ks (+100 ks OH) ~ 1.5 % of XMM time

+ NRCOs

future CALCLOSED strategy

- Meeting: 05-11-2004 to evaluate the the possibility of using slews for CALCLOSED
- Decision:
  - period of 2 months to perform slews in CALCLSOED
  - Until a decision is taken about any modified approach ALL CALCLOSED currently mandated for execution in the Science Window will continue to be executed nominally.
  - Even when we have determined a new scenario we will need the current and future CALCLOSED strategies running in parallel for some months of evaluation.
- test period still running
- data need to be evaluated

CALCLOSED test period

- Use all slews longer than 15 min
- On average:
  - MOS: 4 ks/revolution in FF
    → 740 ks per year
  - pn: more often different modes from FF are used: 2.5 ks/revolution in FF
    → 450 ks per year

future CAL-target strategy

- many variations in setting to establish calibration of different modes/filters etc.
  →lag of a profound set of reference measurements with exactly the same setting
- IT IS NOT TO LATE …
- establish for the coming XMM years a basic set of NOT changing observations that guarantee tracking of possible
  - contamination
  - redistribution changes
  - all we can think of ☺
- perform in addition calibration observations for special calibration issues

future possible situation

- CALCLOSED
  - MOS using slews
  - pn and MOS: parasitically long calclosed on RGS cal targets (every 2 month)
  - no dedicated CALCLOSED ????

→ - gain monitoring
- CTI determination

0 ks

- Targets with FIXED setting:
  - 1E0102 (2/year 30 ks) TBD
    SW thin, SW medium
  - N132D (1/year 30 ks):
    SW thin, re-center to SW pn, MOS in LW
  - Vela FF thin 60 ks (1/year)
  - Tycho 1 per year TBD 30 ks

→ - flux/gain stability

SNRs always same Roll angle, same time of the year

→ - low energy flux stability

  - RXJ1856 (2/year 35 ks):
    SW thin

→ - redistribution

  - Zeta puppis SW thick(RGS target)

→ - timing
- flux stability thick filter

  - Crab (2/year 15 ks):
    Burst/Timing/Burst thick filter
  - PKS2155 SW medium (1/year 30 ks)

→ - Chandra cross cal

310 ks (+130 ks OH) < 2 % of XMM time

+ NRCOs (H1426 1 per year with Chandra 90 ks)