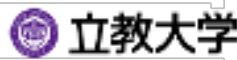# XIS Status Update

M. Tsujimoto (JAXA ISAS)

on behalf of the XIS team.

Contents

- Scope : Updates since last Suzaku conf. in 2009.
- Audience : Users of XIS.
- Topics <# of slides> **(Related presentations)**
  1. <2> Micrometeorite hits.
  2. <2> Improved energy calibration **(Sawada+ #10)**
  3. <2> XIS1 increased charge injection.
  4. <1> P-sum calibration **(Kohmura+ #11)**
  5. <1> Supported clocking modes.
  6. <1> Contamination modeling
  7. <1> Cross-calibration w. other instruments. **(Ishida+#8)**

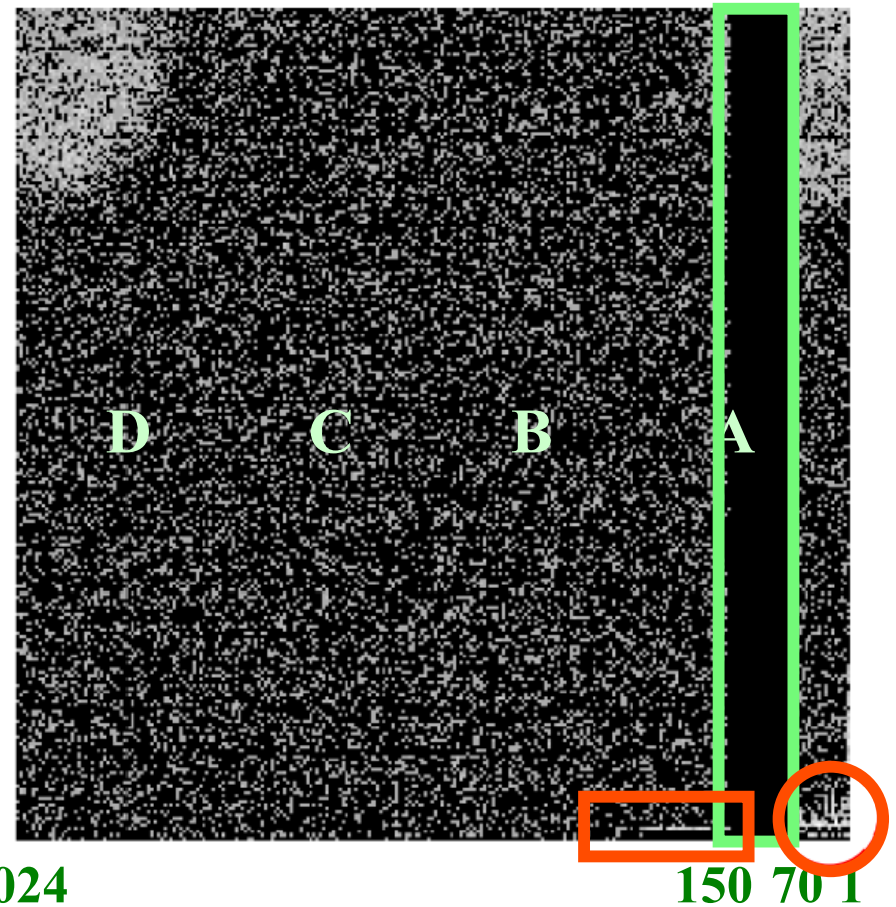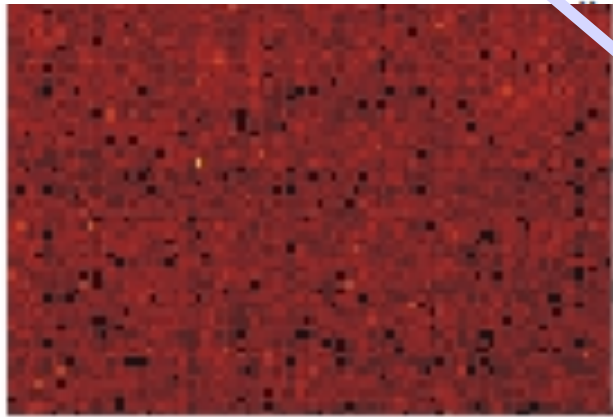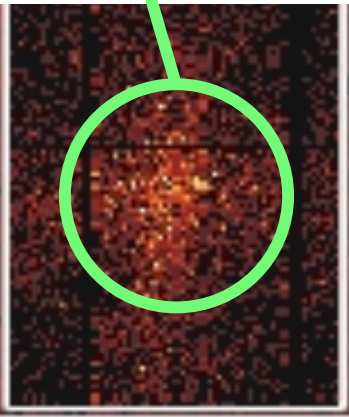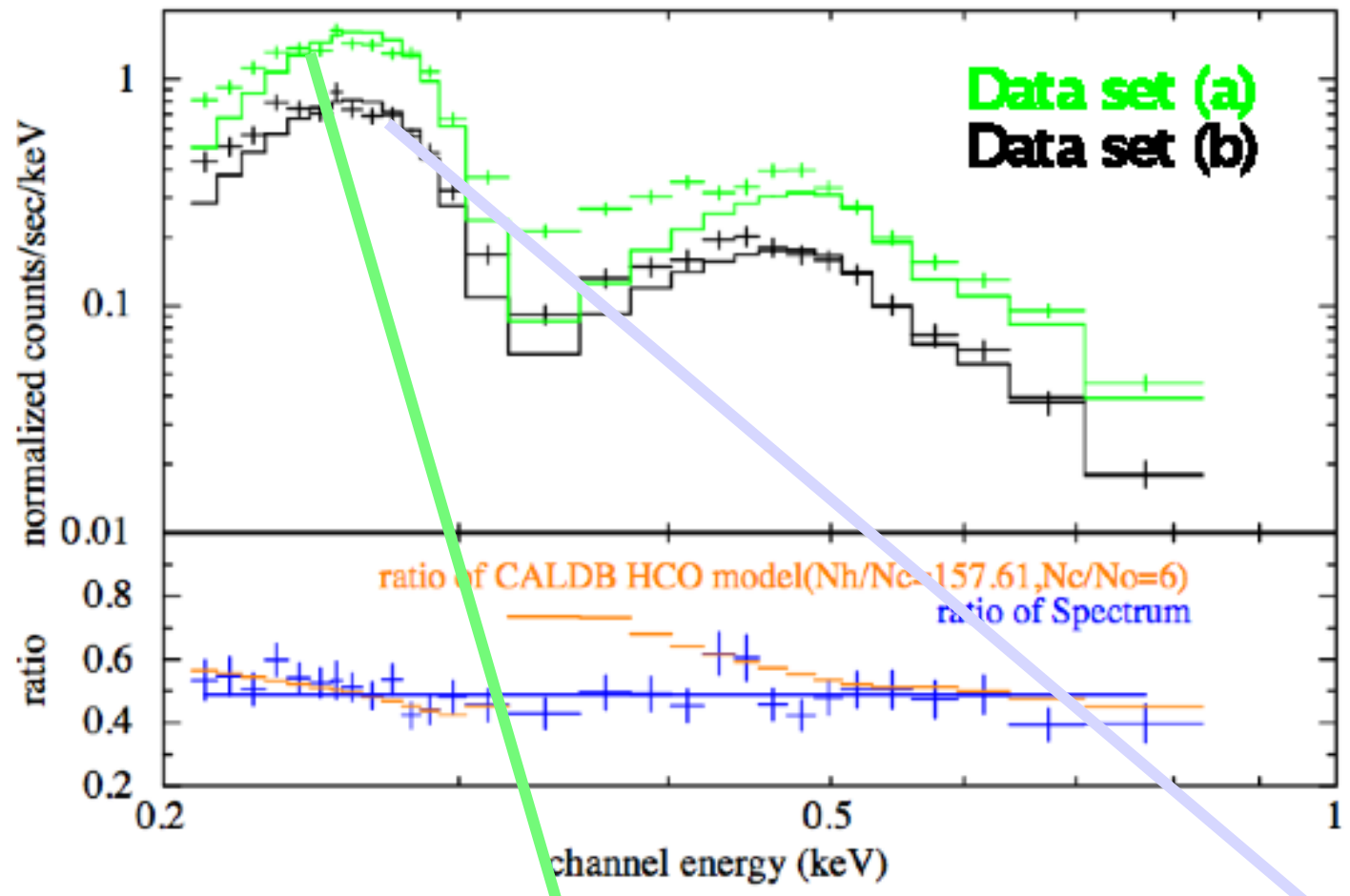 **Other related posters: Grant+#12, Todoroki+#13)**

References

[1] Suzaku memo 2010-01 "XIS Anomaly of XIS0"

[2] Suzaku memo 2010-03 "XIS Anomaly of XIS1"

[3] Suzaku memo 2011-01 "
XIS Result of On-board Experiments of Increased Amount of Charge Injection for XIS"

[4] XIS analysis memo "How to check the significance of pileup"

[5] XIS analysis memo "
Notes for reducing XIS0 data with area discrimination after 2009-06-27"

[6] XIS analysis memo "Recipe for reducing XIS data taken with the P-sum/timing mode"

[7] Tsujimoto, M. et al. A&A, 2011, 525, A25 "
Cross-calibration of the X-ray Instruments onboard the Chandra, INTEGRAL, RXTE, Suzaku, Swift, and XMM-Newton Observatories using G21.5-0.9"

[8] Miller, J. M. et al. ApJ, 2010, 724, 1441 "
On Relativistic Disk Spectroscopy in Compact Objects with X-ray CCD Cameras"

[9] Yamada, S. et al. PASJ, in prep "Data-oriented Diagnostics of Pileup Effects on the Suzaku XIS"

[10] Ishida, M. et al. PASJ, in prep "Cross-calibration with PKS2155-304"

[11] XIS Quick Reference

1. Micrometeorite hits (1/2)
Event in Jun 23, 2009 for XIS0. **Ref [1,5]**

- A part of XIS0-A dead.
- Dead area masked.
- No change since then.
- Cautions.
  - Tools works by masking dead area in region files.
  - Spurious events.
  - NXB generation for data in 2009/1/24-2009/6/27.
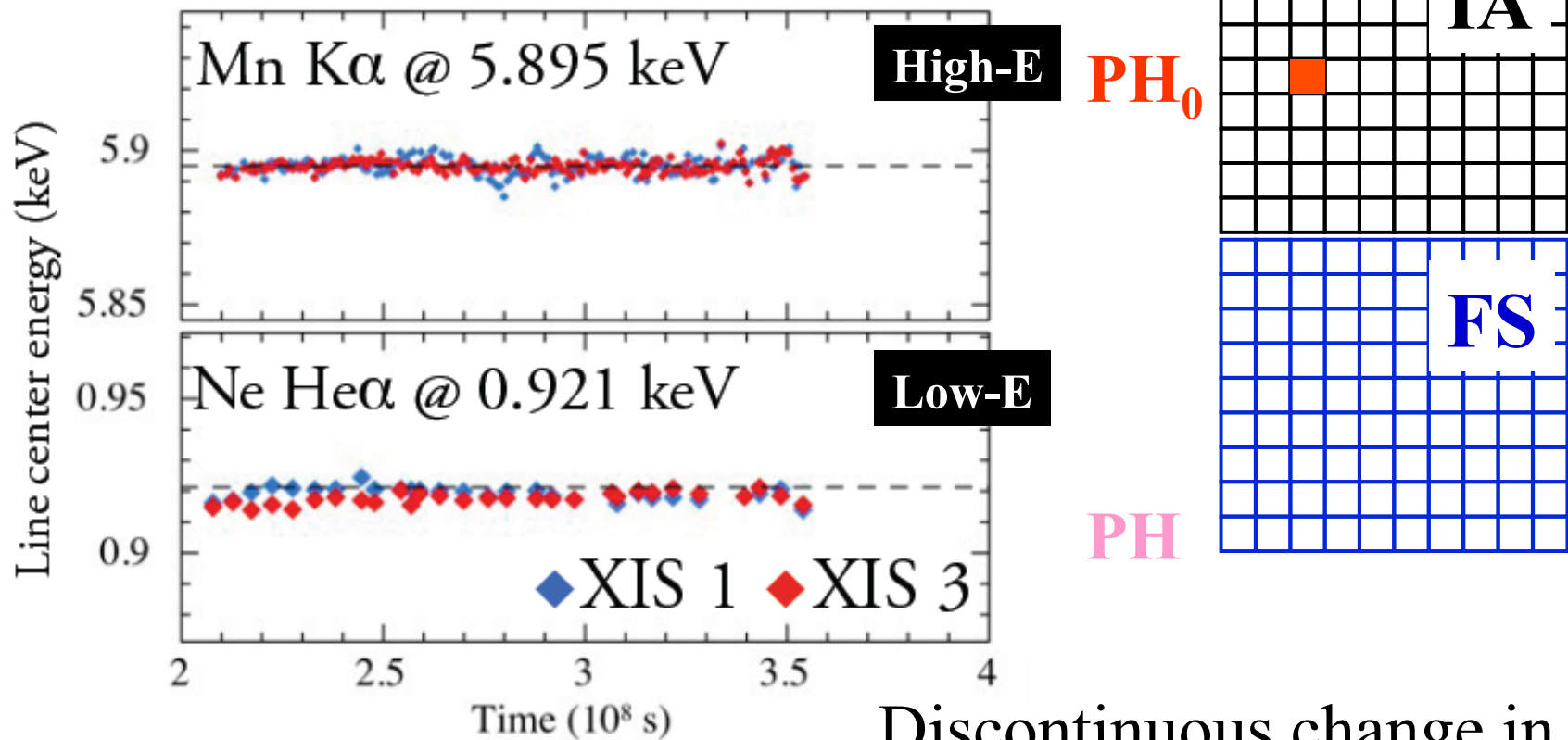

D   C   B   A

1024   150 70 1

Data set (a)
Data set (b)

ratio of CALDB HCO model(Nh/Nc=157.61,Nc/No=6)
ratio of Spectrum

normalized counts/sec/keV

ratio

channel energy (keV)

CO= 0.4891   , WV= 30.93   , N= 29.00

2. Improved energy calibration (1/2)
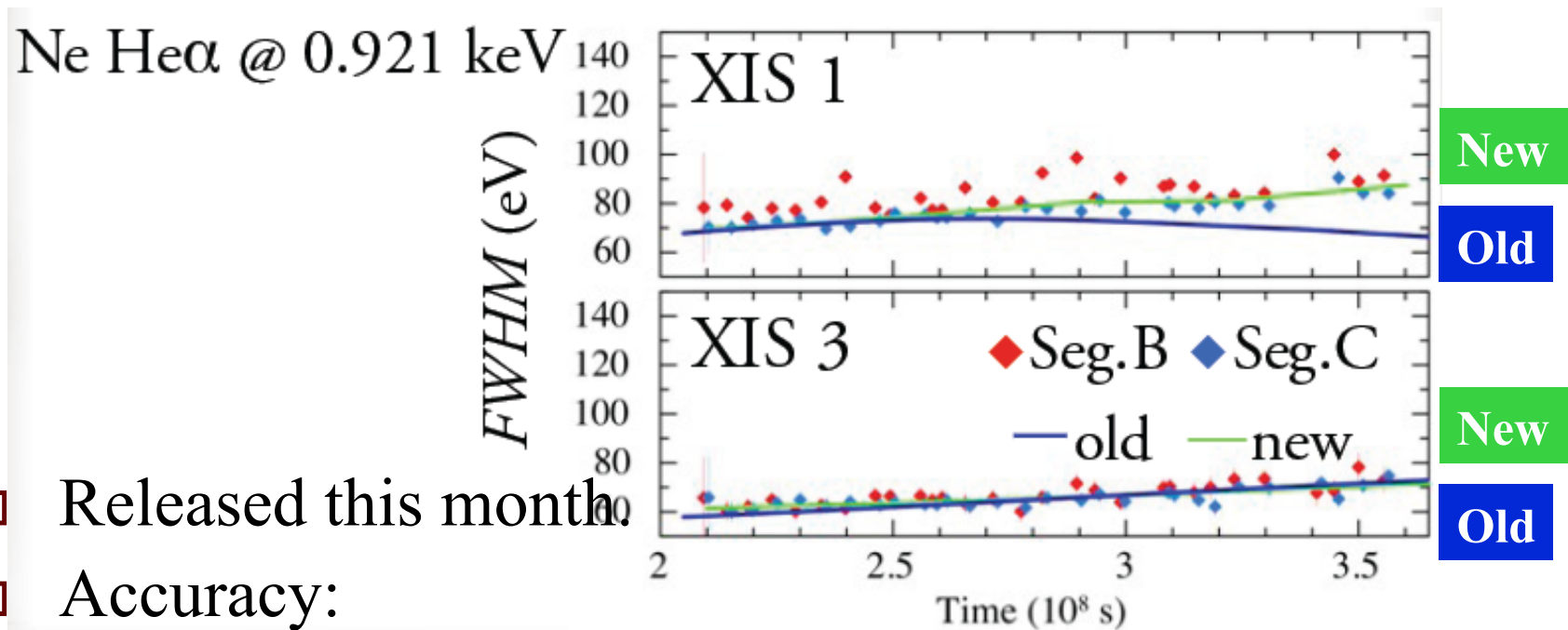## Energy gain. **Poster #10 (Sawada+)**

Discontinuous change in t.
Time dependence in β. [6]

2. Improved energy calibration (2/2)
Energy Resolution. **Poster #10 (Sawada+)**
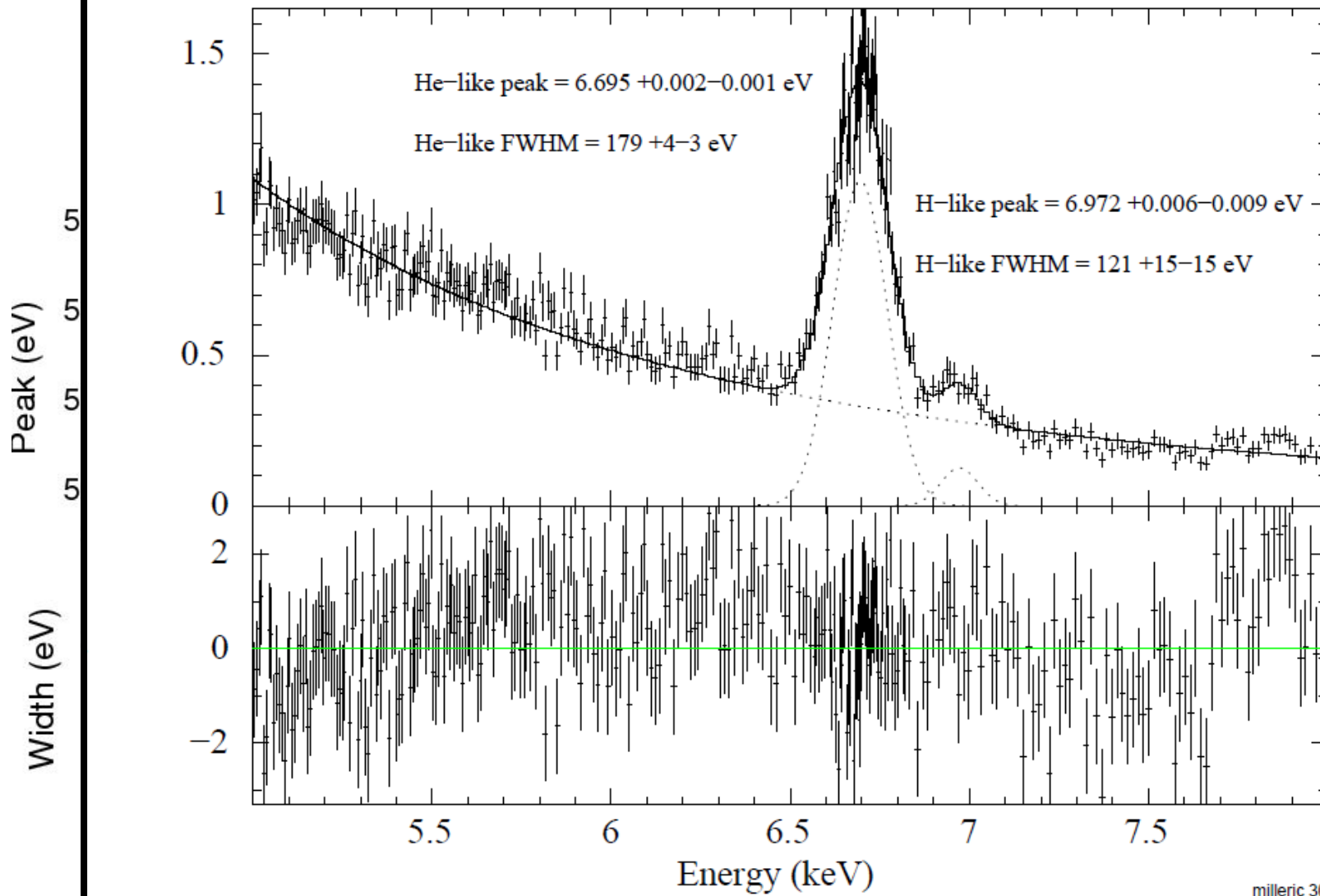
☐ Better modeling of time-dependence.

☐ Released this month.

☐ Accuracy:
- Gain <0.7% (0.9 keV), <0.1 % (5.9 keV)
- Resolution (add. width): 12% (0.9 keV), 7% (5.9 keV)

CI=6 keV

Perseus − XIS1, 20100809 (higher SCI)

He−like peak = 6.695 +0.002−0.001 eV

He−like FWHM = 179 +4−3 eV

H−like peak = 6.972 +0.006−0.009 eV

H−like FWHM = 121 +15−15 eV

Peak (eV)

Width (eV)

Energy (keV)

millericc 30−Sep−2010 11:41

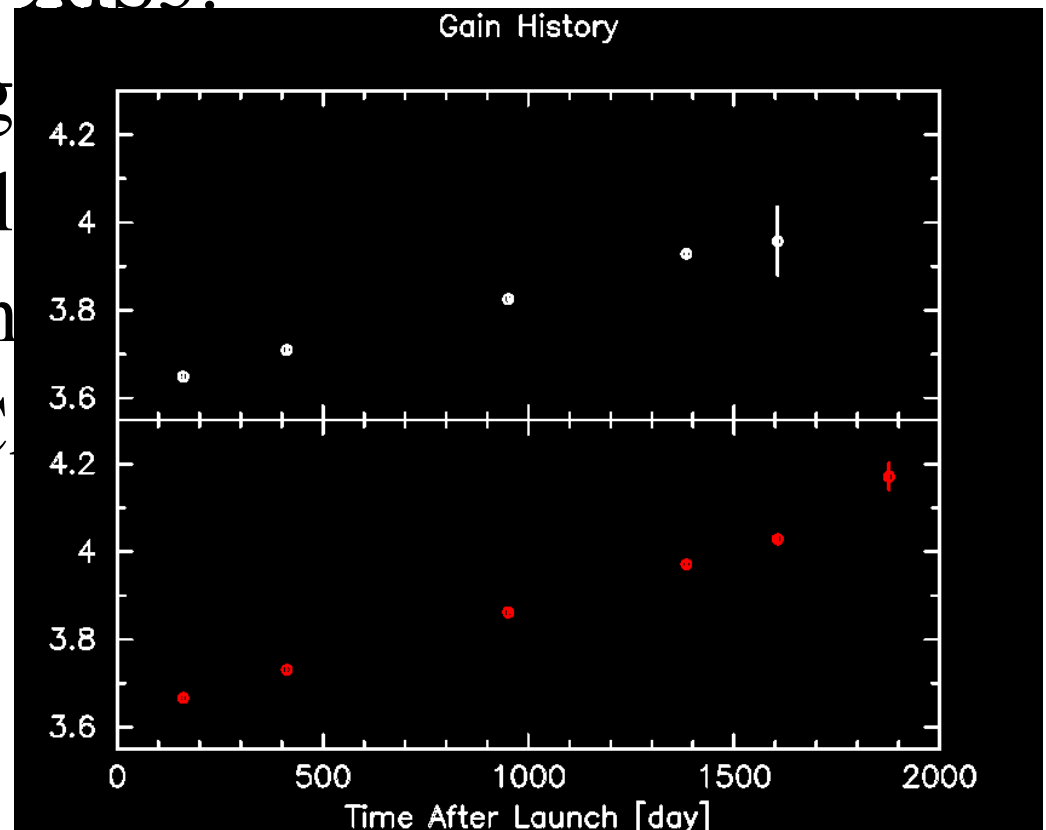# 3. XIS1 increased CI (2/2)
Performance and Caution. **Ref [3]**

- Increased CI caused telemetry saturation.
- New clocks being developed to avoid this.
- CI=6 keV started in 2011/6/1 for Normal (no option). Others follow by 2011/09-10.

SCI_2nd_TRAILING_ROW
SCI_TRAILING_ROW
SCI_ROW

A charge injection row.

read-out direction
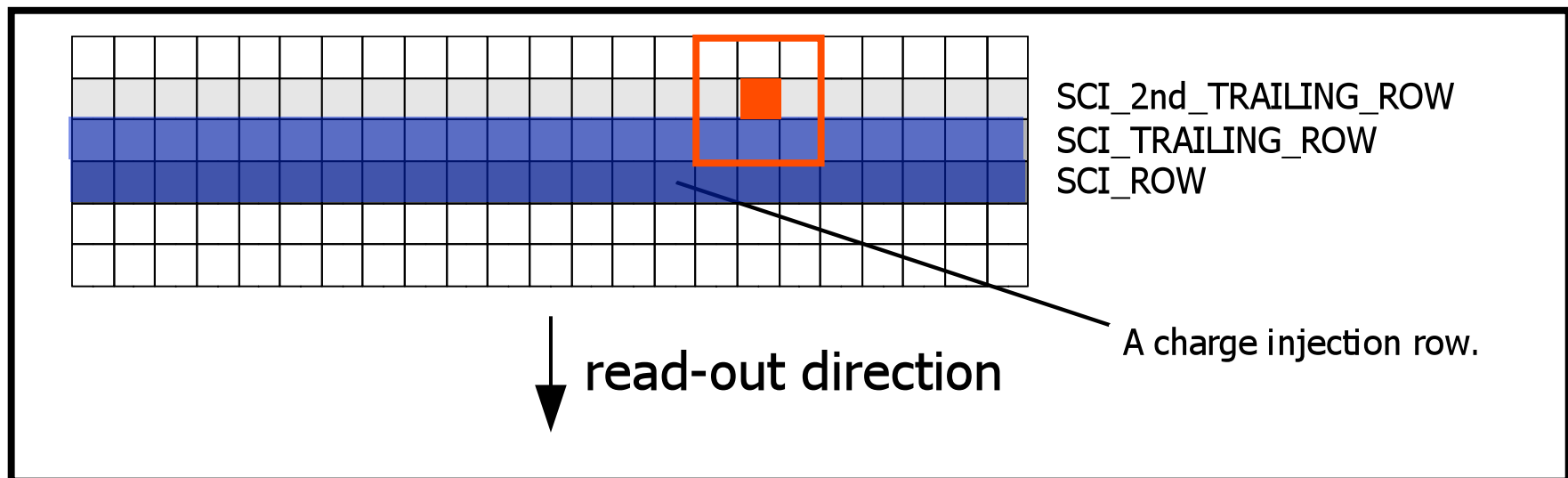
4. P-sum calibration

Gain and resolution. **Poster #11 (Kohmura+). [6]**

- ☐ P-sum mode started in AO4.
- ☐ Available only for XIS3.
- ☐ Evolution of energ
- ☐ Analysis recipe rel
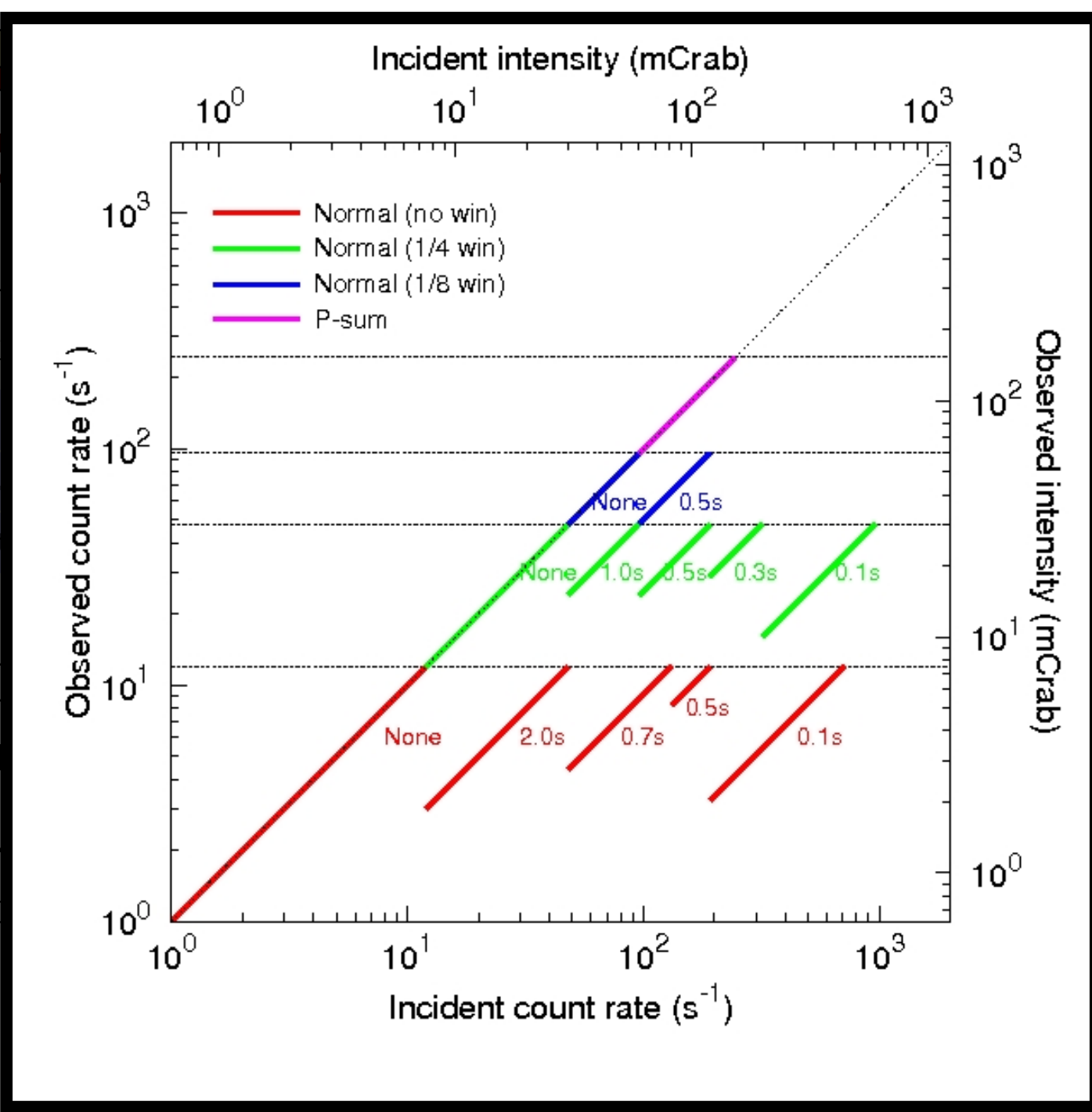- ☐ Included in pipelin
- ☐ To be include in C

□ C

Clock mode			Psum
Opt ion	Win.		1/8	no
	Burst		0.5	no

□ H br ons.

□ A de ch d.

Incident intensity (mCrab)

10^0 10^1 10^2 10^3

Observed count rate (s⁻¹)

10^3 10^2 10^1 10^0

— Normal (no win)
— Normal (1/4 win)
— Normal (1/8 win)
— P-sum

None   0.5s
None   1.0s   0.5s   0.3s   0.1s

0.5s
None   2.0s   0.7s   0.1s

Observed intensity (mCrab)

10^3 10^2 10^1 10^0

Incident count rate (s⁻¹)

10^0 10^1 10^2 10^3

New model

RXJ1856 xissimarfgen-with-HCO-model(v2009-12-01)

hayasida 15-Dec-2010 09:50
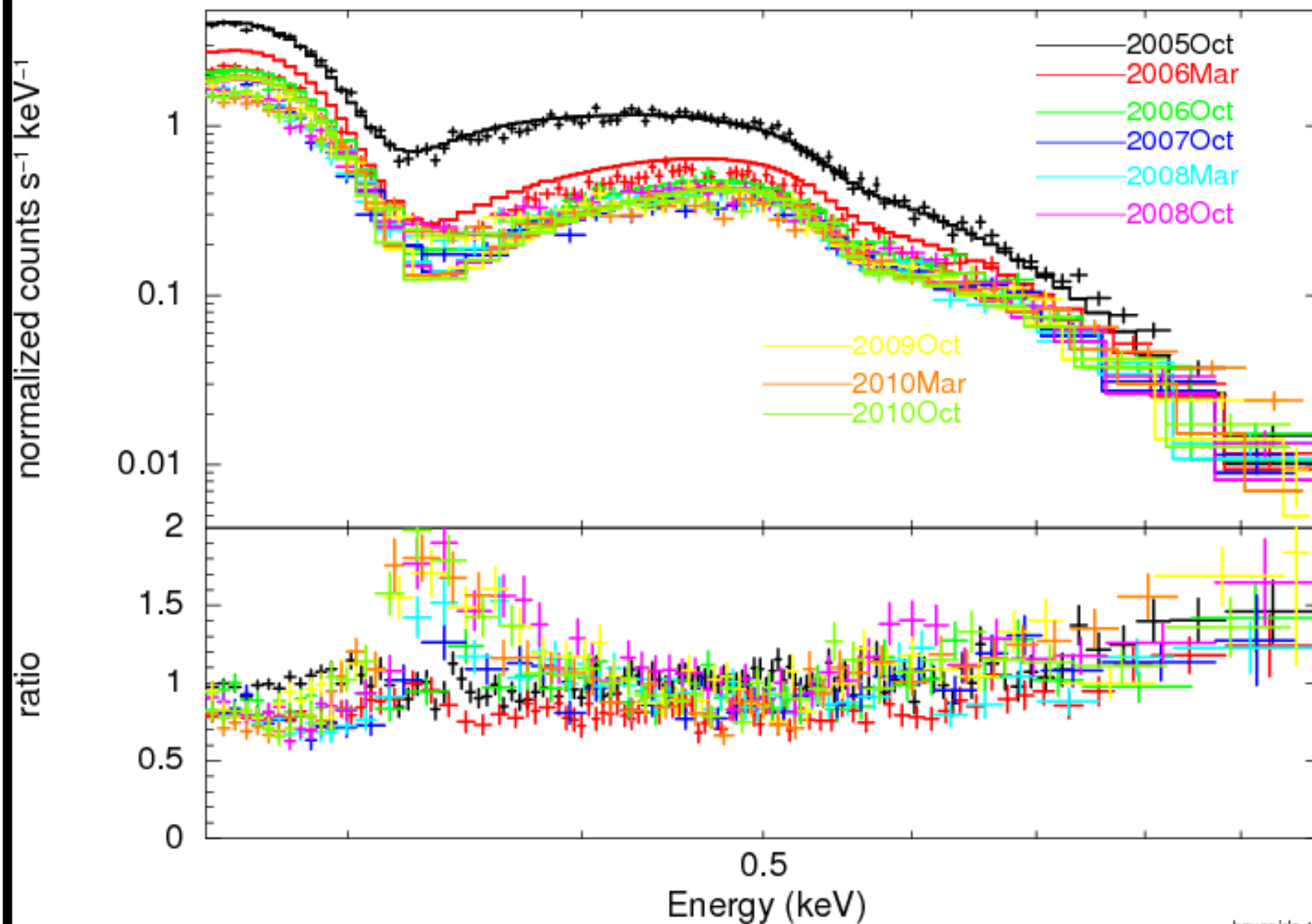
7. Cross-calibration with others

IACHEC study of G21.5-0.9. **Ref [7]**

- XIS participates IACHEC.
- Results emerging from various source types. e.g, PKS2155 (#8)
- XIS is self-consistent.
- Some inconsistencies with others.

$F_{X,soft}$ (10^{-11} erg/s/cm^2) vs Γ

Legend: ACIS-S3, XIS0, XIS1, XIS3, XRT, MOS1, MOS2, pn, All

2-8 keV fitting in G21.5-0.9
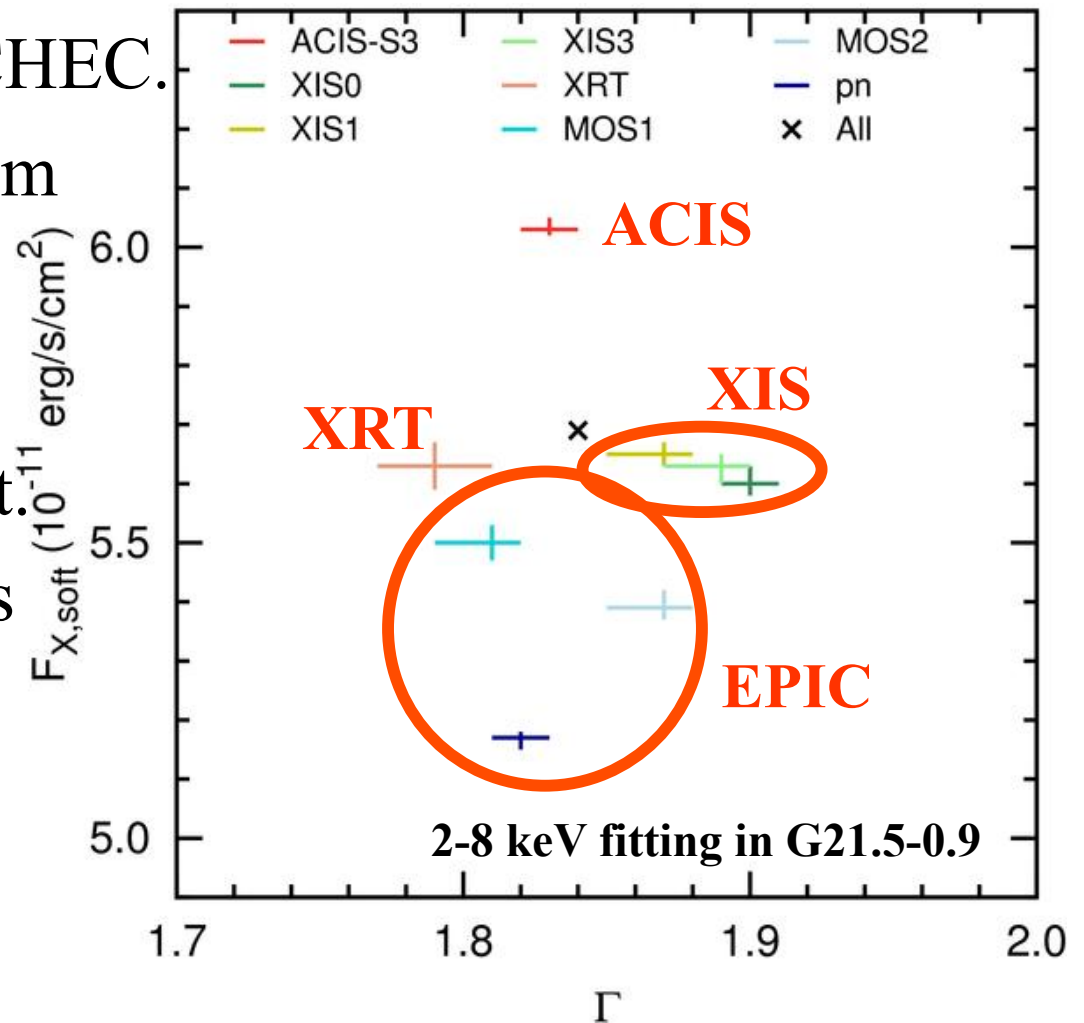
Other topics & remaining issues

- Other topics
  - Stability in normalization calibration.
  - A stead increase in NXB for XIS1.
- Remaining issues
  - Si-edge calibration.
  - Win/burst option calibration (inc. CI=6 keV for XIS1)
  - Better calibration documentation.

Summary

- XIS operating safely for 6+ years (with some anomalies).

- Enhanced capabilities & improved performances. (Normal clocking mode options, P-sum, CI increase).

- Energy calibration goal is achieved.

- Some remaining issues to be addressed by the next Suzaku conference.