

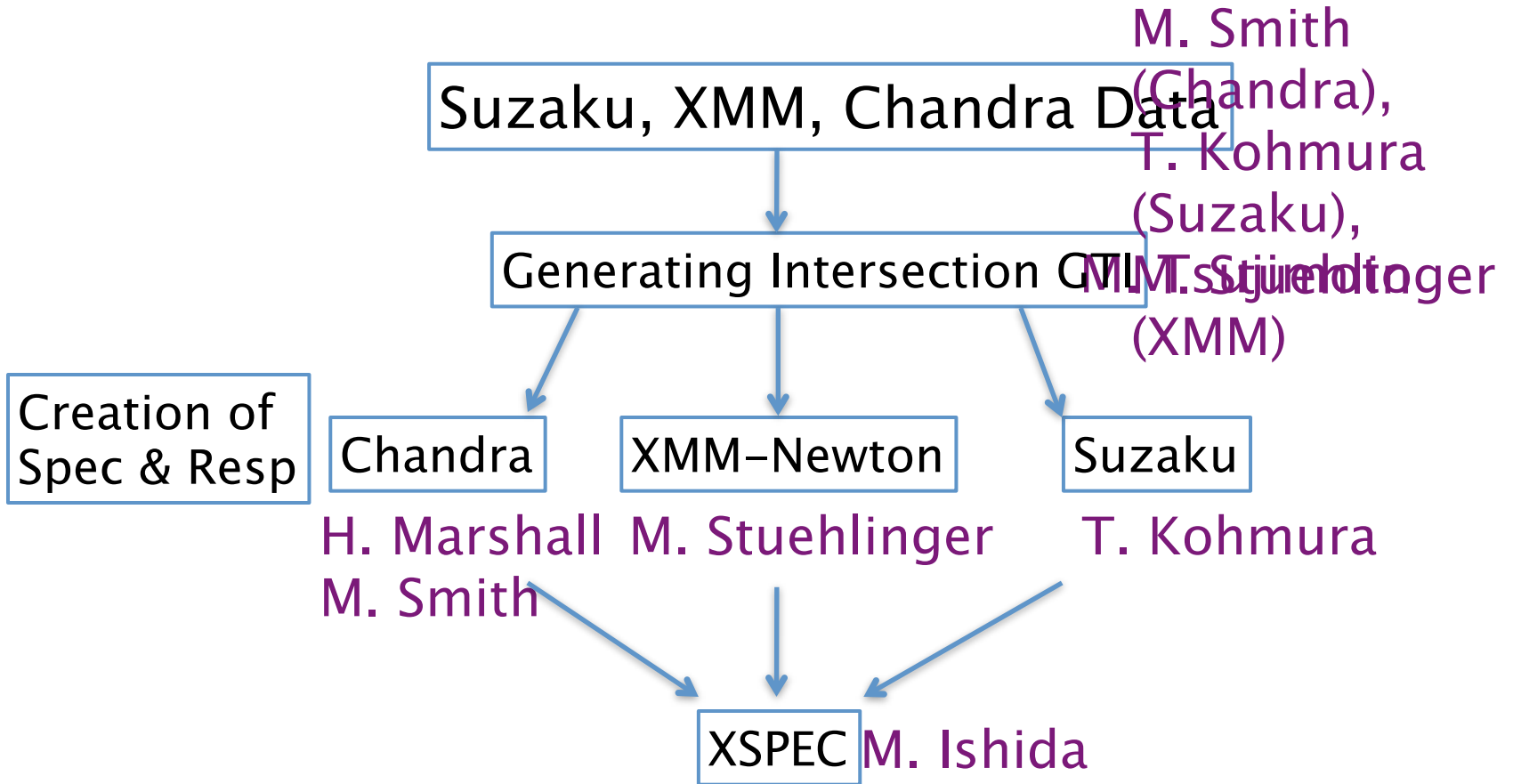
# Cross calibration of Suzaku/ XMM/Chandra with

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Kohmura, M. Stuehlinger, M.  
Smith, H. Marshall, M.

# PKS2155–304

- One of the brightest BL Lac objects.
    - Showing simple power-law (possibly broken power-law) spectrum.
  - Point source.
    - Needless to care about telescope vignetting within the source (unlike diffuse sources like non-thermal SNRs).
    - Free from diffuse X-ray contamination (unlike a rotation-powered pulsar in SNRs).
  - Variable: need simultaneous observation among alive missions.
- ⇒ We planned coordinated observation among Suzaku, XMM-Newton and Chandra for calibration purpose since 2005.

# WBS

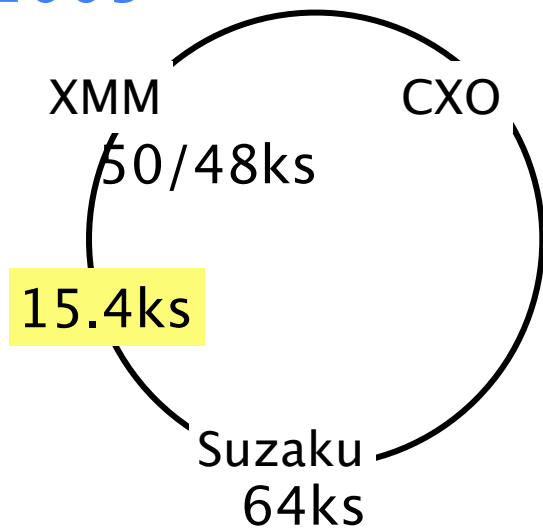


# Observations

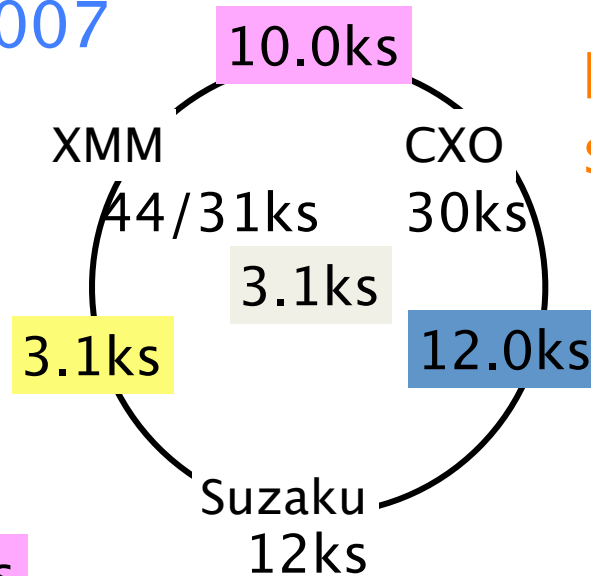
- 2005 Nov 30–Dec 2
  - XIS–FI/BI, EPIC–MOS/pn
- 2006 May 1–2
  - XIS–FI/BI, EPIC–MOS/pn, HRC–LETGS
- 2007 Apr 22
  - XIS–FI/BI, EPIC–MOS/pn, HRC–LETGS
- 2008 May 12–13
  - XIS–FI/BI, EPIC–MOS/pn, ACIS–LETGS

# Intersection GTI Summary

2005

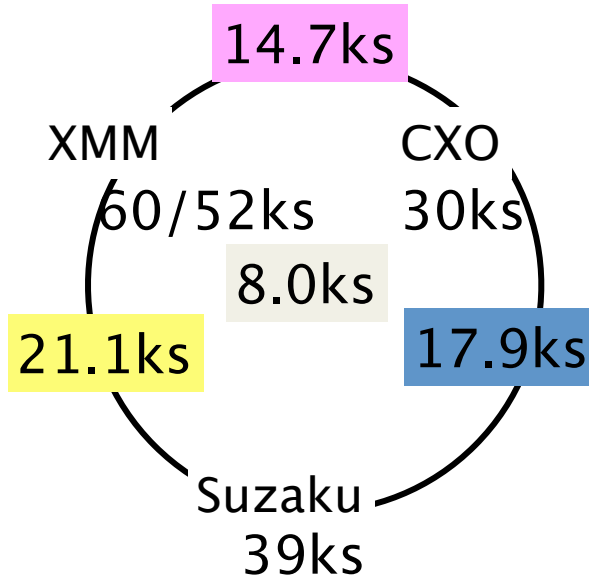


2007

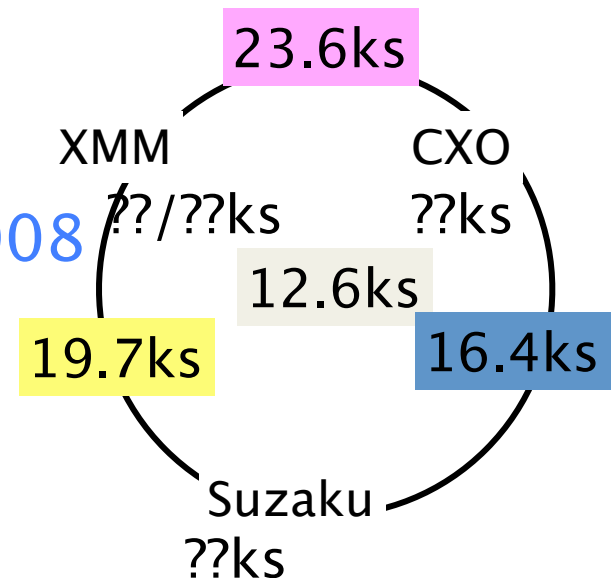


By Tsujimoto-san

2006



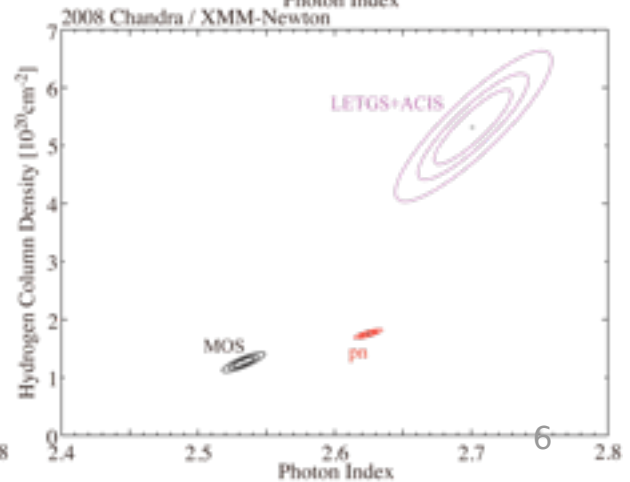
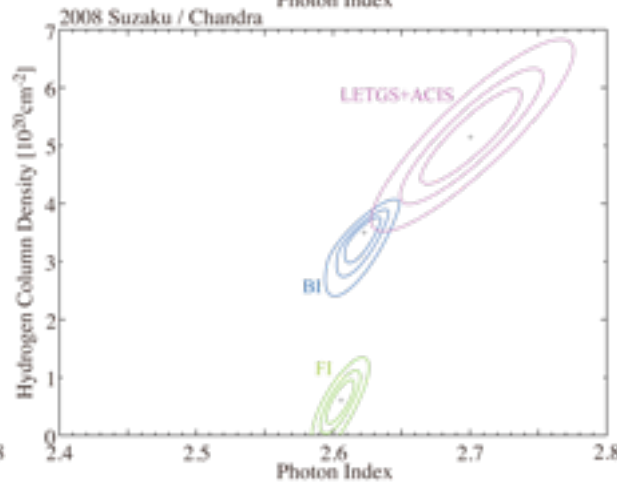
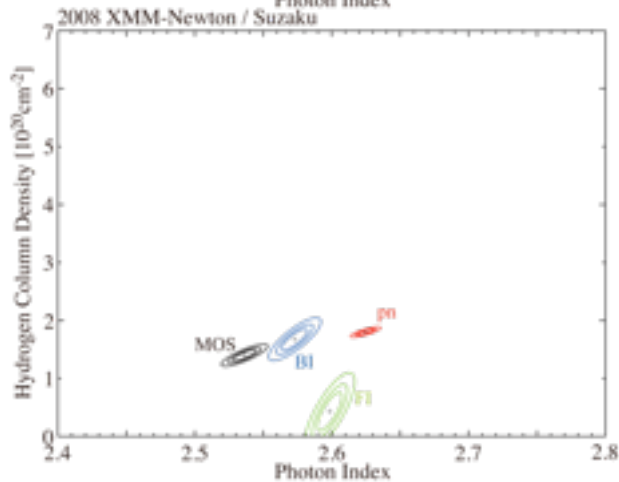
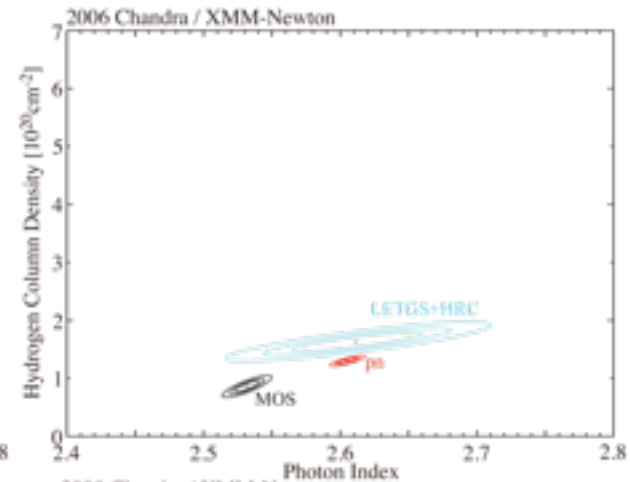
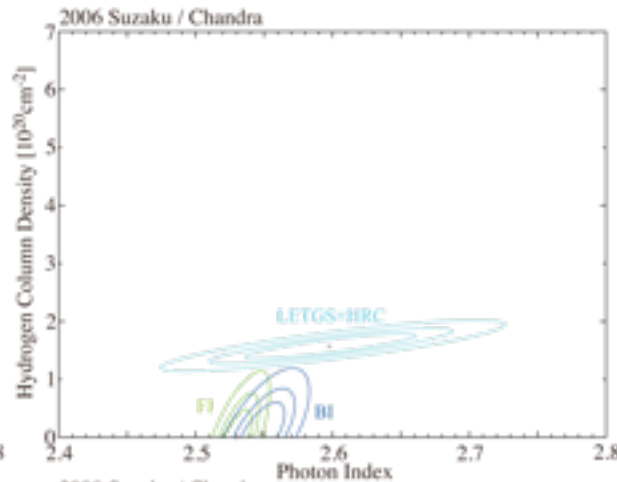
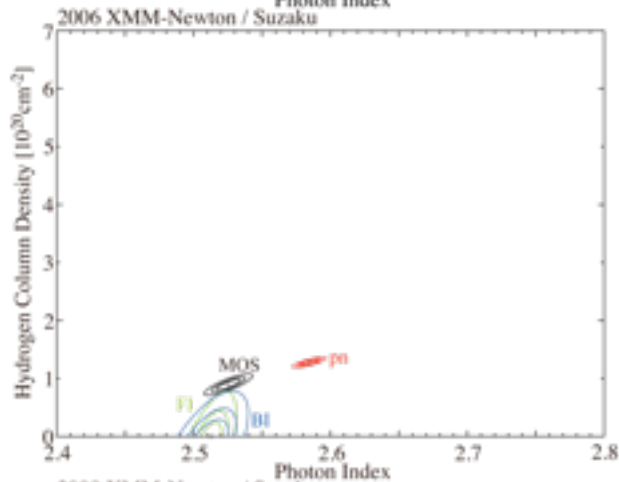
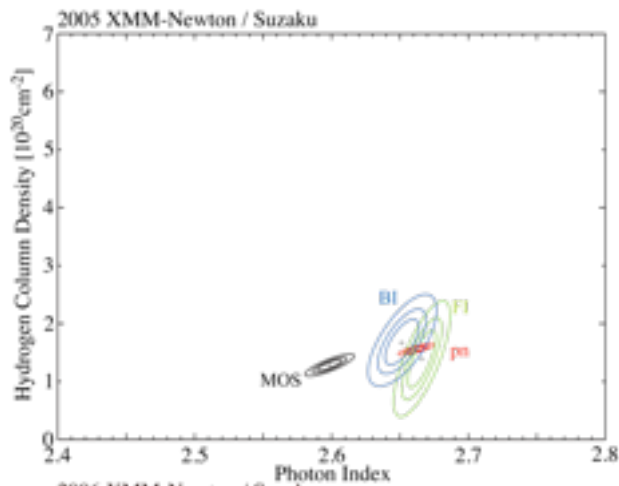
2008



As of today, all the analysis on 2005, 2006, 2008 data are finished

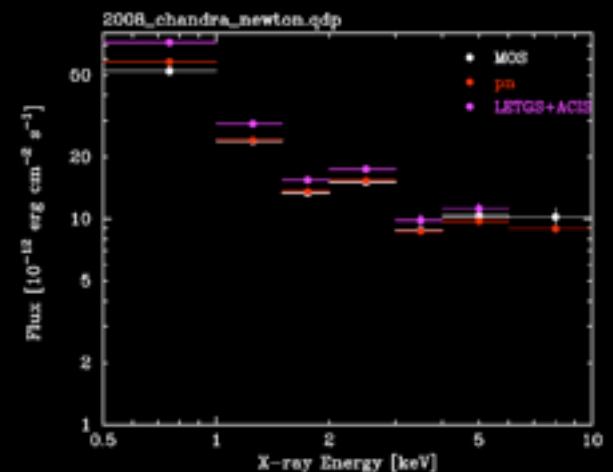
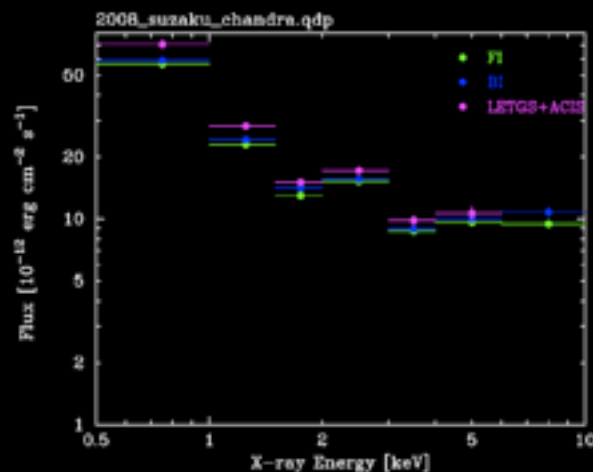
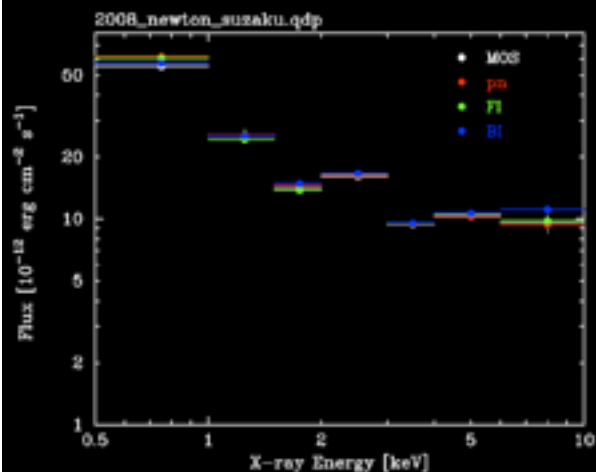
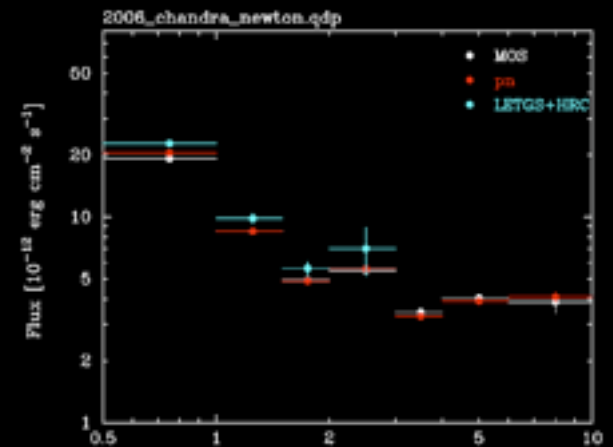
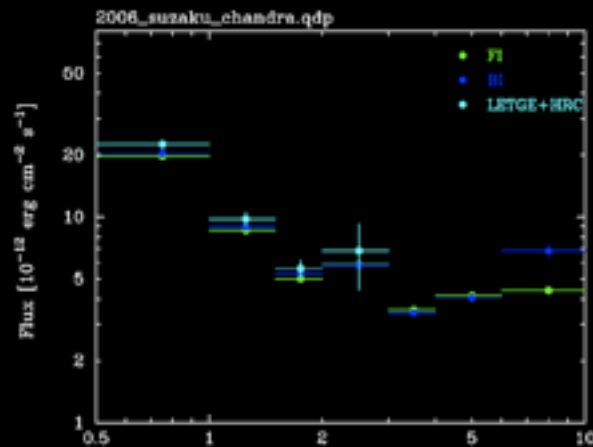
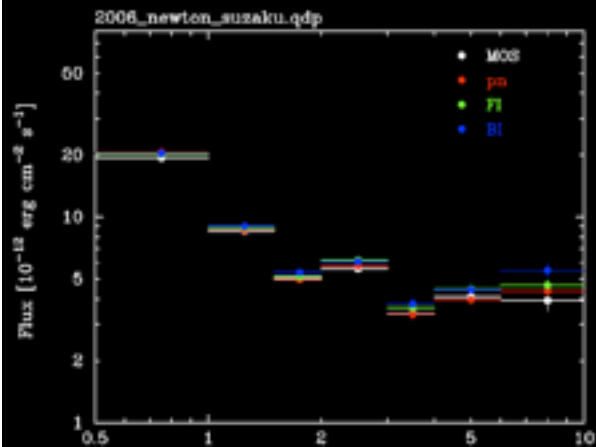
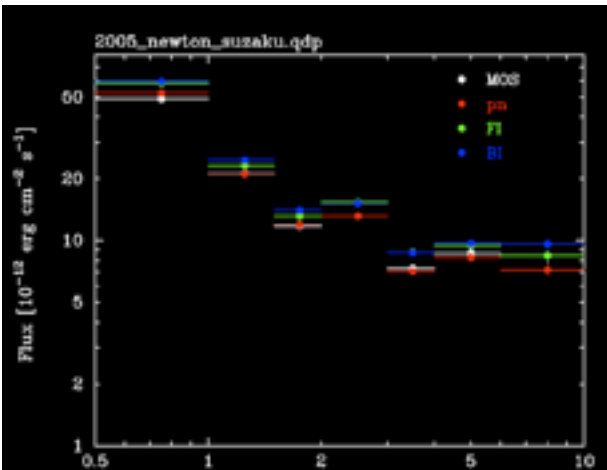
# NH vs. $\gamma$

- $\gamma$  is consistent within  $\pm 0.1$  among all the detectors.
- $N_H$  scatters up to  $6 \times 10^{20} \text{cm}^{-2}$  ( $1.7 \times 10^{20} \text{cm}^{-2}$  to the source) probably due to contaminations



# Fluxes

- Fluxes are evaluated in 7 separate energy bands.
- $N_H$  is fixed at the value from the fit in entire band.
- $\gamma$  is set free to vary.
- XMM and Suzaku are consistent within  $\sim 10\%$ .
- Chandra fluxes seem systematically larger than



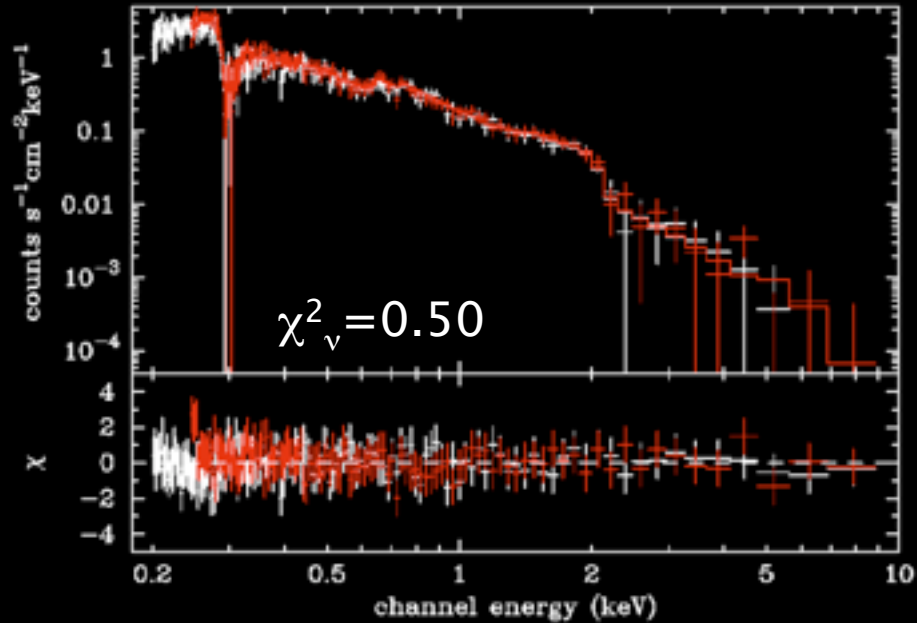
# Remaining Issues to be Addressed prior

- Any updates on calibration data base & softwares ?
  - Chandra: CIAO 4.1 + CALDB 4.1.1
    - I heard some new features are introduced in Chandra response.
  - XMM–Newton: CCF as of 2009 January 1.
  - Suzaku: XIS20090402, XRT20080709 + HEASOFT 6.6.2
- Spectral qualities
  - Chandra seems OK (reduced  $\chi^2 < 1.0$ )
  - Systematic residuals in XMM–Newton & Suzaku
- Include 2009 (and 2010) data ?
- How to open the data

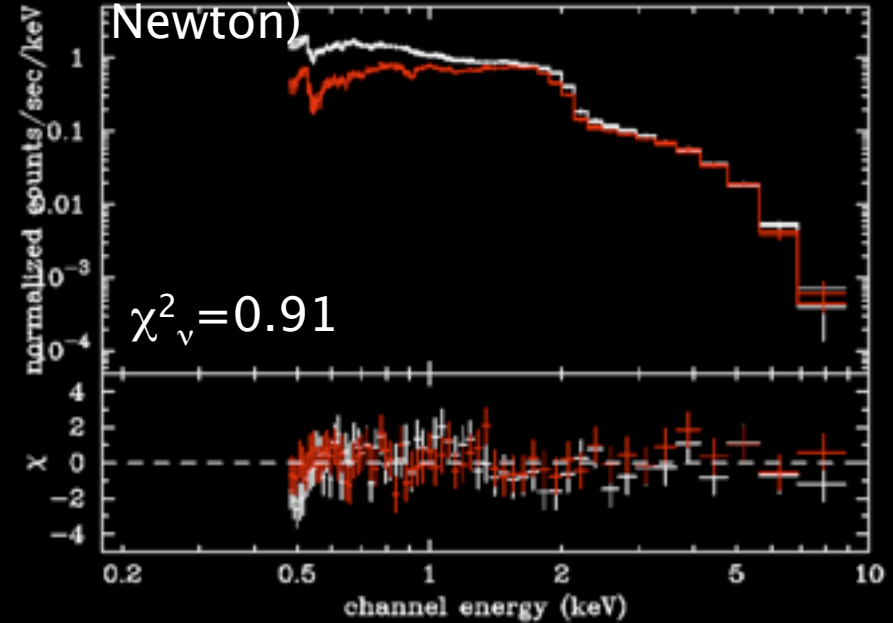


# Chandra: LETGS+HRC(2006)/

2006 LETGS+HRC (with Suzaku)



2008 LETGS+ACIS (with XMM-Newton)



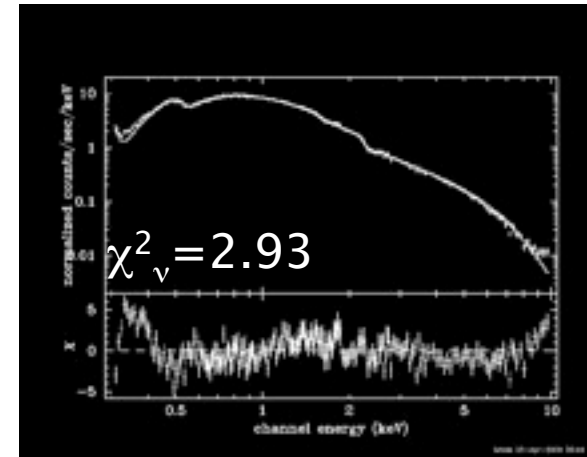
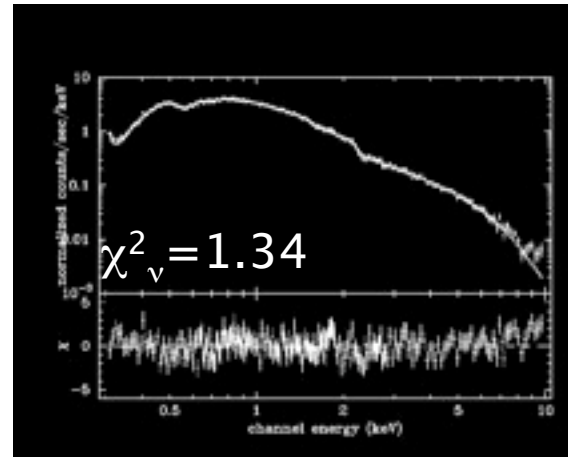
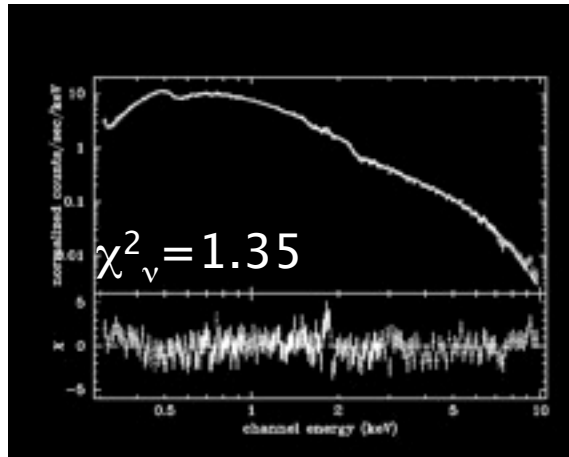
# Suzaku XIS: 2005, 2006,

2005

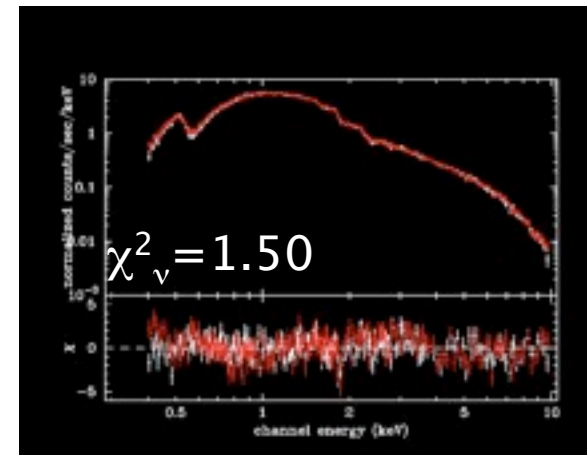
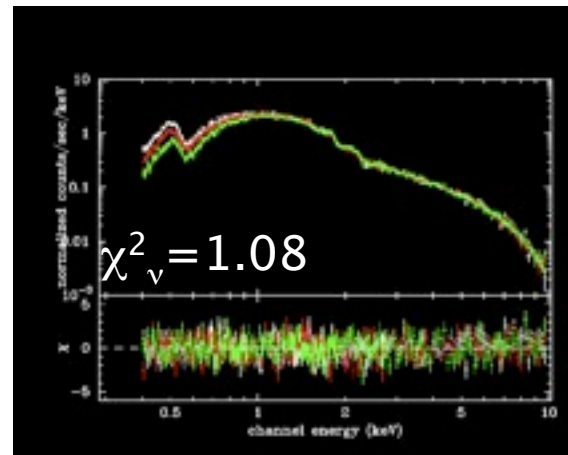
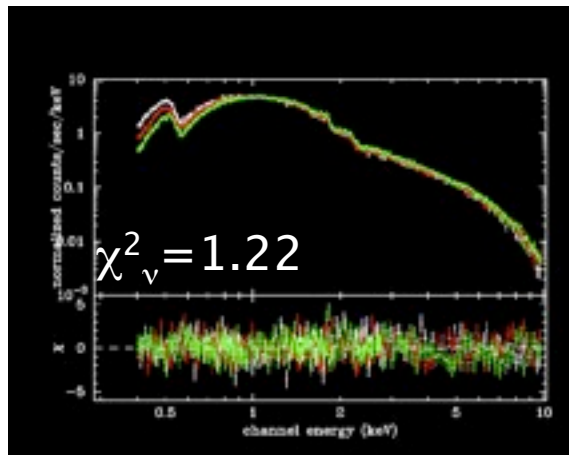
2006

2008

XIS-BI



XIS-FI



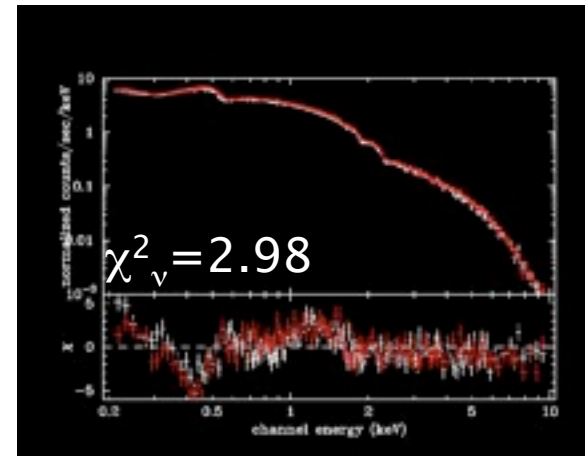
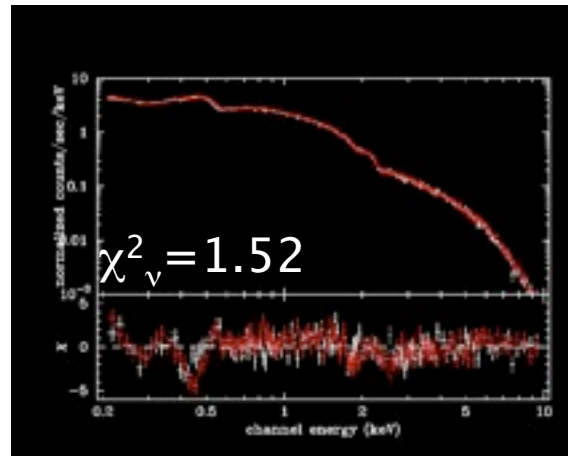
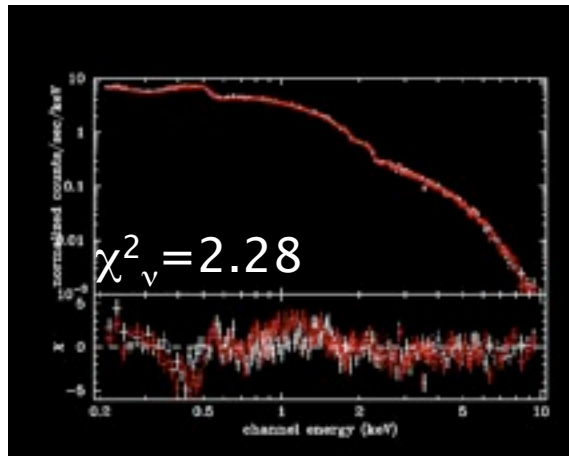
# EPIC Spectra: 2005, 2006,

2005

2006

2008

EPIC-MOS



EPIC-pn

