

Cross-Calibration between XMM-Newton and Chandra

Herman L. Marshall

Chandra X-ray Center, MIT Kavli Institute

XMM/Chandra Blazar Observations to Date

XMM-Chandra Cross-Calibration Observations of AGN												
Target	XMM						Chandra					
	Rev	Seq #	Start Date	exp (ks)	A	Γ	Config	ObsID	Start Date	exp (ks)	A	Γ
PKS 2155-304	87	124930101	2000-05-30:0530	61			HETGS	1705	2000-05-31:1740	30	4e-2	2.507
		124930201	2000-05-31:0030	72			LETG/ACIS	1703	2000-05-31:0220	30	0.051	2.66
											1e-1	1.72
3C 273	94	126700301	2000-06-13:2340	73			LETG/HRC	1704	2000-05-31:0950	30		
	96	126700801	2000-06-17:2320	73	0.0024	3.17	ACIS-S	1711	2000-06-14:0550	30		
					0.0176	1.63	ACIS-S	1712	2000-06-14:1420	30		
	277	136550101	2001-06-13:0710	90	6.48e-3	3	HETG	2463	2001-06-13:0700	30	2e-2	1.74
					0.0187	1.57	LETG/ACIS	2464	2001-06-13:1610	30	7e-3	2.577
											1e-2	1.47
PKS 2155-304	362	89210101	2001-12-01:0600	15	0.063	2.5	LETG/HRC	2462	2001-06-14:1250	30		
					0.068	2.86	LETG/ACIS	2471	2001-06-15:2030	30	8e-3	2.72
					Eb=1.22						1e-2	2.72
	545	124930601	2002-11-29:2330	115	0.0272	2.28	HETGS	3167	2001-11-30:2010	30	6e-2	2.738
					0.0269	2.81	LETG/ACIS	3168	2001-11-30:1120	30	9e-2	2.995
					Eb = 0.98						0.171	1.71
3C 273	655	159960101	2003-07-07:1740	58	2.15e-3	3.14	LETG/HRC	3166	2001-11-30:0230	30		
					0.0278	1.81	HETGS	3706	2002-11-29:2230	30	0.02	2.72
							LETG/ACIS	3707	2002-11-30:0700	30	2e-2	2.91
											0.052	1.67
							HETGS	3708	2002-11-29:1430	30	3e-2	2.759
							LETG/HRC	4406	2002-11-30:0210	15		
PKS 2155-304	908	158960901	2004-11-22:2130	29			LETG/HRC	3709	2002-11-30:1450	15		
		158961001	2004-11-23:1950	40			HETGS	5172	2004-11-22:2330	30		
							HETGS	5173	2004-11-23:2330	30	2e-2	2.8
1H1426+428	1015	310190201	2005-06-25:0603	45	0.015	1.9	HETGS	6088	2005-06-25:0555	45	2e-2	2.03
					0.0153	2.16						
	1035	310190501	2005-08-04:0452	47			LETG/ACIS	6089	2005-08-04:0436	45	2e-2	2.266
											0.112	0.427

From <http://space.mit.edu/ASC/calib/crosscal/>

Comparing XMM and Chandra

- XMM web pages
 - Fit results internal for now
 - data page: http://xmm.esac.esa.int/~xmmdoc/EPIC_CROSSCAL/sat_cross_cal.php
- XMM report: XMM-SOC-CAL-TN-0052 (Stuhlinger et al. 2006)
- CXC web page: <http://space.mit.edu/ASC/calib/crosscal/>
- XMM whiteboard used for some reports
- Results agree generally but not within errors

Sample XMM-Chandra Comparison (XMM side)

Object: H1426+428

Date: 25-Jun-2005
 Obs.IDs: [XMM 0310190201](#)
 Chandra 6088
 Absorption: fixed to $1.36\text{E}+20$ $1/\text{cm}^2$
 Model: [TBabs * bknpower](#)
 Fit ranges: EPIC 0.2-10.0 keV
 RGS 0.33-2.0 keV
 ACIS HEG 0.7-7.5 keV
 ACIS MEG 0.5-6.5 keV

Comparing indices is difficult

Instrument	nH	PhoIndx1	BreakE	PhoIndx2	norm
XMM+Chandra	1.36E+20 (fixed)	1.89 (+0.007/-0.004)	1.23 (+0.05/-0.04)	2.16 (+0.009/-0.008)	1.52±0.007 E-02
pn	1.36E+20 (fixed)	1.90±0.01	1.08±0.04	2.16±0.01	1.55±0.01 E-02
MOS1	1.36E+20 (fixed)	1.83±0.02	1.43±0.09	2.10±0.02	1.52±0.01 E-02
MOS2	1.36E+20 (fixed)	1.87±0.02	1.36±0.08	2.18±0.02	1.54±0.01 E-02
RGS1	1.36E+20 (fixed)	1.40 (+0.09/-0.12)	0.71 (+0.14/-0.11)	1.81 (+0.10/-0.05)	1.65 (+0.17/-0.10) E-02
RGS2	1.36E+20 (fixed)	1.58 (+0.26/-0.04)	0.87 (+0.38/-0.12)	1.75 (+0.08/-0.07)	1.47 (+0.03/-0.04) E-02
ACIS HEG	1.36E+20 (fixed)	1.54 (+0.36/-0.89)	1.08 (+0.23/-0.16)	2.04 (+0.03/-0.04)	1.50 (+0.19/-0.06) E-02
ACIS MEG	1.36E+20 (fixed)	2.15 (+0.11/-0.09)	1.06±0.14	1.96±0.03	1.44 (+0.03/-0.05) E-02

From http://xmm.esac.esa.int/~xmmdoc/EPIC_CROSSCAL/cross_cal_data.php

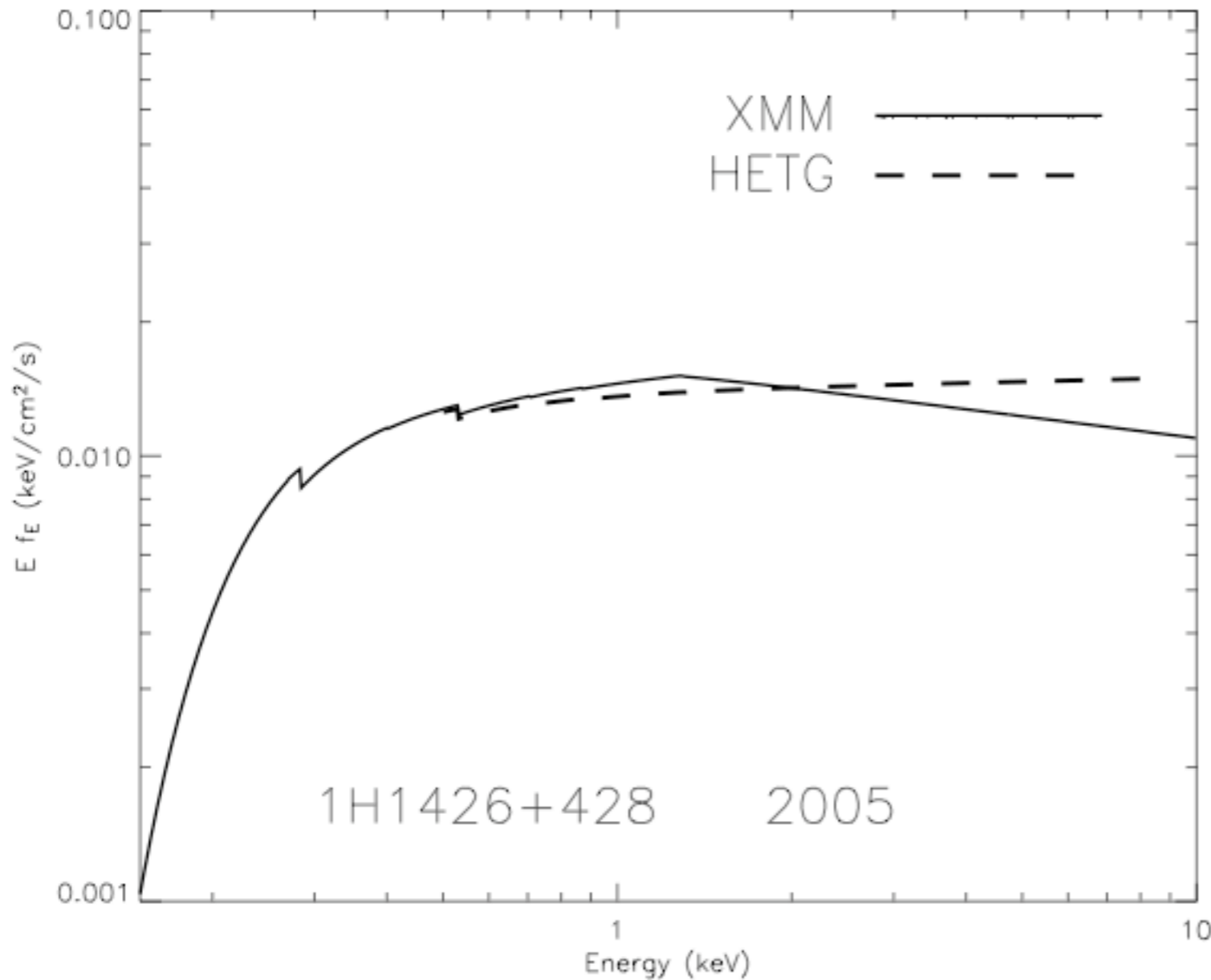
Sample XMM-*Chandra* Comparison (XMM side)

Object: H1426+428

Date: 25-Jun-2005

Obs.IDs: [XMM 0310190201](#)

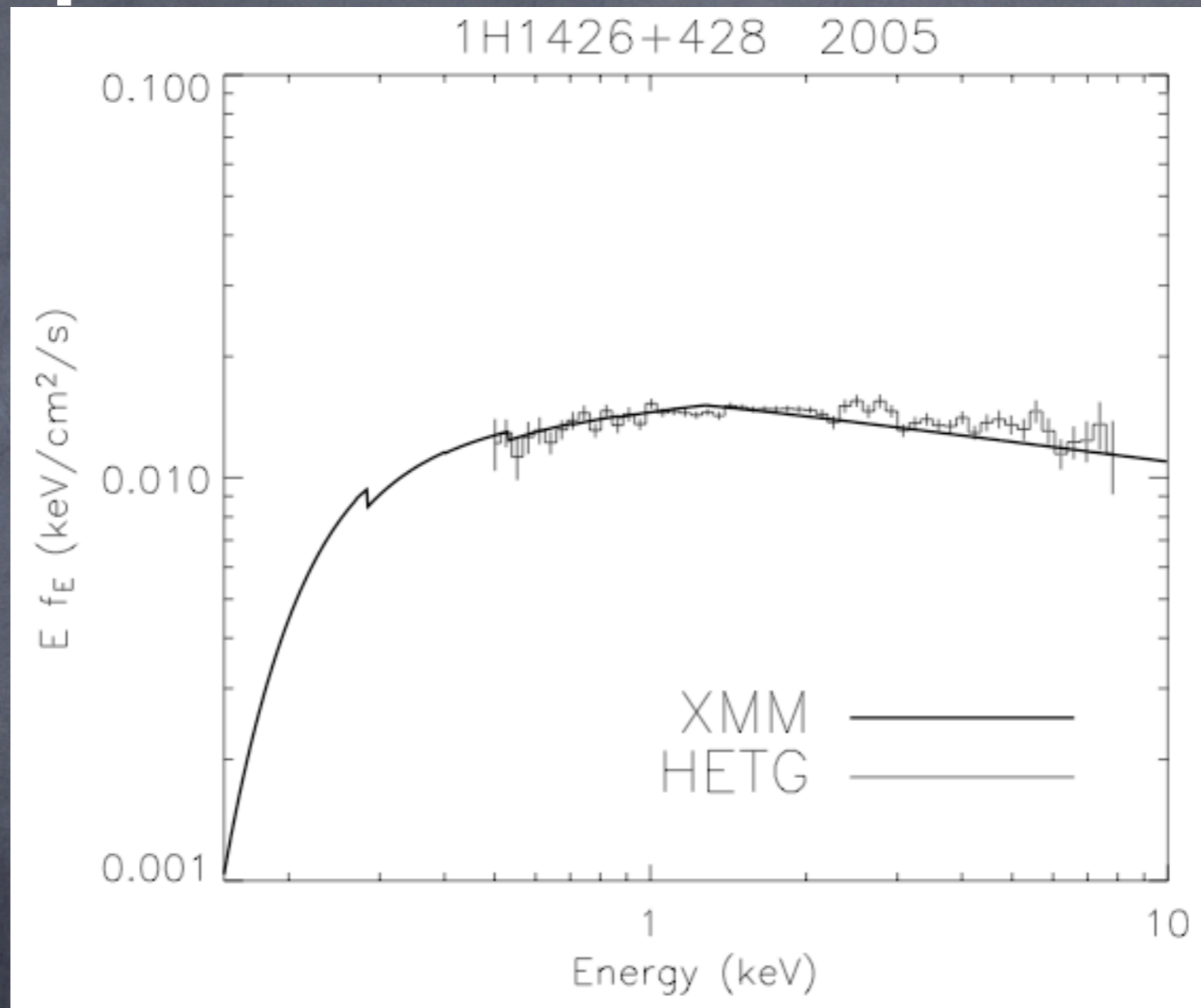
Comparing indices is difficult



PhoIndx2	norm
2.16 (+0.009/-0.008)	1.52±0.007 E-02
2.16±0.01	1.55±0.01 E-02
2.16±0.02	1.52±0.01 E-02
2.18±0.02	1.54±0.01 E-02
1.81 (+0.10/-0.05)	1.65 (+0.17/-0.10) E-02
1.77 (+0.08/-0.07)	1.47 (+0.03/-0.04) E-02
2.04 (+0.03/-0.04)	1.50 (+0.19/-0.06) E-02
1.96±0.03	1.44 (+0.03/-0.05) E-02

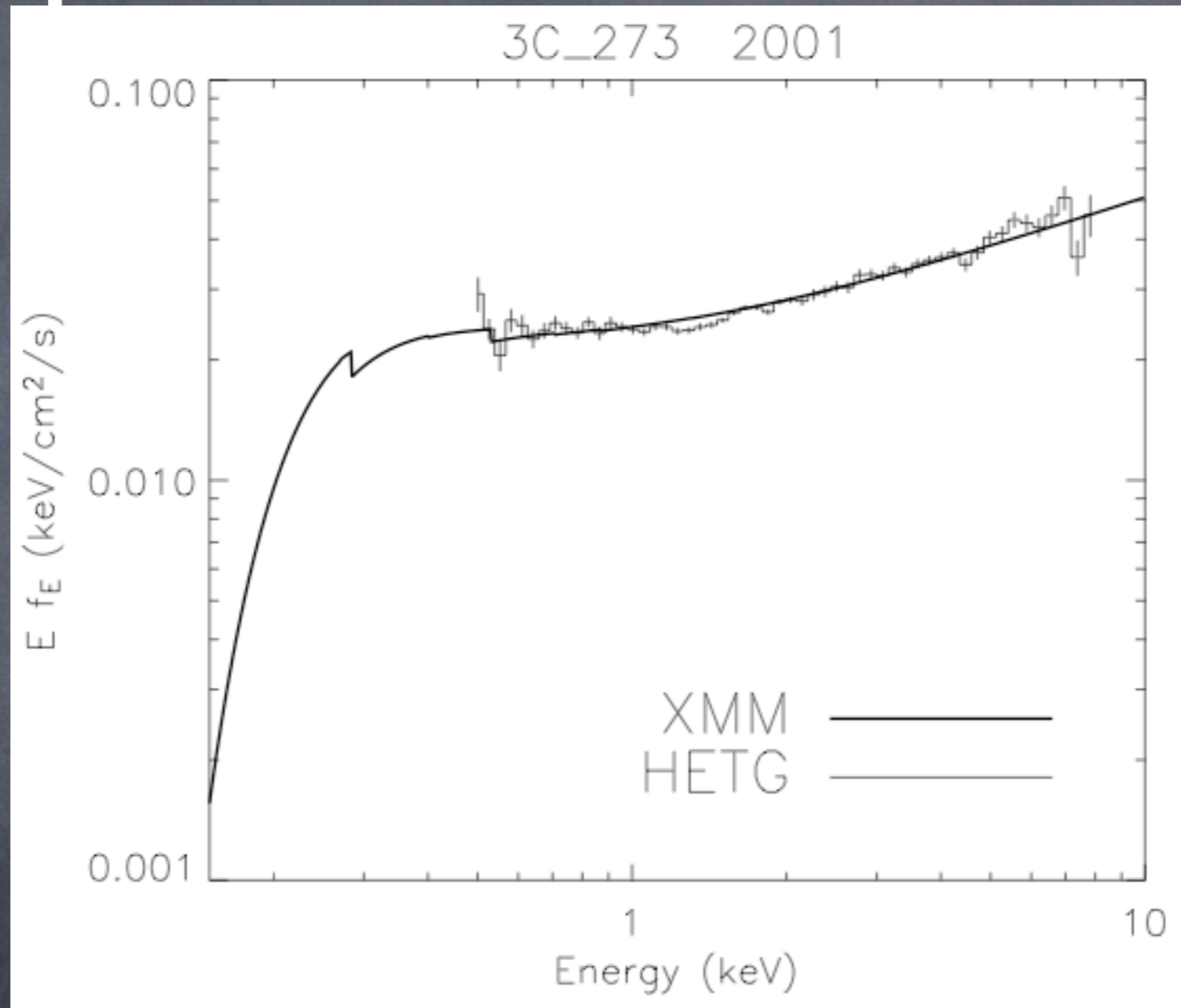
[CROSSCAL/cross_cal_data.php](#)

Sample XMM-Chandra Comparison (HETGS side)



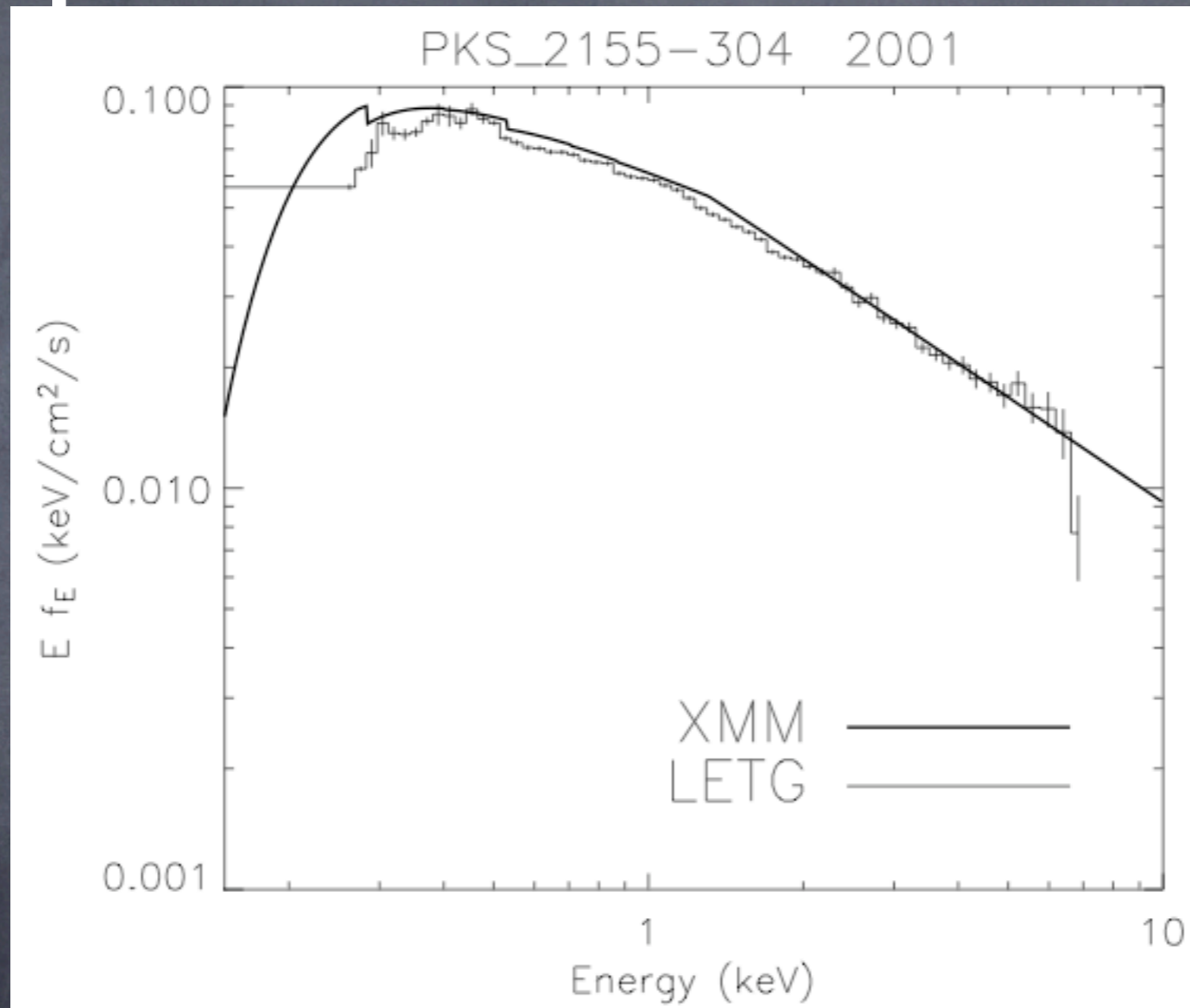
From <http://space.mit.edu/ASC/calib/crosscal/>

Sample XMM-Chandra Comparison (HETGS side)



From <http://space.mit.edu/ASC/calib/crosscal/>

Sample XMM-Chandra Comparison (HETGS side)



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