

# Relativistic Iron K Line in the X-ray spectra of AGN

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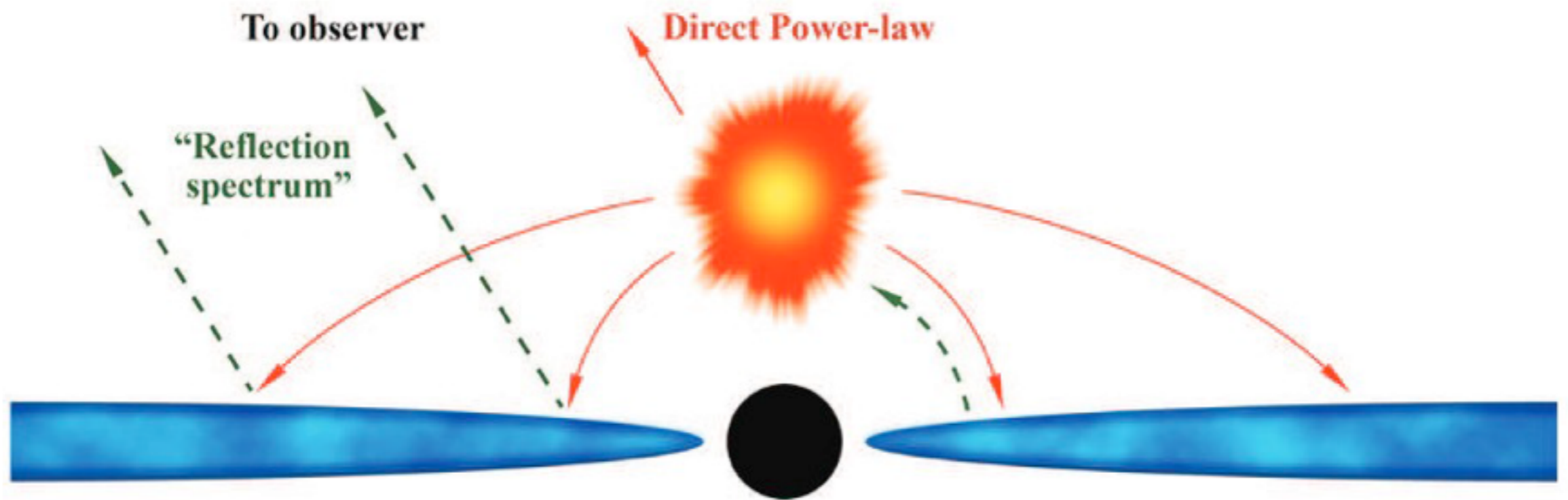


The XMM-Newton 2015 Science Workshop  
The Extremes of Black Hole Accretion

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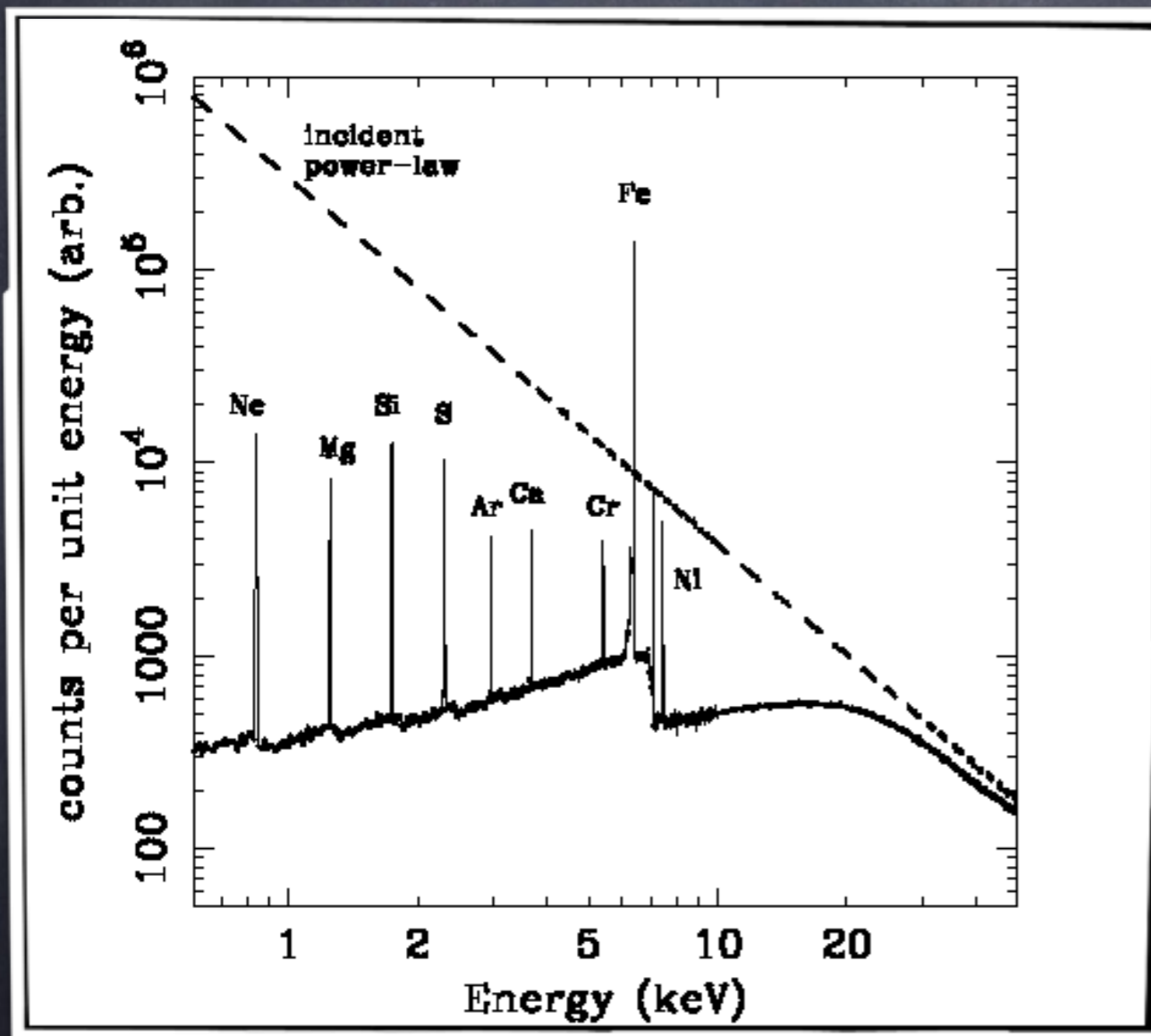


# X-ray Emission



# X-ray emission

The X-ray analysis is a fundamental key to probe the innermost regions of the AGNs.



- Continuum: power law
- Fluorescence: emission lines
- Reflection: Compton Hump

# Motivations

Broad iron lines are expected to be a widespread feature in the bright AGN

Guainazzi et al. (2006), Nandra et al. (2007), de La Calle Pérez et al. (2010)

Bhayani & Nandra 2011: Strong relativistic Effects

Still in some sources relativistic component is missing

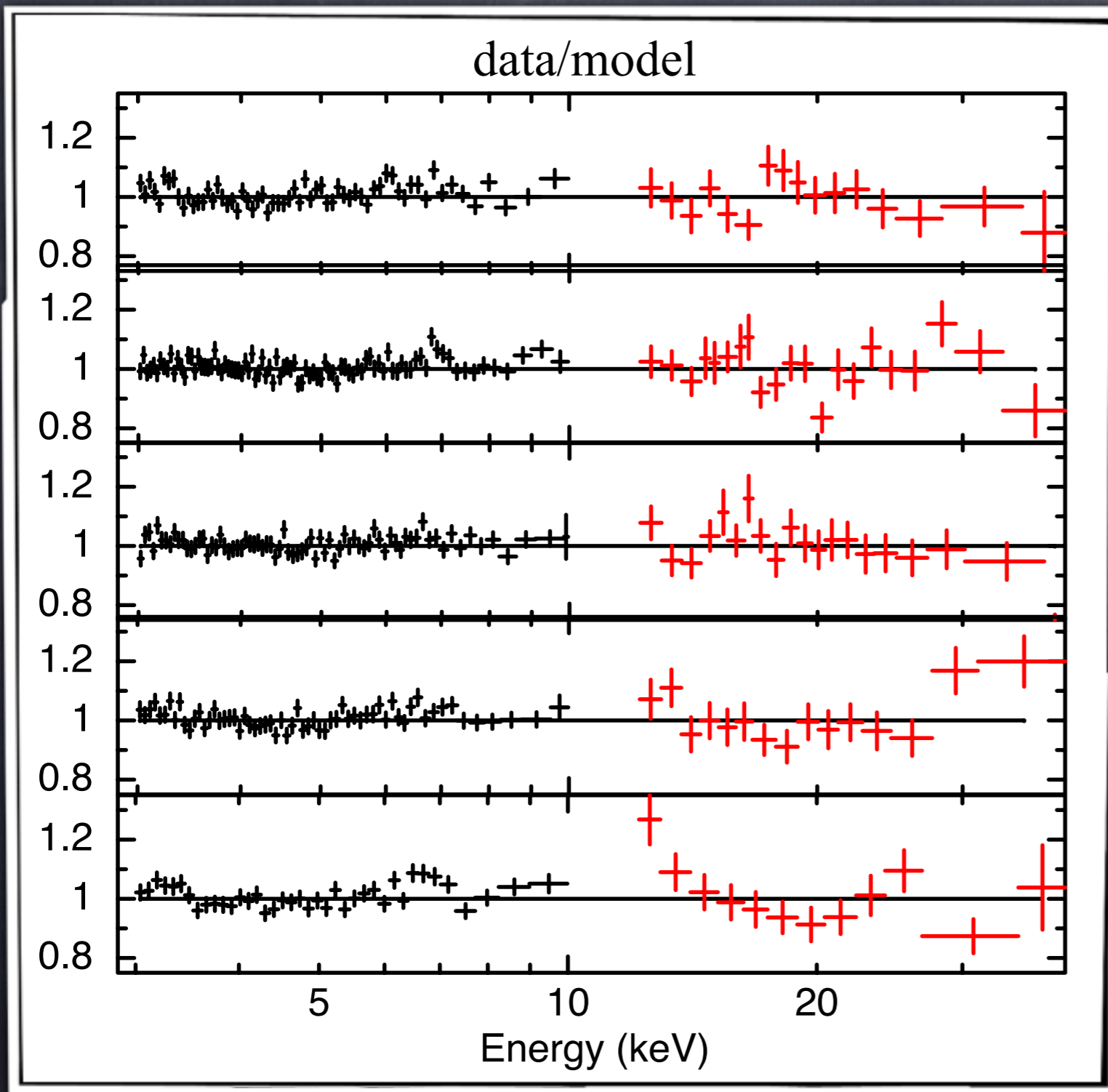
# Sources and Data

Object	Flux 5-7 keV	#Suzaku Obs	Exposure (ks)
NGC 2110	3.4	2	205.300
NGC 5506	2.7	3	158.455
IC 4329A	2.6	6	248.820
MCG +8-11-11	1.6	1	98.750
NGC 7213	0.57	1	90.750
MRK 110	0.48	1	90.900
NGC 7469	0.49	1	112.100
NGC 5548	0.46	7	209.435
MRK 590	0.18	2	102.520

We used Suzaku data in order to have better constraints on the high energies spectra

We applied the same fitting process of Nandra et al. (2007)

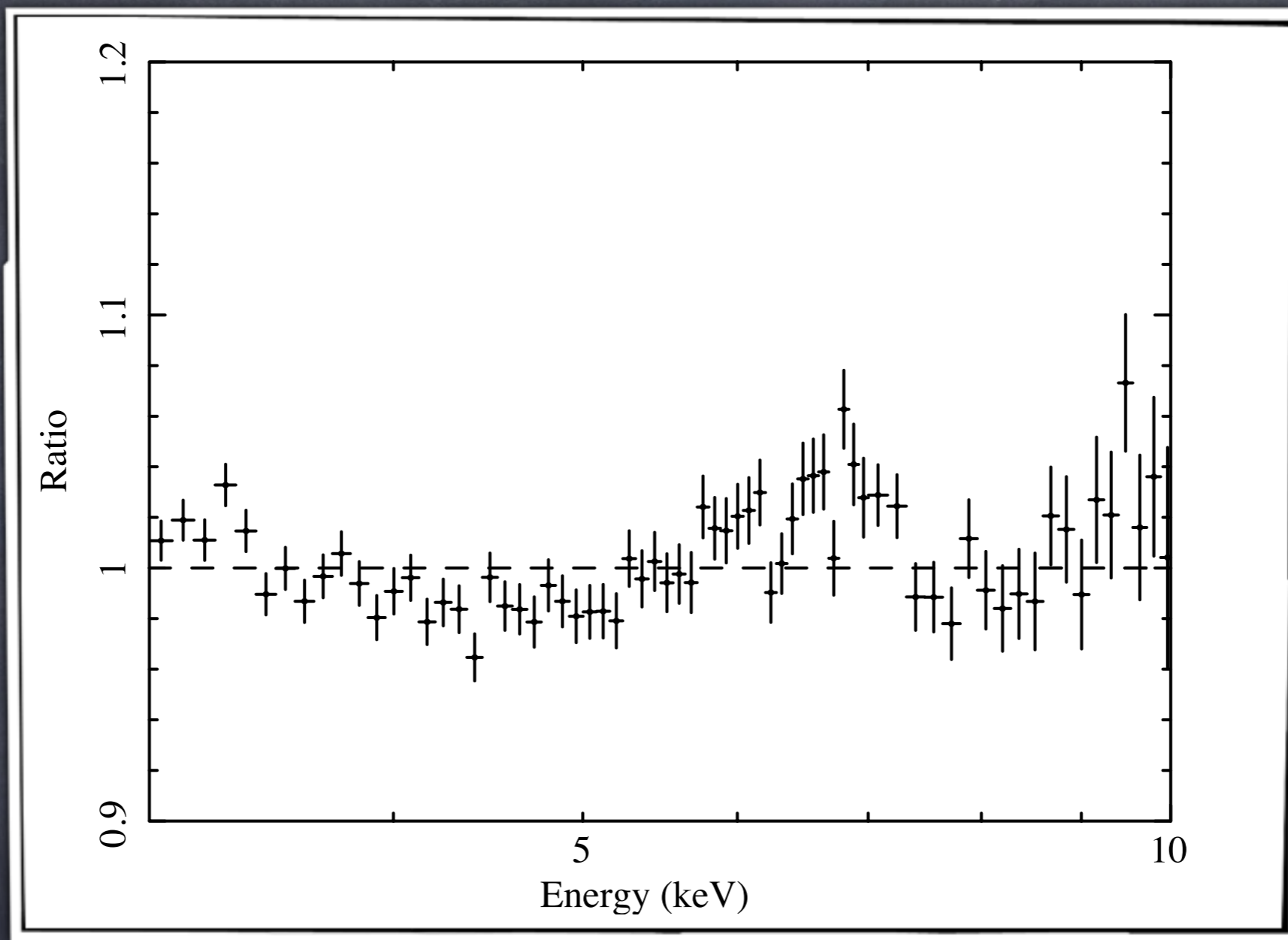
# IC 4329A



Significance  
between  $2-4\sigma$  for  
single observation

Model:  
 $zwabs*(pexrav+zgauss)$

# IC 4329A

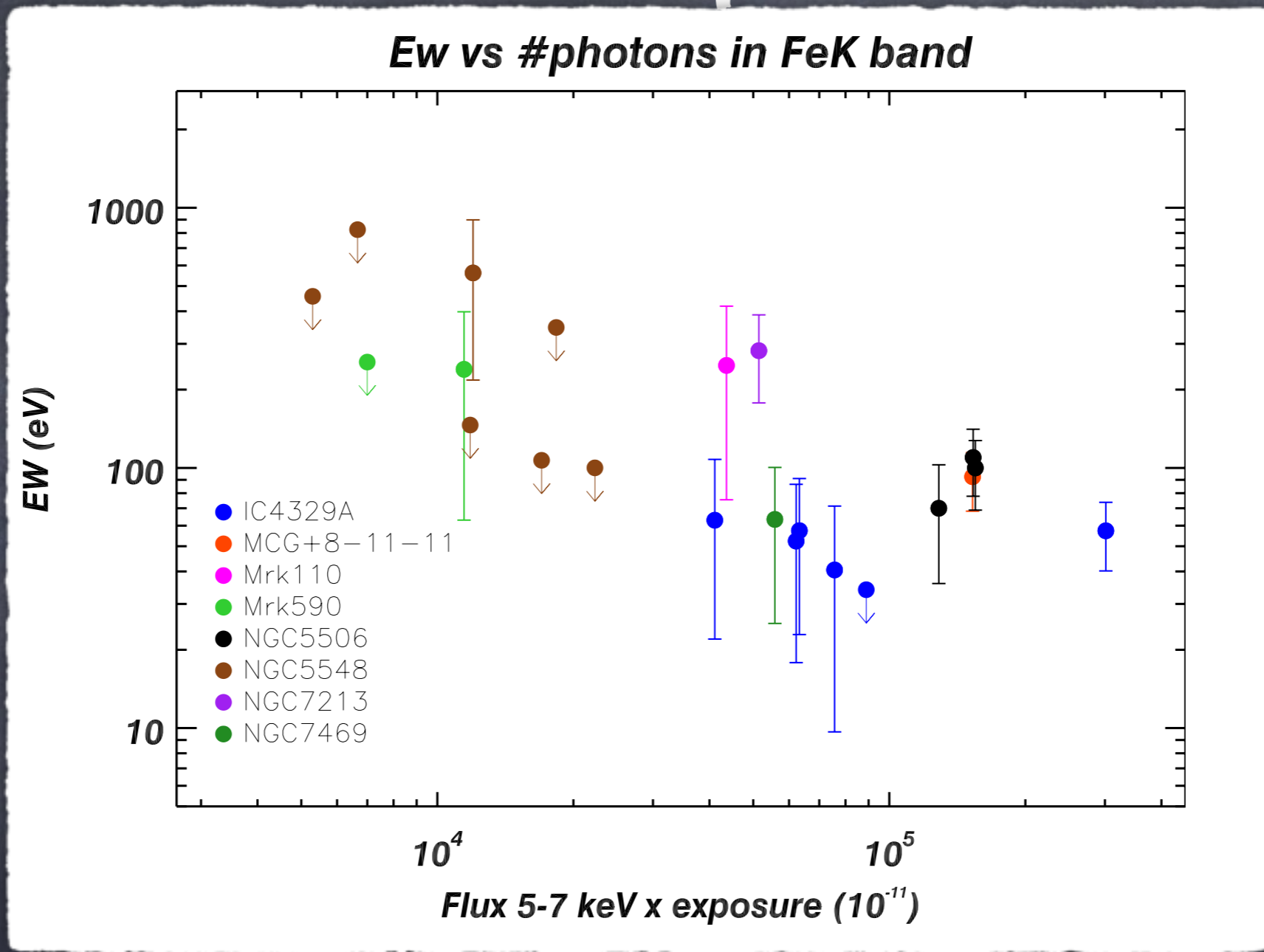


Relativistic emission detected in IC 4329A  
( $>5.5\sigma$  significance)

Model:  $zwabs*(pextrav+zgauss+Laor)$

Mantovani et al. 2014

# Sample



Detections for counts  $> 2 \times 10^4$

Relativistic Iron Ka line common feature in AGN

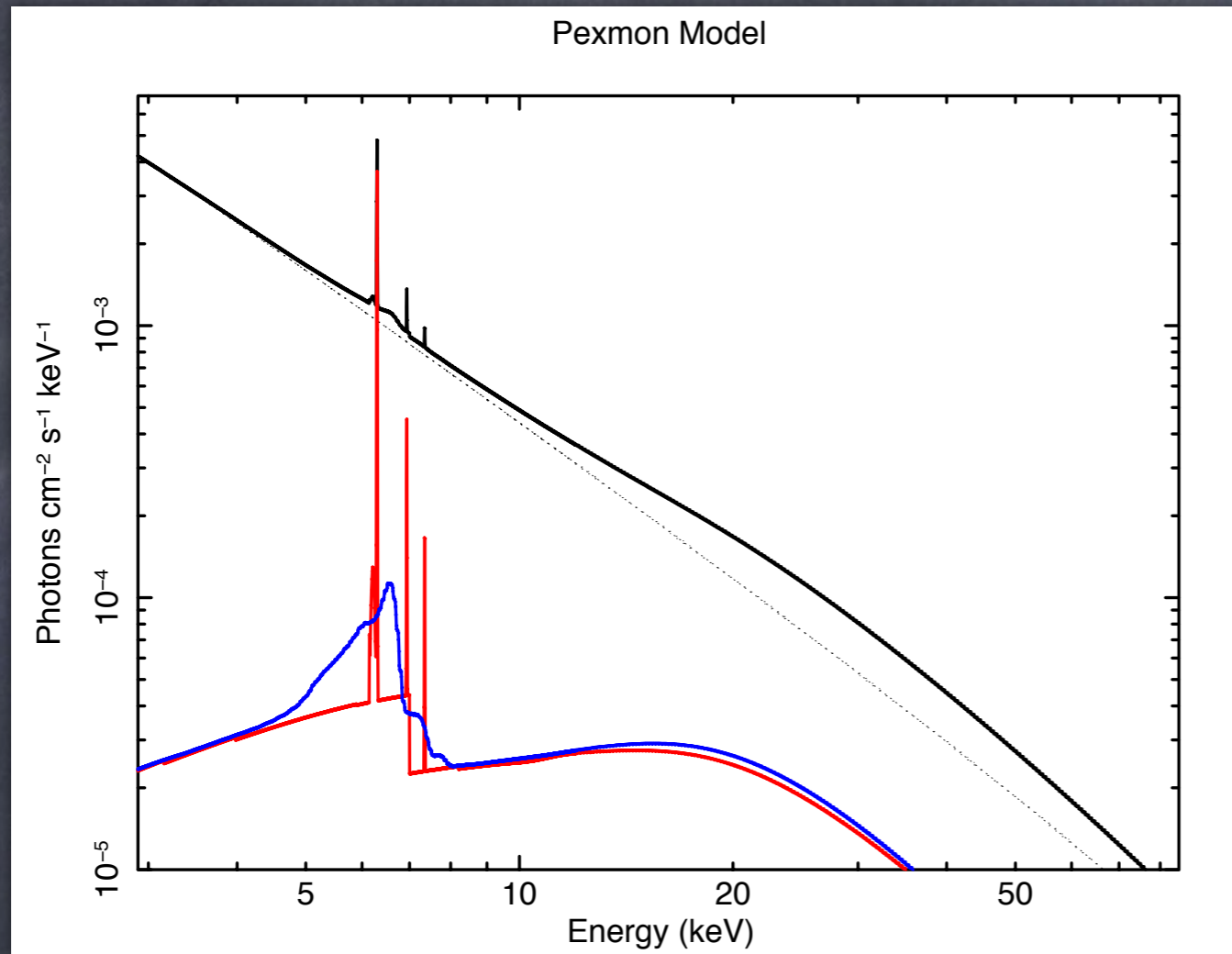
Model: pexrav+zgauss+Laor

Mantovani et al. 2015, submitted



# Relativistic Pexmon

Nandra et al. 2007



Fe  $K_{\alpha}$  flux linked to  
Compton Hump

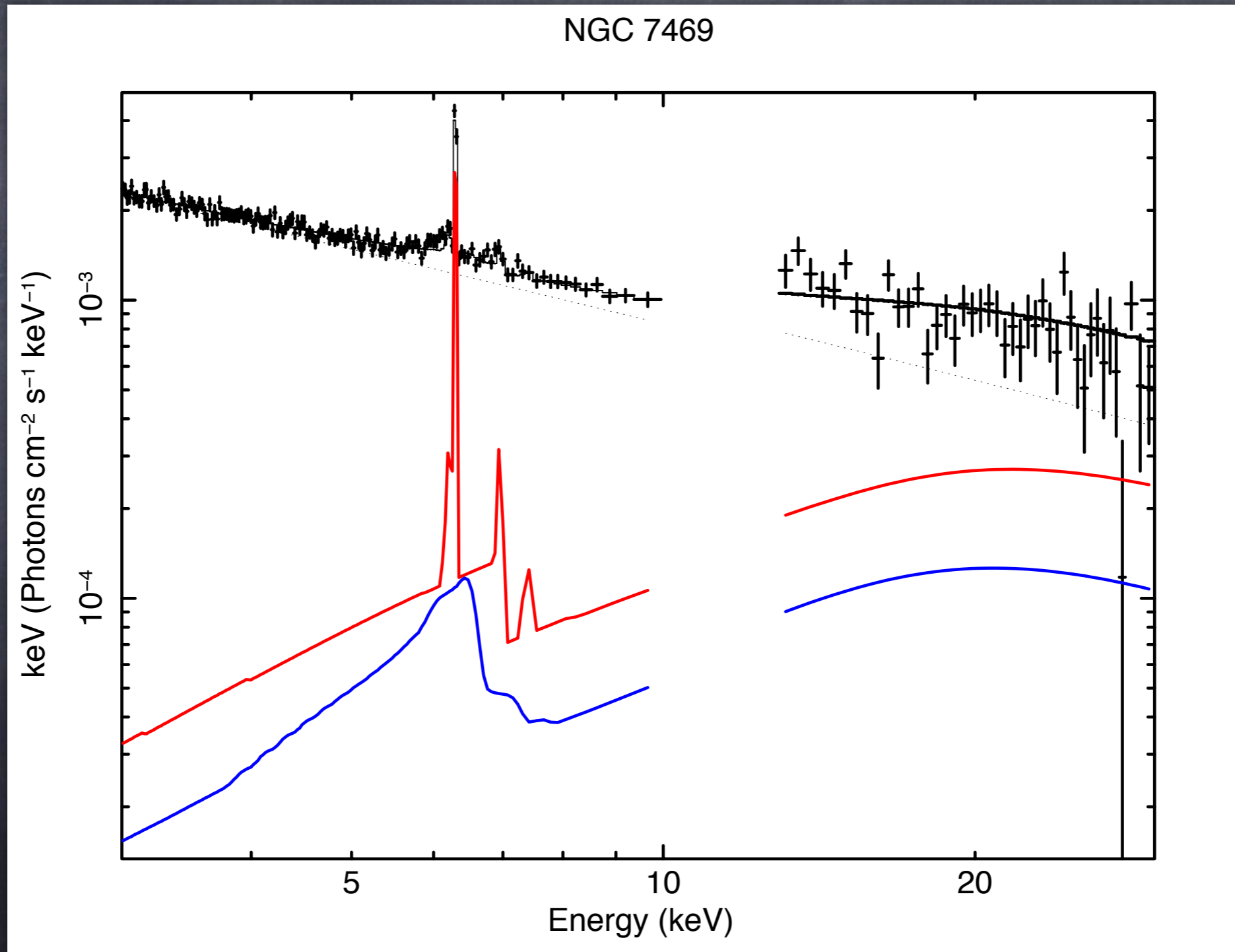
Fe  $K_{\alpha}$  (6.4 keV), Fe  $K_{\beta}$  (7.06 keV) flux 11.3% of  $K_{\alpha}$ , Ni  $K_{\alpha}$  (7.47 keV) flux 5% of  $K_{\alpha}$

Compton Reflection (pexrav)

Fe  $K_{\alpha}$  Compton shoulder

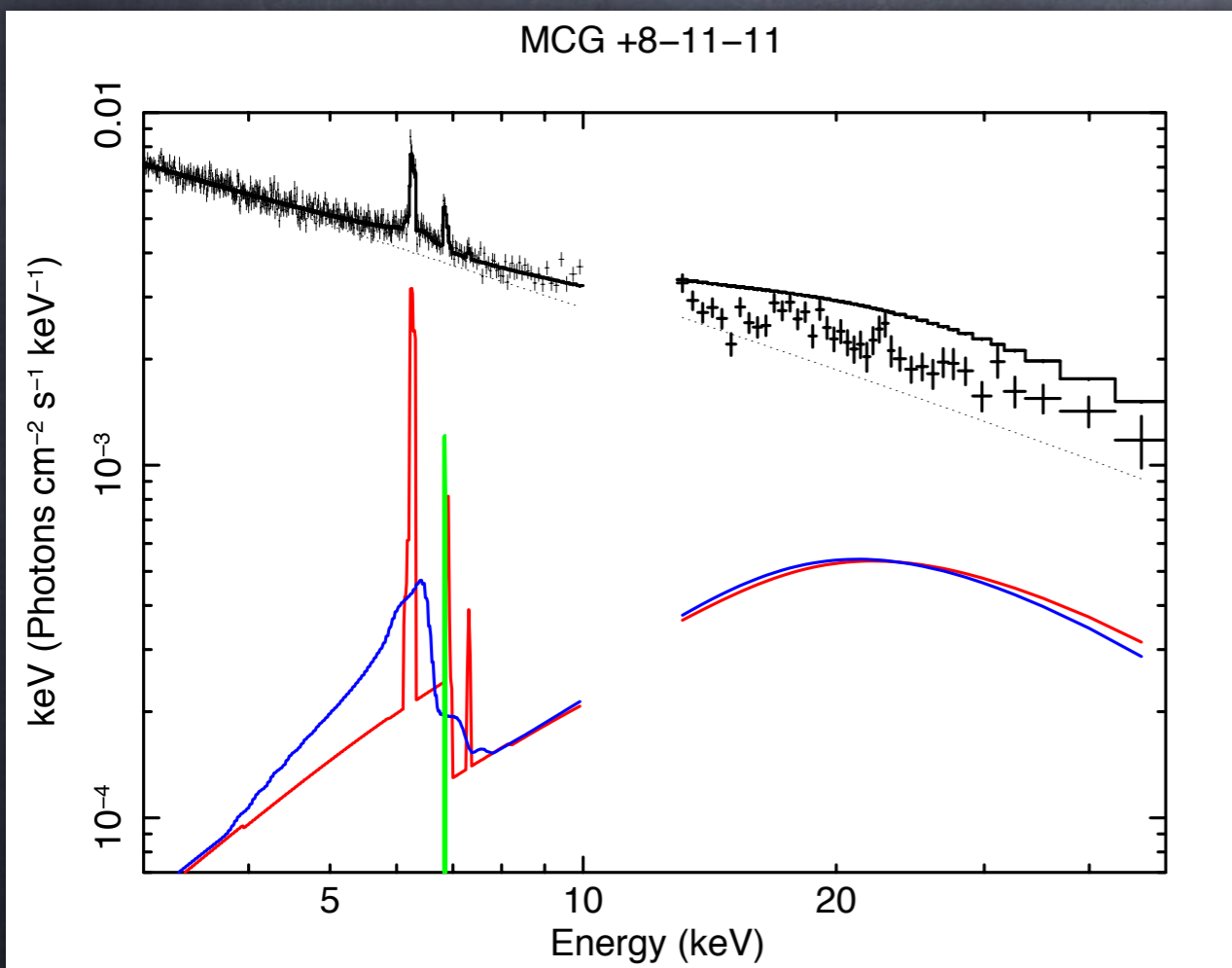
# Relativistic Pexmon

Model:  $\text{cutoffpl} + \text{pexmon} + \text{kdblur} * \text{pexmon}$

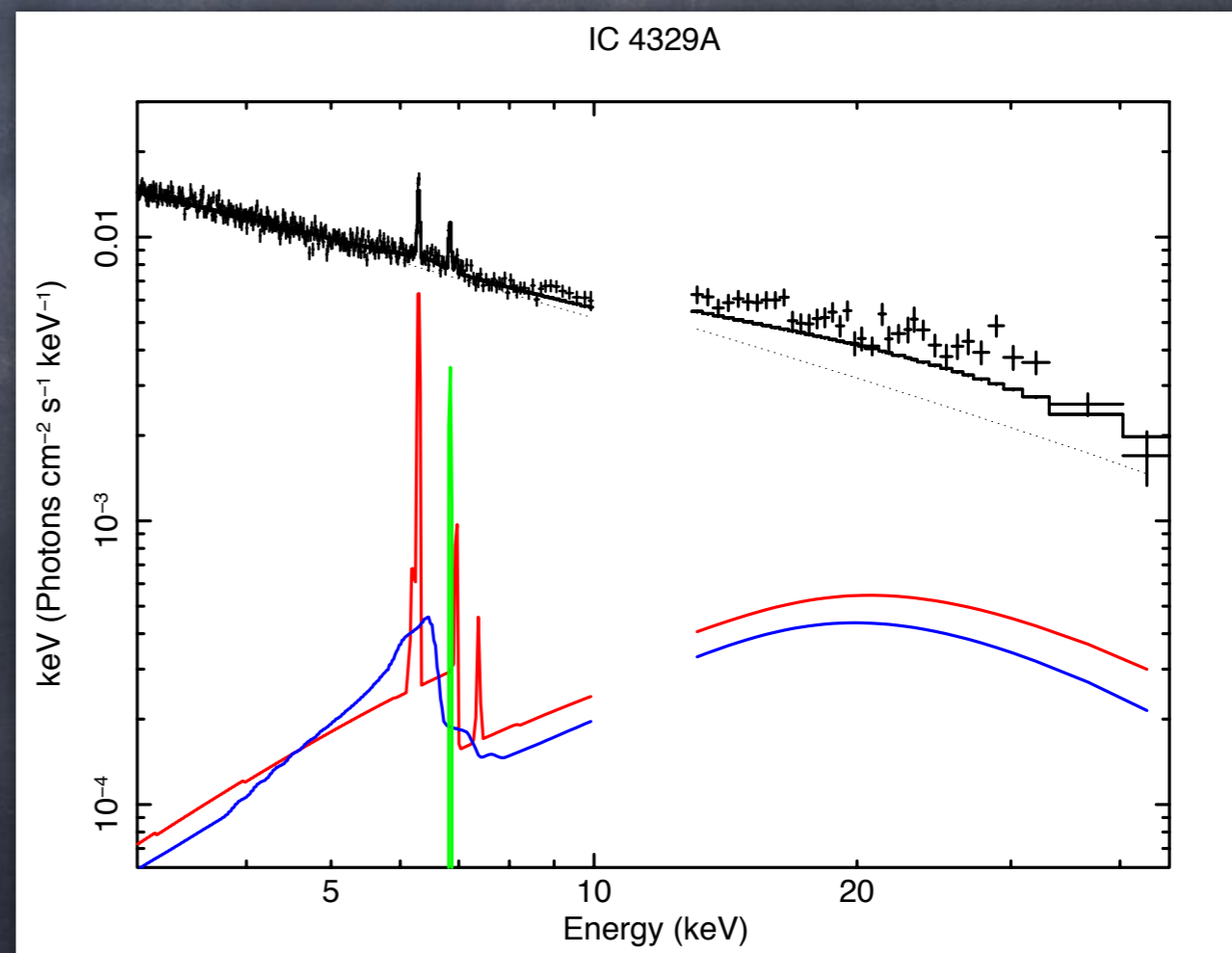


# Relativistic Pexmon

In general, the Pexmon model gives similar fit to the data compared to the phenomenological one



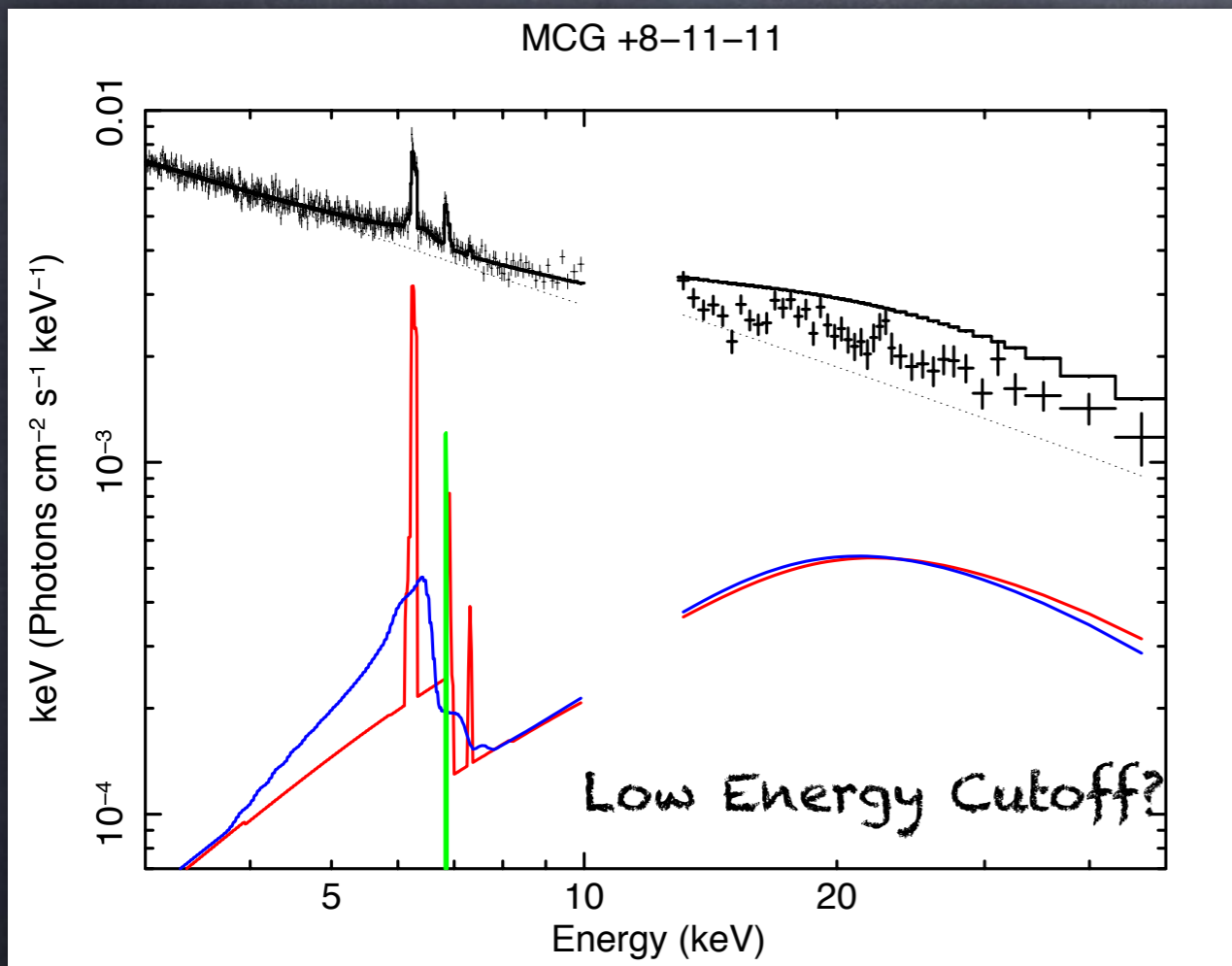
MCG+8-11-11  $\Delta\chi^2/\Delta$  d.o.f. > 123/1



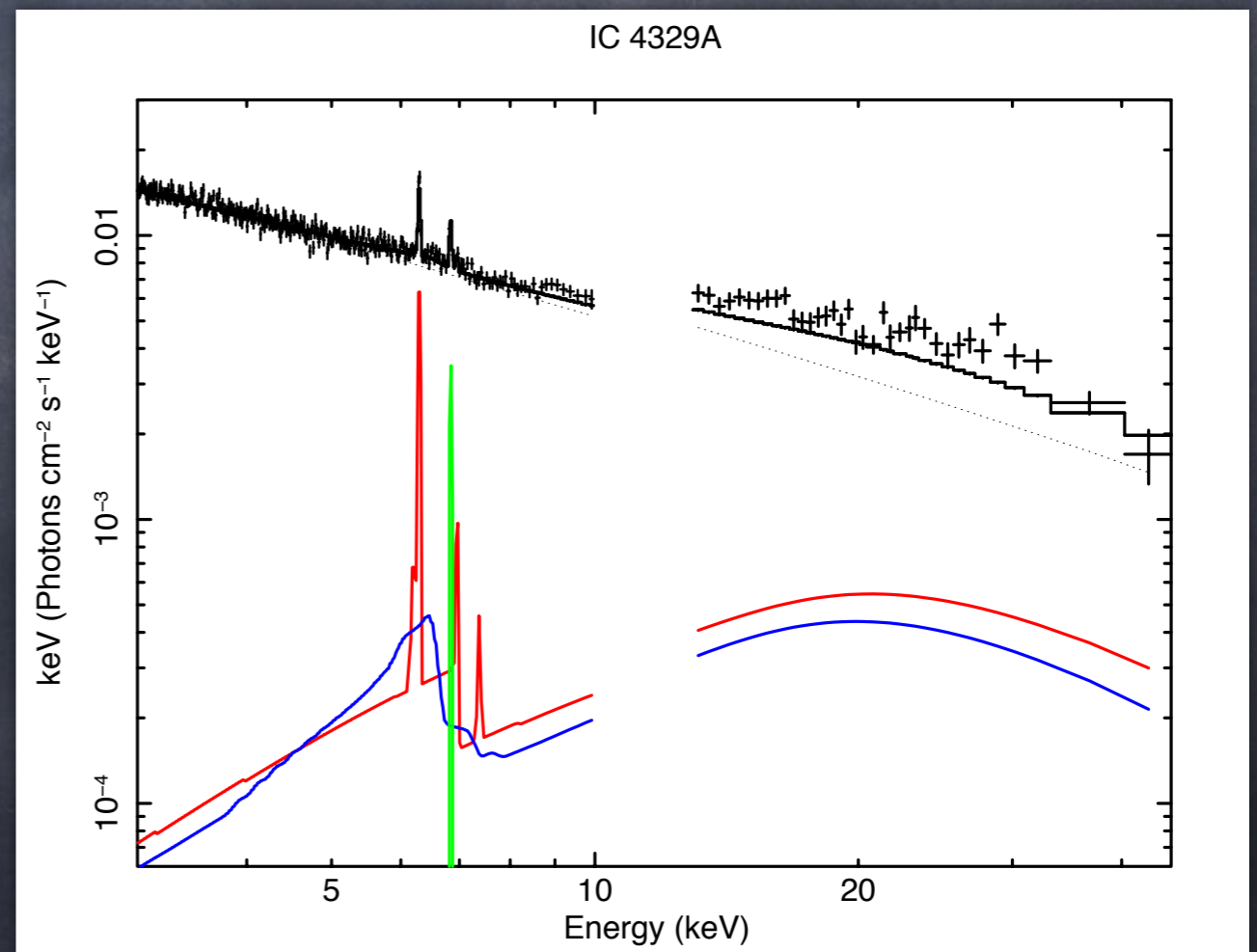
IC 4329A  $\Delta\chi^2/\Delta$  d.o.f. > 57/1

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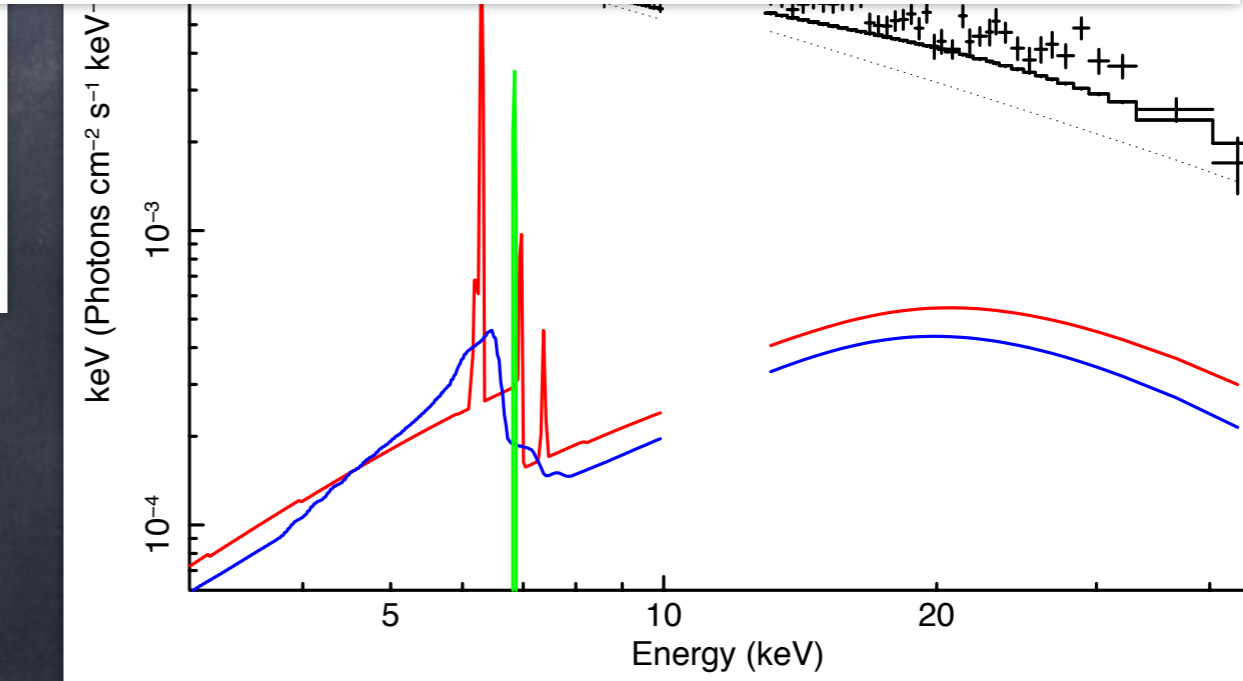
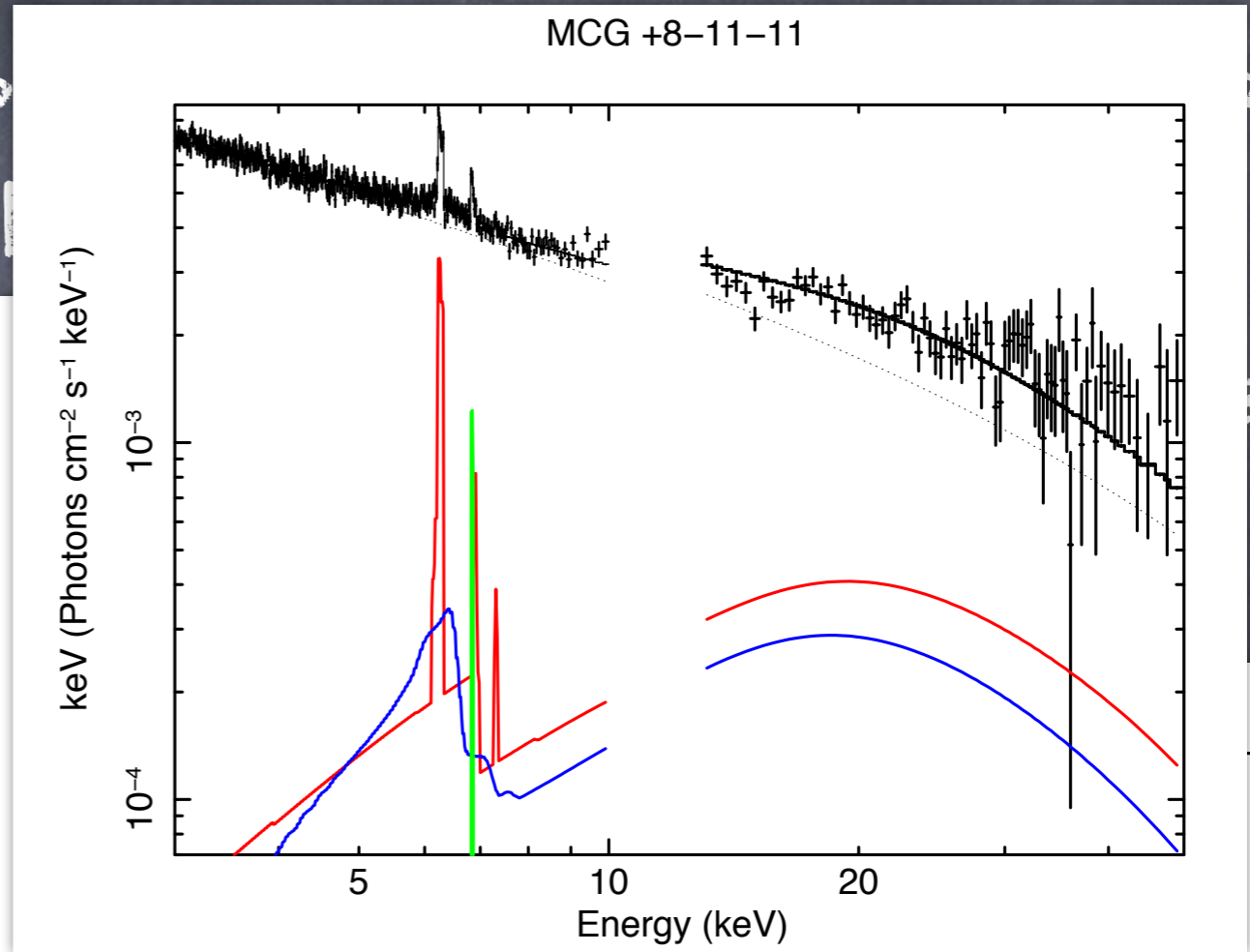
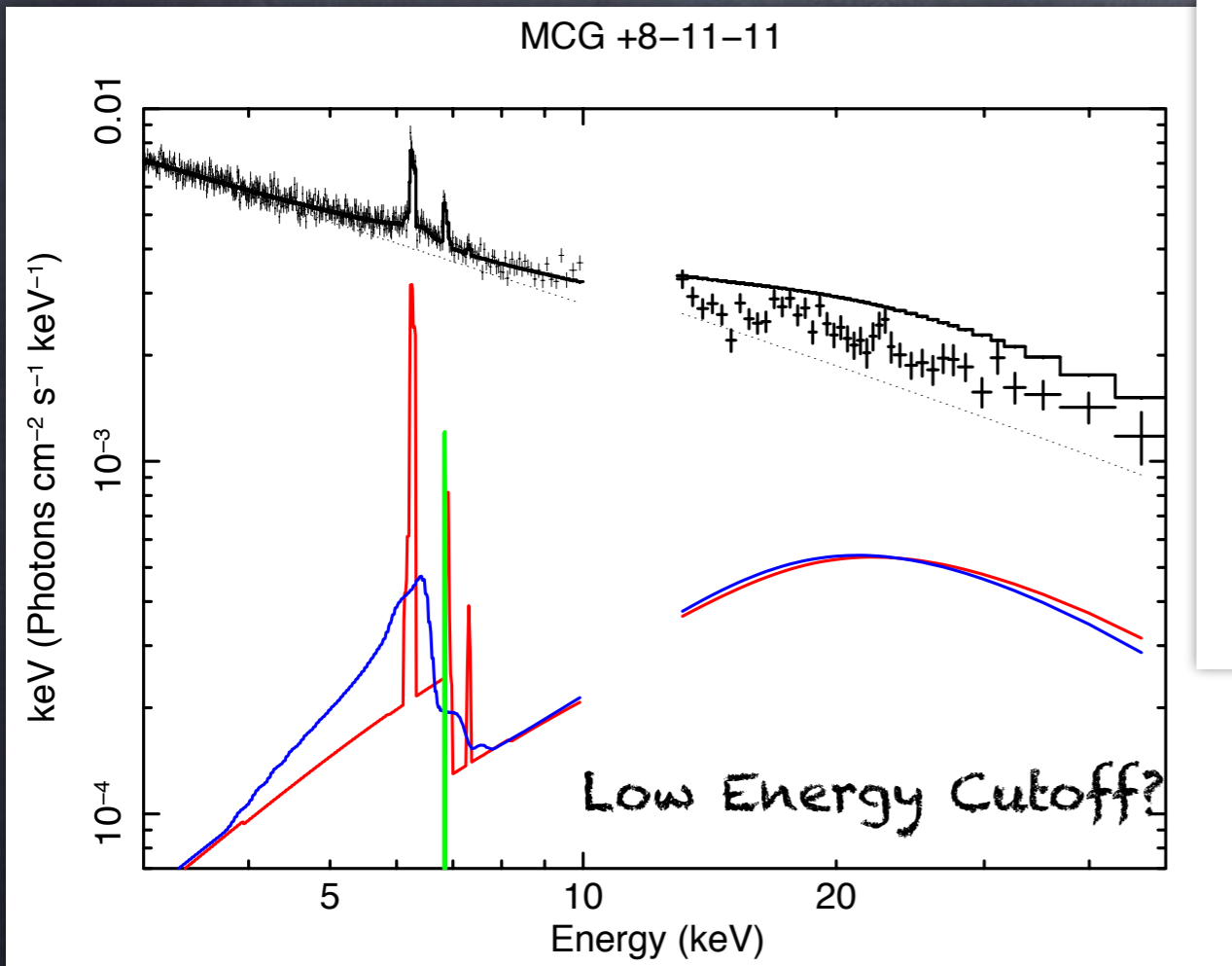


IC 4329A  $\Delta\chi^2/\Delta$  d.o.f. > 57/1

Mantovani et al. 2015, submitted

# Relativistic Pexmon

In general, the Pexmon model compared to the



IC 4329A  $\Delta\chi^2/\Delta$  d.o.f. > 57/1

Mantovani et al. 2015, submitted

# Conclusions

- Detection of broad iron line in IC 4329A when the data are combined
- We do not detect the relativistic line only when the statistics is low  $< 2 \times 10^4$
- Data consistent with a correlation between the emission of the Reflection and the Iron  $K_{\alpha}$  emission line