The EPIC-pn detector stability

Low energies: RX J1856.5-3754

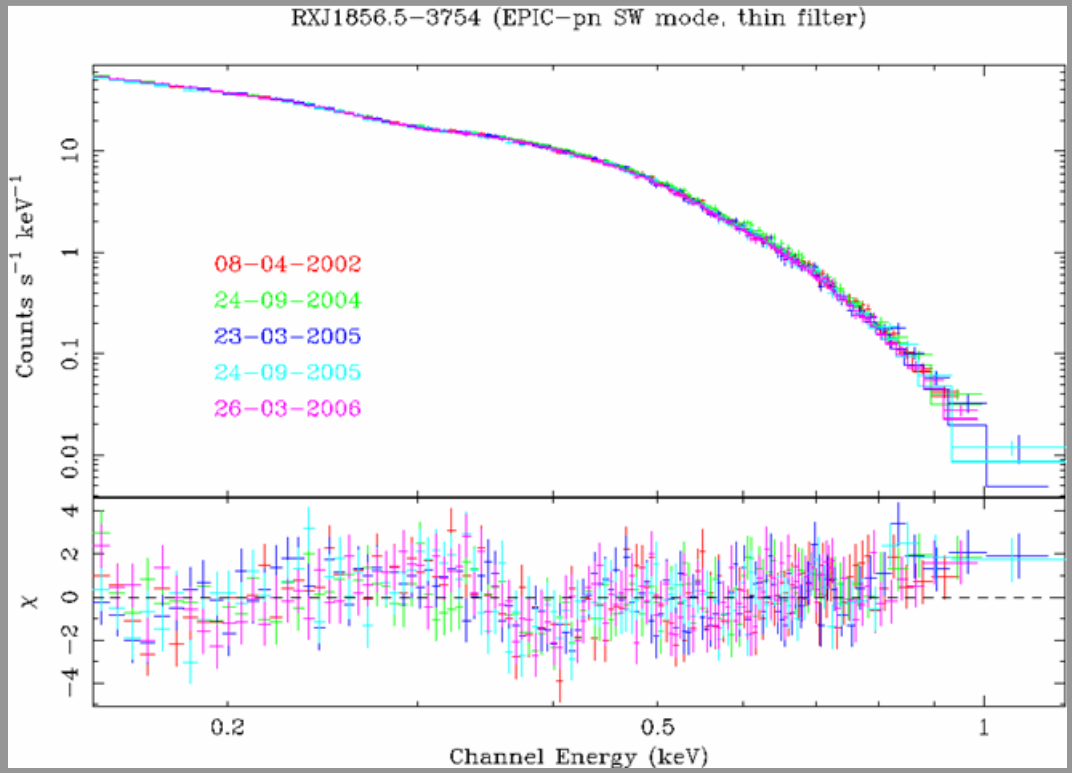
Medium energies: 1E0102

High energies (resolution): Eta Carinae

Frank Haberl

EPIC cal meeting, Garching, 4-5 May 2006

RX J1856.5–3754: A `stable‘ neutron star



- 5 observations in FF mode + thin1 filter
- 1 observation in timing mode + thin1 filter

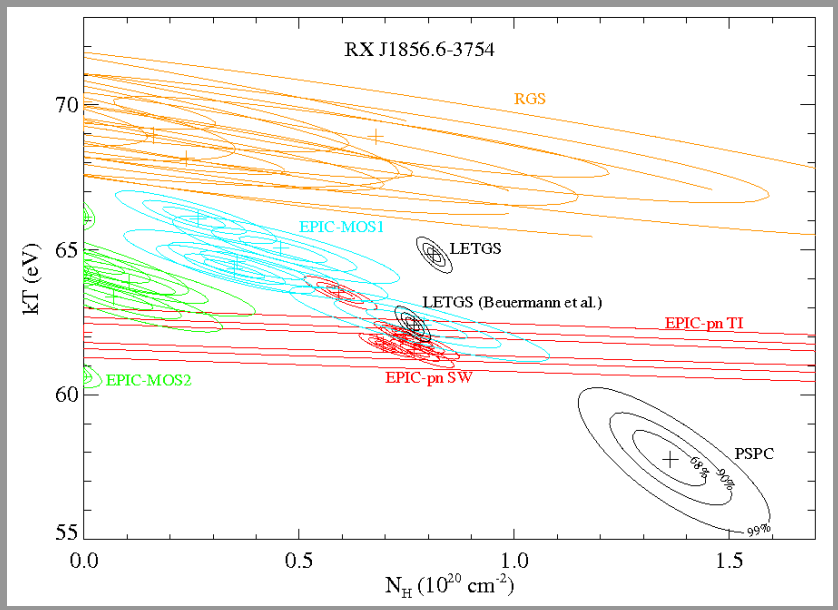
Model: tbabs*bbody

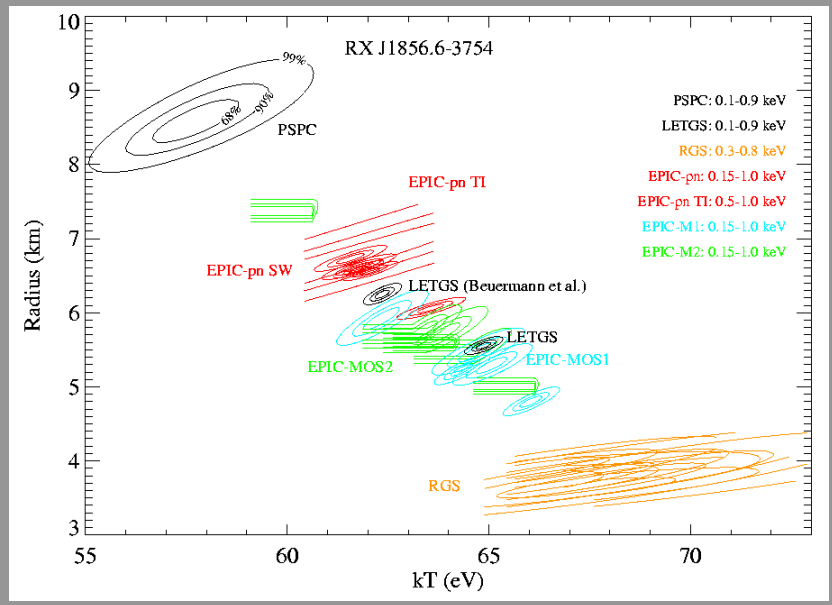
Simultaneous fit with all parameters linked except norm:

1.000
1.008 ± 0.005
0.995 ± 0.005
0.983 ± 0.005 (*)
0.989 ± 0.004

(*) 69 intervals in STDGTI extension!
exposure overestimated also seen in other cases (RX J1605 up to 10%)

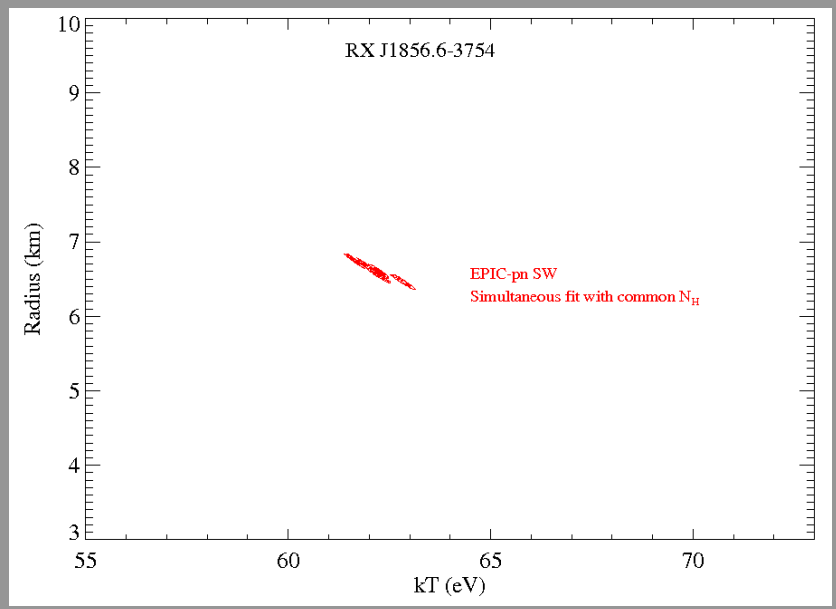
RX J1856.5–3754: A `stable‘ neutron star





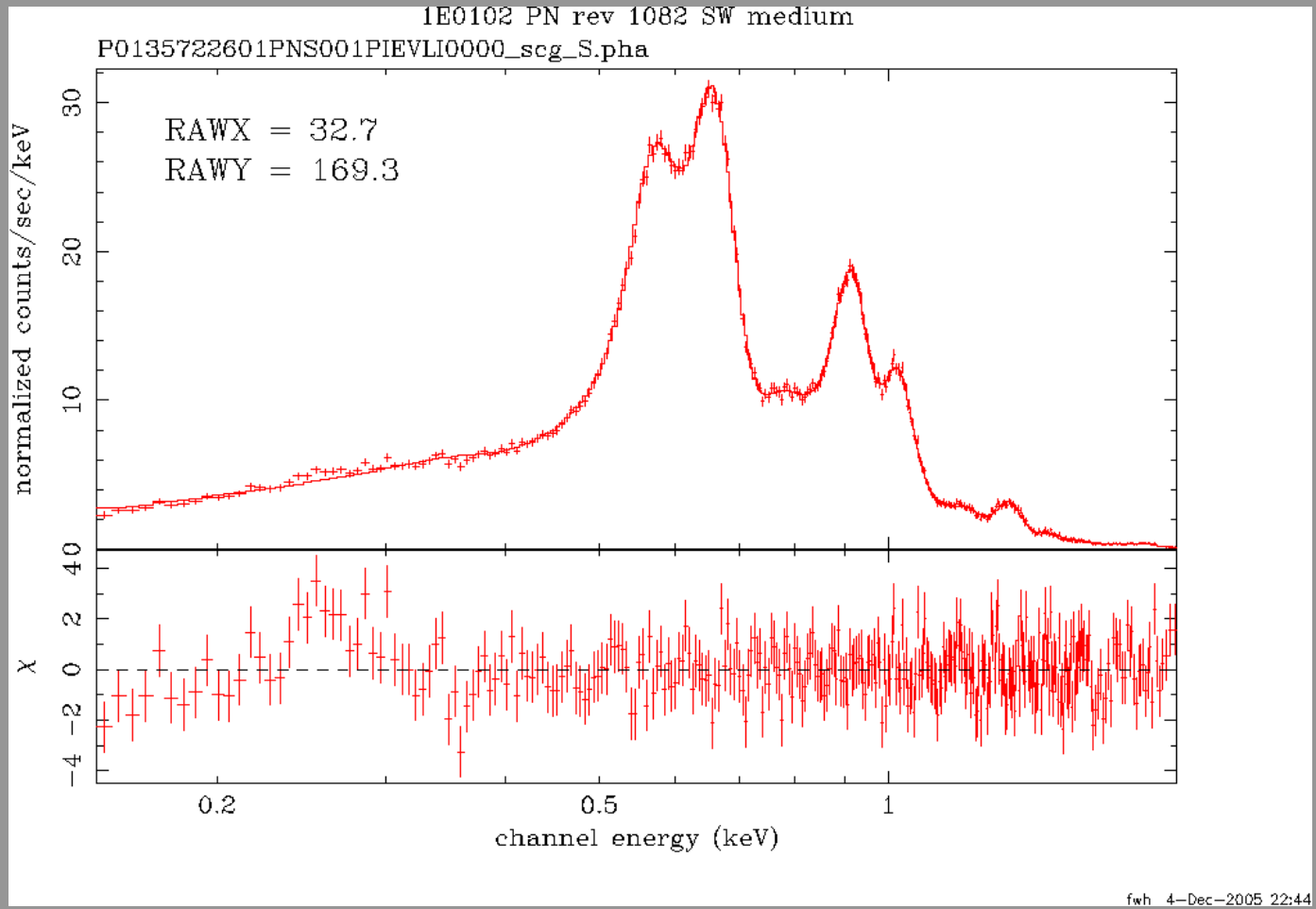
Individual fits with all parameters free:

Model: tbabs*bbody

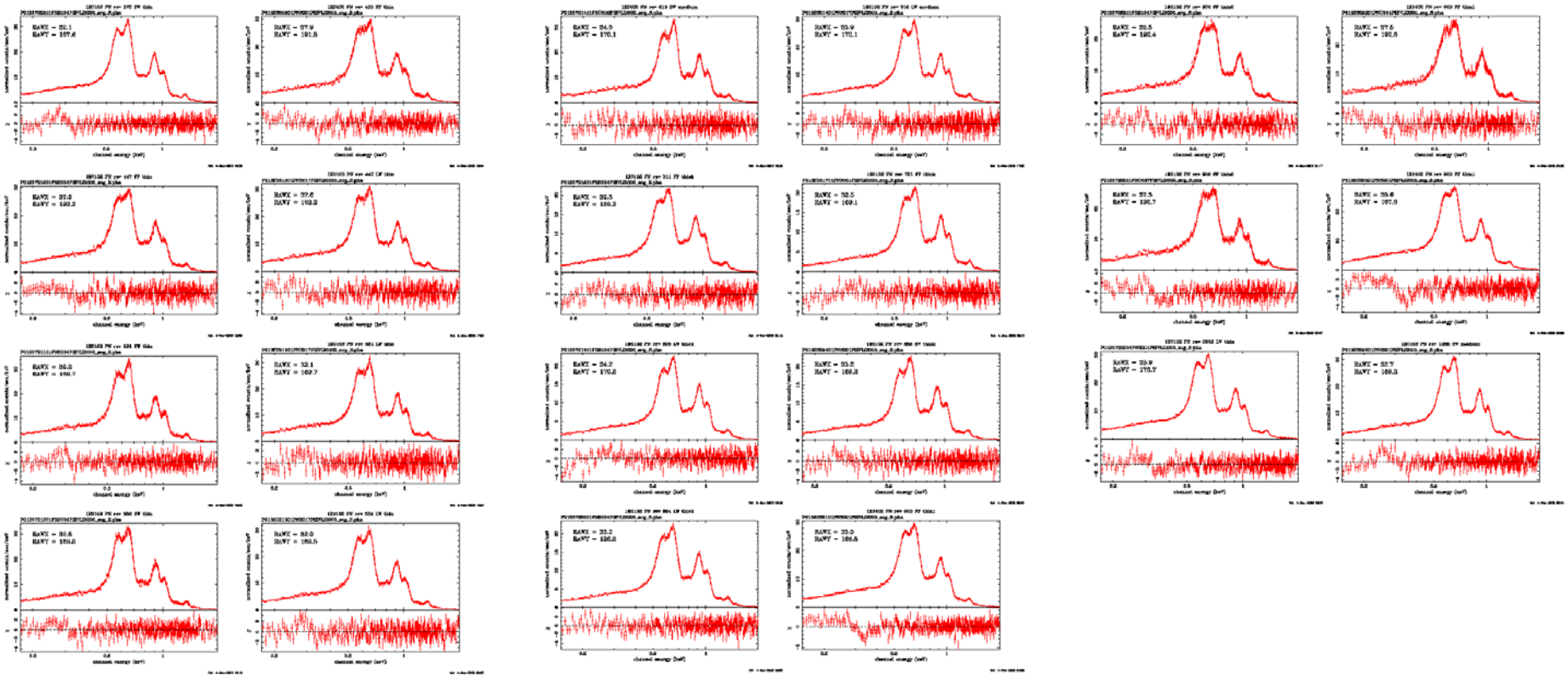


Simultaneous fits with N_H linked:

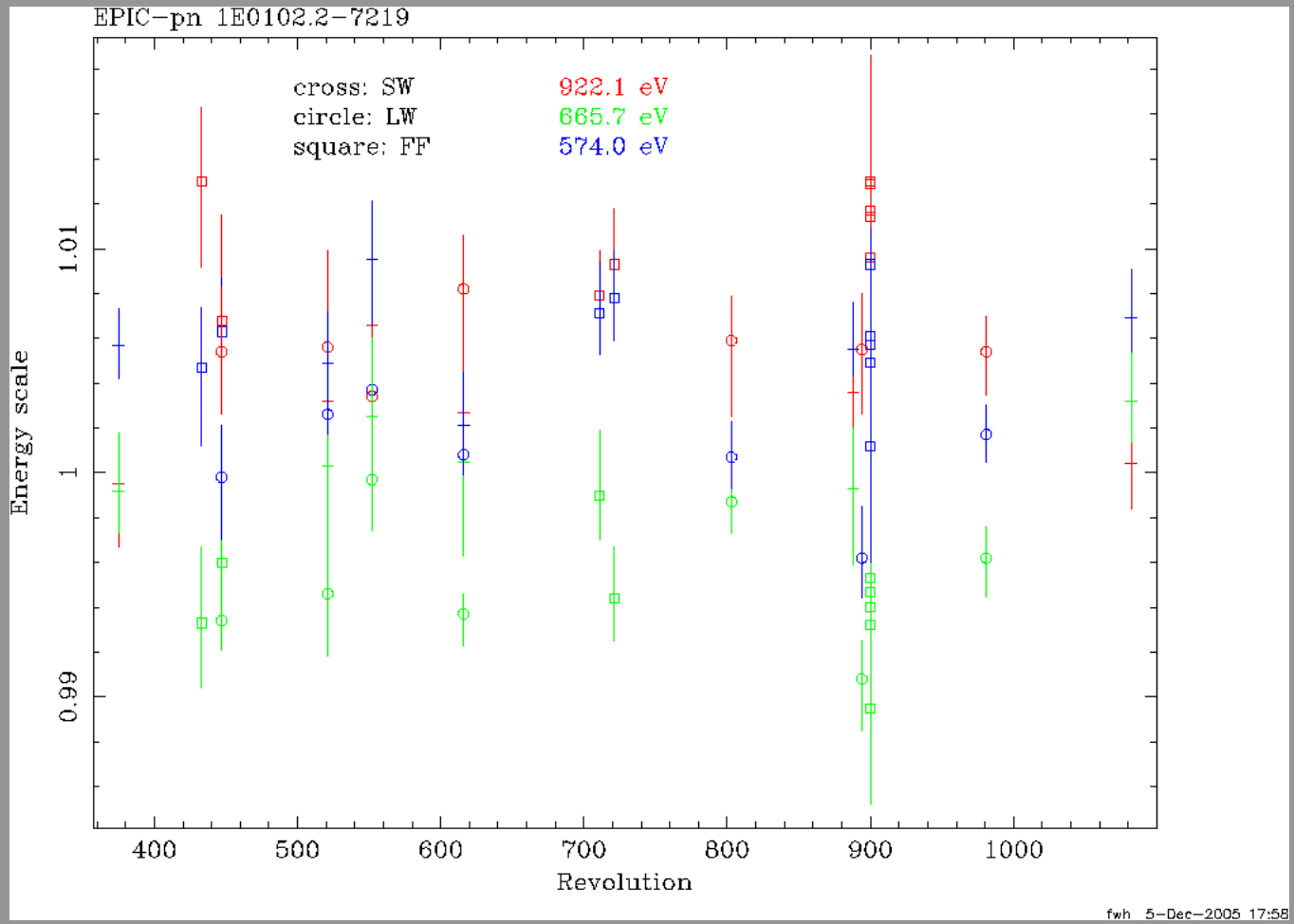
The SNR 1E0102



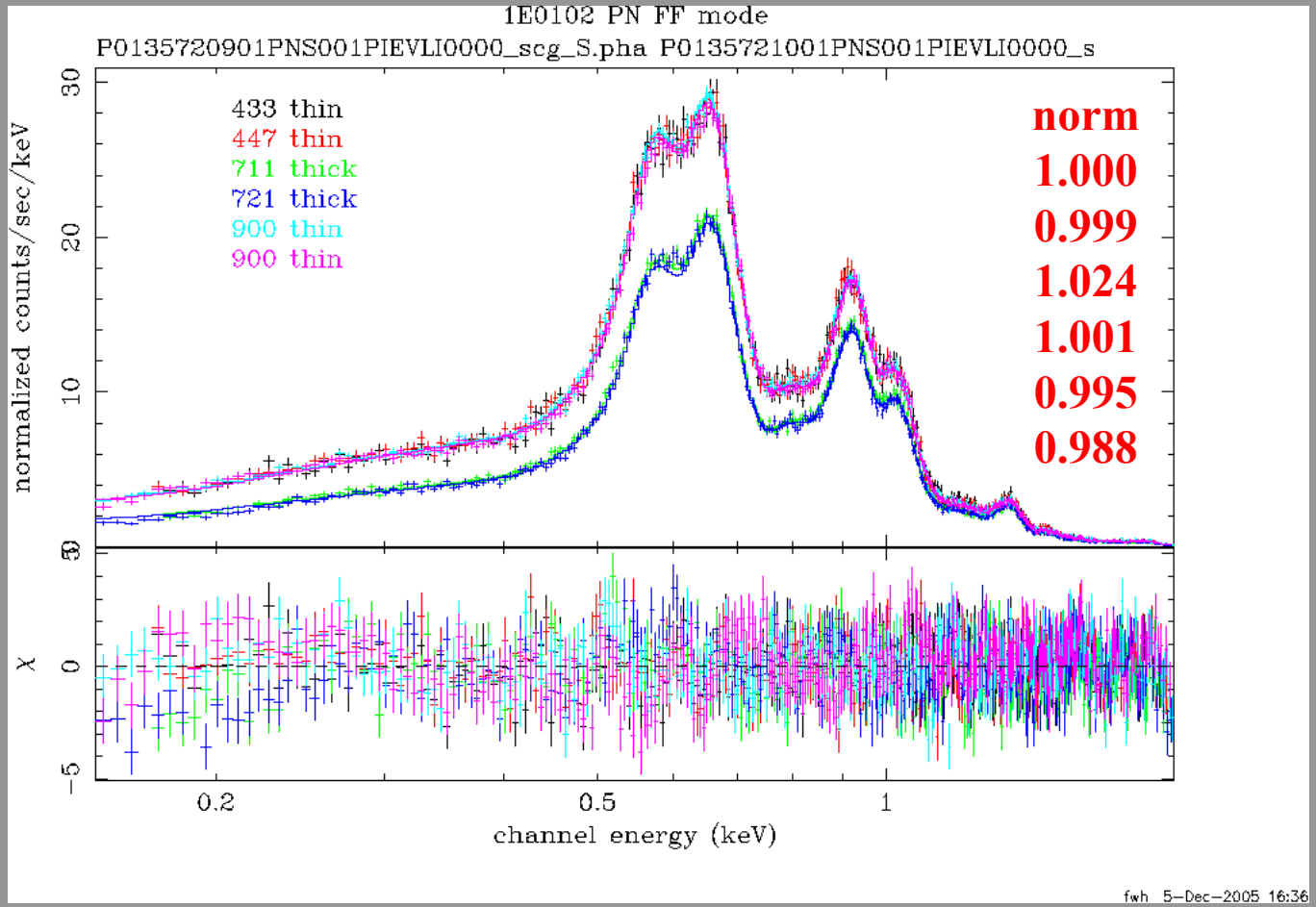
1E0102 EPIC-pn spectra



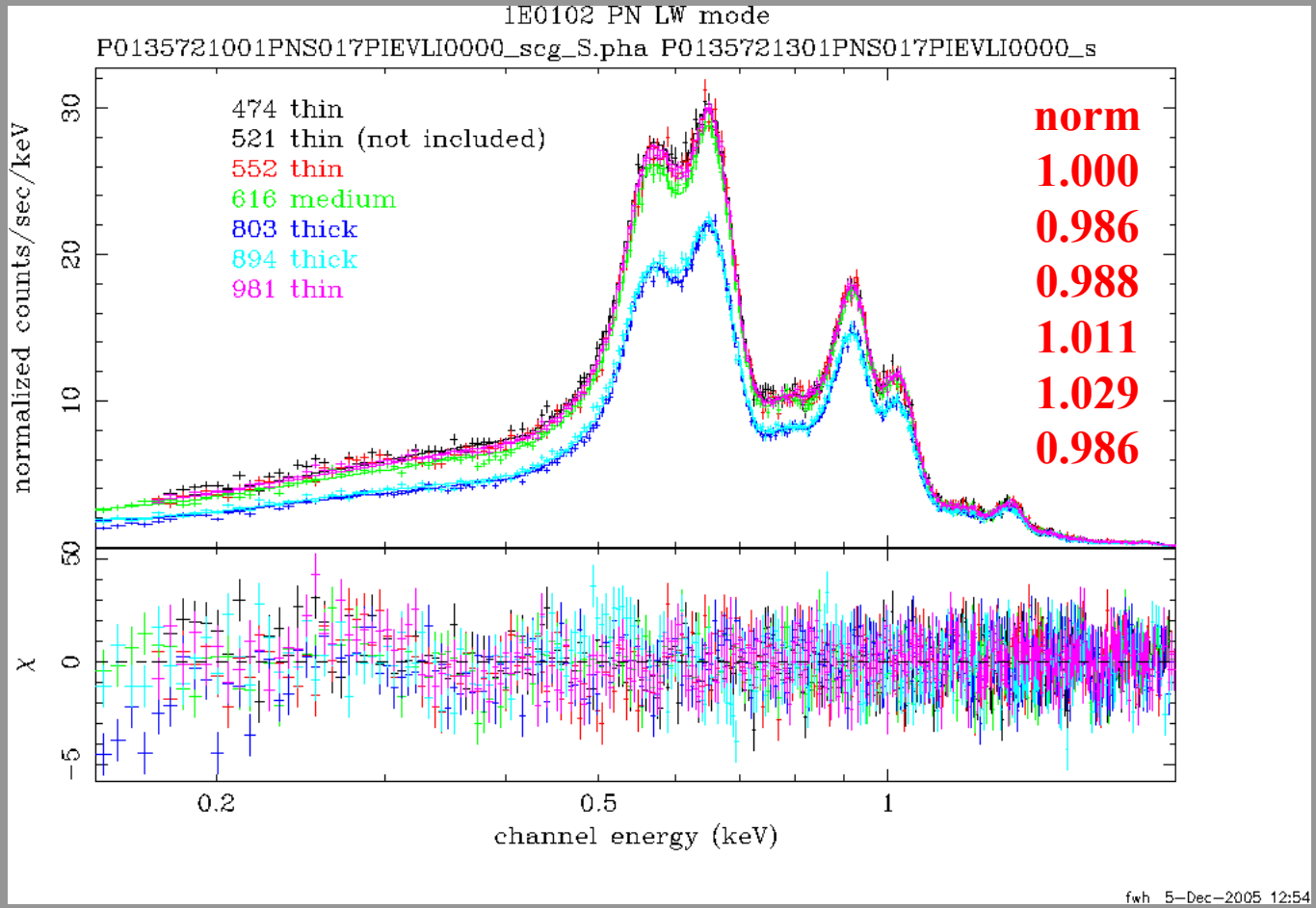
Line energies



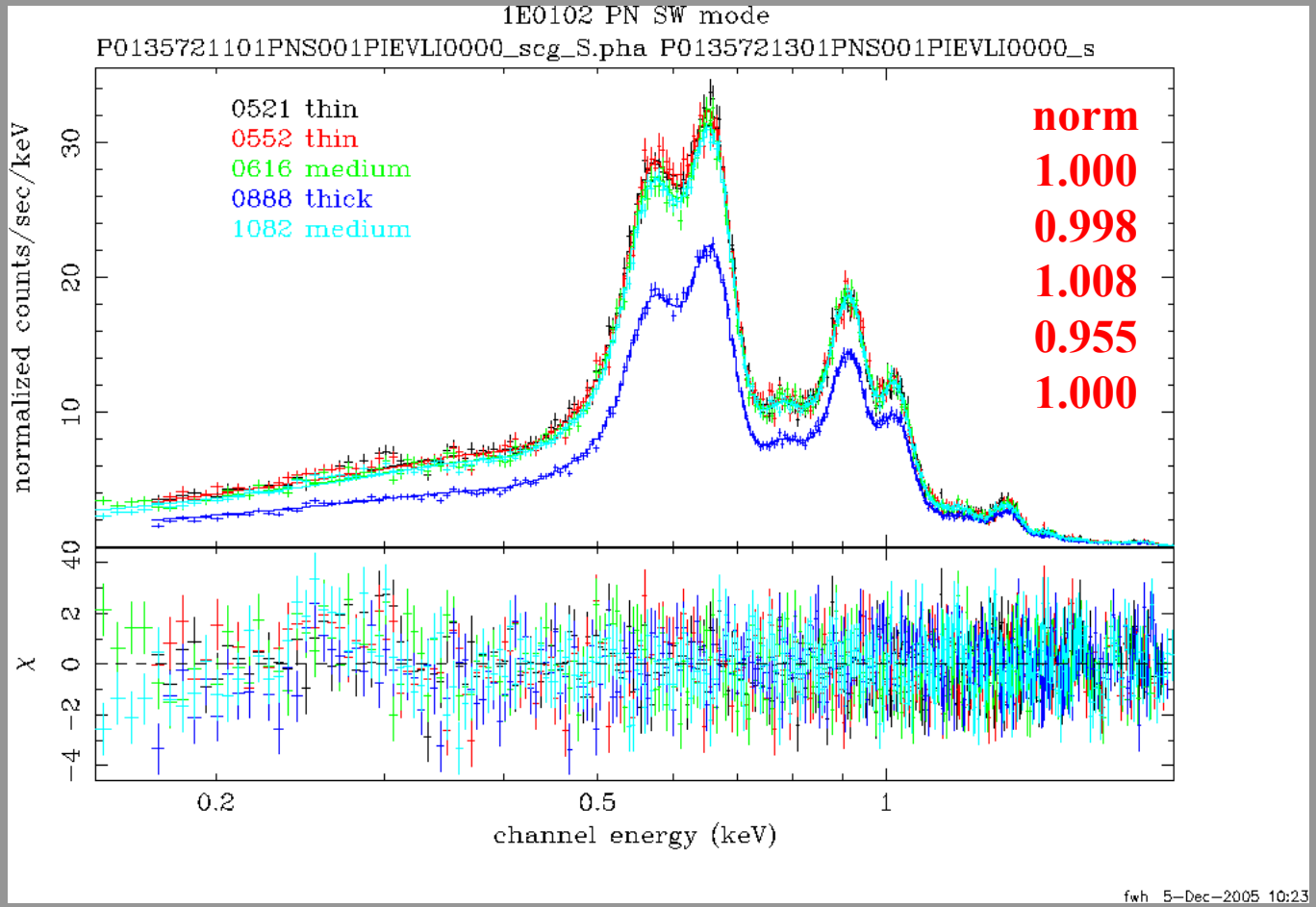
FF read-out mode



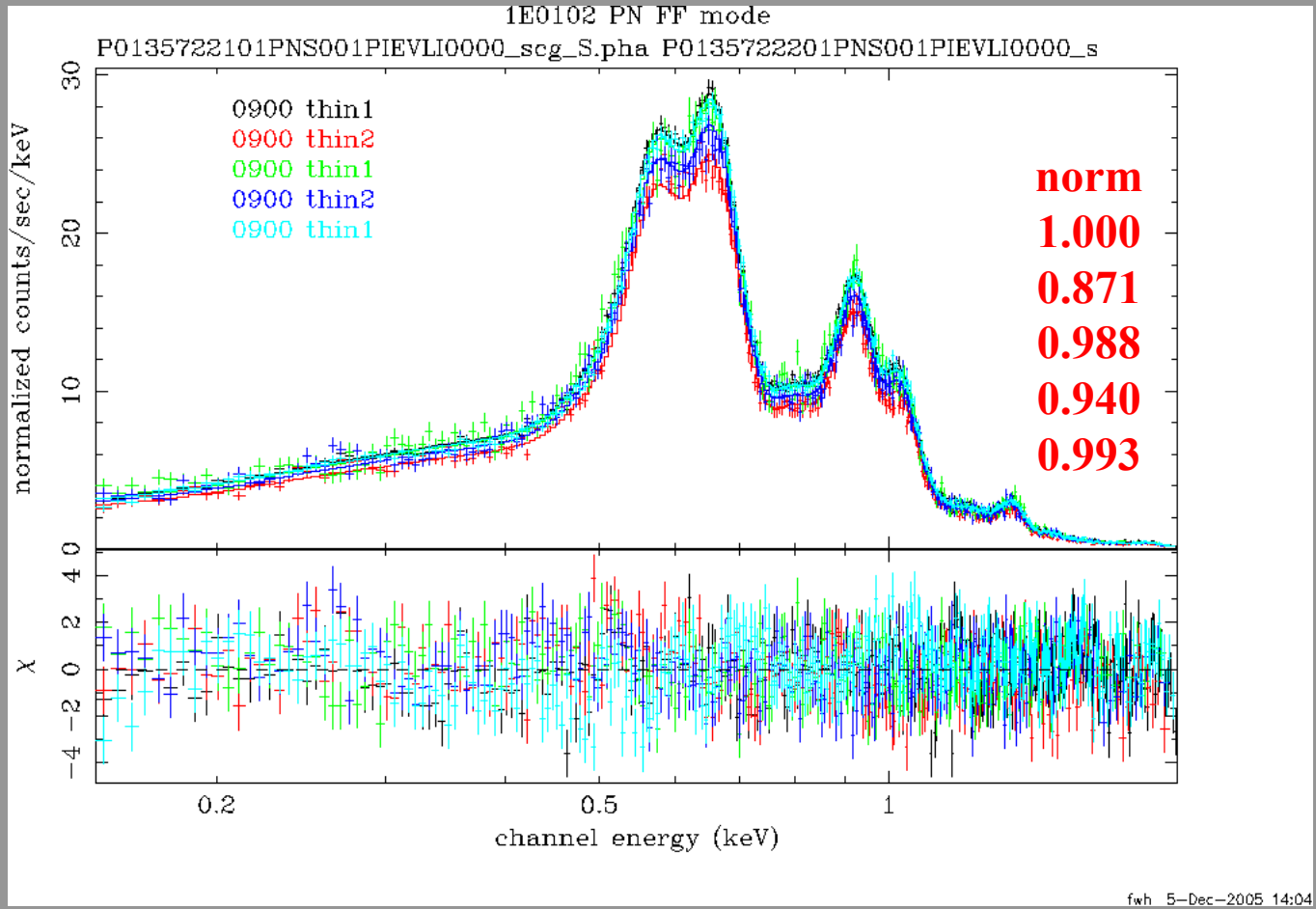
LW read-out mode



SW read-out mode



Filter dependence

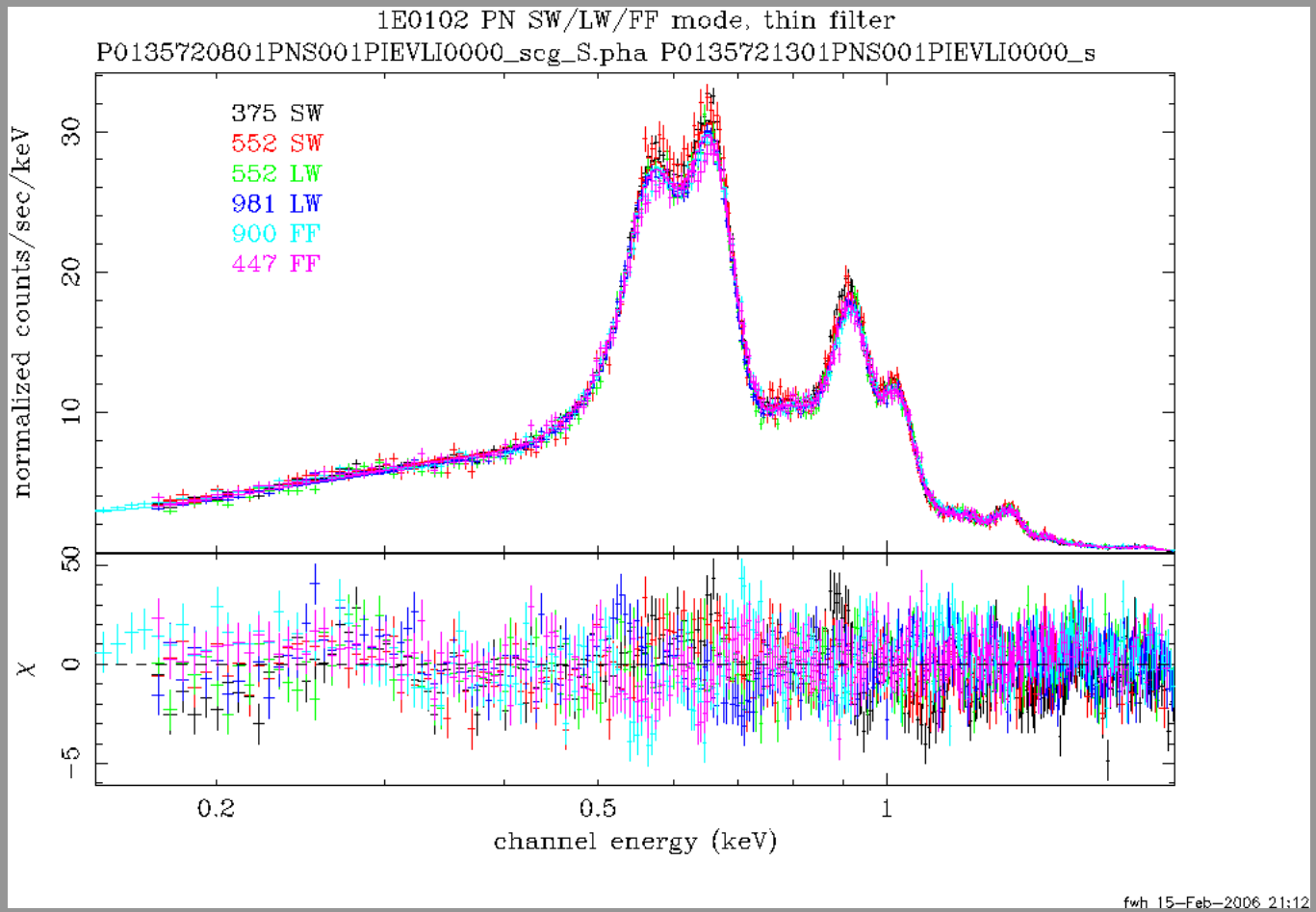


High background

Many short GTIs → problems with exposure

No MOS thin2

Dependence on read-out mode

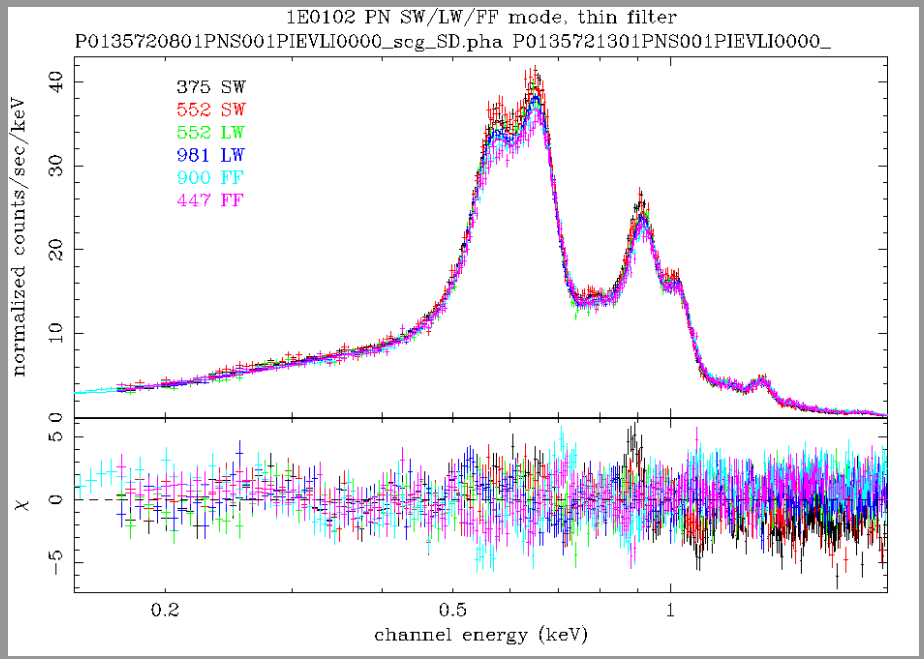


Norm
1.000
0.992
0.928
0.928
0.918
0.923

Single-pixel events

Dependence on read-out mode

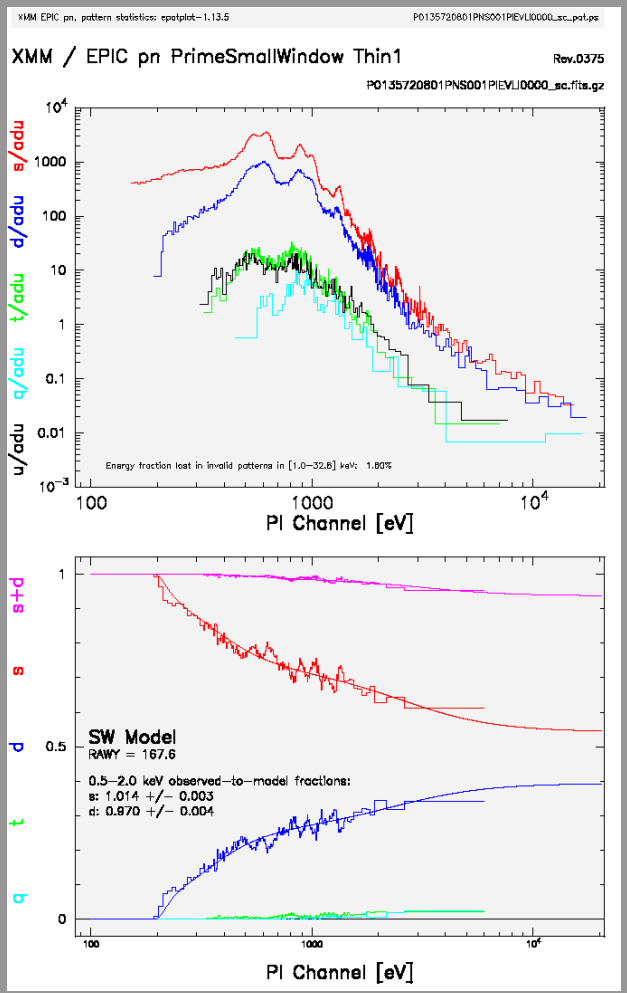
Single- and double-pixel events

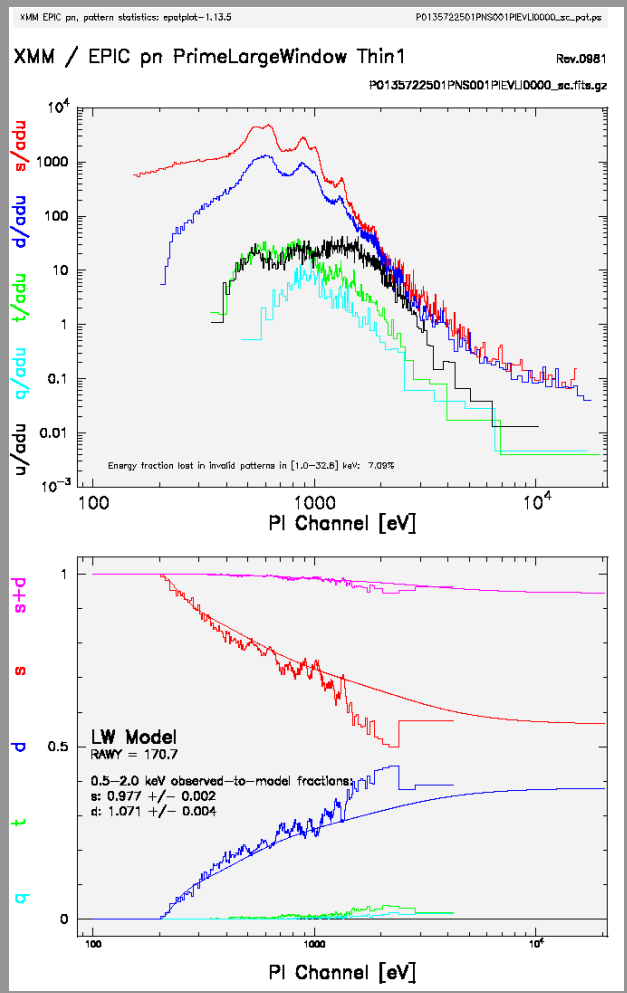


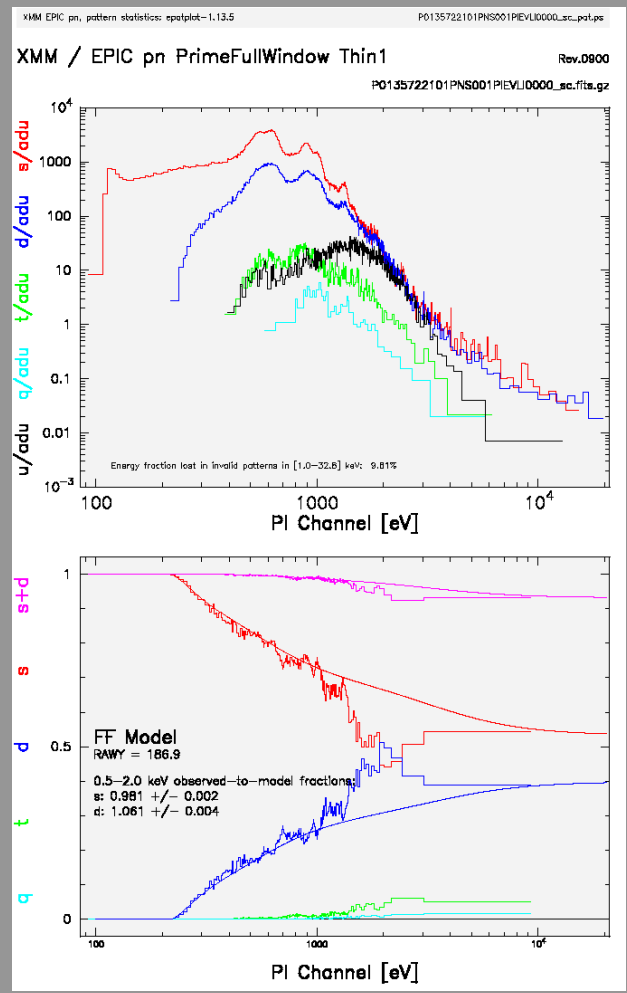
	Norm S	Norm SD	<PI> eV	E_{tot} / s eV/s
SW	1.000	1.000	737	12946
SW	0.992	0.993	738	12879
LW	0.928	0.958	756	12863
LW	0.928	0.957	756	12825
FF	0.918	0.942	771	13013
FF	0.923	0.945	768	12895

pile-up shifts events to higher energies
no energy gets lost
but shifts to different patterns

Pattern distribution



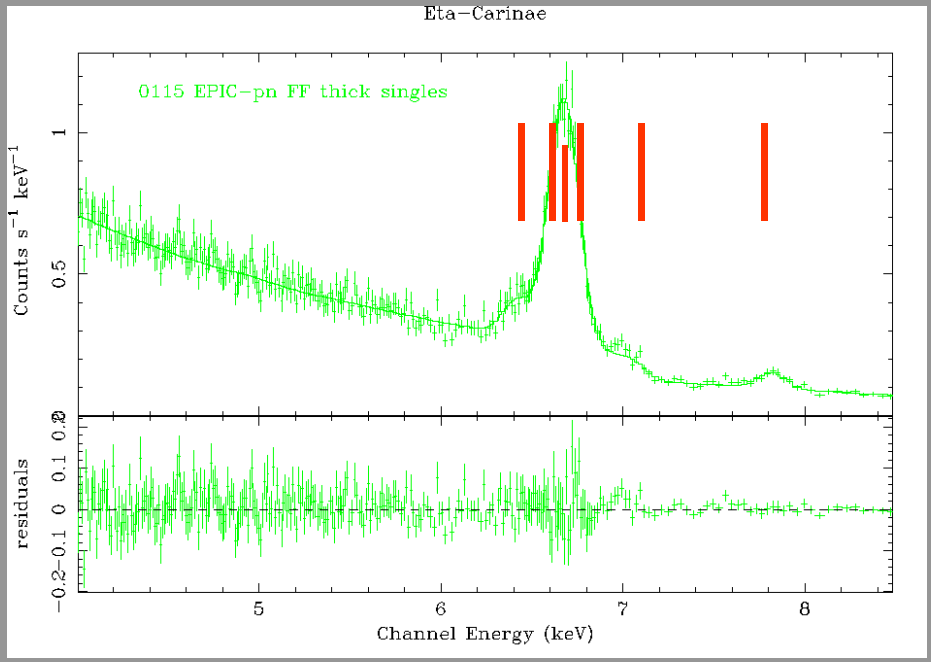




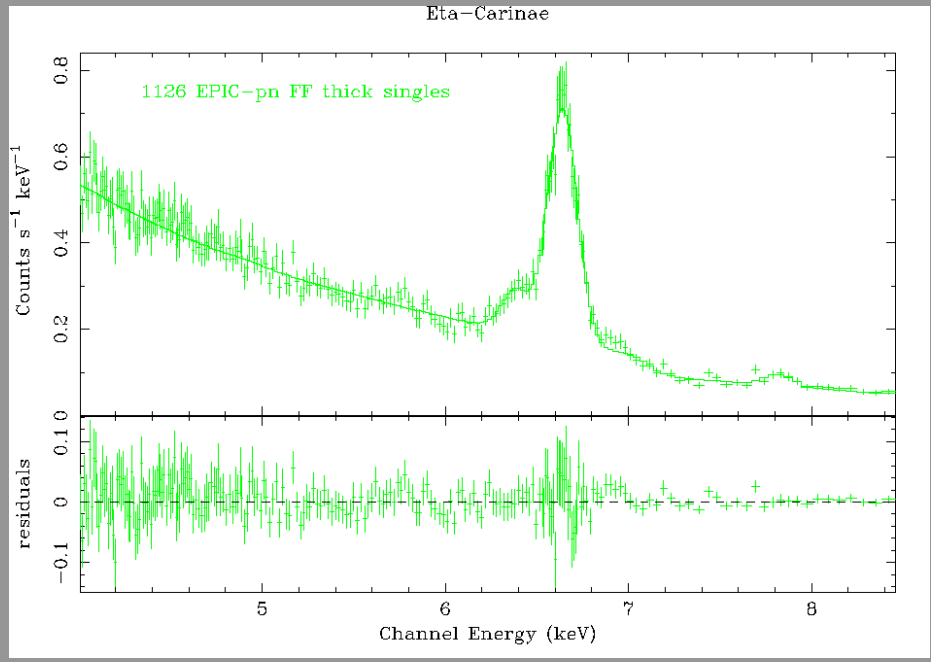
pile-up origin of mode dependence ?
repeat analysis with central part of PSF excluded
flux comparison in different modes: make sure that pile-up free

Eta Carinae

2000-07-26



2006-01-31



Model: egde*pow + gaus + gaus + gaus + gaus $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4$

Fe I	6.424 keV	$E_1 = E_3 - 0.275$	N_1
Fe XXV (f)	6.634 keV	$E_2 = E_3 - 0.065$	$N_2 = N_3 \cdot 0.441$
Fe XXV (i)			
Fe XXV (r)	6.699 keV	E_3	N_3
Fe K-edge		E_E	
Fe XXV Heβ	7.881 keV (blend with Ni XXVII f/i/r)	E_4	N_4

		2000-07-26	2006-01-31
Fit results:	E_3 (keV):	6.694 ± 0.003	6.658 ± 0.004
	σ (eV):	46 ± 5	40 ± 8

FF Mn-K Pos CCD 1 - 6

Konrad Dennerl