Non-thermal SNR Fitting WG

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Agreements

- We have to define column densities of each element rather than using one particular abundance table.
- RGS can determine column densities of (C,) N, O, Ne, Fe(L-edge).
- Use “angr” at the moment as the abundance table to keep consistency with historical value of N_H, and fill the table, and eventually adopt RGS values.
- Use “bcmc” for the cross section model.
- Model: phabs * pegpwrlw
- Fill the table…

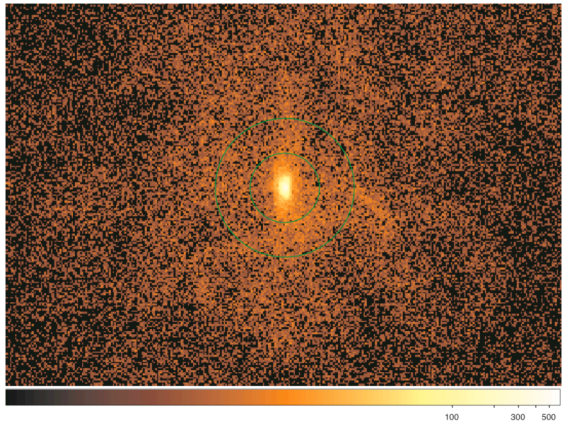
Fit to Crab

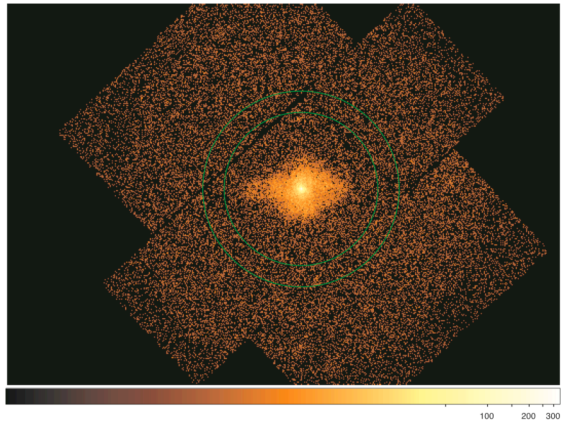
Satellite	Det	xsect	Abun	E-band for fit	N_H 10^{21}cm^2	ph. Index	Norm (2-10) 10^{-8}erg/cm^2/s	$\chi^2\nu$	Observed Flux (10^{-8}erg/cm^2/s) 0.5–2	2–10	20–50	50–100
Suzaku	XIS	bcmc	wilm	1.0-10.0	4.61±0.10	2.070±0.008	2.239±0.012	1.19	–	2.170	–	–
			angr	1.0-10.0	3.19±0.07	2.077±0.008	2.244±0.012	1.19	–	2.169	–	–
	PIN		angr	12.0-70.0	3.19 (fixed)	2.110±0.007	2.267±0.023	1.03	–	–	1.039	–
RXTE	HEXTE	bcmc	angr	20-240	3.19 (fixed)	2.087±0.008	1.929±0.027	0.99	–	–	0.928	0.657
XMM	pn	bcmc	angr	1.0-10.0	$2.41^{+0.03}_{-0.07}$	$2.107^{+0.004}_{-0.009}$	$1.876^{+0.003}_{-0.006}$	1.31	–	1.827	–	–
INTEGRA	SPI	bcmc	angr	22-100	3.19 (fixed)	2.123±0.014	±	0.7	–	–	1.04	0.73
RXTE	PCA			3-50	3.19 (fixed)	2.114	2.4018	2.63	–	2.320	1.09	–
Swift	BAT	bcmc	angr	30-100	3.19 (fixed)	2.10±0.06	1.74±0.25	0.82	–	–	0.82	0.57

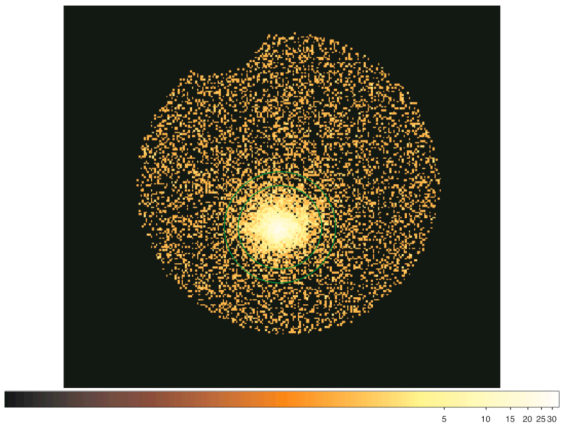
- We are going to do the same thing to G21.5-0.9, 3C58 and PSR1509+58…
- We may have to include a broken power-law fit for Crab for instruments sensitive to ~100keV X-ray.

3C58

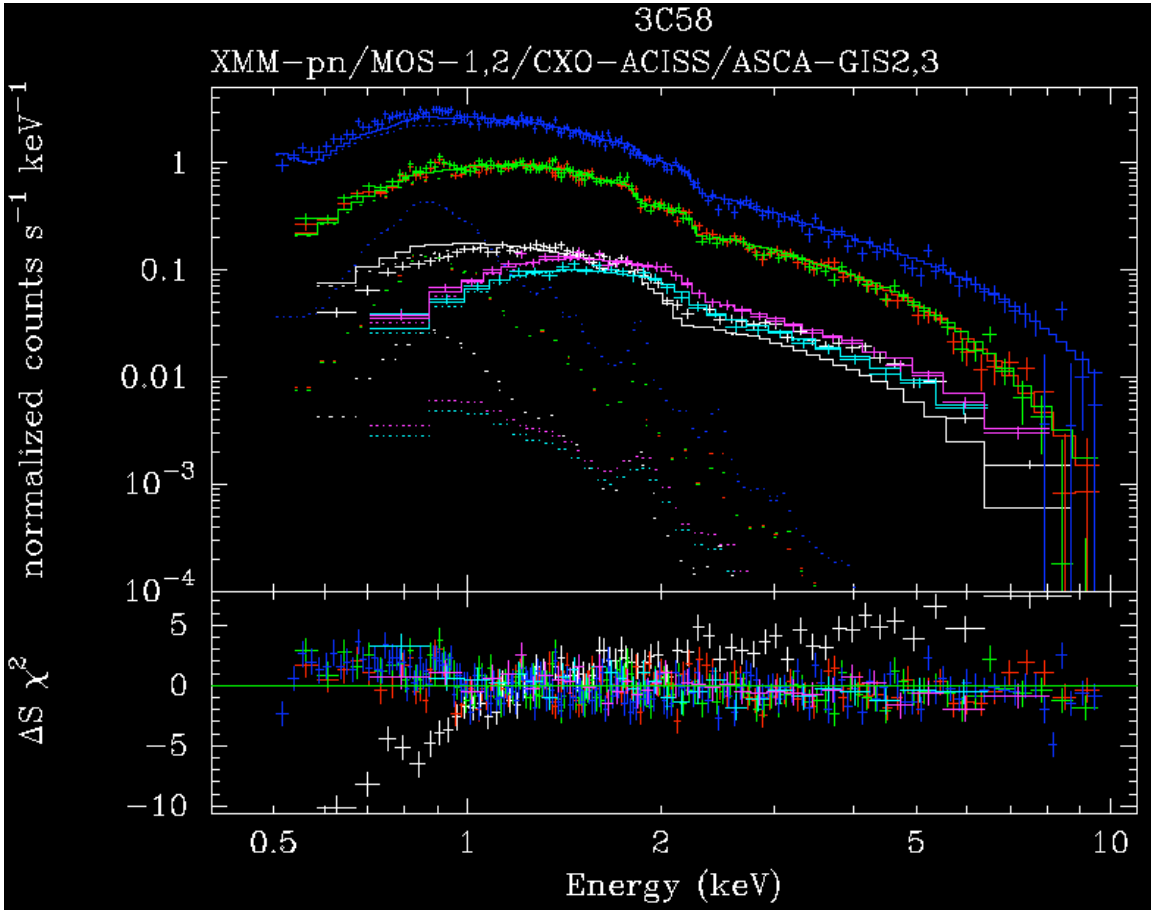
- Integration region sizes
- CXO ACIS-S
  - $r_{src} = 10''$/ $r_{bgd} = 20''$
- XMM EPIC-MOS/pn
  - $r_{src} = 360''$/ $r_{bgd} = 480''$
- ASCA GIS
  - $r_{src} = 360''$/ $r_{bgd} = 480''$







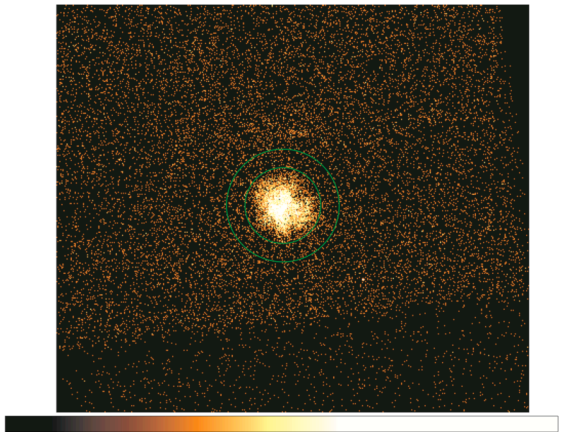
3C58

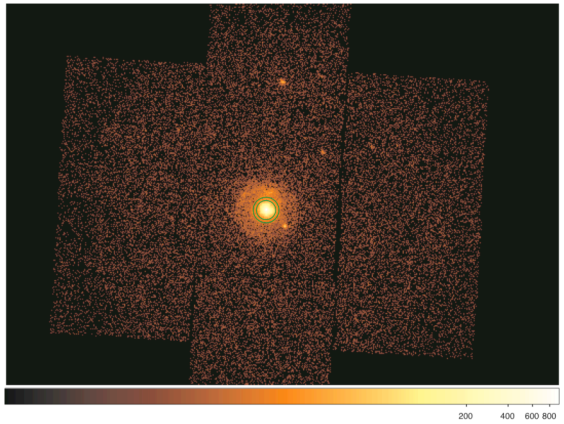


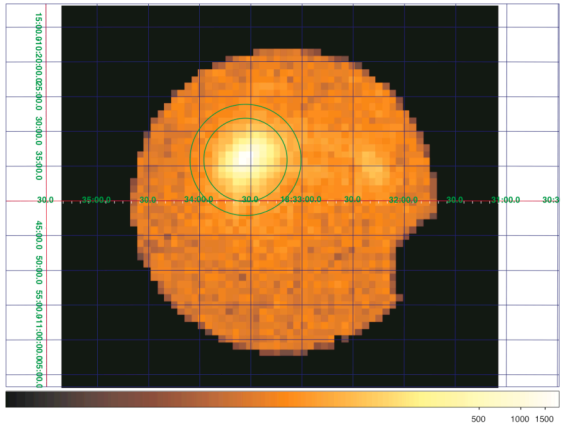
- Photon index = 2.18
- $N_H = 0.32\times10^{22}$cm^{-2}
- *Norm*: MOS1:MOS2:pn:GIS2:GIS3 = 1:1.01:0.93:0.89:0.90
- $F_{2\text{-}10} = 1.0\times10^{-11}$ erg cm^{-2}s^{-1} … too faint ?

G21.5-0.9

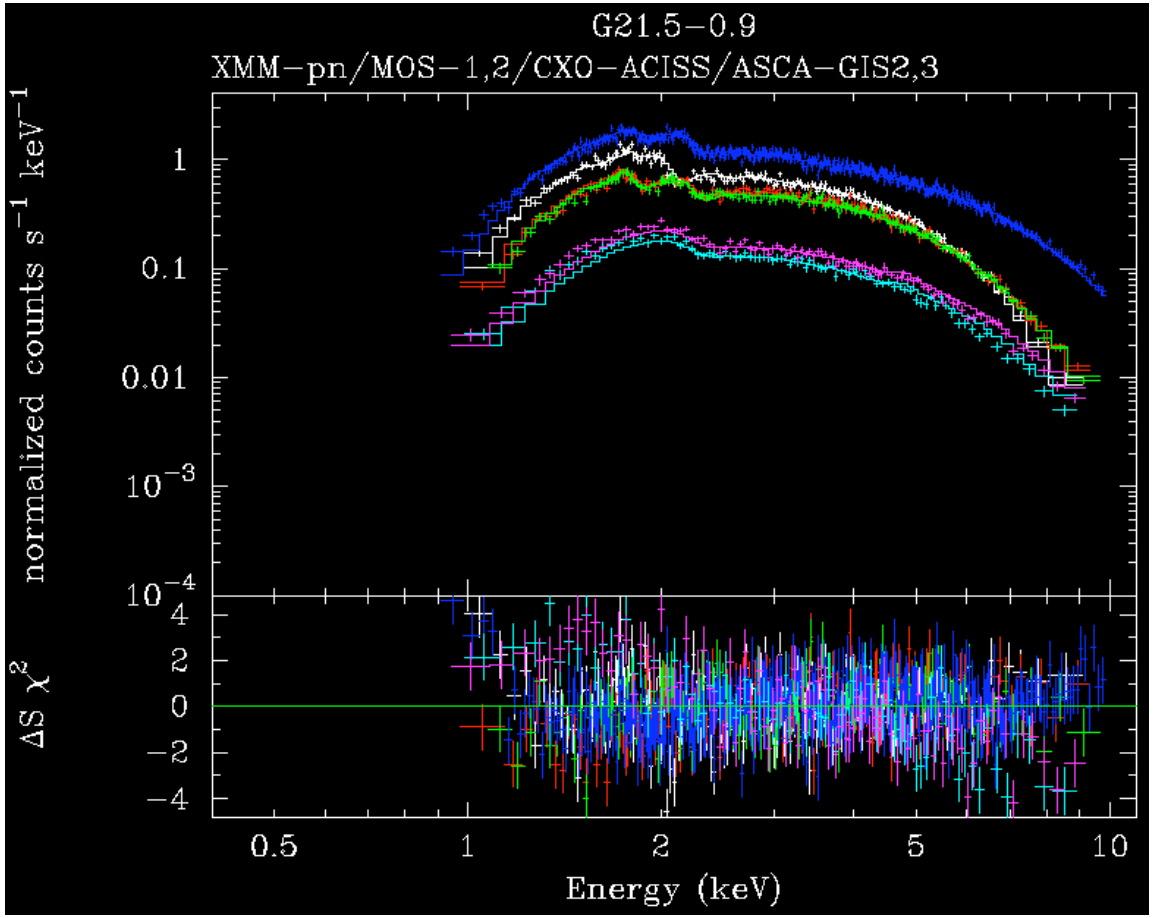
- Integration region sizes
- CXO ACIS-S
  - $r_{src} = 40''/ r_{bgd} = 60''$
- XMM EPIC-MOS/pn
  - $r_{src} = 45''/ r_{bgd} = 60''$
- ASCA GIS
  - $r_{src} = 360''/ r_{bgd} = 480''$





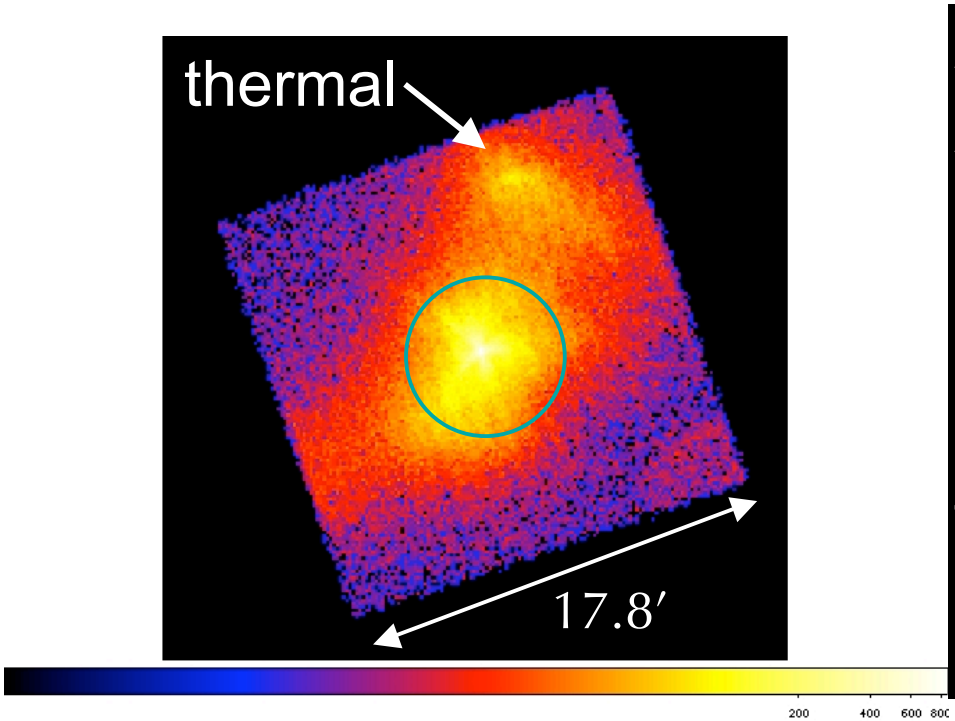


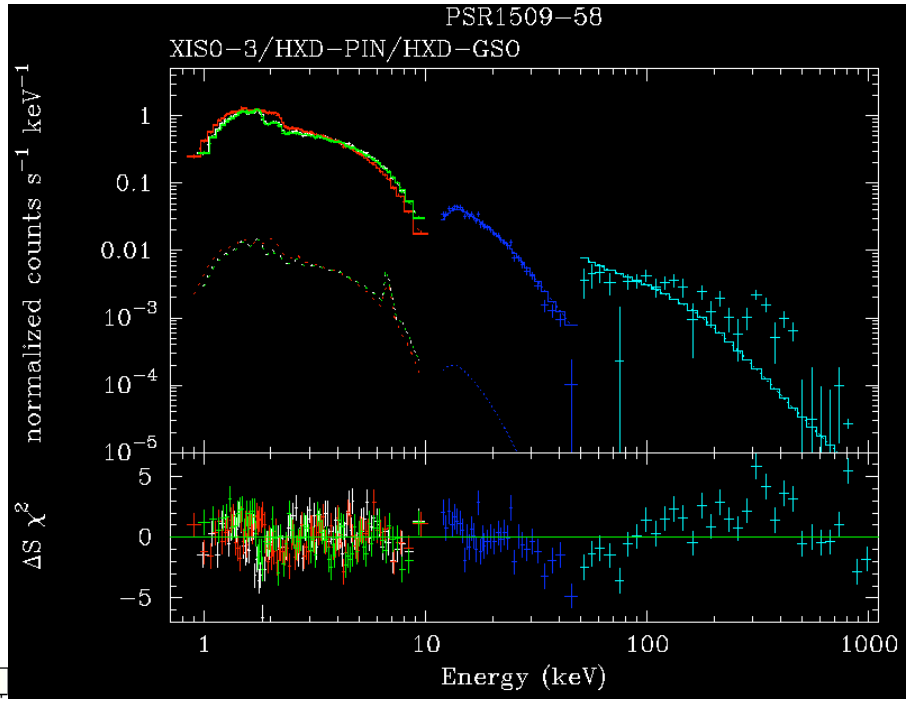
G21.5-0.9



- Photon index = 1.82
- $N_H = 2.10\times10^{22}$cm^{-2}
- *Norm*: ACISS:MOS1:2:pn:GIS2:3 = 1:1.01:0.98:0.90:1.27:1.29
- $F_{2\text{-}10} = 4.4\times10^{-11}$ erg cm^{-2}s^{-1}

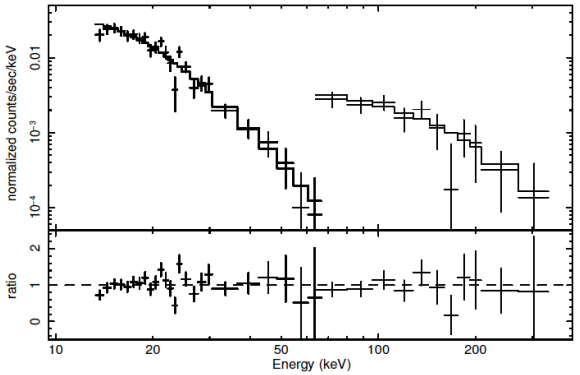
PSR1509-58





- Photon index = 1.76
- $N_H = 0.88\times10^{22}\mathrm{cm}^{-2}$
- $F_{2\text{-}10/20\text{-}50/50\text{-}100} = 7.3\times10^{-11}/\ 1.2\times10^{-10}/\ 1.1\times10^{-10}$ erg cm^{-2}s^{-1}
- Hard X-ray pulse at a period of 150ms.

PSR1509-58



- Ginga 2-60 keV (Kawai et al, 1992)
  - pulsed comp. : Γ= 1.33+/-0.06
  - unpulsed comp. : Γ = 2.15+/-0.02
- Wellcome 90-240 keV (Gunji et al, 1994)
  - pulsed comp. : Γ = 1.64+/-0.4
- RXTE 2-250 keV (Marsden et al, 1997)
  - pulsed comp. : Γ = 1.36+/-0.01
  - unpulsed comp. : Γ = 2.215+/-0.005
- PDS/BeppoSAX 15-300 keV (Cusumano et al, 2001)
  - pulsed comp. : Γ = 1.48+/-0.06
- Suzaku/HXD 10-300keV (Terada et al. 2008)
  - Pulsed comp. : $\Gamma = 1.55^{+0.10}_{-0.09}$

Summary

- Need to collect data on 3C58, G21.5-0.9 and PSR1509-58 from other missions.
  - Extracting central object if the detector has good eyes.
  - Extracting entire SNR spectra.
  - Pulsed/unpulsed spectra for PSR1509-58.
- Need to collect updates of the Crab fits.
  - .pha, .arf., .rmf with .xcm
  - Taking into account the broken power law.