

HOORNAERT Adrien
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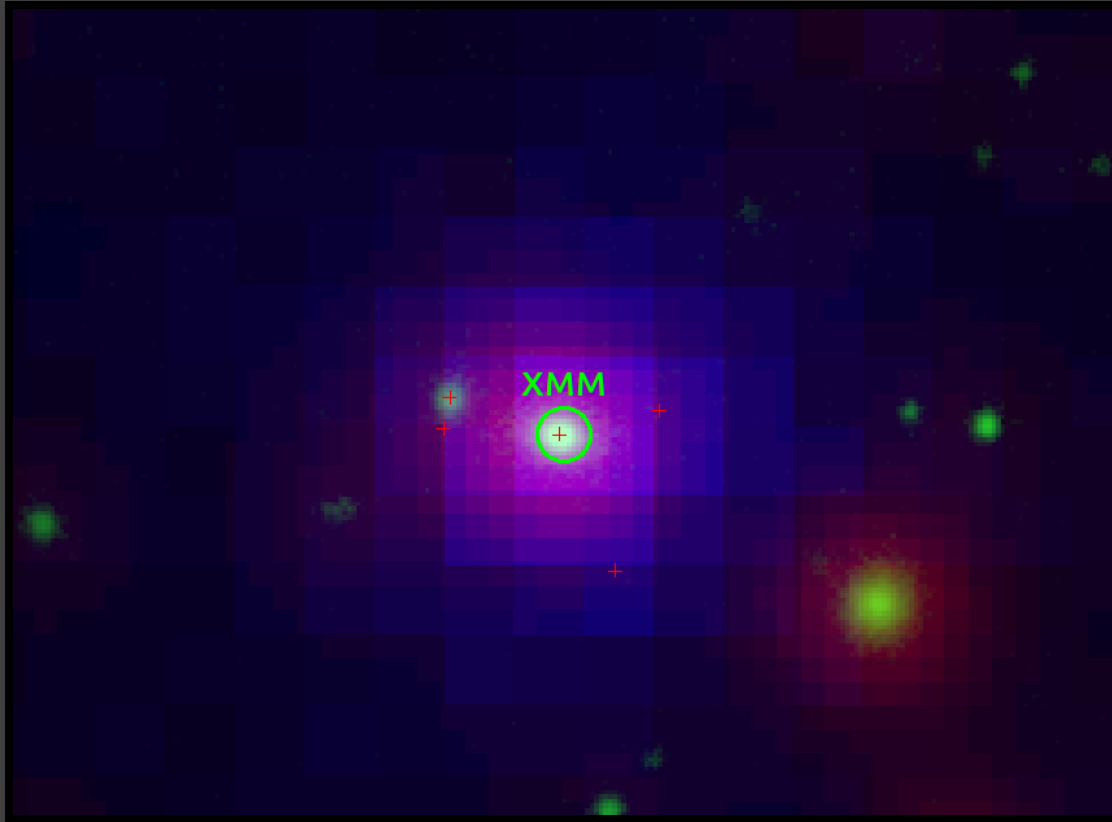
Bi-weekly meeting on Magellanic Clouds

Study of an X-Ray source (MC-Bridge) : eRASSU J031038.2-734935
eROSITA / **XMM** / NuSTAR



LMC- NASA/ESA HST

Reminder



RGB Image (IR/V/X)
R : W1, V : Opt, B : EPIC/PN
circle : 1.53 arcsec radius

Temporal analysis :

No significant variability.

Spectral analysis :

Models :

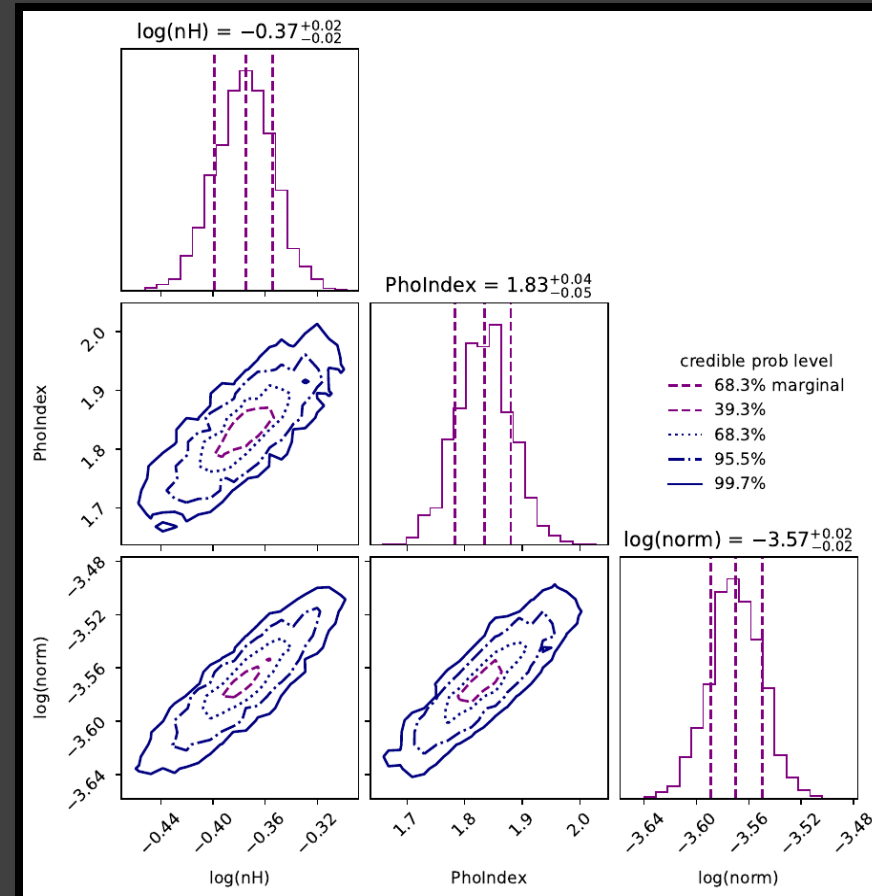
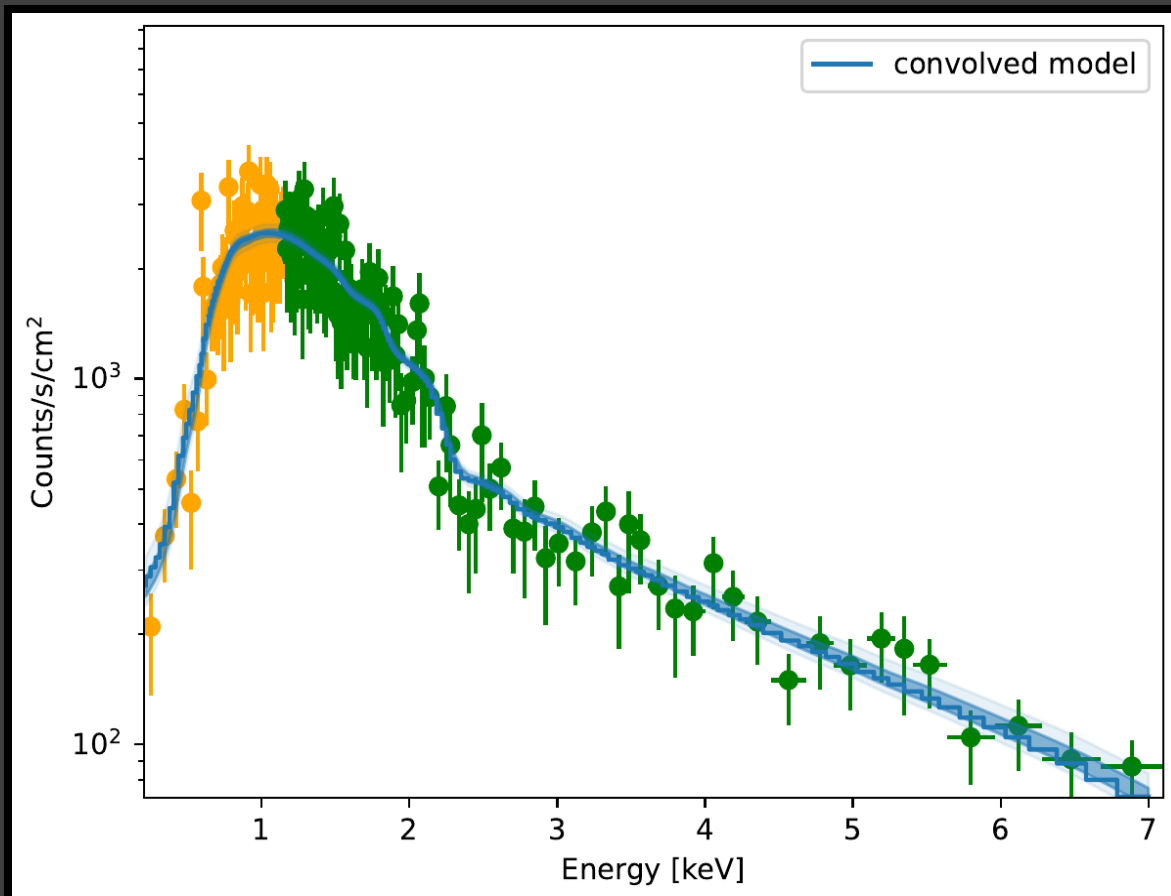
- One component -> **absorbed power-law**
- Two components -> **+ diskbb** but overfitting

Bayesian fitting :

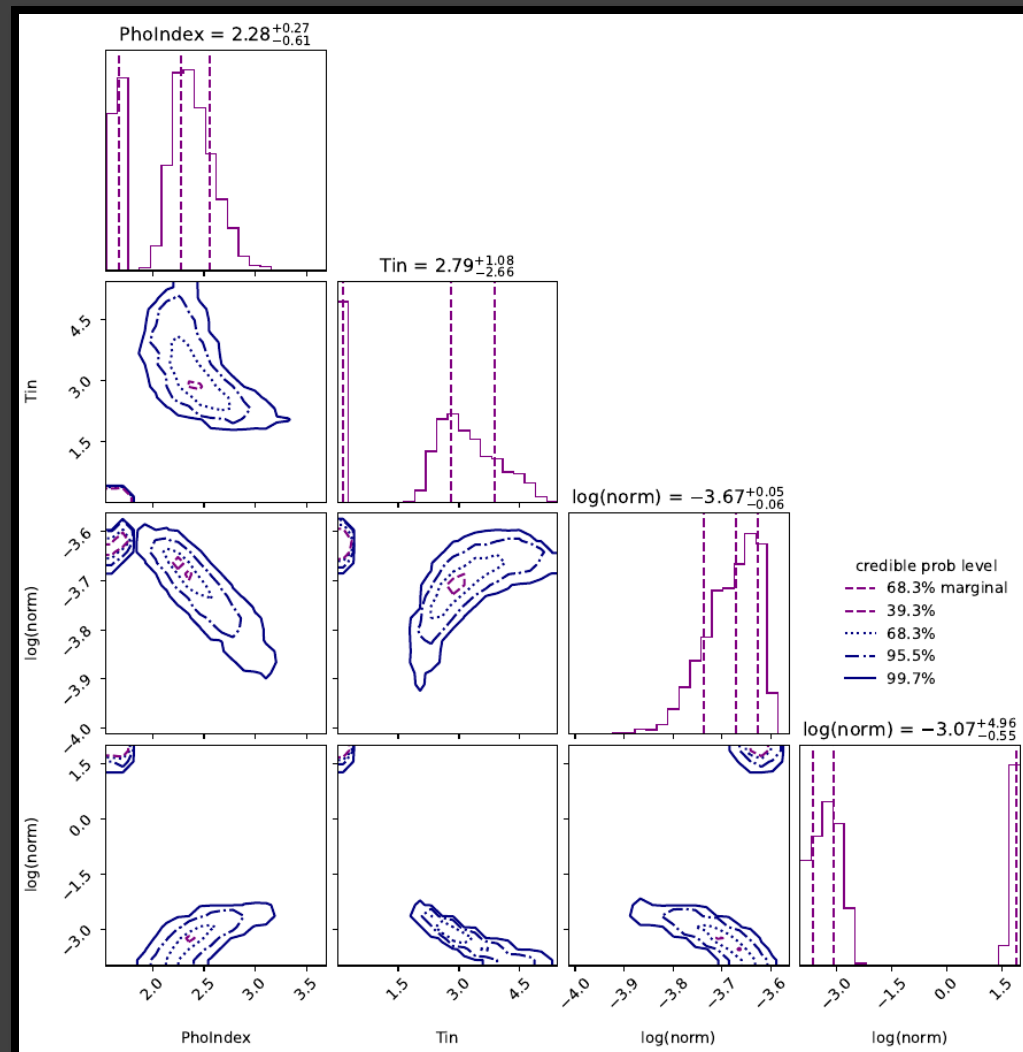
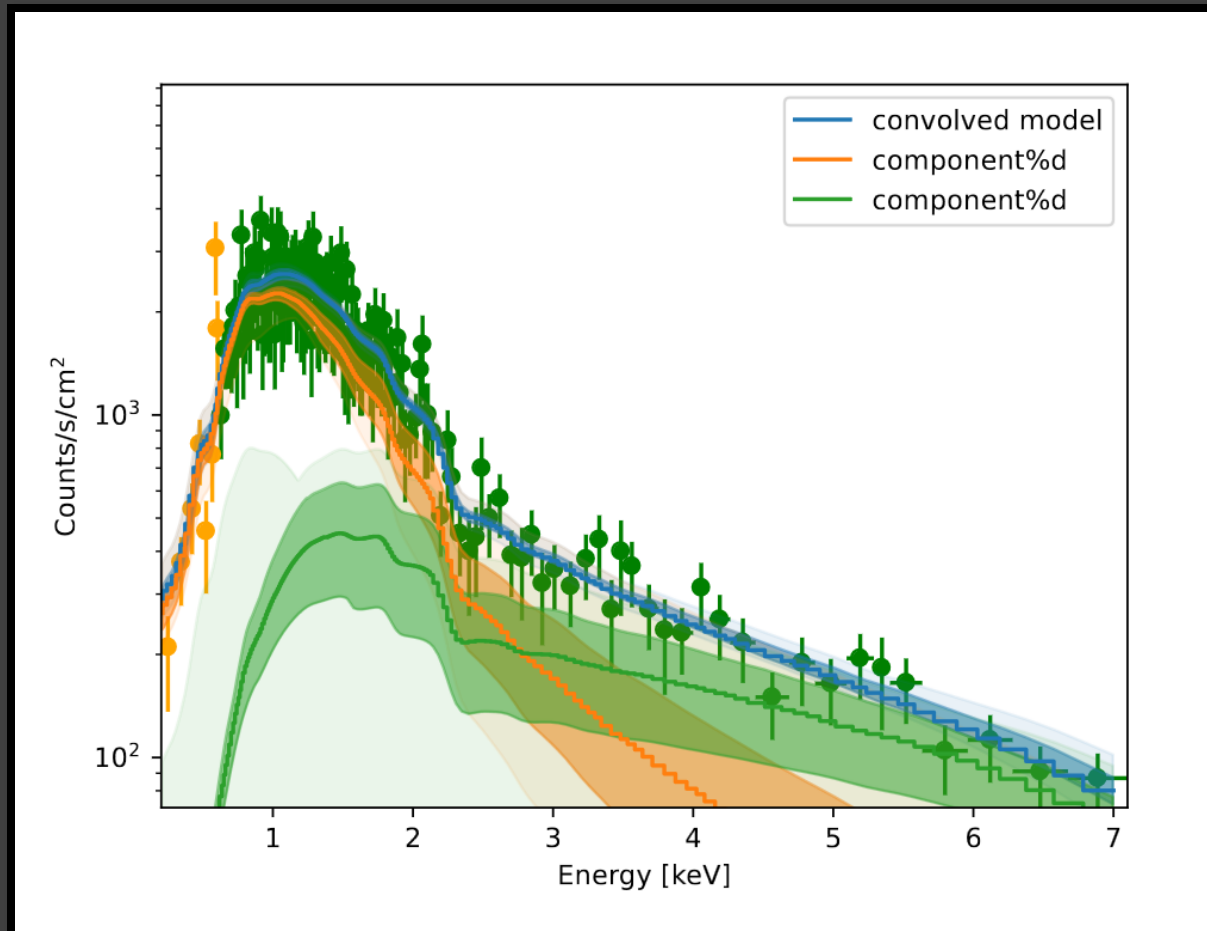
Slight preference for two-components model

LaTeX draft

Absorbed power-law



Absorbed power-law + diskbb



Optical counterpart



DECAM Legacy Survey Image
DR10, Sky Viewer

One within 3σ error circle (1.53 arcsec)
Sometimes classified as star / extended source / galaxy

Bmag : 20.22
Rmag : 18.27
Vmag : 20.8

DECAM

$\sim 400\sigma$ pref for a galaxy

Gaia Collab. Filtering passed because of error bars

Optical counterpart

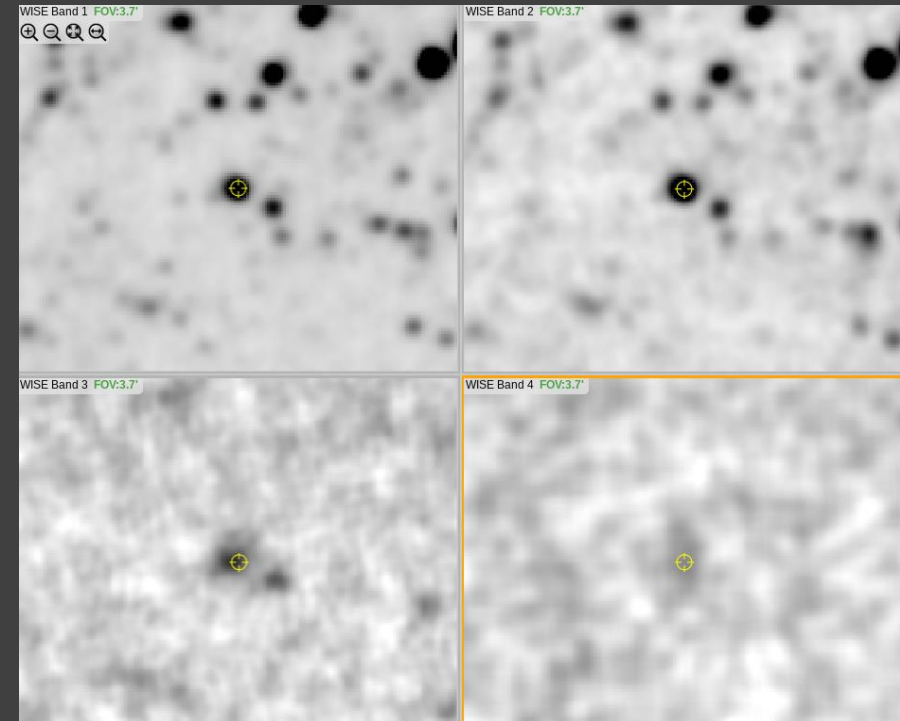
g (nanomaggy)	r (nanomaggy)	i (nanomaggy)	z (nanomaggy)
11.37	41.62	73.72	95.12
w_1 (nanomaggy)	w_2 (nanomaggy)	w_3 (nanomaggy)	w_4 (nanomaggy)
226.79	254.97	155.37	402.26

Table 5. Fluxes of Gaia DR3 4640596753263650560 from DECALS DR10 Tractor catalog in the AB system.

G (mag)	G_{BP} (mag)	G_{RP} (mag)	G_{BP-RP} (mag)	G_{BP-G} (mag)	G_{G-RP} (mag)	V_{mag} (mag)
20.60	20.22	18.28	1.95	-0.38	2.33	20.85
J_{mag} (mag)	H_{mag} (mag)	K_{mag} (mag)	$W1$ (mag)	$W2$ (mag)	$W3$ (mag)	$W4$ (mag)
16.3	15.5	15.2	14.53	13.05	11.99	5.29

Table 6. Photometric magnitudes of Gaia DR3 4640596753263650560 from Gaia DR3 / 2MASS / WISE catalogs

g $\mu(Jy)$	r $\mu(Jy)$	i $\mu(Jy)$	z $\mu(Jy)$
41.29	151.13	267.67	345.36
w_1 $\mu(Jy)$	w_2 $\mu(Jy)$	w_3 $\mu(Jy)$	w_4 $\mu(Jy)$
823.46	925.80	564.14	1460.60



Fit the spectrum for a galaxy

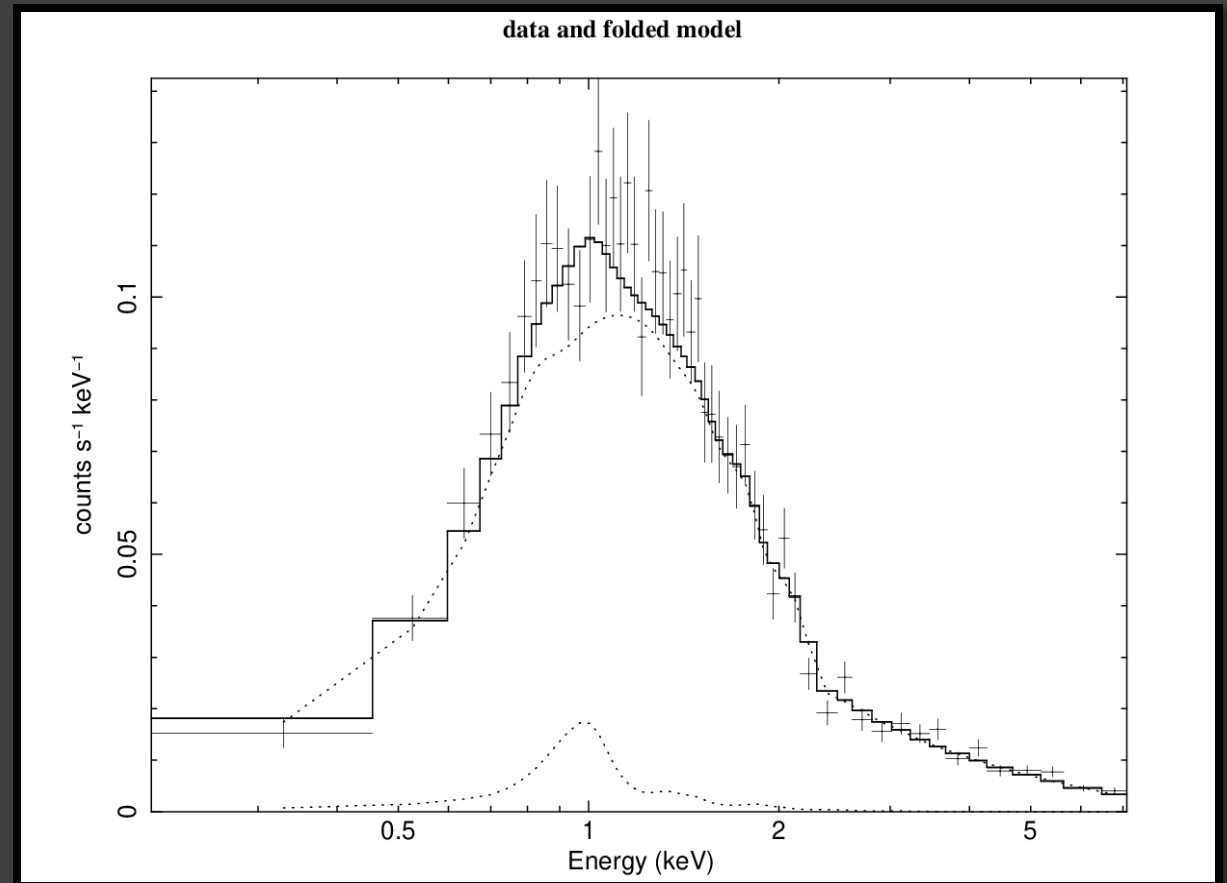
Spectral analysis :

Models, following *Lehmer et al. 2015*

- One component -> **absorbed power-law**
- Two components -> **+ apec**
- More thermal components : not consistent

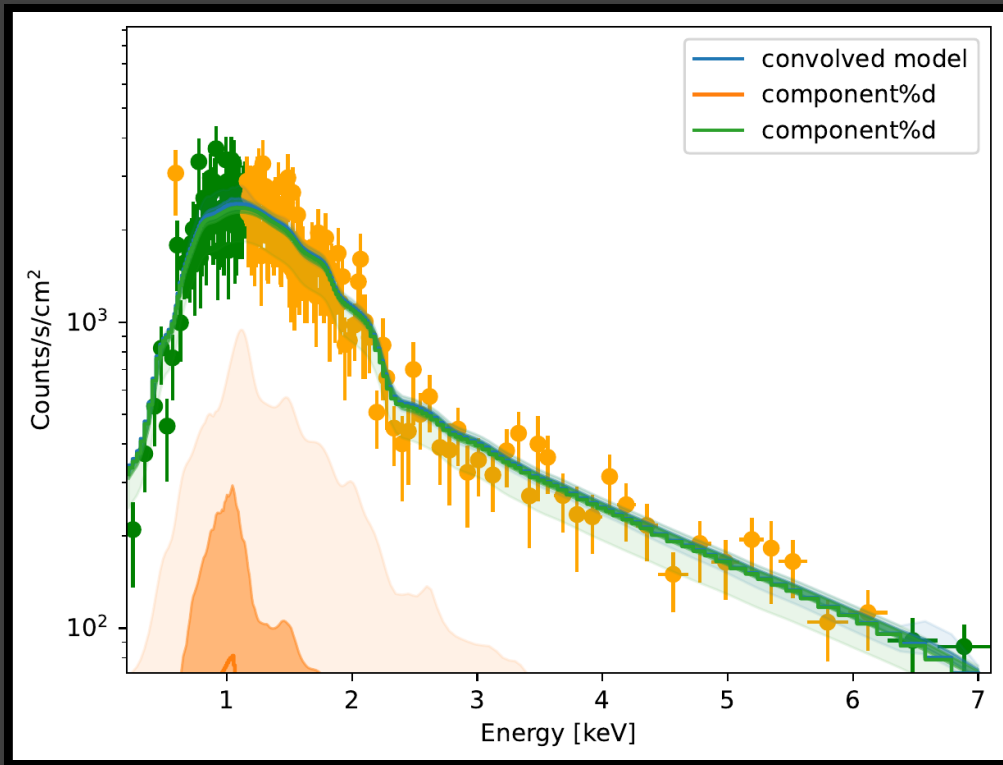
Bayesian fitting :

Slight preference for two-components model

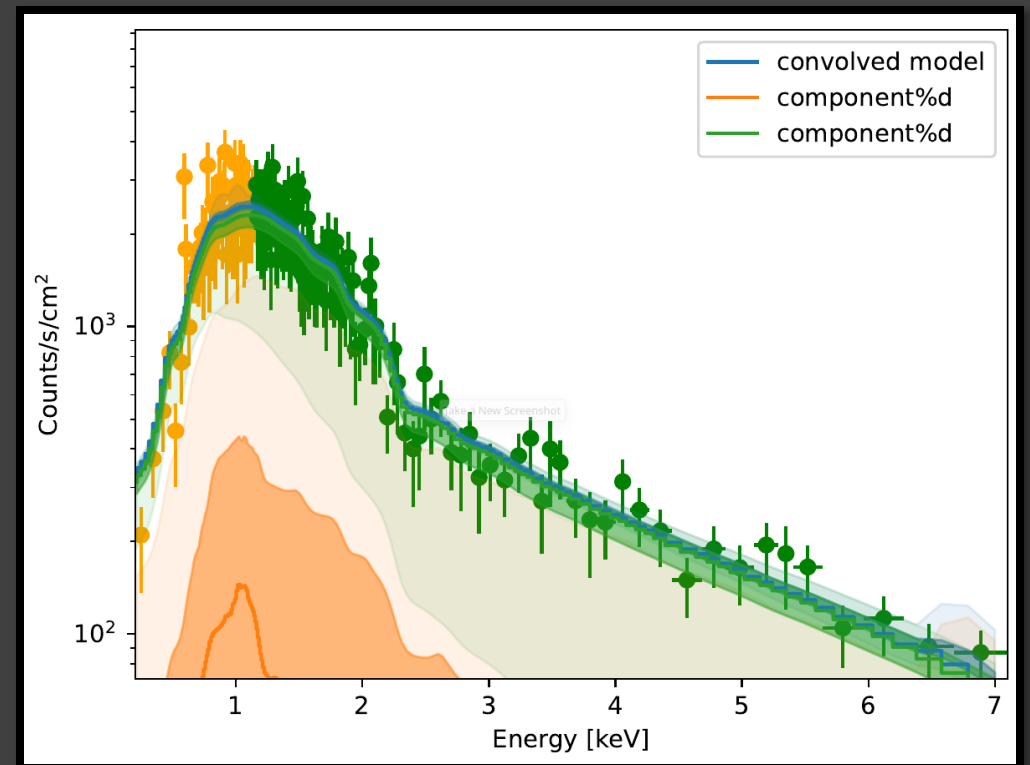


PN spectrum
(XSPEC)

Fit the spectrum for a galaxy



Absorbed apec + pow
Fix. NH and gamma



Absorbed apec + pow
Fix. NH

Fit the spectrum for a galaxy

	N_H 10^{21} cm^{-2}	Γ -	K $10^{-4} \text{ cts/keV/cm}^2/\text{s}$	kT keV	$norm$ 10^{-5}	χ -
abs_pow	$4.10^{+0.28}_{-0.27}$	$1.78^{+0.06}_{-0.06}$	$2.49^{+0.15}_{-0.14}$	-	-	415.27
abs_gal	$3.07^{+0.19}_{-0.19}$	-	-	$6.80^{+0.94}_{-0.65}$	$75.2^{+1.9}_{-1.8}$	472.42
abs_pow_gal	$4.09^{+0.33}_{-0.31}$	$1.71^{+0.07}_{-0.07}$	$2.29^{+0.18}_{-0.18}$	$1.08^{+0.28}_{-0.21}$	$2.61^{+1.99}_{-1.37}$	404.25

N_H 10^{21} cm^{-2}	Γ -	K $10^{-4} \text{ cts/keV/cm}^2/\text{s}$	kT keV	$norm$ 10^{-5}	F $10^{-13} \text{ erg/s/cm}^2$
4.10 (fix)	1.78 (fix)	$2.51^{+0.06}_{-0.11}$	$2.35^{+4.41}_{-1.43}$	$1.51^{+3.16}_{-1.18}$	10.50
4.10 (fix)	$1.81^{+0.04}_{-0.04}$	$2.51^{+0.12}_{-0.22}$	$4.08^{+4.19}_{-3.00}$	$1.95^{+7.82}_{-1.63}$	10.39

Best fit parameters (XSPEC)

chi/dof = 0.977

chi/dof = 1.112

chi/dof = 0.955

Best fit parameters (BXA)

F-Test

Apec to apec + pow : $F = 35.7$, $p = 1e-15$

pow to pow + apec : $F = 5.77$, $p = 0.34\%$

Model comparison

```
model results/abs_pow/bg_substraction/: log10(Z) = -4.1 XXX ruled out
model results/abs_pow_gal/bg_substraction/: log10(Z) = -1.7 XXX ruled out
model results/simple_abs_pow_gal/bg_substraction/: log10(Z) = 0.0 <-- GOOD
```

The last, most likely model was used as normalization.

Uniform model priors are assumed, with a cut of $\log_{10}(30)$ to rule out models.