Broadband Spectroscopy of SGR J1550-5418 Bursts

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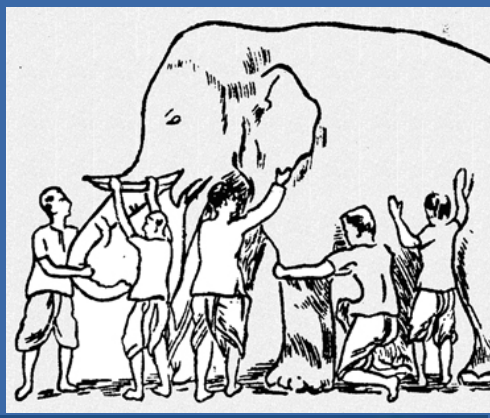
Why Broadband ?

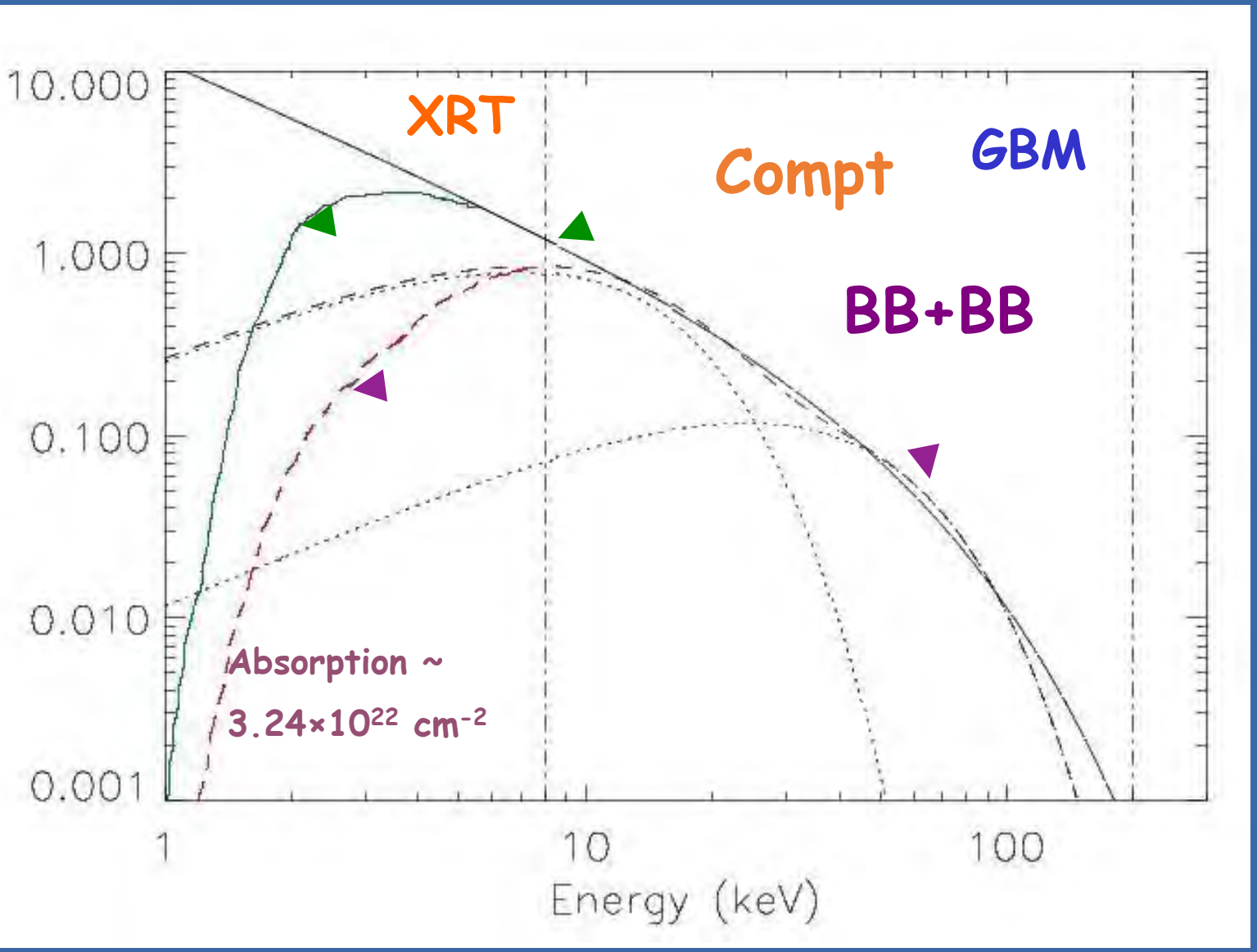


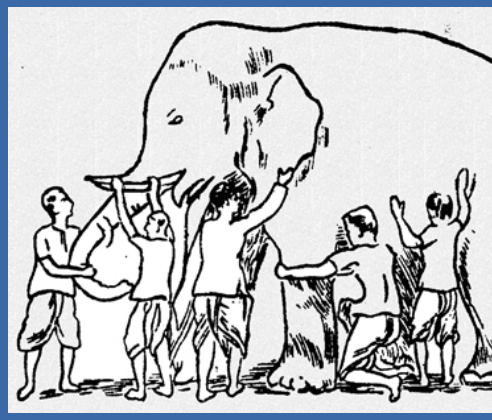
ndra, XMM-Newton, Swift/XRT	RXTE/PCA	RXTE/HEXTE, Swift/BAT	Fermi/GBM
0.5-10 keV	0.5-60 keV	~15-150 keV	8-200 keV ~ 1 MeV
PL, BB, OTTB	PL, BB, OTTB	BB, OTTB, Compt	BB+BB, Compt, BB, OTTB

Comptonized model (COMPT): a single power law with a high E exponential cutoff

Lin et al. 2011
Van der Horst et al. 2

Why Broadband ?





COMPT and BB+
can be distinguis
the lower energy
photons are inclu

GR J1550-5418

rly discovered (1981) X-ray urce associate with a young pernova remnant

lsations in both radio and X-y (2007, 2008)

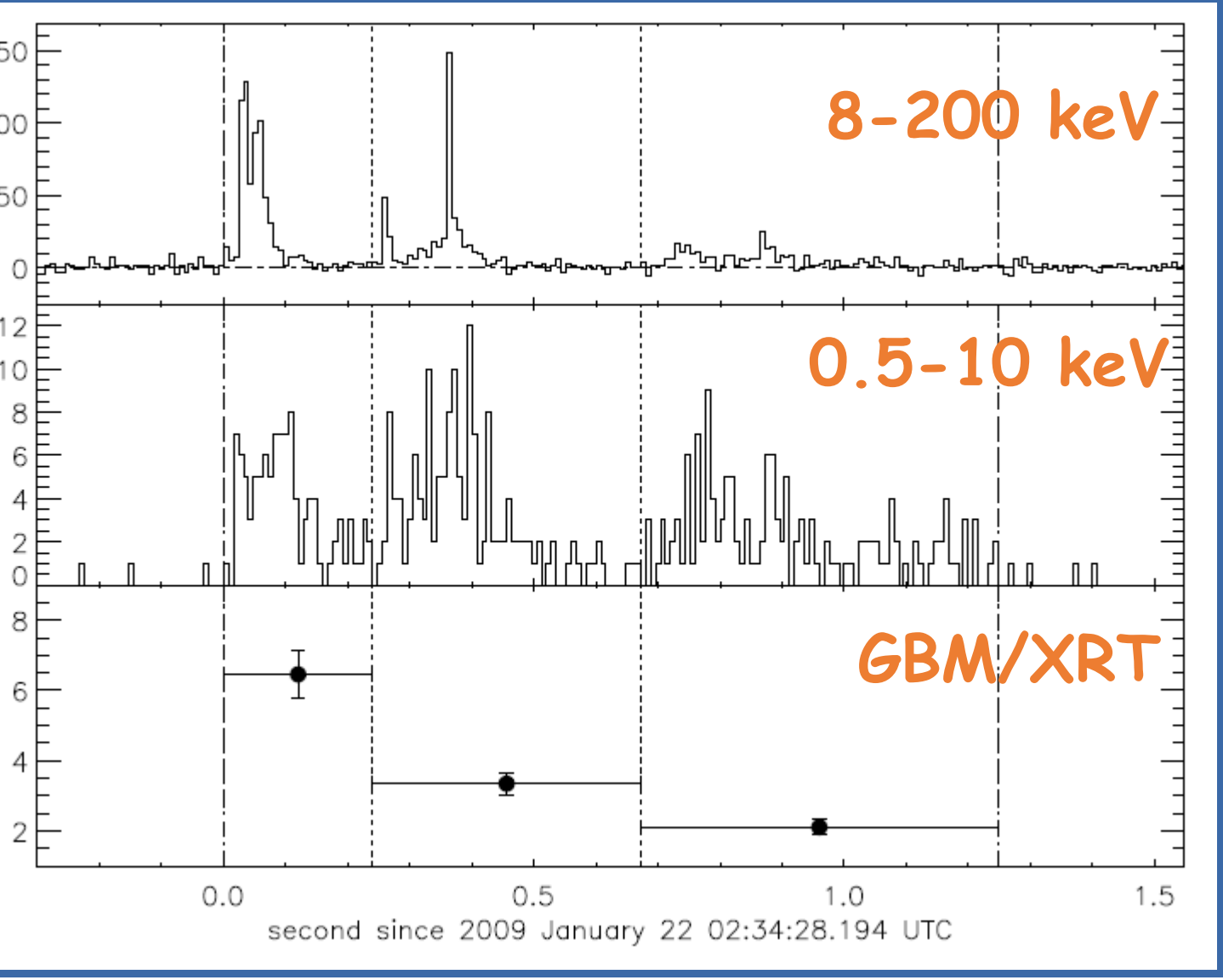
- $P = 2.096\ \mathrm{s}$
- $\dot{P} = 2.318 \times 10^{-11}$
- $B = 2.2 \times 10^{14}\ \mathrm{G}$

- Detected burst emission fr SGR J1550-5418 in 2008 October for the first time
- GBM was triggered by its burst:

  7 times in 2008/10/3-2008/10/2
  117 times in 2009/1/22-2009/2/
  14 times in 2009/3/22-2009/4/1
  128 times in total, more than 3x burst triggers from other magne

- During burst active episode several high energy instruments also recorded hundreds of its bursts.

XRT-GBM Simultaneous Event



42 simultaneo
burst spectra
total from
SGR J1550-541
2009 January

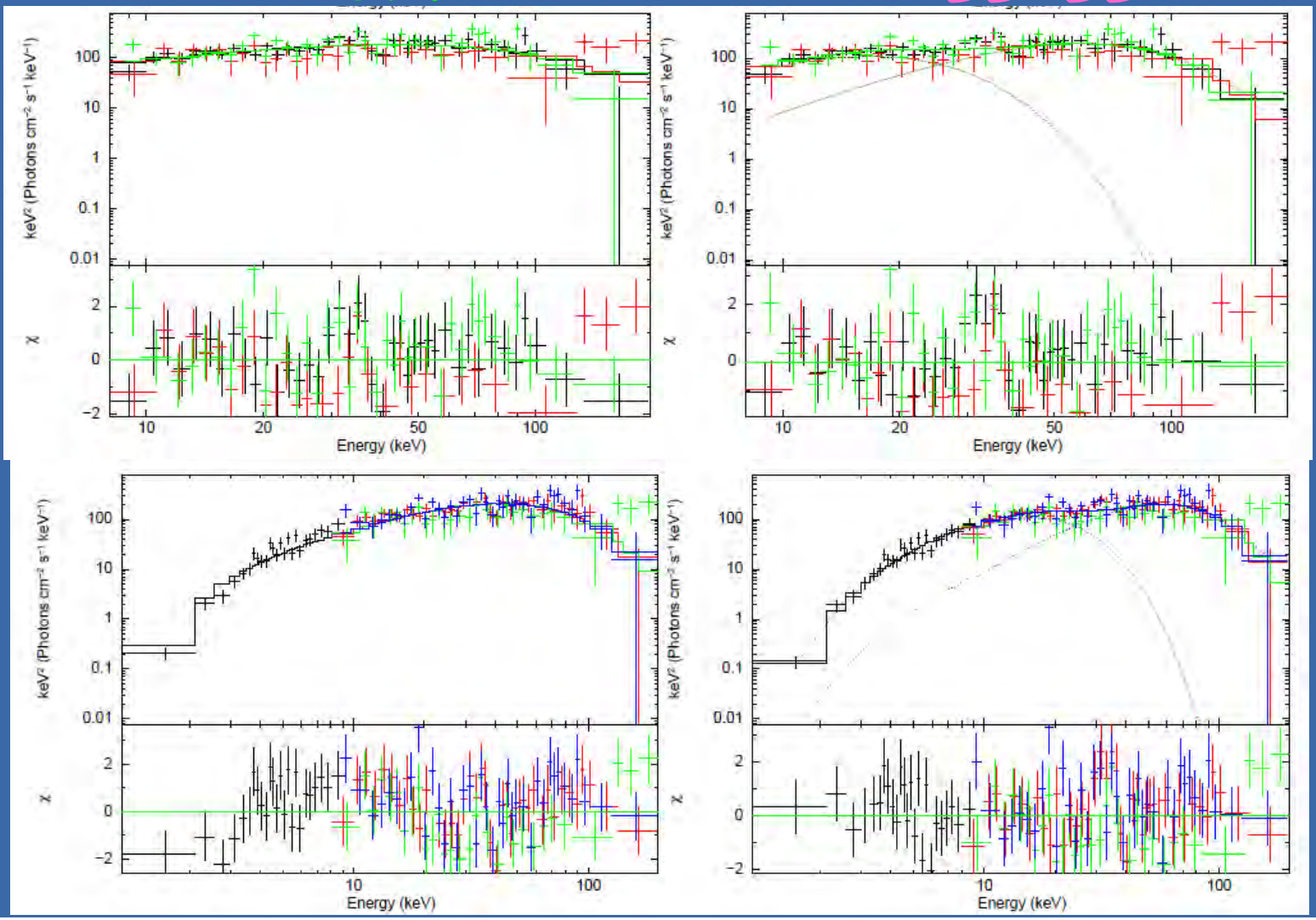
B+BB fits better than COMPT !

Better residuals and smaller average reduced χ^2

χ^2 is reduc
>32 with B
model

COMPT

BB+BB



GBM Fit

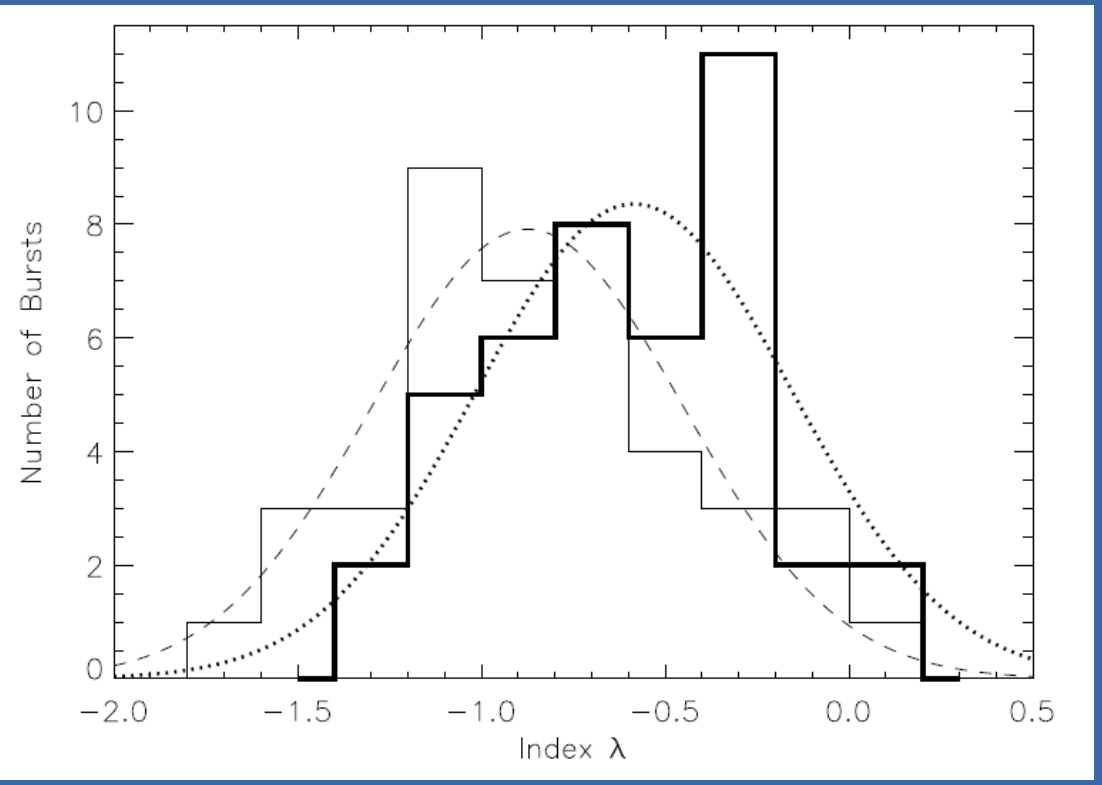
Joint Fit

+BB fits better than COMPT !

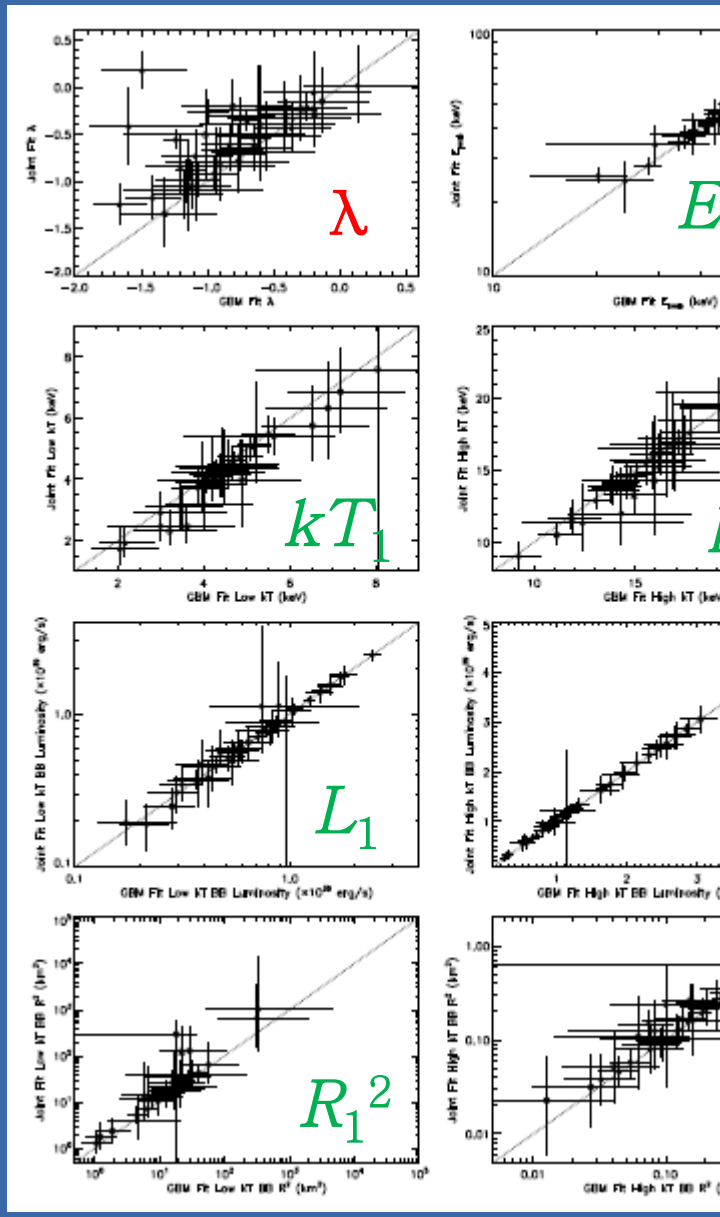
BM data only fits may over estimate low energy emission

GBM only: $\langle\lambda\rangle$ = -0.87 ± 0.05

Joint fit : $\langle\lambda\rangle$ = -0.58 ± 0.09



Joint Fit



GBM Fit

BB+BB fits better than COMPT !

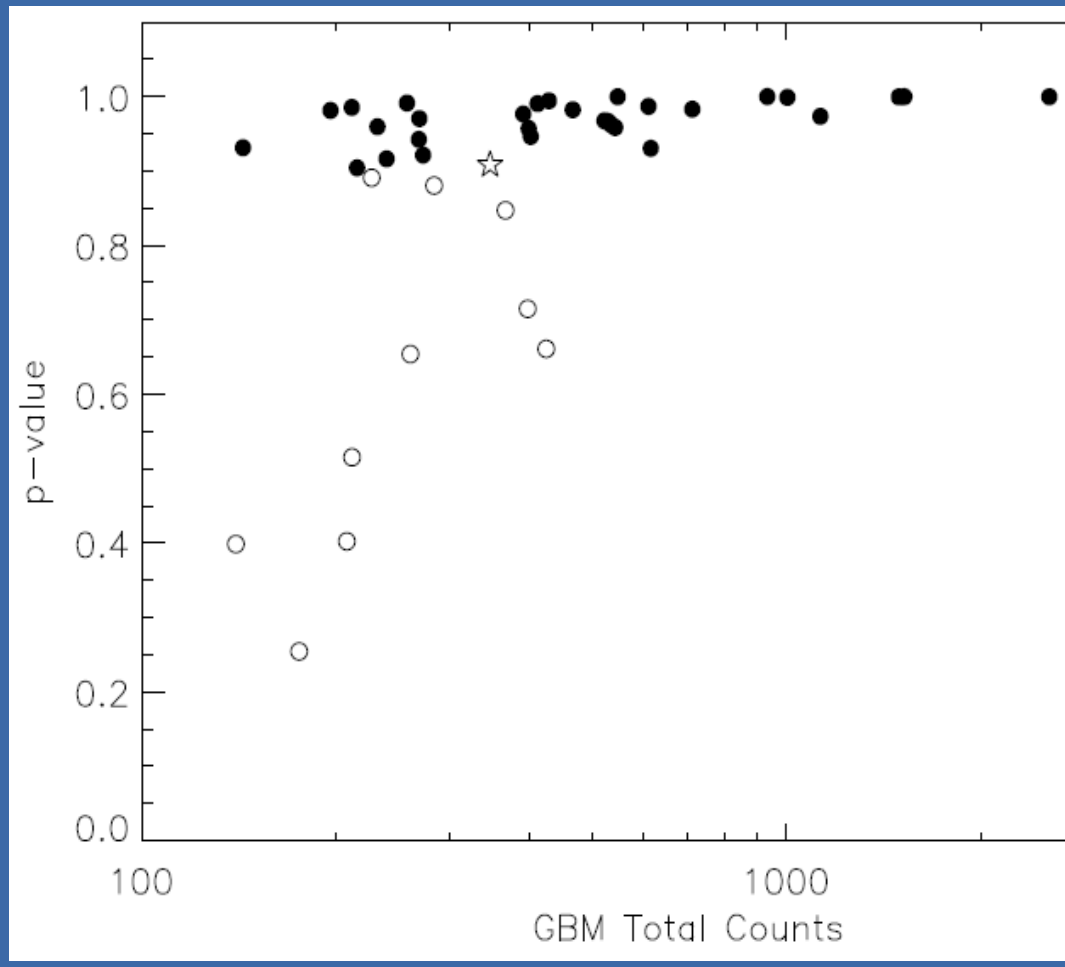
mulation

d: model with smaller χ^2

ne probability of the simulated ectra have a smaller χ^2 fit with e seed model

90% → seed model significantly tter than the other one

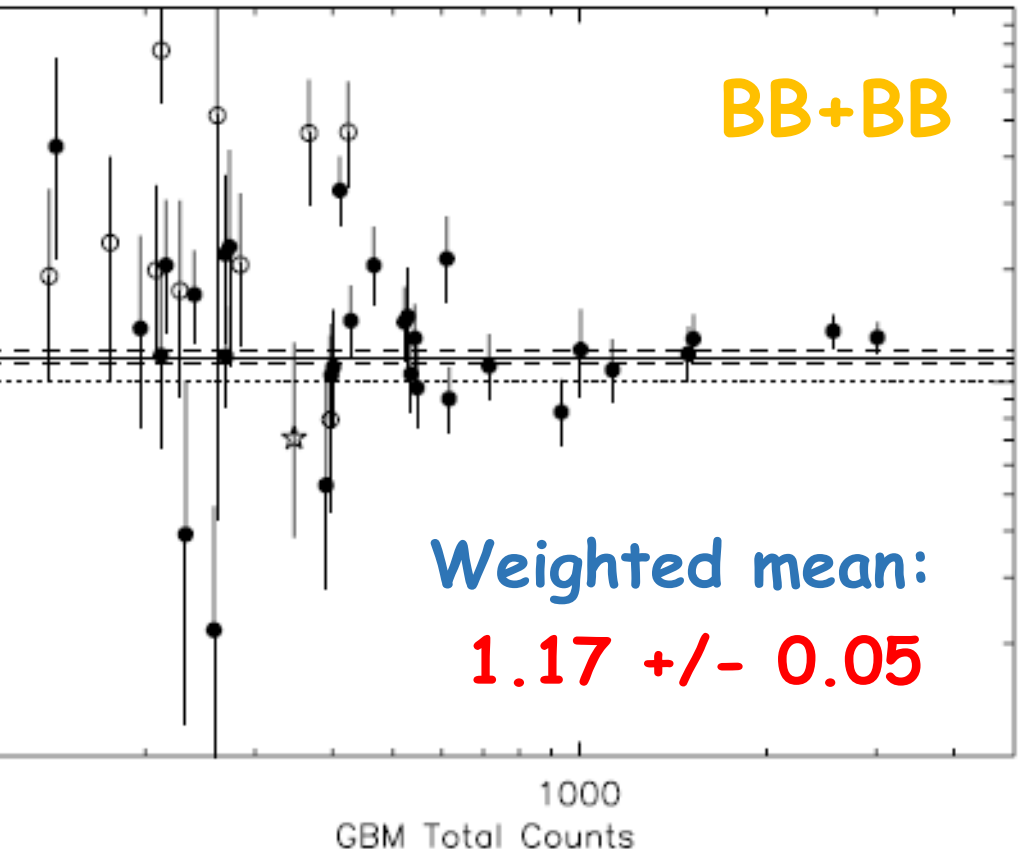
P

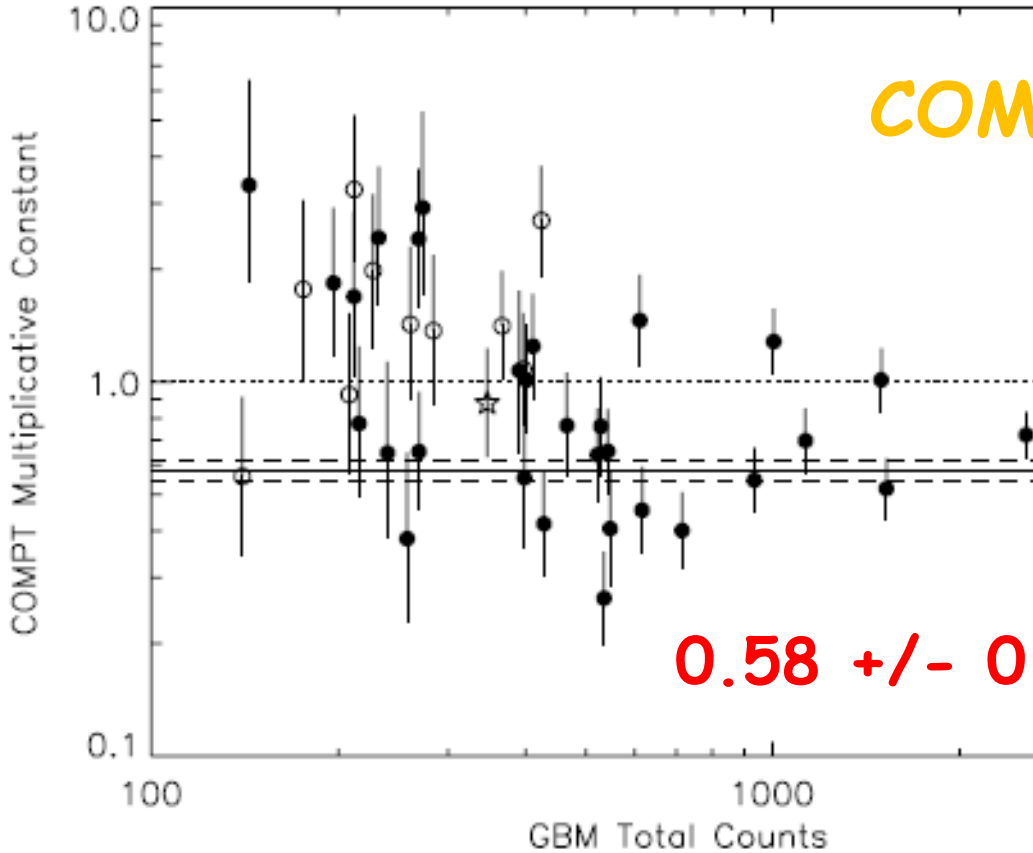


- ● BB+BB bursts : 31/42
- ○ Intermediate group : 10/42
- ☆ COMPT burst : 1/42

GBM Total Counts

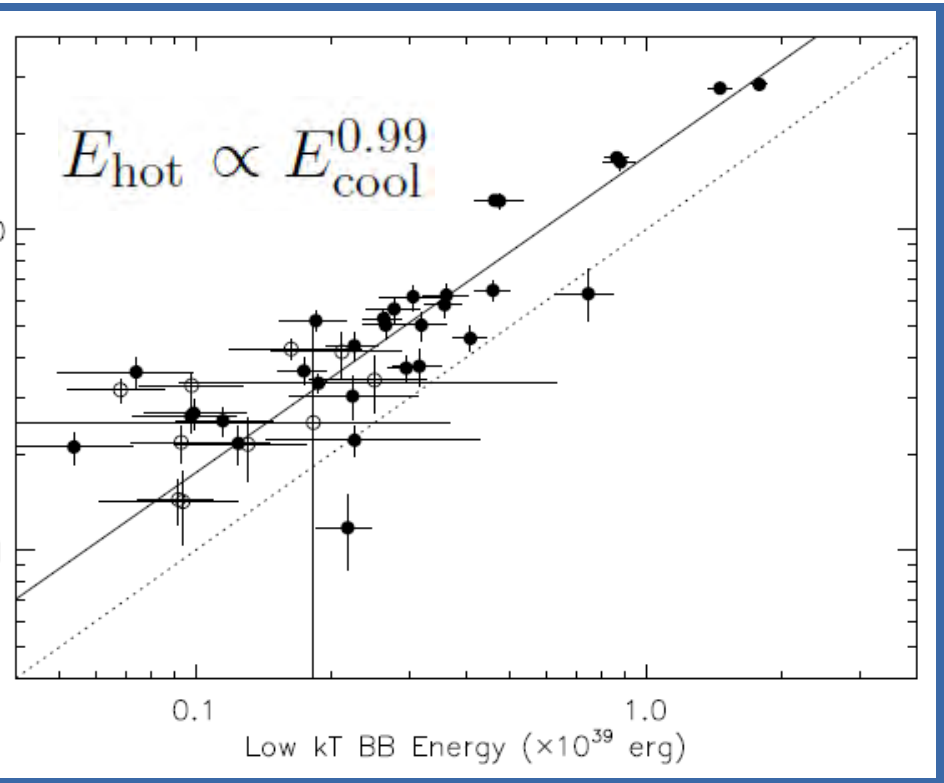
Cross-calibration of XRT and GBM

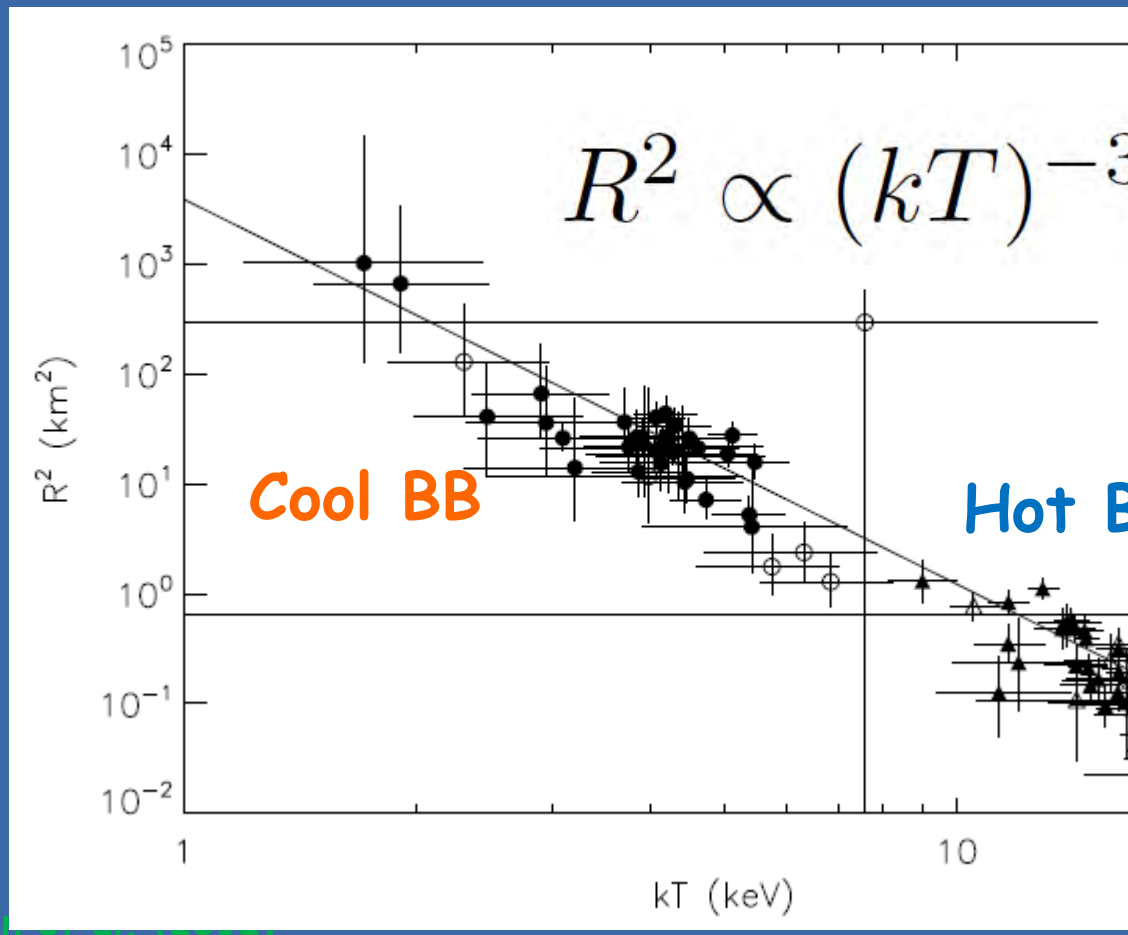




cross-calibration of XRT and GBM instruments works reasonab
within the fluence and energy range of the bursts in our samp

BB+BB Parameters





$E_{hot} \sim 2 \times E_{cool}$

$\langle kT_{cool} \rangle = 4.4 \pm 0.2$ keV,

$\sigma = 0.8 \pm 0.1$ keV

$\langle kT_{hot} \rangle = 16.0 \pm 0.4$ keV,

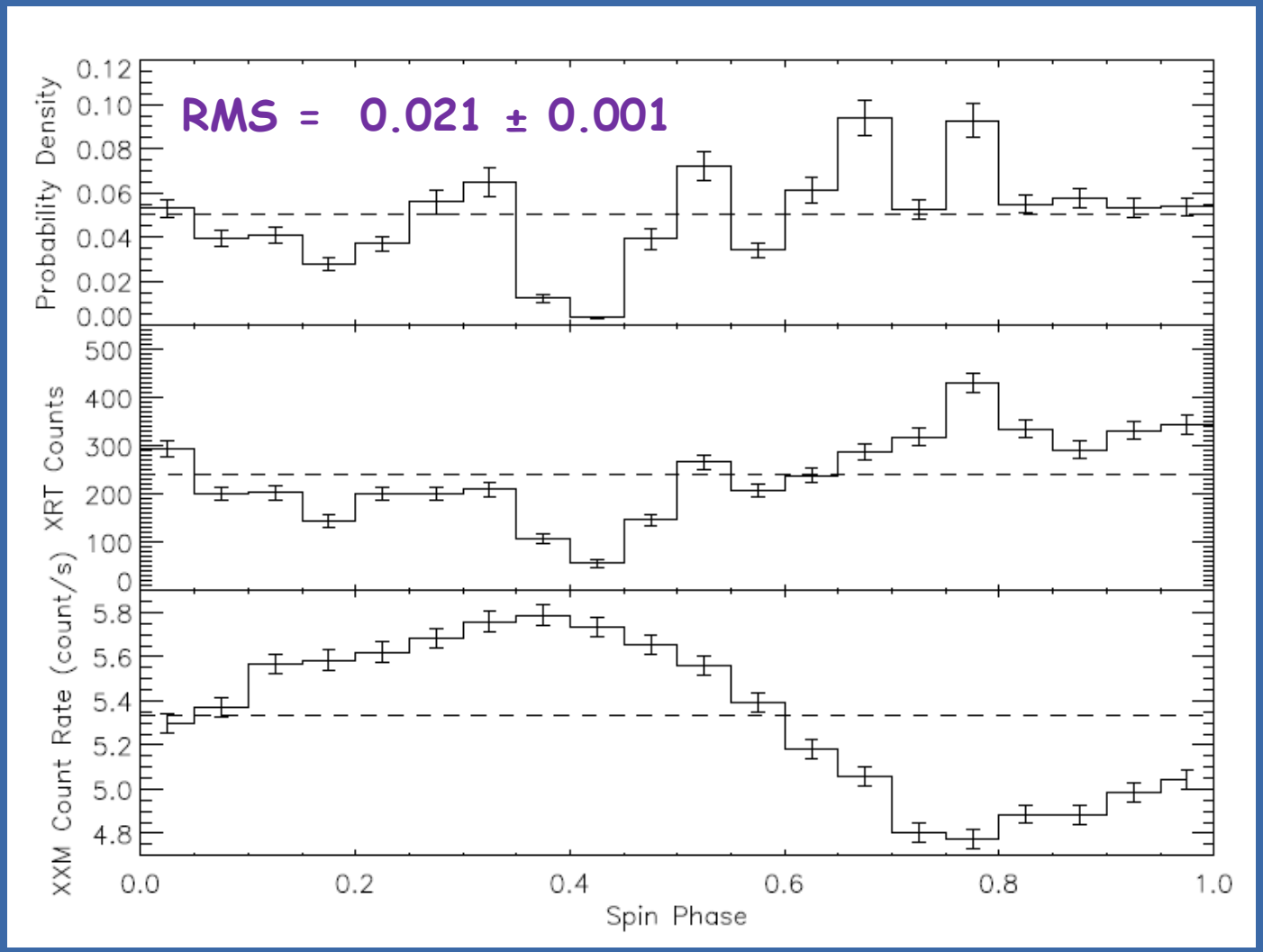
$\sigma = 2.2 \pm 0.4$ keV

Are bursts spin phase dependent?

robability
ensity

RT counts from
B+BB bursts

ersistent Pulse
rofile observed
th XMM-
ewton



rsts emission region on the magnetar surface is not necessarily
sociated with the site persistently emitting in X-ray, and not unifo

Summary

We studied 0.5-200 keV broadband time-integrated spectra of 42 bursts observed simultaneously with Swift/XRT and Fermi/GBM from SGR J1550-5418.

BB+BB fits better than COMPT model.

XRT and GBM are well cross-calibrated from a rough study

Bursts emission region is not necessarily associated with the site

persistently emitting in X-ray, and not uniform.