

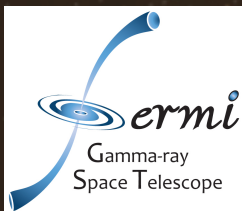


MAGIC observation of a short nearby GRB 160821B

Michele Palatiello

Koji Noda, Susumu Inoue, Pierre Colin, Elena Moretti, Francesco Longo

on behalf of the MAGIC and Fermi Collaboration



15-20 October

7th International Fermi Symposium

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Short GRB 160821B

One of the **nearest** observed GRBs: $z = 0.16$! (Levan et al. 2016)

Multiwavelength Observations

Fermi-GBM:

$T_{90} < 1s$, $E_p \sim 84$ keV

$S = 1.7 \times 10^{-6} \text{ erg cm}^{-2}$, $E_{\text{iso}} = 1.2 \times 10^{50} \text{ erg}$

Swift-XRT:

Extended Emission (<300 s)

+ Steep Decay $t < 500s$

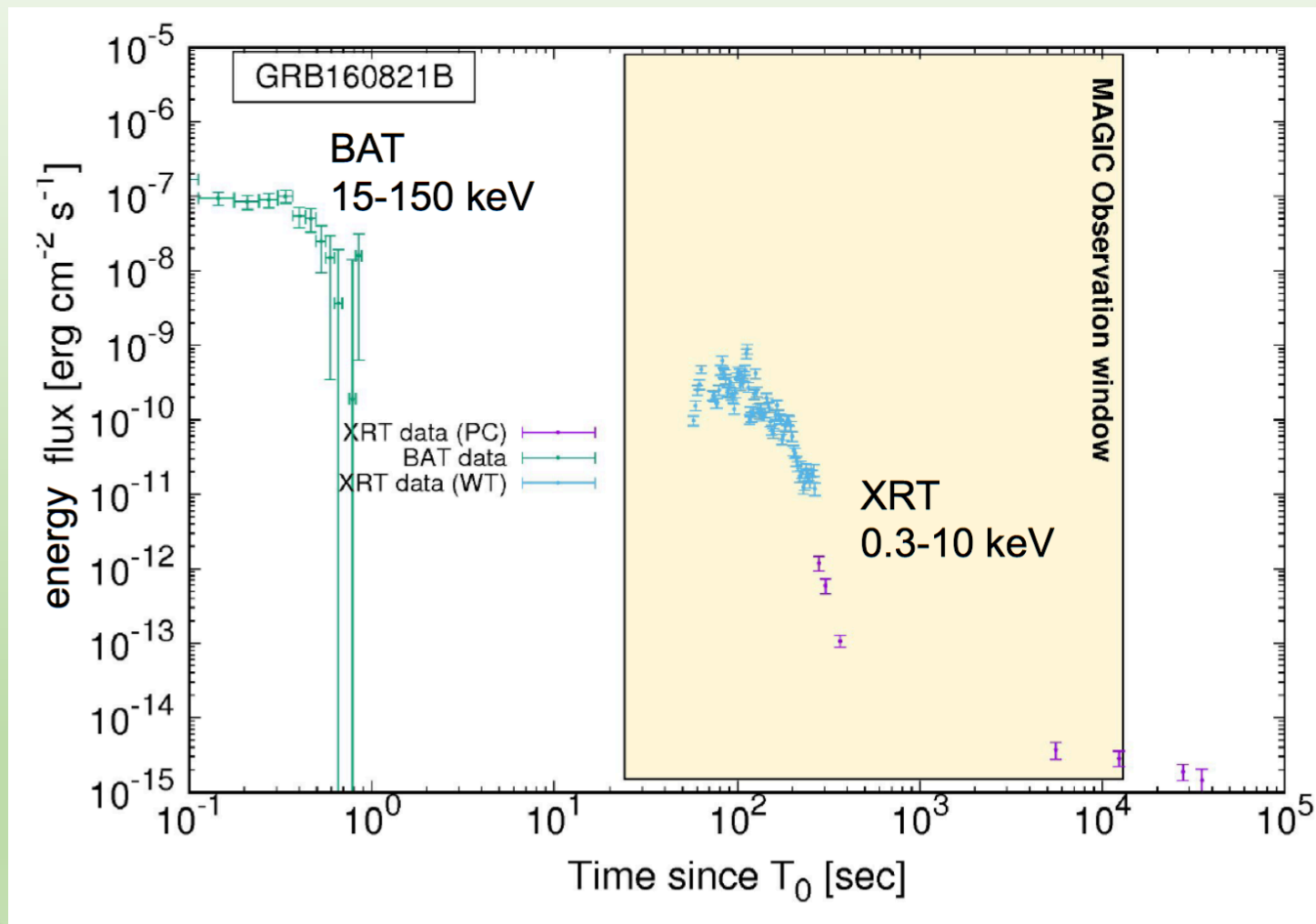
+ Plateau $t < 30ks$

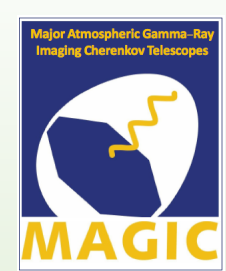
Afterglow constrains on kilonova

Optical (Xu et al. 2016)

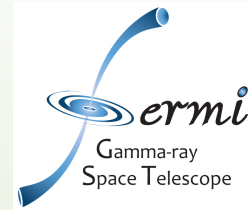
IR (Fong et al. 2016)

hint in H-band? (Tanvir et al. in prep)





Short GRB 160821B: MAGIC/Fermi-LAT Analysis



Automatic follow-up by MAGIC

- $t \sim 24 \text{ s} - 1.5 \text{ h}$, $Z_d \sim 34-40^\circ$, poor weather, NSB $\sim 3-5 \times$ dark
- $t \sim 1.5 \text{ h} - 4 \text{ h}$, $Z_d \sim 40-55^\circ$, good weather, NSB $\sim 5-9 \times$ dark

Fermi-LAT Observation

Due to a previous repointing alert (GRB160821A) the *Fermi*-LAT GRB160821B data are taken in a *not Favourable* pointing conditions:

First $T_0+2315\text{s}$ lie on the border of the instrument FoV (61deg)!

➤ Maximum considered FoV $\sim 70 \text{ deg}$ (including RoI)

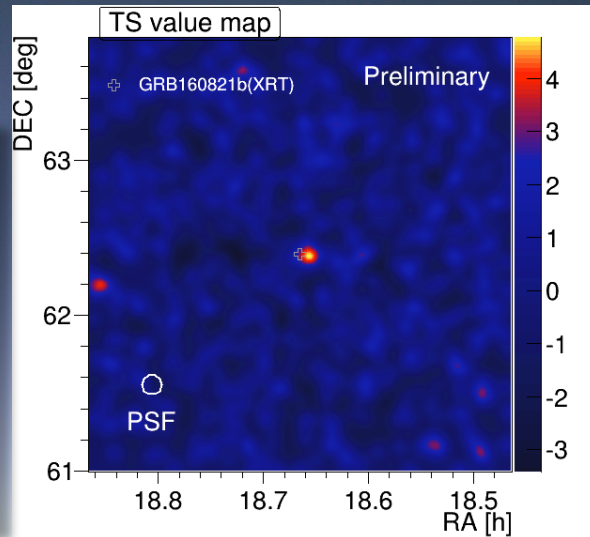
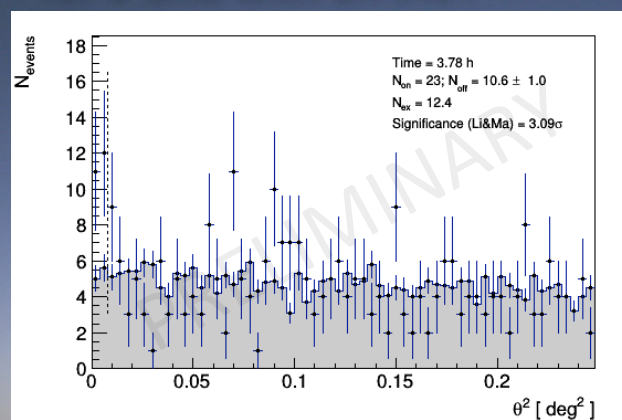
➤ TS < 1!

Bayesian Approach to calculate the ULs

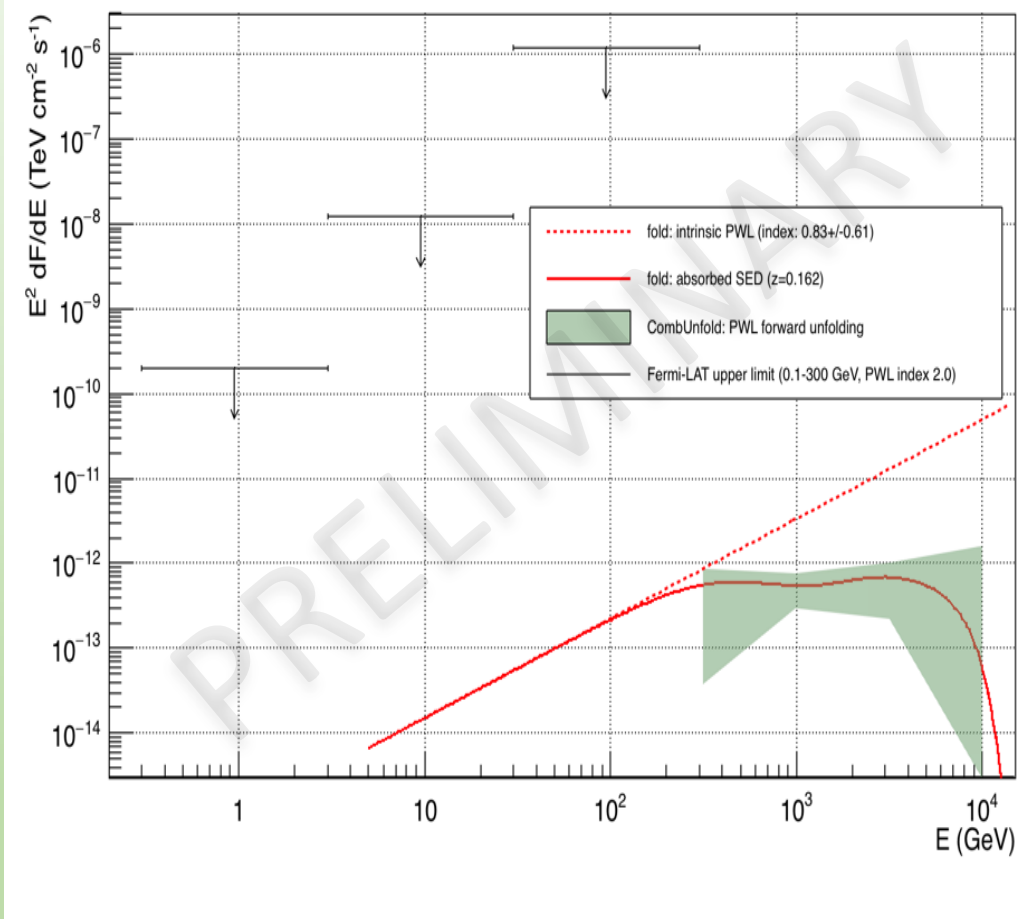
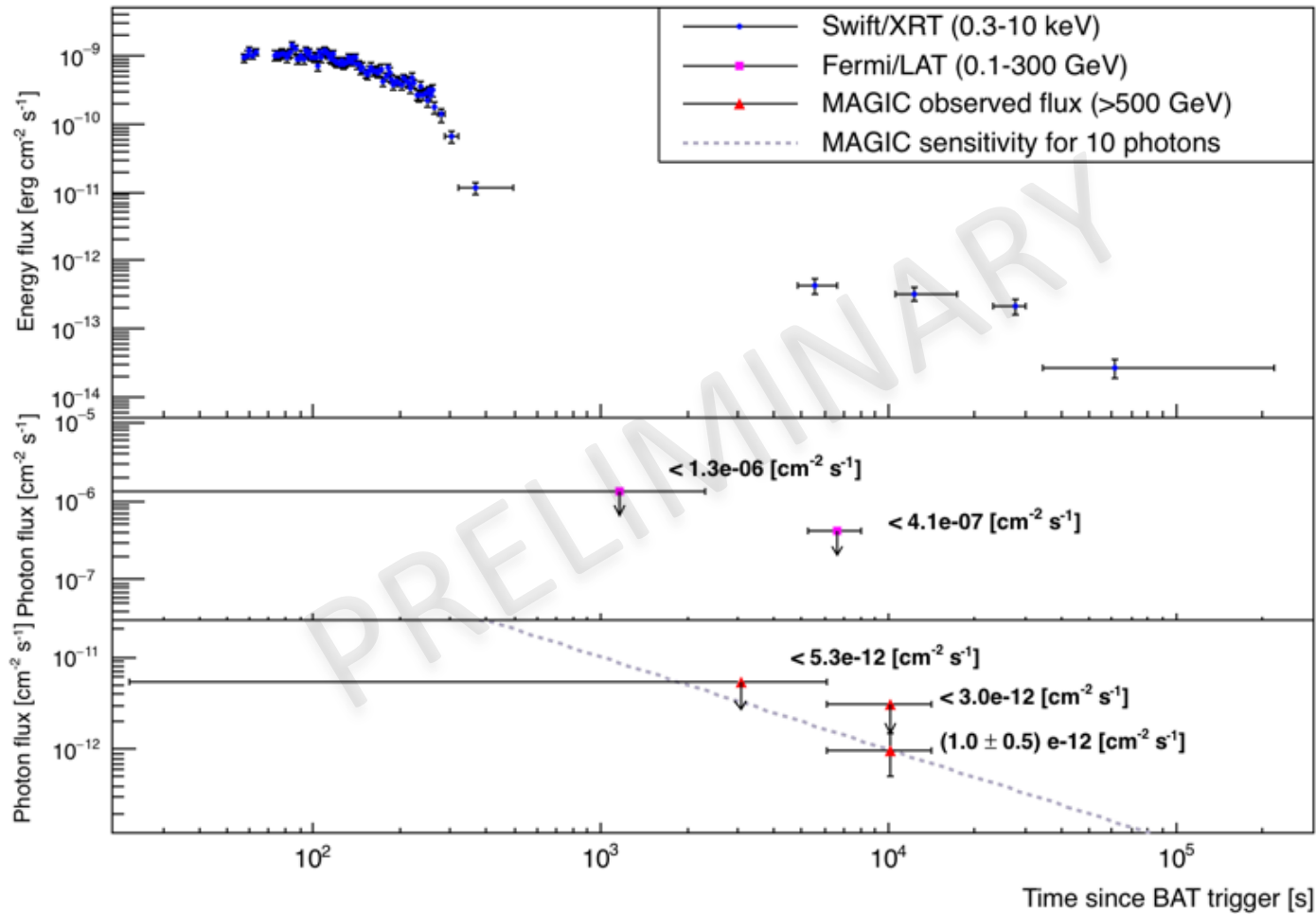
$$T_0 - T_0 + 2315 \rightarrow 1.34 \times 10^{-6} \text{ ph/cm}^2/\text{s} \quad (2.15 \times 10^{-10} \text{ erg/cm}^2/\text{s})$$

$$T_0 + 5270 \text{ s} - T_0 + 8050 \text{ s} \rightarrow 4.10 \times 10^{-7} \text{ ph/cm}^2/\text{s} \quad (6.57 \times 10^{-11} \text{ erg/cm}^2/\text{s})$$

Highest significant hint at VHE for a GRB with an IACT



GRB 160821B Multiwavelength Results



Suggesting a relatively flat light curve in HE-VHE?

Flat VHE SED seems well explained by EBL-attenuated PL. Modeling ongoing.