Detection prospects for low-energy muon neutrinos from collisionally heated GRBs with current and future neutrino telescopes

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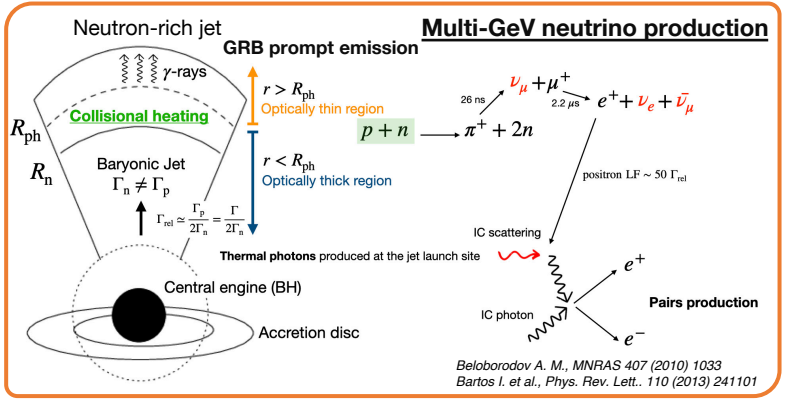
Inelastic collisional model



Beloborodov A. M., MNRAS 407 (2010) 1033
Bartos I. et al., Phys. Rev. Lett.. 110 (2013) 241101

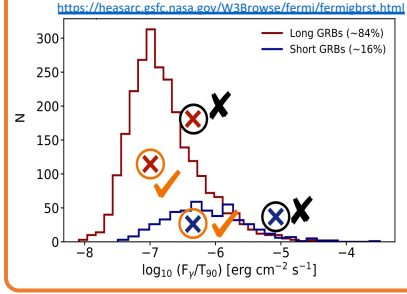
GRBs added in sequence choosing the one that gives, for each step, the maximum increase of total significance $\sigma = n_s/\sqrt{n_b}$

Procedure repeated **1000 times**

GRBs selection and neutrino fluence estimation

1. Extractions of GRB **gamma-ray fluence** F_γ and **prompt duration** T_{90} equivalent to ~**5 years** of observation in the 2π **sky** from Fermi GBM distributions

https://heasarc.gsfc.nasa.gov/W3Browse/fermi/fermigbrst.html



2. Estimation of the expected **signal neutrino fluence** according to the model

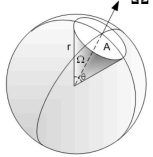
$$E_\gamma^2 \phi_\gamma \sim E_{\nu_\mu}^2 \phi_{\nu_\mu} \xrightarrow{\text{peaking at}} E_\nu \sim 100\ \text{GeV} \left(\frac{\Gamma}{600}\right)\left(\frac{\Gamma_{rel}}{2}\right)$$

Murase K., Kashiyama K., Mészaros P., Phys. Rev. Lett. 111 (2013) 131102

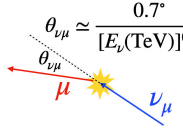
3. Estimation of the **background** (atmospheric neutrino flux by Honda model) within $T_{90} \pm 30\% T_{90}$

$$\Omega = 2\pi\left(1 - \cos(\theta/2)\right)$$

$$\theta_{bkg} = 3\theta_{\nu\mu}(E_{\nu_\mu})$$

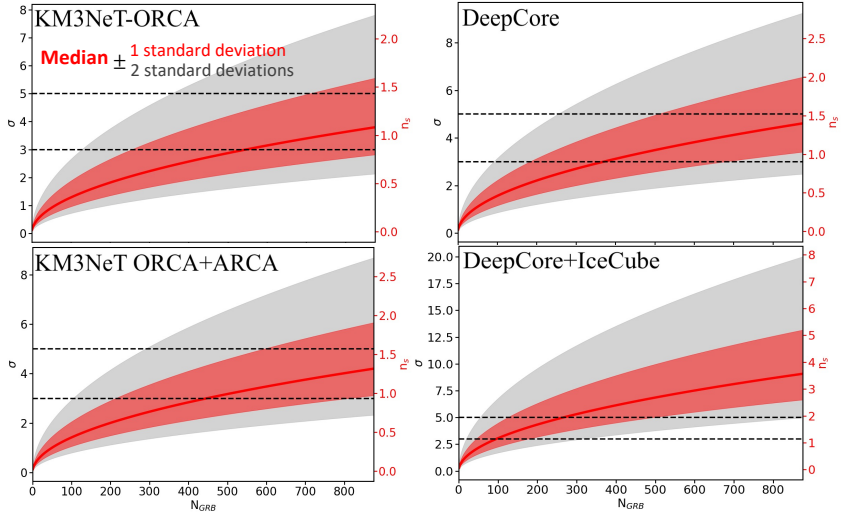


$$\theta_{\nu\mu} \simeq \frac{0.7^\circ}{[E_\nu(\text{TeV})]^{0.7}}$$



Stacking detection prospects for ν's observatories

Results shown for long GRBs with $\Gamma = 300$ and with effective areas at TRIGGER LEVEL



There is a good chance to detect multi-GeV neutrinos after stacking ~900 long GRBs with low-energy neutrino detectors (ORCA and DeepCore)