CONSTRAINTS ON THE VERY HIGH ENERGY GAMMA-RAY EMISSION WITH HAWC

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Gamma-ray bursts (GRBs) are among the most luminous sources in the universe. The nature of their emission at TeV energies is one of the most relevant open issues related to these events. The temporal and spectral features inferred from the early and late emissions usually known as prompt and afterglow, respectively, can be interpreted within the context of the fireball model [1–3]. In particular, in the fireball model, the synchrotron radiation is considered the cooling mechanisms responsible of the afterglow emission. Very-high-energy emission, delayed and longer than the prompt emission, is predicted as result of synchrotron self-Compton (SSC) process in external forward shocks. Observations of GRB 180720B and GRB 190114C by HESS and MAGIC observatories [4, 5] agree with the expectations. In this work, we focus on short GRBs which have an average redshift of 0.48. We obtain expressions for light curves of the afterglow emission in the SSC model assuming a homogeneous medium. We explain how these light curves can be compared with observed upper limits to restrict the microphysical parameters as in the different cooling phases. We show results for a hypothetical burst observed by Fermi-GBM and the HAWC observatories, with X-ray fluence of 5×10^{-7} erg cm^{-2} and an upper limit for the VHE fluence in the energy range of hundreds of GeV of 1×10^{-6} erg cm^{-2}. The most restrictive results are obtained for the fast cooling regime.

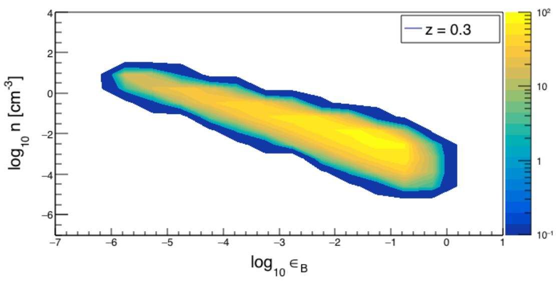

Figure 1: Allowed values for microphysical parameters ϵ_B and density of the external medium assuming a fast cooling regime.

References

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