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Modelling very high-energy gamma rays detected from GRBs with external Compton emission using Naima

Contributed Talk //

Gamma-Ray Bursts (GRBs)

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Recent observations of very-high-energy (VHE, ≳ 100 GeV) afterglow emission from GRBs raised important questions regarding the emission mechanism responsible for this radiation. So far, synchrotron-selfCompton (SSC) has been primarily used to model VHE emission from GRBs, but we interpret VHE observations using a combined SSC and external Compton (EC) emission, where the latter dominates at the late time. We have considered both the wind and interstellar medium scenarios. As a first approach we will implement our EC model into Naima, an inference of relativistic particle energy distributions from observed nonthermal spectra (including synchrotron, inverse Compton, Bremsstrahlung, and neutral pion decay processes). Naima already includes optimization tools to perform Markov Chain Monte Carlo (MCMC) fitting of radiative models to X-ray, GeV, and TeV spectra. We present predictions of multiwavelength light curves and energy spectra, ranging from optical to VHE. In prior work our EC model gave a satisfactory fit to the VHE data for a given set of fixed model parameters for both GRBs, with a wind environment preferred over constant density inter-stellar medium, and the Cosmic Microwave Background as the external radiation field. However, with an effective optimisation tool such as the MCMC method we can find a more robust fit of the model to the observations, implying better constraints on the GRB environment and the particle energy requirements for the emission observed at late times. This has consequences for future observations of GRBs at these extreme energies.

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