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Muti-collision lepto-hadronic models for energetic Gamma-Ray Bursts

Gamma-Ray Bursts (GRBs) are among the most energetic transients in the universe. Although mostly observed in keV to MeV energies, some GRBs have been detected in MeV to GeV energies by the Fermi-LAT. Generally, those bursts are among the brightest events of the observed population.
Motivated by this, we investigate lepto-hadronic multi-wavelength models for energetic GRBs with $E_{\gamma,\mathrm{iso}} > 10^{54}$ erg. Our approach includes both a self-consistent radiative treatment (also of the secondary particle cascade) as well as a spatially resolved multi-zone internal shock model.
In this framework we investigate low- to high-energy signatures of different leptonic and hadronic processes in synchrotron and inverse-Compton dominated scenarios.
We further calculate the associated neutrino fluences and discuss the implications for (high-energy) cosmic rays.

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