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Simulations and the Resulting Spectra for Reactions in Astrophysical Electromagnetic Cascades with Lorentz Invariance Violation

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Lorentz Invariance Violation (LIV) is a feature of several quantum gravity models in which Lorentz symmetry is broken at high energies, leading to potential changes in particle behavior and interactions. In this study, we present simulations (and the corresponding methods) of the propagation of astrophysical electromagnetic cascades with LIV, which in particular results in new types of reactions such as the Vacuum Cherenkov effect or Photon Decay, which are forbidden when Lorentz Symmetry is conserved. In particular, we derive, for the first time, spectra for the vacuum Cherenkov reaction, and confirm our results numerically. These results can be used to derive limits on LIV.

Working Group

WG1 - High Energy QG Theory

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