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The Photon Dispersion as an Indicator for New Physics ?

Abstract content

We first review the status of the search for a deviation from the linear photon dispersion relation, in particular by monitoring cosmic photons from gamma ray bursts or blazar flares. Then we discuss theoretical concepts that could lead to such a deviation, as a manifestation of Lorentz invariance violation. In particular we present a numerical study of pure U(1) gauge theory in a 4d non-commutative space. Starting from a finite lattice, we explore the phase diagram and its extrapolation to the continuum and infinite volume. These simultaneous limits lead to a phase of broken Poincare symmetry, where photons appears to be IR stable, despite the perturbatively negative IR singularity. We evaluate the corresponding photon dispersion relation explicitly.

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