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# On Lorentz invariance violation using astrophysical observations

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The Lorentz invariance violation (LIV) concerns the fundamental predictions of special relativity such as the principle of relativity: the constancy of the speed of light in all inertial frames of reference, also time dilation and the predictions of the standard model of particle physics. To assess and predict possible violations, tests of special relativity and effective field theories (EFT) such as the Standard-Model Extension (SME) have been invented. These models introduce LIV through spontaneous symmetry breaking caused by hypothetical background fields, this results in some sort of preferred frame effects. This could lead, for instance, to modifications on the dispersion relation, causing differences between the maximal attainable speed of matter and the speed of light. In this communication, we present an experimental test of LIV from astrophysical sources such as gamma-ray bursts (GRBs). We consider the measure of the helicity dependence about the propagation velocity of photons originating in distant astrophysical events. Specifically, we use a recent determination of the distance of the Gamma-Ray Burst GRB 041219A, for which a high degree of polarization is observed, then, we determine a constraint on Lorentz invariance violation parameter, arising from the phenomenon of vacuum birefringence.