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Bounding anisotropic Lorentz Invariance Violation

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Observations of energy-dependent photon time delays from distant flaring sources provide significant constraints on Lorentz Invariance Violation (LIV). Such effects originate from modified vacuum dispersion relations, causing differences in propagation times for photons emitted simultaneously from gamma-ray bursts, active galactic nuclei, or pulsars. These modifications are often parametrized within a general framework by an effective quantum gravity energy scale $E_{QG,n}$. While such general constraints are well established in the LIV literature, their translation into specific coefficients of alternative theoretical frameworks, such as the Standard-Model Extension (SME), is rarely carried out. In particular, existing limits on the quadratic case ($n = 2$) of $E_{QG,n}$ can be systematically converted into constraints on the non-birefringent, CPT-conserving SME coefficients $c^{(6)}_{(I)jm}$.

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