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New Constraint for Isotropic Lorentz Violation from LHC Data

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New calculations for the kinematics of photon decay to fermions in vacuo under an isotropic violation of Lorentz invariance (LV), parameterized by the Standard-Model Extension (SME), are presented and used to interpret prompt photon production in LHC data. The measurement of inclusive prompt photon production at the LHC Run 2, with photons observed up to a transverse energy of 2.5 TeV, provides the lower bound $\tilde{\kappa}_{\text{tr}} > -1.06 \times 10^{-13}$ on the isotropic coefficient $\tilde{\kappa}_{\text{tr}}$ at 95% confidence level. This result improves over the previous bound from hadron colliders by a factor of 55. The calculations for the kinematics of photon decay have further potential use to constrain LV coefficients from the appearance of fermion pairs, for instance, top-antitop.

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