

Testing Lorentz and CPT invariance through ultra-high-energy cosmic rays

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We study CPT and Lorentz violation in the tau-lepton sector of the Standard Model in the context of the Standard-Model Extension, described by a coefficient which is thus far unbounded by experiment. We show that any non-zero value of this coefficient implies that, for sufficiently large energies, standard-model fermions become unstable against decay due to the emission of a pair of tau-antitau leptons. We calculate the induced fermion energy-loss rate and we deduce the first limit on the Lorentz- and CPT-violating coefficient.

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