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Limits on Lorentz invariance violation at the Planck energy scale from H.E.S.S. spectral analysis of the blazar Mrk 501

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Some extensions to the Standard Model lead to the introduction of Lorentz symmetry breaking terms, expected to induce deviations from Lorentz symmetry around the Planck scale. A parameterization of Lorentz invariance violating (LIV) effects can be introduced by adding an effective term to the photon dispersion relation. This affects the kinematics of electron-positron pair creation by TeV gamma rays on the extragalactic background light (EBL) and translates into modifications of the standard EBL opacity for the TeV photon spectra of extragalactic sources. Exclusion limits are presented, obtained with the spectral analysis of H.E.S.S. observations taken on the blazar Mrk 501 during the exceptional 2014 flare. The energy spectrum, extending very significantly above 10 TeV, allows us to place strong limits on the LIV in the photon sector at the level of the Planck energy scale for linear perturbations in the photon dispersion relation, and provides the strongest constraints pre!

sently for the case of quadratic perturbations.

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