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High-energy hadronic processes in the presence of Lorentz violation

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An approach is presented for the calculation of high-energy hadron-lepton and hadron-hadron interactions at large momentum transfer in the presence of Lorentz-violating background fields affecting quarks. Cross sections for deep inelastic scattering and the Drell-Yan process are calculated at leading order for minimal and nonminimal Lorentz violation using the Standard-Model Extension, an effective field theory characterizing general Lorentz-violating effects for the Standard Model fields and General Relativity. Estimated bounds are placed using sidereal-time analyses of existing HERA, LHC, and future US-based electron-ion collider data.

Authors: Mr SHERRILL, nathan (Indiana University); Dr LUNGHI, Enrico (Indiana University (US)); VIEIRA, Alexandre (Universidade Federal do Triangulo Mineiro); KOSTELECKY, Alan (unknown)

Presenter: Mr SHERRILL, nathan (Indiana University)

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