Testing the Ampère-Maxwell law on the photon mass and Lorentz symmetry violation with MMS multi-spacecraft data

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Abstract

We investigate possible evidence from Extended Theories of Electro-Magnetism (ETEM) by looking for deviations from the Ampère-Maxwell law. The photon, main messenger for interpreting the universe, is the only free massless particle in the Standard-Model (SM). Indeed, the deviations may be due to a photon mass for the de Broglie-Proca (dBP) theory or the Lorentz Symmetry Violation (LSV) in the SM Extension (SME), but also to non-linearities from theories as of Born-Infeld, Heisenberg-Euler. With this aim, we have analysed six years of data of the Magnetospheric Multi-Scale mission, which is a four-satellite constellation, crossing mostly turbulent regions of magnetic reconnection and collecting about 95

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