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Measuring the Helicity of Intergalactic Magnetic Fields with Numerical Simulations in Astroparticle Physics

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The origin of the first magnetic fields in the Universe is a standing problem in cosmology. Intergalactic Magnetic Fields (IGMFs) may be an untapped window to the primeval Universe, providing further constrains on magnetogenesis. We demonstrate the feasibility of using gamma rays from electromagnetic cascades originating from TeV blazars and Ultra-High-Energy Cosmic Rays (UHECRs) to constrain the helicity of IGMFs by performing simulations of their propagation in simple magnetic field and source configurations. We show that the arrival directions of the respective particles may be used to measure the absolute value of the helicity and its sign.

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