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The Impact of Plasma Instabilities on the Constraints on the Intergalactic Magnetic Field

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A relativistic electron–positron pair beam can be produced in the interaction between TeV photons from a blazar and extragalactic background light. The relativistic e ± pairs lose energy through inverse-Compton scattering (ICS) photons of the cosmic microwave background or plasma instabilities. The dominant energy-loss process is under debate. Based on the assumption that the dominant energy-loss process is ICS, the resulting cascade GeV radiation is usually used to constrain the intergalactic magnetic field (IGMF). Here, we include the energy-loss due to plasma oblique instability in the calculation of cascade gamma-ray flux, and investigate the impact of the plasma instability on the constraint of IGMF. Up-to-date GeV data and archival TeV data of the blazar 1ES 0229+200 are used. The results indicate that even if the oblique instability cooling is dominating ICS cooling, the cascade flux could still be used to constrain the IGMF.

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