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Total and linearly polarized synchrotron emission from overpressured magnetized relativistic jets

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We present relativistic magnetohydrodynamic (RMHD) simulations of stationary overpressured magnetized relativistic jets, which are characterized by their dominant type of energy: internal, kinetic, or magnetic. Each model is threaded by a helical magnetic field with a pitch angle of 45º and features a series of recollimation shocks produced by the initial pressure mismatch, whose strength and number varies as a function of the dominant type of energy. We perform a study of the polarization signatures from these models by integrating the radiative transfer equations for synchrotron radiation using as inputs the RMHD solutions. These simulations show a top-down emission asymmetry produced by the helical magnetic field and a progressive confinement of the emission into a jet spine as the magnetization increases and the internal energy of the non-thermal population is considered to be a constant fraction of the thermal one. Bright stationary components associated with the recollimation shocks appear, presenting a relative intensity modulated by the Doppler boosting ratio between the pre-shock and post-shock states. Small viewing angles show a roughly bimodal distribution in the polarization angle, due to the helical structure of the magnetic field, which is also responsible for the highly stratified degree of linear polarization across the jet width. In addition, small variations of the order of 26º are observed in the polarization angle of the stationary components, which can be used to identify recollimation shocks in astrophysical jets.