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Saturation of the Non-Resonant Cosmic Ray Streaming Instability[1] SIDDHARTHA GUPTA, GEORGIOS ZACHAREGKAS, COLBY HAGGERTY, DAMIANO CAPRIOLI, University of Chicago — We perform both fully-kinetic and hybrid (kinetic protons-fluid electrons) plasma simulations to study the saturated amplified magnetic fields produced by the non-resonant (or Bell) instability driven by energetic particles (cosmic rays, CRs). Using a survey of 1D, 2D and 3D simulations, we connect initial plasma and CR parameters to the strength of the magnetic fields at saturation. A simple analytic theory is derived for such a saturation, which agrees well with the simulations. These results are important for understanding CR acceleration and transport in astrophysical systems, as well as beam-driven instabilities in laboratory experiments.

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