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The nonlinear phase of the non-resonant cosmic ray-driven Bell instability LUIS GARGATE, GoLP/IPFN Instituto Superior Tecnico, RICARDO FONSECA, DCTI Instituto Superior de Ciencias do Trabalho e da Empresa, JACEK NIEMIEC, Instytut Fizyki Jadrowej PAN, ROBERT BINGHAM, SSTD Rutherford Appleton Laboratory, LUIS O. SILVA, GoLP/IPFN Instituto Superior Tecnico — Cosmic rays (CR) with very high energies are produced in Supernova Remnant (SNR) shocks, via Diffusive Shock Acceleration. The typical interstellar magnetic field present, however, is too low to explain the highest energy particles observed, implying that a magnetic field amplification mechanism is operating. We analyze Bell's instability [1], in which small-scale non-resonant wave modes are driven by cosmic ray ions streaming in the shock precursor along a background magnetic field B0, and driving a current. We use hybrid simulations to study the feedback of magnetic turbulence produced on cosmic ray trajectories. Our results show an amplification of ~ 10 relative to B0. On the nonlinear phase, the background plasma cavitates, gaining a bulk velocity in the CR propagation direction. The nonlinear phase of the instability is explored in detail, and the reaction of the background plasma, along with the isotropization of the CR population is shown to be relevant for the saturation mechanism. The relevance of the mechanism for the acceleration of CRs is also thoroughly discussed. [1] A. R. Bell, Mon. Not. R. Astron. Soc. 353, 550, 2004

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