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Nonlinear evolution of cosmic-ray driven instabilities[1] ARNO VANTHIEGHEM, FREDERICO FIUZA, High Energy Density Science Division, SLAC National Accelerator Laboratory, Menlo Park, California 94025, USA — Extreme astrophysical objects such as relativistic jets and supernova remnants exhibit nonthermal radiative spectra highlighting the presence and the generation of suprathermal particle distributions – *i.e.* cosmic rays. The maximum energy reached through diffusive shock acceleration in such environments is directly conditioned by the energy injected by the cosmic rays in the self-generated turbulent electromagnetic field at large scales comparable to the Larmor radius of the most energetic particles. Capturing the self-consistent, multiscale feedback of the turbulence on the nonthermal distribution, taking into account kinetic effects, has been a significant challenge. We will present the results of large-scale particle-in-cell kinetic simulations that capture the generation and the nonlinear evolution of current- and pressure-driven instabilities relevant to the context of relativistic and sub-relativistic shocks. We will discuss how the coupling between different instabilities affects the nonlinear evolution of the system and shapes the magnetic field energy injected at the largest scales.

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