

Abstract Submitted  
for the DPP20 Meeting of  
The American Physical Society

**Nonlinear streaming instability and super-diffusion of particles<sup>1</sup>**

ANDREY BERESNYAK, US NAVAL RESEARSC LABORATORY — Cosmic ray acceleration in supernova remnants is characterized by turbulence and magnetic field amplification created by streaming cosmic rays. Physics upstream of the shock is most important for acceleration; both the scale and the magnitude of the magnetic field have to be large enough to ensure sufficiently rapid acceleration to observed energies. The physics of small-scale dynamo, driven by cosmic ray pressure can provide such scales and magnitudes, however, the critical question remains regarding the dynamics of particles. I report the results of PIC-MHD modeling of nonlinear streaming and dynamo of cosmic rays having broad energy distribution. It has been often assumed that cosmic ray dynamics is diffusive. In fact, in this cosmic ray driven turbulence the dynamics is super-diffusive and the index as well as the coefficient of diffusion depends on energy. We discuss implications of this to the standard shock acceleration picture.

<sup>1</sup>Supported by NASA Astrophysics Theory Program

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Date submitted: 29 Jun 2020

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