Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Proton and Helium Injection Into First Order Fermi Acceleration at Shocks: Hybrid Simulation and Analysis[1] GALINA DUDNIKOVA, University of Maryland, Institute of Computational Technologies SBRAS, MIKHAIL MALKOV, University of California, San Diego, ROALD SAGDEEV, University of Maryland, TATJANA LISEYKINA, Rostock University, Institute of Computational Technologies SBRAS, ADRIAN HANUSCH, Rostock University — Elemental composition of galactic cosmic rays (CR) probably holds the key to their origin. Most likely, they are accelerated at collisionless shocks in supernova remnants, but the acceleration mechanism is not entirely understood. One complicated problem is injection, a process whereby the shock selects a tiny fraction of particles to keep on crossing its front and gain more energy. Comparing the injection rates of particles with different mass to charge ratio is a powerful tool for studying this process. Recent advances in measurements of CR He/p ratio have provided particularly important new clues. We performed a series of hybrid simulations and analyzed a joint injection of protons and Helium, in conjunction with upstream waves they generate. The emphasis of this work is on the bootstrap aspects of injection manifested in particle confinement to the shock and, therefore, their continuing acceleration by the self-driven waves. The waves are initially generated by He and protons in separate spectral regions, and their interaction plays a crucial role in particle acceleration. The work is ongoing and new results will be reported along with their analysis and comparison with the latest data from the AMS-02 space-based spectrometer.

[1]Work supported grant RFBR 16-01-00209, NASA ATP-program under award NNX14AH36G, and by the US Department of Energy under Award No. DE-FG02-04ER54738.

Mikhail Malkov
University of California, San Diego

Date submitted: 15 Jul 2016 Electronic form version 1.4