Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Dynamics of Cosmic Ray acceleration in a modified shock[1]
ALEXANDER PUSHKIN, MIKHAIL MALKOV, PATRICK DIAMOND, University of California San Diego — Backreaction of accelerated cosmic rays (CRs) on the structure of the shock which supports their acceleration results in bifurcation of stationary solutions. Therefore the process of nonlinear shock acceleration of CRs in strong astrophysical shocks cannot be fully understood within a steady state approach. We analyze stability and evolution of the structure of a nonlinearly modified shock in the framework of a zero-dimensional time dependent system of ODEs. The system is derived from the convection-diffusion equation which describes the acceleration and transport of cosmic rays coupled to the plasma flow profile near the shock. The main variables of the resulting system are the shock strength (in form of subshock and precursor compression ratios) and the maximum CR energy. A self-consistent dependence of the injection rate on the subshock compression is included. This study enables: (i) selection of possible acceleration regimes (ii) analysis of stability of different steady state solutions (iii) time dependent description of the dynamics of coupled CR-shock system.

[1]NASA, US DoE

Mikhail Malkov
University of California San Diego

Date submitted: 20 Jul 2007 Electronic form version 1.4