Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Positron Anomaly in Galactic Cosmic Rays: Constraining Dark Matter Contribution[1] ROALD SAGDEEV, University of Maryland, MIKHAIL MALKOV, PATRICK DIAMOND, University of California, San Diego — An explanation of the unexpected rise in the positron fraction of the cosmic ray (CR) leptonic energy spectrum, is proposed. It is argued that the $e^{\pm}$ spectra are different because they are accelerated by a charge-sign selective mechanism. This premise was hinted at by a recent result from the AMS-02 spectrometer that revealed a difference between e^{+} and antiproton spectra, which both are secondary CRs but of the opposite charges. The new mechanism extends the diffusive shock acceleration (DSA) to make it charge-sign selective. The DSA, operating in Galactic supernova remnant (SNR) shocks, is held responsible for the production of the bulk of the CRs. The new mechanism was found to account for the positron data with an excellent agreement, except in a limited energy range between 100-300 GeV. In this range, the data exceed the theoretical prediction systematically, thus opening a window for a contribution from dark matter decay or annihilation as well as nearby pulsars. The charge-sign selectivity of the DSA arises from an electric field induced by the CR protons illuminating the neutral gas clumps in the SNR surroundings. The electric field expels positrons from the clump but traps electrons and secondary antiprotons, thus suppressing their acceleration in such SNRs.

[1]Work supported by NASA ATP-program under grant 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