Abstract Submitted
for the APR10 Meeting of
The American Physical Society

On the positron fraction and models of cosmic ray propagation[1]

RAMANATH COWSIK, BENJAMIN BURCH, Washington University in St. Louis

— The recent observations of the positron fraction in cosmic rays by PAMELA has created much excitement because of its possible connection with annihilation or decay of dark matter in the Galaxy, or with a variety of astrophysical processes taking place in nearby pulsars or supernova explosions. The PAMELA instrument measured a positron fraction of ~ 0.0673 at ~ 1.64 GeV, which decreases to $\sim$0.0483 at $\sim$6.83 GeV, and thereupon increases monotonically, reaching a value of $\sim$0.137 at mean energy of 82.55 GeV. It is this monotonic increase that has been called anomalous, as it does not conform to the predictions of the leaky box model with the residence time of cosmic rays decreasing with increasing energy. Accordingly the possibility of the reacceleration of positrons in the cosmic ray sources, and the effects of inhomogeneous distribution of cosmic ray sources about the solar system, have been discussed. Detailed comments on these suggestions may be found in Ahlers et al. and in Mertsch et al.. We wish to point out here that very general arguments based on cosmic-ray propagation models indicate that the positron fraction should increase at high energies, and asymptotically reach a value of $\sim$0.6 at the highest energies. Furthermore, we show that these observations support the nested leaky-box models for cosmic ray propagation.

[1]Funding provided by the McDonnell Center for the Space Sciences, Washington University in St. Louis.

Ramanath Cowsik
Washington University in St. Louis

Date submitted: 26 Oct 2009 Electronic form version 1.4