Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

The Importance of Large-Scale Irregular Magnetic Fields in Particle Acceleration by Astrophysical Shocks. JOE GIACALONE, University of Arizona — Magnetic fields in space have an irregular, or turbulent, component that gives rise to spatial meandering and braiding of the lines of magnetic force. This large-scale structure has several important consequences that are relevant to our understanding of particle acceleration at astrophysical shocks, such as those associated with supernovae, the termination of the solar wind, and near the Sun. We will discuss recent numerical simulations which illustrate the basic physics. Particular attention is placed on the importance of the angle between the mean magnetic field and the shock normal. For the case of a parallel shock, acceleration of particles to very high energies (e.g. the knee in the cosmic-ray spectrum, or >GeV energy solar cosmic rays) requires very special conditions to explain the observations. These include a strong increase in the magnetic field, perhaps due to excitation from the streaming cosmic rays. In this talk, we show that no such special circumstances are required when one considers acceleration at nearly perpendicular shocks. We will also discuss the physics of the well-known injection problem, and suggest that, in actuality, there is no such problem.

Joe Giacalone
University of Arizona

Date submitted: 23 Jul 2006 Electronic form version 1.4