Title: Transport Measurements in a Stochastic Magnetic Field

Authors: CHIKERE, K.R

University of Ibadan,
Faculty of sciences
Depertment of Elect. Elect. Engin.

Abstract

Transport from stochastic magnetic turbulence can be so neceessary in astrophysical settings, such as thermal conduction in galaxy-cluster plasmas and cosmic ray propagation. The MST reversed field pinch provides an ideal laboratory for investigating transport resulting from magnetic field braiding. For instance, the main theoretical expectation for stochastic heat conduction is the product of the test-particle thermal velocity and the magnetic diffusivity. In MST, conditions can be controlled to vary the magnetic diffusivity, and the predicted transport then compared with power balance measurements. These agree, but only where the magnetic field is sufficiently stochastic, and only the portion of the fluctuations responsible for local field line tearing must be used to evaluate the magnetic diffusivity. The largest components of the fluctuations do not necessarily enhance transport. High energy particles can transport at a reduced rate if their drift orbits are not aligned with the magnetic field, observed for neutral beam-injected ions in MST. We will also describe the spectral features of the observed broadband spectrum of magnetic fluctuations, which exhibit power decay suggestive of MHD cascade physics. This may be relevant, for example, to magnetic fluctuations in the solar wind. Work supported by USDoE and NSF.