Measurements of Particle Flux due to Stochastic Magnetic Field In MST

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We report direct measurements of the particle flux associated with a stochastic magnetic field in the core of the MST reversed field pinch, particularly during the sawtooth crash when tearing reconnection is strongest. Such measurements are relatively rare, and the physics is of great interest these days for practical application to ELM stability control. Direct measurements of the magnetic fluctuation-induced particle flux are made using a newly developed differential interferometer in combination with a Faraday rotation system. The differential interferometer allows us to measure the gradient of electron density fluctuations with high spatial resolution while Faraday rotation is used to measure core magnetic fluctuations. Measurements show that convective electron particle transport (the correlated product of density fluctuations and radial magnetic fluctuations) can account for the equilibrium density change at the magnetic axis. The difference between electron flux and ion flux is measured to be much smaller than the electron flux or ion flux. It is found that electron particle flux primarily arises from electron density fluctuations and ion particle flux arises from the ion velocity fluctuation.