

Experimental Verification of the Hall Effect during Pull Reconnection in MRX

Y. Ren, M. Yamada, H. Ji, S. P. Gerhardt,
A. Kuritsyn and R. Kulsrud

Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas,
Princeton Plasma Physics Laboratory, Princeton University, Princeton, NJ 08543

The most important goal in magnetic reconnection research is to explain the fast magnetic reconnection phenomena observed in nature. The Hall effect has been found to drive fast magnetic reconnection in 2D numerical simulations [1]. An out-of-plane quadrupole magnetic field found in these numerical simulations [2,3] is the hallmark of the Hall effect. This quadrupole magnetic field has been observed during magnetic reconnection in the Magnetic Reconnection Experiment (MRX) [4]. The spatial scale of this quadrupole magnetic field and the deduced electron current pattern show good agreement with simulation results. Measurements also show that the Hall effect is more significant in the collisionless regime and becomes small as the collisionality increases, indicating that the Hall effect plays an important role in collisionless reconnection. This work is supported by DOE, NSF and NASA.

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