

Abstract Submitted  
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**Mach probe measurements in the context of the Hall effect at MRX.** HUMBERTO TORREBLANCA, University of California, Los Angeles (UCLA), STEFAN GERHARDT, MASA AKI YAMADA, HANTAO JI, YANG REN, Princeton Plasma Physics Lab (PPPL) — MRX clearly observes the quadrupole out-of-plane field, which is the most significant signature of the Hall effect. This effect appears when we go from the collisional to the collisionless regime where the one-fluid MHD formulation no longer holds and the separation of the electron and ion motions give rise to in-plane currents. These currents can be calculated from the measured quadrupole field. We used a Mach probe to measure the axial (along current sheet) profile of the ion flow velocity in the outflow region of the current sheet. We have calculated a calibration factor to overcome the difference in the effective area of the Mach probe electrodes. We have written a code to filter and analyze the data and we have used the unmagnetized model by Hutchinson to extract the Mach numbers from the raw signals. The ion outflow speed is at most  $0.2V_A$ , which is much less than the maximum electron outflow speed of 2-3  $V_A$  in the same region. These measurements confirm the separation between electron and ion motions, which is the basis of the Hall effect. Y. Ren, M. Yamada, S. Gerhardt *et al.*, Phys. Rev. Lett. **95**, 055003 (2005). M. Yamada, Y. Ren, H. Ji *et al.*, Phys. Plasmas **13**, 052119 (2006).

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