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Identification of a Two-scale Diffusion Layer During Magnetic Reconnection in a Laboratory Plasma M. YAMADA, Y. REN, H. JI, S. GERHARDT, B. MCGEEHAN, C. JACOBSON, J. BAUMGAERTEL, R. KULSRUD, S. DORFMAN, Center for Magnetic Self-Organization in Laboratory and Astrophysical Plasmas, PPPL, Princeton U. — Recent results from the Magnetic Reconnection Experiment (MRX)[1] are reported. For the first time in a laboratory plasma, a two-scale diffusion layer in a reconnection region has been identified. Recent 2D numerical simulations predict a thin electron diffusion layer residing inside the broader ion diffusion layer, which has width of approximately the ion skin depth. In our experiments, the electron diffusion layer is also identified inside the ion diffusion region. Demagnetized electrons are found to be accelerated in the outflow, in good agreement with recent numerical simulation data. The measured width of the electron diffusion region scales with the electron skin depth (5-8 c/ω_{pe}), and the electron outflow scales with the electron Alfvén velocity. While the electron outflow appears to slow down by dissipation in the electron diffusion region, the total electron outflow remains independent of its width. The ion outflow channel is shown to be much broader than the electron channel. Our results will be compared with recent space data. The effects of guide field on the layer structure will also be presented. 1. M. Yamada et al, Phys. Plasma v.4, 1936 (1997). Research Supported by DoE, NSF and NASA

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