Abstract Submitted
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Mechanisms of Energization of Plasma Particles in the Magnetic Reconnection Layer of a Laboratory Plasma[1] M. YAMADA, J. YOO, J. JARA ALMONTE, H. JI, C. MYERS, C. SWANSON, Princeton Plasma Physics Laboratory, Princeton University — Mechanisms of the energization of plasma particles in the magnetic reconnection layer has been studied by monitoring the behavior of electrons and ions in MRX [1, 2]. The measured profiles of plasma parameters are quantitatively analyzed in the context of the two-fluid reconnection physics [1] and compared with the recent numerical simulation results. The electron heating is observed to extend beyond the electron diffusion region and considered to be due to energization by magnetic instabilities of incoming electrons trapped in the magnetic mirror. This energization often occurs impulsively. Ions are accelerated by an electrostatic field across the separatrices to the plasma exhaust region of the reconnection layer and become thermalized through re-magnetization by the exiting magnetic fields. In this paper, the acceleration and heating of ions and electrons which extents much wider than the length scale of the ion skin depth, is addressed quantitatively for the first time in a laboratory reconnection layer. The results will bring a new insight into the conversion mechanism of magnetic energy to that of plasma particles during magnetic reconnection.

[1] M. Yamada, R. Kulsrud, H. Ji, Rev. Mod. Phys. v.82, 602 (2010)
[2] J. Yoo et al, Phys. Rev. Letts. 110, 215007 (2013)

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