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Development of phosphor imaging diagnostics for particle energization and field line mapping studies in MRX W. FOX, S.J. ZWEBEN, J. YOO, J. JARA-ALMONTE, C. MYERS, M. YAMADA, H. JI, Princeton Plasma Physics Laboratory — The energization of particles by magnetic reconnection is one of its most important roles in space and astrophysical plasmas. We present results from phosphor-screen imaging diagnostics for the Magnetic Reconnection Experiment, developed to measure the location and timing of particle energization by magnetic reconnection and to map field lines. Phosphor-based imaging diagnostics have previously been to study plasma dynamics in in non-neutral plasmas and low-temperature linear machines [1]. In MRX, movable, phosphor-coated probes are scanned across the current sheet, and phosphor emission is imaged on a fast camera acquiring at typically 500k frames/sec. Optical filters isolate the phosphor emission from line emission in the plasma. The energy sensitivity of the probe is determined by the characteristics of the phosphor and bias of the probe with respect to the plasma. We also present the development of an e-beam diagnostic to directly map the magnetic field line structure and possibly to measure the parallel electric field and/or cross-field electron transport. A modulated electron beam from a hot tungsten filament will be detected downstream by Langmuir probes and the phosphor imager.

[1] A. Liebscher, et al, Rev. Sci. Instrum. **72**, 953 (2001).

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