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Experimental Studies on the 3D Macro- and Microphysics of Magnetic Reconnection JONATHAN JARA-ALMONTE, HANTAO JI, MASAAKI YAMADA, JONGSOO YOO, WILL FOX, BYUNGKEUN NA, Princeton University / PPPL — 2D magnetic reconnection has been studied for many decades and considerable progress has been made, yet in real plasmas reconnection is fundamentally 3D in nature. Only recently has it become possible to simulate 3D reconnection, and some results have suggested that 3D does not strongly affect the basic properties of reconnection. In contrast, previous experiments have implied that 3D effects could be important even in a quasi-2D system. Here both the (1) macro- and (2) microphysics of 3D reconnection are experimentally studied in order to test the importance of 3D effects. Using fully simultaneous 3D measurements, it is shown that during highly driven reconnection the macroscopic structure of the current sheet can become strongly 3D despite a nearly 2D upstream. Results from new experiments with diagnostics designed to estimate the 3D reconnection rate will be discussed. With regards to (2), the 3D microphysics, new diagnostics capable of measuring fluctuations at frequencies up to the electron cyclotron frequency (300 MHz) have been developed and have identified the presence of very high frequency waves (100 MHz) during asymmetric reconnection, localized to the low-density side. The detailed properties of these waves including the measured dispersion relation will be discussed.

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