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Systematic Study of the Effects of Guide Field on Reconnection Layer Dynamics in MRX TIM THARP, MASAAKI YAMADA, HANTAO JI, Princeton Plasma Physics Laboratory — Past results from collisionless simulation and laboratory experiments agree that guide field acts to reduce the reconnection rate, though the precise physical mechanism for this is not apparent. Here, we perform a systematic study of guide field effects on collisionless reconnection in a laboratory plasma. An external guide field has been applied to reconnecting plasmas in MRX. Reconnection rate is observed to decrease with guide field as expected. The quadrupole field, a signature of two-fluid reconnection, is readily identifiable in $B_g = 0$ plasmas, and a morphing of this structure is observed as guide field is incrementally applied. The change is largely due to a strong paramagnetic effect, similar to that seen in O-point configurations like the RFP, but in this case produced by poloidal currents flowing around the reconnection x-point. An overall anti-symmetric structure in the toroidal field can still be seen with total guide fields as large as $B_g \sim B_0 = 200$ Gauss. These observations are directly compared with numerical simulations performed by the group at UNH, and will be discussed in the context of space and fusion reconnecting plasmas.

Eric Lawrence
Princeton Plasma Physics Laboratory

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