Abstract Submitted
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Formation of Transient Plasmas with Beta and Hall Parameters Simultaneously Greater than Unity[1] TOM BYVANK, Los Alamos National Laboratory, D. ENDRIZZI, University of Wisconsin, S. J. LANGENDORF, S. C. HSU, Los Alamos National Laboratory, K. MCCOLLAM, C. FOREST, University of Wisconsin, E. HANSEN, P. TZEFERACOS, University of Chicago — We report results from the head-on merging of two coaxial-gun-formed pre-magnetized plasma jets. This is an exploratory first step toward forming thermal-pressure-dominated plasmas with tangled magnetic fields [1], which may be of interest as a plasma target for magneto-inertial fusion [2] or as a novel platform for laboratory astrophysics studies. In these experiments, we vary the gun current and magnetic flux linking the electrodes to study those parameters' effects on the resulting plasma collision. A Langmuir probe, magnetic probe array, and visible fast-framing camera are used to diagnose the plasma conditions at the plasma-merging region to experimentally infer both the β and Hall parameters (assuming $T_e = T_i$). A second experimental campaign is planned to include measurement of T_i. The objective is to achieve a transient plasma state where β and the Hall parameter $\omega\tau$ (for both electrons and ions) are simultaneously greater than unity. Using the FLASH code, we study the jet-merging process and the compression of the transient plasma state (at higher densities) by a plasma liner. [1] D. D. Ryutov, Fus. Sci. Tech. 56, 1489 (2009). [2] S. C. Hsu and S. J. Langendorf, J. Fusion Energy 38, 182 (2019). LA-UR-19-26020.

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Tom Byvank
Los Alamos National Laboratory

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