Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

2D Kinetic Particle in Cell Simulations of a Flow-Shear Stabilized Z-Pinch[1] KURT TUMMEL, DREW HIGGINSON, ANTHONY LINK, ANDREA SCHMIDT, HARRY MCLEAN, Lawrence Livermore Natl Lab, URI SHUMLAK, BRIAN NELSON, RAY GOLINGO, ELLIOT CLAVEAU, ELEANOR FORBES, TOBIN WEBER, YUE ZHANG, ANTON STEPANOV, University of Washington, LLNL TEAM, UW TEAM — The lifetime of Z-pinch plasmas is typically limited by MHD instabilities, e.g. the m = 0 sausage and m = 1 kink modes. An attractive strategy to suppress these and related instabilities and extend the lifetime of a Z-pinch is to drive sheared axial flows in the plasma, $dv_z/dr \neq 0$. This stabilization was demonstrated in a series of experiments at the UW and these long-lived Z-pinches may offer viable sources of ion beams, neutrons and radiation, or potentially, a fusion reactor. LLNL is running 2D simulations using the particle-in-cell(PIC) code, LSP, to study flow-shear Z-pinch stability and performance. The suppression of the sausage mode by axial flow-shear is seen under the present experimental conditions as well as at reactor scales, with multiple shear-flow profiles. The longevity of these sheared-flows depends on the plasma viscosity, and a preliminary viscosity and shear-flow longevity analysis is also presented. This work represents the first fully-kinetic modeling results for the flow-shear stabilized Z-pinch.

[1]This work funded by USDOE ARPA-E and performed under the auspices of Lawrence Livermore National Laboratory under Contract DE-AC52-07NA23744. LLNL-ABS-734820

Kurt Tummel
Lawrence Livermore Natl Lab

Date submitted: 14 Jul 2017 Electronic form version 1.4