Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Simulation of FuZE pinch axisymmetric stability using gyrokinetic and extended-MHD models[1] V. I. GEYKO, J. R. ANGUS, M. A. DORF, Lawrence Livermore Natl Lab — Axisymmetric ($m = 0$) gyrokinetic and extended-MHD simulations of the shear flow stabilized Z-pinch plasmas are performed with the high-order finite volume code COGENT. A prominent feature of this work is that the radial profiles for the plasma density and temperature are taken from the recent experimental data and the magnetic field profile is obtained as a solution of the MHD force balance equation. Such an approach allows to address realistic plasma parameters and provide insights into the current and planned experiments. In particular, it is demonstrated that the radial profiles play an important role in stabilization, as the embedded guiding center (ExB) drift has a strong radial shear, which can contribute to the Z-pinch stabilization even in the absence of the fluid flow shear. As the result, the stability properties become dependent of the sign of the fluid flow velocity and a modest fluid shear might even play a destabilizing role. These results are supported by both the MHD and gyrokinetic simulations. It is also shown that the linear modes are not stabilized by a moderate (up to a sound speed) fluid shear flow. The nonlinear stabilization, however, can be achieved for short wavelength modes, which is demonstrated in both models.

[1]Prepared by LLNL for USDOE SC-FES under Contract DE-AC52-07NA27344, LLNL LDRD project 18-ERD-007

Vasily Geyko
Lawrence Livermore Natl Lab

Date submitted: 29 Jun 2020 Electronic form version 1.4