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2D Kinetic Particle in Cell Simulations of a Shear-Flow Stabilized Z-Pinch[1] KURT TUMMEL, DREW HIGGINSON, ANDREA SCHMIDT, ANTHONY LINK, HARRY MCLEAN, Lawrence Livermore Natl Lab, URI SHUMLAK, BRIAN NELSON, RAYMOND GOLINGO, ELLIOT CLAVEAU, University of Washington, LAWRENCE LIVERMORE NATIONAL LAB TEAM, UNIVERSITY OF WASHINGTON TEAM — The Z-pinch is a relatively simple and attractive potential fusion reactor design, but attempts to develop such a reactor have consistently struggled to overcome Z-pinch instabilities. The "sausage" and "kink" modes are among the most robust and prevalent Z-pinch instabilities, but theory and simulations suggest that axial flow-shear, $dv_z/dr \neq 0$, can suppress these modes. Experiments have confirmed that Z-pinch plasmas with embedded axial flow-shear display a significantly enhanced resilience to the sausage and kink modes at a demonstration current of 50kAmps. A new experiment is under way to test the concept at higher current, and efforts to model these plasmas are being expanded. The performance and stability of these devices will depend on features like the plasma viscosity, anomalous resistivity, and finite Larmor radius effects, which are most accurately characterized in kinetic models. To predict these features, kinetic simulations using the particle in cell code LSP are now in development, and initial benchmarking and 2D stability analyses of the sausage mode are presented here. These results represent the first kinetic modeling of the flow-shear stabilized Z-pinch.
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