Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

The Effect of Anomalous Resistivity on Electrothermal Instability Growth[1] ROBERT MASTI, BHUVANA SRINIVASAN, Virginia Tech, LELAND ELLISON, WILLIAM FARMER, KURT TUMMEL, Lawrence Livermore National Laboratory — The current driven ETI (Electrothermal instability) forms when the mate- rial resistivity is temperature dependent, occurring in nearly all Z-pinch-like high energy density platforms. High mass density ETI growth is predominantly striation form, magnetically perpendicular modes, because the resistivity tends to increase with temperature in this regime. In contrast, low mass density ETI growth is mainly filamentation form, magnetically aligned modes, because the resistivity tends to decrease with temperature. Simulations of ETI typically use a collisional form of the resistivity as provided, e.g., in a Lee-More Desjarlais conductivity table. However, in regions of low density, collisionless transport needs to be incorporated to properly simulate the filamentation form of ETI growth. Anomalous resistivity is an avenue by which these collisionless micro-turbulent effects can be incorporated into a collisional resistivity. For this work, 3D simulations of filamentation ETI explore the effect of anomalous resistivity. Additionally, newly derived theoretical forms of the filamentation ETI growth rate including anomalous resistivity are reproduced through simulation.

[1]A portion of work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract DE-AC52-07NA27344. This work is supported through the US Department of Energy under grant DE-NA0003881.

Robert Masti
Virginia Tech

Date submitted: 26 Jun 2020