Abstract Submitted
for the 4CS19 Meeting of
The American Physical Society

Numerical Calculations of the Superconducting Superheating Field within Eilenberger Theory[1] ALDEN PACK, MARK TRANSTRUM, Brigham Young University — The superheating field (Hsh) is the largest applied field a type ii superconductor can withstand before magnetic vortices nucleate. The movement of magnetic vortices in AC fields dissipates heat and can lead to quenching (a loss of superconductivity). This is a major bottleneck for superconducting resonant frequency cavities used in particle accelerators. Previously Hsh has been calculated using Ginzburg-Landau theory, which is valid close to the critical temperature (Tc). The operating temperature of SRF cavities is significantly lower than Tc. We calculate Hsh using Eilenberger in the clean limit, which is valid for general temperatures. This is done by first solving the Ginzburg-Landau equations for an initial guess of the order parameter and magnetic potential vector. We then numerically solve for when the first variation of the Eilenberger free energy is zero and then use the second variation to evaluate Hsh. We show that our calculations close to Tc match the results of Ginzburg-Landau theory.

[1]This work was supported by the U.S. National Science Foundation under Award PHY-1549132, the Center for Bright Beams.

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Date submitted: 13 Sep 2019 Electronic form version 1.4