

Abstract Submitted
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Waveguide Mode Analysis of Cyclotron Resonance Heating and Precision Magnetometry Inside Penning-Malmberg Trap¹ JONATHAN WURTELE, EUGENE KUR, ANDREW CHRISTENSEN, JOEL FAJANS, ERIC HUNTER, University of California, Berkeley — Recent experiments at UC Berkeley [1] have demonstrated precise magnetometry inside a Penning-Malmberg trap by using the structure of resonant heating peaks of a plasma exposed to microwave waveguide radiation. The collection of heating peaks shows electron cyclotron resonance along with sidebands coming from plasma rotation and axial bounce motion. By carefully modeling the peak structure, we identify the cyclotron frequency, providing a measurement of the magnetic field to a precision of 30 parts per billion. In the model, we consider a single electron in the presence of trapping fields, DC self-fields, and electromagnetic modes of a cylindrical waveguide. Evaluating the Lorentz force law to leading order in the Larmor radius produces resonances at the mode frequencies seen in the experiments. [1] Christensen, A., et. al. 60th Annual Meeting of the APS Division of Plasma Physics. American Physical Society. Oregon Convention Center, Portland, Oregon. 8 Nov. 2018. Poster Presentation.

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