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Testing of a First Order AC Magnetic Susceptometer RYAN FUKUDA, SMITHA SUNNY, PEI-CHUN HO, Department of Physics, California State University, Fresno, California — A first-order AC magnetic susceptometer has been constructed and tested to find the magnetic response of strongly correlated electron materials. The instrument works by using a primary coil to apply a small AC magnetic field of .104 Oe to a sample with a cylindrical coil space of length .635 cm and diameter .355 cm. A lock-in amplifier is used to monitor the induced voltage from a set of secondary coils. By coupling a temperature-controlled system with this instrument, the change in the magnetic signal with respect to temperature is measured. Monitoring the signal changes may indicate the temperature that causes the material to transition to either a ferromagnetic, anti-ferromagnetic, or superconducting state. A 122.47 mg Gd polycrystal was used to test our susceptometer. The data qualitatively agrees with the previous results of magnetization vs. temperature of Gd single crystals by Nigh et al. [1]: there is a steep increase in the pick-up signal at 300 K where Gd becomes ferromagnetic and a peak at 210 K [1]. This susceptometer will be used for our future investigation of magnetic properties of rare earth compounds and nanoparticles in the temperature range of 10 K to 300 K.

[1] H. E. Nigh, S. Legvold, and F. H. Spedding, Physical Review 132, 1092 (1963)

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