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Instrumentation for Cyclotron Resonance and Electron Spin Resonance in Pulsed Magnetic Fields CHRISTOPHER BEEDLE, Los Alamos Natl Lab, PAUL GODDARD, Warwick University, United Kingdom, NIEL HARRISON, Los Alamos Natl Lab, JAMIE MANSON, Eastern Washington University, ROSS MCDONALD, JOHN SINGLETON, Los Alamos Natl Lab — Electron spin resonance (ESR) and cyclotron resonance (CR) are vital in the study of electronic structure and magnetism of materials. For example, CR can yield the strength of electron-electron correlations via the dynamic mass, and determine the Fermi surface topology. However, very high magnetic fields are required to extend CR to heavy mass and/or disordered correlated-electron systems, and to cuprate superconductors, where the upper critical field must be exceeded. Similarly, magnetic fields $\sim$ 100 T in conjunction with high-frequency ESR could access the magnetic interactions in highly anisotropic spin-gap materials and molecular quantum magnets, probe phase transitions in $f-$electron systems, and examine the electronic structure of organic radicals. Pulsed magnets are therefore *required* for such ultra-high-field CR and ESR experiments; but the resulting extreme environment presents challenges in resonant cavity and waveguide design. In this presentation, we describe probe designs tailored to CR and ESR experiments spanning fields up to 100 T and frequencies from 40 GHz to 4 THz. These new techniques will be illustrated using experimental ESR data from organic quantum magnets.

Christopher Beedle
Los Alamos Natl Lab

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