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**Studying Superconductivity and Magnetism in $Y_9Co_7$ with a Tunnel Diode Resonator Circuit** R.T. GORDON, Western Illinois University, M.D. VANNETTE, Saginaw Valley State University, J. STRYCHALSKA, T. KLIMCZUK, Gdansk University of Technology, R.J. CAVA, Princeton University, R. PROZOROV, Ames Laboratory and Iowa State University — I will discuss recent tunnel diode resonator (TDR) circuit measurements on a single crystal of the material $Y_9Co_7$. This material displays a superconducting transition at T = 2.5 K and an unusual magnetic state at temperatures just above this transition, up to 8 K. The exact nature of this magnetic state is a point of contention among researchers and one of the goals of this study was to elucidate the details of this magnetism that is proximate to superconductivity. Another goal of this study was to search for signatures of an interaction between the superconducting and magnetic states. The magnetic susceptibility as a function of both temperature and magnetic field was measured using TDR circuits, which are radio frequency oscillators having parts-per-billion sensitivity to measure changes in physical properties of materials. Using both $^3$He and $^4$He cryostats mounted into superconducting magnet bores, this experiment was able to reach temperatures as low as 500 mK and magnetic fields as high as 9 T. The resulting measurements will be discussed and compared to TDR measurements done on other magnetic materials, especially $ZrZn_2$.

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