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Analyzing Magnetic Molecules Using TDR STEVEN YENINAS, RUSLAN PROZOROV, MARSHALL LUBAN, Iowa State University/Ames Laboratory — Since the early nineties, much interest has grown in the field of magnetic molecules due to the fact that at suitably low temperatures, intermolecular interactions can be ignored. As a result, studying crystalline samples can be reduced to analyzing the discrete spectrum of magnetic energy levels within an individual molecule. As the size and complexity of magnetic molecules continues to grow, we see that low temperature DC magnetization measurements are restricted to regions of ground state level crossings, demanding a more detailed experimental technique. However, using a tunnel diode resonator (TDR) to measure the dynamic magnetic susceptibility in the millikelvin range, we can probe the magnetic spectrum in both the ground state and low-lying excited states. The TDR technique has recently been used to investigate the magnetic molecules $Cr_{12}Cu_2$ and $Cr_{10}Cu_2$. When compared with theoretical quantum Monte Carlo (QMC) simulations, we find the TDR results to be in excellent agreement with the predicted energy spectrum. This demonstrates that the QMC model can be a valuable quantitative tool for predicting properties of magnetic molecules; as well, the TDR technique is demonstrated to be a unique and powerful tool for analyzing the magnetic spectrum.

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