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**Anomalous power dependence in the zero-field resonance for the molecular nanomagnet $Cr_7Mn$** C.A. COLLETT, Department of Physics, Amherst College, Amherst, MA, USA, G.A. TIMCO, R.E.P. WINPENNY, School of Chemistry, The University of Manchester, Manchester, UK, J.R. FRIEDMAN, Department of Physics, Amherst College, Amherst, MA, USA — We report electron-spin resonance studies of the paramagnetic ring $[(CH_3)_2NH_2][Cr_7MnF_8((CH_3)_3CCOO)_{16}]$ ("$Cr_7Mn$"), a spin S=1 molecular nanomagnet with a large zero-field ground-state tunnel splitting of $\sim$4 GHz. We perform parallel-mode electron-spin-resonance (ESR) spectroscopy with loop-gap resonators (LGRs) with resonance frequencies of 4-6 GHz. A crystal of $Cr_7Mn$ is placed on the loop of the LGR with the sample's easy axis parallel to the field. We observe an ESR peak at zero dc field. With increasing radiation power, a pronounced dip develops in the center of the resonance peak, indicating a decoupling of the sample from the resonator with increased power. The onset of this decoupling depends on both the temperature and the applied power, with greater power required to observe the dip at higher temperatures. By pulsing the radiation, we can rule out that the dip is related to sample heating or saturation of the resonance. Power, temperature, and frequency dependence of the decoupling will be presented, and possible explanations will be discussed.

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