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Observation and Theory of Intrinsic Ferromagnetism in Ferroelectric Materials J. LASHLEY, K. GOFRYK, D.J. SAFARIK, J.L. SMITH, Los Alamos National Laboratory, I.E. DZYALOSHINSKII, University of California, Irvine — Quantized waves obeying Bose-Einstein statistics will contribute a $T^{3/2}$ term to the specific heat if the dispersion relation goes as q2. We measure the magnetic and electric field dependence of the specific heat on the ferroelectric material tri-glycine sulphate (TGS) over the temperature range 0.05 K $<$ T $<$ 350 K. We detect a $T^{3/2}$ term in the specific heat in the low-temperature limit, which is taken to be the dielectric analog to magnetic spin wave. Near the Curie temperature (T_C = 320 K), the shape of the specific-heat anomaly is thermally broadened. However, the anomaly changes to the characteristic sharp lambda-shape expected for a continuous transition with the application of either a magnetic field or electric field, giving the expected entropy change at T_C of Rln2. These results are explained on the basis that the frequencies of optical dipole oscillations are split by the magnetic field, and the resulting gas of excitations are paramagnetic. Consequently they contribute to the specific heat near T_C, which increases with magnetic field.

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