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Thermodynamic and Magnetostriction Measuremetns of the Bose-Einstein Condensate $NiCl_2$-4SC$(NH_2)_2$ V.S. ZAPF, National High Magnetic Field Lab at Los Alamos National Lab, V. CORREA, NHMFL, Tallahassee, FL, D. ZOCCO, M. JAIME, N. HARRISON, A. LACERDA, NHMFL, LANL, C.D. BATISTA, T-11, LANL, T. MURPHY, E. PALM, S. TOZER, NHMFL, Tallahassee, FL, A. PADUAN-FILHO, Universidade de Sao Paulo, Brazil — We investigate Bose-Einstein condensation (BEC) of magnons in the organic magnet $NiCl_2$-4SC$(NH_2)_2$ (DTN). For magnetic fields applied along the tetragonal c-axis, the antiferromagnetically (AFM) ordered Ni spins can be recharacterized as a system of effective bosons with a hard-core repulsive interaction where the AFM transition corresponds to BEC. New, detailed data of the field-temperature phase diagram of DTN have been taken by means of thermodynamic measurements to dilution fridge temperatures. The magnetic field-temperature quantum phase transition line H_c-H_{c1} $\sim T^{\alpha}$ approaches a power law at low temperatures, with an exponent α at the quantum critical point that is consistent with the BEC theory prediction of $\alpha = 3/2$. In addition, new magnetostriction data at dilution refrigerator temperatures will be presented. In the AFM ordering regime, field-induced 2^{nd} order changes in the lattice parameters create field-dependent AFM and spin-orbit coupling parameters, which can in turn distort the phase diagram at high fields.

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