A direct measurement of the Bose-Einstein condensation universality class in $NiCl_2$-4SC$(NH_2)_2$ at ultra-low temperatures

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The experimental signature of field-induced BEC in the S=1 $NiCl_2$-4SC$(NH_2)_2$ is a power-law temperature-dependence of the number of condensed bosons with an exponent of 3/2. In this work, AC susceptibility measurements were performed down to 1mK. The Ni S=1 spins exhibit 3D XY anti-ferromagnetism between a lower critical field H_{c1} ~ 2T and a upper critical field H_{c2} ~ 12T. The result show a power-law temperature dependence of the phase transition line $H_{c1}(T) - H_{c1}(0) \sim T^{\alpha}$ with $\alpha = 1.47$ and $H_{c1}(0)$ = 2.055T, consistent with the 3D Bose-Einstein Condensation universality class.

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