Investigation of the magnetic susceptibility of the disordered BEC system $NiCl_{0.85}Br_{0.15}$-4SC(NH$_2$)$_2$ and $Ni_{0.85}Cd_{0.15}$-4SC(NH$_2$)$_2$ at ultralow-temperatures

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We report measurements of the magnetic susceptibility of a disordered BEC system of magnons for single crystals of $NiCl_{0.85}Br_{0.15}$-4SC(NH$_2$)$_2$ and $Ni_{0.85}Cd_{0.15}$-4SC(NH$_2$)$_2$. Both of them are the potential candidates for a Bose glass (BG) phase of the spins adjacent to a region of Bose-Einstein condensation (BEC). The BG to BEC phase is the bosonic analog of a metal-insulator transition for fermions. The measurements were carried out for temperatures down to 1mK and for applied magnetic fields up to 14.5 T. The results show that the critical fields H_c do not obey the conventional 3D universality class for a BEC, $H_c(T) - H_c(0) \sim T^{\alpha}$, where $\alpha \sim$1.5. The values of α changes from $\sim$1.5 above $\sim$200 mK to 1.1$\sim$0.9 below $\sim$200 mK, indicating a crossover to possible BG behavior. This observed crossover behavior is in agreement with the numerical simulations of Quantum Monte Carlo in this system.