Magnetic Bose condensation vs. magnon localization in a model magnet with site dilution$^1$ TOMMASO ROSCILDE, Ecole Normale Superieure - Lyon, STEPHAN HAAS, University of Southern California, RONG YU, University of Tennessee - Knoxville — We report on the theoretical field-temperature phase diagram of anisotropic coupled $S=1$ chains with site dilution, modeling the magnetic behavior of doped NiCl$_2$-tetrakis thiourea (DTN). In absence of doping, this compound clearly displays field-induced Bose-Einstein condensation of magnons [V. Zapf et al., Phys. Rev. Lett. 98, 047205 (2007)], as revealed by the mean-field scaling of the field-induced ordering temperature, $T_c \sim |H - H_c|^{\phi}$ with $\phi = 2/3$. The critical field $H_c$ corresponds to a $T=0$ quantum phase transition (QPT) between a spin gap phase and a gapless ordered phase. Here we show that site dilution opens a novel gapless spin-liquid phase close to the ordering transition, corresponding to a Bose glass phase of localized magnons. Disorder leads to a radical change in the universality class of the QPT (which turns into a quantum percolation transition), and in the critical temperature scaling, which exhibits a novel universal exponent $\phi \approx 1.2$. A crossover to mean-field scaling of $T_c$ at finite temperature is observed, and explained via a scenario of thermal percolation of magnons.

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