Abstract Submitted
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Effect of site disorder on the ground state of a frustrated spin dimer quantum magnet[1] ALEXANDER HRISTOV, MAXWELL SHAPIRO, Stanford University, MINSEONG LEE, LINSEY RODENBACH, EUN SANG CHOI, JU-HYUN PARK, NHMFL, Florida State University, TIM MUNSIE, GRAEME LUKE, McMaster University, IAN FISHER, Stanford University — $Ba_3Mn_2O_8$ is a geometrically frustrated spin dimer quantum magnet. Pairs of Mn $^{5+}$ ($S = 1$) ions are strongly coupled via antiferromagnetic exchange to yield a singlet ground state, with excited triplet and quintuplet states. Isovalent substitution of V^{5+} ($S = 0$) for Mn breaks dimers, resulting in unpaired $S = 1$ spins, the ground state of which is investigated here for compositions spanning the range $0 \leq x \leq 1$ of $Ba_3(Mn_{1-x}V_x)_2O_8$. From a theoretical perspective, for dimers occupying an unfrustrated bipartite lattice, such site disorder is anticipated to yield long range magnetism for unpaired Mn spins both in the dilute limit where x is small, a phenomena known as order-by-disorder, and in the proximity of $x = 1/2$ where the system is maximally disordered and close to a percolation threshold. In this frustrated system, however, our experiments find evidence of spin freezing for six compositions $0.05 \leq x \leq 0.85$. In this regime, we find entropy removed at an energy scale independent of the freezing temperature. We discuss the possibility of a spin-glass to random singlet transition for critical compositions in the two dilute limits $x \to 0$ and $x \to 1$.

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