Effect of site disorder on the ground state of a frustrated spin dimer quantum magnet\textsuperscript{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\textsubscript{3}Mn\textsubscript{2}O\textsubscript{8} is a geometrically frustrated spin dimer quantum magnet. Pairs of Mn \textsuperscript{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\textsuperscript{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\textsubscript{3}(Mn\textsubscript{1-x}V\textsubscript{x})\textsubscript{2}O\textsubscript{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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