Ground States of a Disordered Frustrated Quantum Dimer Magnet\textsuperscript{1} ALEXANDER HRISTOV, MAXWELL SHAPIRO, IAN FISHER, Stanford University, MINSEONG LEE, LINSEY RODENBACH, ASHLEY BERNHEISEL, EUN SANG CHOI, JU-HYUN PARK, Florida State University, LEONARDO CIVALE, Los Alamos National Laboratory, TIM MUNSIE, GRAEME LUKE, McMaster University — We present results of thermodynamic measurements of the site-diluted spin-dimer magnet Ba$_3$(Mn$_{1-x}$V$_x$)$_2$O$_8$, including magnetization, torque magnetometry, and AC susceptibility. The parent compound Ba$_3$Mn$_2$O$_8$ is a frustrated $S=1$ quantum dimer-magnet with a singlet ground state, and triplet and quintuplet excitations. A magnetic field can be used to tune the energy spectrum of this system, yielding successive triplet and quintuplet condensates at low temperatures. Site substitution with $S=0$ V breaks Mn-dimers, introducing site disorder into the high-field ordered states. This substitution also introduces unpaired $S=1$ Mn ions, and it has been an open question whether such spins order at low temperatures. Here, we present evidence of the spin-freezing of unpaired Mn ions below 240mK for all compositions measured, from $x=0.05$ to 0.85. We also present the evolution of the high field ordered state with increasing disorder.

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