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Dispersive excitations in the S = 1 antiferromagnet $Ba_3Mn_2O_8$ MATTHEW STONE, MARK LUMSDEN, Neutron Scattering Science Division, Oak Ridge National Laboratory, ERIC SAMULON, Department of Applied Physics and Geballe Laboratory, Stanford University, YIMING QIU, Department of Materials Science and Engineering, University of Maryland, CRISTIAN BATISTA, Theoretical Division, Los Alamos National Laboratory, IAN FISHER, Department of Applied Physics and Geballe Laboratory — We present powder inelastic neutron scattering measurements on the S = 1 dimerized antiferromagnet Ba₃Mn₂O₈. The measured T = 1.4 K magnetic spectrum exhibits a spin-gap of $\Delta = 0.99$ meV and a dispersive spectrum with a bandwidth of approximately 1.67 meV. Comparison to a coupled dimer model of the dispersion and scattering intensity yields an accurate description of the exchange constants in $Ba_3Mn_2O_8$. Interdimer exchange between the stacked triangular lattice dimer bilayers is found to be two orders of magnitude weaker than the intradimer exchange resulting in a quasi-two-dimensional frustrated bilayer triangular lattice. The wave- vector dependent scattering intensity also confirms the proposed S = 1 dimer bond. Temperature dependent measurements of the magnetic excitations indicate the presence of both singlet- triplet and thermally activated triplet-quintet excitations, with temperature dependent damping and spin-gap consistent with current models for weakly coupled quantum spin-liquids.

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