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High-Frequency EPR Studies of the Antiferromagnet Spin Dimer Compound $Ba_3Mn_2O_8$ CHANGHYUN KOO, STEPHEN HILL, Department of Physics, University of Florida, Gainesville, FL 32611; NHMFL and Department of Physics, FSU, Tallahassee, FL 32310, ERIC C. SAMULON, IAN R. FISHER, Geballe Laboratory for Advanced Materials and Department of Applied Physics, Stanford University, Stanford, CA 94305 — $Ba_3Mn_2O_8$ is a triangular lattice antiferromagnetic spin-dimer system based on pairs of spin $S = 1$ Mn^{5+} ions. In zero-field, $Ba_3Mn_2O_8$ possesses a singlet ground state. Meanwhile, application of a large magnetic field induces several ordered phases associated with the closing of gaps to the excited triplet and quintet states. Field orientation dependent high frequency electron paramagnetic resonance (HFEPR) measurements for a single crystal of $Ba_3Mn_2O_8$ have been carried out in fields up to 45 T using the hybrid magnet at the National High Magnetic Field Laboratory. Broad low-frequency transitions are observed in the field ranges close to $\sim$9 T and $\sim$32 T, suggesting inter-spin multiplet excitations. Sharper resonances are observed at higher frequencies, which persist to 42 T. Meanwhile, low-field studies provide information on the magnetic anisotropy of the system, which is of the easy-plane type with $D = +0.375$ K. We attempt to account for the observed HFEPR spectra in the context of a model recently developed to explain the magnetic properties of this compound [E. C. Samulon et al., Phys. Rev. B **77**, 214441 (2008)].

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