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Mapping the Phase Diagram of RMMO4 Compounds in Pursuit of the Coveted Quantum Spin Liquid state WILLIAM STEINHARDT, CASEY MARJERRISON, Duke University, YAOHUA LIU, SACHITH DISSANAYAKE, Oak Ridge National Laboratory, DAVID GRAF, National High Magnetic Field Laboratory, MARCUS DAUM, MARTIN MOURIGAL, Georgia Institute of Technology, SARA HARAVIFARD, Duke University — Recently the rare earth RMMO4 systems (where R = rare earth, M and M = transition or main group) have been suggested as strong spin-orbit coupled quantum spin liquid candidates. In these systems, effective spin-half moments arising from odd numbers of electrons per unit cell lie on a planar, geometrically frustrated triangular lattice. We have synthesized large high-quality single crystals of a variety of these compounds using the optical floating zone technique. In this talk we present our recent x-ray and neutron scattering results at extreme environmental conditions as well as magnetization measurements, and discuss the induced quantum critical phenomena and the phase diagram for this family of materials as a function of site mixing, substitution, magnetic field, pressure, and temperature.

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