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Probing Spin Excitations Using Magneto-Raman Spectroscopy
K. THIRUNAVUKKUARASU[1], Z. LU, National High Magnetic Field Laboratory, Tallahassee, FL, J. SIMPSON, Department of Physics, Towson University, MD, A. WALKER, National Institute of Standards and Technology, Gaithersburg MD, J. SEARS, Y.-J. KIM, Department of Physics, University of Toronto, Canada, K. BURCH, Department of Physics, Boston College, MA, D. SMIRNOV, National High Magnetic Field Laboratory, Tallahassee, FL — The presence of a 2D quantum spin liquid state was recently suggested for the spin-orbit coupled Mott insulator α-$RuCl_3$ with a honeycomb lattice.[Phys. Rev. 90, 041112 (2014)] Optical spectroscopy, Raman scattering, specific heat as well as magnetic susceptibility measurements on α-$RuCl_3$ identified elementary excitations due to electronic correlations and spin-orbit coupling.[arXiv:1503.07593, Phys. Rev. Letters 114, 147201 (2015), and Phys. Rev. 91, 144420 (2015)] These observations appear to be consistent with theoretical expectations for Heisenberg-Kitaev model for QSL.[Phys. Rev. 91, 241110 (2015)] The underlying mechanism for the unconventional magnetism in α-$RuCl_3$ was further investigated by probing the effect of external magnetic field on the Raman spectroscopic signatures. Raman scattering experiments were performed at temperatures down to 5 K and magnetic fields up to 10 T. The intensity of strongest A_{1g} phonon was found to decrease with increasing magnetic field strength suggesting the presence of strong magnetic interactions. The experimental observations and its implications will be presented.

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