Isotropic and anisotropic regimes of the spin-dynamics in Sr$_2$IrO$_4$ : Field-dependent Raman scattering study$^1$ Y. GIM, A. SETHI, Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, 104 South Goodwin Avenue, Urbana, Illinois 61801-2902, Q. ZHAO, J.F. MITCHELL, Material Science Division, Argonne National Laboratory, Argonne, Illinois 60439, USA , G. CAO, Center for Advanced Materials, University of Kentucky, Lexington, Kentucky 40506, USA, S.L. COOPER, Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana-Champaign, 104 South Goodwin Avenue, Urbana, Illinois 61801-2902 — Experimental studies of the strong spin-orbit coupled material, Sr$_2$IrO$_4$, have provided evidence that the spin dynamics of this material can be described by an isotropic two-dimensional effective Heisenberg description. To study how well this description describes the spin-dynamics of Sr$_2$IrO$_4$ in different magnetic field regimes, in this talk, we present field-dependent Raman scattering studies of the low-energy spin-dynamics in Sr$_2$IrO$_4$. We find that for $H>$1.5 T, the spin-dynamics of Sr$_2$IrO$_4$ are well described by an isotropic, 2D description. However, at low fields, $H<1.5$ T, the spin dynamics show evidence for the effects of in-plane anisotropy and interlayer coupling. These effects must therefore be considered when modeling the low-field magnetic and dynamical properties of Sr$_2$IrO$_4$.

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