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Singlet-triplet excitations and long range entanglement in the spin-orbital liquid candidate $FeSc_2S_4$[1] N.J. LAURITA, Institute of Quantum Matter, Johns Hopkins University, J. DEISENHOFER, University of Augsburg, LIDONG PAN, C.M. MORRIS, Institute of Quantum Matter, Johns Hopkins University, M. SCHMIDT, University of Augsburg, M. JOHNSSON, Stockholm University, V. TSURKAN, University of Augsburg, Academy of Sciences of Moldova, A. LOIDL, University of Augsburg, N.P. ARMITAGE, Institute of Quantum Matter, Johns Hopkins University — Theoretical models of the spin-orbital liquid (SOL) $FeSc_2S_4$ have predicted it to be in close proximity to a quantum critical point separating a spin-orbital liquid phase from a long-range ordered magnetic phase. Here, we examine the magnetic excitations of $FeSc_2S_4$ through time-domain terahertz spectroscopy under an applied magnetic field. At low temperatures an excitation emerges that we attribute to a singlet-triplet excitation from the SOL ground state. A three-fold splitting of this excitation is observed as a function of applied magnetic field. Using experimentally obtained parameters we compare to existing theoretical models to determine $FeSc_2S_4$'s proximity to the quantum critical point and establish $FeSc_2S_4$ as a SOL with long-range entanglement.

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