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**Terahertz excitations of spin-orbital ground state in multiferroic $Sr_2FeSi_2O_7$** THUC MAI, C. SVOBODA, E.V. JASPER, M.T. WARREN, J. BRANGHAM, Department of Physics, The Ohio State University, Columbus OH 43210, S-W. CHEONG, Rutgers Center for Emergent Materials, Rutgers University, T-H. HWAN, POSTECH, South Korea, R. VALDÉS AGUILAR, Department of Physics, The Ohio State University, Columbus OH 43210 — We studied the elementary excitations in $Sr_2FeSi_2O_7$, a novel multiferroic material, using time domain terahertz spectroscopy. We found 3 absorption modes above the Néel temperature. These modes can be described as optical transitions between the $Fe^{2+}$ $3d^6$ energy levels, that are split by the compressive tetrahedral crystal field and spin orbit coupling. The excitations from the singlet spin-orbital ground state to the upper doublets are both magnetic and electric dipole active. We explored the behavior of these transitions at temperatures below $T_{N\acute{e}el}$, and as a function of external magnetic field, applied along different crystalline axes.

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