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Magnetic Excitation Spectrum of $\mathbf{FeTe_{1-x}Se_x}$ M.D. LUMSDEN, A.D. CHRISTIANSON, Oak Ridge National Laboratory, E.A. GOREMYCHKIN, Argonne National Laboratory, S.E. NAGLER, H.A. MOOK, M.B. STONE, D.L. ABERNATHY, Oak Ridge National Laboratory, T. GUIDI, Rutherford Appleton Laboratory, G.J. MACDOUGALL, Oak Ridge National Laboratory, C. DE LA CRUZ, University of Tennessee, A.S. SEFAT, Oak Ridge National Laboratory, M.A. MCGUIRE, B.C. SALES, D. MANDRUS, Oak Ridge National Laboratory — The magnetic excitation spectrum of single crystal samples of the bulk superconductor $FeTe_{0.51}Se_{0.49}$ and $Fe_{1.04}Te_{0.73}Se_{0.27}$ (not a bulk superconductor) have been studied using inelastic neutron scattering. Both samples exhibit incommensurate magnetic excitations despite the lack of long-range magnetic order. These incommensurate excitations are very two-dimensional in nature and persist to energies greater than 250 meV. The incommensurate excitations originate from a 2d wavevector near (1/2, 1/2), where the resonance was observed for the bulk superconductor $FeTe_{0.51}Se_{0.49}$, and broaden with increasing energy transfer. The spectrum exhibits four-fold symmetry about the (1,0) wavevector (the square lattice (π, π) point) consistent with the symmetry of the underlying Fe square lattice. The excitations can be characterized by the same model and the incommensuration is parameterized by the same wavevector as the high-T_C cuprates demonstrating commonality in the magnetism of these two classes of unconventional superconductors.

Mark Lumsden
Oak Ridge National Laboratory

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