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Friedel-like Oscillations from Interstitial Iron in Superconducting $\mathbf{Fe_{1+y}Te_{0.62}Se_{0.38}}$[1] VIVEK THAMPY, Johns Hopkins University, J. KANG, Institute for Quantum Matter, Johns Hopkins University, J.A. RODRIGUEZ-RIVERA, NIST Center for Neutron Research, W. BAO, Department of Physics, Renmin University of China, A.T. SAVICI, NSSD, Oak Ridge National Laboratory, J. HU, T.J. LIU, B. QIAN, D. FOBES, Z.Q. MAO, Department of Physics, Tulane University, C.B. FU, Department of Physics, Indiana University, W.C. CHEN, Department of Materials Science and Engineering, University of Maryland, Q. YE, NSSD, Oak Ridge National Laboratory, R.W. ERWIN, NIST Center for Neutron Research, T.R. GENTILE, National Institute of Standards and Technology, Z. TESANOVIC, C. BROHOLM, Institute for Quantum Matter, Johns Hopkins University — Using polarized and unpolarized neutron scattering we show that interstitial Fe in superconducting $Fe_{1+y}Te_{1-x}Se_x$ induces a magnetic Friedel-like oscillation that diffracts at $\mathbf{Q}_\perp = (\frac{1}{2}0)$ and involves >50 neighboring Fe sites. The interstitial $> 2\ \mu_B$ moment is surrounded by compensating ferromagnetic four spin clusters that may seed double stripe ordering in $Fe_{1+y}Te$. A semi-metallic 5-band model with $(\frac{1}{2}\frac{1}{2})$ Fermi surface nesting and four fold symmetric super-exchange between interstitial Fe and two in-plane nearest neighbors largely accounts for the observed diffraction.

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