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Copper-tuned magnetic order and excitations in iron-based superconductors Fe1+yTe1-xSex[1] JINSHENG WEN, University of California at Berkeley, ZHIJUN XU, GUANGYONG XU, Brookhaven Natl Lab, MARK LUMSDEN, MASAAKI MATSUDA, Oak Ridge Natl Lab, PATRICK VALDIVIA, UC Berkeley, EDITH BOURRET, Lawrence Berkeley Lab, DUNGHAI LEE, UC Berkeley, GENDA GU, JOHN TRANQUADA, Brookhaven Natl Lab, ROBERT BIRGENEAU, UC Berkeley — We report neutron scattering results on the Cu-substitution effects in the iron-based superconductors, $Fe_{1+y}Te_{1-x}Se_x$. In the parent compound, it is found that Cu drives the low-temperature magnetic ground state from long-range commensurate antiferromagnetic order in $Fe_{1.06}TeCu_{0.04}$ to short-range incommensurate order in $FeTeCu_{0.1}$. In the former sample, the structural and magnetic ordering temperature is 40 K; in $FeTeCu_{0.1}$, the structural phase transition is not obvious and a transition to the spin-glass state is found at 22 K. Cu suppresses superconductivity in $FeTe_{0.5}Se_{0.5}$—T_c is reduced to 7 K with a 2% Cu doping, and no superconductivity is found in the 10% Cu-doped sample. In the meantime, the intensity and energy of the resonance mode are suppressed in the 2% Cu-doped sample, while there is no resonance in the non-superconducting sample. Besides, the low-temperature magnetic excitation spectra are distinct for these two samples, with the superconducting one having an "hour-glass" shape and the other one having a "waterfall" shape. Our results provide further insights on the interplay between magnetism and superconductivity in the iron-based superconductors.

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