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Effect of hydrostatic pressure on the structural and magnetic transitions in FeSe K. KOTHAPALLI*, A. E. BÖHMER*, W. T. JAYASEKARA*, P. DAS*, A. SAPKOTA*, B. G. UELAND*, V. TAUFOUR*, S. L. BUD'KO*, P. C. CANFIELD*, Y. XIAO+, A. I. GOLDMAN, A. KREYSSIG*, *Ames Laboratory, Dept. of Phys. and Astro., Iowa State University, IA, USA; +Argonne National Laboratory, Argonne, IL, USA — The phase diagram of FeSe is unique among all the iron-based superconductors. At ambient pressure, FeSe undergoes a tetragonal-to-orthorhombic structural phase transition at $T_s = 90$ K, and becomes superconducting below $T_c = 8$ K. Unlike other iron-based materials, it does not magnetically order down to the lowest measured temperature (T). However, under the application of hydrostatic pressure (p), a new magnetic phase is stabilized starting from $\sim$1 GPa. Higher pressure increases T_c, whose maximum onset reaches a surprising 37 K at $\sim$7 GPa. We investigate the p-T phase diagram using high-quality vapor-grown single crystals, which shows features not seen previously in powder and mixed-phase samples. Specifically, using high-pressure low-temperature diffraction and synchrotron Mössbauer we elucidate the effect of pressure - evolution of orthorhombic distortion and emergence of magnetic ordering - in the vicinity of the crossover region of the structural, magnetic and superconducting transitions.
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