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In Plane Resistivity Anisotropy in iron Chalcogenides[1]

JIUN-HAW CHU, CHRIS KUCHARCZYK, IAN FISHER, Stanford University — FeTe suffers a bicolinear antiferromagnetic ordering, with a $(\frac{1}{2}\ 0)$ ordering wave-vector, in contrast to the $(\frac{1}{2}\ \frac{1}{2})$ ordering wave-vector found in underdoped "122" and "1111" iron pnictides. At the optimal doping the static $(\frac{1}{2}\ 0)$ order disappears and a spin resonance at the $(\frac{1}{2}\ \frac{1}{2})$ wave-vector emerges. Here we report measurements of the in-plane resistivity anisotropy of single crystals of $Fe_{1+\delta}Te_{1-x}Se_x$ for underdoped and optimally doped compositions. The underdoped compounds were partially detwinned by applying uni-axial strain along the $(\frac{1}{2}\ 0)$, revealing a larger resistivity along the antiferromagnetic ordering direction. However, for optimal doping uni-axial strain induces the largest resistivity anisotropy along the $(\frac{1}{2}\ \frac{1}{2})$ direction, similar to the "122" family of compounds. This behaviour suggests that in addition to the presence of spin resonance, a divergent nematic susceptibility might be a key feature associated with optimal doping in iron based superconductors.

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