Field Angle Dependence of Vortex Lattice Structure in KFe_2As_2

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The current challenge in iron-based superconductors is to determine the symmetry of the superconducting gap, with a view to identifying the pairing mechanism. Our investigation of the vortex lattice (VL) in KFe_2As_2 (T_c = 3.6 K)[1] have made a prominent contribution to this debate. Measurements of the vortex lattice with the magnetic field applied parallel to the c-axis found no VL structural transitions up to $0.5H_{c2}$, ruling out a strong basal plane anisotropy. However, the diffracted intensity at 0.1 T varied strongly with temperature down to 50 mK, indicating a range of gaps extending down to very low values. This is consistent with having multiple full superconducting gaps on different Fermi sheets or, alternatively, a nodal gap, but with the nodal lines horizontal, circulating around the approximately cylindrical sheets of the Fermi surface. In the present study, by using the technique of small angle neutron scattering, we have extended our measurements of the vortex lattice in KFe_2As_2. We applied the magnetic field at multiple angles away from the c-axis, which allowed us to probe penetration depth anisotropy and possible unconventional effects. We will discuss the superconducting symmetry of the pnictide superconductors. [1] H. Kawano-Furukawa *et al.*, arXiv:1005.4468v2