Model for nodal quasiparticle scattering in a disordered vortex lattice

MARIANNA MALTSEVA, PIERS COLEMAN, Rutgers University — Recent experiments by T. Hanaguri et al. on underdoped Ca$_2$-xNaCuO$_2$Cl$_2$ [1] have observed quasiparticle interference effects [2], which are sensitive to the sign of the d-wave order parameter. In a magnetic field, they observe a sizable transfer of scattering spectral weight from scattering events between anti-nodes of opposite sign to scattering events between anti-nodes of the same sign. We interpret high momentum phase-coherent scattering in terms of the quasiparticle scattering off the vortex walls. The reduction of scattering at even-odd scattering points indicates that the vortices “screen” some of the underlying impurity scattering, as the impurities get trapped inside the vortex cores.