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Echolocation of Scatterers by Quasiparticles in Cuprate Superconductors SUMIRAN PUJARI, CHRISTOPHER HENLEY, Cornell University — How much can STM techniques tell us about the realization of disorder in a particular sample under study? We propose a new method of STM-data analysis which allows for the determination of the position and strength of impurities/scatterers. Furthermore, for cuprates, it can potentially be used to distinguish if the scatterer is "ordinary" or "anomalous" [1], i.e. part of the pairing potential. The method relies on quasiparticle interference [2] as observed in cuprates[3]. As for much of the STM phenomenology in cuprates[1–3], our starting point is the existence of well-defined Bogoliubov quasiparticles defined by a quadratic phenomenological Hamiltonian with intrinsic disorder. By *Energy* "Fourier-Transform"ing the measured local density of states (LDOS) spectrum from a single point, one can extract the "echo" time that a quasiparticle takes to go to and return from a nearby scatterer; doing this at several points in a local patch allows a "sonar"-like echolocation of the scatterer. This method is complementary to Fourier-Transform Scanning Tunneling Spectroscopy [3] wherein *Space* Fourier transforms of LDOS data yield the quasiparticle dispersion.

[1]T. S. Nunner et al, Phys. Rev. B, **73**, 104511 (2006)
[2]Q. Wang and D.-H. Lee, Phys. Rev. B **67**, 020511 (2003)
[3]K. McElroy et al, Nature, **422**, 592 (2003)

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