

Abstract Submitted
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Measuring the inertial mass of a vortex in the cuprate superconductors LORENZ BARTOSCH, SUBIR SACHDEV, Yale University, LEON BALENTS, University of California, Santa Barbara — Scanning tunneling microscopy measurements by Hoffman *et al.* [1] on the vortex lattice of $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$ exhibit halos in the vicinity of each vortex with modulations in the tunneling conductance at a period close to 4 lattice spacings. We discuss these observations in the light of a novel theory for superfluids in the vicinity of a Mott transition [2]. Such superfluids have a ‘quantum order’ which is reflected in a degeneracy in the vortex excitation spectrum, and leads to modulations when a vortex is localized. Our interpretation implies that the size of the halos is determined by the zero-point fluctuations of the quantum vortices. We will show how the existing scanning tunneling microscopy measurements, when combined with measurements of the London penetration length, lead to a quantitative estimate of the vortex inertial mass.

References

- [1] J. E. Hoffman *et al.*, *Science* **295**, 466 (2002).
- [2] L. Balents, L. Bartosch, A. Burkov, S. Sachdev, and K. Sengupta, [cond-mat/0408329](#), [cond-mat/0409470](#).

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