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On the possibility of fast vortices in the cuprates: A vortex plasma model analysis of THz conductivity and diamagnetism in La<sub>2-x</sub>Sr<sub>x</sub>Cu<sub>4</sub> Source

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## Abstract

We present measurements of the fluctuation superconductivity in an underdoped thin film of La<sub>1.905</sub>Sr<sub>0.095</sub>CuO<sub>4</sub> using time-domain THz spectroscopy. We compare our results with measurements of diamagnetism in a similarly doped crystal of La<sub>2-x</sub>Sr<sub>x</sub>Cu<sub>4</sub>. We show through а vortex-plasma model that if the fluctuation diamagnetism solely originates in vortices, then they must necessarily exhibit an anomalously large vortex diffusion constant, which is more than two orders of magnitude larger than the Bardeen-Stephen estimate. This points to either the extremely unusual properties of vortices in the underdoped d-wave cuprates or a contribution to the diamagnetic response that is not superconducting in origin. (35 References).