Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Theory of quantum fluctuating superconductivity in incoherent metals LUCA DELACRETAZ, Department of Physics, Stanford University, RICHARD DAVISON, Department of Physics, Harvard University, BLAISE GOUTERAUX, SEAN HARTNOLL, Department of Physics, Stanford University
— Quantum superconducting fluctuations can be important in two-dimensional, disordered thin films. They lead to the appearance of a metallic state characterized by a non-zero resistivity. We construct an effective description of superfluid hydrodynamics where the phase of the order parameter is relaxed, due to Coulomb interactions or the motion of vortices for instance. We predict there should be a Drude-like or a cyclotron-like pole in the spectrum, and corresponding sharp peaks in the optical conductivity. In some cases the finite electrical conductivity in the phase-fluctuating metallic state is found to be related in a novel way to the thermal conductivity of the normal state.

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Date submitted: 06 Nov 2015 Electronic form version 1.4