Abstract Submitted
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Theory of quantum magneto-oscillations in underdoped cuprate superconductors[1] SASHA ALEXANDROV, Loughborough University — Magneto-oscillations in kinetic and magnetic response functions of a few underdoped cuprates are perhaps one of the most striking observations since many probes of underdoped cuprates clearly point to a non Fermi-liquid normal state. Their observation in the vortex state well below the upper critical field raises a doubt concerning their normal state origin. Here I propose an explanation of the magneto-oscillations as emerging from the quantum interference of the vortex lattice and checkerboard modulations of the electron density of states revealed by STM with atomic resolution in some cuprate superconductors. The checkerboard effectively pins the vortex lattice, when the period of the latter is commensurate with the period of the checkerboard. This condition yields $1/\sqrt{B}$ periodicity of the response functions, rather than $1/B$ periodicity of conventional normal state oscillations periodic versus inverse magnetic field B. Our solution of the Gross-Pitaevskii-type equation for composed charged bosons accounts for the d-wave symmetry of the order-parameter and its checkerboard modulations, and describes well changes in resonant frequency of the tunnel-diode oscillator circuit with $YBa_2Cu_4O_8$ and the oscillatory part of the Hall resistance in the mixed state of $YBa_2Cu_3O_{6.5}$.

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