

de Haas-van Alphen oscillations in underdoped and overdoped high-temperature superconductors

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We report de Haas-van Alphen (dHvA) measurement in underdoped YBa₂Cu₃O_{6.5} [1] and overdoped Tl₂Ba₂CuO₆+? [2] cuprates via a torque technique down to low temperature (0.7K) and up to high magnetic field (59T). dHvA oscillations are a thermodynamic signature of a close and coherent Fermi surface (FS). Fits to the standard Lifshitz-Kosevich theory allows the frequency (proportional to the area of the FS), the cyclotron mass and the scattering rate to be extracted. Our measurements show a drastic change in the FS topology from small pocket at low doping to large cylinder in the overdoped regime. Our measurements in association with Hall effect [4] suggest that a Fermi surface reconstruction occurs in the underdoped side of the phase diagram. Moreover, high resolution dHvA measurement displays multiple frequencies [3] which point out that c axis coherence is restored at low temperature.

[1]: C. Jaudet et al., Phys. Rev. Lett. 100, 187005 (2008)

[2]: B.Vignolle et al., Nature 455, 952 (2008)

[3]: A. Audouard et al., PRL in Press

[4]: D. LeBoeuf et al., Nature 450, 533 (2008)