Contribution ID: **154** Type: **Poster**

Towards understanding the c-axis infrared response of underdoped cuprate superconductors

Tuesday 24 July 2012 20:00 (2 hours)

Dominik Munzar and Jiri Vasatko,
Department of Condensed Matter Physics, Faculty of Science, and Central
European Institute of Technology,
Masaryk University, Kotlarska 2, 611 37 Brno, Czech Republic

The c-axis infrared (IR) conductivity of underdoped high-Tc cuprate superconductors reveals a pronounced pseudogap (PG) and, for materials with two CuO2 planes per unit cell, signatures of coherent electronic coupling within the pair of closely spaced planes, in particular the so-called transverse plasma mode (TPM) located around 400 cm-1. The PG develops below T*much greater than Tc, the TPM below Tons, Tc less than Tons much less than T*. We report on results of our recent studies aiming at understanding these phenomena. (a) The formulas frequently used to describe the c-axis response of the coupled electron-phonon system of bilayer cuprate superconductors, that were originally obtained at the level of the phenomenological multilayer model (MLM), have been derived by using diagrammatic perturbation theory [1,2]. This provides a support for several important findings based thereon, in particular those of [3]. (b) The reported magnetic field (H perpendicular to the planes) induced changes of the TPM [4,3] have been clarified using the MLM [5]. Results of our analysis suggest that the response at H=0 and T=Tc is close to that at H = ca 25 T less than Hc2 and T much less than Tc, in accord with theories attributing the above Tc state to that of a superconductor lacking the long range phase coherence. (c) The qualitative difference between the manifestations of the PG in the c-axis IR response and those in the in-plane one belongs to major unsolved problems in the physics of the cuprates. In the third part of our contribution, implications of the MIR data reported by Yu et al. [6] will be discussed.

[1] J. Chaloupka, C. Bernhard, D. Munzar, Phys. Rev. B 79, 184513 (2009).
[2] J. Vasatko and D. Munzar, submitted to Phys. Rev. B, cond-mat 1203.6523v1.
[3] A. Dubroka et al., Phys. Rev. Lett. 106, 047006 (2011).
[4] A. D. LaForge et al., Phys. Rev. B 76, 054524 (2007).
[5] J. Marek and D. Munzar, Journ. of Phys.: Condensed Matter 23, 415703 (2011).
[6] L. Yu et al., Phys. Rev. Lett. 100, 177004 (2008).

Author: MUNZAR, Dominik (Masaryk University)

Presenter: MUNZAR, Dominik (Masaryk University)

Session Classification: Poster Session 2

Track Classification: High-Tc Cuprates