

Insights into charge stripe order in a co-doped cuprate superconductor from nonlinear response

Damjan Pelc^{1*}, M. Došlić¹, H.-J. Grafe², S.-H. Baek² and M. Požek¹

¹Department of Physics, Faculty of Science, University of Zagreb, Bijenička 32, HR-10000 Zagreb, Croatia

²IFW Dresden, Institute for Solid State Research, P.O. Box 270116, D-01171 Dresden, Germany

*dpelc@phy.hr

We present a study of the charge-stripe ordered phase and unconventional precursor ordering in the lanthanum cuprate $\text{La}_{2-x-y}\text{Eu}_y\text{Sr}_x\text{CuO}_4$ (LESCO) using nonlinear conductivity. The experiment is made possible through an innovative contactless nonlinear response measurement setup [1], eliminating the usual heating problems and enabling insight into the collective dynamics of charge stripes and the mechanism of their melting. In the charge-ordered phase, we find a clear signature of stripe pinning in the nonlinear response, obtaining a detailed picture of the pinning mechanism for the first time [2]. Above the charge-stripe transition (as detected by scattering techniques) we observe an additional, unconventional ordered phase, its onset characterized by a sharp peak in nonlinear conductivity. Other experimental techniques (such as nuclear quadrupole resonance and specific heat) also detect the novel phase, further elucidating its nature; by comparing the results to a strong-coupling theory of charge stripe melting, this additional phase is identified as possible electron nematic ordering, which remains translationally invariant while breaking local orientational symmetry [3]. We thus show that the stripe melting physics is intricate in LESCO, and discuss the implications for other cuprates possessing charge and related stripe order.

[1] M. Došlić, D. Pelc and M. Požek, *Rev. Sci. Instrum.* **85**, 073905 (2014)

[2] M. Došlić, D. Pelc et al., *in preparation*

[3] D. Pelc, M. Došlić, H.-J. Grafe, S.-H. Baek, M. Požek, arxiv:1406.7836 (2014)