

Charge density waves in cuprates outside the pseudogap regime

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It is commonly accepted that charge density waves (CDW) are present in all high T_c superconducting cuprates in the underdoped regime. Their importance is due to their interplay with superconductivity, as competing and/or intertwined phenomena. Resonant soft x-ray scattering is probably the most direct and sensitive experimental method for their observation, and has been providing the core of the systematic information on them, including temperature dependence and onset temperature that are used to delimitate the CDW region in the phase diagram. The picture is nonetheless still fragmented, also because other techniques have been bringing results not easy to reconcile, eg the influence of magnetic fields on c-axis correlation and the role of discommensuration.

We have exploited the superior sensitivity of the ERIXS instrument of the beam line ID32 of the ESRF to take a deeper look at the CDW phenomenon. We could thus re-examine the temperature dependence of CDW in the 123 family [1] with surprising results that, combined with the discovery of charge order in overdoped Bi2201 [2] and with the observation of high temperature CDW in LBCO [3], are going to stimulate a revision of the current understanding of the CDW phenomenon in cuprates. In particular we have found several interesting confirmations of the theoretical predictions by Caprara et al [4], where dynamic CDW are related to a quantum critical point in the optimal-overdoped region of the phase diagram.

References

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