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Amplitude of charge density wave in cuprates

Discovery of charge density wave (CDW) in the pseudogap phase is the most significant breakthrough in physics of cuprates in the past few years. The CDW has been reported in YBCO [1,2] and other cuprates [3,4] by several experimental groups.

Even though the microscopic mechanism of CDW and its relation to superconductivity remains a puzzle, it is firmly established that CDW is incommensurate with ordering wave-vector laying in the Cu-O plane. Value of CDW wave-vector has been measured by X-ray diffraction and by RIXS. In YBCO CDW exist in the doping interval $0.09 \leq p \leq 0.13$ and the wave vector, $q_{CDW} \approx (0, 0, 31)$ r.l.u., only very weakly depends on doping.

The amplitude and the pattern ("s-wave" CDW versus "d-wave" CDW) of the CDW modulation is unknown and highly disputable in literature. The amplitude/pattern is the very important missing piece of information.

In the present work we point out that the most recent data on nuclear quadrupole resonance [5] and on phonon dispersion anomalies [6] allow to determine the amplitude and also shed light on the pattern.

We perform the corresponding analysis of the data and for the first time determine the amplitude of CDW.

In the proposed talk we overview CDW experiments, explain the idea of our analysis, and for the first time report the value of the CDW amplitude.

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- [2] J. Chang, Nature Phys. **8**, 871 (2012).
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- [5] T. Wu *et al*, Nature Commun. **6**, 6438 (2015).
- [6] M. Le Tacon *et al*, Nature Phys. **10**, 52 (2014).

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