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Charge order phase transition in an underdoped cuprate: a sound velocity study

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The recent discovery of charge order in underdoped YBCO has attracted a remarkable wealth of attention [T. Wu et al. Nature 477 191 (2011)]. Not only does it bring a natural explanation for the dramatic change in the Fermi surface observed with quantum oscillation, but recent theories also suggest it might be a fundamental ingredient for the formation of the pseudogap phase [K. B. Efetov et al. Nature Physics 9 442 (2013)]. Hence, the exact role of this charge order in the phase diagram of high-T_c cuprates must be elucidated. Here we use sound velocity, a simple yet very sensitive probe of phase transition, to study this charge order in underdoped YBCO [D. LeBoeuf et al. Nature Physics 9 79 (2013)]. I will show that sound velocity is a unique thermodynamic probe that allows to determine the (B,T) phase diagram of this charge order. This diagram contains information about key aspects of the interplay between charge order and superconductivity, such as competition. I will also show that using tensor properties of elastic constants one can elaborate about the symmetry of this charge order.