



Physics & Astronomy Colloquium *- Spring 2019*



Monday, Feb 4th at 3:30 pm in SC 234

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Charge Density Wave Memory in a Cuprate Superconductor $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$

Charge density wave (CDW) order is known to coexist with superconductivity in essentially all underdoped cuprates. Yet, its precise nature and the relationship with superconductivity is still unclear. Specifically, whether the CDW is static or fluctuating is a long-standing question whose answer will provide deep insight into whether the CDW order competes or cooperates with superconductivity. In the first part of my talk, I will show how performing diffraction with coherent x-rays can be a test for dynamics. Coherent x-ray scattering from electronic and magnetic orders result in complex interference (speckle) patterns. These speckle patterns are dependent on the detailed order parameter configuration and therefore provide insight into their structure, motion, and dynamics. By correlating speckle positions over time, we showed that the CDW domains in underdoped cuprate $\text{La}_{2-x}\text{Ba}_x\text{CuO}_4$ (LBCO) are surprisingly static, with no evidence of significant fluctuation well into the superconducting state. Is the static nature of CDW order in LBCO universal for all underdoped cuprates? Motivated by this question, I will discuss in the second part of my talk, the CDW pinning mechanism in LBCO. By tracking the history of CDW speckle patterns upon thermal cycling, we have found an unexpected pinning mechanism where memory is only lost on cycling across the structural transition at 240(3) K that restores the 4-fold symmetry of the copper-oxide planes instead of the CDW ordering temperature at 54K.

Refreshments at 3:00 pm in SC 103