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Role of Disorder in Atomic Scale Onset of Charge Density Waves ERICK ANDRADE, CARLOS ARGUELLO, ETHAN ROSENTHAL, SUBBAIAH CHOCKALINGAM, LUIYAN ZHAO, CHRISTOPHER GUTIERREZ, WOO CHUNG, WENCEN JIN, PO-CHUN YEH, Columbia University, TONICA VALLA, Brookhaven National Labs, RAFAEL FERNANDES, Columbia University, SHUANG JIA, Princeton University, RICHARD OSGOOD, ANDREW MILLIS, Columbia University, ROBERT CAVA, Princeton University, ABHAY PASUPATHY, Columbia University — How does strong disorder affect the electronic states of complex electronic materials? This question is of relevance to many quantum materials such as the cuprates and pnictides, where interesting electronic phases like superconductivity only arise in strongly disordered samples. The study of these materials is complicated by the presence of multiple electronic phases, which obscures the interpretation of local spectroscopic measurements. To gain insight into this problem, we study 2H-$NbSe_2$, a relatively simple material with a 2D charge density wave ground state. To tune the disorder in the sample, we use sulfur substitution to go from weak (in pristine $NbSe_2$) to strong disorder (in $NbSe_{2-x}S_x$). We use variable-temperature scanning tunneling microscopy and spectroscopy to visualize the electronic structure in real space. Strong changes in the local electronic spectrum are observed with the introduction of disorder, with a pseudogap appearing in the local density of states. We also observe strong changes in the quasiparticle interference from spectroscopic images. We will discuss the interpretation of quasiparticle interference in the limit of strong disorder, and its relevance to existing measurements in the cuprates and pnictides.

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