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Emergent Phase Coherence of Charge Density Waves in Hole-Doped Manganites ISMAIL EL BAGGARI, BENJAMIN H. SAVITZKY, ROBERT HOVDEN, Cornell University, ALEMAYEHU S. ADMASU, JAE-WOOK KIM, SANG-WOOK CHEONG, Rutgers University, LENA F. KOURKOUTIS, Cornell University — Charge density waves (CDW) are prevalent electronic instabilities that compete, and even coexist, with high Tc superconductivity in cuprates or ferroic order in manganites. Mesoscopic probes including diffraction and transport have provided rich insights into average CDW correlations and their interactions with other electronic phases. However, atomic scale disorder and nanoscale inhomogeneity require real space, phase sensitive characterization of the CDW order parameter and its evolution across temperatures. Here we use scanning transmission electron microscopy (STEM) to map lattice displacements associated with CDWs in a holed-doped manganite. We directly reveal phase disorder in the complex order parameter at room temperature and characterize emergent phase coherence at cryogenic temperatures. Further, while the modulations appear incommensurate in globally averaged electron diffraction, we establish that PLDs are locally commensurate, albeit with temperature dependent order parameter variations. These results demonstrate that phase sensitive STEM of modulated lattices across temperatures permits direct visualization of the phenomenology and evolution of ordered states.

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