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Searching for spectroscopic signatures of density wave correlations in cuprates

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Recent developments in the research on high-temperature cuprate superconductors highlight the relevance of some density wave correlations to the superconductivity and its normal state in this generic class of materials. Depending on specific cuprate systems, these density wave correlations can have diverse manifestations in different (charge, spin, pairing) sectors and likely break (time reversal, space inversion, point group, gauge) symmetries in addition to the lattice translation. A unified understanding of their microscopic nature hinges on further characterizations using direct (imaging scattering) probes for these correlations themselves, as well as indirect probes for their interplay with other degrees of freedom in the system. ARPES can provide information about a density wave order through probing modifications in the electron structure it induces, while other spectroscopy techniques can shed unique lights on the broken symmetry aspect of the order. In this talk, I will review the density-wave signatures that have been or yet to be found in ARPES mainly in terms of the spectral weight, energy gap, and renormalized band dispersions. These experimental observations/proposals, coupled with simple theoretical modeling, promise new insights into the (wavevector, order parameter, form factor) characters of associated density wave correlations. Time permitting, I will introduce a novel x-ray spectroscopy technique that can detect broken time-reversal versus space-inversion symmetry of an electronic order in a way complementary to the polar Kerr effect.