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Asymmetric evolution of low-energy electron-hole pair modes and the Mott pseudogap in doped cuprates[1]

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A central issue in the universal Mott behavior in a variety of complex systems is to understand the nature of the electron- hole pair excitation modes. Using high resolution resonant x- ray scattering we resolve the momentum dependence of low-energy electron-hole pair modes in two major classes of doped copper oxides which reveals the momentum structure of the Mott pseudogap over the entire phase diagram including the superconducting states. The pair bandwidth and zone-boundary velocity renormalize on either sides of the phase diagram at different rates indicating strong doping asymmetries observed in the momentum resolved particle-hole collective channels for the first time. The measured asymmetry of modes is qualitatively consistent with Hubbard model.

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