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The hierarchy of multiple many-body interaction scales in high-temperature superconductors W. MEEVASANA, X.J. ZHOU, Z.-X. SHEN, Stanford University, S. SAHRAKORPI, A. BANSIL, Northeasten University, T. YOSHIDA, A. FUJIMORI, University of Tokyo, Kashiwa, Japan, Y. ANDO, Central Research Institute of Electric Power Industry, Japan, F. ZHOU, Z.X. ZHAO, Chinese Academy of Sciences, China, T. SASAGAWA, K. FUJITA, University of Tokyo, Bunkyo-ku, Japan, H. EISAKI, AIST, Tsukuba, Japan — Many-body interaction is key to novel properties of quantum matter. As an extreme example, the complexity due to charge, spin, and lattice interactions in high-T_c superconductors makes it difficult to identify the essential microscopic ingredients for the basic model. Energy scales where these interactions are manifest usually provide important insights into the nature of the interactions. The energy-momentum dispersion relationship measured by angle-resolved photoemission spectroscopy (ARPES) provides an excellent tool for identifying these scales. To date, the focus of the discussion has been on the low energy anomaly near 0.03-0.09eV. Here we present improved experimental data from four families of high-T_c superconductors that reveal a hierarchy of many-body interaction scales focused on: the low energy anomaly ("kink") of 0.03-0.09eV, a high energy anomaly of 0.3-0.5eV, and an anomalous enhancement of the width of the LDA-based CuO_2 band extending to energies of approximately 2 eV.

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