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Evolution of the gaps through the cuprate phase-diagram

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The actual physical origin of the gap at the antinodes, and a clear identification of the superconducting gap are fundamental open issues in the physics of high-Tc superconductors. Here, we present an electronic Raman scattering study of single layer cuprates, as a function of both doping level and temperature. We examine both the evolution of the gaps close to the nodes and at the antinodes in the normal and superconducting sates. On the deeply over-doped side, we show that the anti-nodal gap is a true superconducting gap. In contrast, on the under-doped side, our results reveal the existence of a break point close to optimal doping below which the anti-nodal gap is gradually disconnected from superconductivity. The nature of both the superconducting and normal state is distinctly different on each side of this breakpoint and will be discussed.

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