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How can we relate the critical temperature and the superconducting gap amplitude in cuprate superconductors? ALAIN SACUTO, SEBASTIEN BLANC, YANN GALLAIS, MAXIMILIEN CAZAYOUS, MARIE AUDE MEASSON, Laboratoire Matériaux et Phénomènes Quantiques, CNRS Université Paris Diderot - Paris 7, Paris Cedex 13, France, J.S. WEN, Z.J. XU, GENDA GU, Matter Physics and Materials Science, Brookhaven National Laboratory (BNL), USA — We explore the superconducting state of hole-doped cuprates by electronic Raman scattering as a function of both temperature and doping level. We observe a loss of coherent quasi-particles in the anti-nodal region and show that coherent Bogoliubov quasiparticles are confined around the nodes. This contrasts to conventional superconductors where superconductivity develops uniformly along the normal-state Fermi surface. We define the fraction of coherent Fermi surface, f_c around the nodes for which quasi-particles are well defined and superconductivity sets in. We establish that $T_c \propto f_c \Delta_{max}$. Δ_{max} is the maximum amplitude of the d-wave superconducting gap. This new relation differs from the standard BCS theory and gives us some clues for increasing T_c in the cuprates. S. Blanc et al. Phys. Rev. B **82**, 144516 (2010); S. Blanc et al. Phys. Rev. B **80**, 140502 (2009).

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