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s-wave-like excitation in the superconducting state of electron-doped cuprates with d-wave pairing QINGSHAN YUAN, XIN-ZHONG YAN, CHIN-SEN TING, Texas Center for Superconductivity, University of Houston, Houston, TX 77204 — It has been quite controversial whether the superconducting (SC) pairing symmetry is s- or d-wave in electron-doped cuprates such as $Nd_{2-x}Ce_xCuO_4$ (NCCO) and $Pr_{2-x}Ce_xCuO_4$ (PCCO). In view that many experimental measurements to study the SC pairing symmetry only give direct information about the quasiparticle excitation gap and not the SC order parameter, we explore a physical mechanism to show the s-wave-like quasiparticle excitation under the d-wave SC pairing in electron-doped cuprates and intend to reconcile the contradictory experimental results. Our idea is based on the intrinsic Fermi surface (FS) evolution with doping as revealed by ARPES measurements on NCCO. It was found that at low doping only a small FS pocket appears around $(\pi, 0)$ and with increasing doping a new FS pocket around $(\pi/2, \pi/2)$ will emerge. We argue that the FS pocket around $(\pi/2, \pi/2)$ has not yet formed until doping reaches about the optimal value $x = 0.15$. Therefore in the underdoped regime, even if the SC order parameter is d-wave which vanishes along the diagonal line, the quasiparticle excitation gap is still finite and looks s-wave-like due to the absence of the FS across that line. This makes it possible, with d-wave SC pairing, to understand those experiments which evidenced the s-wave quasiparticle excitation.

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