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Nodeless d-wave superconducting pairing in antiferromagnetic underdoped $Pr_{2-x}Ce_xCuO_{4-\delta}$ TANMOY DAS, R.S. MARKIEWICZ, A. BANSIL, Northeastern University — Experimental results concerning the superconducting pairing symmetry have been contradictory in electron doped cuprates. In particular, penetration depth measurements appear to indicate the presence of an s-wave and/or a d-wave gap in different doping regimes [1]. Here, we discuss the doping and T-dependence of the penetration depth in $Pr_{2-x}Ce_xCuO_{4-\delta}$ (PCCO) and provide a natural explanation for the occurrence of a nodeless superconducting gap and a nonmonotonic gap variation with maximum gap near hot-spots in the underdoped system [2]. Despite the presence of a $d_{x^2-y^2}$ pairing gap, we find a crossover of the low-T penetration depth from a nodeless behavior in the underdoped case to a linear-in-T behavior (characteristic of d-wave) as doping increases and a nodal Fermi surface pocket emerges. The present results support the coexistence of antiferromagnetism and superconductivity in the electron doped cuprates [3]. Work supported in part by the USDOE.
[1] M.-S. Kim *et. al.,* PRL, **91**, 087001 (2003).
[2] T. Das *et. al.,* PRB, **74**, 020506(R) (2006).
[3] Y. Dagan *et. al.,* PRL, **92**, 167001 (2004).

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