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Magnetic Phase Diagram of the electron-doped high-T_c superconductor $Nd_{2-x}Ce_xCuO_4$ M.K. CHAN[1], E.M. MOTOYAMA[2], G. YU[1], Y. LI[2], J.P. CARLO[3], T.J. WILLIAMS[4], S.K. KIM[3], T. GOKO[3,4], Y.J. UEMURA[3], G.M. LUKE[4], M. GREVEN[1], [1]University of Minnesota, [2]Stanford University, [3]Columbia University, [4]McMaster University — An intriguing issue in high-T_c superconductivity is the phase diagram asymmetry with respect to electron and hole-doping. The antiferromagnetic phase extends further with electron doping and appears to overlap with superconductivity. Our prior results suggested that genuine long-range antiferromagnetic order and superconductivity do not co-exist in $Nd_{2-x}Ce_xCuO_4$ [Motoyama *et al.* Nature 445, 186 (2007)]. However, some uncertainty remained due to Ce concentration inhomogeneity in large single crystals. Here we report neutron scattering and μSR measurements on crystals with improved Ce homogeneity. Inelastic neutron scattering indicates that genuine long-range antiferromagnetic order indeed disappears within a small doping window around x =0.12. Meanwhile, μSR measurements show that static magnetic order persists up to x = 0.14, where bulk superconductivity first unambiguously appears. Our results suggest a possible first-order phase transition in a narrow region of the phase diagram, between x = 0.12 and x =0.14, characterized by clusters of short-range static magnetic order and traces of superconductivity.

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