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Nodeless and topological superconducting phases of d-wave superconductors in proximity to antiferromagnets GUANG-MING ZHANG, GUO-YI ZHU, Department of Physics, Tsinghua University, Beijing, China, ZIQIANG WANG, Department of Physics, Boston College, USA — Motivated by the recent observations of nodeless superconductivity in high-T_c cuprates, we study the superconducting (SC) phase of doped Mott insulators described by the two-dimensional t-J model in proximity to an antiferromagnetic insulator. We found that (i) the nodal d-wave SC state can be driven via a continuous transition into a nodeless (fully gapped) d-wave pairing state by the proximity induced staggered magnetic field. (ii) The energetically favorable pairing states in the strong field regime have extended s-wave symmetry and can be nodal or nodeless. (iii) Between the pure d-wave and s-wave paired phases, there emerge two topologically distinct SC phases with (s+id) symmetry, the weak and strong pairing phases, and the weak pairing phase represents a valley symmetry protected Z_2 topological superconductor, supporting robust gapless non-chiral edge modes.

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