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Amperean (2k_F) pairing and the pseudo-gap phase in HiTc Cuprates[1]

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We propose that the pseudogap phase is a novel pairing state where electrons on the same side of the Fermi surface are paired, in strong contrast with conventional BCS theory which pairs electrons on opposite sides of the Fermi surface. The pair carries a net momentum 2k_F, forming a pair density wave. The microscopic pairing mechanism comes from a gauge theory formulation of the resonating valence bond (RVB) picture, where spinons traveling in the same direction feel an attractive force in analogy with Ampere's effects in electromagnetism. We call this Amperean pairing. Charge order appears as a subsidiary order parameter even when pair order is destroyed by phase fluctuations. Our theory gives a prediction of the ordering wave vector which is in good agreement with experiment. Furthermore, the quasiparticle spectrum from our model explains many of the unusual features reported in photoemission experiments. Finally, we propose an experiment that can directly test the idea of Amperean pairing.

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