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A novel homogeneous superconducting state to compete with the inhomogeneous FFLO states in conductors with exchange or Zeeman split Fermi surfaces CHIA-REN HU, Texas A&M University — The Fulde-Ferrell-Larkin-Ovchinikov (FFLO) states have been proposed as the states to replace the usual BCS state when the Fermi surfaces of spin-up and down electrons are sufficiently different due to exchange or Zeeman splitting. The FF state has a space-varying phase and the LO state has an oscillating order-parameter magnitude. Thus both are inhomogeneous states. Here I propose a novel homogeneous state to compete with the FFLO state: Instead of forming Cooper pairing of one spin-up electron of momentum $\mathbf{k}$ and one spin-down electron on momentum $-\mathbf{k}$, this new state involves a generalized Cooper pair which is actually a triplet: One spin-up electron of momentum $(1+\delta)\mathbf{k}$, one spin-down electron of momentum $-(1-\delta)\mathbf{k}$, AND one boson of momentum $-2\delta\mathbf{k}$, which can be a phonon, or a magnon, etc. (This state might also form in Fermion-Boson atomic mixtures, and in quark-gluon plasma.) The value of δ is such that $(1+\delta)\mathrm{k}_F$ is the spin-up Fermi momentum, and $(1-\delta)\mathrm{k}_F$ is the spin-down Fermi momentum. Since the boson involved does not have a fixed momentum $\mathbf{q}$, this state is not a density wave state of any sort coexisting with superconductivity. A mean field theory of this state will be presented.

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