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d_{xy}-density wave in fermion-fermion cold atom mixtures CHEN-YEN LAI, University of California Riverside, WENMIN HUANG, Universität Hamburg, DAVID CAMPBELL, Boston University, SHAN-WEN TSAI, University of California Riverside — Using a functional renormalization group (FRG) calculation, we predict number density wave instabilities in a doubly-degenerate Fermi-Fermi mixture on a square optical lattice. We take both inter-species and intra-species interactions into account and treat them on an equal footing. When the two species of fermions are both at half-filling, we find two out-of-phase conventional (s-wave) number density waves, which arise from from a sufficiently strong on-site inter-species repulsion. Moving only one species away from half-filling, we discover that an unconventional d_{xy}-density emerges. When both species are away from half-filling, a superconductivity instability becomes dominant. Apart from the detailed FRG calculation, we develop an intuitive minimal model to capture the physical mechanism, which emerges from the density imbalance between the two species of fermions in the vicinity of half-filling. Our study sheds light on the search for unconventional density waves in strong correlated systems.

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