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The phase diagram of ultra-cold fermionic atoms across the BCS-BEC crossover in the presence of disorder PARAG GHOSH, PREDRAG NIKOLIC, George Mason / NIST — We study the effect of disorder in a two-component attractive fermionic system with nearly resonant interactions placed in a periodic potential. Treating disorder as a weak perturbation we first obtain Born correction to thermodynamic potential and explore the conventional phenomena such as suppression of superfluidity and enhancement of insulating states. Then, going beyond Born approximation we investigate the possibility of obtaining unconventional paired states, namely a Bose glass of Cooper pairs. Such a state is expected to arise from efficient pairing of low-energy fermions localized by the disorder potential, but lacks long-range order due to strong phase fluctuations. We discuss experimental signatures of states in our phase diagram.

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