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BCS-BEC Crossover of a Quasi-two-dimensional Fermi Gas: the Significance of Dressed Molecules WEI ZHANG, GUIN-DAR LIN, LUMING DUAN, Department of Physics, University of Michigan — We study the crossover of a quasi-two-dimensional Fermi gas trapped in the radial plane from the Bardeen-Cooper-Schrieffer (BCS) regime to the Bose-Einstein condensation (BEC) regime by crossing a Feshbach resonance. Using an effective two-dimensional Hamiltonian with renormalized interaction between atoms and dressed molecules, we calculate the zero temperature cloud size and number density distribution and conclude that the results are consistent with the picture of BCS-BEC crossover. These results are in clear contrast to the predictions of an effective two-dimensional Hamiltonian with renormalized atom-atom interaction, where a constant cloud size and identical density profile are expected for arbitrary detunings. This inconsistence indicates that the inclusion of dressed molecules is essential to describe the two-dimensional Fermi systems, especially on the BEC side of the Feshbach resonance.

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