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Superfluid Density of an inhomogeneous Fermi Gas NICOLAI NYGAARD, NIST, CHARLES W. CLARK, NIST — We present a microscopic calculation of the superfluid density for a Fermi gas with a spatially varying density profile. By imposing an infinitesimal twist on the phase of the order parameter and calculating the resulting strain energy perturbatively, we find the helicity modulus, which is directly tied to the density of the superfluid component. By self consistently solving the Bogoliubov-de Gennes equations for a harmonically trapped gas we compare the exact expression to that obtained by using the homogeneous gas result in a local density approximation. In addition, it is shown that as the critical temperature is approached the superfluid density acquires the same spatial profile as the squared norm of the order parameter.

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