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"Underlying Fermi surface" and violation of Luttinger count in strongly correlated superconductors MOHIT RANDERIA, RAJDEEP SENSARMA, NANDINI TRIVEDI, The Ohio State University — The question of determining the "underlying Fermi surface" (FS) that is gapped out by superconductivity (SC) is of great importance in strongly correlated systems, particularly in view of angle-resolved photoemission (ARPES) experiments. We explore various definitions for the FS in the T=0 SC state using the zero-energy Green's function, the excitation spectrum and the momentum distribution. We examine (i) the d-wave SC in high Tc cuprates, and (ii) the s-wave superfluid in the BCS-BEC crossover. In each case we show [1] that the various definitions agree, to a large extent, but all of them violate the Luttinger sum rule and do not enclose the total electron density. We discuss the important role of chemical potential renormalization and incoherent spectral weight in this violation. We show that the magnitude of the violation scales like $(\Delta/E_f)^2$, and its sign correlates with the electron-like or hole-like topology of the FS. These results are in good agreement with ARPES data on LSSCO [2].
[1] R. Sensarma, M. Randeria, N. Trivedi, cond-mat/0607006.
[2] T. Yoshida *et al.*, cond-mat/0510608.

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