

Abstract Submitted  
for the MAR07 Meeting of  
The American Physical Society

**Much Ado about Zeros: The Luttinger Surface and Mottness<sup>1</sup>**

PHILIP PHILLIPS, University of Illinois, TUDOR STANESCU, University of Maryland, TING-PONG CHOY, University of Illinois — We prove that the Mott insulating state is characterized by a divergence of the electron self energy at well-defined values of momenta in the first Brillouin zone. When particle-hole symmetry is present, the divergence obtains at the momenta of the Fermi surface for the corresponding non-interacting system. Such a divergence gives rise to a surface of zeros (the Luttinger surface) of the single-particle Green function and offers a single unifying principle of Mottness from which pseudogap phenomena, spectral weight transfer, and broad spectral features emerge in doped Mott insulators. We also show that only when particle-hole symmetry is present does the volume of the zero surface equal the particle density. We identify that the general breakdown of Luttinger's theorem in a Mott insulator arises from the breakdown of a perturbative expansion for the self energy in the single-particle Green function around the non-interacting limit. A modified version of Luttinger's theorem is derived for special cases.

<sup>1</sup>NSF, DMR 0605769

Philip phillips  
University of Illinois

Date submitted: 30 Nov 2006

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