Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Probing Critical Surfaces in Momentum Space Using Real-Space Entanglement Entropy: Bose versus Fermi[1] KUN YANG, Department of Physics and National High Magnetic Field Laboratory, Florida State University, HSIN-HUA LAI, Department of Physics and Astronomy, Rice University — A co-dimension one critical surface in the momentum space can be either a familiar Fermi surface, which separates occupied states from empty ones in the non-interacting fermion case, or a novel Bose surface, where gapless bosonic excitations are anchored. Their presence gives rise to logarithmic violation of entanglement entropy area law. When they are *convex*, we show that the shape of these critical surfaces can be determined by inspecting the leading logarithmic term of real space entanglement entropy. The fundamental difference between a Fermi surface and a Bose surface is revealed by the fact that the logarithmic terms in entanglement entropies differ by a factor of two: $S_{log}^{Bose} = 2S_{log}^{Fermi}$, even when they have identical geometry. Our method has remarkable similarity with determining Fermi surface shape using quantum oscillation. We also discuss possible probes of *concave* critical surfaces in momentum space.

[1]HHL and KY acknowledge the National Science Foundation through grants No. DMR-1004545, DMR-1157490, No. DMR-1442366, and State of Florida. HHL is also partially supported by NSF Grant No. DMR -1309531, and the Smalley Postdoctoral Fellowship in Quantum Ma

Hsin-Hua Lai
Rice Univ

Date submitted: 19 Jan 2016 Electronic form version 1.4