

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Violation of the Entanglement Area Law in Bosonic Systems with Bose Surfaces: Possible Application to Bose Metals¹ HSIN-HUA LAI, Natl High Magnetic Field Lab, KUN YANG, NICHOLAS BONESTEEL, Natl High Magnetic Field Lab and Department of Physics, FSU — We show the violation of the entanglement-area law for bosonic systems with Bose surfaces. For bosonic systems with gapless factorized energy dispersions on a N^d Cartesian lattice in d -dimension, e.g., the exciton Bose liquid in two dimension, we explicitly show that a belt subsystem with width L preserving translational symmetry along $d - 1$ Cartesian axes has leading entanglement entropy $(N^{d-1}/3) \ln L$. Using this result, the strong subadditivity inequality, and lattice symmetries, we bound the entanglement entropy of a rectangular subsystem from below and above showing a logarithmic violation of the area law. For subsystems with a single flat boundary we also bound the entanglement entropy from below showing a logarithmic violation, and argue that the entanglement entropy of subsystems with arbitrary smooth boundaries are similarly bounded.

¹National Science Foundation through Grant No. DMR- 1004545 and U.S. DOE Grant No. DE-FG02-97ER45639.

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Date submitted: 11 Nov 2013

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