Laboratoire de Physique Théorique et Hautes Energies

Unité Mixte de Recherche (UMR 7589) de Sorbonne Université et du CNRS

SEMINAIRE du LPTHE

Vendredi 25 Janvier 2019, 11:00

Bertrand Lacroix-A-Chez-Toine

LPTMS Orsay

Exact entanglement entropy for non-interacting fermions in rotation

Bipartite entanglement entropy is a convenient observable to characterise critical and topological phases of matter. Despite numerous recent efforts, it remains a challenge to obtain both analytical results as well as experimental measurements of this quantity, even for simple systems. Some progress has been achieved recently by realising that in specific cases, e.g. for N non-interacting particles, the entanglement entropy is directly proportional to the number vari- ance in the large N limit [1]. This number variance corresponds to the variance of the number of particles in a given domain, an observable much easier to measure experimentally. In this talk I will present a system of non-interacting fermions in two dimensions trapped by an harmonic potential and rotating at constant frequency. I will first show that the ground-state of this model can be mapped to the so-called complex Ginibre ensemble of Random Matrix Theory (RMT). Then I will use RMT techniques to obtain both the entanglement entropy and the number variance for the fermions in a disk [2]. This computation remains valid for any number N of particles. In the large N limit, we show that the proportionality between number variance and entanglement entropy holds in the bulk, i.e. far enough from the edge of the density while it breaks down at this edge.

References :

[1] I. Klich, L. Levitov, Quantum noise as an entanglement meter, Phys. Rev. Lett. 102, 100502 (2009) ;

[2] B. Lacroix-A-Chez-Toine, S. N. Majumdar and G. Schehr, Entanglement Entropy and Full Counting Statistics for 2d-Rotating Trapped Fermions, arXiv preprint 1809.05835, (2018).

Bibliothèque du LPTHE, tour 13/14, 4ème étage

N.B. La liste de tous les séminaires en région parisienne est disponible sur

http ://semparis.lpthe.jussieu.fr

LPTHE tour 13/14, 4ème étage, Campus P. et M. Curie, BP 126, 4, place Jussieu, F-75005 Paris, France