CENTRE
DE RECHERCHES
MATHÉMATIQUES

Théorie conforme des champs et systèmes quantiques à plusieurs corps
21 août – 9 septembre 2022

Conformal field theory and quantum many-body physics
August 21 – September 9, 2022

Paola Ruggiero
(King's College London)

Entanglement Rényi entropies from Ballistic Fluctuations Theory: the free fermionic case

---

Recently, a new framework dubbed Ballistic Fluctuation Theory (BFT) has been proposed, which gives access to the full statistics of fluctuations of ballistically transported conserved quantities within homogeneous, stationary states [1]. The formalism, based on large deviation theory (LDT), is expected to apply to generic one-dimensional systems with an Euler hydrodynamic description. One of its most interesting application is to correlation functions of twist fields, which can be introduced any time the system possesses a symmetry. A particularly important example are *branch-point twist fields* associated to the Zn symmetry in a n-copies replicated theory, whose correlations functions provide the starting point for computing Rényi entanglement entropies within the replica approach [2]. In this talk, focusing on free fermionic systems, we apply the formalism to correlation functions of branch-point twist fields and show that both the equilibrium behavior and the dynamics of Renyi entanglement entropies can be simply derived from a unique formula, thus providing a unified interpretation of the two results [3].

Refs:

[1] Doyon, Myers, “Fluctuations in ballistic transport from Euler hydrodynamics”, *J. Ann. Henri Poincaré 21, 255-302 (2020)*

[2] Calabrese, Cardy, “Entanglement Entropy and Quantum Field Theory”, *J. Stat. Mech. P06002 (2004)*

[3] Del Vecchio Del Vecchio, Doyon, Ruggiero, *In preparation*