Bologna Workshop on:
CFT AND INTEGRABLE MODELS
and their applications from gauge/gravity dualities to statistical mechanics and quantum information

Contribution ID: **140** Type: **Talk (20 min)**

Wetting and entropic repulsion in two dimensions. Exact results from boundary field theory.

Thursday, 7 September 2023 12:20 (20 minutes)

The exact characterization of order parameter correlations in the presence of strongly fluctuating interfaces is a notoriously difficult problem in classical statistical mechanics. In this talk we present exact results for order parameter and energy density correlations for an interface forming a droplet in two dimensions whose endpoints are pinned on a wall. Our framework, which hinges on integrable boundary quantum field theories and general low-energy properties of two-dimensional field theories, applies to interfaces entropically repelled by a hard wall as well as to the regime of wetting transitions. In particular, we will show that for entropically repelled interfaces the finite extent of the sessile droplet yields finite-size corrections to one- and two- point functions. These corrections are interpreted as adsorption of bubbles and self-interaction of the interface, their exact form is identified, interpreted in terms of Brownian excursions, and successfully tested against high-precision Monte Carlo simulations in the absence of adjustable parameters. This analysis allows us to resolve a 40-years old discrepancy occurred in early Monte Carlo studies. The regime of wetting is also considered and in this case we show how the existence of a boundary bound state yields the dominant contribution to the one- and two-point functions, which we calculate exactly. We show that correlations are long-ranged for entropic repulsion and at wetting. For both the regimes we investigate correlations in momentum space by generalizing the notion of interface structure factor to semi-confined systems. Distinctive signatures of the two regimes manifest in the structure factor through a term that we identify on top of the capillary-wave one.

Based on

[1] A. S. and A. Tinti, Interfacially adsorbed bubbles determine the shape of droplets, J. Stat. Mech. (2023) 013206.

[2] A. S. and A. Tinti, Droplet-mediated long-range interfacial correlations. Exact field theory for entropic repulsion effects, Journal of High Energy Physics 123 (2023).

[3] A. S. and A. Tinti, Interfacially adsorbed bubbles determine the shape of droplets, to appear in SciPost (2023) [scipost 202302 00024v2].

Primary author: SQUARCINI, Alessio (Institute for Theoretical Physics, Innsbruck University)

Presenter: SQUARCINI, Alessio (Institute for Theoretical Physics, Innsbruck University)

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