Bologna Workshop on:

CFT AND INTEGRABLE MODELS

and their applications to Quantum Field Theory, Statistical Mechanics and Condensed Matter Physics

Istituto Nazionale di Fisica Nucleare

Contribution ID: **19** Type: **Talk**

”Off-critical interfaces in two dimensions. Exact results from field theory”

Thursday, 18 September 2014 10:00 (30 minutes)

We will consider interfaces of systems of classical statistical mechanics in two dimensions. Interfaces at criticality are conformally invariant random curves and SLE together with field theory have been successfully applied to several models. On the other hand, below criticality exact results are available only from lattice calculations which are restricted to the Ising model, a circumstance that raises the question about the role of Ising solvability. Our aim is to fill this gap, presenting a new, exact, field-theoretic description of interfaces in two dimension which works directly in the continuum. Finally this framework allow us to clarify the role of integrability.

In particular we show how field theory yields the exact description of intermediate phases in the scaling limit close to a first order phase transition point. The ability of a third phase to form an intermediate wetting layer or only isolated bubbles is explicitly related to the spectrum of excitations of the field theory. The order parameter profiles are determined and interface properties such as passage probabilities and internal structure are deduced from them. The theory is illustrated through the application to the q-state Potts model and Ashkin-Teller model. The latter is shown to provide the first exact solution of a bulk wetting transition. The whole technique can be applied also to the study of interfaces at boundaries. We will develop the exact theory of phase separation in a two-dimensional wedge from the properties of the order parameter and boundary condition changing operators in field theory. For a shallow wedge we determine the passage probability for an interface with endpoints on the boundary. For generic opening angles we exhibit the fundamental origin of the filling transition condition and of the property known as wedge covariance. The limit of a straight opening angle corresponds to an interface on the half plane, the midpoint average distance of the interface from the boundary grows as the square root of the distance between the endpoints, unless the reflection amplitude of the bulk excitations on the boundary possesses a stable bound state pole. The contact angle of the phenomenological wetting theory is exactly related to the location of this pole. Results available from the lattice solution of the Ising model are recovered as a particular case.

References

[1] G. Delfino and A.S., Interfaces and wetting transition on the half plane. Exact results from field theory, J. Stat. Mech. P05010 (2013)

[2] G. Delfino and A.S., Exact theory of intermediate phases in two dimensions, Annals of Physics 342, 171 (2014)

[3] G. Delfino and A.S., Phase separation in a wedge. Exact results, [arXiv1403.1138], to appear in Physical Review Letters

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