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Effective string description of the interquark potential in the 3D U(1) Lattice Gauge Theory

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The U(1) lattice gauge theory in three dimensions is a perfect laboratory to study the subtle properties of the confining string. On the one hand, thanks to the mapping to a coulomb gas of monopoles, the model can be exactly solved and confinement proven analytically. On the other hand high-precision numerical estimates of Polyakov loop correlators can be obtained via a duality map to a spin model. This allowed us to perform high precision tests of the universal behaviour of the effective string and to find macroscopic deviations with respect to the expected Nambu-Goto predictions. These corrections could be fitted with very good precision by the addition of a contribution proportional to the square of the extrinsic curvature to the effective string action. Such a contribution is allowed by Lorentz invariance and its presence in the infrared regime of the U(1) model was indeed predicted by Polyakov several years ago.
Performing our analysis at different values of β we were able to
show that this term scales as expected by Polyakov's solution and becomes the dominant contribution in the continuum limit. We also discuss the interplay between the extrinsic curvature contribution and the boundary correction induced by the Polyakov loops.

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