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Duality and entanglement in lattice gauge theories

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The study of entanglement in quantum field theories provides insight into universal properties which are typically challenging to extract by means of local observables. However, conventional numerical techniques to compute entanglement measures are limited to low-dimensional systems, and, for gauge theories, the definition itself of entanglement is ambiguous due to the non-factorizability of the Hilbert space. On the other hand, Abelian lattice gauge theories are known to admit a dual description in terms of spin models, for which the replica trick and Rényi entropies are well defined. In this talk, I will review recent developments in lattice calculations of Rényi entropies and entropic c-functions using Monte Carlo methods, which allow for large scale simulations of these quantities in arbitrary dimensions. Then, I will discuss how duality transformations can be used as useful tools to unambiguously study entanglement in lattice gauge theories. Finally, I will present a numerical study of the entropic c-function of the (2+1)-dimensional Z2 gauge theory in the thermodynamic and continuum limits, comparing the results with holographic models.

Authors: BULGARELLI, Andrea (University of Turin and INFN Turin); PANERO, Marco (University of Turin and INFN Turin)

Presenter: BULGARELLI, Andrea (University of Turin and INFN Turin)