« Atelier sur l'information quantique et mécanique statistique quantique »
15 au 19 octobre 2018

"Workshop on Quantum Information and Quantum Statistical Mechanics"
October 15-19, 2018

Locality at the boundary implies gap in the bulk for 2D PEPS

Michael Kastoryano *

mkastory@thp.uni-koeln.de

Proving that the parent Hamiltonian of a Projected Entangled Pair State (PEPS) is gapped remains an important open problem. We take a step forward in solving this problem by showing that if the boundary state of any rectangular subregion is a quasi-local Gibbs state of the virtual indices, then the parent Hamiltonian of the bulk 2D PEPS has a constant gap in the thermodynamic limit. The proof employs the martingale method of nearly commuting projectors, and exploits a result of Araki on the robustness of one dimensional Gibbs states. Our result provides one of the first rigorous connections between boundary theories and dynamical properties in an interacting many body system. We discuss some recent attempts at showing the converse of the statement; that a gapped parent hamiltonian implies a local boundary state.

*Institute for Theoretical Physics, University of Cologne, Zülpicher Strasse 77, D-50937 Köln, GERMANY