| | |
|---|---|
| Contribution Title: | FROM AREA LAWS TO THE SIMULATION OF QUANTUM SYSTEMS |
| Authors: | M. Plenio |
| Presenting author: | Plenio M. |
| Affilation: | Imperial College London |
| E-mail: | m.plenio@imperial.ac.uk |
| Invited speaker: | Topical session |
| YRS seminar: | NO |

Physical interactions in quantum many-body systems are typically local: Individual constituents interact mainly with their few nearest neighbors. This locality of interactions is inherited by a decay of correlation functions, but also reflected by scaling laws of the entanglement entropy of ground states. This entropy of the reduced state of a subregion often merely grows like the boundary area of the subregion, and not like its volume, in sharp contrast to an extensive behavior. Such "area laws" for the entanglement entropy and related quantities have received considerable attention in recent years initiated by [1]. They emerge in several seemingly unrelated fields, in the context of black hole physics, quantum information science, and quantum many-body physics. In this talk I will present an overview over recent results on this topic. Center stage is taken by rigorous results on lattice models in one and higher spatial dimensions [2,3,4] and the connection between the entanglement content of states and the possibility of their efficient numerical simulation as they were recently reviewed in [5].

[1] K. Audenaert, J. Eisert, M.B. Plenio and R.F. Werner, Phys. Rev. A 66, 042327 (2002)

[2] M.B. Plenio, J. Eisert, J. Dreissig, and M. Cramer, Phys. Rev. Lett. 94, 060503 (2005)

[3] M. Cramer, J. Eisert, M.B. Plenio, and J. Dreissig, Phys. Rev. A 73, 012309 (2006)

[4] M. Cramer, J. Eisert, M.B. Plenio, Phys. Rev. Lett. 98, 220603 (2007)

[5] J. Eisert, M. Cramer, and M.B. Plenio, to appear in Rev. Mod. Phys. 2009, see also e-print arXiv:0808.3773 [quant-ph]