Entanglement in random quantum system

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We consider the entanglement of quantum many-body systems, which is characterized by the von Neumann entropy of blocks. We show that in random quantum spin chains sample dependent finite-size transition points can be defined through the position of the maxima of the von Neumann entropy and we study the distribution of these transition points. In 2d the entanglement entropy of the random quantum Ising model is studied with a numerical implementation of the strong disorder renormalization group. Here we show that the entropy per surface area diverges at, and only at, the quantum phase transition point, where we have identified a double-logarithmic multiplicative correction.

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[2] Y.-C. Lin, F. Iglói, and H. Rieger, Phys. Rev. Lett. **99**, 147202 (2007).