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Entanglement entropy of quantum-critical spin chains with strong randomness

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For disorder-free critical quantum spin chains, the entanglement of a segment of $N \gg 1$ spins with the remainder scales as $log_2 N$, with a prefactor fixed by the central charge of the associated conformal field theory. The mean entanglement entropy of quantum spin chains with randomness follows the same logarithmic scaling, and provides a universal critical entropy, which is equivalent to the central charge in the pure case. In my talk I will explore the origin and derivation of the universal entanglment entropy of the random spin-1/2 Heiseneberg model in the random-singlet phase, as well as that of the random spin-1 Heisenberg chain at the breakdown of its Haldane phase. The entanglement of these and related infinite-randomness fixed points makes it possible to speculate on possible extensions of the c-theorem of CFTs to the realm of systems with strong randomness.

[1]Work reported done in collaboration with Joel Moore.