"Soft expansion and asymptotic charges"

In recent years, there has been a surge of activities in proposing exactly solvable quantum spin chains with the surprisingly high amount of ground state entanglement entropies--beyond what one expects from critical systems described by conformal field theories (i.e., super-logarithmic violations of the area law). We will introduce entanglement and discuss these models. We prove that the ground state entanglement entropy is $\sqrt{n}$ and in some cases even extensive (i.e., $\sim n$). These models have rich connections with combinatorics, random walks, and universality of Brownian excursions. Lastly, we develop techniques that enable proving the gap of these models. As a consequence, the gap scaling rules out the possibility of these models having a relativistic conformal field theory description.

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