Entanglement Entropy in a Curved Lattice of Quantum Harmonic Oscillators

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Abstract: Entanglement is a purely quantum phenomenon. If the whole system is pure, the best way to quantify entanglement is by its entanglement entropy, which is described as the Von-Neumann entropy of either subsystem. This implies that vacuum has entropy too. It has been shown that the entanglement entropy of a ball of QHOs in a lattice in vacuum is proportional to the surface area of the ball. In this study we demonstrate the effect on entropy when the lattice sits in a curved space. We show that the entropy decreases. Furthermore, the entropy decrease is proportional to the surface area decrease due to the curvature. This demonstrates a further link between surface area and entropy.