

Proof of the quantum null energy condition for free fermionic field theories

The quantum null energy condition (QNEC) is a quantum generalization of the null energy condition which gives a lower bound on the null energy in terms of the second derivative of the von Neumann entropy or entanglement entropy of some region with respect to a null direction. The QNEC states that $T_{kk} \geq -2 \lim_{A \rightarrow 0} \frac{d^2 S_{out}}{dA^2}$ where S_{out} is the entanglement entropy restricted to one side of a codimension-2 surface which is deformed in the null direction about a neighborhood of point p with area A . A proof of QNEC has been given before, which applies to free and super-renormalizable bosonic field theories, and to any points that lie on a stationary null surface. Using similar assumptions and methods, we prove the QNEC for fermionic field theories.

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