

Quantum Inequality Bounds for Free Rarita-Schwinger Field in Flat Spacetime

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Abstract: Although quantum field theory allows the local energy density negative, it also places severe restrictions on the negative energy. One of the restrictions is the quantum energy inequality (QEI), in which the energy density is averaged over time, or space, or over space and time. By now temporal QEIs have been established for various quantum fields, but less work has been done for the spacetime quantum energy inequality. In this paper we deal with the free Rarita-Schwinger field and present a quantum inequality bound on the energy density averaged over space and time. Comparison with the QEI for the Rarita-Schwinger field shows that the lower bound is the same with the QEI. At the same time, we find the quantum inequality for the Rarita-Schwinger field is weaker than those for the scalar and Dirac fields. This fact gives further support to the conjecture that the more freedom the field has, the more easily the field displays negative energy density and the weaker the quantum inequality becomes.

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Key words: negative energy density, quantum inequality

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