

Delocalization of energy by local operators in a ground state of harmonic oscillators

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Abstract

Reeh-Schlieder theorem is known as a fundamental property in quantum field theory. This theorem implies that local operators in a finite region excites the vacuum state globally and hence they generate the nonlocal distribution of energy. In this presentation, we investigate the delocalization of energy by local operators acting on the ground state of discretized Klein-Gordon field in 1+1 dimensional Minkowski spacetime. Considering the class of a local operator constructed by a polynomial in the discretized Klein-Gordon field, we compare the energy in the two regions; the region where local operators are acting and another distant region. Then we find that the local operator constructed by only a polynomial of degree m in the discretized Klein-Gordon field cannot excites the state in a distant region non-locally for massive theory, unless for massless theory. It is important to note that there is quantum entanglement between the two spatial separated regions for massive theory. Hence the delocalization of energy is more sensitive to the mass parameter than quantum entanglement.