

Lifshitz formula using box renormalization scheme

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Abstract

In this paper, the Lifshitz formula for the Casimir energy between two dielectrics in zero temperature is derived using box renormalization. Although there are several derivations for the force in this case in the literature, including Lifshitz's own proof, so far there has been no unambiguous and rigorous derivation for energy that we are aware of. Since energy becomes important in some cases, e.g. calculation of entropy or heat capacity, using the correct and precise definition of the Casimir energy, for the first time, we remove all of the infinities systematically without any ambiguity. This proof also shows the strength and accuracy of the box renormalization scheme.

Keywords: Casimir energy, Lifshitz Formula, Quantum vacuum, Electromagnetic field, Box renormalization

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