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Casimir energy for surfaces with constant conductivity

Khusnutdinov N., Drosdoff D., Woods L.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We consider the vacuum energy of the electromagnetic field in systems characterized by a constant conductivity using the zeta-regularization approach. The interaction in two cases is investigated: two infinitely thin parallel sheets and an infinitely thin spherical shell. We found that the Casimir energy for the planar system is always attractive and it has the same characteristic distance dependence as the interaction for two perfect semi-infinite metals. The Casimir energy for the spherical shell depends on the inverse radius of the sphere, but it maybe negative or positive depending on the value of the conductivity. If the conductivity is less than a certain critical value, the interaction is attractive, otherwise the Casimir force is repulsive regardless of the spherical shell radius. © 2014 American Physical Society.

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