Abstract Submitted
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On the Direction of the Casimir Force due to a Dirichlet Scalar[1]

MARTIN SCHADEN, Rutgers University - Newark — I present a geometrical subtraction scheme for physical and manifestly finite vacuum energy differences. The procedure does not require intermediate regularization and is well suited for numerical studies since it only a good numerical description of the spectral function at low temperatures is needed. This subtraction method combined with the world-line formalism is used to prove that depending on the geometry, the Casimir force due to a massless scalar field satisfying Dirichlet boundary conditions will draw a piston into the neck or toward the bulb of a flask. This is due to competing contributions to the interaction energy from two types of Brownian bridges. The analysis is robust with respect to variations in the shape of both piston and flask. It depends only on differences of finite positive transition probabilities and extends results obtained by reflection positivity to rather involved geometries. In the limit of a flask with a bulb that is large compared the diameter of the neck, the example suggests that atoms are drawn into metallic micro-pores. This can also be qualitatively understood as the net effect of Van der Waals forces on an atom, but the attraction here is related to the change in zero-point energy with boundary conditions.

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