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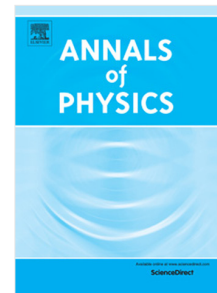
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Casimir self-stress in a dielectric sphere

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Abstract

The dielectric sphere has been an important test case for understanding and calculating the vacuum force of a dielectric body onto itself. Here we develop a method for computing this force in homogeneous spheres of arbitrary dielectric properties embedded in arbitrary homogeneous backgrounds, assuming only that both materials are isotropic and dispersionless. Our results agree with known special cases; most notably we reproduce the prediction of Boyer and Schwinger et al. of a repulsive Casimir force of a perfectly reflecting shell. Our results disagree with the literature in the dilute limit. We argue that the Casimir self-stress can not be regarded as due to pair-wise Casimir-Polder interactions, but rather due to reflections of virtual electromagnetic waves.

Keywords: Casimir forces; dielectrics; vacuum fluctuations; quantum optics in media

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