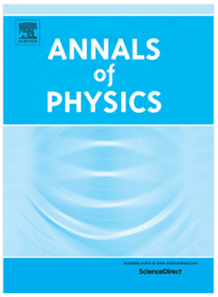
Accepted Manuscript



Casimir self-stress in a dielectric sphere

Yael Avni, Ulf Leonhardt

PII: S0003-4916(18)30165-9
DOI: https://doi.org/10.1016/j.aop.2018.06.002
Reference: YAPHY 67689

To appear in: *Annals of Physics*

Received date : 18 March 2018
Accepted date : 4 June 2018

Please cite this article as: Y. Avni, U. Leonhardt, Casimir self-stress in a dielectric sphere, *Annals of Physics* (2018), https://doi.org/10.1016/j.aop.2018.06.002

Casimir self-stress in a dielectric sphere

Yael Avni and Ulf Leonhardt

Department of Physics of Complex Systems,

Weizmann Institute of Science, Rehovot 76100, Israel

(Dated: May 27, 2018)

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