Quantum Physics

Casimir Friction Between Dense Polarizable Media

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The present paper - a continuation of our recent series of papers on Casimir friction for a pair of particles at low relative particle velocity - extends the analysis so as to include dense media. The situation becomes in this case more complex due to induced dipolar correlations, both within planes, and between planes. We show that the structure of the problem can be simplified by regarding the two half-planes as a generalized version of a pair of particles. It turns out that macroscopic parameters such as permittivity suffice to describe the friction also in the finite density case. The expression for the friction force per unit surface area becomes mathematically well-defined and finite, although extremely small, of the order of 10^{-100} Pa or less, for a typical example involving two equal gold plates. We also show in an appendix how the statistical methods that we are using, correspond to the field theoretical methods more commonly in use.

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