



Universidade Federal da Paraíba
Centro de Ciências Exatas e da Natureza
Programa de Pós-Graduação *Stricto Sensu* em Física

colóquio

“Advances and problems in the Lifshitz theory of dispersion forces”

RESUMO: We consider theory of the van der Waals and Casimir forces which arise between closely spaced material surfaces due to the alteration of spectrum of zero-point and thermal fluctuations of the secondary quantized electromagnetic field. Similar forces arise for quantized fields of different spin in cosmological models with non-Euclidean topology. During the last 10 years a lot of precise experiments on measuring the Casimir force between metallic, semiconductor and dielectric test bodies was performed. The measurement results have been compared with theoretical predictions of the Lifshitz theory. It was found that in all cases there is good agreement between the data and the theory, but under an assumption that for metals the low-frequency behavior of the dielectric permittivity is described by the plasma model except of the conventional Drude model. For dielectrics an agreement with theory was achieved by omitting the contribution of the conductivity at a constant current in the dielectric permittivity. Simultaneously, it was shown that the Lifshitz theory combined with the Drude model or including the conductivity at a constant current violates the third law of thermodynamics (the Nernst heat theorem). Possible ways on how to resolve these puzzles proposed in the literature are discussed.

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