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Casimir effect and Lorentz invariance violation (LIV)

From nanoscience to high energy physics and cosmology, fluctuation-induced phenomena are accepted as underlying mechanism of some most interesting features of the physical world. The Casimir effect is one of the most direct manifestations of the existence of the vacuum quantum fluctuations, discovered by H. B Casimir in 1948, and experimentally confirmed about one decade later by M. J. Sparnaay. While the first application of Casimir effect has been developed for the electromagnetic fields, but all quantum fields should demonstrate this phenomenon. Moreover, the Casimir effect has been suggested as an experimentally powerful tool for investigating new physics beyond the standard model. On the other hand, Lorentz invariance is one of the main and basic concepts in high energy physics. Recent studies in Standard Model Extension (SME) at high energies indicate that this symmetry may be violated. Such an extension of the Standard Model (SME) has been applied to several scenarios to evaluate the breakdown of symmetries.

In this work using the corrections due to LIV on the electric and magnetic fields, we calculate the corrections imposed by LIV on Casimir effect (force). This may provide a direct probe to test LIV in nature. Finally using the accuracy of the experimental measurements, we impose some upper bounds on the LIV parameter.

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Collaboration / Activity

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