

An Update on Casimir Physics in Amsterdam

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During the past 20 years the Casimir effect has been assessed in many ways both experimentally and theoretically. Nonetheless, there remain white spots on the map of our knowledge, which may still hold surprises. In the present talk, we give an update and overview of the efforts of our group in narrowing down these white areas.

As a first point, we discuss the status and first calibration data from our parallel plate Cannex experiment. By design, this setup is poised to overcome the limitations of previous precision experiments using curved surfaces by implementing a set of truly parallel plates with an interaction area of 1 cm² at separations of 10-30 μm. While the aimed sub-pN precision and measurements of (thermal) Casimir forces with an accuracy of around 1 % are highly motivating, the practical implementation of the experiment has lead us to the limits of technical feasibility. Insulation mechanisms against vibrations down to 0.1 Hz, perfect control over parallelism, flatness, geometry, thermal drift, and electrical disturbances have demanded for several years of work to be developed and tested. Now, we are nearing the end of this debugging phase, constantly improving sensitivity and reducing systematic errors. In this talk, we present the latest results of force measurements and an outlook on planned measurements with the Cannex setup.

A second project aims at the investigation of the influence of molecular thin films on the dielectric properties of bulk gold mirrors. We present results of ellipsometry measurements and compare the outcome of force calculations using Lifshitz theory to actual experimental data obtained using our established ferrule-top setup.