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Direttore: prof. Gioacchino Massimo Palma



The Casimir-Polder interaction and the geometry of the system.

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Fluctuation-induced interactions are ubiquitous in classical and quantum physics, impacting various disciplines. The comprehension and management of these phenomena are crucial not only for fundamental research but also for the advancement of promising quantum technologies. A paradigmatic example of these phenomena is the Casimir-Polder force, i.e. a quantum electromagnetic interaction between a microscopic object and another micro- or macroscopic body. In this presentation, this interaction is examined in relation to the geometry of the system, analyzing the force's behavior. The interplay between geometrical and material-related length scales is thoroughly investigated, demonstrating how they characterize the interaction. A flexible and fast-converging numerical scheme is developed for evaluating the interaction over a broad range of distances. The numerical results are corroborated by a detailed analytical examination of limiting behaviors, underscoring how the interplay between material and geometrical parameters facilitates the control of the interaction.