Investigating and manipulating atom-surface interactions

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Nowadays, small objects (atoms, nano-particles, etc.) can be very precisely manipulated and brought in close proximity of a macroscopic object. At distances of the order of a few micrometers or less the interaction with the (quantum and classical) electromagnetic fluctuations play a fundamental role leading to a panoply of phenomena. One example is the generally attractive van der Waals/Casimir-Polder force which sets a limit to the closest trapping distance for atoms near a surface [3] (see fig.1).

Recent theoretical [2] and experimental investigations have shown that, using the interplay of material properties, thermodynamics and geometry, such interactions are tunable in strength and sign [4] (see fig. 2).

This talk discusses recent results focusing on these aspects. I will show how these phenomena can be controlled and manipulated to design new experimental setups for the investigation of fundamental concepts and promising multifunctional nanoscopic devices.

References