

New Windows on Fundamental Physics: from tabletop devices to large scale detectors



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Dark energy and modified gravity with levitated sensors

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Testing modified gravity is essential for probing physics beyond general relativity and for constraining light scalar fields motivated by dark energy. In this talk, I will outline theory calculations which show how levitated cavity optomechanical systems operated in high vacuum can function as sensitive quantum probes of short-range deviations from Newtonian gravity. Focusing on Yukawa-type and chameleon-like interactions, we derive fundamental sensitivity bounds while accounting for the finite geometry of both the levitated optomechanical sensor and the source mass. We demonstrate that geometric screening plays a central role when the force range is comparable to the system size, and that realistic optomechanical platforms can yield improvements on constraints on fifth-force parameters.

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