

**HARNESSING VACUUM FLUCTUATIONS: PHYSICS AND
NANOMECHANICS APPLICATIONS OF CASIMIR-LIFSHITZ FORCES**

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The Casimir/Lifshitz force is the attraction between uncharged metallic or dielectric surfaces due to quantum mechanical vacuum fluctuations of the electromagnetic field. We will review first our work on MicroElectroMechanicalSystems (MEMS) in which the Casimir force between metallic surfaces at submicron distances has been exploited for the quantum mechanical actuation of MEMS and for the realization of a new class of nonlinear oscillators. Next new experiments on tuning the Casimir force using hydrogen switchable mirrors and thin metallic films will be presented. The last part of the talk will describe new experiments aimed at detecting the predicted vacuum torque between suitable birefringent materials.