University of Crete
Department of Physics

Physics Colloquium

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Non-perturbative (cavity) QED

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ABSTRACT

The structure of atoms, molecules and solids is mainly determined by static Coulomb forces, while the coupling to the quantized degrees of freedom of the electromagnetic field plays only a secondary role. Recently, it has been speculated that this general rule can be overcome in the context of cavity quantum electrodynamics (QED), where the coupling of dipoles to a single field mode can exceed the bare energy of the photon itself. Under these conditions, light-matter interactions become non-perturbative, as characterized by an effective finestructure constant of order unity. In this seminar I will give a basic introduction to this extreme coupling regime of cavity QED and explain how vacuum-induced many-body effects can lead to novel ground state phases in QED, which are the opposite of what has been assumed so far. Beyond a purely fundamental interest, these general mechanisms can be important for potential applications, ranging from cavity-assisted chemistry to quantum technologies based on ultrastrongly coupled circuit QED systems.

ZOOM Link: https://zoom.us/j/92211633525?pwd=R1hyU0d4WTBCNFlWelIvcmdhaDBpQT09