University of Crete
Department of Physics

Physics Colloquium

Thursday, 5 October 2023 | 17:00 – 18:00, Seminar Room 3rd Floor

Precision measurements at the quantum interface between light and atomic spin ensembles

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ABSTRACT

Quantum features of atom-light interaction have been among the central issues in physics since the early days of quantum mechanics. Recent technological breakthroughs have transformed the light-atom quantum interface to a powerful tool for performing measurements with unprecedented accuracy. In this talk I will describe experiments that harness quantum features of the light-atom interaction for precision sensing. Specifically, I will show how a spin ensemble can be interfaced with a mechanical oscillator in order to track the motion of the mechanical oscillator without disturbance from the quantum probe. By cascading the two oscillators, linked by the probing light, destructive interference cancels the effect of probe quantum noise on the position sensing of the mechanical oscillator. Additionally, I will describe a table-top experiment based on optically-probed overlapping spin-ensembles that exhibits exceptional sensitivity in the quest for new spin-dependent interactions. The talk will conclude with ongoing efforts at FORTH to develop an atomic-optical magnetometer that will address simultaneously for the first time all the quantum sources of noise.