UNIVERSITY OF CRETE
DEPARTMENT OF PHYSICS

CRETE CENTER FOR
QUANTUM COMPLEXITY
AND NANOTECHNOLOGY

ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 22 May 2014

17:00 -18:00

3rd Floor Seminar Room

"Measurement of Photon Statistics with Live Photoreceptor Cells "

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Abstract

Interfacing biological objects with quantum light allows to enhance the precision of biological measurements, fosters development of models of biological processes, and allows to reveal possible role of quantum effects in neurobiology and perception. Rod cells of the retina are natural photodetectors, and they are perfect candidates for studies of biological interfaces with quantum light. We interface rod cells with light sources of different photon statistics [1,2]. We show that similar to man-made photodetectors, the rod cells are able to discriminate between thermal and coherent statistics of light [1]. We also interface rod cells with a heralded single photon source [2]. This approach allows us to directly demonstrate single photon sensitivity of rod cells, to measure their quantum efficiency and assess parameters of single photon responses. The results are relevant to ongoing studies of manifestation of quantum effects in phototransduction, vision, and photosynthesis.

[1] N. Sim et al., Measurement of Photon Statistics with Live Photoreceptor Cells, Phys. Rev. Lett. **109**, 113601 (2012) (Editor's suggestion).
[2] N. M. Phan et al., Controllable stimulation of retinal rod cells using single photons, arXiv:1308.0670