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Measuring mouse retina response near the detection threshold to direct stimulation of photons with sub-poisson statistics[1] AMIR TAVALA, IQOQI, Austrian Academy of Sciences - VCQ Vienna - Uni. of Vienna, KRISHNA DOVZHIK, Uni. of Vienna, KLAUS SCHICKER, Center for Physiology and Pharmacology, Medical Uni. of Vienna, ALEXANDRA KOSCHAK, Uni. of Innsbruck, Center for Chemistry and Biomedicine, ANTON ZEILINGER, IQOQI, Austrian Academy of Sciences - VCQ Vienna - Uni. of Vienna — Probing the visual system of human and animals at very low photon rate regime has recently attracted the quantum optics community. In an experiment on the isolated photoreceptor cells of Xenopus, the cell output signal was measured while stimulating it by pulses with sub-poisson distributed photons. The results showed single photon detection efficiency of 29+/-4.7% [1]. Another behavioral experiment on human suggests a less detection capability at perception level with the chance of 0.516+/-0.01 (i.e. slightly better than random guess) [2]. Although the species are different, both biological models and experimental observations with classical light stimuli expect that a fraction of single photon responses is filtered somewhere within the retina network and/or during the neural processes in the brain. In this ongoing experiment, we look for a quantitative answer to this question by measuring the output signals of the last neural layer of WT mouse retina using microelectrode arrays. We use a heralded downconversion single-photon source. We stimulate the retina directly since the eye lens (responsible for 20-50% of optical loss and scattering [2]) is being removed. Here, we demonstrate our first results that confirms the response to the sub-poisson distributied pulses.

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