KONWERSATORIUM INSTYTUTU FIZYKI UMCS

16.03.2023 r., (czwartek) godz. 11^{15}, Aula IF im. St. Ziemeckiego

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Functional retinal imaging - a new hope

The gold standard for obtaining information about physiological retinal function is ERG electroretinography. Since the 1990s, scientists have observed optical effects associated with retinal activity. Since then, several different approaches have emerged to optically test retinal function in vivo in a non-invasive and non-contact manner. Techniques such as retinal function analyzer, optophysiology, and optoretinography have been developed by more than a dozen research groups worldwide. Unfortunately, none of these techniques has so far been translated into a real biological mechanism related to the visual process and thus their clinical usefulness is rather low.

In our work, we focus on two approaches of functional retinal imaging: 1. SLO with Two-photon Excited Fluorescence (TPEF-SLO) and 2. optoretinography, in which the physiological response of retinal photoreceptors to visible light causes a nanometric change in the optical path length of the photoreceptors.

In TPEF-SLO we demonstrated for the first time the ability to image human eye in vivo in excitations regimes that were not available before. This gave us access to pigments actively involved in the visual process such as retinol esters. In optoretinography we have shown that the photoreceptor thickness change can be measured using phase-sensitive optical coherence tomography with flicker light stimulation at frequencies on the order of tens of Hertz. To address this challenge, we have developed a new measurement method called Spatio-Temporal Optical Coherence Tomography - STOC-T. in this presentation I will present statistically significant differences in the amplitudes of photoreceptor optical path length (OPL) modulations in response to different flicker frequencies.

Uprzejmie zapraszam wszystkich pracowników, doktorantów i studentów Instytutu Fizyki.

Prof. dr hab. Ryszard Zdyb
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