

MULTIPLEXED MEASUREMENT OF MOLECULAR INTERACTIONS BY HYPERDIMENSIONAL IMAGING MICROSCOPY

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1. BACKGROUND

A large number of molecules cooperate in an intricate network of interactions for the maintenance of the structural integrity, the metabolism and the function of the living cell. A challenge for engineering and physics in optical microscopy is to provide tools that could offer the highest spatio-temporal resolution with the capability to decode complex networks of molecular interactions by the development of technologies and methods that, at the same time, may provide cost-effective and user-friendly instruments [1-2].

2. HYPERDIMENSIONAL IMAGING MICROSCOPY (HDIM)

We present our latest development of a novel architecture for a confocal imaging spectropolarimeter that will permit to characterize fluorescence emission (excitation and emission spectra, fluorescence anisotropy and fluorescence lifetime) in a quantitative and efficient manner. By the exploitation of Foerster resonance energy transfer between a number of fluorophores, it will be possible to probe multi-molecular interactions. The novel system offers parallel acquisition with a single detector and, by the use of a novel solid-state detector (time-gated single-photon avalanche photodiodes) and a supercontinuum light source [3], it provides excellent versatility of use at comparatively low costs.

Novel biophysical imaging techniques are fundamental for our research activities in cancer research: to probe the key molecular processes underlying genomic stability and for a better understanding of the molecular aspects of cancer.

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