O-18.3 Short talk

Multimodal characterization of biological samples through label-free and fluorescence microscopy

Nicolò Incardona¹, Paolo Bianchini¹, Marco Scotto¹, Michele Oneto¹, Hawraa Zbeeb¹, Alberto Diaspro²

¹ Istituto Italiano di Tecnologia, Genova, Italy

² Ist. Italiano Tecnologia, Univ. di Genova, Genova, Italy

Fluorescence microscopy is the standard method for the observation of biological samples. The application of fluorescent molecules ensures high specificity, permitting to distinguish the different structures of the specimen. However, staining involves contamination of the samples and can produce phototoxicity. Several label-free techniques exist, that obtain contrast images without the need for staining. Among these, Mueller matrix microscopy exploits the change in the polarization of the light after the interaction with the sample, to obtain spatial and structural information. In this work, we built a Mueller matrix microscope based on the use of a photoelastic modulator to generate alternate left and right circularly polarized light in a fast way. This permits to get multiple images corresponding to different elements of the matrix, after the demodulation of the detected signal and simple mathematical operations. We focus our attention on the element m14 of the Mueller matrix, that provides information on the differential scattering (or absorption) of left and right circularly polarized light. This element is, therefore, particularly suited to the characterization of chiral structures, such as chromatin. This label-free technique is combined with standard fluorescence systems, in a multimodal approach that permits a more complete description of the sample under observation.