

Combined Optical Coherence Microscopy and Spectrally Resolved Multiphoton Microscopy

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Abstract : A multimodal imaging system, combining spectrally resolved multiphoton microscopy (MPM) and optical coherence microscopy (OCM) is demonstrated. MPM and OCM are commonly integrated into multimodal imaging platforms to combine functional and morphological information. The MPM signals, such as two-photon fluorescence emission (TPFE) and signals created by second harmonic generation (SHG) are biomarkers which exhibit information on functional biological features such as the ratio of pyridine nucleotide (NAD(P)H) and flavin adenine dinucleotide (FAD) in the classification of cancerous tissue. While the spectrally resolved imaging allows for the study of biomarkers, using a spectrometer as a detector limits the imaging speed of the system significantly. To overcome those limitations, an OCM setup was added to the system, which allows for fast acquisition of structural information. Thus, after rapid imaging of larger specimens, navigation within the sample is possible. Subsequently, distinct features can be selected for further investigation using MPM. Additionally, by probing a different contrast, complementary information is obtained, and different biomarkers can be investigated. OCM images of tissue and cell samples are obtained, and distinctive features are evaluated using MPM to illustrate the benefits of the system.

Keywords : optical coherence microscopy, multiphoton microscopy, multimodal imaging, two-photon fluorescence emission

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