

# Crossdisciplinary Applications of Microscopy Techniques, e.g. Physic-Life Science Interfaces

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### Application of multiphoton microscopy in diagnosis and therapy of cancer

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Multiphoton microscopy uses ultrafast, near-infrared laser as excitation sources and bases on nonlinear optical signals of intrinsic fluorophores in tissues such as two or three photon-excited fluorescence (2PEF or 3PEF) and second or third harmonic generation (SHG or THG), providing enhanced imaging penetration depths in scattering samples, reduced overall specimen photodamage, photobleaching and phototoxicity. These advantages make it more suitable for studying intact living tissues at the cellular level without the need of fluorescent dyes. Multiphoton endoscopy has been regarded as a method which may be capable of providing immediate histological images. Using LSM 510 META system (Zeiss, Jena, Germany) coupled to a Ti:sapphire laser (Coherent Mira 900-F), the application of multiphoton microscopy in diagnosis and therapy of cancer were investigated. We focus on esophageal cancer, gastric cancer, colorectal cancer and cervical cancer. We established relevance between optical diagnostic features and physiological and pathological states of tissue which was used to identify tumor tissue [1-8]. The targeted ablation of preinvasive cancer cells with micrometer-sized volume precision was also performed [9]. Our findings provided a “seek-and-treat” medical photonics technology for cancer in epithelial tissues at the molecular level. With the implementation of multiphoton microscopy concept in endoscopy applications, multiphoton endoscopy might realize in vivo histological diagnosis goal of endoscopists.

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