**Advanced fiber optic solutions for biomedical diagnostics and theranostics in 0.3-16µm range**

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Present review will highlight the latest results in advanced fiber optic solutions for a broad spectral range of 0,4-16µm: multi-spectral tissue diagnostics to detect malignant tissue ex-vivo and in-vivo, minimal invasive laser angioplasty, inter-corporal InfraRed-imaging of tissue during RFA procedures in heart and the other ways to use fiber optics in intraoperative therapy control. Thus fiber optics enables to fuse diagnostics and therapy procedures in so called "theranostic" applications.

Spectral fiber sensing for label free analysis of tissue composition helps to differentiate malignant and normal tissue to secure minimal invasive, but complete tumor removal or treatment. All key methods of Raman, fluorescence, diffuse reflection & MIR-absorption spectroscopy will be compared when used for the same spot of tissue - to select the most specific, sensitive and accurate method or to combine them for the synergy enhanced effect. Examples of multi-spectral tissue diagnostics will be presented for several organs together with the preclinical trials of the 1st tumor sensor prototypes.

The 1st results on Mid IR-fiber endoscopy imaging will be presented – used for thermography control of RadioFrequency Ablation (RFA) for pulmonary vein isolation (PVI) - the common treatment used against atrial fibrillation (AF).

Unique advantage of PIR-fiber transmission in Mid IR-range 3-16µm enables also to run non-contact temperature control for various laser-tissue operations: ablation, coagulation and welding of vessels, - providing non-contact control of tissue temperature at the spot of laser beam on tissue. This feature helps to design “smart” laser systems for minimal invasive operations.