DEVELOPMENT OF PHOTO-ACOUSTICS BASED MICROSCOPY FOR *IN VIVO* AND *IN VITRO* STUDIES OF BIOLOGICAL SYSTEMS

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The choice of a microscopy method is always a compromise between resolution and working distance. With optical super-resolution techniques it is possible to achieve resolution down-to few nanometers, but only with thin, transparent samples, such as petri dish cultured cells, fixed on a microscope cover slide. Photo-acoustic microscopy on the other hand, enables label free optical contrast imaging up to depths of several millimeters in complex biological samples, such as tissue section or animal, with sub-cellular (μm-scale) resolution.

Photo-Acoustic Microscopy (PAM) is based on "listening" the broadband ultrasonic signal that is generated by absorption of pulsed excitation light in the sample – in structures that naturally absorb light at the excitation wavelength, or that have been specifically labeled.

In the Laboratory of Biophysics at the University of Turku photo-acoustic microscope has been build to increase the lateral resolution, thus establishing the super-resolution method in PAM, and to develop a contrast method similar to bright-field illumination for PAM.

The main hypothesis for super-resolution method is that it should be possible to control the photoacoustic signal at the perimeters of the diffraction limited excitation volume, with an additional specially shaped beam, as it should suppress the thermal relaxation process. In the work we demonstrate the functionality of the chosen approach.