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# PROJECT 1 PhD/WP2

## Time-dependent fields in optical fibres

Fibre optics is experiencing unprecedented developments in both experimental and theoretical areas nowadays. Recently, for example, image transmission has been demonstrated by multimode fibre resilient to fibre deformation, as well as manipulation by microscopic objects using light transmitted by the fibre. New types of fibers with complex internal structures are also being developed. Very promising is the use of optical fiber as a specific time response element that promises applications in spectroscopy.
The PhD student will initially learn the fiber optics methods, measurement of the transformation matrix, creation of required input states using spatial light modulator (SLM) and imaging by the fiber. Then he/she will focus on the time response of the fiber based on measurement of the frequency dependence of the transformation matrix. The result will be used to generate pulses with specific properties that behave in the fiber in the desired way. Based on this knowledge, the student will try to develop new spectroscopic methods using optical fibers.
The work will include the theoretical and experimental parts. Knowledge of some programming language (Matlab, Mathematica, Labview, etc.) for the calculation and management of experiments will be very useful.
The work will take place at the Institute of Scientific Instruments of the Academy of Sciences of the Czech Republic with the possibility of full-time employment. The PhD student will be involved in the project "Holographic endoscopy for *in vivo* applications", shortly Gate2mu, project number CZ.02.1.01/0.0/0.0/15_003/0000476, which is currently running at this institute. The whole Gate2mu project will consist of ca 15 people (PHD students, postdocs and several senior researchers).

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Literature:
[1] A. Snyder, J. Love, Optical Waveguide Theory (Springer, 1983).
[2] I. Leite, S. Turtaev, X. Jiang, M. Šiler, A. Cuschieri, P. Russell, T. Čižmár, Three-dimensional holographic optical manipulation through a high-numerical-aperture soft-glass multimode fiber, Nature Photonics 12, 33 (2018).
[3] M. Plöschner, T. Tyc, T. Čižmár, Seeing through Chaos and Multimode Fiber, Nature Photonics 9, 529 (2015).

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