# S10-O1

# Femtosecond Laser-Written Photonic Integrated Circuits for Quantum Applications

Ubaid ur Rehman[1], Vakaris Silys[1], Valdemar Stankevič[2], Eimantas Dermauskas[2], Tadas Paulauskas[1]

[1]*Department of Optoelectronics, FTMC, Vilnius, Lithuania*

[2]*Department of Laser Technologies, FTMC, Vilnius, Lithuania*

Email: ubaid.rehman@ftmc.lt

Femtosecond laser-written waveguides in transparent dielectric materials are attracting significant interest for applications in photonic integrated circuits (PICs) and emerging quantum photonic applications. They offer low-loss three-dimensional routing capability, flexibility in defining waveguide core shapes, rapid prototyping, and suitability for wavelength spanning from visible to infrared [1,2].

In this work, femtosecond laser-written waveguides were developed in aluminoborosilicate glass for integrated photonic applications. The influence of laser writing parameters on waveguide formation, mode propagation, and coupling characteristics was systematically investigated. Detailed studies of the modal field profiles revealed fundamental as well as higher-order mode propagation depending on the writing conditions.

In parallel, beam propagation method (BPM)-based numerical model was developed to simulate light propagation in laser-written refractive index structures. Furthermore, the thermo-optic effect was incorporated into the BPM framework to investigate phase control and tuning mechanisms for interferometric applications. The developed model enables the analysis of integrated thermo-optic phase shifters for reconfigurable quantum photonic circuit applications.

## REFERNCES

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[2]. Corrielli, et al. "Femtosecond laser micromachining for integrated quantum photonics." *Nanophotonics* 10.15 (2021): 3789-3812.