Femtosecond Laser Written 2d Waveguide Lattices for Nonlinear Topological Photonics

S A Zhuravitskii[1,2], N N Skryabin[1,2], I V Dyakonov[1], A A Kalinkin[1,2], S P Kulik[1], Y V Kartashov[2], A A Arkhipova[2,3], V O Kompanets[2], S V Chekalin[2], and V N Zadkov[2,3]

[1] *Quantum Technology Centre of Moscow State University, Moscow, Russia*
[2] *Institute of spectroscopy RAS, Moscow, Troitsk, Russia*
[3] *Faculty of Physics, Higher School of Economics, Moscow, Russia*
Contact Email: zhuravicky.sa15@physics.msu.ru

Light localization in periodic waveguide structures has been an intriguing phenomenon in the last decade. The nature of these phenomena is completely different and can be based on nontrivial topology of underlying waveguide array, induced by rotation and structure defects. In recent years, the influence of nonlinearity in such structures has been of particular interest and complements the variety of effects.

In our work we report on the femtosecond laser writing of one- and two dimensional low-loss waveguide lattices in fused silica. This technique enables to fabricate various highly homogeneous waveguide lattices and investigate nonlinear effects. We have both experimentally and theoretically demonstrated topological solitons in one-dimensional SSH trimer array, oscillating two-dimensional square lattice and honeycomb lattices with disclinations, as well as nonlinear light localization in truncated moire lattices and rotating square lattice.

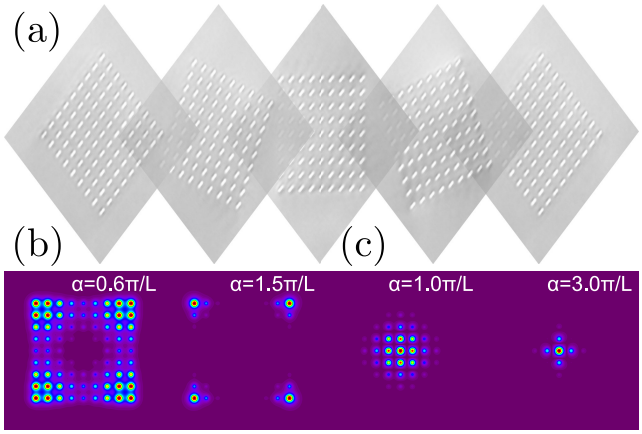

Figure 1: (a) Microphotographs of rotating waveguide array at different distances z illustrating its counterclockwise rotation. Examples of corner (b) and central (c) eigenmodes supported by the rotating array for different rotation frequencies