Linear and Nonlinear Light Localization at the Edges of Quasicrystal Array

S K Ivanov[1], S A Zhuravitskii[2,3], N N Skryabin[2,3], I V Dyakonov[2], A A Kalinkin[2,3], S P Kulik[2], V O Kompanets[3], S V Chekalin[3], S Alyatkin[4], A Ferrando[1], Y V Kartashov[3], and V N Zadkov[3,5]

[1]*Instituto de Ciencia de los Materiales, Universitat de València, Valencia, Spain*
[2]*Quantum Technology Center, M.V. Lomonosov Moscow State University, Moscow, Russia*
[3]*Institute of Spectroscopy, Troitsk, Moscow, Russia*
[4]*Hybrid Photonics Laboratory, Skolkovo Institute of Science and Technology, Moscow, Russia*
[5]*Higher School of Economics, Moscow, Russia*
Contact Email: ivanoff.iks@gmail.com

We theoretically and experimentally observed linear and nonlinear light localization at the edges of truncated quasiperiodic waveguide arrays based on Penrose tiling. By exciting corner linear modes in quasiperiodic arrays created using the femtosecond laser writing technique, we discovered significant differences in their localization properties compared to bulk excitations. Additionally, we observed that the presence of localized modes varies significantly depending on the type of array truncation. We also examined the influence of nonlinearity on both corner and bulk modes, and experimentally observed the transition from linear quasi-localized states to surface solitons at higher input powers. Our results represent the first theoretical and experimental demonstration of localization phenomena induced by truncation in quasiperiodic photonic structures.