Europska unija
Zajedno do fondova EU

EUROPSKI STRUKTURNI I INVESTICIJSKI FONDOVI

Operativni program KONKURENTNOST I KOHEZIJA

STIM

Projekt je sufinancirala Europska unija iz Europskog fonda za regionalni razvoj.

SUB-SYMMETRY PROTECTED TOPOLOGICAL STATES

prof. dr. sc. Hrvoje Buljan

Faculty of Science, University of Zagreb

Abstract:

A hallmark of symmetry-protected topological phases are topological boundary states, which are immune to perturbations that respect the protecting symmetry. It is commonly believed that any perturbation that destroys such a topological phase simultaneously destroys the boundary states. However, by introducing and exploring a weaker sub-symmetry requirement on perturbations, we find that the nature of boundary state protection is in fact more complex. We demonstrate that the boundary states are protected by only the sub-symmetry, using Su-Schrieffer-Heeger and breathing Kagome lattice models, even though the overall topological invariant and the associated topological phase can be destroyed by sub-symmetry preserving perturbations. By precisely controlling symmetry-breaking in photonic lattices, we experimentally demonstrate such sub-symmetry protection of topological states. Furthermore, we introduce a long-range hopping symmetry in breathing Kagome lattices, which resolves a debate on the higher-order topological nature of their corner states. Our results apply beyond photonics and could be used to explore the properties of symmetry-protected topological phases in the absence of full symmetry in different physical contexts.

Organized by the Center of Excellence for Science and Technology – Integration of Mediterranean Region (STIM) as part of the implementation of the STIM-REI project (KK.01.1.1.01.0003)