Mode selection by symmetry and topology

Henning Schomerus

1 Department of Physics, Lancaster University, Lancaster, LA1 4YB, UK

Topological photonic systems: (a) Mode guiding in a quasi-one dimensional structure supporting a localised defect state. (b) Sublattice polarisation of Landau levels in strained honeycomb systems. (c) Point defect state in a dimerised Lieb lattice.

In systems with suitable symmetries, topologically protected states can arise that are immune to perturbations. I discuss how the properties of such states can be enriched in photonic systems, where one has access to absorption and amplification. In particular, I describe analogues of the chiral symmetry and the charge-conjugation symmetry and elucidate their role for the selective amplification of topological defect states. This includes the setting of point defects in one dimensional chain1,2 and two-dimensional lattices with flat bands3, as well as the case of the sublattice-polarised Landau level in strained honeycomb lattices4,5.