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Topological protection of photonic mid-gap cavity modes[1]
WLADIMIR A. BENALCAZAR, University of Illinois at Urbana-Champaign, JIHO NOH, Pennsylvania State University, SHENG HUANG, University of Pittsburgh, MATTHEW J. COLLINS, Pennsylvania State University, KEVIN CHEN, University of Pittsburgh, TAYLOR L. HUGHES, University of Illinois at Urbana-Champaign, MIKAEL RECHTSMAN, Pennsylvania State University — Defect modes in two-dimensional periodic photonic structures have found use in a highly diverse set of optical devices. Here, we show in theory and experiment that a photonic topological crystalline insulator structure can be used to generate topological defect-localized modes. These defect modes are protected by chiral and crystalline symmetries, and have resonance frequencies in the middle of the photonic band gap (which minimize the mode volume). This protection of zero-dimensional states (defect modes) embedded in a two-dimensional environment constitutes a novel form of topological protection that has not been previously demonstrated.

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