

Topological rainbow trapping

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Topological rainbow trapping (TRT) is a novel phenomenon that arises from the interplay between topological states and frequency-dependent slow-light effects. In this process, waves first slow down, then become spatially separated by frequency and are ultimately trapped at distinct locations. In the talk, we shall elucidate the fundamental principles of TRT, emphasizing the physical mechanisms that create near-zero group velocity points with robust frequency-dependent localization. Notably, Berry curvature, a geometric property of Bloch bands, plays a crucial role in this process, introducing an anomalous velocity term that alters wavepacket dynamics and modifies the effective group velocity. We shall highlight three key TRT mechanisms: graded index profiles, which gradually vary material parameters to reshape dispersion and induce slow-light effects; higher-order topological corner modes (HOTCMs), which exploit localized corner states for robust frequency-specific wave confinement; and synthetic dimensions, which expand the system's parameter space to engineer stable interface states at distinct frequencies.



Short Bio:

Kosmas L. Tsakmakidis is a tenured assistant Professor at the National and Kapodistrian University of Athens, Greece. He is one of the early pioneers in the field of metamaterials, where he introduced the concept of 'rainbow trapping' and demonstrated loss-free and lasing metamaterials. He has first-author original, theory papers in *Nature*, *Science*, and *Physical Review Letters*, among his many other scholarly contributions.

