Spatial asymmetry and nonreciprocity in topological photonic crystals and metasurfaces

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Symmetry and reciprocity are fundamentally significant in the manipulation of light flow. Intertwined with broken spatial symmetry and Lorentz reciprocity, the emerging topological photonic structures is a versatile testbed for a plethora of exotic topological concepts and phenomena. In this presentation, I will overview our theoretical works on magneto-optical planar structures with different types of broken symmetries, such as photonic crystals, metasurfaces, and optical thin-film. We have investigated and explored several topological and nonreciprocal phenomena, including topological bandgap enlargement in Chern insulators, large group velocity contrast in multimodal topological edge modes, electromagnetically induced transparency in all-dielectric bianisotropic metasurfaces, quasi-bound states in the continuum in guided mode resonance coupled photonic crystals, and anisotropy-mediated evolution of topological phase singularity pairs. Our results may provide novel perspectives and opportunities on robust slow light, enhanced Faraday rotation effect, and broadband directional thermal emission.

Short Bio:

Tianji Liu received his PhD degree in Applied Physics from Osaka University, Japan. Currently, he is an associate research professor of CIOMP, CAS, China. His research interests include micro/nanostructures-based electromagnetic wave-matter interaction in topological photonics and thermal photonics.