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Topological bands and triply-degenerate points in non-Hermitian hyperbolic metamaterials[1] JUNPENG HOU, ZHITONG LI, XI-WANG LUO, QING GU, CHUANWEI ZHANG, University of Texas at Dallas — Hyperbolic metamaterials (HMMs), an unusual class of electromagnetic metamaterials, have found important applications in various fields due to their distinctive properties. A surprising feature of HHMs found recently is that even continuous HMMs can possess topological edge modes. However, previous studies based on equal-frequency surface (analogy of Fermi surface) may not correctly capture the topology of entire bands. Here we develop a topological band description for continuous HMMs that can be described by a non-Hermitian Hamiltonian formulated from Maxwell's equations. We find two types of three dimensional photonic triply-degenerate points with topological charges ± 2 and 0 induced by chiral and gyromagnetic effects that break spatial inversion and time-reversal symmetries, respectively. Because of the photonic nature, the vacuum band plays an important role for topological edge states and bulk-edge correspondence in HMMs. The topological band results are numerically confirmed by direct simulation of Maxwell's equations. Our work presents a general non-Hermitian topological band treatment of continuous HMMs, paving the way for exploring interesting topological phases in photonic continua.

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