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Weyl Phases in a Three Dimensional Network Model[1] HAILONG WANG, YIDONG CHONG, Division of Physics and Applied Physics, Nanyang Technological University, THEORETICAL PHOTONICS TEAM — We study the topological properties of 3D "Floquet" band structures, defined using unitary evolution matrices rather than Hamiltonians. Such band structures can be realized in coherent-wave networks or lattices subjected to time-periodic drives. Previously, 2D Floquet band structures have been shown to exhibit unusual topological behaviors such as topologically-nontrivial zero-Chern-number phases. Here, we analyze the Floquet band structure of a 3D network model, which exhibits an Floquet analogue of a Weyl phase. The surface states exhibit topologically-protected "Fermi" arcs, similar to the recently-discovered Weyl semi-metals; however, the Weyl points in different quasi-energy gaps are related by a particle-hole symmetry which is unique to the Floquet system. By tuning the coupling parameters of the network, we can drive a transition between conventional insulator, weak topological insulator, and Weyl phases. Finally, we discuss the possibility of realizing this model using custom-designed electromagnetic networks.

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