Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Z_2 Characterization for Three-Dimensional Multiband Hubbard Models[1] BERNHARD IRSIGLER, Goethe-University, Frankfurt, Germany, JUN-HUI ZHENG, Norwegian University of Science and Technology, Trondheim, Norway, FABIAN GRUSDT, Ludwig-Maximilians-University, Munich, Germany, WALTER HOFSTETTER, Goethe-University, Frankfurt, Germany — We introduce three numerical methods for characterizing the topological phases of three-dimensional multiband Hubbard models based on twisted boundary conditions, Wilson loops, as well as the local topological marker. We focus on the half-filled, three-dimensional time-reversal-invariant Hofstadter model with finite spin-orbit coupling. Besides the weak and strong topological insulator phases we find a nodal line semimetal in the parameter regime between the two three-dimensional topological insulator phases. Using dynamical mean-field theory combined with the topological Hamiltonian approach we find stabilization of these three-dimensional topological states due to the Hubbard interaction. We study surface states which exhibit an asymmetry between left and right surface originating from the broken parity symmetry of the system. Our results set the stage for further research on inhomogeneous three-dimensional topological systems, proximity effects, topological Mott insulators and non-trivially linked nodal line semimetals.

[1]This work was supported by the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) via Research Unit FOR 2414 and Germanys Excellence Strategy.

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Date submitted: 14 Jan 2020 Electronic form version 1.4