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Time-reversal-invariant Hofstadter-Hubbard model with ultracold fermions PETER P. ORTH, Karlsruhe Institute of Technology (KIT), Germany, DANIEL COCKS, Institut fuer Theoretische Physik, Goethe Universitaet, 60438 Frankfurt/Main, Germany, STEPHAN RACHEL, Institute for Theoretical Physics, Dresden University of Technology, 01062 Dresden, Germany, MICHAEL BUCHHOLD, Institut fuer Theoretische Physik, Universitaet Innsbruck, Austria, KARYN LE HUR, [1] Center for Theoretical Physics, Ecole Polytechnique, CNRS, 91128 Palaiseau Cedex, France; [2] Yale University, WALTER HOFSTETTER, Institut fuer Theoretische Physik, Goethe Universitaet, 60438 Frankfurt/Main, Germany — We consider the time-reversal-invariant Hofstadter-Hubbard model which can be realized in cold-atom experiments [1]. In these experiments, an additional staggered potential and an artificial Rashba-type spin-orbit coupling are available. Without interactions, the system exhibits various phases such as topological and normal insulator, metal as well as semi-metal phases with two or even more Dirac cones. Using a combination of real-space dynamical mean-field theory and analytical techniques, we discuss the effect of on-site interactions and determine the corresponding phase diagram. In particular, we investigate the semi-metal to antiferromagnetic insulator transition and the stability of different topological insulator phases in the presence of strong interactions. We compute spectral functions which allow us to study the edge states of the strongly correlated topological phases. [1] Daniel Cocks, Peter P. Orth, Stephan Rachel, Michael Buchhold, Karyn Le Hur, and Walter Hofstetter, arXiv:1204.4171 (2012) (accepted for Phys. Rev. Lett.)

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