Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Critical integer quantum Hall topology in the integrable Maryland model[1] SRIRAM GANESHAN, KOSTYANTYN KECHEDZHI, University of Maryland College Park — One-dimensional tight binding models such as Aubry-Andre-Harper (AAH) model (with onsite cosine potential) and the integrable Maryland model (with onsite tangent potential) have been the subjects of extensive theoretical research in localization studies. AAH can be directly mapped onto the two-dimensional Hofstadter model that manifests the integer quantum Hall topology on a lattice. However, no such connection has been made for the Maryland model (MM). In this talk, we present a generalized model that contains AAH and MM as the limiting cases with the MM lying precisely at a topological quantum phase transition (TQPT) point. A remarkable feature of this critical point is that the 1D MM retains well-defined energy gaps whereas the equivalent 2D model becomes gapless, signifying the 2D nature of the TQPT. The criticality allows us to associate topological invariants with the Maryland model in a restricted mathematical sense at the special filling factors that are adiabatically connected to the spectral gaps in the 1D Aubry-Andre-Harper model. Our theory presented in this work establishes deep and unexpected mathematical connections between 2D topological models and a family of 1D incommensurate localization models.

[1]This work is supported by JQI-NSF-PFC, Microsoft Q and JQI-ARO-MU

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Date submitted: 13 Nov 2013 Electronic form version 1.4