Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Chasing the Hofstadter Butterfly INDU SATIJA, George Mason University — The experimental observation of the Hofstadter butterfly, the fascinating quantum fractal that also encodes the Chern numbers associated with quantum Hall state, continues to remain a challenging task. It may be possible to observe the fine structure of the butterfly, consisting of small gaps of the spectrum characterized by topological invariants greater than unity, with a resolution matching that of the Chern-1 gaps that form the skeleton of the butterfly. The tiny gaps of the butterfly emanating from a rational flux p/q are found to be associated with infinity of possible solutions (of Diophantine equation)for the rational flux. Not supported by the simple square lattice nearest-neighbor hopping model of the Hofstadter system, these solutions are found to be hiding in neighborhood of these fluxes. By perturbing this simple system, it is possible to "amplify" these small gaps corresponding to higher Chern states where they replace the Chern 1 gap of the Hofstadter butterfly. In other words, by tuning a parameter, it is possible to induce topological quantum phase transitions where the finer gaps become the new major gaps that dominate the spectrum. This may provide a possible pathway to see the topological landscape of the Hofstadter butterfly fractal in its entirety.

Indu Satija
George Mason University

Date submitted: 14 Nov 2013 Electronic form version 1.4