

K. Le Hur: *Topological Insulators, Mott physics and Artificial Gauge Fields*

In this talk, we review the fate of topological insulators in the presence of interactions and show the stability towards moderate interactions. The transition to the Mott state in these systems is characterized by the disappearance of helical edge states. Above the Mott transition, the system can be in a Neel ordered phase or in a spin liquid phase dependently on the dimensionality of the system [1-4]. We discuss applications to materials and cold atomic systems where spin-orbit coupling and artificial gauge fields can be simulated. Finally, we study photon analogues and discuss the possibility to realize artificial gauge fields and topological phases [5-6].

[1] Stephan Rachel and Karyn Le Hur, Phys. Rev. B 82, 075106 (2010); W.

Wu, S. Rachel; W.-M. Liu and K. Le Hur, Phys. Rev. B 85, 205102 (2012)

[2] Tianhan Liu, Benoit Doucot and Karyn Le Hur, in preparation

[3] D. Pesin and L. Balents, Nature Physics 6, 376 (2010)

[4] Reviews: M. Hohenadler and F. Assaad, arXiv:1211.1774; P. Orth, D.

Cocks, S. Rachel, M. Buchhold, K. Le Hur and W. Hofstetter, arXiv:1212.5607

[5] Jens Koch, Andrew Houck, Karyn Le Hur, S. M. Girvin Phys. Rev. A 82, 043811 (2010)

[6] A. Petrescu, A. Houck, K. Le Hur, Phys. Rev. A 86, 053804 (2012)