

Abstract Submitted
for the NWS12 Meeting of
The American Physical Society

Birefringent fermions and their phase transitions on square lattices NAZANIN KOMEILIZADEH, MALCOLM KENNETT, Simon Fraser University — We introduce a tight-binding model for spinless fermions on a square lattice, which when half-filled has low energy excitations with a Dirac-like dispersion. In the vicinity of these Dirac points there are unusual gapless excitations with the feature that there are two different “speeds of light.” This is a consequence of a broken chiral symmetry in the model, which occurs in the kinetic energy term, and hence leaves the spectrum gapless in the vicinity of the Dirac points. This chiral symmetry breaking is fundamentally different from spontaneous chiral symmetry breaking that leads to mass generation in field theoretic models. We investigate the effects of interactions in this model and present the associated phase diagrams and phase transitions when there are nearest neighbour and next nearest neighbour interactions.

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Date submitted: 14 Sep 2012

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