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JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Theoriekolloquium

Dec. 1, 2016 at 4 p.m.
Newton-Raum, Staudinger Weg 9, 01-122

Dr. Michele Burrello
Niels Bohr Institut, Kopenhagen

Weyl semimetals in artificial gauge potentials

In the last year, several research groups worlwide managed to reproduce the physics of Weyl fermions and to obtain the exotic features of Weyl semimetals in different setups, including not only solid state compounds, but also photonic crystals.
In this talk I will introduce the main features of this gapless 3D topological state of matter and I will focus on an alternative realization of Weyl semimetals based on a model for ultracold fermions in the presence of artificial magnetic fluxes in a cubic lattice.
I will study the stability of this system under several perturbations including trapping potentials and a random variations of the fluxes.
In particular, I will show that for realistic sizes, this system behaves like a disordered Weyl semimetal, therefore it is stable against small perturbations of the artificial magnetic field.
Finally I will address a more exotic state, characterized by double Weyl-points, which is obtained through the introduction of non-Abelian gauge potentials.

References:
L. Lepori, I. C. Fulga, A. Trombettoni, and M. Burrello, PT-invariant Weyl semimetals in gauge-symmetric systems, Phys. Rev. B 94, 085107 (2016)
Double Weyl points and Fermi arcs of topological semimetals in non-Abelian gauge potentials, arXiv:1603.02292 (to be published in PRA)

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