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SÉMINAIRE

Vendredi 16 septembre, 10h30

*Salle de Conférence, 4ème étage, Tour 22-23, Salle 1
IMPMC, Université P. et M. Curie, 4, Place Jussieu, 75005 Paris*

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ULTRACOLD FERMIONS IN OPTICAL LATTICES UNDER ARTIFICIAL MAGNETIC FIELDS

In this talk, I first discuss an experimental set-up recently proposed by us, which allows for the realization of a "staggered gauge field" in a 2D square optical lattice. When the system is loaded with a mixture of bosons and fermions, several features of the high- T_c phase diagram can be reproduced. Starting from a DDW phase, unconventional superconductivity with features of the RVB state is obtained for a certain range of parameters.

In the second part, fermions in a honeycomb lattice in the presence of a magnetic field and spin-orbit interactions will be considered. The single-particle spectrum of this system has a fractal structure, which is known as the Hofstadter butterfly. We study the effects of spin-orbit interactions and Zeeman splitting on this spectrum. When combined with the usual magnetic field, this interaction may lead to spin-imbalanced topological phases, where there is quantized charge and spin transport. If instead a Rashba spin-orbit interaction is considered, we find that complex chiral spin structures may be generated.