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Photo-induced topological phase transitions in ultracold fermions

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Photo-induced quantum phenomena have attracted much attention recently. Here, we address the following quantum phase transitions induced by external laser fields in cold fermions in optical lattices. Recently, concepts of topological phases of matter are extended to non-equilibrium systems, especially periodically driven systems. We construct a model which shows non-equilibrium topological phase transitions using a simple phenomenon in cold-atomic systems. We show that the celebrated Rabi oscillation has the possibility to tune the band structure in fermionic optical lattices and thereby drives non-equilibrium topological phase transitions. If time allows, we also address a possible realization of a photo-induced Kondo effect induced for cold fermions in optical lattices. Using a model for cold alkaline-earth atoms driven by optical coupling, we demonstrate that photo-induced Kondo effect overcomes the heating effect, and thus realizes orbital-spin entangled states leading to heavy-fermion liquids.

Biography

Norio Kawakami has completed his PhD from Osaka University (Japan). His research concerns Theory of Condensed Matter Physics with particular emphasis on many-body problems where interactions between the constituent particles, such as electrons in solids, are very strong and thus give rise to novel quantum phenomena.

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