# Floquet engineering in Mott insulators and control of spin chirality

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Floquet engineering, *i.e.* control of quantum states using time-periodic driving, has been successfully applied in ultracold atoms [1], while its application in solid states is still at an early stage [2]. In solid states, Floquet engineering is typically performed by irradiating materials by carefully selected laser light with specific frequency and helicity. For example, circularly polarized laser (CPL) can be used to control the "chirality" of materials. This is because it breaks time reversal symmetry, and it can be used as a dynamical counterpart of magnetic fields. In the talk, I will report our theoretical studies toward controlling the magnetic structure of strongly correlated insulators using CPL [3, 4]. By starting from realistic quantum Hamiltonians describing spins (Heisenberg model) and electrons (Hubbard model) in strong CPL irradiation, we can derive the effective spin Hamiltonian describing their slow dynamics. By selecting the materials, interesting terms such as the Dzyaloshinskii-Moriya interaction or scalar spin chirality can be laser-induced.

*This work has been done in collaboration with Masahiro Sato, Shintaro Takayoshi, Sota Kitamura, and Hideo Aoki.

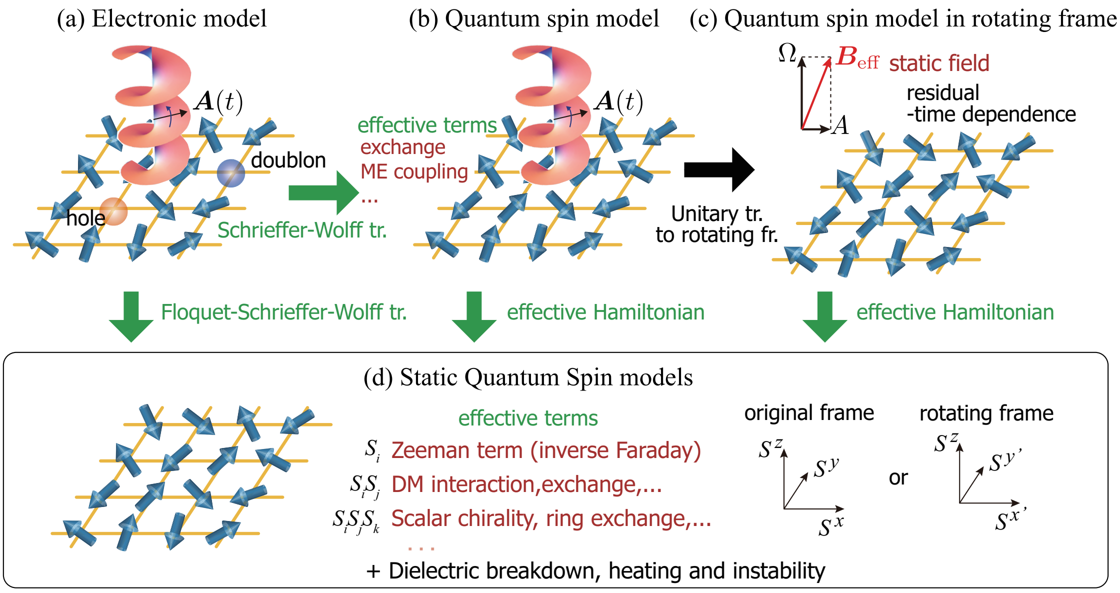


FIG. 1: Effective spin models with "Floquet engineered" terms (d) can be derived from time-dependent electronic or spin models (a) to (c) [4]. This can be used to realize exotic quantum spin states.

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