Detecting localization in 1D lattices through strong light-matter interactions

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The interaction between a strong laser field and material results in a nonlinear optical process that gives rise to the generation of high harmonics of the incident frequency. Recently, there has been a growing interest in the use of high harmonic generation (HHG) to probe various properties of matter, as it can track the electronic motion at the attosecond time scales in both gases and solid state systems. Spectroscopy based on the HHG can serve as a tool of ultrafast imaging to detect signatures of quantum phase transitions in high-temperature superconductors[1], distinguish between trivial and nontrivial topological phases[2,3], and probe dynamical and structural properties of electrons. Here, we present theoretical results for high-harmonic spectroscopy on three distinct condensed matter platforms. In particular, we show that HHG can be used to distinguish between topological phases with different numbers of edge modes in the long-ranged Su–Schrieffer–Heeger model and detect quantum phases of the generalized Aubry-André-Harper model and the Hubbard model with intersite interaction.

References:

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