

I will discuss our recent efforts to understand and predict ways of engineering quantum materials with light, beyond the paradigm of Floquet engineering with continuous driving fields. First I will show results for a cavity quantum-electrodynamical modification of electron-phonon coupling and superconductivity in monolayer FeSe/SrTiO [1], in which the pure vacuum fluctuations of a confined photon field are used. Then I will present a study on ultrafast optical control of chiral Majorana modes in topological superconductors [2], in which we present a simple double-pump-pulse switching protocol purely on symmetry grounds, which implies that it works both in the high-frequency („Floquet“) and low-frequency limits.

[1] M. A. Sentef, M. Ruggenthaler, A. Rubio, arXiv:1802.09437, to appear in Science Advances

[2] M. Claassen, D. M. Kennes, M. Zingl, M. A. Sentef, A. Rubio, arXiv:1810.06536

