Mapping out transient topological states in graphene by dichroic time-resolved photoemission*

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We study the build-up of the Floquet-Chern insulator state in graphene and its implications in time- and angle-resolved photoemission (ARPES). In particular, we show that the circular dichroism in the angular distribution is directly related to the induced pseudospin texture and thus the Berry curvature of the Floquet band structure. Our conclusions are corroborated by realistic time-dependent simulation under experimentally relevant conditions. Including electron-electron and electron-phonon scattering, we reveal the crucial role of scattering mechanisms for the effective thermalization of the Floquet band structure. These calculations are combined with accurate onestep calculations, yielding an excellent description of the circular dichroism in ARPES (CD-ARPES). Albeit the system is highly excited, we show that CD-ARPES provides the unique possibility of discerning light-engineered topological properties of the effective band structure and the Floquet side bands.

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