Electron-photon Chern number in cavity-embedded 2D moiré materials

Danh Phuong Nguyen*[1], Geva Arwas[1], Zuzhang Lin[2], Wang Yao[2], and Cristiano Ciuti†[1]

[1]Laboratoire Matériaux et Phénomènes Quantiques – Centre National de la Recherche Scientifique, Université Paris Cité – France

[2]Department of Physics, The University of Hong Kong – R.A.S. chinoise de Hong Kong

Résumé

We explore theoretically how the topological properties of 2D materials can be manipulated by cavity quantum electromagnetic fields for both resonant and off-resonant electron-photon coupling, with a focus on van der Waals moiré superlattices. We investigate an electron-photon topological Chern number for the cavity-dressed energy minibands that is well defined for any degree of hybridization of the electron and photon states. While an off-resonant cavity mode can renormalize electronic topological phases that exist without cavity coupling, we show that when the cavity mode is resonant to electronic miniband transitions, new and higher electron-photon Chern numbers can emerge.

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*Intervenant

†Auteur correspondant: cristiano.ciuti@u-paris.fr