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Photon-dressed quasiparticle states in 1D and 2D materials: a many-body Floquet approach FRANCA MANGHI, MATTEO PUVIANI, University of Modena and Reggio Emilia — We studiy the interplay between electron-electron interactions and non-equilibrium conditions associated to time-dependent external fields. Exploring phases of quantum matter away from equilibrium may give access to regimes inaccessible under equilibrium conditions. What makes this field particularly interesting is the possibility to engineer new phases of matter by an external tunable control. We have developed a scheme that allows to treat photo-induced phenomena in the presence of electron-electron many body interactions, where both the nonlinear effects of the external field and the electron-electron correlation are treated simultaneously and in a non-perturbative way. The Floquet approach is used to include the effects of the external time periodic field, and the Cluster Perturbation Theory to describe interacting electrons in a lattice. They are merged in a Floquet-Green function method that allows to calculate photon dressed quasiparticle excitation. For 1D systems we show that an unconventional Mott insulator-to-metal transition occurs for given characteristics of the applied field (intensity and frequency). The method has also been applied to the 2D honeycomb lattice (graphene), where in the presence of realistic values of electron-electron interaction, we show that linearly polarized light may give rise to non-dissipative edge states associated to a non-trivial topological behavior.

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