

# Discrete Flat Band Photonics

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In this talk, I will review the state of the art on the topic of Flat Band (FB) photonic lattices. We will focus on explaining the main conditions for observing localization on those systems, a historical problem in discrete lattices that has been solved using simple geometrical arguments. We will review different experimental realizations and main findings concerning localization and transport on these non-conventional systems. I will show that, by using a highly controlled excitation of higher-order modes, it is possible to experimentally observe dipolar flat band states on a Graphene ribbon lattice. At the end, I will present some recent theoretical findings showing that by exciting the lattices — simultaneously using fundamental and excited states — it is possible to modify original trivial linear properties and observe FB phenomenology. Finally, I will comment some results on nonlinear FB lattices, where the mobility of nonlinear FB states has been predicted numerically.