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Light-induced fractional quantum Hall phases in graphene[1] AREG GHAZARYAN, Physics Department, City College of the City University of New York, New York 10031, MICHAEL GULLANS, Joint Quantum Institute and Joint Center for Quantum Information and Computer Science, NIST and University of Maryland, College Park, Maryland 20742, POUYAN GHAEMI, Physics Department, City College of the City University of New York, New York 10031, MOHAMMAD HAFEZI, Department of Electrical and Computer Engineering, IREAP, and Joint Quantum Institute, University of Maryland, College Park, Maryland 20742
— Graphene has a special property that, under a strong magnetic field, its Landau levels are not equidistant. This propety allows one to selectively couple only two Landau levels, using a laser field resonant with their spacing. Such light-matter coupling results in a new form of bilayer fractional quantum Hall system, where the role of the layer is played by Landau level index and hopping between the layers is controlled by light-matter interaction strenght. We present the realizable fractional quantum Hall phases in these systems for 2/3 filling, and analyze the special type of interaction responsible for these phases. We also show that the form of the interaction distinguishes these systems from previously studied bilayer systems.

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