Gram Matrices, Coherent States, and Hofstadter Butterfly with Flat Band YOUJIANG XU, HAN PU, Rice Univ — We propose a new principle using which Hamiltonians supporting flat band can be systematically constructed. The principle is built upon the properties of the Gram matrices. Especially, the Gram matrices of certain subsets of coherent states can be interpreted as Hamiltonians describing a charged particle hopping on a two-dimensional lattice subjected to a gauge field. The massive degeneracy of the ground states in these models is a universal property guaranteed by the (over)completeness of the coherent states, independent from the geometry of the lattice. We study the ground state wave functions and the band structure of these models. Experimental realization of the model is promising because the essential features can be seen on very small lattices.

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