Critical-to-Insulator Transitions and Fractality Edges in Perturbed Flatbands

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We add weak quasiperiodic perturbations to one dimensional two-band ladders with both bands flat.

For weak perturbation, an additional projection onto a single flatband Hilbert space allows to study the properties of the eigenstates upon variation of the control parameters of the all-bands-flat ladder.

We observe localized insulating states, and an entire parameter range hosting critical states.

These critical states have multifractal behavior and support subdiffusive transport.

The Critical-to-Insulator transition turns energy dependent upon increasing the strength of the quasiperiodic perturbations.

We therefore discover fractality edges - energy dependent transitions between an insulator and criticality.

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