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## Local Symmetries in Wave Mechanics: From Fundamentals to First Applications

The concept of local symmetries which hold only in spatially limited domains is developed. Decomposing space into domains where different local symmetries hold a novel layer of complexity is derived. This way the parity and Bloch theorems are generalized to the case of broken global symmetry [1]. Local inversion or translation symmetries are shown to yield invariant currents that characterize wave propagation. These currents map the wave function from an arbitrary spatial domain to any symmetry-related domain. Nonvanishing values of the invariant currents provide a systematic pathway to the breaking of discrete global symmetries [1]. Some examples of applications are provided. A classification of perfectly transmitting resonances in completely locally symmetric scattering setups [2] allows for the design of the scattering behaviour in these non-periodic setups. The emergence and control of flatbands in corresponding discrete quasi 1D setups based on local symmetries are discussed [3]. Local symmetries also allow for the real space design of edge states in aperiodic chains [4]. A generalization to interacting many-body systems is outlined [5].

### References

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