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The Axial Charge in Hilbert Space and Their Role in Chiral Gauge Theories

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We focus on the fact that the Hamiltonian of the $1 + 1$ D staggered fermion system can be smoothly deformed into that of Wilson fermions. We reinterpret the structure of the axial charge operator proposed by A. Chatterjee, S. D. Pace, and S.-H. Shao using Wilson fermions.

We show that the eigenstates of the axial charge operator can be interpreted as fermion states with a well-defined integer chirality, analogous to those in the continuum theory.

The resulting $1 + 1$ D Hamiltonian formulation is expected to be useful in constructing chiral gauge theories based on the symmetric mass generation (SMG) mechanism. SMG refers to a mechanism by which gapless systems can be gapped without fermion bilinears, purely through appropriate interactions, while preserving symmetries. To demonstrate this, we examine the feasibility of realizing SMG while maintaining the $U(1)_A$ gauge symmetry generated by the axial charge operator Q_A , using the 3-4-5-0 models as examples.

Parallel Session (for talks only)

Theoretical developments and applications beyond Standard Model

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