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Weyl Fermions on a Finite Lattice

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The phenomenon of unpaired Weyl fermions appearing on the sole $2n$ dimensional boundary of a $(2n+1)$ -dimensional manifold with massive Dirac fermions was recently analyzed. Similar unpaired Weyl edge states can be seen on a finite lattice. In particular, we consider the discretized Hamiltonian for a Wilson fermion in $(2+1)$ dimensions with a $1+1$ dimensional boundary and continuous time. We demonstrate that the low-lying boundary spectrum is indeed Weyl-like: it has a linear dispersion relation and definite chirality and circulates in only one direction around the boundary. We comment on how these results are consistent with Nielsen-Ninomiya theorem. This work removes one potential obstacle facing the program for regulating chiral gauge theories.

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