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Magnetic translation algebra with or without magnetic field CHRISTOPHER MUDRY, Paul Scherrer Institute, CLAUDIO CHAMON, Boston University — The magnetic translation algebra plays an important role in the quantum Hall effect. Murthy and Shankar have shown how to realize this algebra using fermionic bilinears defined on a two-dimensional square lattice. We show that, in any dimension d, it is always possible to close the magnetic translation algebra using fermionic bilinears, be it in the continuum or on the lattice. We also show that these generators are complete in even, but not odd, dimensions, in the sense that any fermionic Hamiltonian in even dimensions that conserves particle number can be represented in terms of the generators of this algebra, whether or not time-reversal symmetry is broken. As an example, we reproduce the f-sum rule of interacting electrons at vanishing magnetic field using this representation. We also show that interactions can significantly change the bare band width of lattice Hamiltonians when represented in terms of the generators of the magnetic translation algebra.

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