Quantum Group in 2D Lattice Field Theory

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The tight-binding model of quantum particles on a honeycomb lattice is investigated in the presence of homogeneous magnetic field. Provided the magnetic flux per unit hexagon is rational of elementary flux, the one-particle Hamiltonian is expressed in terms of the generators of the quantum group $U_q(sl_2)$. Employing the functional representation of the quantum group $U_q(sl_2)$ the Harper equation is rewritten as a system of two coupled functional equations in the complex plane. The system is shown to exhibit certain symmetry allowing to resolve the entanglement, and basic single equation determining the eigenvalues and eigenstates (polynomials) is obtained.

References

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