Abstract Submitted
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2D and 3D topological states of cold atoms with synthetic gauge fields[1] CONGJUN WU, YI LI, Department of Physics, University of California, San Diego, XIANGFA ZHOU, Key Laboratory of Quantum Information, University of Science and Technology of China, CAS, Hefei, Anhui 230026, People's Republic of China — We found that the synthetic gauge fields from the light-atom interaction combined with harmonic trapping potential give rise to exotic topological band structure in both 2D and 3D. Landau-level like quantizations appear with the full 2D and 3D rotational symmetry and time-reversal symmetry. Inside each band, states are labeled by their angular momenta over which energy dispersions are strongly suppressed by spin-orbit coupling to nearly flat. The radial quantization generates the energy gap between neighboring bands at the order of the harmonic frequency. Helical edge or surface states appear on open boundaries characterized by the Z2 index. These Hamiltonians can be viewed from the dimensional reduction of the high dimensional quantum Hall states in 3D and 4D flat spaces.

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