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Time-Dependent Artificial Gauge Fields in Ultracold Quantum Gases

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Here, we study the effects of various time-dependent artificial gauge fields on a Bose-Einstein condensate (BEC) of rubidium-87 atoms. In particular, we perform numerical simulations of a quasi-3D BEC in a harmonic trap subjected to artificial gauge fields. We study oscillating synthetic electric fields, synthetic magnetic fields, and combinations thereof; we look at the contributions from interactions within the gas as well as other various system parameters. Simulations of spinor-BECs and progress towards experimental implementations are also discussed. This work is expected to further expand the quantum simulation toolbox, leading to new venues in quantum simulation.

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