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Inter-band transitions and dynamics of Bose-Einstein condensates with modulated spin-orbit and scalar gauge field potentials ABRAHAM OLSON, ROBERT NIFFENEGGER, YONG P. CHEN, Purdue University — We have experimentally studied optically-trapped Bose-Einstein condensates (BECs) of ^{87}Rb atoms in the presence of temporally modulated synthetic spin-orbit (SO) and scalar gauge potentials. We load our BECs in spin-momentum dressed-state energy bands in either the SO or scalar gauge potential regime using a Raman coupling of the ground state atomic magnetic sublevels (following similar techniques developed by the NIST group). We then modulate the strength of the Raman coupling, and study the evolution of the BEC following the modulation for different initial conditions and modulation parameters. A number of interesting behaviors are observed, including inter-band oscillations and various complex longer-time scale dynamics. We have also developed another technique of inter-band excitation spectroscopy to probe the synthetic energy bands of the BEC.

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