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Experimental studies of transport and dynamics of BEC in synthetic gauge fields and spin-orbit coupling YONG P. CHEN, ROBERT NIFFENEGGER, ABRAHAM OLSON, CHUAN-HSUN LI, DAVID BLASING, Purdue University — We have set up a ^{87}Rb BEC experiment focusing on the transport and dynamical phenomena of BECs in synthetic gauge fields and spin orbit interactions. The synthetic gauge and spin-orbit fields are created optically using a pair of counter propagating Raman beams, detuned $\sim 400\text{-}1000$ GHz from the D2 line (780 nm), coupling different hyperfine spin (in the $F=1$ ground manifold) and momentum states. We have characterized the loading of our BEC into synthetic dressed state energy bands, in both the spin-orbit (weak Raman coupling) and vector gauge potential (strong coupling) regimes. We have developed techniques to probe the dressed band structure through driven inter-band transitions. We have also studied various dynamical and transport phenomena of the BECs in the dressed bands, and developed schemes to generate spin dependent electromagnetic fields that may be used to study spin dependent transport physics previously explored in solid state systems.

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