

Description of Additional Supplementary Files

File name: Supplementary Movie 1

Description: Video demonstrating the band structure measurement for on-resonance modulation with only nearest-neighbor hopping, as in Fig. 3b. The right panel shows the time-resolved transmission as the laser-cavity detuning is scanned. This directly maps out the band structure shown on the left.

File name: Supplementary Movie 2

Description: Video demonstrating band structure measurement in the presence of long-range hopping and synthetic gauge potentials, as in Fig. 4c. The right panel shows the time-resolved transmission as the laser-cavity detuning is scanned. This directly maps out the band structure shown on the left.