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Sculpting the spectral density of an atomic transition LOGAN W. CLARK, NINGYUAN JIA, NATHAN SCHINE, CLAIRE BAUM, JONATHAN SIMON, University of Chicago — Floquet engineering enables atomic and optical systems to realize many interesting and otherwise inaccessible Hamiltonians. Here, we explore the use of a rapidly modulated AC Stark shift to dramatically modify the excitation spectrum of an atom. With this modulated driving we can split a single atomic line into multiple separate lines or convert an ordinary, Lorentzian line into an exotic new shape. One exciting application of this technique is to cavity QED experiments, where splitting one line into many enables a single atomic transition to be coupled with multiple modes of a non-degenerate cavity. We discuss experiments using this capability to explore collisions between strongly-interacting cavity Rydberg polaritons in multiple transverse modes.

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