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Probing non-exponential decay in a Floquet-engineered optical lattice[1] ETHAN SIMMONS, ALEC CAO, ROSHAN SAJJAD, DAVID WELD, University of California, Santa Barbara — Given the ubiquity of exponential decay as a description of a wide variety of physical processes, it is a surprising fact that purely exponential decay is forbidden by quantum mechanics: population dynamics must deviate from exponential time dependence at both very short and very long times. Long-time quantum corrections to exponential decay in individual metastable systems may be observable in processes ranging from negative-ion photodetachment to synthetic spontaneous emission of matter waves to emission near photonic crystal bandgaps, but a direct theory-experiment comparison for this fundamental phenomenon remains a challenge. We describe a new experimental probe of non-exponential decay dynamics, in which a non-interacting quantum gas is driven through a tunably avoided crossing between two Floquet-engineered quasienergy bands. We discuss the potential of this new tool as a means of directly measuring fundamental quantum corrections to exponential decay.

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