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Optical generation of Fock states in a weakly nonlinear oscillator BOTAN KHANI, JAY GAMBETTA, FELIX MOTZOI, FRANK WILHELM, QUANTUM DEVICE THEORY GROUP TEAM — We apply optimal control theory to determine the shortest time in which an energy eigenstate of a weakly anharmonic oscillator can be created under the practical constraint of linear driving. We show that the optimal pulses are beatings of mostly the transition frequencies for the transitions up to the desired state and the next leakage level. The time of a shortest possible pulse for a given nonlinearity scale with the nonlinearity parameter as a power law. This power law is weaker than the one expected by a simple spectroscopic argument, emphasizing the benefits of quantum interference. Furthermore we confirm that even with realistic models for decoherence high fidelity energy eigenstates can be achieved.

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