Multi-valley effective mass theory for device-level modeling of open quantum dynamics\textsuperscript{1} N. TOBIAS JACOBSON, ANDREW D. BACZEWSKI, Sandia National Labs, ADAM FREES, University of Wisconsin-Madison, Sandia National Labs, JOHN KING GAMBLE, INES MONTANO, JONATHAN E. MOUSSA, RICHARD P. MULLER, ERIK NIELSEN, Sandia National Labs — Simple models for semiconductor-based quantum information processors can provide useful qualitative descriptions of device behavior. However, as experimental implementations have matured, more specific guidance from theory has become necessary, particularly in the form of quantitatively reliable yet computationally efficient modeling. Besides modeling static device properties, improved characterization of noisy gate operations requires a more sophisticated description of device dynamics. Making use of recent developments in multi-valley effective mass theory, we discuss device-level simulations of the open system quantum dynamics of a qubit interacting with phonons and other noise sources.

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