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Second-order self-refocusing pulse shapes for arbitrary rotation angles[1] LEONID P. PRYADKO, University of California, Riverside, PINAKI SENGUPTA, Los Alamos National Laboratory — We construct several families of high-precision 1st- and 2nd-order self-refocusing pulse shapes for rotation angles $\alpha = 0^\circ$, 10°, ..., 360°. To characterize their performance, we show that for an arbitrarily-coupled qubit driven by a general one-dimensional symmetric pulse shape, in addition to the net rotation angle, the second-order average Hamiltonian is defined by three parameters. Our 1st- and 2nd-order self-refocusing pulses respectively have one or two of these equal to zero, which makes them useful as a drop-in replacement for hard pulses. We illustrate this by analyzing several commonly-used composite pulses in terms of the average Hamiltonian theory. The results are in an excellent agreement with numerical simulations.

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