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Spin Manipulation in lateral quantum dots under time-dependent confinement.[1] JAMIE WALLS, ERIC HELLER, Harvard University — Single spin manipulations are a critical component to potential realizations of spintronic devices and quantum computers in lateral quantum dots. In this work, we demonstrate a new method for creating spin excitations in lateral quantum dots which uses the interplay between the spin-orbit interaction and a time-dependent lateral confining potential. For an asymmetric dot in the presence of an in-plane magnetic field, the spin quantization axis can be tilted away from the applied magnetic field due to the Rashba spin-orbit coupling, with the degree of tilting depending parametrically upon the confinement potential. By making small modulations to the confinement potential at a frequency given roughly by the Zeeman splitting, efficient spin excitations can be performed. We have performed theoretical and numerical calculations which demonstrate that Rabi frequencies on the order of tens of megahertz can be achieved for experimentally accessible parameters. Extensions to spin excitations in multi-electron quantum dots will also be presented.

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