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Effects of Strain on Single Electron Devices[1] EDGAR GARCIA, JUSTIN PERRON, Department of Physics, California State University San Marcos — Gate-defined quantum dots have the ability to isolate and control individual electrons. This ability makes them a promising candidate quantum computing architecture. Control is achieved by applying electrostatic forces via metallic gates deposited on the surface of a semiconducting crystal. The requirement that these devices be operated at extremely low temperatures coupled with the difference in thermal expansion between the metallic gates and the semiconductor crystal results in a complicated strain profile during operation. To better understand effects of this strain profile, we perform finite-element simulations of these devices and look at how the gate-induced strain impacts the electron states in these devices. In agreement with previous studies, our results suggest that strain can lead to changes in quantum dot location as well as the formation of unintentional quantum dots. Building on these results, future studies will incorporate the electrostatics from the gates into these simulations to provide a more complete picture of these devices. Ultimately, we aim to accurately predict quantum dot location as well as the location and energy associated with any strain-induced unintentional charge traps.

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