Cavity universal control with quantum gates: ECD and CNOD gates at comparison

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Abstract

Circuit quantum electrodynamics (cQED) presents itself as one of the most promising fields to achieve scalable quantum computers. In this field, quantum gates are of particular interest since they allow universal control of the cavities quantum state space, as well as state tomography. Thus, they represent potential tools for multimode cavity control. My project focuses on simulating realistic cQED systems to provide a better understanding of how different quantum gates operate on the system, analysing their strengths and weaknesses in different parameter regimes and noise models. The echoed conditional displacement (ECD) is a well-known quantum gate compared to the novel Conditional Not Displacement (CNOD) gate designed by Diringer et al. The goal is to achieve a better understanding of the similarities and differences between the two quantum gates, and provide a framework of comparison at different parameter regimes. Understanding which input pulses are optimal for the use of each gate is an important step to achieve high-fidelity cavity control.

References

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Figures

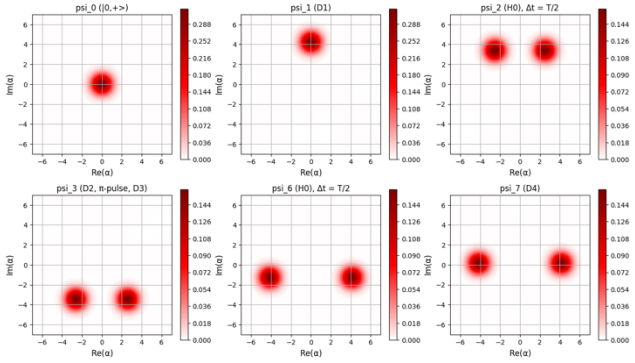

Figure 1: Wigner function representation of a |+> state controlled with the ECD gate. The above is an implementation of the ECD sequence [3].