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Numerical Analysis of Robust Phase Estimation KENNETH RUDINGER, Center for Computing Research, Sandia National Laboratories, SHELBY KIMMEL, QuICS, University of Maryland — Robust phase estimation (RPE) is a new technique for estimating rotation angles and axes of single-qubit operations, steps necessary for developing useful quantum gates [arXiv:1502.02677]. As RPE only diagnoses a few parameters of a set of gate operations while at the same time achieving Heisenberg scaling, it requires relatively few resources compared to traditional tomographic procedures. In this talk, we present numerical simulations of RPE that show both Heisenberg scaling and robustness against state preparation and measurement errors, while also demonstrating numerical bounds on the procedure's efficacy. We additionally compare RPE to gate set tomography (GST), another Heisenberg-limited tomographic procedure. While GST provides a full gate set description, it is more resource-intensive than RPE, leading to potential tradeoffs between the procedures. We explore these tradeoffs and numerically establish criteria to guide experimentalists in deciding when to use RPE or GST to characterize their gate sets.

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