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Implementation of gate set tomography on transmon qubit to characterize and optimize single qubit gates TAEWAN NOH, Korea Research Institute of Standards and Science, GWANYEOL PARK, Korea Research Institute of Standards and Science, Korea University Sejong Campus, GAHYUN CHOI, Korea Research Institute of Standards and Science, Ulsan National Institute of Science and Technology, JIMAN CHOI, Korea Research Institute of Standards and Science, University of Science and Technology, WOON SONG, Korea Research Institute of Standards and Science, SOON GUL LEE, Korea University Sejong Campus, GIBOG PARK, Ulsan National Institute of Science and Technology, YONUK CHONG, Korea Research Institute of Standards and Science, University of Science and Technology — Characterizing the fidelities of quantum gates and improving them are essential requirements to build a scalable quantum computation platform. Two typical methods for such purpose, i.e., randomized benchmarking and quantum process tomography, contain drawbacks that cannot be compensated without the aid of the other, which demands the development of a new stand-alone protocol. Gate set tomography (GST) is one of such protocols developed to obtain detailed information of qubit gates that are free from the state preparation and measurement (SPAM) errors. We have implemented GST on several packages of single transmon qubit embedded in a 3 dimensional cavity. As a result, GST analysis not only estimated the process matrices of target gates but also suggested the direction for further calibration to achieve more accurate gate operations.

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