

We would like to thank the reviewers for their comments. Below we provide a response to their specific remarks.

1 Reviewer 1

1. The cross-entropy benchmarking technique used in the validation of the Sycamore-53 QPU in quantum supremacy experiments (<https://www.nature.com/articles/s41586-019-1666-5>) should also be mentioned in the Introduction (<https://www.nature.com/articles/s41586-018-0124-x>).

Response We modified manuscript to include mention of cross-entropy benchmarking as suggested by the referee.

2. The generalization of the suggested benchmarking technique to multiple qubits should be described in more detail, explicitly mentioning whether the complexity of the derivation and actual benchmarking depends on the number of qubits.

Response We thank the referee for this suggestion. We extended the manuscript with a paragraph describing differences between a single-qubit and higher-dimensional cases.

2 Reviewer 2