Supplemental Material for The Open Science Prize - IBM Quantum 2021

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TBD[*]

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I. INTRODUCTION

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(Alexander *et al.*, 2020)
(Bharti *et al.*, 2022)
(Bravyi *et al.*, 2021)
(Córcoles *et al.*, 2021)
(Earnest *et al.*, 2021)
(Gokhale *et al.*, 2020)
(Heras *et al.*, 2014)
(Iten *et al.*, 2019)
(Kandala *et al.*, 2019)
(Krantz *et al.*, 2019)
(LaRose *et al.*, 2020)
(Lloyd, 1996)
(Nation *et al.*, 2021)
(Preskill, 2018)
(Salathé *et al.*, 2015)
(Satoh *et al.*, 2021)
(Sheldon *et al.*, 2016)
(Smith *et al.*, 2019)
(Smith *et al.*, 2022)
(Stenger *et al.*, 2021)
(Sundaresan *et al.*, 2020)
(Tacchino *et al.*, 2019)
(Temme *et al.*, 2017)
(Tucci, 2005)
(Wootton, 2020)
(Zhang *et al.*, 2003)
(Kandala *et al.*, 2019)
(Kim *et al.*, 2021)
(Gokhale *et al.*, 2020)

II. SUMMARY

Performance benchmarks have always been difficult to properly engineer for classical computer systems, and quantum systems add both result quality and interaction with classical systems into the equation. We have shown that low level, single dimension benchmarks do not properly express the performance that user's see from the system. Instead it is necessary to create holistic benchmarks that capture all of the components that will translate to performance on real world applications but not be overly cumbersome to execute. We have defined a CLOPS benchmark that captures many of the necessary aspects for running user applications with good performance, and provided examples of using the benchmark to find current bottlenecks in the system.

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