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Towards an automatized framework to perform quantum calibration

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Over the last 20 years, thanks to the development of quantum technologies, it has been possible to deploy quantum algorithms and applications, that before were only accessible through simulation, on real quantum hardware. The current devices available are often refereed to as noisy intermediate-scale quantum (NISQ) computers and they require calibration routines in order to obtain consistent results.

In this context, we present the latest developments of Qibo, an open-source framework for quantum computing.
Qibo was initially born as a simulation tool in order to simulate quantum circuits.
Through its modular layout for backend abstraction it is possible to change effortlessly between different backends, including a high-performance simulator based on just-in-time compilation able to simulate circuit with large number of qubits (greater than 35).

The latest addiction has been the possibility to employ the language developed by Qibo to execute quantum circuit on real quantum hardware.

Given the necessity to apply calibration routines to characterize the experimental setup, we've also developed a plugin for Qibo, which implements both basic and more advanced calibration routines, including randomized benchmarking and gate set tomography.

Significance

The latest updates on Qibo regards the possibility of executing quantum circuits directly on quantum hardware instead of simulating them. We also show how to perform calibration routines and quantum protocols in an automatized way.

References

https://inspirehep.net/literature/1986757
https://inspirehep.net/literature/2032781
https://inspirehep.net/literature/2054070

Experiment context, if any

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