Qiskit Deep Dive: Experiments

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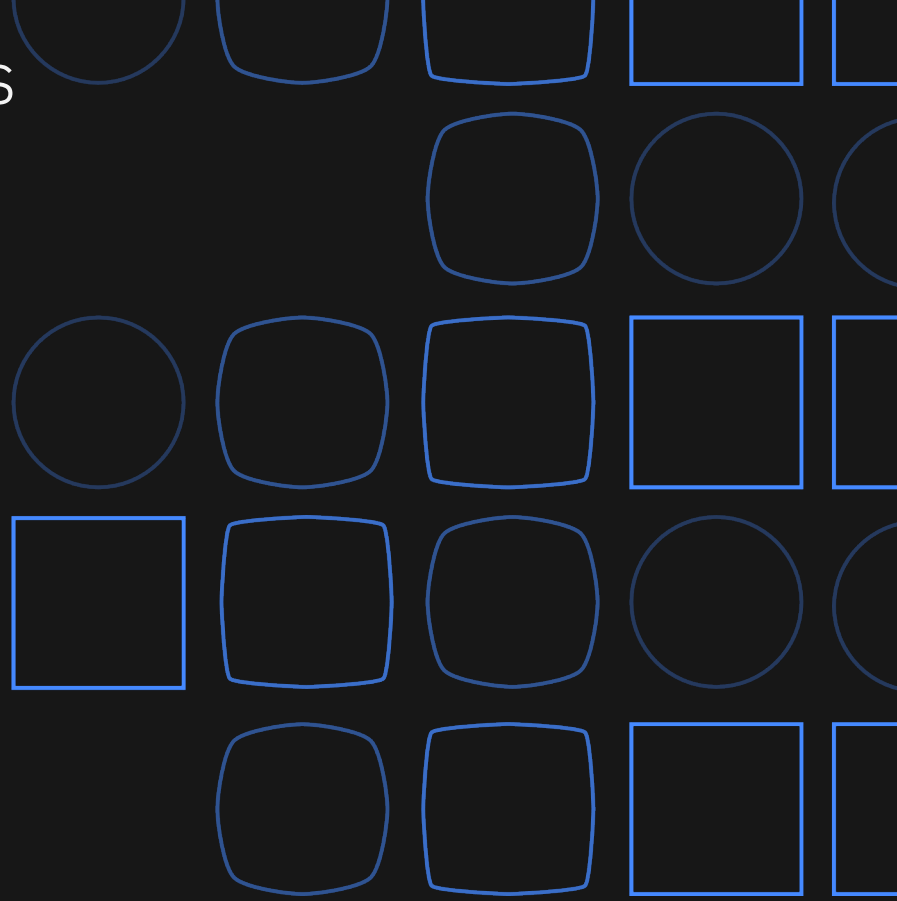

IBM **Quantum**

Qiskit Experiments

- New Qiskit package for end-to-end running of experiments on quantum computers and storing of results in an online IBM experiment database.
- Focus on calibration and characterization experiments
- Provides a framework for developers to create their own experiments.
- Custom experiments can also be stored and retrieved from IBM experiment database.

Install
`pip install qiskit-experiments`

Documentation
`qiskit.org/documentation/experiments/`

Github
`github.com/Qiskit/qiskit-experiments/`

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Qiskit Experiments API Reference ¶

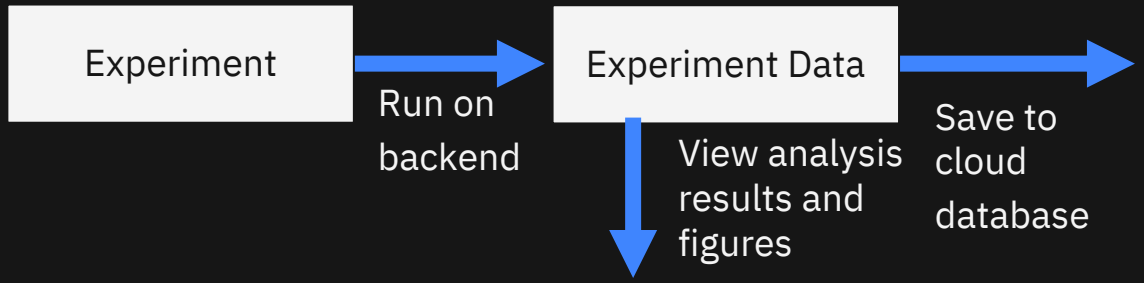
Package Modules ¶

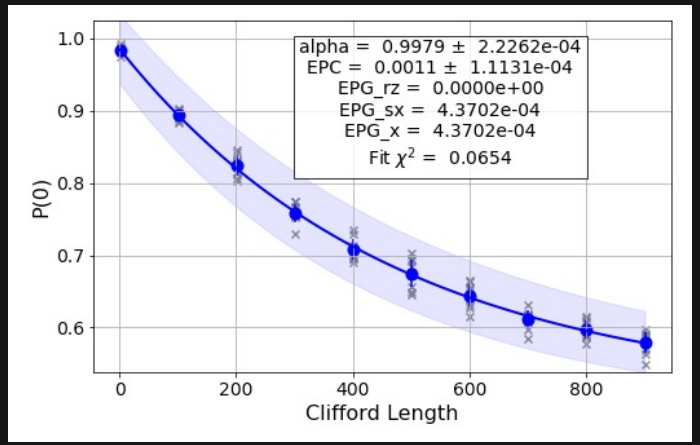
- Qiskit Experiments (`qiskit_experiments`)
- Experiment Framework (`qiskit_experiments.framework`)
- Experiment Library (`qiskit_experiments.library`)
- Data Processing (`qiskit_experiments.data_processing`)
- Curve Analysis (`qiskit_experiments.curve_analysis`)
- Calibration Management (`qiskit_experiments.calibration_management`)
- Database Service (`qiskit_experiments.database_service`)

Experiment Modules ¶

- Calibration Experiments (`qiskit_experiments.library.calibration`)
- Characterization Experiments (`qiskit_experiments.library.characterization`)
- Randomized Benchmarking Experiments (`qiskit_experiments.library.randomized_benchmarking`)
- Tomography Experiments (`qiskit_experiments.library.tomography`)
- Quantum Volume Experiment (`qiskit_experiments.library.quantum_volume`)

Framework Overview



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- χ²: 0.06537136051261279
- device_components: ['Q0']
- verified: False
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- name: EPG_sx
- value: 0.00043701967376250566
- χ²: 0.06537136051261279
- device_components: ['Q0']
- verified: False
DbAnalysisResultV1
- name: EPG_x
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- χ²: 0.06537136051261279
- device_components: ['Q0']
- verified: False
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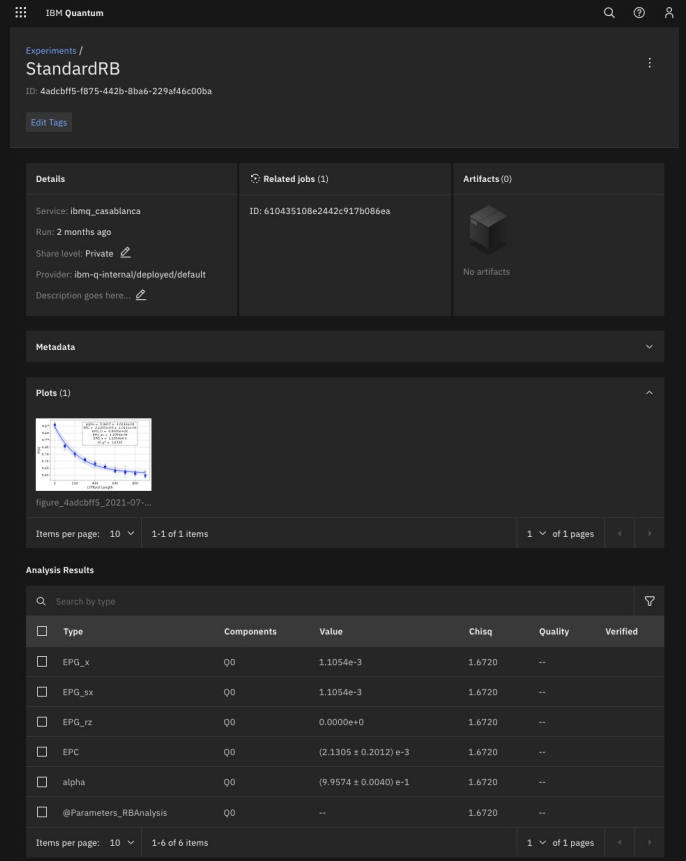

Framework Overview

Experiment Class

- Generates and transpiles circuits to run on backend
- Contains an analysis class for processing result data

Analysis Class

- Processes raw result data (counts or IQ)
- Generates analysis results and figures from data

Experiment Data Class

- Stores job information for running circuits
- Stores result data
- Stores analysis results and figures
- Can be saved and loaded to online cloud database

Running Experiments

Let’s try it out in a Jupyter Notebook...

For more documentation and tutorials see

https://qiskit.org/documentation/experiments/