

Welcome, and Happy IYQ!!!

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Seattle Quantum Computing Meetup, Founder

IBM Quantum

'Quantum' should



Sat, Oct 4, 2025, 12:30pm-2:00pm

Today’s Agenda



Qiskit Fall Fest 2025

What is it?
Who are the hosts?
SQCM FF25 Schedule

IBM Quantum, and others

IBM Hardware
IBM Roadmap
Quantum Computers
Quantum Programming

Qiskit

How to use it?

SQCM Fall Fest 2025 Activities

Coding Challenges
Hackathon Prompts
Open-Your-Choice Project
Quantum Games
Free Time

Qiskit Fall Fest — What is it?



Qiskit Fall Fest 2025

Qiskit Fall Fest is a collection of quantum computing events created and planned by university students and volunteer hosts, with support from IBM Quantum.

54 Sponsored Events
+ 89 Extension Events
143 Total Events

<https://www.ibm.com/quantum/events/fall-fest-2025>

The Seattle Quantum Computing Meetup was selected as one of 150 universities or organizations to host a FF25, out of 600 applications.

https://github.com/SeattleQuantumComputingMeetup/qiskit_fall_fest_2025/tree/main



SQCM FF25 Schedule



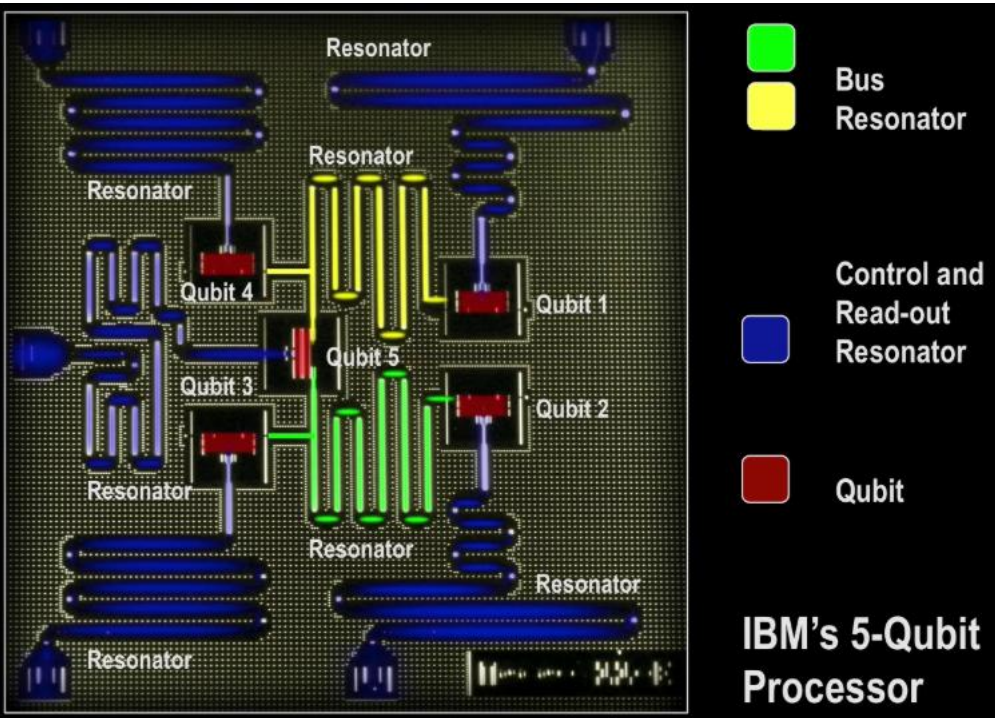
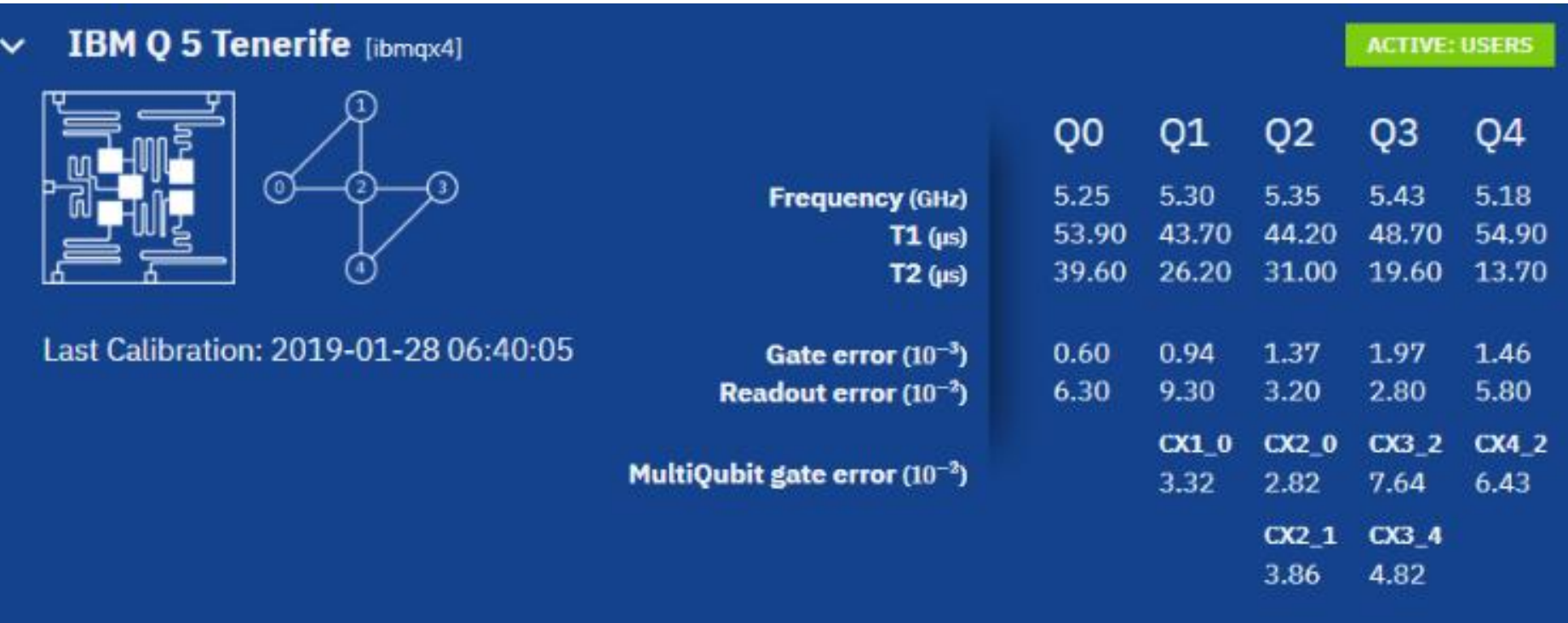
Date	Time	Activity	Location
Sep 30	6-7:30pm PT	<u>Fall Fest 2025 Prep - Qiskit and Quantum Computing 101</u>	Northgate Branch, Seattle Public Library
Oct 4	12:30-2:00pm PT	<u>Qiskit Coding Challenges, Hackathon Prompts, Game Day</u>	Montlake Branch, Seattle Public Library
Nov 3	10:00 am PT	Deadline for Coding Challenges and Hackathon Work	submit online
By Dec 1	11:59 pm PT	Participation and Winner Certificates Will Be Awarded	delivered online

IBM Quantum and Others – hardware and software

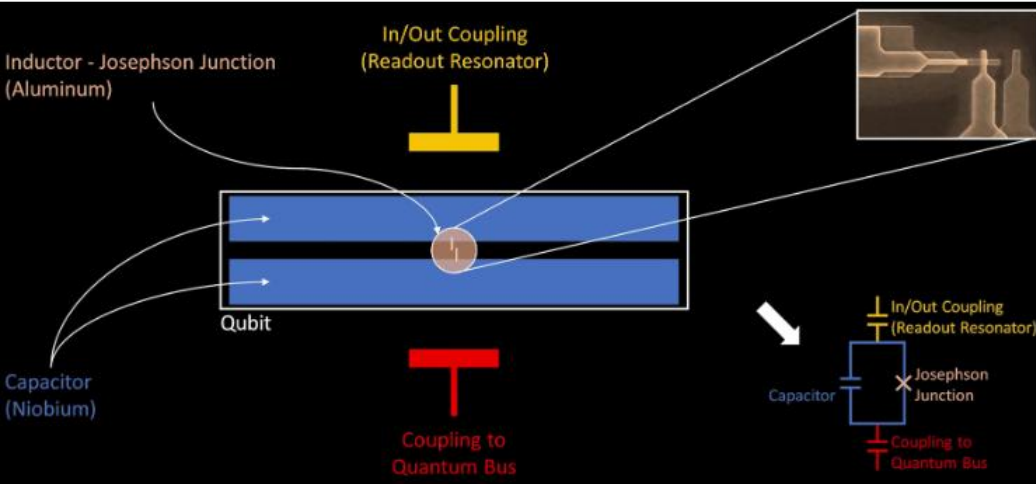


IBM Quantum, Hardware

The IBM Quantum Experience went live on May 4, 2016:



Superconducting Qubit with Josephson Junction (JJ):

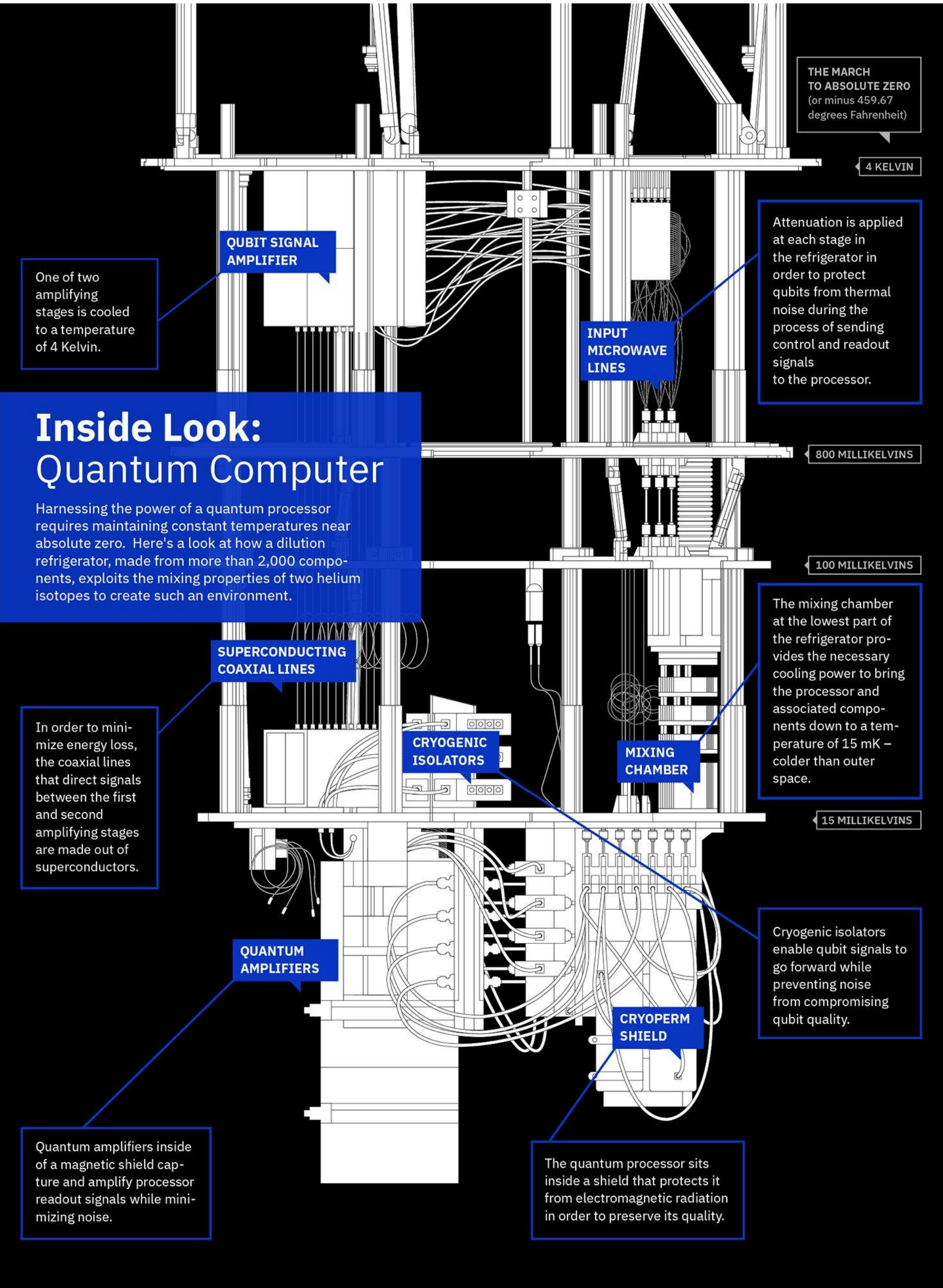
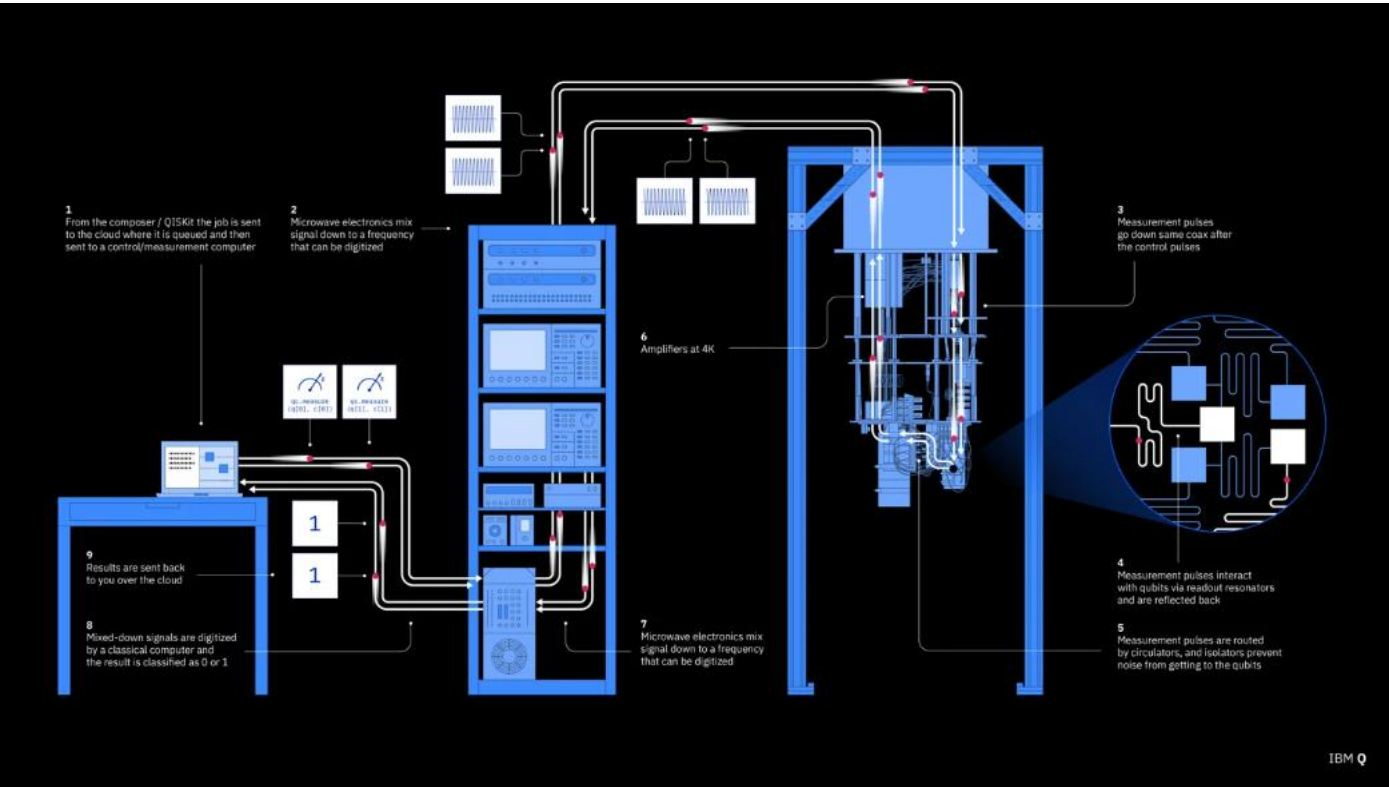


QPU: size like CPU

Qubit: millimeters

JJ: microscopic
(≤ micrometers)

Qiskit Fall Fest 2025



<https://electronics360.globalspec.com/article/13553/how-quantum-computers-work>

IBM Quantum, Roadmap

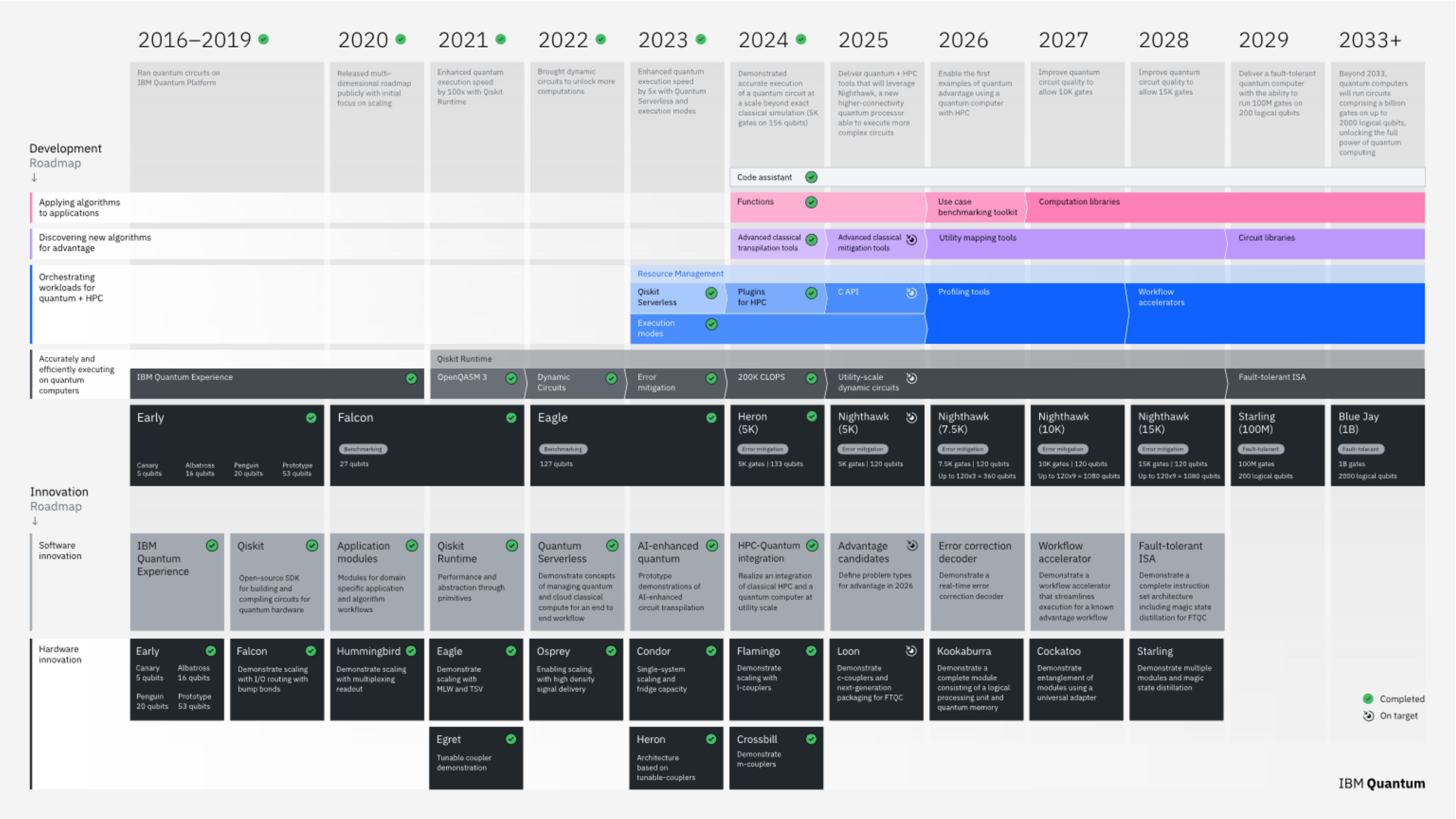


Diagram:

<https://www.ibm.com/roadmaps/quantum/>

Video:

<https://www.ibm.com/quantum/technology#roadmap>

What's Out There?

“The development of quantum software has been strongly influenced by the [open-source](#) community, with many toolkits and frameworks—such as [Qiskit](#), [Cirq](#), PennyLane, and qBraid SDK—available under open licenses,” Wikipedia, Quantum Programming.

<https://unitary.foundation/posts/2024-surveyresults/>



Quantum Processors

There are different types of quantum processors:

- ❑ Circuit-based quantum processors - QPUs are based on the [quantum circuit](#) and [quantum logic gate](#)-based [model of computing](#). (e.g. IBM and others)
- ❑ Annealing quantum processors - QPUs are based on [quantum annealing](#), not to be confused with digital annealing. (e.g. D-Wave)
- ❑ Analog quantum processors - These QPUs are based on analog Hamiltonian simulation. (e.g. QuEra)

https://en.wikipedia.org/wiki/List_of_quantum_processors

Quantum Programming

Quantum programming refers to the process of designing and implementing algorithms that operate on [quantum systems](#), typically using quantum circuits composed of quantum gates, measurements, and classical control logic.

These circuits are developed to manipulate quantum states for specific computational tasks or experimental outcomes.

Quantum programs may be executed on quantum processors, simulated on classical hardware, or implemented through laboratory instrumentation for research purposes.

There are:

- Quantum instruction sets (e.g. OpenQASM)
- Quantum software development kits (e.g. Qiskit and others)
- Quantum programming languages

https://en.wikipedia.org/wiki/Quantum_programming

Qiskit



How do I write and run Qiskit code?



Online Lab Environments

- Google Colab is the easiest
- qBraid is another option

<https://quantum.cloud.ibm.com/docs/en/guides/online-lab-environments>

Install Locally in a Python environment

You can run your Qiskit code on your own computer.

<https://quantum.cloud.ibm.com/docs/en/guides/install-qiskit>

Jupyter Notebooks

This is the most common way to get started with Qiskit code.

You can upload your notebook, or start a new one, in Google Colab, for the easiest path as a Beginner.

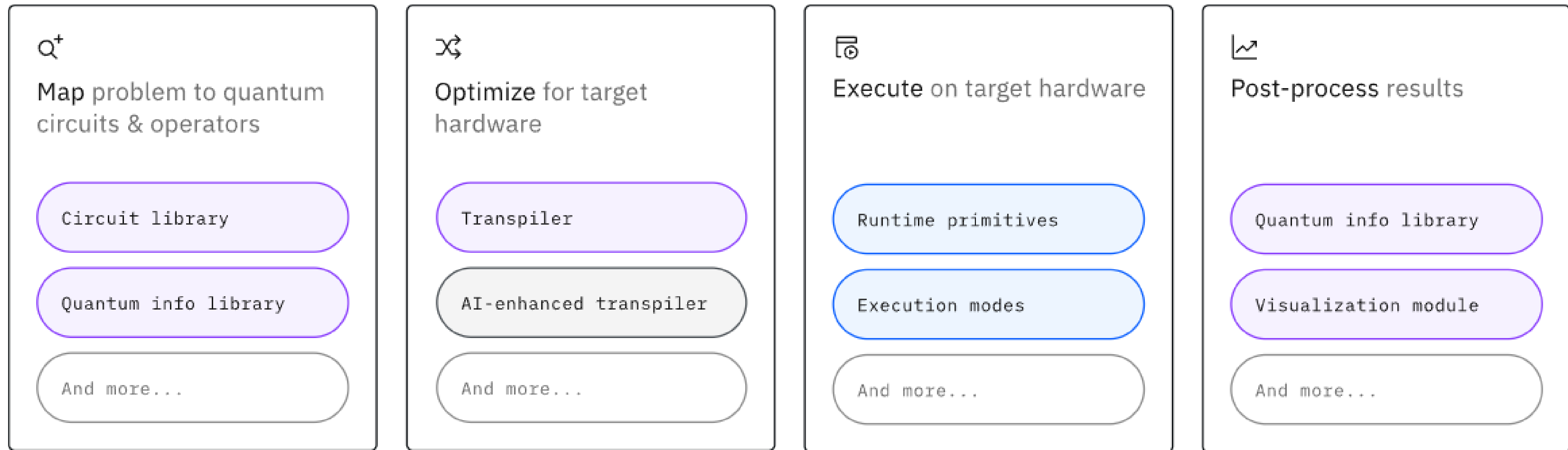
Qiskit Documentation

The IBM Quantum Platform has Guides, an API Reference, Tutorials, and other Documentation.

<https://quantum.cloud.ibm.com/docs/en/guides>

Qiskit Pattern:

The anatomy of a quantum algorithm – when ready to run on a backend




 Qiskit SDK  Qiskit Runtime Service  Qiskit Transpiler Service

Qiskit Pattern:

The anatomy of a quantum algorithm – when ready to run on a backend



How will you encode your data in a quantum state (angle, amplitude)? What qalg or subroutines will you use? ↓ ↓


**Map problem to quantum circuits & operators**

Circuit library

Quantum info library

And more...

Create an Instruction Set Architecture (ISA) circuit (native gates + SWAPs) ↓ ↓


**Optimize for target hardware**

Transpiler

AI-enhanced transpiler

And more...

Use the Sampler() or Estimator() Primitive to run a job ↓ ↓


**Execute on target hardware**

Runtime primitives

Execution modes

And more...

Egs. result = job.result(), plot_histogram(counts) ↓ ↓

**Post-process results**

Quantum info library

Visualization module

And more...

Example Backends: ↑ ↑
AerSimulator(), FakeTorino(),
ibm_torino (Heron 133 QBs)

How will you test the code ↑ ↑
that is producing these
results?

 Qiskit SDK  Qiskit Runtime Service  Qiskit Transpiler Service

How do I learn more?

Qiskit Channel on YouTube

- Topic videos – short and long
- Seminar videos
- Qiskit Global Summer School presentations and panels
- Lab tours

<https://www.youtube.com/qiskit>



Qiskit-Community GitHub repos

- qgss-2025
- qiskit-machine-learning
- qiskit-experiments
- qiskit-optimization
- qiskit-metal

<https://github.com/qiskit-community>

Qiskit Guides / API Reference

- Introduction to Qiskit
- Install Qiskit
- Qiskit Tools - such as Circuits and Operators, Transpiler, Debugging Tools, Primitives, Execution Modes, Manage jobs, IBM Quantum Computers

<https://quantum.cloud.ibm.com/docs/en/guides>

IBM Quantum Platform Tutorials

- Hello world
- Shor’s Alg
- Grover’s Alg
- QAOA Alg
- Quantum kernel training

<https://quantum.cloud.ibm.com/docs/en/tutorials>

IBM Quantum Platform Learning

Free Online Classes, work at your own pace – Foundations, Focused topics, QC for business, Qiskit in classroom

<https://quantum.cloud.ibm.com/learning/en>

Qiskit v2.0 Developer Certification Study Guide and Sample Test

Useful materials – whether or not you actually take the test

<https://www.ibm.com/training/certification/ibm-certified-quantum-computation-using-qiskit-v2x-developer-associate-C9008400>

SQCM Fall Fest 2025 Activities



What are the project options?

Define your own project –

- You can create a project on a topic of your own choosing, related to Quantum Computing.
- This could be a hackathon-like prompt, an idea for a start-up, an article or essay or piece of creative writing, an idea for a game, a type of art of any form, or any other suggestion you might have; the sky's the limit!
- If you're interested in defining a business, or some other type of business challenge, you can look at this page from the fall fest we hosted last year:
<https://dorahacks.io/hackathon/564/businesschallenge>
- Have fun!



Qiskit Coding Challenges

- **Beginner Notebook – Qiskit 2 Fundamentals Lab**, This notebook is designed to help you get up to speed on Qiskit 2 fundamentals by providing hands-on exercises for 18 core concepts. As a bonus, in the last cell, you can run code on real IBM quantum hardware!
- **Intermediate Notebook – Hands-On Introduction to DiVincenzo Criteria with Qiskit 2**, Physicist David DiVincenzo outlined five key requirements for any physical implementation of a quantum computer, plus two additional criteria for quantum communication. In this notebook, we will **experience each DiVincenzo criterion through practical Qiskit demonstrations**. You will get to run circuits on simulators and real IBM Quantum devices to **explore each principle hands-on**.

https://github.com/SeattleQuantumComputingMeetup/qiskit_fall_fest_2025/tree/main/coding_challenges

Hackathon Prompts

- ❖ Cleveland Clinic – protein structure prediction
- ❖ BasQ – quantum Battleship/BombTester game
- ❖ Mila – financial application, options pricing
- ❖ Rensselaer PTI – cryptography/Quantum Key Distribution

https://github.com/SeattleQuantumComputingMeetup/qiskit_fall_fest_2025/tree/main/hackathon_prompts

How do I earn a certificate from IBM Quantum?

Submit your work by sending a direct message in Discord (nhawkins), Meetup (Natalie Hawkins), or LinkedIn (natalie-hawkins-seattle) or an email to nrhawkins@gmail.com with **ONE** of the following, as well as indicating your full name as you wish it to appear on the certificate:

- a link to a github repo or other storage location, like Box, containing your work
- attach your file(s) to the message



Participation Certificate

Do one of the following:

- Attend at least one in-person SQCM FF25 event
- Complete the Beginner or Intermediate Notebook

Winner Certificate

Do one of the following:

- Complete both the Beginner and Intermediate Notebooks
- Submit work on one of the Hackathon prompts
- Submit work on a topic of your own choosing related to Quantum Computing. This could be a hackathon-like prompt, an idea for a start-up, an article or essay or piece of creative writing, an idea for a game, a type of art of any form, or any other suggestion you might have; the sky's the limit! Have fun!

How do spend the rest of my time today at the SQCM FF25 Kickoff?



1

Start working on the Beginner Notebook. Choose a path of uploading the notebook to an online lab environment or create a Python environment on your own machine and install Qiskit.

2

Join the SQCM Discord.
Network with others, to see what they're interested in.

Find the Discord invite link under the About tab on:
<https://www.meetup.com/seattle-quantum-computing-meetup/>

3

Read through the Hackathon Prompts, if that path interests you, or brainstorm on a topic of your own choice.

4

Try out the board game Entanglion, created by IBM Quantum Researchers, or the digital QC game, Qpong, created by Junye Huang, Technical Integrations Engineer at IBM Quantum.

<https://www.lexaloffle.com/bbs/?tid=39762>

Thanks for
Joining the
SQCM Qiskit Fall
Fest!!

IBM Quantum

'Quantum' should

