



IonQ Investor Updates

August 2024

Cautionary Notes

This presentation contains statements that constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995 and other securities laws. Whenever we use words such as "believe," "expect," "anticipate," "intend," "plan," "estimate," "can," "will," "may," "has the potential to" and negatives and derivatives of these or similar expressions, we are making forward-looking statements. Forward-looking statements in this presentation relate to various aspects of our business, including statements about IonQ, Inc. ("IonQ," "our" or "we") and our technology roadmap; our anticipated timing and ability to achieve higher algorithmic qubits, better error correction and sustained growth in system usage; the potential benefits of our partnership with Quantum Basel and other partners and customers; the sufficiency of the our cash reserves; the growth, retention and capabilities of our team; the scale and projected growth of quantum computing's total addressable market; the possible applications of quantum computing; and the timing and value impact of maturity growth in quantum computing. These forward-looking statements are based upon our present intent, beliefs or expectations, but forward-looking statements are not guaranteed or may not occur.

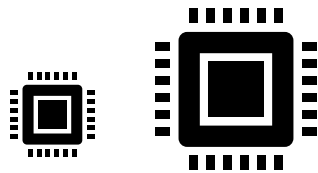
Forward-looking statements involve known risks, uncertainties and other factors, some of which are beyond our control. Many of these factors could cause actual future events to differ materially from the forward-looking statements in this presentation, including but not limited to: market adoption of quantum computing solutions and our products, services and solutions; our ability to protect our intellectual property; changes in the competitive industries in which we operate; changes in laws and regulations affecting our business; our ability to implement our business plans, forecasts and other expectations, and identify and realize additional partnerships and opportunities; and the risk of downturns in the market and the technology industry. These and other risks identified under the header "Risk Factors" in our Annual Report on Form 10-K for the year ended December 31, 2023, filed with the Securities and Exchange Commission, or SEC, as well as other information we file with the SEC could cause our results to differ materially from those stated or implied by our forward-looking statements. You are encouraged to read our filings with the SEC, available at www.sec.gov, for a discussion of these and other risks and uncertainties. You should not place undue reliance upon forward-looking statements. Except as required by law, we undertake no obligation to update or revise any forward-looking statement as a result of new information, future events or otherwise.

Our Goal:

**Build the World's Best
Quantum Computers
to Solve the World's
Most Complex and
Impactful Problems.**



The Quantum Revolution is Here, with IonQ Leading the Pack



**Met 2024 Technical
Scaling Goal
12 Months Early**

\$65B

TAM By 2030 ²

**Large & Growing
Market Opportunity**

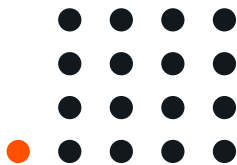
\$402M

Cash Balance ³

**Capitalized to
Execute & Deliver**

36 #AQ

**Algorithmic Qubits on
Industry Leading
IonQ Forte¹**



**Exceedingly Low Error
Correction Overhead**



**Only Quantum Hardware
Available on
All Major Clouds**



**Premier Partners
& Customers**



**Every Major
Quantum Language
& SDK Supported**

1. Based on IonQ Forte data taken on January 22, 2024

2. Prescient & Strategic Intelligence Private Limited, February 2020

3. Cash, cash equivalents and investments were \$402.0M as of June 30, 2024

Led by Distinguished Industry Veterans



Peter Chapman
President & CEO
amazon



Thomas Kramer
Chief Financial Officer
ORACLE **OPower** **cvent** **BCG**



Rima Alameddine
Chief Revenue Officer
nvidia **cisco** **Sun**
microsystems



Margaret Arakawa
Chief Marketing Officer
Microsoft **fastly**



Stacey Giamalis
Chief Legal Officer
PagerDuty **apigee**



Tom Jones
Chief People Officer
BLUE ORIGIN **Microsoft** **Honeywell**



Ariel Braunstein
SVP, Product
Google **cisco**



Dean Kassmann
SVP, Engineering & Technology
BLUE ORIGIN **amazon**



David Mehuiys
VP, Production Engineering
PsiQuantum **Infinera**



Jordan Shapiro
VP, FP&A | Head of IR, CorpDev
NEA **SAMSUNG**



Martin Roetteler
Sr. Director, Quantum Solutions
Microsoft **NEC**

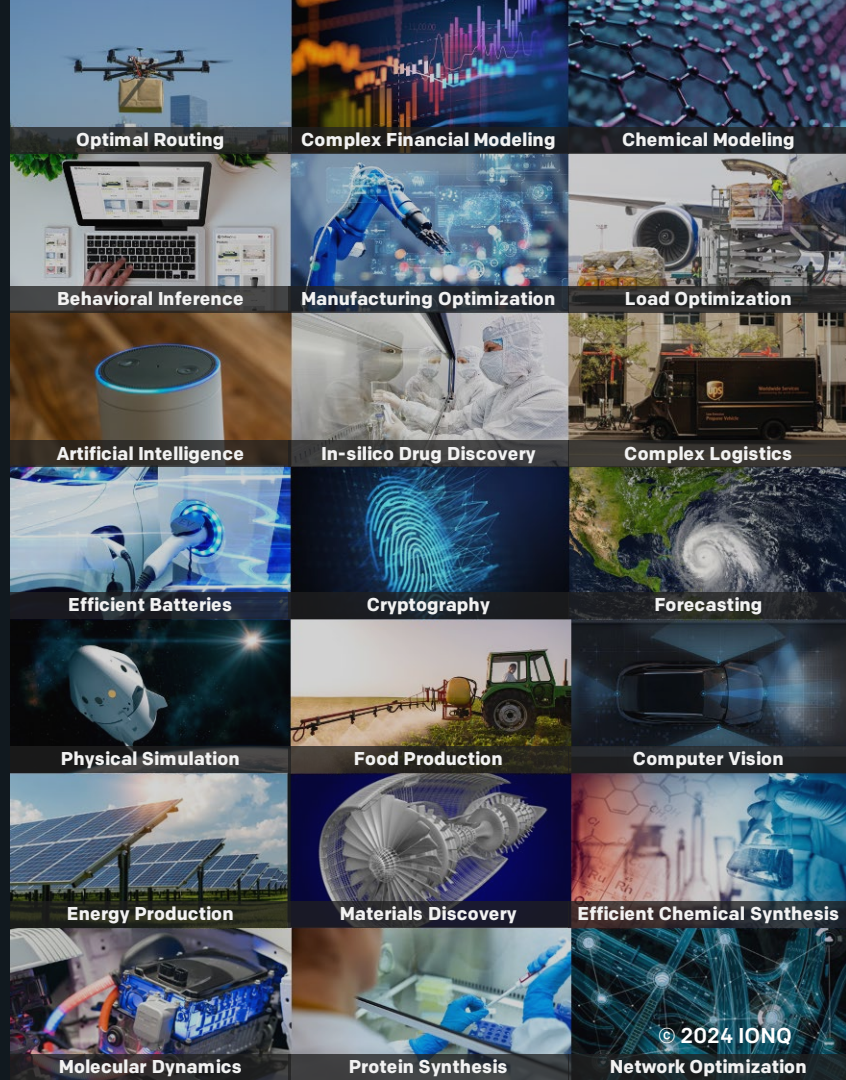


Anuja Singh
Sr. Director, Customer Success
amazon **cisco**

The Quantum Revolution is Here



Quantum Computers
unlock commercial
applications beyond
the limits of classical
computers.



Quantum Computing to Create Up to **\$850B** in Economic Value by 2040

Machine Learning

Automotive: AV AI Algorithms
\$1B-\$10B

Finance: AML and anti-fraud
\$20B-\$30B

Tech: Search/ads optimization
\$50B-\$100B

Other Use Cases
\$25B-\$110B

Optimization

Logistics: Network Optimization
\$50B-\$100B

Insurance: Risk Management
\$10B-\$20B

Finance: Portfolio Optimization
\$20B-\$50B

Aerospace: Route Optimization
\$20B-\$50B

Simulation

Pharma: Drug Discovery
\$40B-\$80B

Aerospace: CFD
\$10B-\$20B

Chemistry: Catalyst Design
\$20B-\$50B

Energy: Solar Conversion
\$10B-\$30B

Finance: Market Simulation
\$20B-\$35B

Other Use Cases
\$75B-\$115B

Cryptography

**Government: Encryption,
Decryption (cybersecurity)**
\$20B-\$40B

**Corporate: Encryption
(cybersecurity)**
\$20B-\$40B

Machine learning applications to impact most, if not all, industries

IonQ's **Winning** Qubit Modality

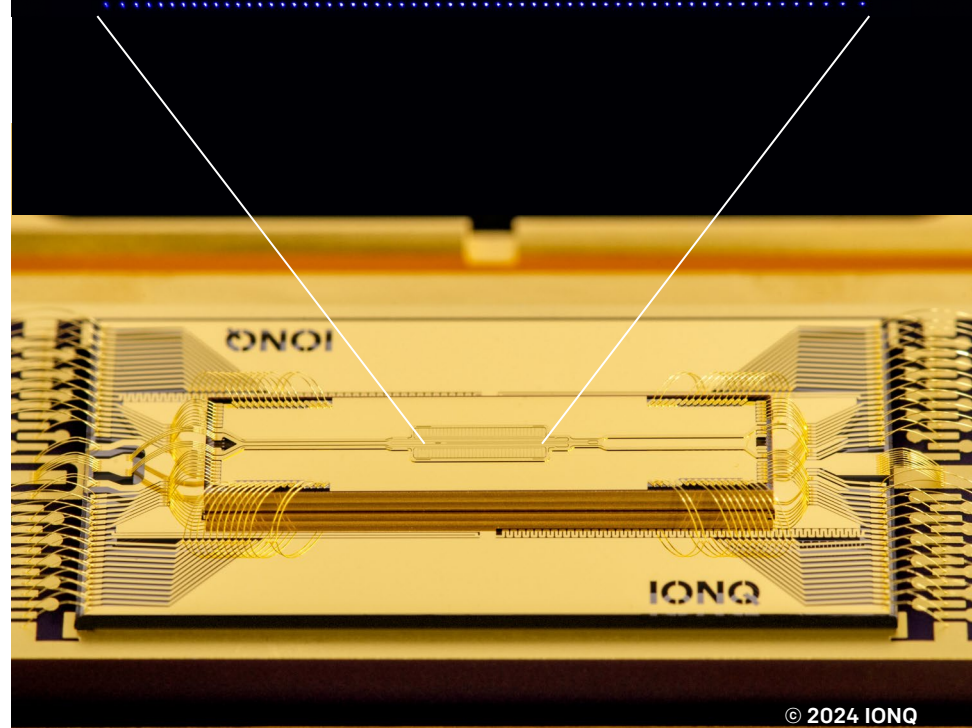


IonQ's Trapped Ion Architecture is the Winning Qubit Modality

- Identical and naturally quantum
- Long coherence and qubit lifetime
- 99.9% 2QG native fidelity
- Universal gates
- Reconfigurable and highly connected
- Modular and scalable system architecture
- Capable of running at room temperature
- Practical time-to-solution

Actual Photo of 64 Barium Ion Chain
IonQ Barium R&D System
Q2 2024

~100x
Zoom



Industry Leading Commercial Product Portfolio



Harmony



A Pioneering Quantum Computer



2019

Aria



Widely Accessible, High Performance



2021

Forte



Commercially Available, Higher Performing



2023

Selling

Forte Enterprise

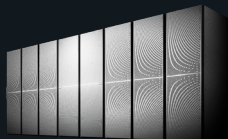


Hybrid Enabled, Data Center-Ready



2024

Tempo



Commercial Advantage Capable



2025

Planned

Future Systems



Broad Commercial Advantage



2025+

Launched

System
Production

Form Factor

Custom Form Factor

Standard Data Center Form Factor

Qubit Species

Ytterbium

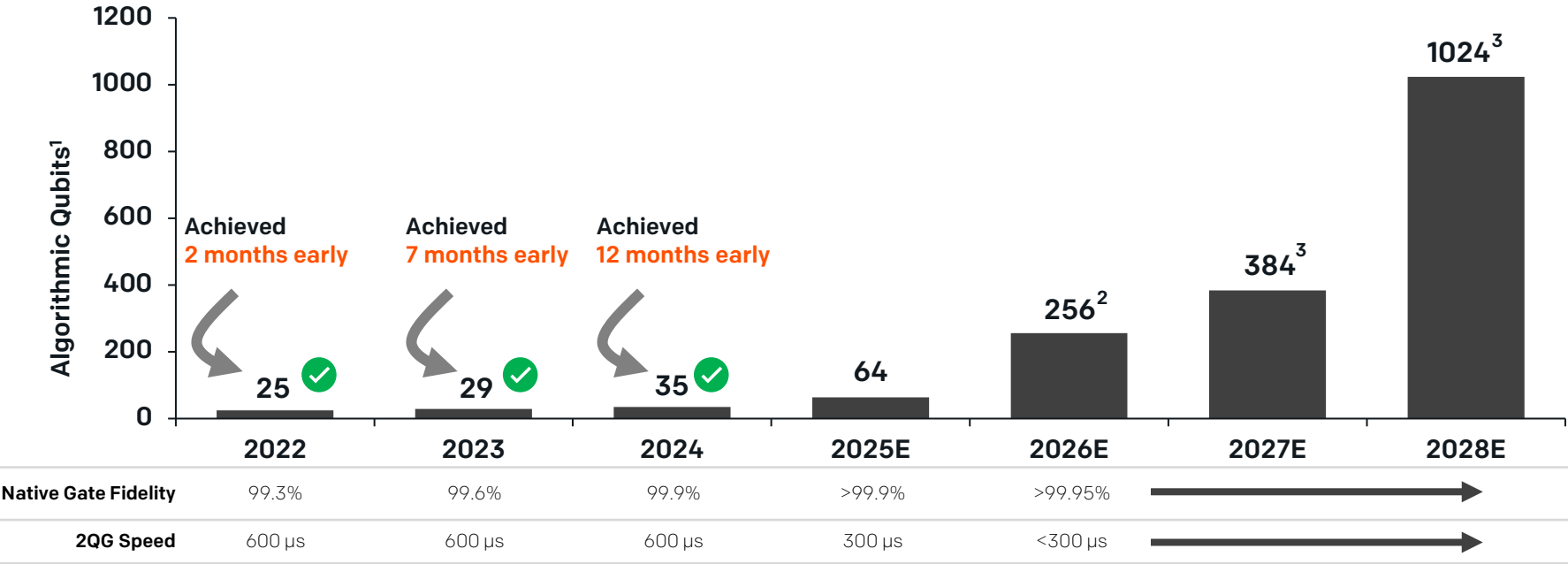
Barium

* to be announced

Consistently Ahead of Technology Roadmap



IonQ delivered Forte’s #AQ35 a full 12 months early, and #AQ36 mere weeks later



Note: Prepared on the basis of certain technical, market, competitive and other assumptions to be subsequently described in further detail, and which may not be satisfied. As a result, these projections are subject to a high degree of uncertainty and may not be achieved within the time-frames described or at all

1. Algorithmic qubit number defined as the effective number of qubits for typical algorithms, limited by the 2Q fidelity

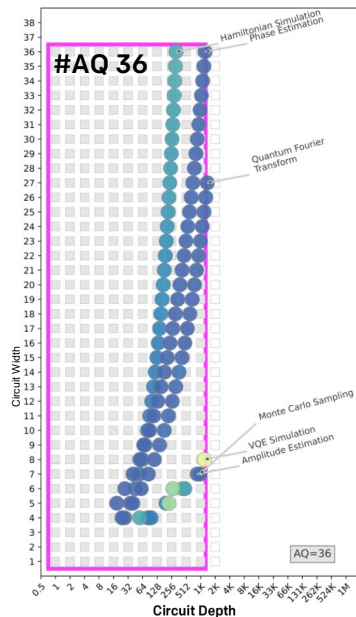
2. Assumes 16:1 error-correction encoding

3. Assumes 32:1 error-correction encoding

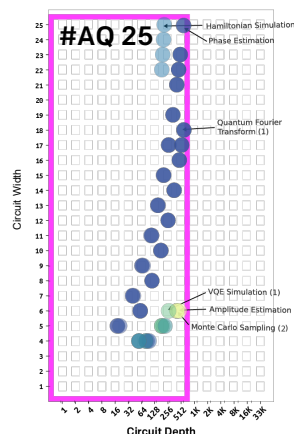
IonQ Forte Achieves 36 Algorithmic Qubits (#AQ)



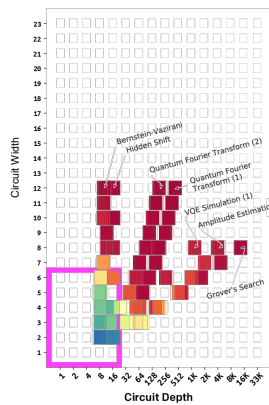
IonQ already exceeds 2024 Technical Milestone One Year Ahead of Schedule



IonQ Forte

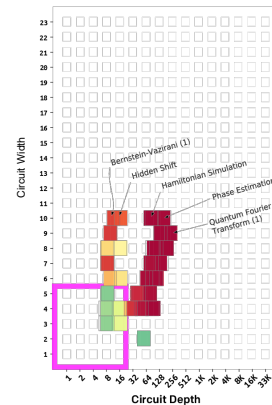


IonQ Aria



IBM

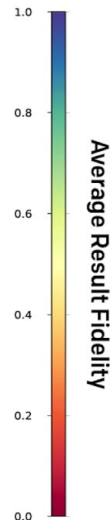
Falcon r4P (Guadalupe)



Rigetti

Aspen-M-1

Best – Result is indistinguishable from ideal



Worst – Result is indistinguishable from noise

Note: QED-C latest data available. IBM data adapted from [Application-Oriented Performance Benchmarks for Quantum Computing \(2022\)](#). Rigetti data taken using Bracket between February 18th and 20th, 2022. IonQ Forte and IonQ Aria data taken on January 22nd, 2024, and November 13th, 2022, respectively.

Commercial Advantage Pillars



Performance

High Qubit Quality

- Naturally Identical
 - Excellent Prep and Readout
 - Long Coherence Time
 - Highly Stable
-

Gate Performance

- High Native Gate Fidelity
 - Fast Gate Speeds
 - Parallel Operations
 - Mid-Circuit Measurement
-

Error Handling

- Error Mitigation
- (Partial) Error Correction
- Logical Operations
- Quantum Memory



Scale

High Connectivity

- Compiler Optimization
 - Low Resource Overhead
 - All-to-All in Core Parcel
 - High Connectivity Between Cores
-

High Qubit Count

- Large Core Size
 - Multi-Core
 - Multi-QPU
 - Limited Shuttling
-

Modularity

- Photonic Networking
- Manufacturing Capacity
- Quantum Networking
- Flexibility & Upgradability



Enterprise-Grade

Deployability & Availability

- Durability
 - Data Center Form Factor
 - Reliability
 - Manufacturability
-

Interoperability

- Hybrid Services
 - SDK & API Compatibility
 - Cross Platform Libraries
 - Platform Integrations
-

Business Value

- Customer Applications
- Low Energy Costs
- Fast Time-to-Solution
- Low Cost per Qubit

Performance:

Practical Time to Solution

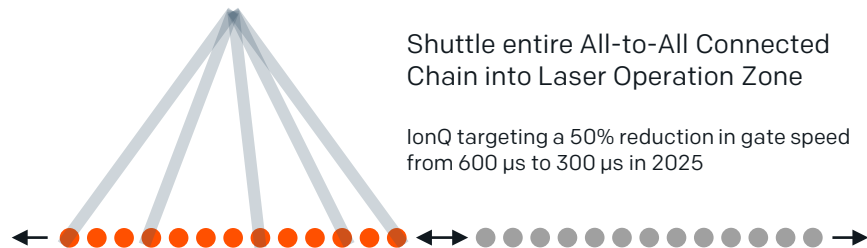
IonQ's multi-core architecture produces a faster compute time to solution than competing trapped ion architectures

IonQ's Trapped Ion Multi-Core Architecture

Fidelity Limit



Speed to Solution

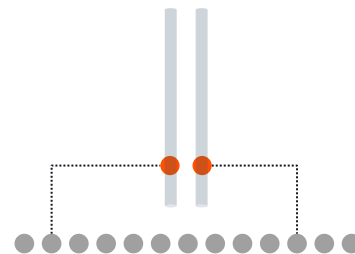


Competing Trapped Ion Architecture

Fidelity Limit



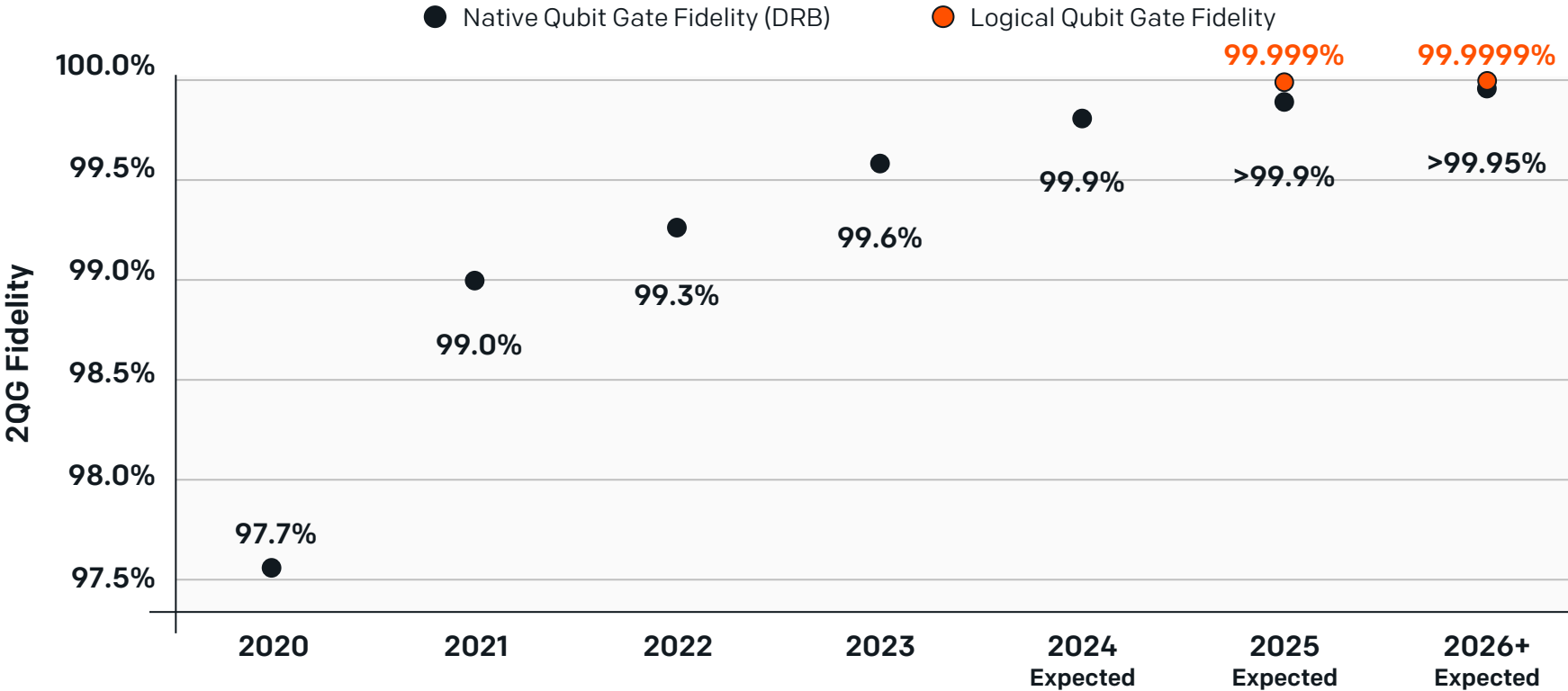
Speed to Solution



1. Developed by NIST in the 2000s <https://www.nist.gov/publications/high-fidelity-universal-gate-set-9be-ion-qubits>

Performance:

High Native Gate Fidelity

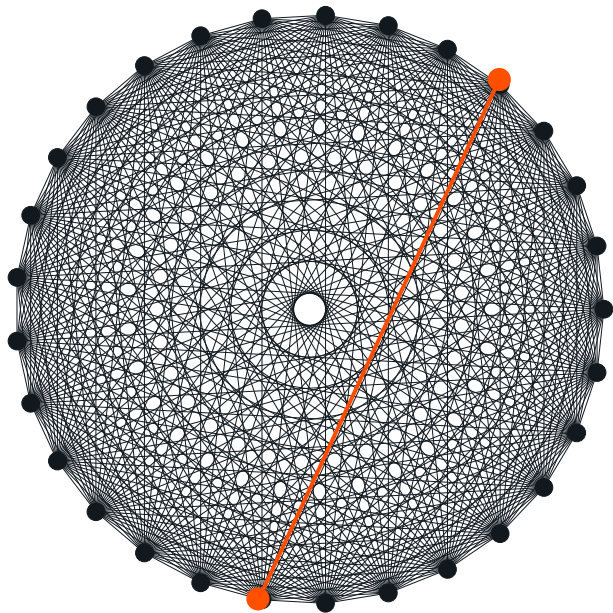


Performance:

Architecture Advantage in Connectivity and Flexibility

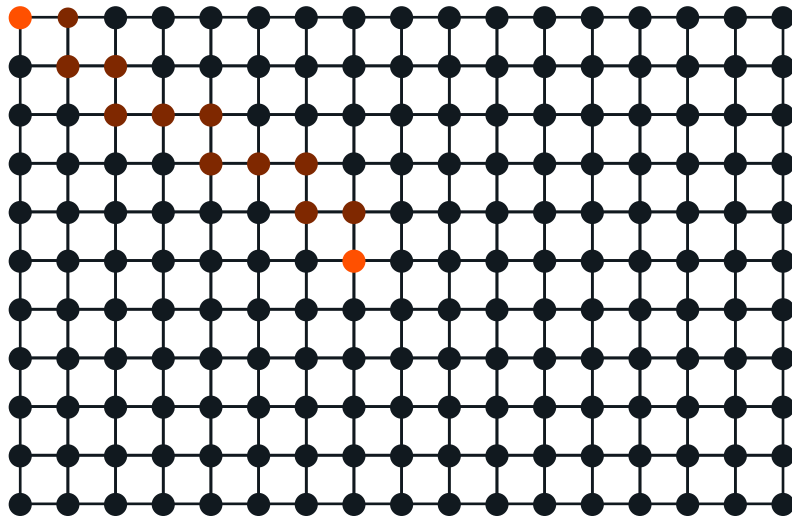
IonQ Advantage

- All-to-all connectivity
- Two qubit gates fidelity



Superconducting Competitors

- Nearest-neighbor connectivity
- Multiple swap gates required



Performance:



IonQ's Exceedingly Low Error Correction Overhead



NEW: Partial Error Correction
3:1¹

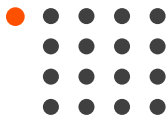


Partial Error Correction Advantages:

- Significantly lower qubit overhead ratio
- More scalable than error mitigation techniques
- Increasing fidelity to unlock deeper quantum circuits
- Available in near term IonQ systems as early as Tempo

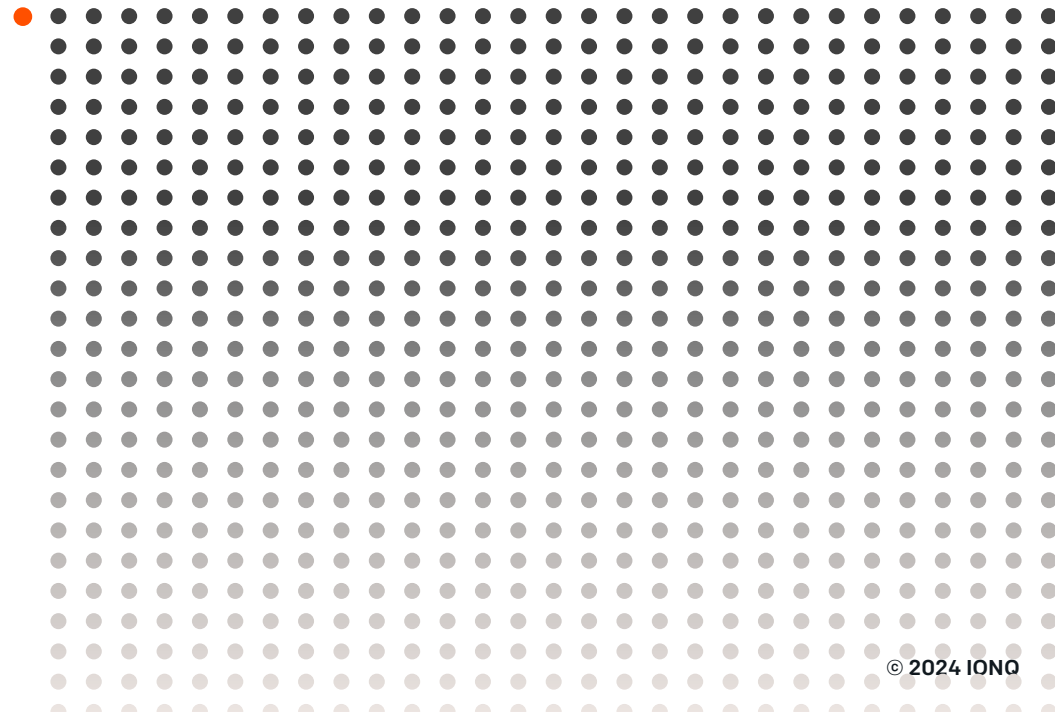


Error Correction
16:1²



Other Approaches

Error Correction
1000:1 - 1,000,000:1³



1. ArXiv, [Low-cost noise reduction for Clifford circuits](#), July 2024

2. Estimate based on IonQ technical roadmap and experimental results published by IonQ founder Chris Monroe, advisor Ken Brown, and collaborators

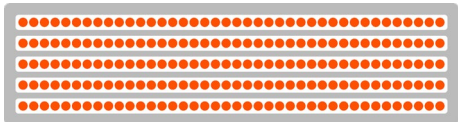
3. Based on various surface code approaches, depending on required logical error rate

Scale:

Path to a Scalable, Modular Architecture

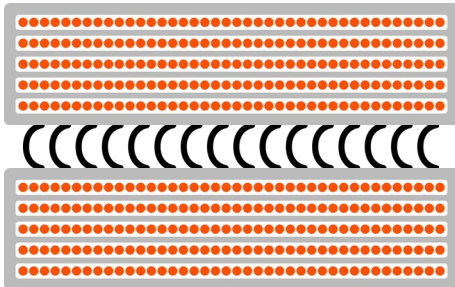
Stage 1: 200 Qubits

- Multi-Core Technology



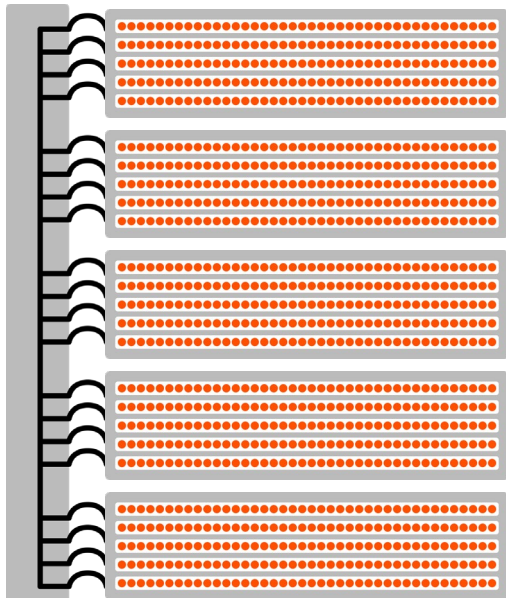
Stage 2: 400 Qubits

- Multi-Core Technology
- Photonic Interconnect



Stage 3: 1000+ Qubits

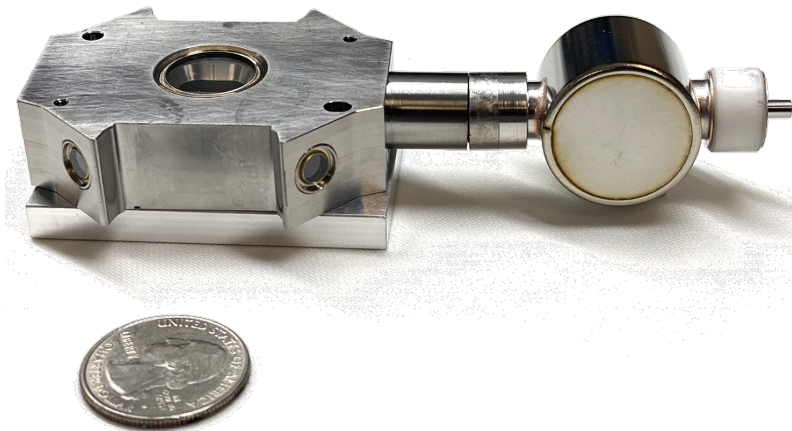
- Multi-Core Technology
- Photonic Interconnect
- Quantum Network



Miniaturized Vacuum Packages for Increased Scale

Developing compact room temperature trap packages enables more modularity for scaling next generation systems

- Approaching a vacuum similar to the pressure achieved at CERN, without cryostats
- Reducing size, weight, and power consumption of systems
- Simplifying and accelerating the installation and maintenance



Enterprise Grade: Expanding Footprint

Only known dedicated Quantum Computing manufacturing facility
focused on system manufacturing at scale



Seattle, WA Opened Manufacturing Facility June 2023



College Park, MD
IonQ Headquarters
2015



Basel, Switzerland
Started Partnership
June 2023



Toronto, Canada
Acquired Entangled
Networks
Dec 2022

Enterprise Grade: Deployable for Modern Data Centers



Delivering a customer-ready fully packaged quantum computing solution

Deployable

Rack-mounted, data center friendly “plug and play” quantum computers

Interoperable

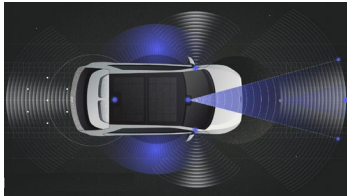
Seamless integrations with hybrid compute, cross-platform SDK & APIs

Business Value

Energy efficient, operable at room temperature, and servicing customer applications



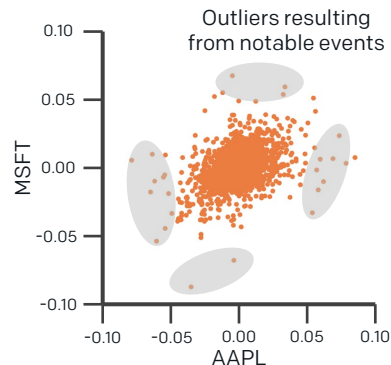
Enterprise Grade: Applications for Commercial Advantage

Optimization	Optimization	Machine Learning	Machine Learning	Optimization
AIRBUS  Cargo Loading - Developing quantum algorithms for optimizing cargo loading - Increasing operational efficiency to drive fuel and labor cost savings Potential Market Size: \$50B-\$100B	 Critical U.S. Infrastructure Improvements - Developing practical quantum hybrid applications that leverage both classical and quantum resources - Accelerating grid modernization Potential Market Size: \$50B-\$100B	 Image Recognition for Autonomous Driving - Leveraging machine learning image recognition to process street signs - Enabling applications in enabling self-driving cars Potential Market Size: \$1B-\$10B	 Predictive Maintenance - Using machine learning to predict machinery failure - Enabling proactive maintenance rather than reactive maintenance - Driving operational savings Potential Market Size: \$1B-\$10B	Top-Tier Financial Institution  Investment Portfolio Optimization - Recognizing outliers in correlation analysis to accurately model portfolio risk - Achieving clearer distribution using fewer iterations than a classical GAN Potential Market Size: \$20B-\$50B

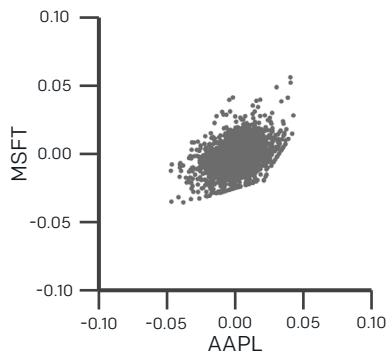
Quantum Enabled Portfolio Optimization

Enabling portfolio creation of more accurate predictive models using fewer iterations

Target Distribution

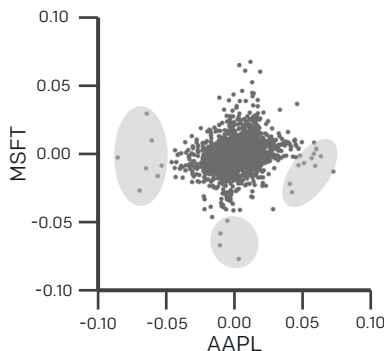


**Classical Computer
Generative Adversarial Network**



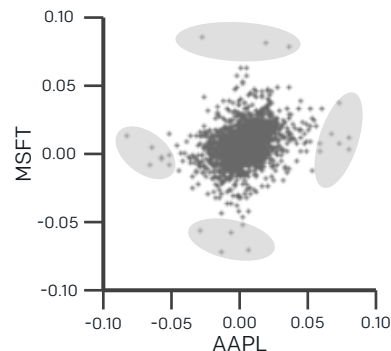
20,000 iterations

**IonQ Quantum Computer
Generative Adversarial Network**



1,000 iterations

**IonQ Quantum Computer
Circuit Born Machine**



26 iterations

Recent Announcements

IonQ Announces Partnership with Applied Research Laboratory for Intelligence and Security



APPLIED RESEARCH LABORATORY FOR
INTELLIGENCE
AND SECURITY



IonQ was selected through a competitive bidding process to design a first-of-its-kind, networked system for blind quantum computing. The initial phase of the contract is a \$5.7 million-dollar award for the design of the quantum computers based on IonQ trapped ion processors.



APPLIED RESEARCH LAB
FOR INTELLIGENCE AND SECURITY

IonQ Announces Final Assembly of First IonQ Forte Enterprise System at QuantumBasel

Represents next step in path towards broad commercial advantage



IonQ Announces Contract Extension with AWS on Amazon Braket



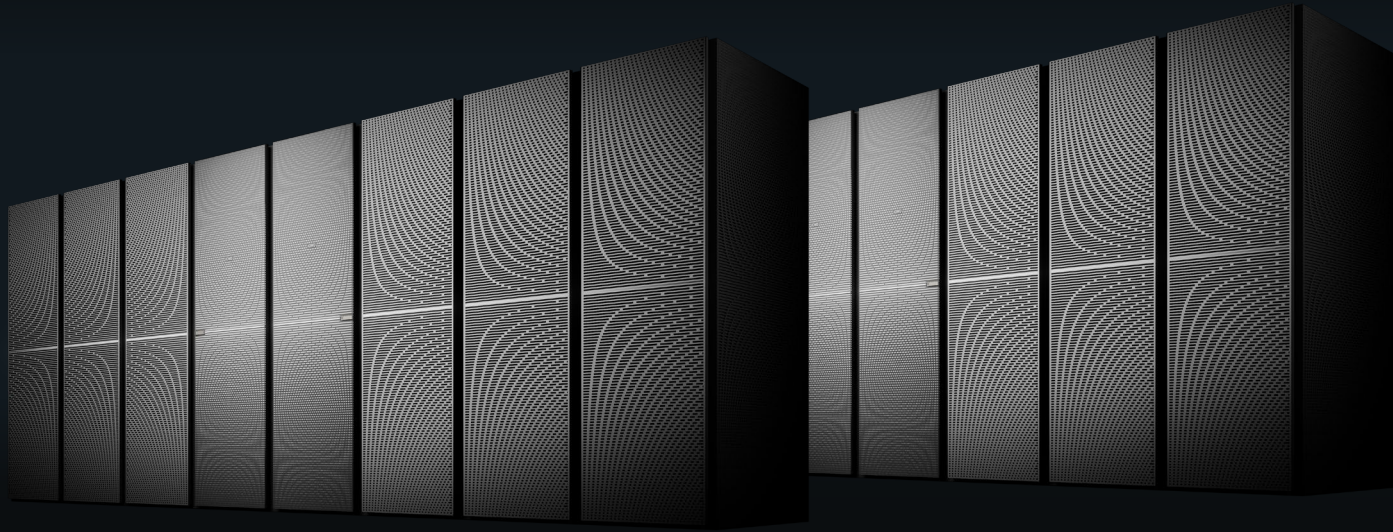
IonQ will continue offering world-class quantum computers to developers globally, via Amazon Braket, the quantum computing service of AWS.



IonQ Begins Construction of Two More Forte Enterprise Systems



System will be built in our new IonQ Seattle manufacturing facility



IonQ Announces a New Research Project with U.S. Naval Research Laboratory



IonQ quantum computers used to sample quantum states in molecular systems affecting corrosion

All-to-all connectivity of IonQ architecture resulted in best-in-class solution

Quantum computing could accelerate the development of new corrosion inhibitors and abatement technologies

\$20.6B

Annual cost of corrosion to US Navy

55%

Reduction in total gates from initial circuit through compilation

“Calculations that previously took months can now be performed in hours.”

– Dr. John Stenger, Naval Research Lab

IonQ Announces Groundbreaking Quantum Algorithm Work, Optimizing Flight Gate Assignments with DESY



Collaborated to solve for reduced connecting times, gate occupancy, and plane turnaround time

Ran eight to 36 variable problems on IonQ Aria, with 12 variable problems being fully optimized

Unique cross-industry potential and scale

12

Variable Problems fully optimized

18

Qubits used to solve the largest problems

“We’re very excited by the early results we’re seeing in running quadratic assignment problems across IonQ’s quantum hardware.”

– Dr. Karl Jansen, Head of the Center of Quantum Technology and Applications, Deutsches Elektronen-Synchrotron (DESY)



IONQ