



# March 2022: IonQ Investor Updates

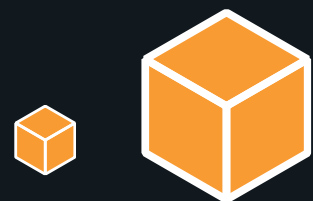
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## OUR MISSION

**To build the world's best quantum computers to solve the world's most complex problems, transforming business, society, and the planet for the better.**

# Quantum Computing Is Now, and IonQ Is Leading the Way



Best Measured Performance in Industry<sup>1</sup>



Projected 2021 Contract Bookings<sup>3</sup> 3x Original Forecast

\$65B

TAM By 2030<sup>2</sup>

Large & Growing Market Opportunity



Triple Expected Systems Online



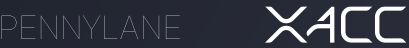
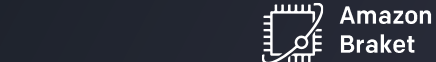
World-Class Investor Base



Only Quantum Hardware Available on All Major Clouds



Premier Partners & Customers



Every Major Quantum Language & SDK Supported

<sup>1</sup> Based on publicly-available data as of September 10, 2021

<sup>2</sup> Prescient & Strategic Intelligence Private Limited, February 2020

<sup>3</sup> Sales channels still being defined; exact nature and accounting recognition of IonQ revenue to be determined. Bookings may include prepayments, cloud-based revenue, and signed contracts for future performance.



# Led by Industry Pioneers



## Peter Chapman

President & CEO

Career began at 16 in MIT AI Lab under Marvin Minsky

Led technology for Amazon's Prime division, 2014–2019

Innovator in financial, aviation, e-reader technology with several successful exits (Data Acquisition Systems, New Media Graphics, Boston Compliance Systems)



## Christopher Monroe

Co-founder & Chief Scientist

Demonstrated first ever quantum logic gate with Nobel laureate David Wineland at NIST in 1995

Over 25 years in quantum computing. Developed many of the fundamental techniques for trapped-ion QC

**Citations:** 44774 **h-index:** 83<sup>1</sup>



## Jungsang Kim

Co-founder & CTO

In 2001, led a Bell Labs team to break the world record for what is still the world's largest optical switch

Over 20 years in quantum computing and related tech. Duke lab leads the world in miniaturization of quantum systems

**Citations:** 7136 **h-index:** 38<sup>1</sup>



Bell Laboratories



## Thomas Kramer

Chief Financial Officer

CFO at Opower, 2011–2016, taking company through IPO in 2014 and acquisition by Oracle in 2016

CFO and Co-Founder at Cvent, 2000–2011, taking company from zero revenue to 800 employees and market dominance



## Tom Jones

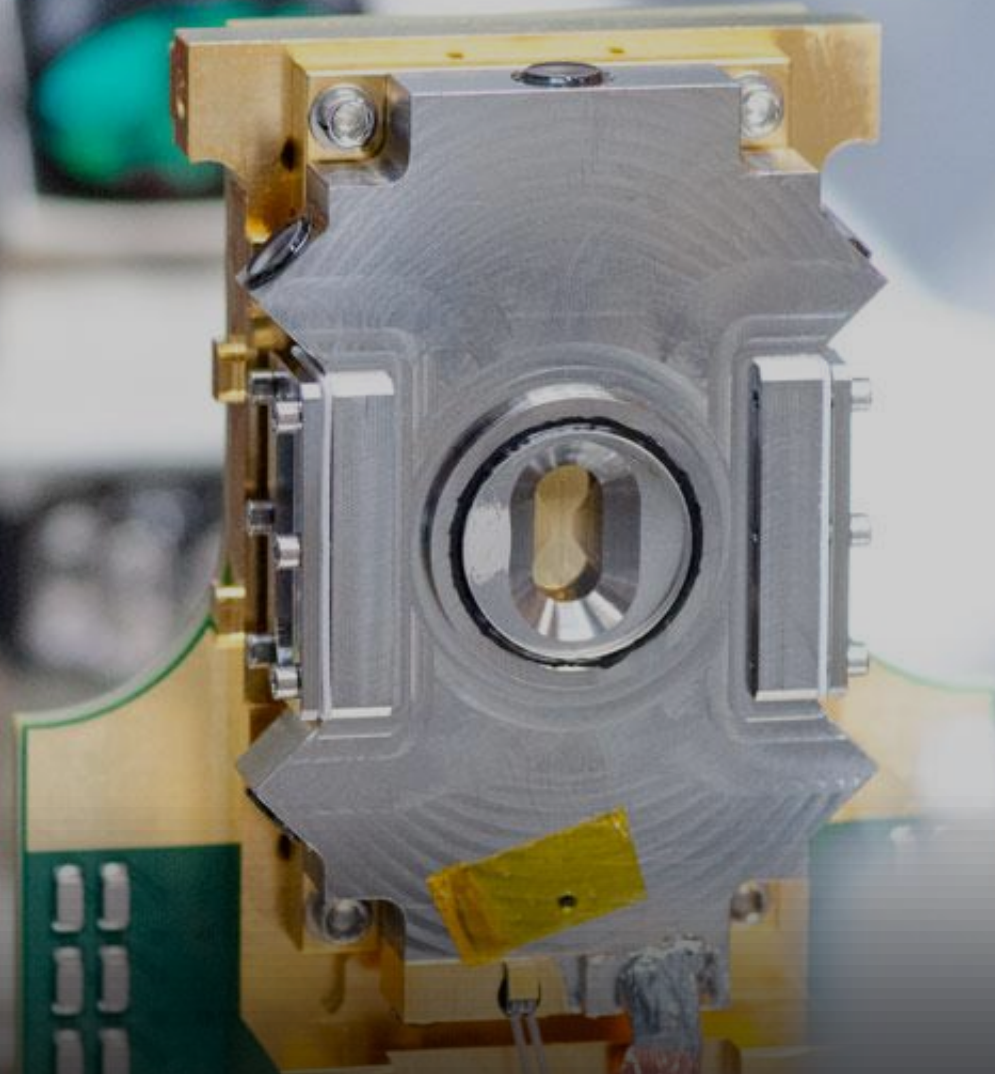
Chief People Officer

Led Human Resources and Talent Development at Blue Origin during scale-up from 600 employees to 3000, ultimately enabling human spaceflight

Led and developed people teams at transformative technology companies including Honeywell and Microsoft



<sup>1</sup> Citations and h-indices as of March 2022



# IonQ is Winning The Quantum Space Race

# Expected Phases of Quantum Computing Maturity

Boston Consulting Group Analysis

## Phase I

Estimated Impact (Operating Income):

**\$2-5 Billion**

Technical Barrier To Entry

**Error Reduction**



## Phase II

Estimated Impact (Operating Income):

**\$25-50 Billion**

Technical Barrier To Entry

**Error Correction**



## Phase III

Estimated Impact (Operating Income):

**\$450-850 Billion**

Technical Barrier To Entry

**Modular Architecture**



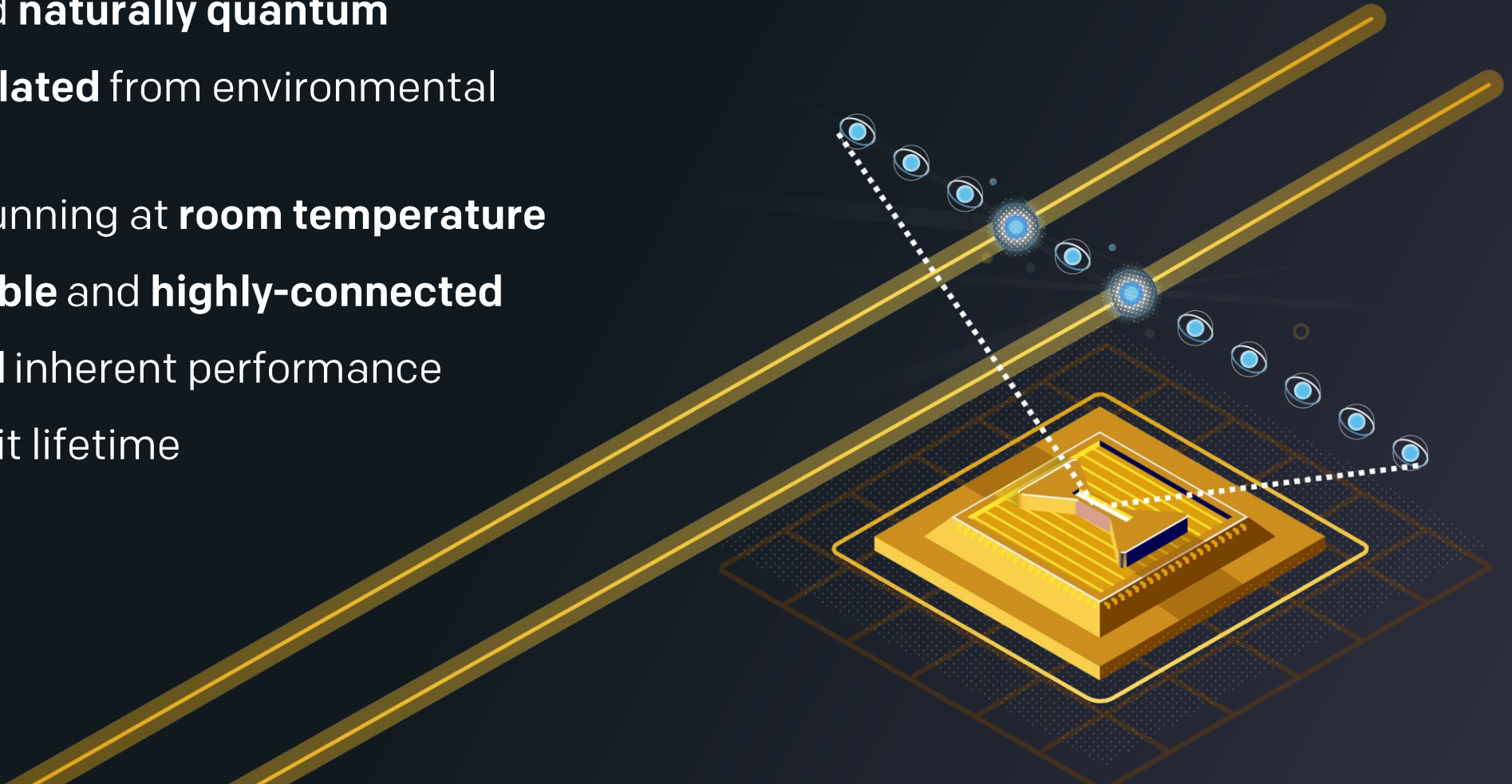


# Empowered by Unique Technological Advantages

Phase I

Individual **atomic ion qubits** in an ion trap are superior to competing qubit platforms, **creating the ability for IonQ to move farther, faster than the competition.**

- **Identical** and **naturally quantum**
- **Perfectly isolated** from environmental influences
- Capable of running at **room temperature**
- **Reconfigurable** and **highly-connected**
- **Unparalleled** inherent performance
- **Longest** qubit lifetime



# IonQ Leads in Error Correction Overhead

Phase II



16:1<sup>1</sup>



1000:1 – 1,000,000:1<sup>2</sup>

Other Approaches

<sup>1</sup> Estimate based on IonQ technical roadmap and [experimental results](#) recently published by IonQ founder Chris Monroe, advisor Ken Brown, and collaborators

<sup>2</sup> 1000:1 based on overhead for surface codes on a 2-D lattice. 1,000,000:1 based on linear connectivity systems.



# IonQ's Leading Modular Architecture

Phase III

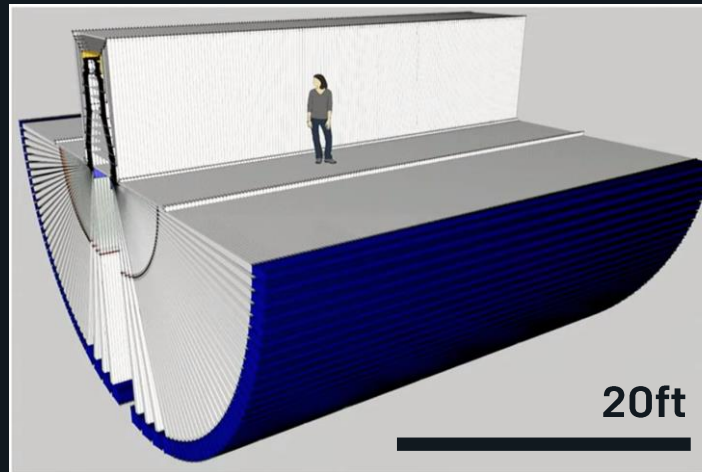
Each Generation of IonQ Hardware is Getting Smaller & Cheaper to Build

IBM



An IBM engineer working on the custom-built dilution refrigerator casing for a single QPU

Google



Google rendering of a planned million-physical-qubit system

IONQ



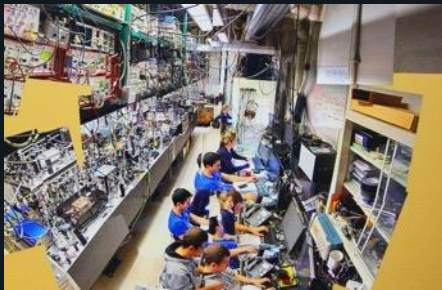
IonQ ion trap and vacuum chamber in a single, minuscule package<sup>1</sup>

<sup>1</sup>The package pictured is a prototype developed at IonQ founder Jungsang Kim's Duke University lab.

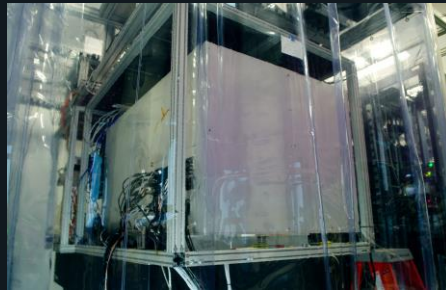
# Smaller Every Generation: Complete System

Phase III

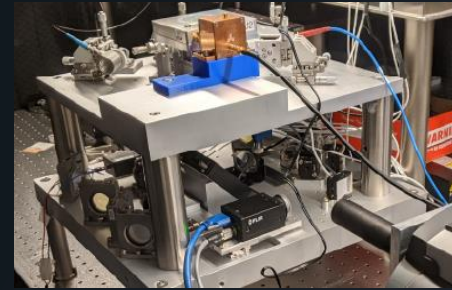
**2016**  
**Lab Scale**<sup>1</sup>



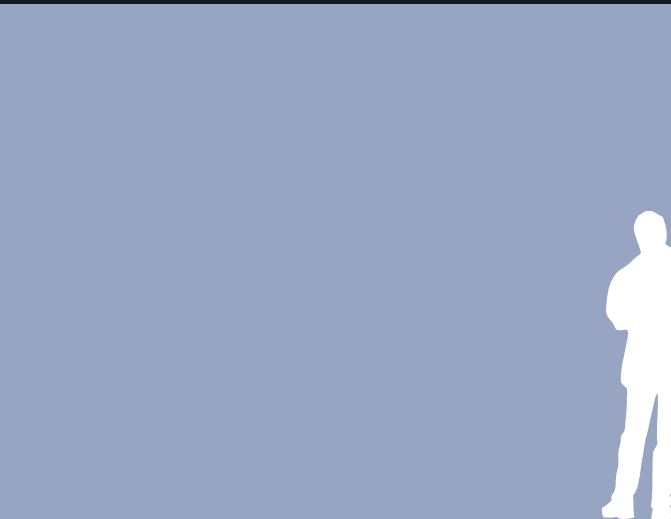
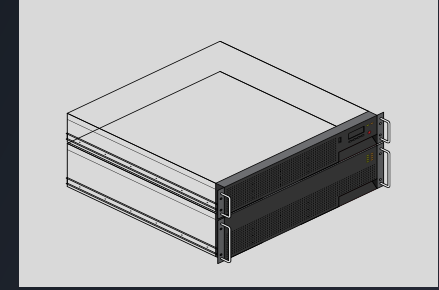
**2020**  
**Tabletop**



**Current System**  
**Benchtop**<sup>2</sup>



**Near Future**  
**Rackmount**<sup>3</sup>



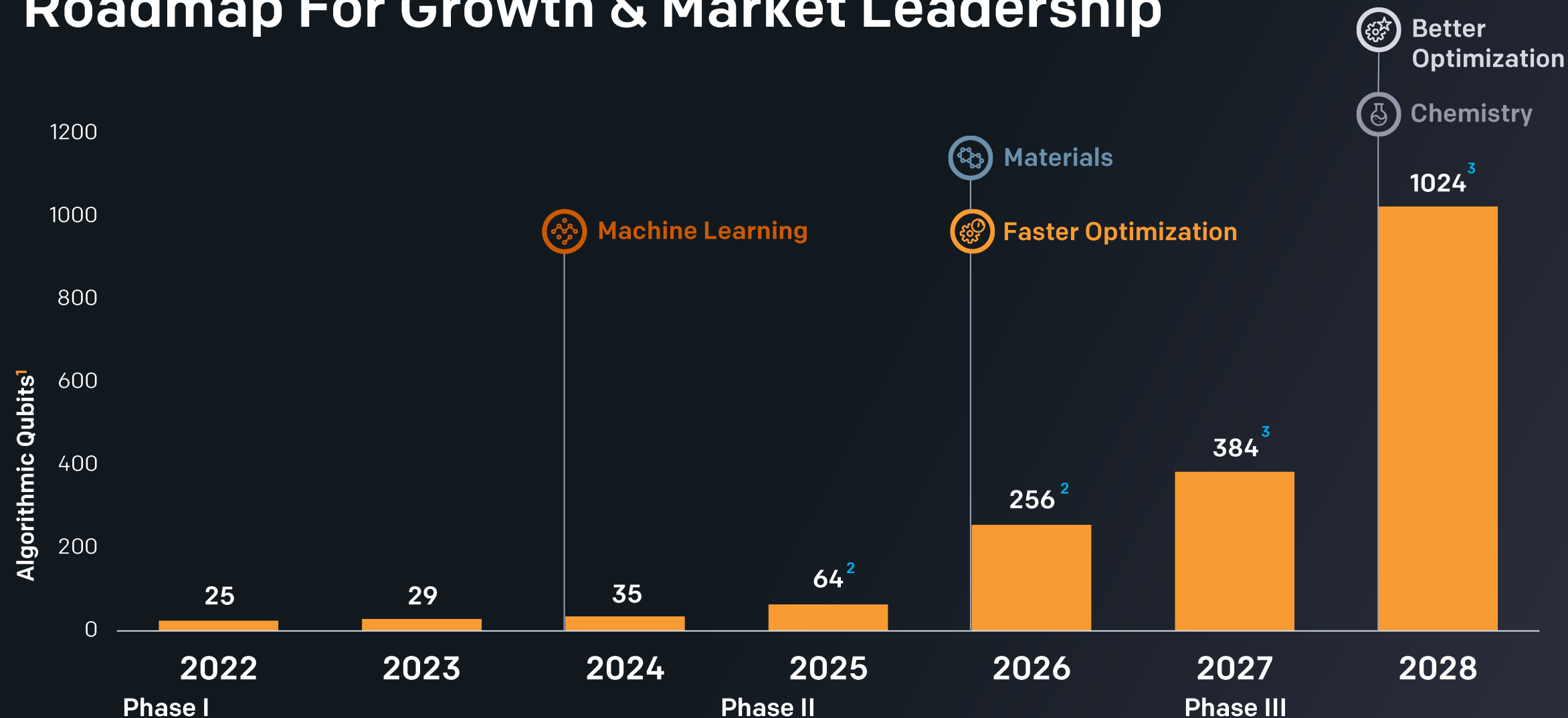
<sup>1</sup> The system pictured is an early trapped ion system from IonQ founder Chris Monroe's UMD lab.

<sup>2</sup> The system pictured is a prototype developed at IonQ founder Jungsang Kim's Duke University lab.

<sup>3</sup> Illustrative rendering of a potential form-factor for rackmount QPU. Not a designed system.



# Roadmap For Growth & Market Leadership



**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.

**Note** Market inflection points are estimated based on alignment of IonQ technical roadmap with publicly documented quantum research problems in each market

<sup>1</sup> Algorithmic qubit number defined as the effective number of qubits for typical algorithms, limited by the 2Q fidelity

<sup>2</sup> Employs 16:1 error-correction encoding

<sup>3</sup> Employs 32:1 error-correction encoding



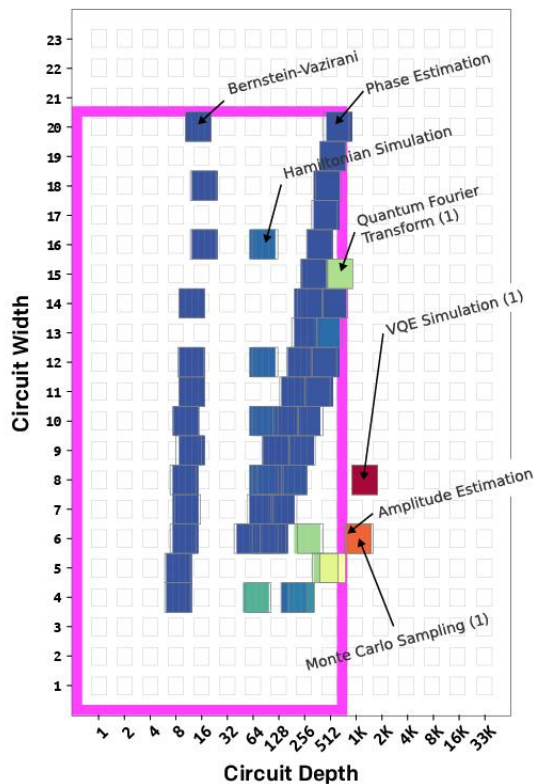
# Investor Updates

March 2022



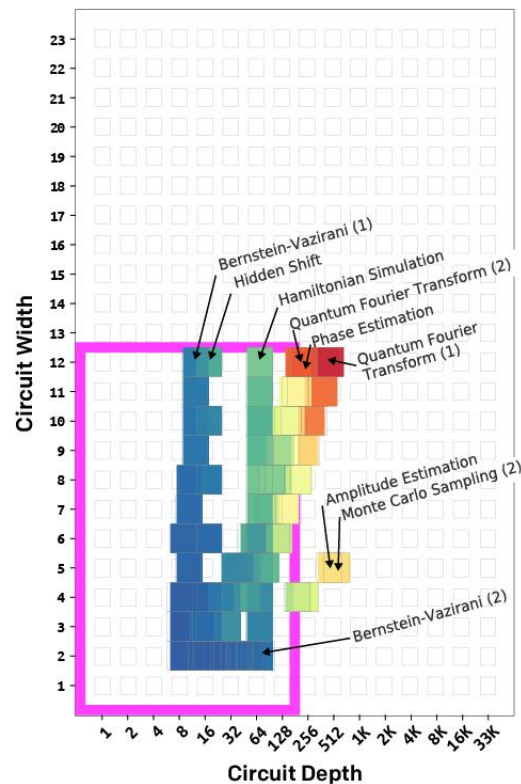
# IonQ Aria System Performance

## Record, Industry-Leading 20 Algorithmic Qubits (#AQ)



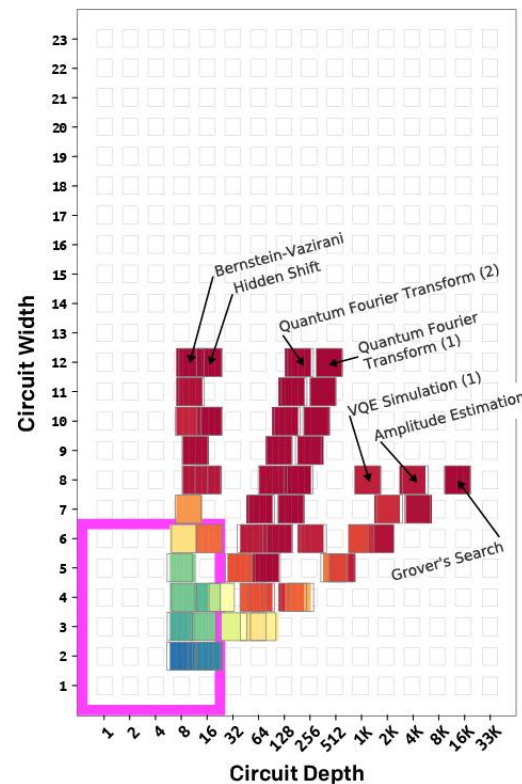
**IonQ**

IonQ Aria



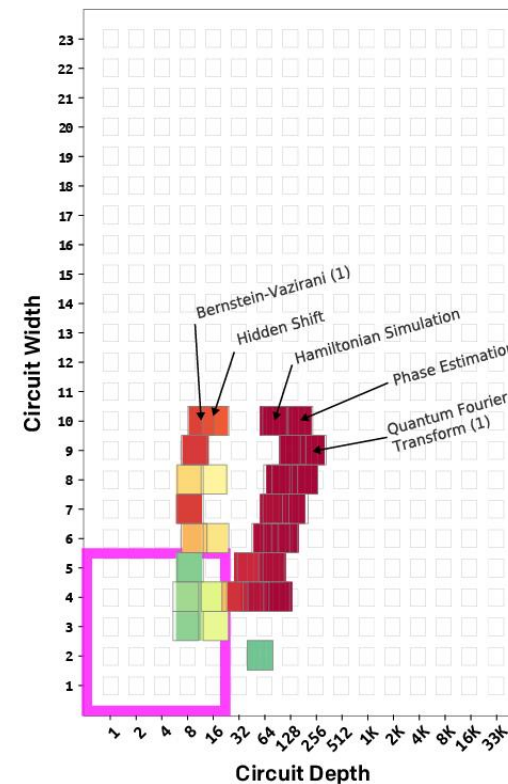
**Quantinuum**

Model H1.1



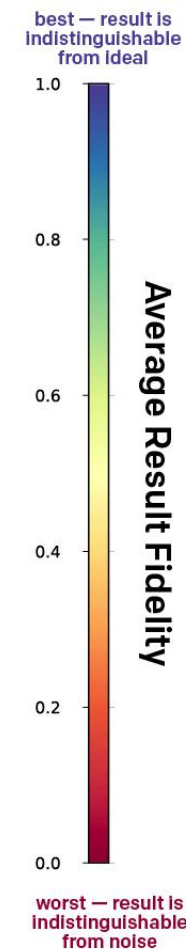
**IBM**

Falcon r4P (Guadalupe)



**Rigetti**

Aspen-M-1



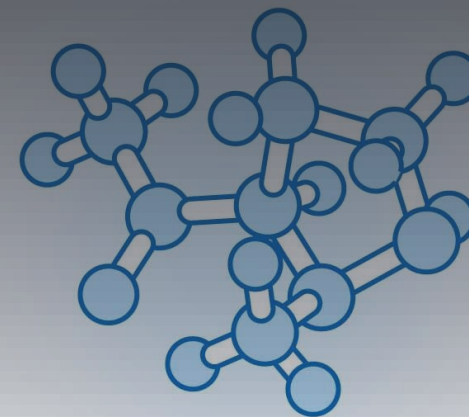
IBM and Quantinuum data adapted from *Application-Oriented Performance Benchmarks for Quantum Computing* (2022) <https://arxiv.org/abs/2110.03137>

Rigetti data taken using Braket between February 18th and 20th, 2022

## IonQ and Hyundai

# Quantum Applications for Designing Next-Gen EV Batteries

IonQ and Hyundai are partnering to create the largest battery chemistry model yet to be run on a quantum computer, laying the groundwork to improve performance, cost and safety of lithium batteries





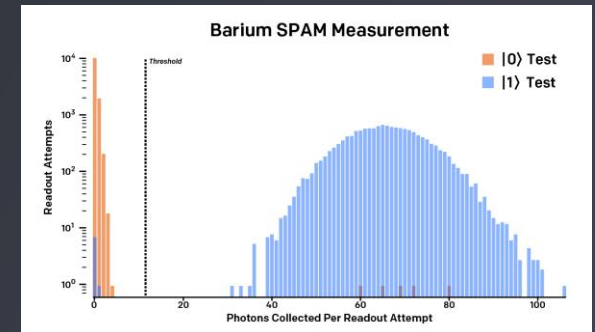
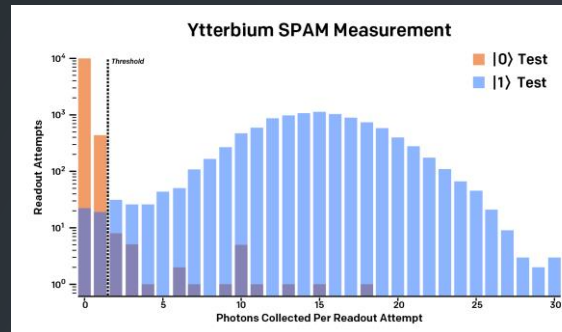
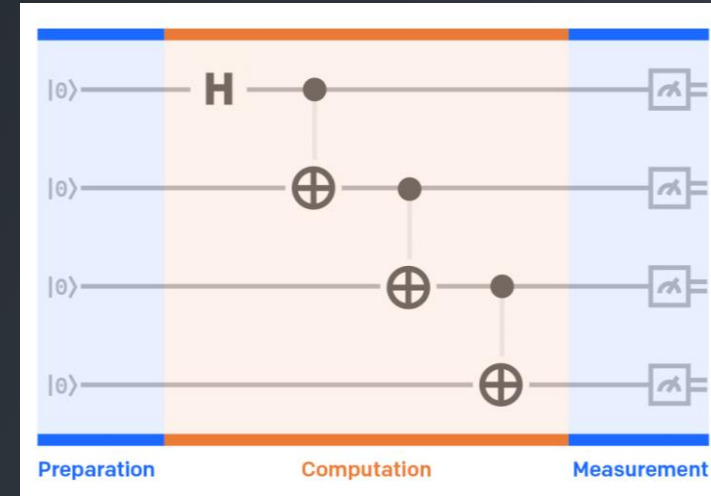
# New Barium Based-Systems

## Laying the Groundwork to Scale Quantum

Key benefits of barium ions:

- Lower error rates
- Higher gate fidelity
- Better state detection
- Increased clock speed
- Iterable, more reliable hardware
- More uptime for customers
- More easily networked systems

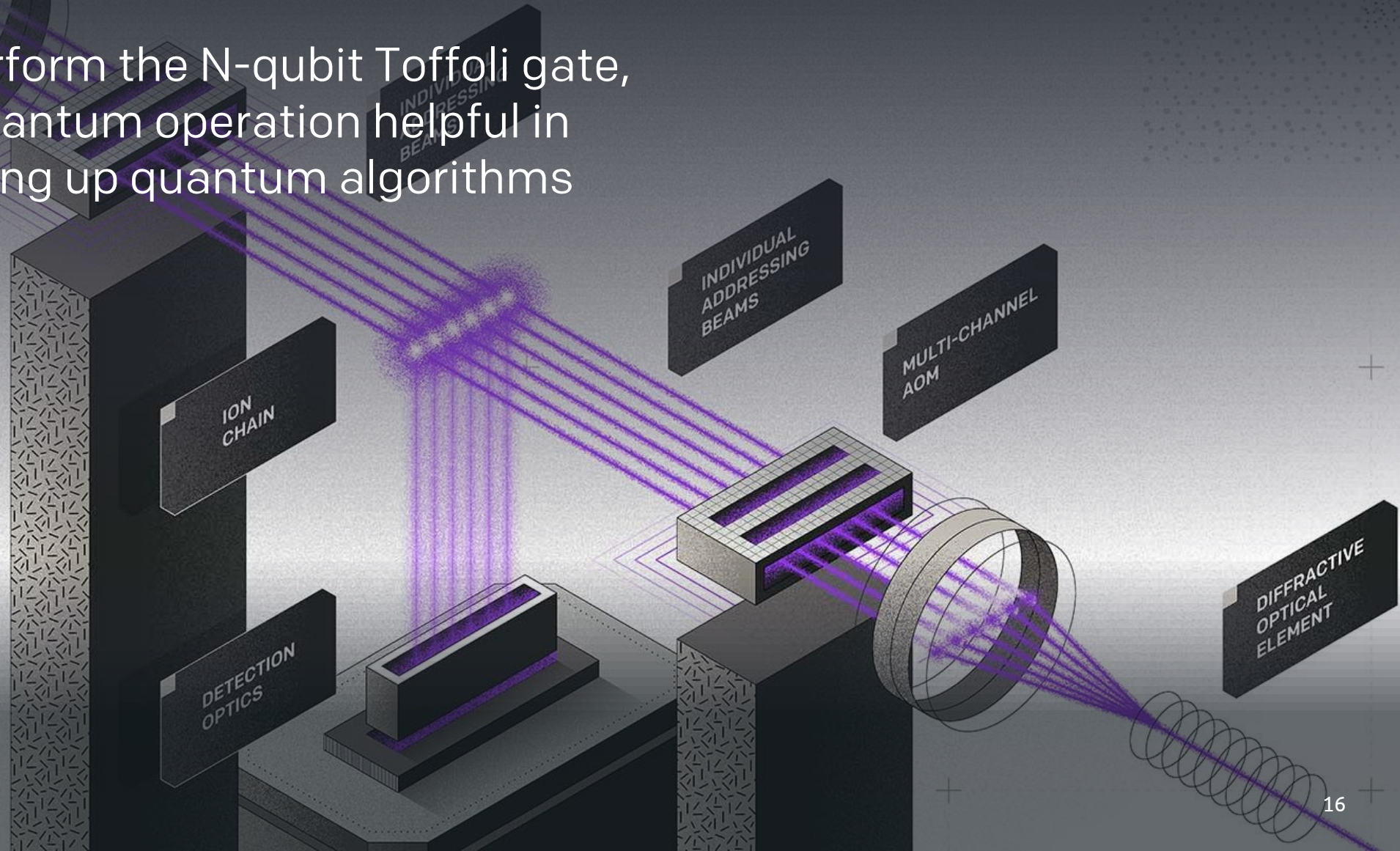
### Demonstrated Benefit on State Detection





# Unique N-Qubit Quantum Gates Only Available on IonQ and Duke Quantum Computers

New method to perform the N-qubit Toffoli gate, a more efficient quantum operation helpful in scaling and speeding up quantum algorithms





# IonQ, Goldman Sachs, and QC Ware Producing Superior Monte Carlo Simulations

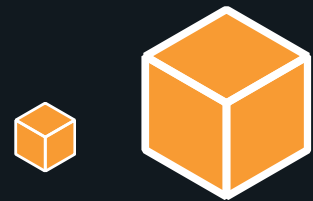
IonQ's latest-generation system provided the first demonstration of quantum Monte Carlo simulation, paving the way for quantum enabled risk analysis and price simulation

Goldman  
Sachs



QCWARE

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# Cautionary Notes

## Forward Looking Statements

This Presentation may contain forward-looking statements made pursuant to the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. These statements may be identified by words such as “believe,” “may,” “will,” “estimate,” “continue,” “anticipate,” “intend,” “expect,” “should,” “would,” “plan,” “predict,” “potential,” “seem,” “seek,” “future,” “outlook,” and similar expressions that predict or indicate future events or trends or that are not statements of historical matters. These forward-looking statements include, but are not limited to, statements regarding estimates and forecasts of other financial and performance metrics and projections of market opportunity. These statements are based on various assumptions, whether or not identified in this Presentation, and on the current expectations of the management of IonQ and are not predictions of actual performance. These forward-looking statements are provided for illustrative purposes only and are not intended to serve as, and must not be relied on by an investor as, a guarantee, an assurance, a prediction or a definitive statement of fact or probability. Actual events and circumstances are difficult or impossible to predict and will differ from assumptions. Many actual events and circumstances are beyond the control of IonQ. Many 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 IonQ’s products, services and solutions; the ability of IonQ to protect its intellectual property; changes in the competitive industries in which IonQ operates; changes in laws and regulations affecting IonQ’s business; IonQ’s ability to implement its 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 including, but not limited to, as a result of the COVID-19 pandemic. The foregoing list of factors is not exhaustive. You should carefully consider the foregoing factors and the other risks and uncertainties described in the “Risk Factors” section of IonQ’s Quarterly Report on Form 10-Q for the quarter ended September 30, 2021 and other documents filed by IonQ from time to time with the Securities and Exchange Commission. These filings

identify and address other important risks and uncertainties that could cause actual events and results to differ materially from those contained in the forward-looking statements. Forward-looking statements speak only as of the date they are made. Readers are cautioned not to put undue reliance on forward-looking statements, and IonQ assumes no obligation and do not intend to update or revise these forward-looking statements, whether as a result of new information, future events, or otherwise. IonQ does not give any assurance that it will achieve its expectations.

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