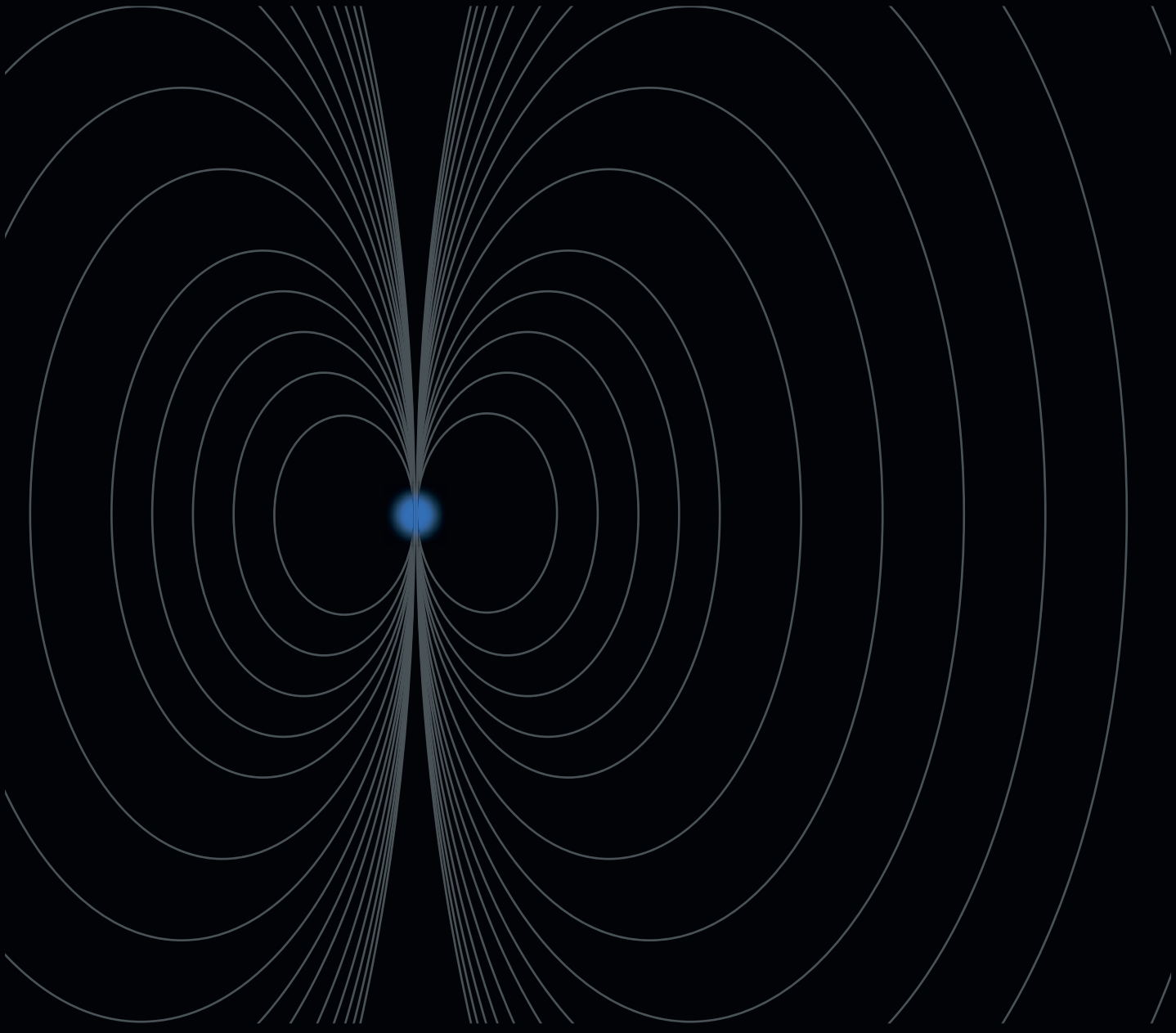
2022



IONQ

Annual Report

Dear Stockholders,

In 2022, we delivered what we promised to our customers and to investors. We achieved our technical milestone of 25 algorithmic qubits (#AQ), and delivered strong financial growth with $24.5 million in new bookings and $11.1 in revenue. We continue to distinguish IonQ as a leader in our industry, with a significant head start relative to our peers.

The 25 algorithmic qubits milestone is one more step towards "quantum advantage," the point at which quantum computers will exceed the capabilities of their classical computing counterparts and are likely to propagate broader commercial use cases. We are confident we will hit an #AQ of 29 in 2023, putting us in clear striking range for #AQ 35 in 2024.

The #AQ milestone of 35 is particularly significant because reaching it means that classical hardware will no longer be able to fully simulate our quantum hardware at commercial scale. And more importantly, we expect that at #AQ 35, the commercial value of the first quantum machine learning (QML) applications will crystallize, driving adoption of IonQ's industry-leading quantum computers.

Today, we are laser-focused on building on our head start to be the first company to achieve quantum advantage and scaling our system manufacturing to meet surging demand.

IonQ's Head Start Towards Quantum Advantage

At IonQ, our primary focus has been not on the *quantity* of qubits in a system, but on the *quality* of the qubits and their operations. For quantum computers, this quality–also known as *fidelity*–is the key differentiator in successfully completing computational tasks. If the quality of the qubits and their operations is low, no number of qubits can lead to useful quantum computation.

IonQ differs from most other commercial quantum computers by using trapped ion qubits, which naturally have the highest fidelities of any mainstream quantum architecture. We have always maintained that the superior fidelity of our qubits and their operations will give us a head start over our peers. Others may proclaim they have over 100 qubits in their systems, but the fidelity of the 25 qubits in our IonQ Aria system is much higher, making it the most powerful commercial system we have yet to see.

In the past months, we have seen our peers (somewhat reluctantly) accept the fact that the fidelities of qubits and their operations are key indicators of performance. At least two have delayed their public technical roadmaps to give themselves additional time to improve their fidelities before scaling the number of qubits in their systems.

At IonQ, our qubit and operation fidelities are already best in class.[1] Unlike our peers, our technical roadmap has always focused on the operational fidelities of our qubits, and our public technical roadmap remains unchanged. This means that while others are debugging their qubit technology, IonQ is already hard at work scaling our qubit count, giving us a tangible advantage in addressing the quantum market opportunity.

[1] IonQ Aria has an average 1-qubit gate fidelity of 99.94% and an average 2-qubit gate fidelity of 99.4%. IonQ Forte has an average 1-qubit gate fidelity of 99.98% and an average 2-qubit gate fidelity of 99.6%.

The lead is ours. And we have full intent to take advantage of it.

The (Short) Road to Quantum Advantage

Often I hear various individuals from academia and industry opine on when quantum will take off. At a recent industry conference, this question was asked to various panelists, with answers ranging from this year to 20 years or more. It reminds me of the artificial general intelligence market prior to ChatGPT, also with a divergence of viewpoints from so-called experts.

So how can there be such conflicting stories about when the industry will reach quantum advantage? The answer lies in that these narratives are conspicuously tied to each company's individual progress and technical approach, rather than the progress of our industry as a whole. Next time you hear a company executive say, "I think quantum will take off in X years …" you need to mentally append "... for our company's technology."

The world is starting to come to grips with the implications of ChatGPT, with most caught off guard and with some facing an existential threat to their business.

Within approximately the next two years, we expect that quantum will have its own ChatGPT-like moment, with QML in 2024, and line of sight for IonQ's broader adoption with an #AQ of 64 in 2025. My prediction is that no matter how much we say it and deliver on our technology roadmap, both investors and customers will be taken by surprise. Even for OpenAI, quantum will likely be highly disruptive to their business too. The companies who choose to jump start their journey in quantum now will have the first-mover advantage in their industry sector.

We are in the "development window" for quantum advantage: if preparations for the propagation of quantum computing were once theoretical or exploratory, they are now immediate and urgent. Today's leading companies and US-friendly governments need to be building their first quantum applications now if they want to benefit from the new opportunities enabled by quantum.

IonQ is partnering with forward-looking companies to accelerate their quantum applications. Our approach in the near term is to form a limited number of highly strategic partnerships to develop solutions that open up quantum advantage in select industry sectors, while focusing on our technology development to reach quantum advantage. We challenge leading companies that want to reap the benefits of quantum advantage to step forward now with proposals for joint applications.

Leveraging Existing Technology to Scale

With quantum advantage on the horizon and IonQ's technological head start, we have seen rapidly growing demand for our current supply of IonQ computers. As a result, our team is focused on scaling up our manufacturing processes to design increasingly modular, economical, and serviceable systems in the near future.

One may assume that scaling quantum computer manufacturing will be an uphill battle given the nascency of the technology. But while the ions at the core of our systems are quantum in nature, everything else in our systems is classical. This means we can leverage half a century of advancements in manufacturing computer chips, optical networks and other semiconductor devices to accelerate the manufacturing of our IonQ systems. We see ample opportunity to optimize our hardware.

Take, for example, our photonic interconnects technology, a technique invented and demonstrated by our founders that will allow us to scale to multiple, networked quantum processors in the same system. This technology uses the same optical switching technology developed for optical communications that are

now deployed at scale in data centers. It is no coincidence that our co-founder and CTO, Dr. Jungsang Kim, led a team to build the world's largest optical switch during his time at Bell Labs. Employing optical switches makes IonQ's networked system designs look like a data center made of a large network of computers, and we can leverage the learnings from these highly mature industries to scale our systems.

Another example lies in our laser technology, where we have already made great strides in improving miniaturization and stability. While the high-powered lasers currently used in IonQ's systems can be bulky and expensive, we remind investors of the rapid advances in laser technology we have seen play out historically, such as in the Blu-ray DVD industry. We deploy commodity semiconductor diode lasers and mature laser systems widely used in the semiconductor manufacturing process to build our systems, rather than relying upon exotic laser systems normally used in scientific research labs. We are now starting to learn how to miniaturize the lasers and their delivery systems to make them extremely stable, leading to even higher performance quantum computing operations.

We are already at work deploying these classical computing technologies for the benefit of IonQ systems. With every new system we design, we methodically review each component technology and ask ourselves if we should buy it, build it, or partner on its development, which keeps us focused on what matters most to us at IonQ: delivering the best systems possible to service our customers.

Over the past months, we have provided you with glimpses of how IonQ is scaling to meet the growing demand in our market. We announced our new Bothell, Washington location, the first dedicated quantum computing manufacturing facility in the United States, a year ahead of schedule. We shared news of recent additions to the IonQ team who will spur growth in sales and production engineering. We have discussed the potential for full-system sales to customers who see the immediate value of having quantum compute capabilities on premises.

In many ways, 2023 is just the beginning, as the power of a quantum computer doubles with each incremental #AQ. In the coming months, we expect to announce our progress in achieving new heights of system performance, new projects with leading customers, and even a new system that incorporates learnings from the latest generations. We encourage our investors to stay tuned for what should be a thrilling couple of years ahead.

Our Thanks

Our first year as a public company was an opportunity for IonQ to demonstrate our ability to project and deliver on our financial and technical milestones. We broke apart from the pack and have set our sights on becoming the first quantum company to offer quantum advantage to the market. With a strong balance sheet and a healthy head start achieved by the outstanding IonQ team, we look to the future with confidence.

On behalf of the full IonQ team, we appreciate your support as an investor in IonQ and look forward to an exciting journey together in 2023 and beyond.

Best,

Peter Chapman

Peter Chapman
President and Chief Executive Officer
IonQ, Inc.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**
For the fiscal year ended December 31, 2022
OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934 FOR THE TRANSITION PERIOD FROM TO**
Commission File Number 001-39694

IONQ, INC.
(Exact name of Registrant as specified in its charter)

Delaware	**85-2992192**
(State or other jurisdiction of incorporation or organization)	**(I.R.S. Employer Identification No.)**
4505 Campus Drive College Park, MD	**20740**
(Address of principal executive offices)	**(Zip Code)**

Registrant's telephone number, including area code: (301) 298-7997
Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.0001 par value per share	**IONQ**	**New York Stock Exchange**
Warrants, each exercisable for one share of common stock for $11.50 per share	**IONQ WS**	**New York Stock Exchange**

Securities registered pursuant to Section 12(g) of the Act: None

Indicate by check mark if the Registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes ☐ No ☒
Indicate by check mark if the Registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. Yes ☐ No ☒
Indicate by check mark whether the Registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the Registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐
Indicate by check mark whether the Registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T(§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the Registrant was required to submit such files). Yes ☒ No ☐
Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer ☐	Accelerated filer ☐
Non-accelerated filer ☒	Smaller reporting company ☒
Emerging growth company ☒	

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐
Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☐
If securities are registered pursuant to Section 12(b) of the Act, indicate by check mark whether the financial statements of the registrant included in the filing reflect the correction of an error to previously issued financial statements. ☐
Indicate by check mark whether any of those error corrections are restatements that required a recovery analysis of incentive-based compensation received by any of the registrant's executive officers during the relevant recovery period pursuant to § 240.10D-1(b). ☐
Indicate by check mark whether the Registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes ☐ No ☒
The aggregate market value of the voting and non-voting common equity held by non-affiliates of the Registrant, based on the closing price of $4.38, per share of the Registrant's common stock on the New York Stock Exchange on June 30, 2022, was $675.6 million. This calculation excludes shares of the registrant's common stock held by current executive officers, directors and stockholders that the registrant has concluded are affiliates of the registrant. This determination of affiliate status is not a determination for other purposes.
The number of shares of registrant's common stock outstanding as of March 23, 2023 was 201,551,436.

DOCUMENTS INCORPORATED BY REFERENCE

Certain information required in Item 10 through Item 14 of Part III of this Annual Report on Form 10-K is incorporated herein by reference to the Registrant's definitive proxy statement for its 2023 Annual Meeting of Stockholders, which shall be filed with the Securities and Exchange Commission pursuant to Regulation 14A of the Securities Act of 1934, as amended.

Table of Contents

In this report, unless otherwise stated or the context otherwise indicates, the terms "IonQ, Inc.," "the company," "we," "us," "our" and similar references refer to "IonQ" and our other registered and common law trade names, trademarks and service marks are property of IonQ, Inc. All other trademarks, trade names and service marks appearing in this annual report are the property of their respective owners. Solely for convenience, the trademarks and trade names in this report may be referred to without the ® and ™ symbols, but such references should not be construed as any indicator that their respective owners will not assert their rights thereto.

WHERE YOU CAN FIND MORE INFORMATION

Investors and others should note that we announce material financial information to our investors using our investor relations website at investors.ionq.com, press releases, filings with the U.S. Securities and Exchange Commission ("SEC") and public conference calls and webcasts. We also use IonQ's blog and the following social media channels as a means of disclosing information about the company, our products and services, our planned financials and other announcements and attendance at upcoming investor and industry conferences, and other matters. This is in compliance with our disclosure obligations under Regulation FD:

- IonQ Company Blog (https://ionq.com/resources/learn)
- IonQ LinkedIn Page (https://www.linkedin.com/company/ionq.co)

- IonQ Twitter Account (https://twitter.com/ionq_inc)
- IonQ YouTube Account (https://www.youtube.com/@ionq_inc)

Information posted through these social media channels may be deemed material. Accordingly, in addition to reviewing our press releases, SEC filings, public conference calls and webcasts, investors should monitor IonQ's blog and our other social media channels. The information we post through these channels is not part of this Annual Report on Form 10-K. The channel list on how to connect with us may be updated from time to time and is available on our investor relations website.

CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K (this "Annual Report") contains statements that may constitute "forward-looking statements" within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act") and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act") that involve substantial risks and uncertainties. All statements contained in this Annual Report other than statements of historical fact, including statements regarding our future results of operations and financial position, our business strategy and plans, and our objectives for future operations, are forward-looking statements. The words "believes," "expects," "intends," "estimates," "projects," "anticipates," "will," "plan," "may," "should," or similar language are intended to identify forward-looking statements. These forward-looking statements include statements concerning the following:

- our financial and business performance, including financial projections and business metrics;
- changes in our strategy, future operations, financial position, estimated revenues and losses, projected costs, prospects and plans;
- the implementation, market acceptance and success of our business model and growth strategy;
- our expectations and forecasts with respect to market opportunity and market growth;
- our ability to sell full quantum computing systems to customers, either over the cloud or for local access;
- the ability of our products and services to meet customers' compliance and regulatory needs;
- our ability to attract and retain qualified employees and management;
- our ability to adapt to changes in consumer preferences, perception and spending habits and develop and expand our product offerings and gain market acceptance of our products, including in new geographies;
- our ability to develop and maintain our brand and reputation;
- developments and projections relating to our competitors and industry;
- our expectations regarding our ability to obtain and maintain intellectual property protection and not infringe on the rights of others;
- expectations regarding the time during which we will be an emerging growth company under the Jumpstart Our Business Startups Act of 2012 (the "JOBS Act");
- the impact of global economic and political developments on our business, as well as the value of our common stock and our ability to access capital markets;
- the impact of public health crises, or geopolitical tensions, such as the Russia-Ukraine war, on our business and the actions we may take in response thereto;
- our future capital requirements and sources and uses of cash;
- our ability to obtain funding for our operations and future growth; and
- our business, expansion plans and opportunities.

You should not rely on forward-looking statements as predictions of future events. We have based the forward-looking statements contained in this Annual Report primarily on our current expectations and projections about future events and trends that we believe may affect our business, financial condition and operating results. The outcome of the events described in these forward-looking statements is subject to risks, uncertainties and other factors described in the section titled "Risk Factors" and elsewhere in this Annual Report. A summary of selected risks associated with our business are set forth below. Moreover, we operate in a very competitive and rapidly changing environment. New risks and uncertainties emerge from time to time, and it is not possible for us to

predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this Annual Report. The results, events and circumstances reflected in the forward-looking statements may not be achieved or occur, and actual results, events or circumstances could differ materially from those described in the forward-looking statements.

In addition, statements that "we believe" and similar statements reflect our beliefs and opinions on the relevant subject. These statements are based on information available to us as of the date of this Annual Report. And while we believe that information provides a reasonable basis for these statements, that information may be limited or incomplete. Our statements should not be read to indicate that we have conducted an exhaustive inquiry into, or review of, all relevant information. These statements are inherently uncertain, and investors are cautioned not to unduly rely on these statements.

The forward-looking statements made in this Annual Report relate only to events as of the date on which the statements are made. We undertake no obligation to update any forward-looking statements made in this Annual Report to reflect events or circumstances after the date of this Annual Report or to reflect new information or the occurrence of unanticipated events, except as required by law. We may not actually achieve the plans, intentions or expectations disclosed in our forward-looking statements, and you should not place undue reliance on our forward-looking statements. Our forward-looking statements do not reflect the potential impact of any future acquisitions, mergers, dispositions, joint ventures or investments.

PART I

Item 1. Business.

Overview

We are developing quantum computers designed to solve some of the world's most complex problems, and transform business, society and the planet for the better. We believe that our proprietary technology, our architecture and the technology exclusively available to us through license agreements will offer us advantages both in terms of research and development, as well as the commercial value of our intended product offerings.

Today, we sell access to several quantum computers of various qubit capacities and are in the process of researching and developing technologies for quantum computers with increasing computational capabilities. We currently make access to our quantum computers available via three major cloud platforms, Amazon Web Services' ("AWS") Amazon Braket, Microsoft's Azure Quantum and Google's Cloud Marketplace, and also to select customers via our own cloud service. This cloud-based approach enables the broad availability of quantum-computing-as-a-service ("QCaaS").

We supplement our QCaaS offering with professional services focused on assisting our customers in applying quantum computing to their businesses. We also expect to sell full quantum computing systems to customers, either over the cloud or for local access.

We are still in the early stages of commercial growth. Since our inception, we have incurred significant operating losses. Our ability to generate revenue sufficient to achieve profitability will depend heavily on the successful development and further commercialization of our quantum computing systems. Our net losses were $48.5 million and $106.2 million for the years ended December 31, 2022 and 2021, respectively, and we expect to continue to incur significant losses for the foreseeable future. As of December 31, 2022, we had an accumulated deficit of $194.3 million. We expect to continue to incur losses for the foreseeable future as we prioritize reaching the technical milestones necessary to achieve an increasingly higher number of stable qubits and higher levels of fidelity than presently exists—prerequisites for quantum computing to reach broad quantum advantage.

The Quantum Opportunity

Throughout human history, technological breakthroughs have dramatically transformed society and altered the trajectory of economic productivity. In the 19th century, it was the industrial revolution, powered by the scientific advances that brought us steam-powered machines, electricity, and advanced medicine. These technologies drastically improved human productivity and lengthened life expectancy.

In the 20th century, computing—arguably the greatest of all human inventions—leveraged human intelligence to run complex calculations, paving the way for profound advances in virtually every realm of human experience, including information processing, communication, energy, transportation, biotechnology, pharmaceuticals, agriculture and industry.

Since classical computing emerged in the mid-twentieth century, there has been exponential progress in computer design, with processing power roughly doubling every few years (Moore's law). The true economic and social impact of computing is difficult to measure because it has so thoroughly permeated every aspect of life, altering the trajectory of society.

However, as transformative as computing has been, many classes of problems strain the ability of classical computers, and some will never be solvable with classical computing. In this traditional binary approach to computing, information is stored in bits that are represented logically by either a 0 (off) or a 1 (on). Quantum computing uses information in a fundamentally different way than classical computing. Quantum computers are

based on quantum bits (qubits), a fundamental unit that can exist in both states 0 and 1 simultaneously (superposition). As a result, we believe that quantum computers can address a set of problems classical computing may never solve. The types of problems that currently defeat classical computing include: the simulation of quantum systems (e.g., in materials science or pharmaceuticals); number factoring for decryption; and complex optimization problems. Many of these problems are fundamental, involving society's most pressing needs, such as how to live sustainably on our planet, how to cure diseases, and how to efficiently move people and goods. Classical computers cannot solve these problems because the calculations would take far too long (i.e., millions to trillions of years) or because the problems involve quantum systems that are far too complex to be represented on a classical computer, even if their remarkable pace of development were to continue indefinitely. While these problems are not solvable by today's quantum computers, we believe that a quantum computer currently offers the best possibility for computational power that could be used to solve them.

The future success of quantum computing will be based on the development of a computer with a substantially higher number of qubits than our current computers. We believe that we will find solutions to these challenges and that our proprietary technology and architecture and the technology exclusively available to us through exclusive license agreements will offer advantages both in terms of research and development as well as the ultimate product we wish to offer customers.

There are certainly thousands, if not millions, of important and fundamental unanswered questions about how the universe works and opportunities associated with the answers to those questions. We envision a future powered by quantum computing and believe the 21st century is poised to be the dawn of this era.

Our Strategy

Our mission is to be the leading quantum computing company enabling the new era of quantum computing. We intend to fulfill our mission by:

- ***Leveraging Our Technology***. We believe that our technology offers substantial technological advantages compared to other competing quantum computing systems. We intend to build upon our technological lead by leveraging our world-class team of leaders and engineers who are pioneers in quantum computing, with proven track records in innovation and technical leadership. To date, we have developed and assembled eight generations of quantum computer prototypes and systems, have constructed quantum operating systems and software tools, and have worked with leading cloud vendors, quantum programming languages and quantum software development kits ("SDKs").
- ***Offering QCaaS***. We intend to provide QCaaS, complemented by access to quantum experts and algorithm development capabilities. We plan to manufacture, own and operate quantum computers, with compute units offered on a usage basis. Our quantum computing solution is currently delivered via AWS's Amazon Braket, Microsoft's Azure Quantum and Google's Cloud Marketplace. We believe that by offering QCaaS, we can accelerate the adoption of our quantum computing solutions, while efficiently promoting quantum computing across our partner ecosystems.
- ***Selling Direct Access to Quantum Computers***. We intend to sell direct access to the quantum computers we manufacture, with units offered on a whole system or usage basis. We believe that by offering direct access to quantum computing, we can assist select customers in deepening their application of quantum solutions.
- ***Continuing to Enhance Our Proprietary Position***. We have exclusively licensed our core technology from the University of Maryland and Duke University (together, the "Universities"), and our complex technology is protected by an extensive patent portfolio. We intend to continue to drive innovation in quantum computing and seek intellectual property protection where appropriate to enhance our proprietary technology position.
- ***Further Developing Our Quantum Computing Partner Ecosystem***. We believe our relationships with leading technology enterprises and university research institutes will accelerate innovation, distribution and monetization of our quantum capabilities.

Market Opportunity: A Future Driven by Quantum Computing

The potential uses for quantum applications are widespread and address a number of problems that would be impossible to solve using classical computing technology. According to a 2020 report from P&S Intelligence, the total addressable market of quantum computing is expected to be approximately $65 billion by 2030. Below are a few of the use cases in which we believe quantum computers, if they are successfully developed, will become an important tool for businesses to remain competitive in the market over the coming years.

Quantum Simulations in Chemistry

We believe that there are thousands of problems that could benefit from these quantum algorithms across the pharmaceutical, chemical, energy and materials industries. An example of such a simulation problem is modeling the core molecule in the nitrogen fixation process to make fertilizer. Nature is able to fixate nitrogen (i.e., turn atmospheric nitrogen into more useful ammonia) at room temperature. Scientists, however, have only been able to achieve fixation using a resource-intensive, high-temperature, high-pressure process, called the Haber-Bosch process. A cornerstone of the global agriculture industry, the Haber-Bosch process consumes about one percent of the world's energy and produces about one percent of the world's carbon dioxide. Agronomists have attempted to model the core molecule in nature's nitrogen fixation process, but the molecule is too large for today's classical supercomputers to simulate. Understanding the quantum process used in nature to fixate nitrogen could lead directly to more efficient ways for scientists to do the same.

Quantum chemistry simulation is expected to impact multiple markets and become an essential tool in chemical industries. For example, computer-aided drug discovery in the pharmaceutical industry is limited by the computing time and resources required to simulate a large enough chemical system with sufficient accuracy to be useful. If future generations of more powerful quantum computers are successfully developed, we believe that we could improve the speed and accuracy of virtual high-throughput screening and improve the molecular docking predictions used in structure-based drug discovery, dramatically reducing the development cost of new drugs and reducing the time to market. Similarly, we believe that developing a detailed understanding of chemical reactions critical to various industries, such as catalytic reaction in battery chemistry for electric vehicles, can lead to higher performing solutions with extended energy storage capacity.

Quantum Algorithms for Monte Carlo Simulations

Monte Carlo simulations are probability simulations used to calculate the expected distribution of possible outcomes in hard-to-predict processes involving random variables. Such simulations are used pervasively in finance, banking, logistics, economics, engineering and applied sciences. A key parameter of Monte Carlo simulations is the degree of accuracy desired to attain with the result. To obtain 99.9% accuracy, a classical computer requires around one million simulations. Quantum algorithms, however, can achieve the same accuracy using only one thousand simulations, thereby significantly reducing the time it takes to perform Monte Carlo simulations. This is especially important when running these simulations is expensive.

One application of the quantum Monte Carlo algorithm is to price options for the financial industry. Simple options models are used ubiquitously in finance, the most famous of these being the Black-Scholes model. However, these models fail to capture the complexities of real markets, and financiers use more sophisticated simulations to obtain better model predictions. Currently, many of these models are limited by the number of simulations required to reach the desired accuracy within a fixed time budget. Quantum algorithms for Monte Carlo simulations could give some financial firms a competitive advantage by enabling them to price options more quickly.

Quantum Algorithms for Optimization

Optimization problems have enormous economic significance in many industries, and they often cannot be solved with classical computers due to their daunting complexity. Quantum algorithms are naturally suited for

problems in which an exponential number of possibilities must be considered before an optimized output can be identified. It is widely believed that quantum computers will be able to arrive at a better approximate optimization solution than classical computers can, and with reduced computational cost and time. One method of quantum optimization is a hybrid method called the Quantum Approximate Optimization Algorithm, in which layers of quantum computations are executed within circuit parameters optimized using classical high-performance computers. Because optimization issues bedevil so many complicated processes in industries ranging from logistics to pharmaceutical drug design to climate modeling, the application of quantum algorithms to optimization problems could have far-reaching impacts on society.

Quantum Machine Learning

Quantum computers can generate probability distributions that cannot be efficiently simulated on a classical computer. Similarly, there are probability distributions that can only be efficiently distinguished from each other using a quantum computer. In these examples, models utilizing quantum circuits can be used to capture complex internal structures in the data set much more effectively than classical models. In other words, quantum computers can "learn" things that are beyond the capabilities of classical computers. Quantum computing is likely to offer new machine-learning modalities, greatly improving existing classical machine learning when used in tandem with it. Examples of areas where quantum machine learning could have an impact are risk analysis in finance, natural language processing, and classification of multivariate data such as images and chemical structures. Machine learning is used broadly in industry today, and we believe quantum machine learning could have a similarly broad impact.

As with any completely new technology, the use cases imagined by us today are only a subset of the opportunities that will emerge if future generations of more powerful quantum computers are successfully developed, as users understand the power of quantum algorithms.

Remaining Challenges in Quantum Computing Evolution

One can compare any particular quantum algorithm's performance to the best classical algorithm for the same problem. The point at which a quantum computer is able to perform a particular computation that exceeds its classical counterpart in speed or reduces its cost to solution is known as the point of "quantum advantage."

Given the substantial research and development required to build a modern quantum computer that is both functional and practical, industry experts describe the remaining challenges in quantum computing to achieve quantum advantage as being solved in three phases. Although none of these challenges have yet been fully solved, we believe that we are well positioned to do so. A 2019 publicly available report by a leading third-party consulting firm describes these phases—and the associated technical barriers—as paraphrased below:

- *Noisy and intermediate-scale quantum (NISQ) computers*: The earliest stage of development will see component demonstrations and intermediate-scale system development with limited commercial application. The main technical barrier involves the mitigation of errors through improved fabrication and engineering of underlying qubit devices and advanced control techniques for the qubits. These devices are used for developing and validating fundamentally new quantum approaches to tackling difficult problems, but are not expected to generate substantial commercial revenues.
- *Broad quantum advantage*: In this stage, quantum computers are expected to provide an advantage over classical computers with a meaningful commercial impact. The main technical barrier is the deployment of quantum error-correcting codes that allow bigger applications to be executed. If this barrier can be overcome, we believe that quantum computing will offer practical solutions to meaningful problems superior to those provided by classical computers.
- *Full-scale fault tolerance*: This last stage will see large modular quantum computers with enough power to tackle a wide array of commercial applications relevant to many sectors of the economy. At

this stage, classical computers are expected to no longer compete with quantum computers in many fields. The technical barrier will be the adoption of a modular quantum computer architecture that allows the scalable manufacturing of large quantum computer systems.

Building a Quantum Computer

Requirements for Building Useful Quantum Computers

Quantum computers are difficult to build and operate because the physical system of qubits must be nearly perfectly isolated from its environment to faithfully store quantum information. Yet the system must also be precisely controlled through the application of quantum gate operations, and it must ultimately be measured with high accuracy. A practical quantum computer requires well-isolated, near-perfect qubits that are cheap, replicable and scalable, along with the ability to initialize, control and measure their states. Breakthroughs in physics, engineering, and classical computing were prerequisites for building a quantum computer, which is why for many decades the task was beyond the limits of available technology.

To execute computational tasks, a quantum computer must be able to (i) initialize and store quantum information in qubits, (ii) operate quantum gates to modify information stored in qubits and (iii) output measurable results. Each of these steps must be accomplished with sufficiently low error rates to produce reliable results. Moreover, to be practical, a quantum computer must be economical in cost and scalable in compute power (i.e., the number of qubits and the number of gate operations) to handle real world problems.

The development of large-scale quantum computing systems is still in early stages, and several potential engineering architectures for how to build a quantum computer have emerged. We are developing quantum computers based on individual atoms as the core qubit technology, which we believe has key advantages in scaling. The ability to produce cheap error-corrected qubits at scale in a modular architecture is one of the key differentiators of our approach. Today, we have achieved many engineering firsts in this field and we believe that, with our focus on achieving additional technical milestones over the next few years, we are well positioned to bring quantum computing advantage to the commercial market.

Scientific Approaches to Quantum Computing

There are a variety of different approaches to (or architectures for) building a quantum computer, each of which involves tradeoffs in meeting the three functional and practical requirements outlined above. Roughly, approaches to performing a quantum computation fall into one of three categories: natural quantum bits, solid state or classical computer simulation.

Natural quantum bits: In natural qubit-based quantum computers, a system is built around naturally occurring substrates exhibiting quantum properties.

- *Atoms*: In atomic-based quantum computers, the qubits are represented by internal states of individual atoms trapped and isolated in a vacuum. There are two categories within this approach: the use of ionized (charged) atoms and the use of neutral atoms.
- *Photons*: In this approach, the state of a photon, a particle of light, is used as the qubit. Various aspects of a photon, such as presence/absence, polarization, frequency (color) or its temporal location can be used to represent a qubit.

Solid state: In solid-state-based quantum computers, the qubits are engineered into the system.

- *Spins in semiconductors*: This approach uses the spins of individual electrons or atomic nuclei in a semiconductor matrix. There are two categories within this approach: (1) the use of electrons trapped in quantum dot structures fabricated by lithographic techniques and (2) the use of atomic defects (or dopants) that capture single electrons. The nuclear spin of the dopant atoms, or the nearby atoms to defects, are often used to store qubits.

- *Superconducting circuits*: This approach uses circuits fabricated using superconducting material that features quantum phenomena at cryogenic temperatures. Two states of the circuit, either charge states or states of circulating current, are used as the qubit.

Classical computer simulation: Classical computers in a data center can be used to simulate quantum computers. Although useful for small-scale quantum experiments, quantum simulation on classical computers is still bound by the same limitations of classical computing and would require an impractical number of data centers to tackle meaningful quantum problems.

Our Technology Approach

Our Approach to Quantum Computing: Trapped Ions

We have adopted the atom-based approach described above and use trapped atomic ions as the foundational qubits to construct practical quantum computers. We are pursuing a modular computing architecture to scale our quantum computers, meaning that, if successful, individual quantum processing units will be connected to form increasingly powerful systems. We believe that the ion trap approach offers the following advantages over other approaches:

- *Atomic qubits are nature's qubits*: Using atoms as qubits means that every qubit is exactly identical and perfectly quantum. This is why atomic qubits are used in the atomic clocks that do the precise timekeeping for mankind. Many other quantum systems rely upon fabricated qubits, which bring about imprecisions such that no single qubit is exactly the same as any other qubit in the system. For example, every superconducting qubit comes with a different frequency (or must be tuned to a frequency) due to manufacturing imprecision. Overall, we believe that systems relying upon fabrication of their qubits are more susceptible to error.
- *Trapped ion qubits are well-isolated from environmental influences*: When a quantum system interacts with its environment, the quantum state loses coherence and is no longer useful for computing. For example, in a superconducting qubit, the qubit tends to lose its coherence within approximately 10 to 50 microseconds. Even neutral atoms are perturbed to some extent when they are trapped in space. In contrast, trapped ion qubits are confined via electric fields in an ultra-high vacuum environment, and their internal qubits are hence perfectly isolated. As a result, the coherence of trapped ions can be preserved for about an hour, and may be able to be preserved for longer if isolation technology improves. Longer coherence times mean more computations can be performed before noise overwhelms the quantum calculation and are key to minimizing the overhead of error correction needed for large-scale quantum computers.
- *Lower overhead for quantum error-correction*. Quantum error-correction will likely be necessary to reduce the operational errors in any large-scale quantum computations relevant to commercial problems. Quantum error-correction uses multiple physical qubits to create an error-corrected qubit with lower levels of operational errors. For solid-state architectures, we estimate that it may take at least 1,000 physical qubits to form a single error-corrected qubit, while for near-term applications with ion traps the ratio is closer to 16:1.
- *Trapped ion quantum computers can run at room temperature*: Solid-state qubits currently require temperatures close to absolute zero (i.e., -273.15°C, or -459.67°F) to minimize external interference and noise levels. Maintaining the correct temperature requires the use of large and expensive dilution refrigerators, which can hamper a system's long-term scalability because the cooling space, and hence the system space, is limited. Trapped ion systems, on the other hand, can operate at room temperature. This is because the qubits themselves are not in thermal contact with the environment, as they are electromagnetically confined in free space inside a vacuum chamber. Although modest cryogenics (< 10 degrees above absolute zero) can be used to dramatically improve the vacuum environment, the inherent properties of the qubits themselves do not degrade at room temperature. The laser-cooling of

the qubits themselves is extremely efficient because the atomic ions have very little mass and this requires just a single low-power laser beam (microwatts). This allows us to minimize the system size as technology progresses, while scaling the compute power and simultaneously reducing costs.

- *All-to-all connectivity*: In superconducting and other solid-state architectures, individual qubits are connected via physical wires, hence a particular qubit can only communicate with a further-removed qubit by going through the qubits that lie in-between. In the trapped ion approach, however, qubits are connected by electrostatic repulsion rather than through physical wires. As a result, qubits in our existing systems can directly interact with any other qubit in the system. Our modular architecture benefits from this flexible connectivity, significantly reducing the complexity of implementing a given quantum circuit.
- *Ion traps require no novel manufacturing capabilities*: Ion trap chips consist of electrodes and their electrical connections, which are built using existing technologies. The trap chips themselves are not quantum materials. They simply provide the conditions for the ion qubits to be trapped in space, and in their current state, they can be fabricated with existing conventional and standard silicon or other micro-fabrication technologies. By contrast, solid-state qubits, such as superconducting qubits or solid-state silicon spins, require exotic materials and fabrication processes that demand atomic perfection in the structures of the qubits and their surroundings; fabrication with this level of precision is an unsolved challenge.

Technological Complexity Creates Significant Barriers to Entry

Alongside the benefits of the trapped ion approach, there are several challenges inherent in it that serve as barriers-to-entry, strengthening the advantages of our systems. These key challenges include:

- *Complex laser systems*: One of the challenges of trapped ion quantum computing is the set of lasers required and the degree to which they must be stable to operate the system. Traditionally, these laser systems were assembled on an optical table on a component-by-component basis, which led to serious stability and reliability issues. We believe that we have resolved this issue from an engineering standpoint and that our future roadmap will further improve manufacturability.
- *Ultra-high vacuum (UHV) technology*: The conventional method to achieve UHV conditions for ion trapping experiments involves using vacuum chamber designs with carefully chosen materials, assembly procedures with cumbersome electrical connections, and a conditioning procedure to prepare and bake the chamber at elevated temperatures for extended periods of time. We have developed new approaches, such as environmental conditioning, that we believe will substantially reduce the time and cost to prepare the UHV environment to operate the quantum computer.
- *Executing high fidelity gates with all-to-all connectivity*: While trapped ion qubits feature the highest fidelity entangling gates, it is nevertheless a major technical challenge to design a control scheme that enables all qubits in a system to form gates with each other under full software control. Through innovation in gate-implementation protocols, we believe that we have developed laser delivery and control systems that will allow us to implement fully programmable, fully connected gate schemes in our system.
- *Slow gate speeds*: Compared to their solid-state counterparts, trapped ions are widely believed to have slow gate speeds. While slow gate speeds are the case for many systems in operation today, both theoretical analyses and experimental demonstrations suggest this may not be a fundamental limit of trapped ion qubits (although this has not yet been demonstrated in commercial applications). In fact, high-fidelity gates with speeds comparable to those of solid-state qubits have been realized in several research laboratories. We expect that our future quantum computers based on barium ions will be faster, more powerful, more easily interconnected, and that feature more uptime for customers. Moreover, we believe that as systems with other qubit technologies scale up, their restricted

connectivity and high error-correction overhead will significantly slow down their overall computation time, which we believe will make the trapped ion approach more competitive in terms of operational speed.

Our Trapped Ion Implementation

The specific implementation of our trapped ion systems leverages the inherent advantages of the substrate and creates what we believe is a path for building stable, replicable and scalable quantum computers.

Trapped Ion Infrastructure

Our systems are built on individual atomic ions that serve as the computer's qubits. Maintaining identical, replicable, and cost-effective qubits is critical to our potential competitive advantage, and we have developed a process to produce, confine and manipulate atomic ion qubits.

To create trapped atomic ion qubits using our approach, a solid source containing the element of interest is either evaporated or laser-ablated to create a vapor of atoms. Laser light is then used to strip one electron selectively from each of only those atoms of a particular isotope, creating an electrically charged ion. Ions are then confined in a specific configuration of electromagnetic fields created by the trapping structure (*i.e.*, the ion trap), to which their motion is confined due to their charge. The trapping is done in an UHV chamber to keep the ions well-isolated from the environment. Isolating and loading a specific isotope of a specific atomic species ensures each qubit in the system is identical. Two internal electronic states of the atom are selected to serve as the qubit for each ion. The two atomic states have enough frequency separation that the qubit is easy to measure through fluorescence detection when an appropriate laser beam is applied.

To build quantum computers, many atomic ions are held in a single trap, and the repulsion from their charges naturally forces them into a stable linear crystal (or chain) of qubits. The qubits are highly isolated in the UHV chamber, only perturbed by occasional collisions with residual molecules in the chamber, which provides near-perfect quantum memory that lasts much longer than most currently envisioned quantum computing tasks require. The qubits are initialized and measured through a system of external gated laser beams. An additional set of gated laser beams applies a force to selected ions and modulates the electrical repulsion between the ions. This process allows the creation of quantum logic gates between any pair of qubits, regardless of their distance within the crystal, which can be arbitrarily reconfigured in software.

System Modularity and Scalability

Today, all qubits in our systems are stored on a single chip, referred to as a quantum processing unit ("QPU"). QPUs can have several cores, or zones for trapping chains of ions, comparable to multicore central processing unit ("CPU") chips in classical computing. Each core can contain up to about 100 qubits in a linear crystal, and dozens of cores can potentially be co-located in a single QPU. Within a QPU, some qubits can be physically moved between cores to accommodate quantum communication between the cores. This process of moving ions within a QPU is called "shuttling" and is achieved by modifying the electromagnetic fields that form the trap.

In addition to increasing the number of qubits per QPU, we believe we have identified, and we are currently developing, the technology needed to connect qubits between trapped ion QPUs, which may be commercially viable in the future. This technology, known as a photonic interconnect, uses light particles to communicate between qubits while keeping information stored stably on either end of the interconnect. The basic protocol for this photonic interconnect between ion traps in two different vacuum chambers was first realized by our co-founder Christopher Monroe's research team in 2007. We believe this protocol can be combined with all-optical switching technology to enable multi-QPU quantum computers at large scale. We have deep expertise

in photonics; while at Bell Labs, co-founder Jungsang Kim led a team to build the world's largest optical switch. Photonic interconnects are designed to allow our systems to compute with entangled qubits spanning multiple QPUs, which we believe can open up the possibility of scaling quantum computers indefinitely, similar to how high-performance computers and data centers have been scaled.

Our quantum architecture is modular, meaning that if development of this architecture is successful, the number of qubits in a QPU, or the number of QPUs in a system, could be scaled. Also, by allowing for each qubit in a system to entangle with any other qubit in that system, we believe that a system's number of quantum gates could increase rapidly with each additional qubit added. This all-to-all connectivity is one of the key reasons we believe our systems will be computationally powerful.

Gate Configuration

Our qubits are manipulated (for initialization, detection, and forming quantum logic gates) by shining specific laser beams onto the trapped ions. Our systems employ a set of lasers and a sophisticated optical system to deliver beams precisely tailored to achieve this manipulation. The laser beams are tailored by programming radio frequency ("RF") signals using state-of-the-art digital chipsets, which are custom-configured to generate the signals for qubit manipulation. An operating system manages the quantum computer, maintaining the system in operation. It includes software toolsets for converting quantum programs from users into a set of instructions the computer hardware can execute to yield the desired computational results. To support system access from the cloud, we offer cloud management tools and application programming interfaces ("APIs") that permit programming jobs to run remotely.

Our quantum gates are fully programmable in software; there is no "hard-wiring" of qubit connections in the quantum computing hardware. The structure of a quantum circuit or algorithm can therefore be optimized in software, and the appropriate laser beams can then be generated, switched, or modulated to execute any pattern of gate interactions. Our programmable gate configurations make our systems adaptable. Unlike quantum computer systems that are limited to a single class of problems due to their architecture, we believe that any computational problem with arbitrary internal algorithmic structure could be optimized to run on our system (although this has not been demonstrated at scale).

Quantum Error Correction

A key milestone in building larger quantum computers is achieving fault-tolerant quantum error-correction. In quantum error-correction, individual physical qubits prone to errors are combined to form an error-corrected qubit (sometimes referred to as a logical qubit) with a much lower error rate. Determining how many physical qubits are needed to form a more reliable logical qubit (the resource "overhead") depends on both the error rate of the physical qubits and the specific error-correcting codes used. In 2020, our co-founder Dr. Monroe's research team at the University of Maryland demonstrated the first error-corrected qubit using 13 trapped ion qubits. With our unique architecture, we believe quantum error-correction can be completely coded in software, allowing varying levels and depths of quantum error-correction to be deployed as needed. Because the ion qubits feature very low idle and native error rates and are highly connected, we expect the error-correction overhead to be about 16:1 to achieve the first useful quantum applications. This contrasts with other approaches, for which we estimate the overhead to be in the range of 1,000:1 to 100,000:1.

We believe our architectural decisions will make our systems uniquely capable of achieving scale. We have published a roadmap for scaling to larger quantum computing systems, with concrete technological innovations designed to significantly improve the performance of the systems. For example, last year, we announced that through our partnership with the U.S. Department of Energy's Pacific Northwest National Laboratory ("PNNL"), we were able to shrink the barium source material down to a microscopic scale. We believe this is significant because it will allow us to reduce the size of core system components, an important step in the creation of quantum computers small enough to be networked together. However, meeting future milestones included in our

roadmap is not guaranteed and is dependent on various technological advancements, which could take longer than expected to realize or turn out to be impossible to achieve. We believe that, with engineering advancements and firsts yet to be achieved, our quantum computers will become increasingly compact and transportable, opening up future applications of quantum computing at the edge.

Our Forward-Looking Roadmap

In December 2020, we publicly released a forward-looking technical roadmap for the next eight years. Our technical roadmap was designed to provide transparent guidance to our quantum computer users regarding when we expect certain quantum computing capabilities to become available. As part of this roadmap, we introduced the notion of "algorithmic qubits" as a metric to measure progress, and a detailed description of how to define and measure the number of algorithmic qubits (#AQ) in early 2022. Roughly speaking, #AQ represents the total number of qubits that can be used to perform a quantum computational task that involves an order of ~(#AQ)^2 entangling gate operations in a list of quantum algorithms that reflect representative real-world use cases of a quantum computer. This metric provides a simple and effective measure to estimate the computational power of each generation of quantum computers. At low #AQ, the size of the problem the quantum computer can tackle is limited by the error rate of the entangling gate operations, rather than by the number of physical qubits available in the computer. The aggressive push for improving the power of quantum computers, including the early introduction of quantum error-correction, is intended to significantly compress the time required for reaching the point when we expect quantum computers may become commercially impactful at scale. We believe that many of the technological components needed to accomplish the performance goals of the roadmap, such as high-fidelity gate operations, photonic interconnects and quantum error-correction, have been realized in proof-of-concept demonstrations in trapped ion systems. Given our track record of engineering and technology development, we believe that, over time, we will be able to successfully translate these technology components into products, which may enable successful deployment of our quantum computers and deliver material commercial value to customers.

We are targeting a Modular Architecture, Designed to Scale, resulting in Smaller Systems and Cheaper Compute Power for Each Generation

The scaling of classical computer technology, which unlocked continuously growing markets over many decades, was driven by exponential growth in computational power coupled with exponential reduction in the cost of computational power for each generation (Moore's law). The key economic driver permitting the expansion of digital computer applications to new segments of the market was this very phenomenon of capability doubling in each generation with costs rising only modestly. We believe the scaling of quantum computing may follow a similar trajectory: as the #AQ available in each generation scales, the per-AQ cost is also reduced and enables true scaling of quantum computers. Our systems have benefitted from years of architectural focus on scalability that addresses both #AQ and per-AQ cost and, as such, we believe that if we are able to successfully solve remaining scalability challenges, these systems may become increasingly powerful and accessible in tandem.

At the heart of our approach is the modular architecture that may enable such growth. We expect our future systems to be modular networks of many QPUs working together as a large quantum computer, similar to how classical data centers are designed, constructed and operated today. Our engineering effort is focused on reducing the size, weight, cost and power consumption of the QPUs that will be the center of each generation of the modular quantum computer, while increasing the number of QPUs manufactured each year. We intend to focus on achieving these engineering efforts over the next several years. If successful, we expect that we may be able to achieve compact, lightweight and reliable quantum computers, which can be deployed at the edge, similarly to how personal computers have enabled new applications for both government and commercial use.

Our Business Model

Quantum Computing and the Software-as-a-Service Model

As quantum hardware matures, we expect the quantum computing industry to increasingly focus on practical applications for real-world problems, known as quantum algorithms. Today, we believe that there are a large number of quantum algorithms widely thought to offer advantages over classical algorithms in that each of these algorithms can solve a problem more efficiently, or in a different manner, than a classical algorithm. Our business model is premised on the belief that businesses with access to quantum computers will likely have a competitive advantage in the future.

We envision providing quantum computing services, complemented by access to quantum experts and algorithm development capabilities, to solve some of the most challenging issues facing corporations, governments and other large-scale entities today. We intend to manufacture, own and operate quantum computers, with compute units being offered to potential customers on a QCaaS basis.

We expect our target markets to experience two stages of quantum algorithm deployment: the development stage and the application stage. We expect our involvement in these two stages, to the extent they will take place, to be as follows:

- During the development stage, our experts will assist customers in developing an algorithm to solve their business challenges. Customers may be expected to pay for quantum compute usage, in addition to an incremental amount for the consulting and development services provided in the creation of algorithms. We may choose to sell this computing time to customers in a variety of ways. In this stage, we expect revenue to be unevenly distributed, with individual customers potentially contributing to peaks in bookings.
- During the application stage, once an algorithm is fully developed for a market, we anticipate that customers would be charged to run the algorithm on our hardware. Given the mission critical nature of the use cases we anticipate quantum computing will attract, we believe a usage-based revenue model will result in a steady stream of revenue while providing the incremental ability to grow with customers as their algorithm complexity and inputs scale.

Our Customer Journey

In each new market that stands to benefit from quantum computing, we intend to guide our customers and partners through two stages: the development phase and the application phase.

Development Phase: This first stage focuses on quantum algorithm development and we expect it to involve deep partnerships between us and our customers to lay the groundwork for applying quantum solutions to the customer's industry. We also anticipate uneven revenue for this period given that the quantum computing market is still nascent. We expect the development phase for each market to be characterized by the following go-to-market channels:

- *Co-development of quantum applications with strategic partners.* We intend to form long-term partnerships with select industry-leading companies (aligned with our technology roadmap) to co-develop end-to-end solutions for the partner and to provide an early-adopter advantage to the partner in their industry. IonQ has announced co-development agreements with Hyundai Motor Company to pursue solutions for battery chemistry and with GE Research to apply quantum computing to risk management.
- *Preferred compute agreements with clients*. We expect our preferred offerings to give the customer's application engineers direct access to our cutting-edge quantum systems, as well as technical support to pursue their solution development.

- *Cloud access to quantum computing*. Our current and future cloud partnerships with AWS's Amazon Braket, Microsoft's Azure Quantum, Google's Cloud Marketplace and other cloud providers are or will be designed to make access to quantum computing hardware available to a broader community of quantum programmers.
- *Dedicated hardware*. We anticipate manufacturing and selling complete quantum systems for dedicated use by a single customer, to be hosted on premises by the customer or remotely by us.

Application Phase: This second phase is expected to commence if we are successful in demonstrating the commercial viability of quantum advantage in the industry and can therefore commence with developing commercial applications and applying that advantage broadly throughout the market with new customers.

- *Delivery of a full-scale quantum compute platform*. For customers who have worked alongside us in the development phase to curate deep in-house technical expertise in quantum computing capabilities at the time quantum advantage is achieved for the customer's application, our preferred compute agreements, cloud offerings, and dedicated hardware sales are expected to offer sufficient quantum computational capacity.
- *Packaged solution offerings*. When appropriate, we may develop full-stack quantum solutions that can be provided directly to customers, regardless of their in-house quantum expertise.
- *Accelerated high-impact applications development*. We intend to provide opportunities for accelerated applications development to customers seeking compressed development timelines to solve some of their biggest problems and drive efficiencies.

We expect the technical complexity of the solutions required for quantum algorithms to address each application area will impact the timing of that market's inflection point and transition from the development phase to the application phase. During the NISQ computing era, we expect quantum machine learning to be the first solution to transition into broadly available applications. Additional markets taking advantage of quantum material science research and optimization speed-ups may come online next if broad-scale quantum advantage becomes accessible. If our quantum computers achieve full-scale fault tolerance, a diverse array of industries, ranging from quantum chemistry to deeper optimization, may be able to be transitioned to the application phase.

Customers and Prospects

QCaaS

We sell access to our quantum computing solutions via AWS's Amazon Braket, Microsoft's Azure Quantum, and Google's Cloud Marketplace, and directly to select customers via our own cloud service. Making systems available through the cloud in both cases enables wide distribution. Through our cloud service providers, potential customers across the world in industry, academia and government can access our quantum hardware with just a few clicks. These platforms serve an important purpose in the quantum ecosystem, allowing virtually anyone to try our systems without an upfront commitment or needing to integrate with our platform.

Direct Access Customers

By directly integrating with us, customers can reserve dedicated execution windows, receive concierge-level application development support, gain early access to next-generation hardware, or host their own quantum computer. Such access is currently limited to a select group of end-users.

We expect our standard offerings will include additional bundled value-add services in exchange for an annual commitment, such as usage-based access to our cloud platform, reserved system time, consultations with solution scientists, and other application and integration support.

Quantum Computing Systems and Hardware

We are engaged with certain prospects who are interested in purchasing partial or entire quantum computing systems, either over the cloud or for local access. We also sell certain specialized quantum computing hardware to select customers.

Government Agencies

Our customers, potential customers and partners include government agencies such as the United States Air Force Research Lab. Government agencies and large organizations often undertake a significant evaluation process. Our contracts with government agencies are typically structured in phases, with each phase subject to satisfaction of certain conditions.

Agreements with the University of Maryland and Duke University

Exclusive License Agreement

In July 2016, we entered into a license agreement with the University of Maryland and Duke University, which was subsequently amended in September 2017, October 2017, October 2018, February 2021, April 2021 and September 2021 (as amended, the "License Agreement"), under which we obtained a worldwide, royalty-free, sublicensable license under certain patents, know-how and other intellectual property to develop, manufacture and commercialize products for use in certain licensed fields, the scope of which would include the application of the licensed intellectual property in ion trap quantum computing. The License Agreement provides an exclusive license under the Universities' interest in all patents (and non-exclusive for other types of intellectual property), subject to certain governmental rights and retained rights by the Universities and other non-profit institutions to use and practice the licensed patents and technology for internal research and other non-profit purposes. We also entered into an exclusive option agreement ("Option Agreement") with each of the Universities in 2016 whereby we have the right to exclusively license additional intellectual property developed by the Universities by exercising an annual option and issuing a certain number of common shares to each of Duke University and University of Maryland.

We are obligated to use commercially reasonable efforts to commercialize the inventions covered by the licensed patent rights and achieve certain milestones, including the hiring of a Chief Executive Officer, obtaining equity financing by specified times and such other milestones that we may specify in a development plan provided by us to the universities. We have met all existing milestones as provided for in the License Agreement, have not included any additional milestones in any development plan provided to the universities, and no longer have any obligation to submit any future development plans to the universities. We are also responsible for the prosecution and maintenance of the licensed patents, at our expense and using commercially reasonable efforts. We have the sole right to enforce the licensed patents, at our expense.

We may terminate the License Agreement at any time for any reason with at least 90 days' written notice to the University of Maryland. The University of Maryland and Duke University may terminate the License Agreement if we enter into an insolvency-related event or in the event of our material breach of the agreement or other specified obligations therein, in each case, that remains uncured for 90 days after the date that it is provided with written notice of such breach by either university.

In consideration for the rights granted to us under the License Agreement, we issued the University of Maryland and Duke University shares of our common stock. Pursuant to the University of Maryland policy, Christopher Monroe, our Chief Scientist, may receive renumeration from the University of Maryland relating to any stock we have issued to the University of Maryland. Pursuant to Duke University's policy, Christopher Monroe and Jungsang Kim, our Chief Technology Officer and Director, may receive renumeration from Duke University relating to any stock we have issued to Duke University.

Option Agreement with Duke University

In July 2016, we entered into an option agreement with Duke University, which was subsequently amended in December 2020 and March 2021 (as amended, the "Duke Option Agreement"), under which it obtained the

right to add Duke University's interests in certain patents or other intellectual property to the License Agreement, including if they were developed by Jungsang Kim, Christopher Monroe or Kenneth Brown, a professor at Duke University, or by individuals under their respective supervision and such patents or intellectual property relates to the field of quantum information processing devices. We have added patents and other intellectual property to the License Agreement through the Duke Option Agreement. Pursuant to the terms of the Duke Option Agreement, we issued Duke University shares of common stock, including shares of common stock issued pursuant to the amendment of the Duke Option Agreement. The Duke Option Agreement terminates in July 2026.

Lease with the University of Maryland

In March 2020, we entered into an amended and restated office lease with the University of Maryland for the lease of our corporate headquarters and our research and development and manufacturing facility. This lease expires on December 31, 2030. We may terminate this lease with not less than 120 days written notice beginning in year six. Any early termination will result in a termination fee ranging from $2.5 million in year six to $500,000 in year ten, with each year subject to a reduction of $0.5 million. Annual base rent starts at $684,472 and increases approximately 3.0% each subsequent year.

Competition

There are many other approaches to quantum computing that use qubit technology besides the trapped ion approach we are taking. In some cases, conflicting marketing messages from these competitors can lead to confusion among our potential customer base. Large technology companies such as Google and IBM, and startup companies such as Rigetti Computing, are adopting a superconducting circuit technology approach, in which small amounts of electrical current circulate in a loop of superconducting material (usually metal where the electrical resistance vanishes at low temperatures). The directionality of the current flow, in such an example, can represent the two quantum states of a qubit. An advantage of superconducting qubits is that the microfabrication technology developed for silicon devices can be leveraged to make the qubits on a chip; however, a disadvantage of superconducting qubits is that they need to be operated in a cryogenic environment at near absolute-zero temperatures, and it is difficult to scale the cryogenic technology. Compared to the trapped ion approach, the qubits generated via superconducting suffer from short coherence times, high error rates, limited connectivity, and higher estimated error-correction overhead (ranging from 1,000:1 to 100,000:1 to realize the error-corrected qubits from physical qubits).

There are companies pursuing photonic qubits, such as PsiQuantum and Xanadu, among others. PsiQuantum uses photons (i.e., individual particles of light) as qubits, whereas Xanadu uses a combination of photons and a collective state of many photons, known as continuous variable entangled states, as the qubits. Each company's approach leverages silicon photonics technology to fabricate highly integrated on-chip photonic devices to achieve scaling. The advantages to this approach are that photons are cheap to generate, they can remain coherent depending on the property of the photons used as the qubit, and they integrate well with recently-developed silicon photonics technology; however, the disadvantages of photonic qubit approaches include the lack of high-quality storage devices for the qubits (photons move at the speed of light) and weak gate interactions (photons do not interact with one another easily). Both of these problems lead to photon loss during computation. Additionally, this approach requires quantum error correcting protocols with high overhead (10,000:1 or more).

Several other companies use a trapped ion quantum computing approach similar to ours, including Quantinuum Ltd. and Alpine Quantum Technologies GmbH. These companies share the fundamental advantages of the atomic qubit enjoyed by our approach. The differences between our technology and that of these companies lies in our processor architecture, system design and implementation and our strategies to scale. Based on publicly available information, Quantinuum processors operate with the application circuits broken down to two qubits at a time, with a bus width of two, and the ion qubits are shuffled between each gate operation. Our processor core involves a wide-bus architecture, where the interaction among a few dozens of atomic ion qubits can be controlled using programmable laser pulses. This typically allows quantum logic gates between all possible pairs of qubits in the processor core without extraneous operations, which will enable us to operate some quantum gates that are not possible on other quantum architectures. We have also demonstrated the ability to

shuttle multiple processor cores on the same chip, increasing the potential qubit capacity of a system. At scale, we believe these architectural features will confer benefits in the speed and efficiency of running algorithms. At a higher level, our scaling architecture will exploit optical interconnects among multiple QPUs in a way that allows full connectivity between any pair of qubits across the entire system. The modular scaling of multiple QPUs with photonic interconnects is unique in our architecture.

Lastly, there are alternative approaches to quantum computing being pursued by other private companies as well as the research departments at major universities or educational institutions. For example, D-Wave computing produces quantum annealers, a separate form of computing technology that hopes to tackle a class of problems with some overlap to those solved by quantum computing. To our knowledge, none of these alternative approaches has produced a commercial-grade quantum computer.

Intellectual Property

We protect our intellectual property rights via a combination of patent, trademark and trade secret laws in the United States and other jurisdictions, as well as with contractual protections, to establish, maintain and enforce rights in its proprietary technologies. Unpatented research, development, know-how and engineering skills make an important contribution to our business. We pursue patent protection only when it is consistent with our overall strategy for safeguarding intellectual property.

In addition, we seek to protect our intellectual property rights through non-disclosure and invention assignment agreements with our employees and consultants and through non-disclosure agreements with business partners and other third parties. We have accumulated a broad patent portfolio, both owned and exclusively licensed, across the range of technological fronts that make up our systems and will continue to protect our innovative inventions in the United States and other countries. Our patent portfolio is deepest in the area of devices, methods and algorithms for controlling and manipulating trapped ions for quantum computing. Our trade secrets primarily cover the design, configuration, operation and testing of its trapped-ion quantum computers.

As of March 1, 2023, we own or license, on an exclusive basis, 57 issued U.S. patents and 136 pending or allowed U.S. patent applications, 7 issued foreign patents and 99 pending or allowed foreign patent applications, 8 registered U.S. trademarks and 11 pending U.S. trademark applications, and 17 registered international trademarks and 7 pending international trademark applications. Our issued patents expire between 2029 and 2041.

Human Capital Management

Our employees are critical to our success. As of December 31, 2022, we had a 202 person-strong team of quantum hardware and software developers, engineers, and general and administrative staff. Approximately 49% of our full-time employees are based in the greater Washington, D.C. metropolitan area and approximately 12% of our full-time employees are based in the greater Seattle, WA metropolitan area. We also engage a small number of consultants and contractors to supplement our permanent workforce. A majority of our employees are engaged in research and development and related functions, and more than half of our research and development employees hold advanced engineering and scientific degrees, including many from the world's top universities.

To date, we have not experienced any work stoppages and maintain good working relationships with our employees. None of our employees are subject to a collective bargaining agreement or are represented by a labor union at this time.

Corporate Information

IonQ, formerly known as dMY Technology Group, Inc. III ("dMY") was incorporated in the state of Delaware in September 2020 and formed as a special purpose acquisition company. Our wholly owned subsidiary, IonQ Quantum, Inc. (formerly known as IonQ, Inc., and referred to as "Legacy IonQ" herein), was incorporated in the state of Delaware in September 2015.

On March 7, 2021, Legacy IonQ entered into an Agreement and Plan of Merger (the "Merger Agreement"), with dMY and Ion Trap Acquisition Inc., a direct, wholly owned subsidiary of dMY (the "Merger Sub"). Pursuant to the Merger Agreement, on September 30, 2021, the Merger Sub was merged with and into Legacy IonQ with Legacy IonQ continuing as the surviving corporation following the Merger, becoming a wholly owned subsidiary of dMY and the separate corporate existence of the Merger Sub ceased (the "Business Combination"). Commensurate with the closing of the Business Combination, dMY changed its name to IonQ, Inc. and Legacy IonQ changed its name to IonQ Quantum, Inc.

Our principal executive offices are located at 4505 Campus Drive, College Park, MD 20740, and our telephone number is (301) 298-7997. Our corporate website address is www.ionq.com. Information contained on or accessible through our website is not a part of this Annual Report, and the inclusion of our website address in this Annual Report is an inactive textual reference only.

Available Information

Our website address is *www.ionq.com*. We make available on our website, free of charge, our Annual Reports, our Quarterly Reports on Form 10-Q and our Current Reports on Form 8-K and any amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the Securities and Exchange Commission (the "SEC"). The SEC maintains a website that contains reports, proxy and information statements and other information regarding our filings at *www.sec.gov*. The information found on our website is not incorporated by reference into this Annual Report or any other report we file with or furnish to the SEC.

Item 1A. Risk Factors.

RISK FACTORS

Investing in our securities involves a high degree of risk. Before you make a decision to buy our securities, in addition to the risks and uncertainties described above under "Special Note Regarding Forward-Looking Statements," you should carefully consider the risks and uncertainties described below together with all of the other information contained in this Annual Report. If any of the events or developments described below were to occur, our business, prospects, operating results and financial condition could suffer materially, the trading price of our common stock could decline, and you could lose all or part of your investment. The risks and uncertainties described below are not the only ones we face. Additional risks and uncertainties not presently known to us or that we currently believe to be immaterial may also adversely affect our business.

Summary Risk Factors

Our business is subject to a number of risks of which you should be aware before making a decision to invest in our securities. These risks include, among others, the following:

- We are an early-stage company and have a limited operating history, which makes it difficult to forecast our future results of operations.
- We have a history of operating losses and expect to incur significant expenses and continuing losses for the foreseeable future.
- We may not be able to scale our business quickly enough to meet customer and market demand, which could result in lower profitability or cause us to fail to execute on our business strategies.
- We may not manage our growth effectively.
- Our management has limited experience in operating a public company.
- Our estimates of market opportunity and forecasts of market growth may prove to be inaccurate.

- Even if the market in which we compete achieves the forecasted growth, our business could fail to grow at similar rates, if at all.
- Our operating and financial results forecast relies in large part upon assumptions and analyses we developed. If these assumptions or analyses prove to be incorrect, our actual operating results may be materially different from our forecasted results.
- We may need additional capital to pursue our business objectives and respond to business opportunities, challenges or unforeseen circumstances, and we cannot be sure that additional financing will be available.
- We have not produced a scalable quantum computer and face significant barriers in our attempts to produce quantum computers.
- The quantum computing industry is competitive on a global scale and we may not be successful in competing in this industry or establishing and maintaining confidence in our long-term business prospects among current and future partners and customers.
- Even if we are successful in developing quantum computing systems and executing our strategy, competitors in the industry may achieve technological breakthroughs that render our quantum computing systems obsolete or inferior to other products.
- We may be unable to reduce the cost per qubit, which may prevent us from pricing our quantum systems competitively.
- The quantum computing industry is in its early stages and volatile, and if it does not develop, if it develops slower than we expect, if it develops in a manner that does not require use of our quantum computing solutions, if it encounters negative publicity or if our solution does not drive commercial engagement, the growth of our business will be harmed.
- If our computers fail to achieve a broad quantum advantage, our business, financial condition and future prospects may be harmed.
- We could suffer disruptions, outages, defects and other performance and quality problems with our quantum computing systems or with the public cloud and internet infrastructure on which they rely.
- We have and may continue to face supply chain issues that could delay the introduction of our product and negatively impact our business and operating results.
- If we cannot successfully execute on our strategy or achieve our objectives in a timely manner, our business, financial condition and results of operations could be harmed.
- Our products may not achieve market success, but will still require significant costs to develop.
- We are highly dependent on our co-founders, and our ability to attract and retain senior management and other key employees is critical to our success.
- We may not be able to accurately estimate the future supply and demand for our quantum computers, which could result in a variety of inefficiencies in our business and hinder our ability to generate revenue.
- Our systems depend on the use of a particular isotope of an atomic element that provides qubits for our ion trap technology. If we are unable to procure these isotopically enriched atomic samples, or are unable to do so on a timely and cost-effective basis, and in sufficient quantities, we may incur significant costs or delays, which could negatively affect our operations and business.
- If our quantum computing systems are not compatible with some or all industry-standard software and hardware in the future, our business could be harmed.
- If we are unable to maintain our current strategic partnerships or we are unable to develop future collaborative partnerships, our future growth and development could be negatively impacted.

- Our business depends on our customers' abilities to implement useful quantum algorithms and sufficient quantum resources for their business.
- Our future growth and success depend in part on our ability to sell effectively to government entities and large enterprises.
- Contracts with government and state agencies are subject to a number of challenges and risks.
- Our future growth and success depend on our ability to sell effectively to large customers.
- Contracts with government and state agencies are subject to a number of challenges and risks.
- If our information technology systems, data, or physical facilities where our quantum computers are stored, or those of third parties upon which we rely, are or were compromised, we could experience adverse business consequences resulting from such compromise.
- Unfavorable conditions in our industry or the global economy, could limit our ability to grow our business and negatively affect our results of operations.
- Government actions and regulations, such as tariffs and trade protection measures, may limit our ability to obtain products from our suppliers.
- Because our success depends, in part, on our ability to expand sales internationally, our business will be susceptible to risks associated with international operations.
- Licensing of intellectual property is of critical importance to our business.
- If we are unable to obtain and maintain patent protection for our products and technology, or if the scope of the patent protection obtained is not sufficiently broad or robust, our competitors could develop and commercialize products and technology similar or identical to ours, and our ability to successfully commercialize our products and technology may be adversely affected. Moreover, our trade secrets could be compromised, which could cause us to lose the competitive advantage resulting from these trade secrets.
- We may face patent infringement and other intellectual property claims that could be costly to defend, result in injunctions and significant damage awards or other costs and limit our ability to use certain key technologies in the future or require development of non-infringing products, services, or technologies.
- Some of our in-licensed intellectual property, including the intellectual property licensed from the University of Maryland and Duke University, has been conceived or developed through government-funded research and thus may be subject to federal regulations providing for certain rights for the U.S. government or imposing certain obligations on us and compliance with such regulations may limit our exclusive rights and our ability to contract with non-U.S. manufacturers.

Risks Related to Our Financial Condition and Status as an Early Stage Company

We are an early stage company and have a limited operating history, which makes it difficult to forecast our future results of operations.

As a result of our limited operating history, our ability to accurately forecast our future results of operations is limited and subject to a number of uncertainties, including our ability to plan for and model future growth. Our ability to generate revenues will largely be dependent on our ability to develop and produce quantum computers with increasing numbers of algorithmic qubits. As a result, our scalable business model has not been formed and our technical roadmap may not be realized as quickly as expected, or even at all. The development of our scalable business model will likely require the incurrence of a substantially higher level of costs than incurred to date, while our revenues will not substantially increase until more powerful, scalable computers are produced, that requires a number of technological advancements which may not occur on the currently anticipated

timetable or at all. As a result, our historical results should not be considered indicative of our future performance. Further, in future periods, our growth could slow or decline for a number of reasons, including but not limited to slowing demand for our service offerings, increased competition, changes to technology, inability to scale up our technology, a decrease in the growth of the overall market, or our failure, for any reason, to continue to take advantage of growth opportunities.

We have also encountered, and will continue to encounter, risks and uncertainties frequently experienced by growing companies in rapidly changing industries. If our assumptions regarding these risks and uncertainties and our future growth are incorrect or change, or if we do not address these risks successfully, our operating and financial results could differ materially from our expectations, and our business could suffer. Our success as a business ultimately relies upon fundamental research and development breakthroughs in the coming years and decade. There is no certainty these research and development milestones will be achieved as quickly as expected, or even at all.

We have a history of operating losses and expect to incur significant expenses and continuing losses for the foreseeable future.

We have historically experienced net losses from operations. For the year ended December 31, 2022, we incurred a loss from operations of $48.5 million. As of December 31, 2022, we had an accumulated deficit of $194.3 million. We believe that we will continue to incur losses each year until at least the time we begin significant production and delivery of our quantum computers, which is not expected to occur until 2025, at the earliest, and may occur later, or never. Even with significant production, such production may never become profitable.

We expect the rate at which we will incur operating losses to be significantly higher in future periods as we, among other things, continue to incur significant expenses in connection with the design, development and construction of our quantum computers, and as we expand our research and development activities, invest in manufacturing capabilities, build up inventories of components for our quantum computers, increase our sales and marketing activities, develop our distribution infrastructure, and increase our general and administrative functions to support our growing operations and costs of being a public company. We may find that these efforts are more expensive than we currently anticipate or that these efforts may not result in revenues, which would further increase our losses. If we are unable to achieve and/or sustain profitability, or if we are unable to achieve the growth that we expect from these investments, it could have a material effect on our business, financial condition or results of operations. Our business model is unproven and may never allow us to cover our costs.

We may not be able to scale our business quickly enough to meet customer and market demand, which could result in lower profitability or cause us to fail to execute on our business strategies.

In order to grow our business, we will need to continually evolve and scale our business and operations to meet customer and market demand. Quantum computing technology has never been sold at large-scale commercial levels. Evolving and scaling our business and operations places increased demands on our management as well as our financial and operational resources to:

- effectively manage organizational change;
- design scalable processes;
- accelerate and/or refocus research and development activities;
- expand manufacturing, supply chain and distribution capacity;
- increase sales and marketing efforts;
- broaden customer-support and services capabilities;
- maintain or increase operational efficiencies;

- scale support operations in a cost-effective manner;
- implement appropriate operational and financial systems; and
- maintain effective financial disclosure controls and procedures.

Commercial production of quantum computers may never occur. We have no experience in producing large quantities of our products and are currently constructing advanced generations of our products. As noted above, there are significant technological and logistical challenges associated with developing, producing, marketing, selling and distributing products in the advanced technology industry, including our products, and we may not be able to resolve all of the difficulties that may arise in a timely or cost-effective manner, or at all. We may not be able to cost-effectively manage production at a scale or quality consistent with customer demand in a timely or economical manner.

Our ability to scale is dependent also upon components we must source from the optical, electronics and semiconductor industries. Shortages or supply interruptions in any of these components will adversely impact our ability to deliver revenues.

The stability of ion traps may prove poorer than hoped, or more difficult to manufacture. It may also prove more difficult or even impossible to reliably entangle/connect ion traps together. Both of these factors would adversely impact scalability and costs of the ion trap system.

If commercial production of our quantum computers commences, our products may contain defects in design and manufacture that may cause them to not perform as expected or that may require repair, recalls and design changes. Our quantum computers are inherently complex and incorporate technology and components that have not been used for other applications and that may contain defects and errors, particularly when first introduced. We have a limited frame of reference from which to evaluate the long-term performance of our products. There can be no assurance that we will be able to detect and fix any defects in our quantum computers prior to the sale to potential consumers. If our products fail to perform as expected, customers may delay deliveries, terminate further orders or initiate product recalls, each of which could adversely affect our sales and brand and could adversely affect our business, prospects and results of operations.

If we cannot evolve and scale our business and operations effectively, we may not be able to execute our business strategies in a cost-effective manner and our business, financial condition, profitability and results of operations could be adversely affected.

We may not manage growth effectively.

If we fail to manage growth effectively, our business, results of operations and financial condition could be harmed. We anticipate that a period of significant expansion will be required to address potential growth. This expansion will place a significant strain on our management, operational and financial resources. Expansion will require significant cash investments and management resources and there is no guarantee that they will generate additional sales of our products or services, or that we will be able to avoid cost overruns or be able to hire additional personnel to support them. In addition, we will also need to ensure our compliance with regulatory requirements in various jurisdictions applicable to the sale, installation and servicing of our products. To manage the growth of our operations and personnel, we must establish appropriate and scalable operational and financial systems, procedures and controls and establish and maintain a qualified finance, administrative and operations staff. We may be unable to acquire the necessary capabilities and personnel required to manage growth or to identify, manage and exploit potential strategic relationships and market opportunities.

Our management has limited experience in operating a public company.

Our executive officers have limited experience in the management of a publicly traded company. Our management team may not successfully or effectively manage reporting obligations under federal securities laws. Their limited experience in dealing with the increasingly complex laws pertaining to public companies could be a

significant disadvantage in that it is likely that an increasing amount of their time may be devoted to these activities, which will result in less time being devoted to our management and growth. The development and implementation of the standards and controls necessary for us to achieve the level of accounting standards required of a public company in the United States may require costs greater than expected. It is possible that we will be required to expand our employee base and hire additional employees to support our operations as a public company, which will increase our operating costs in future periods.

Our estimates of market opportunity and forecasts of market growth may prove to be inaccurate.

Market opportunity estimates and growth forecasts, including those we have generated, are subject to significant uncertainty and are based on assumptions and estimates that may not prove to be accurate. The variables that go into the calculation of our market opportunity are subject to change over time, and there is no guarantee that any particular number or percentage of companies covered by our market opportunity estimates will purchase our products at all or generate any particular level of revenue for us. In addition, alternatives to quantum computing may present themselves and if they did, could substantially reduce the market for quantum computing services. Any expansion in our market depends on a number of factors, including the cost, performance, and perceived value associated with quantum computing solutions.

The methodology and assumptions used to estimate market opportunities may differ materially from the methodologies and assumptions previously used to estimate the total addressable market. To estimate the size of our market opportunities and our growth rates, we have relied on market reports by leading research and consulting firms. These estimates of the total addressable market and growth forecasts are subject to significant uncertainty, are based on assumptions and estimates that may not prove to be accurate and are based on data published by third parties that we have not independently verified. Advances in classical computing may prove more robust for longer than currently anticipated. This could adversely affect the timing of any quantum advantage being achieved, if at all.

Even if the market in which we compete achieves the forecasted growth, our business could fail to grow at similar rates, if at all.

Our success will depend upon our ability to expand, scale our operations, and increase our sales capability. Even if the market in which we compete meets the size estimates and growth forecasted, our business could fail to grow at similar rates, if at all.

Our growth is dependent upon our ability to successfully scale up manufacturing of our products in sufficient quantity and quality, in a timely or cost-effective manner. Our growth is also dependent upon our ability to successfully market and sell quantum computing technology. We do not have experience with the mass distribution and sale of quantum computing technology. Our growth and long-term success will depend upon the development of our sales and delivery capabilities.

Unforeseen issues associated with scaling up and constructing quantum computing technology at commercially viable levels, and selling our technology, could negatively impact our business, financial condition and results of operations.

Moreover, because of our unique technology, our customers will require particular support and service functions, some of which are not currently available. If we experience delays in adding such support capacity or servicing our customers efficiently, or experience unforeseen issues with the reliability of our technology, it could overburden our servicing and support capabilities. Similarly, increasing the number of our customers, products or services, for example by entering into government contracts and expanding to new geographies, has required and may continue to require us to rapidly increase the availability of these services. Failure to adequately support and service our customers may inhibit our growth and ability to expand computing targets globally. There can be no assurance that our projections on which such targets are based will prove accurate or

that the pace of growth or coverage of our customer infrastructure network will meet customer expectations. Failure to grow at rates similar to that of the quantum computing industry may adversely affect our operating results and ability to effectively compete within the industry.

Our operating and financial results forecast relies in large part upon assumptions and analyses we have developed. If these assumptions or analyses prove to be incorrect, our actual operating results may be materially different from our forecasted results.

Our projected financial and operating information reflect current estimates of future performance, which may never occur. Whether actual operating and financial results and business developments will be consistent with our expectations and assumptions as reflected in our forecasts depends on a number of factors, many of which are outside our control, including, but not limited to:

- success and timing of development activity;
- customer acceptance of our quantum computing systems;
- breakthroughs in classical computing or other computing technologies that could eliminate the advantages of quantum computing systems rendering them less practical to customers;
- competition, including from established and future competitors;
- whether we can obtain sufficient capital to sustain and grow our business;
- our ability to manage our growth;
- our ability to retain existing key management, integrate recent hires and attract, retain and motivate qualified personnel; and
- the overall strength and stability of domestic and international economies.

Unfavorable changes in any of these or other factors, most of which are beyond our control, could materially and adversely affect our business, financial condition and results of operations.

We may need additional capital to pursue our business objectives and respond to business opportunities, challenges or unforeseen circumstances, and we cannot be sure that additional financing will be available.

Our business and our future plans for expansion are capital-intensive and the specific timing of cash inflows and outflows may fluctuate substantially from period to period. Our operating plan may change because of factors currently unknown, and we may need to seek additional funds sooner than planned, through public or private equity or debt financings or other sources, such as strategic collaborations. Such financings may result in dilution to our stockholders, issuance of securities with priority as to liquidation and dividend and other rights more favorable than common stock, imposition of debt covenants and repayment obligations or other restrictions that may adversely affect our business. In addition, we may seek additional capital due to favorable market conditions or strategic considerations even if we believe that we have sufficient funds for current or future operating plans. Weakness and volatility in capital markets and the economy, in general or as a result of bank failures or macroeconomic conditions such as rising inflation and interest rates, could limit our access to capital markets and increase our costs of borrowing. There can be no assurance that financing will be available to us on favorable terms, or at all. The inability to obtain financing when needed may make it more difficult for us to operate our business or implement our growth plans.

Our ability to use net operating loss carryforwards and other tax attributes may be limited.

We have incurred losses during our history, do not expect to become profitable in the near future and may never achieve profitability. To the extent that we continue to generate taxable losses, unused losses will carry

forward to offset future taxable income, if any, until such unused losses expire, if at all. As of December 31, 2022, we had U.S. federal and state net operating loss carryforwards of approximately $96.3 million and $69.5 million, respectively.

Our net operating loss carryforwards are subject to review and possible adjustment by the IRS, and state tax authorities. Under Sections 382 and 383 of the Internal Revenue Code of 1986, as amended (the "Code"), our federal net operating loss carryforwards and other tax attributes may become subject to an annual limitation in the event of certain cumulative changes in the ownership of our stock. An "ownership change" pursuant to Section 382 of the Code generally occurs if one or more stockholders or groups of stockholders who own at least 5% of a company's stock increase their ownership by more than 50 percentage points over their lowest ownership percentage within a rolling three-year period. Our ability to utilize our net operating loss carryforwards and other tax attributes to offset future taxable income or tax liabilities may be limited as a result of ownership changes, including changes in connection with our Business Combination with dMY or other transactions. Similar rules may apply under state tax laws. We have not yet determined the amount of the cumulative change in our ownership resulting from our Business Combination with dMY or other transactions, or any resulting limitations on our ability to utilize our net operating loss carryforwards and other tax attributes. If we earn taxable income, such limitations could result in increased future income tax liability and our future cash flows could be adversely affected. We have recorded a full valuation allowance related to our net operating loss carryforwards and other deferred tax assets due to the uncertainty of the ultimate realization of the future benefits of those assets.

Risks Related to Our Business and Industry

We have not produced a scalable quantum computer and face significant barriers in our attempts to produce quantum computers. If we cannot successfully overcome those barriers, our business will be negatively impacted and could fail.

Producing quantum computers is a difficult undertaking. There are significant engineering challenges that we must overcome to build our quantum computers. We are still in the development stage and face significant challenges in completing development of our quantum computers and in producing quantum computers in commercial volumes. Some of the development challenges that could prevent the introduction of our quantum computers include, but are not limited to, failure to find scalable ways to flexibly manipulate qubits, failure to transition quantum systems to leverage low-cost, commodity optical technology, and failure to realize multicore quantum computer technology.

Additional development challenges we face include:

- gate fidelity, error correction and miniaturization may not commercialize from the lab and scale as hoped or at all;
- it could prove more challenging and take materially longer than expected to operate parallel gates within a single ion trap and maintain gate fidelity;
- the photonic interconnect between ion traps could prove more challenging and take longer to perfect than currently expected. This would limit our ability to scale to a sufficiently large number of algorithmic qubits in a single system;
- it could take longer to tune the qubits in a single ion trap, as well as preserve the stability of the qubits within a trap as we seek to maximize the total number of qubits within one trap;
- the gate speed in our technology could prove more difficult to improve than expected; and
- the scaling of fidelity with qubit number could prove poorer than expected, limiting our ability to achieve larger algorithmic qubits.

In addition, we will need to develop the manufacturing process necessary to make these quantum computers in high volume. We have not yet validated a manufacturing process or acquired the tools or processes necessary to produce high volumes of our quantum computers that meet all commercial requirements. If we are not able to overcome these manufacturing hurdles in building our quantum computers, our business is likely to fail.

Even if we complete development and achieve volume production of our quantum computers, if the cost, performance characteristics or other specifications of the quantum computer fall short of our projections, our business, financial condition and results of operations would be adversely affected.

The quantum computing industry is competitive on a global scale and we may not be successful in competing in this industry or establishing and maintaining confidence in our long-term business prospects among current and future partners and customers.

The markets in which we operate are rapidly evolving and highly competitive. As these markets continue to mature and new technologies and competitors enter such markets, we expect competition to intensify. Our current competitors include:

- large, well-established tech companies that generally compete in all of our markets, including Google, Microsoft, Amazon, Intel and IBM;
- countries such as China, Russia, Canada, Australia and the United Kingdom, and those in the European Union and we believe additional countries in the future;
- less-established public and private companies with competing technology, including companies located outside the United States; and

- new or emerging entrants seeking to develop competing technologies.

We compete based on various factors, including technology, performance, multi-cloud availability, brand recognition and reputation, customer support and differentiated capabilities, including ease of administration and use, scalability and reliability, data governance and security. Many of our competitors have substantially greater brand recognition, customer relationships, and financial, technical and other resources, including an experienced sales force and sophisticated supply chain management. They may be able to respond more effectively than us to new or changing opportunities, technologies, standards, customer requirements and buying practices. In addition, many countries are focused on developing quantum computing solutions either in the private or public sector and may subsidize quantum computers, which may make it difficult for us to compete. Many of these competitors do not face the same challenges we do in growing our business. In addition, other competitors might be able to compete with us by bundling their other products in a way that does not allow us to offer a competitive solution.

Additionally, we must be able to achieve our objectives in a timely manner or quantum computing may lose ground to competitors, including competing technologies. Because there are a large number of market participants, including certain sovereign nations, focused on developing quantum computing technology, we must dedicate significant resources to achieving any technical objectives on the timelines established by our management team. Any failure to achieve objectives in a timely manner could adversely affect our business, operating results and financial condition.

For all of these reasons, competition may negatively impact our ability to maintain and grow consumption of our platform or put downward pressure on our prices and gross margins, any of which could materially harm our reputation, business, results of operations, and financial condition.

An element of our business is currently dependent upon our relationship with our cloud providers. There are no assurances that we will be able to commercialize quantum computers from our relationships with cloud providers.

We currently offer our QCaaS on public clouds provided by AWS's Amazon Braket, Microsoft's Azure Quantum, and the Google Cloud Marketplace. The companies that own these public clouds have internal quantum computing efforts that are competitive to our technology. There is risk that one or more of these public cloud providers could use their respective control of their public clouds to embed innovations or privileged interoperating capabilities in competing products, bundle competing products, provide us with unfavorable pricing, leverage their public cloud customer relationships to exclude us from opportunities, and treat us and our customers differently with respect to terms and conditions or regulatory requirements than they would treat their similarly situated customers. Further, they have the resources to acquire or partner with existing and emerging providers of competing technology and thereby accelerate adoption of those competing technologies. All of the foregoing could make it difficult or impossible for us to provide products and services that compete favorably with those of the public cloud providers.

Any material change in our contractual and other business relationships with our public cloud providers could result in harm to our brand and reputation and reduced use of our systems, which could have a material adverse effect on our business, financial condition and results of operations.

Even if we are successful in developing quantum computing systems and executing our strategy, competitors in the industry may achieve technological breakthroughs that render our quantum computing systems obsolete or inferior to other products.

Our continued growth and success depend on our ability to innovate and develop quantum computing technology in a timely manner and effectively market these products. Without timely innovation and development, our quantum computing solutions could be rendered obsolete or less competitive by changing customer preferences or because of the introduction of a competitor's newer technologies. We believe that many

competing technologies will require a technological breakthrough in one or more problems related to science, fundamental physics or manufacturing. While it is uncertain whether such technological breakthroughs will occur in the next several years, that does not preclude the possibility that such technological breakthroughs could eventually occur. Any technological breakthroughs that render our technology obsolete or inferior to other products could have a material effect on our business, financial condition or results of operations.

We may be unable to reduce the cost per qubit, which may prevent us from pricing our quantum systems competitively.

Our projections are dependent on the cost per qubit decreasing over the next several years as our quantum computers advance. These cost projections are based on economies of scale due to demand for our computer systems, technological innovation and negotiations with third-party parts suppliers. If these cost savings do not materialize, the cost per qubit may be higher than projected, making our quantum computing solution less competitive than those produced by our competitors, which could have a material effect on our business, financial condition or results of operations.

The quantum computing industry is in its early stages and volatile, and if it does not develop, if it develops slower than we expect, if it develops in a manner that does not require use of our quantum computing solutions, if it encounters negative publicity or if our solution does not drive commercial engagement, the growth of our business will be harmed.

The nascent market for quantum computers is still rapidly evolving, characterized by rapidly changing technologies, competitive pricing and competitive factors, evolving government regulation and industry standards, and changing customer demands and behaviors. If the market for quantum computers in general does not develop as expected, or develops more slowly than expected, our business, prospects, financial condition and operating results could be harmed.

In addition, our growth and future demand for our products is highly dependent upon the adoption by developers and customers of quantum computers, as well as on our ability to demonstrate the value of quantum computing to our customers. Delays in future generations of our quantum computers or technical failures at other quantum computing companies could limit market acceptance of our solution. Negative publicity concerning our solution or the quantum computing industry as a whole could limit market acceptance of our solution. We believe quantum computing will solve many large-scale problems. However, such problems may never be solvable by quantum computing technology. If our clients and partners do not perceive the benefits of our solution, or if our solution does not drive member engagement, then our market may not develop at all, or it may develop slower than we expect. If any of these events occur, it could have a material adverse effect on our business, financial condition or results of operations. If progress towards quantum advantage ever slows relative to expectations, it could adversely impact revenues and customer confidence to continue to pay for testing, access and "quantum readiness." This would harm or even eliminate revenues in the period before quantum advantage.

If our computers fail to achieve a broad quantum advantage, our business, financial condition and future prospects may be harmed.

Quantum advantage refers to the moment when a quantum computer can compute faster than traditional computers, while quantum supremacy is achieved once quantum computers are powerful enough to complete calculations that traditional supercomputers cannot perform at all. Broad quantum advantage is when quantum advantage is seen in many applications and developers prefer quantum computers to a traditional computer. No current quantum computers, including our quantum hardware, have reached a broad quantum advantage, and they may never reach such advantage. Achieving a broad quantum advantage will be critical to the success of any quantum computing company, including us. However, achieving quantum advantage would not necessarily lead to commercial viability of the technology that accomplished such advantage, nor would it mean that such system could outperform classical computers in tasks other than the one used to determine a quantum advantage.

Quantum computing technology, including broad quantum advantage, may take decades to be realized, if ever. If we cannot develop quantum computers that have quantum advantage, customers may not continue to purchase our products and services. If other companies' quantum computers reach a broad quantum advantage prior to the time ours reaches such capabilities, it could lead to a loss of customers. If any of these events occur, it could have a material adverse effect on our business, financial condition or results of operations.

We could suffer disruptions, outages, defects and other performance and quality problems with our quantum computing systems or with the public cloud and internet infrastructure on which they rely.

Our business depends on our quantum computing systems to be available. We have experienced, and may in the future further experience, disruptions, outages, defects and other performance and quality problems with our systems. We have also experienced, and may in the future further experience, disruptions, outages, defects and other performance and quality problems with the public cloud and internet infrastructure on which our systems rely. These problems can be caused by a variety of factors, including failed introductions of new functionality, vulnerabilities and defects in proprietary and open-source software, hardware components, human error or misconduct, capacity constraints, design limitations or denial of service attacks or other security-related incidents. We do not have a contractual right with our public cloud providers that compensates us for any losses due to availability interruptions in the public cloud.

Any disruptions, outages, defects and other performance and quality problems with our quantum computing system or with the public cloud and internet infrastructure on which it relies, could result in reduced use of our systems, increased expenses, including service credit obligations, and harm to our brand and reputation, any of which could have a material adverse effect on our business, financial condition and results of operations.

We have and may continue to face supply chain issues that could delay the introduction of our product and negatively impact our business and operating results.

We are reliant on third-party suppliers for components necessary to develop and manufacture our quantum computing solutions. As our business grows, we must continue to scale and adapt our supply chain or it could have an adverse impact on our business. Any of the following factors (and others) could have an adverse impact on the availability of these components necessary to our business:

- our inability to enter into agreements with suppliers on commercially reasonable terms, or at all;
- difficulties of suppliers ramping up their supply of materials to meet our requirements;
- a significant increase in the price of one or more components, including due to industry consolidation occurring within one or more component supplier markets or as a result of decreased production capacity at manufacturers;
- any reductions or interruption in supply, including disruptions on our global supply chain as a result of the global chip shortage, or the Russia-Ukraine war and any indirect effects thereof;
- financial problems of either manufacturers or component suppliers;
- significantly increased freight charges, or raw material costs and other expenses associated with our business;
- other factors beyond our control or that we do not presently anticipate, could also affect our suppliers' ability to deliver components to us on a timely basis;
- a failure to develop our supply chain management capabilities and recruit and retain qualified professionals;
- a failure to adequately authorize procurement of inventory by our contract manufacturers; or
- a failure to appropriately cancel, reschedule, or adjust our requirements based on our business needs.

We have experienced supply chain issues in the past as a result of COVID-19. If any of the aforementioned factors were to materialize, it could cause us to delay or halt production of our quantum computing solutions and/or entail higher manufacturing costs, any of which could materially adversely affect our business, operating results, and financial condition and could materially damage customer relationships.

If we cannot successfully execute on our strategy, including in response to changing customer needs and new technologies and other market requirements, or achieve our objectives in a timely manner, our business, financial condition and results of operations could be harmed.

The quantum computing market is characterized by rapid technological change, changing user requirements, uncertain product lifecycles and evolving industry standards. We believe that the pace of innovation will continue to accelerate as technology changes and different approaches to quantum computing mature on a broad range of factors, including system architecture, error correction, performance and scale, ease of programming, user experience, markets addressed, types of data processed, and data governance and regulatory compliance. Our future success depends on our ability to continue to innovate and increase customer adoption of our quantum computer. If we are unable to enhance our quantum computing system to keep pace with these rapidly evolving customer requirements, or if new technologies emerge that are able to deliver competitive products at lower prices, more efficiently, with better functionality, more conveniently, or more securely than our platform, our business, financial condition and results of operations could be adversely affected.

Our products may not achieve market success, but will still require significant costs to develop.

We believe that we must continue to dedicate significant resources to our research and development efforts before knowing whether there will be market acceptance of our quantum computing technologies. Furthermore, the technology for our products is new, and the performance of these products is uncertain. Our quantum computing technologies could fail to attain sufficient market acceptance, if at all, for many reasons, including:

- pricing and the perceived value of our systems relative to its cost;
- delays in releasing quantum computers with sufficient performance and scale to the market;
- failure to produce products of consistent quality that offer functionality comparable or superior to existing or new products;
- ability to produce products fit for their intended purpose;
- failures to accurately predict market or customer demands;
- defects, errors or failures in the design or performance of our quantum computing systems;
- negative publicity about the performance or effectiveness of our systems;
- strategic reaction of companies that market competitive products; and
- the introduction or anticipated introduction of competing technology.

To the extent we are unable to effectively develop and market a quantum computing system to address these challenges and attain market acceptance, our business, operating results and financial condition may be adversely affected.

We are highly dependent on our co-founders, and our ability to attract and retain senior management and other key employees, such as quantum physicists and other key technical employees, is critical to our success. If we fail to retain talented, highly-qualified senior management, engineers and other key employees or attract them when needed, such failure could negatively impact our business.

Our future success is highly dependent on our ability to attract and retain our executive officers, key employees and other qualified personnel, including our co-founders, Jungsang Kim, our Chief Technology Officer, and Christopher Monroe, our Chief Scientist. As we build our brand and become more well known, there is increased risk that competitors or other companies may seek to hire our personnel. The loss of the services provided by these individuals will adversely impact the achievement of our business strategy. These individuals could leave our employment at any time, as they are "at will" employees. A loss of one of our co-founders, a member of senior management, or an engineer or other key employee particularly to a competitor, could also place us at a competitive disadvantage. Effective succession planning is also important to our long-term success. Failure to ensure effective transfer of knowledge and smooth transitions involving key employees could hinder our strategic planning and execution.

Our future success also depends on our continuing ability to attract, develop, motivate and retain highly qualified and skilled employees. The market for highly skilled workers and leaders in the quantum computing industry is extremely competitive. In particular, hiring qualified personnel specializing in engineering, software development and sales, as well as other technical staff and research and development personnel is critical to our business and the development of our quantum computing systems. Some of these professionals are hard to find and we may encounter significant competition in our efforts to hire them. Many of the other companies with which we compete for qualified personnel have greater financial and other resources than we do. The effective operation of our supply chain, including the acquisition of critical components and materials, the development of our quantum computing technologies, the commercialization of our quantum computing technologies and the effective operation of our managerial and operating systems all depend upon our ability to attract, train and retain qualified personnel in the aforementioned specialties. Additionally, changes in immigration and work permit laws and regulations or the administration or interpretation of such laws or regulations could impair our ability to attract and retain highly qualified employees. If we cannot attract, train and retain qualified personnel, including our co-founders, in this competitive environment, we may experience delays in the development of our quantum computing technologies and be otherwise unable to develop and grow our business as projected, or even at all.

We may not be able to accurately estimate the future supply and demand for our quantum computers, which could result in a variety of inefficiencies in our business and hinder our ability to generate revenue. If we fail to accurately predict our manufacturing requirements, we could incur additional costs or experience delays.

It is difficult to predict our future revenues and appropriately budget for our expenses, and we may have limited insight into trends that may emerge and affect our business. We anticipate being required to provide forecasts of our demand to our current and future suppliers prior to the scheduled delivery of products to potential customers. Currently, there is very little historical basis for making judgments on the demand for our quantum computers or our ability to develop, manufacture, and deliver quantum computers, or our profitability, if any, in the future. If we overestimate our requirements, our suppliers may have excess inventory, which indirectly would increase our costs. If we underestimate our requirements, our suppliers may have inadequate inventory, which could interrupt manufacturing of our products and result in delays in shipments and revenues. In addition, lead times for materials and components that our suppliers order may vary significantly and depend on factors such as the specific supplier, contract terms and demand for each component at a given time. If we fail to order sufficient quantities of product components in a timely manner, the delivery of quantum computers and related compute time to our potential customers could be delayed, which would harm our business, financial condition and operating results.

Our systems depend on the use of a particular isotope of an atomic element that provides qubits for our ion trap technology. If we are unable to procure these isotopically enriched atomic samples, or are unable to do so on a timely and cost-effective basis, and in sufficient quantities, we may incur significant costs or delays, which could negatively affect our operations and business.

There are limited suppliers to sources of isotopically enriched materials that may be necessary for the production of our ion trap technology. We currently purchase such materials through the National Isotope Development Center managed by the U.S. Department of Energy Isotope Program. We do not have any supplier agreements with the U.S. Department of Energy, and purchase the materials through a standard ordering process. While we are currently looking to engage additional suppliers, there is no guarantee we will be able to establish or maintain relationships with such additional suppliers on terms satisfactory to us. Reliance on any single supplier increases the risks associated with being unable to obtain the necessary atomic samples because the supplier may have laboratory constraints, can be subject to unanticipated shutdowns and/or may be affected by natural disasters and other catastrophic events. Some of these factors may be completely out of our and our suppliers' control. Failure to acquire sufficient quantities of the necessary isotopically enriched atomic samples in a timely or cost-effective manner could materially harm our business.

If our quantum computing systems are not compatible with some or all industry-standard software and hardware in the future, our business could be harmed.

Programming for quantum computing requires unique tools, software, hardware, and development environments. We have focused our efforts on creating quantum computing hardware, the operating system for such hardware and a suite of low-level software programs that optimize execution of quantum algorithms on our hardware. Further up the software stack, we rely on third parties to create higher level quantum programming languages, SDKs, and application libraries. Such third-party software and programming is essential to operating our quantum computing products and services. Our quantum computing solutions are designed today to be compatible with most major quantum SDKs, including Qiskit, Cirq, Q# QDK, and OpenQASM, all of which are open source. If a proprietary (not open source) software toolset became the standard for quantum application development in the future by a competitor, usage of our hardware might be limited as a result, which would have a negative impact on us. Similarly, if a piece of hardware or other quantum tool became a necessary component for quantum computing (for instance, quantum networking) and we cannot integrate with it (as we have thus far), the result might have a negative impact on us and our anticipated growth.

If our customers are unable to achieve compatibility between other software and hardware and our hardware, it could impact our relationships with such customers or with customers, generally, if the incompatibility is more widespread. In addition, the mere announcement of an incompatibility problem relating to our products with higher level software tools could cause us to suffer reputational harm and/or lead to a loss of customers. Any adverse impacts from the incompatibility of our quantum computing solutions could adversely affect our business, operating results and financial condition.

If we are unable to maintain our current strategic partnerships or we are unable to develop future collaborative partnerships, our future growth and development could be negatively impacted.

We have entered into, and may enter into, strategic partnerships to develop and commercialize our current and future research and development programs with other companies to accomplish one or more of the following:

- obtain expertise in relevant markets;
- obtain sales and marketing services or support;
- obtain equipment and facilities;
- develop relationships with potential future customers; and

- generate revenue.

We may not be successful in establishing or maintaining suitable partnerships, and we may not be able to negotiate collaboration agreements having terms satisfactory to us, or at all. Failure to make or maintain these arrangements or a delay or failure in a collaborative partner's performance under any such arrangements could harm our business and financial condition.

Our business depends on our customers' abilities to implement useful quantum algorithms and sufficient quantum resources for their business. If they are unable to do so due to the nature of their algorithmic challenge or other technical or personnel dilemmas, our growth may be negatively impacted.

We have entered into, and may enter into, contracts, partnerships and other arrangements with customers to develop, test and run quantum algorithms specific to their business. The success of these contracts and partnerships is dependent on our customer's ability to implement useful and scalable algorithms for their portfolio. These arrangements are also dependent on the availability of time and resources to develop and optimize these algorithms. The development and optimization of these algorithms is reliant on employing sufficient talent familiar with quantum computing, a unique skill that requires special training and education. If the market fails to train a sufficient number of engineers, researchers and other key quantum personnel, our customers may not find sufficient talent to partner with us to solve these problems. To the extent our customers are unable to effectively develop or utilize resources to advance algorithmic-use cases, our business, operating results and financial condition may be adversely impacted.

Our future growth and success depends in part on our ability to sell effectively to government entities and large enterprises.

Our customers and potential customers include government agencies and large enterprises. Therefore, our future success will depend on our ability to effectively sell our products to such customers. Sales to these end-customers involve risks that may not be present (or that are present to a lesser extent) with sales to non-governmental agencies or smaller customers. These risks include, but are not limited to, (i) increased purchasing power and leverage held by such customers in negotiating contractual arrangements with us and (ii) longer sales cycles and the associated risk that substantial time and resources may be spent on a potential end-customer that elects not to purchase our solutions. Sales to government agencies are typically under fixed fee development contracts, which involve additional risks. In addition, government contracts generally include the ability of government agencies to terminate early which, if exercised, would result in a lower contract value and lower than anticipated revenues generated by such arrangement.

Government agencies and large organizations often undertake a significant evaluation process that results in a lengthy sales cycle. Our contracts with government agencies are typically structured in phases, with each phase subject to satisfaction of certain conditions. As a result, the actual scope of work performed pursuant to any such contracts, in addition to related contract revenue, could be less than total contract value. In addition, product purchases by such organizations are frequently subject to budget constraints, multiple approvals and unanticipated administrative, processing and other delays. Finally, these organizations typically have longer implementation cycles, require greater product functionality and scalability, require a broader range of services, demand that vendors take on a larger share of risks, require acceptance provisions that can lead to a delay in revenue recognition and expect greater payment flexibility. All of these factors can add further risk to business conducted with these potential customers and could lead to lower revenue results than originally anticipated.

Additionally, changes in government defense spending could have adverse consequences on our financial position, results of operations and business. Certain current contracts and our anticipated future revenues from the U.S. government are expected to result from contracts awarded under various U.S. government programs. Cost cutting, including through consolidation and elimination of duplicative organizations, has become a major initiative for certain departments within the U.S. government. The funding of our programs is subject to the

overall U.S. government budget and appropriation decisions and processes, which are driven by numerous factors, including geo-political events and macroeconomic conditions. The overall level of U.S. defense spending increased in recent years for numerous reasons.

Significant reduction in defense spending could have long-term consequences for our size and structure. In addition, reduction in government priorities and requirements could impact the funding, or the timing of funding, of our programs, which could negatively impact our results of operations and financial condition.

Contracts with government and state agencies are subject to a number of challenges and risks.

Contracts with government and state agencies are subject to a number of challenges and risks. The bidding process for government contracts can be highly competitive, expensive and time-consuming, often requiring significant upfront time and expense without any assurance that these efforts will generate revenue.

We also must comply with laws and regulations relating to the formation, administration, and performance of contracts, which provide public sector customers rights, many of which are not typically found in commercial contracts. For example, in 2021, the U.S. House of Representatives introduced the Quantum Cybersecurity Preparedness Act, signaling fresh focus on the need for U.S. investment in quantum computing—both to protect against quantum-powered attacks from foreign actors and to develop quantum computing strength on the domestic front. In May 2022, the Biden administration announced directives to support U.S. leadership in quantum computing, and in September 2022, the National Security Administration (NSA) shared guidance on the importance of cybersecurity readiness against would-be adversaries developing quantum systems. Any changes to government regulations as a result of this demonstrated focus on quantum computing could affect our ability to enter into, or the profitability of, contracts with government entities.

In addition, our perceived relationship with the U.S. government could adversely affect our business prospects in certain non-U.S. geographies or with certain non-U.S. governments.

Accordingly, our business, financial condition, results of operations, and growth prospects may be adversely affected by certain events or activities, including, but not limited to:

- changes in government fiscal or procurement policies, or decreases in government funding available for procurement of goods and services generally, or for our federal government contracts specifically;
- changes in government programs or applicable requirements;
- restrictions in the grant of personnel security clearances to our employees;
- ability to maintain facility clearances required to perform on classified contracts for U.S. federal government and foreign government agencies, as applicable;
- changes in the political environment, including before or after a change to the leadership within the government administration, and any resulting uncertainty or changes in policy or priorities and resultant funding;
- changes in the government's attitude towards us as a company or our technology;
- appeals, disputes, or litigation relating to government procurement, including but not limited to bid protests by unsuccessful bidders on potential or actual awards of contracts to us or our partners by the government;
- the adoption of new laws or regulations or changes to existing laws or regulations;
- budgetary constraints, including automatic reductions as a result of "sequestration" or similar measures and constraints imposed by any lapses in appropriations for the federal government or certain of its departments and agencies;

- influence by, or competition from, third parties with respect to pending, new, or existing contracts with government customers;
- changes in legal obligations or political or social attitudes with respect to security or data privacy issues;
- potential delays or changes in the government appropriations or procurement processes, including as a result of events such as war, incidents of terrorism, natural disasters, and public health concerns; and
- increased or unexpected costs or unanticipated delays caused by other factors outside of our control.

Any such event or activity, among others, could cause governments and governmental agencies to delay or refrain entering into contracts with us and/or purchasing our computers in the future, reduce the size or timing of payment with respect to our services to or purchases from existing or new government customers, or otherwise have an adverse effect on our business, results of operations, financial condition, and growth prospects.

If our information technology systems, data, or physical facilities where our quantum computers are stored, or those of third parties upon which we rely, are or were compromised, we could experience adverse business consequences resulting from such compromise.

In the ordinary course of business, we collect, receive, store, process, generate, use, transfer, disclose, make accessible, protect, secure, dispose of, transmit, and share (collectively, "Processing") personal data and other sensitive information, including intellectual property, proprietary and confidential business data, trade secrets, sensitive third-party data, business plans, transactions, and financial information of our own, our partners, our customers, or other third parties (collectively, "Sensitive Data").

We and the third parties upon which we rely may process Sensitive Data, and, as a result, we and the third parties upon which we rely face a variety of evolving threats to our information technology systems, data, or physical facilities where our quantum computers are stored, including but not limited to ransomware attacks, which could cause security incidents. Cyber-attacks, malicious internet-based activity, online and offline fraud, and other similar activities threaten the confidentiality, integrity, and availability of our Sensitive Data and information technology systems, and those of the third parties upon which we rely. Such threats are prevalent and continue to rise, are increasingly difficult to detect, and come from a variety of sources, including traditional computer "hackers," threat actors, "hacktivists," organized criminal threat actors, personnel (such as through theft or misuse), sophisticated nation states, and nation-state-supported actors. U.S. law enforcement agencies have indicated to us that quantum computing technology is of particular interest to certain threat actors, including nation state and other malicious actors, who may steal our Sensitive Data, including our intellectual property or other proprietary or confidential information, including our trade secrets.

Some actors now engage and are expected to continue to engage in cyber-attacks, including without limitation nation-state and nation-state-supported actors for geopolitical reasons and in conjunction with military conflicts and defense activities. During times of war and other major conflicts, we, the third parties upon which we rely, and our customers may be vulnerable to a heightened risk of these attacks, including retaliatory cyber-attacks, that could materially disrupt our systems and operations, supply chain, and ability to distribute our services.

We and the third parties upon which we rely may be subject to a variety of evolving threats, including but not limited to social-engineering attacks (including through phishing attacks), malicious code (such as viruses and worms), malware (including as a result of advanced persistent threat intrusions), denial-of-service attacks (such as credential stuffing), credential harvesting, personnel misconduct or error, ransomware attacks, supply-chain attacks, software bugs, server malfunctions, software or hardware failures, loss of data or other information technology assets, adware, telecommunications failures, earthquakes, fires, floods, and other similar threats.

In particular, severe ransomware attacks are becoming increasingly prevalent and could lead to significant interruptions in our operations, loss of Sensitive Data and income, reputational harm, and diversion of funds.

Extortion payments may alleviate the negative impact of a ransomware attack, but we may be unwilling or unable to make such payments due to, for example, applicable laws or regulations prohibiting such payments.

Additionally, we are incorporated into the supply chain of a large number of companies worldwide and, as a result, if our services are compromised, a significant number or, in some instances, all of our customers and their data could be simultaneously affected. The potential liability and associated consequences we could suffer as a result of such a large-scale event could be catastrophic and result in irreparable harm.

Remote work has become more common and has increased risks to our information technology systems and data, as more of our employees utilize network connections, computers, and devices outside our premises or network, including working at home, while in transit and in public locations. Additionally, future or past business transactions (such as acquisitions or integrations) could expose us to additional cybersecurity risks and vulnerabilities, as our systems could be negatively affected by vulnerabilities present in acquired or integrated entities' systems and technologies. Furthermore, we may discover security issues that were not found during due diligence of such acquired or integrated entities, and it may be difficult to integrate companies into our information technology environment and security program.

In addition, our reliance on third-party service providers could introduce new cybersecurity risks and vulnerabilities, including supply-chain attacks, and other threats to our business operations. Our platform is built to be accessed through third-party cloud providers, such as AWS's Amazon Braket, Microsoft's Azure Quantum, and Google's Cloud Marketplace, and we rely on these and other third-party service providers and technologies to operate critical business systems to process Sensitive Data in a variety of contexts, including, without limitation, other cloud-based infrastructure, data center facilities, encryption and authentication technology, employee email, content delivery to customers, and other functions. We may also rely on third-party service providers to provide other products, services, parts, or otherwise to operate our business. Our ability to monitor these third parties' information security practices is limited. Although we understand our third-party cloud providers have implemented security measures designed to protect against various cybersecurity risks and vulnerabilities, these and other third parties may nevertheless not have adequate information security measures in place. If our third-party service providers experience a security incident or other interruption, we could experience adverse consequences. While we may be entitled to damages if our third-party service providers fail to satisfy their privacy or security-related obligations to us, any award may be insufficient to cover our damages, or we may be unable to recover such award. In addition, supply-chain attacks have increased in frequency and severity, and we cannot guarantee that third parties' infrastructure in our supply chain or our third-party partners' supply chains have not been compromised.

Any of the previously identified or similar threats could cause a security incident or other interruption that could result in unauthorized, unlawful, or accidental acquisition, modification, destruction, loss, alteration, encryption, disclosure of, or access to our Sensitive Data (including proprietary information and intellectual property) or our information technology systems, or those of the third parties upon whom we rely. A security incident or other interruption could disrupt our ability (and that of third parties upon whom we rely) to provide our services.

We may expend significant resources or modify our business activities to try to protect against security incidents. Additionally, certain data privacy and security obligations may require us to implement and maintain specific security measures or industry-standard or reasonable security measures to protect our information technology systems and Sensitive Data.

While we have implemented security measures designed to protect against security incidents, there can be no assurance that these measures will be effective. We take steps to detect and remediate vulnerabilities in our information technology systems (including in our services), but we may not be able to detect and remediate all vulnerabilities because the threats and techniques used to exploit vulnerabilities change frequently and, are often sophisticated in nature. Therefore, such vulnerabilities could be exploited but, may not be detected until after a

security incident has occurred. These vulnerabilities pose material risks to our business. Further, we may experience delays in developing and deploying remedial measures designed to address any such identified vulnerabilities. As a result, we may be unable to implement adequate preventative and responsive measures to stop or mitigate security breaches before or while they are occurring.

Applicable data privacy and security obligations may require us to notify relevant stakeholders of security incidents. Such disclosures are costly, and the disclosure or the failure to comply with such requirements could lead to adverse consequences.

If we (or a third party upon whom we rely) experience a security incident or are perceived to have experienced a security incident, we may experience adverse consequences. These consequences may include: exposure of Sensitive Data (including intellectual property or confidential or proprietary information); government enforcement actions (for example, investigations, fines, penalties, audits, and inspections); additional reporting requirements and/or oversight; restrictions on Processing Sensitive Data (including personal data); litigation (including class claims); indemnification obligations; negative publicity; reputational harm; monetary fund diversions; interruptions in our operations (including availability of data); financial loss; and other similar harms. Security incidents and attendant consequences may cause customers to stop using our services, deter new customers from using our services, and negatively impact our ability to grow and operate our business. Our efforts to prevent and overcome these challenges could increase our expenses and may not be successful.

Our contracts may not contain limitations of liability, and even where they do, there can be no assurance that limitations of liability in our contracts are sufficient to protect us from liabilities, damages, or claims related to our data privacy and security obligations. We cannot be sure that our insurance coverage will be adequate or sufficient to protect us from or to mitigate liabilities arising out of our privacy and security practices, that such coverage will continue to be available on commercially reasonable terms or at all, or that such coverage will pay future claims.

In addition to experiencing a security incident, third parties may gather, collect, or infer sensitive information about us from public sources, data brokers, or other means that reveals competitively sensitive details about our organization and could be used to undermine our competitive advantage or market position.

Unfavorable conditions in our industry or the global economy, could limit our ability to grow our business and negatively affect our results of operations.

Our results of operations may vary based on the impact of changes in our industry or the global economy on the company or our customers and potential customers. The global economy, including credit and financial markets, has experienced extreme volatility and disruptions, including severely diminished liquidity and credit availability, declines in consumer confidence, declines in economic growth, increases in unemployment rates, increases in inflation rates, higher interest rates and uncertainty about economic stability. For example, the COVID-19 pandemic resulted in widespread unemployment, economic slowdown and extreme volatility in the capital markets and any future public health crises could result in similar impacts on the global economy. Similarly, the Russia-Ukraine war has created extreme volatility in the global capital markets and is expected to have further global economic consequences, including disruptions of the global supply chain and energy markets. Increased inflation rates can adversely affect us by increasing our costs, including labor and employee benefit costs. Employee salaries and benefits expenses have increased as a result of economic growth, increased demand for business services, increased competition for trained and talented employees, among other wage-inflationary pressures and we cannot assure that they will not continue to rise. In addition, higher inflation also could increase our customers' operating costs, which could result in reduced budgets for our customers and potentially less demand for our platform and the development of quantum technologies. Any significant increases in inflation and related increase in interest rates could have a material adverse effect on our business, results of operations and financial condition.

In addition, in challenging economic times, our current or potential future customers may experience cash flow problems and as a result may modify, delay or cancel plans to purchase our products and services. Additionally, if our customers are not successful in generating sufficient revenue or are unable to secure financing, they may not be able to pay, or may delay payment of, accounts receivable due to us. Moreover, our key suppliers may reduce their output or become insolvent, thereby adversely impacting our ability to manufacture our products. Furthermore, uncertain economic conditions may make it more difficult for us to raise funds through borrowings or private or public sales of debt or equity securities. We cannot predict the timing, strength or duration of any economic slowdown, instability or recovery, generally or within any particular industry.

Government actions and regulations, such as tariffs and trade protection measures, may limit our ability to obtain products from our suppliers.

Political challenges between the United States and countries in which our suppliers are located, including China, and changes to trade policies, including tariff rates and customs duties, trade relations between the United States and China and other macroeconomic issues could adversely impact our business. Specifically, United States-China trade relations remain uncertain. The United States administration has announced tariffs on certain products imported into the United States with China as the country of origin, and China has imposed tariffs in response to the actions of the United States. There is also a possibility of future tariffs, trade protection measures or other restrictions imposed on our products or on our customers by the United States, China or other countries that could have a material adverse effect on our business. Our technology may be deemed a matter of national security and as such our customer base may be tightly restricted. We may accept government grants that place restrictions on our ability to operate.

Acquisitions, divestitures, strategic investments and strategic partnerships could disrupt our business and harm our financial condition and operating results.

We have pursued and we may continue to pursue growth opportunities by acquiring complementary businesses, solutions or technologies through strategic transactions, investments or partnerships. The identification of suitable acquisition, strategic investment or strategic partnership candidates can be costly and time consuming and can distract our management team from our current operations. If such strategic transactions require us to seek additional debt or equity financing, we may not be able to obtain such financing on terms favorable to us or at all, and such transactions may adversely affect our liquidity and capital structure. Any strategic transaction might not strengthen our competitive position, may increase some of our risks, and may be viewed negatively by our customers, partners or investors. Even if we successfully complete a strategic transaction, we may not be able to effectively integrate the acquired business, technology, systems, control environment, solutions, personnel or operations into our business. We may experience unexpected changes in how we are required to account for strategic transactions pursuant to accounting principles generally accepted in the United States of America ("U.S. GAAP") and may not achieve the anticipated benefits of any strategic transaction. We may incur unexpected costs, claims or liabilities that we incur during the strategic transaction or that we assume from the acquired company, or we may discover adverse conditions post acquisition for which we have limited or no recourse.

Risks Related to Our International Expansion and Future Operations

Because our success depends, in part, on our ability to expand sales internationally, our business will be susceptible to risks associated with international operations.

We currently maintain offices and/or have personnel in the United States and Canada, and recently expanded operations to Germany, Israel, and Canada. We expect to continue to expand our international operations by developing a sales and operations presence in other international markets, which may include opening offices in new jurisdictions. Any additional international expansion efforts that we are undertaking and may undertake may not be successful. In addition, conducting international operations subjects us to new risks,

some of which we have not generally faced in the United States or other countries where we currently operate. These risks include, among other things:

- lack of familiarity and burdens of complying with foreign laws, legal standards, privacy and cybersecurity standards, regulatory requirements, tariffs and other barriers, and the risk of penalties to our customers and individual members of management or employees if our practices are deemed to not be in compliance;
- practical difficulties of enforcing intellectual property rights in countries with varying laws and standards and reduced or varied protection for intellectual property rights in some countries;
- an evolving legal framework and additional legal or regulatory requirements for data privacy and cybersecurity, which may necessitate the establishment of systems to maintain data in local markets, requiring us to invest in additional data centers and network infrastructure, and the implementation of additional employee data privacy documentation (including locally compliant data privacy notice and policies), all of which may involve substantial expense and may cause us to need to divert resources from other aspects of our business, all of which may adversely affect our business;
- unexpected changes in regulatory requirements, taxes, trade laws, tariffs, export quotas, custom duties or other trade restrictions;
- difficulties in managing systems integrators and partners;
- differing technology standards;
- different pricing environments, longer sales cycles, longer accounts receivable payment cycles and difficulties in collecting accounts receivable;
- increased financial accounting and reporting burdens and complexities;
- difficulties in managing and staffing international operations including the proper classification of independent contractors and other contingent workers, differing employer/employee relationships and local employment laws;
- increased costs involved with recruiting and retaining an expanded employee population outside the United States through cash and equity-based incentive programs and unexpected legal costs and regulatory restrictions in issuing our shares to employees outside the United States;
- global political and regulatory changes that may lead to restrictions on immigration and travel for our employees;
- fluctuations in exchange rates that may decrease the value of our foreign-based revenue or increase the cost of our foreign operations;
- global public health threats;
- potentially adverse tax consequences, including the complexities of foreign value added tax (or other tax) systems, restrictions on the repatriation of earnings, and transfer pricing requirements; and
- permanent establishment risks and complexities in connection with international payroll, tax and social security requirements for international employees.

Additionally, operating in international markets also requires significant management attention and financial resources. We cannot be certain that the investment and additional resources required in establishing operations in other countries will produce desired levels of revenue or profitability.

Compliance with laws and regulations applicable to our global operations also substantially increases our cost of doing business in foreign jurisdictions. We have limited experience in marketing, selling and supporting our platform outside of the United States. Our limited experience in operating our business internationally increases the risk that any potential future expansion efforts that we may undertake will not be successful. If we

invest substantial time and resources to expand our international operations and are unable to do so successfully and in a timely manner, our business, financial condition, revenues, results of operations or cash flows will suffer. We may be unable to keep current with changes in government requirements as they change from time to time. Failure to comply with these regulations could harm our business. In many countries, it is common for others to engage in business practices that are prohibited by our internal policies and procedures or other regulations applicable to us. Although we have implemented policies and procedures designed to ensure compliance with these laws and policies, there can be no assurance that all of our employees, contractors, partners and agents will comply with these laws and policies. Violations of laws or key control policies by our employees, contractors, partners or agents could result in delays in revenue recognition, financial reporting misstatements, enforcement actions, reputational harm, disgorgement of profits, fines, civil and criminal penalties, damages, injunctions, other collateral consequences or the prohibition of the importation or exportation of our solutions and could harm our business, financial condition, revenues, results of operations or cash flows.

Our international sales and operations subject us to additional risks and costs, including the ability to engage with customers in new geographies and exposure to foreign currency exchange rate fluctuations, that can adversely affect our business, financial condition, revenues, results of operations or cash flows.

We are continuing to expand our international operations as part of our growth strategy. However, there are a variety of risks and costs associated with our international sales and operations, which include making investments prior to the sales or use of quantum computers, the cost of conducting our business internationally and hiring and training international employees and the costs associated with complying with local law. Furthermore, we cannot predict the rate at which our quantum computers will be accepted in international markets by potential customers.

We have a limited sales presence in Germany and Israel; and, as a result, our sales, support and engineering organization outside the United States is substantially smaller than our U.S. sales organization. We believe our ability to attract new customers to subscribe to our platform or to attract existing customers to renew or expand their use of our platform is directly correlated to the level of engagement we obtain with the customer. To the extent we are unable to effectively engage with non-U.S. customers due to our limited sales force capacity, we may be unable to effectively grow in international markets.

As our international operations expand, our exposure to the effects of fluctuations in currency exchange rates grows. While we have primarily transacted with customers in U.S. dollars, historically, we expect to continue to expand the number of transactions with our customers that are denominated in foreign currencies in the future. Additionally, fluctuations in the value of the U.S. dollar and foreign currencies may make our subscriptions more expensive for international customers, which could harm our business. Additionally, we incur expenses for employee compensation and other operating expenses for our non-U.S. employees in the local currency for such locations. Fluctuations in the exchange rates between the U.S. dollar and other currencies could result in an increase to the U.S. dollar equivalent of such expenses. These fluctuations could cause our results of operations to differ from our expectations or the expectations of our investors. Additionally, such foreign currency exchange rate fluctuations could make it more difficult to detect underlying trends in our business and results of operations.

Our international operations may subject us to greater than anticipated tax liabilities.

The amount of taxes we may pay in different jurisdictions depends on the application of the tax laws of various jurisdictions, including the United States, to our international business activities, changes in tax rates, new or revised tax laws or interpretations of existing tax laws and policies, and our ability to operate our business in a manner consistent with our corporate structure and intercompany arrangements. The taxing authorities of the jurisdictions in which we operate may challenge our methodologies for pricing intercompany transactions pursuant to any future intercompany arrangement or disagree with our determinations as to the income and expenses attributable to specific jurisdictions. If such a challenge or disagreement were to occur, and our position

was not sustained, we could be required to pay additional taxes, interest and penalties, which could result in one-time tax charges, higher effective tax rates, reduced cash flows, and lower overall profitability of our operations. Our financial statements could fail to reflect adequate reserves to cover such a contingency. Similarly, a taxing authority could assert that we are subject to tax in a jurisdiction where we believe we have not established a taxable connection, often referred to as a "permanent establishment" under international tax treaties, and such an assertion, if successful, could increase our expected tax liability in one or more jurisdictions.

Risks Related to Litigation and Government Regulation

Our business is exposed to risks associated with litigation, investigations and regulatory proceedings.

We may face legal, administrative and regulatory proceedings, claims, demands and/or investigations involving stockholder, consumer, competition and/or other issues relating to our business. Litigation and regulatory proceedings are inherently uncertain, and adverse rulings could occur, including monetary damages, or an injunction stopping us from engaging in certain business practices, or requiring other remedies, such as compulsory licensing of patents. For example, on January 12, 2021, dMY Technology Group, Inc. II, dMY Sponsor II, LLC, dMY and dMY Sponsor III, LLC ("Sponsor") accepted service of a lawsuit where we are named as counterclaim defendants in an underlying action by and between GTY Technology Holdings, Inc. ("GTY"), dMY Technology Group, Inc. and dMY Sponsor, LLC, dMY Sponsor II, LLC, dMY Technology Group Inc. II, dMY and Sponsor (collectively, "dMY Defendants") and Carter Glatt ("Glatt") and Captains Neck Holdings LLC ("Captains Neck"), an entity of which Mr. Glatt is a member. The underlying lawsuit, filed by dMY Technology Group, Inc. and dMY Sponsor, LLC, seeks a declaratory judgment that Glatt and Captains Neck are not entitled to membership units of dMY Sponsor LLC, which was formed by Harry L. You, the co-founder and former President and Chief Financial Officer of GTY when Glatt was still working at GTY. The underlying lawsuit contains claims arising from Glatt's termination of employment from GTY, including theft and misappropriation of confidential GTY information, breach of contract, breach of the duties of loyalty and fiduciary duty and conversion. Glatt has responded to the underlying lawsuit by adding members of the Sponsor and officers of dMY as additional counterclaim defendants (collectively with the dMY Defendants, Glatt and Captains Neck, the "Counterclaim Defendants") and adding Dune Acquisition Holdings LLC, a newly formed special purpose acquisition company, as a counterclaimant and asserting claims for breach of contract, fraudulent misrepresentation, negligent misrepresentation, tortious interference with business relations, quantum meruit and unjust enrichment. The Counterclaim Defendants have denied the claims against them and have a motion to dismiss the suit.

In May 2022, a securities class action complaint captioned Leacock v. IonQ, Inc. et al., Case No. 8:22-cv-01306, was filed by a stockholder of the Company in the United States District Court for the District of Maryland (the "Leacock Litigation") against the Company and certain of the Company's current officers. In June 2022, a securities class action complaint captioned Fisher v. IonQ, Inc., Case No. 8:22-cv-01306-DLB (the "Fisher Litigation") was filed by a stockholder against the Company and certain of the Company's current officers (the "IonQ Defendants"). Both the Leacock Litigation and Fisher Litigation, which have been consolidated into a single action, allege violations of Section 10(b) of the Exchange Act, and Rule 10b-5 promulgated thereunder, and Section 20(a) of the Exchange Act and seek damages. In September 2022, the Court appointed lead plaintiffs and counsel for lead plaintiffs, and ordered lead plaintiffs to file a consolidated amended complaint. The consolidated amended complaint was filed on November 22, 2022. As part of the consolidated amended complaint, certain members of the Company's board of directors (the "Board") as well as other dMY related defendants ("Additional Defendants") have been added as defendants to the case. On February 7, 2023, the IonQ Defendants and the Additional Defendants each filed a motion to dismiss the consolidated amended complaint. Both the IonQ Defendants and the Additional Defendants believe that the allegations in the various complaints are without merit and intend to defend the matters vigorously.

These proceedings and any additional investigations, inquiries or litigation by various regulators may harm our reputation regardless of the outcome of any such action. The outcome of any litigation, regardless of its merits, is inherently uncertain. Any claims and lawsuits, and the disposition of such claims and lawsuits, could be

time-consuming and expensive to resolve, divert management attention and resources, and lead to attempts on the part of other parties to pursue similar claims. Negative perceptions of our business may result in additional regulation, enforcement actions by the government and increased litigation, or harm to our ability to attract or retain customers or strategic partners, any of which may affect our business. Any damage to our reputation, including from publicity from legal proceedings against us or companies that work within our industry, governmental proceedings, unfavorable media coverage or class action could adversely affect our business, financial condition and results of operations.

An unfavorable outcome or settlement or any other legal, administrative and regulatory proceeding may result in a material adverse impact on our business, results of operations, financial position and overall trends. In addition, regardless of the outcome, litigation can be costly, time-consuming, and disruptive to our operations. Any claims or litigation, even if fully indemnified or insured, could damage our reputation and make it more difficult to compete effectively or to obtain adequate insurance in the future. In addition, the laws and regulations our business is subject to are complex and change frequently. We may be required to incur significant expense to comply with changes in, or remedy violations of, these laws and regulations.

Furthermore, while we maintain insurance for certain potential liabilities, such insurance does not cover all types and amounts of potential liabilities and is subject to various exclusions as well as caps on amounts recoverable. Even if we believe a claim is covered by insurance, insurers may dispute our entitlement to recovery for a variety of potential reasons, which may affect the timing and, if the insurers prevail, the amount of our recovery.

We may become subject to product liability claims, which could harm our financial condition and liquidity if we are not able to successfully defend or insure against such claims.

We may become subject to product liability claims, even those without merit, which could harm our business prospects, operating results, and financial condition. We may face inherent risk of exposure to claims in the event our quantum computers do not perform as expected or malfunction. A successful product liability claim against us could require us to pay a substantial monetary award. Moreover, a product liability claim could generate substantial negative publicity about our quantum computers and business and inhibit or prevent commercialization of other future quantum computers, which would have material adverse effects on our brand, business, prospects and operating results. Any insurance coverage might not be sufficient to cover all potential product liability claims. Any lawsuit seeking significant monetary damages either in excess of our coverage, or outside of our coverage, may have a material adverse effect on our reputation, business and financial condition. We may not be able to secure additional product liability insurance coverage on commercially acceptable terms or at reasonable costs when needed, particularly if we do face liability for our products and are forced to make a claim under our policy.

We are subject to requirements relating to environmental and safety regulations and environmental remediation matters, which could adversely affect our business, results of operation and reputation.

We are subject to numerous federal, state and local environmental laws and regulations governing, among other things, solid and hazardous waste storage, treatment and disposal, and remediation of releases of hazardous materials. There are significant capital, operating and other costs associated with compliance with these environmental laws and regulations. Environmental laws and regulations may become more stringent in the future, which could increase costs of compliance or require us to manufacture with alternative technologies and materials.

Federal, state and local authorities also regulate a variety of matters, including, but not limited to, health, safety and permitting in addition to the environmental matters discussed above. New legislation and regulations may require us to make material changes to our operations, resulting in significant increases to the cost of production.

Our manufacturing process will have hazards such as but not limited to hazardous materials, machines with moving parts, and high voltage and/or high current electrical systems typical of large manufacturing equipment and related safety incidents. There may be safety incidents that damage machinery or product, slow or stop production, or harm employees. Consequences may include litigation, regulation, fines, increased insurance premiums, mandates to temporarily halt production, workers' compensation claims, or other actions that impact the company brand, finances, or ability to operate.

Contracts with U.S. government entities subject us to risks, including early termination, audits, investigations, sanctions and penalties.

As part of our business strategy, we have entered into and may enter into additional contracts with state and federal government entities, which subjects our business to statutes and regulations applicable to companies doing business with the government, including the Federal Acquisition Regulation. These government contracts customarily contain provisions that give the government substantial rights and remedies, many of which are not typically found in commercial contracts and which are unfavorable to contractors. For instance, most U.S. government agencies include provisions that allow the government to unilaterally terminate or modify contracts for convenience, and in that event, the counterparty to the contract may generally recover only its incurred or committed costs and settlement expenses and profit on work completed prior to the termination. If the government terminates a contract for default, the defaulting party may be liable for any extra costs incurred by the government in procuring undelivered items from another source.

In addition, government contracts normally contain additional requirements that may increase our costs of doing business, reduce our profits, and expose us to liability for failure to comply with these terms and conditions. These requirements include, for example:

- specialized disclosure and accounting requirements unique to government contracts;
- financial and compliance audits that may result in potential liability for price adjustments, recoupment of government funds after such funds have been spent, civil and criminal penalties, or administrative sanctions such as suspension or debarment from doing business with the U.S. government;
- public disclosures of certain contract and company information; and
- mandatory socioeconomic compliance requirements, including labor requirements, non-discrimination and affirmative action programs and environmental compliance requirements.

Government contracts are also generally subject to greater scrutiny by the government, which can initiate reviews, audits and investigations regarding our compliance with government contract requirements. In addition, if we fail to comply with government contracting laws, regulations and contract requirements, our contracts may be subject to termination, and we may be subject to financial and/or other liability under our contracts, the Federal Civil False Claims Act (including treble damages and other penalties), or criminal law. In particular, the False Claims Act's "whistleblower" provisions also allow private individuals, including present and former employees, to sue on behalf of the U.S. government. Any penalties, damages, fines, suspension, or damages could adversely affect our ability to operate our business and our financial results.

We are subject to stringent and evolving U.S. and foreign laws, regulations, rules, contractual obligations, policies and other obligations related to data privacy and security. Our actual or perceived failure to comply with such obligations could lead to adverse business consequences.

Our data processing activities may subject us to numerous data privacy and security obligations, such as various laws, regulations, guidance, industry standards, external and internal privacy and security policies, contractual requirements, and other obligations relating to data privacy and security.

In the United States, federal, state, and local governments have enacted numerous data privacy and security laws, including data breach notification laws, personal data privacy laws, consumer protection laws (e.g., Section 5 of the Federal Trade Commission Act), and other similar laws (e.g., wiretapping laws). For example, the California Consumer Privacy Act of 2018 ("CCPA") applies to personal information of California consumers, business representatives and employees, and requires businesses to provide specific disclosures in privacy notices and honor requests of California residents to exercise certain privacy rights. The CCPA provides for civil penalties of up to $7,500 per violation and allows private litigants affected by certain data breaches to recover significant statutory damages. In addition, the California Privacy Rights Act of 2020 ("CPRA") expands the CCPA's requirements, including by adding a new right for individuals to correct their personal information and establishing a new regulatory agency to implement and enforce the law.

Other states, such as Virginia and Colorado, have also passed comprehensive privacy laws, and similar laws are being considered in several other states, as well as at the federal and local levels. Additionally, several states and localities have enacted measures related to the use of artificial intelligence and machine learning in products and services. These developments may further complicate compliance efforts, and may increase legal risk and compliance costs for us, the third parties upon whom we rely, and our customers.

Outside the United States, an increasing number of laws, regulations, and industry standards may govern data privacy and security. For example, the European Union's General Data Protection Regulation ("EU GDPR"), the United Kingdom's General Data Protection Regulation ("UK GDPR"), Brazil's General Data Protection Law (Lei Geral de Proteção de Dados Pessoais, or "LGPD") (Law No. 13,709/2018), and China's Personal Information Protection Law ("PIPL") impose strict requirements for processing personal data.

For example, under the EU GDPR, companies may face temporary or definitive bans on data processing and other corrective actions; fines of up to 20 million Euros or 4% of annual global revenue, whichever is greater; or private litigation related to processing of personal data brought by classes of data subjects or consumer protection organizations authorized at law to represent their interests. Additionally, we also target customers in Asia and may be subject to new and emerging data privacy regimes in Asia, including China's PIPL, Japan's Act on the Protection of Personal Information, and Singapore's Personal Data Protection Act.

In addition, we may be unable to transfer personal data from Europe and other jurisdictions to the United States or other countries due to data localization requirements or limitations on cross-border data flows. Europe and other jurisdictions have enacted laws requiring data to be localized or limiting the transfer of personal data to other countries. In particular, the European Economic Area ("EEA") and the United Kingdom ("UK") have significantly restricted the transfer of personal data to the United States and other countries whose privacy laws it believes are inadequate. Other jurisdictions may adopt similarly stringent interpretations of their data localization and cross-border data transfer laws. Although there are currently various mechanisms that may be used to transfer personal data from the EEA and UK to the United States in compliance with law, such as the EEA and UK's standard contractual clauses, these mechanisms are subject to legal challenges, and there is no assurance that we can satisfy or rely on these measures to lawfully transfer personal data to the United States. If there is no lawful manner for us to transfer personal data from the EEA, the UK, or other jurisdictions to the United States, or if the requirements for a legally-compliant transfer are too onerous, we could face significant adverse consequences, including the interruption or degradation of our operations, the need to relocate part of or all of our business or data processing activities to other jurisdictions at significant expense, increased exposure to regulatory actions, substantial fines and penalties, the inability to transfer data and work with partners, vendors and other third parties, and injunctions against our processing or transferring of personal data necessary to operate our business. Additionally, companies that transfer personal data out of the EEA and UK to other jurisdictions, particularly to the United States, are subject to increased scrutiny from regulators, individual litigators, and activist groups. Some European regulators have ordered certain companies to suspend or permanently cease certain transfers of personal data out of Europe for allegedly violating the EU GDPR's cross-border data transfer limitations.

In addition to data privacy and security laws, we are contractually subject to industry standards adopted by industry groups and may become subject to such obligations in the future. We are also bound by other contractual obligations related to data privacy and security, and our efforts to comply with such obligations may not be successful. For example, certain privacy laws, such as the EU GDPR, UK GDPR and CCPA, require our customers to impose specific contractual restrictions on their service providers. Additionally, some of our customers may require us to host personal data locally.

We publish privacy policies, marketing materials, and other statements, such as compliance with certain certifications or self-regulatory principles, regarding data privacy and security. If these policies, materials or statements are found to be deficient, lacking in transparency, deceptive, unfair, or misrepresentative of our practices, we may be subject to investigation, enforcement actions by regulators, or other adverse consequences.

Obligations related to data privacy and security are quickly changing, becoming increasingly stringent, and creating regulatory uncertainty. Additionally, these obligations may be subject to differing applications and interpretations, which may be inconsistent or conflict among jurisdictions. Preparing for and complying with these obligations requires us to devote significant resources and may necessitate changes to our services, information technologies, systems, and practices and to those of any third parties that process personal data on our behalf.

We may at times fail (or be perceived to have failed) in our efforts to comply with our data privacy and security obligations. Moreover, despite our efforts, our personnel or third parties on whom we rely may fail to comply with such obligations, which could negatively impact our business operations. If we or the third parties on which we rely fail, or are perceived to have failed, to address or comply with applicable data privacy and security obligations, we could face significant consequences, including but not limited to: government enforcement actions (e.g., investigations, fines, penalties, audits, inspections, and similar); litigation (including class-action claims); additional reporting requirements and/or oversight; bans on processing personal data; and orders to destroy or not use personal data. Any of these events could have a material adverse effect on our reputation, business, or financial condition, including but not limited to: loss of customers; inability to process personal data or to operate in certain jurisdictions; interruptions or stoppages in our business operations or data collection; limited ability to develop or commercialize our products; expenditure of time and resources to defend any claim or inquiry; adverse publicity; or substantial changes to our business model or operations.

We are subject to U.S. and foreign anti-corruption, anti-bribery and similar laws, and non-compliance with such laws can subject us to criminal or civil liability and harm our business.

We are subject to the U.S. Foreign Corrupt Practices Act of 1977, as amended, the U.S. domestic bribery statute contained in 18 U.S.C. § 201, the U.S. Travel Act, and other anti-bribery, and anti-corruption laws in countries in which we conduct activities. Anti-corruption and anti-bribery laws have been enforced aggressively in recent years and are interpreted broadly to generally prohibit companies, their employees, and their third-party intermediaries from authorizing, promising, offering, providing, soliciting, or accepting, directly or indirectly, improper payments or benefits to or from any person whether in the public or private sector. We may engage with partners and third-party intermediaries to market our services and to obtain necessary permits, licenses, and other regulatory approvals. In addition, we or our third-party intermediaries may have direct or indirect interactions with officials and employees of government agencies or state-owned or affiliated entities. We can be held liable for the corrupt or other illegal activities of these third-party intermediaries, and of our employees, representatives, contractors, partners, and agents, even if we do not explicitly authorize such activities. We cannot provide any assurance that all of our employees and agents will not take actions in violation of our policies and applicable law, for which we may be ultimately held responsible.

Detecting, investigating, and resolving actual or alleged violations of anti-corruption laws can require a significant diversion of time, resources, and attention from senior management. In addition, noncompliance with anti-corruption or anti-bribery laws could subject us to whistleblower complaints, investigations, sanctions,

settlements, prosecution, enforcement actions, fines, damages, other civil or criminal penalties, injunctions, suspension or debarment from contracting with certain persons, reputational harm, adverse media coverage, and other collateral consequences.

We are subject to governmental export and import controls that could impair our ability to compete in international markets due to licensing requirements and subject us to liability if we are not in compliance with applicable laws.

Our products and technologies are subject to U.S. export control and import laws and regulations, including the U.S. Export Administration Regulations, U.S. Customs regulations, and various economic and trade sanctions regulations administered by the U.S. Treasury Department's Office of Foreign Assets Controls. U.S. export control and economic sanctions laws include restrictions or prohibitions on the sale or supply of certain products, technologies, and services to U.S. government embargoed or sanctioned countries, governments, persons and entities. In addition, certain products and technology may be subject to export licensing or approval requirements. Exports of our products and technology must be made in compliance with export control and sanctions laws and regulations. If we fail to comply with these laws and regulations, we and certain of our employees could be subject to substantial civil or criminal penalties, including the possible loss of export or import privileges; fines, which may be imposed on us and responsible employees or managers; and, in extreme cases, the incarceration of responsible employees or managers.

In addition, changes in our products or technologies or changes in applicable export or import laws and regulations may create delays in the introduction and sale of our products and technologies in international markets or, in some cases, prevent the export or import of our products and technologies to certain countries, governments or persons altogether. Any change in export or import laws and regulations, shift in the enforcement or scope of existing laws and regulations, or change in the countries, governments, persons or technologies targeted by such laws and regulations, could also result in decreased use of our products and technologies, or in our decreased ability to export or sell our products and technologies to existing or potential customers. Any decreased use of our products and technologies or limitation on our ability to export or sell our products and technologies would likely adversely affect our business, financial condition and results of operations.

We expect to incur significant costs in complying with these regulations. Regulations related to quantum computing are currently evolving and we may face additional risks associated with changes to these regulations.

Risks Related to our Intellectual Property

Licensing of intellectual property is of critical importance to our business. For example, we license patents (some of which are foundational patents) and other intellectual property from the University of Maryland and Duke University on an exclusive basis. If the license agreement with these universities terminates, or if any of the other agreements under which we acquired or licensed, or will acquire or license, material intellectual property rights is terminated, we could lose the ability to develop and operate our business.

We are heavily reliant upon licenses to certain patent rights and other intellectual property from third parties that are important or necessary to the development of our products. In particular, our quantum computing technology is dependent on our license agreement with University of Maryland and Duke University. Significant intellectual property developed by our co-founders, Jungsang Kim, our Chief Technology Officer, and Christopher Monroe, our Chief Scientist, has been and is required to be assigned to the Universities as a result of Dr. Kim and Dr. Monroe's employment by the Universities, and certain such intellectual property is licensed pursuant to the license agreement with the Universities. Pursuant to the license agreement with the universities, we were granted an exclusive, worldwide, royalty-free, sublicenseable license for certain patents, know-how (on a non- exclusive basis) and other intellectual property to develop, manufacture and commercialize products for use in certain licensed fields, the scope of which includes the application of the licensed intellectual property in ion trap quantum computing.

Our existing license agreement with the Universities imposes, and we expect that any future license agreements will impose, upon us various commercial and development obligations. If we fail to comply with our obligations under these agreements, or we are subject to an insolvency-related event, the licensor may have the right to terminate these agreements, in which event we would not be able to develop, market or otherwise commercialize products covered by these agreements, including if any of the foregoing were to occur with respect to our license agreement with the Universities. Our business could significantly suffer, for example, if any current or future licenses terminate, if the licensors fail to abide by the terms of the license, if the licensed patents or other rights are found to be invalid or unenforceable, or if we are unable to enter into necessary licenses on acceptable terms.

Licensing of intellectual property is of critical importance to our business and involves complex legal, business and scientific issues, and certain provisions in intellectual property license agreements may be susceptible to multiple interpretations. Disputes may arise between us and our licensors regarding intellectual property subject to a license agreement, including:

- the scope of rights granted under the license agreement and other interpretation-related issues;
- whether and the extent to which our technology and processes infringe on intellectual property of the licensor that is not subject to the licensing agreement;
- our right to sublicense patent and other rights to third parties;
- our diligence obligations with respect to the use of the licensed technology in relation to our development and commercialization of our product and technology, and what activities satisfy those diligence obligations;
- the ownership of inventions and know-how resulting from the joint creation or use of intellectual property by our licensors and the company;
- our right to transfer or assign the license; and
- the effects of termination.

The resolution of any contract interpretation disagreement that may arise could narrow what we believe to be the scope of our rights to the relevant intellectual property or technology, or increase what we believe to be our financial or other obligations under the relevant agreement, either of which could harm our business, financial condition and results of operations. Moreover, if disputes over intellectual property that we have licensed prevent or impair our ability to maintain our current licensing arrangements on acceptable terms, we may be unable to successfully develop and commercialize our products or technology.

While we would expect to exercise all rights and remedies available to us, including seeking to cure any breach by us, and otherwise seek to preserve our rights under the license agreement, we may not be able to do so in a timely manner, at an acceptable cost or at all.

If we are unable to obtain and maintain patent protection for our products and technology, or if the scope of the patent protection obtained is not sufficiently broad or robust, our competitors could develop and commercialize products and technology similar or identical to ours, and our ability to successfully commercialize our products and technology may be adversely affected. Moreover, our trade secrets could be compromised, which could cause us to lose the competitive advantage resulting from these trade secrets.

Our success depends, in significant part, on our ability to obtain, maintain, enforce and defend patents and other intellectual property rights, including trade secrets, with respect to our products and technology and to operate our business without infringing, misappropriating, or otherwise violating the intellectual property rights of others. We may not be able to prevent unauthorized use of our intellectual property. We rely upon a combination of the intellectual property protections afforded by patent, copyright, trademark and trade secret

laws in the United States and other jurisdictions, as well as license agreements and other contractual protections, to establish, maintain and enforce rights in our proprietary technologies. In addition, we seek to protect our intellectual property rights through nondisclosure and invention assignment agreements with our employees and consultants, and through non-disclosure agreements with business partners and other third parties. Our trade secrets may also be compromised, which could cause us to lose the competitive advantage from such trade secrets. Despite our efforts to protect our proprietary rights, third parties may attempt to copy or otherwise obtain and use our intellectual property. Monitoring unauthorized use of our intellectual property is difficult and costly, and the steps we have taken or will take to prevent misappropriation may not be sufficient. Any enforcement efforts we undertake, including litigation, could be time-consuming and expensive and could divert management's attention, which could harm our business, results of operations and financial condition. In addition, existing intellectual property laws and contractual remedies may afford less protection than needed to safeguard our intellectual property portfolio.

Patent, copyright, trademark and trade secret laws vary significantly throughout the world. A number of foreign countries do not protect intellectual property rights to the same extent as do the laws of the United States. Therefore, our intellectual property rights may not be as strong or as easily enforced outside of the United States and efforts to protect against the unauthorized use of our intellectual property rights, technology and other proprietary rights may be more expensive and difficult outside of the United States. Failure to adequately protect our intellectual property rights could result in our competitors using our intellectual property to offer products, potentially resulting in the loss of some of our competitive advantage and a decrease in our revenue, which would adversely affect our business, financial condition and operating results.

Our patent applications may not result in issued patents or our patent rights may be contested, circumvented, invalidated or limited in scope, any of which could have a material adverse effect on our ability to prevent others from interfering with our commercialization of our products.

Our patent applications may not result in issued patents, which may have a material adverse effect on our ability to prevent others from commercially exploiting products similar to ours. The status of patents involves complex legal and factual questions and the breadth of claims allowed is uncertain. As a result, we cannot be certain that the patent applications that we file will result in patents being issued, or that our patents and any patents that may be issued to us will afford protection against competitors with similar technology. Numerous patents and pending patent applications owned by others exist in the fields in which we have developed and are developing our technology. In addition to those who may have patents or patent applications directed to relevant technology with an effective filing date earlier than any of our existing patents or pending patent applications, any of our existing or pending patents may also be challenged by others on the basis that they are otherwise invalid or unenforceable. Furthermore, patent applications filed in foreign countries are subject to laws, rules and procedures that differ from those of the United States, and thus we cannot be certain that foreign patent applications related to issued U.S. patents will be issued.

Even if our patent applications succeed and we are issued patents in accordance with them, it is still uncertain whether these patents will be contested, circumvented, invalidated or limited in scope in the future. The rights granted under any issued patents may not provide us with meaningful protection or competitive advantages, and some foreign countries provide significantly less effective patent enforcement than in the United States. In addition, the claims under any patents that issue from our patent applications may not be broad enough to prevent others from developing technologies that are similar or that achieve results similar to ours. The intellectual property rights of others could also bar us from licensing and exploiting any patents that issue from our pending applications. In addition, patents issued to us may be infringed upon or designed around by others and others may obtain patents that it needs to license or design around, either of which would increase costs and may adversely affect our business, prospects, financial condition and operating results.

We may face patent infringement and other intellectual property claims that could be costly to defend, result in injunctions and significant damage awards or other costs (including indemnification of third parties or costly licensing arrangements (if licenses are available at all)) and limit our ability to use certain key technologies in the future or require development of non-infringing products, services, or technologies, which could result in a significant expenditure and otherwise harm our business.

We may become subject to intellectual property disputes. Our success depends, in part, on our ability to develop and commercialize our products, services and technologies without infringing, misappropriating or otherwise violating the intellectual property rights of third parties. However, we may not be aware that our products, services or technologies are infringing, misappropriating or otherwise violating third-party intellectual property rights and such third parties may bring claims alleging such infringement, misappropriation or violation. For example, there may be issued patents of which we are unaware, held by third parties that, if found to be valid and enforceable, could be alleged to be infringed by our current or future products, services or technologies. There also may be pending patent applications of which we are not aware that may result in issued patents, which could be alleged to be infringed by our current or future products, services or technologies. Because patent applications can take years to issue and are often afforded confidentiality for some period of time there may currently be pending applications, unknown to us, that later result in issued patents that could cover our current or future products, services or technologies. Lawsuits can be time-consuming and expensive to resolve, and they divert management's time and attention. Numerous patents and pending patent applications owned by others exist in the fields in which we have developed and are developing our technology. Companies that have developed and are developing technology are often required to defend against litigation claims based on allegations of infringement, misappropriation or other violations of intellectual property rights. Our products, services or technologies may not be able to withstand any third-party claims against their use. In addition, many companies have the capability to dedicate substantially greater resources to enforce their intellectual property rights and to defend claims that may be brought against them. In a patent infringement claim against us, we may assert, as a defense, that we do not infringe the relevant patent claims, that the patent is invalid or both. The strength of our defenses will depend on the patents asserted, the interpretation of these patents, and our ability to invalidate the asserted patents. However, we could be unsuccessful in advancing non-infringement and/or invalidity arguments in our defense. In the United States, issued patents enjoy a presumption of validity, and the party challenging the validity of a patent claim must present clear and convincing evidence of invalidity, which is a high burden of proof. Conversely, the patent owner need only prove infringement by a preponderance of the evidence, which is a lower burden of proof. Our patent portfolio may not be large enough to deter patent infringement claims, and our competitors and others may now and in the future have significantly larger and more mature patent portfolios. Any litigation may also involve patent holding companies or other adverse patent owners that have no relevant solution revenue, and therefore, our patent portfolio may provide little or no deterrence as we would not be able to assert our patents against such entities or individuals. If a third party is able to obtain an injunction preventing us from accessing such third-party intellectual property rights, or if we cannot license or develop alternative technology for any infringing aspect of our business, we may be forced to limit or stop sales of our products, services or technologies or cease business activities related to such intellectual property.

Although we carry general liability insurance, our insurance may not cover potential claims of this type or may not be adequate to indemnify us for all liability that may be imposed. We cannot predict the outcome of lawsuits and cannot ensure that the results of any such actions will not have an adverse effect on our business, financial condition or results of operations. Any intellectual property litigation to which we might become a party, or for which we are required to provide indemnification, regardless of the merit of the claim or our defenses, may require us to do one or more of the following:

- cease selling or using solutions or services that incorporate the intellectual property rights that allegedly infringe, misappropriate or violate the intellectual property of a third party;
- make substantial payments for legal fees, settlement payments or other costs or damages;

- obtain a license, which may not be available on reasonable terms or at all, to sell or use the relevant technology;
- redesign the allegedly infringing solutions to avoid infringement, misappropriation or violation, which could be costly, time-consuming or impossible; or
- indemnify organizations using our platform or third-party service providers.

Even if the claims do not result in litigation or are resolved in our favor, these claims, and the time and resources necessary to resolve them, could divert the resources of our management and harm our business and operating results. Moreover, there could be public announcements of the results of hearings, motions or other interim proceedings or developments and if securities analysts or investors perceive these results to be negative, it could have a substantial adverse effect on the price of our common stock. The occurrence of infringement claims may grow as the market for our products, services and technologies grows. Accordingly, our exposure to damages resulting from infringement claims could increase and this could further exhaust our financial and management resources.

Some of our in-licensed intellectual property, including the intellectual property licensed from the Universities, has been conceived or developed through government-funded research and thus may be subject to federal regulations providing for certain rights for the U.S. government or imposing certain obligations on us, such as a license to the U.S. government under such intellectual property, "march-in" rights, certain reporting requirements and a preference for U.S.-based companies, and compliance with such regulations may limit our exclusive rights and our ability to contract with non-U.S. manufacturers.

Certain intellectual property rights that have been in-licensed pursuant to the license agreement with the Universities have been generated through the use of U.S. government funding and are therefore subject to certain federal regulations. As a result, the U.S. government may have certain rights to intellectual property embodied in our current or future product candidates pursuant to the Bayh-Dole Act of 1980, or the Patent and Trademark Law Amendment. These U.S. government rights include a non-exclusive, non-transferable, irrevocable worldwide license to use inventions for any governmental purpose. In addition, the U.S. government has the right, under certain limited circumstances, to require the licensor to grant exclusive, partially exclusive or non-exclusive licenses to any of these inventions to a third party if it determines that: (1) adequate steps have not been taken to commercialize the invention, (2) government action is necessary to meet public health or safety needs or (3) government action is necessary to meet requirements for public use under federal regulations (also referred to as "march-in rights"). The U.S. government also has the right to take title to these inventions if the licensor fails to disclose the invention to the government or fails to file an application to register the intellectual property within specified time limits. Intellectual property generated under a government funded program is also subject to certain reporting requirements, compliance with which may require us to expend substantial resources. In addition, the U.S. government requires that any products embodying any of these inventions or produced through the use of any of these inventions be manufactured substantially in the U.S., and the license agreement with the Universities requires that we comply with this requirement. This preference for U.S. industry may be waived by the federal agency that provided the funding if the owner or assignee of the intellectual property can show that reasonable but unsuccessful efforts have been made to grant licenses on similar terms to potential licensees that would be likely to manufacture the products substantially in the United States or that under the circumstances domestic manufacture is not commercially feasible. To the extent any of our owned or licensed future intellectual property is also generated through the use of U.S. government funding, the provisions of the Bayh-Dole Act may similarly apply.

Risks Related to an Investment in our Securities and Other General Matters

The market price of shares of our common stock or public warrants may be volatile, which could cause the value of your investment to decline.

If you purchase shares of our common stock, you may not be able to resell those shares at or above the price you paid. The market price of our common stock may be highly volatile and may fluctuate or decline significantly in response to numerous factors, some of which are beyond our control. The securities markets have experienced and continue to experience significant volatility. Market volatility, as well as general economic, market or political conditions, could reduce the market price of shares of our common stock regardless of our operating performance. Our operating results could be below the expectations of public market analysts and investors due to a number of potential factors, including:

- variations in quarterly operating results or dividends, if any, to stockholders;
- additions or departures of key management personnel;
- publication of research reports about our industry;
- rumors and market speculation involving us or other companies in our industry, which may include short seller reports;
- litigation and government investigations;
- changes or proposed changes in laws or regulations or differing interpretations or enforcement of laws or regulations affecting our business;
- adverse market reaction to any indebtedness incurred or securities issued in the future;
- changes in market valuations of similar companies;
- announcements by competitors of significant contracts, acquisitions, dispositions, strategic partnerships, joint ventures, or capital commitments;
- the impact of any future bank failures, public health crises or geopolitical events such as the Russia-Ukraine war; and
- the impact of any of the foregoing on our management, employees, partners, customers, and operating results.

Following periods of volatility in the overall market and the market price of a company's securities, securities class action litigation has often been instituted against such company. Such litigation could result in substantial costs and a diversion of management's attention and resources. See also "*—Risks Related to Litigation and Government Regulation—Our business is exposed to risks associated with litigation, investigations and regulatory proceedings*."

Short sellers may engage in manipulative activity intended to drive down the market price of our common stock, which could also result in related regulatory and governmental scrutiny, among other effects.

Short selling is the practice of selling securities that the seller does not own but rather has borrowed or intends to borrow from a third party with the intention of later buying lower priced identical securities to return to the lender. Accordingly, it is in the interest of a short seller of our common stock for the price to decline. At any time, short sellers may publish, or arrange for the publication of, opinions or characterizations that are intended to create negative market momentum. Issuers, like us, whose securities have historically had limited trading history or volumes and/or have been susceptible to relatively high volatility levels can be vulnerable to such short seller attacks. Short selling reports can cause increased volatility in an issuer's stock price, and result in regulatory and governmental inquiries. On May 3, 2022, a short seller report was published about us, which contained certain allegations against us. Any inquiry or formal investigation from a governmental organization or other regulatory body, including any inquiry from the SEC or the U.S. Department of Justice, could result in a material diversion of our management's time and could have a material adverse effect on our business and results of operations.

There may not be an active trading market for our common stock or public warrants, which may make it difficult to sell such securities.

It is possible that an active trading market will not be sustained. This would make it difficult for you to sell shares of our common stock or public warrants at an attractive price or at all.

Our ability to timely raise capital in the future may be limited, or may be unavailable on acceptable terms, if at all. The failure to raise capital when needed could harm our business, operating results and financial condition. Debt or equity issued to raise additional capital may reduce the value of our common stock.

We cannot be certain when or if the operations of our business will generate sufficient cash to fund our ongoing operations or the growth of our business. We intend to make investments to support our current business and may require additional funds to respond to business challenges, including the need to develop or enhance our technology, improve our operating infrastructure or acquire complementary businesses and technologies. Additional financing may not be available on favorable terms, if at all. In addition, we may not be able to access a portion of our existing cash, cash equivalents and investments due to market conditions. For example, on March 10, 2023, the Federal Deposit Insurance Corporation ("FDIC") took control and was appointed receiver of Silicon Valley Bank ("SVB"). Similarly, on March 12, 2023, Signature Bank and Silvergate Capital Corp. were each swept into receivership. If other banks and financial institutions enter receivership or become insolvent in the future in response to financial conditions affecting the banking system and financial markets, our ability to access our existing cash, cash equivalents and investments may be threatened and could have a material adverse effect on our business and financial condition. Additionally, weakness and volatility in capital markets and the economy, in general or as a result of bank failures or macroeconomic conditions such as rising inflation, could limit our access to capital markets and increase our costs of borrowing. If adequate funds are not available on acceptable terms, we may be unable to invest in future growth opportunities, which could harm our business, operating results and financial condition. If we incur debt, the debt holders could have rights senior to holders of our common stock to make claims on our assets. The terms of any debt could restrict our operations, including our ability to pay dividends on our common stock. If we issue additional equity securities, stockholders will experience dilution, and the new equity securities could have rights senior to those of our common stock.

Because the decision to issue securities in the future offering will depend on numerous considerations, including factors beyond our control, we cannot predict or estimate the amount, timing or nature of any future issuances of debt or equity securities. As a result, stockholders will bear the risk of future issuances of debt or equity securities reducing the value of their common stock and diluting their interest.

A small number of stockholders will continue to have substantial control over us, which may limit other stockholders' ability to influence corporate matters and delay or prevent a third party from acquiring control over us.

As of December 31, 2022, our directors and executive officers of, and beneficial owners of 5% or more of our voting securities and their respective affiliates beneficially own, in the aggregate, approximately 20% of our outstanding common stock. This concentration of ownership may have a negative impact on the trading price for our common stock because investors often perceive disadvantages in owning stock in companies with controlling stockholders. In addition, these stockholders will be able to exercise influence over all matters requiring stockholder approval, including the election of directors and approval of corporate transactions, such as a merger or other sale of us or our assets. This concentration of ownership could limit stockholders' ability to influence corporate matters and may have the effect of delaying or preventing a change in control, including a merger, consolidation or other business combination, or discouraging a potential acquirer from making a tender offer or otherwise attempting to obtain control, even if that change in control would benefit the other stockholders.

There can be no assurance that we will be able to comply with the continued listing standards of the New York Stock Exchange ("NYSE").

If we fail to satisfy the continued listing requirements of NYSE, such as the corporate governance requirements or the minimum share price requirement, NYSE may take steps to delist our securities. Such a

delisting would likely have a negative effect on the price of the securities and would impair your ability to sell or purchase the securities when you wish to do so. In the event of a delisting, we can provide no assurance that any action taken by us to restore compliance with listing requirements would allow our securities to become listed again, stabilize the market price or improve the liquidity of our securities, prevent our securities from dropping below the NYSE minimum share price requirement or prevent future non-compliance with NYSE's listing requirements. Additionally, if our securities are not listed on, or become delisted from the NYSE, for any reason, and are quoted on the OTC Bulletin Board, an inter-dealer automated quotation system for equity securities that is not a national securities exchange, the liquidity and price of our securities may be more limited than if we were quoted or listed on the NYSE or another national securities exchange. You may be unable to sell your securities unless a market can be established or sustained.

If we are unable to implement and maintain effective internal control over financial reporting, investors may lose confidence in the accuracy and completeness of financial reports, and the market price of our common stock may decline.

We are required to maintain internal controls over financial reporting and to report any material weaknesses in such internal controls. The process of designing, implementing, and testing the internal control over financial reporting required to comply with this obligation is time-consuming, costly, and complicated. In connection with the preparation of our financial statements as of and for the year ended December 31, 2021, we identified a material weakness in our internal control over financial reporting specifically related to our financial statement close process. Although we have remediated the material weakness as of December 31, 2022, there can be no assurance that the controls put in place will remain effective or that any additional controls needed will be designed and implemented timely to prevent material misstatements in our consolidated financial statements in future periods. If we identify material weaknesses in our internal control over financial reporting in the future, if we are unable to comply with the requirements of Section 404 of Sarbanes-Oxley Act of 2002 in a timely manner, or if we are unable to assert that our internal control over financial reporting is effective, we will be unable to certify that our internal control over financial reporting is effective. We cannot assure you that there will not be material weaknesses or significant deficiencies in our internal control over financial reporting in the future. Any failure to maintain internal control over financial reporting could severely inhibit our ability to accurately report our financial condition or results of operations. If we are unable to conclude that our internal control over financial reporting is effective, investors may lose confidence in the accuracy and completeness of our financial reports and the market price of our common stock could decline. We could become subject to investigations by the NYSE, the SEC or other regulatory authorities, which could require additional financial and management resources.

If our operating and financial performance in any given period does not meet the guidance provided to the public or the expectations of investment analysts, the market price of our common stock may decline.

We may, but are not obligated to, provide public guidance on our expected operating and financial results for future periods. Any such guidance will consist of forward-looking statements, subject to the risks and uncertainties described in this filing and in our other public filings and public statements. Our actual results may not always be in line with or exceed any guidance we have provided, especially in times of economic uncertainty, such as the current global economic uncertainty being experienced. If, in the future, our operating or financial results for a particular period do not meet any guidance provided or the expectations of investment analysts, or if we reduce our guidance for future periods, the market price of our common stock may decline as well. Even if we do issue public guidance, there can be no assurance that we will continue to do so in the future.

Our quarterly operating results may fluctuate significantly and could fall below the expectations of securities analysts and investors due several factors, some of which are beyond our control, resulting in a decline in our stock price.

Our quarterly operating results may fluctuate significantly because of several factors, including:

- labor availability and costs for hourly and management personnel;

- profitability of our products, especially in new markets;
- changes in interest rates;
- impairment of long-lived assets;
- macroeconomic conditions, both nationally and locally;
- size and scope of our revenue arrangements with our customers;
- negative publicity relating to products we serve;
- changes in consumer preferences and competitive conditions;
- expansion to new markets; and
- fluctuations in commodity prices.

We will continue to incur significant increased expenses and administrative burdens as a public company, which could negatively impact our business, financial condition and results of operations.

We face increased legal, accounting, insurance, administrative and other costs and expenses as a public company that we did not incur as a private company. Sarbanes-Oxley, including the requirements of Section 404, as well as rules and regulations subsequently implemented by the SEC, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 and the rules and regulations promulgated and to be promulgated thereunder, the Public Company Accounting Oversight Board ("PCAOB") and the securities exchanges, impose additional reporting and other obligations on public companies. Compliance with public company requirements will continue to increase costs and make certain activities more time-consuming. A number of those requirements require us to carry out activities we have not done previously. For example, we adopted new internal controls and disclosure controls and procedures.

If any issues in complying with SEC reporting requirements are identified (for example, if we identify a material weakness or significant deficiency in the internal control over financial reporting), we could incur additional costs rectifying those issues, and the existence of those issues could harm our reputation or investor perceptions of us. Further, the costs to maintain our director and officer liability insurance may continue to rise to unprecedented levels. Risks associated with our status as a public company may make it more difficult to attract and retain qualified persons to serve on our Board or as executive officers. The additional reporting and other obligations imposed by these rules and regulations will increase legal and financial compliance costs and the costs of related legal, accounting and administrative activities. These increased costs will require us to divert a significant amount of money that could otherwise be used to expand our business and achieve strategic objectives. Advocacy efforts by stockholders and third parties may also prompt additional changes in governance and reporting requirements, which could further increase costs.

We qualify as an emerging growth company as well as a smaller reporting company. The reduced public company reporting requirements applicable to emerging growth companies may make our common stock less attractive to investors.

We qualify as an emerging growth company under SEC rules. As an emerging growth company, we are permitted and plan to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These provisions include: (1) presenting only two years of audited financial statements; (2) presenting only two years of related selected financial data and "Management's Discussion and Analysis of Financial Condition and Results of Operations" disclosure; (3) an exemption from compliance with the auditor attestation requirement in the assessment of internal control over financial reporting pursuant to Section 404 of Sarbanes-Oxley; (4) not being required to comply with any requirement that may be adopted by the PCAOB regarding mandatory audit firm rotation or a supplement to the auditor's report providing additional information about the audit and the financial statements; (5) reduced disclosure obligations regarding executive compensation arrangements in periodic reports, registration statements, and proxy statements; and

(6) exemptions from the requirements of holding a nonbinding advisory vote on executive compensation and stockholder approval of any golden parachute payments not previously approved. As a result, the information we provide will be different than the information that is available with respect to other public companies that are not emerging growth companies. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock, and the market price of our common stock may be more volatile. We will remain an emerging growth company until the earliest of: (1) December 31, 2025; (2) the last day of the fiscal year in which we have gross revenue exceeding $1.235 billion; (3) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the prior three year period; and (4) the last day of the year in which we are deemed to be a large accelerated filer, which means the market value of our common stock held by non-affiliates exceeds $700 million as of the prior June 30th.

Additionally, we qualify as a "smaller reporting company" as defined in Item 10(f)(1) of Regulation S-K. Smaller reporting companies may take advantage of certain reduced disclosure obligations, including, among other things, providing only two years of audited financial statements. We will remain a smaller reporting company until the last day of the fiscal year in which (1) the market value of common stock held by non-affiliates exceeds $250 million as of the end of that year's second fiscal quarter, or (2) our annual revenues exceeded $100 million during such completed fiscal year and the market value of common stock held by non-affiliates equals or exceeds $700 million as of the end of that year's second fiscal quarter. To the extent we take advantage of such reduced disclosure obligations, this may also make comparison of our financial statements with other public companies difficult or impossible.

We may issue additional shares of common stock or other equity securities without your approval, which would dilute your ownership interests and may depress the market price of our common stock.

As of December 31, 2022, we had warrants outstanding to purchase an aggregate of 13,532,688 shares of common stock. Pursuant to our employee benefit plans, we may issue an aggregate of up to 28,769,625 shares of common stock, which amount may be subject to increase from time to time. We may also issue additional shares of common stock or other equity securities of equal or senior rank in the future in connection with, among other things, future acquisitions or repayment of outstanding indebtedness, without stockholder approval, in a number of circumstances.

The issuance of additional shares or other equity securities of equal or senior rank would have the following effects:

- existing stockholders' proportionate ownership interest in us will decrease;
- the amount of cash available per share, including for payment of dividends, if any, may decrease;
- the relative voting strength of each previously outstanding common stock may be diminished; and
- the market price of our common stock may decline.

There is no guarantee that the public warrants will be in the money, and they may expire worthless.

The exercise price for our public warrants is $11.50 per share of common stock. There is no guarantee that the public warrants will be in the money prior to their expiration, and as such, the public warrants may expire worthless. The public warrants expire on September 30, 2026.

We may amend the terms of the public warrants in a manner that may be adverse to holders with the approval by the holders of at least 50% of the then-outstanding public warrants. As a result, the exercise price of your public warrants could be increased, the exercise period could be shortened and the number of shares of our common stock purchasable upon exercise of a public warrant could be decreased, all without your approval.

Our public warrants are issued in registered form under the Warrant Agreement between the warrant agent and us. The Warrant Agreement provides that the terms of the public warrants may be amended without the

consent of any holder to cure any ambiguity or correct any defective provision, but requires the approval by the holders of at least 50% of the then-outstanding public warrants to make any change that adversely affects the interests of the registered holders of public warrants. Accordingly, we may amend the terms of the public warrants in a manner adverse to a holder if holders of at least 50% of the then-outstanding public warrants approve of such amendment. Although our ability to amend the terms of the public warrants with the consent of at least 50% of the then-outstanding public warrants is unlimited, examples of such amendments could be amendments to, among other things, increase the exercise price of the warrants, convert the public warrants into cash or stock (at a ratio different than initially provided), shorten the exercise period or decrease the number of shares of our common stock purchasable upon exercise of a public warrant.

We may redeem unexpired public warrants prior to their exercise at a time that is disadvantageous to warrantholders, thereby making such warrants worthless.

We have the ability to redeem outstanding public warrants prior to their expiration, at a price of $0.01 per warrant, provided that the last reported sales price of our common stock equals or exceeds $18.00 per share (as adjusted for stock splits, stock dividends, reorganizations, recapitalizations and the like) for any 20 trading days within a 30-trading day period ending on the third trading day prior to the date on which we give proper notice of such redemption and provided certain other conditions are met. If and when the public warrants become redeemable by us, we may exercise our redemption right even if we are unable to register or qualify the underlying securities for sale under all applicable state securities laws. Redemption of the outstanding public warrants could force you (1) to exercise your public warrants and pay the exercise price therefor at a time when it may be disadvantageous for you to do so, (2) to sell your public warrants at the then-current market price when you might otherwise wish to hold your public warrants or (3) to accept the nominal redemption price which, at the time the outstanding public warrants are called for redemption, is likely to be substantially less than the market value of your public warrants.

In addition, we may redeem the public warrants after they become exercisable for a number of shares of common stock determined based on the redemption date and the fair market value of our common stock. Any such redemption may have similar consequences to a cash redemption described above. In addition, such redemption may occur at a time when the public warrants are "out-of-the-money," in which case, you would lose any potential embedded value from a subsequent increase in the value of our common stock had your public warrants remained outstanding.

We have no current plans to pay cash dividends on our common stock; as a result, stockholders may not receive any return on investment unless they sell their common stock for a price greater than the purchase price.

We have no current plans to pay dividends on our common stock. Any future determination to pay dividends will be made at the discretion of our Board, subject to applicable laws. It will depend on a number of factors, including our financial condition, results of operations, capital requirements, contractual, legal, tax and regulatory restrictions, general business conditions, and other factors that the Board may deem relevant. In addition, the ability to pay cash dividends may be restricted by the terms of debt financing arrangements, as any future debt financing arrangement likely will contain terms restricting or limiting the amount of dividends that may be declared or paid on our common stock. As a result, stockholders may not receive any return on an investment in our common stock unless they sell their shares for a price greater than what they paid for them.

Provisions in our organizational documents and certain rules imposed by regulatory authorities may delay or prevent an acquisition by a third party that could otherwise be in the interests of stockholders.

Our second amended and restated certificate of incorporation ("Certificate of Incorporation") and amended and restated bylaws ("Bylaws") contain several provisions that may make it more difficult or expensive for a

third party to acquire control of us without the approval of the Board. These provisions, which may delay, prevent or deter a merger, acquisition, tender offer, proxy contest, or other transaction that stockholders may consider favorable, include the following:

- a classified board;
- advance notice for nominations of directors by stockholders and for stockholders to include matters to be considered at our annual meetings;
- certain limitations on convening special stockholder meetings;
- limiting the persons who may call special meetings of stockholders;
- limiting the ability of stockholders to act by written consent;
- restrictions on business combinations with interested stockholder;
- in certain cases, the approval of holders representing at least 66 2/3% of the total voting power of the shares entitled to vote generally in the election of directors will be required for stockholders to adopt, amend or repeal the Bylaws, or amend or repeal certain provisions of the Certificate of Incorporation;
- no cumulative voting;
- the required approval of holders representing at least 66 2/3% of the total voting power of the shares entitled to vote at an election of the directors to remove directors; and
- the ability of the Board to designate the terms of and issue new series of preferred stock without stockholder approval, which could be used, among other things, to institute a rights plan that would have the effect of significantly diluting the stock ownership of a potential hostile acquirer, likely preventing acquisitions.

These provisions of our Certificate of Incorporation and Bylaws could discourage potential takeover attempts and reduce the price that investors might be willing to pay for shares of our common stock in the future, which could reduce the market price of our common stock.

The provision of our Certificate of Incorporation requiring exclusive venue in the Court of Chancery in the State of Delaware and the federal district courts of the United States for certain types of lawsuits may have the effect of discouraging lawsuits against directors and officers.

Our Certificate of Incorporation provides that, unless we consent in writing to the selection of an alternative forum, the Court of Chancery of the State of Delaware shall be the sole and exclusive forum for:

- any derivative action or proceeding brought on behalf of us;
- any action asserting a claim of breach of fiduciary duty owed by any director, officer, agent or other employee or stockholder to us or our stockholders;
- any action asserting a claim arising pursuant to any provision of the Delaware General Corporation Law (the "DGCL"), the Certificate of Incorporation or Bylaws or as to which the DGCL confers jurisdiction on the Court of Chancery of the State of Delaware;
- any claim or cause of action seeking to interpret, apply, enforce or determine the validity of the Certificate of Incorporation or the Bylaws; or
- any action asserting a claim governed by the internal affairs doctrine, in each case subject to such Court of Chancery having personal jurisdiction over the indispensable parties named as defendants therein. It further provides that, unless we consent in writing to the selection of an alternative forum, the federal district courts of the United States shall, to the fullest extent permitted by law, be the sole and exclusive forum for the resolutions of any complaint asserting a cause of action arising under the Securities Act. The exclusive forum clauses described above shall not apply to suits brought to enforce a duty or liability created by the Exchange Act, or any other claim for which the federal courts have exclusive

jurisdiction. Although these provisions are expected to benefit us by providing increased consistency in the application of applicable law in the types of lawsuits to which they apply, the provisions may have the effect of discouraging lawsuits against directors and officers. The enforceability of similar choice of forum provisions in other companies' certificates of incorporation have been challenged in legal proceedings and there is uncertainty as to whether a court would enforce such provisions. In addition, investors cannot waive compliance with the federal securities laws and the rules and regulations thereunder. It is possible that, in connection with any applicable action brought against us, a court could find the choice of forum provisions contained in our Certificate of Incorporation to be inapplicable or unenforceable in such action. If so, we may incur additional costs associated with resolving such action in other jurisdictions, which could harm our business, financial condition or results of operations.

These provisions of our Certificate of Incorporation and Bylaws could discourage lawsuits against directors and officers, which could reduce the market price of our common stock.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Our principal facility is our corporate headquarters, located in College Park, Maryland, where we lease approximately 32,000 square feet of space from the University of Maryland under an agreement that expires in 2030. Most of the facility is used for research and development and corporate functions. We also signed a lease for approximately 65,000 square feet of space in Bothell, Washington under an agreement that commenced in 2023 and expires in 2030. Most of the facility will be used for manufacturing in addition to general office space. We believe that our facilities are sufficient to meet our current needs and we will be able to obtain additional space as needed under commercially reasonable terms.

Item 3. Legal Proceedings.

From time to time, we may become involved in legal proceedings relating to claims arising from the ordinary course of business. Future litigation may be necessary to defend ourselves. The results of any current or future litigation cannot be predicted with certainty, and regardless of the outcome, litigation can have an adverse impact on us because of defense and settlement costs, diversion of management resources and other factors.

In May 2022, a securities class action complaint captioned *Leacock v. IonQ, Inc. et al.*, Case No. 8:22-cv-01306, was filed by a stockholder of the Company in the United States District Court for the District of Maryland (the "Leacock Litigation") against the Company and certain of the Company's current officers. In June 2022, a securities class action complaint captioned *Fisher v. IonQ, Inc.*, Case No. 8:22-cv-01306-DLB (the "Fisher Litigation") was filed by a stockholder of the Company and certain of the Company's current officers ("IonQ Defendants"). Both the Leacock Litigation and Fisher Litigation, which have been consolidated into a single action, allege violations of Section 10(b) of the Exchange Act, and Rule 10b-5 promulgated thereunder, and Section 20(a) of the Exchange Act and seek damages. In September 2022, the Court appointed lead plaintiffs and counsel for lead plaintiffs, and ordered lead plaintiffs to file a consolidated amended complaint. The consolidated amended complaint was filed on November 22, 2022. As part of the consolidated amended complaint, certain members of the Company's Board as well as other dMY related defendants (the "Additional Defendants") have been added as defendants to the case. On February 7, 2023, the IonQ Defendants and the Additional Defendants each filed a motion to dismiss the consolidated amended complaint. Both the IonQ Defendants and the Additional Defendant believe that the allegations in the various complaints are without merit and intend to defend the matters vigorously.

On March 2, 2023, we filed a petition in the Delaware Court of Chancery pursuant to Section 205 of the Delaware General Corporation Law, which permits the Court of Chancery, in its discretion, to validate potentially

defective corporate acts. The petition sought an order of the Chancery Court validating and declaring effective (i) our Second Amended and Restated Certificate of Incorporation dated September 30, 2021 (the "A&R COI"), including its filing and effectiveness, as of the date and time that it was originally filed with the Delaware Secretary of State and (ii) all shares of our capital stock issued in reliance on the validity and effectiveness of the A&R COI as of the date and time of the original issuance of such shares. Although we believe the A&R COI and all shares issued under it were valid and effective at all relevant times, a recent decision of the Court of Chancery created uncertainty regarding the approval of the A&R COI by our stockholders in February 2021. On March 17, 2023, the Court of Chancery entered the requested order. In addition, at no point prior to March 17, 2023 had we issued or reserved for issuance shares in excess of the predecessor certificate of incorporation of the Company.

Please refer to Note 10, Commitments and Contingencies, to the consolidated financial statements included in this Annual Report for further details on current legal proceedings.

Item 4. Mine Safety Disclosures.

Not applicable.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities.

Market Information

Our common stock and public warrants are traded on the NYSE under the symbols "IONQ" and "IONQ WS," respectively.

Holders

As of March 23, 2023, there were approximately 103 stockholders of record. The actual number of stockholders is greater than this number of record holders, and includes stockholders who are beneficial owners, but whose shares are held in street name by brokers and other nominees. This number of holders of record also does not include stockholders whose shares may be held in trust by other entities.

Dividend Policy

We have never declared or paid any cash dividends on our capital stock and do not anticipate paying any cash dividends in the foreseeable future. Payment of cash dividends, if any, in the future will be at the discretion of our Board and will depend on then-existing conditions, including our financial condition, operating results, contractual restrictions, capital requirements, business prospects and other factors our Board may deem relevant.

Recent Sales of Unregistered Equity Securities

None.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

None.

Item 6. [Reserved].

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations.

This Annual Report contains statements that may constitute "forward-looking statements" within the meaning of Section 27A of the Securities Act of 1933, as amended (the "Securities Act"), and Section 21E of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), that involve substantial risks and uncertainties. All statements contained in this Annual Report other than statements of historical fact, including statements regarding our future results of operations and financial position, our business strategy and plans, and our objectives for future operations, are forward-looking statements. The words "believes," "expects," "intends," "estimates," "projects," "anticipates," "will," "plan," "may," "should," or similar language are intended to identify forward-looking statements.

It is routine for our internal projections and expectations to change throughout the year, and any forward-looking statements based upon these projections or expectations may change prior to the end of the next quarter or year. Readers of this Annual Report are cautioned not to place undue reliance on any such forward-looking statements. As a result of a number of known and unknown risks and uncertainties, our actual results or performance may be materially different from those expressed or implied by these forward-looking statements. Risks and uncertainties are identified under "Risk Factors" in Item 1A herein and in our other filings with the Securities and Exchange Commission (the "SEC"). All forward-looking statements included herein are made only as of the date hereof. Unless otherwise required by law, we do not undertake, and specifically disclaim, any obligation to update any forward-looking statement, whether as a result of new information, future events, or otherwise after the date of such statement.

You should read the following discussion and analysis of our financial condition and results of operations together with our audited consolidated financial statements and related notes included elsewhere in this Annual Report. Unless the context otherwise requires, the terms "IonQ," "Legacy IonQ" "we," "us," "our" and similar terms refer to IonQ Quantum, Inc. prior to the consummation of the Business Combination and IonQ, Inc. and its wholly owned subsidiary, IonQ Quantum, Inc., after the consummation of the Business Combination. References to "dMY" refer to the predecessor company prior to the consummation of the Business Combination.

Overview

We are developing quantum computers designed to solve some of the world's most complex problems, and transform business, society and the planet for the better. We believe that our proprietary technology, our architecture, and the technology exclusively available to us through license agreements will offer us advantages both in terms of research and development, as well as the commercial value of our intended product offerings.

Today, we sell access to several quantum computers of various qubit capacities and are in the process of researching and developing technologies for quantum computers with increasing computational capabilities. We currently make access to our quantum computers available via three major cloud platforms, AWS's Amazon Braket, Microsoft's Azure Quantum and Google's Cloud Marketplace, and also to select customers via our own cloud service. This cloud-based approach enables the broad availability of QCaaS.

We supplement our QCaaS offering with professional services focused on assisting our customers in applying quantum computing to their businesses. We also expect to sell full quantum computing systems to customers, either over the cloud or for local access.

We are still in the early stages of commercial growth. Since our inception we have incurred significant operating losses. Our ability to generate revenue sufficient to achieve profitability will depend heavily on the successful development and further commercialization of our quantum computing systems. Our net losses were $48.5 million and $106.2 million for the years ended December 31, 2022 and 2021, respectively. As of December 31, 2022, we had an accumulated deficit of $194.3 million. We expect to continue to incur significant losses for the foreseeable future as we prioritize reaching the technical milestones necessary to achieve an increasingly higher number of stable qubits and higher levels of fidelity than presently exists—prerequisites for quantum computing to reach broad quantum advantage.

The Merger Agreement and Public Company Costs

On March 7, 2021, Legacy IonQ, dMY and Ion Trap Acquisition Inc. (the "Merger Sub") entered into an Agreement and Plan of Merger (the "Merger Agreement"). Pursuant to the Merger Agreement, at the closing, the Merger Sub was merged with and into Legacy IonQ, with Legacy IonQ continuing as the surviving corporation following the merger, being a wholly owned subsidiary of dMY and the separate corporate existence of the Merger Sub ceased (the "Business Combination"). Commensurate with the Business Combination, dMY changed its name to IonQ, Inc. and Legacy IonQ changed its name to IonQ Quantum, Inc. IonQ became the successor registrant with the SEC, meaning that Legacy IonQ's financial statements for previous periods will be disclosed in the registrant's future periodic reports filed with the SEC.

While the legal acquirer in the Merger Agreement is dMY, for financial accounting and reporting purposes under accounting principles generally accepted in the United States of America ("U.S. GAAP"), Legacy IonQ is the accounting acquirer and the merger is accounted for as a "reverse recapitalization" (i.e., a capital transaction involving the issuance of stock by dMY for the stock of Legacy IonQ). A reverse recapitalization does not result in a new basis of accounting, and the financial statements of the Company represent the continuation of the financial statements of Legacy IonQ in many respects. Under this method of accounting, dMY is treated as the "acquired" company for financial reporting purposes.

As a result of the Business Combination, Legacy IonQ is the successor to an SEC registrant and is listed on the NYSE, which will require IonQ to continue to hire additional personnel as it continues to implement procedures and processes to address public company regulatory requirements and customary practices. As a public company, we have incurred and expect to continue to incur, expenses for, among other things, directors' and officers' liability insurance, director fees and additional internal and external accounting, legal and administrative resources, including increased audit and legal fees.

Impact of the Macroeconomic Climate on Our Business

The recent trends towards rising inflation may also materially adversely affect our business and corresponding financial position and cash flows. Inflationary factors, interest rates and overhead costs may adversely affect our operating results. Rising interest and inflation rates also present a recent challenge impacting the U.S. economy and could make it more difficult for us to obtain traditional financing on acceptable terms, if at all, in the future. Although we do not believe that inflation has had a material impact on our financial position or results of operations to date, we may experience increases in the near future (especially if inflation rates continue to rise) on our operating costs, including our labor, due to supply chain constraints, consequences associated with COVID-19 and the Russia-Ukraine war, and employee availability and wage increases, which may result in additional stress on our working capital resources.

Key Components of Results of Operations

Revenue

We have generated limited revenues since our inception. We derive revenue from providing access to quantum-computing-as-a-service ("QCaaS"), consulting services related to co-developing algorithms on our quantum computing systems, and from contracts associated with the design, development, and construction of specialized quantum computing systems together with related services. In arrangements with the cloud service providers, the cloud service provider is considered the customer and we do not have any contractual relationships with the cloud service providers' end users.

We have determined that our QCaaS contracts represent a combined, stand-ready performance obligation to provide access to our quantum computing systems together with related maintenance and support. The transaction price generally includes a variable fee based on usage of our quantum computing systems and may include a fixed fee for a minimum volume of usage to be made available over a defined period of access. Fixed fee arrangements may also include a variable component whereby customers pay an amount for usage over contractual minimums contained in the contracts. We have determined that contracts that contain consulting

services related to co-developing quantum computing algorithms and the ability to use our quantum computing systems to run such algorithms represent a combined performance obligation that is satisfied over-time with revenue recognized based on the efforts incurred to date relative to the total expected effort.

Certain of our contracts contain multiple performance obligations, most commonly in contracts for specialized quantum computing systems together with related maintenance and support. Such contracts may also include access to our QCaaS. A contract's transaction price is allocated to each distinct performance obligation and recognized as revenue when or as the performance obligation is satisfied. When there are multiple performance obligations in a contract, we allocate the transaction price to each performance obligation based on its standalone selling price when available. We determine standalone selling price based on the observable price of a product or service when we sell the products or services separately in similar circumstances and to similar customers. When the standalone selling price is not known, due to it being either highly variable or uncertain, we allocate the transaction price using the residual approach.

For contracts with a fixed transaction price, the fixed fee is recognized on a straight-line basis over the access period or associated measure of progress for our consulting services contracts. For contracts without fixed fees, variable usage fees are billed and recognized during the period of such usage. Performance obligations are satisfied over-time if the customer receives the benefits as we perform the work, if the customer controls the asset as it is being produced (continuous transfer of control), or if the product being produced for the customer has no alternative use and we have a contractual right to payment for performance to date. Revenue is recognized on performance obligations satisfied over time based on the efforts incurred to date relative to the total expected effort.

We are currently focused on marketing our QCaaS and consulting services and have entered into, and are continuing to enter into, new contracts with customers. We have also engaged with certain prospects who are interested in purchasing entire quantum computers, either over the cloud or for local access.

Operating Costs and Expenses

Cost of revenue

Cost of revenue primarily consists of expenses related to delivering our services, including personnel-related expenses, allocated facility and other costs for customer facing functions, and costs associated with maintaining our in-service quantum computing systems to ensure proper calibration as well as costs incurred for maintaining the cloud on which the QCaaS resides. Personnel-related expenses include salaries, benefits, and stock-based compensation. Cost of revenue excludes depreciation and amortization related to our quantum computing systems and related software.

Research and development

Research and development expenses consist of personnel-related expenses, including salaries, benefits and stock-based compensation, and allocated facility and other costs for our research and development functions. Unlike a standard computer, design and development efforts continue throughout the useful life of our quantum computing systems to ensure proper calibration and optimal functionality. Research and development expenses also include purchased hardware and software costs related to quantum computing systems constructed for research purposes that are not probable of providing future economic benefit and have no alternate future use as well as costs associated with third-party research and development arrangements.

Sales and marketing

Sales and marketing expenses consist of personnel-related expenses, including salaries, benefits and stock-based compensation, costs for direct advertising, marketing and promotional expenditures and allocated facility and other costs for our sales and marketing functions. We expect to continue to make the necessary sales and marketing investments to enable us to increase our market penetration and expand our customer base.

General and administrative

General and administrative expenses consist of personnel-related expenses, including salaries, benefits and stock-based compensation, and allocated facility and other costs for our corporate, executive, finance, and other administrative functions. General and administrative expenses also include expenses for outside professional services, including legal, auditing and accounting services, recruitment expenses, information technology, travel expenses and certain non-income taxes, insurance, and other administrative expenses.

We expect our general and administrative expenses to increase for the foreseeable future as we scale headcount with the growth of our business, and as a result of operating as a public company, including compliance with the rules and regulations of the SEC, NYSE, legal, audit, additional insurance expenses, investor relations activities, and other administrative and professional services. As a result, we expect that our general and administrative expenses will increase in absolute dollars but may fluctuate as a percentage of total revenue over time.

Depreciation and amortization

Depreciation and amortization expense results from depreciation and amortization of our property and equipment, including our quantum computing systems, and intangible assets that is recognized over their estimated lives.

Nonoperating Costs and Expenses

Change in fair value of warrant liabilities

The change in fair value of warrant liabilities consists of mark-to-market fair value adjustments recorded associated with the public and private placement warrants assumed as part of the Business Combination.

Interest income, net

Interest income, net consists of income earned on our money market funds and other available-for-sale investments.

Offering costs associated with warrants

Offering costs associated with warrants consist of transaction costs that have been allocated to the public and private warrants and were expensed upon consummation of the Business Combination on September 30, 2021, based on the relative fair value of the equity issued and the liability-classified warrants.

Other income (expense), net

Other income (expense), net consists of realized losses on our available-for-sale investments and certain other expenses.

Results of Operations

The following table sets forth our statements of operations for the periods indicated:

	Year Ended December 31,	
	2022	2021
	(in thousands)	
Revenue	$ 11,131	$ 2,099
Costs and expenses:		
Cost of revenue (excluding depreciation and amortization)[1]	2,944	1,040
Research and development[1]	43,978	20,228
Sales and marketing[1]	8,385	3,233
General and administrative[1]	35,966	13,737
Depreciation and amortization	5,604	2,548
Total operating costs and expenses	96,877	40,786
Loss from operations	(85,746)	(38,687)
Change in fair value of warrant liabilities	30,136	(63,332)
Interest income, net	7,093	64
Offering costs associated with warrants	—	(4,259)
Other income (expense), net	6	28
Loss before benefit for income taxes	(48,511)	(106,186)
Benefit for income taxes	—	—
Net loss	$(48,511)	$(106,186)

(1) Cost of revenue, research and development, sales and marketing, and general and administrative expenses for the periods include stock-based compensation expense as follows:

	Year Ended December 31,	
	2022	2021
	(in thousands)	
Cost of revenue	$ 902	$ 62
Research and development	13,472	2,841
Sales and marketing	1,298	67
General and administrative	15,784	4,778

Comparison of the Years Ended December 31, 2022 and 2021

Revenue

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Revenue	$11,131	$2,099	$9,032	430%

Revenue increased by $9.0 million, or 430%, to $11.1 million for the year ended December 31, 2022, from $2.1 million for the year ended December 31, 2021. The increase was primarily driven by new revenue contracts under which we provided services during the year ended December 31, 2022, an increase in revenue from our cloud service providers and an increase in revenue from services provided under our contract with UMD, as well as other existing contracts.

Cost of revenue

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Cost of revenue (excluding depreciation and amortization)	$2,944	$1,040	$1,904	183%

Cost of revenue increased by $1.9 million, or 183%, to $2.9 million for the year ended December 31, 2022, from $1.0 million for the year ended December 31, 2021. The increase was driven primarily by the increase in costs to service contracts for the year ended December 31, 2022, including an increase in labor costs to service consulting arrangements.

Research and development

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Research and development	$43,978	$20,228	$23,750	117%

Research and development expense increased by $23.8 million, or 117%, to $44.0 million for the year ended December 31, 2022, from $20.2 million for the year ended December 31, 2021. The increase was primarily driven by an $18.1 million increase in payroll-related expenses, including stock-based compensation of $10.6 million, as a result of increased headcount, a $2.6 million increase in materials, supplies and equipment costs, and a $2.3 million increase in professional service costs to support research and development initiatives.

Sales and marketing

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Sales and marketing	$8,385	$3,233	$5,152	159%

Sales and marketing expense increased by $5.2 million, or 159%, to $8.4 million for the year ended December 31, 2022, from $3.2 million for the year ended December 31, 2021. The increase was primarily due to an increase of $3.7 million of payroll-related expenses, including an increase in stock-based compensation of $1.2 million, as a result of increased headcount, and increased costs to promote our services and other marketing initiatives of approximately $1.5 million.

General and administrative

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
General and administrative	$35,966	$13,737	$22,229	162%

General and administrative expenses increased by $22.2 million, or 162%, to $36.0 million for the year ended December 31, 2022, from $13.7 million for the year ended December 31, 2021. The increase was primarily driven by an increase of $14.9 million in payroll-related expenses, including an increase in stock-based compensation of $11.0 million, due to increased headcount, and an increase of $3.4 million in director and

officer liability insurance costs. The remaining increase is primarily due to additional transition costs incurred to operate as a public company and other general and administrative activities as a result of hiring additional personnel.

Depreciation and amortization

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Depreciation and amortization	$5,604	$2,548	$3,056	120%

Depreciation and amortization expenses increased by $3.1 million, or 120%, to $5.6 million for the year ended December 31, 2022, from $2.5 million for the year ended December 31, 2021. The increase was primarily driven by an increase of $0.7 million due to amortization of capitalized internally developed software and an increase of $1.3 million in depreciation expense associated with capitalized quantum computing system costs, as well as an increase of $1.0 million in depreciation expenses associated with other property and equipment.

Change in fair value of warrant liabilities

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Change in fair value of warrant liabilities	$30,136	$(63,332)	$93,468	148%

The change in fair value of warrant liabilities increased by $93.5 million, or 148%, to a gain of $30.1 million for the year ended December 31, 2022, from a loss of $63.3 million for the year ended December 31, 2021. The increase was primarily due to mark-to-market income adjustments recorded for the public and private warrants assumed as part of the Business Combination.

Interest income, net

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Interest income, net	$7,093	$64	$7,029	NM

NM-Not meaningful

Interest income, net increased by $7.0 million to $7.1 million for the year ended December 31, 2022, from $0.1 million for the year ended December 31, 2021. The increase was primarily driven by interest income earned on our cash equivalents and available-for-sale investments from the investment of the proceeds from the Business Combination.

Offering costs associated with warrants

	Year Ended December 31,		$	%
	2022	2021	Change	Change
	(in thousands)			
Offering costs associated with warrants	$ —	$(4,259)	$4,259	100%

Offering costs associated with warrants decreased by $4.3 million, or 100%, to zero for the year ended December 31, 2022, from $4.3 million for the year ended December 31, 2021. In connection with the Business Combination, $4.3 million of transaction costs were allocated and expensed related to the liability-classified public and private warrants.

Liquidity and Capital Resources

As of December 31, 2022, we had cash, cash equivalents and available-for-sale securities of $537.8 million. Excluded from our available liquidity is $2.0 million of restricted cash, which is recorded in other noncurrent assets in our consolidated balance sheets. We believe that our cash, cash equivalents and investments as of December 31, 2022, will be sufficient to meet our working capital and capital expenditure needs for the next 12 months. We believe we will meet longer term expected future cash requirements and obligations through a combination of cash flows from operating activities and available funds from our cash, cash equivalents and investment balances. However, this determination is based upon internal projections and is subject to changes in market and business conditions. We have incurred significant losses since our inception and as of December 31, 2022, we had an accumulated deficit of $194.3 million. During the year ended December 31, 2022, we incurred net losses of $48.5 million. We expect to incur significant losses and higher operating expenses for the foreseeable future.

Future Funding Requirements

We expect our principal sources of liquidity will continue to be our cash, cash equivalents and investments and any additional capital we may obtain through additional equity or debt financings. Our future capital requirements will depend on many factors, including investments in growth and technology. We may, in the future, enter into arrangements to acquire or invest in complementary businesses, services, and technologies, which may require us to seek additional equity or debt financing.

Upon the closing of the Business Combination, we received approximately $636.0 million of gross proceeds. The proceeds are invested in money market funds, commercial paper, corporate and municipal notes and bonds, and other U.S. government and agency securities as disclosed in Note 4 in our consolidated financial statements. We expect to use these investments to fund our strategic operations.

Our primary uses of cash and investments are to fund our operations as we continue to grow our business. We require a significant amount of cash for expenditures as we invest in ongoing research and development and commercialization of our products. Until such time as we can generate significant revenue from commercializing our quantum computing technology, if ever, we expect to finance our liquidity needs through our cash, cash equivalents and investments, as well as equity or debt financings or other capital sources, including potential collaborations and other similar arrangements. However, we may be unable to raise additional funds or enter into such other arrangements when needed on favorable terms or at all. Rising interest and inflation rates present a recent challenge impacting the U.S. economy and could make it more difficult for us to obtain traditional financing on acceptable terms, if at all, in the future. To the extent that we raise additional capital through the sale of equity or convertible debt securities, the ownership interest of our stockholders will be or could be diluted, and the terms of these securities may include liquidation or other preferences that adversely affect the rights of our stockholders. Debt financing and equity financing, if available, may involve agreements that include covenants limiting or restricting our ability to take specific actions, such as incurring additional debt, making capital expenditures, or declaring dividends. If we raise funds through collaborations, or other similar arrangements with third parties, we may have to relinquish valuable rights to our quantum computing technology on terms that may not be favorable to us and/or may reduce the value of our common stock. If we are unable to raise additional funds through equity or debt financings when needed, we may be required to delay, limit, reduce or terminate our quantum computing development efforts. Our future capital requirements and the adequacy of available funds will depend on many factors, including those set forth in the section titled “Risk Factors.”

Other than operating expenses and our continued investment in our quantum computers, cash requirements for fiscal year 2023 are expected to consist primarily of capital expenditures for corporate facilities.

Our material cash requirements as of December 31, 2022, include operating lease commitments, including the lease of our headquarters in College Park, Maryland and manufacturing and office space in Bothell, Washington. As of December 31, 2022, we have total operating lease obligations of $16.1 million, with $0.7 million payable within 12 months.

Cash flows

The following table summarizes our cash flows for the period indicated:

	Year Ended December 31,	
	2022	2021
	(in thousands)	
Net cash used in operating activities	$ (44,698)	$ (26,537)
Net cash used in investing activities	(309,056)	(213,785)
Net cash provided by financing activities	1,096	603,227

Cash flows from operating activities

Our cash flows from operating activities are significantly affected by the growth of our business, primarily related to research and development, sales and marketing, and general and administrative activities. Our operating cash flows are also affected by our working capital needs to support growth in personnel-related expenditures and fluctuations in accounts payable and other current assets and liabilities.

Net cash used in operating activities during year ended December 31, 2022, was $44.7 million, resulting primarily from a net loss of $48.5 million, adjusted for non-cash activity, primarily related to the gain recorded as a result of mark-to-market activity for our public warrants offset by stock-based compensation and other working capital activities. The increase in net cash used in operations from the prior year period was primarily related to increased research and development activities, increased compensation costs as a result of hiring personnel and increased costs incurred as a public company.

Net cash used in operating activities during the year ended December 31, 2021, was $26.5 million, resulting primarily from a net loss of $106.2 million, adjusted for non-cash activity, primarily related to the loss recorded as a result of mark-to-market activity for our public and private warrants, stock-based compensation and offering costs associated with warrants, as well as other working capital activities.

Cash flows from investing activities

Net cash used in investing activities during the year ended December 31, 2022, was $309.1 million, primarily resulting from purchases of available-for-sale securities of $605.7 million, additions of $9.3 million to property and equipment primarily related to the development of our quantum computing systems, offset by cash received from sales and maturities of available-for-sale investments of $310.0 million.

Net cash used in investing activities during the year ended December 31, 2021, was $213.8 million, primarily resulting from purchases of available-for-sale securities of $203.8 million, additions of $7.8 million to property and equipment primarily related to the development of our quantum computing systems, $1.6 million of capitalized internal software development costs, and $0.6 million of intangible asset acquisition costs.

Cash flows from financing activities

Net cash provided by financing activities during the year ended December 31, 2022, was $1.1 million, primarily resulting from proceeds from stock options exercised.

Net cash provided by financing activities during the year ended December 31, 2021, was $603.2 million primarily reflecting proceeds received from the Business Combination, including the PIPE investment, as well as cash received from the exercise of warrants and exercise of stock options.

Critical Accounting Estimates

This discussion and analysis of financial condition and results of operations is based upon the Company's consolidated financial statements, which have been prepared in accordance with U.S. GAAP. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities. We also make estimates and assumptions on revenue generated and reported expenses incurred during the reporting periods. Our estimates are based on our historical experience and on various other factors that we believe are reasonable under the circumstances. The results of these estimates form the basis for making judgments about the carrying value of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates. Our critical accounting policies are described in greater detail in Note 2 to our audited consolidated financial statements included in this Annual Report.

Critical accounting estimates are defined as those reflective of significant judgments, estimates and uncertainties, which may result in materially different results under different assumptions and conditions. We have listed below our critical accounting estimates that we believe to have the greatest potential impact on our consolidated financial statements. Historically, our assumptions, judgments and estimates relative to our critical accounting estimates have not differed materially from actual results.

Revenue recognition

We derive revenue from our QCaaS arrangements, consulting services related to co-developing algorithms on our quantum computing systems, and from contracts associated with the design, development, and construction of specialized quantum computing systems together with related services.

We have applied judgment in determining that our QCaaS contracts represent a combined, stand-ready performance obligation to provide access to our quantum computing systems together with related maintenance and support. For arrangements with multiple performance obligations, judgment is used to determine whether multiple services in the contract should be accounted for separately or as a group. Judgment is also applied when determining the relative standalone selling price of each performance obligation, including determining when to apply the residual method, as this is used to allocate the transaction price to each performance obligation within the contract. We determine standalone selling price based on the observable price of a product or service when we sell the products or services separately in similar circumstances and to similar customers. When the standalone selling price is not known, due to it being either highly variable or uncertain, we allocate the transaction price using the residual approach. In addition, we apply judgment in evaluating any consideration payable to the customer and whether it is in exchange for distinct goods or services or should be reflected as a reduction of revenue.

For arrangements where we enter into multiple contracts with a single counterparty at or near the same time, we use judgment in determining whether the contracts should be combined and whether we should account for them as a single contract. We account for them as a single contract when one or more of the following criteria are met: (i) the contracts are negotiated as a package with a single commercial objective; (ii) consideration to be paid in one contract depends on the price or performance of the other contract; and (iii) goods or services promised are a single performance obligation.

Contracts with customers are evaluated at the time of execution and may vary in terms. The amount of revenue recognized in a period may vary with respect to the allocation of arrangement consideration to performance obligations with different revenue recognition patterns and changes to existing contract terms.

Quantum computing systems

Quantum computing systems are included within property and equipment, net on the consolidated balance sheet. Prior to 2019, we built certain quantum computing systems solely for research and development purposes and these quantum computing systems were deemed to have no alternative future use. In 2019, we began to commercialize our quantum computing systems via the offering of QCaaS and quantum computing systems built thereafter were determined to provide a probable future economic benefit. As a result, hardware and labor costs associated with the building of such quantum computing systems were capitalized in the period the costs were incurred. Costs to maintain quantum computing systems are expensed as incurred.

Judgment is used to determine when hardware and labor costs incurred for our quantum computing systems should be capitalized as a result of our assessment of whether the system will provide a probable future economic benefit and whether or not the costs represent activities necessary to build the systems, maintain the systems or to perform certain research and development functions. Judgment is also used to determine when the systems are placed into service and the estimated useful life of the associated systems.

Changes in these estimates can have a significant impact on the assessment of capitalized costs, which could result in material changes to reported property and equipment, net. The amount of depreciation expense associated with the quantum computing systems may also vary based on the estimated useful life.

Capitalized internally developed software

Capitalized internally developed software, which is included in intangible assets, net, on the consolidated balance sheet, consists of costs to purchase and develop internal-use software, which we use to provide services to our customers.

Judgment is used to determine when costs to develop internal-use software for a specific project should be capitalized and whether or not the costs represent activities necessary to enhance the functionality of the software or maintain the performance of the software, and whether it is considered probable that the software will be used to perform the function intended. Judgment is also used to determine when the software is available for use as well as the estimated useful life of the software.

The assumptions used to capitalize internally developed software costs consider when the preliminary project stage is completed, whether the software will perform the function intended, and whether the development activities enhance the functionality of the software or maintain the performance of the software. Changes in these estimates can have a significant impact on the assessment of capitalized costs, which could result in material changes to reported intangible assets, net. The amortization of capitalized internally developed software may also be impacted by the estimated useful life associated with these intangible assets.

Impairment of long-lived assets

Long-lived assets, such as our quantum computing systems and capitalized internally developed software, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable.

As of December 31, 2022, we did not have an impairment of any long-lived assets. In determining whether a potential impairment exists, judgment is used in determining the level at which the assessment is made. We have determined that the company consists of one entity-wide asset group for purposes of assessing whether a triggering event has occurred that would indicate the long-lived asset group’s carrying value is not recoverable. Impairment calculations, if necessary, contain uncertainties because they require management to make assumptions and to apply judgment to estimate future cash flows and asset fair values. Key assumptions used in estimating future cash flows and asset fair values include projected revenue growth and operating expenses, as well as forecasting asset useful lives and selecting an appropriate discount rate with respect to any terminal value cash flows.

Triggering events occur when there are indicators that the carrying value of a long-lived asset may not be recoverable. These indicators may include internal and external economic factors, including significant decrease in market price of our capital stock, adverse market conditions, and an adverse change in the manner of which the asset is used. The assumptions used to assess impairment consider historical trends, macroeconomic conditions, and projections consistent with our operating strategy including the pace of technological change or specific technological challenges in building our quantum computing systems. Changes in these estimates can have a significant impact on the assessment of fair value, which could result in material impairment losses.

Emerging Growth Company Status and Smaller Reporting Company Status

Section 102(b)(1) of the JOBS Act exempts emerging growth companies from being required to comply with new or revised financial accounting standards until private companies are required to comply with the new or revised financial accounting standards. The JOBS Act provides that a company can choose not to take advantage of the extended transition period and comply with the requirements that apply to non-emerging growth companies, and any such election to not take advantage of the extended transition period is irrevocable. During the extended transition period, it may be difficult or impossible to compare our financial results with the financial results of another public company that complies with public company effective dates for accounting standard updates because of the potential differences in accounting standards used.

We will remain an emerging growth company under the JOBS Act until the earliest of (a) December 31, 2025, (b) the last date of the fiscal year in which we have total annual gross revenue of at least $1.235 billion, (c) the last day of the fiscal year in which we are deemed to be a "large accelerated filer" under the rules of the SEC, which means the market value of our common stock that is held by non-affiliates exceeds $700.0 million as of the prior June 30th or (d) the date on which we have issued more than $1.0 billion in non-convertible debt securities during the previous three-year period.

We are also a smaller reporting company as defined in the Exchange Act. We may continue to be a smaller reporting company even after we are no longer an emerging growth company. We may take advantage of certain of the scaled disclosures available to smaller reporting companies and will be able to take advantage of these scaled disclosures for so long as (i) our voting and non-voting common stock held by non-affiliates is less than $250.0 million measured on the last business day of our second fiscal quarter or (ii) our annual revenue is less than $100.0 million during the most recently completed fiscal year and our voting and non-voting common stock held by non-affiliates is less than $700.0 million measured on the last business day of our second fiscal quarter.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

Interest Rate Risk

We had cash, cash equivalents and available-for-sale securities of $537.8 million as of December 31, 2022. We hold our cash and cash equivalents for working capital purposes. Our cash and cash equivalents are held in cash deposits and money market funds. Our investments are held in commercial paper, corporate notes and bonds, municipal bonds, and U.S. government and agency securities. The primary objective of our investment activities is to preserve principal while at the same time maximizing yields without significantly increased risk. To achieve this object, we invest in highly liquid securities depending on our strategic cash needs. Due to the nature of these instruments, we believe that we do not have any material exposure to changes in the fair value due to changes in interest rates. Declines in interest rates, however, would reduce our future interest income. Further, in the event of a change of such magnitude, we would consider taking actions to further mitigate our exposure to the change.

Concentration of Credit Risk

We deposit our cash, restricted cash, cash equivalents and investments with financial institutions, and, at times, such balances may exceed federally insured limits. While the company has not experienced any losses in such accounts, the recent failure of Silicon Valley Bank ("SVB"), at which we held cash and cash equivalents in

multiple accounts, exposed us to limited credit risk prior to the completion by the Federal Deposit Insurance Corporation of the resolution of SVB in a manner that fully protected all depositors. We are in the process of transferring our accounts to one or more additional depository institutions.

Item 8. Financial Statements and Supplementary Data.

The financial statements, together with the report of our independent registered public accounting firm, required by this item are set forth beginning on page F-1 of this Annual Report.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

We maintain "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act that are designed to ensure that information required to be disclosed in the reports that we file or submit under the Exchange Act is (1) recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms and (2) accumulated and communicated to our management, including our principal executive officer and principal financial officer, to allow timely decisions regarding required disclosure. Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures.

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act), as of the end of the period covered by this Annual Report. Based on such evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that as of December 31, 2022, our disclosure controls and procedures were effective in providing reasonable assurance that information required to be disclosed in our reports filed under the Exchange Act was recorded, processed, summarized and reported within the time periods prescribed by SEC rules and regulations, and that such information was accumulated and communicated to our management to allow timely decisions regarding required disclosure. Accordingly, we believe that the consolidated financial statements included in this Annual Report do fairly present, in all material respects, our financial position, results of operations and cash flows for the periods presented.

Management's Annual Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting for the Company. We conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework in *Internal Control—Integrated Framework* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in 2013. This evaluation included review of the documentation of controls, evaluation of the design effectiveness of controls, testing of the operating effectiveness of controls and a conclusion on this evaluation. Based on our evaluation, we have concluded that our internal control over financial reporting was effective as of December 31, 2022.

Remediation of Previously Identified Material Weakness

As previously disclosed in Item 9A of our Annual Report on Form 10-K for the year ended December 31, 2021, management concluded that there was a material weakness in our internal control over financial reporting

specifically related to our financial statement close process. In response to the material weakness identified, management developed and implemented a remediation plan to address the underlying causes of the material weakness, which was subject to senior management review and oversight of the audit committee of the Board (the "Audit Committee").

The remediation plan included:

- hiring additional full-time accounting personnel with appropriate levels of experience, and augmenting skills gaps with external experts;
- establishing and implementing policies surrounding the approval of transactions, related to, but not limited to, account reconciliations and journal entries; and
- implementing a financial accounting system that supports effective information technology general controls, as well as the anticipated growth of the business.

Implementation of the remediation plan described above and the resulting improvements in controls have strengthened our internal control over financial reporting and have addressed the related material weakness that was identified as of December 31, 2021. As part of our assessment of internal control over financial reporting, management tested and evaluated all internal controls to assess whether they were designed and operating effectively as of December 31, 2022. Management determined that its internal controls over financial reporting were designed and operating effectively to prevent and detect a material misstatement due to error or fraud and therefore concluded that the material weakness was remediated.

Attestation Report of the Registered Public Accounting Firm

This Annual Report does not include an attestation report of our registered public accounting firm due to an exemption for "emerging growth companies."

Changes in Internal Control over Financial Reporting

Except as described above under "Remediation of Previously Identified Material Weakness," there were no changes in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) and 15d-15(d) of the Exchange Act that occurred during the three months ended December 31, 2022, that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Item 9B. Other Information.

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections.

Not applicable.

PART III

Certain information required by Part III is omitted from this report because we will file with the SEC a definitive proxy statement pursuant to Regulation 14A (the "2023 Proxy Statement"), no later than 120 days after the end of our fiscal year, and certain information included therein is incorporated herein by reference.

Item 10. Directors, Executive Officers and Corporate Governance.

Information About Our Directors

Information regarding directors required by this item will be contained in our 2023 Proxy Statement under the caption "Information Regarding Director Nominees and Current Directors," and is hereby incorporated by reference.

Information About Our Executive Officers

The following table sets forth information regarding our executive officers who are not listed above as members of our Board as of March 15, 2023:

Name	Age	Position
Peter Chapman	62	President & Chief Executive Officer and Director
Jungsang Kim	53	Chief Technology Officer and Director
Christopher Monroe	57	Chief Scientist
Thomas Kramer	52	Chief Financial Officer
Rima Alameddine	57	Chief Revenue Officer
Laurie Babinski	41	General Counsel and Secretary

Peter Chapman has served as a member of our Board and president and chief executive officer since the closing of the Business Combination in September 2021. Mr. Chapman previously served as Legacy IonQ's president and chief executive officer and a member of its board of directors since May 2019. From September 2014 to May 2019, Mr. Chapman served as a director of engineering for Amazon Prime at Amazon.com, Inc. prior to joining IonQ. Before that, Mr. Chapman was the president at Media Arc, Inc. We believe Mr. Chapman is well qualified to serve as a member of our Board because of his prior leadership and officer positions at technology and software companies.

Jungsang Kim has served as a member of our Board and chief strategy officer since the closing of the Business Combination in September 2021. Dr. Kim is the co-founder of Legacy IonQ and served as its chief technology officer and a member of its board of directors since September 2015. Dr. Kim assumed the role of chief technology officer in May 2020. Dr. Kim has served as assistant/associate/full professor in the Department of Electrical and Computer Engineering, Department of Physics and Department of Computer Science at Duke University since June 2004. From August 2006 to February 2020, Dr. Kim was also the founder and president and chief executive officer of Applied Quantum Technologies, Inc. Dr. Kim received a B.S. in physics from Seoul National University and a Ph.D. in physics from Stanford University. We believe Dr. Kim is well qualified to serve as a member of our Board because of his extensive research in electrical and computer engineering and quantum mechanics.

Christopher Monroe has served as our chief scientist since the closing of the Business Combination in September 2021. Dr. Monroe is the co-founder of Legacy IonQ and served as its chief scientist since September 2016. From August 2018 until May 2019, Dr. Monroe served as IonQ's chief executive officer. Dr. Monroe has served as a Professor of Electrical Computer Engineering and Physics at Duke University since January 2021. Dr. Monroe held various positions at the University of Maryland, including from January 2021 to present as a College Park Professor, from 2015 to December 2020 as a Distinguished University Professor of Physics, from

September 2018 to December 2020 as a Professor of Electrical and Computer Engineering, and from September 2007 to December 2020 as a Bice Zorn Professor of Physics. From 2014 to December 2020, Dr. Monroe was a Fellow at the Center for Quantum Information and Computer Science and from 2007 to December 2020, Dr. Monroe was a Fellow at the Joint Quantum Institute. Dr. Monroe also held various academic and research positions at the University of Michigan, Ann Arbor, University of Colorado, Boulder, and the National Institute of Standards and Technology. Dr. Monroe serves on advisory boards at several academic institutions, including the Max Planck Institute of Quantum Optics and the Center for Quantum Technology, National University of Singapore. Dr. Monroe received an S.B. in physics from Massachusetts Institute of Technology and a Ph.D. in physics from the University of Colorado, Boulder.

Thomas Kramer has served as our chief financial officer since the closing of the Business Combination in September 2021, and as our secretary from September 2021 to March 2022. Mr. Kramer served as Legacy IonQ's chief financial officer since February 2021. From February 2017 to February 2021, Mr. Kramer served as managing director of Remarque Advisory. From November 2011 to October 2016, Mr. Kramer also served as chief financial officer of Opower, Inc., a cloud-based enterprise software company in the utilities space. From 2000 to 2011, Mr. Kramer served as chief financial officer of Cvent, Inc., a cloud-based enterprise software company in the event-management space. From 1998 to 2000, Mr. Kramer served as a consultant at the Boston Consulting Group. Mr. Kramer holds an M.B.A. from Harvard Business School and an M.S. in economics from the Norwegian School of Economics.

Rima Alameddine has served as our chief revenue officer since December 2022. Previously, Ms. Alameddine served as the Vice President, Enterprise Sales, Healthcare, Life Science and Manufacturing, Americas, of NVIDIA Corporation, a publicly listed company, from November 2018 to December 2022. From July 2016 to October 2018, Ms. Alameddine served as the Vice President, Enterprise Sales, East and Central United States, of NVIDIA. Prior to this, between September 1998 and July 2016, Ms. Alameddine served in various roles at Cisco Systems, Inc., a publicly listed company, including Director, Enterprise Sales, New York from August 2012 to 2016 and Director, Enterprise Sales, Financial Services, from November 2010 to July 2012. Ms. Alameddine holds an M.S. in computer engineering and a B.S. in computer and communications engineering from Syracuse University and the American University of Beirut, respectively.

Laurie Babinski has served as our general counsel and secretary since March 2022. From December 2019 to March 2022, Ms. Babinski served as deputy general counsel at Credit Karma, LLC, a multinational personal finance company, where she also served in various roles from August 2015 to December 2019, including as the lead of numerous legal functions such as product, marketing, regulatory, privacy, litigation, employment and government relations in the United States, Canada and the United Kingdom. Prior to that, Ms. Babinski worked at the law firm Baker Hostetler LLP practicing in the Media, Technology and Intellectual Property group. Ms. Babinski received a J.D. from Northwestern University Pritzker School of Law and holds a B.A. in Journalism and Spanish from Pepperdine University.

Identification of Audit Committee and Financial Experts

Information regarding our Audit Committee required by this item will be contained in our 2023 Proxy Statement under the caption "Information Regarding the Board of Directors and Corporate Governance," and is hereby incorporated by reference.

Material Changes to Procedures for Recommending Directors

Information regarding procedures for recommending directors required by this item will be contained in our 2023 Proxy Statement under the caption "Information Regarding the Board of Directors and Corporate Governance," and is hereby incorporated by reference.

Code of Business Conduct and Ethics

Information regarding our Code of Business Conduct and Ethics (the "Code of Conduct"), required by this item will be contained in our 2023 Proxy Statement under the caption "Information Regarding the Board of Directors and Corporate Governance—Code of Conduct and Ethics," and is hereby incorporated by reference. The full text of our Code of Conduct is available at the investors section of our website at *www.ionq.com.* The reference to our website address does not constitute incorporation by reference of the information contained at or available through our website, and you should not consider it to be a part of this Annual Report.

Delinquent Section 16(a) Reports

Information regarding compliance with Section 16(a) of the Exchange Act required by this item will be contained in our 2023 Proxy Statement under the caption "Delinquent Section 16(a) Reports," if any, and is hereby incorporated by reference.

Item 11. Executive Compensation.

Information regarding our executive compensation required by this item will be contained in our 2023 Proxy Statement under the captions "Executive Compensation," "Director Compensation" and "Information Regarding the Board of Directors and Corporate Governance—Information Regarding Committees of the Board of Directors—Compensation Committee—Compensation Committee Interlocks and Insider Participation," and is hereby incorporated by reference.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters.

Ownership of Securities

Information regarding ownership of our securities required by this item will be contained in our 2023 Proxy Statement under the caption "Security Ownership of Certain Beneficial Owners and Management," and is hereby incorporated by reference.

Equity Compensation Plan Information

Information regarding our equity compensation plans required by this item will be contained in our 2023 Proxy Statement under the caption "Equity Compensation Plan Information," and is hereby incorporated by reference.

Item 13. Certain Relationships and Related Transactions, and Director Independence.

Information regarding related transactions and director independence required by this item will be contained in our 2023 Proxy Statement under the captions "Transactions with Related Persons" and "Information Regarding the Board of Directors and Corporate Governance—Independence of Our Board of Directors," and is hereby incorporated by reference.

Item 14. Principal Accountant Fees and Services.

Information regarding accounting fees and services required by this item will be contained in our 2023 Proxy Statement in Proposal 2 under the captions "Principal Accountant Fees and Services" and "Pre-Approval Policies and Procedures" and is hereby incorporated by reference.

PART IV

Item 15. Exhibit and Financial Statement Schedules.

The financial statements schedules and exhibits filed as part of this Annual Report are as follows:

(a)(1) Financial Statements

(a)(2) Financial Statement Schedules

All other financial statement schedules are omitted because they are not required or the required information is included in the financial statements or notes thereto.

(a)(3) Exhibits

The exhibits required to be filed as part of this Annual Report on Form 10-K are listed in the Exhibit List attached hereto and are incorporated herein by reference.

Exhibit Number	Description
2.1^	Agreement and Plan of Merger, dated as of March 7, 2021, by and among dMY Technology Group, Inc. III, IonQ, Inc. and IonQ Trap Acquisition Inc. (incorporated herein by reference to Exhibit 2.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
3.1	Second Amended and Restated Certificate of Incorporation of the Company (incorporated herein by reference to Exhibit 3.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
3.2	Amended and Restated Bylaws of the Company (incorporated herein by reference to Exhibit 3.2 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
4.1	Specimen Common Stock Certificate (incorporated herein by reference to Exhibit 4.4 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on August 11, 2021).
4.2	Warrant Agreement, dated November 12, 2020, between Continental Stock Transfer & Trust Company and IonQ, Inc. (incorporated herein by reference to Exhibit 4.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on November 17, 2020).
4.3	Description of the Registrant's Securities (incorporated herein by reference to Exhibit 4.3 to the Company's Annual Report on Form 10-K (File No. 001-39694), filed with the SEC on March 28, 2022).
10.1	Amended and Restated Registration Rights Agreement, dated September 30, 2021, between and among the investors party thereto and IonQ, Inc. (incorporated herein by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).

Exhibit Number	Description
10.2	Form of Subscription Agreement (incorporated herein by reference to Exhibit 10.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.3	Hyundai Subscription Agreement (incorporated herein by reference to Exhibit 10.2 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.4	Kia Subscription Agreement (incorporated herein by reference to Exhibit 10.3 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.5	MSD Subscription Agreement (incorporated herein by reference to Exhibit 10.4 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.6	Silver Lake Subscription Agreement (incorporated herein by reference to Exhibit 10.5 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.7	BVE Subscription Agreement (incorporated herein by reference to Exhibit 10.6 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.8	Form of Venture Capital / Other Investors Subscription Agreement (incorporated herein by reference to Exhibit 10.7 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on March 8, 2021).
10.9+	IonQ, Inc. Change in Control Severance Plan and Summary Plan Description (incorporated herein by reference to Exhibit 10.36 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on August 5, 2021).
10.10+	Form of Indemnification Agreement of IonQ, Inc. (incorporated herein by reference to Exhibit 10.13 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
10.11+	2015 Equity Incentive Plan (incorporated herein by reference to Exhibit 10.14 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
10.12+	Forms of Stock Option Grant Notice and Option Agreement under 2015 Equity Incentive Plan (incorporated herein by reference to Exhibit 10.15 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
10.13+	2021 Equity Incentive Plan (incorporated herein by reference to Exhibit 10.16 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
10.14+	Forms of Option Grant Notice and Option Agreement under 2021 Equity Incentive Plan.
10.15+	Form of Restricted Stock Unit Grant Notice and Unit Award Agreement under 2021 Equity Incentive Plan (incorporated herein by reference to Exhibit 10.1 to the Company's Quarterly Report on Form 10-Q (File No. 001-39694), filed with the SEC on August 15, 2022).
10.16+	2021 Employee Stock Purchase Plan (incorporated herein by reference to Exhibit 10.19 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021).
10.17	Amended and Restated Office Lease, by and between University of Maryland – College Park and IonQ, Inc. (incorporated herein by reference to Exhibit 10.20 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the SEC on October 4, 2021)

Exhibit Number	Description
10.18	Warrant to Purchase Shares, dated November 27, 2019, issued to Amazon.com NV Investment Holdings LLC by IonQ, Inc. (incorporated herein by reference to Exhibit 10.33 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on July 16, 2021).
10.19	License Agreement, dated July 19, 2016, among the University of Maryland, Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.20 to the (incorporated herein by reference to Exhibit 10.20 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.20	Amendment No. 1 to Exclusive License Agreement, dated September 22, 2017, between Duke University and the Registrant (incorporated herein by reference to Exhibit 10.21 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.21†	Amendment No. 1 to Exclusive License Agreement, dated October 11, 2017, between the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.22 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.22†	Amendment No. 2 to Exclusive License Agreement, dated October 4, 2018, between Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.23 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.23†	Amendment No. 2 to Exclusive License Agreement, dated October 9, 2018, between the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.24 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.24†	Amendment No. 3 to Exclusive License Agreement, dated April 27, 2021, between Duke University, the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.25 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.25†	Amendment No. 3 to Exclusive License Agreement, dated February 1, 2021, between the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.2 to the Company's Quarterly Report on Form 10-Q (File No. 001-39694), filed with the SEC on May 16, 2022).
10.26†	Amendment No. 4 to Exclusive License Agreement, dated April 27, 2021, between Duke University, the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.26 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.27†	Amendment No. 4 to Exclusive License Agreement, dated February 1, 2021, between the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.3 to the Company's Quarterly Report on Form 10-Q (File No. 001-39694), filed with the SEC on May 16, 2022).
10.28†	Amendment No. 5 to Exclusive License Agreement, dated September 10, 2021, between Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.29 to the Company's Annual Report on Form 10-K (File No. 001-39694), filed with the SEC on March 28, 2022).
10.29†	Amendment No. 5 to Exclusive License Agreement, dated September 24, 2021, between the University of Maryland and IonQ, Inc. (incorporated herein by reference to Exhibit 10.30 to the Company's Annual Report on Form 10-K (File No. 001-39694), filed with the SEC on March 28, 2022).
10.30†	Amendment No. 6 to Exclusive License Agreement, dated January 23, 2023, between Duke University and IonQ, Inc.
10.31†	Exclusive Option Agreement, dated July 15, 2016, between Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.27 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).

Exhibit Number	Description
10.32†	First Amendment to Option Agreement, dated December 18, 2020, between Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.28 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.33	Second Amendment to Option Agreement, dated March 19, 2021, between Duke University and IonQ, Inc. (incorporated herein by reference to Exhibit 10.29 to the Company's Registration Statement on Form S-4/A (File No. 333-254840), filed with the SEC on June 17, 2021).
10.34	Non-Employee Director Compensation Policy (incorporated herein by reference to Exhibit 10.34 to the Company's Annual Report on Form 10-K (File No. 001-39694), filed with the SEC on March 28, 2022).
21.1	List of Subsidiaries of Company (incorporated herein by reference to Exhibit 21.1 to the Company's Current Report on Form 8-K (File No. 001-39694), filed with the Commission on October 4, 2021).
23.1	Consent of Ernst & Young LLP, an Independent Registered Public Accounting Firm.
24.1	Power of Attorney (included on the signature page to this report).
31.1	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Principal Executive Officer and Principal Financial Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	Inline XBRL Instance Document—the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL Document.
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted as inline XBRL with applicable taxonomy extension information contained in Exhibit 101).

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* Furnished herewith and not deemed to be "filed" for purposes of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act (whether made before or after the date of the Form10-K),irrespective of any general incorporation language contained in such filing.

\+ Indicates a management contract or compensatory plan.

† Certain of the exhibits and schedules to this Exhibit have been omitted in accordance with Regulation S-K Item 601(b)(10)(iv). The Registrant agrees to furnish a copy of all omitted exhibits and schedules to the SEC upon its request.

^ Certain of the exhibits and schedules to this exhibit have been omitted in accordance with Regulation S-K Item 601(1)(5). The Registrant agrees to furnish a copy of all omitted exhibits and schedules to the SEC upon its request.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this report on Form 10-K to be signed on its behalf by the undersigned, thereunto duly authorized.

IonQ, Inc.

March 30, 2023

BY: /s/ Peter Chapman

Peter Chapman
President and Chief Executive Officer
(*Principal Executive Officer*)

POWER OF ATTORNEY

Each person whose individual signature appears below hereby authorizes and appoints Peter Chapman and Thomas Kramer, and each of them, with full power of substitution and resubstitution and full power to act without the other, as his or her true and lawful attorney-in-fact and agent to act in his or her name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this Annual Report on Form 10-K has been signed below by the following persons on behalf of the Registrant in the capacities and on the dates indicated.

Name	Title	Date
/s/ Peter Chapman Peter Chapman	President and Chief Executive Officer and Director (Principal Executive Officer)	March 30, 2023
/s/ Thomas Kramer Thomas Kramer	Chief Financial Officer (Principal Financial and Accounting Officer)	March 30, 2023
/s/ Craig Barratt Craig Barratt	Chair of the Board of Directors	March 30, 2023
/s/ Ronald Bernal Ronald Bernal	Director	March 30, 2023
/s/ Kathryn Chou Kathryn Chou	Director	March 30, 2023
/s/ Niccolo de Masi Niccolo de Masi	Director	March 30, 2023
/s/ Jungsang Kim Jungsang Kim	Co-Founder, Chief Technology Officer and Director	March 30, 2023

/s/ Inder M. Singh Inder M. Singh	Director	March 30, 2023
/s/ Wendy Thomas Wendy Thomas	Director	March 30, 2023
/s/ Harry You Harry You	Director	March 30, 2023

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Registered Public Accounting Firm

To the Stockholders and the Board of Directors of IonQ, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of IonQ, Inc. and subsidiaries (the Company) as of December 31, 2022 and 2021, the related consolidated statements of operations, comprehensive loss, changes in stockholders' equity and cash flows for the years then ended, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of the Company at December 31, 2022 and 2021, and the results of its operations and its cash flows for the years then ended, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ Ernst & Young LLP

We have served as the Company's auditor since 2020.

Tysons, Virginia

March 30, 2023

IONQ, INC.
Consolidated Balance Sheets
(in thousands, except share and per share data)

	As of December 31,	
	2022	**2021**
Assets		
Current assets:		
Cash and cash equivalents	$ 44,367	$ 399,025
Short-term investments	311,430	123,443
Accounts receivable	3,292	707
Prepaid expenses and other current assets	12,539	6,442
Total current assets	371,628	529,617
Long-term investments	182,001	80,110
Property and equipment, net	26,014	18,870
Operating lease right-of-use assets	3,753	4,032
Intangible assets, net	8,944	5,841
Goodwill	742	—
Other noncurrent assets	4,910	3,558
Total Assets	**$ 597,992**	**$ 642,028**
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 3,055	$ 1,882
Accrued expenses	6,655	2,647
Current portion of operating lease liabilities	591	568
Unearned revenue	8,729	3,430
Current portion of stock option early exercise liabilities	1,130	1,164
Total current liabilities	20,160	9,691
Operating lease liabilities, net of current portion	3,459	3,643
Unearned revenue, net of current portion	1,201	1,533
Stock option early exercise liabilities, net of current portion	839	1,969
Warrant liabilities	3,819	33,962
Other noncurrent liabilities	303	—
Total liabilities	$ 29,781	$ 50,798
Commitments and contingencies (see Note 10)		
Stockholders' Equity:		
Common stock $0.0001 par value; 1,000,000,000 shares authorized; 199,862,123 and 195,630,975 shares issued and outstanding as of December 31, 2022 and December 31, 2021, respectively	20	19
Additional paid-in capital	769,848	737,150
Accumulated deficit	(194,302)	(145,791)
Accumulated other comprehensive loss	(7,355)	(148)
Total stockholders' equity	568,211	591,230
Total Liabilities and Stockholders' Equity	**$ 597,992**	**$ 642,028**

The accompanying notes are an integral part of these consolidated financial statements.

IONQ, INC.
Consolidated Statements of Operations
(in thousands, except share and per share data)

	Year Ended December 31,	
	2022	**2021**
Revenue	$ 11,131	$ 2,099
Costs and expenses:		
Cost of revenue (excluding depreciation and amortization)	2,944	1,040
Research and development	43,978	20,228
Sales and marketing	8,385	3,233
General and administrative	35,966	13,737
Depreciation and amortization	5,604	2,548
Total operating costs and expenses	**96,877**	**40,786**
Loss from operations	**(85,746)**	**(38,687)**
Change in fair value of warrant liabilities	30,136	(63,332)
Interest income, net	7,093	64
Offering costs associated with warrants	—	(4,259)
Other income (expense), net	6	28
Loss before benefit for income taxes	**(48,511)**	**(106,186)**
Benefit for income taxes	—	—
Net loss	**$ (48,511)**	**$ (106,186)**
Net loss per share attributable to common stockholders—basic and diluted	$ (0.25)	$ (0.77)
Weighted average shares used in computing net loss per share attributable to common stockholders—basic and diluted	197,727,642	137,609,620

The accompanying notes are an integral part of these consolidated financial statements.

IONQ, INC.
Consolidated Statements of Comprehensive Loss
(in thousands)

	Year Ended December 31,	
	2022	**2021**
Net loss	$(48,511)	$(106,186)
Other comprehensive loss, net of reclassification adjustments:		
Change in unrealized loss on available-for-sale securities, net	(7,207)	(148)
Total other comprehensive loss	(7,207)	(148)
Total comprehensive loss	**$(55,718)**	**$(106,334)**

The accompanying notes are an integral part of these consolidated financial statements.

IONQ, INC.
Consolidated Statements of Changes in Stockholders' Equity
(in thousands, except share data)

	Stockholders' Equity					
	Common Stock		Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders Equity'
	Shares	Amount				
Balance, December 31, 2020	**118,146,795**	**$ 3**	**$ 93,305**	**$ (39,605)**	**$ —**	**$ 53,703**
Net loss	—	—	—	(106,186)	—	(106,186)
Other comprehensive loss	—	—	—	—	(148)	(148)
Equity instruments issued in consideration for intellectual property and research and development arrangements	385,797	—	2,381	—	—	2,381
Stock options exercised	1,044,199	—	288	—	—	288
Vesting of restricted common stock	1,259,074	—	1,068	—	—	1,068
Merger and PIPE transaction, net of transaction costs	70,300,768	16	526,296	—	—	526,312
Stock-based compensation	—	—	8,023	—	—	8,023
Warrants exercised	4,494,342	—	105,789	—	—	105,789
Balance, December 31, 2021	**195,630,975**	**$ 19**	**$737,150**	**$(145,791)**	**$ (148)**	**$ 591,230**
Net loss	—	—	—	(48,511)	—	(48,511)
Other comprehensive loss	—	—	—	—	(7,207)	(7,207)
Stock options exercised	2,239,490	1	1,058	—	—	1,059
Vesting of restricted common stock	515,534	—	1,162	—	—	1,162
Issuance of common stock from the settlement of restricted stock units	1,474,592	—	473	—	—	473
Stock-based compensation	—	—	29,980	—	—	29,980
Warrants exercised	1,532	—	25	—	—	25
Balance, December 31, 2022	**199,862,123**	**$ 20**	**$769,848**	**$(194,302)**	**$(7,355)**	**$ 568,211**

The accompanying notes are an integral part of these consolidated financial statements.

IONQ, INC.
Consolidated Statements of Cash Flows
(in thousands)

	Year Ended December 31,	
	2022	**2021**
Cash flows from operating activities:		
Net loss	$ (48,511)	$(106,186)
Adjustments to reconcile net loss to net cash used in operating activities:		
Depreciation and amortization	5,604	2,548
Non-cash research and development arrangements	520	1,335
Amortization of customer warrant	—	528
Offering costs associated with warrants	—	4,259
Stock-based compensation	31,456	7,748
Change in fair value of warrant liabilities	(30,136)	63,332
Other, net	(1,136)	101
Changes in operating assets and liabilities:		
Accounts receivable	(1,510)	(317)
Prepaid expenses and other current assets	(7,012)	(3,790)
Accounts payable	1,060	763
Accrued expenses	1,344	1,259
Unearned revenue	3,892	3,605
Other assets and liabilities	(269)	(1,722)
Net cash used in operating activities	(44,698)	(26,537)
Cash flows from investing activities:		
Purchases of property and equipment	(9,336)	(7,783)
Capitalized software development costs	(2,179)	(1,621)
Intangible asset acquisition costs	(1,049)	(620)
Purchases of available-for-sale securities	(605,689)	(203,761)
Maturities and sales of available-for-sale securities	310,045	—
Business acquired	(848)	—
Net cash used in investing activities	(309,056)	(213,785)
Cash flows from financing activities:		
Proceeds from stock options exercised	1,059	5,457
Tax withholding receipts related to vested and released restricted stock units	2,001	—
Tax withholding payments related to vested and released restricted stock units	(1,981)	—
Proceeds from public warrants exercised	17	26,070
Repurchase of early exercised stock options	—	(968)
Proceeds from merger and PIPE transactions, net of transaction costs	—	572,668
Net cash provided by financing activities	1,096	603,227
Net change in cash, cash equivalents and restricted cash	(352,658)	362,905
Cash, cash equivalents and restricted cash at the beginning of the period	399,025	36,120
Cash, cash equivalents and restricted cash at the end of the period	$ 46,367	$ 399,025
Supplemental disclosures of non-cash investing and financing transactions:		
Issuance of common stock for intellectual property	$ —	$ 1,567
Issuance of common stock for research and development arrangement	—	814
Property and equipment purchases in accounts payable and accrued expenses	485	553
Intangible asset purchases in accounts payable and accrued expenses	164	83
Noncash reclassification of warrant liabilities to equity upon exercise	8	79,719
Bonus settled in restricted stock units	473	—

The accompanying notes are an integral part of these consolidated financial statements.

1. DESCRIPTION OF BUSINESS

IonQ, Inc. ("IonQ" or "the Company"), formerly known as dMY Technology Group, Inc. III ("dMY"), was incorporated in the state of Delaware in September 2020 and formed as a special purpose acquisition company for the purpose of effecting a merger, capital stock exchange, asset acquisition, stock purchase, reorganization, or similar business combination with one or more businesses. IonQ Quantum, Inc. (formerly known as IonQ, Inc., and referred to as "Legacy IonQ" herein), was incorporated in the state of Delaware in September 2015 and is headquartered in College Park, Maryland.

On March 7, 2021, Legacy IonQ entered into an Agreement and Plan of Merger (the "Merger Agreement") with dMY and Ion Trap Acquisition Inc. ("Merger Sub"), a direct, wholly owned subsidiary of dMY. Pursuant to the Merger Agreement, on September 30, 2021 ("the Closing Date"), the Merger Sub was merged with and into Legacy IonQ with Legacy IonQ continuing as the surviving corporation following the Merger, becoming a wholly owned subsidiary of dMY and the separate corporate existence of the Merger Sub ceased (the "Business Combination"). Commensurate with the Business Combination, dMY changed its name to IonQ, Inc. and Legacy IonQ changed its name to IonQ Quantum, Inc.

Unless otherwise indicated, references in this Annual Report on Form 10-K to the "Company" and "IonQ" refer to the consolidated operations of IonQ, Inc. and IonQ Quantum, Inc subsequent to the Business Combination. References to "dMY" refer to the company prior to the consummation of the Business Combination and references to "Legacy IonQ" refer to IonQ, Inc. prior to the consummation of the Business Combination.

IonQ is engaged in quantum computing and develops general-purpose quantum computing systems designed to solve some of the world's most complex problems, and transform business, society, and the planet for the better. To operate the quantum computing systems, the Company has developed custom hardware, custom firmware, and an operating system to orchestrate the quantum computers.

Business Combination

While the legal acquirer in the Merger Agreement is dMY, for financial accounting and reporting purposes under accounting principles generally accepted in the United States of America ("U.S. GAAP"), Legacy IonQ is the accounting acquirer and the merger is accounted for as a "reverse recapitalization" (i.e., a capital transaction involving the issuance of stock by dMY for the stock of Legacy IonQ).

For accounting purposes, the Business Combination was treated as the equivalent of Legacy IonQ issuing stock for the net assets of dMY, accompanied by a recapitalization. The net assets of dMY are stated at historical cost, and no goodwill or other intangible assets were recorded. Because Legacy IonQ was deemed the accounting acquirer in the Business Combination, the historical financial statements of Legacy IonQ are the historical financial statements of the Company upon the consummation of the Business Combination. As a result, the consolidated financial statements included in this report reflect: (i) the historical operating results of Legacy IonQ prior to the Business Combination; (ii) the combined results of dMY and Legacy IonQ following the close of the Business Combination on September 30, 2021; and (iii) the assets and liabilities of Legacy IonQ stated at their historical cost.

In accordance with guidance applicable to these circumstances, the equity structure has been retroactively restated in all comparative periods to reflect the number of shares of the Company's common stock, $0.0001 par value per share, issued to Legacy IonQ's stockholders in connection with the Business Combination. As such, the shares and corresponding capital amounts and earnings per share related to Legacy IonQ convertible redeemable preferred stock and warrants and Legacy IonQ common stock prior to the Business Combination have been

retroactively restated as shares reflecting the exchange ratio established in the Business Combination. Legacy IonQ's convertible redeemable preferred stock and warrants previously classified as mezzanine equity were retroactively adjusted, converted into common stock, and reclassified to permanent equity because of the reverse recapitalization. All exercise prices for stock options and customer warrants have similarly been retroactively restated to reflect the exchange ratio established in the Business Combination.

At the Closing Date, the consummation of the Merger provided approximately $636.0 million of gross proceeds, including $345.0 million from the PIPE investment in common stock at $10.00 per share. In connection with the Business Combination, Legacy IonQ and dMY incurred direct and incremental costs of approximately $52.0 million related to the equity issuance, consisting primarily of banking, legal, accounting, and other professional fees, which were recorded to additional paid-in capital as a reduction of proceeds. Additionally, approximately $4.3 million in offering costs were allocated to liability-classified warrants assumed in the Merger and expensed upon the close of the Business Combination.

Concurrently with the execution of the Merger Agreement, certain former dMY stockholders entered into a sponsor support agreement. Under the sponsor support agreement, and effective upon the consummation of the Business Combination, 10% of the dMY Class B common stock (or 750,000 shares), which were converted into shares of common stock at the consummation of the Business Combination, were unvested and subject to certain vesting and forfeiture provisions (the "Vesting Shares").

The Vesting Shares are accounted for as equity classified instruments and were included as merger consideration as part of the reverse recapitalization and recorded in additional paid-in capital. As of December 31, 2021, all of the Vesting Shares had vested and were released from any restrictions.

Segment Reporting

The Company operates as one operating segment as its chief executive officer, who is the chief operating decision maker, reviews financial information on a consolidated basis for purposes of making operating decisions, allocating resources, and evaluating financial performance.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Preparation

The accompanying consolidated financial statements have been prepared in accordance with U.S. GAAP as determined by the Financial Accounting Standards Board ("FASB"). Such consolidated financial statements include the accounts of IonQ and its wholly owned subsidiaries. All intercompany transactions and balances have been eliminated in consolidation.

Emerging Growth Company

The Company is an emerging growth company, as defined in the Jumpstart Our Business Startups Act of 2012 (the "JOBS Act"). Under the JOBS Act, emerging growth companies can delay adopting new or revised accounting standards issued subsequent to the enactment of the JOBS Act, until such time as those standards apply to private companies.

The Company has elected to use this extended transition period for complying with new or revised accounting standards that have different effective dates for public and private companies until the earlier of the date that it is (i) no longer an emerging growth company or (ii) affirmatively and irrevocably opt out of the extended transition period provided in the JOBS Act. As a result, the Company's consolidated financial statements may not be comparable to companies that comply with the new or revised accounting pronouncements as of public company effective dates.

The Company remains an emerging growth company until the earliest of (i) December 31, 2025, (ii) the last day of the fiscal year in which the Company has total annual gross revenue of at least $1.235 billion, (iii) the last day of the fiscal year in which the Company is deemed to be a large accelerated filer, which means the market value of the Company's common stock that is held by non-affiliates exceeds $700.0 million as of the prior June 30th or (iv) the date on which the Company has issued more than $1.0 billion in non-convertible debt securities during the prior three-year period.

Use of Estimates

The preparation of consolidated financial statements in conformity with U.S. GAAP and regulations of the SEC requires management to make estimates and assumptions that affect the amounts reported in these consolidated financial statements and accompanying notes.

Significant estimates and judgments are inherent in the analysis and measurement of items including, but not limited to: revenue recognition, capitalization of internally developed software and quantum computing costs, useful lives of long-lived assets, and fair value of available-for-sale securities. Management bases its estimates and assumptions on historical experience, expectations, forecasts, and on various other factors that are believed to be reasonable under the circumstances. Due to the inherent uncertainty involved in making estimates, actual results reported in future periods may differ and be affected by changes in those estimates.

Fair Value Measurements

The Company evaluates the fair value of certain assets and liabilities using the fair value hierarchy. Fair value is an exit price representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair value is estimated by applying the following hierarchy, which prioritizes the inputs used to measure fair value into three levels and bases the categorization within the hierarchy upon the lowest level of input that is available and significant to the fair value measurement:

- Level 1—Observable inputs, which include quoted prices in active markets;
- Level 2—Observable inputs other than the quoted prices in active markets that are observable either directly or indirectly, such as quoted prices in markets that are not active, or other inputs such as broker quotes, benchmark yield curves, credit spreads and market interest rates for similar securities that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities;
- Level 3—Unobservable inputs that are supported by little or no market activity and that are based on management's assumptions, including fair value measurements determined using pricing models, discounted cash flow methodologies or similar techniques.

The Company's assessment of the significance of a particular input to the fair value measurements requires judgment and may affect the valuation of the assets and liabilities being measured and their placement within the fair value hierarchy.

For assets that are measured using quoted prices in active markets, the total fair value is the published market price per unit multiplied by the number of units held, without consideration of transaction costs. Assets and liabilities that are measured using significant other observable inputs are primarily valued by reference to quoted prices of similar assets or liabilities in active markets, adjusted for any terms specific to that asset or liability.

Assets and liabilities that are measured at fair value on a non-recurring basis include property and equipment, intangible assets, and goodwill. The Company recognizes these items at fair value when they are considered to be

impaired or upon initial recognition when acquired through a business combination or an asset acquisition. The fair value of these assets and liabilities are determined with valuation techniques using the best information available and may include quoted market prices, market comparables and discounted cash flow models.

Due to their short-term nature, the carrying amounts reported in the Company's consolidated financial statements approximates the fair value for cash and cash equivalents, accounts receivable, accounts payable and accrued expenses.

Cash, Cash Equivalents and Restricted Cash

Cash and cash equivalents include cash in banks, checking deposits, money market funds, and certain commercial paper and U.S. government and agency securities. The Company considers all short-term highly liquid investments with an original maturity at the date of purchase of three months or less to be cash equivalents. Restricted cash collateralizing letters of credit is included in other noncurrent assets in the consolidated balance sheets. The Company issues letters of credits in the ordinary course of business, including for lease arrangements. As of December 31, 2022, letters of credit totaling $2.0 million were outstanding.

The following table provides a reconciliation of cash and restricted cash included in the consolidated balance sheets to the amounts included in the statements of cash flows (in thousands):

	2022	2021
Cash and cash equivalents	$44,367	$399,025
Restricted cash	2,000	—
Total cash, cash equivalents and restricted cash in the consolidated statements of cash flows	$46,367	$399,025

Accounts Receivable and Allowance for Doubtful Accounts

Accounts receivable are non-interest bearing and represent amounts billed and currently due from customers at the gross invoiced amount as well as unbilled amounts related to unconditional rights for consideration to be received for services performed but not yet invoiced. A receivable is recorded when the Company has an unconditional right to receive payment. Accounts receivable consists of the following at December 31, 2022 and 2021 (in thousands):

	2022	2021
Billed accounts receivable	$1,150	$261
Unbilled accounts receivable	2,142	446
Total accounts receivable	$3,292	$707

On a periodic basis, management evaluates its accounts receivable and determines whether to provide an allowance or if any accounts should be written off. This assessment is based on management's evaluation of the past due receivables, collectability of specific accounts, historical loss experience and overall economic conditions.

The Company did not have any allowance for doubtful accounts as of December 31, 2022 and 2021.

Materials and Supplies

Materials and supplies are carried at average cost and recorded in prepaid expenses and other current assets in the consolidated balance sheets. Materials and supplies used in the production of quantum computing systems to be made commercially available are capitalized to property and equipment when installed. Materials and supplies used for maintenance or research and development efforts are expensed when consumed. The Company capitalized $1.3 million of materials and supplies to property and equipment for the year ended December 31, 2022.

Investments

Management determines the appropriate classification of investments at the time of purchase based upon management's intent with regard to such investments. The Company primarily invests in debt securities and classifies its investments as available-for-sale at the time of purchase if they are available to support either current or future operations. This classification is re-evaluated at each balance sheet date. Investments not considered cash equivalents, with remaining contractual maturities of one year or less from the balance sheet date are classified as short-term investments, and those with remaining contractual maturities greater than one year from the balance sheet date are classified as long-term investments. All investments are recorded at their estimated fair value, and any unrealized gains and losses are recorded in accumulated other comprehensive loss. Realized gains and losses on sales and maturities of investments are determined based on the specific identification method and are recognized in the consolidated statements of operations in other income (expense), net.

The Company performs periodic evaluations to determine whether any declines in the fair value of investments below cost are other-than-temporary. The evaluation consists of qualitative and quantitative factors regarding the severity and duration of the unrealized loss, as well as the Company's ability and intent to hold the investments until a forecasted recovery occurs. The impairments are considered to be other-than-temporary if they are related to deterioration in credit risk or if it is likely that the underlying securities will be sold prior to a full recovery of their cost basis. Other-than-temporary fair value impairments are determined based on the specific identification method and are reported in other income (expense), net in the consolidated statements of operations.

Property and Equipment, Net

Property and equipment, net is stated at cost less accumulated depreciation. Historical cost of fixed assets is the cost as of the date acquired. Hardware and labor costs associated with the building of quantum computing systems are capitalized. Costs to maintain quantum computing systems are expensed as incurred.

Depreciation is calculated using the straight-line method over the estimated useful lives of the assets. Useful lives are as follows:

Computer equipment and acquired computer software	3 – 5 years
Machinery, equipment, furniture and fixtures	5 – 7 years
Quantum computing systems	3 years
Leasehold improvements	Shorter of the lease term or the estimated useful life of the related asset

Effective October 1, 2022, the Company revised the accounting useful life of quantum computing systems, which was determined to be a change in accounting estimate and is being applied prospectively. This change in accounting estimate is not material for the year ended December 31, 2022. The estimated useful life for quantum computing systems was previously 2 years.

Leases

The Company determines if an arrangement is a lease at inception. Operating leases are included in operating lease right-of-use ("ROU") assets and current operating lease liabilities and operating lease liabilities, net of current portion on the Company's consolidated balance sheets. As of December 31, 2022, the Company has no financing lease arrangements. The Company recognizes lease expense for its operating leases on a straight-line basis over the term of the lease.

The Company records a ROU asset and lease liability in connection with its operating leases. The Company's lease portfolio is comprised primarily of real estate leases, which are accounted for as operating leases. The Company elected the practical expedient to not separate lease and non-lease components for all leases.

ROU assets and lease liabilities are recognized at the lease commencement date based on the present value of the future minimum lease payments over the lease term. Operating lease ROU assets also include the impact of any lease incentives. Amendments to a lease are assessed to determine if it represents a lease modification or a separate contract. Lease modifications are reassessed as of the effective date of the modification using an incremental borrowing rate based on the information available at the commencement date. For modified leases the Company also reassesses the lease classification as of the effective date of the modification.

The interest rate used to determine the present value of the future lease payments is the Company's incremental borrowing rate, because the interest rate implicit in the Company's leases is not readily determinable. The incremental borrowing rate is estimated to approximate the interest rate on a collateralized basis with similar terms and payments, and in economic environments where the leased asset is located.

The Company's lease terms include periods under options to extend or terminate the lease when it is reasonably certain that the Company will exercise that option. The Company considers contractual-based factors such as the nature and terms of the renewal or termination, asset-based factors such as physical location of the asset and entity-based factors such as the importance of the leased asset to the Company's operations to determine the lease term. The Company generally uses the base non-cancelable lease term when determining the ROU assets and lease liabilities.

Intangible Assets, Net

The Company's intangible assets include website domain costs, patents, intellectual property, developed technology and trademarks. Intangible assets with identifiable useful lives are initially valued at acquisition cost and are amortized over their estimated useful lives using the straight-line method. With respect to patents, acquisition costs include external legal and patent application costs. Intangible assets with indefinite useful lives, such as trademarks, are assessed for impairment at least annually.

Capitalized Internally Developed Software

Capitalized internally developed software, which is included in intangible assets, net, consists of costs to purchase and develop internal-use software, which the Company primarily uses to provide services to its customers. The costs to purchase and develop internal-use software are capitalized from the time that the preliminary project stage is completed, and it is considered probable that the software will be used to perform the function intended, until the time the software is placed in service for its intended use. Any costs incurred during subsequent efforts to upgrade and enhance the functionality of the software are also capitalized. Once this software is ready for its intended use, these costs are amortized on a straight-line basis over the estimated useful life of the software, which is typically assessed to be 3 years. During the years ended December 31, 2022 and 2021, the Company capitalized $3.2 million and $1.7 million in internal-use software costs, respectively. The Company amortized $1.5 million and $0.8 million of capitalized internally developed software costs during the years ended December 31, 2022 and 2021, respectively.

Goodwill

Goodwill is the excess of the purchase price over the fair values assigned to the net assets acquired in a business combination. The Company tests goodwill for impairment on an annual basis, which it has determined to be the first day of the fiscal fourth quarter, and whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. The Company tests goodwill qualitatively, or quantitatively by comparing the fair value of the reporting unit with the unit's carrying amount. No impairment loss was recognized for the year ended December 31, 2022.

Impairment of Long-Lived Assets

Long-lived assets, such as property and equipment and other long-term assets, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be

recoverable. If circumstances require a long-lived asset or asset group be tested for possible impairment, the Company first compares undiscounted cash flows expected to be generated by that asset or asset group to its carrying amount. If the carrying amount of the long-lived asset or asset group is not recoverable on an undiscounted cash flow basis, an impairment is recognized to the extent the carrying amount of the underlying asset exceeds its fair value. No impairment loss was recognized for the years ended December 31, 2022 or 2021.

Early Exercise of Stock Options

Stock options granted under the 2015 Equity Incentive Plan provide employee option holders, if approved by the Board, the right to exercise unvested options in exchange for restricted common stock, which is subject to a repurchase right held by the Company at the lower of (i) the fair market value of its common stock on the date of repurchase or (ii) the original purchase price. Early exercises of options are not deemed to be substantive exercises for accounting purposes and accordingly, amounts received for early exercises are recorded as a liability. These amounts are reclassified to common stock and additional paid-in capital as the underlying shares vest.

Warrant Liabilities

The Company evaluates its financial instruments to determine if such instruments are derivatives or contain features that qualify as embedded derivatives in accordance with ASC Topic 815, "Derivatives and Hedging." For derivative financial instruments that are accounted for as liabilities, the derivative instrument is initially recorded at its fair value on the grant date and is then re-valued upon exercise or at each reporting date for the unexercised warrants, with changes in the fair value reported in the consolidated statements of operations. The classification of derivative instruments, including whether such instruments should be recorded as liabilities or as equity, is evaluated at the end of each reporting period. The warrants of dMY assumed in the Business Combination are classified as liabilities and remeasured at each reporting period (as more fully described in Note 13). The determination of the fair value of the warrant liabilities may be subject to change as more current information becomes available and accordingly the actual results could differ significantly. Derivative warrant liabilities are classified as non-current liabilities as their liquidation is not reasonably expected to require the use of current assets or require the creation of current liabilities.

Revenue Recognition

The Company derives revenue from providing access to its QCaaS, consulting services related to co-developing algorithms on the quantum computing systems, and from contracts associated with the design, development, and construction of specialized quantum computing systems together with related services. The Company applies the provisions of the FASB Accounting Standards Update ("ASU"), Revenue from Contracts with Customers ("ASC 606"), and all related applicable guidance. The core principle of ASC 606 is that an entity shall recognize revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services.

To support this core principle, the Company applies the following five step approach:

1. Identify the contract with the customer
2. Identify the performance obligations
3. Determine the transaction price
4. Allocate the transaction price to the performance obligations
5. Recognize revenue when (or as) the entity satisfies a performance obligation

The Company has determined that its QCaaS contracts represent a combined, stand-ready performance obligation to provide access to its quantum computing systems together with related maintenance and support. The

transaction price may consist of a variable fee based on usage of its quantum computing systems or a fixed fee for a minimum volume of usage to be made available over a defined period of access. Fixed fee arrangements may also include a variable component whereby customers pay an amount for usage over contractual minimums contained in the contracts. The Company has determined that contracts that contain consulting services related to co-developing quantum computing algorithms and the ability to use its quantum computing systems to run such algorithms represent a combined performance obligation that is satisfied over-time with revenue recognized based on the efforts incurred to date relative to the total expected effort. For contracts with a fixed transaction price, the fixed fee is recognized on a straight-line basis over the access period or associated measure of progress for the Company's consulting services contracts. For contracts without fixed fees, variable usage fees are billed and recognized during the period of such usage.

Certain of the Company's contracts contain multiple performance obligations, most commonly in contracts for specialized quantum computing systems together with related maintenance and support. Such contracts may also include access to the Company's QCaaS. A contract's transaction price is allocated to each distinct performance obligation and recognized as revenue when or as the performance obligation is satisfied. When there are multiple performance obligations in a contract, the Company allocates the transaction price to each performance obligation based on its standalone selling price when available. We determine standalone selling price based on the observable price of a product or service when we sell the products or services separately in similar circumstances and to similar customers. When the standalone selling price is not known, due to it being either highly variable or uncertain, the Company allocates the transaction price using the residual approach.

Performance obligations are satisfied over time if the customer receives the benefits as we perform the work, if the customer controls the asset as it is being produced (continuous transfer of control), or if the product being produced for the customer has no alternative use and we have a contractual right to payment for performance to date. Revenue is recognized on performance obligations satisfied over time based on the efforts incurred to date relative to the total expected effort.

As of December 31, 2022 and 2021, substantially all of the revenue recognized by the Company was recognized based on transfer of service over time. Revenues recognized at a point in time were not material. In arrangements with cloud service providers, the cloud service provider is considered the customer and IonQ does not have any contractual relationships with the cloud service providers' end users. For these arrangements, revenue is recognized at the amount charged to the cloud service provider and does not reflect any mark-up to the end user.

The Company may enter into multiple contracts with a single counterparty at or near the same time. The Company will combine contracts and account for them as a single contract when one or more of the following criteria are met: (i) the contracts are negotiated as a package with a single commercial objective; (ii) consideration to be paid in one contract depends on the price or performance of the other contract; and (iii) goods or services promised are a single performance obligation. Consideration payable to a customer includes cash amounts that an entity pays, or expects to pay, to the customer. For arrangements that contain consideration payable to a customer, the Company uses judgment in determining whether such payments are a reduction of the transaction price or a payment to the customer for a distinct good or service. In 2019, the Company has entered into one revenue arrangement in which it granted warrants to the counterparty. Refer to Note 12 for further information on the customer warrants.

The variable fees associated with the QCaaS are generally billed a month in arrears. Customers also have the ability to make advance payments. If a contract exists under ASC 606, advance payments are recorded as a contract liability until services are delivered or obligations are met and revenue is earned. Contract liabilities to be recognized in the succeeding 12-month period are classified as current and the remaining amounts are classified as non-current liabilities in the Company's consolidated balance sheets.

As of December 31, 2022, approximately $30.5 million of revenue is expected to be recognized from remaining performance obligations that are unsatisfied (or partially unsatisfied) for non-cancelable contracts, including both funded (firm orders for which funding has been both authorized and appropriated by the customer) and unfunded (firm orders for which funding has not been appropriated) orders. The Company expects approximately 60% of the remaining performance obligations to be recognized as revenue within the next twelve months.

The following table summarizes the changes in unearned revenue for the years ended December 31, 2022 and 2021 (in thousands):

	2022	2021
Beginning balance	$ 4,963	$1,358
Revenue recognized	(4,216)	(200)
New deferrals, net	9,183	3,805
Ending balance	$ 9,930	$4,963

For contractual arrangements where consideration is paid up-front, the transfer of the quantum computing services is completed at the discretion of the customer as the customer chooses to use the services starting from the date of contract inception. As such, the up-front payment of consideration does not represent a significant financing component.

Assets Recognized from Costs to Obtain a Contract

Sales commissions paid to employees and third parties are considered incremental costs to obtain a contract with a customer. These costs are capitalized in the period a customer contract is executed and are amortized as an expense consistent with the transfer of the goods or services to the customer. Capitalized costs are recorded in prepaid expenses and other current assets and other noncurrent assets in the consolidated balance sheets. Applying the practical expedient, the Company recognizes the incremental costs of obtaining contracts as an expense when incurred if the amortization period of the assets is one year or less. As of December 31, 2022 and 2021, total capitalized costs were $1.0 million and zero, respectively. Amortization expense was less than $0.1 million and zero for the years ended December 31, 2022 and 2021, respectively.

Cost of Revenue

Cost of revenue primarily consists of expenses related to delivering the Company's services, including direct labor costs, direct service costs and allocated shared resources. Cost of revenue excludes depreciation and amortization related to the Company's quantum computing systems and related software and developed technology.

Research and Development

Research and development expenses consist of personnel costs, including stock-based compensation expense, and allocated shared resource costs for the Company's hardware, software and engineering personnel who design and develop the Company's quantum computing systems and research new quantum computing technologies. Unlike a standard computer, design and development efforts continue throughout the useful life of the Company's quantum computing systems to ensure proper calibration and optimal functionality. Research and development expenses also include purchased hardware and software costs related to quantum computing systems constructed for research purposes that are not probable of providing future economic benefit and have no alternate future use.

In December 2020, the Company amended its option agreement with Duke University ("Duke"), and under this amendment, the Company issued common shares to Duke in consideration for research and development services through July 15, 2026. The amended arrangement is considered a research and development service arrangement and recorded as a prepayment based on the fair value of the common stock issued on the effective date of the amendment and amortized over the term of the arrangement as services are received.

In February 2021, the Company and the University of Maryland ("UMD") amended the option agreement with UMD pursuant to which the Company issued shares of common stock to UMD as a nonrefundable upfront payment in exchange for research and development services by UMD and rights to any potential future intellectual property developed through July 2021. The amended arrangement is considered a research and

development service arrangement and recorded as a prepayment based on the fair value of the common stock issued on the effective date of the amendment and amortized over the term of the arrangement as services are received.

Refer to Note 8 for further information on the Duke and UMD agreements.

Advertising Costs

Advertising costs are expensed as incurred and are included in sales and marketing expenses in the consolidated statements of operations. These costs were $1.3 million and $1.1 million for the years ended December 31, 2022 and 2021, respectively.

Stock-Based Compensation

The Company measures and records the expense related to stock-based awards based on the fair value of those awards as determined on the date of grant. The Company recognizes stock-based compensation expense over the requisite service period of the individual grant, generally equal to the vesting period and uses the straight-line method to recognize stock-based compensation. The Company uses the Black-Scholes-Merton ("Black-Scholes") option-pricing model to determine the fair value of stock awards and the estimated fair value for stock options. The Black-Scholes option- pricing model requires the use of subjective assumptions, which determine the fair value of share-based awards, including the fair value of the Company's common stock, the option's expected term, the price volatility of the underlying common stock, risk-free interest rates, and the expected dividend yield of the common stock. The assumptions used to determine the fair value of the stock awards represent management's best estimates. These estimates involve inherent uncertainties and the application of management's judgment. The Company records forfeitures as they occur.

Stock-based compensation cost for restricted stock units is measured based on the fair value of the Company's common stock on the grant date. For awards with a performance-based vesting condition, the Company records stock-based compensation cost if it is probable that the performance condition will be achieved.

The Company records stock-based compensation expense for incentive compensation liabilities based on estimated payments to employees for which the Company expects to settle the liability by granting restricted stock units. For these awards, stock-based compensation expense is accrued commencing at the service inception date, which generally precedes the grant date, through the end of the requisite service period.

The Company obtained third-party valuations to estimate the fair value of its common stock for awards granted prior to the Business Combination, for purposes of measuring stock-based compensation expense. The third-party valuations were prepared using methodologies, approaches, and assumptions consistent with the American Institute of Certified Public Accountants ("AICPA") Accounting & Valuation Guide, Valuation of Privately-Held-Company Equity Securities Issued as Compensation.

Income Taxes

Income taxes are accounted for using the asset and liability method. Deferred income taxes are provided for temporary differences in recognizing certain income, expense and credit items for financial reporting purposes and tax reporting purposes. Such deferred income taxes primarily relate to the difference between the tax bases of assets and liabilities and their financial reporting amounts. Deferred tax assets and liabilities are measured by applying enacted statutory tax rates applicable to the future years in which deferred tax assets or liabilities are expected to be settled or realized. Excess tax benefits or tax deficiencies from stock option exercises are recognized in the income tax provision in the period in which they occur.

The Company records a valuation allowance when it determines, based on available positive and negative evidence, that it is more-likely-than-not that some portion or all of its deferred tax assets will not be realized. The

Company determines the realizability of its deferred tax assets primarily based on the reversal of existing taxable temporary differences and projections of future taxable income (exclusive of reversing temporary differences and carryforwards). In evaluating such projections, the Company considers its history of profitability, the competitive environment, and general economic conditions. In addition, the Company considers the time frame over which it would take to utilize the deferred tax assets prior to their expiration.

For certain tax positions, the Company uses a more-likely-than-not threshold based on the technical merits of the tax position taken. Tax positions that meet the more-likely-than-not recognition threshold are measured at the largest amount of tax benefits determined on a cumulative probability basis, which are more-likely-than-not to be realized upon ultimate settlement in the financial statements. The Company's policy is to recognize interest and penalties related to income tax matters in income tax expense. However, there were no amounts recognized relating to interest and penalties in the consolidated statements of operations for the years ended December 31, 2022 and 2021. The Company had no uncertain income tax positions as of December 31, 2022 and 2021.

Concentrations of Credit Risk

Financial instruments that potentially subject the Company to concentrations of credit risk consist primarily of cash, cash equivalents, restricted cash, investments, and trade accounts receivable. The Company maintains the majority of its cash, cash equivalents, restricted cash and investments with two financial institutions. The Company's deposits periodically exceed amounts guaranteed by the Federal Deposit Insurance Corporation. While the Company has not experienced any losses in such accounts, the recent failure of Silicon Valley Bank ("SVB"), at which the Company held cash and cash equivalents in multiple accounts, exposed the Company to limited credit risk prior to the completion by the Federal Deposit Insurance Corporation of the resolution of SVB in a manner that fully protected all depositors.

The Company's accounts receivable are derived from customers primarily located in the U.S. The Company performs periodic evaluations of its customers' financial condition and generally does not require its customers to provide collateral or other security to support accounts receivable and maintains an allowance for doubtful accounts. Credit losses historically have not been material.

Significant customers are those that represent more than 10% of the Company's total revenue. The Company's revenue was primarily from three significant customers for the year ended December 31, 2022, and from two significant customers for the year ended December 31, 2021.

Earnings (Loss) Per Share

Basic earnings (loss) per share is computed by dividing net income (loss) by the weighted-average number of shares of common stock outstanding for the period. Diluted earnings per share is computed by dividing net income (loss) by the weighted average number of shares of common stock during the period, plus common stock equivalents, outstanding during the period. If the Company reports a net loss, the computation of diluted loss per share excludes the effect of dilutive common stock equivalents, as their effect would be antidilutive.

The following table sets forth the computation of basic and diluted loss per share attributable to common stockholders (in thousands, except share and per share data):

	Year Ended December 31,	
	2022	2021
Numerator:		
Net loss attributable to common stockholders	$ (48,511)	$ (106,186)
Denominator:		
Weighted average shares used in computing net loss per share attributable to common stockholders—basic and diluted	197,727,642	137,609,620
Net loss per share attributable to common stockholders—basic and diluted	$ (0.25)	$ (0.77)

In periods with a reported net loss, the effect of anti-dilutive stock options, unvested restricted stock units, unvested common stock (including unvested restricted common stock) and warrants are excluded and diluted loss per share is equal to basic loss per share. The following is a summary of the weighted average common stock equivalents for the securities outstanding during the respective periods that have been excluded from the computation of diluted net loss per common share, as their effect would be anti-dilutive:

	Year Ended December 31	
	2022	2021
Common stock options outstanding	22,951,439	24,206,373
Warrants to purchase common stock	8,301,202	8,301,202
Public and private warrants	5,231,750	2,359,179
Unvested Vesting Shares	—	129,452
Unvested restricted stock units	4,418,852	—
Unvested common stock	1,158,095	1,407,500
Total	**42,061,338**	**36,403,706**

Recently Issued Accounting Standards Not Yet Adopted

In June 2016, the FASB issued ASU 2016-13, Financial Instruments—Credit Losses, along with various updates and improvements. The standard, including subsequently issued amendments, requires a financial asset measured at amortized cost basis, such as accounts receivable and certain other financial assets, to be presented at the net amount expected to be collected based on relevant information about past events, including historical experience, current conditions and reasonable and supportable forecasts that affect the collectability of the reported amount. ASU 2016-13 is effective for annual reporting periods beginning after December 15, 2022, with early adoption permitted. The Company will adopt this standard in the first quarter of 2023. Based on the composition of the Company's trade receivables and other financial assets, current market conditions and historical credit loss activity, the adoption of this standard is not expected to have a material impact on the Company's consolidated financial statements and related disclosures.

In August 2020, the FASB issued ASU 2020-06, Debt, Debt with Conversion and Other Options (Subtopic 470-20) and Derivatives and Hedging Contracts in Entity's Own Equity (Subtopic815-40) Accounting for Convertible Instruments and Contracts in an Entity's Own Equity. The ASU simplifies accounting for convertible instruments by removing major separation models required under current U.S. GAAP. Consequently, more convertible debt instruments will be reported as a single liability instrument with no separate accounting for embedded conversion features. The ASU removes certain settlement conditions that are required for equity contracts to qualify for the derivative scope exception, which will permit more equity contracts to qualify for the exception. The ASU also simplifies the diluted net income per share calculation in certain areas. The new guidance is effective for fiscal years beginning after December 15, 2023, including interim periods within those fiscal years, and early adoption is permitted. The Company does not expect adoption of this guidance to have a material impact on its consolidated financial statements and related disclosures.

3. ACQUISITIONS

On December 30, 2022, the Company acquired the assets of Entangled Networks Ltd. for total cash consideration of $1.0 million. The acquisition supports the Company's efforts to build large-scale quantum computers by enabling computation across multiple distributed quantum processors. As part of the preliminary purchase price allocation, the Company recorded $0.3 million in identifiable intangible assets and $0.7 million in goodwill.

4. CASH EQUIVALENTS, RESTRICTED CASH AND INVESTMENTS

The following table summarizes the Company's unrealized gains and losses and estimated fair value of cash equivalents, restricted cash and investments in available-for-sale securities recorded in the consolidated balance sheets (in thousands):

	AS OF DECEMBER 31, 2022				AS OF DECEMBER 31, 2021			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
Cash and money market funds	$ 46,367	$—	$ —	$ 46,367	$123,690	$—	$ —	$123,690
Commercial paper	130,141	—	(443)	129,698	203,628	—	(21)	203,607
Corporate notes and bonds	277,184	19	(5,993)	271,210	80,060	2	(109)	79,953
Municipal bonds	9,905	—	(273)	9,632	2,000	—	—	2,000
US government and agency	83,556	23	(688)	82,891	193,347	1	(20)	193,328
Total cash equivalents, restricted cash and investments	**$547,153**	**$ 42**	**$(7,397)**	**$539,798**	**$602,725**	**$ 3**	**$(150)**	**$602,578**

Unrealized losses related to investments were primarily a result of interest rate fluctuations, and none of the investments held as of December 31, 2022, have been in a continuous unrealized loss position for greater than one year. As of December 31, 2022, the Company did not consider any of its available-for-sale investments to be other-than-temporarily impaired nor does the Company intend, or believe it is more likely than not, that it will be required to sell the investments in an unrealized loss position before the recovery of the associated amortized cost basis.

The estimated fair value of the Company's cash equivalents, restricted cash and investments in available-for-sale securities as of December 31, 2022, aggregated by investment category and classified by contractual maturity date, is as follows (in thousands):

	1 Year or Less	1 Year or Greater	Total
Cash and money market funds	$ 44,367	$ 2,000	$ 46,367
Commercial paper	129,698	—	129,698
Corporate notes and bonds	120,447	150,763	271,210
Municipal bonds	4,911	4,721	9,632
US government and agency	56,374	26,517	82,891
Total	**$355,797**	**$184,001**	**$539,798**

5. FAIR VALUE MEASUREMENTS

The Company's financial assets and liabilities subject to fair value measurements on a recurring basis and the level of inputs used for such measurements were as follows (in thousands):

	Fair Value Measured as of December 31, 2022:			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash, cash equivalents and restricted cash:				
Cash and money market funds[1]	$ 46,367	$ —	$—	$ 46,367
Total cash, cash equivalents and restricted cash	46,367	—	—	46,367
Short-term investments:				
Commercial paper	—	129,698	—	129,698
Corporate notes and bonds	—	120,447	—	120,447
Municipal bonds	—	4,911		4,911
US government and agency	—	56,374	—	56,374
Total short-term investments	—	311,430	—	311,430
Long-term investments:				
Corporate notes and bonds	—	150,763	—	150,763
Municipal bonds	—	4,721	—	4,721
US government and agency	—	26,517	—	26,517
Total long-term investments	—	182,001	—	182,001
Total Assets	$ 46,367	$493,431	$—	$539,798
Liabilities:				
Public warrants	$ 3,819	$ —	$—	$ 3,819

	Fair Value Measured as of December 31, 2021:			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash, cash equivalents, and restricted cash:				
Cash and money market funds[1]	$123,690	$ —	$—	$123,690
Commercial paper	—	125,335	—	125,335
US government and agency	—	150,000	—	150,000
Total cash, cash equivalents and restricted cash	123,690	275,335		399,025
Short-term investments:				
Commercial paper	—	78,272	—	78,272
Corporate notes and bonds	—	14,818	—	14,818
Municipal bonds		2,000		2,000
US government and agency	—	28,353	—	28,353
Total short-term investments	—	123,443	—	123,443
Long-term investments:				
Corporate notes and bonds	—	65,135	—	65,135
US government and agency	—	14,975	—	14,975
Total long-term investments	—	80,110	—	80,110
Total Assets	$123,690	$478,888	$—	$602,578
Liabilities:				
Public warrants	$ 33,962	$ —	$—	$ 33,962

(1) Includes money market funds associated with the Company's overnight investment sweep account and collateralizing letters of credit.

The Company's warrant liabilities are comprised of the public warrants. The private placement warrants were fully exercised as of December 31, 2021. Refer to Note 13 for further information. Transfers to/from Levels 1, 2 and 3 are recognized at the beginning of the reporting period. There were no transfers between levels during the years ended December 31, 2022 and 2021. As of December 31, 2022, the public warrants were publicly traded at $0.73 per warrant.

The private placement warrants were marked to fair value on the date of exercise. The fair value of the private placement warrants was determined using Level 3 inputs. Management determined the fair value of the private placement warrants using unobservable inputs in the Black-Scholes valuation model. Inherent in the valuation were assumptions related to expected stock-price volatility, expected term, risk-free interest rate and dividend yield. The Company estimated the volatility of its common stock warrants based on implied volatility from the Company's traded warrants and from historical volatility of select peer company's common stock that matches the expected remaining life of the warrants. The risk-free interest rate was based on the U.S. Treasury zero-coupon yield curve on the grant date for a maturity similar to the expected remaining life of the warrants.

The expected life of the warrants was assumed to be equivalent to their remaining contractual term. The dividend rate was based on the historical rate, which the Company anticipated remaining at zero.

The following table provides quantitative information regarding Level 3 fair value measurement inputs for the private placement warrants as of the date the private placement warrants were exercised.

	December 3, 2021
Exercise price	$11.50
Stock price	$18.78
Volatility	74.10%
Term	4.83
Risk-free rate	1.10%
Dividend yield	— %

The Company did not have any Level 3 assets or liabilities as of December 31, 2022 or 2021, as the private placement warrants were fully exercised.

6. PROPERTY AND EQUIPMENT, NET

Property and equipment, net as of December 31, 2022 and 2021, are composed of the following (in thousands):

	2022	2021
Computer equipment and acquired computer software	$ 2,407	$ 840
Machinery, equipment, furniture and fixtures	7,506	5,497
Leasehold improvements	1,132	827
Quantum computing systems	22,430	15,151
Gross property and equipment	**33,475**	**22,315**
Less: accumulated depreciation	(7,461)	(3,445)
Property and equipment, net	**$26,014**	**$18,870**

Depreciation expense for the years ended December 31, 2022 and 2021 was $4.0 million and $1.7 million, respectively.

7. INTANGIBLE ASSETS, NET

Intangible assets as of December 31, 2022 and 2021, are composed of the following (in thousands, except as otherwise noted):

	December 31, 2022			
	Weighted Average Remaining Useful Life (Years)	Gross Carrying Amount	Accumulated Amortization	Net Amount
Patents	16.5	$ 4,438	$ (146)	$4,292
Trademark	Indefinite	131	—	131
Website and other	9.6	220	(17)	203
Developed technology	2.0	318	—	318
Internally developed software	2.2	6,548	(2,548)	4,000
Total		**$11,655**	**$(2,711)**	**$8,944**

	December 31, 2021			
	Weighted Average Remaining Useful Life (Years)	Gross Carrying Amount	Accumulated Amortization	Net Amount
Patents	17.0	$ 3,555	$ (51)	$3,504
Trademark	Indefinite	82	—	82
Website and other	10.0	51	(11)	40
Internally developed software	2.3	3,297	(1,082)	2,215
Total		**$ 6,985**	**$(1,144)**	**$5,841**

Total amortization expense for intangible assets for the years ended December 31, 2022 and 2021, was $1.6 million and $0.8 million, respectively. As of December 31, 2022, the projected annual amortization expense for the Company's intangible assets is as follows (in thousands):

Year ending December 31,	
2023	$2,130
2024	1,646
2025	744
2026	124
2027	124
Thereafter	4,045
Total	**$8,813**

8. AGREEMENTS WITH UMD AND DUKE

Exclusive License Agreement

The Company entered into an exclusive license agreement ("License Agreement") in July 2016 with UMD and Duke. The License Agreement grants to the Company an exclusive, perpetual license ("Initial Patents") to certain patents, know-how and other intellectual property utilized in trapped-ion quantum computing systems. The license granted to the Company is exclusive for all patents (and non-exclusive for other types of intellectual property), subject to certain governmental rights and retained rights by UMD and Duke and other non-profit

institutions to use and practice the Licensed Patents (as defined below) and technology for internal research and other non-profit purposes. In exchange for the Initial Patents, UMD and Duke received an aggregate of 142,886 common shares after giving effect to the recapitalization.

On February 1, 2021, the Company and UMD executed two amendments to the License Agreement granting exclusive rights to license additional intellectual property in exchange for a total of 257,198 common shares after giving effect to the recapitalization. Management evaluated the amendments and concluded that the arrangements qualify as equity-classified instruments and recorded an intangible asset and additional paid-in capital based on the fair value of the shares at the date the amendments were executed of $1.6 million. The shares for each executed amendment were issued during the year ended December 31, 2021.

Exclusive Option Agreements

The Company also entered into an exclusive option agreement ("Option Agreement") with each of UMD and Duke in 2016 whereby on the anniversary of the effective date of the License Agreement for a period of 5 years, the Company has the right to exclusively license additional intellectual property developed by UMD and Duke (the "Additional Patents" and together with the Initial Patents, the "Licensed Patents") by exercising an annual option and issuing common shares each to Duke and UMD in consideration for the Additional Patents. The amount issued to UMD and Duke pursuant to the option over the 5-year term was equal to an aggregate of 642,995 common shares to each university after giving effect to the recapitalization. The Company may elect not to exercise the option if there was not a minimum number of intellectual property developed in a given year and then the Option Agreement would extend another year.

In December 2020, the Company amended its option agreement with Duke, and under this amendment, the Company issued 1,214,317 common shares after giving effect to the recapitalization, to Duke in consideration for research and development services through July 15, 2026. Under the terms of the amended Option Agreement, the issuance of shares is a nonrefundable upfront payment in exchange for research and development services by Duke whereby the Company will obtain rights to any potential future intellectual property developed during the term. As such, the fair value of the shares of common stock was recorded as a prepaid expense and is being amortized over the term of the arrangement as services are received. The Company recognized $0.5 million of research and development expense related to the agreement with Duke during each of the years ended December 31, 2022 and 2021.

In February 2021, the Company and UMD amended the UMD Option Agreement pursuant to which the Company issued the remaining 128,599 shares of common stock after giving effect to the recapitalization to UMD as a nonrefundable upfront payment in exchange for research and development services by UMD and rights to any potential future intellectual property developed through July 2021. The fair value of the shares issued to UMD was $0.8 million. The Company recognized $0.8 million of research and development expense associated with the UMD Option Agreement amendment for the year ended December 31, 2021. The UMD Option Agreement was fully amortized in 2021 and therefore no research and development expense was recognized for the year ended December 31, 2022.

Additionally, under the terms of the License Agreement and Option Agreement, UMD was provided an exit guarantee if a sale or liquidation of the Company would occur that provides for the following:

- acceleration of the issuance of common stock as if exercised through the License Agreement,
- additional consideration equal to the consideration that a holder of one-half of one percent (0.5%) of the common stock of the Company, on a fully-diluted basis, would have received in the sale to the extent it exceeds the amount UMD and Duke shall be entitled to as a result of ownership at the time of sale.

The exit guarantee with UMD lapsed as a result of the Business Combination in September 2021.

The useful life of the Licensed Patents derived from the License Agreement and the Option Agreement is the remaining legal life at the time of acquisition. The value of the Licensed Patents is based on the fair value of the

common stock given as consideration on the effective date of each agreement and exercise of option. The asset is amortized over the useful life of the Licensed Patents.

9. ACCRUED EXPENSES

Accrued expenses as of December 31, 2022 and 2021, are composed of the following (in thousands):

	2022	2021
Accrued salaries and other payroll liabilities	$4,935	$1,025
Accrued accounting and tax liabilities	250	700
Accrued expenses—other	1,470	922
Total accrued expenses	**$6,655**	**$2,647**

10. COMMITMENTS AND CONTINGENCIES

Warranties and Indemnification

The Company's commercial services are typically warranted to perform in a manner consistent with general industry standards that are reasonably applicable and materially in accordance with the Company's documentation under normal use and circumstances.

The Company's arrangements generally include certain provisions for indemnifying customers against liabilities if its products or services infringe third- party intellectual property rights. To date, the Company has not incurred any material costs as a result of such obligations and has not accrued any liabilities related to such obligations in the accompanying financial statements.

Shareholder Lawsuit

In May 2022, a securities class action complaint captioned *Leacock v. IonQ, Inc. et al*., Case No.8:22-cv-01306, was filed by a stockholder of the Company in the United States District Court for the District of Maryland (the "Leacock Litigation") against the Company and certain of the Company's current officers. In June 2022, a securities class action complaint captioned *Fisher v. IonQ, Inc*., Case No.8:22-cv-01306-DLB (the "Fisher Litigation") was filed by a stockholder against the Company and certain of the Company's current officers ("IonQ Defendants"). Both the Leacock Litigation and Fisher Litigation, which have been consolidated into a single action, allege violations of Section 10(b) of the Exchange Act, and Rule 10b-5 promulgated thereunder, and Section 20(a) of the Exchange Act and seek damages. In September 2022, the Court appointed lead plaintiffs and counsel for lead plaintiffs, and ordered lead plaintiffs to file a consolidated amended complaint. The consolidated amended complaint was filed on November 22, 2022. As part of the consolidated amended complaint, certain members of the Company's Board of Directors as well as other dMY related defendants ("Additional Defendants") have been added as defendants to the case. On February 7, 2023, the IonQ Defendants and the Additional Defendants each filed a motion to dismiss the consolidated amended complaint. Both the IonQ Defendants and Additional Defendants believe that the allegations in the complaints are without merit and intend to defend the matters vigorously. Given the uncertainty of litigation, the preliminary stage of the case, and the legal standards that must be met for, among other things, class certification and success on the merits, the Company cannot reasonably estimate the possible loss or range of loss, if any, that may result from the associated suit.

Glatt Litigation

On January 12, 2021, dMY Technology Group, Inc. II, dMY Sponsor II, LLC, dMY, and dMY Sponsor III, LLC ("Sponsor") accepted service of a lawsuit where they were named as counterclaim defendants in an underlying action by and between GTY Technology Holdings, Inc. ("GTY"), dMY Technology Holdings Inc., dMY Sponsor, LLC, dMY Sponsor II, LLC, dMY Technology Group Inc. II, dMY and Sponsor (collectively "dMY Defendants")

and Carter Glatt ("Glatt") and Captains Neck Holdings LLC ("Captains Neck"), an entity of which Mr. Glatt is a member. The underlying lawsuit, filed by dMY Technology Group, Inc. and dMY Sponsor, LLC, seeks a declaratory judgment that Glatt and Captains Neck are not entitled to membership units of dMY Sponsor LLC, which was formed by Harry L. You, the co-founder and former President and Chief Financial Officer of GTY when Glatt was still working at GTY. The underlying lawsuit contains claims arising from Glatt's termination of employment from GTY, including theft and misappropriation of confidential GTY information, breach of contract, breach of the duties of loyalty and fiduciary duty and conversion. Glatt responded to the underlying lawsuit by adding members of the Sponsor and officers of dMY as additional counterclaim defendants (collectively with the dMY Defendants Glatt and Captains neck, the "Counterclaim Defendants") and adding Dune Acquisition Holdings LLC, a newly formed special purpose acquisition company, as a counterclaimant and asserting claims for breach of contract, fraudulent misrepresentation, negligent misrepresentation, tortious interference with business relations, quantum meruit and unjust enrichment. dMY, and now the Company, has never employed Glatt and has no business agreements with him. The Counterclaim Defendants have denied the claims against them and have filed a motion to dismiss the suit. Although the outcome of this matter cannot be predicted with certainty and the impact of the final resolution of this matter on the Company's results of operations in a particular subsequent reporting period is not known, management does not believe that the resolution of this matter will have a material adverse effect on the Company's future consolidated financial position, future results of operations or cash flows.

11. STOCKHOLDERS' EQUITY

Our second amended and restated certificate of incorporation authorizes us to issue up to 1,000,000,000 shares of common stock, $0.0001 par value per share, and 20,000,000 shares of preferred stock, par value $0.0001 per share.

Preferred Stock

Under our second amended and restated certificate of incorporation, our board of directors may, without further action by our stockholders, fix the rights, preferences, privileges and restrictions of up to an aggregate of 20,000,000 shares of preferred stock in one or more series and authorize their issuance. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of common stock. Any issuance of preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders would receive dividend payments and payments on liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deterring or preventing a change of control or other corporate action. No shares of preferred stock have been issued as of December 31, 2022.

Common Stock

The terms, rights, preference, and privileges of the common stock are as follows:

Voting Rights

Except as otherwise required by law or as otherwise provided in any certificate of designation for any series of preferred stock, each holder of common stock possess all voting power for the election of our directors and all other matters requiring stockholder action. Holders of common stock are entitled to one vote per share on matters to be voted on by stockholders. The Company's second amended and restated certificate of incorporation and bylaws do not provide for cumulative voting rights.

Dividends

Subject to preferences that may be applicable to any then outstanding preferred stock, the holders of common stock may be entitled to receive dividends out of legally available funds if the board of directors, in its discretion, determines to issue dividends and then only at the times and in the amounts that the board of directors may determine. We do not anticipate paying any cash dividends in the foreseeable future.

Liquidation

In the event of our voluntary or involuntary liquidation, dissolution, distribution of assets or winding-up, the holders of common stock will be entitled to receive an equal amount per share of all of our assets of whatever kind available for distribution to stockholders, after the rights of the holders of the preferred stock, if any, have been satisfied.

Rights and Preference

Holders of the Company's common stock have no preemptive or other subscription rights, and there are no sinking fund or redemption provisions applicable to the common stock. The rights, preferences, and privileges of the holders of common stock are subject to, and may be adversely affected by, the rights of the holders of shares of any series of the Company's preferred stock that may be issued.

Common Stock Reserved for Issuance

The Company's common stock reserved for future issuances after giving effect to the recapitalization are as follows:

	As of December 31,	
	2022	2021
Stock options outstanding	24,716,270	22,133,210
Warrants to acquire common stock	8,301,202	8,301,202
Public warrants outstanding	5,231,486	5,233,018
Shares available for future grant	28,769,625	31,589,000
Total common stock reserved	67,018,583	67,256,430

12. WARRANT TRANSACTION AGREEMENT

In November 2019, contemporaneously with a revenue arrangement, the Company entered into a contract, pursuant to which the Company agreed to issue to a customer warrants to acquire shares of Legacy IonQ Series B-1 preferred stock (the "Warrant Shares"), subject to certain vesting events. Upon closing of the Business Combination, these warrants exercisable for Legacy IonQ Series B-1 preferred stock were assumed by the Company and converted into a warrant to purchase a number of shares of common stock equal to the product (rounded down to the nearest whole number) of (a) the number of shares of Legacy IonQ common stock issuable upon conversion of a share of Legacy IonQ Series B-1 preferred stock and(b) the Exchange Ratio (as defined in the Super 8-K filed with the SEC on October 4, 2021), at an exercise price per share (rounded up to the nearest whole cent) equal to (i) the exercise price per share of such Legacy IonQ Warrant Shares divided by (ii) the Exchange Ratio. Except as specifically provided in the Merger Agreement, the Warrant Shares will have the same terms and be subject to the same conditions (including applicable vesting conditions) as set forth in the Legacy IonQ warrant agreement. As of December 31, 2022, the contract allows for the customer to acquire up to 8,301,202 shares of common stock in the Company.

As the Warrant Shares were issued in connection with an existing commercial agreement with a customer, the value of the Warrant Shares was determined to be consideration payable to the customer and consequently is treated as a reduction to revenue recognized under the corresponding revenue arrangement.

Approximately 6.5% of the Warrant Shares vested and became immediately exercisable in August 2020. The remaining Warrant Shares will vest and become exercisable upon satisfaction of certain milestones based on revenue generated under the commercial agreement with the customer, to the extent certain prepayments are made by the customer. The exercise price for the Warrant Shares is $1.38 per share and the warrant is exercisable through November 2029. The fair value of the Warrant Shares at the date of issuance was determined to be $8.7 million.

During 2020, Warrant Shares with a fair value of $0.6 million vested. This fair value of the unamortized warrants was recorded within other noncurrent assets and the Warrant Shares are amortized over time as the related customer revenue is earned. During the year ended December 31, 2021, $0.5 million of the warrant amortization was recorded as a reduction of the related customer revenue. As of December 31, 2021, the contract asset was fully amortized, and therefore no warrant amortization was recorded as a reduction of the related customer revenue during the year ended December 31, 2022.

13. WARRANT LIABILITIES

The Company assumed 11,500,000 warrants, comprised of 7,500,000 public warrants and 4,000,000 private placement warrants, on September 30, 2021 as part of the Business Combination. There were 5,231,486 and 5,233,018 of public warrants to purchase common stock outstanding as of December 31, 2022 and 2021, respectively. There were no private placement warrants outstanding as of December 31, 2022 and 2021. Each warrant entitles the registered holder to purchase one share of common stock at a price of $11.50 per share.

Public warrants

The public warrants may be exercised on the later of (a) 30 days after the completion of a Business Combination or (b) 12 months from the closing of the Initial Public Offering of dMY; provided in each case that the Company has an effective registration statement under the Securities Act covering the shares of common stock issuable upon exercise of the public warrants and a current prospectus relating to them is available (or the Company permits holders to exercise their public warrants on a cashless basis and such cashless exercise is exempt from registration under the Securities Act). The public warrants became exercisable on November 17, 2021.

Redemption of warrants when the price per share of common stock equals or exceeds $18.00:

Once the warrants become exercisable, the Company may redeem the outstanding warrants for cash:

- in whole and not in part;
- at a price of $0.01 per warrant;
- upon a minimum of 30 days' prior written notice of redemption; and
- if, and only if, the closing price of common stock equals or exceeds $18.00 per share (as adjusted) for any 20 trading days within a 30-trading day period ending on the third trading day prior to the date on which the Company sends the notice of redemption to the warrant holders.

Redemption of warrants for when the price per share of common stock equals or exceeds $10.00:

Once the warrants become exercisable, the Company may redeem the outstanding warrants:

- in whole and not in part;
- at $0.10 per warrant upon a minimum of 30 days' prior written notice of redemption provided that holders will be able to exercise their warrants on a cashless basis prior to redemption and receive that number of shares determined by reference to an agreed table based on the redemption date and the fair market value (as defined within the warrant agreement) of the common stock except as otherwise described within the warrant agreement; and upon a minimum of 30 days' prior written notice of redemption; and
- if, and only if, the closing price of common stock equals or exceeds $10.00 per public share (as adjusted) for any 20 trading days within the 30-trading day period ending three trading days before the Company sends notice of redemption to the warrant holders.

No public warrants were redeemed by the Company as of December 31, 2022.

Private placement warrants

The private placement warrants were identical to the public warrants, except that the private placement warrants and the shares of common stock issuable upon exercise of the private placement warrants were not transferable, assignable, or salable until 30 days after the completion of a Business Combination, subject to certain limited exceptions. Additionally, the private placement warrants were non-redeemable so long as they were held by dMY Sponsor III, LLC or its permitted transferees. Otherwise, the private placement warrants had terms and provisions that were identical to those of the public warrants, including as to exercise price, exercisability and exercise period. In December 2021, 4.0 million private placement warrants were exercised on a cashless basis, resulting in the net issuance of 2.2 million shares.

14. STOCK-BASED COMPENSATION

Equity Incentive Plans

The Company has a 2015 Equity Incentive Plan (the "2015 Plan"), which provided for the grant of share-based compensation to certain officers, directors, employees, consultants, and advisors. Upon the closing of the Business Combination, no further awards were made pursuant to the 2015 Plan and all outstanding Legacy IonQ stock options under the 2015 Plan were assumed by the Company. Each Legacy IonQ stock option issued and outstanding immediately prior to the Business Combination was converted into an option to purchase shares of common stock of the Company equal to the product of (a) the number of shares of Legacy IonQ common stock subject to such Legacy IonQ stock option agreement immediately prior to the Business Combination and (b) the exchange ratio at an exercise price equal to the (i) the exercise price per share of such Legacy IonQ stock option divided by (ii) the exchange ratio. Such stock options will continue to be governed by the terms of the 2015 Plan and the stock option agreements thereunder, until such outstanding options are exercised or until they terminate or expire by their terms. For awards granted under the 2015 Plan, vesting generally occurs over four to five years from the date of grant.

In August 2021, the Company's board of directors adopted the 2021 Equity Incentive Plan (the "2021 Plan"), which was subsequently approved by the Company's stockholders in September 2021, and became effective upon the closing of the Business Combination. The 2021 Plan provides for the grant of stock options, stock appreciation rights, restricted stock awards, restricted stock unit awards ("RSU"), performance awards and other forms of awards to employees, directors, and consultants. The number of shares of the Company's common stock reserved for issuance under the 2021 Plan automatically increases on January 1 of each year, beginning on January 1, 2022, and continuing through and including January 1, 2031, by 5% of the Fully Diluted Common Stock (as defined in the 2021 Plan) outstanding on December 31 of the preceding year, or a lesser number of shares determined by the Company's board of directors prior to such increase. As of January 1, 2023, the number of shares reserved for issuance under the 2021 Plan increased by 13,587,593. For awards granted under the 2021 Plan, vesting terms range from one to four years from the date of grant. As of December 31, 2022, the Company had 23,415,625 shares available for grant under the 2021 Plan.

Under both equity incentive plans, all options granted have a contractual term of 10 years.

Stock Options

The Company estimates the fair value of stock options on the date of grant using the Black-Scholes option-pricing model. The Black-Scholes option- pricing model requires estimates of highly subjective assumptions, which affect the fair value of each stock option.

Expected Volatility—As the Company was privately held until 2021 and there has been limited history of a public market for its common stock prior to closing the Business Combination, the expected volatility is based on the average historical stock price volatility of comparable publicly-traded companies in its industry peer group, financial, and market capitalization data.

Expected Term—The expected term of the Company's options represents the period that the stock-based awards are expected to be outstanding.

The Company has estimated the expected term of its employee awards using the SAB Topic 14 Simplified Method allowed by the FASB and SEC, for calculating expected term as it has limited historical exercise data to provide a reasonable basis upon which to otherwise estimate expected term. Certain of the Company's options began vesting prior to the grant date, in which case the Company uses the remaining vesting term at the grant date in the expected term calculation.

Risk-Free Interest Rate—The Company estimates its risk-free interest rate by using the yield on actively traded non-inflation-indexed U.S. treasury securities with contract maturities equal to the expected term.

Dividend Yield—The Company has not declared or paid dividends to date and does not anticipate declaring dividends. As such, the dividend yield has been estimated to be zero.

Fair Value of Underlying Common Stock—For options granted under the 2015 Plan, because the Company's common stock was not yet publicly traded on the date of grant, the Company estimated the fair value of common stock prior to closing the Business Combination. The board of directors considered numerous objective and subjective factors to determine the fair value of the Company's common stock at each meeting in which awards were approved. The factors considered included, but were not limited to: (i) the results of contemporaneous independent third-party valuations of the Company's common stock; (ii) the prices, rights, preferences, and privileges of Legacy IonQ's previously Convertible Redeemable Preferred Stock relative to those of its common stock; (iii) the lack of marketability of the Company's common stock; (iv) actual operating and financial results; (v) current business conditions and projections; (vi) the likelihood of achieving a liquidity event, such as an initial public offering or sale of the Company, given prevailing market conditions; and (vii) precedent transactions involving the Company's shares. For options granted under the 2021 Plan, the Company utilizes the closing stock price on the date of grant as the fair value of the common stock underlying such options.

The assumptions used to estimate the fair value of stock options granted during the years ended December 31, 2022 and 2021, are as follows:

	2022	2021
Risk-free interest rate	2.60%	0.96%
Expected term (in years)	5.82	6.26
Expected volatility	75.82%	77.04%
Dividend yield	— %	— %

The stock option activity is summarized in the following table:

	Number of Option Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value (in millions)
Outstanding as of December 31, 2021	22,133,210	$0.64	7.84	$377.58
Granted	4,974,350	8.28		
Exercised	(2,239,490)	0.47		
Cancelled/ Forfeited	(151,800)	0.66		
Outstanding as of December 31, 2022	24,716,270	$2.19	7.32	$ 49.69
Exercisable as of December 31, 2022	11,484,369	$0.85	6.50	$ 31.49
Exercisable and expected to vest as of December 31, 2022	24,716,270	$2.19	7.32	$ 49.69

The following table summarizes additional information on stock option grants, vesting and exercises (in millions, except per share amounts):

	Year Ended December 31,	
	2022	2021
Total intrinsic value of options exercised	$ 6.7	$54.4
Aggregate grant-date fair value of options vested	$ 9.9	$ 7.4
Weighted-average grant date fair value per share for options granted	$5.58	$5.83

Early Exercised Stock Options

As of December 31, 2022 and 2021, there were 905,128 and 1,420,662 shares, respectively, subject to repurchase related to stock options early exercised and unvested. As of December 31, 2022 and 2021, the Company recorded a liability related to these shares subject to repurchase in the amount of $2.0 million and $3.1 million, respectively, in its consolidated balance sheets.

During 2021, we exercised our right to repurchase 0.4 million shares related to the early exercise of stock options. The unvested shares were repurchased for $1.0 million from an employee in connection with the termination of their service.

Restricted Stock Units

The RSU activity is summarized in the following table:

	Number of RSUs	Weighted Average Grant Date Fair Value	Weighted Average Remaining Contractual Term (Years)	Aggregate Fair Value (in millions)
Outstanding as of December 31, 2021	—	$ —	—	$ —
Granted	10,891,685	7.34		
Vested	(1,472,683)	9.29		
Forfeited	(98,957)	9.01		
Outstanding as of December 31, 2022	9,320,045	$7.02	3.21	$65.38
Expected to vest after December 31, 2022	9,279,045	$6.99	3.22	$64.85

During the year ended December 31, 2022, the Company granted 81,134 RSUs related to the settlement of an accrued bonus liability.

Stock-Based Compensation Expense

Total stock-based compensation expense for stock option awards and RSU awards, which are included in the consolidated financial statements, is as follows (in thousands):

	Years Ended December 31,	
	2022	2021
Cost of revenue	$ 902	$ 62
Research and development	13,472	2,841
Sales and marketing	1,298	67
General and administrative	15,784	4,778
Stock-based compensation, net of amounts capitalized	31,456	7,748
Capitalized stock-based compensation—Intangibles and fixed assets	1,741	275
Total stock-based compensation	$33,197	$8,023

Unrecognized Stock-Based Compensation

A summary of our remaining unrecognized compensation expense and the weighted-average remaining amortization period as of December 31, 2022, related to our non-vested stock options and RSU awards is presented below (in millions, except time period amounts):

	Unrecognized Expense	Weighted-Average Amortization Period (Years)
Restricted stock units	$61.3	1.6
Stock options	$44.7	1.6

Employee Stock Purchase Plan

In August 2021, the Company's board of directors adopted the Employee Stock Purchase Plan (the "ESPP"), which was subsequently approved by the Company's stockholders in September 2021, and became effective upon the closing of the Business Combination. The ESPP is intended to qualify as an "employee stock purchase plan" within the meaning of Section 423 of the U.S. Internal Revenue Code of 1986, as amended (the "Code"). The number of shares of common stock initially reserved for issuance under the ESPP was 5,354,000 shares. The ESPP provides for an annual increase on January 1 of each year, beginning on January 1, 2022, and continuing through and including January 1, 2031, equal to the lesser of (i) 1% of the fully diluted shares of common stock outstanding on the last day of the prior fiscal year, (ii) 10,708,000 shares, or (iii) a lesser number of shares determined by the Company's board of directors prior to such increase. The board of directors elected not to approve the annual increase of ESPP shares on January 1, 2023.

Under the terms of the ESPP, eligible employees can elect to acquire shares of the Company's common stock through periodic payroll deductions during a series of offering periods. Purchases under the ESPP are affected on the last business day of each offering period at a 15% discount to the lower of closing price on that day or the closing price on the first day of the offering period. As of December 31, 2022, no shares of common stock had been issued under the ESPP and no offering period had been set by the board of directors.

15. INCOME TAXES

The current and deferred components of the provision for income taxes for both Federal, State and foreign jurisdictions are zero for both of the years ended December 31, 2022 and 2021.

The Company's provision for income taxes differs from the amount determined by applying the applicable federal statutory tax rate to the loss before income taxes due to the valuation allowance for the net deferred income tax assets. A reconciliation of the U.S. statutory tax rate to our effective tax rate is presented below:

	Years Ended December 31,	
	2022	2021
U.S. federal statutory income tax rate	21.0%	21.0%
State and local income taxes	7.4%	1.2%
R&D tax credits	5.9%	1.7%
Stock-based compensation	-5.1%	-0.6%
Warrant expense	13.0%	-12.5%
Change in tax rates	0.4%	-2.1%
Provision to return and deferred tax adjustments	10.9%	—
Valuation allowance	-53.4%	-8.1%
Other	-0.1%	-0.6%
Effective tax rate	0.0%	0.0%

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. Significant components of the Company's deferred tax assets and liabilities as of December 31, 2022 and 2021, were as follows (in thousands):

	2022	2021
Deferred tax assets:		
Accrued bonus	$ 1,018	$ 310
Unearned revenue	—	281
Stock-based compensation	2,965	1,002
Accrued expenses	152	119
Warrant expenses	149	138
Depreciation and amortization	2,725	170
Other	1,955	809
Lease liabilities	1,068	1,023
R&D credit carryforwards	6,240	3,781
Net operating loss carryforwards	24,836	14,148
Capitalized R&D costs	8,262	—
Total deferred tax assets	**49,370**	**21,781**
Valuation allowance	(48,212)	(20,388)
Total deferred tax assets, net of valuation allowance	**1,158**	**1,393**
Deferred tax liabilities:		
Right of use assets	(989)	(979)
Capitalized R&D costs	—	(414)
Other	(169)	—
Total deferred tax liabilities	**(1,158)**	**(1,393)**
Net deferred tax assets (liabilities)	**$ —**	**—**

The following table summarizes the activity in the Company's valuation allowance against its gross deferred tax assets (in thousands):

	2022	2021
Beginning balance	$20,388	$ 9,747
Charged to costs and expenses	25,925	10,677
Charged (credited) to other accounts	1,899	(36)
Ending balance	$48,212	$20,388

The Company had pre-tax U.S. federal and state net operating loss carryforwards of approximately $96.3 million and $69.5 million, respectively, as of December 31, 2022. The Company's net operating loss carryforwards generated prior to January 1, 2018 of $1.1 million will begin to expire, if not utilized, in 2036. The Company's net operating loss carry forwards generated after December 31, 2017, will carryforward indefinitely. As of December 31, 2022, the Company had U.S. federal and state tax credit carryforwards of $6.3 million. The tax credit carryforwards will expire between 2025 and 2042.

The deductibility of such credits and net operating losses ("NOL") may be limited. Under Sections 383 and 382 of the Internal Revenue Code of 1986, as amended (the "Code"), and corresponding provisions of state law, if a corporation undergoes an "ownership change," which generally occurs if the percentage of the corporation's stock owned by 5% stockholders increases by more than 50% over a three-year period, the corporation's ability to use its pre-change credits and NOL carryforwards and other pre-change tax attributes to offset its post-change income, may be limited. The Company has not determined if it has experienced Section 383/382 ownership changes in the past and if a portion of its NOL and tax credit carryforwards are subject to an annual limitation. In addition, the Company may experience ownership changes in the future as a result of subsequent shifts in its stock ownership, some of which may be outside of its control. If the Company determines that an ownership change has occurred and its ability to use its historical NOL and tax credit carryforwards is significantly limited, it would harm the Company's future operating results by effectively increasing its future tax obligations.

The Company has evaluated the positive and negative evidence bearing upon the realizability of its deferred tax assets. Based on the Company's history of operating losses, including a three-year cumulative loss position as of December 31, 2022 and 2021, the Company has concluded that it is not more likely than not that its deferred income tax assets will be realized. Accordingly, the Company has provided a full valuation allowance, for each of the years ended December 31, 2022 and 2021. The net increase in the valuation allowance of $27.8 million is due to the impacts of capitalized research and development and current year operating losses.

The Company is generally subject to a three-year statute of limitations by major tax jurisdictions. The current tax years that are subject for examination are tax years 2019 through 2021, although tax years dating back to 2016 remain open up to the tax attribute amounts carried forward for future use.

16. LEASES

The Company has one operating lease for its corporate headquarters with UMD that is also used for its research and development functions. As of December 31, 2022 and 2021, the weighted-average remaining lease term was 8 years and 9 years, respectively. The weighted-average discount rate was 11.9% at both December 31, 2022 and 2021.

The components of lease cost were as follows (in thousands):

	2022	2021
Operating lease cost[(1)]		
Fixed lease cost	$763	$763
Short-term cost	79	13
Total operating lease cost	$842	$776

(1) The lease costs are reflected in the consolidated statements of operations as follows (in thousands):

	Year Ended December 31,	
	2022	2021
Cost of revenue	$ 53	$ 45
Research and development	612	613
Sales and marketing	46	8
General and administrative	131	110
Total	$842	$776

Supplemental cash flow and other information related to operating leases was as follows (in thousands):

	Year Ended December 31	
	2022	2021
Cash payments included in the measurement of operating lease liabilities	$644	$561

As of December 31, 2022, maturities of operating lease liabilities are as follows (in thousands):

	Amount
Year Ending December 31,	
2023	$ 671
2024	750
2025	772
2026	795
2027	819
Thereafter	2,532
Total lease payments	6,339
Less: imputed interest	(2,289)
Present value of operating lease liabilities	$ 4,050

In December 2022, the Company entered into a lease agreement for approximately 65,000 square feet in Bothell, Washington, which will commence in 2023 and expire in 2030, with total future lease payments of approximately $9.7 million.

17. EMPLOYEE BENEFIT PLAN

The Company has a 401(k) savings plan (the "401(k) Plan"), which qualifies as a deferred salary arrangement under Section 401(k) of the Internal Revenue Code. Under the 401(k) Plan, participating employees may elect to contribute up to 100% of their eligible compensation, subject to certain limitations. The 401(k) Plan provides for a discretionary employer-matching contribution. The Company made a matching contribution of $0.9 million and $0.5 million to the 401(k) Plan for the years ended December 31, 2022 and 2021, respectively.

18. RELATED PARTY TRANSACTIONS

Transactions with UMD and Duke

As described in Note 8, the Company entered into a License Agreement and Option Agreement with UMD and Duke whereby the Company, in the normal course of business, has licensed certain intellectual property and, in

the case of the amendments to the Option Agreements, has purchased research and development services. The Company considers these agreements to be related party transactions because the Company's Co-founder and Chief Technology Officer served as a professor at Duke and the Company's Co-founder and Chief Scientist served as a professor at UMD. During 2021, the Company's Chief Scientist moved to Duke and each, in their role as professors at Duke, are leading the research subject to the License Agreement and Option Agreement with Duke as of December 31, 2022.

In addition, the Company has an operating lease for office space with UMD.

In September 2021, the Company entered into a contract with UMD to provide certain quantum computing services and facility access (the "UMD Quantum Agreement") related to the National Quantum Lab at UMD in exchange for payments totaling $14.0 million over 3 years. Over the term of the contract, the Company estimates that it will make payments to UMD of approximately $1.4 million, including a pledge to establish the IonQ Endowed Professorship in the College of Computer, Mathematical and Natural Sciences at UMD with a contribution of $1.0 million. The pledge and other estimated payments to UMD will not be an exchange for distinct goods or services under the provisions of ASC 606 and therefore are considered a reduction of the transaction price for the UMD Quantum Agreement. The transaction price is currently estimated at $12.6 million, reflecting this reduction.

In July 2022, the Company entered into an agreement to provide customized quantum computing hardware to UMD for a transaction price of $0.7 million.

The Company's results from transactions with related parties, as reflected in the consolidated statements of operations are detailed below. Except for $0.5 million related to the amortization of a research and development arrangement with Duke for each of the years ended December 31, 2022 and 2021, all transactions in the table below relate to the Company's arrangements with UMD (in thousands):

	Year Ended December 31,	
	2022	2021
Revenue	$4,022	$1,179
Cost of revenue	51	35
Research and development[(1)]	1,082	1,949
Sales and marketing	131	8
General and administrative	117	218

(1) Included in research and development expenses is non-cash amortization associated with the Exclusive Option Agreements with UMD and Duke of $0.5 million and $1.3 million for the years ended December 31, 2022 and 2021, respectively. Also included in research and development expenses is $0.6 million in allocated rent expense for each of the years ended December 31, 2022 and 2021.

The Company has the following balances related to transactions with related parties, as reflected in the consolidated balance sheets. Except for $0.5 million prepaid expenses and other current assets as of both December 31, 2022 and 2021, and $1.3 million and $1.8 million in other noncurrent assets as of December 31, 2022 and 2021, respectively, which relate to prepaid services to Duke under the Option agreement, all transactions in the table below relate to the Company's arrangements with UMD (in thousands):

	December 31,	
	2022	2021
Assets		
Prepaid expenses and other current assets	$ 529	$ 612
Operating lease right-of-use asset	3,753	4,032
Other noncurrent assets	1,325	1,845
Liabilities		
Accounts payable	29	54
Current operating lease liabilities	591	568
Unearned revenue	3,514	2,821
Non-current operating lease liabilities	3,459	3,643

19. GEOGRAPHIC INFORMATION

Revenue generated for customers located in the United States was approximately 82% and 90% of revenue for the years ended December 31, 2022 and 2021, respectively.

EXECUTIVE OFFICERS

Peter Chapman
President & Chief Executive Officer

Rima Alameddine
Chief Revenue Officer

Laurie Babinski
General Counsel and Corporate Secretary

Jungsang Kim
Chief Technology Officer

Thomas Kramer
Chief Financial Officer

Christopher Monroe
Chief Scientist

BOARD OF DIRECTORS

Craig Barratt
Independent Consultant

Ronald Bernal
Venture Partner
New Enterprise Associates

Peter Chapman
President & Chief Executive Officer
IonQ, Inc.

Kathryn Chou
Senior Vice President of SaaS Engineering
Nutanix

Niccolo de Masi
Chief Executive Officer and Director
dMY Technology Group, Inc. and affiliated entities

Jungsang Kim
Chief Technology Officer
IonQ, Inc.

Inder M. Singh
Former Executive Vice President & Chief Financial Officer
Arm Limited

Wendy Thomas
Chief Executive Officer
SecureWorks Corp.

Harry You
Chairman of the Board and Director
dMY Technology Group, Inc. and affiliated entities

LISTING

Our common stock and publicly traded warrants are listed on the New York Stock Exchange under the ticker symbols "IONQ" and "IONQ WS," respectively.

TRANSFER AGENT AND REGISTRAR

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INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Ernst & Young LLP, Tysons, VA

LEGAL COUNSEL

Cooley LLP, Washington, DC

ANNUAL MEETING

June 7, 2023, at 10:00 a.m. Eastern time

Virtual Meeting Access at:
www.proxydocs.com/IONQ

FORM 10-K

A copy of our Form 10-K filed with the SEC will be made available to all stockholders at no charge.

The Form 10-K also can be accessed through the SEC website at **www.sec.gov**, or through our Investor website at **investors.ionq.com**.

To receive a copy by mail please contact:

Investor Relations
IonQ, Inc.
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College Park, MD 20740
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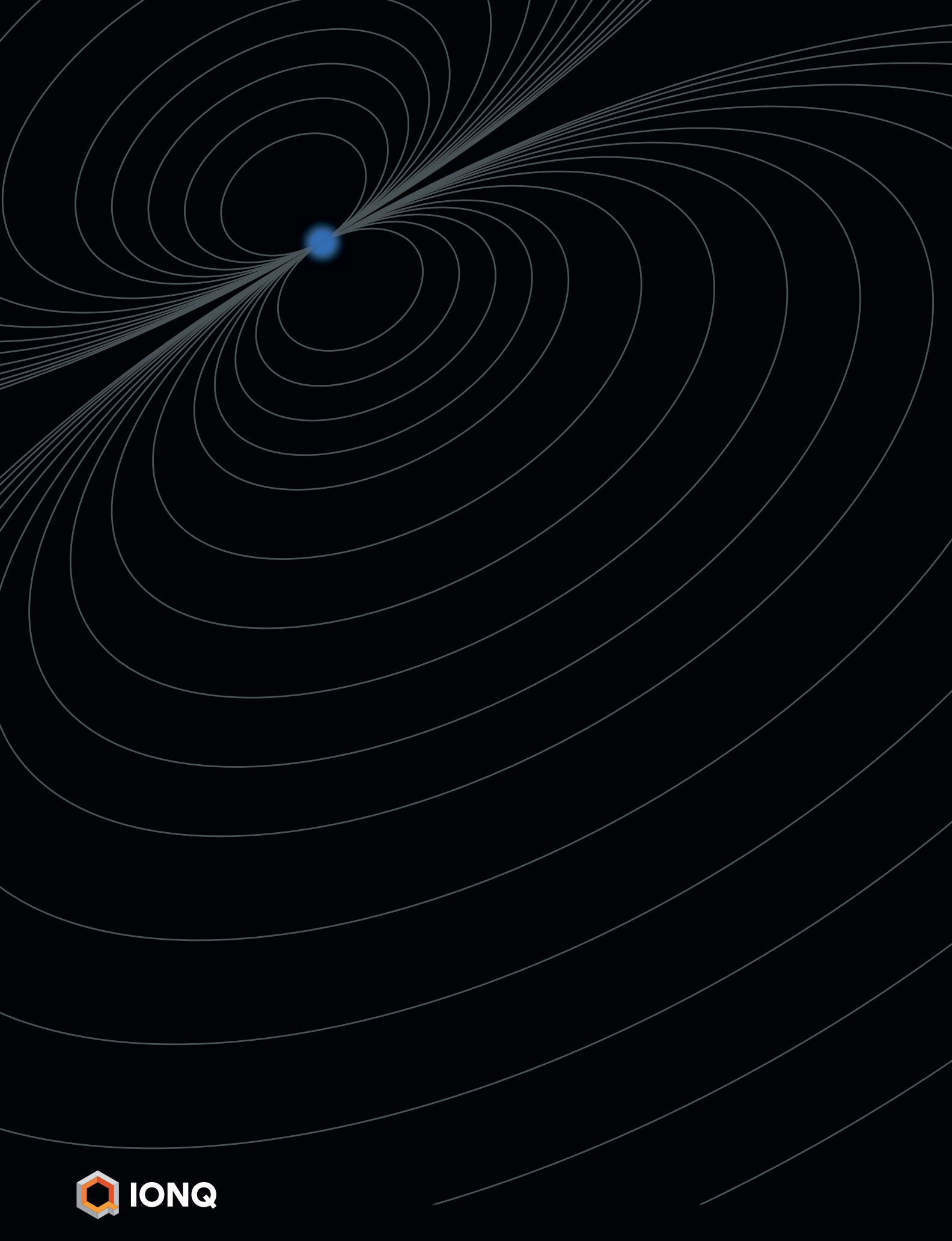
IONQ