AXCELIS TECHNOLOGIES INC
Form 10-K
March 14, 2017

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, 2016

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 000-30941

AXCELIS TECHNOLOGIES, INC.

(Exact name of registrant as specified in its charter)

Delaware	34-1818596
(State or other jurisdiction of incorporation or organization)	(IRS Employer Identification No.)

108 Cherry Hill Drive

Beverly, Massachusetts 01915

(Address of principal executive offices) (zip code)

(978) 787-4000

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, $.001 par value	The Nasdaq Stock Market LLC

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 Section 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 checkmark whether the registrant has submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes No

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements

incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, or a smaller reporting company. See the definitions of “large accelerated filer,” “accelerated filer” and “smaller reporting company” in Rule 12b-2 of the Exchange Act.

Large accelerated filer	Accelerated filer	Non-accelerated filer (Do not check if a smaller reporting company)	Smaller reporting company

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act). Yes No

Aggregate market value of the voting stock held by non-affiliates of the registrant as of June 30, 2016: $310,378,330

Number of shares outstanding of the registrant’s Common Stock, $0.001 par value, as of March 13, 2017: 29,917,059

Documents incorporated by reference:

Portions of the definitive Proxy Statement for Axcelis Technologies, Inc.’s Annual Meeting of Stockholders to be held on May 16, 2017 are incorporated by reference into Part III of this Form 10-K.

PART I

Item 1. Business.

Overview of Our Business

Axcelis Technologies, Inc. ("Axcelis," the "Company," "we," "us," or "our") designs, manufactures and services ion implantation and other processing equipment used in the fabrication of semiconductor chips. We believe that our Purion family of products are the most innovative implanters available on the market today. We sell to leading semiconductor chip manufacturers worldwide. The ion implantation business represents 93.2% of our revenue in 2016 with the remaining 6.8% of revenue derived from other legacy processing systems. In addition to equipment, we provide extensive aftermarket lifecycle products and services, including used tools, spare parts, equipment upgrades, maintenance services and customer training.

Axcelis' business commenced in 1978 and its current corporate entity was incorporated in Delaware in 1995, and is headquartered in Beverly, Massachusetts. We maintain an internet site at www.axcelis.com. On or through our website, investors may access, free of charge, our annual reports on Form 10 K, quarterly reports on Form 10 Q, current reports on Form 8 K, and 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. Our website and the information contained therein or connected thereto shall not be deemed to be incorporated into this Form 10 K.

2016 was a challenging year for the Company. Our 2016 revenues of $267.0 million were below our 2015 revenues due to lower purchasing from key memory customers, particularly in dynamic random-access memory ("DRAM"). Despite this, Axcelis made progress towards our long-term strategic goal of regaining a position of market share leadership in the ion implant semiconductor equipment market.

In 2016 we continued to invest a significant portion of our resources in research and development programs related to our Purion ion implantation platform. During the year, our customer base for Purion ion implanters expanded significantly, and we successfully introduced several new extensions to our core Purion systems, such as the hot silicon carbide Purion M, the Purion EXE and Purion VXE. We placed Purion ion implanters with seven new customers, as well as within seven new fabs owned by existing customers. We expect customer adoption and demand for our Purion products to continue to grow.

In addition, we continued to improve our gross margin performance in 2016. The Company's gross margins for 2016 were 37.3%, up from 33.7% in 2015. We also worked hard to ensure that manufacturing and operating expense levels remain well aligned to business conditions. We believe that the most fundamental interest of our stockholders is in

consistent, profitable, financial performance and we expect to deliver such results in 2017. Our performance is subject to risks and uncertainties discussed below under Item 1A Risk Factors.

Industry Overview

Semiconductor chips, also known as integrated circuits, are used in a continuously evolving range of consumer and industrial products, including for example, personal computers, mobile devices, automobiles, sensors and controllers for the “internet of things,” and data storage servers. Types of semiconductor chips include DRAM and “negative and” (“NAND”) Flash memory; logic devices to process information; and “system on chip” devices (which have both logic and memory features). The semiconductor chip manufacturers industry is entering a period of sustained growth driven by the increased number of devices providing information to, and receiving information from, the internet. This development, sometimes referred to as the “Connected World,” is increasing demand for chips used in data input, such as image sensors, which are often manufactured using mature processing technologies, as well as for memory chips to support the storage of data, internet streaming and “cloud computing” data analytics.

Most semiconductor chips are built on a wafer of silicon of either 200mm (8 inches) or 300mm (12 inches) in diameter. Each semiconductor chip is made up of millions of tiny transistors or “switches” to control the functions of the

device. Transistors are created in the silicon wafer by introducing various precisely placed impurities into the silicon in specific patterns.

Semiconductor chip manufacturers own or manage wafer fabrication facilities (often referred to as a “fab”), which utilize many different types of equipment in the making of integrated circuits. Over 300 process steps utilizing over 50 different types of process tools are required to make a single device like a microprocessor. Semiconductor chip manufacturers seek device performance benefits through new products and technology enhancements and productivity improvements through increased throughput, equipment utilization and higher manufacturing yields. Capacity is added by increasing the amount of manufacturing equipment in existing fabrication facilities and by constructing new fabrication facilities.

We have different types of customers, which impacts timing of purchases and technology requirements. Some customers are integrated electronics manufacturers, who make semiconductor chips for their own devices. These same companies may also act as foundries, who manufacture chips for other electronic manufacturers or chip design companies. Some customers only function as foundries. A few companies design and manufacture branded chips that are sold to device manufacturers. In addition, some customers may have partnerships or joint ventures with two or more semiconductor chip manufacturers to share the technology development and capital investment. The timing of purchases by foundry customers will depend on their receipt or loss of manufacturing contracts. Also, foundry customers will look for equipment that can deliver the broadest capabilities so that they are prepared to manufacture all chip types, while integrated electronics manufacturers may invest in processing equipment that is dedicated to a specific application they require for their products.

The semiconductor capital equipment industry is highly cyclical, as global chip production capacities successively exceed, then lag behind, global chip demand. When chip demand is high, and inventories low, chip manufacturers add capacity through capital equipment purchases. Given the difficulties of forecasting and calibrating chip demand and production capacity, the industry periodically experiences excess chip inventories and softening chip prices. Device manufacturers react with muted capital spending, lowering the demand for capital equipment. Changes in consumer and business demand for products in which chips are used also affect the industry. A successful semiconductor capital equipment manufacturer must not only provide some of the most technically complex products manufactured in the world but also must manage its business to thrive during the inevitable low points in the cycle.

Axcelis’ Strategy

Axcelis’ 2017 strategic initiatives are:

· Drive top line and market share growth with Purion systems, capitalizing on investments by customers in the memory and the mature technology sectors

- Increase aftermarket revenues by delivering differentiated high value products in each business segment, including upgrades, spares, consumables, service and used tools

- Improve gross margins

- Enhance profitability and cash generation

We have continued to invest in research and development through the industry cycles to ensure our products meet the needs of our customers. We take pride in our scientists and engineers who continue to add to our portfolio of patents and unpatented proprietary technology to ensure that our investment in technology leadership is translated into unique product advantages. We strive for operational excellence by focusing on ways to lower our product, manufacturing and design costs and to improve our delivery times to our customers. We will continue to use our Global Customer Teams and a focused account management structure to maintain and strengthen our customer relationships and increase customer satisfaction. Finally, we will maintain a strong cash balance to ensure that we have enough capital to fund a potential ramp up in our business.

Ion Implantation Systems

Ion implantation is a principal step in the transistor formation cycle of the semiconductor chip manufacturing process. Ion implantation is also used to change the characteristics of the silicon for reasons other than transistor formation, a process known as “material modification”. An ion implanter is a large, technically advanced system that injects dopants such as arsenic, boron or phosphorus into a wafer. These dopants are ionized and therefore have electric charges. This electric charge allows the dopants to be manipulated, moved and accelerated with electric and magnetic fields. Ion implanters use these fields to create a beam of ions with a precisely defined amount of energy (ranging between several hundred and three million electron volts) and with a precisely defined amount of beam current (ranging from microamps to milliamps). Certain areas of the silicon wafer are blocked off by a polymer material known as photoresist, which acts as a “stencil” to pattern devices so that the dopants will only enter the wafer where needed. Typical process flows require twenty implant steps, with the most advanced processes requiring thirty or more. Each implant step is characterized by four key parameters: dopant type, dose (amount of dopant), energy (depth into the silicon) and tilt (angle of wafer relative to the ion beam).

In order to cover the wide range of implant steps, three different types of implanters have been developed, each designed to cover a specific range of applications, primarily defined by dose and energy. The three traditional implanter types are referred to as medium current, high current and high energy:

- Medium current implanters are the original model of ion implanter, with mid to low range energy and dose capability.

- High current implanters were the second type of implanter to emerge, having low energy capability and high dose range.

- High energy implanters emerged to address the need for deeper implants with a high energy range and low dose.

The Purion Platform and Family of Ion Implanters

Axcelis offers a complete line of high energy, high current and medium current implanters for all application requirements. Our flagship systems are all based on a common Purion platform which offers purity, precision and productivity by combining a high speed, state of the art single wafer end station, enabling unmatched throughput (500 wafers per hour), and an advanced spot beam that ensures that all points across the wafer see the same beam at the same beam angle, resulting in exceptional process control and maximum yield.

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High Energy Implant. Our Purion XE high energy system combines Axcelis' production proven RF Linac high energy, spot beam technology with the Purion platform. Axcelis is a market leader in high energy ion implanters, and we expect to maintain our leadership in the high energy segment through sales of both our multi wafer legacy high energy systems and the Purion XE, the Purion EXE and the Purion VXE.

· Medium Current Implant. Our Purion M medium current system offers higher productivity and lower cost of ownership than competitive offerings, in addition to other advantages. Our Purion M systems also offer differentiation for specialty applications, like hot silicon carbide.

· High Current Implant. Our Purion H high current system fulfills all traditional high current requirements while extending beyond traditional high current energy and dose ranges. In order to maximize utilization and flexibility, the Purion H can process some traditional mid current implants. In addition, the Purion H is extendable into ultra low energy applications to satisfy future process requirements, including leakage current performance. The Purion H also provides advantages for material modification applications, including hot and cold implant.

We believe our ion implant products will continue to meet customer demand for advantages in productivity, process performance and technical extendibility.

Dry Strip

Axcelis previously manufactured other types of semiconductor processing equipment in addition to the ion implanters, including dry strip wafer cleaning systems. In December 2012, we sold the intellectual property rights relating to our dry strip business to Lam Research Corporation ("Lam"). Under the agreements with Lam, Axcelis may continue to sell dry strip systems for 200mm and 150mm wafers through December 2017. We will continue to service and support our dry strip installed base indefinitely.

Aftermarket Support and Services

Through our Customer Innovation and Support business, we offer our customers extensive aftermarket service and support throughout the lifecycle of the equipment we manufacture as well as equipment we previously manufactured. We believe that approximately 3,000 of our products are in use in 32 countries worldwide. The service and support that we provide includes used tools, spare parts, equipment upgrades, and maintenance services. We provide varying levels of sales, service and applications support out of our field offices to customers located in 32 countries. Revenue generated through our service and support business represented 47.8%, 43.0% and 59.8% of revenue in 2016, 2015 and 2014, respectively.

To support our aftermarket business, we have approximately 200 staff members, including sales and marketing personnel, field service engineers, and spare parts and applications engineers, as well as employees located at our manufacturing facilities who work with our customers to provide customer training and documentation, product, process and applications support.

Most of our customers maintain spare parts inventories for our machines. In addition to our web based spare parts management and replenishment tracking program, we offer a number of Business to Business options to support our customers' parts management requirements. Our Axcelis Managed Inventory service offering, a parts consignment arrangement, provides the customer with full spares support, with Axcelis retaining responsibility for the complete supply chain. The expansion of these services provides ease of use alternatives that help us reduce order fulfillment costs and improve cycle time, resulting in an expanded customer base for this service offering.

Sales and Marketing

We primarily sell our equipment and services through our direct sales force. We conduct sales and marketing activities from our sales offices located in the United States, Taiwan, South Korea, China, Germany, Singapore, Japan and Italy.

International revenue, including export sales from our U.S. manufacturing facilities to foreign customers and sales by foreign subsidiaries and branches, accounted for 80.0%, 85.1% and 80.0% of total revenue in 2016, 2015 and 2014, respectively. Substantially all of our sales are denominated in U.S. dollars. See Note 18 to our Consolidated Financial Statements contained in Item 15 of this Form 10 K for a breakdown of our revenue and long lived assets in the United States, Europe and Asia. See also Item 1A, “Risk Factors,” for information about risks attendant to our foreign operations.

Customers

In 2016, the top 20 semiconductor chip manufacturers accounted for approximately 87.2% of total semiconductor capital equipment spending, down slightly from 87.7% in 2015. These manufacturers are from the largest semiconductor chip manufacturing regions in the world: the United States, Asia Pacific (Taiwan, South Korea, Singapore and China), Japan and Europe.

Revenue from our ten largest customers accounted for 70.2%, 76.8% and 68.1%, of revenue in 2016, 2015 and 2014, respectively. We expect that sales of our products to relatively few customers will continue to account for a high percentage of revenue for the foreseeable future. In 2016, one customer accounted for 17.0% of revenue. In 2015, two customers accounted for 29.3% and 10.5% of revenue, respectively. In 2014, two customers accounted for 17.4% and 12.3% of revenue, respectively.

Our Beverly, Massachusetts Advanced Technology Center houses a process development laboratory with 12,500 sq. ft. of class 10/100/1000 clean room for product demonstrations and process development and a 34,000 sq. ft. customer training center. The Advanced Technology Center provides infrastructure and process capabilities that allow customers to test their unique process steps on our systems under conditions that substantially replicate the customers' production environment. This facility also provides significant capability for our research and development efforts.

Research and Development

Our industry continues to experience rapid technological change, requiring us to frequently introduce new products and enhancements. Our ability to remain competitive in this market will depend in part upon our ability to develop new and enhanced systems and to introduce these systems at competitive prices on a timely and cost effective basis.

We devote a significant portion of our personnel and financial resources to research and development programs and seek to maintain close relationships with our customers to remain responsive to their product needs. We have also sought to reduce the development cycle for new products through a collaborative process whereby our engineering, manufacturing and marketing personnel work closely together with one another and with our customers at an earlier stage in the process. We use 3D, computer aided design, finite element analysis and other computer based modeling methods to test new designs.

Our expenses for research and development were $34.4 million, $32.6 million and $33.5 million in 2016, 2015 and 2014, respectively, or 12.9%, 10.8% and 16.5% of revenue, respectively. We expect that research and development expenditures will continue to represent a similar level of investment in future years.

Manufacturing

We manufacture products at our 417,000 sq. ft. ISO 9001:2008, ISO 14001:2004 certified plant in Beverly, Massachusetts. Our facility employs best in class manufacturing techniques, including lean manufacturing, six sigma controls and advanced inventory management, purchasing and quality systems.

Our clean manufacturing process uses class 1,000/10,000 space to facilitate most of our manufacturing requirements.

The Company's core manufacturing and supply chain competency is built around system assembly and testing, which remains an in house capability due to the high degree of expertise and intellectual property associated with the process and design. Non core work is sourced to one of several global partners and includes items such as vacuum systems, wafer handling and commodity level components. We continuously pursue outsourcing opportunities where the economics are justified, with a goal of enabling quality and margin improvement. Our supply chain team is globally focused and is located in Beverly and Singapore. Customized and commercially available software solutions drive our planning, purchasing and inventory tracking process.

Our products are designed to be assembled and tested in a modular fashion, which facilitates our industry recognized "ship from cell" process. Specially developed test stands, software and tooling provide the framework for this accelerated delivery process. Customers that choose ship from cell substantially improve their delivery times while receiving the same high level of quality provided by more traditional longer cycle integration techniques. Product margins and inventory turns also improve as a result of shorter factory cycle times and increased labor productivity.

Installation of our equipment is provided by factory and field teams. The process includes assembling the equipment at its installation site and after it has been connected, recalibrating it to factory specifications.

Competition

The semiconductor chip manufacturer industry is highly competitive and is characterized by a small number of participants ranging in size. Significant competitive factors in the semiconductor capital equipment market include price, cost of ownership, equipment performance, customer support, capabilities and breadth of product line.

In ion implantation, we mainly compete against Applied Materials, Inc. We and Applied Materials are the only ion implant manufacturers with a full range of implant products, and service and support infrastructures able to service our customers globally. Three other niche players we compete with from time to time include Advanced Ion Beam Technology, Inc., Nissin Ion Implantation Co., Ltd. and SEN Corporation.

Intellectual Property

We rely on patent, copyright, trademark and trade secret protection in the United States and in other countries, as well as contractual restrictions, to protect our proprietary rights in our products and our business. As of December 31, 2016, we had 314 active patents issued in the United States and 465 active patents granted in other countries, as well as 191 patent applications (44 in the United States and 147 in other countries) on file with various patent agencies worldwide. Patents are generally in effect for up to 20 years from the filing of the application.

We intend to file additional patent applications and grow our intellectual property portfolio as appropriate. Although patents are important to our business, we do not believe that we are substantially dependent on any single patent or any group of patents.

We have trademarks, both registered and unregistered, that are maintained to provide customer recognition for our products in the marketplace. Trademark registrations generally remain in effect as long as the trademarks are in use. From time to time, we enter into license agreements with third parties under which we obtain or grant rights to patented or proprietary technology. We do not believe that any of our licenses are currently material to us.

Backlog

Systems backlog, including deferred systems revenue, was $17.5 million and $22.5 million as of December 31, 2016 and 2015, respectively. We believe it is meaningful to investors to include deferred systems revenue as part of our backlog. Deferred systems revenue represents revenue that will be recognized in future periods based on prior shipments. Our policy is to include in backlog only those system orders for which we have accepted purchase orders and are typically due to ship within six months. All orders are subject to cancellations or rescheduling by customers with limited or no penalties.

Backlog does not include orders received and fulfilled within a quarter. Our backlog at the beginning of a quarter typically does not include all orders required to achieve our sales objectives for that quarter. Backlog is not necessarily an indicator of future business trends because orders for services or parts received during the quarter are generally performed or shipped within the same quarter.

Bookings in the quarter ended December 31, 2016 were $34.8 million compared to $26.1 million in the quarter ended December 31, 2015.

Employees

As of December 31, 2016, we had 814 employees and 31 temporary staff worldwide, of which 603 work in North America, 190 in Asia and 52 in Europe. We consider our relationship with our employees to be good. Our employees are not represented by a labor union and are not subject to a collective bargaining agreement. One of our European locations has formed a work council, which has certain information and discussion rights under applicable law.

Environmental

We are subject to environmental laws and regulations in the countries in which we operate that regulate, among other things: air emissions; water discharges; and the generation, use, storage, transportation, handling and disposal of solid and hazardous wastes produced by our manufacturing, research and development and sales activities. As with other companies engaged in like businesses, the nature of our operations exposes us to the risk of environmental liabilities, claims, penalties and orders.

We are proud of our commitment to improving our environment. We believe that our operations are in substantial compliance with applicable environmental laws and regulations and that there are no pending environmental matters that would have a material impact on our business. We are ISO 14001 certified at our Beverly, MA facility.

Executive Officers of the Registrant

Mary G. Puma, 59, has been our President and Chief Executive Officer since January 2002, having served as Chairman from 2005 to 2015. From May 2000 until January 2002, Ms. Puma was our President and Chief Operating Officer. In 1998, she became General Manager and Vice President of the Implant Systems Division of Eaton Corporation, a global diversified industrial manufacturer. In May 1996, she joined Eaton as General Manager of the Commercial Controls Division. Prior to joining Eaton, Ms. Puma spent 15 years in various marketing and general management positions for General Electric Company. Ms. Puma is a director of Nordson Corporation and Semiconductor Equipment and Materials International (SEMI).

Kevin J. Brewer, 58, became our Executive Vice President and Chief Financial Officer in September 2013, having served as interim Chief Financial Officer beginning in June 2013. Mr. Brewer also manages our Global Operations. Mr. Brewer had been our Executive Vice President, Global Operations since 2008 and our Senior Vice President, Manufacturing Operations since May 2005, prior to which he had been Vice President of Manufacturing Operations since October 2002 and Director of Operations from 1999 to 2002. Prior to joining Axcelis in 1999, Mr. Brewer was Director of Operations, Business Jets at Raytheon Aircraft Company, a leading manufacturer of business and special mission aircraft owned by Raytheon Company, a manufacturer of defense, government and commercial electronics, as well as aircraft. Prior to that, Mr. Brewer held various management positions in operations and strategic planning in Raytheon Company’s Electronic Systems and Missile Systems groups.

John E. Aldeborgh, 60, has been our Executive Vice President, Customer Operations since February 2013, having joined Axcelis in January 2013 as our Senior Vice President, Customer Operations. Prior to joining Axcelis, Mr. Aldeborgh served as the Chief Executive Officer and President, and as a Director, of innoPad, Inc., a privately held manufacturer of Chemical Mechanical Planarization pads, since 2006. Mr. Aldeborgh served in various marketing and sales position at Varian Semiconductor Equipment Associates Inc. (an ion implantation systems

business acquired by Applied Materials Inc. in 2011) from 2002 to 2005, including Vice President of Sales and Marketing. Prior to Varian, Mr. Aldeborgh served as President and Chief Operating Officer of Ebara Technologies, Inc., from 1998 to 2002. Mr. Aldeborgh also held various positions, at Genus, Inc. from 1989 to 1998, including Executive Vice President and Chief Operating Officer.

William Bintz, 60, is our Executive Vice President, Product Development since November 2016. From 2011 until November 2016, Mr. Bintz served as Executive Vice President, Product Development, Engineering and Marketing. Prior to that, he served as Senior Vice President, Marketing beginning in September 2007, after joining Axcelis in early 2006 as Director of Marketing for curing and cleaning products and shortly thereafter becoming Vice President of Product Marketing. Prior to joining Axcelis, from 2002 Mr. Bintz was Product Director for Medium Current and High Energy Ion Implant System at Varian Semiconductor Equipment Associates, Inc. Before that, he was General Manager of the Materials Delivery Products Group at MKS Instruments, beginning in 1999, and General Manager of the Thermal Processing Systems Division at Eaton Corporation (now Axcelis) beginning in 1995.

Lynnette C. Fallon, 57, is our Executive Vice President, Human Resources/Legal and General Counsel, a position she has held since May 2005. Prior to that, Ms. Fallon was Senior Vice President HR/Legal and General

Counsel since 2002, and Senior Vice President and General Counsel since 2001. Ms. Fallon has also been our corporate Secretary since 2001. Before joining Axcelis, Ms. Fallon was a partner in the Boston law firm of Palmer & Dodge LLP since 1992, where she was head of the Business Law Department from 1997 to 2001.

Douglas A. Lawson, 56, has been our Executive Vice President, Corporate Marketing and Strategy since November 2013, having joined Axcelis as Vice President Business Development in 2010, and holding the position of Senior Vice President of Strategic Initiatives beginning in 2011. Mr. Lawson also manages our Information Technology function. Prior to joining the company in 2010, he held the position of General Manager of Luminus Devices from 2009 to 2010. He has over 30 years of experience in the technology industry, and has held numerous executive and technical positions at BTU International, PRI Automation, Digital Equipment and Intel.

Russell J. Low, Ph. D., 46, is our Executive Vice President, Engineering, having joined Axcelis in October 2016. Prior to joining the Company, Dr. Low held the position of Vice President of Engineering, MOCVD Business Unit at Veeco Instruments since 2013, prior to which he was Veeco's Senior Director of Engineering, Molecular Beam Epitaxy Business Unit beginning in 2012. From 2003 to 2012, Dr. Low held a number of positions at Varian Semiconductor Equipment Associates, most recently as Director of Technology. Prior to that, Dr. Low held engineering positions in the thermal processing and ion implant divisions of Applied Materials, Inc. from 1997 to 2003.

Item 1A. Risk Factors.

Risks Related to Our Business and Industry

Set forth below and elsewhere in this Form 10 K and in other documents we file with the SEC are risks and uncertainties that could cause actual results to differ materially from the results contemplated by the forward looking statements contained in this Form 10 K. We note that factors set forth below, individually or in the aggregate, may cause our actual results to differ materially from expected and historical results. We note these factors for investors as permitted by the Private Securities Litigation Reform Act of 1995. You should understand that it is not possible to predict or identify all such factors. Consequently, you should not consider the following to be a complete discussion of all potential risks or uncertainties.

If semiconductor chip manufacturers do not make sufficient capital expenditures, our sales and profitability will be harmed.

New systems orders and used tool sales depend upon demand from semiconductor chip manufacturers who build or expand fabrication facilities. The impact of this demand on the Company will vary with the type of semiconductor chip manufacturers who are purchasing systems. For example, changes in demand in the memory and mature process technology segments will most significantly impact the Company since customers in these segments have established Axcelis ion implanters as process tools of record. When the rate of construction or expansion of fabrication facilities declines, demand for our systems will decline, reducing our revenue. In addition, all or a portion of the demand for increased capacity may be satisfied by a semiconductor chip manufacturer's ability to reconfigure and re-use equipment they already own. Revenue decline also hurts our profitability because our established cost structure and our continued investments in engineering, research and development and marketing necessary to develop new products and to maintain extensive customer service and support capabilities limit our ability to reduce expenses in proportion to declining sales.

If we fail to develop and introduce reliable new or enhanced products and services that meet the needs of semiconductor chip manufacturers, our results will suffer.

Rapid technological changes in semiconductor chip manufacturing processes require us to respond quickly to changing customer requirements. Our future success will depend in part upon our ability to develop, manufacture and successfully introduce new systems and product lines with improved capabilities and to continue to enhance existing products. This will depend upon a variety of factors, including new product selection, timely and efficient completion of product design and development as well as manufacturing and assembly processes, product performance in the field and effective sales and marketing. In particular:

- We must continue to develop competitive technical specifications of new systems, or enhancements to our existing systems, and manufacture and ship these systems or enhancements in volume in a timely manner.

- We will need to accurately predict the schedule on which our customers will be ready to transition to new products, in order to accurately forecast demand for new products while managing the transition from older products.

- We will need to effectively manage product reliability or quality problems that often exist with new systems, in order to avoid reduced orders, higher manufacturing costs, delays in acceptance and payment and additional service and warranty expenses.

- Our new products must be accepted in the marketplace.

Our failure to meet any of these requirements will have a material adverse effect on our operating results and profitability.

A significant portion of our revenue depends on customers electing to buy aftermarket products and services from Axcelis.

Historically, a significant portion of our product revenue and all of our service revenue relates to our sale of "aftermarket" products and services, which include parts, consumables, upgrades, service contracts, and time and materials billings. Some of our customers purchase fewer aftermarket products and services, often training their own staff to maintain and service semiconductor capital equipment rather than relying on the equipment manufacturer for these services. In addition, we compete against third party parts suppliers for the sale of parts and consumables that are not protected by patents or otherwise proprietary. To the extent our customers purchase parts and services from other vendors or provide their own system maintenance labor, our revenue will be less.

Our financial results may fluctuate significantly.

We derive our new systems revenue from the sale of a small number of expensive products to a relatively small number of customers. The list prices on our ion implant and other systems range from $0.6 million to $7.5 million. We also sell used equipment in our aftermarket business. At our current sales level, each sale, or failure to make a sale, has a significant effect on us in a particular quarter. In a given quarter, a number of factors can adversely affect our revenue and results, including changes in our product mix, increased fixed expenses per unit due to reductions in the number of products manufactured, and higher fixed costs due to increased levels of research and development and expansion of our worldwide sales and marketing organization. Our financial results also fluctuate based on gross profit realized on sales. A variety of factors may cause gross profit as a percentage of revenue to vary, including the mix and average selling prices of products sold, costs to manufacture and customize systems, warranty costs and impact of changes to inventory reserves. New product introductions may also affect our gross margins. Fluctuations in our financial results may have an adverse effect on the price of our common stock.

Our financial results may fall short of anticipated levels because forecasting revenue and profitability is complex and may be inaccurate.

Management may from time to time provide financial forecasts. These forecasts are based on assumptions, which are believed to be reasonable when made, of fab utilization, shipment timing and system acceptance timing. Any of these assumptions can prove erroneous and the level of revenue recognizable in a particular quarter may vary from the forecast. Our lengthy sales cycle, coupled with customers' competing capital budget considerations, make the timing of customer orders difficult to predict. In addition, our backlog at the beginning of a quarter typically does not include all orders required to achieve our sales objectives for that quarter and is not a reliable indicator of our future sales. As a result, our revenue and operating results for a quarter depend on our shipping orders as scheduled during that quarter, receiving customer acceptance of previously shipped products, and obtaining new orders for products to be shipped in that same quarter. Any delay in, or cancellation of, scheduled shipments and customer acceptances or in shipments from new orders could materially affect our financial results.

Accounting rules addressing revenue recognition add more complexity in forecasting quarterly revenue and profitability. Orders for our products usually contain multiple delivery elements that result in revenue deferral under generally accepted accounting principles. Due to the foregoing factors, investors should understand that our actual financial results for a quarter may vary significantly from our forecasts of financial performance for that quarter. Failure to meet forecasted financial performance may have an adverse effect on the price of our common stock.

The semiconductor industry is highly cyclical and we expect that demand for our products will regularly increase and decrease, making it difficult to manage the business and potentially causing harm to our sales and profitability.

The semiconductor business is highly cyclical, experiencing upturns when the demand for our products is high and downturns when our customers are not investing in new or expanded fabrication facilities. From time to time, inventory buildups in the semiconductor industry, resulting in part from periodic downturns, produce an oversupply of semiconductors. This can cause a reduced demand for capital equipment such as our products, negatively impacting our sales and level of profitability. Our revenue can vary significantly from one point in the cycle to another, making it difficult to manage the business, both when revenue is increasing and when it is decreasing. In addition, a substantial

portion of our operating expenses do not fluctuate with changes in volume. Significant decreases in revenue can therefore have a disproportionate effect on profitability. In addition, reduced demand for our products and services may require Axcelis to implement cost reduction efforts, including restructuring activities, which may adversely affect Axcelis' ability to capitalize on opportunities that arise in the future due to our highly cyclical industry.

If we fail to compete successfully in the highly competitive semiconductor capital equipment industry, our sales and profitability will decline.

The ion implant segment is highly competitive and includes one company with substantially greater financial, engineering, manufacturing, marketing and customer service and support resources that may better position it to compete successfully, as well as several smaller companies that could provide innovative systems with technology that may have performance advantages. We expect our competitors to continue to improve the design and performance of their existing products and processes and to introduce new products and processes with improved price and performance characteristics. If we are unable to improve or introduce competing products when demanded by the markets, our business will be harmed. Finally, if we must lower prices to remain competitive without commensurate cost of goods savings, our gross margins and profitability will be adversely affected.

We are dependent on sales to a limited number of large customers; the loss of a significant customer or any reduction in orders from them could materially affect our sales.

Historically, we have sold a significant portion of our products and services to a limited number of fabricators of semiconductor products. For example, in 2016, our top ten customers accounted for 70.2% of our net sales, in comparison to 76.8% and 68.1% in 2015 and 2014, respectively. None of our customers has entered into a long term agreement requiring it to purchase our products. Although the composition of the group comprising our largest customers has varied from year to year, the loss of a significant customer or any reduction or delays in orders from any significant customer will adversely affect us. The ongoing consolidation of semiconductor chip manufacturers may result in the loss of a customer.

Axcelis is subject to the risks of operating internationally and we derive a substantial portion of our revenue from outside the United States, especially from Asia.

We are substantially dependent on sales of our products and services to customers outside the United States. International sales, including export sales from our U.S. manufacturing facilities to non U.S. customers and sales by our non U.S. subsidiaries and branches, accounted for 80.0% of total revenue in 2016 in comparison to 84.8% of total revenue in 2015 and 80.0% in 2014. Ion implanter system shipments to Asian customers represented 75.3% of total shipment dollars in 2016 in comparison to 78.9% in 2015 and 78.3% in 2014. We anticipate that international sales will continue to account for a significant portion of our revenue. The potential increasing investment in semiconductor

chip manufacturing capability in China is expected to create disruption in our markets, resulting in both risk and opportunity. Because of our dependence upon international sales, our results and prospects may be adversely affected by a number of factors, including:

- unexpected changes in laws or regulations resulting in more burdensome governmental controls, tariffs, restrictions, embargoes or export license requirements;

- volatility in currency exchange rates;

- political and economic instability;

- difficulties in accounts receivable collections;

- extended payment terms beyond those customarily offered in the United States;

- difficulties in managing suppliers, service providers or representatives outside the United States;

· difficulties in staffing and managing foreign subsidiary and branch operations; and

· potential adverse tax consequences.

We may not be able to maintain and expand our business if we are not able to hire, retain and integrate qualified personnel.

Our business depends on our ability to attract and retain qualified, experienced employees. There is substantial competition for experienced engineering, technical, financial, sales and marketing personnel in our industry. In particular, we must attract and retain highly skilled design and process engineers. Competition for such personnel is intense, particularly in the Boston metropolitan area, as well as in other locations around the world. If we are unable to retain our existing key personnel, or attract and retain additional qualified personnel, we may from time to time experience insufficient levels of staffing to fully develop, manufacture and market our products and perform services for our customers. As a result, our growth could be limited or we could fail to meet our delivery commitments or experience deterioration in service levels or decreased customer satisfaction, all of which could adversely affect our financial results.

Our dependence upon suppliers for many components and sub assemblies could result in increased costs or delays in the manufacture and sale of our products.

We rely to a substantial extent on outside vendors to manufacture many of the components and sub assemblies of our products. We obtain many of these components and sub assemblies from a limited group of suppliers. Accordingly, based on situations outside of our control, we may be unable to obtain an adequate supply of required components on a timely basis, on price and other terms acceptable to us, or at all. In addition, we often quote prices to our customers and accept customer orders for our products before purchasing components and sub assemblies from our suppliers. If our suppliers increase the cost of components or sub assemblies, we may not have alternative sources of supply and may not be able to raise the price of our products to cover all or part of the increased cost of components, negatively impacting our gross margins.

The manufacture of some of these components and sub assemblies is an extremely complex process and requires long lead times. As a result, we have in the past, and may in the future, experience delays or shortages. If we are unable to obtain adequate and timely deliveries of our required components or sub assemblies, we may have to seek alternative sources of supply or manufacture these components internally. This could delay our ability to manufacture or to ship our systems on a timely basis, causing us to lose sales, incur additional costs, delay new product introductions and suffer harm to our reputation.

Moreover, if actual demand for Axcelis' products is different than expected, Axcelis may purchase more or fewer parts than necessary or incur costs for canceling, postponing or expediting delivery of parts. If Axcelis purchases inventory in anticipation of customer demand that does not materialize, or if customers reduce or delay orders, Axcelis may incur excess inventory charges.

We may be unable to obtain needed additional capital to finance our operations.

Our capital requirements may vary widely from quarter to quarter, depending on, among other things, capital expenditures, fluctuations in our operating results, financing activities, acquisitions and investments and inventory and receivables management. We believe that our existing cash and cash equivalents will be sufficient to satisfy our anticipated cash requirements. A number of factors, including those described in these "Risk Factors," could prove our assumptions wrong and cause us to require additional capital from external sources. Depending on market conditions, future debt or equity financings may not be possible on attractive terms or at all. In addition, future debt or equity financings could be dilutive to the existing holders of our common stock.

Our international operations involve currency risk.

Substantially all of our sales are billed in U.S. dollars, thereby reducing the impact of fluctuations in foreign exchange rates on our results. However, the aftermarket revenues of our non-U.S. subsidiaries, and most of the operating expenses of these non-U.S. subsidiaries, are received and incurred in local currencies. The translation of these operating results into U.S. dollars in our Consolidated Statement of Operations can result in other income (expense). Similarly, the translation of asset and liability values to U.S. dollars are recorded in stockholders' equity as an element of accumulated other comprehensive income (loss). Accordingly, fluctuations in exchange rates can impact reported revenues, expense, profitability and asset values in our Consolidated Financial Statements. During the year ended December 31, 2016, approximately 28.4% of our revenue was derived from foreign operations with this inherent risk. In addition, at December 31, 2016, our operations outside of the United States accounted for approximately 20.1% of our total assets, the majority of which was denominated in currencies other than the U.S. dollar.

Axcelis is exposed to risks related to cybersecurity threats and incidents.

In the conduct of its business, Axcelis collects, uses, transmits and stores data on information technology systems. This data includes confidential information belonging to Axcelis or its customers or other business partners, as well as personally-identifiable information of individuals. Axcelis has been and expects to be subject to cybersecurity threats and incidents, ranging from employee error or misuse to individual attempts to gain unauthorized access to information systems to sophisticated and targeted measures known as advanced persistent threats, none of which have been material to the Company to date. Axcelis devotes significant resources to network security, data encryption and other measures to protect its systems and data from unauthorized access or misuse. However, depending on their nature and scope, cybersecurity incidents could result in business disruption; the misappropriation, corruption or loss of confidential information and critical data (Axcelis' and that of third parties); reputational damage; litigation with third parties; diminution in the value of Axcelis' investment in research, development and engineering; data privacy issues; and increased cybersecurity protection and remediation costs.

Our proprietary technology may be vulnerable to efforts by competitors to challenge or design around, potentially reducing our market share.

We rely on a combination of patents, copyrights, trademark and trade secret laws, non-disclosure agreements and other intellectual property protection methods to protect our proprietary technology. Despite our efforts to protect our intellectual property, our competitors may be able to challenge, design around or legitimately use the proprietary technology embedded in our systems or other technology or information used in our business. If this occurs, the value of our proprietary technology will be diminished. Our means of protecting our proprietary rights may not be adequate and our patents may not be sufficient to prevent others from using technology that is similar to or the same as our technology. Patents issued to us have been, or might be challenged, and might be invalidated or circumvented and any rights granted under our patents may not provide adequate protection to us. Our competitors may independently develop similar technology, duplicate features of our products or design around patents that may be issued to us. As a result of these threats to our proprietary technology, we may have to resort to costly litigation to enforce or defend our intellectual property rights. Finally, all patents expire after a period of time (in the U.S., patents expire 20 years from the date of filing of the patent application). Our market share could be negatively impacted by the expiration of a patent which had created a barrier for our competitors.

Axcelis also has agreements with third parties for licensing of patented or proprietary technology with Axcelis as the licensor or the licensee. Termination of license agreements or claims of infringement with respect to such technology could have an adverse impact on our financial performance or ability to ship products with existing configurations.

We (or customers that we indemnify) might face intellectual property infringement claims or patent disputes that may be costly to resolve and, if resolved against us, could be very costly to us and prevent us from making and selling our systems.

From time to time, claims and proceedings have been or may be asserted against us relative to patent validity or infringement matters. We typically agree to indemnify our customers from liability to third parties for intellectual property infringement arising from the use of our products in their intended manner. Therefore, we occasionally receive notification from customers who believe that we owe them indemnification or other obligations related to infringement claims made against the customers by third parties. Our involvement in any patent dispute or other intellectual property dispute or action to protect trade secrets, even if the claims are without merit, could be very expensive and could divert the attention of our management. Adverse determinations in any litigation could subject us to significant liabilities to third parties, require us to remove certain features from our products or seek costly licenses from third parties or prevent us from manufacturing and selling our systems. In addition, infringement indemnification clauses in system sale agreements may require us to take other actions or require us to provide certain remedies to customers who are exposed to indemnified liabilities. Any of these situations could have a material adverse effect on our business results.

If operations were disrupted at Axcelis' primary manufacturing facility, it would have a negative impact on our business.

We have one primary manufacturing facility located in Massachusetts. Its operations could be subject to disruption for a variety of reasons, including, but not limited to natural disasters, work stoppages, operational facility constraints and terrorism. Such disruption could cause delays in shipments of products to our customers and could result in cancellation of orders or loss of customers, which could seriously harm our business.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

We lease our principal facility in Beverly, Massachusetts, which comprises 417,000 square feet. The facility is principally used for manufacturing, research and development, sales/marketing, customer support, advanced process development, product demonstration, customer training center and corporate headquarters. We believe that our manufacturing facilities and equipment generally are well maintained, in good operating condition, suitable for our purposes, and adequate for our present operations.

We own 23 acres of undeveloped property in Beverly, Massachusetts, adjacent to our headquarters.

As of December 31, 2016, the Company also leased 41 other properties, of which 11 are located in the United States and the remainder are located in Asia and Europe, including offices in Taiwan, Singapore, South Korea, China, Malaysia, Japan, Italy and Germany. These properties are used for sales and service offices and warehousing.

Our Beverly, Massachusetts facility is ISO 9001:2008 and ISO 14001:2004 and our European office is ISO 9001:2008 certified.

Item 3. Legal Proceedings.

The Company is not presently a party to any litigation that it believes might have a material adverse effect on its business operations. The Company is, from time to time, a party to litigation that arises in the normal course of its business operations.

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.

Our common stock trades on the Nasdaq Global Select Market under the symbol ACLS. The following table sets forth the high and low closing sale prices as reported on the Nasdaq Global Select Market during each of the quarters for the two most recent years, as adjusted for our 1-4 reverse stock split as discussed in Note 4. As of March 6, 2017, we had approximately 4,000 stockholders of record. We have never paid any cash dividends to our shareholders and do not anticipate paying cash dividends in the foreseeable future.

	Common Stock Price	
	High	Low
2015		
First Quarter	$ 11.52	$ 9.40
Second Quarter	$ 12.96	$ 9.96
Third Quarter	$ 13.64	$ 9.56
Fourth Quarter	$ 12.24	$ 9.36
2016		
First Quarter	$ 11.40	$ 8.96
Second Quarter	$ 11.88	$ 9.16
Third Quarter	$ 13.43	$ 9.91
Fourth Quarter	$ 14.55	$ 11.20

Item 6. Selected Financial Data.

The following selected consolidated statements of operations data for each of the three years ended December 31, 2016, 2015 and 2014 and the consolidated balance sheets data as of December 31, 2016 and 2015 have been derived from the audited consolidated financial statements contained in Item 15 of Part IV of this Form 10 K. The selected consolidated balance sheets data as of December 31, 2014 and 2013, and the statements of operations data for the years ended December 31, 2013 and 2012, have been derived from the audited financial statements contained in our Form 10 K filed on March 4, 2015. The consolidated balance sheets data as of December 31, 2012 has been derived from the audited financial statements contained in our Form 10-K filed on March 1, 2013.

The historical financial information set forth below may not be indicative of our future performance and should be read together with "Management's Discussion and Analysis of Financial Condition and Results of Operations" and

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our historical consolidated financial statements and notes to those statements included in Item 7 of Part II and Item 15 of Part IV, respectively, of this Form 10 K.

	Year ended December 31,				
	2016	2015	2014	2013	2012
	(In thousands, except per share amounts)				
Consolidated statements of operations data:					
Revenue	$ 266,980	$ 301,495	$ 203,051	$ 195,632	$ 203,385
Gross profit	99,598	101,706	70,164	67,935	58,171
Income (loss) from operations	16,623	20,718	(10,661)	(14,618)	(30,938)
Income (loss) before income taxes	11,024	15,205	(10,167)	(16,104)	(32,388)
Net income (loss)	11,001	14,678	(11,266)	(17,144)	(34,034)
Net income (loss) per share:					
Basic	$ 0.38	$ 0.51	$ (0.40)	$ (0.63)	$ (1.26)
Diluted	$ 0.36	$ 0.49	$ (0.40)	$ (0.63)	$ (1.26)
Shares used in computing basic and diluted per share amounts:					
Basic	29,195	28,595	27,863	27,217	26,905
Diluted	30,947	30,229	27,863	27,217	26,905
Consolidated balance sheets data:					
Cash and cash equivalents	$ 70,791	$ 78,889	$ 30,753	$ 46,290	$ 44,986
Working capital	192,998	185,589*	126,541 *	142,952 *	138,947 *
Total assets	302,231	281,784*	221,158 *	227,053 *	215,662 *
Long-term liabilities	53,045	53,652	7,204	22,087	6,300
Stockholders’ equity	201,455	183,764*	161,856 *	169,506 *	179,580 *

* As adjusted for correction of prior period error. Please see Note 3 for further discussion.

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

Certain statements in "Management's Discussion and Analysis of Financial Condition and Results of Operations" are forward looking statements that involve risks and uncertainties. Words such as may, will, should, would, anticipates, expects, intends, plans, believes, seeks, estimates and similar expressions identify such forward looking statements. The forward looking statements contained herein are based on current expectations and entail various risks and uncertainties that could cause actual results to differ materially from those expressed in such forward looking statements. Factors that might cause such a difference include, among other things, those set forth under "Liquidity and Capital Resources" and "Risk Factors" and others discussed elsewhere in this Form 10 K. Readers are cautioned not to place undue reliance on these forward looking statements, which reflect management's analysis only as of the date hereof. We assume no obligation to update these forward looking statements to reflect actual results or changes in factors or assumptions affecting forward looking statements, except as may be required by law.

Overview

The semiconductor capital equipment industry is subject to significant cyclical swings in capital spending by semiconductor chip manufacturers. Capital spending is influenced by demand for semiconductors and the products using them, the utilization rate and capacity of existing semiconductor chip manufacturing facilities and changes in semiconductor technology, all of which are outside of our control. As a result, our revenue may fluctuate from year to year and period to period. Our established cost structure does not vary significantly with changes in volume. We may also experience fluctuations in operating results and cash flows depending on our revenue level.

2016 was a challenging year for the Company. Our 2016 revenues of $267.0 million were below our 2015 revenues due to lower purchasing from key memory customers, particularly in DRAM. Despite this, Axcelis made progress towards our long-term strategic goal of regaining a position of market share leadership in the ion implant semiconductor capital equipment market.

In 2016 we continued to invest a significant portion of our resources in research and development programs related to our Purion ion implantation platform. During the year, our customer base for Purion ion implanters expanded significantly, and we successfully introduced several new extensions to our core Purion systems, such as the hot silicon carbide Purion M, the Purion EXE and Purion VXE. We placed Purion ion implanters with seven new customers, as well as within seven new fabs owned by existing customers. We expect customer adoption and demand for our Purion products to continue to grow.

In addition, we continued to improve our gross margin performance in 2016. The Company's gross margins for 2016 were 37.3%, up from 33.7% in 2015. We also worked hard to ensure that manufacturing and operating expense levels remain well aligned to business conditions. We believe that the most fundamental interest of our stockholders is in consistent, profitable, financial performance and we expect to deliver such results in 2017.

Consolidation and partnering within the semiconductor chip manufacturing industry has resulted in a smaller number of customers. Our net revenue from our ten largest customers accounted for 70.2% of total revenue for the year ended December 31, 2016 compared to 76.8% and 68.1% of revenue for the years ended December 31, 2015 and 2014, respectively. For the year ended December 31, 2016, the Company had one customer representing 17.0% of total revenue.

Critical Accounting Estimates

Management's discussion and analysis of our financial condition and results of operations are based upon Axcelis' consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States. The preparation of these financial statements requires management to make estimates and judgments that affect the reported amounts of assets, liabilities, revenue and expenses, and related disclosure of contingent assets and liabilities. On an on going basis, we evaluate our estimates and assumptions. Management's estimates are based on historical experience and on various other assumptions that are believed to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and

liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

We believe the following accounting policies are critical in the portrayal of our financial condition and results of operations and require management's most significant judgments and estimates in the preparation of our consolidated financial statements. For additional accounting policies see Note 2 to the consolidated financial statements for the year ended December 31, 2016 included in this Annual Report on Form 10-K.

Revenue Recognition

Our revenue recognition policy involves significant judgment by management. As described below, we consider a broad array of facts and circumstances in determining when to recognize revenue, including contractual service obligations to the customer, the complexity of the customer's post delivery acceptance provisions, payment history, customer creditworthiness and the installation process.

Our system sales transactions are made up of multiple elements, including the system itself and elements that are not delivered simultaneously with the system. These undelivered elements might include a combination of installation services, extended warranty and support and spare parts, all of which are generally covered by a single sales price.

Our system revenue arrangements with multiple elements are divided into separate units of accounting if specified criteria are met, including whether the delivered element has stand alone value to the customer. If the criteria are met, then the consideration received is allocated among the separate units based on their relative selling price, and the revenue is recognized separately for each of the separate units.

We determine selling price for each unit of accounting (element) using vendor specific objective evidence ("VSOE") or third party evidence ("TPE"), if they exist, otherwise, we use best estimated selling price ("BESP"). We generally expect that we will not be able to establish TPE due to the nature of our products, and, as such, we typically will determine selling price using VSOE or BESP.

Where required, we determine BESP for an individual element based on consideration of both market and Company specific factors, including the selling price and profit margin for similar products, the cost to produce the deliverable and the anticipated margin on that deliverable and the characteristics of the markets in which the deliverable is sold.

Systems are not sold separately and VSOE or TPE is not available for the systems element. Therefore the selling price associated with systems is based on BESP. The allocated value for installation in the arrangement includes the either (i) the relative selling price of the installation or (ii) the portion of the sales price that will not be received until the installation is completed (the “retention”). The selling price of elements such as extended warranty for support, spare parts and support labor is also based on BESP. For the majority of regions, the selling price of installation is based upon the fair value of the service performed, including labor, which is based upon the estimated time to complete the installation at hourly rates, and material components, both of which are sold separately, or VSOE. In regions where VSOE does not exist the Company uses BESP.

Product revenue for products which have demonstrated market acceptance is generally recognized upon shipment provided title and risk of loss has passed to the customer, evidence of an arrangement exists, prices are contractually fixed or determinable, collection is reasonably assured through historical collection results and regular credit evaluations and there are no uncertainties regarding customer acceptance. Revenue from installation services is recognized at the time acceptance has occurred, as defined in the sales documentation, or, for certain customers, when both the acceptance has occurred and retention payment has been received. Revenue for other elements is recognized at the time products are shipped or the related services are performed.

We generally recognize product revenue for systems which have demonstrated market acceptance at the time of shipment because the customer’s post delivery acceptance provisions and installation process have been established to be

routine, commercially inconsequential and perfunctory. We believe the risk of failure to complete a system installation is remote.

For initial shipments of systems with new technologies or in the small number of instances where we are unsure of meeting the customer's specifications or obtaining customer acceptance upon shipment of the system, we will defer the recognition of systems revenue and related costs until written customer acceptance of the system is obtained. This deferral period is generally within twelve months of shipment.

Impairment of Long Lived Assets

We record impairment losses on long lived assets when events and circumstances indicate that these assets might not be recoverable. Recoverability is measured by a comparison of the assets' carrying amount to their expected future undiscounted net cash flows. If such assets are considered to be impaired, the impairment is measured based on the amount by which the carrying value exceeds its fair value.

Actual performance could be materially different from our current forecasts, which could impact estimates of undiscounted cash flows and may result in the impairment of the carrying amount of the long lived assets in the future. This could be caused by strategic decisions made in response to economic and competitive conditions, the impact of the economic environment on our customer base or a material adverse change in our relationships with significant customers.

We did not record an impairment charge in the years ended December 31, 2016, 2015 or 2014.

Accounts Receivable—Allowance for Doubtful Accounts

We record an allowance for doubtful accounts for estimated losses resulting from the inability of our customers to make required payments. Our allowance for doubtful accounts is established based on a specific assessment of collectability of our customer accounts. If the financial condition of our customers were to deteriorate, resulting in an impairment of their ability to make payments, additional allowances may be necessary.

Inventory—Allowance for Excess and Obsolescence and Lower of Cost or Market

We record an allowance for estimated excess and obsolete inventory and lower of cost or market. The allowance is determined using management's assumptions of materials usage, based on estimates of forecasted and historical demand and market conditions. If actual market conditions become less favorable than those projected by management, additional inventory write downs may be required.

Although we make every effort to ensure the accuracy of our forecasts or product demand and pricing assumptions, any significant unanticipated changes in demand, pricing, or technical developments would significantly impact the value of our inventory and our reported operating results. In the future, if we determine that inventory needs to be written down, the Company will recognize such costs in our cost of revenue at the time of such determination. If we subsequently sell product that has previously been written down, our gross margin in that period will be favorably impacted.

Product Warranty

We generally offer a one year warranty for all of our systems, the terms and conditions of which vary depending upon the product sold. For all systems sold, we accrue a liability for the estimated cost of standard warranty at the time of system shipment and defer the portion of systems revenue attributable to the relative fair value of non standard warranty. Costs for non standard warranty are expensed as incurred. Factors that affect our warranty liability include the number of installed units, historical and anticipated product failure rates, material usage and service labor costs. We periodically assess the adequacy of our recorded liability and adjust the amount as necessary.

Stock-based Compensation

Stock based compensation expense for stock options with time based conditions is estimated as of the grant date based on the fair value of the award and is recognized as expense over the requisite service period, which generally equals the vesting period, based on the number of awards that are expected to vest. Estimating the fair value for stock options requires judgment, including the expected term of our stock options, volatility of our stock, expected dividends, risk free interest rates over the expected term of the options and the expected forfeiture rate.

We considered a number of factors when estimating volatility. Our method of estimating expected volatility for all stock options granted relies on a combination of historical and implied volatility. We believe that this blended volatility results in a more accurate estimate of the grant date fair value of employee stock options because it more appropriately reflects the market's current expectations of future volatility.

In limited circumstances, we also issue stock option grants with vesting based on performance or market conditions, such as the price of our common stock, or, a combination of time, performance or market conditions. The fair values and derived service periods for all grants that have vesting based on performance or market conditions are estimated using the Monte Carlo valuation method. For each stock option grant with vesting based on a combination of time or market conditions, where vesting will occur if either condition is met, the related compensation costs are recognized over the shorter of the explicit service period or the derived service period.

We use the straight line attribution method to recognize expense for stock based awards such that the expense associated with awards is evenly recognized throughout the period.

The amount of stock based compensation recognized is based on the value of the portion of the awards that are ultimately expected to vest. We estimate forfeitures at the time of grant and revise them, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The term "forfeitures" is distinct from "cancellations" or "expirations" and represents only the unvested portion of the surrendered stock based award.

The benefits of tax deductions in excess of recognized compensation cost is reported as a financing cash flow, rather than as an operating cash flow. Because the Company does not recognize the benefit of tax deductions in excess of recognized compensation cost due to its cumulative net operating loss position, this had no impact on the Company's consolidated statement of cash flows for the years ended December 31, 2016, 2015 and 2014.

Income Taxes

We record income taxes using the asset and liability method. Deferred income tax assets and liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of existing assets and liabilities and their respective income tax basis, and net operating loss and tax credit carryforwards.

Our consolidated financial statements contain certain deferred tax assets which have arisen primarily as a result of operating losses, as well as other temporary differences between financial and income tax accounting.

We establish a valuation allowance when it is more likely than not that some portion or all of the deferred tax assets will not be realized. Significant management judgment is required in determining our provision for income taxes, the deferred tax assets and liabilities and any valuation allowance recorded against those net deferred tax assets.

We evaluate the weight of all available evidence such as historical losses, projected future taxable income and the expected timing of the reversals of existing temporary differences to determine whether it is more likely than not that some portion or all of the net deferred income tax assets will not be realized.

Based on our level of deferred tax assets as of December 31, 2016 and our level of historical U.S. losses, we have determined that the current uncertainty regarding the realization of these assets is sufficient to warrant the need for a full valuation allowance against our U.S. net deferred tax assets. We have also determined that a valuation allowance is required on a portion of our foreign deferred tax assets.

Our income tax expense includes the largest amount of tax benefit for an uncertain tax position that is more likely than not to be sustained upon audit based on the technical merits of the tax position. Settlements with tax authorities, the expiration of statutes of limitations for particular tax positions, or obtaining new information on particular tax positions may cause a change to the effective tax rate. The Company recognizes accrued interest related to unrecognized tax benefits as interest expense and penalties as operating expense.

Results of Operations

The following table sets forth our results of operations as a percentage of total revenue:

	Year ended December 31,		
	2016	2015	2014
Revenue:			
Product	91.5 %	92.5 %	88.3 %
Services	8.5	7.5	11.7
Total revenue	100	100	100
Cost of revenue:			
Product	55.8	60.1	55.8
Services	6.9	6.2	9.7
Total cost of revenue	62.7	66.3	65.5
Gross profit	37.3	33.7	34.5
Operating expenses:			
Research and development	12.9	10.8	16.5
Sales and marketing	8.9	7.7	10.2
General and administrative	9.2	8.3	11.8
Restructuring charges	0.1	—	1.3
Total operating expenses	31.1	26.8	39.8
Income (loss) from operations	6.2	6.9	(5.3)
Other (expense) income:			
Interest income	0.1	—	—
Interest expense	(1.9)	(1.7)	(0.5)
Other, net	(0.3)	(0.2)	0.8
Total other (expense) income	(2.1)	(1.9)	0.3
Income (loss) before income taxes	4.1	5.0	(5.0)
Income tax provision	0.0	0.1	0.5
Net income (loss)	4.1 %	4.9 %	(5.5) %

Revenue

The following table sets forth our revenue:

	Year ended December 31,		Period-to-Period Change		Year ended December 31,		Period-to-Period Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
Revenue:								
Product	$ 244,295	$ 278,875	$ (34,580)	(12.4)%	$ 278,875	$ 179,246	$ 99,629	55.6 %
Percentage of revenue	91.5 %	92.5 %			92.5 %	88.3 %		
Services	22,685	22,620	65	0.3 %	22,620	23,805	(1,185)	(5.0)%
Percentage of revenue	8.5 %	7.5 %			7.5 %	11.7 %		
Total revenue	$ 266,980	$ 301,495	$ (34,515)	(11.4)%	$ 301,495	$ 203,051	$ 98,444	48.5 %

2016 Compared with 2015

Product

Product revenue, which includes new system sales, sales of spare parts, product upgrades and used system sales was $244.3 million or 91.5% of revenue in 2016, compared with $278.9 million, or 92.5% of revenue in 2015. The decrease in product revenue in 2016 was primarily driven by a decrease in the number of Purion systems sold due to an unexpected decline in DRAM spending.

Approximately 38.9% of systems revenue in 2016 was from sales of 200mm products and 61.1% was from sales of 300mm products, compared with 13.0% and 87.0% for sales of 200mm products and 300mm products in 2015, respectively. The increase in 200mm system sales is attributed to a resurgence in the mature process technology segment including shipments of both legacy and 200mm Purion systems

A portion of our revenue from system sales is deferred until installation and other services related to future deliverables are performed. The total amount of deferred revenue at December 31, 2016 and 2015 was $11.0 million and $8.5 million, respectively. The increase was primarily due to a prepayment of a system sale.

Services

Services revenue, which includes the labor component of maintenance and service contracts and fees for service hours provided by on site service personnel, was $22.7 million, or 8.5% of revenue for 2016, compared with $22.6 million, or 7.5% of revenue for 2015. Although services revenue should increase with the expansion of the installed base of systems, it can fluctuate from period to period based on capacity utilization at customers' manufacturing facilities, which affects the need for equipment service.

2015 Compared with 2014

Product

Product revenue was $278.9 million or 92.5% of revenue in 2015, compared with $179.2 million, or 88.3% of revenue in 2014. The increase in product revenue in 2015 was primarily driven by an increase in the number of Purion systems sold.

Approximately 13.0% of systems revenue in 2015 was from sales of 200mm products and 87.0% was from sales of 300mm products, compared with 18.1% and 81.9% for sales of 200mm products and 300mm products in 2014, respectively.

The total amount of deferred revenue at December 31, 2015 and 2014 was $8.5 million and $7.2 million, respectively. The increase was mainly due to the increase in systems sales in 2015 and the timing of acceptance of deferred system sales.

Services

Services revenue was $22.6 million, or 7.5% of revenue for 2015, compared with $23.8 million, or 11.7% of revenue for 2014.

Revenue Categories used by Management

In addition to the line item revenue categories discussed above, management also uses revenue categorizations which look at revenue by product line (the most significant of which is ion implant) and by aftermarket, as described below.

2016 Compared with 2015

Ion Implant

Revenue from sales of ion implantation products and related service was $248.9 million, or 93.2% of total revenue in 2016, compared with $282.6 million, or 93.2%, of total revenue in 2015.

Aftermarket

We refer to the business of selling spare parts, product upgrades, and used systems, combined with the sale of maintenance labor and service contracts and service hours, as the “aftermarket” business. Revenue from our aftermarket business was $127.7 million in 2016, which decreased slightly compared to $129.6 million for 2015. Aftermarket revenue generally increases with the expansion of the installed base of systems but can fluctuate from period to period based on capacity utilization at customers’ manufacturing facilities which affects the sale of spare parts and demand for equipment service.

2015 Compared with 2014

Ion Implant

Revenue from sales of ion implantation products and related service was $282.6 million, or 93.7% of total revenue in 2015, compared with $183.1 million, or 90.2%, of total revenue in 2014. The increase in ion implant's share of total revenue for 2015 reflects a continuing reduction in dry strip revenue following the sale of assets relating to the dry strip product line in December 2012. Total revenue in ion implant increased as our market share increased in 2015 due to our Purion products.

Aftermarket

Revenue from our aftermarket business was $129.6 million in 2015, which increased moderately compared to $121.4 million for 2014.

Gross Profit / Gross Margin

The following table sets forth our gross profit:

	Year ended December 31,		Period-to-Period Change		Year ended December 31,		Period-to-Period Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
Gross Profit:								
Product	$ 95,288	$ 97,815	$ (2,527)	(2.6)%	$ 97,815	$ 65,961	$ 31,854	48.3 %
Product gross margin	39.0 %	35.1 %			35.1 %	36.8 %		
Services	4,310	3,891	419	10.8 %	3,891	$ 4,203	(312)	(7.4) %
Services gross margin	19.0 %	17.2 %			17.2 %	17.7 %		
Total gross profit	$ 99,598	$ 101,706	$ (2,108)	(2.1)%	$ 101,706	$ 70,164	$ 31,542	45.0 %
Gross margin	37.3 %	33.7 %			33.7 %	34.5 %		

2016 Compared with 2015

Product

Gross margin from product revenue was 39.0% for the twelve months ended December 31, 2016, compared to 35.1% for the twelve months ended December 31, 2015. The increase in gross margin of 3.9% resulted from improved margins on Purion systems as a result of continued focus on supply chain optimization, value engineering and lean performance, combined with an increased mix of higher margin parts and upgrades.

Services

Gross margin from services revenue was 19.0% for the twelve months ended December 31, 2016, compared to 17.2% for the twelve months ended December 31, 2015. The increase in gross margin is attributable to lower service costs and higher margin service revenues.

2015 Compared with 2014

Product

Gross margin from product revenue was 35.1% for the twelve months ended December 31, 2015, compared to 36.8% for the twelve months ended December 31, 2014. The decrease in gross margin resulted from the net effect of significantly higher systems sales volume of new Purion systems at lower margins and a decreased mix of parts and upgrade revenue, partially offset by sale of previously written down systems.

Services

Gross margin from services revenue was 17.2% for the twelve months ended December 31, 2015, compared to 17.7% for the twelve months ended December 31, 2014. The decrease in gross margin is due to lower volumes and changes in the mix and timing of service contracts.

Operating Expenses

The following table sets forth our operating expenses:

	Year ended December 31,		Period-to-Period Change		Year ended December 31,		Period-to-Period Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
Research and development	$ 34,402	$ 32,586	$ 1,816	5.6 %	$ 32,586	$ 33,533	$ (947)	(2.8) %
Percentage of revenue	12.9 %	10.8 %			10.8 %	16.5 %		
Sales and marketing	23,839	23,325	514	2.2 %	23,325	20,713	2,612	12.6 %
Percentage of revenue	8.9 %	7.7 %			7.7 %	10.2 %		
General and administrative	24,452	25,059	(607)	(2.4) %	25,059	23,958	1,101	4.6 %
Percentage of revenue	9.2 %	8.3 %			8.3 %	11.8 %		
Restructuring charges	282	18	264	1,466.7%	18	2,621	(2,603)	(99.3)%
Percentage of revenue	0.1 %	0.0 %			0.0 %	1.3 %		
Total operating expenses	$ 82,975	$ 80,988	$ 1,987	2.5 %	$ 80,988	$ 80,825	$ 163	0.2 %
Percentage of revenue	31.1 %	26.9 %			26.9 %	39.8 %		

Our operating expenses consist primarily of personnel costs, including salaries, commissions, bonuses, stock-based compensation and related benefits and taxes; project material costs related to the design and development of new products and enhancement of existing products; and professional fees, travel and depreciation expenses. Personnel costs are our largest expense, representing $47.6 million, or 57.5% of our total operating expenses, for the year ended December 31, 2016; $47.9 million, or 59.1%, of our total operating expenses for the year ended December 31, 2015; and $45.3 million, or 57.9%, of our total operating expenses, excluding the restructuring charge of $2.6 million for the year ended December 31, 2014.

Research and Development

	Year ended		Period-to-Period		Year ended		Period-to-Period	

	December 31,		Change		December 31,		Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
Research and development	$ 34,402	$ 32,586	$ 1,816	5.6 %	$ 32,586	$ 33,533	(947)	(2.8) %
Percentage of revenue	12.9 %	10.8 %			10.8 %	16.5 %		

Our ability to remain competitive depends largely on continuously developing innovative technology, with new and enhanced features and systems and introducing them at competitive prices on a timely basis. Accordingly, based on our strategic plan, we establish annual R&D budgets to fund programs that we expect will drive competitive advantages.

2016 Compared with 2015

Research and development expense was $34.4 million in 2016, an increase of approximately $1.8 million, or 5.6%, compared with $32.6 million in 2015. The increase was primarily due to increased headcount and outside services to support product enhancements of our Purion platform partially offset by lower variable incentive plan expense.

2015 Compared with 2014

Research and development expense was $32.6 million in 2015, a decrease of approximately $0.9 million, or 2.8%, compared with $33.5 million in 2014. The decrease was primarily due to lower personnel costs driven by reduced headcount from a reduction in force in 2014 and a spike in labor and material costs in the prior year related to the rollout of our Purion platform. This was partially offset by higher variable incentive plan expense in 2015.

Sales and Marketing

	Year ended December 31,		Period-to-Period Change		Year ended December 31,		Period-to-Period Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
Sales and marketing	$ 23,839	$ 23,325	$ 514	2.2 %	$ 23,325	$ 20,713	$ 2,612	12.6 %
Percentage of revenue	8.9 %	7.7 %			7.7 %	10.2 %		

Our sales and marketing expenses result primarily from the sale of our equipment and services through our direct sales force.

2016 Compared with 2015

Sales and marketing expense was $23.8 million in 2016, an increase of $0.5 million, or 2.2%, compared with $23.3 million in 2015. The increase was primarily due to an increase in new tool evaluation costs.

2015 Compared with 2014

Sales and marketing expense was $23.3 million in 2015, an increase of $2.6 million, or 12.6%, compared with $20.7 million in 2014. The increase was primarily due to variable incentive plan expense and other compensation expense as well as higher new tool evaluation costs.

General and Administrative

	Year ended December 31,		Period-to-Period Change		Year ended December 31,		Period-to-Period Change	
	2016	2015	$	%	2015	2014	$	%
	(dollars in thousands)							
General and administrative	$ 24,452	$ 25,059	$ (607)	(2.4) %	$ 25,059	$ 23,958	1,101	4.6 %
Percentage of revenue	9.2 %	8.3 %			8.3 %	11.8 %		

Our general and administrative expenses result primarily from the costs associated with our executive, finance, information technology, legal and human resource functions.

2016 Compared with 2015

General and administrative expense was $24.5 million in 2016, a decrease of $0.6 million, or 2.4% compared with $25.1 million in 2015. The decrease was primarily due to a reduction in personnel costs driven by a decrease in variable incentive plan expense.

2015 Compared with 2014

General and administrative expense was $25.1 million in 2015, an increase of $1.1 million, or 4.6% compared with $24.0 million in 2014. The increase was primarily due to variable incentive plan expense.

Restructuring

The Company from time to time incurs expenses relating to restructuring.

2016 Compared with 2015

During the year ended December 31, 2016 we recorded $0.3 million to restructuring expense due to a consolidation in our customer base. During the year ended December 31, 2015, we recorded an immaterial charge to restructuring expense.

2015 Compared with 2014

During the year ended December 31, 2015 we recorded an immaterial charge to restructuring expense. During the year ended December 31, 2014 we recorded $2.6 million in restructuring expense for severance and other related costs.

Other (Expense) Income

Other (expense) income consists primarily of interest relating to the lease obligation we incurred in connection with the 2015 sale of our headquarters facility (“sale leaseback”) and other financing obligations, foreign exchange gains and losses attributable to fluctuations of the U.S. dollar against the local currencies of certain of the countries in which we operate, as well as interest earned on our invested cash balances.

2016 Compared with 2015

Other expense for the years ended December 31, 2016 and 2015 was $5.5 million and includes interest related to our sale leaseback obligation of $5.1 million and $4.8 million, respectively.

2015 Compared with 2014

Other expense for the year ended December 31, 2015 of $5.5 million consists primarily of $4.8 million of interest related to our sale leaseback obligation. Other income for the year ended December 31, 2014 of $0.5 million consists primarily of foreign exchange gain of $1.8 million offset partially by interest expense of $1.1 million associated with the business loan agreement with Northern Bank & Trust Company (“Term Loan”).

Income Taxes

Income tax expense was less than $0.1 million, $0.5 million and $1.1 million for the year ended December 31, 2016, 2015 and 2014, respectively. Our income tax expense is primarily due to operating results of foreign entities in jurisdictions in Europe and Asia, where we earn taxable income. We have significant net operating loss carryforwards in the United States and certain European jurisdictions, and, as a result, we do not currently pay significant income taxes in those jurisdictions. Additionally, we do not recognize the tax benefit for such losses in the United States and certain European taxing jurisdictions until it is determinable that there will be sufficient income such that the tax benefits can be recognized.

Liquidity and Capital Resources

Our liquidity is affected by many factors. Some of these relate specifically to the operations of our business, for example, our sales and other factors relate to the uncertainties of global economies, including the availability of credit and the condition of the overall semiconductor capital equipment industry. Our established cost structure does not vary significantly with changes in volume. We experience fluctuations in operating results and cash flows depending on fluctuations in our revenue level.

In 2016, $8.8 million of cash was used to support operating activities. This compares to $18.3 million of cash provided by operating activities in 2015. Cash and cash equivalents at December 31, 2016 was $70.8 million, compared to $78.9 million at December 31, 2015. Approximately $16.4 million of cash was located in foreign jurisdictions as of December 31, 2016. In addition to the cash and cash equivalent balance at December 31, 2016, the Company had $6.9 million in restricted cash which relates to a $5.9 million letter of credit associated with the security deposit for the sale leaseback transaction, a $0.9 million letter of credit relating to workers' compensation insurance, and a $0.1 million deposit relating to customs activity. Working capital at December 31, 2016 was $193.0 million. At December 31, 2016, the Company had no bank debt.

Capital expenditures were $2.5 million and $1.8 million for the years ended December 31, 2016 and 2015, respectively. Total capital expenditures for 2017 are projected to be approximately $7.5 million. Future capital

expenditures beyond 2017 will depend on a number of factors, including the timing and rate of expansion of our business and our ability to generate cash to fund them.

Cash provided by financing activities was $2.4 million and $31.4 million for the years ended December 31, 2016 and 2015, respectively. The $2.4 million cash provided by financing activities in 2016 was mainly due to the exercise of stock options and proceeds received from the employee stock purchase plan.

The $31.4 million cash provided by financing activities from the prior year resulted largely from the first quarter 2015 sale of our corporate headquarters building in Beverly, Massachusetts, which provided $48.9 million of gross proceeds, less $0.4 million for prepaid rent, for a net amount of $48.5 million. At the time of this sale, the Company discharged an outstanding term loan of $14.4 million, with related accrued interest, and paid a pre payment penalty to Northern Bank and Trust Company for a total payment of $14.8 million. The Company incurred $0.8 million of related financing expenses associated with this transaction and entered into a 22-year leaseback of the facility, the financial commitment for which is included in the table of contractual obligations below. The Company also received proceeds of $4.4 million relating to the exercise of stock options and purchases of Company stock through the Employee Stock Purchase Plan.

We have outstanding letters of credit and surety bonds in the amount of $9.0 million to support our sale leaseback, workers' compensation insurance program and certain value added tax claims in Europe.

The following represents our commercial commitments as of December 31, 2016 (in thousands):

		Amount of Commitment Expiration by Period	
Other Commercial Commitments	Total	2017	2018-2019
Surety bonds	$ 2,172	$ 520	$ 1,652
Standby letters of credit	6,862	6,800	62
Total	$ 9,034	$ 7,320	$ 1,714

The following represents our contractual obligations as of December 31, 2016 (in thousands):

		Payments Due by Period			
Contractual Obligations	Total	2017	2018-2019	2020-2021	2022 - Beyond
Sale leaseback obligation	$ 125,945	$ 5,315	$ 11,064	$ 11,567	$ 97,999

Purchase order commitments	43,867	42,973	63	178	653
Operating leases	5,228	2,581	2,094	553	—
Total	$ 175,040	$ 50,869	$ 13,221	$ 12,298	$ 98,652

We have no off balance sheet arrangements at December 31, 2016, exclusive of operating leases.

We have net operating loss and tax credit carryforwards, the tax effect of which aggregate $115.6 million at December 31, 2016. These carryforwards, which expire principally between 2017 and 2034, are available to reduce future income tax liabilities in the United States and certain foreign jurisdictions.

It is Company policy to provide taxes for the total anticipated tax impact of the undistributed earnings of our wholly owned foreign subsidiaries, as such earnings are not expected to be reinvested indefinitely. The Company anticipates that U.S. tax resulting from remitting such earnings will be off set by net operating loss or credit carryforwards to the extent available. In addition, the Company does not anticipate incurring a foreign withholding tax on remitting such earnings since it does not intend to remit the earnings as dividends.

We believe that based on our current market, revenue, expense and cash flow forecasts, our existing cash, cash equivalents and borrowing capacity will be sufficient to satisfy our anticipated cash requirements for the short and

long term. We currently have no credit facility but management believes we would be able to borrow on reasonable terms if needed.

Related Party Transactions

There are no significant related party transactions that require disclosure in the consolidated financial statements for the year ended December 31, 2016, or in this Annual Report on Form 10 K.

Recent Accounting Pronouncements

A discussion of recent accounting pronouncements, the impact of some of which may be material, is included in Note 2 to the consolidated financial statements for the year ended December 31, 2016 included in this Annual Report on Form 10 K.

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

Interest Rate Sensitivity

Our exposure to market risk for changes in interest rates relates primarily to our investment portfolio, which consists entirely of cash equivalents at December 31, 2016. The primary objective of our investment activities is to preserve principal while maximizing yields without significantly increasing risk. This is accomplished by investing in marketable high investment grade securities. We do not use derivative financial instruments in managing our investment portfolio. Due to the nature of our investments, we do not expect our operating results or cash flows to be affected to any significant degree by any change in market interest rates.

Foreign Currency Exchange Risk

Substantially all of our sales are billed in U.S. dollars, thereby reducing the impact of fluctuations in foreign exchange rates on our results. Operating margins of certain foreign operations can fluctuate with changes in foreign exchange rates to the extent revenue is billed in U.S. dollars and operating expenses are incurred in the local currency. During the years ended December 31, 2016 and 2015, approximately 28.4% and 24.7% of our revenue were derived from foreign operations with this inherent risk. In addition, at both December 31, 2016 and 2015, our operations outside of the United States accounted for approximately 20.1% and 20.7% of our total assets, respectively, the majority of

which was denominated in currencies other than the U.S. dollar. We do not use derivative financial instruments in managing our foreign currency exchange risk.

Item 8. Financial Statements and Supplementary Data.

Response to this Item is submitted as a separate section of this report immediately following Item 15.

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.

Our management, with the participation of our principal executive officer and principal financial officer, has evaluated the effectiveness of our disclosure controls and procedures (as defined in Rule 13a 15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act") as of the end of the period covered by this annual report (the "Evaluation Date"). Based on this evaluation, our principal executive officer and principal financial officer concluded that, as of the Evaluation Date, these disclosure controls and procedures are effective.

Internal Control over Financial Reporting

Management's Annual Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting, as such term is defined in Rule 13a 15(f) under the Exchange Act. Because of its inherent limitations, internal control over financial reporting may not prevent or detect all misstatements. A control system, no matter how well designed and operated, can provide only reasonable assurance with respect to financial statement preparation and presentation. Projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Management assessed the effectiveness of our internal control over financial reporting as of December 31, 2016. In making this assessment, management used the criteria set forth in the Committee of Sponsoring Organizations of the Treadway Commission (COSO) Internal Control—2013 Integrated Framework.

Based on this assessment, management has concluded that, as of December 31, 2016, our internal control over financial reporting is effective based on those criteria.

The independent registered public accounting firm of Ernst & Young LLP, as auditors of our consolidated financial statements, has issued an attestation report on its assessment of our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders of Axcelis Technologies, Inc.

We have audited Axcelis Technologies, Inc.'s internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) (the COSO criteria). Axcelis Technologies, Inc.'s management is responsible for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting included in the accompanying Management's Annual Report on Internal Control over Financial Reporting. Our responsibility is to express an opinion on the company's internal control over financial reporting based on our audit.

We conducted our audit in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

In our opinion, Axcelis Technologies, Inc. maintained, in all material respects, effective internal control over financial reporting as of December 31, 2016, based on the COSO criteria.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), the consolidated balance sheets of Axcelis Technologies, Inc. as of December 31, 2016 and 2015, and the related consolidated statements of operations, comprehensive income, changes in stockholders' equity and cash flows for each of the three years in the period ended December 31, 2016 of Axcelis Technologies, Inc. and our report dated March 14, 2017 expressed an unqualified opinion thereon.

/s/ Ernst & Young LLP

Boston, Massachusetts

March 14, 2017

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting (as defined in Rule 13a 15(f) under the Exchange Act) identified in connection with the evaluation of our internal control that occurred during our fourth quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

PART III

Item 10. Directors, Executive Officers and Corporate Governance.

A portion of the information required by Item 10 of Form 10 K is incorporated by reference from the information responsive thereto contained in the sections in Axcelis Proxy Statement for the Annual Meeting of Stockholders to be held May 16, 2017 (the "Proxy Statement") captioned:

· "Proposal 1: Election of Directors,"

· "Board of Directors,"

· "Board Committees," and

· "Corporate Governance,"

The remainder of such information is set forth under the heading "Executive Officers of the Registrant" at the end of Item 1 in Part I of this report and is incorporated herein by reference.

Item 11. Executive Compensation.

The information required by Item 11 of Form 10 K is incorporated by reference from the information responsive thereto contained in the sections in the Proxy Statement captioned:

· "Executive Compensation," and

· "Board Committees—Compensation Committee Interlocks and Insider Participation."

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

The information required by Item 12 of Form 10 K is incorporated by reference from the information responsive thereto contained in the sections in the Proxy Statement captioned:

· "Share Ownership of 5% Stockholders," and

· "Share Ownership of Directors and Executive Officers,"

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

The information required by Item 13 of Form 10 K is incorporated by reference from the information responsive thereto contained in the sections in the Proxy Statement captioned:

· "Executive Compensation,"

· "Board of Directors," and

· "Corporate Governance—Certain Relationships and Related Transactions."

Item 14. Principal Accounting Fees and Services

The information required by Item 14 of Form 10 K is incorporated by reference from the information responsive thereto contained in the section captioned "Proposal 2: Ratification of the Appointment of our Independent Registered Public Accounting Firm" in the Proxy Statement.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(a)The following documents are filed as part of this Report:

1) Financial Statements:

2) Financial Statement Schedules:

Schedule II—Valuation and Qualifying Accounts for the years ended December 31, 2016, 2015 and 2014.

All other schedules for which provision is made in the applicable regulation of the Securities and Exchange Commission are not required under the related instructions or are inapplicable, and therefore have been omitted.

3) Exhibits

The exhibits filed as part of this Form 10 K are listed on the Exhibit Index immediately preceding such Exhibits, which Exhibit Index is incorporated herein by reference.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

The Board of Directors and Stockholders of Axcelis Technologies, Inc.

We have audited the accompanying consolidated balance sheets of Axcelis Technologies, Inc. as of December 31, 2016 and 2015, and the related consolidated statements of operations, comprehensive income, changes in stockholders' equity and cash flows for each of the three years in the period ended December 31, 2016. Our audits also include the financial statement schedule listed in the Index at Item 15(a). These financial statements and schedule are the responsibility of the Company's management. Our responsibility is to express an opinion on these financial statements and schedule based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the consolidated financial position of Axcelis Technologies, Inc. at December 31, 2016 and 2015, and the consolidated results of its operations and its cash flows for each of the three years in the period ended December 31, 2016, in conformity with U.S. generally accepted accounting principles. Also, in our opinion, the related financial statement schedule, when considered in relation to the basic financial statements taken as a whole, presents fairly in all material respects the information set forth therein.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States), Axcelis Technologies, Inc.'s internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) and our report dated March 14, 2017 expressed an unqualified opinion thereon.

/s/ Ernst & Young LLP

Boston, Massachusetts

March 14, 2017

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Axcelis Technologies, Inc.

Consolidated Statements of Operations

(In thousands, except per share amounts)

	Twelve months ended December 31,		
	2016	2015	2014
Revenue:			
Product	$ 244,295	$ 278,875	$ 179,246
Services	22,685	22,620	23,805
Total revenue	266,980	301,495	203,051
Cost of revenue:			
Product	149,007	181,060	113,285
Services	18,375	18,729	19,602
Total cost of revenue	167,382	199,789	132,887
Gross profit	99,598	101,706	70,164
Operating expenses:			
Research and development	34,402	32,586	33,533
Sales and marketing	23,839	23,325	20,713
General and administrative	24,452	25,059	23,958
Restructuring charges	282	18	2,621
Total operating expenses	82,975	80,988	80,825
Income (loss) from operations	16,623	20,718	(10,661)
Other (expense) income:			
Interest income	238	64	32
Interest expense	(5,073)	(4,976)	(1,069)
Other, net	(764)	(601)	1,531
Total other (expense) income	(5,599)	(5,513)	494
Income (loss) before income taxes	11,024	15,205	(10,167)
Income tax provision	23	527	1,099
Net income (loss)	$ 11,001	$ 14,678	$ (11,266)
Net income (loss) per share:			
Basic	$ 0.38	$ 0.51	$ (0.40)
Diluted	$ 0.36	$ 0.49	$ (0.40)
Shares used in computing net income (loss) per share:			
Basic weighted average common shares	29,195	28,595	27,862
Diluted weighted average common shares	30,947	30,229	27,862

See accompanying Notes to these Consolidated Financial Statements

Axcelis Technologies, Inc.

Consolidated Statements of Comprehensive Income (Loss)

(In thousands)

	Twelve months ended December 31,		
	2016	2015	2014
Net income (loss)	$ 11,001	$ 14,678	$ (11,266)
Other comprehensive (loss):			
Foreign currency translation adjustments	(847)	(2,664)	(4,150)
Amortization of actuarial gains/losses and other adjustments from pension plan	(1)	(43)	(313)
Total other comprehensive (loss)	(848)	(2,707)	(4,463)
Comprehensive income (loss)	$ 10,153	$ 11,971	$ (15,729)

See accompanying Notes to these Consolidated Financial Statements

Axcelis Technologies, Inc.

Consolidated Balance Sheets

(In thousands, except per share amounts)

	December 31, 2016	December 31, 2015
ASSETS		
Current assets:		
Cash and cash equivalents	$ 70,791	$ 78,889
Accounts receivable, net	50,573	36,868
Inventories, net	113,853	109,408
Prepaid expenses and other current assets	5,512	4,792
Total current assets	240,729	229,957
Property, plant and equipment, net	30,840	30,031
Long-term restricted cash	6,864	6,936
Other assets	23,798	14,860
Total assets	$ 302,231	$ 281,784
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 24,996	$ 19,849
Accrued compensation	5,142	9,059
Warranty	2,426	3,363
Income taxes	240	143
Deferred revenue	10,335	7,863
Other current liabilities	4,592	4,091
Total current liabilities	47,731	44,368
Sale leaseback obligation	47,586	47,586
Long-term deferred revenue	674	679
Other long-term liabilities	4,785	5,387
Total liabilities	100,776	98,020
Commitments and contingencies (Note 17)		
Stockholders' equity:		
Preferred stock, $0.001 par value, 30,000 shares authorized; none issued or outstanding	—	—
Common stock, $0.001 par value, 75,000 shares authorized; 29,518 shares issued and outstanding at December 31, 2016; 29,025 shares issued and 28,995 shares outstanding at December 31, 2015	30	29
Additional paid-in capital	535,408	529,089
Treasury stock, at cost, no shares at December 31, 2016 and 30 shares at December 31, 2015	—	(1,218)
Accumulated deficit	(331,704)	(342,705)
Accumulated other comprehensive loss	(2,279)	(1,431)
Total stockholders' equity	201,455	183,764

Total liabilities and stockholders' equity	$ 302,231	$ 281,784

See accompanying Notes to these Consolidated Financial Statements

Axcelis Technologies, Inc.

Consolidated Statements of Stockholders' Equity

(In thousands)

	Common Stock Shares	Common Stock Amount	Additional Paid-in Capital	Treasury Stock	Accumulated Deficit	Accumulated Other Comprehensive Income (Loss)	Total Stockholders' Equity
Balance at December 31, 2013	27,556	$ 27	$ 511,075	$ (1,218)	$ (346,117)	$ 5,739	$ 169,506
Net loss	—	—	—	—	(11,266)	—	(11,266)
Foreign currency translation adjustments	—	—	—	—	—	(4,150)	(4,150)
Change in pension obligation	—	—	—	—	—	(313)	(313)
Exercise of stock options	605	1	2,894	—	—	—	2,895
Issuance of shares under Employee Stock Purchase Plan	50	—	446	—	—	—	446
Issuance of restricted common shares	2	—	(7)	—	—	—	(7)
Stock-based compensation expense	—	—	4,745	—	—	—	4,745
Balance at December 31, 2014	28,213	28	519,153	(1,218)	(357,383)	1,276	161,856
Net income	—	—	—	—	14,678	—	14,678
Foreign currency translation adjustments	—	—	—	—	—	(2,664)	(2,664)
Change in pension obligation	—	—	—	—	—	(43)	(43)
Exercise of stock options	759	1	3,920	—	—	—	3,921
Issuance of shares under	47	—	441	—	—	—	441

Employee Stock Purchase Plan Issuance of restricted common shares	7	—	(7)	—	—	—	(7)
Stock-based compensation expense	—						