NOVA MEASURING INSTRUMENTS LTD
Form 20-F
February 29, 2016

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

Form 20-F

o REGISTRATION STATEMENT PURSUANT TO SECTION 12(b) or (g) OF THE SECURITIES EXCHANGE ACT OF 1934

OR

x ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

For the fiscal year ended December 31, 2015

OR

o TRANSITION REPORT PURSUANT TO SECTION 13 or 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

OR

o SHELL COMPANY REPORT PURSUANT TO SECTION 13 or 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934

Commission File Number 000-30668

NOVA MEASURING INSTRUMENTS LTD.
(Exact name of Registrant as specified in its charter)

Nova Measuring Instruments Ltd.	Israel
(Translation of Registrant's name into English)	(Jurisdiction of incorporation or organization)

Weizmann Science Park, Einstein St., Building 22, 2nd Floor, Ness-Ziona, Israel
(Address of principal executive offices)

Dror David, +972-73-2295833, +972-8-9407776, P.O.B 266, Rehovot 7610201, Israel
(Name, Telephone, E-mail and/or Facsimile number and Address of the Registrant's Contact Person)

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

Title of each class	Name of each exchange on which registered
Ordinary Shares, nominal value NIS 0.01 per share	The NASDAQ Global Select Market

Securities registered or to be registered pursuant to Section 12(g) of the Act:

None

Securities for which there is a reporting obligation pursuant to Section 15(d) of the Act:

None

Indicate the number of outstanding shares of each of the issuer's classes of capital or common stock as of the close of the period covered by the annual report: 27,093,937 ordinary shares, NIS 0.01 nominal (par) value per share, as of December 31, 2015.

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act.

Yes o No x

If this report is an annual or transition report, indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934.

Yes o No x

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 x No o

Indicate by check mark 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 (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files).

Yes x No o

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, or a non-accelerated filer. See definition of “accelerated filer and large accelerated filer” in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer o Accelerated filer x Non-accelerated filer o

Indicate by check mark which basis of accounting the registrant has used to prepare the financial statements included in this filing:

U.S. GAAP x

International Financing Reporting Standards as issued by the International Accounting Standards Board o

Other o

If “Other” has been checked in response to the previous question, indicate by check mark which financial statement item the registrant has elected to follow:

Item 17 o Item 18 o

If this is an annual report, indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act).

Yes o No x

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Introduction

In this Annual Report, the “Company”, “Nova”, “we” or “our” refers to Nova Measuring Instruments Ltd. and its consolidated subsidiaries, when the context requires.

Our Functional Currency

Unless otherwise indicated, all amounts herein are expressed in United States dollars (“U.S. dollars”, “dollars”, “USD”, “US$” or “$”).

The currency of the primary economic environment in which we operate is the U.S. dollar, since substantially all our revenues to date have been denominated in U.S. dollars and over 50% of our expenses are in U.S. dollars or in New Israeli Shekels linked to the dollar. Transactions and balances denominated in dollars are presented at their original amounts. Non-dollar transactions and balances have been re-measured into dollars as required by the principles in ASC 830 Foreign Currency Matters. All exchange gains and losses from such re-measurement are included in the net financial income when they arise.

Cautionary Statement Regarding Forward-Looking Statements

Certain information contained herein, which does not relate to historical financial information, may be deemed to constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. The words or phrases “will likely result”, “are expected to”, “will continue”, “is anticipated”, “estimate”, “project”, “believe” or similar expressions identify “forward looking statements”. Such statements, including without limitation, statements relating to our anticipated sales, revenues and expenses in 2016, our expectations with respect to our business and operations and our ability to gain market share are subject to certain risks and uncertainties that could cause actual results to differ materially from historical results and those presently anticipated or projected. We wish to caution readers not to place undue reliance on any such forward-looking statements, which speak only as of the date made. We cannot guarantee future results, levels of activity, performance or achievements. We also undertake no obligation to release publicly any revisions to these forward–looking statements to reflect events or circumstances after the date hereof or to reflect the occurrence of unanticipated events. Among the factors that could cause our actual results in the future to differ materially from any opinions or statements expressed with respect to future periods are competitive industry conditions and the ability to forecast the needs of the semiconductor industry with respect to the very cyclical nature of the industry and the very fast pace of technology evolutions and factors related to the conditions of the global markets and the global economy. Various other factors that could cause our actual results to differ materially are set forth in “Item 3D. Risk Factors” in this annual report on Form 20-F and elsewhere herein.

PART I

Item 1. Identity of Directors, Senior Management and Advisors

Not applicable.

Item 2. Offer Statistics and Expected Timetable

Not applicable.

Item 3. Key Information

3A. Selected Financial Data

The following selected consolidated financial data as of December 31, 2015 and 2014 and for the years ended December 31, 2015, 2014 and 2013 have been derived from our audited consolidated financial statements included elsewhere in this annual report. These financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America ("U.S. GAAP"), and audited by our independent registered public accounting firm. The consolidated selected financial data as of December 31, 2013, 2012 and 2011 and for the years ended December 31, 2012 and December 31, 2011 have been derived from other consolidated financial statements not included in this Form 20-F that were also prepared in accordance with U.S. GAAP and audited by our independent registered public accounting firm. The selected consolidated financial data set forth below should be read in conjunction with and are qualified by reference to "Item 5. Operating and Financial Review and Prospects" and the consolidated financial statements and notes thereto and other financial information included elsewhere in this annual report on Form 20-F.

Summary of Consolidated Financial Data

	Year ended December 31,				
	2011	2012	2013	2014	2015
	(in thousands, except per share data)				
Consolidated Statement of Operations Data:					
Revenues	$102,828	$96,168	$111,509	$120,618	$148,514
Cost of revenues	44,832	45,014	52,438	57,005	71,434
Gross profit	57,996	51,154	59,071	63,613	77,080
Operating expenses:					
Research and development expenses, net	18,677	24,594	29,578	29,498	39,703
Sales and marketing expenses	11,373	11,998	11,963	12,747	15,967
General and administrative expenses	3,229	3,978	5,197	4,457	8,511
Amortization of intangible assets					1,318
Total operating expenses	33,279	40,570	46,738	46,702	65,499
Operating profit	24,717	10,584	12,333	16,911	11,581
Financing income, net	901	1,368	693	563	643
Income before income taxes	25,618	11,952	13,026	17,474	12,224
Income taxes expenses (benefit)	(2,500)	124	2,511	(1,178)	(3,501)
Net income for the year	$28,118	$11,828	$10,515	$18,652	$15,725
Earnings per share:					
Basic	$1.07	$0.44	$0.39	$0.68	$0.58

Diluted	$1.04	$0.43	$0.38	$0.67	$0.57
Shares used in calculation of net earnings per share:					
Basic	26,232	26,619	27,091	27,447	27,185
Diluted	26,931	27,277	27,373	27,807	27,510

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	2011	2012	December 31, 2013	2014	2015
			(in thousands)		
Consolidated Balance Data:					
Working capital	94,669	106,298	118,596	130,480	112,819
Total assets	122,947	142,044	162,277	173,279	207,269
Capital stock (including additional paid-in capital)	108,710	111,062	114,348	119,058	113,022
Shareholders' equity	99,906	114,771	128,664	143,582	161,060

3B. Capitalization and Indebtedness

Not applicable.

3C. Reasons for the Offer and Use of Proceeds

Not applicable.

3D. Risk Factors

Risks Related to Our Business and Our Industry

Because substantially most of our current sales are dependent on three specific product lines, factors that adversely affect the pricing and demand for these product lines could substantially reduce our sales.

We are currently dependent on three process control product lines. We expect revenues from these product lines to continue to account for a substantial portion of our revenues in the coming years. As a result, factors adversely affecting the pricing of, or demand for, these product lines, such as competition and technological change, could significantly reduce our sales.

We depend on a small number of large customers, and the loss of one or more of them could significantly lower our revenues.

Like our peers serving the semiconductor market, our customer base is highly concentrated among a limited number of large customers. We anticipate that our revenues will continue to depend on a limited number of major customers, although the companies considered to be our major customers and the percentage of our revenue represented by each major customer may vary from period to period. As a result of our customer concentration, our financial performance may fluctuate significantly from period to period based, among others, on exogenous circumstances related to our clients. For example, it is possible that any of our major customers could terminate its purchasing relationship with us or significantly reduce or delay the amount of our products that it orders, purchase products from our competitors, or develop its own products internally. The loss of any one of our major customers would adversely affect our revenues. Furthermore, if any of our customers become insolvent or have difficulties meeting their financial obligations to us for any reason, we may suffer losses. For more information regarding our sales by major customers as percentage of our total sales, see Note 11 to our consolidated financial statements contained elsewhere in this report.

The markets we target are cyclical and it is difficult to predict the length and strength of any downturn or expansion period.

The semiconductor capital equipment market and industries, which are cyclical, experienced a steep downturns and upturns between the years 2008 and 2011. Since 2012 we have seen a more stable overall capital investment patterns, yet we cannot predict the length and strength of potential future downturns or expansions.

Our inability to significantly reduce spending during a protracted slowdown in the semiconductor industry could reduce our prospects of achieving continued profitability.

Historically, we have derived all of our revenues, and we expect to continue to derive practically all of our revenues, from sales of our products and related services to the semiconductor industry. Our business depends in large part upon capital expenditures by semiconductor manufacturers, which in turn depend upon the current and anticipated demand for semiconductors. The semiconductor industry has experienced severe and protracted cyclical downturns and upturns. Specifically, during 2010, the semiconductor industry experienced a steep upturn of over 100%, which followed a severe downturn in 2008 and 2009. During cyclical downturns, as those we have experienced in the past and are likely to experience in the future, material reductions in the demand for the type of capital equipment and process technology that we offer may result in a decline in our sales. In addition, our ability to significantly reduce expenses in response to any downturn or slowdown in the rate of capital investment by manufacturers in these industries may be limited because of:

- our continuing need to invest in research and development;
- our continuing need to market our new products to new and existing customers; and
- our extensive ongoing customer service and support requirements worldwide.

As a result, we may have difficulty achieving continued profitability during a protracted slowdown.

If we do not respond effectively and on a timely basis to rapid technological change, our ability to attract and retain customers could be diminished, which would have an adverse effect on our sales and ability to remain competitive.

The semiconductor manufacturing industry is characterized by rapid technological change, new product introductions and enhancements and evolving industry standards. Our ability to remain competitive and generate sales revenue will depend in part upon our ability to develop new and enhanced systems at competitive prices in a timely and cost-effective manner and to accurately predict technology transitions. Because new product development commitments must be made well in advance of sales, new product decisions must anticipate the future demand for products. If we fail to correctly anticipate future demand for products, our sales and competitive position will suffer. In addition, the development of new measurement technologies, new product introductions or enhancements by our competitors could cause a decline in our sales or loss of market acceptance of our existing products.

We depend on Process Equipment Manufacturers (“PEMs”) for sales of our integrated metrology systems, and the loss of PEMs as business partners could harm our business.

We believe that sales of integrated metrology systems will continue to be an important source of our revenues. Sales of our integrated metrology systems depend upon the ability of PEMs to sell semiconductor equipment products that are able to integrate with our metrology systems. If our PEMs are unable to sell such products, if they choose to focus their attention on products that do not integrate our systems, or if they choose to develop their own metrology solutions, our business could suffer. If we were to lose our PEMs as business partners for any reason, our inability to

realize sales from integrated metrology systems could significantly harm our business. In addition, we may not be able to develop or market new integrated metrology products, which could slow or prevent our growth.

Some of our commercial agreements with PEMs and customers may include exclusivity provisions. Such exclusivity obligations may prevent us from engaging in certain business relationships with third parties, and thus may affect our ability to introduce new products into relevant markets.

Some of our commercial agreements with PEMs and customers may include exclusivity provisions, which prevent us from engaging in certain business relationships with third parties. These exclusivity obligations are normally used as a tool to promote the development and the penetration of innovative new products, and are usually limited in terms of scope and length. When considering whether to enter into any such exclusivity arrangements, we usually take into the consideration the terms of the exclusivity (e.g., length and scope), the expected benefit to the Company, and the risks and limitations associated with such exclusivity undertakings. Exclusivity obligations relating to our technology and products may affect our ability to commercialize our products, engage in potentially beneficial business relationships with third parties, or introduce new products into relevant markets, which could slow or prevent our growth.

If any of our systems fail to meet or exceed our internal quality specifications, we cannot ship them until such time as they have met such specifications. If we experience significant delays or are unable to ship our products to our customers as a result of our internal processes or for any other reason, our business and reputation may be adversely affected.

Our products are complex and require technical expertise to design and manufacture. Various problems occasionally arise during the manufacturing process that may cause delays and/or impair product quality. We actively monitor our manufacturing processes to ensure that our products meet our internal quality specifications. Any significant delays stemming from the failure of our products to meet or exceed our internal quality specifications, or for any other reasons, would delay our shipments. Shipment delays could be harmful to our business, revenues and reputation in the industry.

We are exposed to cyber security risks that, if materialized, may affect our business and operations.

Our global operations are linked by information systems, including telecommunications, the internet, our corporate intranet, network communications, email and various computer hardware and software applications. Despite our implementation of network security measures, our tools and servers are vulnerable to computer viruses, break-ins and similar disruptions from unauthorized tampering with our computer systems and tools located at customer sites, or could be subject to system failures or malfunctions for other reasons. System failures or malfunctioning could disrupt our operations and our ability to timely and accurately process and report key components of our financial results.

We may incorporate open source technology in some of our software and products, which may expose us to liability and have a material impact on our product development and sales

Some of our software and products may utilize open source technologies. These technologies may be subject to certain open source licenses, including but not limited to the General Public License, which, when used or integrated in particular manners, impose certain requirements on the subsequent use of such technologies, and pose a potential risk to proprietary nature of products. In the event that we have or will in the future, use or integrate software that is subject to such open source licenses into or in connection with our products in such ways that will trigger certain requirements of these open source licenses, we may (i) be required to include certain notices and abide by other requirements in the absence of which we may be found in breach of the copyrights owned by the creators of such open source technologies; and/or (ii) be required to disclose our own source code or parts thereof to the public, which could enable our competitors to eliminate some or any technological advantage that our products may have over theirs. Any such requirement to disclose our source code or other confidential information related to our products, and the failure to abide by license requirement resulting in copyright infringement, could materially adversely affect our competitive position and impact our business results of operations and financial condition.

New product lines that we may introduce in the future may contain defects, which will require us to allocate time and financial resources to correct.

Our new product lines may contain defects when first introduced. If there are defects, we will need to divert the attention of our personnel from our ongoing product development efforts to address the detection and correction of the defects. In the past, no liability claims have been filed against us for damages related to product defects, and we have not experienced any material delays as a result of product defects. However, we cannot provide assurances that we will not incur these costs or liabilities or experience these lags or delays in the future. Moreover, the occurrence of such defects, whether caused by our products or the products of another vendor, may result in significant customer relations problems and adversely affect our reputation and may impair the market acceptance of our products.

We have historically generated losses and may incur future losses.

Since the year 2009, we have been able to demonstrate continued profitability, yet since our inception in 1993, we have had several years of losses and we may incur net losses in future years as well. We plan to increase our aggregate operating expenses in 2016 relative to 2015. However, our ability to generate profits is dependent mainly on our ability to generate sufficient sales. In the future, our sales may not be sufficient to cover the increase in our expenses and we may not be able to maintain profitability, mainly during a protracted slowdown.

Our dependence on a single manufacturing facility per product line magnifies the risk of an interruption in our production capabilities.

We have one manufacturing facility for our Optical CD product lines, which is located in Weizman Science Park, Ness-Ziona-Rehovot, Israel, and one manufacturing facility for our XPS product line, which is located in Santa Clara, CA, US (the "Manufacturing Facilities"). Although we adopted a disaster recovery plan, any event affecting any of our Manufacturing Facilities, including natural disaster, labor stoppages or armed conflict, may disrupt or indefinitely discontinue our manufacturing capabilities and could significantly impair our ability to fulfill orders and generate revenues, thus negatively impacting our business.

Our lease agreements for our Manufacturing Facilities include provisions that exempt the landlord and others from liability for damages to our Manufacturing Facilities.

Pursuant to our lease agreements for our Manufacturing Facilities (one of which is also our headquarters), the landlord and anyone on its behalf, and additional tenants are exempt from any liability for direct or consequential damages to our Manufacturing Facilities, except in the event of willful misconduct. While we have obtained insurance policies against certain damages, the aforementioned exemption of liability could compromise our ability to recover the full amount of such damages, and consequently we may incur substantial costs upon the occurrence of such damages.

Because shipment dates may be changed and some of our customers may cancel or delay orders with little or no penalty, and since we encounter difficulties in collecting cancellation fees from our customers, our backlog may not be a reliable indicator of actual sales and financial results.

We schedule production of our systems based upon order backlog and customer forecasts. We include in backlog only those orders to which the customer has assigned a purchase order number and for which delivery has been specified. In general, our ability to rely on our backlog for future forecasting and planning is limited because shipment dates may be changed, some customers may cancel or delay orders with little or no penalty, and our ability to collect cancelation fees from customers is not assured. Thus, our backlog may not be a reliable indicator of actual sales and financial results.

We experience quarterly fluctuations in our operating results, which may adversely impact our share price.

Our quarterly operating results within a specific year have fluctuated significantly in the past. We expect this trend to continue. A principal reason is that we derive a substantial portion of our revenue from the sale of a relatively small number of systems to a relatively small number of customers. As a result, our revenues and results of operations for any given quarter may decrease due to factors relating to the timing of orders, the timing of shipments of systems, and the timing of recognizing these revenues. Furthermore, our quarterly results are affected by the cyclical nature of the semiconductor capital equipment market and industries.

We also have a limited ability to predict revenues for future quarterly periods and, as a result, face risks of revenue shortfalls. If the number of systems we actually ship, and thus the amount of revenues we are able to record in any particular quarter, is below our expectations, the adverse effect may be magnified by our inability to adjust spending quickly enough to compensate for the revenue shortfall.

We operate in an extremely competitive market, and if we fail to compete effectively, our revenues and market share will decline.

Although the market for process control systems used in semiconductor manufacturing is currently concentrated and characterized by relatively few participants, the semiconductor capital equipment industry is intensely competitive.

We compete mainly with Nanometrics Inc., KLA-Tencor Corp. (which recently announced its planned merger with Lam Research Inc., another competitor of ours) and Rudolph Technologies, Inc. which manufacture and sell integrated and/or stand-alone process control systems. In addition, we compete with PEMs, such as ASML Holdings N.V., Applied Materials Inc. and Lam Research Inc., which develop in-situ sensors and metrology products. Established companies, both domestic and foreign, compete with our product lines, and new competitors enter our market from time to time. Some of our competitors have greater financial, engineering, manufacturing and marketing resources than we do. If a particular customer selects a competitor's capital equipment, we expect to experience difficulty in selling to that customer for a significant period of time. A substantial investment is required by the customers to evaluate, test, select and integrate capital equipment into a production line. As a result, once a manufacturer has selected a particular vendor's capital equipment, we believe that the manufacturer generally relies upon that equipment for the specific production line application and frequently will attempt to consolidate its other capital equipment requirements with the same vendor. Accordingly, unless our systems offer performance or cost advantages that outweigh a customer's expense of switching to our systems, it will be difficult for us to achieve significant sales from that customer once it has selected another vendor's system for an application. We believe that our ability to compete successfully depends on a number of factors both within and outside of our control, including:

Ÿ the contribution of our equipment to the customers' productivity;

- our product quality and performance;
- our global technical service and support;
- the return on investment (ROI) of our equipment and its cost of ownership;
- the breadth of our product line;
- our success in developing and marketing new products; and
- the extendibility of our products.

If we fail to compete in a timely and cost-effective manner against current or future competitors, our revenues and market share will decline.

The ongoing consolidation in our industry may harm us if our competitors are able to offer a broader range of products and greater customer support than we can offer.

We believe that the semiconductor capital equipment market is undergoing consolidation. A number of process control suppliers have been acquired by larger equipment manufacturers. For example, in 2005 Rudolph Technologies, Inc. acquired August Technologies, Inc., in 2006 Nanometrics acquired Soluris, Inc. and Accent Technologies, Inc., in 2007 KLA-Tencor Corp. acquired Therma-Wave, Inc. and Nanometrics acquired Tevet Ltd., and in 2011 Nanometrics acquired Nanda Technologies. In addition, in the recent two years a major consolidation has occurred in the process equipment manufacturers segment, such as Applied Materials Inc. acquiring Varian Semiconductor Equipment Associates, Lam Research Corporation acquiring Novellus Systems Inc., and recently Lam Research Corporation announced its planned merger with KLA-Tencor Corp. We believe that similar acquisitions and business combinations involving our competitors, our customers and the PMEs may occur in the future. These acquisitions could adversely impact our competitive position by enabling our competitors and potential competitors to expand their product offerings and customer services, which could provide them an advantage in meeting customers' needs, particularly with those customers that seek to consolidate their capital equipment requirements with a smaller number of vendors. The greater resources, including financial, marketing, intellectual property and support resources, of competitors involved in these acquisitions could allow them to accelerate the development and commercialization of new competitive products and the marketing of existing competitive products to their larger installed bases. Accordingly, such business combinations and acquisitions by competitors and/or customers could jeopardize our competitive position.

We may not be successful in our efforts to complete and integrate current and/or future acquisitions, which could disrupt our current business activities and adversely affect our results of operations or future growth.

Any acquisition may involve many risks, including the risks of:

- diverting management's attention and other resources from our ongoing business concerns;
- entering markets in which we have no direct prior experience;
- improperly evaluating new services, products and markets;
- being unable to maintain uniform standards, controls, procedures and policies;

- failing to comply with governmental requirements pertaining to acquisitions of local companies or assets by foreign entities;
- being unable to integrate new technologies or personnel;
- incurring the expenses of any undisclosed or potential liabilities; and
- the departure of key management and employees.

If we are unable to successfully complete future acquisitions or to effectively integrate our current acquisition of ReVera or future acquisitions, our ability to grow our business or to operate our business effectively could be reduced, and our business, financial condition and operating results could suffer. Even if we are successful in completing acquisitions, we cannot assure you that we will be able to integrate the operations of the acquired business without encountering difficulty regarding different business strategies with respect to marketing and integration of personnel with disparate business backgrounds and corporate cultures. The integration of ReVera operations is still an ongoing process and, as of the date of this annual report on Form 20-F, we cannot assure you that such process will be completed without encountering difficulties. Further, in certain cases, mergers and acquisitions require special approvals, or are subject to scrutiny by the local authorities, and failing to comply with such requirements or to receive such approvals, may prevent or limit our ability to complete the acquisitions as well as expose us to legal proceedings prior or following the consummation of such acquisitions. In some cases, such proceedings, if initiated, may conclude in a requirement to divest portions of the acquired business. As of the date of this annual report on Form 20-F, we are not aware of any pending proceedings as such in connection with the acquisition of ReVera.

Some of our contracts and arrangements potentially subject us to the risk of significant or non-limited liability.

We produce highly complex optical and electronic components and, accordingly, there is a risk that defects may occur in any of our products. Such defects can give rise to significant costs, including expenses relating to recalling products, replacing defective items, writing down defective inventory and loss of potential sales. In addition, the occurrence of such defects may give rise to product liability and warranty claims, including liability for damages caused by such defects.

In our commercial relationship with customers, we attempt to negotiate waivers of consequential damages arising from damages for loss of use, loss of product, loss of revenue and loss of profit caused by our products. Similarly, with respect to our commercial relationship with subcontractors and suppliers, we attempt to negotiate arrangements which do not include a limitation of liabilities and limitation of consequential damages. However, some contracts and arrangements we are bound by expose us to product liability claims resulting in personal injury or death, up to an unlimited amount, and the incurrence of the risk of material penalties for consequential or liquidated damages. Additionally, under such contracts and arrangements, we may be named in product liability claims even if there is no evidence that our products caused the damage in question, and such claims could result in significant costs and expenses relating to attorneys' fees and damages.

In addition, such contracts and arrangements may include non-limited liability provisions for infringement of a third party's intellectual property rights in connection with our products.

Although we have not incurred material penalties for consequential or liquidated damages during the past, we may incur such penalties in the future. Such penalties for consequential or liquidated damages may be significant and could negatively affect our financial condition or results of operations.

Because of our small size, we depend on a small number of employees who possess both executive and technical expertise, and the loss of any of these key employees would hurt our ability to implement our strategy and to compete effectively.

Because of our small size and our reliance on employees with both executive and advanced technical skills, our success depends significantly upon the continued contributions of our officers and key personnel. All of our key management and technical personnel have expertise, which is in high demand among our competitors, and the loss of any of these individuals could cause our business to suffer. We do not maintain life insurance policies for our officers and directors.

Our lengthy sales cycle increases our exposure to customer delays in orders, which may result in obsolete inventory and volatile quarterly revenues.

Sales of our systems depend, in significant part, upon our customers adding new manufacturing capacity or expanding existing manufacturing capacity, both of which involve a significant capital commitment. We may experience delays in finalizing sales following initial system qualification while a customer evaluates and approves an initial purchase of our systems. In general, for new customers or applications, our normal sales cycle takes between six (6) to twelve (12) months to complete. During this time, we may expend substantial funds and management effort, but fail to make any sales. Lengthy sales cycles subject us to a number of significant risks, including inventory obsolescence and fluctuations in operating results, over which we have limited control.

Because of the technical nature of our business, our intellectual property is extremely important to our business, and our inability to protect our intellectual property would harm our competitive position.

As of December 31, 2015, we have been granted more than 125 U.S. patents and have about 39 U.S. patent applications pending including US provisional patent applications. In addition, we have been granted about 65 non-U.S. patents and more than 69 non-U.S. patent applications pending.

We cannot assure that:

- pending patent applications will be approved;
- any patents will be broad enough to protect our technology, will provide us with competitive advantages or will not be challenged or invalidated by third parties; or
- the patents of others will not have an adverse effect on our ability to do business.

We also cannot assure that others will not independently develop similar products, duplicate our products or, if patents are issued to us, design around these patents. Furthermore, because patents may afford less protection under foreign law than is available under U.S. law, we cannot assure that any foreign patents issued to us will adequately protect our proprietary rights.

In addition to patent protection, we also rely upon trade secret protection, employee and third-party nondisclosure agreements and other intellectual property protection methods to protect our confidential and proprietary information. Despite these efforts, we cannot be certain that others will not otherwise gain access to our trade secrets or disclose our technology.

Additionally, as part of our long term technological collaboration, we are engaged with joint development activities with some of our strategic customers as well as with research institutes. These activities impose some limitations on the joint intellectual property developed as part of these programs.

Furthermore, we may be required to institute legal proceedings to protect our intellectual property. If such legal proceedings are resolved adversely to us, our competitive position and/or results of operations could be harmed. For additional information on our intellectual property, see “Item 4B – Intellectual Property” in this annual report on Form 20-F.

There has been significant litigation involving intellectual property rights in the semiconductor and related industries, and similar litigation involving Nova could force us to divert resources to defend against such litigation or deter our customers from purchasing our systems.

We have been, and may in the future be, notified of allegations that we may be infringing intellectual property rights possessed by others. In addition, we may be required to commence legal proceedings against third parties, which may be infringing our intellectual property, in order to defend our intellectual property. In the future, protracted litigation and expense may be incurred to defend ourselves against alleged infringement of third party rights or to defend our intellectual property against infringement by third parties. Adverse determinations in that type of litigation could:

- result in our loss of proprietary rights;
- subject us to significant liabilities, including triple damages in some instances;

- require us to seek licenses from third parties, which licenses may not be available on reasonable terms or at all; or
- prevent us from selling our products.

Any litigation of this type, even if we are ultimately successful, could result in substantial cost and diversion of time and effort by our management, which by itself could have a negative impact on our profit margin, available funds, competitive position and ability to develop and market new and existing products. For additional information on our intellectual property, see “Item 4B – Intellectual Property” in this annual report on Form 20-F.

We depend on a limited number of suppliers, and in some cases a sole supplier. Any disruption or termination of these supply channels may adversely affect our ability to manufacture our products and to deliver them to our customers.

We purchase components, subassemblies and services from a limited number of suppliers and occasionally from a single source. Disruption or termination of these sources could occur (due to several factors, including, but not limited to, work stoppages, acts of war, terrorism, fire, earthquake, energy shortages, flooding or other natural disasters), and these disruptions could have at least a temporary adverse effect on our operations. Although we generally maintain an inventory of critical components used in the manufacture and assembly of our systems, such supplies may not be sufficient to avoid potential delays that could have an adverse effect on our business.

To date, we have not experienced any material disruption or termination of our supply sources.

A prolonged inability on our part to obtain components included in our systems on a cost-effective basis could adversely impact our ability to deliver products on a timely basis, which could harm our sales and customer relationships.

The new disclosure rules regarding the use of conflict minerals may affect our relationships with suppliers and customers.

The Securities and Exchange Commission requires certain disclosure by companies that use conflict minerals in their products, with substantial supply chain verification requirements in the event that the materials come from, or could have come from, the Democratic Republic of the Congo or adjoining countries. These rules and verification requirements may impose additional costs on us and on our suppliers, and limit the sources or increase the prices of materials used in our products. Among other things, this rule could affect sourcing at competitive prices and availability in sufficient quantities of certain minerals used in the manufacture of components that are incorporated into our products. In addition, the number of suppliers who provide conflict-free minerals may be limited, and there may be material costs associated with complying with the disclosure requirements, such as costs related to the process of determining the source of certain minerals used in our products, as well as costs of possible changes to products, processes, or sources of supply as a consequence of such verification activities. We may not be able to sufficiently verify the origins of the relevant minerals used in components manufactured by third parties through the procedures that we implement, and we may encounter challenges to satisfy those customers who require that all of the components of our products be certified as conflict-free, which could place us at a competitive disadvantage if we are unable to do so. While we have created processes and procedures designed to enable compliance to these rules, if in the future we are unable to certify that our products are conflict free, we may face challenges with our customers, which could place us at a competitive disadvantage and harm our reputation. In addition, because Securities and Exchange Commission rules allow an issuer to delay reporting on an acquired company's products until the first calendar year that begins no sooner than eight months after the effective date of the acquisition, products of ReVera, which was acquired on April 2, 2015, would be included for the first time in the Form SD to be filed for calendar year 2016 (to be filed in 2017).

We are dependent on international sales, which expose us to foreign political and economic risks that could impede our plans for expansion and growth.

Our principal customers are located in Taiwan, South Korea, China, the United States and Germany, and we produce our products in Israel. International operations expose us to a variety of risks that could seriously impact our financial condition and impede our growth. For instance, trade restrictions, changes in tariffs and import and export license requirements could adversely affect our ability to sell our products in the countries adopting or changing those restrictions, tariffs or requirements. This could reduce our sales by a material amount.

We may be affected by instability in the global economy, including the European and Chinese economic and financial turmoil.

Instability in the global credit markets, including the European economic and financial turmoil related to sovereign debt issues in certain countries, the instability in the Chinese economy with its global effect, the instability in the geopolitical environment in many parts of the world and other disruptions, such as changes in energy costs, may continue to put pressure on global economic conditions. The world has recently experienced a global macroeconomic downturn, and if global economic and market conditions, or economic conditions in key markets, remain uncertain or deteriorate further, we may experience material impacts on our business, operating results, and financial condition.

Because we derive a significant portion of our revenues from sales in Asia, our sales could be hurt by the recent instability of Asian economies.

A number of Asian countries have experienced political and economic instability. For instance, Taiwan and China have had a number of disputes, as have North and South Korea, and Japan has for a number of years experienced significant economic instability. Additionally, the Asia-Pacific region is susceptible to the occurrence of natural disasters, such as earthquakes, cyclones, tsunamis and flooding. We have subsidiaries in Taiwan, Japan and South Korea and we have significant customers in Taiwan and South Korea as well as in China. An outbreak of hostilities or other political upheaval, economic downturns or the occurrence of a natural disaster in these or other Asian countries would likely harm the operations of our customers in these countries, causing our sales to suffer.

A large number of our ordinary shares continue to be owned by a relatively small number of shareholders, whose future sales of our shares, if substantial, may depress our share price.

If our principal shareholders sell substantial amounts of our ordinary shares, including shares issued upon the exercise of outstanding options or warrants, the market price of our ordinary shares may fall. For additional information on our major shareholders, see "Item 7A – Major Shareholders" in this annual report on Form 20-F.

Certain shareholders may control the outcome of matters submitted to a vote of our shareholders, including the election of directors.

To the best of our knowledge, approximately 45% of our outstanding ordinary shares are cumulatively held by six of our shareholders. As a result, and although we are currently not aware of any voting agreement between such shareholders, if these shareholders voted together or in the same manner, they would have the ability to control the outcome of corporate actions requiring an ordinary majority vote of shareholders as set in the Company's Amended and Restated Articles of Association. Even if these shareholders do not vote together, each one of them may have the ability to influence the outcome of corporate actions requiring the vote of shareholders as set in the Company's Amended and Restated Articles of Association. For additional information on our major shareholders, see "Item 7A – Major Shareholders" in this annual report on Form 20-F.

The market price of our ordinary shares may be affected by a limited trading volume and may fluctuate significantly.

In the past there has been a limited public market for our ordinary shares and there can be no assurance that an active trading market for our ordinary shares will continue. An absence of an active trading market could adversely affect our shareholders' ability to sell our ordinary shares in short time periods. Our ordinary shares have experienced, and are likely to experience in the future, significant price and volume fluctuations, which could adversely affect the market price of our ordinary shares without regard to our operating performance.

We manage our available cash through various bank institutions and invest large portions of our cash reserves in bank deposits. A bankruptcy of one of the banks in which or through which we hold or invest our cash reserves, might prevent us to access that cash for an uncertain period of time.

We manage our available cash through various bank institutions and invest large portions of our cash reserves in bank deposits. As of December 31, 2015, more than 90% of our cash reserves were invested in bank institutions, and more than 40% was invested in one institution. A bankruptcy of one of the banks in which we hold our cash reserves or through which we invest our cash reserves, might prevent us to access that cash for an uncertain period of time.

We may fail to maintain effective internal control over financial reporting in accordance with Section 404 of the Sarbanes-Oxley Act of 2002.

The Sarbanes-Oxley Act of 2002 imposes certain duties on us and our executives and directors. Our efforts to comply with the requirements of Section 404 (Assessment of Internal Control), which started in connection with our Annual Report on Form 20-F for the fiscal year ended December 31, 2007, have resulted in increased general and administrative expense and a diversion of management time and attention, and we expect these efforts to require the continued commitment of resources. Section 404 of the Sarbanes-Oxley Act of 2002 requires (i) management's annual review and evaluation of our internal control over financial reporting and (ii) an attestation report issued by an independent registered public accounting firm on our internal control over financial reporting, in connection with the filing of our Annual Report on Form 20-F for each fiscal year. We have documented and tested our internal control systems and procedures in order for us to comply with the requirements of Section 404 (in accordance with the guidance issued by the Securities and Exchange Commission which permit companies to exclude acquisitions from

their final assessment of internal control over financial reporting for the first fiscal year in which the acquisition occurred, our management's evaluation of internal control over financial reporting excluded the internal control activities of ReVera, which we acquired in April 2015). While our assessment of our internal control over financial reporting resulted in our conclusion that as of December 31, 2015, our internal control over financial reporting was effective, we cannot predict the outcome of our testing in future periods. If we fail to maintain the adequacy of our internal controls, we may not be able to ensure that we can conclude on an ongoing basis that we have effective internal controls over financial reporting. Failure to maintain effective internal control over financial reporting could result in investigation or sanctions by regulatory authorities, and could have a material adverse effect on our operating results, investor confidence in our reported financial information, and the market price of our ordinary shares.

Risks Related to Operations in Israel

Potential political, economic and military instability in Israel may adversely affect our growth and revenues.

Our principal offices and manufacturing facilities and many of our suppliers are located in Israel. Although most of our sales are currently being made outside Israel, potential political, economic and military conditions in Israel directly affect our operations.

Since the establishment of the State of Israel in 1948, a number of armed conflicts have occurred between Israel and its Arab neighbors, including extensive hostilities along Israel's northern border with Lebanon in 2006 and continuous hostilities along Israel's border with the Gaza Strip. Some of these hostilities and armed conflicts resulted in artillery attacks on Israeli territories and civil facilities. In 2012 as well as during the summer of 2014, rocket attacks from Gaza Strip resulted in damages in areas which are close to our Manufacturing Facility. In addition, it is widely believed that Iran, which has previously threatened to attack Israel, has been stepping up its efforts to achieve nuclear capability. The tension between Israel and Iran may escalate in the future and turn violent, which could affect the Israeli economy generally and us in particular. Moreover, since December 2010, there has been a wave of protests and civil resistance demonstrations in several countries in the Middle East and North Africa, including Egypt and Syria, both of which share a border with Israel. This situation creates instability in the Middle East and the surrounding countries. The resumption of hostilities and on-going tension and instability in the region, may have a negative effect on our business and harm our growth and revenues.

Our operations may be disrupted by the obligation of key personnel to perform military service.

Some of our executive officers and employees in Israel are obligated to perform significant periods of military reserve service until the age of 40 for soldiers and until the age of 45 for officers. This time-period may also be extended by the Military Chief of the General Staff and the approval of the Minister of Defense or by a directive of the Minister of Defense in the event of a declared national emergency. Our operations could be disrupted by the absence for a significant period of one or more of our executive officers or key employees due to military service. To date, our operations have not been materially disrupted as a result of these military service obligations. Any disruption in our operations due to such obligations would adversely affect our ability to produce and market our existing products and to develop and market future products.

Provisions of our Amended and Restated Articles of Association and Israeli law may delay, prevent or make difficult an acquisition of Nova, which could prevent a change of control and negatively affect the price of our ordinary shares.

Israeli corporate law regulates mergers, requires tender offers for acquisitions of shares above specified thresholds, for special approvals for transactions involving directors, officers or significant shareholders and regulates other matters that may be relevant to these types of transactions. Furthermore, Israeli tax considerations may make potential transactions unappealing to us or to some of our shareholders. See Item 10.B, "Additional Information – Memorandum and Articles of Association". For a more detailed discussion regarding some anti-takeover effects of Israeli law.

These provisions of Israeli law may delay, prevent or make difficult an acquisition of Nova, which could prevent a change of control and therefore depress the price of our shares.

The rights and responsibilities of our shareholders are governed by Israeli law and differ in some respects from the rights and responsibilities of shareholders under U.S. law.

We are incorporated under Israeli law. The rights and responsibilities of holders of our ordinary shares are governed by our Amended and Restated Articles of Association and by the Israeli Companies Law, 1999 (the "Companies Law").

These rights and responsibilities differ in some respects from the rights and responsibilities of shareholders in typical U.S. corporations. In particular, pursuant to the Companies Law each shareholder of an Israeli company has to act in good faith in exercising his or her rights and fulfilling his or her obligations toward the company and other shareholders and to refrain from abusing his power in the company, including, among other things, in voting at the general meeting of shareholders and class meetings, on amendments to a company's articles of association, increases in a company's authorized share capital, mergers, and transactions requiring shareholders' approval under the Companies Law. In addition, a controlling shareholder of an Israeli company or a shareholder who knows that it possesses the power to determine the outcome of a shareholder vote or who has the power to appoint or prevent the appointment of a director or officer in the company, or has other powers toward the company has a duty of fairness toward the company. However, Israeli law does not define the substance of this duty of fairness. Because Israeli corporate law has undergone extensive revision in recent years, there is little case law available to assist in understanding the implications of these provisions that govern shareholder behavior.

Because most of our revenues are generated in U.S. dollars, but a significant portion of our expenses is incurred in currencies other than U.S. dollars, and mainly New Israeli Shekels, our profit margin may be seriously harmed by currency fluctuations.

We generate most of our revenues in U.S. dollars, but incur a significant portion of our expenses in currencies other than U.S. dollar, and mainly New Israeli Shekel, commonly referred to as NIS. As a result, we are exposed to risk of devaluation of the U.S. dollar in relation to the NIS and other currencies. In that event, the dollar cost of our operations in countries other than the U.S. will increase and our dollar measured results of operations will be adversely affected. During 2015, the U.S. dollar revaluated against the NIS by 0.3%, after revaluated by approximately 4.5% in the previous three years. We cannot predict the future trends in the rate of devaluation or revaluation of the U.S. dollar against the NIS, and our operations also could be adversely affected if we are unable to hedge against currency fluctuations in the future.

We participate in government programs under which we receive grants and tax benefits. These programs impose restrictions on our ability to use the technologies developed under these programs. In addition, the reduction or termination of these programs would increase our costs and/or our effective tax rate. We are also subject to certain limitations related to the repatriation of funds that benefited from the tax holiday under the Approved and Benefited Enterprises regimes. The distribution or deemed distribution of such funds may be subject to recapture provisions under which we will be subject to the corporate tax that we were initially exempt from.

Government Programs. We receive royalty-bearing grants from the Office of the Chief Scientist of the Israeli Ministry of Economy and Industry, or OCS, for the financing of certain of our research and development programs that meet specified criteria. In addition, we are currently participating in intellectual property consortiums in Europe, mainly in order to be able to support our customers in the transition to advance technology nodes in the coming years. These consortiums are joint programs with the OCS and the European Research Area. To maintain our eligibility for these programs, we must continue to meet certain conditions, including paying royalties related to grants received. Some of these programs also restrict our ability to manufacture particular products and transfer particular technology, which were developed as part of the OCS's programs outside of Israel. The restrictions associated with receiving such OCS's grants may require us to obtain approval of the research and development committee nominated by the OCS for certain actions and transactions and pay additional royalties to the OCS. Such approval may be given only if the recipient abides by all the provisions of the law and related regulations. Approval to manufacture products outside of Israel or consent to the transfer of technology, if requested, might not be granted. In addition, if we fail to comply with certain restrictions associated with receiving such OCS's grants, we may be subject to criminal charges.

Approved and Benefited Enterprises Regimes. In addition to the above mentioned grants, we are also eligible to receive tax benefits under Israeli law for capital investments that are designated as “approved enterprises”. While we believe that we meet the statutory conditions to entitle us to such benefits there can be no assurance that the tax authorities in Israel will concur. Should it be determined that we have not, or do not meet such conditions, the benefits received could be cancelled. We could also be required to pay increased taxes or refund any benefits previously received, adjusted for inflation and interest. Moreover, as certain tax benefits for Approved Enterprises are granted for a period of between two (2) to ten (10) years, starting from the first year the company derives taxable income under the Approved Enterprise program. Any adjustment to our taxable income resulting from a tax audit for a certain tax year or several tax years, may change the periods in which benefits are granted for and may result in increasing our tax expenses. From time to time, we submit requests for expansion of our approved enterprise programs. These requests might not be approved.

It should be noted that the Israeli government may reduce or eliminate the above mentioned benefits in the future. The termination or reduction of these grants or tax benefits could harm our business, financial condition and results of operations. In addition, if we increase our activities outside Israel due to, for example, future acquisitions or outsourcing of manufacturing or development activities, these activities generally will not be eligible for inclusion in Israeli grants or tax benefit programs. Accordingly, our effective corporate tax rate could increase significantly in the future and our grants might be reduced.

Our effective tax rate could be materially affected by several factors including, among others, changes in the amount of income taxed by or allocated to the various jurisdictions in which we operate that have differing statutory tax rates, changing tax laws, regulations and interpretations of such tax laws in multiple jurisdictions.

We conduct business globally and file income tax returns in multiple jurisdictions. We report our results of operations based on our determination of the amount of taxes owed in the various jurisdictions in which we operate. We have transfer pricing arrangements among our subsidiaries in relation to various aspects of our business, including operations, marketing, sales and delivery functions. Any applicable transfer pricing rules, require that any international transaction involving associated enterprises be on arm's-length terms. We consider the transactions among our subsidiaries to be on arm's-length terms. The determination of our consolidated provision for income taxes and other tax liabilities requires estimation, judgment and calculations where the ultimate tax determination may not be certain. Our determination of tax liability is always subject to review or examination by authorities in various jurisdictions.

If a tax authority in any jurisdiction reviews any of our tax returns and proposes an adjustment, including as a result of a determination that the transfer prices and terms we have applied are not appropriate, such an adjustment could have a negative impact on our financial results.

Any shareholder with a cause of action against us as a result of buying, selling or holding our ordinary shares may have difficulty asserting a claim under U.S. securities laws or enforcing a U.S. judgment against us or our officers, directors or Israeli auditors.

We are organized under the laws of the State of Israel, and we maintain most of our operations in Israel. Most of our officers and directors as well as our Israeli auditors reside outside of the United States and a substantial portion of our assets and the assets of these persons are located outside the United States. Therefore, if you wish to enforce a judgment obtained in the United States against us, or our officers, directors and auditors, you will probably have to file a claim in an Israeli court. Additionally, you might not be able to bring civil actions under U.S. securities laws if you file a lawsuit in Israel. We have been advised by our Israeli counsel that Israeli courts generally enforce a final executory judgment of a U.S. court for liquidated amounts in civil matters after a hearing in Israel. If a foreign judgment is enforced by an Israeli court, it will be payable in Israeli currency. However, payment in the local currency of the country where the foreign judgment was given will be acceptable, subject to applicable foreign currency restrictions.

Our shares are listed for trade on more than one stock exchange, and this may result in price variations.

Our ordinary shares are listed for trading on The NASDAQ Global Select Market and on the Tel Aviv Stock Exchange Ltd., or TASE. This may result in price variations. Our ordinary shares are traded on these markets in different currencies, U.S. dollars on The NASDAQ Global Select Market and New Israeli Shekels on the TASE. These markets have different opening times and close on different days. Different trading times and differences in exchange rates, among other factors, may result in our shares being traded at a price differential on these two markets. In addition, market influences in one market may influence the price at which our shares are traded on the other.

We may be classified as a "passive foreign investment company" for U.S. income tax purposes, which could have significant and adverse tax consequences to U.S. shareholders.

Generally, if for any taxable year 75% or more of our gross income consists of specified types of passive income, or, on average, at least 50% of our assets are held for the production of, or produce, passive income, we may be characterized as a passive foreign investment company (a "PFIC") for U.S. federal income tax purposes. Classification of Nova as a PFIC could result in adverse U.S. tax consequences to our U.S. shareholders, including having gain realized on the sale or other disposition of our shares being treated as ordinary income as opposed to capital gain income, and computing tax liability on that gain, as well as on dividends and other distributions, as if the income had been earned ratably over each day in the U.S. holder's holding period for the shares. In addition, an interest charge will be imposed on the amount of the tax allocated to these taxable years. It may be possible for U.S. holders of common shares to mitigate certain of these consequences by making an election to treat us as a "qualified electing fund" under Section 1295 of the Internal Revenue Code of 1986, as amended (the "Code") or a "mark-to-market election" under Section 1296 of the Code. U.S. shareholders should consult with their own U.S. tax advisors with respect to the U.S. tax consequences of investing in our ordinary shares.

We believe that in 2015 we were not a PFIC. Nonetheless, because the determination of whether we are, or will be, a PFIC for a taxable year depends, in part, on the application of complex U.S. federal income tax rules, which are subject to various interpretations, there is a risk that we were a PFIC in 2015. Absent one of the elections described above, if we are a PFIC for any taxable year during which a U.S. holder holds our ordinary shares, we generally will continue to be treated as a PFIC regardless of whether we cease to meet the PFIC tests in one or more subsequent years. Currently we expect that we will not be a PFIC in 2016. However, PFIC status is determined based on our assets and income over the course of each taxable year, and is dependent on a number of factors, including the value of our assets, the trading price of our ordinary shares and the amount and type of our gross income. Therefore, there can be no assurances that we will not become a PFIC for the current fiscal year ending on December 31, 2016, or any future year, or that the Internal Revenue Service will not challenge any determination made by us concerning our PFIC status. For a discussion on how we might be characterized as a PFIC and related tax consequences, please see the section of this annual report entitled “U.S. Taxation – Passive Foreign Investment Companies.”

Item 4. Information on the Company

4.A History and Development of the Company

Nova Measuring Instruments Ltd. was incorporated in May 1993 under the laws of the State of Israel. We commenced operations in October 1993 to design, develop and produce integrated process control systems for use in the manufacture of semiconductors, also known as integrated circuits or chips.

In April 2000, we conducted an initial public offering and our shares were listed for trading on NASDAQ.

In June 2002, we listed our shares on the TASE, pursuant to legislation which enables Israeli companies whose shares are traded on certain stock exchanges outside of Israel to be registered on the TASE, while reporting, in substance, in accordance with the provision of the relevant foreign securities law applicable to the Company.

During 2003, we began expanding our product offerings to include stand-alone systems. In recent years stand-alone metrology has started to account for a significant portion of our overall revenues.

Until 2008, most of our products were sold to process equipment manufacturers such as Applied Materials, Inc. and Ebara Corp., which later sold these products to semiconductor manufacturers. Since then, we have completely changed our business model, selling most of our products directly to semiconductor manufacturers. Through this process, which has also enabled us to introduce to these customers additional products and features, we have improved our products gross margins and net profitability. In parallel, we continue to work with the process equipment manufacturers as business partners for future products and process control solutions.

In February 2010, we successfully completed an underwritten public follow-on offering in which we received approximately $17.0 million in net proceeds.

In March 2014, we announced a $12 million share repurchase program, which we plan to execute by the first half of 2016.

In April 2015, we acquired ReVera Inc. or ReVera, a privately held company headquartered in Santa Clara, California, which develops, manufactures and sells stand-alone metrology tools for measurements of thin-films and composition applications in the semiconductor industry.

We currently have seven direct and indirect fully owned subsidiaries in the U.S., Japan, Taiwan, Korea, Germany and the Netherlands.

Our headquarter office is located in Israel at the Weizmann Science Park, Building 22, 2nd Floor, Ness-Ziona. Our telephone number at our main office is +1-972-73-229-5600.

4.B Business Overview

We deliver continuous innovation by providing advanced metrology solutions for the semiconductor manufacturing industry. Deployed with the world's largest integrated-circuit manufacturers, our products deliver state of the art, high performance metrology solutions for effective process control throughout the semiconductor fabrication lifecycle. Our holistic approach and complete suite of products, which combines high-precision hardware and cutting-edge software, support the development and production of the most advanced devices in today's high-end semiconductor market.

We offer in-line Optical and x-ray stand-alone metrology systems, as well as integrated optical metrology systems, which are attached directly to wafer fabrication process equipment. Our metrology product portfolio combined with Nova's modeling software, aim to deliver unique measurement solutions to measure the most advanced semiconductor technology nodes. Our suit of products are designed to deliver a holistic solution while demonstrating high performance and fast time to solution. Our metrology systems measure various film thickness and composition properties as well as critical-dimension (CD) variables during various front-end and back-end of line steps in the semiconductor wafer fabrication process, allowing semiconductor manufacturers to improve quality, productivity and yields, lower manufacturing costs and increase profitability. We supply our metrology solutions to major semiconductor manufacturers worldwide, and are recognized for excellence since our first system was installed in 1995.

The semiconductor manufacturing process starts with a flat silicon disc known as a silicon wafer upon which circuits are constructed. To construct the circuits, a series of layers of thin films that act as conductors, semiconductors or insulators are applied to the polished side of the wafer. During the manufacturing process, these film layers are subjected to processes which remove portions of the film, create circuit patterns and perform other functions. The semiconductor manufacturing process requires precise steps and strict control of equipment performance and process sequences. Tight control can be achieved through monitoring silicon wafers and measuring relevant parameters before or after each process step with metrology tools such as those we produce.

Prior to the introduction of our integrated metrology systems, process control was solely achieved through stand-alone measurement equipment. Stand-alone measurement equipment requires semiconductor manufacturers to interrupt the manufacturing process sequence, remove sample silicon wafers from the process equipment and place the silicon wafers on the stand-alone measuring or inspection tool. In contrast, our integrated metrology approach is based on patented measuring methods that enable us to produce optical measuring systems that are small enough to be integrated directly inside many types of semiconductor process equipment. We believe that in several instances during the manufacturing process, our integrated approach offers considerable advantages over the conventional stand-alone approach to metrology control, enabling manufacturers using our integrated equipment to reduce costs and to improve production efficiency, yield and quality.

We have always invested in our integrated metrology solutions as this continues to be an area where we have a leading position. In addition, in the past few years, we developed and started manufacturing stand-alone metrology systems, leveraging our technology, methods, metrology expertise and market position in the integrated metrology field to expand our offerings into the larger market for stand-alone metrology systems. Over the past several years we developed several generations of Stand-Alone metrology tools. Through a customer driven roadmap which aligns our development efforts with both R&D as well as high volume manufacturing needs of our customers, we have been able to build a differentiated product offering. The success of this endeavor has allowed us to grow this aspect of our business such that it now represents a significant part of our overall business. Today, both stand-alone and integrated metrology solutions have reached a level of maturity allowing semiconductor manufactures to choose how to use either technology and make decisions based on merit specific to the process step in question, always balancing between the amount of data attained and the use made of the data for capabilities such as automated process control. Our long-term strategy is focused on advanced metrology and process control solutions where our integrated process

control products and stand-alone products are compatible or complementary and used in a customized way to meet specific customer needs.

In April 2015, through the acquisition of ReVera, we expanded our technology base. The foregoing technology added a unique capability to our product portfolio, allowing us to measure ultra-thin film thickness and composition for critical wafer fabrication steps. We believe that the combination of ReVera's XPS/XRF technology and Nova's dimensional Holistic FAB-Wide Solution, creates a compelling and unique portfolio for the measurement of film, composition, material properties and critical-dimension (CD) variables, which address today's growing challenges associated with the transition to advanced nodes in the semiconductor segments.

Demand for metrology systems is driven by capital equipment spending by semiconductor manufacturers, which in turn are driven by worldwide demand for semiconductor devices and technological transition processes, which are required from these devices for the most advanced high end applications. Industry data indicates that through the years worldwide demand for semiconductors has been growing. We believe that this growth in demand will continue to generate demand for process control equipment, including metrology systems, as semiconductor manufacturers invest in technology and capacity expansion. We also believe that demand for metrology systems will be driven by the increasing cost of semiconductor manufacturing and by the requirements of semiconductor manufacturers for better control of process equipment. Finally, demand for metrology is strongly driven by technology challenges. The growing investment in advanced technology nodes and device structures introduces growing complexity and new challenges. Scaling limits and technology progress are continuously pushed in order to improve cost and gain competitive advantage. These fundamental elements create favorable market conditions for metrology growth where more process steps are needed, new novel materials are introduced and innovative structures and packaging solutions are incorporated. We believe that all the above market conditions set favorable business environment for growth.

Our Market

Semiconductor Industry and the Metrology Market

The increased use of semiconductors has been accompanied by an increase in their complexity. Due to the creation of new applications and markets for semiconductors, suppliers and manufacturers are faced with an increasing demand for new products that provide greater functionality and higher performance at lower prices. As a result, many new complex materials, structures and processes are being introduced into semiconductor manufacturing ecosystem. Such materials include, among others, copper, low-k and high-k dielectrics, silicon-on-insulator, silicon-germanium, III-V, strained silicon and raised source/drain. Manufacturers have transitioned in the past years toward 300 mm silicon wafers (from 200 mm silicon wafers). While 300 mm wafers can yield up to twice as many integrated circuits than 200 mm wafers, they also create new manufacturing challenges. For example, because 300 mm wafers can bend or bow more than twice than the 200 mm wafers, they are more susceptible to damage. The larger area of 300 mm wafers also makes it more difficult to maintain film uniformity across the entire wafer. The phenomena is expected to become even more challenging as the semiconductor industry considers a move to 450 mm production in the future (currently on hold due to questions on cost effectiveness). Semiconductors also continue to move toward smaller feature sizes and more complex structures such as 3D FinFET transistors, GAA (Get All Around), 3D-NAND and emerging memory structures. The growing complexity of semiconductor devices increase the complexity and the costs of the semiconductor manufacturing process, which has also been a driver for the growing demand for metrology systems.

The ever-increasing level of complexity and the decrease in feature sizes has also significantly increased the cost and performance requirements of semiconductor fabrication equipment. The cost of wafer fabrication equipment has also increased due to the higher levels of automation being utilized by manufacturers. Thus, semiconductor manufacturers must increase their investment in capital equipment in order to sustain technological leadership, to expand manufacturing capacity and maintain profitability. According to published reports by an industry market research firm, the cost of building a state-of-the-art semiconductor manufacturing facility has grown from approximately $200 million in 1983 and may reach up to $5 billion in 2016 for building mega fab facilities capable of manufacturing 300 mm wafers. We believe that the process control equipment market, which includes the metrology segment, will grow in the future at a pace greater than the overall process equipment market since the challenges of meeting process design goals will become increasingly difficult such that process control equipment will consume a larger portion of the overall costs of semiconductor manufacturing equipment.

The Semiconductor Manufacturing Process

Semiconductors typically consist of transistors or other components connected by an intricate system of circuitry on silicon wafers. Integrated circuit manufacturing involves well over a dozen individual steps, some of which are repeated several times, through which numerous copies of an integrated circuit are formed on a single silicon wafer. Typically, up to 30 very thin patterned layers are created on each wafer during the manufacturing process. At the end of the manufacturing process, the wafer is cut into individual chips or dies. Because semiconductor specifications are extremely tight, and integrated circuits are becoming more complex, requiring ever more sophisticated manufacturing processes, the process steps are constantly monitored, and critical parameters are measured at each step using metrology equipment.

Many of the manufacturing steps involve the controlled application or removal of layers of materials to or from the wafer. The application of materials to the wafer, known as deposition, involves the layering of extremely thin films of electrically insulating, conducting or semi-conducting materials. These layers can range from one-thousandth to less than one-hundred-thousandth of a millimeter in thickness and create electrically active regions on the wafer and its surface. A wide range of materials and deposition processes are used to build up thin film layers on wafers to achieve specific performance characteristics. One of the principal methods of thin film layer deposition is chemical vapor deposition (CVD). In CVD, a chemical is introduced into the chamber where the wafer is being processed and is deposited using heat and a chemical reaction to form a layer of solid material on the surface of the silicon wafer. Although CVD equipment represents the largest equipment type, there are more segments in the thin-layer deposition equipment market as epitaxy, physical vapor deposition (PVD) and atomic layer deposition (ALD). Currently the ALD represents the fastest growing equipment category. Metrology systems monitor the thickness and uniformity of thin film layers during the deposition process.

Once the thin film has been deposited on the wafer to form a solid material, circuit patterns are created using a process known as photolithography. During this process, a light-sensitive coating called photoresist is applied to the wafer, which is then exposed to intense light through a patterned, opaque piece of glass. For the photolithography process to work properly, the thickness of the photoresist must be precise and uniform. In addition, to control the photolithography process, the film thickness, reflectivity, overlay registration and critical dimensions are all measured and verified. The exposed photoresist is developed when it is subjected to a chemical solution. The developed wafer is then exposed to another chemical solution, or plasma, that etches away any areas not covered by the photoresist to create the structure of the integrated circuit. Semiconductor manufacturers use metrology systems to verify the removal of material through the etch process and the critical dimensions of the structures created.

To meet the flatness challenges posed by ever smaller feature sizes and the critical need for ultra-flat foundation for high precision photolithography, manufacturers use process technology known as Chemical Mechanical Planarization, or CMP. CMP removes uneven film material deposited on the surface of the wafer from processes such as CVD and photolithography by carefully “polishing” the wafer with abrasives and chemicals, creating an extremely flat and even surface for the patterning of subsequent film layers. Metrology systems are used to control and verify the results of the CMP process by measuring the thin film layer to determine when the correct thickness has been achieved.

The processes described above are repeated in sequence until the last layer of structures on the wafer has been completed. Each integrated circuit on the wafer is then inspected and its functionality tested before shipment. Measurements taken by metrology systems during the manufacturing process help insure process uniformity and help semiconductor manufacturers avoid costly rework and misprocessing, thereby increasing efficiency and profitability.

Process Control Requirement

The steps used to create semiconductors are accurate processes that require strict control of equipment performance and process sequences for the resulting semiconductors devices to function properly. Tight control is achieved through monitoring of the in-process wafers and by measuring relevant parameters after each process step. These procedures are usually carried out on a small sample of the wafers though in some steps where process stability if difficult to achieve, the number of sampled wafers will increase. The monitoring may include measurement of several parameters, such as the thickness of the layers of thin film deposited, the sizes of the features that are patterned through the photolithography process, as well as the registration or alignment between two consecutive layers, known as overlay. Monitoring also includes inspection of the wafer for irregularities, defects or scratches. If parameters are out of specification or if defects or contamination are present, the manufacturer adjusts the process and measures another sample of wafers thereby allowing manufacturers to reduce costs and improve device performance.

The Need for Effective Process Control Tools

A number of technical and operational trends within the semiconductor manufacturing industry are strengthening the need for more effective process control solutions. These trends include:

- Development of Smaller Semiconductor Features. The development of smaller features, now as small as 16nm in production and 10nm in R&D, enables semiconductor manufacturers to produce larger numbers of circuits per wafer and to achieve higher circuit performance. As feature geometries decrease, manufacturing yields become increasingly sensitive to processing deviations and defects, as more integrated circuits are lost with every discarded wafer. In addition, the increased complexity and number of layers of the integrated circuits increase the chance of error during the manufacturing of the wafer.

- Transition to 3D Device Structures. Foundries are adopting 3D FinFET transistors starting at 14/16 nm technology nodes to get improved performance and use less power in 1x technology nodes. Memory makers will move to 3D NAND and vertical structures for next generation NAND technology. These trends will require process control with metrology solutions capable of measuring critical dimensions in these 3D structures that are currently supported only by optical metrology technology.

- Transition to 3D Integration Technology. Three-dimensional (3D) integration of active devices, directly connecting multiple IC chips, offers many benefits, including power efficiency, performance enhancements, significant product miniaturization, and cost reduction. It provides an additional way to extend Moore's law beyond spending ever-increasing efforts to shrink feature sizes. A critical element in enabling 3D integration is the Through-Silicon Via (TSV); TSV provides the high-bandwidth interconnection between stacked chips. The TSV process is beginning to enter production. In the case of TSV, since multiple chips are connected, the process has to achieve and maintain very high yield levels in order to be economically viable. TSV metrology solutions are required to closely monitor and measure depth, side-wall slope, top and bottom diameter (CD), and bottom curvature.

- Shortening of Technology Life Cycles. The technology life cycle of integrated circuits continues to shorten as semiconductor manufacturers strive to adopt new processes that allow a faster transition to smaller, faster and more complex devices. In the past, the technology life cycle was approximately three years; it is now only two years. The accelerating rate of obsolescence of technology makes early achievement of enhanced productivity and high manufacturing yields an even more critical component of a semiconductor manufacturer's profitability and metrology continues to play an even more critical role in achieving these demanding results.

- New Materials. Copper metal layers continue to be the key material for the back end of line for advanced integrated circuits in order to increase performance and reduce the cost of integrated circuits. The Industry is continuously searching directions to reduce the effective K of the low K materials and to reduce the barrier thickness and material types. These changes require new processing and metrology equipment and thus represents challenging developments for the semiconductor manufacturing industry. In addition, in order to overcome limitations in the continued shrink of transistor dimensions, leading edge integrated circuit manufacturers are introducing new materials in the transistor gate stack. The adoption of high-k dielectrics is a key element for gate control in the most advanced technology nodes of 28nm, 20nm and 14nm currently in production, while R&D work to implement the next gate control material being done with III-IV materials. These new materials, combined with metal layers, require new processing and metrology equipment in the atom level and thus represent a challenging development for the semiconductor manufacturing industry.

- Increasing Use of Multi Patterning Lithography. The continuous need for scaling to meet reduced transistor costs combined with delays in EUV lithography is pushing the industry to develop alternative lithography techniques such as multi patterning, DSA and E-Beam. These alternative technology are increasing the Etch and CMP process steps and thus increasing the process control and metrology steps in these areas accordingly.

- Growing of Foundry Manufacturing. As a result of the rising investment needed for semiconductor process development and production as well as the proliferation of different types of semiconductors, semiconductor manufacturing is increasingly being outsourced to large semiconductor contract manufacturers, or foundries. A foundry typically runs several different processes and makes hundreds to thousands of different semiconductor product types in one facility, making the maintenance of a constant high production yield and overall equipment efficiency more difficult to achieve. This trend of shifting to foundries for manufacturing needs has progressed even further during recent years. The challenges associated with foundry in the following years relate to aspects such as: shortening the time to market, reducing costs and monitoring process complexity.

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Advanced Memory Manufacturing. As a result of recent years progress, the NAND market is entering a critical transition phase as NAND technology shifts from traditional 2D planar structures to 3D structures where 2D NAND flash is reaching its practical limit for cost-per-bit reductions and thus major cost reductions in the future will come from the shifting to 3D NAND structures.

In order to address the increasing costs associated with these trends, we believe semiconductor manufacturers must enhance manufacturing productivity. One way to enhance productivity is through improvements in process control, with a greater emphasis on metrology as part of process control. As part of this emphasis on metrology, manufacturers are taking more measurements to characterize each step of the semiconductor manufacturing process, new and enhanced measurement techniques are being used to provide meaningful data and the data provided is being used in new ways to enhance the manufacturing process. We believe that the demand for advanced process control systems that address the evolving needs of semiconductor manufacturers will continue to drive the growth in the market for process control systems and that the demand for metrology will be even higher as a result of the short time cycle of each technology and the need to fast ramp from R&D to production.

We believe that in certain process steps, integrated metrology systems provide semiconductor manufacturers with the greatest opportunity to increase the productivity and yields of their equipment, thereby increasing their profitability. Therefore, we plan to continue to maintain a major focus on the integrated metrology market. However, recognizing that a significant number of process steps will continue to rely on stand-alone equipment, we intend to continue leveraging our market leading position in the integrated metrology market and our metrology expertise to deepen our penetration of the stand-alone metrology market. Furthermore, the technological and operational trends within the semiconductor manufacturing industry that are strengthening the need for more effective process control solutions can sometimes be addressed through the use of stand-alone metrology equipment or a combination of both stand-alone and integrated metrology.

The World Economy – Update

Gartner Inc. forecasts the world GDP to grow by 2.9% in 2016 compared to an estimated increase of 2.6% in 2015, and forecasts the U.S. GDP to grow by 2.9% in 2016.

Gartner Inc. forecasts semiconductor revenues to increase by 1.9% in 2016, compared to a decrease of 1.9% in 2015. In addition, Gartner Inc. forecasts WFE sales in 2016 to decrease by 2.5% following an estimated decrease of 0.1% in 2015.

According to research reports, future demand drivers for semiconductors include Smartphones, Solid State Drives (SSD), internet-of-things and other electronic equipment.

Expected Equipment Spending in 2016

We believe that over capital spending and Wafer-Fab-Equipment in 2016 is expected to be flat or to slight decline compared to 2015. By the main customer segments we expect that the key investment trends will be as follow:

1. Foundry spending is expected to be flat over 2016 with investment targeting 10nm pilot lines and production ramp starting in the second half of 2016, and potential moderate expansions in 28/16/14nm production lines.

2. NAND/Flash is expected to continue its growth driven by ramp of 3D-NAND.

3. DRAM investment is expected to decline as the market shifts to oversupply.

In the metrology segment we note some positive signs for investment growth, driven by an increase in complexity and overall process steps. We believe the growth is a result of the use of multi-patterning techniques in leading edge technologies, which increases the number of measurement steps, and requires advanced metrology solutions. We also believe this can generate growth opportunities for our optical CD integrated and stand-alone product lines as well as for our X-Ray products.

The Nova Approach

Optical CD Integrated Metrology

As development cycles are becoming shorter, fabrication processes are becoming less stable and call for tight process control schemes that is closer to the actual process step and produce wafer to wafer variation control. Nova's approach is to lead the industry with solutions that can enable effective and accurate measurements in non-ideal process conditions. Our integrated metrology systems provide semiconductor manufacturers with effective and efficient process control by measuring wafers and their properties immediately after the process, without removing the wafer from the process equipment. All our products use our patented measuring methods that enable us to produce optical measuring systems that are small enough to be incorporated directly inside many types of equipment used in semiconductor processing. Integrated systems measure the wafer within the actual process environment, reducing labor and wafer handling as well as the risk of contamination of or damage to the wafer. In addition, we believe that our systems deliver significant increases in overall equipment efficiency through advanced process control, along with improving wafer-to-wafer uniformity, all with minimal operator intervention.

We provide our customers with flexible integrated process control solutions by offering systems that meet thin film as well as Optical CD measurement needs in critical applications in the wafer fabrication process. Our integrated process control platform can be deployed in multiple processes and applications of semiconductor manufacturing cycle.

We believe that our integrated metrology systems can provide several important advantages to semiconductor manufacturers, enabling them to:

- utilize the process equipment wafer handling mechanism to allow measurement of the sample wafers while processing other wafers and avoid the need for the costly additional wafer handling required by stand-alone metrology systems;

- perform the measurements without removing the wafer from the process equipment, increasing the efficiency of the process and decreasing the risk of contamination;

- reduce manufacturing equipment processing variability through the use of wafer to wafer measurements and closed loop control based on automated feedback of process variability;

- reduce capital costs of the fabrication facility by increasing overall equipment efficiency and reducing labor costs and necessary clean room area;

- reduce the amount of time required to qualify process equipment that is usually idle during qualification steps, thus, minimizing costly equipment down-time;

- reduce the number of test wafers; and

- detect processing errors as early as possible.

We believe that as semiconductor manufacturers demand greater efficiency from their manufacturing equipment, process equipment manufacturers will increasingly seek to offer their customers integrated metrology in their tools to lower costs and increase overall efficiency. We believe the drive toward more efficient manufacturing operations in the face of increasing complexity and cost will continue the trend of adopting integrated metrology solutions such as those we offer to multiple processes.

In prior years, most of our integrated metrology products were sold through process equipment manufacturers (such as Applied Materials, Inc. and Ebara Corporation). These products were later sold by the process equipment manufacturers (PEMs) to the semiconductor manufacturers. In recent years, we completely changed this model and now we sell our integrated metrology products directly to semiconductor manufacturers. This resulted in more favorable commercial terms to end users, to PEMs and to our Company. It also enabled deeper technological cooperation with end users and expansion of our product offering through new, and previously unavailable, features and functionality.

Optical CD Stand-Alone Metrology

As stated above, we pioneered the area of integrated metrology and to-date revenues from that product continue to represent the larger portion of our overall revenues. With the adoption of our technology and the formation of long standing relationships with leading customers, we have come to realize that our technology can be extended beyond integrated metrology into areas such as stand-alone metrology. Accordingly, in the past few years we developed stand-alone metrology tools to perform measurements similar to those performed by our integrated metrology tools. The expression “stand-alone metrology” generically describes free standing metrology equipment which is located in

line, i.e., next to the processing equipment and receives cassettes or FOUP of wafers to allow sampling of a few or several wafers from each cassette it receives. There are several types of stand-alone metrology tools each of which performs a distinct type of measurement, e.g., defect inspection, electrical performance, microscopic analysis, cross sections, etc. Our specific focus is in the area of optical CD measurement which is generally utilized in order to characterize critical dimensions on a wafer, their width, shape and profile. This technology is utilized today in several areas of the fab such as photolithography, etch, CMP, deposition, etc. The key advantage offered by this technique is that it provides visualization of the full cross-section-like profile of the structure, while remaining non-destructive and extremely fast with very high accuracy and repeatability. Adding stand-alone metrology to our product portfolio has allowed us to expand our reach into more areas of the fab.

We introduced this concept in 2006 and were successful in penetrating several major accounts since then, allowing us to see a significant increase in our overall customer base and revenues with the stand-alone products. With the introduction of stand-alone metrology, we have expanded our addressable markets and are now able to provide metrology solutions for four of the five critical manufacturing steps, as opposed to the one or two we were previously able to provide, when our product offering was limited to integrated tools only.

Modeling and Software Solutions

The integrated and stand-alone products are combined with the NovaMARS modeling engine to create Nova's metrology holistic solution. NovaMARS is our modeling and application development software that enables complex 2D, 3D and in-die measurements with high accuracy and fast time-to-solution. Over the past several years we have leveraged our advanced modeling know-how to create unique solutions that address industry growing process challenges. Furthermore, we are continuously exploring new methods to deliver superior process control solutions that leverage our advanced modeling engines. In addition to our modeling software solutions, we have introduced the fleet management software which is Nova solution for managing large fleets of metrology tools to deliver high productivity and operational efficiency in high volume production environment of foundry and memory customers. The fleet management solution offers an easy and intuitive platform for managing and improving the overall productivity of Nova's fleet of systems and is designed to address the needs and working methodologies of metrology and process engineers in the fab.

InSitu Measurement

Taking advantage of our extensive and unique experience in advanced modeling and real-time optical integrated measurements, we have introduced the NovaRPM solution – a real time profile monitoring system enabling in-situ process control. The NovaRPM system receives spectral information from an in-situ process tool sensor, interprets the spectra in real-time and extracts information such as depth, CD, and profile information that provides real-time data and trends on critical parameters. The profile changes are used by automated process control (APC) software to control the process. This unique capability to track target parameters in real-time enables reducing the process tool instability, incoming wafer variability and tool-to-tool variability.

Materials and TF Measurements

The growing usage of complex materials in advanced FinFET logic, DRAM and flash memory technology nodes has increased the demand for metrology solutions that can measure composition and film thickness with high precision and accuracy in recent years. ReVera, a Nova company, has pioneered the materials metrology segment with products that utilize x-ray photoelectron spectroscopy (XPS), a powerful technology that has been optimized to provide the automation, speed and reliability required in today's advanced semiconductor production environment. XPS is uniquely suited for the move to thinner films and smaller features, while improving the performance at each new technology node. ReVera's products are used by logic and memory device manufacturers worldwide to measure, monitor and control critical device layers in high-volume production and to enable rapid development and control of complex, new processes. ReVera products set the standard for High K – Metal Gate, tunnel oxide and capacitor film metrology.

Hybrid and Technology Synergies

As part of our holistic metrology approach that uses additional sources and channels of information to optimize the metrology performance, we have introduced hybrid metrology. Hybrid metrology combines measurements from multiple metrology toolset types in order to enable or improve the measurement of one or more critical parameters required for process control of advanced devices, materials and architectures. In the hybrid ecosystem, two or more

toolsets measure the same or similar targets. The data from one toolset helps reducing the model degrees of freedom of the other toolset (typically Optical metrology) resulting in improved performance of the combined measurement in compare of that of any of the individual toolsets. Nova's hybrid metrology solution is implemented in production in advanced technology nodes and is available with multiple metrology toolsets including CD SEM and x-ray Photoelectron Spectroscopy (XPS) technologies.

Our Technology

We believe that our technological and engineering expertise and research and development capabilities allow us to develop and offer new products and technologies to meet the ever-changing demands of the semiconductor industry. We have applied our technological and engineering expertise to develop a wide range of integrated and stand-alone products for the dielectric CMP, copper CMP, Tungsten CMP, Etch and lithography processes as well as high end CVD deposited layers, Cu electroplating and sputtering of Cu barrier and seed materials. Because of our open architecture policy, our integrated metrology solutions can work with most models of CMP and Etch tools made by the major process equipment manufacturers, for both 200 mm and 300 mm applications.

Our scatterometry capabilities have enabled us to penetrate new customers with Stand-Alone Optical CD metrology systems. Our combined offering of advanced measurement hardware and advanced modeling software place us in a position to offer an advantageous solution to our customers.

In addition to the above applications, we have a stand-alone product for the emerging 3D-interconnect market. This internal development is based on an extension of our existing technologies.

Following the acquisition of ReVera in April 2015, we have expanded our capabilities beyond dimensional metrology in the measurement of material composition and areal density of films down to sub-atomic thickness. These stand-alone products address issues in transistor gate dielectrics, work function adjustment materials, DRAM capacitor dielectrics, and VNAND cell fabrication.

Our suite of technological capabilities includes:

- Broadband Spectrophotometry. Our broadband Spectrophotometry capabilities range from deep ultraviolet to infrared. This technology enables fast, accurate and small spot size film thickness measurement in a large range of applications on a very cost effective basis, both as an integrated system and as a stand-alone system.

- Scatterometry. Our Scatterometry systems are based on our broadband Spectrophotometry technology. These systems use a fully polarized deep ultraviolet to near-infrared spectral light source. This technology enables fast and cost effective system development. Scatterometry provides two and three dimensional characterization of very fine geometries on patterned product wafers. These profiling and critical dimension capabilities are key enablers of advanced process control, allowing almost real time metrology of the most advanced design rules, down to 7 nm and below. A key component in scatterometry technology is the modeling software which converts raw spectra coming from the measurement tool into useful information in terms of customer parameters. This segment of the technology is where we currently focus our attention and where we have also acquired specific advantages due to our unique solutions. Some of Nova’s metrology solutions use multi-channel reflectometry to reduce the ambiguity, increase the sensitivity to critical parameters, and improve measurement accuracy. The measurements are gathered using different wave lengths, polarizations and directions in order to deliver highly-accurate results.

- Dark Field Spectral Reflectometry - In order to further increase the variety of independent channels, we implemented measurement schemes based on the notion of dark-field (DF) detection. In DF measurements, the optical system is designed so that light going through 'simple' reflection from the sample is blocked before detection. Dark field spectral reflectometry is currently implemented in Nova’s V2600 for measurements of Through-Silicon-Via (TSV). In order to isolate and highlight the signal related to reflection from TSV side walls, we implemented a dark-field method by which all light specularly reflected from the wafer top surface is blocked, and only light that has entered the via is collected for analysis. This method is beneficial for the characterization of the TSV profile, allowing sensitivity to the via side walls and bottom characteristics. In addition, we have extended the usage of DSR measurement channels in the newly HelioSense™100 to enhance its ability to measure critical

parameters for tighter process control in the most advanced node that use multi-patterning process techniques in Logic, Flash and DRAM.

- Imaging and Image Processing. One of Nova's key core technologies is high-end optical imaging. As part of this specialty, Nova has implemented advanced image processing algorithms, sophisticated navigational channels, and robust pattern recognition capabilities, in its tools.

- Computational Modeling for Electromagnetic and Optical Systems. Our MARS multi-channel metrology modeling suite is capable of providing modeling solutions for the most advanced 3D structures in semiconductor manufacturing. It is a complete modeling and application development solution designed to provide high accuracy in short time to solution and is coupled with Nova advanced computation hardware.

- X-ray Photoelectron Spectroscopy. Our XPS systems measure the material composition, bonding states, and thicknesses of thin (<10nm) film stacks. The primary application is monitoring of the transistor gates in integrated circuits. Through XRS we have also gained expertise in charged particle optics technologies

- X-ray Fluorescence. We have added XRF capability to our Veraflex III XPS tool. The combination of XPS and XRF allows measurement of composition and thickness at greater depths than provided by XPS alone. Compared to conventional XRF systems, our vacuum-based XRF system offers superior detection of elements of low atomic number, and smaller measurement areas.

- Lab to Fab - Nova now has the experience, capability and know-how to transform traditional analytical laboratory instrumentation into high volume, high productivity production tools.

The measurement techniques used in our metrology products are unique and protected by a number of patents.

Throughout our history, we have been a technological leader in the integrated metrology field. We were the first to offer integrated metrology solutions for semiconductor manufacturers and are the only provider of integrated metrology solutions that can measure wafers in water, which allows for more efficient and close-to-the-process metrology.

Through the acquisition of ReVera, Nova has gained market leadership in x-ray technologies, and is the sole provider of XPS technology to semiconductor high volume manufacturing customers.

Products

Our product portfolio includes a complete set of in-situ, integrated and stand-alone metrology platforms suited for dimensional, films and material metrology measurements for process control across multiple semiconductor manufacturing process steps including lithography, Etch, CMP and deposition. Our solutions utilize optical spectral reflectometry and x-ray technologies combined with advanced software modeling and unique algorithmic capabilities and address a broad range of metrology requirements of our end-user and process equipment manufacturer customers. Nova's fleet management platform addresses the need for high efficiency and productivity in the most advanced production lines of our customers, manages large fleets of metrology tools, and is designed to address the needs and working methodologies of metrology and process engineers in the fab. As part of our holistic view of metrology that extends to use more channels and sources of information available for optimizing the metrology solution performance, we also provide the hybrid metrology solution that combines data from different toolsets in the fab such as CD-SEM and x-ray together with Nova's optical metrology to provide improved performance above that of any individual toolset. Following is a summary of our main products:

Thin Film and Optical CD Process Control

- The NovaScan 2040 is the second generation of integrated thickness monitoring systems with enhanced spectral range, responding to the needs of the industry for emerging chemical mechanical polishing high-end applications of thin films and complex layer stacks. The 2040 model was introduced to the market at the end of 2000, and since then has replaced the NovaScan 840 and accounted for the majority of our sales for 200 mm production lines.

- The NovaScan 3090Next is a legacy system still sold into 300mm fabs as the latest and best of the NovaScan line. Targeted for 45 nm and 32 nm technology nodes with extendibility down to 20nm, this tool was released in 2006 and provided significant improvements in throughput, accuracy, tool to tool matching and spectral range over the older NovaScan 3090. It also improved overall tool reliability. The NovaScan 3090Next is available as integrated metrology and as stand-alone metrology systems for both thin film and Optical CD (scatterometry) applications.

- The new generation Nova i500 and i500 Plus integrated metrology feature the same metrology as the Nova T500, for complete stand-alone to integrated metrology compatibility. The Nova i500 features advanced metrology for technology nodes smaller than 20nm with high throughput. The Nova i500 Plus provides further technology enhancement to address the need for increased sampling in advanced nodes and to support next generation high performance polishers and was qualified at multiple customers for the most advanced nodes metrology needs.

- The Nova T500 stand-alone product family, targeted at technology nodes ranging from 32nm and smaller than 20nm. The Nova T500 features improved metrology performance, improving both accuracy and tool to tool matching, providing industry leading throughput of 250WPH using dual metrology units.

- The Nova T600 is the latest addition to the stand-alone product family, targeted at technology nodes of 2x and beyond. The Nova T600 features multi-channel re