PUTNAM MANAGED MUNICIPAL INCOME TRUST
Form N-CSR
December 29, 2010

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM N-CSR

CERTIFIED SHAREHOLDER REPORT OF REGISTERED MANAGEMENT INVESTMENT COMPANIES

Investment Company Act file number: (811-05740)

Exact name of registrant as specified in charter: Putnam Managed Municipal Income Trust

Address of principal executive offices: One Post Office Square, Boston, Massachusetts 02109

Name and address of agent for service: Beth S. Mazor, Vice President
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Registrants telephone number, including area code: (617) 292-1000

Date of fiscal year end: October 31, 2010

Date of reporting period: November 1, 2009 - October 31, 2010

Item 1. Report to Stockholders:
The following is a copy of the report transmitted to stockholders pursuant to Rule 30e-1 under the Investment Company Act of 1940:

Putnam Managed Municipal Income Trust

Annual report 10|31|10

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Message from the Trustees

Dear Fellow Shareholder:

Stock markets around the world rallied strongly over the past few months, riding a rising tide of strengthening investor confidence and slowly improving economic and corporate data. Indeed, U.S. stocks delivered their best September in 71 years, and continued to add to those gains in October. Bond markets also have generated positive results for much of 2010 and continue to be a source of refuge for risk-averse investors.

It is important to recognize, however, that we may see periods of heightened market volatility as markets and economies seek more solid ground. The slow pace of the U.S. economic recovery and ongoing European sovereign debt concerns have made markets more susceptible to disappointing news. We believe, however, that Putnams research-intensive, actively managed investment approach is well suited for this environment.

In developments affecting oversight of your fund, Barbara M. Baumann has been elected to the Board of Trustees of the Putnam Funds, effective July 1, 2010. Ms. Baumann is president and owner of Cross Creek Energy Corporation of Denver, Colorado, a strategic consultant to domestic energy firms and direct investor in energy assets. We also want to thank Elizabeth T. Kennan, who has retired from the Board of Trustees, for her many years of dedicated and thoughtful leadership.

Lastly, we would like to take this opportunity to welcome new shareholders to the fund and to thank all of our investors for your continued confidence in Putnam.

About the fund

Potential for income exempt from federal income tax

Municipal bonds can help investors keep more of their investment income while also financing important public projects such as schools, roads, and hospitals. The bonds are typically issued by states and local municipalities to raise funds for building and maintaining public facilities, and they offer income that is generally exempt from federal, state, and local income tax.

Putnam Managed Municipal Income Trust has the flexibility to invest in municipal bonds issued by any state in the country. The bonds are backed by the issuing city or town or by revenues collected from usage fees, and have varying degrees of credit risk the risk that the issuer would not be able to repay the bond.

The fund also combines bonds of differing credit quality. In addition to investing in high-quality bonds, the funds managers allocate a portion of the portfolio to lower-rated bonds, which may offer higher income in return for more risk. When deciding whether to invest in a bond, the managers consider factors such as credit risk, interest-rate risk, and the risk that the bond will be prepaid.

The managers are backed by Putnams fixed-income organization, where municipal bond analysts are grouped into sector teams and conduct ongoing research. Once a bond has been purchased, the managers continue to monitor developments that affect the bond market, the sector, and the issuer of the bond.

The goal of this research and active management is to stay a step ahead of the industry and pinpoint opportunities for investors.

Consider these risks before investing: Lower-rated bonds may offer higher yields in return for more risk. Funds that invest in bonds are subject to certain risks including interest-rate risk, credit risk, and inflation risk. As interest rates rise, the prices of bonds fall. Long-term bonds are more exposed to interest-rate risk than short-term bonds.

Unlike bonds, bond funds have ongoing fees and expenses. The fund uses leverage, which involves risk and may increase the volatility of the fund's net asset value. The fund's shares trade on a stock exchange at market prices, which may be lower than the fund's net asset value.

How do closed-end funds differ from open-end funds?

More assets at work While open-end funds need to maintain a cash position to meet redemptions, closed-end funds are not subject to redemptions and can keep more of their assets invested in the market.

Traded like stocks Closed-end fund shares are traded on stock exchanges, and their market prices fluctuate in response to supply and demand, among other factors.

Net asset value vs. market price Like an open-end fund's net asset value (NAV) per share, the NAV of a closed-end fund share is equal to the current value of the fund's assets, minus its liabilities, divided by the number of shares outstanding. However, when buying or selling closed-end fund shares, the price you pay or receive is the market price. Market price reflects current market supply and demand and may be higher or lower than the NAV.

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Data is historical. Past performance does not guarantee future results. More recent returns may be less or more than those shown. Investment return and net asset value will fluctuate, and you may have a gain or a loss when you sell your shares. Performance assumes reinvestment of distributions and does not account for taxes. Fund returns in the bar chart are at NAV. See pages 5 and 10–11 for additional performance information, including fund returns at market price. Index and Lipper results should be compared with fund performance at NAV. Lipper calculates performance differently than the closed-end funds it ranks, due to varying methods for determining a fund's monthly reinvestment NAV.

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Interview with your fund's portfolio manager

Paul Drury

How did the fund and the municipal bond market perform for the 12-month period, Paul?

For the fiscal year ended October 31, 2010, Putnam Managed Municipal Income Trust advanced 14.11% at net asset value, topping the 7.78% return for its benchmark, the Barclays Capital Municipal Bond Index. However, the fund's return trailed the 15.20% average return of its peers in the Lipper High Yield Municipal Debt Funds category [closed end].

What role did the fund's use of leverage play in the fund's performance?

Leverage generally involves borrowing funds and investing the proceeds with the expectation of producing a return that exceeds the cost of borrowing. Unlike open-end funds, closed-end funds are permitted to engage in investment leverage by issuing preferred shares. Your fund has used this form of investment leverage, which offers opportunities for increased investment yield, while also effectively amplifying the common shareholders’ exposure to the effects of both investment losses and investment gains. To the extent your fund can invest the assets attributable to leverage in securities with greater return than the cost of leverage, the use of leverage should benefit your fund’s common shareholders.

Due to Federal Reserve actions that have reduced short-term borrowing costs to historical lows, and due to generally favorable municipal bond market conditions over recent periods, preferred share leverage has been generally advantageous to your fund’s common shareholders over recent periods. We will continue to monitor the overall impact of preferred share leverage on your fund’s portfolio.

This comparison shows your fund’s performance in the context of broad market indexes for the 12 months ended 10/31/10. See pages 4 and 10–11 for additional fund performance information. Index descriptions can be found on page 12.

What was the market environment like during the year?

During the fund’s fiscal year, the financial markets experienced a broad-based recovery as investors began to reallocate money away from cash and other safe assets into longer-term and higher-risk investments. As the credit markets stabilized and risk tolerance increased, strong demand from yield-hungry investors pushed bond prices higher in the more credit-sensitive sectors of the municipal bond market.

By early 2010, however, the financial markets encountered new concerns — chief among them the growing European debt crisis and fears that it might derail the global economic recovery. Investors were also uncertain about the inevitable withdrawal of stimulus funds around the globe, and how this process would affect growth. Those concerns subsided somewhat by the summer, as the European debt markets stabilized and the Federal Reserve Board again suggested that its easing policies would continue for an extended period. On the whole, the third quarter of 2010 was fairly solid for municipal bonds after a choppy start to the calendar year.

What other factors influenced the municipal bond market during the period?

Build America Bonds — or “BABs” — continued to have a significant impact on the municipal bond market. The program began in early 2009 as part of the federal government’s stimulus package and allows states and municipalities to issue bonds in the taxable market, providing them with access to a wider range of investors. The federal government in turn subsidizes a portion of the interest payments, currently 35%. As of October 31, nearly $90 billion worth of BABs were issued in 2010.

Overall, the plan has been successful in lowering financing costs for states, and has also benefited municipal bond investors by

Credit qualities are shown as a percentage of portfolio value as of 10/31/10. A bond rated Baa or higher (MIG3/VMIG3 or higher, for short-term debt) is considered investment grade. The chart reflects Moody’s ratings; percentages may include bonds or derivatives not rated by Moody’s but rated by Standard & Poor’s or, if unrated by S&P, by Fitch, and then included in the closest equivalent Moody’s rating. Ratings will vary over time. Credit qualities are included for portfolio securities and are not included for derivative instruments and cash. The fund itself has not been rated by an independent rating agency.

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reducing the supply of tax-exempt bonds in the market, which has led to improved supply and demand dynamics. Congress is currently considering extending the program with a slightly lower subsidy, although, as of this writing, its unclear whether such an extension will be acted upon by the lame-duck Congress.

We also think that the health-care reform legislation should be a modest positive for the tax-exempt bond market, because it contains a 3.8% tax on capital gains, unearned interest, and dividends for individuals with income over $200,000 or households with income over $250,000. Municipal bond income would not be subject to the tax, and any tax increase improves the attractiveness of tax-exempt funds. Ultimately, we believe investors tax burden is likely to head higher, and that should make municipal bonds tax-exempt income even more attractive.

Turning back to the fund, which market segments drove performance during the 12-month period?

The biggest driver of performance was the funds position in BBB-rated securities. Early in 2009, municipal bonds across the board looked extremely undervalued by historical standards, with wider spreads occurring in the lower-rated segments of the market. We targeted those opportunities by increasing the funds exposure to BBB-rated securities throughout 2009 and continued to do so more selectively in 2010. This generally helped performance during the period. As the market recovered, the funds position in

Top ten state allocations are shown as a percentage of the funds portfolio value as of 10/31/10Investments in Puerto Rico represented 2.2% of net assets. Holdings will vary over time.

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tobacco bonds rallied sharply, placing them among the top contributors in 2009. In 2010, we began reducing our exposure to tobacco bonds for two reasons: first, to lock in their strong performance, and second, because we felt their fundamentals had become somewhat less attractive. That said, tobacco bond spreads which measure the sectors excess yield over similar U.S. Treasuries are currently wider than average, and we believe certain opportunities still exist within the sector.

The funds investments in California and Puerto Rico municipal bonds also helped fund performance, as those areas of the market performed well over the past 12 months. In general, however, weve been limiting the funds exposure to general obligation [G.O.] bonds, particularly those issued by local municipalities such as cities and counties, as negative headlines and potential downgrades by ratings agencies could put pressure on bond prices. Instead, weve been finding better opportunities in revenue bonds, which are secured by cash flows tied to specific projects. The health-care and utilities sectors are two areas of the market where we are overweight, and, in general, our positions helped performance over the period.

What is your outlook for the municipal bond market?

While we believe the U.S. economy will continue recovering, growth could remain muted for some time. The volatility that returned to stock and bond markets this spring, aggravated by growing concerns over sovereign debt problems in Europe, appears unlikely to dissipate soon in our view. U.S. unemployment remains persistently high, while consumer and business spending have been sporadic, which has diminished many states tax revenues. However, we believe the real risk for most municipal bonds is not default risk, but headline risk posed by the

This chart shows how the funds top weightings have changed over the past six months. Weightings are shown as a percentage of net assets. Summary information may differ from the portfolio schedule included in the financial statements due to the inclusion of derivative securities and the exclusion of as-of trades, if any, and the use of different classifications of securities for presentation purposes. Holdings will vary over time. Sector concentrations listed after the portfolio schedule in the Financial Statements section of this shareholder report are exclusive of insured status and any interest accruals and may differ from the summary information above.

Data in the chart reflect a new calculation methodology placed in effect within the past six months.

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ongoing media coverage of state budgetary woes. We believe the financial challenges faced by states like California are significant, but can be dealt with. Its important for investors to remember that most states pass a balanced budget every year, and although it took a record-setting time to do so, California recently resolved its budget impasse for the current fiscal year.

Overall, supply/demand technicals are supportive of the market, but over the near term, we believe the market will be tested by a likely increase in supply given uncertainty surrounding the BABs extension. We believe investment opportunities continue to exist in certain areas of the market, such as the BBB-rated segment, and, as always, we are monitoring the market closely, and will seek to take advantage of new opportunities as they develop.

Thank you, Paul, for your time and insights today.

The views expressed in this report are exclusively those of Putnam Management. They are not meant as investment advice.

Please note that the holdings discussed in this report may not have been held by the fund for the entire period. Portfolio composition is subject to review in accordance with the funds investment strategy and may vary in the future. Current and future portfolio holdings are subject to risk.

Of special interest

Effective February 2010, the fund increased its dividend per share from $0.0402 to $0.0440 due to an increase in income from the funds holdings.

Portfolio Manager **Paul Drury** is a Tax Exempt Specialist at Putnam. He has a B.A. from Suffolk University. A CFA charterholder, Paul has been in the investment industry since he joined Putnam in 1989.

In addition to Paul, your funds portfolio managers are Susan McCormack and Thalia Meehan. Brad Libby departed the funds portfolio management team in December 2009.

IN THE NEWS

The Federal Reserves QE2 has set sail. In light of what has been a tepid economic recovery, in October the Fed announced a second round of monetary stimulus via quantitative easing dubbed QE2 by the media involving the purchase of an additional $600 billion of U.S. Treasury bonds through the end of June 2011. The Fed has suggested in recent months that it is particularly concerned about the prospect of deflation, which has plagued the Japanese economy for the better part of the past decade. By purchasing Treasuries, the central bank could drive down already low yields by injecting about $75 billion a month into the capital markets. The idea behind QE2 is that the money would then be reinvested, and the expected upward pressure on asset prices could create inflationary expectations sufficient to prevent deflation from becoming a problem.

Your fund's performance

This section shows your fund's performance, price, and distribution information for periods ended October 31, 2010, the end of its most recent fiscal year. In accordance with regulatory requirements for mutual funds, we also include performance as of the most recent calendar quarter-end. Performance should always be considered in light of a fund's investment strategy. Data represents past performance. Past performance does not guarantee future results. More recent returns may be less or more than those shown. Investment return, net asset value, and market price will fluctuate, and you may have a gain or a loss when you sell your shares.

Fund performance Total return for periods ended 10/31/10

	NAV	Market price	Barclays Capital Municipal Bond Index	Lipper High Yield Municipal Debt Funds (closed-end) category average*
Annual average				
Life of fund (since 2/24/89)	6.53%	6.24%	6.59%	5.53%
10 years	74.40	55.14	72.25	73.47
Annual average	5.72	4.49	5.59	5.59
5 years	27.62	48.48	28.84	25.04
Annual average	5.00	8.23	5.20	4.52
3 years	16.80	32.68	18.39	11.68
Annual average	5.31	9.88	5.79	3.70
1 year	14.11	25.94	7.78	15.20

Performance assumes reinvestment of distributions and does not account for taxes.

Index and Lipper results should be compared to fund performance at net asset value. Lipper calculates performance differently than the closed-end funds it ranks, due to varying methods for determining a fund's monthly reinvestment NAV.

* Over the 1-year, 3-year, 5-year, 10-year, and life-of-fund periods ended 10/31/10, there were 15, 14, 14, 11, and 6 funds, respectively, in this Lipper category.

Fund price and distribution information For the 12-month period ended 10/31/10

Distributions	
Number	12
Income [1]	$0.5166
Capital gains [2]	—
Total	**$0.5166**

Distributions — Preferred shares*	**Series A (245 shares)**	**Series C (1,980 shares)**
Income [1]	$254.52	$124.74
Capital gains [2]	—	—
Total	**$254.52**	**$124.74**

Share value	**NAV**	**Market price**
10/31/09	$7.17	$6.59
10/31/10	7.62	7.73
Current yield (end of period)		
Current dividend rate [3]	6.93%	6.83%
Taxable equivalent [4]	10.66%	10.51%

The classification of distributions, if any, is an estimate. Final distribution information will appear on your year-end tax forms.

* For further information on the preferred shares outstanding during the period, please refer to Note 4: Preferred shares on page 46.

[1] For some investors, investment income may be subject to the federal alternative minimum tax. Income from federally exempt funds may be subject to state and local taxes.

[2] Capital gains, if any, are taxable for federal and, in most cases, state purposes.

[3] Most recent distribution, excluding capital gains, annualized and divided by NAV or market price at end of period.

[4] Assumes maximum 35% federal tax rate for 2010. Results for investors subject to lower tax rates would not be as advantageous.

Fund performance as of most recent calendar quarter

Total return for periods ended 9/30/10

	NAV	Market price
Annual average		
Life of fund (since 2/24/89)	6.53%	6.28%
10 years	75.03	65.32
Annual average	5.76	5.16
5 years	26.42	42.69
Annual average	4.80	7.37
3 years	16.68	32.08
Annual average	5.28	9.72
1 year	11.49	22.65

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Terms and definitions

Important terms

Total return shows how the value of the fund's shares changed over time, assuming you held the shares through the entire period and reinvested all distributions in the fund.

Net asset value (NAV) is the value of all your fund's assets, minus any liabilities and the net assets allocated to any outstanding preferred shares, divided by the number of outstanding common shares.

Market price is the current trading price of one share of the fund. Market prices are set by transactions between buyers and sellers on exchanges such as the New York Stock Exchange.

Current yield is the annual rate of return earned from dividends or interest of an investment. Current yield is expressed as a percentage of the price of a security, fund share, or principal investment.

Comparative indexes

Barclays Capital Aggregate Bond Index is an unmanaged index of U.S. investment-grade fixed-income securities.

Barclays Capital Municipal Bond Index is an unmanaged index of long-term fixed-rate investment-grade tax-exempt bonds.

BofA (Bank of America) Merrill Lynch U.S. 3-Month Treasury Bill Index is an unmanaged index that seeks to measure the performance of U.S. Treasury bills available in the marketplace.

S&P 500 Index is an unmanaged index of common stock performance.

Indexes assume reinvestment of all distributions and do not account for fees. Securities and performance of a fund and an index will differ. You cannot invest directly in an index.

Lipper is a third-party industry-ranking entity that ranks mutual funds. Its rankings do not reflect sales charges. Lipper rankings are based on total return at net asset value relative to other funds that have similar current investment styles or objectives as determined by Lipper. Lipper may change a fund's category assignment at its discretion. Lipper category averages reflect performance trends for funds within a category.

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Trustee approval of management contract

General conclusions

The Board of Trustees of the Putnam funds oversees the management of each fund and, as required by law, determines annually whether to approve the continuance of your fund's management contract with Putnam Investment Management ("Putnam Management") and the sub-management contract with respect to your fund between Putnam Management and its affiliate, Putnam Investments Limited ("PIL").

In this regard, the Board of Trustees, with the assistance of its Contract Committee consisting solely of Trustees who are not "interested persons" (as this term is defined in the Investment Company Act of 1940, as amended) of the Putnam funds (the "Independent Trustees"), requests and evaluates all information it deems reasonably necessary under the circumstances. Over the course of several months ending in June 2010, the Contract Committee met on a number of occasions with representatives of Putnam Management and in executive session to consider the information provided by Putnam Management and other information developed with the assistance of the Board's independent counsel and independent staff. The Contract Committee reviewed and discussed key aspects of this information with all of the Independent Trustees. At the Trustees' June 11, 2010 meeting, the Contract Committee recommended, and the Independent Trustees approved, the continuance of your fund's management and sub-management contracts, effective July 1, 2010. (Because PIL is an affiliate of Putnam Management and Putnam Management remains fully responsible for all services provided by PIL, the Trustees have not evaluated PIL as a separate entity, and all subsequent references to Putnam Management below should be deemed to include reference to PIL as necessary or appropriate in the context.)

The Independent Trustees' approval was based on the following conclusions:

- That the fee schedule in effect for your fund represented reasonable compensation in light of the nature and quality of the services being provided to the fund, the fees paid by competitive funds, and the costs incurred by Putnam Management in providing such services, and

- That the fee schedule represented an appropriate sharing between fund shareholders and Putnam Management of such economies of scale as may exist in the management of the fund at current asset levels.

These conclusions were based on a comprehensive consideration of all information provided to the Trustees and were not the result of any single factor. Some of the factors that figured particularly in the Trustees' deliberations and how the Trustees considered these factors are described below, although individual Trustees may have evaluated the information presented differently, giving different weights to various factors. It is also important to recognize that the fee arrangements for your fund and the other Putnam funds are the result of many years of

review and discussion between the Independent Trustees and Putnam Management, that certain aspects of the arrangements may receive greater scrutiny in some years than others, and that the Trustees conclusions may be based, in part, on their consideration of fee arrangements in prior years.

Management fee schedules and categories; total expenses

The Trustees reviewed the management fee schedules in effect for all Putnam funds, including fee levels and breakpoints. In reviewing management fees, the Trustees generally focus their attention on material changes in circumstances for example,

changes in assets under management or investment style, changes in Putnam Managements operating costs, or changes in competitive practices in the mutual fund industry that suggest that consideration of fee changes might be warranted. The Trustees concluded that the circumstances did not warrant changes to the management fee structure of your fund.

The Trustees reviewed comparative fee and expense information for a custom group of competitive funds selected by Lipper Inc. This comparative information included your funds percentile ranking for effective management fees and total expenses, which provides a general indication of your funds relative standing. In the custom peer group, your fund ranked in the 1st quintile in effective management fees (determined for your fund and the other funds in the custom peer group based on fund asset size and the applicable contractual management fee schedule) and in the 1st quintile in total expenses as of December 31, 2009 (the first quintile representing the least expensive funds and the fifth quintile the most expensive funds).

Your fund currently has the benefit of breakpoints in its management fee that provide shareholders with significant economies of scale in the form of reduced fee levels as the funds assets under management increase. In recent years, the Trustees have examined the operation of the existing breakpoint structure during periods of both growth and decline in asset levels. The Trustees concluded that the fee schedule in effect for your fund represented an appropriate sharing of economies of scale at that time.

In connection with their review of the management fees and total expenses of the Putnam funds, the Trustees also reviewed the costs of the services provided and the profits realized by Putnam Management and its affiliates from their contractual relationships with the funds. This information included trends in revenues, expenses and profitability of Putnam Management and its affiliates relating to the investment management, investor servicing and distribution services provided to the funds. In this regard, the Trustees also reviewed an analysis of Putnam Managements revenues, expenses and profitability, allocated on a fund-by-fund basis, with respect to the funds management, distribution, and investor servicing contracts. For each fund, the analysis presented information about revenues, expenses and profitability for each of the agreements separately and for the agreements taken together on a combined basis. The Trustees concluded that, at current asset levels, the fee schedules currently in place represented an appropriate sharing of economies of scale at that time.

The information examined by the Trustees as part of their annual contract review for the Putnam funds has included for many years information regarding fees charged by Putnam Management and its affiliates to institutional clients such as defined benefit pension plans, college endowments, and the like. This information included comparisons of such fees with fees charged to the funds, as well as an assessment of the differences in the services provided to these two types of clients. The Trustees observed, in this regard, that the differences in fee rates between institutional clients and mutual funds are by no means uniform when examined by individual asset sectors, suggesting that differences in the pricing of investment management services to these types of clients may reflect historical competitive forces operating in separate market places. The Trustees considered the fact that fee rates across different asset classes are typically higher on average for mutual funds than for institutional clients, as well as the differences between the services that Putnam Management provides to the Putnam funds and those that it provides to its institutional clients, and did not rely on these comparisons

to any significant extent in concluding that the management fees paid by your fund are reasonable.

Investment performance

The quality of the investment process provided by Putnam Management represented a major factor in the Trustees evaluation of the quality of services provided by Putnam Management under your fund s management contract. The Trustees were assisted in their review of the Putnam funds investment process and performance by the work of the Investment Oversight Coordinating Committee of the Trustees and the Investment Oversight Committees of the Trustees, which met on a regular basis with the funds portfolio teams throughout the year. The Trustees concluded that Putnam Management generally provides a high-quality investment process based on the experience and skills of the individuals assigned to the management of fund portfolios, the resources made available to them, and in general Putnam Management s ability to attract and retain high-quality personnel but also recognized that this does not guarantee favorable investment results for every fund in every time period. The Trustees considered the investment performance of each fund over multiple time periods and considered information comparing each fund s performance with various benchmarks and with the performance of competitive funds.

The Committee noted the substantial improvement in the performance of most Putnam funds during 2009. The Committee also noted the disappointing investment performance of a number of the funds for periods ended December 31, 2009 and considered information provided by Putnam Management regarding the factors contributing to the underperformance and actions being taken to improve performance. The Trustees indicated their intention to continue to monitor performance trends to assess the effectiveness of these efforts and to evaluate whether additional changes to address areas of underperformance are warranted.

In the case of your fund, the Trustees considered that your fund s common share cumulative total return performance at net asset value was in the following quartiles of its Lipper Inc. peer group (Lipper High Yield Municipal Debt Funds) for the one-year, three-year and five-year periods ended December 31, 2009 (the first quartile representing the best-performing funds and the fourth quartile the worst-performing funds):

One-year period	3rd
Three-year period	2nd
Five-year period	3rd

Over the one-year, three-year and five-year periods ended December 31, 2009, there were 15, 14 and 14 funds, respectively, in your fund s Lipper peer group. (When considering performance information, shareholders should be mindful that past performance is not a guarantee of future results.)

Brokerage and soft-dollar allocations; investor servicing

The Trustees considered various potential benefits that Putnam Management may receive in connection with the services it provides under the management contract with your fund. These include benefits related to brokerage and soft-dollar allocations, whereby a portion of the commissions paid by a fund for brokerage may be used to acquire research services that are expected to be useful to Putnam Management in managing the assets of the fund and of other clients. The Trustees considered a change made, at Putnam Management s request, to the Putnam funds brokerage allocation policies commencing in 2010, which increased the permitted soft dollar allocation to third-party services over what had been authorized in previous years. The Trustees

noted that a portion of available soft dollars continues to be allocated to the payment of fund expenses. The Trustees indicated their continued intent to monitor regulatory developments in this area with the assistance of their Brokerage Committee and also indicated their continued intent to monitor the potential benefits associated with fund brokerage and soft-dollar allocations and trends in industry practices to ensure that the principle of seeking best price and execution remains paramount in the portfolio trading process.

Putnam Management may also receive benefits from payments that the funds make to Putnam Managements affiliates for investor services. In conjunction with the annual review of your funds management contract, the Trustees reviewed your funds investor servicing agreement with Putnam Fiduciary Trust Company (PFTC), an affiliate of Putnam Management. The Trustees concluded that the fees payable by the funds to PFTC for such services are reasonable in relation to the nature and quality of such services.

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Other information for shareholders

Important notice regarding share repurchase program

In September 2010, the Trustees of your fund approved the renewal of a share repurchase program that had been in effect since 2005. This renewal will allow your fund to repurchase, in the 12 months beginning October 8, 2010, up to 10% of the funds common shares outstanding as of October 7, 2010.

Important notice regarding Putnams privacy policy

In order to conduct business with our shareholders, we must obtain certain personal information such as account holders names, addresses, Social Security numbers, and dates of birth. Using this information, we are able to maintain accurate records of accounts and transactions.

It is our policy to protect the confidentiality of our shareholder information, whether or not a shareholder currently owns shares of our funds. In particular, it is our policy not to sell information about you or your accounts to outside marketing firms. We have safeguards in place designed to prevent unauthorized access to our computer systems and procedures to protect personal information from unauthorized use.

Under certain circumstances, we must share account information with outside vendors who provide services to us, such as mailings and proxy solicitations. In these cases, the service providers enter into confidentiality agreements with us, and we provide only the information necessary to process transactions and perform other services related to your account. Finally, it is our policy to share account information with your financial representative, if youve listed one on your Putnam account.

Proxy voting

Putnam is committed to managing our mutual funds in the best interests of our shareholders. The Putnam funds proxy voting guidelines and procedures, as well as information regarding how your fund voted proxies relating to portfolio securities during the 12-month period ended June 30, 2010, are available in the Individual Investors section at putnam.com, and on the SECs Web site, www.sec.gov. If you have questions about finding forms on the SECs Web site, you may call the SEC at 1-800-SEC-0330. You may also obtain the Putnam funds proxy voting guidelines and procedures at no charge by calling Putnams Shareholder Services at 1-800-225-1581.

Fund portfolio holdings

The fund will file a complete schedule of its portfolio holdings with the SEC for the first and third quarters of each fiscal year on Form N-Q. Shareholders may obtain the funds Forms N-Q on the SECs Web site at www.sec.gov. In addition, the funds Forms N-Q may be reviewed and copied at the SECs Public Reference Room in Washington, D.C. You may call the SEC at 1-800-SEC-0330 for information about the SECs Web site or the operation of the Public Reference Room.

Trustee and employee fund ownership

Putnam employees and members of the Board of Trustees place their faith, confidence, and, most importantly, investment dollars in Putnam mutual funds. As of October 31, 2010, Putnam employees had approximately $324,000,000 and the Trustees had approximately $68,000,000 invested in Putnam mutual funds. These amounts include investments by the Trustees and employees immediate family members as well as investments through retirement and deferred compensation plans.

Financial statements

These sections of the report, as well as the accompanying Notes, preceded by the Report of Independent Registered Public Accounting Firm, constitute the funds financial statements.

The funds portfolio lists all the funds investments and their values as of the last day of the reporting period. Holdings are organized by asset type and industry sector, country, or state to show areas of concentration and diversification.

Statement of assets and liabilities shows how the funds net assets and share price are determined. All investment and non-investment assets are added together. Any unpaid expenses and other liabilities are subtracted from this total. The result is divided by the number of shares to determine the net asset value per share. (For funds with preferred shares, the amount subtracted from total assets includes the liquidation preference of preferred shares.)

Statement of operations shows the funds net investment gain or loss. This is done by first adding up all the funds earnings from dividends and interest income and subtracting its operating expenses to determine net investment income (or loss). Then, any net gain or loss the fund realized on the sales of its holdings as well as any unrealized gains or losses over the period is added to or subtracted from the net investment result to determine the funds net gain or loss for the fiscal year.

Statement of changes in net assets shows how the funds net assets were affected by the funds net investment gain or loss, by distributions to shareholders, and by changes in the number of the funds shares. It lists distributions and their sources (net investment income or realized capital gains) over the current reporting period and the most recent fiscal year-end. The distributions listed here may not match the sources listed in the Statement of operations because the distributions are determined on a tax basis and may be paid in a different period from the one in which they were earned.

Financial highlights provide an overview of the funds investment results, per-share distributions, expense ratios, net investment income ratios, and portfolio turnover in one summary table, reflecting the five most recent reporting periods. In a semiannual report, the highlights table also includes the current reporting period.

Report of Independent Registered Public Accounting Firm

The Board of Trustees and Shareholders
Putnam Managed Municipal Income Trust:

We have audited the accompanying statement of assets and liabilities of Putnam Managed Municipal Income Trust (the fund), including the funds portfolio, as of October 31, 2010 and the related statement of operations for the year then ended, the statements of changes in net assets for each of the two years in the period then ended and

the financial highlights for each of the five years in the period then ended. These financial statements and financial highlights are the responsibility of the fund's management. Our responsibility is to express an opinion on these financial statements and financial highlights based on our audits.

We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform our audit to obtain reasonable assurance about whether the financial statements and financial highlights are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. Our procedures included confirmation of securities owned as of October 31, 2010 by correspondence with the custodian and brokers or by other appropriate auditing procedures. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements and financial highlights referred to above present fairly, in all material respects, the financial position of Putnam Managed Municipal Income Trust as of October 31, 2010, the results of its operations for the year then ended, the changes in its net assets for each of the two years in the period then ended, and the financial highlights for each of the five years in the period then ended, in conformity with U.S. generally accepted accounting principles.

Boston, Massachusetts
December 17, 2010

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The fund's portfolio 10/31/10

Key to holding's abbreviations

AGM Assured Guaranty Municipal Corporation
AMBAC AMBAC Indemnity Corporation
COP Certificates of Participation
FGIC Financial Guaranty Insurance Company
FNMA Coll. Federal National Mortgage Association Collateralized
FRB Floating Rate Bonds
FRN Floating Rate Notes
G.O. Bonds General Obligation Bonds
GNMA Coll. Government National Mortgage Association Collateralized
NATL National Public Finance Guarantee Corp.
Radian Insd. Radian Group Insured
U.S. Govt. Coll. U.S. Government Collateralized
VRDN Variable Rate Demand Notes

MUNICIPAL BONDS AND NOTES (127.6%)*	Rating**	Principal amount	Value
Alabama (1.9%)			
Butler, Indl. Dev. Board Solid Waste Disp. Rev. Bonds			
(GA. Pacific Corp.), 5 3/4s, 9/1/28	BBB	$1,500,000	$1,455,945
Courtland, Indl. Dev. Board Env. Impt. Rev. Bonds			

(Intl. Paper Co.), Ser. A, 5s, 11/1/13	BBB	1,500,000	1,618,800
Cullman Cnty., Hlth. Care Auth. Rev. Bonds			
(Cullman Regl. Med. Ctr.), Ser. A, 6 3/4s, 2/1/29	Baa3	3,000,000	3,166,230
Selma, Indl. Dev. Board Rev. Bonds (Gulf			
Opportunity Zone Intl. Paper Co.), Ser. A,			
6 1/4s, 11/1/33	BBB	1,000,000	1,079,140
Sylacauga, Hlth. Care Auth. Rev. Bonds (Coosa			
Valley Med. Ctr.), Ser. A			
6s, 8/1/35	B/P	250,000	219,438
6s, 8/1/25	B/P	650,000	602,550
			8,142,103
Arizona (5.1%)			
Apache Cnty., Indl. Dev. Auth. Poll. Control Rev.			
Bonds (Tucson Elec. Pwr. Co.)			
Ser. B, 5 7/8s, 3/1/33	Baa3	1,000,000	1,003,890
Ser. A, 5.85s, 3/1/28	Baa3	250,000	250,775
AZ Hlth. Fac. Auth. Hosp. Syst. Rev. Bonds			
(John C. Lincoln Hlth. Network), 6 3/8s, 12/1/37			
(Prerefunded 12/1/12)	BBB	1,500,000	1,687,050
Calhoun Cnty., Sales & Use Tax Rev. Bonds			
(Georgia-Pacific Corp.), 6 3/8s, 11/1/26	Ba3	830,000	834,997
Casa Grande, Indl. Dev. Auth. Rev. Bonds (Casa			
Grande Regl. Med. Ctr.), Ser. A			
7 5/8s, 12/1/29	B+/P	1,800,000	1,824,804
7 1/4s, 12/1/19	B+/P	1,000,000	1,031,090
Cochise Cnty., Indl. Dev. Auth. Rev. Bonds			
(Sierra Vista Regl. Hlth. Ctr.), Ser. A, 6.2s, 12/1/21	BBB+/P	440,000	481,725
Coconino Cnty., Poll. Control Rev. Bonds			
(Tuscon/Navajo Elec. Pwr.), Ser. A,			
7 1/8s, 10/1/32	Baa3	3,750,000	3,765,038
(Tucson Elec. Pwr. Co. □ Navajo), Ser. A,			
5 1/8s, 10/1/32	Baa3	2,000,000	2,002,040

Maricopa Cnty., Poll. Control Rev. Bonds (El Paso Elec. Co.), Ser. A, 7 1/4s, 2/1/40	Baa2	2,200,000	2,564,848

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	Rating**	Principal amount	Value
Arizona *cont.*			
Navajo Cnty., Poll. Control Corp. Mandatory Put Bonds (6/1/16), Ser. E, 5 3/4s, 6/1/34	Baa2	$1,950,000	$2,158,026
Phoenix, Indl. Dev. Auth. Ed. Rev. Bonds (Career Success Schools), 7 1/8s, 1/1/45	BBB–	500,000	510,880
Pima Cnty., Indl. Dev. Auth. Rev. Bonds			
(Tucson Elec. Pwr.), Ser. A, 6 3/8s, 9/1/29	Baa3	500,000	518,555
(Horizon Cmnty. Learning Ctr.), 5.05s, 6/1/25	BBB	1,140,000	1,033,627
Salt Verde, Fin. Corp. Gas Rev. Bonds, 5 1/2s, 12/1/29	A	2,000,000	2,089,280
Tempe, Indl. Dev. Auth. Sr. Living Rev. Bonds (Friendship Village), Ser. A, 5 3/8s, 12/1/13	BB–/P	393,000	389,604
			22,146,229
Arkansas (0.2%)			
Arkadelphia, Pub. Ed. Fac. Board Rev. Bonds (Ouachita Baptist U.), 6s, 3/1/33	BBB–/P	840,000	870,097
			870,097
California (10.3%)			
CA Hlth. Fac. Fin. Auth. Rev. Bonds, AMBAC, 5.293s, 7/1/17	A2	3,400,000	3,407,241
CA Muni. Fin. Auth. COP (Cmnty. Hosp. Central CA), 5 1/4s, 2/1/37	Baa2	1,105,000	1,063,795

CA Poll. Control Fin. Auth. Rev. Bonds (Pacific Gas &			
Electric Corp.), Class D, FGIC, 4 3/4s, 12/1/23	A3	2,500,000	2,512,525
CA Poll. Control Fin. Auth. Solid Waste Disp. FRB			
(Waste Management, Inc.), Ser. C, 5 1/8s, 11/1/23	BBB	2,150,000	2,228,668
CA Poll. Control Fin. Auth. Solid Waste Disp. Rev.			
Bonds (Waste Management, Inc.), Ser. A-2,			
5.4s, 4/1/25	BBB	1,760,000	1,820,738
CA State G.O. Bonds, 6 1/2s, 4/1/33	A1	5,000,000	5,850,100
CA State Pub. Wks. Board Rev. Bonds, Ser. I-1,			
6 5/8s, 11/1/34	A2	5,595,000	6,170,445
CA Statewide Cmnty. Dev. Auth. COP (The Internext			
Group), 5 3/8s, 4/1/30	BBB	3,950,000	3,849,946
CA Statewide Cmnty. Dev. Auth. Rev. Bonds			
(Thomas Jefferson School of Law), Ser. A,			
7 1/4s, 10/1/38	BB+	560,000	603,512
(American Baptist Homes West), 5 3/4s, 10/1/25	BBB–	3,000,000	3,090,450
Cathedral City, Impt. Board Act of 1915 Special			
Assmt. Bonds (Cove Impt. Dist.), Ser. 04-02			
5.05s, 9/2/35	BBB–/P	1,015,000	877,173
5s, 9/2/30	BBB–/P	245,000	222,600
Chula Vista, Cmnty. Fac. Dist. Special Tax Rev. Bonds			
(No. 06-1 Eastlake Woods Area), 6.1s, 9/1/21	BBB/P	1,000,000	1,030,650
(No. 07-1 Otay Ranch Village Eleven), 5.8s, 9/1/28	BB+/P	290,000	290,365
Foothill/Eastern Corridor Agcy. Rev. Bonds			
(Toll Road), 5.85s, 1/15/23	Baa3	500,000	513,965
(CA Toll Roads), 5 3/4s, 1/15/40	Baa3	2,745,000	2,714,091
M-S-R Energy Auth. Rev. Bonds, Ser. A,			
6 1/2s, 11/1/39	A	750,000	881,295

Orange Cnty., Cmnty. Fac. Dist. Special Tax Rev. Bonds (Ladera Ranch No. 02-1), Ser. A, 5.55s, 8/15/33	BBB–/P	900,000	874,989

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
California *cont.*			
Poway, Unified School Dist. Cmnty. Facs. Special Tax Bonds (Dist. No. 14- Area A), 5 1/8s, 9/1/26	B+/P	$850,000	$797,725
Sacramento, Special Tax (North Natomas Cmnty. Fac.), Ser. 4-C, 6s, 9/1/33	BBB–/P	1,245,000	1,238,750
San Francisco, City & Cnty. Redev. Fin. Auth. Tax Alloc. Bonds (Mission Bay South), Ser. D, 6 5/8s, 8/1/39	BBB	250,000	268,213
Santaluz, Cmnty. Facs. Dist. No. 2 Special Tax Rev. Bonds (Impt. Area No. 1), Ser. B, 6 3/8s, 9/1/30	BBB/P	2,810,000	2,815,254
Sunnyvale, Special Tax Rev. Bonds (Cmnty. Fac. Dist. No. 1), 7 3/4s, 8/1/32	B+/P	835,000	840,411
Thousand Oaks, Cmnty. Fac. Dist. Special Tax Rev. Bonds (Marketplace 94-1), zero %, 9/1/14	B+/P	1,720,000	1,278,304
			45,241,205
Colorado (2.1%)			
CO Hlth. Fac. Auth. Rev. Bonds			
(Christian Living Cmntys.), Ser. A, 5 3/4s, 1/1/26	BB–/P	425,000	410,788
(Christian Living Cmntys.), Ser. A, 8 1/4s, 1/1/24	BB–/P	375,000	402,589
(Evangelical Lutheran), Ser. A, 6 1/8s, 6/1/38	A3	2,045,000	2,108,620
(Total Longterm Care National), Ser. A, 6 1/4s, 11/15/40	BBB–/F	300,000	308,772
(Valley View Assn.), 5 1/4s, 5/15/42	BBB	3,495,000	3,385,081

CO Pub. Hwy. Auth. Rev. Bonds			
(E-470 Pub. Hwy.), Ser. C1, NATL, 5 1/2s, 9/1/24	A	1,000,000	1,018,560
(E-470 Pub. Hwy.), Ser. C, 5 3/8s, 9/1/36	Baa2	500,000	505,095
Denver, City & Cnty. Special Fac. Arpt. Rev. Bonds			
(United Airlines), Ser. A, 5 1/4s, 10/1/32	B	325,000	290,752
Regl. Trans. Dist. Rev. Bonds (Denver Trans. Partners),			
6s, 1/15/41	Baa3	750,000	788,190
			9,218,447
Connecticut (0.4%)			
CT State Dev. Auth. 1st. Mtg. Gross Rev. Hlth. Care			
Rev. Bonds (Elim Street Park Baptist, Inc.),			
5.85s, 12/1/33	BBB+	650,000	633,906
Hamden, Fac. Rev. Bonds (Whitney Ctr.), Ser. A,			
7 3/4s, 1/1/43	BB/P	1,050,000	1,125,800
			1,759,706
Delaware (0.8%)			
DE St. Econ. Dev. Auth. Rev. Bonds			
(Delmarva Pwr.), 5.4s, 2/1/31	BBB+	500,000	526,275
(Indian River Pwr.), 5 3/8s, 10/1/45	Baa3	2,600,000	2,604,810
Sussex Cnty., Rev. Bonds (First Mtge. Cadbury			
Lewes), Ser. A, 5.9s, 1/1/26	B/P	500,000	444,780
			3,575,865
District of Columbia (0.5%)			
DC Tobacco Settlement Fin. Corp. Rev. Bonds, Ser. A,			
zero %, 6/15/46	BB/F	17,500,000	661,675
Metro. Washington, Arpt. Auth. Dulles Toll Rd. Rev.			
Bonds (2nd Sr. Lien), Ser. B, zero %, 10/1/40	Baa1	10,000,000	1,568,600
			2,230,275

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
Florida (7.0%)			
Double Branch Cmnty. Dev. Dist. Rev. Bonds, Ser. A, 6.7s, 5/1/34	A-	$930,000	$962,485
Escambia Cnty., Env. Impt. Rev. Bonds (Intl. Paper Co.), Ser. A, 5s, 8/1/26	BBB	2,000,000	1,967,740
Fishhawk, Cmnty. Dev. Dist. II Rev. Bonds			
Ser. A, 6 1/8s, 5/1/34	B-/P	445,000	447,563
Ser. B, 5 1/8s, 11/1/14	B-/P	35,000	34,726
FL Hsg. Fin. Corp. Rev. Bonds, Ser. G, 5 3/4s, 1/1/37	Aa1	1,035,000	1,097,411
Halifax, Hosp. Med. Ctr. Rev. Bonds, Ser. A, 5 3/8s, 6/1/46	A-	4,380,000	4,385,036
Heritage Harbour Marketplace Cmnty., Dev. Dist. Special Assmt. Bonds, 5.6s, 5/1/36	B/P	375,000	306,514
Heritage Harbour, South Cmnty. Dev. Distr. Rev. Bonds, Ser. A, 6 1/2s, 5/1/34	BB+/P	460,000	474,738
Hillsborough Cnty., Indl. Dev. Auth. Poll. Control Mandatory Put Bonds (9/1/13) (Tampa Elec. Co.), Ser. B, 5.15s, 9/1/25	Baa1	400,000	436,772
Jacksonville, Econ. Dev. Comm. Hlth. Care Fac. Rev. Bonds (Proton Therapy Inst.), Class A, 6s, 9/1/17	B/P	450,000	477,860
Jacksonville, Econ. Dev. Comm. Indl. Dev. Rev. Bonds (Gerdau Ameristeel US, Inc.), 5.3s, 5/1/37	BBB-	2,450,000	2,173,591
Lakeland, Retirement Cmnty. Rev. Bonds (1st Mtge. – Carpenters), 6 3/8s, 1/1/43	BBB-/F	840,000	806,182

Lee Cnty., Indl. Dev. Auth. Hlth. Care Fac. Rev. Bonds			
(Cypress Cove Hlth. Pk.), Ser. A, 6 3/8s, 10/1/25	BB/P	1,100,000	915,728
(Shell Pt./Alliance Oblig. Group), 5 1/8s, 11/15/36	BB	1,075,000	927,843
(Shell Pt./Alliance Cmnty.), 5s, 11/15/22	BB	1,500,000	1,424,460
Main St. Cmnty., Dev. Dist. Special Assmt. Bonds,			
Ser. A, 6.8s, 5/1/38	BB/P	245,000	209,164
Miami Beach, Hlth. Fac. Auth. Hosp. Rev. Bonds			
(Mount Sinai Med. Ctr.), Ser. A			
6.8s, 11/15/31	Ba1	500,000	507,440
6.7s, 11/15/19	Ba1	1,335,000	1,371,045
Palm Coast Pk. Cmnty. Dev. Dist. Special Assmt.			
Bonds, 5.7s, 5/1/37	B+/P	960,000	578,304
Reunion West, Cmnty. Dev. Dist. Special Assmt.			
Bonds, 1.919s, 5/1/36 (In default)	D/P	1,670,000	912,238
Six Mile Creek, Cmnty. Dev. Dist. Rev. Bonds,			
5.65s, 5/1/22	CCC/P	1,240,000	403,000
South Lake Hosp. Dist. (South Lake Hosp.), Ser. A,			
6s, 4/1/29	Baa2	1,000,000	1,052,500
South Miami, Hlth. Fac. Auth. Rev. Bonds (Baptist			
Hlth.), 5 1/4s, 11/15/33 (Prerefunded 2/1/13)	Aaa	1,500,000	1,652,775
South Village, Cmnty. Dev. Dist. Rev. Bonds, Ser. A,			
5.7s, 5/1/35	B/P	940,000	706,175
Tampa Bay, Cmnty. Dev. Dist. Special Assmt. Bonds			
(New Port), Ser. A, 5 7/8s, 5/1/38 (In default)	D/P	655,000	209,600
Tolomato, Cmnty. Dev. Dist. Special Assmt. Bonds			
(Split Pine Cmnty. Dev. Dist.), Ser. A, 5 1/4s, 5/1/39	B/P	1,825,000	1,242,278
6.55s, 5/1/27	B/P	700,000	527,156
5.4s, 5/1/37	BB/P	1,415,000	1,138,070

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
Florida *cont.*			
Verandah, West Cmnty. Dev. Dist. Rev. Bonds (Cap. Impt.), Ser. A, 6 5/8s, 5/1/33	BB/P	$455,000	$455,905
Verano Ctr. Cmnty. Dev. Dist. Special Assmt. Bonds (Cmnty. Infrastructure)			
Ser. A, 5 3/8s, 5/1/37	B/P	1,000,000	632,770
Ser. B, 5s, 11/1/13	B/P	605,000	452,685
Village Cmnty. Dev. Dist. No. 8 Special Assmt. Bonds (Dist. No. 8 Phase II), 6 1/8s, 5/1/39	BB/P	500,000	515,045
Wentworth Estates, Cmnty. Dev. Dist. Special Assmt. Bonds, Ser. A, 5 5/8s, 5/1/37 (In default)	D/P	970,000	363,750
World Commerce Cmnty. Dev. Dist. Special Assmt., Ser. A-1			
6 1/2s, 5/1/36 (In default)	D/P	1,250,000	422,738
6 1/4s, 5/1/22 (In default)	D/P	695,000	244,661
			30,435,948
Georgia (2.8%)			
Atlanta, Wtr. & Waste Wtr. Rev. Bonds, Ser. A, 6 1/4s, 11/1/39	A1	2,500,000	2,832,550
Clayton Cnty., Dev. Auth. Special Fac. Rev. Bonds (Delta Airlines), Ser. A, 8 3/4s, 6/1/29	CCC+	2,000,000	2,316,960
Forsyth Cnty., Hosp. Auth. Rev. Bonds (Baptist Hlth. Care Syst.), U.S. Govt. Coll., 6 1/4s, 10/1/18 (Escrowed to maturity)	AAA	1,690,000	1,982,319
Fulton Cnty., Res. Care Fac. Rev. Bonds			
(Canterbury Court), Class A, 6 1/8s, 2/15/34	BB/P	600,000	561,540
(First Mtge. Lenbrook), Ser. A, 5s, 7/1/17	B/P	1,370,000	1,260,893

Gainesville & Hall Cnty., Devauth Retirement Cmnty.			
Rev. Bonds (Acts Retirement-Life Cmnty.), Ser. A-2,			
6 3/8s, 11/15/29	BBB+	700,000	737,226
Marietta, Dev. Auth. Rev. Bonds (U. Fac. Life U., Inc.),			
Ser. PJ, 6 1/4s, 6/15/20	Ba3	1,315,000	1,300,877
Med. Ctr. Hosp. Auth. Rev. Bonds (Spring Harbor			
Green Island), 5 1/4s, 7/1/27	B+/P	575,000	513,211
Rockdale Cnty., Dev. Auth. Rev. Bonds (Visy Paper),			
Ser. A, 6 1/8s, 1/1/34	B+/P	600,000	604,986
			12,110,562
Hawaii (0.8%)			
HI Dept. of Trans. Special Fac. Rev. Bonds			
(Continental Airlines, Inc.), 7s, 6/1/20	B	1,315,000	1,315,039
HI State Dept. Budget & Fin. Rev. Bonds			
(Craigside), Ser. A, 9s, 11/15/44	B/P	400,000	463,644
(Hawaiian Elec. Co. Subsidiary), 6 1/2s, 7/1/39	Baa1	1,500,000	1,678,845
			3,457,528
Illinois (2.9%)			
Du Page Cnty., Special Svc. Area No. 31 Special Tax			
Bonds (Monarch Landing)			
5 5/8s, 3/1/36	CCC/P	350,000	284,774
5.4s, 3/1/16	CCC/P	196,000	190,773
IL Fin. Auth. Rev. Bonds			
(American Wtr. Cap. Corp.), 5 1/4s, 10/1/39	BBB+	1,575,000	1,624,676
(IL Rush U. Med Ctr.), Ser. C, 6 5/8s, 11/1/39	A3	1,075,000	1,173,717

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	Rating**	Principal amount	Value

Illinois *cont.*			
IL Fin. Auth. Rev. Bonds			
(Landing At Plymouth Place), Ser. A, 5.35s,			
5/15/15	B+/P	$600,000	$591,702
(Landing At Plymouth Place), Ser. A, 6s, 5/15/25	B+/P	200,000	186,766
(Navistar Intl. Recvy. Zone), 6 1/2s, 10/15/40	BB	1,000,000	1,043,100
(Provena Hlth.), Ser. A, 7 3/4s, 8/15/34	Baa1	1,500,000	1,757,550
(Roosevelt U.), 6 1/4s, 4/1/29	Baa2	1,500,000	1,615,530
(Silver Cross Hosp. & Med. Ctr.), 7s, 8/15/44	BBB	2,000,000	2,246,540
(Three Crowns Pk. Plaza), Ser. A, 5 7/8s, 2/15/26	B+/P	1,000,000	1,002,370
IL Hlth. Fac. Auth. Rev. Bonds			
(Cmnty. Rehab. Providers Fac.), Ser. A,			
7 7/8s, 7/1/20	CCC/P	130,697	104,300
(St. Benedict), Ser. 03A-1, 6.9s, 11/15/33			
(In default)	D/P	500,000	150,000
(Elmhurst Memorial Hlth. Care), 5 5/8s, 1/1/28	Baa1	550,000	547,855
			12,519,653
Indiana (1.7%)			
Indianapolis, Arpt. Auth. Rev. Bonds (Federal			
Express Corp.), 5.1s, 1/15/17	Baa2	3,500,000	3,777,130
Jasper Cnty., Indl. Poll. Control Rev. Bonds			
AMBAC, 5.7s, 7/1/17	Baa2	1,125,000	1,251,090
NATL, 5.6s, 11/1/16	A	700,000	775,677
Ser. A, NATL, 5.6s, 11/1/16	A	500,000	554,025
Jasper Hosp. Auth. Rev. Bonds (Memorial Hosp.),			
5 1/2s, 11/1/32	A	500,000	501,400
St. Joseph Cnty., Econ. Dev. Rev. Bonds (Holy Cross			
Village Notre Dame), Ser. A, 5 3/4s, 5/15/15	B/P	455,000	467,936
			7,327,258
Iowa (2.7%)			
IA Fin. Auth. Hlth. Care Fac. Rev. Bonds			
(Care Initiatives)			
9 1/4s, 7/1/25 (Prerefunded 7/1/11)	AAA	4,180,000	4,506,249
Ser. A, 5 1/4s, 7/1/17	BB+	1,040,000	998,150
Ser. A, 5s, 7/1/19	BB+	2,750,000	2,532,915

Ser. A, 5 1/2s, 7/1/25	BB+	950,000	877,012
IA Fin. Auth. Retirement Cmnty. Rev. Bonds (Friendship Haven), Ser. A			
6 1/8s, 11/15/32	BB/P	750,000	748,628
6s, 11/15/24	BB/P	200,000	200,026
IA State Higher Ed. Loan Auth. Rev. Bonds, 5s, 10/1/22	BB/F	800,000	758,640
Tobacco Settlement Auth. of IA Rev. Bonds, Ser. C, 5 3/8s, 6/1/38	BBB	1,250,000	1,042,888
			11,664,508
Kansas (0.1%)			
Lenexa, Hlth. Care Fac. Rev. Bonds (LakeView Village), 7 1/8s, 5/15/29	BB+/P	500,000	529,260
			529,260
Kentucky (0.6%)			
KY Econ. Dev. Fin. Auth. Rev. Bonds (First Mtge.), Ser. IA, 8s, 1/1/29	B+/P	290,000	292,743
KY Econ. Dev. Fin. Auth. Hlth. Syst. Rev. Bonds (Norton Hlth. Care), Ser. A, 6 1/2s, 10/1/20	A–/F	1,040,000	1,052,969

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
Kentucky *cont.*			
Louisville/Jefferson Cnty., Metro. Govt. College Rev. Bonds (Bellarmine U.), Ser. A, 6s, 5/1/28	Baa2	$500,000	$530,610
Owen Cnty., Wtr. Wks. Syst. Rev. Bonds (American Wtr. Co.), Ser. A, 6 1/4s, 6/1/39	BBB+	700,000	770,651

			2,646,973
Louisiana (1.0%)			
Rapides, Fin. Auth. FRB (Cleco Pwr.), AMBAC,			
4.7s, 11/1/36	Baa2	750,000	684,915
Tobacco Settlement Fin. Corp. Rev. Bonds, Ser. 01-B,			
5 7/8s, 5/15/39	BBB	2,700,000	2,722,113
W. Feliciana Parish, Poll. Control Rev. Bonds			
(Gulf States Util. Co.), Ser. C, 7s, 11/1/15	Baa2	1,160,000	1,160,000
			4,567,028
Maine (0.6%)			
Rumford, Solid Waste Disp. Rev. Bonds (Boise			
Cascade Corp.), 6 7/8s, 10/1/26	B2	2,500,000	2,517,725
			2,517,725
Maryland (1.6%)			
Baltimore Cnty., Rev. Bonds (Oak Crest Village, Inc.			
Fac.), Ser. A, 5s, 1/1/37	BBB+	2,000,000	1,891,140
MD Econ. Dev. Corp. Poll. Control Rev. Bonds			
(Potomac Electric Power Co.), 6.2s, 9/1/22	A	550,000	652,509
MD State Hlth. & Higher Edl. Fac. Auth. Rev. Bonds			
(WA Cnty. Hosp.), 5 3/4s, 1/1/38	BBB□	450,000	461,363
(King Farm Presbyterian Cmnty.), Ser. A,			
5 1/4s, 1/1/27	B/P	710,000	596,876
MD State Indl. Dev. Fin. Auth. Rev. Bonds			
(Synagro-Baltimore), Ser. A, 5 3/8s, 12/1/14	BBB+/F	1,000,000	1,043,960
MD State Indl. Dev. Fin. Auth. Econ. Dev. Rev.			
Bonds (Our Lady of Good Counsel School), Ser. A,			
6s, 5/1/35	BB□/P	400,000	401,088
Westminster, Econ. Dev. Rev. Bonds (Carroll			
Lutheran Village), Ser. A			
6 1/4s, 5/1/34	BB/P	600,000	537,096
5 7/8s, 5/1/21	BB/P	1,600,000	1,509,680

			7,093,712
Massachusetts (8.3%)			
Boston, Indl. Dev. Fin. Auth. Rev. Bonds			
(Springhouse, Inc.), 6s, 7/1/28	BB/P	1,600,000	1,518,128
MA Dev. Fin. Agcy. Sr. Living Fac. Rev. Bonds,			
Ser. B1, 7 1/4s, 6/1/16	BB/P	2,000,000	2,009,000
MA Edl. Fin. Auth. Rev. Bonds, Ser. B, 5 1/2s, 1/1/23	AA	1,000,000	1,029,650
MA State Dev. Fin. Agcy. Rev. Bonds			
(Boston Biomedical Research), 5 3/4s, 2/1/29	Baa3	1,000,000	962,750
(First Mtge. Orchard Cove), 5s, 10/1/19	BB+/P	550,000	514,234
(Linden Ponds, Inc.), Ser. A, 5 3/4s, 11/15/42	BB/P	1,200,000	848,508
(Linden Ponds, Inc.), Ser. A, 5 1/2s, 11/15/22	BB/P	390,000	317,359
(Linden Ponds, Inc.), Ser. A, 5 3/4s, 11/15/35	BB/P	755,000	552,683
(Sabis Intl.), Ser. A, 8s, 4/15/39	BBB	690,000	784,461
(Wheelock College), Ser. C, 5 1/4s, 10/1/29	BBB	1,700,000	1,748,501
MA State Dev. Fin. Agcy. Hlth. Care Fac. Rev. Bonds			
(Adventcare), Ser. A, 6.65s, 10/15/28	B/P	1,050,000	971,429

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
Massachusetts *cont.*			
MA State Dev. Fin. Agcy. Solid Waste Disp.			
Mandatory Put Bonds (5/1/19) (Dominion Energy			
Brayton), Ser. 1, 5 3/4s, 12/1/42	A	$1,050,000	$1,145,676
MA State Hlth. & Edl. Fac. Auth. Rev. Bonds			
(Baystate Med. Ctr.), Ser. F, 5.7s, 7/1/27	A+	1,000,000	1,030,900
(Baystate Med. Ctr.), Ser. I, 5 3/4s, 7/1/36	A+	1,500,000	1,651,245
(Civic Investments/HPHC), Ser. A, 9s, 12/15/15			
(Prerefunded 12/15/12)	AAA/P	2,175,000	2,470,626
(Emerson Hosp.), Ser. E, Radian Insd., 5s, 8/15/25	BB/P	1,500,000	1,394,505

(Fisher College), Ser. A, 5 1/8s, 4/1/37	BBB-	250,000	222,388
(Jordan Hosp.), Ser. E, 6 3/4s, 10/1/33	BB-	2,550,000	2,566,473
(Milford Regl. Med.), Ser. E, 5s, 7/15/22	Baa3	2,200,000	2,171,092
(Norwood Hosp.), Ser. C, 7s, 7/1/14 (Escrowed to maturity)	BB/P	1,185,000	1,374,292
(Quincy Med. Ctr.), Ser. A, 6 1/4s, 1/15/28	BB-/P	1,700,000	1,612,416
(Springfield College), 5 1/2s, 10/15/31	Baa1	1,100,000	1,162,018
(UMass Memorial), Ser. C, 6 1/2s, 7/1/21	Baa1	3,450,000	3,512,066
(UMass Memorial), Ser. C, 6 5/8s, 7/1/32	Baa1	2,225,000	2,250,343
MA State Indl. Fin. Agcy. Rev. Bonds			
(1st Mtge. Stone Institute & Newton Home), 7.9s, 1/1/24	B-/P	750,000	749,265
(1st Mtge. Berkshire Retirement), Ser. A, 6 5/8s, 7/1/16	BBB	1,865,000	1,871,826
			36,441,834
Michigan (4.1%)			
Detroit, G.O. Bonds (Cap. Impt.), Ser. A-1, 5s, 4/1/15	BB	950,000	924,692
Detroit, Wtr. Supply Syst. Rev. Bonds, Ser. B, AGM, 6 1/4s, 7/1/36	AA+	1,660,000	1,811,591
Flint, Hosp. Bldg. Auth. Rev. Bonds (Hurley Med. Ctr.), 6s, 7/1/20	Ba1	1,120,000	1,127,538
Garden City, Hosp. Fin. Auth. Rev. Bonds (Garden City Hosp.), Ser. A, 5 3/4s, 9/1/17	Ba1	450,000	449,960
MI State Hosp. Fin. Auth. Rev. Bonds			
Ser. A, 6 1/8s, 6/1/39	A1	2,000,000	2,187,400
(Henry Ford Hlth.), 5 3/4s, 11/15/39	A1	1,600,000	1,680,400
(Henry Ford Hlth.), Ser. A, 5 1/4s, 11/15/46	A1	2,565,000	2,564,949
(Chelsea Cmnty. Hosp. Oblig.), 5s, 5/15/25 (Prerefunded 5/15/15)	AAA	755,000	877,589
MI State Strategic Fund, Ltd. Rev. Bonds (Worthington Armstrong Venture), U.S. Govt. Coll., 5 3/4s, 10/1/22 (Escrowed to maturity)	AAA/P	1,350,000	1,608,849

MI Tobacco Settlement Fin. Auth. Rev. Bonds, Ser. A, 6s, 6/1/48	BBB	4,000,000	3,200,480
Monroe Cnty., Hosp. Fin. Auth. Rev. Bonds (Mercy Memorial Hosp.), 5 1/2s, 6/1/20	Baa3	1,480,000	1,473,399
			17,906,847
Minnesota (2.2%)			
Douglas Cnty., Gross Hlth. Care Fac. Rev. Bonds (Douglas Cnty. Hosp.), Ser. A, 6 1/4s, 7/1/34	BBB-	3,000,000	3,204,510
Duluth, Econ. Dev. Auth. Hlth. Care Fac. Rev. Bonds (BSM Properties, Inc.), Ser. A, 5 7/8s, 12/1/28	B+/P	115,000	103,030

MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	**Rating****	**Principal amount**	**Value**
Minnesota *cont.*			
Inver Grove Heights, Nursing Home Rev. Bonds (Presbyterian Homes Care), 5 3/8s, 10/1/26	B/P	$700,000	$660,296
North Oaks, Sr. Hsg. Rev. Bonds (Presbyterian Homes North Oaks), 6 1/8s, 10/1/39	BB/P	315,000	318,600
Northfield, Hosp. Rev. Bonds, 5 3/8s, 11/1/26	BBB-	750,000	765,188
Rochester, Hlth. Care Fac. Rev. Bonds (Olmsted Med. Ctr.), 5 7/8s, 7/1/30	BBB-/F	1,000,000	1,023,210
Sauk Rapids Hlth. Care & Hsg. Fac. Rev. Bonds (Good Shepherd Lutheran Home)			
7 1/2s, 1/1/39	B+/P	500,000	519,350
6s, 1/1/34	B+/P	400,000	374,372
St. Paul, Hsg. & Redev. Auth. Hosp. Rev. Bonds (Healtheast)			

6s, 11/15/35	Ba1	1,350,000	1,329,345
Ser. B, 5.85s, 11/1/17	Ba1	250,000	250,790
St. Paul, Port Auth. Lease Rev. Bonds (Regions Hosp. Pkg. Ramp), Ser. 1, 5s, 8/1/36	BBB+/P	1,125,000	978,323
			9,527,014
Mississippi (0.9%)			
MS Bus. Fin. Corp. Poll. Control Rev. Bonds (Syst. Energy Resources, Inc.), 5.9s, 5/1/22	BBB	1,630,000	1,635,738
MS Home Corp. Rev. Bonds (Single Fam. Mtge.), Ser. B-2, GNMA Coll., FNMA Coll., 6.45s, 12/1/33	Aaa	635,000	672,636
Warren Cnty., Gulf Opportunity Zone (Intl. Paper Co.), Ser. A, 6 1/2s, 9/1/32	BBB	1,600,000	1,738,640
			4,047,014
Missouri (3.6%)			
Cape Girardeau Cnty., Indl. Dev. Auth. Hlth. Care Fac. Rev. Bonds (St. Francis Med. Ctr.), Ser. A, 5 1/2s, 6/1/16	A+	1,000,000	1,056,960
Kansas City, Indl. Dev. Auth. Hlth. Fac. Rev. Bonds (First Mtge. Bishop Spencer), Ser. A, 6 1/2s, 1/1/35	BB/P	2,000,000	1,975,780
MO State Hlth. & Edl. Fac. Auth. Rev. Bonds, Ser. 2003A (St. Lukes Health), 5 1/2s, 11/15/28 T	AAA	10,000,000	11,008,145
MO State Hsg. Dev. Comm. Mtge. Rev. Bonds			
(Single Fam. Homeowner Loan), Ser. A-1, GNMA Coll, FNMA Coll, 7 1/2s, 3/1/31	AAA	155,000	165,184
(Single Fam. Homeowner Loan), Ser. B-1, GNMA Coll., FNMA Coll., 7.45s, 9/1/31	AAA	185,000	191,660
(Single Fam. Homeowner Loan), Ser. A-1, GNMA Coll., FNMA Coll., 6 3/4s, 3/1/34	AAA	270,000	282,309
St. Louis Arpt. Rev. Bonds (Lambert-St. Louis Intl.), Ser. A-1, 6 5/8s, 7/1/34	A	1,000,000	1,098,270
			15,778,308

Montana (0.8%)			
MT Fac. Fin. Auth. Rev. Bonds (Sr. Living St. Johns Lutheran), Ser. A, 6s, 5/15/25	B+/P	500,000	451,460
MT Fac. Fin. Auth. VRDN (Sisters of Charity), Ser. A, 0.28s, 12/1/25	VMIG1	3,015,000	3,015,000
MT State Board Inv. Exempt Fac. Rev. Bonds (Stillwater Mining), 8s, 7/1/20	B	250,000	241,210
			3,707,670

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MUNICIPAL BONDS AND NOTES (127.6%)* *cont.*	Rating**	Principal amount	Value
Nebraska (0.6%)			
Central Plains, Energy Rev. Bonds (NE Gas No. 1), Ser. A, 5 1/4s, 12/1/18	BB+	$1,500,000	$1,590,015
Lancaster Cnty., Hosp. Auth. Rev. Bonds (Immanuel Oblig. Group), 5 1/2s, 1/1/30	A/F	1,000,000	1,046,040
			2,636,055
Nevada (2.3%)			
Clark Cnty., Impt. Dist. Special Assmt. Bonds			
(Summerlin No. 151), 5s, 8/1/16	BB/P	990,000	905,434
(Summerlin No. 142), 6 3/8s, 8/1/23	BB+/P	935,000	926,454
(Summerlin No. 151), 5s, 8/1/20	BB/P	420,000	$

190,895

$
97,331

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

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Luna Innovations Incorporated
Notes to Unaudited Consolidated Financial Statements

1. Basis of Presentation and Significant Accounting Policies

Nature of Operations

Luna Innovations Incorporated ("we," "Luna Innovations" or the "Company"), headquartered in Roanoke, Virginia, was incorporated in the Commonwealth of Virginia in 1990 and reincorporated in the State of Delaware in April 2003. We are a leader in advanced optical technology, providing unique capabilities in high performance fiber optic test products for the telecommunications industry and distributed fiber optic sensing for the aerospace and automotive industries. Prior to the sale of our optoelectronics business in July 2018 (See Note 2), we also developed and manufactured custom optoelectronic components and sub-assemblies for various industrial applications. We are organized into two reportable segments, which work closely together to turn ideas into products: our Technology Development segment and our Products and Licensing segment. Our business model is designed to accelerate the process of bringing new and innovative technologies to market.

Unaudited Interim Financial Information

The accompanying unaudited consolidated interim financial statements have been prepared in accordance with accounting principles generally accepted in the United Stated of America ("U.S. GAAP") for interim financial statements and Article 10 of Regulation S-X of the Securities Exchange Act of 1934, as amended. Accordingly, they do not include all of the information and footnotes required by U.S. GAAP for annual financial statements. The unaudited consolidated interim financial statements have been prepared on the same basis as the annual financial statements and in the opinion of management reflect all adjustments, consisting of only normal recurring accruals considered necessary to present fairly our financial position at September 30, 2018, results of operations for the three and nine months ended September 30, 2018 and 2017, and cash flows for the nine months ended September 30, 2018 and 2017. The results of operations for the three and nine months ended September 30, 2018, are not necessarily indicative of the results that may be expected for the year ending December 31, 2018. The consolidated balance sheet as of December 31, 2017 was derived from our audited consolidated financial statements.

The consolidated interim financial statements, including our significant accounting policies, should be read in conjunction with the audited Consolidated Financial Statements and the notes thereto for the year ended December 31, 2017, included in our Annual Report on Form 10-K as filed with the Securities and Exchange Commission ("SEC") on March 21, 2018.

Reclassifications

Certain amounts in the prior period have been reclassified to conform to current presentation. As a result of the adoption of Accounting Standards Codification ("ASC") 2014-09, Revenue from Contracts with Customers (Topic 606), we presented balances entitled contract assets and contract liabilities within the consolidated balance sheet as well as the impact of the changes in these balances within the consolidated statement of cash flows. We reclassified comparable balances within the December 31, 2017 consolidated balance sheet as well as the impact of changes in those balances within the consolidated statement of cash flows in order to enhance comparability. These reclassifications had no effect on our reported financial condition, results of operations, or cash flows. Any other reclassifications were immaterial to the consolidated interim financial statements taken as a whole.

Fair Value Measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in the principal or most advantageous market in an orderly transaction between marketplace participants. Various valuation approaches can be used to determine fair value, each requiring different valuation inputs. The following hierarchy classifies the inputs used to determine fair value into three levels:

- Level 1—Quoted prices for identical instruments in active markets
- Level 2—Quoted prices for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, and model-derived valuations in which all significant inputs and significant value drivers are observable in active markets

- Level 3—Valuations derived from valuation techniques in which one or more significant inputs or significant value drivers are unobservable

The carrying values of cash and cash equivalents, accounts receivable and accounts payable approximate fair value because of the short-term nature of these instruments. The carrying value of our debt approximates fair value, as we consider the floating interest

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rate on our credit facilities with Silicon Valley Bank ("SVB") to be at market for similar instruments. Certain non-financial assets and liabilities are measured at fair value on a nonrecurring basis in accordance with U.S. GAAP. This includes items such as non-financial assets and liabilities initially measured at fair value in a business combination and non-financial long-lived asset groups measured at fair value for an impairment assessment. In general, non-financial assets including intangible assets and property and equipment are measured at fair value when there is an indication of impairment and are recorded at fair value only when any impairment is recognized.

Net Income/(Loss) Per Share

Basic per share data is computed by dividing our net income/(loss) by the weighted average number of shares outstanding during the period. Diluted per share data is computed by dividing net income/(loss), if applicable, by the weighted average shares outstanding during the period increased to include, if dilutive, the number of additional common share equivalents that would have been outstanding if potential shares of common stock had been issued using the treasury stock method. Diluted per share data would also include the potential common share equivalents relating to convertible securities by application of the if-converted method.

The effects of 5.2 million and 5.0 million common stock equivalents (which include outstanding warrants, preferred stock and stock options) are included for the diluted per share data for the three months ended September 30, 2018 and 2017, respectively. The effect of 5.2 million common stock equivalents are included for the diluted per share data for the nine months ended September 30, 2018. The effect of 4.9 million common stock equivalents are not included for the nine months ended September 30, 2017, as they are anti-dilutive to earnings per share due to our net loss from continuing operations.

Recently Issued Accounting Pronouncements

Effective January 1, 2018, we adopted Revenue from Contracts with Customers (Topic 606), using the modified retrospective transition method. Under the modified retrospective approach, we apply the standards to new contracts and those that were not completed as of January 1, 2018. For those contracts not completed as of January 1, 2018, this method resulted in a cumulative adjustment to decrease the accumulated deficit in the net amount of $0.4 million. Prior periods will not be retrospectively adjusted, but we will maintain dual reporting for the year of initial application in order to maintain comparability of the periods presented. The cumulative effect of the changes made to our January 1, 2018 unaudited consolidated balance sheet for the adoption of Topic 606 was as follows:

	Balance at December 31, 2017	Adjustment for Topic 606	Adjusted balance at January 1, 2018
Assets:			
Current assets held for sale	$4,336,105	$ 379,891	$4,715,996
Liabilities:			
Contract liabilities	$3,318,379	$ 2,250	$3,320,629
Current liabilities held for sale	$862,205	$ 23,613	$885,818
Stockholders' equity:			
Accumulated deficit	$(32,406,189)	$ 354,028	$(32,052,161)

Contract assets were formerly reported as unbilled accounts receivable. Contract liabilities were formerly reported as accrued liabilities or deferred revenue. Inventory was also impacted by the adoption of the new guidance. The titles have been changed in the table below to be consistent with accounts currently used under the new standard.

	December 31, 2017	
	As Reported	As Adopted
Accounts receivables, net	$9,857,009	$5,929,042
Contract assets	—	1,778,142
Current assets held for sale	—	1,940,126
Long-term contract assets	—	209,699
Accrued liabilities	8,959,935	6,547,230
Contract liabilities	—	3,318,379
Current liabilities held for sale	—	120,665
Deferred revenue	1,026,339	—

Under the new standard, contracts in our Technology Development segment, which primarily provide research services, are not materially impacted upon the adoption of Topic 606 as revenue will continue to be recognized over time using an input model. Contracts in our Products and Licensing segment generally provide for the following revenue sources: standard product sales, custom product development and sales, product rental, extended warranties, training/service, and certain royalties. Revenues for this segment are recognized using either the "point in time" or "over time" methods of Topic 606, depending upon the revenue source. The major change in revenue recognition for the Products and Licensing segment related to custom optoelectronic products which changed from "point in time" to "over time" upon the adoption of Topic 606. This change results in the acceleration of revenue when compared to existing standards with the cumulative adjustment relating to contracts that are not complete as of December 31, 2017 recognized as an adjustment to opening accumulated deficit on January 1, 2018. The revenue received from our custom optoelectronic products segment is included as part of our discontinued operations section (Note 2) and shown above in the current assets and liabilities held for sale as of December 31, 2017. Our revenue for our standard products will continue to be recognized using the "point in time" model of Topic 606, and the timing of such revenue recognition is not expected to differ materially from our historical revenue recognition. Other immaterial adjustments related to the Products and Licensing segment that are sometimes offered to customers include discounts on future purchases related to rental agreements, customer rights of return, and volume discounts.

Technology Development Revenues

We perform research and development for U.S. Federal government agencies, educational institutions and commercial organizations. We account for a research contract when a contract has been executed, the rights of the parties are identified, payment terms are identified, the contract has commercial substance, and collectability of the contract price is considered probable. Revenue is earned under cost reimbursable, time and materials and fixed price contracts. Direct contract costs are expensed as incurred.

Our contracts with agencies of the U.S. government are subject to periodic funding by the respective contracting agency. Funding for a contract may be provided in full at inception of the contract or ratably throughout the contract as the services are provided. In evaluating the probability of funding for purposes of assessing collectability of the contract price, we consider our previous experience with our customers, communication with our customers regarding funding status and our knowledge of available funding for the contract or program. If funding is not assessed as probable, revenue recognition is deferred until realization is reasonably assured.

Under the typical payment terms of our U.S. government contracts, the customer pays us either performance-based payments ("PBPs") or progress payments. PBPs, which are typically used in the firm fixed price contracts, are interim payments based on quantifiable measures of performance or on the achievement of specified events or milestones. Progress payments, which are typically used in our cost type contracts, are interim payments based on costs incurred

as the work progresses. For our U.S. government cost-type contracts, the customer generally pays us during the performance period for 80%-90% of our actual costs incurred. Because the customer retains a small portion of the contract price until completion of the contract and audit of allowable costs, cost type contracts generally result in revenue recognized in excess of billings which we present as contract assets on the balance sheet. Amounts billed and due from our customers are classified as receivables on the balance sheet. For non-U.S. government contracts, we typically receive interim payments as work progresses, although for some contracts, we may be entitled to receive an advance payment. We recognize a liability for these advance payments and PBPs paid in advance which are in excess of the revenue recognized and present these amounts as contract liabilities on the balance sheet.

To determine the proper revenue recognition method for research and development contracts, we evaluate whether two or more contracts should be combined and accounted for as one single modified contract and whether the combined or single contract should

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be accounted for as more than one performance obligation. For instances where a contract has options that were bid with the initial contract and awarded at a later date, we combine the options with the original contract when options are awarded. For most of our contracts, the customer contracts for research with multiple milestones that are interdependent. Consequently, the entire contract is accounted for as one performance obligation. The effect of the combined or modified contract on the transaction price and measure of progress for the performance obligation to which it relates, is recognized as an adjustment to revenue (either as an increase in or a reduction of revenue) on a cumulative catch-up basis.

Contract revenue recognition is measured over time as we perform because of continuous transfer of control to the customer. For U.S. government contracts which are typically subject to the Federal Acquisition Regulation ("FAR"), this continuous transfer of control to the customer is supported by clauses in the contract that allow the customer to unilaterally terminate the contract for convenience, pay us for cost incurred plus a reasonable profit and take control of any work in process. From time to time, as part of normal management processes, facts may change, causing revisions to estimated total costs or revenues expected. The cumulative impact of any revisions to estimates and the full impact of anticipated losses on any type of contract are recognized in the period in which they become known.

Because of control transferring over time, revenue is recognized based on the extent of progress towards completion of the performance obligation. The selection of the method to measure progress towards completion requires judgment and is based on the nature of the services to be provided. We generally use the input method, more specifically the cost-to-cost measure of progress for our contracts because it best depicts the transfer of control to the customer which occurs as we incur costs on our contracts. Under the cost-to-cost measure of progress, the extent of progress towards completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. The underlying bases for estimating our contract research revenues are measurable expenses, such as labor, subcontractor costs and materials, and data that are updated on a regular basis for purposes of preparing our cost estimates. Our research contracts generally have a period of performance of six months to three years, and our estimates of contract costs have historically been consistent with actual results. Revisions in these estimates between accounting periods to reflect changing facts and circumstances have not had a material impact on our operating results, and we do not expect future changes in these estimates to be material. The cumulative impact of any revisions to estimates and the full impact of anticipated losses on any type of contract are recognized in the period in which they become known.

Under cost reimbursable contracts, we are reimbursed for costs that are determined to be reasonable, allowable and allocable to the contract and paid a fixed fee representing the profit negotiated between us and the contracting agency. Revenue from cost reimbursable contracts is recognized as costs are incurred plus an estimate of applicable fees earned. We consider fixed fees under cost reimbursable contracts to be earned in proportion to the allowable costs incurred in performance of the contract.

Revenue from time and materials contracts is recognized based on direct labor hours expended at contract billing rates plus other billable direct costs.

Fixed price contracts may include either a product delivery or specific service performance throughout a period. For fixed price contracts that are based on the proportional performance method and involve a specified number of deliverables, we recognize revenue based on the proportion of the cost of the deliverables compared to the cost of all deliverables included in the contract as this method more accurately measures performance under these arrangements. For fixed price contracts that provide for the development and delivery of a specific prototype or product, revenue is recognized based upon the percentage of completion method.

Whether certain costs under government contracts are allowable is subject to audit by the government. Certain indirect costs are charged to contracts using provisional or estimated indirect rates, which are subject to later revision based on

government audits of those costs. Management is of the opinion that costs subsequently disallowed, if any, would not likely have a significant impact on revenues recognized for those contracts.

Products and Licensing Revenues

We produce standard and customized products for commercial organizations, educational institutions, and U.S. Federal government agencies. In addition we will also offer extended warranties, product rentals, and services which include testing, training, or repairs for specific products. Customers also pay royalties as agreed based on sales or usage. We account for product and related items when a contract has been executed, the rights of the parties are identified, payment terms are identified, the contract has commercial substance, and collectability of the contract price is considered probable.

To determine the proper revenue recognition method for Products and Licensing contracts, we evaluate whether two or more contracts should be combined and accounted for as one single contract and whether the combined or single contract should be accounted for as more than one performance obligation. We recognize revenue when the performance obligation has been satisfied by

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transferring the control of the product or service to the customer. For tangible products that contain software that is essential to the tangible product's functionality, we consider the product and software to be a single performance obligation and recognize revenue accordingly. For contracts with multiple performance obligations, we allocate the contract's transaction price to each performance obligation based on their relative stand-alone selling prices. In such circumstances, we use the observable price of goods or services which are sold separately in similar circumstances to similar customers. If these prices are not observable, then we will estimate the stand-alone selling price using information that is reasonably available. For the majority of our standard products and services, price list and discount structures related to customer type are available. For products and services that do not have price list and discount structures, we may use one or more of the following: (i) adjusted market assessment approach, (ii) expected cost plus a margin approach, and (iii) residual approach. The adjusted market approach requires us to evaluate the market in which we sell goods or services and estimate the price that a customer in that market would be willing to pay for those goods or services. The expected cost plus margin approach requires us to forecast our expected costs of satisfying the performance obligation and then add a reasonable margin for that good or service. The residual approach decreases the total transaction price by the sum of the observable standalone selling prices if either the company sells the same good or services to different customers for a broad range of amounts or the company has not established a price for the good or service and that good or service has not been sold on a standalone basis. Shipping and handling activities primarily occur after a customer obtains control and are considered fulfillment cost rather than separate performance obligations. Similarly, sales and similar taxes assessed by a governmental authority that are both imposed on and concurrent with a specific revenue-producing transaction and collected by the entity from a customer are excluded from the measurement of the transaction price.

For standard products, we recognize revenue at a point in time when control passes to the customer. Absent substantial product acceptance clauses, this is based on the shipping terms. For custom products that require engineering and development based on customer requirements, we will recognize revenue over time using the output method for any items shipped and any finished goods or work in process that is produced for balances of open sales orders. For any finished goods or work in process that has been produced for the balance of open sales orders we recognize revenue by applying the average selling price for such open order to the lesser of the on hand balance in finished goods or open sales order quantity which we present as a contract asset on the balance sheet. Cost of sales is recognized based on the standard cost of the finished goods and work in process associated with this revenue and inventory balances are reduced accordingly. For extended warranties and product rentals, revenue is recognized over time using the output method based on the time elapsed for the warranty or service period. In the case of warranties, we record a contract liability for amounts billed but that are not recognized until subsequent period. A separate contract liability is recorded for the cost associated with warranty repairs based on our estimate of future expense. For testing services where we are performing testing on an asset the customer controls, revenue is recognized over time by the output method using the performance to date. For training where the customer is receiving the benefit of training as it is occurring and for repairs to a customer controlled asset, revenue is recognized over time by the output method using the performance to date. For royalty revenue, we apply the practical expedient "royalty exception" recognizing revenue based on the royalty agreement which specifies an amount based on sales or minimum amount, whichever is greater.

In some product rental contracts, a customer may be offered a discount on the purchase of an item that would provide for a material right. When a material right has been provided to a customer, a separate performance obligation is established and a portion of the rental revenue will be deferred until the future product is purchased or the option expires. This deferred revenue is recognized as a contract liability on the balance sheet. In certain circumstances we may offer a "right of return" to a distributor of our products, in which case a contract liability is calculated based on the terms of the agreement and recorded as a reduction to revenue. In addition, a contract asset for the rights to recover products from customers and a reduction of cost of sales is also calculated and recorded.

Unfulfilled performance obligations represent amounts expected to be earned on executed contracts. Indefinite delivery and quantity contracts and unexercised options are not reported in total unfulfilled performance obligations. Unfulfilled performance obligations include funded obligations, which is the amount for which money has been directly authorized by the U.S. government and for which a purchase order has been received by a commercial customer, and unfunded obligations, representing firm orders for which funding has not yet been appropriated. The approximate value of our Technology Development segment unfulfilled performance obligations was $28.8 million at September 30, 2018. We expect to satisfy 25% of the performance obligations in 2018, 54% in 2019 and the remaining by 2022. The approximate value of our Products and Licensing segment unfulfilled performance obligations was $1.8 million at September 30, 2018. We expect to satisfy 84% of the performance obligations in 2018, 8% in 2019 and the remaining by 2023.

We disaggregate our revenue from contracts with customers by geographic locations, customer-type, contract type, timing of recognition, and major categories for each of our segments, as we believe it best depicts how the nature, amount, timing and uncertainty of our revenue and cash flows are affected by economic factors. See details in the tables below.

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	Three Months Ended September 30, 2018 (unaudited)			Nine Months Ended September 30, 2018 (unaudited)		
	Technology Development	Products and Licensing	Total	Technology Development	Products and Licensing	Total
Total Revenue by Geographic Location						
United States	$5,315,861	$3,251,602	$8,567,463	$15,418,919	$7,961,048	$23,379,967
Asia	—	1,143,767	1,143,767	—	3,280,348	3,280,348
Europe	—	899,683	899,683	—	2,542,017	2,542,017
Canada, Central and South America	—	1,330	1,330	—	99,807	99,807
All Others	—	74,783	74,783	—	76,783	76,783
Total	$5,315,861	$5,371,165	$10,687,026	$15,418,919	$13,960,003	$29,378,922
Total Revenue by Major Customer Type						
Sales to the U.S. government	$5,216,389	$977,076	$6,193,465	$15,284,661	$1,364,755	$16,649,416
U.S. direct commercial sales and other	99,472	2,250,656	2,350,128	134,258	6,583,006	6,717,264
Foreign commercial sales & other	—	2,143,433	2,143,433	—	6,012,242	6,012,242
Total	$5,315,861	$5,371,165	$10,687,026	$15,418,919	$13,960,003	$29,378,922
Total Revenue by Contract Type						
Fixed-price contracts	$2,004,166	$5,371,165	$7,375,331	$6,611,758	$13,960,003	$20,571,761
Cost-type contracts	3,311,695	—	3,311,695	8,807,161	—	8,807,161
Total	$5,315,861	$5,371,165	$10,687,026	$15,418,919	$13,960,003	$29,378,922
Total Revenue by Timing of Recognition						
Goods transferred at a point in time	$—	$5,190,830	$5,190,830	$—	$13,505,897	$13,505,897
Goods/services transferred over time	5,315,861	180,335	5,496,196	15,418,919	454,106	15,873,025
Total	$5,315,861	$5,371,165	$10,687,026	$15,418,919	$13,960,003	$29,378,922
Total Revenue by Major Products/Services						
Technology development	$5,315,861	$—	$5,315,861	$15,418,919	$—	$15,418,919
Optical test and measurement systems	—	4,469,677	4,469,677	—	12,129,197	12,129,197
Other	—	901,488	901,488	—	1,830,806	1,830,806
Total	$5,315,861	$5,371,165	$10,687,026	$15,418,919	$13,960,003	$29,378,922

The following tables summarize the impacts of adopting Topic 606 on our consolidated financial statements as of and for the three and nine months ended September 30, 2018.

	Impact of changes in accounting policies		
	As Reported	Adjustments	Balances without adoption of Topic 606
	(unaudited)	(unaudited)	(unaudited)
Assets			
Current assets:			
Cash and cash equivalents	$47,144,719	$ —	$47,144,719
Accounts receivable, net	9,110,713	—	9,110,713
Receivable from sale of HSOR business	4,002,342	—	4,002,342
Contract assets	2,611,122	—	2,611,122
Inventory	5,462,414	—	5,462,414
Prepaid expenses and other current assets	730,368	—	730,368
Total current assets	69,061,678	—	69,061,678
Long-term contract assets	343,492	—	343,492
Property and equipment, net	2,678,411	—	2,678,411
Intangible assets, net	1,709,003	—	1,709,003
Other assets	1,995	—	1,995
Total assets	$73,794,579	$ —	$73,794,579
Liabilities and stockholders’ equity			
Liabilities:			
Current liabilities:			
Current portion of long-term debt obligations	$1,073,571	$ —	$1,073,571
Current portion of capital lease obligations	39,748	—	39,748
Accounts payable	2,297,457	—	2,297,457
Accrued liabilities	6,589,310	—	6,589,310
Contract liabilities	1,548,371	(3,880)	1,544,491
Total current liabilities	11,548,457	(3,880)	11,544,577
Long-term deferred rent	1,072,696	—	1,072,696
Long-term capital lease obligations	83,405	—	83,405
Total liabilities	12,704,558	(3,880)	12,700,678
Commitments and contingencies			
Stockholders’ equity:			
Preferred stock, par value $0.001, 1,321,514 shares authorized, issued and outstanding at September 30, 2018 and December 31, 2017, respectively	1,322	—	1,322
Common stock, par value $0.001, 100,000,000 shares authorized, 29,189,506 and 28,354,822 shares issued, 27,936,401 and 27,283,918 shares outstanding at September 30, 2018 and December 31, 2017, respectively	30,081	—	30,081
Treasury stock at cost, 1,253,105 and 1,070,904 shares at September 30, 2018 and December 31, 2017, respectively	(2,116,640)	—	(2,116,640)
Additional paid-in capital	85,353,909	—	85,353,909
Accumulated deficit	(22,178,651)	3,880	(22,174,771)
Total stockholders’ equity	61,090,021	3,880	61,093,901
Total liabilities and stockholders’ equity	$73,794,579	$ —	$73,794,579

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	Impact of changes in accounting policies Three Months Ended September 30, 2018			Nine Months Ended September 30, 2018		
	As reported	Adjustments	Balances without adoption of Topic 606	As reported	Adjustments	Balances without adoption of Topic 606
	(unaudited)	(unaudited)	(unaudited)	(unaudited)	(unaudited)	(unaudited)
Revenues:						
Technology development	$5,315,861	$ —	$5,315,861	$15,418,919	$ —	$15,418,919
Products and licensing	5,371,165	(2,790)	5,368,375	13,960,003	1,630	13,961,633
Total revenues	10,687,026	(2,790)	10,684,236	29,378,922	1,630	29,380,552
Cost of revenues:						
Technology development	3,918,666	—	3,918,666	11,131,965	—	11,131,965
Products and licensing	2,079,749	—	2,079,749	5,381,333	—	5,381,333
Total cost of revenues	5,998,415	—	5,998,415	16,513,298	—	16,513,298
Gross profit	4,688,611	(2,790)	4,685,821	12,865,624	1,630	12,867,254
Operating expense:						
Selling, general and administrative	3,233,485	—	3,233,485	9,898,064	—	9,898,064
Research, development and engineering	873,629	—	873,629	2,513,497	—	2,513,497
Total operating expense	4,107,114	—	4,107,114	12,411,561	—	12,411,561
Operating income	581,497	(2,790)	578,707	454,063	1,630	455,693
Other income:						
Investment income	171,896	—	171,896	350,976	—	350,976
Other income/(expense)	8,319	—	8,319	(16,001)	—	(16,001)
Interest expense	(28,029)	—	(28,029)	(103,208)	—	(103,208)
Total other income	152,186	—	152,186	231,767	—	231,767
Income from continuing operations before income taxes	733,683	(2,790)	730,893	685,830	1,630	687,460
Income tax benefit	(559,093)	—	(559,093)	(674,329)	—	(674,329)
Net income from continuing operations	$1,292,776	$ (2,790)	$1,289,986	$1,360,159	$ 1,630	$1,361,789

Effective January 1, 2018, we adopted Accounting Standards Update ("ASU") No. 2016-15, Statement of Cash Flows (Topic 230), which addresses eight specific cash flow issues with the objective of reducing the existing diversity in practice in how cash receipts and cash payments are presented in the statement of cash flows. The adoption of ASU No. 2016-15 did not have a significant impact on our consolidated financial statements.

In February 2016, the FASB issued ASU No. 2016-02, Leases (Topic 842), which requires a lessee to recognize in its statement of financial position an asset and liability for most leases with a term greater than 12 months. Lessees should recognize a liability to make lease payments and a right-of-use asset representing the lessee's right to use the underlying asset for the lease term. This guidance is effective for us in our first quarter of fiscal 2019. In July 2018, the FASB issued ASU 2018-11, Leases (Topic 842): Targeted Improvements, which provides lessees an additional, and optional, transition method to apply the new leasing standard to all open leases at the adoption date and recognize a cumulative effect adjustment to the opening balance of retained earnings in the period of adoption. We currently plan to elect this transition method, and as a result, we will not adjust our comparative period financial information or make the required lease disclosures for periods before the effective date. We are currently evaluating the impact the adoption of ASU 2016-02 and ASU 2018-11 will have on our consolidated financial statements and expect to have

increases in the assets and liabilities of our consolidated balance sheet.

In February 2018, the FASB issued ASU 2018-02: Income Statement – Reporting Comprehensive Income (Topic 220). Under current accounting guidance, the income tax effects for changes in income tax rates and certain other transactions are recognized in income from continuing operations resulting in income tax effects recognized in AOCI that do not reflect the current tax rate of the

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entity ("stranded tax effects"). The new guidance allows us the option to reclassify these stranded tax effects to accumulated deficit that relate to the change in the federal tax rate resulting from the passage of the Tax Cuts and Jobs Act. This update is effective for fiscal years beginning after December 15, 2018, including interim periods therein, and early adoption is permitted. We do not expect the adoption of this standard will have a significant impact on our consolidated financial statements.

In January 2017, the FASB issued ASU No. 2017-04, Intangibles-Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment. This update simplifies the subsequent measurement of goodwill. The guidance removes Step 2 of the goodwill impairment test, which requires a hypothetical purchase price allocation. A goodwill impairment will now be the amount by which a reporting unit's carrying value exceeds its fair value, not to exceed the carrying amount of goodwill. The accounting standard will be effective for reporting periods beginning after December 15, 2019. We do not expect ASU 2017-04 will have a material impact on our financial statements.

In August 2018, the FASB issued ASU No. 2018-13, Fair Value Measurement (Topic 820): Changes to the Disclosure Requirements for Fair Value Measurement. which amends the disclosure requirements in ASC 820 by adding, changing, or removing certain disclosures. The ASU applies to all entities that are required under this guidance to provide disclosures about recurring or nonrecurring fair value measurements. These amendments are effective for all entities for fiscal years beginning after December 15, 2019 including interim periods within those fiscal years. We do not expect ASU 2018-13 will have a material impact on our financial statements.

2. Discontinued Operations

On August 9, 2017, we completed the sale of our high speed optical receivers ("HSOR") business, which was part of our Products and Licensing segment, to an unaffiliated third party for an initial purchase price of $33.5 million, of which $29.5 million in cash has been received, and $4.0 million was placed into escrow until December 15, 2018 for potential satisfaction of certain post-closing indemnification obligations (the "Transaction"). The HSOR business was a component of the operations of Advanced Photonix, Inc., which we acquired in May 2015. The HSOR business accounted for 34.5% of revenues and 37.2% of our cost of revenues for the three months ended September 30, 2017 and 35.5% of revenues and 39.6% of our cost of revenues for the nine months ended September 30, 2017.

On July 31, 2018 , we sold the assets and operations related to our optoelectronic components and subassemblies ("Opto") business, which was part of our Products and Licensing segment, to an unaffiliated third party for an initial purchase price up to $18.5 million, of which $17.5 million was received at closing and has been properly recorded in the financial statements with the remaining purchase price adjustment up to $1.0 million which is contingent upon the attainment of specified revenue targets during the eighteen months following the closing of the sale. The purchase price is subject to adjustment in the future based upon a determination of final working capital, as defined in the asset purchase agreement. The Opto business was a component of the operations of Advanced Photonix, Inc., which we acquired in May 2015, and represented all of our operations in our Camarillo, California and Montreal, Quebec facilities.

We have reported the results of operations of both our HSOR and Opto businesses as discontinued operations in our consolidated interim financial statements. We allocated a portion of the consolidated tax expense to discontinued operations based on the ratio of the discontinued business's loss before allocations.

The following table presents a summary of the transactions related to the sales of HSOR in the nine months ended September 30, 2017 and Opto in the nine months ended September 30, 2018:

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	Nine Months Ended September 30,	
	2018 (unaudited)	2017 (unaudited)
Sale price	$17,500,000	$33,500,000
Less: transition services payments	—	(1,500,000)
	17,500,000	32,000,000
Assets held for sale	(8,193,184)	(16,851,540)
Liabilities held for sale	989,453	2,330,052
Transaction costs	(858,227)	(873,473)
Income tax expense	(1,866,232)	(1,508,373)
Gain on sale of discontinued operations	$7,571,810	$15,096,666

Assets and liabilities held for sale associated with our Opto business as of December 31, 2017 were as follows:

	December 31, 2017
Assets	
Current assets:	
Accounts receivable, net	$1,940,125
Inventory	2,316,329
Prepaid expenses and other assets	79,651
Total current assets	4,336,105
Property and equipment, net	599,102
Intangible assets, net	1,510,203
Goodwill	502,000
Other assets	16,028
Total non-current assets	2,627,333
Total assets held for sale	$6,963,438
Liabilities	
Current liabilities:	
Accounts payable	$851,785
Accrued liabilities	120,666
Total current liabilities	972,451
Total liabilities held for sale	$972,451

The key components of net income from discontinued operations were as follows:

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	Three Months Ended September 30,		Nine Months Ended September 30,	
	2018	2017	2018	2017
	(unaudited)		(unaudited)	
Net revenues	$1,089,681	$4,380,747	$8,363,606	$16,158,672
Cost of revenues	648,652	2,945,264	5,294,268	10,806,456
Operating expenses	271,262	1,044,104	1,714,920	4,733,603
Other (expenses)/income	(9,372)	(17,374)	13,330	(31,525)
Income before income taxes	160,395	374,005	1,367,748	587,088
Allocated tax expense/(benefit)	216,813	(91,705)	235,312	249,184
Operating (loss)/income from discontinued operations	(56,418)	465,710	1,132,436	337,904
Gain on sale, net of related income taxes	7,612,044	15,096,666	7,571,810	15,096,666
Net income from discontinued operations	$7,555,626	$15,562,376	$8,704,246	$15,434,570

For the nine months ended September 30, 2018 and 2017, cash flows provided by/(used in) operating activities for discontinued operations were $0.1 million and $(0.3) million, respectively. For the nine months ended September 30, 2018 and 2017 cash flows provided by investing activities for discontinued operations were $16.6 million and $26.6 million, respectively.

3. Contract Balances

Our contract assets consist of unbilled amounts for technology development contracts as well as custom product contracts. Also included in contract assets are royalty revenue and carrying amounts of right of returned inventory. Long-term contract assets include the fee withholding on cost reimbursable contracts that will not be billed within a year. Contract liabilities include excess billings, subcontractor accruals, warranty expense, extended warranty revenue, right of return refund, and customer deposits.

The following table shows the significant changes in contract balances for the nine month period ending September 30, 2018:

	Contract Assets	Contract Liabilities
Opening Balance as of January 1, 2018	$1,987,841	$3,320,629
Revenue recognized that was included in the contract liabilities balance at the beginning of the period	—	(808,977)
Transferred to payables from contract liabilities recognized at the beginning of the period	—	(2,052,955)
Increases due to cash received or adjustment of estimates, excluding amounts recognized as revenue during the period	—	1,089,674
Transferred to receivables from contract assets recognized at the beginning of the period	(1,543,925)	—
Increases as a result of cumulative catch-up adjustment arising from changes in the estimate of the stage of completion	2,510,698	—
Balance as of September 30, 2018	$2,954,614	$1,548,371

4. Inventory

Inventory consists of finished goods, work-in-process and raw materials valued at the lower of cost (determined on the first-in, first-out basis) or market. We write down inventory for estimated obsolescence or unmarketable inventory in an amount

equal to the difference between the cost of the inventory and the estimated market value based upon assumptions about future demand and market conditions.
Components of inventory were as follows:

	September 30, 2018 (unaudited)	December 31, 2017
Finished goods	$ 1,036,581	$ 762,394
Work-in-process	389,801	288,165
Raw materials	4,036,032	3,584,222
Total inventory	$ 5,462,414	$ 4,634,781

5. Accrued Liabilities

Accrued liabilities at September 30, 2018 and December 31, 2017 consisted of the following:

	September 30, 2018 (unaudited)	December 31, 2017
Accrued compensation	$ 4,164,573	$ 5,274,005
Income tax payable	1,676,503	403,548
Accrued professional fees	104,742	117,445
Deferred rent	143,933	144,741
Royalties	231,122	290,235
Accrued interest	6,439	—
Accrued liabilities - other	261,998	317,256
Total accrued liabilities	$ 6,589,310	$ 6,547,230

6. Debt

Silicon Valley Bank Facility

We currently have a Loan and Security Agreement with SVB (the "Credit Facility") under which, as amended on May 8, 2015, we have a term loan with an original borrowing amount of $6.0 million (the “Original Term Loan”). The Original Term Loan is repayable in 48 monthly installments of $125,000, plus accrued interest payable monthly in arrears, and unless earlier terminated, is scheduled to mature in May 2020. The Original Term Loan carries a floating annual interest rate equal to SVB’s prime rate then in effect plus 2%. We may prepay amounts due under the Original Term Loan at any time, subject to an early termination fee of up to 2% of the amount of prepayment.

In September 2015, we entered into the Waiver and Seventh Loan Modification Agreement, which provided an additional $1.0 million of available financing for purchases of equipment through December 31, 2015, which we fully borrowed in December 2015 (the "Second Term Loan" and, together with the Original Term Loan, the "Term Loans"). The Second Term Loan also bears interest at a floating prime rate plus 2% and is to be repaid in 35 monthly installments of $27,778 plus accrued interest.

The Credit Facility requires us to maintain a minimum cash balance of $4.0 million and to maintain at each month end a ratio of cash plus 60% of accounts receivable greater than or equal to 1.5 times the outstanding principal of the Term Loans. The Credit Facility also requires us to observe a number of additional operational covenants, including protection and registration of intellectual property rights, and certain customary negative covenants. As of September 30, 2018, we were in compliance with all covenants under the Credit Facility.

Amounts due under the Credit Facility are secured by substantially all of our assets, including intellectual property, personal property and bank accounts. In addition, the Credit Facility contains customary events of default, including nonpayment of principal, interest or other amounts, violation of covenants, material adverse change, an event of default under any subordinated debt documents, incorrectness of representations and warranties in any material

respect, bankruptcy,

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judgments in excess of a threshold amount, and violations of other agreements in excess of a threshold amount. If any event of default occurs SVB may declare due immediately all borrowings under the Credit Facility and foreclose on the collateral. Furthermore, an event of default under the Credit Facility would result in an increase in the interest rate on any amounts outstanding. As of September 30, 2018, there were no events of default on the Credit Facility.
The aggregate balance under the Term Loans at September 30, 2018 and December 31, 2017, was $1.1 million and $2.5 million, respectively. One term loan, with a balance of $0.1 million and $0.3 million as of September 30, 2018 and December 31, 2017, respectively, matures on December 1, 2018. The other term loan, with a balance of $1.0 million and $2.1 million as of September 30, 2018 and December 31, 2017, respectively, matures on May 1, 2019. The effective rate of our Term Loan at September 30, 2018 was 7%.
The following table presents a summary of debt outstanding as of September 30, 2018 and December 31, 2017:

	September 30, 2018 (unaudited)	December 31, 2017
Silicon Valley Bank Term Loan	$ 1,083,333	$ 2,458,333
Less: unamortized debt issuance costs	9,762	21,993
Less: current portion	1,073,571	1,833,333
Total long-term debt	$ —	$ 603,007

The schedule of remaining principal payments under our Term Loans as of September 30, 2018 was as follows:

2018 (remaining three months)	458,333
2019	625,000
	$1,083,333

7. Capital Stock and Share-Based Compensation

We recognize share-based compensation expense based upon the fair value of the underlying equity award on the date of the grant. For restricted stock awards and restricted stock units, we recognize expense based upon the price of our underlying stock at the date of the grant. We have elected to use the Black-Scholes-Merton option pricing model to value any option or warrant awards granted. We recognize share-based compensation for such awards on a straight-line basis over the requisite service period of the awards. The risk-free interest rate is based on U.S. Treasury interest rates, the terms of which are consistent with the expected life of the stock options. The expected life is based upon historical experience of homogeneous groups within our company. We also assume an expected dividend yield of zero for all periods, as we have never paid a dividend on our common stock and do not have any plans to do so in the future.

Stock Options

A summary of the stock option activity for the nine months ended September 30, 2018 is presented below:

	Options Outstanding				Options Exercisable		
	Number of Shares	Price per Share Range	Weighted Average Exercise Price	Aggregate Intrinsic Value (1)	Number of Shares	Weighted Average Exercise Price	Aggregate Intrinsic Value (1)
Balance, January 1, 2018	2,714,561	$0.61 - $6.55	$ 1.88	$2,098,195	2,590,030	$ 1.89	$2,013,034
Granted	273,212	$2.46 - $3.27	$ 3.24				
Exercised	(76,425)	$0.65 - $2.46	$ 2.07				
Canceled	(645,421)	$1.21 - $6.55	$ 2.11				
Balance, September 30, 2018	2,265,927	$0.61 - $6.23	$ 1.83	$3,239,122	1,979,179	$ 1.81	$3,149,186

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(1) The intrinsic value of an option represents the amount by which the market value of the stock exceeds the exercise price of the option of in-the-money options only. The aggregate intrinsic value is based on the closing price of our common stock on the Nasdaq Capital Market, as applicable, on the respective dates.

At September 30, 2018, the outstanding stock options to purchase an aggregate of 2.3 million shares had a weighted-average remaining contractual term of 4.3 years, and the exercisable stock options to purchase an aggregate of 2.0 million shares had a weighted-average remaining contractual term of 3.5 years. The fair value of shares underlying vested options was $6.4 million at September 30, 2018. The fair value of shares underlying options exercised during the nine months ended September 30, 2018 was $255,102.
For the nine months ended September 30, 2018 and 2017 we recognized $0.3 million and $0.5 million in share-based compensation expense, respectively, which is included in our selling, general and administrative expense in the accompanying consolidated interim financial statements. We expect to recognize $0.6 million in share-based compensation expense over the weighted-average remaining service period of 3.8 years for stock options outstanding as of September 30, 2018.

Restricted Stock and Stock Units

For the nine months ended September 30, 2018, we issued 280,000 shares of restricted stock to certain employees. Shares of restricted stock issued to employees vest in three equal annual installments on the anniversary dates of their grant. For the nine months ended September 30, 2018, 182,500 shares of restricted stock vested.

For the nine months ended September 30, 2018, we issued 16,287 restricted stock units to certain non-employee members of our Board of Directors in respect of the annual equity grants pursuant to our non-employee director compensation policy. This amount represents the equity compensation to those non-employee directors who did not elect to defer the receipt of their equity compensation pursuant to our non-employee director deferred compensation plan described below. Restricted stock units issued to our directors vest at the earlier of the one year anniversary of their grant or the next annual stockholders' meeting. During the nine months ended September 30, 2018, 129,865 restricted stock units vested.

The following table summarizes the value of our unvested restricted stock awards and restricted stock units:

	Number of Unvested Shares	Weighted Average Grant Date Fair Value	Aggregate Value of Unvested Shares
Balance, January 1, 2018	489,698	$ 1.51	$738,345
Granted	296,287	$ 3.07	909,600
Vested	(312,365)	$ 2.75	(454,339)
Forfeitures	(15,000)	$ 1.41	(21,150)
Balance, September 30, 2018	458,620	$ 2.56	$1,172,456

Non-employee Director Deferred Compensation Plan

We maintain a non-employee director deferred compensation plan (the “Deferred Compensation Plan”) that permits our non-employee directors to defer receipt of certain of the compensation that they receive for serving on our board and board committees. The Deferred Compensation Plan has historically permitted the participants to elect to defer cash fees to which they were entitled for board and committee service. For participating directors, in lieu of payment of cash fees, we credit their accounts under the Deferred Compensation Plan with a number of stock units based on the trading price of our common stock as of the date of the deferral. These stock units vest immediately, although the participating directors do not receive the shares represented by such units until a future qualifying event.

In December 2017, we amended and restated our Deferred Compensation Plan to also permit participating non-employee directors to elect, beginning in 2018, to defer the receipt of some or all of the equity compensation that they receive for board and committee service. Stock units representing this equity compensation vest at the earlier of the one year anniversary of their grant or the next annual stockholders' meeting.
The following is a summary of our stock unit activity under the Deferred Compensation Plan for the nine months ended September 30, 2018:

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	Number of Stock Units	Weighted Average Grant Date Fair Value per Share	Intrinsic Value Outstanding
Balance, January 1, 2018	466,702	$1.40	$ 1,134,086
Granted	80,006	$3.00	
Forfeitures	—	—	
Converted	—	—	
Balance, September 30, 2018	546,708	$1.64	$ 1,765,867

As of September 30, 2018, 48,859 of the outstanding stock units had not yet vested.

The following table details our equity transactions during the nine months ended September 30, 2018:

	Preferred Stock		Common Stock		Treasury Stock		Additional Paid-in Capital	Accumulated Deficit	Total
	Shares	$	Shares	$	Shares	$	$		
Balance at January 1, 2018, as previously reported	1,321,514	1,322	27,283,918	29,186	1,070,904	(1,649,746)	83,563,208	(32,406,189)	49,537,781
Impact of change in accounting policy	—	—	—	—	—	—	—	354,028	354,028
As adjusted balance at January 1, 2018	1,321,514	1,322	27,283,918	29,186	1,070,904	(1,649,746)	83,563,208	(32,052,161)	49,891,809
Exercise of stock options	—	—	442,425	442	—	—	1,054,412	—	1,054,854
Share-based compensation	—	—	262,394	262	—	—	345,582	—	345,844
Non-cash compensation	—	—	129,865	131	—	—	199,872	—	200,003
Stock dividends to Carilion Clinic[1]	—	—	—	60	—	—	190,835	(190,895)	—
Net Income	—	—	—	—	—	—	—	10,064,405	10,064,405
Purchase of treasury stock	—	—	(182,201)	—	182,201	(466,894)	—	—	(466,894)
Balance, September 30, 2018	1,321,514	1,322	27,936,401	30,081	1,253,105	(2,116,640)	85,353,909	(22,178,651)	61,090,021

(1) The stock dividends payable in connection with Carilion Clinic's Series A Preferred Stock will be issued subsequent to September 30, 2018. For the period from January 12, 2010, the original issue date of the Series A Preferred Stock, through September 30, 2018, the Series A Preferred Stock issued to Carilion has accrued $1,351,226 in dividends. The accrued and unpaid dividends as of September 30, 2018 will be paid by the issuance

of 691,162 shares of our common stock upon Carilion's written request.

Stock Repurchase Program

In May 2016, our board of directors authorized us to repurchase up to $2.0 million of our common stock through May 31, 2017. As of May 31, 2017, we had repurchased a total of 205,500 shares for an aggregate purchase price of $0.2 million under this stock repurchase program, after which this stock repurchase program expired.

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In September 2017, our board of directors re-instituted the stock repurchase program and authorized us to repurchase up to $2.0 million of our common stock through September 19, 2018. Our stock repurchase program does not obligate us to acquire any specific number of shares. Under the program, shares may be repurchased in privately negotiated or open market transactions, including under plans complying with Rule 10b5-1 under the Securities Exchange Act of 1934, as amended. As of September 19, 2018, we had repurchased a total of 565,629 shares for an aggregate purchase price of $1.1 million under this stock repurchase program, after which this stock repurchase program expired. We currently maintain all repurchased shares under these stock repurchase programs as treasury stock.

8. Income Taxes

We and our subsidiaries file U.S. Federal income tax returns and income tax returns in various state, local and foreign jurisdictions.

Our quarterly tax provision, and our quarterly estimate of our annual effective tax rate, is subject to significant variation due to several factors, including the variability in accurately predicting our pre-tax and taxable income and the mix of jurisdictions to which they relate, changes in how we do business, changes in our stock price, tax law developments (including changes in statues, regulations, case law, and administrative practices), and relative changes of expenses or losses for which tax benefits are not recognized. Additionally, our effective tax rate can be more or less volatile based on the amount if pre-tax income or loss. For example, the impact of discrete items and non-deductible expenses on our effective tax rate is greater when our pre-tax income is lower.

For 2018, the anticipated effective income tax rate is expected to continue to differ from the Federal statutory rate of 21% primarily because of the release of valuation allowance related to net operating loss carryfowards expected to be used to offset taxable income in the period and certain discrete items.

We consider both positive and negative evidence when evaluating the recoverability of our deferred tax assets ("DTAs"). The assessment is required to determine whether based on all available evidence, it is more likely than not (i.e. greater than a 50% probability) that all or some portion of the DTAs will be realized in the future. As of September 30, 2018 management has concluded a full valuation allowance of the DTAs is necessary because of sufficient uncertainty in our ability to realize the benefit associated with such DTAs in the future.

9. Operating Segments

Our operations are divided into two operating segments—“Technology Development” and “Products and Licensing”. The Technology Development segment provides applied research to customers in our areas of focus. Our engineers and scientists collaborate with our network of government, academic and industry experts to identify technologies and ideas with promising market potential. We then compete to win fee-for-service contracts from government agencies and industrial customers who seek innovative solutions to practical problems that require new technology. The Technology Development segment derives its revenues primarily from services.

The Products and Licensing segment derives its revenues from product sales, funded product development and technology licenses.

Through September 30, 2018, our Chief Executive Officer and his direct reports collectively represented our chief operating decision makers, and they evaluated segment performance based primarily on revenues and operating income or loss. The accounting policies of our segments are the same as those described in the summary of significant accounting policies (see Note 1 to our Financial Statements, “Organization and Summary of Significant Accounting Policies,” presented in our Annual Report on Form 10-K as filed with the SEC on March 21, 2018).

The table below presents revenues and operating income/(loss) for reportable segments:

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	Three Months Ended September 30,		Nine Months Ended September 30,	
	2018 (unaudited)	2017	2018 (unaudited)	2017
Revenues:				
Technology development	$4,590,054	$5,315,861	$13,428,428	$15,418,919
Products and licensing	3,712,657	5,371,165	9,791,213	13,960,003
Total revenues	$10,687,026	$8,302,711	$29,378,922	$23,219,641
Technology development operating income/(loss)	$340,852	$182,776	$864,540	$(77,323)
Products and licensing operating income/(loss)	240,645	(335,501)	(410,477)	(1,687,127)
Total operating income/(loss)	$581,497	$(152,725)	$454,063	$(1,764,450)
Depreciation, technology development	$95,673	$87,389	$283,550	$267,282
Depreciation, products and licensing	$42,559	$117,219	$127,796	$688,700
Amortization, technology development	$43,708	$28,935	$121,770	$95,540
Amortization, products and licensing	$56,062	$247,522	$178,028	$1,178,113

Products and licensing depreciation includes amounts from discontinued operations of $0.6 million for the nine months ended September 30, 2017. Products and licensing amortization includes amounts from discontinued operations of $1.0 million for the nine months ended September 30, 2017.

The table below presents assets for reportable segments:

	September 30, 2018 (unaudited)	December 31, 2017
Total segment assets:		
Technology development	$42,536,930	$32,011,084
Products and licensing	31,257,649	34,211,552
Total assets	$73,794,579	$66,222,636
Property plant and equipment, and intangible assets, technology development	$2,194,466	$1,762,561
Property plant and equipment, and intangible assets, products and licensing	$2,192,948	$2,819,470

The U.S. government accounted for 58% and 45% of total consolidated revenues for the three months ended September 30, 2018 and 2017, respectively and for 57% and 45% of total consolidated revenues for the nine months ended September 30, 2018 and 2017, respectively.

International revenues (customers outside the United States) accounted for 20% and 19% of total consolidated revenues for the three months ended September 30, 2018 and 2017, respectively, and 20% of the total consolidated revenues for each of the nine months ended September 30, 2018 and 2017. No single country, outside of the United States, represented more than 10% of total revenues in the three and nine months ended September 30, 2018 and 2017.

10. Contingencies and Guarantees

We are from time to time involved in certain legal proceedings in the ordinary course of conducting our business. While the ultimate liability pursuant to these actions cannot currently be determined, we believe it is not reasonably possible that these legal proceedings will have a material adverse effect on our financial position or results of operations.

In March 2018, we received a notice of claim (the "Claim") from Macom Technology Solutions, Inc. ("Macom"), who acquired our HSOR business in August 2017 pursuant to an asset purchase agreement. Under the asset purchase agreement, we agreed to indemnify Macom for certain matters, including, among other things, the collection of accounts receivable from certain major customers, and placed $4.0 million of the purchase price into an escrow account for the potential settlement of any valid indemnity claims. The notice of claim received from Macom totaled

$2.0 million under various indemnity

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provisions. We have disputed Macom's assertion of right to payment for the matters described in the Claim. It is uncertain what amount, if any, will be owed in settlement of the Claim.

On July 31, 2018, we sold the assets associated with our Opto components business to an unaffiliated third party. The asset purchase agreement provides for additional consideration of up to $1.0 million contingent upon the achievement of a specified revenue level by the sold business during the 18 months following the sale. In addition, the asset purchase agreement provides for a potential adjustment to the consideration paid, either positive or negative, to the extent that working capital transferred to the buyer is greater or less than a specified target amount. There have been no amounts recorded in reference to the above matter in the financial statements as of September 30, 2018. It is uncertain what amount, if any, will be received or paid with respect to each of these potential adjustments.

We executed a non-cancelable purchase order totaling $0.5 million in the fourth quarter of 2017 and a non-cancelable purchase order totaling $1.1 million in the first quarter of 2018 for multiple shipments of tunable lasers to be delivered over an 18-month period. At September 30, 2018, approximately $0.4 million of these commitments remained and is expected to be delivered by July 30, 2019.

We have entered into indemnification agreements with our officers and directors, to the extent permitted by law, pursuant to which we have agreed to reimburse the officers and directors for legal expenses in the event of litigation and regulatory matters. The terms of these indemnification agreements provide for no limitation to the maximum potential future payments. We have a directors and officers insurance policy that may, in certain instances, mitigate the potential liability and payments.

11. Subsequent Event

On October 15, 2018, we acquired substantially all of the assets, other than cash, as well as specified liabilities of Micron Optics, Inc. ("Micron"), a leading provider of innovative optical components and laser-based measurement technology, whose sensing and measurement solutions are deployed in multiple industries, for total cash consideration of $5.0 million, including $4.0 million paid at closing and $1.0 million placed in escrow until the later of October 1, 2019 or the date that specified matters are resolved as agreed by us and Micron. The purchase price is subject to positive or negative adjustment based upon the final determination of working capital of Micron compared to a target working capital amount specified in the asset purchase agreement. Due to the timing of the acquisition, the initial accounting has not been finalized as we were drafting Micron's opening balance sheet and related preliminary purchase price allocation as of the date the financial statements were available for issuance.

ITEM 2. MANAGEMENT’S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

CAUTIONARY NOTE REGARDING FORWARD LOOKING STATEMENTS

This Quarterly Report on Form 10-Q, including the sections entitled “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and “Quantitative and Qualitative Disclosures About Market Risk” under Items 2 and 3, respectively, of Part I of this report, and the section entitled “Risk Factors” under Item 1A of Part II of this report, may contain forward-looking statements within the meaning of Section 21E of the Securities Exchange Act of 1934, as amended, and Section 27A of the Securities Act of 1933, as amended. All statements other than statements of historical fact are “forward-looking statements” for purposes of these statutes, including those relating to future events or our future financial performance. In some cases, you can identify these forward looking statements by words such as “intends,” “will,” “plans,” “anticipates,” “expects,” “may,” “might,” “estimates,” “believes,” “should,” “projects “potential” or “continue,” or the negative of those words and other comparable words, and other words or terms of similar meaning in connection with any discussion of future operating or financial performance. Similarly, statements that describe our business strategy, goals, prospects, opportunities, outlook, objectives, plans or intentions are also forward-looking statements. These statements are only predictions and may relate to, but are not limited to, expectations of future operating results or financial performance, capital expenditures, introduction of new products, regulatory compliance and plans for growth and future operations, as well as assumptions relating to the foregoing.

These statements are based on current expectations and assumptions regarding future events and business performance and involve known and unknown risks, uncertainties and other factors that may cause actual events or results to be materially different from any future events or results expressed or implied by these statements. These factors include those set forth in the

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following discussion and within Item 1A “Risk Factors” of this Quarterly Report on Form 10-Q and elsewhere within this report.

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and the related notes to those statements included elsewhere in this report. In addition to historical financial information, the following discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. Our actual results and timing of selected events may differ materially from those anticipated in these forward-looking statements as a result of many factors, including those discussed under “Risk Factors” and elsewhere in this report.

Overview of Our Business

We are a leader in advanced optical technology, providing unique capabilities in high performance fiber optic test products for the telecommunications industry and distributed fiber optic sensing for the aerospace and automotive industries. Our distributed fiber optic sensing products provide critical stress, strain and temperature information to designers and manufacturers working with advanced materials. Prior to the sale of our optoelectronics business in July 2018, we also developed and manufactured custom optoelectronic products for various applications such as metrology, missile guidance, flame monitoring, and temperature sensing. In addition, we provide applied research services, typically under research programs funded by the U.S. government, in areas of advanced materials, sensing, and healthcare applications. Our business model is designed to accelerate the process of bringing new and innovative products to market. We use our in-house technical expertise across a range of technologies to perform applied research services for companies and for government funded projects. We continue to invest in product development and commercialization, which we anticipate will lead to increased product sales growth.

We are organized into two main business segments, the Products and Licensing segment and the Technology Development segment. Our Products and Licensing segment develops, manufactures and markets fiber optic sensing products, as well as test and measurement products, and also conducts applied research in the fiber optic sensing area for both corporate and government customers. Our Products and Licensing segment revenues represented 50% and 45% of our total revenues for the three months ended September 30, 2018 and 2017, respectively, and 48% and 42% of our total revenues for the nine months ended September 30, 2018 and 2017, respectively. The approximate value of our Products and Licensing segment backlog was $1.8 million at September 30, 2018 and $6.9 million at December 31, 2017. The backlog at September 30, 2018 is expected to be recognized as revenue in the future as follows:

	2018	2019	2020	2021	2022 and beyond	Total
Products and Licensing	$1,547,440	$151,681	$62,324	$23,126	$64,869	$1,849,440

The Technology Development segment performs applied research principally in the areas of sensing and instrumentation, advanced materials and health sciences. This segment comprised 50% and 55% of our total revenues for the three months ended September 30, 2018 and 2017, respectively, and 52% and 58% of our total revenues for the nine months ended September 30, 2018 and 2017, respectively. Most of the government funding for our Technology Development segment is derived from the Small Business Innovation Research ("SBIR") program coordinated by the U.S. Small Business Administration ("SBA"). The Technology Development segment revenues have historically accounted for a large portion of our total revenues, and we expect that they will continue to represent a significant portion of our total revenues for the foreseeable future. The Technology Development segment revenues were $5.3 million and $4.6 million for the three months ended September 30, 2018 and 2017, respectively, and $15.4 million and $13.4 million for the nine months ended September 30, 2018 and 2017. Within the Technology Development segment, we have historically had a backlog of contracts for which work has been scheduled, but for which a specified portion of work has not yet been completed. We define backlog as the dollar amount of obligations payable to us under negotiated contracts upon completion of a specified portion of work that has not yet been completed, exclusive of revenues previously recognized for work already performed under these contracts, if any. Total backlog includes

funded backlog, which is the amount for which money has been directly authorized by the U.S. government and for which a purchase order has been received by a commercial customer, and unfunded backlog, representing firm orders for which funding has not yet been appropriated. Indefinite delivery and quantity contracts and unexercised options are not reported in total backlog. The approximate value of our Technology Development segment backlog was $28.8 million at September 30, 2018 and $23.5 million at December 31, 2017. The backlog at September 30, 2018 is expected to be recognized as revenue in the future as follows:

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Technology Development	2018	2019	2020	2021	2022 and beyond	Total
Funded	$6,582,679	$13,238,423	$3,745,951	$99,658	$754	$23,667,465
Unfunded	$720,238	$2,286,629	$1,371,922	$500,921	$250,460	$5,130,170

Revenues from product sales are mostly derived from the sales of our, sensing and test and measurement products that make use of light-transmitting optical fibers, or fiber optics. We continue to invest in product development and commercialization, which we anticipate will lead to increased product sales growth. Prior to the sale of our optoelectronics business in July 2018, revenues from product sales also included custom optoelectronic components and sub-assemblies sold to scientific instrumentation manufacturers. Although we have been successful in licensing certain technology in past years, we do not expect license revenues to represent a significant portion of future revenues. Over time, however, we do intend to gradually increase such revenues. In the near term, we expect revenues from product to continue to be primarily in areas associated with our fiber optic-based test and measurement and sensing platforms. In the long term, we expect that revenues from product sales will represent a larger portion of our total revenues and that as we develop and commercialize new products, these revenues will reflect a broader and more diversified mix of products.

On October 15, 2018, we acquired substantially all of the assets, other than cash, as well as specified liabilities of Micron Optics, Inc. ("Micron"), a leading provider of innovative optical components and laser-based measurement technology, whose sensing and measurement solutions are deployed in multiple industries, for total cash consideration of $5.0 million, including $4.0 million paid at closing and $1.0 million placed in escrow until the later of October 1, 2019 or the date that specified matters are resolved as agreed by us and Micron. The purchase price is subject to positive or negative adjustment based upon the final determination of working capital of Micron compared to a target working capital amount specified in the asset purchase agreement. We may also grow our business in part through acquisitions of additional companies and complementary technologies, which could cause us to incur transaction expenses, amortization or write-offs of intangible assets and other acquisition-related expenses.

Description of Revenues, Costs and Expenses

Revenues

We generate revenues from technology development, product sales and commercial product development and licensing activities. We derive Technology Development segment revenues from providing research and development services to third parties, including government entities, academic institutions and corporations, and from achieving milestones established by some of these contracts and in collaboration agreements. In general, we complete contracted research over periods ranging from six months to three years, and recognize these revenues over the life of the contract as costs are incurred. The Technology Development segment revenues represented 50% and 55% of total revenues for the three months ended September 30, 2018 and 2017, respectively and 52% and 58% of our total revenues for the nine months ended September 30, 2018 and 2017, respectively.

The Products and Licensing segment revenues reflect amounts that we receive from sales of our products or development of products for third parties and, to a lesser extent, fees paid to us in connection with licenses or sub-licenses of certain patents and other intellectual property, and represented 50% and 45% of our total revenues for the three months ended September 30, 2018 and 2017, respectively, and 48% and 42% of our total revenues for nine months ended September 30, 2018 and 2017, respectively.

Cost of Revenues

Cost of revenues associated with our Technology Development segment revenues consists of costs associated with performing the related research activities including direct labor, amounts paid to subcontractors and overhead allocated to Technology Development segment activities.

Cost of revenues associated with our Products and Licensing segment revenues consists of license fees for use of certain technologies, product manufacturing costs including all direct material and direct labor costs, amounts paid to our contract manufacturers, manufacturing, shipping and handling, provisions for product warranties, and inventory obsolescence as well as overhead allocated to each of these activities.

Operating Expense

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Operating expense consists of selling, general and administrative expenses, as well as expenses related to research, development and engineering, depreciation of fixed assets and amortization of intangible assets. These expenses also include compensation for employees in executive and operational functions including certain non-cash charges related to expenses from option grants, facilities costs, professional fees, salaries, commissions, travel expense and related benefits of personnel engaged in sales, product management and marketing activities, costs of marketing programs and promotional materials, salaries, bonuses and related benefits of personnel engaged in our own research and development beyond the scope and activities of our Technology Development segment, product development activities not provided under contracts with third parties, and overhead costs related to these activities.

Investment Income

Investment income consists of amounts earned on our cash equivalents. We sweep on a daily basis a portion of our cash on hand into a fund invested in U.S. government obligations.

Interest Expense

Interest expense is composed of interest paid under our term loans as well as interest accrued on our capital lease obligations.

Critical Accounting Policies and Estimates

Our discussion and analysis of our financial condition and results of operations are based on our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires us to make estimates, assumptions and judgments that affect the amounts reported in our financial statements and the accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. Actual results may differ from these estimates under different assumptions or judgments.

Our critical accounting policies are described in the Management’s Discussion and Analysis section and the notes to our audited consolidated financial statements previously included in our Annual Report on Form 10-K for the year ended December 31, 2017, as filed with the Securities and Exchange Commission ("SEC") on March 21, 2018. Changes to our critical accounting estimates as a result of adopting Topic 606 are discussed in Note 1 of our unaudited consolidated financial statements included in this Quarterly Report on Form 10-Q. Changes to our accounting estimates as a result of Topic 606 did not have a significant impact to the financial statements.

Results of Operations

Three Months Ended September 30, 2018 Compared to Three Months Ended September 30, 2017

Revenues

	Three Months Ended September 30,				
	2018	2017	$ Difference	% Difference	
Revenues:					
Technology development	$5,315,861	$4,590,054	$725,807	16	%
Products and licensing	5,371,165	3,712,657	1,658,508	45	%
Total revenues	$10,687,026	$8,302,711	$2,384,315	29	%

Revenues from our Technology Development segment for the three months ended September 30, 2018, increased $0.7 million, or 16%, to $5.3 million compared to $4.6 million for the three months ended September 30, 2017. The increase in Technology Development segment revenues continues a growth trend experienced over the past two years largely driven by successes in Phase 2 SBIR awards. The increase for the three months ended September 30, 2018, compared to the three months ended September 30, 2017, was realized primarily in our optical systems research and biomedical groups. As Phase 2 contracts generally have a performance period of a year or more, we currently expect revenues to remain at a similar level for the near term.

Our Products and Licensing segment included revenues from sales of test and measurement systems, primarily representing sales of our ODiSI, Optical Vector Analyzer, and Optical Backscatter Reflectometer platforms, optical components

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and sub-assemblies and sales of Terahertz sensing systems. Products and Licensing segment revenues for the three months ended September 30, 2018 increased $1.7 million, or 45%, to $5.4 million compared to $3.7 million for the three months ended September 30, 2017. The increase for the three months ended September 30, 2018, compared to the three months ended September 30, 2017, was realized primarily in our ODiSI products directed toward the expanding use of composite materials and the need for improved means of testing their structural integrity and our Terahertz products for industrial process control and the measurement of discrete layers in manufactured products.

Cost of Revenues and Gross Profit

	Three Months Ended September 30,				
	2018	2017	$ Difference	% Difference	
Cost of revenues:					
Technology development	$3,918,666	$3,491,840	$426,826	12	%
Products and licensing	2,079,749	1,469,961	609,788	41	%
Total cost of revenues	5,998,415	4,961,801	1,036,614	21	%
Gross profit	$4,688,611	$3,340,910	$1,347,701	40	%

The cost of Technology Development segment revenues for the three months ended September 30, 2018, increased $0.4 million, or 12%, to $3.9 million compared to $3.5 million for the three months ended September 30, 2017. The increase in cost of Technology Development segment revenues was attributable to additional headcount and the increased utilization of third-party analytical services to support the growth in our research contracts.

The cost of revenues associated with our Products and Licensing segment increased by $0.6 million, or 41%, to $2.1 million for the three months ended September 30, 2018, compared to $1.5 million for the three months ended September 30, 2017. This increase in cost of revenues resulted from an increase in sales volume. Cost of revenues increased at a lower rate than our revenues increased due to the product mix. Our overall gross margin increased to 44% for the three months ended September 30, 2018, compared to 40% for the three months ended September 30, 2017 primarily as a result of our revenue mix, with Technology Development segment sales representing a larger portion of our revenues during the three months ended September 30, 2018.

Operating Expense

	Three Months Ended September 30,				
	2018	2017	$ Difference	% Difference	
Operating expense:					
Selling, general and administrative	$3,233,485	$2,831,493	$401,992	14	%
Research, development and engineering	873,629	662,142	211,487	32	%
Total operating expense	$4,107,114	$3,493,635	$613,479	18	%

Our selling, general and administrative expense increased $0.4 million, or 14%, to $3.2 million for the three months ended September 30, 2018 compared to $2.8 million for the three months ended September 30, 2017. Selling, general and administrative expense increased primarily due to the addition of sales personnel to market our fiber optic test and measurement products.

Research, development and engineering expense increased $0.2 million, or 32%, to $0.9 million for the three months ended September 30, 2018, compared to $0.7 million for the three months ended September 30, 2017 due to increased engineering personnel and development costs associated with our fiber optic test and measurement products.

Investment Income

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Investment income was $0.2 million for the three months ended September 30, 2018. During the three months ended September 30, 2018, we invested a portion of our cash in funds holding U.S. treasury instruments. We did not have any investment income for the three months ended September 30, 2017.

Income Tax Benefit

For the three months ended September 30, 2018 and 2017, we recognized an income tax benefit from continuing operations of $0.6 million, representing an effective tax rate of (76%), and $0.4 million, representing an effective tax rate of 200%, respectively. The decrease in our effective tax rate for continuing operations in 2018 as compared to 2017 was primarily due to an increase in the intraperiod allocation of tax benefit from discontinued operations. In addition, as a result of the Tax Cuts and Jobs Act of 2017, the corporate federal statutory tax rate decreased to 21% in 2018 from 35% in 2017.

Net Income/(Loss) From Continuing Operations

During the three months ended September 30, 2018, we recognized income from continuing operations before income taxes of $0.7 million compared to a loss from continuing operations before income taxes of $0.2 million for the three months ended September 30, 2017. After tax, our net income from continuing operations was $1.3 million and $0.2 million for the three months ended September 30, 2018 and 2017, respectively.

Net Income From Discontinued Operations

For the three months ended September 30, 2018, our net income from discontinued operations of $7.6 million represented the operating results of our optoelectronic components business for the period prior to the sale of that business and the after-tax gain associated with the sale of that business in July 2018. For the three months ended September 30, 2017, our net income from discontinued operations of $15.6 million represented the operating results of our high speed optical receivers business for the period prior to the sale of that business, and the after-tax gain associated with the sale of that business in August 2017.

Nine Months Ended September 30, 2018 Compared to Nine Months Ended September 30, 2017

Revenues

	Nine Months Ended September 30,			
	2018	2017	$ Difference	% Difference
Revenues:				
Technology development	$15,418,919	$13,428,428	$1,990,491	15 %
Products and licensing	13,960,003	9,791,213	4,168,790	43 %
Total revenues	$29,378,922	$23,219,641	$6,159,281	27 %

Technology Development segment revenues increased $2.0 million, or 15%, to $15.4 million for the nine months ended September 30, 2018 compared to $13.4 million for the nine months ended September 30, 2017. The increase for the nine months ended September 30, 2018 compared to the nine months ended September 30, 2017 continues a growth trend experienced over the past two years largely driven by successes in Phase 2 SBIR awards. The increase was realized primarily in our optical systems and biomedical research groups. As Phase 2 contracts generally have a performance period of a year or more, we currently expect revenues to remain at a similar level for the near term.

Our Products and Licensing segment included revenues from sales of test and measurement systems, primarily representing sales of our ODiSI, Optical Vector Analyzer, and Optical Backscatter Reflectometer platforms, optical components and sub-assemblies and sales of Terahertz sensing systems. Products and Licensing segment revenues increased $4.2 million, or 43%, to $14.0 million for the nine months ended September 30, 2018 compared to $9.8 million for the nine months ended September 30, 2017. The increase in revenues was realized primarily in our ODiSI systems supporting the expanding use of composite materials and the need for improved means of testing their structural integrity and in sales of our Terahertz instruments.

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Cost of Revenues and Gross Profit

	Nine Months Ended September 30,			
	2018	2017	$ Difference	% Difference
Cost of revenues:				
Technology development	11,131,965	$10,045,261	$1,086,704	11 %
Products and licensing	5,381,333	3,994,044	1,387,289	35 %
Total cost of revenues	16,513,298	14,039,305	2,473,993	18 %
Gross profit	$12,865,624	$9,180,336	$3,685,288	40 %

Costs of Technology Development segment revenues increased $1.1 million, or 11%, to $11.1 million for the nine months ended September 30, 2018, compared to $10.0 million the nine months ended September 30, 2017. This increase was primarily driven by the increase in Technology Development segment revenues in addition to increased headcount and the utilization of third-party subcontractors and other analytical services to support the growth in our research contracts over the same period

Costs of Products and Licensing segment revenues increased $1.4 million, or 35%, to $5.4 million for the nine months ended September 30, 2018 compared to $4.0 million for the nine months ended September 30, 2017. This increase in cost of revenues resulted from an increase in sales volume. Our overall gross margin for the nine months ended September 30, 2018 increased to 44% compared to 40% for the nine months ended September 30, 2017 primarily as a result of our revenue mix, with technology development segment sales representing a larger portion of our revenues during the nine months ended September 30, 2018.

Operating Expense

	Nine Months Ended September 30,			
	2018	2017	$ Difference	% Difference
Operating expense:				
Selling, general and administrative	$9,898,064	$8,983,016	$915,048	10 %
Research, development and engineering	2,513,497	1,961,770	551,727	28 %
Total operating expense	$12,411,561	$10,944,786	$1,466,775	13 %

Selling, general and administrative expense increased $0.9 million, or 10%, to $9.9 million for the nine months ended September 30, 2018, compared to $9.0 million for the nine months ended September 30, 2017. The increase in selling, general and administrative expense resulted primarily from the addition of sales personnel associated with our fiber optic test and measurement products and the commission costs associated with the growth in product revenues.

Research, development and engineering expense increased $0.6 million, or 28%, to $2.5 million for the nine months ended September 30, 2018, compared to $2.0 million for the nine months ended September 30, 2017. The increase in research, development, and engineering expense resulted primarily from increased engineering personnel and development costs associated with our fiber optic test and measurement products.

Investment Income

Investment income was $0.4 million for the nine months ended September 30, 2018. During the nine months ended September 30, 2018, we invested a portion of our cash in funds holding U.S. treasury securities. We did not have any investment income for the nine months ended September 30, 2017.

Income Tax Benefit

For each of the nine months ended September 30, 2018 and 2017, we recognized an income tax benefit from continuing operations of $0.7 million, representing an effective tax rate of (98%) and 35%, respectively. The decrease in our effective tax rate for continuing operations in 2018 as compared to 2017 was primarily due to an increase in the intraperiod allocation of tax benefit from discontinued operations. In addition, as a result of the Tax Cuts and Jobs Act of 2017, the corporate federal statutory tax rate decreased to 21% in 2018 from 35% in 2017.

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Net Income/(Loss) From Continuing Operations

During the nine months ended September 30, 2018, we recognized income from continuing operations before income taxes of $0.7 million compared to a loss from continuing operations before income taxes of $1.9 million for the nine months ended September 30, 2017. After tax, our net income from continuing operations was $1.4 million for the nine months ended September 30, 2018, compared to a net loss from continuing operations of $1.3 million for the nine months ended September 30, 2017.

Net Income From Discontinued Operations

For the nine months ended September 30, 2018, our net income from discontinued operations of $8.7 million represented the operating results of our optoelectronic components business for the period prior to the sale of that business and the after-tax gain realized upon the sale of that business in July 2018. For the nine months ended September 30, 2017, our net income from discontinued operations of $15.4 million represented the operating results of our high speed optical receivers business for the period prior to the sale of that business in addition to the after-tax gain realized upon the sale of the business in August 2017.

Liquidity and Capital Resources

At September 30, 2018, our total cash and cash equivalents were $47.1 million.

We currently have a Loan and Security Agreement with Silicon Valley Bank ("SVB") under which we have two term loans with an aggregate original borrowing amount of $7.0 million. As of September 30, 2018, these term loans had an aggregate outstanding principal balance of $1.1 million. One term loan, with a balance of $0.1 million as of September 30, 2018, matures on December 1, 2018. The other term loan, with a balance of $1.0 million as of September 30, 2018, matures on May 1, 2019. The term loans bear interest at a floating rate of prime plus 2%. We may prepay amounts due under the term loans at any time, subject to prepayment penalties of up to 2% of the amount of prepayment. Amounts due under the term loans are secured by substantially all of our assets, including intellectual property, personal property and bank accounts. The term loans contain customary events of default, including nonpayment of principal, interest or other amounts, violation of covenants, material adverse change, an event of default under any subordinated debt documents, incorrectness of representations and warranties in any material respect, bankruptcy, judgments in excess of a threshold amount, and violations of other agreements in excess of a threshold amount. If any event of default occurs, SVB may declare due immediately all borrowings under the credit facility and foreclose on the collateral. Furthermore, an event of default under the credit facility would result in an increase in the interest rate on any amounts outstanding. As of September 30, 2018, we were in compliance with all covenants under the Loan and Security Agreement.

We believe that our cash balance as of September 30, 2018 will provide adequate liquidity for us to meet our working capital needs over the next twelve months. Additionally, we believe that should we have the need for increased capital spending to support our planned growth, we will be able to fund such growth through either third-party financing on competitive market terms or through our available cash.

Discussion of Cash Flows

Recent Activity

	Nine Months Ended September 30,		
	2018	2017	$ Difference
Net cash (used in)/provided by operating activities	$(3,444,408)	$581,386	$(4,025,794)
Net cash provided by investing activities	14,227,434	26,743,345	(12,515,911)
Net cash used in financing activities	(619,840)	(1,612,752)	992,912
Net increase in cash and cash equivalents	$10,163,186	$25,711,979	$(15,548,793)

During the first nine months of 2018, operations used $3.4 million of cash, as compared to the same period in 2017 in which operations provided $0.6 million of cash. During the first nine months of 2018, net cash used in operating

activities consisted of our net income of $10.1 million, which included a gain recognized on the sale of our optoelectronic components

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business of $7.6 million in addition to non-cash charges for depreciation and amortization of $0.9 million and share-based compensation of $0.3 million, offset by a net cash outflow of $7.2 million from changes in working capital. The changes in working capital included a reduction in contract liabilities of $1.9 million primarily as a result of the payment of $1.6 million in outstanding claims for excess billed amounts on government research contracts. The changes in working capital also included an increase in accounts receivable of $4.1 million, an increase in contract assets of $1.0 million, an increase in inventory of $1.0 million, all partially offset by a reduction in other current assets of $0.5 million and increase in accounts payable and accrued expenses of $0.3 million.

During the first nine months of 2017, the $0.6 million of net cash provided by operating activities consisted of our net income of $14.2 million which included a gain recognized on the sale of our high speed optical receivers business of $15.1 million in addition to non-cash charges for depreciation and amortization of $2.2 million and share-based compensation of $0.5 million. Additionally, changes in working capital resulted in a net cash outflow of $1.3 million, principally driven by a reduction in accounts receivable of $2.1 million, a reduction in other current assets of $0.5 million, an increase in accounts payable and accrued expenses of $1.6 million, and an increase in inventory of $2.3 million.

Cash provided by investing activities for the nine months ended September 30, 2018 included $14.8 million in proceeds from the sale of our optoelectronic components business, partially offset by $0.3 million of fixed asset additions and $0.3 million of capitalized intellectual property costs. Cash provided by investing activities for the nine months ended September 30, 2017 included $28.0 million in proceeds from the sale of our high speed optical receivers business partially offset by fixed asset additions of $0.9 million and capitalized intellectual property costs of $0.4 million.

Net cash used in financing activities during the nine months ended September 30, 2018 and 2017 included long term debt repayments of $1.4 million. During the nine months ended September 30, 2018 and 2017 we also repurchased $0.5 million and $0.2 million, respectively of our common stock on the open market. During the nine months ended September 30, 2018 we received proceeds from the exercise of options and warrants of $1.3 million.

Off-Balance Sheet Arrangements

We have no material off-balance sheet arrangements as defined in Regulation S-K Item 303(a)(4)(ii).

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ITEM 3. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Market risk represents the risk of loss that may impact our financial position due to adverse changes in financial market prices and rates. We do not hold or issue financial instruments for trading purposes or have any derivative financial instruments. Our exposure to market risk is limited to interest rate fluctuations due to changes in the general level of U.S. interest rates.

Interest Rate Risk

We do not use derivative financial instruments as a hedge against interest rate fluctuations, and, as a result, interest income earned on our cash and cash equivalents and short-term investments is subject to changes in interest rates. However, we believe that the impact of these fluctuations does not have a material effect on our financial position due to the immediately available liquidity or short-term nature of these financial instruments.

We are exposed to interest rate fluctuations as a result of our term loans with SVB having a variable interest rate. We do not currently use derivative instruments to alter the interest rate characteristics of our debt. For the principal amount of 1.1 million outstanding under the term loans as of September 30, 2018, a change in the interest rate by one percentage point for one year would result in a change in our annual interest expense of $6,000.

Although we believe that this measure is indicative of our sensitivity to interest rate changes, it does not adjust for potential changes in our credit quality, composition of our balance sheet and other business developments that could affect our interest rate exposure. Accordingly, no assurances can be given that actual results would not differ materially from the potential outcome simulated by this estimate.

Foreign Currency Exchange Rate Risk

As of September 30, 2018, all payments made under our research contracts have been denominated in U.S. dollars. Our product sales to foreign customers are also generally denominated in U.S. dollars, and we generally do not receive payments in foreign currency. As such, we are not directly exposed to significant currency gains or losses resulting from fluctuations in foreign exchange rates.

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ITEM 4. CONTROLS AND PROCEDURES

Evaluation of Disclosure Controls and Procedures

We maintain "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), which are controls and other procedures that are designed to provide reasonable assurance that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms. Disclosure controls and procedures also include, without limitation, controls and procedures designed to provide reasonable assurance that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, as appropriate to allow timely decisions regarding required disclosure.

Management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. In addition, the design of any system of controls also is based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions; over time, controls may become inadequate because of changes in conditions, or the degree of compliance with policies or procedures may deteriorate. Because of the inherent limitations in a control system, misstatements due to error or fraud may occur and not be detected.

Under the supervision and with the participation of our management, including our principal executive officer and our principal financial officer, we evaluated the effectiveness of the design and operation of our disclosure controls and procedures as of the end of the period covered by this Quarterly Report. Based on this evaluation, our principal executive officer and our principal financial officer have concluded that, as of September 30, 2018, our disclosure controls and procedures were effective.

Changes in Internal Control over Financial Reporting

No change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) occurred during the three months ended September 30, 2018 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

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PART II. OTHER INFORMATION

ITEM 1. LEGAL PROCEEDINGS

None.

ITEM 1A. RISK FACTORS

You should carefully consider the risks described below before deciding whether to invest in our common stock. The risks described below are not the only ones we face. Additional risks not presently known to us or that we currently believe are immaterial may also impair our business operations and financial results. If any of the following risks actually occurs, our business, financial condition or results of operations could be adversely affected. In such case, the trading price of our common stock could decline and you could lose all or part of your investment. Our filings with the SEC also contain forward-looking statements that involve risks or uncertainties. Our actual results could differ materially from those anticipated or contemplated by these forward-looking statements as a result of a number of factors, including the risks we face described below, as well as other variables that could affect our operating results. Past financial performance should not be considered to be a reliable indicator of future performance, and investors should not use historical trends to anticipate results or trends in future periods.

RISKS RELATING TO OUR BUSINESS GENERALLY

Our technology is subject to a license from Intuitive Surgical, Inc., which is revocable in certain circumstances. Without this license, we cannot continue to market, manufacture or sell our fiber-optic products.

As a part of the sale of certain assets to Intuitive Surgical, Inc. ("Intuitive") in 2014, we entered into a license agreement with Intuitive pursuant to which we received rights to use all of our transferred technology outside the field of medicine and in respect of our existing non-shape sensing products in certain non-robotic medical fields. This license back to us is revocable if after notice and certain time periods, we were to (i) challenge the validity or enforceability of the transferred patents and patent applications, (ii) commercialize our fiber optical shape sensing and localization technology in the field of medicine (except to perform on a development and supply project for Hansen Medical, Inc.), (iii) violate our obligations related to our ability to sublicense in the field of medicine or (iv) violate our confidentiality obligations in a manner that advantages a competitor in the field of medicine and not cure such violation. Maintaining this license is necessary for us to conduct our fiber-optic products business, both for our telecom products and our ODiSI sensing products. If this license were to be revoked by Intuitive, we would no longer be able to market, manufacture or sell these products which could have a material adverse effect on our operations.

We depend on third-party vendors for specialized components in our manufacturing operations, making us vulnerable to supply shortages and price fluctuations that could harm our business.

We primarily rely on third-party vendors for the manufacture of the specialized components used in our products. The highly specialized nature of our supply requirements poses risks that we may not be able to locate additional sources of the specialized components required in our business. For example, there are few manufacturers who produce the special lasers used in our optical test equipment. Our reliance on these vendors subjects us to a number of risks that could negatively affect our ability to manufacture our products and harm our business, including interruption of supply. Although we are now manufacturing tunable lasers in low-rate initial production, we expect our overall reliance on third-party vendors to continue. Any significant delay or interruption in the supply of components, or our inability to obtain substitute components or materials from alternate sources at acceptable prices and in a timely manner could impair our ability to meet the demand of our customers and could harm our business.

We depend upon outside contract manufacturers for a portion of the manufacturing process for some of our products. Our operations and revenue related to these products could be adversely affected if we encounter problems with these contract manufacturers.

Many of our products are manufactured internally. However, we also rely upon contract manufacturers to produce the finished portion of certain lasers. Our reliance on contract manufacturers for these products makes us vulnerable to possible

capacity constraints and reduced control over delivery schedules, manufacturing yields, manufacturing quality control and costs. If the contract manufacturer for our products were unable or unwilling to manufacture our products in required volumes and at high quality levels or to continue our existing supply arrangement, we would have to identify, qualify and select an acceptable alternative contract manufacturer or move these manufacturing operations to internal manufacturing facilities. An alternative contract manufacturer may not be available to us when needed or may not be in a position to satisfy our quality or production requirements on commercially reasonable terms, including price. Any significant interruption in manufacturing our products would require us to reduce the supply of products to our customers, which in turn would reduce our revenue, harm our relationships with the customers of these products and cause us to forego potential revenue opportunities.

As a provider of contract research to the U.S. government, we are subject to federal rules, regulations, audits and investigations, the violation or failure of which could adversely affect our business.

We must comply with and are affected by laws and regulations relating to the award, administration and performance of U.S. government contracts. Government contract laws and regulations affect how we do business with our government customers and, in some instances, impose added costs on our business. A violation of a specific law or regulation could result in the imposition of fines and penalties, termination of our contracts or debarment from bidding on contracts. In some instances, these laws and regulations impose terms or rights that are more favorable to the government than those typically available to commercial parties in negotiated transactions. For example, the U.S. government may terminate any of our government contracts and, in general, subcontracts, at their convenience, as well as for default based on performance.

In addition, U.S. government agencies, including the Defense Contract Audit Agency and the Department of Labor, routinely audit and investigate government contractors. These agencies review a contractor’s performance under its contracts, cost structure and compliance with applicable laws, regulations and standards. The U.S. government also may review the adequacy of, and a contractor’s compliance with, its internal control systems and policies, including the contractor’s purchasing, property, estimating, compensation and management information systems. Any costs found to be improperly allocated to a specific contract will not be reimbursed, while such costs already reimbursed must be refunded. If an audit uncovers the inclusion of certain claimed costs deemed to be expressly unallowable, or improper or illegal activities, we may be subject to civil and criminal penalties and administrative sanctions, including termination of contracts, forfeiture of profits, suspension of payments, fines and suspension or prohibition from doing business with the U.S. government. In addition, our reputation could suffer serious harm if allegations of impropriety were made against us.

In addition to the risk of government audits and investigations, U.S. government contracts and grants impose requirements on contractors and grantees relating to ethics and business practices, which carry civil and criminal penalties including monetary fines, assessments, loss of the ability to do business with the U.S. government and certain other criminal penalties.

We may also be prohibited from commercially selling certain products that we develop under our Technology Development segment or related products based on the same core technologies if the U.S. government determines that the commercial availability of those products could pose a risk to national security. For example, certain of our wireless technologies have been classified as secret by the U.S. government and as a result we cannot sell them commercially. Any of these determinations would limit our ability to generate product sales and license revenues.

We rely and will continue to rely on contracts and grants awarded under the SBIR program for a significant portion of our revenues. A finding by the SBA that we no longer qualify to receive SBIR awards could adversely affect our business.

We compete as a small business for some of our government contracts. Our revenues derived from the SBIR program account for a significant portion of our consolidated total revenues, and contract research, including SBIR contracts, will remain a significant portion of our consolidated total revenues for the foreseeable future. For the nine months ended September 30, 2018 and 2017, revenues generated under the SBIR program represented 37% and 32%, respectively, of our total revenues.

We may not continue to qualify to participate in the SBIR program or to receive new SBIR awards from federal agencies. In order to qualify for SBIR contracts and grants, we must meet certain size and ownership eligibility

criteria. These eligibility criteria are applied as of the time of the award of a contract or grant. A company can be declared ineligible for a contract award as a result of a size challenge filed with the SBA by a competitor or a federal agency.

In order to be eligible for SBIR contracts and grants, under current SBA rules we must be more than 50% owned and controlled by individuals who are U.S. citizens or permanent resident aliens, and/or other small business concerns (each of which is more than 50% owned and controlled by individuals who are U.S. citizens or permanent resident aliens) or certain qualified investment companies. In the event our institutional ownership significantly increases, either because of increased buying by institutions or selling by individuals, we could lose eligibility for new SBIR contracts and grants.

Also, in order to be eligible for SBIR contracts and grants, the number of our employees, including those of any entities that are considered to be affiliated with us, cannot exceed 500. As of September 30, 2018, we had approximately 166 full-time employees. In determining whether we are affiliated with any other entity, the SBA may analyze whether another entity controls or has the power to control us. Carilion Clinic is our largest institutional stockholder. Since early 2011, a formal size determination by the SBA that focused on whether or not Carilion is or was our affiliate has been outstanding. Although we do not believe that Carilion has or had the power to control our company, we cannot assure you that the SBA will interpret its regulations in our favor on this question. If the SBA were to make a determination that we are or were affiliated with Carilion, we would exceed the size limitations, as Carilion has over 500 employees. In that case, we would lose eligibility for new SBIR contracts and grants and other awards that are set aside for small businesses based on the criterion of number of employees, and the relevant government agency would have the discretion to suspend performance on existing SBIR grants. The loss of our eligibility to receive SBIR awards would have a material adverse impact on our revenues, cash flows and our ability to fund our growth.

Moreover, as our business grows, it is foreseeable that we will eventually exceed the SBIR size limitations, in which case we may be required to seek alternative sources of revenues or capital.

A decline in government research contract awards or government funding for existing or future government research contracts, including SBIR contracts, could adversely affect our revenues, cash flows and ability to fund our growth.

Technology Development segment revenues, which consist primarily of government-funded research, accounted for 52% and 58% of our consolidated total revenues for the nine months ended September 30, 2018 and 2017, respectively. As a result, we are vulnerable to adverse changes in our revenues and cash flows if a significant number of our research contracts and subcontracts were to be simultaneously delayed or canceled for budgetary, performance or other reasons. For example, the U.S. government may cancel these contracts at any time without cause and without penalty or may change its requirements, programs or contract budget, any of which could reduce our revenues and cash flows from U.S. government research contracts. Our revenues and cash flows from U.S. government research contracts and subcontracts could also be reduced by declines or other changes in U.S. defense, homeland security and other federal agency budgets. In addition, we compete as a small business for some of these contracts, and in order to maintain our eligibility to compete as a small business, we, together with any affiliates, must continue to meet size and revenue limitations established by the U.S. government.

Our contract research customer base includes government agencies, corporations and academic institutions. Our customers are not obligated to extend their agreements with us and may elect not to do so. Also, our customers' priorities regarding funding for certain projects may change and funding resources may no longer be available at previous levels.

In addition to contract cancellations and changes in agency budgets, our future financial results may be adversely affected by curtailment of or restrictions on the U.S. government's use of contract research providers, including curtailment due to government budget reductions and related fiscal matters or any legislation or resolution limiting the number or amount of awards we may receive. These or other factors could cause U.S. defense and other federal agencies to conduct research internally rather than through commercial research organizations or direct awards to other organizations, to reduce their overall contract research requirements or to exercise their rights to terminate contracts. Alternatively, the U.S. government may discontinue the SBIR program or its funding altogether. Also, SBIR regulations permit increased competition for SBIR awards from companies that may not have previously been eligible, such as those backed by venture capital operating companies, hedge funds and private equity firms. Any of these developments could limit our ability to obtain new contract awards and adversely affect our revenues, cash flows and ability to fund our growth.

Our failure to attract, train and retain skilled employees or members of our senior management and to obtain necessary security clearances for such persons or maintain a facility security clearance would adversely affect our business and operating results.

The availability of highly trained and skilled technical and professional personnel is critical to our future growth and profitability. Competition for scientists, engineers, technicians and professional personnel is intense and our competitors aggressively recruit key employees. In the past, we have experienced difficulties in recruiting and hiring

these personnel as a result of the tight labor market in certain fields. Any difficulty in hiring or retaining qualified employees, combined with our growth strategy and future needs for additional experienced personnel, particularly in highly specialized areas such as nanomaterial manufacturing and fiber optic sensing technologies, may make it more difficult to meet all of our needs for these employees in a timely manner. Although we intend to continue to devote significant resources to recruit, train and retain qualified employees, we may not be able to attract and retain these employees, especially in technical fields in which the supply of experienced qualified candidates is limited, or at the senior management level. Any failure to do so would have an adverse effect on our business. Any loss of key personnel could have a material adverse effect on our ability to meet key operational

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objectives, such as timely and effective project milestones and product introductions, which in turn could adversely affect our business, results of operations and financial condition.

We provide certain services to the U.S. government that require us to maintain a facility security clearance and for certain of our employees and our board chairman to hold security clearances. In general, the failure for necessary persons to obtain or retain sufficient security clearances, any loss by us of a facility security clearance or any public reprimand related to security matters could result in a U.S. government customer terminating an existing contract or choosing not to renew a contract or prevent us from bidding on or winning certain new government contracts.

In addition, our future success depends in a large part upon the continued service of key members of our senior management team. We do not maintain any key-person life insurance policies on our officers. The loss of any members of our management team or other key personnel could seriously harm our business.

Our business is subject to the cyclical nature of the markets in which we compete and any future downturn may reduce demand for our products and revenue.

Many factors beyond our control affect our business, including consumer confidence in the economy, interest rates, fuel prices and the general availability of credit. The overall economic climate and changes in Gross National Product growth have a direct impact on some of our customers and the demand for our products. We cannot be sure that our business will not be adversely affected as a result of an industry or general economic downturn.

Our customers may reduce capital expenditures and have difficulty satisfying liquidity needs because of continued turbulence in the U.S. and global economies, resulting in reduced sales of our products and harm to our financial condition and results of operations.

In particular, our historical results of operations have been subject to substantial fluctuations, and we may experience substantial period-to-period fluctuations in future results of operations. Any future downturn in the markets in which we compete could significantly reduce the demand for our products and therefore may result in a significant reduction in revenue or increase the volatility of the price of our common stock. Our revenue and results of operations may be adversely affected in the future due to changes in demand from customers or cyclical changes in the markets utilizing our products.

In addition, the telecommunications industry has, from time to time, experienced, and may again experience, a pronounced downturn. To respond to a downturn, many service providers may slow their capital expenditures, cancel or delay new developments, reduce their workforces and inventories and take a cautious approach to acquiring new equipment and technologies from original equipment manufacturers, which would have a negative impact on our business. Weakness in the global economy or a future downturn in the telecommunications industry may cause our results of operations to fluctuate from quarter-to-quarter and year-to-year, harm our business, and may increase the volatility of the price of our common stock.

Customer acceptance of our products is dependent on our ability to meet changing requirements, and any decrease in acceptance could adversely affect our revenue.

Customer acceptance of our products is significantly dependent on our ability to offer products that meet the changing requirements of our customers, including telecommunication, military, medical and industrial corporations, as well as government agencies. Any decrease in the level of customer acceptance of our products could harm our business.

Our products must meet exacting specifications, and defects and failures may occur, which may cause customers to return or stop buying our products.

Our customers generally establish demanding specifications for quality, performance and reliability that our products must meet. However, our products are highly complex and may contain defects and failures when they are first introduced or as new versions are released. Our products are also subject to rough environments as they are integrated into our customer products for use by the end customers. If defects and failures occur in our products, we could experience lost revenue, increased costs, including warranty expense and costs associated with customer support, delays in or cancellations or rescheduling of orders or shipments, product returns or discounts, diversion of management resources or damage to our reputation and brand equity, and in some cases consequential damages, any of which would harm our operating results. In addition, delays in our ability to fill product orders as a result of quality control issues may negatively impact our relationship with our customers. We cannot assure you that we will have sufficient resources, including any available insurance, to satisfy any asserted claims.

Rapidly changing standards and regulations could make our products obsolete, which would cause our revenue and results of operations to suffer.

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We design products to conform to our customers' requirements and our customers' systems may be subject to regulations established by governments or industry standards bodies worldwide. Because some of our products are designed to conform to current specific industry standards, if competing or new standards emerge that are preferred by our customers, we would have to make significant expenditures to develop new products. If our customers adopt new or competing industry standards with which our products are not compatible, or the industry groups adopt standards or governments issue regulations with which our products are not compatible, our existing products would become less desirable to our customers and our revenue and results of operations would suffer.

The markets for many of our products are characterized by changing technology which could cause obsolescence of our products, and we may incur substantial costs in delivering new products.

The markets for many of our products are characterized by changing technology, new product introductions and product enhancements, and evolving industry standards. The introduction or enhancement of products embodying new technology or the emergence of new industry standards could render existing products obsolete, and result in a write down to the value of our inventory, or result in shortened product life cycles. Accordingly, our ability to compete is in part dependent on our ability to continually offer enhanced and improved products.

The success of our new product offerings will depend upon several factors, including our ability to:

- accurately anticipate customer needs;
- innovate and develop new technologies and applications;
- successfully commercialize new technologies in a timely manner;
- price products competitively and manufacture and deliver products in sufficient volumes and on time; and
- differentiate our product offerings from those of our competitors.

Our inability to find new customers or retain existing customers could harm our business.

Our business is reliant on our ability to find new customers and retain existing customers. In particular, customers normally purchase certain of our products and incorporate them into products that they, in turn, sell in their own markets on an ongoing basis. As a result, the historical sales or these products have been dependent upon the success of our customers' products and our future performance is dependent upon our success in finding new customers and receiving new orders from existing customers.

In several markets, the quality and reliability of our products are a major concern for our customers, not only upon the initial manufacture of the product, but for the life of the product. Many of our products are used in remote locations for higher value assembly, making servicing of our products unfeasible. Any failure of the quality or reliability of our products could harm our business.

If our customers do not qualify our products or if their customers do not qualify their products, our results of operations may suffer.

Most of our customers do not purchase our products prior to qualification of the products and satisfactory completion of factory audits and vendor evaluation. Our existing products, as well as each new product, must pass through varying levels of qualification with our customers. In addition, because of the rapid technological changes in some markets, a customer may cancel or modify a design project before we begin large-scale manufacturing and receiving revenues from the customer. It is difficult to predict with any certainty whether our customers will delay or terminate product qualification or the frequency with which customers will cancel or modify their projects. Any such delay, cancellation or modification could have a negative effect on our results of operations.

In addition, once a customer qualifies a particular supplier's product or component, these potential customers design the product into their system, which is known as a design-in win. Suppliers whose products or components are not designed in are unlikely to make sales to that customer until at least the adoption of a future redesigned system. Even then, many customers may be reluctant to incorporate entirely new products into their new systems, as doing so could involve significant additional redesign efforts and increased costs. If we fail to achieve design-in wins in potential customers' qualification processes, we will likely lose the opportunity for significant sales to those customers for a lengthy period of time.

If the end user customers that purchase systems from our customers fail to qualify or delay qualifications of any products sold by our customers that contain our products, our business could be harmed. The qualification and field testing of our customers' systems by end user customers is long and unpredictable. This process is not under our control or that of our customers and, as a result, the timing of our sales may be unpredictable. Any unanticipated delay in qualification of one of our

customers' products could result in the delay or cancellation of orders from our customers for products included in their equipment, which could harm our results of operations.

Customer demand for our products is difficult to accurately forecast and, as a result, we may be unable to optimally match production with customer demand, which could adversely affect our business and financial results.

We make planning and spending decisions, including determining the levels of business that we will seek and accept, production schedules, inventory levels, component procurement commitments, personnel needs and other resource requirements, based on our estimates of customer requirements. The short-term nature of commitments by many of our customers and the possibility of unexpected changes in demand for their products reduce our ability to accurately estimate future customer requirements. On occasion, customers may require rapid increases in production, which can strain our resources, cause our manufacturing to be negatively impacted by materials shortages, necessitate higher or more restrictive procurement commitments, increase our manufacturing yield loss and scrapping of excess materials, and reduce our gross margin. We may not have sufficient capacity at any given time to meet the volume demands of our customers, or one or more of our suppliers may not have sufficient capacity at any given time to meet our volume demands. Conversely, a downturn in the markets in which our customers compete can cause, and in the past have caused, our customers to significantly reduce or delay the amount of products ordered or to cancel existing orders, leading to lower utilization of our facilities. Because many of our costs and operating expenses are relatively fixed, reduction in customer demand due to market downturns or other reasons would have a negative effect on our gross margin, operating income and cash flow.

Customer orders and forecasts are subject to cancellation or modification at any time which could result in higher manufacturing costs.

Our sales are made primarily pursuant to standard purchase orders for delivery of products. However, by industry practice, some orders may be canceled or modified at any time. When a customer cancels an order, they may responsible for all finished goods, all costs, direct and indirect, incurred by us, as well as a reasonable allowance for anticipated profits. No assurance can be given that we will receive these amounts after cancellation. Furthermore, uncertainty in customer forecasts of their demands and other factors may lead to delays and disruptions in manufacturing, which could result in delays in product shipments to customers and could adversely affect our business.

Fluctuations and changes in customer demand are common in our business. Such fluctuations, as well as quality control problems experienced in manufacturing operations, may cause delays and disruptions in our manufacturing process and overall operations and reduce output capacity. As a result, product shipments could be delayed beyond the shipment schedules requested by our customers or could be canceled, which would negatively affect our sales, operating income, strategic position at customers, market share and reputation. In addition, disruptions, delays or cancellations could cause inefficient production which in turn could result in higher manufacturing costs, lower yields and potential excess and obsolete inventory or manufacturing equipment. In the past, we have experienced such delays, disruptions and cancellations.

The results of our operations could be adversely affected by economic and political conditions and the effects of these conditions on our customers' businesses and levels of business activity.

Global economic and political conditions affect our customers' businesses and the markets they serve. A severe or prolonged economic downturn or a negative or uncertain political climate could adversely affect our customers' financial conditions and the timing or levels of business activity of our customers and the industries we serve. This may reduce the demand for our products or depress pricing for our products and have a material adverse effect on our results of operations. Changes in global economic conditions could also shift demand to products or services for which we do not have competitive advantages, and this could negatively affect the amount of business we are able to obtain. In addition, if we are unable to successfully anticipate changing economic and political conditions, we may be unable to effectively plan for and respond to those changes, and our business could be negatively affected as a result.

We have a history of losses, and because our strategy for expansion may be costly to implement, we may experience losses and may not maintain profitability or positive cash flow.

We have a history of net losses, including a net loss from continuing operations during the year ended December 31, 2017. We expect to continue to incur significant expenses as we pursue our strategic initiatives, including increased

expenses for research and development, sales and marketing and manufacturing. We may also grow our business in part through acquisitions of additional companies and complementary technologies which could cause us to incur greater than anticipated transaction expenses, amortization or write-offs of intangible assets and other acquisition-related expenses. As a result, we may

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incur net losses in the future, and these losses could be substantial. At a certain level, continued net losses could impair our ability to comply with Nasdaq continued listing standards, as described further below.
Our ability to generate additional revenues and to become profitable will depend on our ability to execute our key growth initiative regarding the development, marketing and sale of sensing products, develop and commercialize innovative technologies, expand our contract research capabilities and sell the products that result from those development initiatives. We may not be able to sustain or increase our profitability on a quarterly or annual basis.

We have obtained capital by borrowing money under term loans and we might require additional capital to support and expand our business; our term loan has various loan covenants with which we must comply.
We intend to continue to make investments to support our business growth, including developing new products, enhancing our existing products, obtaining important regulatory approvals, enhancing our operating infrastructure, completing our development activities and building our commercial scale manufacturing facilities. To the extent that we are unable to become or remain profitable and to finance our activities from continuing operations, we may require additional funds to support these initiatives and to grow our business.
If we are successful in raising additional funds through issuances of equity or convertible debt securities, our existing stockholders could suffer significant dilution, including as the result of the issuance of warrants in connection with the financing, and any new equity securities we issue could have rights, preferences and privileges superior to those of our existing common stock. Furthermore, such financings may jeopardize our ability to apply for SBIR grants or qualify for SBIR contracts or grants, and our dependence on SBIR grants may restrict our ability to raise additional outside capital. If we raise additional funds through debt financings, these financings may involve significant cash payment obligations and covenants that restrict our ability to operate our business and make distributions to our stockholders.
We have term loans with Silicon Valley Bank ("SVB"), which requires us to observe certain financial and operational covenants, including maintenance of a minimum cash balance of $4.0 million, protection and registration of intellectual property rights, and certain customary negative covenants, as well as other customary events of default. If any event of default occurs SVB may declare due immediately all borrowings under our term loans and foreclose on the collateral. Furthermore, an event of default would result in an increase in the interest rate on any amounts outstanding.
If we are unable to obtain adequate financing or financing terms satisfactory to us when we require it, our ability to continue to support our business growth and to respond to business challenges could be significantly limited.
We face and will face substantial competition in several different markets that may adversely affect our results of operations.
We face and will face substantial competition from a variety of companies in several different markets. As we focus on developing marketing and selling fiber optic sensing products, we may also face substantial and entrenched competition in that market.
Many of our competitors have longer operating histories, greater name recognition, larger customer bases and significantly greater financial, sales and marketing, manufacturing, distribution, technical and other resources than we do. These competitors may be able to adapt more quickly to new or emerging technologies and changes in customer requirements. In addition, current and potential competitors have established or may establish financial or strategic relationships among themselves or with existing or potential customers or other third parties. Accordingly, new competitors or alliances among competitors could emerge and rapidly acquire significant market share. We cannot assure you that we will be able to compete successfully against current or new competitors, in which case our revenues may fail to increase or may decline.
Intense competition in our markets could result in aggressive business tactics by our competitors, including aggressively pricing their products or selling older inventory at a discount. If our current or future competitors utilize aggressive business tactics, including those described above, demand for our products could decline, we could experience delays or cancellations of customer orders, or we could be required to reduce our sales prices.
Decreases in average selling prices of our products may increase operating losses and net losses, particularly if we are not able to reduce expenses commensurately.

The market for optical components and subsystems continues to be characterized by declining average selling prices resulting from factors such as increased price competition among optical component and subsystem manufacturers, excess capacity, the introduction of new products and increased unit volumes as manufacturers continue to deploy network and storage systems. In recent years, we have observed a significant decline of average selling prices, primarily in the telecommunications market. We anticipate that average selling prices will continue to decrease in the future in response to product introductions by

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competitors or by us, or in response to other factors, including price pressures from significant customers. In order to sustain profitable operations, we must, therefore, reduce the cost of our current designs or continue to develop and introduce new products on a timely basis that incorporate features that can be sold at higher average selling prices. Failure to do so could cause our sales to decline and operating losses to increase.

Our cost reduction efforts may not keep pace with competitive pricing pressures. To remain competitive, we must continually reduce the cost of manufacturing our products through design and engineering changes. We may not be successful in redesigning our products or delivering our products to market in a timely manner. We cannot assure you that any redesign will result in sufficient cost reductions enabling us to reduce the price of our products to remain competitive or positively contribute to operating results.

Shifts in product mix may result in declines in gross profit.

Our gross profit margins vary among our product platforms, and are generally highest on our test and measurement instruments. Our overall gross profit may fluctuate from period to period as a result of a variety of factors including shifts in product mix, the introduction of new products, and decreases in average selling prices for older products. If our customers decide to buy more of our products with low gross profit margins or fewer of our products with high gross profit margins, our total gross profits could be harmed.

Risks Relating to our Operations and Business Strategy

We may dispose of or discontinue existing product lines and technology developments, which may adversely impact our future results.

On an ongoing basis, we evaluate our various product offerings and technology developments in order to determine whether any should be discontinued or, to the extent possible, divested. For example, in July 2018, we sold the assets and operations related to our optoelectronic components and subassemblies business. In addition, if we are unable to generate the amount of cash needed to fund the future operations of our business, we may be forced to sell one or more of our product lines or technology developments.

We cannot guarantee that we have correctly forecasted, or that we will correctly forecast in the future, the right product lines and technology developments to dispose or discontinue or that our decision to dispose of or discontinue various investments, products lines and technology developments is prudent if market conditions change. In addition, there are no assurances that the discontinuance of various product lines will reduce operating expenses or will not cause us to incur material charges associated with such decision. Furthermore, the discontinuance of existing product lines entails various risks, including the risk that we will not be able to find a purchaser for a product line or the purchase price obtained will not be equal to at least the book value of the net assets for the product line. Other risks include managing the expectations of, and maintaining good relations with, our historical customers who previously purchased products from a disposed or discontinued product line, which could prevent us from selling other products to them in the future. We may also incur other significant liabilities and costs associated with disposal or discontinuance of product lines, including employee severance costs and excess facilities costs.

If we cannot successfully transition our revenue mix from contract research revenues to product sales and license revenues, we may not be able to fully execute our business model or grow our business.

Our business model and future growth depend on our ability to transition to a revenue mix that contains significantly larger product sales and revenues from the provision of services or from licensing. Product sales and these revenues potentially offer greater scalability than contract research revenues. Our current plan is to increase our sales of commercial products, our licensing revenues and our provision of non-research services to customers so as to represent a larger percentage of our total revenues. If we are unable to develop and grow our product sales and revenues from the provision of services or from licensing to augment our contract research revenues, however, our ability to execute our business model or grow our business could suffer. There can be no assurance that we will be able to achieve increased revenues in this manner.

Failure to develop, introduce and sell new products or failure to develop and implement new technologies, could adversely impact our financial results.

Our success will depend on our ability to develop and introduce new products that customers choose to buy. The new products the market requires tend to be increasingly complex, incorporating more functions and operating at faster speeds than old products. If we fail to introduce new product designs or technologies in a timely manner or if

customers do not successfully

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introduce new systems or products incorporating our products , our business, financial condition and results of operations could be materially harmed.

We may not realize the anticipated benefits of our acquisition of Micron.

In October 2018, we acquired Micron. Acquisitions are inherently risky, and we may not realize the anticipated benefits of the acquisition of Micron. Specifically, we are subject to the risks that:

- we fail to successfully develop or integrate Micron's employees and historical business in order to achieve our strategic objectives; and
- our due diligence processes in connection with the acquisition fail to identify significant problems, liabilities or other shortcomings or challenges or Micron.

If we are unable to successfully integrate Micron’s business and employees, it could have an adverse effect on our future results and the market price of our common stock.

The success of our acquisition of Micron will depend, in large part, on our ability to integrate the Micron operations into our existing Lightwave division. This integration may be complex and time-consuming.

The failure to successfully integrate and manage the challenges presented by the integration process may result in our failure to achieve some or all of the anticipated benefits of the acquisition. Potential difficulties that may be encountered in the integration process include the following:

- complexities associated with managing the larger combined company with distant business locations;
- integrating personnel from the two companies;
- current and prospective employees may experience uncertainty regarding their future roles with our company, which might adversely affect our ability to retrain, recruit and motivate key personnel;
- lost sales and customers as a result of Micron's customers deciding not to do business with the combined company;
- potential unknown liabilities and unforeseen expenses associated with the acquisition; and
- performance shortfalls at one or both of the companies as a result of the diversion of management's attention caused by integrating the companies' operations.

If any of these events were to occur, the ability of the combined company to maintain relationships with customers, suppliers and employees or our ability to achieve the anticipated benefits of the acquisition could be adversely affected or could reduce our future earnings or otherwise adversely affect our business and financial results and, as a result, adversely affect the market price of our common stock.
If we are unable to manage growth effectively, our revenues and net loss could be adversely affected.
We may need to expand our personnel resources to grow our business effectively. We believe that sustained growth at a higher rate will place a strain on our management as well as on our other human resources. To manage this growth, we must continue to attract and retain qualified management, professional, scientific and technical and operating personnel. If we are unable to recruit a sufficient number of qualified personnel, we may be unable to staff and manage projects adequately, which in turn may slow the rate of growth of our contract research revenues or our product development efforts.
We may not be successful in identifying market needs for new technologies or in developing new products.
Part of our business model depends on our ability to correctly identify market needs for new technologies. We intend to identify new market needs, but we may not always have success in doing so in part because our contract research largely centers on identification and development of unproven technologies, often for new or emerging markets. Furthermore, we must identify the most promising technologies from a sizable pool of projects. If our commercialization strategy process fails to identify projects with commercial potential or if management does not

ensure that such projects advance to the commercialization stage, we may not successfully commercialize new products and grow our revenues.

Our growth strategy requires that we also develop successful commercial products to address market needs. We face several challenges in developing successful new products. Many of our existing products and those currently under development are technologically innovative and require significant and lengthy product development efforts. These efforts include planning, designing, developing and testing at the technological, product and manufacturing-process levels. These

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activities require us to make significant investments. Although there are many potential applications for our technologies, our resource constraints require us to focus on specific products and to forgo other opportunities. We expect that one or more of the potential products we choose to develop will not be technologically feasible or will not achieve commercial acceptance, and we cannot predict which, if any, of our products we will successfully develop or commercialize. The technologies we research and develop are new and steadily changing and advancing. The products that are derived from these technologies may not be applicable or compatible with the state of technology or demands in existing markets. Our existing products and technologies may become uncompetitive or obsolete if our competitors adapt more quickly than we do to new technologies and changes in customers' requirements. Furthermore, we may not be able to identify if and when new markets will open for our products given that future applications of any given product may not be readily determinable, and we cannot reasonably estimate the size of any markets that may develop. If we are not able to successfully develop new products, we may be unable to increase our product revenues.
We face risks associated with our international business.

We currently conduct business internationally and we might considerably expand our international activities in the future. Our international business operations are subject to a variety of risks associated with conducting business internationally, including:

- having to comply with U.S. export control regulations and policies that restrict our ability to communicate with non-U.S. employees and supply foreign affiliates and customers;
- changes in or interpretations of foreign regulations that may adversely affect our ability to sell our products, perform services or repatriate profits to the United States;
- the imposition of tariffs;
- hyperinflation or economic or political instability in foreign countries;
- imposition of limitations on, or increase of withholding and other taxes on remittances and other payments by foreign subsidiaries or joint ventures;
- conducting business in places where business practices and customs are unfamiliar and unknown;
- the imposition of restrictive trade policies;
- the imposition of inconsistent laws or regulations;
- the imposition or increase of investment and other restrictions or requirements by foreign governments;
- uncertainties relating to foreign laws and legal proceedings;
- having to comply with a variety of U.S. laws, including the Foreign Corrupt Practices Act ("FCPA"); and
- having to comply with licensing requirements.

We do not know the impact that these regulatory, geopolitical and other factors may have on our international business in the future.

We may be liable for damages based on product liability claims relating to defects in our products, which might be brought against us directly, or against our customers in their end-use markets. Such claims could result in a loss of customers in addition to substantial liability in damages.
Our products are complex and undergo quality testing as well as formal qualification, both by our customers and by us. However, defects may occur from time to time. Our customers' testing procedures may be limited to evaluating our products under likely and foreseeable failure scenarios and over varying amounts of time. For various reasons, such as the occurrence of performance problems that are unforeseeable in testing or that are detected only when products age or are operated under peak stress conditions, our products may fail to perform as expected long after customer acceptance. Failures could result from faulty components or design, problems in manufacturing or other unforeseen reasons. As a result, we could incur significant costs to repair or replace defective products under warranty, particularly when such failures occur in installed systems. In addition, we may in certain circumstances honor warranty claims after the warranty has expired or for problems not covered by warranty in order to maintain customer relationships. Any significant product failure could result in lost future sales of the affected product and other products, as well as customer relations problems, litigation and damage to our reputation.

In addition, many of our products are embedded in, or deployed in conjunction with, our customers' products, which incorporate a variety of components, modules and subsystems and may be expected to interoperate with modules produced by third parties. As a result, not all defects are immediately detectable, and, when problems occur, it may be difficult to identify the source of the problem. These problems may cause us to incur significant damages or warranty and repair costs, divert the attention of our engineering personnel from internal product development efforts and cause significant customer relations problems or loss of customers, all of which would harm our business.

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Furthermore, many of our products may provide critical performance attributes to our customers' products that will be sold to end users who could potentially bring product liability suits in which we could be named as a defendant. The sale of these products involves the risk of product liability claims. If a person were to bring a product liability suit against one of our customers, this customer may attempt to seek contribution from us. A person may also bring a product liability claim directly against us. A successful product liability claim or series of claims against us in excess of our insurance coverage for payments, for which we are not otherwise indemnified, could have a material adverse effect on our financial condition or results of operations.

We could be negatively affected by a security breach, either through cyber-attack, cyber-intrusion or other significant disruption of our IT networks and related systems.

We face the risk, as does any company, of a security breach, whether through cyber-attack or cyber-intrusion over the internet, malware, computer viruses, attachments to e-mails, persons inside our organization or persons with access to systems inside our organization, or other significant disruption of our IT networks and related systems. The risk of a security breach or disruption, particularly through cyber-attack or cyber-intrusion, including by computer hackers, foreign governments and cyber terrorists, has increased as the number, intensity and sophistication of attempted attacks and intrusions from around the world have increased.

As a technology company, and particularly as a government contractor, we may face a heightened risk of a security breach or disruption from threats to gain unauthorized access to our proprietary, confidential or classified information on our IT networks and related systems. These types of information and IT networks and related systems are critical to the operation of our business and essential to our ability to perform day-to-day operations, and, in some cases, are critical to the operations of certain of our customers. In addition, as certain of our technological capabilities become widely known, it is possible that we may be subjected to cyber-attack or cyber-intrusion as third parties seek to gain improper access to information regarding these capabilities and cyber-attacks or cyber-intrusion could compromise our confidential information or our IT networks and systems generally, as it is not practical as a business matter to isolate all of our confidential information and trade secrets from email and internet access. To date, we have not experienced a significant cyber-intrusion or cyber-attack. There can be no assurance that our security efforts and measures will be effective or that attempted security breaches or disruptions would not be successful or damaging.

A security breach or other significant disruption involving these types of information and IT networks and related systems could disrupt the proper functioning of these networks and systems and therefore our operations, compromise our confidential information and trade secrets, or damage our reputation among our customers and the public generally. Any of these developments could have a negative impact on our results of operations, financial condition and cash flows.

Risks Relating to our Regulatory Environment

Our operations are subject to domestic and foreign laws, regulations and restrictions, and noncompliance with these laws, regulations and restrictions could expose us to fines, penalties, suspension or debarment, which could have a material adverse effect on our profitability and overall financial position.

Our operations, particularly our international sales, subject us to numerous U.S. and foreign laws and regulations, including, without limitation, regulations relating to imports, exports (including the Export Administration Regulations and the International Traffic in Arms Regulations), technology transfer restrictions, anti-boycott provisions, economic sanctions and the FCPA. The number of our various emerging technologies, the development of many of which has been funded by the Department of Defense, presents us with many regulatory challenges. Failure by us or our sales representatives or consultants to comply with these laws and regulations could result in administrative, civil, or criminal liabilities and could result in suspension of our export privileges, which could have a material adverse effect on our business. Changes in regulation or political environment may affect our ability to conduct business in foreign markets including investment, procurement and repatriation of earnings.

Environmental regulations could increase operating costs and additional capital expenditures and delay or interrupt operations.

The photonics industry, as well as the semiconductor industry, are subject to governmental regulations for the protection of the environment, including those relating to air and water quality, solid and hazardous waste handling, and the promotion of occupational safety. Various federal, state and local laws and regulations require that we

maintain certain environmental permits. While we believe that we have obtained all necessary environmental permits required to conduct our manufacturing

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processes, if we are found to be in violation of these laws, we could be subject to governmental fines and liability for damages resulting from such violations.

Changes in the aforementioned laws and regulations or the enactment of new laws, regulations or policies could require increases in operating costs and additional capital expenditures and could possibly entail delays or interruptions of our operations.

If our manufacturing facilities do not meet Federal, state or foreign country manufacturing standards, we may be required to temporarily cease all or part of our manufacturing operations, which would result in product delivery delays and negatively impact revenues.

Our manufacturing facilities are subject to periodic inspection by regulatory authorities and our operations will continue to be regulated by the FDA for compliance with Good Manufacturing Practice requirements contained in the quality systems regulations. We are also required to comply with International Organization for Standardization ("ISO"), quality system standards in order to produce certain of our products for sale in Europe. If we fail to continue to comply with Good Manufacturing Practice requirements or ISO standards, we may be required to cease all or part of our operations until we comply with these regulations. Obtaining and maintaining such compliance is difficult and costly. We cannot be certain that our facilities will be found to comply with Good Manufacturing Practice requirements or ISO standards in future inspections and audits by regulatory authorities. In addition, if we cannot maintain or establish manufacturing facilities or operations that comply with such standards or do not meet the expectations of our customers, we may not be able to realize certain economic opportunities in our current or future supply arrangements.

Medical products are subject to various international regulatory processes and approval requirements. If we do not obtain and maintain the necessary international regulatory approvals for any such potential products, we may not be able to market and sell our medical products in foreign countries.

To be able to market and sell medical products in other countries, we must obtain regulatory approvals and comply with the regulations of those countries. These regulations, including the requirements for approvals and the time required for regulatory review, vary from country to country. Obtaining and maintaining foreign regulatory approvals are expensive, and we cannot be certain that we will have the resources to be able to pursue such approvals or whether we would receive regulatory approvals in any foreign country in which we plan to market our products. For example, the European Union requires that manufacturers of medical products obtain the right to affix the CE mark to their products before selling them in member countries of the European Union, which we have not yet obtained and may never obtain. If we fail to obtain regulatory approval in any foreign country in which we plan to market our products, our ability to generate revenues will be harmed.

We are subject to additional significant foreign and domestic government regulations, including environmental and health and safety regulations, and failure to comply with these regulations could harm our business.

Our facilities and current and proposed activities involve the use of a broad range of materials that are considered hazardous under applicable laws and regulations. Accordingly, we are subject to a number of foreign, federal, state and local laws and regulations relating to health and safety, protection of the environment and the storage, use, disposal of, and exposure to, hazardous materials and wastes. We could incur costs, fines and civil and criminal penalties, personal injury and third party property damage claims, or could be required to incur substantial investigation or remediation costs, if we were to violate or become liable under environmental, health and safety laws. Moreover, a failure to comply with environmental laws could result in fines and the revocation of environmental permits, which could prevent us from conducting our business. Liability under environmental laws can be joint and several and without regard to fault. There can be no assurance that violations of environmental and health and safety laws will not occur in the future as a result of the inability to obtain permits, human error, equipment failure or other causes. Environmental laws could become more stringent over time, imposing greater compliance costs and increasing risks and penalties associated with violations, which could harm our business. Accordingly, violations of present and future environmental laws could restrict our ability to expand facilities, pursue certain technologies, and could require us to acquire costly equipment or incur potentially significant costs to comply with environmental regulations.

Compliance with foreign, federal, state and local environmental laws and regulations represents a small part of our present budget. If we fail to comply with any such laws or regulations, however, a government entity may levy a fine

on us or require us to take costly measures to ensure compliance. Any such fine or expenditure may adversely affect our development. We cannot predict the extent to which future legislation and regulation could cause us to incur additional operating expenses, capital expenditures or restrictions and delays in the development of our products and properties.

Risks Relating to our Intellectual Property

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Our proprietary rights may not adequately protect our technologies.

Our commercial success will depend in part on our obtaining and maintaining patent, trade secret, copyright and trademark protection of our technologies in the United States and other jurisdictions as well as successfully enforcing this intellectual property and defending it against third-party challenges. We will only be able to protect our technologies from unauthorized use by third parties to the extent that valid and enforceable intellectual property protections, such as patents or trade secrets, cover them. In particular, we place considerable emphasis on obtaining patent and trade secret protection for significant new technologies, products and processes. The degree of future protection of our proprietary rights is uncertain because legal means afford only limited protection and may not adequately protect our rights or permit us to gain or keep our competitive advantage. The degree of future protection of our proprietary rights is also uncertain for products that are currently in the early stages of development because we cannot predict which of these products will ultimately reach the commercial market or whether the commercial versions of these products will incorporate proprietary technologies.

Our patent position is highly uncertain and involves complex legal and factual questions. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our patents or in third-party patents. For example:

- we or our licensors might not have been the first to make the inventions covered by each of our pending patent applications and issued patents;
- we or our licensors might not have been the first to file patent applications for these inventions;
- others may independently develop similar or alternative technologies or duplicate any of our technologies;
- it is possible that none of our pending patent applications or the pending patent applications of our licensors will result in issued patents;
- patents may issue to third parties that cover how we might practice our technology;
- our issued patents and issued patents of our licensors may not provide a basis for commercially viable technologies, may not provide us with any competitive advantages, or may be challenged and invalidated by third parties; and
- we may not develop additional proprietary technologies that are patentable.

Patents may not be issued for any pending or future pending patent applications owned by or licensed to us, and claims allowed under any issued patent or future issued patent owned or licensed by us may not be valid or sufficiently broad to protect our technologies. Moreover, protection of certain of our intellectual property may be unavailable or limited in the United States or in foreign countries, and we have not sought to obtain foreign patent protection for certain of our products or technologies due to cost, concerns about enforceability or other reasons. Any issued patents owned by or licensed to us now or in the future may be challenged, invalidated, or circumvented, and the rights under such patents may not provide us with competitive advantages. In addition, competitors may design around our technology or develop competing technologies. Intellectual property rights may also be unavailable or limited in some foreign countries, and in the case of certain products no foreign patents were filed or can be filed. This could make it easier for competitors to capture or increase their market share with respect to related technologies. We could incur substantial costs to bring suits in which we may assert our patent rights against others or defend ourselves in suits brought against us. An unfavorable outcome of any litigation could have a material adverse effect on our business and results of operations.

We also rely on trade secrets to protect our technology, especially where we believe patent protection is not appropriate or obtainable. However, trade secrets are difficult to protect. We regularly attempt to obtain confidentiality agreements and contractual provisions with our collaborators, employees and consultants to protect our trade secrets and proprietary know-how. These agreements may be breached or may not have adequate remedies for such breach. While we use reasonable efforts to protect our trade secrets, our employees, consultants, contractors or scientific and other advisors, or those of our strategic partners, may unintentionally or willfully disclose our information to competitors. If we were to enforce a claim that a third party had illegally obtained and was using our trade secrets, our enforcement efforts would be expensive and time consuming, and the outcome would be unpredictable. In addition, courts outside the United States are sometimes unwilling to protect trade secrets. Moreover, if our competitors independently develop equivalent knowledge, methods and know-how, it will be more difficult for us to enforce our rights and our business could be harmed.

If we are not able to defend the patent or trade secret protection position of our technologies, then we will not be able to exclude competitors from developing or marketing competing technologies and we may not generate enough revenues from product sales to justify the cost of developing our technologies and to achieve or maintain profitability. We also rely on trademarks to establish a market identity for our company and our products. To maintain the value of our trademarks, we might have to file lawsuits against third parties to prevent them from using trademarks confusingly similar to or dilutive of our registered or unregistered trademarks. Also, we might not obtain registrations for our pending trademark applications, and we might have to defend our registered trademark and pending trademark applications from challenge by third parties. Enforcing or defending our registered and unregistered trademarks might result in significant litigation costs and damages, including the inability to continue using certain trademarks.

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Third parties may claim that we infringe their intellectual property, and we could suffer significant litigation or licensing expense as a result.

Various U.S. and foreign issued patents and pending patent applications, which are owned by third parties, exist in our technology areas. Such third parties may claim that we infringe their patents. Because patent applications can take several years to result in a patent issuance, there may be currently pending applications, unknown to us, which may later result in issued patents that our technologies may infringe. For example, we are aware of competitors with patents in technology areas applicable to our optical test equipment products. Such competitors may allege that we infringe these patents. There could also be existing patents of which we are not aware that our technologies may inadvertently infringe. We have from time to time been, and may in the future be, contacted by third parties, including patent assertion entities or intellectual property advisors, about licensing opportunities that also contain claims that we are infringing on third party patent rights. If third parties assert these claims against us, we could incur extremely substantial costs and diversion of management resources in defending these claims, and the defense of these claims could have a material adverse effect on our business, financial condition and results of operations. Even if we believe we have not infringed on a third party's patent rights, we may have to settle a claim on unfavorable terms because we cannot afford to litigate the claim. In addition, if third parties assert claims against us and we are unsuccessful in defending against these claims, these third parties may be awarded substantial damages as well as injunctive or other equitable relief against us, which could effectively block our ability to make, use, sell, distribute or market our products and services in the United States or abroad.

Commercial application of nanotechnologies in particular, or technologies involving nanomaterials, is new and the scope and breadth of patent protection is uncertain. Consequently, the patent positions of companies involved in nanotechnologies have not been tested, and there are complex legal and factual questions for which important legal principles will be developed or may remain unresolved. In addition, it is not clear whether such patents will be subject to interpretations or legal doctrines that differ from conventional patent law principles. Changes in either the patent laws or in interpretations of patent laws in the United States and other countries may diminish the value of our nanotechnology-related intellectual property. Accordingly, we cannot predict the breadth of claims that may be allowed or enforced in our nanotechnology-related patents or in third party patents. In the event that a claim relating to intellectual property is asserted against us, or third parties not affiliated with us hold pending or issued patents that relate to our products or technology, we may seek licenses to such intellectual property or challenge those patents. However, we may be unable to obtain these licenses on commercially reasonable terms, if at all, and our challenge of the patents may be unsuccessful. Our failure to obtain the necessary licenses or other rights could prevent the sale, manufacture or distribution of our products and, therefore, could have a material adverse effect on our business, financial condition and results of operations.

A substantial portion of our technology is subject to retained rights of our licensors, and we may not be able to prevent the loss of those rights or the grant of similar rights to third parties.

A substantial portion of our technology is licensed from academic institutions, corporations and government agencies. Under these licensing arrangements, a licensor may obtain rights over the technology, including the right to require us to grant a license to one or more third parties selected by the licensor or that we provide licensed technology or material to third parties for non-commercial research. The grant of a license for any of our core technologies to a third party could have a material and adverse effect on our business. In addition, some of our licensors retain certain rights under the licenses, including the right to grant additional licenses to a substantial portion of our core technology to third parties for non-commercial academic and research use. It is difficult to monitor and enforce such non-commercial academic and research uses, and we cannot predict whether the third-party licensees would comply with the use restrictions of such licenses. We have incurred and could incur substantial expenses to enforce our rights against them. We also may not fully control the ability to assert or defend those patents or other intellectual property which we have licensed from other entities, or which we have licensed to other entities.

In addition, some of our licenses with academic institutions give us the right to use certain technology previously developed by researchers at these institutions. In certain cases, we also have the right to practice improvements on the licensed technology to the extent they are encompassed by the licensed patents and are within our field of use. Our licensors may currently own and may in the future obtain additional patents and patent applications that are necessary

for the development, manufacture and commercial sale of our anticipated products. We may be unable to agree with one or more academic institutions from which we have obtained licenses whether certain intellectual property developed by researchers at these academic institutions is covered by our existing licenses. In the event that the new intellectual property is not covered by our existing licenses, we would be required to negotiate a new license agreement. We may not be able to reach agreement with current or future licensors on commercially reasonable terms, if at all, or the terms may not permit us to sell our products at a profit after payment of royalties, which could harm our business.

Some of our patents may cover inventions that were conceived or first reduced to practice under, or in connection with, U.S. government contracts or other federal funding agreements. With respect to inventions conceived or first reduced to practice under a federal funding agreement, the U.S. government may retain a non-exclusive, non-transferable, irrevocable,

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paid-up license to practice or have practiced for or on behalf of the United States the invention throughout the world. We may not succeed in our efforts to retain title in patents, maintain ownership of intellectual property or in limiting the U.S. government's rights in our proprietary technologies and intellectual property when an issue exists as to whether such intellectual property was developed in the performance of a federal funding agreement or developed at private expense.

If we fail to obtain the right to use the intellectual property rights of others which are necessary to operate our business, and to protect their intellectual property, our business and results of operations will be adversely affected.

In the past, we have licensed certain technologies for use in our products. In the future, we may choose, or be required, to license technology or intellectual property from third parties in connection with the development of our products. We cannot assure you that third-party licenses will be available on commercially reasonable terms, if at all. Our competitors may be able to obtain licenses, or cross-license their technology, on better terms than we can, which could put us at a competitive disadvantage. Also, we often enter into confidentiality agreements with such third parties in which we agree to protect and maintain their proprietary and confidential information, including at times requiring our employees to enter into agreements protecting such information. There can be no assurance that the confidentiality agreements will not be breached by any of our employees or that such third parties will not make claims that their proprietary information has been disclosed.

RISKS RELATING TO OUR COMMON STOCK

The United States Tax Cuts and Jobs Act of 2017 could adversely affect our business and financial condition.

The U.S. Tax Cuts and Jobs Act (the "TCJA") significantly reforms the US Internal Revenue Code. The TCJA, among other things, contains significant changes to U.S. federal corporate income taxation, including reduction of the U.S. federal corporate income tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction for net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, immediate deductions for certain new investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits. Federal net operating losses arising in taxable year ending after December 31, 2017, will be carried forward indefinitely pursuant to the TCJA. We continue to examine the impact this tax reform legislation may have on our business. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the TCJA is uncertain and our business and financial condition could be adversely affected. The impact of this tax reform on holders of our common stock is also uncertain and could be adverse. We urge our stockholders to consult with their legal and tax advisors with respect to such legislation and the potential tax consequences of investing in our common stock.

If there are substantial sales of our common stock, or the perception that such sales may occur, our stock price could decline.

If any of our stockholders were to sell substantial amounts of our common stock, the market price of our common stock may decline, which might make it more difficult for us to sell equity or equity-related securities in the future at a time and price that we deem appropriate. Substantial sales of our common stock, or the perception that such sales may occur, may have a material adverse effect on the prevailing market price of our common stock.

Carilion Clinic holds approximately 3.4 million shares of our common stock (including approximately 1.3 million shares issuable to Carilion upon conversion of shares of Series A Convertible Preferred Stock that Carilion holds). All of these shares have been registered for sale on a Form S-3 registration statement and, accordingly, may generally be freely sold by Carilion at any time. Any sales of these shares, or the perception that future sales of shares may occur by Carilion or any of our other significant stockholders, may have a material adverse effect on the market price of our stock. Any such continuing material adverse effect on the market price of our stock could impair our ability to comply with Nasdaq's continuing listing standards in respect of our minimum stock price, as further described below.

We may become involved in securities class action litigation that could divert management's attention and harm our business and our insurance coverage may not be sufficient to cover all costs and damages.

The stock market has from time to time experienced significant price and volume fluctuations that have affected the market prices for the common stock of technology companies. These broad market fluctuations may cause the market price of our common stock to decline. In the past, following periods of volatility in the market price of a particular

company's securities, securities class action litigation has often been brought against that company. Securities class litigation also often follows certain significant business transactions, such as the sale of a business division or a change in control transaction. We

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may become involved in this type of litigation in the future. Litigation often is expensive and diverts management's attention and resources, which could adversely affect our business.

We may not be able to comply with all applicable listing requirements or standards of The Nasdaq Capital Market and Nasdaq could delist our common stock.

Our common stock is listed on The Nasdaq Capital Market. In order to maintain that listing, we must satisfy minimum financial and other continued listing requirements and standards. One such requirement is that we maintain a minimum bid price of at least $1.00 per share for our common stock. Although we currently comply with the minimum bid requirement, in the recent past, our minimum bid price has fallen below $1.00 per share, and it could again do so in the future. If our bid price falls below $1.00 per share for 30 consecutive business days, we will receive a deficiency notice from Nasdaq advising us that we have 180 days to regain compliance by maintaining a minimum bid price of at least $1.00 for a minimum of ten consecutive business days. Under certain circumstances, Nasdaq could require that the minimum bid price exceed $1.00 for more than ten consecutive days before determining that a company complies.

In the event that our common stock is not eligible for continued listing on Nasdaq or another national securities exchange, trading of our common stock could be conducted in the over-the-counter market or on an electronic bulletin board established for unlisted securities such as the Pink Sheets or the OTC Bulletin Board. In such event, it could become more difficult to dispose of, or obtain accurate price quotations for, our common stock, and there would likely also be a reduction in our coverage by security analysts and the news media, which could cause the price of our common stock to decline further. Also, it may be difficult for us to raise additional capital if we are not listed on a major exchange.

Our common stock price has been volatile and we expect that the price of our common stock will fluctuate substantially in the future, which could cause you to lose all or a substantial part of your investment.

The public trading price for our common stock is volatile and may fluctuate significantly. Since January 1, 2009, our common stock has traded between a high of $5.00 per share and a low of $0.26 per share. Among the factors, many of which we cannot control, that could cause material fluctuations in the market price for our common stock are:

- sales of our common stock by our significant stockholders, or the perception that such sales may occur;
- changes in earnings estimates, investors' perceptions, recommendations by securities analysts or our failure to achieve analysts' earnings estimates;
- changes in our status as an entity eligible to receive SBIR contracts and grants;
- quarterly variations in our or our competitors' results of operations;
- general market conditions and other factors unrelated to our operating performance or the operating performance of our competitors;
- announcements by us, or by our competitors, of acquisitions, new products, significant contracts, commercial relationships or capital commitments;
- pending or threatened litigation;
- any major change in our board of directors or management or any competing proxy solicitations for director nominees;
- changes in governmental regulations or in the status of our regulatory approvals;
- announcements related to patents issued to us or our competitors;
- a lack of, limited or negative industry or securities analyst coverage;
- discussions of our company or our stock price by the financial and scientific press and online investor communities; and
- general developments in our industry.

In addition, the stock prices of many technology companies have experienced wide fluctuations that have often been unrelated to the operating performance of those companies. These factors may materially and adversely affect the market price of our common stock.

If our internal control over financial reporting is found not to be effective or if we make disclosure of existing or potential material weaknesses in those controls, investors could lose confidence in our financial reports, and our stock price may be adversely affected.
Section 404 of the Sarbanes-Oxley Act of 2002 requires us to include an internal control report with our Annual Report on Form 10-K. That report must include management's assessment of the effectiveness of our internal control over financial reporting as of the end of the fiscal year.

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We evaluate our existing internal control over financial reporting based on the framework issued by the Committee of Sponsoring Organizations of the Treadway Commission. During the course of our ongoing evaluation of the internal controls, we may identify areas requiring improvement, and may have to design enhanced processes and controls to address issues identified through this review. Remedying any deficiencies, significant deficiencies or material weaknesses that we identify may require us to incur significant costs and expend significant time and management resources. We cannot assure you that any of the measures we implement to remedy any such deficiencies will effectively mitigate or remedy such deficiencies. Investors could lose confidence in our financial reports, and our stock price may be adversely affected, if our internal controls over financial reporting are found not to be effective by management or if we make disclosure of existing or potential significant deficiencies or material weaknesses in those controls.

If our estimates relating to our critical accounting policies are based on assumptions or judgments that change or prove to be incorrect, our operating results could fall below expectations of financial analysts and investors, resulting in a decline in our stock price.

The preparation of financial statements in conformity with U.S. GAAP requires our management to make estimates, assumptions and judgments that affect the amounts reported in the consolidated financial statements and accompanying notes. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets, liabilities, equity, revenue and expenses that are not readily apparent from other sources. Our operating results may be adversely affected if our assumptions change or if actual circumstances differ from those in our assumptions, which could cause our operating results to fall below the expectations of financial analysts and investors, resulting in a decline in our stock price. Significant assumptions and estimates used in preparing our consolidated financial statements include those related to revenue recognition, stock-based compensation and income taxes. Moreover, the new revenue recognition guidance, ASC Topic 606, Revenue from Contracts with Customers, requires more judgment than did the prior guidance.

Our financial results may be adversely affected by changes in accounting principles applicable to us.

U.S. GAAP are subject to interpretation by the FASB, the SEC, and other bodies formed to promulgate and interpret appropriate accounting principles. For example, in May 2014, the FASB issued ASC Topic 606, Revenue from Contracts with Customers, which supersedes nearly all existing revenue recognition guidance under U.S. GAAP. We adopted this guidance as of January 1, 2018. The most significant impact relates to changing the revenue recognition for custom optoelectronics to an over time method. Before the adoption of this standard, we deferred the recognition of revenue until products were shipped to the customer. Any difficulties in implementing these pronouncements or adequately accounting after adoption could cause us to fail to meet our financial reporting obligations, which could result in regulatory discipline and harm investors’ confidence in us.

Anti-takeover provisions in our amended and restated certificate of incorporation and bylaws and Delaware law could discourage or prevent a change in control, even if an acquisition would be beneficial to our stockholders, which could affect our stock price adversely and prevent attempts by our stockholders to replace or remove our current management.

Our amended and restated certificate of incorporation and bylaws and Delaware law contain provisions that might delay or prevent a change in control, discourage bids at a premium over the market price of our common stock and adversely affect the market price of our common stock and the voting and other rights of the holders of our common stock. These provisions include:

- a classified board of directors serving staggered terms;
- advance notice requirements to stockholders for matters to be brought at stockholder meetings;
- a supermajority stockholder vote requirement for amending certain provisions of our amended and restated certificate of incorporation and bylaws; and
- the right to issue preferred stock without stockholder approval, which could be used to dilute the stock ownership of a potential hostile acquirer.

We are also subject to provisions of the Delaware General Corporation law that, in general, prohibit any business combination with a beneficial owner of 15% or more of our common stock for three years unless the holder's acquisition of our stock was approved in advance by our board of directors or certain other conditions are satisfied. The existence of these provisions could adversely affect the voting power of holders of common stock and limit the price that investors might be willing to pay in the future for shares of our common stock.

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ITEM 2. UNREGISTERED SALES OF EQUITY SECURITIES AND USE OF PROCEEDS

(a) Unregistered Sales of Equity Securities during the Three Months Ended September 30, 2018

Common Stock Dividend Payable to Carilion

We issued 1,321,514 shares of Series A Preferred Stock, par value $0.001 per share, to Carilion Clinic in January 2010, which shares were issued in reliance on the exemptions from registration under the Securities Act provided by Sections 3(a)(9) and 4 (a)(2) thereof. The Series A Preferred Stock accrues dividends at the rate of $0.2815 per share per annum, payable quarterly in arrears. Accrued dividends are payable in shares of our common stock, with the number of shares being equal to the quotient of (i) the cumulative aggregate balance of accrued but unpaid dividends on each share of Series A Preferred Stock divided by (ii) the conversion price of the Series A Preferred Stock, which is currently $4.69159 per share. For the period from January 12, 2010, the original issue date of the Series A Preferred Stock, through September 30, 2018, the Series A Preferred Stock issued to Carilion has accrued $1,351,226 in dividends. The accrued dividend as of September 30, 2018 will be paid by the issuance of 691,162 shares of our common stock, which we will issue at Carilion's written request. As the Series A Preferred Stock was issued in reliance on the exemption provided by Section 3(a)(9), the shares of common stock payable as dividends will also be exempt from registration in reliance on Section 3(a)(9) of the Securities Act.

Warrant Exercises

During the three months ended September 30, 2018, Carilion Clinic exercised warrants to purchase an aggregate of 159,097 shares of common stock at an exercise price of $2.50 per share, resulting in aggregate proceeds to us of $397,743. The exercises were exempt from registration under the Securities Act pursuant to the exemption under Section 4(a)(2) as an offering to one accredited investor in an offering that did not involve a public offering.

(b) Use of Proceeds from Sale of Registered Equity Securities

Not applicable.

(c) Purchases of Equity Securities by the Registrant

Not applicable.

ITEM 3. DEFAULTS UPON SENIOR SECURITIES

None.

ITEM 4. MINE SAFETY DISCLOSURES

Not applicable.

ITEM 5. OTHER INFORMATION

Not applicable.

ITEM 6. EXHIBITS

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Exhibit Number	Description
2.1(1)+	Asset Purchase Agreement, by and between the Registrant and OSI Optoelectronics, Inc., dated as of July 31, 2018 (Exhibit 2.1)
2.2(2)+	Asset Purchase Agreement, by and among Luna Technologies, Inc., the Registrant and Micron Optics, Inc., dated as of October 15, 2018 (Exhibit 2.1)
31.1	Certification of the Principal Executive Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of the Principal Financial Officer pursuant to Rule 13a-14(a) and Rule 15d-14(a) of the Securities Exchange Act of 1934, as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Principal Executive Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Principal Financial Officer pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101	The following materials from the Registrant’s Quarterly Report on Form 10-Q for the three and nine months ended September 30, 2018, formatted in XBRL (eXtensible Business Reporting Language): (i) Consolidated Balance Sheets at September 30, 2018 and December 31, 2017, (ii) Consolidated Statements of Operations for the three and nine months ended September 30, 2018 and 2017, (iii) Consolidated Statements of Cash Flows for the nine months ended September 30, 2018 and 2017 and (iv) Notes to Unaudited Consolidated Financial Statements.

(1) Incorporated by reference to the exhibit to the Registrant's Current Report on Form 8-K, Commission File No. 000-52008, filed on August 1, 2018. The number given in parentheses indicates the corresponding exhibit number in such Form 8-K.

(2) Incorporated by reference to the exhibit to the Registrant's Current Report on Form 8-K, Commission File No. 000-52008, filed on October 16, 2018. The number given in parentheses indicates the corresponding exhibit number in such Form 8-K.

(3) Incorporated by reference to the exhibit to the Registrant's Quarterly Report on Form 10-Q, Commission File No. 000-52008, filed on August 1, 2018. The number given in parentheses indicates the corresponding exhibit number in such Form 10-Q.

+ Pursuant to Item 601 (b)(2) of Regulation S-K promulgated by the SEC, certain exhibits and schedules to this agreement have been omitted. The Registrant hereby agrees to furnish supplementally to the SEC, upon its request, any or all of such omitted exhibits or schedules.

† Indicates management contract or compensatory plan.

* These certifications are being furnished solely to accompany this quarterly report pursuant to 18 U.S.C. Section 1350 and are not being filed for purposes of Section 18 of the Securities Exchange Act of 1934 and are not to be incorporated by reference into any filing of the registrant, whether made before or after the date hereof, regardless of any general incorporation language in such filing.

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SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

		Luna Innovations Incorporated
Date:	November 13, 2018	By: /s/ Dale Messick
		Dale Messick
		Chief Financial Officer
		(principal financial and accounting officer and duly authorized officer)

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