

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

**FORM 10-Q**

(Mark One)

☒ **QUARTERLY REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the quarterly period ended September 30, 2024

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from \_\_\_\_\_ to \_\_\_\_\_

Commission File Number 001-40766

**Lightwave Logic, Inc.**

(Exact name of registrant as specified in its charter)

**Nevada**

(State or other jurisdiction of  
incorporation or organization)

**82-0497368**

(I.R.S. Employer Identification No.)

**369 Inverness Parkway, Suite 350  
Englewood, CO**

(Address of principal executive offices)

**80112**

(Zip Code)

**( 720 ) 340-4949**

(Registrant's telephone number, including area code)

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

<u>Title of each class</u>	<u>Trading Symbol(s)</u>	<u>Name of exchange on which registered</u>
Common Stock, \$0.001 par value per share	LWLG	The NASDAQ Stock Market

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☒ No ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes ☒ No ☐

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

Large accelerated filer <input checked="" type="checkbox"/>	Accelerated filer <input type="checkbox"/>
Non-accelerated filer <input type="checkbox"/>	Smaller reporting company <input type="checkbox"/>
	Emerging growth company <input type="checkbox"/>

If an emerging growth company, indicate by checkmark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. ☐

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

The number of shares of the registrant's common stock outstanding as of November 12, 2024 was 122,372,981 .

**TABLE OF CONTENTS**

	<u>Page</u>
<b>Part I Financial Information</b>	
Item 1 <a href="#">Financial Statements</a>	2
Item 2 <a href="#">Management's Discussion and Analysis of Financial Condition and Results of Operations</a>	20
Item 3 <a href="#">Quantitative and Qualitative Disclosures About Market Risk</a>	47
Item 4 <a href="#">Controls and Procedures</a>	47
<b>Part II Other Information</b>	
Item 1 <a href="#">Legal Proceedings</a>	48
Item 1A <a href="#">Risk Factors</a>	48

Item 2	<a href="#">Unregistered Sales of Equity Securities and Use of Proceeds</a>	49
Item 3	<a href="#">Defaults Upon Senior Securities</a>	49
Item 4	<a href="#">Mine Safety Disclosures</a>	49
Item 5	<a href="#">Other Information</a>	49
Item 6	<a href="#">Exhibits</a>	49
	<a href="#">Signatures</a>	50

## Forward-Looking Statements

This report on Form 10-Q contains, and our officers and representatives may from time to time make, “forward-looking statements” within the meaning of the safe harbor provisions of the U.S. Private Securities Litigation Reform Act of 1995. Forward-looking statements can be identified by words such as: “anticipate,” “intend,” “plan,” “goal,” “seek,” “believe,” “project,” “estimate,” “expect,” “continuing,” “ongoing,” “strategy,” “future,” “likely,” “may,” “should,” “could,” “will” and similar references to future periods. Examples of forward-looking statements include, among others, statements we make regarding expected operating results, such as anticipated revenue; anticipated levels of capital expenditures for our current fiscal year; our belief that we have, or will have, sufficient liquidity to fund our business operations during the next 12 months; strategy for gaining customers, growth, product development, market position, financial results and reserves.

Forward-looking statements are neither historical facts nor assurances of future performance. Instead, they are based only on our current beliefs, expectations, and assumptions regarding the future of our business, future plans and strategies, projections, anticipated events and trends, the economy and other future conditions. Because forward-looking statements relate to the future, they are subject to inherent uncertainties, risks and changes in circumstances that are difficult to predict and many of which are outside of our control. Our actual results and financial condition may differ materially from those indicated in the forward-looking statements. Therefore, you should not rely on any of these forward-looking statements. Important factors that could cause our actual results and financial condition to differ materially from those indicated in the forward-looking statements include, among others, the following: inability to generate significant revenue or to manage growth; lack of available funding; lack of a market for or market acceptance of our products; competition from third parties; general economic and business conditions; intellectual property rights of third parties; changes in the price of our stock and dilution; regulatory constraints and potential legal liability; ability to maintain effective internal controls; security breaches, cybersecurity attacks and other significant disruptions in our information technology systems; changes in technology and methods of marketing; delays in completing various engineering and manufacturing programs; changes in customer order patterns and qualification of new customers; changes in product mix; success in technological advances and delivering technological innovations; shortages in components; production delays due to performance quality issues with outsourced components; other risks to which our Company is subject; and other factors beyond the Company’s control.

The ultimate correctness of these forward-looking statements depends upon a number of known and unknown risks and events. We discuss our known material risks under Part I Item 1.A “Risk Factors” contained in our Company’s Annual Report on Form 10-K for the year ended December 31, 2023, and Part II, Item 1.A “Risk Factors” in this report on Form 10-Q. Many factors could cause our actual results to differ materially from the forward-looking statements. In addition, we cannot assess the impact of each factor on our business or the extent to which any factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statements.

The forward-looking statements speak only as of the date on which they are made, and, except as required by law, we undertake no obligation to update any forward-looking statement to reflect events or circumstances after the date on which the statement is made or to reflect the occurrence of unanticipated events.

## PART I – FINANCIAL INFORMATION

### Item 1. Financial Statements

LIGHTWAVE LOGIC, INC.

FINANCIAL STATEMENTS

SEPTEMBER 30, 2024

(UNAUDITED)

## CONTENTS

	<u>PAGE</u>
<a href="#">BALANCE SHEETS</a>	2
<a href="#">STATEMENTS OF COMPREHENSIVE LOSS</a>	3
<a href="#">STATEMENTS OF STOCKHOLDERS’ EQUITY</a>	4
<a href="#">STATEMENTS OF CASH FLOWS</a>	5
<a href="#">NOTES TO FINANCIAL STATEMENTS</a>	6-19

LIGHTWAVE LOGIC, INC.  
BALANCE SHEETS  
UNAUDITED

	September 30, 2024	December 31, 2023
<b>ASSETS</b>		
<b>CURRENT ASSETS</b>		
Cash and cash equivalents	\$ 26,882,467	\$ 31,432,087
Accounts Receivable	26,814	30,376
Prepaid expenses and other current assets	562,084	1,237,621
	<u>27,471,365</u>	<u>32,700,084</u>
<b>PROPERTY AND EQUIPMENT - NET</b>	<u>5,774,568</u>	<u>4,990,790</u>
<b>OTHER ASSETS</b>		
Intangible assets - net	1,295,293	1,254,501
Operating Lease - Right of Use - Building	2,694,971	2,838,210
	<u>3,990,264</u>	<u>4,092,711</u>
<b>TOTAL ASSETS</b>	<u>\$ 37,236,197</u>	<u>\$ 41,783,585</u>
<b>LIABILITIES AND STOCKHOLDERS' EQUITY</b>		
<b>CURRENT LIABILITIES</b>		
Accounts payable	\$ 449,750	\$ 1,447,596
Accrued bonuses and accrued expenses	299,436	599,430
Accounts payable and accrued expenses - related parties	176,745	313,483
Contract liability	27,375	39,875
Deferred lease liability	6,964	38,297
Operating lease liability	162,054	144,120
	<u>1,122,324</u>	<u>2,582,801</u>
<b>LONG TERM LIABILITIES</b>		
Operating lease liability	2,642,303	2,766,970
	<u>2,642,303</u>	<u>2,766,970</u>
<b>TOTAL LIABILITIES</b>	<u>3,764,627</u>	<u>5,349,771</u>
<b>STOCKHOLDERS' EQUITY</b>		
Preferred stock, \$ 0.001 par value, 1,000,000 authorized, no shares issued or outstanding	—	—
Common stock \$ 0.001 par value, 250,000,000 authorized, 121,471,478 and 118,137,309 issued and outstanding at September 30, 2024 and December 31, 2023	121,471	118,137
Additional paid-in-capital	178,728,926	164,619,363
Deferred compensation	( 506,926)	( 432,293)
Accumulated deficit	( 144,871,901)	( 127,871,393)
<b>TOTAL STOCKHOLDERS' EQUITY</b>	<u>33,471,570</u>	<u>36,433,814</u>
<b>TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY</b>	<u>\$ 37,236,197</u>	<u>\$ 41,783,585</u>

See accompanying notes to these financial statements.

LIGHTWAVE LOGIC, INC.  
STATEMENTS OF COMPREHENSIVE LOSS  
FOR THE THREE AND NINE MONTHS ENDED SEPTEMBER 30, 2024 AND 2023  
(UNAUDITED)

	For the Three Months Ended September 30, 2024	For the Three Months Ended September 30, 2023	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023
<b>NET SALES</b>	\$ 22,916	\$ —	\$ 72,688	\$ —
<b>COST AND EXPENSE</b>				
Cost of sales	1,236	—	6,411	—
Research and development	3,828,301	4,040,941	12,811,221	12,006,758
General and administrative	1,490,481	1,345,335	4,642,603	3,879,515
	<u>5,320,018</u>	<u>5,386,276</u>	<u>17,460,235</u>	<u>15,886,273</u>
<b>LOSS FROM OPERATIONS</b>	( 5,297,102)	( 5,386,276)	( 17,387,547)	( 15,886,273)
<b>OTHER INCOME (EXPENSE)</b>				
Interest income	222,404	246,987	727,470	403,960
Commitment fee	( 15,875)	( 25,302)	( 121,834)	( 607,728)
Loss on disposal of property and equipment and intangible assets	( 210,274)	—	( 213,440)	( 581)
Other expense	( 66)	—	( 5,157)	( 7,734)
	<u>( 203,751)</u>	<u>( 25,302)</u>	<u>( 493,961)</u>	<u>( 1,998,083)</u>
<b>NET LOSS</b>	<u>\$ ( 5,300,913)</u>	<u>\$ ( 5,164,591)</u>	<u>\$ ( 17,000,508)</u>	<u>\$ ( 16,098,356)</u>
<b>LOSS PER SHARE</b>				
Basic	<u>\$ ( 0.04)</u>	<u>\$ ( 0.04)</u>	<u>\$ ( 0.14)</u>	<u>\$ ( 0.14)</u>

Diluted	\$ (0.04)	\$ (0.04)	\$ (0.14)	\$ (0.14)
<b>WEIGHTED AVERAGE NUMBER OF SHARES</b>				
Basic	120,901,708	116,491,837	120,005,472	114,899,056
Diluted	120,901,708	116,491,837	120,005,472	114,899,056

See accompanying notes to these financial statements.

3

LIGHTWAVE LOGIC, INC.  
STATEMENTS OF STOCKHOLDERS' EQUITY  
(UNAUDITED)

NINE-MONTH PERIOD ENDED SEPTEMBER 30, 2024

	Number of Shares	Common Stock	Additional Paid-in Capital	Deferred Compensation	Accumulated Deficit	Total
BALANCE AT DECEMBER 31, 2023	118,137,309	\$ 118,137	\$164,619,363	\$ (432,293)	\$127,871,393	\$36,433,814
Common stock issued to institutional investor	2,600,000	2,600	9,173,300	—	—	9,175,900
Common stock issued for commitment shares	31,132	31	121,802	—	—	121,833
Common stock sales at the market by investment banking company	202,150	202	714,699	—	—	714,901
Exercise of options	365,000	365	237,835	—	—	238,200
Exercise of warrants	19,000	19	14,231	—	—	14,250
Options issued for services	—	—	3,468,243	—	—	3,468,243
Restricted stock awards issued for future services	116,887	117	379,453	(379,570)	—	—
Deferred compensation	—	—	—	304,937	—	304,937
Net loss for the nine months ended September 30, 2024	—	—	—	—	17,000,508	17,000,508
BALANCE AT SEPTEMBER 30, 2024	121,471,478	\$ 121,471	\$178,728,926	\$ (506,926)	\$144,871,901	\$33,471,570

NINE-MONTH PERIOD ENDED SEPTEMBER 30, 2023

	Number of Shares	Common Stock	Additional Paid-in Capital	Deferred Compensation	Accumulated Deficit	Total
BALANCE AT DECEMBER 31, 2022	112,882,793	\$ 112,883	\$134,406,825	\$ (133,324)	\$106,833,361	\$27,553,023
Common stock issued to institutional investor	2,750,400	2,750	16,061,159	—	—	16,063,909
Common stock issued for commitment shares	99,407	100	607,628	—	—	607,728
Common stock sales at the market by investment banking company	172,115	172	1,378,302	—	—	1,378,474
Exercise of options	504,408	504	466,820	—	—	467,324
Exercise of warrants	169,000	169	164,581	—	—	164,750
Options issued for services	—	—	5,085,114	—	—	5,085,114
Restricted stock awards issued for future services	105,854	106	561,560	(561,666)	—	—
Deferred compensation	—	—	—	198,253	—	198,253
Net loss for the nine months ended September 30, 2023	—	—	—	—	16,098,356	16,098,356
BALANCE AT SEPTEMBER 30, 2023	116,683,977	\$ 116,684	\$158,731,989	\$ (496,737)	\$122,931,717	\$35,420,219

See accompanying notes to these financial statements.

4

LIGHTWAVE LOGIC, INC.  
STATEMENTS OF STOCKHOLDERS' EQUITY  
(UNAUDITED)

THREE-MONTH PERIOD ENDED SEPTEMBER 30, 2024

	Number of Shares	Common Stock	Additional Paid-in Capital	Deferred Compensation	Accumulated Deficit	Total
BALANCE AT JUNE 30, 2024	120,706,365	\$ 120,707	\$175,608,888	\$ (536,714)	\$139,570,988	\$35,621,893
Common stock issued to institutional investor	650,000	650	1,679,650	—	—	1,680,300
Common stock issued for commitment shares	5,701	5	15,868	—	—	15,873
Common stock sales at the market by investment banking company	75,000	75	214,943	—	—	215,018
Exercise of options	10,000	10	7,190	—	—	7,200
Exercise of warrants	—	—	—	—	—	—
Options issued for services	—	—	1,130,783	—	—	1,130,783
Restricted stock awards issued for future services	24,412	24	71,604	(71,628)	—	—
Deferred compensation	—	—	—	101,416	—	101,416

Net loss for the three months ended September 30, 2024	—	—	—	—	( 5,300,913)	( 5,300,913)
BALANCE AT SEPTEMBER 30, 2024	<u>121,471,478</u>	<u>\$ 121,471</u>	<u>\$178,728,926</u>	<u>\$ ( 506,926)</u>	<u>\$144,871,901</u>	<u>\$33,471,570</u>

THREE-MONTH PERIOD ENDED SEPTEMBER 30, 2023

	Number of Shares	Common Stock	Additional Paid-in Capital	Deferred Compensation	Accumulated Deficit	Total
BALANCE AT JUNE 30, 2023	116,184,724	\$ 116,185	\$154,946,488	\$ ( 519,466)	\$117,767,126	( 36,776,081)
Common stock issued to institutional investor	175,000	175	1,113,325	—	—	1,113,500
Common stock issued for commitment shares	3,777	4	25,298	—	—	25,302
Common stock sales at the market by investment banking company	97,115	97	734,848	—	—	734,945
Exercise of options	198,123	198	160,825	—	—	161,023
Exercise of warrants	19,000	19	14,231	—	—	14,250
Options issued for services	—	—	1,695,310	—	—	1,695,310
Restricted stock awards issued for future services	6,238	6	41,664	( 41,670)	—	—
Deferred compensation	—	—	—	64,399	—	64,399
Net loss for the three months ended September 30, 2023	—	—	—	—	( 5,164,591)	( 5,164,591)
BALANCE AT SEPTEMBER 30, 2023	<u>116,683,977</u>	<u>\$ 116,684</u>	<u>\$158,731,989</u>	<u>\$ ( 496,737)</u>	<u>\$122,931,717</u>	<u>\$35,420,219</u>

See accompanying notes to these financial statements.

LIGHTWAVE LOGIC, INC.  
STATEMENTS OF CASH FLOWS  
FOR THE NINE MONTHS ENDED SEPTEMBER 30, 2024 AND 2023  
(UNAUDITED)

	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023
<b>CASH FLOWS FROM OPERATING ACTIVITIES</b>		
Net loss	\$ ( 17,000,508)	\$ ( 16,098,356)
Adjustments to reconcile net loss to net cash used in operating activities		
Stock options issued for services	3,468,243	5,085,114
Amortization of deferred compensation	304,937	198,253
Common stock issued for commitment shares	121,833	607,728
Depreciation and amortization of patents	1,240,639	797,500
Amortization of right of use asset	143,239	138,502
Loss on disposal of property and equipment and intangible assets	213,440	581
Decrease in assets		
Accounts receivable	3,562	—
Prepaid expenses and other current assets	675,537	87,058
(Decrease) increase in liabilities		
Accounts payable	( 997,846)	( 362,151)
Accrued bonuses, accrued expenses and other liabilities	( 299,994)	( 259,146)
Accounts payable and accrued expenses-related parties	( 136,738)	( 8,557)
Contract liability	( 12,500)	50,000
Deferred lease liability	( 31,333)	( 31,334)
Operating lease liability	( 106,733)	( 118,990)
Net cash used in operating activities	( 12,414,222)	( 9,913,798)
<b>CASH FLOWS FROM INVESTING ACTIVITIES</b>		
Cost of intangibles	( 343,233)	( 215,061)
Purchase of property and equipment	( 1,935,416)	( 1,813,813)
Repayment of loan	—	642,120
Sale of property and equipment	—	590
Net cash used in investing activities	( 2,278,649)	( 1,386,164)
<b>CASH FLOWS FROM FINANCING ACTIVITIES</b>		
Exercise of options and warrants	252,450	632,074
Issuance of common stock, institutional investor	9,175,900	16,063,909
Common stock sales at the market by investment banking company	714,901	1,378,474
Net cash provided by financing activities	10,143,251	18,074,457
NET (DECREASE) INCREASE IN CASH AND CASH EQUIVALENTS	( 4,549,620)	6,774,495
CASH AND CASH EQUIVALENTS - BEGINNING OF PERIOD	31,432,087	24,102,151
CASH AND CASH EQUIVALENTS - END OF PERIOD	<u>\$ 26,882,467</u>	<u>\$ 30,876,646</u>

**Supplemental Disclosure of Non-cash investing and financing activities :**

Amended Operating Lease - Right of Use - Building and Operating lease liability	\$ 2,703,527
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See accompanying notes to these financial statements.

LIGHTWAVE LOGIC, INC.  
STATEMENTS OF CASH FLOWS  
FOR THE NINE MONTHS ENDED SEPTEMBER 30, 2024 AND 2023  
(UNAUDITED)

**NOTE 1 – NATURE OF BUSINESS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES**

**Financial Statements**

The accompanying unaudited financial statements have been prepared by Lightwave Logic, Inc. (the "Company"). These statements include all adjustments (consisting only of its normal recurring adjustments) which management believes necessary for a fair presentation of the statements and have been prepared on a consistent basis using the accounting policies described in the Summary of Significant Accounting Policies included in the financial statements and notes thereto included in the Company's Annual Report on Form 10-K for the year ended December 31, 2023, as filed with the Securities and Exchange Commission on February 29, 2024 (the "2023 Annual Report"). Certain financial information and footnote disclosures normally included in financial statements prepared in accordance with accounting principles generally accepted in the United States have been condensed or omitted pursuant to the rules and regulations of the Securities and Exchange Commission, although the Company firmly believes that the accompanying disclosures are adequate to make the information presented not misleading. The financial statements should be read in conjunction with the financial statements and notes thereto included in the 2023 Annual Report. The interim operating results for the three and nine months ending September 30, 2024 may not be indicative of operating results expected for the full year.

**Nature of Business**

Lightwave Logic, Inc. (the "Company") is a technology company focused on the development of next generation electro-optic photonic devices made on its P2IC™ technology platform which we have detailed as: 1) Polymer Stack™, 2) Polymer Plus™, and 3) Polymer Slot™. Our unique polymer technology platform uses in-house proprietary high-activity and high-stability organic polymers. Electro-optical devices called modulators convert data from electric signals into optical signals for multiple applications. The Company's first revenue stream is from a technology material supply and licensing agreement that incorporates the Company's patented electro-optic polymer materials for use in manufacturing photonic devices. Currently, the Company is in various stages of photonic device and materials development and evaluation with potential customers and strategic partners. The Company expects to obtain additional revenue from material supply and licensing agreements, technology transfer agreements and the production and direct sale of its own photonic devices.

The Company's current development activities are subject to significant risks and uncertainties, including failing to secure additional funding to operationalize the Company's technology now under development.

Lightwave Logic, Inc. was organized under the laws of the State of Nevada in 1997, and it commenced with its current business plan in 2004.

**Revenue Recognition and Deferred Revenue**

The Company's primary revenue stream is from the technology license and material supply agreements the terms of which are jointly agreed upon with the Company's customers. Under these agreements, the Company conveys to the customers the rights and benefits to the Company's patented electro-optic polymer materials by providing the licensee a supply of its proprietary polymers for use in the licensee's manufacturing of photonic devices (the "Licensed Product") as well as non-exclusive, royalty-bearing license to intellectual property rights in the Company's patented polymer technology. The Company receives license and royalty payments under such commercial agreements, some of which are nonrefundable upfront payments for license fees. These advances are initially recorded as deferred revenue on the Company's balance sheets. The Company believes that the licenses provided and materials transferred under such agreements are not distinct from each other for financial reporting purposes and as such, they are accounted for as a single performance obligation. Advance payments for license fees and minimum annual royalties are recognized on a pro-rata basis over the related contract term. Royalties from licensee's sale of the Licensed Product that exceed the minimum annual royalty are recognized when cumulative royalties exceed the minimum royalty. Milestone license fees are recognized when the licensee reaches the milestone of selling a contractually specified number of units of the Licensed Product.

**NOTE 1 – NATURE OF BUSINESS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)**

Revenue associated with the sale of the Company's patented electro-optic polymer materials for incorporation into the customers' commercial photonic devices or for their device development and evaluation activities will be recognized at the time title passes, which is typically at the time of shipment or at the time of delivery, depending upon the contractual agreement between the parties.

**Cost of Sales**

Cost of sales consists of labor costs, material costs and manufacturing overhead costs associated with the production of materials transferred to the customer under the technology license and material supply agreement at the Company's facility.

**Stock-based Payments**

The Company accounts for stock-based compensation under the provisions of Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 718, "Compensation - Stock Compensation", which requires the measurement and recognition of compensation expense for all stock-based awards made to employees and directors based on estimated fair values on the grant date. The fair value of restricted stock awards is estimated by the market price of the Company's common stock at the date of grant. Restricted stock awards are being amortized to expense over the vesting period. The Company estimates the fair value of option and warrant awards on the date of grant using the Black-Scholes model. The value of the portion of the award that is ultimately expected to vest is recognized as expense over the requisite service periods using the straight-line method. In June 2018, the FASB issued ASU No. 2018-07, *Compensation – Stock Compensation (Topic 718), Improvements to Nonemployee Share-Based Payment Accounting* (the "2018 Update"). The amendments in the 2018 Update expand the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from non-employees. Consistent with the accounting requirement for employee share-based payment awards, nonemployee share-based payment awards within the scope of Topic 718 are measured at grant-date fair value of the equity instruments that an entity is obligated to issue when the good has been delivered or the service has been rendered and any other conditions necessary to earn the right to benefit from the instruments have been satisfied.

The Company has elected to account for forfeiture of stock-based awards as they occur.

**Loss Per Share**

The Company follows FASB ASC 260, "Earnings per Share", resulting in the presentation of basic and diluted earnings per share. Because the Company reported a net loss in 2024 and 2023, common stock equivalents, including stock options and warrants were anti-dilutive; therefore, the amounts reported for basic and dilutive loss per share were the same.

**Comprehensive Income (Loss)**

The Company follows FASB ASC 220.10, "Reporting Comprehensive Income (Loss)." Comprehensive income (loss) is a more inclusive financial reporting methodology that includes disclosure of certain financial information that historically has not been recognized in the calculation of net income (loss). Since the Company has no items of other comprehensive income (loss), comprehensive income (loss) is equal to net income (loss).

**NOTE 1 – NATURE OF BUSINESS AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES (CONTINUED)****Recently Issued Accounting Pronouncements Not Yet Adopted**

As of September 30, 2024, there are no recently issued accounting standards not yet adopted which would have a material effect on the Company's financial statements.

**Recently Adopted Accounting Pronouncements**

As of September 30, 2024 and for the period then ended, there are no recently adopted accounting standards that have a material effect on the Company's financial statements.

**Reclassifications**

Certain reclassifications have been made to the 2023 financial statement in order to conform to the 2024 financial statement presentation.

**NOTE 2 – MANAGEMENT'S PLANS**

The Company's future expenditures and capital requirements will depend on numerous factors, including: the progress of its research and development efforts; the rate at which the Company can, directly or through arrangements with original equipment manufacturers, introduce and sell products incorporating its polymer materials technology; the costs of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights; market acceptance of the Company's products and competing technological developments; and the Company's ability to establish cooperative development, joint venture and licensing arrangements. The Company expects that it will incur approximately \$ 1,687,000 of expenditures per month over the next 12 months. The Company's current cash position enables it to finance its operations through February 2026. On February 28, 2023, the Company entered into a purchase agreement with an institutional investor to sell up to \$ 30,000,000 of common stock over a 36-month period (described in Note 10). Pursuant to the purchase agreement, the Company received \$ 1,916,730 in October and November 2024 and the remaining available amount of \$ 2,761,318 is available to the Company per the agreement. On December 9, 2022, the Company entered into a sales agreement with an investment banking company whereby the Company may offer and sell shares of its common stock having an aggregate offering price of up to \$ 35,000,000 from time to time through or to the investment banking company, as sales agent or principal (described in Note 10). Pursuant to the sales agreement, the Company received \$ 817,455 in October and November 2024. The remaining available amount of \$ 31,857,377 is available to the Company per the agreement. The Company's first commercial agreement occurred in May 2023 from a material supply and license agreement that incorporates the Company's patented electro-optic polymer materials for use in manufacturing photonic devices (described in Note 3). For the three and nine months ended September 30, 2024, the Company recognized \$ 22,916 and \$ 58,938 in revenue, respectively, related to this agreement. The Company's cash requirements are expected to increase at a rate consistent with the Company's path to revenue as it expands its activities and operations with the objective of increasing its revenue stream from the commercialization of its electro-optic polymer technology. The Company currently has no debt to service.

**NOTE 3 – REVENUE**

The Company recognizes revenue in accordance with ASC Topic 606, Revenue from Contracts with Customers (Topic 606). The standard establishes the principles that an entity shall apply to report useful information to users of financial statements about the nature, amount, timing, and uncertainty of revenue and cash flows from a contract with a customer.

**NOTE 3 – REVENUE (CONTINUED)**

The Company's first commercial agreement occurred in May 2023, in the form of a four-year material supply and license agreement (the "License Agreement") that incorporates the Company's patented electro-optic polymer materials for use in manufacturing of photonic devices (the "Licensed Product"). The licensee shall pay the Company a running royalty with a minimum royalty paid on an annual basis over the term of the License Agreement. Additional future revenue will be generated from royalties from the licensee's sale of Licensed Product that exceed the minimum royalty payments and milestone license fees. The License Agreement is a non-exclusive material supply and license agreement.

During 2024, the Company performed device processing work for a customer.

**Timing of Revenue Recognition and Contract Balances**

Revenues related to the initial license fee and a minimum annual royalty are recognized over time commencing with the License Agreement in May 2023. An up-front license fee in the amount of \$ 50,000 was paid during the period ending December 31, 2023. \$ 27,375 of this amount is recorded as a contract liability in current liabilities on the Company's balance sheet as of September 30, 2024. For the three and nine months ended September 30, 2024, the Company recognized \$ 22,916 and \$ 58,938 , respectively, in revenue related to this agreement.

In March 2024, the Company completed device processing work on the devices supplied by a customer. Revenue for this contract was recognized at the time of shipment of the devices back to the customer and amounted to \$ 0 and \$ 13,750 for the three and nine months ended September 30, 2024, respectively.

Contract balances are as follows:

	September 30, 2024	December 31, 2023
Accounts receivable, net	\$ 26,814	\$ 30,376
Short-term contract assets	\$ —	\$ —
Long-term contract assets	\$ —	\$ —
Short-term contract liability	\$ 27,375	\$ 39,875

Significant changes in the contract balances for the period ended September 30, 2024 are as follows:

	Nine Months Ended September 30, 2024	
	Assets	Liabilities
Balance at December 31, 2023	\$ 30,376	\$ ( 39,875)
Revenue recognized that was previously included in contract liability	—	12,500
Decreases/increases due to cash received	( 63,884)	—
Billed receivables recorded	63,884	—
Transferred to receivables from unbilled receivables	( 50,000)	—
Unbilled receivables recorded	46,438	—
Balance at September 30, 2024	\$ 26,814	\$ ( 27,375)

## Assets Recognized for the Costs to Obtain a Contract

There are no assets recognized for the costs to obtain the License Agreement.

10

## NOTE 4 – PREPAID EXPENSES AND OTHER CURRENT ASSETS

Prepaid expenses and other current assets consist of the following:

	September 30, 2024	December 31, 2023
Insurance	\$ 272,543	\$ 237,791
License	157,957	241,936
Rent	36,525	36,525
Other	33,350	53,373
Investor relations	32,227	6,313
Prototype devices	29,482	161,267
Materials fabrication	—	475,936
Deposit for equipment	—	20,000
Lease incentive receivable	—	4,480
	<u>\$ 562,084</u>	<u>\$ 1,237,621</u>

## NOTE 5 – LOAN RECEIVABLE

On September 7, 2022, the Company entered into a convertible loan agreement (the "Loan") with an entity and issued a loan on September 12, 2022 in the amount of EUR 600,000 bearing interest at 7 % per annum with a maturity date of March 31, 2023 . The loan and interest were repaid in February and March 2023. The Company recorded \$ 0 and \$ 11,125 of interest income for the three and nine months ended September 30, 2023 and used the average exchange rate for the conversion of the EUR denominated interest income for the period.

## NOTE 6 – PROPERTY AND EQUIPMENT

Property and equipment consist of the following:

	September 30, 2024	December 31, 2023
Office equipment	\$ 161,982	\$ 146,196
Lab equipment	10,630,853	8,937,847
Furniture	74,119	74,119
Leasehold improvements	431,425	396,111
Software	133,377	111,077
	<u>11,431,756</u>	<u>9,665,350</u>
Less: Accumulated depreciation	<u>5,657,188</u>	<u>4,674,560</u>
	<u>\$ 5,774,568</u>	<u>\$ 4,990,790</u>

Depreciation expense for the three months ended September 30, 2024 and 2023 was \$ 386,981 and \$ 242,454 , respectively. Depreciation expense for the nine months ended September 30, 2024 and 2023 was \$ 1,148,472 and \$ 734,798 , respectively. During the three months ended September 30, 2024, the Company didn't retire any property and equipment. During the nine months ended September 30, 2024, the Company retired property and equipment with a cost of \$ 169,010 and accumulated depreciation of \$ 165,844 for a loss of \$ 3,166 . During the nine months ended September 30, 2023, the Company sold equipment for proceeds of \$ 590 and a loss of \$ 581 .

11

## NOTE 7 – INTANGIBLE ASSETS

This represents legal fees and patent fees associated with the prosecution of patent applications. The Company has recorded amortization expense on patents granted, which are amortized over the remaining legal life. Maintenance patent fees are paid to a government patent authority to maintain a granted patent in force. Some countries require the payment of maintenance fees for pending patent applications. Maintenance fees paid after a patent is granted are expensed, as these are considered ongoing costs to "maintain a patent". Maintenance fees paid prior to a patent grant date are capitalized to patent costs, as these are considered "patent application costs". No amortization expense has been recorded on the remaining patent applications since patents have yet to be granted.

Patents consist of the following:

	September 30, 2024	December 31, 2023
Patents	\$ 2,039,808	\$ 1,913,751
Less: Accumulated amortization	<u>744,515</u>	<u>659,250</u>
	<u>\$ 1,295,293</u>	<u>\$ 1,254,501</u>

Amortization expense for the three months ended September 30, 2024 and 2023 was \$ 48,921 and \$ 24,000 , respectively. Amortization expense for the nine months ended September 30, 2024 and 2023 was \$ 92,167 and \$ 62,703 , respectively. During the three and nine months ended September 30, 2024, the Company retired certain expired patent applications and patents with a cost of \$ 217,176 and accumulated amortization of \$ 6,902 for a loss of \$ 210,274 . There were no patent costs written off for the three and nine months ended September 30, 2023.

## NOTE 8 – LEASES

On October 30, 2017, the Company entered into a lease agreement (the "Lease") to lease approximately 13,420 square feet of office, chemistry, clean room and research and development space located in Colorado for the Company's principal executive offices and research and development facility. The term of the lease is sixty- one ( 61 ) months, beginning on November 1, 2017 and ending on November 30, 2022 . In January 2022, the term was extended for an additional twenty-four ( 24 ) months. This extension did not require a lease modification as the additional option period was included in the original computation as of January 1, 2019. Base rent for the first year of the lease term is approximately \$ 168,824 , with an increase in annual base rent of approximately 3 % in each subsequent year of the lease term. As specified in the lease, the Company paid the landlord (i) all base rent for the period November 1, 2017 and ending on October 31, 2019, in the sum of \$ 347,045 ; and (ii) the estimated amount of tenant's proportionate share of operating expenses for the same period in the sum of \$ 186,293 . Commencing on November 1, 2019 , monthly installments of base rent and one-twelfth of landlord's estimate of tenant's proportionate share of annual operating expenses shall be due on the first day of each calendar month. The lease also provides that (i) on November 1, 2019 landlord shall pay the Company for the cost of the cosmetic improvements in the amount of \$ 3.00 per rentable square foot of the premises, and (ii) on or prior to November 1, 2019, the Company shall deposit with Landlord the sum of \$ 36,525 as a security deposit which shall be held by landlord to secure the Company's obligations under the lease. On October 30, 2017, the Company entered into an agreement with the tenant leasing the premise from



the landlord ("Original Lessee") whereby the Original Lessee agreed to pay the Company the sum of \$ 260,000 in consideration of the Company entering into the lease and landlord agreeing to the early termination of the Original Lessee's lease agreement with landlord. The consideration of \$ 260,000 was received on November 1, 2017. \$ 6,964 of this amount is recorded on the Company's balance sheet as deferred lease liability as of September 30, 2024.

#### NOTE 8 – LEASES (CONTINUED)

As a result of adoption of the ASU 2016-02 – "Leases" (Topic 842), the Company has capitalized the present value of the minimum lease payments commencing November 1, 2019, including the additional option period using an estimated incremental borrowing rate of 6.5 %. The minimum lease payments do not include common area annual expenses which are considered to be non-lease components.

As of January 1, 2019 the operating lease right-of-use asset and operating lease liability amounted to \$ 885,094 with no cumulative-effect adjustment to the opening balance of retained earnings/accumulated deficit.

On November 22, 2022, the Company entered into an amendment to the Lease ("the Amended Lease") to lease an additional approximately 9,684 square feet of adjacent office and warehouse space. The term of the Amended Lease is one hundred twenty ( 128 ) months, with an effective date of June 1, 2023 . Base rent through January 31, 2024 of the Amended Lease term is approximately \$ 30,517 per month. The base rent for the next full year of the Amended Lease term is approximately \$ 377,288 , with an increase in annual base rent of approximately 3 % in each subsequent year of the lease term. Commencing on June 1, 2023, monthly installments of base rent and one-twelfth of landlord's estimate of tenant's proportionate share of annual operating expenses shall be due on the first day of each calendar month. The Amended Lease also provides an allowance of up to \$ 43,216 to be used solely for the cost of renovations to the additional lease premises. As of June 1, 2023, the operating lease right-of-use asset and operating lease liability amounted to \$ 2,945,322 . As of September 30, 2024, the operating lease right-of-use asset and operating lease liability amounted to \$ 2,694,971 and \$ 2,804,357 , respectively.

The Company has elected not to recognize right-of-use assets and lease liabilities arising from short-term leases. There are no other material operating leases.

Undiscounted future minimum lease payments under the Amended Lease as of September 30, 2024, by year and in aggregate, including the extended term, are as follows:

YEARS ENDING DECEMBER 31,	AMOUNT
2024	\$ 94,322
2025	387,666
2026	399,199
2027	411,174
2028	423,612
Thereafter	2,357,571
	4,073,544
Less discounted interest	( 1,269,187 )
<b>TOTAL</b>	<b>\$ 2,804,357</b>

Rent expense totaling \$ 75,511 and \$ 25,171 is included in research and development and general and administrative expenses, respectively, for the three months ended September 30, 2024. Rent expense totaling \$ 85,104 and \$ 28,368 is included in research and development and general and administrative expenses, respectively, for the three months ended September 30, 2023. Rent expense totaling \$ 226,532 and \$ 75,511 is included in research and development and general and administrative expenses, respectively, for the nine months ended September 30, 2024. Rent expense totaling \$ 160,660 and \$ 53,553 is included in research and development and general and administrative expenses, respectively, for the nine months ended September 30, 2023.

#### NOTE 9 – INCOME TAXES

There is no income tax benefit for the losses for the three and nine months ended September 30, 2024 and 2023 since management has determined that the realization of the net deferred tax asset is not assured and has created a valuation allowance for the entire amount of such benefits.

The Company's policy is to record interest and penalties associated with unrecognized tax benefits as additional income taxes in the statement of operations. As of September 30, 2024, the Company had no unrecognized tax benefits, or any tax related interest or penalties, and it does not expect significant changes in the amount of unrecognized tax benefits to occur within the next twelve months. There were no changes in the Company's unrecognized tax benefits during the three and nine-month period ended September 30, 2024. The Company did not recognize any interest or penalties during 2023 related to unrecognized tax benefits.

With few exceptions, the U.S. and state income tax returns filed for the tax years ending on December 31, 2020 and thereafter are subject to examination by the relevant taxing authorities. Net operating loss (NOL) carryforwards are subject to examination in the year they are utilized regardless of whether the tax year in which they are generated has been closed by the statute. The amount subject to disallowance is limited to the NOL utilized. Accordingly, the company may be subject to examination for prior NOLs generated as such NOLs are utilized.

#### NOTE 10 – STOCKHOLDERS' EQUITY

##### Preferred Stock

Pursuant to the Company's articles of incorporation, the Company's Board of Directors is empowered, without stockholder approval, to issue series of preferred stock with any designations, rights and preferences as they may from time to time determine. The rights and preferences of this preferred stock may be superior to the rights and preferences of the Company's common stock; consequently, preferred stock, if issued could have dividend, liquidation, conversion, voting or other rights that could adversely affect the voting power or other rights of the common stock. Additionally, preferred stock, if issued, could be utilized, under special circumstances, as a method of discouraging, delaying or preventing a change in control of the Company's business or a takeover from a third party.

##### Common Stock, Options and Warrants

On July 2, 2021, the Company filed a \$100,000,000 universal shelf registration statement with the U.S. Securities and Exchange Commission which became effective on July 9, 2021 and expired on July 8, 2024.

On July 26, 2024, the Company filed a new \$100,000,000 universal shelf registration statement with the U.S. Securities and Exchange Commission which became effective on August 5, 2024.

**NOTE 10 – STOCKHOLDERS' EQUITY (CONTINUED)**

On October 4, 2021, the Company entered into a purchase agreement with the institutional investor to sell up to \$ 33,000,000 of common stock over a 36-month period. Concurrently with entering into the purchase agreement, the Company also entered into a registration rights agreement which provides the institutional investor with certain registration rights related to the shares issued under the purchase agreement. Pursuant to the purchase agreement, the Company issued 30,312 shares of common stock to the institutional investor as an initial commitment fee valued at \$ 279,174 fair value, and 60,623 shares of common stock were reserved for additional commitment fees to the institutional investor in accordance with the terms of the purchase agreement. During the period October 4, 2021 through June 30, 2023, the institutional investor purchased 3,632,456 shares of common stock for proceeds of \$ 33,000,000 and the Company issued 60,623 shares of common stock as additional commitment fee, valued at \$ 694,531 fair value. All of the registered shares under the purchase agreement have been issued as of December 31, 2023.

On February 28, 2023, the Company entered into a purchase agreement with an institutional investor to sell up to \$ 30,000,000 of common stock over a 36-month period. Concurrently with entering into the purchase agreement, the Company also entered into a registration rights agreement which provides the institutional investor with certain registration rights related to the shares issued under the purchase agreement. Pursuant to the purchase agreement, the Company issued 50,891 shares of common stock to the institutional investor as an initial commitment fee valued at \$ 279,391 fair value, and 101,781 shares of common stock are reserved for additional commitment fees to the institutional investor in accordance with the terms of the purchase agreement. During the period February 28, 2023 through September 30, 2024, the institutional investor purchased 5,470,455 shares of common stock for proceeds of \$ 25,321,952 and the Company issued 85,911 shares of common stock as additional commitment fee, valued at \$ 477,859 fair value, leaving 15,870 in reserve for additional commitment fees. During the three-month and nine-month periods ended September 30, 2024, pursuant to the purchase agreement, the institutional investor purchased 650,000 and 2,600,000 shares of common stock for proceeds of \$ 1,680,300 and \$ 9,175,900, and the Company issued 5,701 and 31,132 shares of common stock as additional commitment fee, valued at \$ 15,873 and \$ 121,833 fair value, respectively. During October and November 2024, pursuant to the purchase agreement, the institutional investor purchased 650,000 shares of common stock for proceeds of \$ 1,916,730 and the Company issued 6,503 shares of common stock as additional commitment fee, valued at \$ 22,245 fair value, leaving 9,367 in reserve for additional commitment fees.

On December 9, 2022, the Company entered into a sales agreement with an investment banking company. In accordance with the terms of this sales agreement, the Company may offer and sell shares of its common stock having an aggregate offering price of up to \$ 35,000,000 from time to time through or to the investment banking company, as sales agent or principal. Sales of shares of the Company's common stock, if any, may be made by any method deemed to be an "at the market offering". The sales agent will be entitled to compensation under the terms of the sales agreement at a commission rate equal to 3 % of the gross proceeds of the sales price of common stock that they sell. During the three-month period ended September 30, 2024, pursuant to the sales agreement, the investment banking company sold 75,000 shares of the Company's common stock for proceeds of \$ 215,018 after a payment of the commission in the amount of \$ 6,651 to the investment banking company. During the nine-month period ended September 30, 2024, pursuant to the sales agreement, the investment banking company sold 202,150 shares of the Company's common stock for proceeds of \$ 714,901 after a payment of the commission in the amount of \$ 22,112 to the investment banking company. During October and November 2024, pursuant to the sales agreement, the investment banking company sold 235,000 shares of the Company's common stock for proceeds of \$ 817,455 after a payment of the commission in the amount of \$ 25,283 to the investment banking company.

15

**NOTE 11 – STOCK BASED COMPENSATION**

During 2007, the Board of Directors of the Company adopted the 2007 Employee Stock Plan ("2007 Plan") that was approved by the shareholders. Under the 2007 Plan, the Company is authorized to grant options to purchase up to 10,000,000 shares of common stock to directors, officers, employees and consultants who provide services to the Company. The 2007 Plan is intended to permit stock options granted to employees under the 2007 Plan to qualify as incentive stock options under Section 422 of the Internal Revenue Code of 1986, as amended ("Incentive Stock Options"). All options granted under the 2007 Plan, which are not intended to qualify as Incentive Stock Options are deemed to be non-qualified options ("Non-Statutory Stock Options").

Effective June 24, 2016, the 2007 Plan was terminated. As of September 30, 2024, options to purchase 2,058,000 shares of common stock have been issued and are outstanding.

During 2016, the Board of Directors of the Company adopted the 2016 Plan that was approved by the shareholders at the 2016 annual meeting of shareholders on May 20, 2016. Under the 2016 Plan, the Company is authorized to grant awards of incentive and non-qualified stock options and restricted stock to purchase up to 3,000,000 shares of common stock to employees, directors and consultants. Effective May 16, 2019, the number of shares of the Company's common stock available for issuance under the 2016 Plan was increased from 3,000,000 to 8,000,000 shares. Effective May 25, 2023, the number of shares of the Company's common stock available for issuance under the 2016 Plan was increased from 8,000,000 to 13,000,000 shares and awards of restricted stock units are authorized for issuance. As of September 30, 2024, options to purchase 6,979,519 shares of common stock have been issued and are outstanding and 246,061 restricted shares of common stock are issued. As of September 30, 2024, 4,063,185 shares of common stock remain available for grants under the 2016 Plan.

Both plans are administered by the Company's Board of Directors or its compensation committee which determines the persons to whom awards will be granted, the number of awards to be granted, and the specific terms of each grant. Subject to the provisions regarding Ten Percent Shareholders, (as defined in the 2016 Plan), the exercise price per share of each option cannot be less than 100% of the fair market value of a share of common stock on the date of grant. Options granted under the 2016 Plan are generally exercisable for a period of 10 years from the date of grant and may vest on the grant date, another specified date or over a period of time.

The Company uses the Black-Scholes option pricing model to calculate the grant-date fair value of an award, with the following assumptions for 2024 and 2023: no dividend yield in all years, expected volatility, based on the Company's historical volatility, 76.3 % to 77.1 %, for 2024 and 73.7 % to 77.2 % for 2023, risk-free interest rate between 3.73 % to 4.28 % for 2024 and 3.37 % for 2023, and expected option life of 10 years. Prior to May 2018, the expected life is based on the estimated average of the life of options using the "simplified" method, as prescribed in FASB ASC 718, due to insufficient historical exercise activity during recent years. Starting in May 2018, the expected life is based on the legal contractual life of options.

As of September 30, 2024, there was \$ 2,808,467 of unrecognized compensation expense related to non-vested market-based share awards that is expected to be recognized through September 2027. As of September 30, 2023, there was \$ 3,866,879 of unrecognized compensation expense related to non-vested market-based share awards that is expected to be recognized through September 2026.

16

**NOTE 11 – STOCK BASED COMPENSATION (CONTINUED)**

Share-based compensation was recognized as follows:

	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023
2007 Employee Stock Option Plan	\$ —	\$ —
2016 Equity Incentive Plan	3,468,243	5,085,114
2016 Equity Incentive Plan restricted stock awards	304,937	198,253
Warrants	—	—
Total share-based compensation	<u>\$ 3,773,180</u>	<u>\$ 5,283,367</u>

The following tables summarize all stock option and warrant activity of the Company during the nine months ended September 30, 2024:

Non-Qualified Stock Options and Warrants Outstanding and Exercisable			
	Number of Shares	Exercise Price	Weighted Average Exercise Price
Outstanding, December 31, 2023	8,809,807	\$ 0.51 - \$ 16.81	\$ 2.76
Granted	1,141,500	\$ 3.03 - \$ 5.00	\$ 4.72
Forfeited	( 29,788)	\$ 4.28 - \$ 7.25	\$ 5.18
Exercised	( 384,000)	\$ 0.57 - \$ 1.15	\$ 0.66
Outstanding, September 30, 2024	9,537,519	\$ 0.51 - \$ 16.81	\$ 3.08
Exercisable, September 30, 2024	8,596,375	\$ 0.51 - \$ 16.81	\$ 2.89

The aggregate intrinsic value of options and warrants outstanding and exercisable as of September 30, 2024 was \$ 10,209,133 . The aggregate intrinsic value is calculated as the difference between the exercise price of the underlying options and warrants and the closing stock price of \$ 2.76 for the Company's common stock on September 30, 2024. During the nine-month period ended September 30, 2024, 365,000 options were exercised for proceeds of \$ 238,200 and 19,000 warrants were exercised for proceeds of \$ 14,250 .

Non-Qualified Stock Options and Warrants Outstanding			
Range of Exercise Prices	Number Outstanding Currently Exercisable at September 30, 2024	Weighted Average Remaining Contractual Life	Weighted Average Exercise Price of Options and Warrants Currently Exercisable
\$ 0.51 - \$ 16.81	8,596,375	5.3 Years	\$ 2.89

17

#### NOTE 11 – STOCK BASED COMPENSATION (CONTINUED)

##### Restricted Stock Awards

On March 16, 2023, the Compensation Committee of the Board of Directors approved grants totaling 99,616 Restricted Stock Awards to the Company's four outside directors. Each RSA had a grant date fair value of \$ 5.22 which shall be amortized on a straight-line basis over the vesting period into director's compensation expenses within the Consolidated Statement of Comprehensive Loss. Such RSAs were granted under the 2016 Equity Incentive Plan ("2016 Plan") and vest in total 8,338 shares on March 16, 2023, with the remaining vesting in 33 equal monthly installments in total of 2,766 shares beginning April 1, 2023.

On August 1, 2023, the Compensation Committee of the Board of Directors approved a grant totaling 6,238 Restricted Stock Awards to the Company's outside director. Each RSA had a grant date fair value of \$ 6.68 which shall be amortized on a straight-line basis over the vesting period into director's compensation expenses within the Consolidated Statement of Comprehensive Loss. Such RSA was granted under the 2016 Plan. 218 shares from this grant vested on August 1, with the remaining vesting in 28 equal monthly installments in total of 215 shares beginning September 1, 2023.

On June 18, 2024, the Compensation Committee of the Board of Directors approved grants totaling 92,475 Restricted Stock Awards to the Company's five outside directors. Each RSA had a grant date fair value of \$ 3.33 which shall be amortized on a straight-line basis over the vesting period into director's compensation expenses within the Consolidated Statement of Comprehensive Loss. Such RSAs were granted under the 2016 Equity Incentive Plan ("2016 Plan") and vested in total 15,455 shares on June 18, 2024, with the remaining vesting in 10 equal quarterly installments in total of 7,702 shares beginning July 1, 2024.

On August 1, 2024, the Compensation Committee of the Board of Directors approved a grant totaling 12,924 Restricted Stock Awards to the Company's outside director. Each RSA had a grant date fair value of \$ 3.16 which shall be amortized on a straight-line basis over the vesting period into director's compensation expenses within the Consolidated Statement of Comprehensive Loss. Such RSA was granted under the 2016 Equity Incentive Plan ("2016 Plan") and vests in 9 equal quarterly installments of 1,436 shares beginning September 1, 2024.

On September 4, 2024, the Compensation Committee of the Board of Directors approved a grant totaling 11,488 Restricted Stock Awards to the Company's outside director. Each RSA had a grant date fair value of \$ 2.68 which shall be amortized on a straight-line basis over the vesting period into director's compensation expenses within the Consolidated Statement of Comprehensive Loss. Such RSA was granted under the 2016 Equity Incentive Plan ("2016 Plan") and vests in 8 equal quarterly installments of 1,436 shares beginning October 1, 2024.

Upon the occurrence of a Change in Control, 100% of the unvested Restricted Stock shall vest as of the date of the Change in Control. Upon vesting, the restrictions on the shares lapse.

18

#### NOTE 11 – STOCK BASED COMPENSATION (CONTINUED)

The fair value of restricted stock awards is estimated by the market price of the Company's common stock at the date of grant. Restricted stock activity during the nine-month period ended September 30, 2024 is as follows:

	Number of Shares	Weighted Average Grant Date Fair Value per Share
Non-vested, beginning of period	78,452	\$ 5.71
Granted	116,887	3.25
Vested	( 51,422)	4.37
Cancelled and forfeited	—	—
Non-vested, end of period	143,917	\$ 4.19

Restricted stock awards are being amortized to expense over the vesting period. As of September 30, 2024 and 2023, the unamortized value of the RSAs was \$ 506,925 and \$ 496,736 , respectively.

#### NOTE 12 – RELATED PARTY

At September 30, 2024 the Company had legal accrual to related party of \$ 77,659 , directors' fees accrual in the amount of \$ 58,750 , accrual for consulting fees to related party of \$ 22,500 , and travel and office expense reimbursement accruals of officers and directors in the amount of \$ 17,836 . At December 31, 2023 the Company had a legal accrual to a related party of \$ 115,160 , accounting service fee accrual and expense reimbursement to related parties of \$ 102,351 , fees and travel expense accruals to directors in the amount of \$ 53,776 , fees, consulting expense and travel expense accruals of advisory board members in the amount of \$ 33,746 , and travel and office expense accruals of officers in the amount of \$ 8,450 .

#### NOTE 13 – RETIREMENT PLAN

The Company established a 401(k) retirement plan covering all eligible employees beginning November 15, 2013. For the three months ended September 30, 2024 and 2023, a contribution of \$ 36,432 and \$ 18,554 , respectively, was charged to expense for all eligible non-executive participants. For the nine months ended September 30, 2024 and 2023, a contribution of \$ 95,524 and \$ 51,413 , respectively, was charged to expense for all eligible non-executive participants.

## Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations

*The following discussion and analysis should be read in conjunction with our financial statements, included herewith. This discussion should not be construed to imply that the results discussed herein will necessarily continue into the future, or that any conclusion reached herein will necessarily be indicative of actual operating results in the future. Such discussion represents only the best present assessment of our management. This information should also be read in conjunction with our audited historical financial statements which are included in our Annual Report on Form 10-K for the fiscal year ended December 31, 2023, filed with the Securities and Exchange Commission on February 29, 2024.*

### Overview

Lightwave Logic, Inc. (the "**Company**") is a technology company focused on the development of next generation electro-optic photonic devices made on its P<sup>2</sup>C™ technology platform which we have detailed as: 1) Polymer Stack™, 2) Polymer Plus™, and 3) Polymer Slot™. Our unique polymer technology platform uses in-house proprietary high-activity and high-stability organic polymers. Electro-optical devices called modulators convert data from electric signals into optical signals for multiple applications.

Our differentiation at the modulator device level is in higher speed, lower power consumption, simplicity of manufacturing, small footprint (size), and reliability. We have demonstrated higher speed and lower power consumption in packaged devices, and during 2023, we continued to make advances in techniques to translate our world class material properties to efficient, reliable modulator devices with commercial foundries. We are currently focused on testing and demonstrating the simplicity of manufacturability and reliability of our devices, including in conjunction with the silicon photonics manufacturing ecosystem. In 2023 we worked with silicon-based foundry partners to help scale in volume our polymer modulator devices and we received working modulator chips from these foundries. We have advanced and matured our interactions with our foundry partners and we continue to receive working modulator chips for prototyping. Silicon-based foundries are large semiconductor fabrication plants developed for the electronics IC business, that are now engaging with silicon photonics to increase their wafer throughput. Partnering with silicon-based foundries not only demonstrates that our polymer technology can be transferred into standard production lines using standard equipment, it also allows us to efficiently utilize our capital. The foundry partnerships will allow us to scale our high-performance polymer optical engines quickly and efficiently. We have now received silicon wafers that range up to 200mm in diameter, which aligns well with foundry manufacturing. Using 200mm silicon wafers, we showed packaged polymer modulators operating with open (clean) eye diagrams at 100GBaud PAM4 (or 200Gbps PAM4) at voltage drive levels at 1V at the 2024 Optical Fiber Conference in San Diego, California in March 2024 ("OFC 2024"). OFC is a leading international conference bringing together the complete value chain of fiber communications, datacenter, and telecommunications industrial players. We also showed polymer modulators with voltage drive levels that were below 1V. Driving voltage levels of around 1V is important as it allows our polymer modulators to be driven directly from CMOS ICs (as opposed to dedicated driver integrated circuit chips). This performance is ideal to enable 4 lanes at 200Gbps per lane pluggable transceivers that can operate at an aggregate data rate of 800Gbps. Since the invited talk at OFC 2024, several Tier 1 pluggable transceiver companies have both reviewed our technical results and viewed operating packaged polymer slot modulators at 200Gbps PAM4 with drive voltages at 1V. Further, we have recently demonstrated drive levels below 0.5V which represents the highest performance commercially designed Electro-Optic polymer modulators to date. The impact of driving optical modulators significantly below 1V is significant not only from the impact of directly driving modulators from electronic ICs to save driver costs, but more importantly, savings in power consumption for the module system, which is a key issue for datacenter operators today.

Our extremely strong and broad patent portfolio allows us to optimize our business model in three areas: 1) Traditional focus on product development, 2) Patent licensing and 3) Technology transfer to foundries. We are continually looking to strengthen our patent portfolio both by internal inventions and acquisition of intellectual property.

We are initially targeting applications in fiber optic data communications and telecommunications markets and are exploring other applications that include automotive/LIDAR, sensing, displays etc., for our polymer technology platform. Our goal is to have our unique polymer technology platform become ubiquitous across many market verticals over and above the optical fiber optic communications markets.

Generative Artificial Intelligence (G-AI) has been integrating deeper within our daily activities with applications to make us more efficient and possibly smarter. The impact on the internet is huge, and the internet is based on an optical network that utilizes data centers to route and switch traffic or information to and from destinations. Data centers are being upgraded today in a fashion that the industry has not seen before with significant investments of capital. The expected demands of increased traffic, information, and data driven by G-AI is changing the way the internet is being operated. G-AI is now creating new and interesting market opportunities to upgrade the internet. Three of these opportunities are important today: density, speed, and low power and these are very well aligned with our high performance electro-optic polymers modulator platform. We are designing high performance polymer modulator optical engines to support the rise and growth of G-AI as it generates more information that will travel through the internet and optical network. While we are not directly a G-AI company designing electronic processors, we do see immediate benefits of enabling higher levels of information to cross the internet using our optical polymer modulator platform.

### Commencement of Commercial Operations

We commenced commercial operations in May 2023. Presently, our commercial operations consist of a material supply license agreement to provide Perkinamine® chromophore materials for polymer based photonic devices and photonic integrated circuits (PICs). The license agreement represents tangible commercial progress for electro-optic polymers as part of our Company's business plan. Our Company is also in various stages of photonic device and materials development and evaluation with potential customers and strategic partners. We expect to continue to obtain a revenue stream from technology licensing agreements, and to obtain additional revenue streams from technology transfer agreements and direct sale of our electro-optic device components. We have seen increased interest in our materials during 2023, which has continued into 2024 and we are in discussions on future license agreements. Additionally, during 2024, our Company performed device processing work for a customer.

### Materials Development

Our Company designs and synthesizes organic chromophores for use in its own proprietary electro-optic polymer systems and photonic device designs. A polymer system is not solely a material, but also encompasses various technical enhancements necessary for its implementation. These include host polymers, poling methodologies, and molecular spacer systems that are customized to achieve specific optical properties. Our organic electro-optic polymer systems compounds are mixed into solution form that allows for thin film application. Our proprietary electro-optic polymers are designed at the molecular level for potentially superior performance, stability, and cost-efficiency. We believe our proprietary and unique polymers have the potential to replace more expensive, higher power consuming, slower-performance materials such as semiconductor-based modulator devices that are used in fiber-optic communication networks today.

Our patented and patent pending molecular architectures are based on a well-understood chemical and quantum mechanical occurrence known as *aromaticity*. Aromaticity provides a high degree of molecular stability that enables our core molecular structures to maintain stability under a broad range of operating conditions.

We expect our patented and patent-pending optical materials along with trade secrets and licensed materials, to be the core of and the enabling technology for future generations of optical devices, modules, sub-systems, and systems that we will develop or enable our partners to fully commercialize. Examples of our partners include electro-optic device manufacturers, contract manufacturers, original equipment manufacturers, foundries, packaging and assembly manufacturers etc. Our

Company contemplates future applications in market verticals that may address the needs of semiconductor companies, optical network companies, Web 2.0/3.0 media companies, high performance computing companies, telecommunications companies, aerospace companies, automotive companies, as well as for example, government agencies and defense entities.

## Device Design and Development

### *Electro-optic Modulators*

Our Company designs its own proprietary electro-optical modulation devices. Electro-optical modulators convert data from electric signals into optical signals that can then be transmitted over high-speed fiber-optic cables. Our modulators are electro-optic, meaning they work because the optical properties of the polymers are affected by electric fields applied by means of electrodes. Modulators are key components that are used in fiber optic telecommunications, data communications, and data centers networks etc., to convey the high data flows that have been driven by applications such as pictures, video streaming, movies etc., that are being transmitted through the Internet. Electro-optical modulators are expected to continue to be an essential element as the appetite and hunger for data increases every year as well as the drive towards lower power consumption, and smaller footprint (size).

### *Polymer Photonic Integrated Circuits*

Our Company also designs its own proprietary Photonic Integrated Circuits (otherwise termed a polymer PIC). A polymer PIC is a photonic device that integrates several photonic functions on a single chip. We believe that our technology can enable an ultra-miniaturization footprint that is needed to increase the number of photonic functions residing on a semiconductor chip. We see this creating a progression like what was seen in the computer integrated circuits, commonly referred to as Moore's Law. One type of integration is to combine several instances of the same photonic functions such as a plurality of modulators to create a multi-lane polymer PIC. The number of lanes can be varied depending on application. For example, the number of photonic components could increase by a factor of 4, 8, or 16. Another type of integration is to combine different types of devices including from different technology bases such as the combination of a semiconductor laser with a polymer modulator. Our P<sup>2</sup>IC™ platform encompasses both these types of architecture.

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21

Current semiconductor photonic technology today is both struggling to reach faster device speeds as well as seamless integration with commercial silicon foundries. Our modulator devices, enabled by our electro-optic polymer material systems, work at extremely high frequencies (wide bandwidths) and possess inherent advantages over current crystalline electro-optic material contained in most modulator devices such as bulk lithium niobate (LiNbO<sub>3</sub>), indium phosphide (InP), silicon (Si), and gallium arsenide (GaAs). Our advanced electro-optic polymer platform is creating a new class of modulators such as the Polymer Stack™, Polymer Plus™, Polymer Slot™, and associated PIC platforms that can address higher data rates in a lower cost, lower power consuming manner, smaller footprint (size) with much simpler data encoding techniques. Our electro-optic polymer material will boost the performance of standard PIC platforms such as silicon photonics and indium phosphide. Further, with our recent demonstration of packaged polymer slot modulator devices fabricated onto commercial silicon 200mm wafers using a commercial silicon foundry, our electro-optic polymer material is much easier to integrate with silicon foundries compared to competitive crystalline electro-optic materials.

Our electro-optic polymers can be integrated with other materials platforms because they can be applied as a thin film coating in a fabrication clean room such as may be found in semiconductor foundries using standard clean room tooling. These approaches enable our Polymer Plus™ and Polymer Slot™ device platforms to not only be competitive but fully integrated with foundries. Our polymers are unique in that they are stable enough to seamlessly integrate into existing CMOS, Indium Phosphide (InP), Gallium Arsenide (GaAs), and other semiconductor manufacturing lines. Of relevance are the integrated silicon photonics platforms that combine optical and electronic functions. These include a miniaturized modulator for ultra-small footprint applications in which we term the Polymer Slot™. This design is based on a slot modulator fabricated into semiconductor wafers that can include either silicon or indium phosphide.

Our Company has a fabrication facility in Colorado to apply standard fabrication processes to our electro-optic polymers which create modulator devices. While our internal fabrication facility is capable of manufacturing modulator devices, we have partnered with commercial silicon-based fabrication companies that are called foundries who can scale our technology with volume quickly and efficiently. The process recipe for fabrication plants or foundries is called a 'process development kit' or PDK. We are currently working with commercial foundries to implement our electro-optic polymers into accepted PDKs by the foundries. One of the metrics for successful implementation of PDK is to receive working modulator chips. Our work with the foundries is being focused with the Polymer Plus™ and the Polymer Slot™ polymer modulators. We are currently receiving 200mm silicon wafers with our Polymer Slot™ modulator designs from AMF, a silicon photonics foundry based in Singapore.

## Business Strategy

Our first revenue stream was obtained from our entry into a material supply license agreement to provide Perkinamine<sup>®</sup> chromophore materials for polymer based photonic devices and photonic integrated circuits (PICs). Our Company is also in various stages of photonic device and materials development and evaluation with potential customers and strategic partners that include Tier 1 players in the fiber optic communications industry. We expect to continue to obtain a revenue stream from technology licensing agreements, and to obtain additional revenue streams from technology transfer agreements and direct sale of our electro-optic device components.

Specifically, our business strategy provides that our revenue stream will be derived from one or some combination of the following: (i) technology licensing for specific product application; (ii) joint venture relationships with significant industry leaders; and (iii) the production and direct sale of our own electro-optic device components. Our objective is to be a leading provider of proprietary technology and know-how in the electro-optic device market. In order to meet this objective, we intend to continue to:

- Further the development of proprietary organic electro-optic polymer material systems
- Develop photonic devices based on our P<sup>2</sup>IC™ technology
- Develop proprietary intellectual property
- Grow our commercial device development capabilities
- Partner with silicon-based foundries who can scale volume quickly
- Grow our product reliability and quality assurance capabilities
- Grow our optoelectronic packaging and testing capabilities
- Grow our commercial material manufacturing capabilities
- Maintain/develop strategic relationships with major telecommunications and data communications companies to further the awareness and commercialization of our technology platform
- Add high-level personnel with industrial and manufacturing experience in key areas of our materials and device development programs.

### *Create Organic Polymer-Enabled Electro-Optic Modulators*

We intend to utilize our proprietary optical polymer technology to create an initial portfolio of commercial electro-optic polymer product devices with applications for various markets, including telecommunications, data communications and data centers. These product devices will be part of our proprietary photonics integrated circuit (PIC) technology platform.

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22

We expect our initial modulator products will operate at symbol rates at least 112 Gigabaud which is roughly 200Gbps when utilized with PAM4 encoding schemes that aligns with our recent package polymer slot modulator results presented at OFC 2024. Our devices are highly linear, and can also enable the performance required to take advantage of more advance complex encoding schemes if required.

## Our Proprietary Products in Development

As part of a tactical marketing strategy, our Company is developing several optical devices using our proprietary electro-optical polymer material, which are in various stages of development. These include:

### *Ridge Waveguide Modulator, Polymer Stack™*

Our ridge electro-optic waveguide modulator was designed and fabricated in our in-house laboratory. The fabrication of our first in-house device is significant to

our entire device program and is an important starting point for modulators that are being developed for target markets. We have multiple generations of new materials that we will soon be optimizing for this specific design. In September 2017 we announced that our initial alpha prototype ridge waveguide modulator, enabled by our P<sup>2</sup>IC™ polymer system, demonstrated bandwidth performance levels that will enable 112 Gbaud modulation in fiber-optic communications. This device demonstrated true amplitude (intensity) modulation in a Mach-Zehnder modulator structure incorporating our polymer waveguides. This important achievement will allow users to utilize arrays of 4 x 112 Gbaud symbol rate (4x 200 Gbps data rate) polymer modulators using PAM-4 encoding to enable 800 Gbps data rate systems. These ridge waveguide modulators are currently being packaged with our partner into prototype packages.

These prototype packages will enable potential customers to evaluate the performance at 112 Gbaud. Once a potential customer generates technical feedback on our prototype, we expect to be asked to optimize the performance to their specifications. Assuming this is successful, we expect to enter a qualification phase where our prototypes will be evaluated more fully.

In parallel, we are developing modulators for scalability to higher symbol rates above 112 Gbaud. In September 2018, we showed in conference presentations the potential of our polymer modulator platform to operate at over 100 GHz bandwidth. This preliminary result corresponds to 100 Gbps data rates using a simple NRZ data encoding scheme or 200 Gbps with PAM-4 encoding. With 4 lane arrays in our P<sup>2</sup>IC™ platform, the Company thus has the potential to address both 400 Gbps and 800 Gbps markets. While customers may start the engagement at 112 Gbaud, we believe potential customers recognize that scalability to higher speeds is an important differentiator of the polymer technology.

We believe the ridge waveguide modulator Polymer Stack™ represents our first commercially viable device and targets the fiber optics communications market. We have completed internal market analysis and are initially targeting interconnect reach distances of less than 1km. In these markets, the system network companies are looking to implement modulator-based transceivers that can handle aggregated data rates 800 Gbps and above. The market opportunity for less than 10km is worth over \$2B over the next decade.

#### *Polymer Plus™*

Using our novel waveguide design, we are developing a more compact modulator to be implemented directly with existing integrated photonics platforms such as silicon photonics and Indium Phosphide. As our electro-optic polymers are applied in liquid form, they can be deposited as a thin film coating in a fabrication clean room such as may be found in semiconductor foundries. This approach we call Polymer Plus™. The advantage of this approach is that it allows existing semiconductor integrated photonics platforms such as silicon photonics and indium phosphide to be upgraded with higher speed modulation functionality with the use of polymers in a straight-forward and simple approach. Further, our polymers are unique in that they are stable enough to seamlessly integrate into existing CMOS, Indium Phosphide (InP), Gallium Arsenide (GaAs), and other semiconductor manufacturing lines.

A large majority of commercial silicon photonics platforms utilize large silicon photonics foundries such as those that manufacture IC products for a number of applications such as communications, computing, consumer, etc. In order to seamlessly integrate our polymer materials to upgrade for example, silicon photonics designs, partnering with a silicon foundry is necessary.

#### *Polymer Slot™*

As part of supporting further improvement and scalability of our platform, we continue to develop more advanced device structures that include the Polymer Slot™. Our high performance, low power, extremely small footprint polymer photonics slot waveguide modulator utilizes a slot design that is part of PIC platform such as silicon photonics with one of our proprietary electro-optic polymer material systems as the enabling material layer. Performance results in 2023 from commercial foundries achieved key design specifications for the slot modulator.

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23

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Preliminary testing and initial data on our polymer photonics slot waveguide modulators fabricated at commercial foundries demonstrated extremely high performance suitable for the hyperscaler and fiber optics markets. The tested polymer photonic slot chip had less than 1-millimeter square footprint, enabling the possibility of sophisticated PIC architecture designs on a single silicon substrate. In addition, the waveguide structure was a fraction of the length of a typical inorganic-based silicon photonics modulator waveguide and is suitable to be used as an engine for state-of-the-art pluggable transceiver modules such as the OSFP and the QSFP-DD.

With the combination of our proprietary electro-optic polymer material and the extremely high optical field concentration in the slot waveguide, the test modulators demonstrated very low operating voltage. Initial speeds exceeded 70GHz in the telecom, 1310nm, and 1550 nanometer frequency bands, and there were devices that exceeded over 100GHz 3dB bandwidth.

We are also continuing our collaborative development of our polymer photonic slot waveguide modulators (Polymer Slot™) with a partner that has advanced device design capabilities using Plasmonic technologies. Some of these devices demonstrated performance levels that exceeded 250GHz in 2022 with our partners.

#### *Our Long-Term Device Development Goal - Multilane Polymer Photonic Integrated Circuit (P<sup>2</sup>IC™)*

Our P<sup>2</sup>IC™ platform is positioned to address markets with aggregated data rates of 100 Gbps, 400 Gbps, 800 Gbps and beyond. Our P<sup>2</sup>IC™ platform will contain several photonic devices that may include, over and above polymer-based modulators, photonic devices such as lasers, multiplexers, demultiplexers, detectors, fiber couplers.

While our polymer-based ridge waveguide and slot modulators are currently under development to be commercially viable products, our long-term device development goal is to produce a platform for the 400 Gbps, 800 Gbps, 1600Gbps and beyond fiber optic transceiver market. This has been stated in our photonics product roadmap that is publicly available on our website. The roadmap shows a progression in speed from 50 Gbaud based modulators to 100 Gbaud based modulators. The roadmap shows a progression in integration in which the modulators are arrayed to create a flexible, multilane P<sup>2</sup>IC™ platform that spans 100 Gbps, 400 Gbps, 800 Gbps, 1.6Tbps (or 1600Gbps), and a scaling philosophy that will grow to 3.2Tbps line rates.

We showed bandwidths of polymer-based modulator devices at a major international conference (ECOC – European Conference on Optical Communications 2018) with bandwidths that exceeded 100GHz. We noted that to achieve 100Gbaud, the polymer-based modulator only needs to achieve 80GHz bandwidth. During ECOC 2019, we showed environmental stability. We continue to develop our polymer materials and device designs to optimize additional metrics. We are now optimizing the device parameters for very low voltage operation. At the ECOC 2022 conference we demonstrated two different world record performances using polymer slot-based modulators. In an invited presentation at OFC 2024 in San Diego, we presented data that showed our packaged polymer slot modulators operating with open (clean) eye diagrams at 100GBaud PAM4 (or 200Gbps PAM4) at voltage drive levels at 1V. We also showed polymer modulators with voltage drive levels that were below 1V. Driving voltage levels of around 1V is important as it allows our polymer modulators to be driven directly from CMOS ICs (as opposed to dedicated driver integrated circuit chips). We have recently demonstrated drive levels below 0.5V, which represents the highest performance commercially designed Electro-Optic polymer modulators to date. The impact of very low drive voltages directly affects savings in power consumption for the module system, which is a key issue for datacenter operators today.

#### **Our Target Markets**

##### *Cloud computing and data centers*

*Big data* is a general term used to describe the voluminous amount of unstructured and semi-structured data a Company creates – data that would take too much time and cost too much money to load into a relational database for analysis. Companies are looking to cloud computing in their data centers to access all the data. Inherent speed and bandwidth limits of traditional solutions and the potential of organic polymer devices offer an opportunity to increase the bandwidth, reduce costs, improve speed of access, and to reduce power consumption both at the device as well as the system level.

Datacenters have grown to enormous sizes with hundreds of thousands and even millions of servers in a single datacenter. The number of so-called “hyperscale” datacenters are expected to continue to increase in number. Due to their size, a single “datacenter” may consist of multiple large warehouse-size buildings on a campus or even several locations distributed around a metropolitan area. Data centers are confronted with the problem of moving vast amounts of data not only around a single data center building, but also between buildings in distributed data center architecture. Links within a single datacenter building may be shorter than 500 meters, though some will require optics capable of 2 km. Between datacenter buildings, there is an increasing need for high performance interconnects over 10km in reach.

Our modulators are suitable for single-mode fiber optic links. We believe that our single mode modulator solutions will be competitive at 500m to 10km link

distance lengths, with inherent advantages for 800Gbps applications.

#### *Telecommunications/Data Communications*

The telecommunications industry has evolved from transporting traditional analogue voice data over copper wire into the movement of digital voice and data. Telecommunication companies are faced with the enormous increasing challenges to keep up with the resulting tremendous explosion in demand for bandwidth. The metropolitan network is especially under stress now and into the near future. Telecommunications companies provide services to some data center customers for the inter-data center connections discussed above. 5G mobile upgrade, autonomous driving and IoT are expected to increase the need for data stored and processed close to the end user in edge data centers. This application similarly requires optics capable of very high speeds and greater than 10 km reach.

#### *Industry issues of scaling*

The key issues facing the fiber-optic communications industry are the economic progress and scalability of any PIC based technological platform. Our polymer platform is unique in that it is truly scalable and is expected to become a high-performance engine for transceiver modules. Scalable means being able to scale up for high-speed data rates, while simultaneously being able to scale down in cost, and lower power consumption. This allows a competitive cost per data rate or cost per Gbps metric to be achieved.

Fiber optic datacenter and high-performance computing customers want to achieve the metric of \$1/Gbps @ 800Gbps (this essentially means a single mode fiber optic link that has a total cost of \$800 and operates with a data rate of 800Gbps). Equally importantly, the datacenter industry would like to reduce the power consumption of optical ports for 400Gbps, 800Gbps, etc., significantly. As industry tries to match this target, it needs scalable PIC platforms to achieve this goal, of which our polymer platform is uniquely suited.

An article by Dr. Michael Lebby that was recently published in broadband communities (BBC) magazine in early February 2023 discusses the virtues of polymer-based technologies as part of an industry technology roadmap. The article is entitled 'The internet is the brick wall Nostradamus did not see coming.' In this article cost/performance metrics are discussed that show the trend to higher and higher data rates using PIC platforms that include very high speed, low power modulator devices.

The article also shows that electro-optic polymers play an important role in PICs over the next decade as they can reduce or close the gap between customer expectations and technical performance through effective scaling increase of high performance with low cost for short distance transceiver optical links.

Some of the things needed to achieve the scaling performance of polymers in integrated photonics platforms is within sight today:

1. Increased r33 (which leads to very low Vpi in modulator devices) and we are currently optimizing our polymers for this. With Vpi levels of 1V or less will enable direct from associated electronics and potentially save network architects the cost of individual driver ICs. Recent materials have demonstrated significant increases in r33 performance of our polymers.
2. Increase temperature stability so that the polymers can operate at broader temperature ranges effective, where we have made significant progress over the past few years, and this continues to improve with recent polymers.
3. Low optical loss in waveguides and active/passive devices for improved optical budget metrics which is currently an ongoing development program at our Company.
4. Higher levels of hermeticity for lower cost packaging of optical sub-assemblies within a transceiver module, where our advanced designs are being implemented into polymer-based packages that utilize atomic layer deposition (ALD) that is being developed in-house.

Scalability in terms of cost reduction and high-volume manufacturing can be enhanced by:

1. Leverage of commercial silicon photonics manufacturing capacity using silicon-based foundries. Our Polymer Plus™ platform seeks to be additive to standard silicon photonics circuits.
2. Reduction of optical packaging costs by integration at the chip level of multiple modulators and with other optical devices. Our P<sup>2</sup>IC™ platform seeks to address device integration.

Scalability in terms of cost reduction and high-volume manufacturing can be enhanced by:

1. Leverage of commercial silicon photonics manufacturing using commercial silicon-based foundries running 200mm silicon wafers. Our Polymer Plus™ platform seeks to be additive to standard silicon photonics circuits.
2. Reduction of optical packaging costs by integration at the chip level of multiple modulators and with other optical devices. Our P2IC™ platform seeks to address device integration.

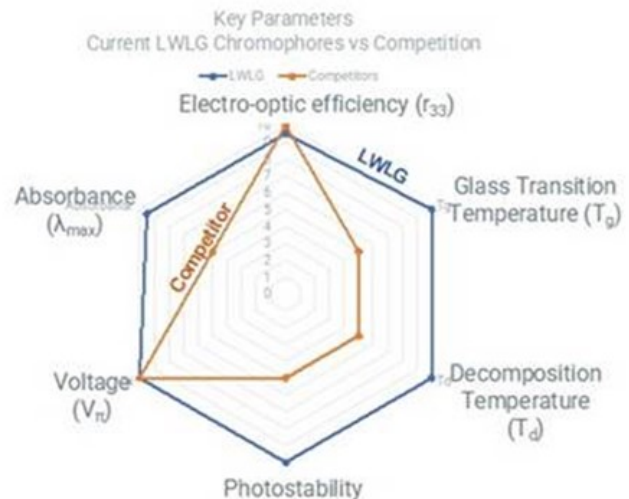
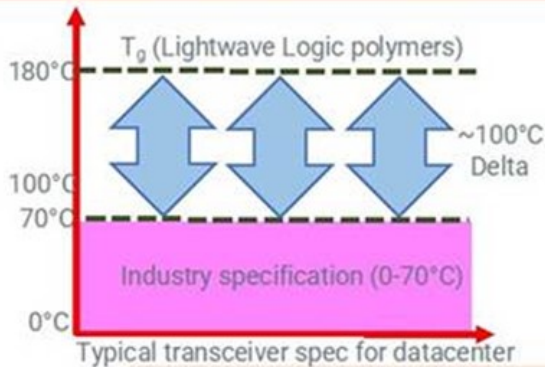


# Design philosophy: optimized reliability & performance

LIGHTWAVELOGIC®

## World class chromophore design

- Very high glass transition temperature ( $T_g$ )
- ~100°C delta between industry spec and  $T_g$
- Eliminates need for cross-linking
- Protects material from de-poling (occurs when  $T_g$  is close to industry specification high limit)



Electro-optic material designed for reliability, stability, and overall operational performance

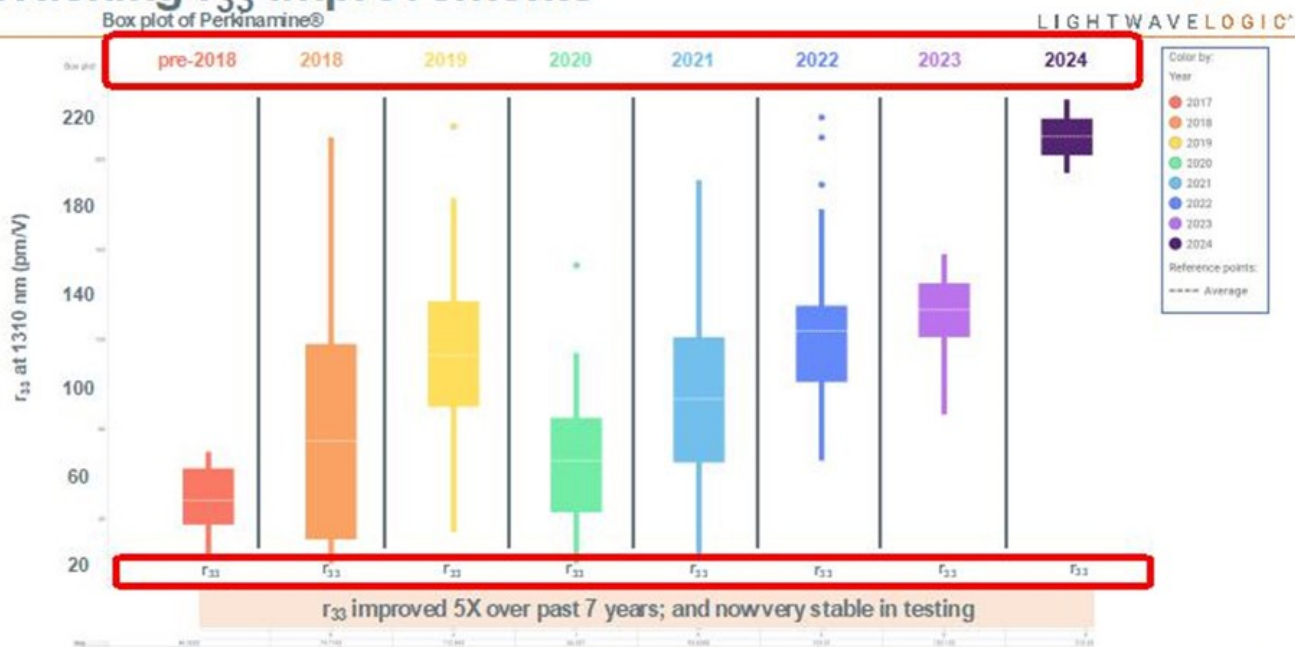
NB: These are qualitative analyses only, i.e. on a scale of 1-10, how "good" is the material in terms of the particular parameter.  
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14

The above graphic shows the Company electro-optic material design philosophy of increased glass transition temperature. When the materials are designed with  $T_g$  above 170°C, this equates to approximately 100°C above the normal operating temperatures in a data center environment. This feature increases the material reliability significantly. Further, as the spider chart on the right of the above graphic indicates that key performance metrics of the Company's electro-optic chromophores perform well against competition in parameters such as photostability, decomposition temperature, voltage, absorbance, glass transition temperature, and  $r_{33}$  (electro-optic efficiency). This positions the Company's materials very well in the marketplace and eliminates the need to cross-link the polymers which jeopardizes stability and reliability.

26

## Tracking $r_{33}$ improvements



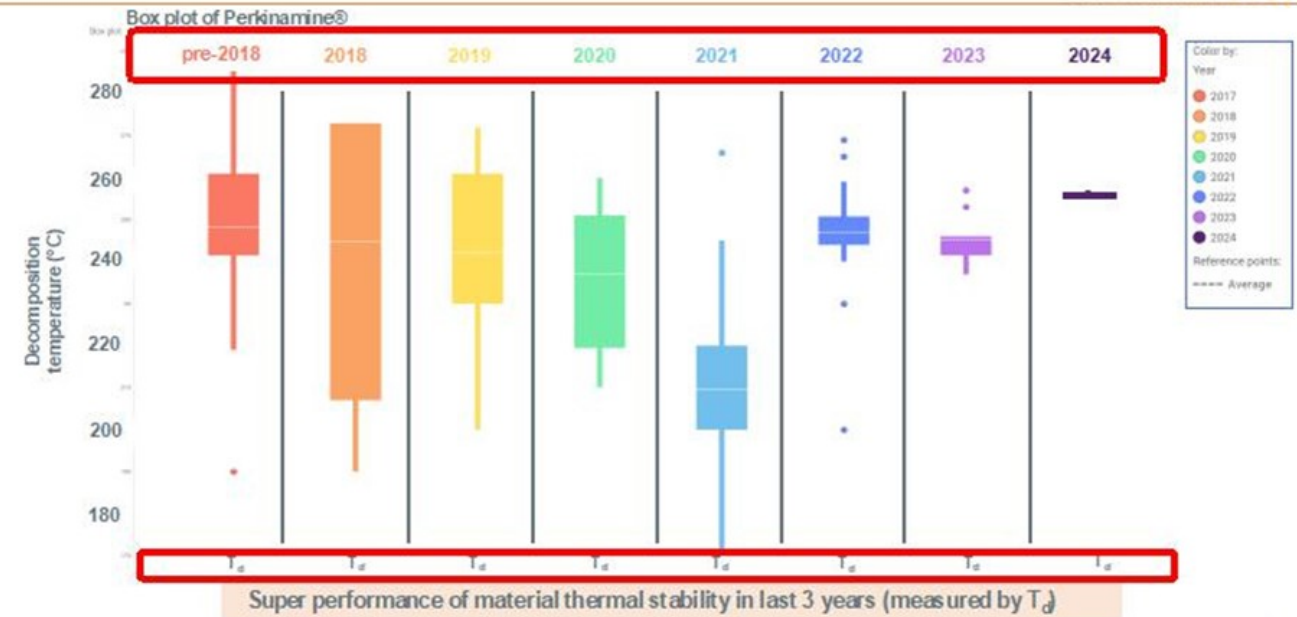
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17

The above graphic shows the increasing trend of improved electro-optic chromophores that have been developed by the Company. The graphic details improvements in  $r_{33}$ , a measure of electro-optic efficiency of Perkinamine® electro-optic material. The  $r_{33}$  has improved using a box plot, approximately over 5X during the past 7 years, and is now very stable in testing.



# Tracking thermal stability improvements



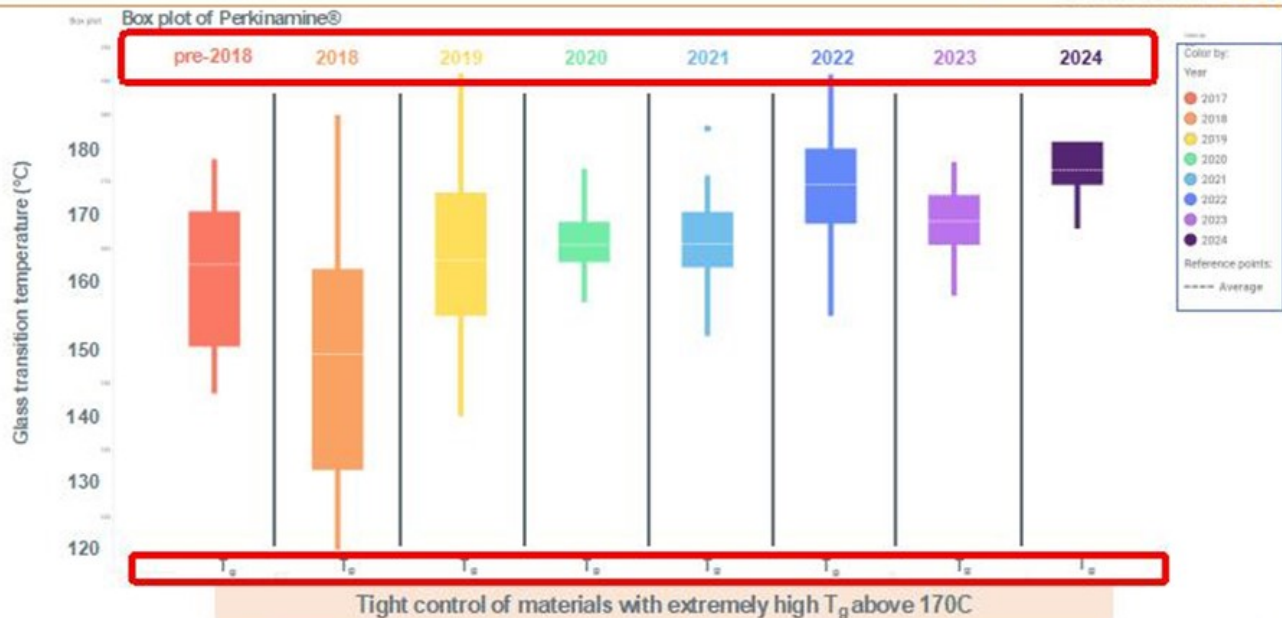
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18

The above graphic shows the increasing trend of improved electro-optic chromophores that have been developed by the Company in respect to decomposition temperature. The graphic details improvements in  $T_d$  showing through the box plot extremely tight and improved material thermal stability over the past 3 years, and excellent results over the past year.

27

# Tracking Glass Transition Temperature ( $T_g$ )



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19

The above graphic shows the increasing trend of improved electro-optic chromophores that have been developed by the Company in respect to glass transition temperature. The graphic details improvements in  $T_g$  showing through the box plot extremely tight and improved material with  $T_g$ 's above 170C with tight control of the materials performance as measured in thin films.

## Recent Significant Events and Milestones Achieved

During February and March 2018, we moved our Newark, Delaware synthetic laboratory and our Longmont, Colorado optical testing laboratory and corporate headquarters to office, laboratory and research and development space located at 369 Inverness Parkway, Suite 350, Englewood, Colorado. The 22,420 square feet Englewood facility includes fully functional 1,000 square feet of class 1,000 cleanroom, 500 square feet of class 10,000 cleanroom, chemistry laboratories, and analytic laboratories. The Englewood facility streamlines all our Company's research and development workflow for greater operational efficiencies.

During March 2018, our Company, together with our packaging partner, successfully demonstrated packaged polymer modulators designed for 50Gbaud, which we believe will allow us to scale our P<sup>2</sup>IC™ platform with our Mach-Zehnder ridge waveguide modulator design as well as other photonics devices competitively in the 100Gbps and 400Gbps datacom and telecommunications applications market. We are currently fine-tuning the performance parameters of these prototypes in preparation for customer evaluations.

During June 2018, our Company Acquired the Polymer Technology Intellectual Property Assets of BrPhotonics Productos Optoelectrónicos S.A., a Brazilian corporation, which significantly advanced our patent portfolio of electro-optic polymer technology with 15 polymer chemistry materials, devices, packaging and subsystems patent and further strengthened our design capabilities to solidify our market position as we prepare to enter the 400Gbps integrated photonics marketplace with a highly competitive, scalable alternative to installed legacy systems.

Also, during June 2018, our Company promoted polymer PICs and Solidified Polymer PICs as Part of the Photonics Roadmap at the World Technology Mapping Forum in Enschede, Netherlands, which includes our Company's technology of polymers and polymer PICs that have the potential to drive not only 400Gbps aggregate data rate solutions, but also 800Gbps and beyond.

In August 2018 we announced the completion (ahead of schedule) of our fully equipped on-site fabrication facility, where we are expanding our high-speed test and design capabilities. We also announced the continuation of the building of our internal expertise with the hiring of world-class technical personnel with 100Gbps experience.

---

28

In February 2019 we announced a major breakthrough in our development of clean technology polymer materials that target the insatiable demand for fast and efficient data communications in the multi-billion-dollar telecom and data markets supporting Internet, 5G and IoT (Internet of Things) webscale services. The improved thermally stable polymer has more than double the electro-optic response of our previous materials, enabling optical device performance of well over 100 GHz with extremely low power requirements. This addition to the family of Perkinamine™ polymers will hold back run-away consumption of resources and energy needed to support ever-growing data consumption demands. We continue to conduct testing of the material and assessment of associated manufacturing processes and device structures prior to release to full development.

In March 2019 we created an Advisory Board comprised of three world-class leaders in the photonics industry: Dr. Craig Ciesla, Dr. Christoph S. Harder, and Mr. Andreas Umbach. In January 2022 Dr. Ciesla was named to our Board of Directors, and our Advisory Board is currently comprised of Dr. Franky So, Dr. Christoph S. Harder, Mr. Andreas Umbach and Dr. Joseph A. Miller, who is a former member of our Board of Directors. The Advisory Board is working closely with our Company leadership to enhance our Company's product positioning and promote our polymer modulator made on our proprietary *Faster by Design*™ polymer P<sup>2</sup> IC™ platform. The mission of the Advisory Board is initially to increase our Company's outreach into the datacenter interconnect market and later to support expansion into other billion-dollar markets. The Advisory Board members have each been chosen for their combination of deep technical expertise, breadth of experience and industry relationships in the fields of fiber optics communications, polymer and semiconductor materials. Each of the Advisory Board members has experience at both innovators like Lightwave Logic and large industry leaders of the type most likely to adopt game-changing polymer-based products. In addition, they possess operational experience with semiconductor and polymer businesses.

Also, in March 2019, our Company received the "Best Achievement in PIC Platform" award for our 100 GHz polymer platform from the PIC International Conference. The award recognizes innovative advances in the development and application of key materials systems driving today's photonic integrated circuits (PICs) and providing a steppingstone to future devices.

During the second quarter of 2019, our Company promoted its polymers at Colnnovate in May and the World Technology Mapping Forum in June. Colnnovate is a meeting of semiconductor industry experts. The World Technology Mapping Forum is a group authoring a photonics roadmap out to 2040.

In September 2019 at the prestigious European Conference on Communications (ECOC) in Dublin, Ireland, we showed measured material response over frequency and the resulting optical data bits stream on our clean technology polymer materials, the newest addition to our family of Perkinamine™ polymers, that meet and exceed of our near-term target speed of 80 GHz. We also released data demonstrating stability under elevated temperatures in the activated (poled to create data carrying capability) state.

In October 2019, we reported that energy-saving polymer technology is highlighted in the recently published Integrated Photonics Systems Roadmap - International (IPSR-I). The roadmap validates the need for low-voltage, high-speed technologies such as ours.

In May 2020, we announced that our latest electro-optic polymer material has exceeded target performance metrics at 1310 nanometers (nm), a wavelength commonly used in high-volume datacenter fiber optics. This material demonstrates an attractive combination at 1310 nm of high electro-optic coefficient, low optical loss and good thermal stability at 85<sup>0</sup> Celsius. The material is expected to enable modulators with 80 GHz bandwidth and low drive power, and has an electro-optic coefficient of 200 pm/V, an industry measure of how responsive a material is to an applied electrical signal. This metric, otherwise known as r<sub>33</sub>, is very important in lowering power consumption when the material is used in modulator devices. This technology is applicable to shorter reach datacenter operators, for whom decreasing power consumption is imperative to the bottom line of a facility. We considered this a truly historic moment—not only in our Company's history, but in our industry—as we have demonstrated a polymer material that provides the basis for a world-class solution at the 1310 nm wavelength, something which other companies have spent decades attempting to achieve.

In July 2020, we announced the official launch of our new corporate website [www.lightwavelogic.com](http://www.lightwavelogic.com), reflecting ongoing efforts to provide up-to-date information for investors and potential strategic partners. The revamped website offers a clean, modern design integrated with helpful tools and investor relations resources, including a new corporate explainer video, to illustrate the target markets and advantages of Lightwave Logic's proprietary electro-optic polymers.

In August 2020, we announced the addition of Dr. Franky So, a leading authority in the OLED industry, to our Advisory Board. Dr. So is the Walter and Ida Freeman Distinguished Professor in the Department of Materials Science and Engineering at North Carolina State University. Previously, he was the Head of Materials and Device research for OLEDs at OSRAM Opto Semiconductors, as well as Motorola's corporate research lab in the 1990s. Dr. So was an early researcher in electro-optic (EO) polymer modulators at Hoechst Celanese. As a member of the Company's advisory board, Dr. So will work closely with management to enhance Lightwave's product positioning for, as well as the promotion of, its polymer modulators made on its proprietary platform. In addition, he will provide technical support and advisory services to the Lightwave materials and device teams.

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29

On October 7, 2020, we announced the receipt of U.S. Patent number 10,754,093 that improves both the performance and reliability of our high-speed, low-power electro-optic polymer modulators intended for datacenter and telecommunications applications. The patent allows multi-layered electro-optic polymer modulators to perform more efficiently through the design of custom interfaces. These interfaces are designed into the cladding layers that allow optical transmission, electrical conductivity, material integrity, as well as a prevention of solvents affecting adjacent polymer materials. The net impact of all of this allows for our Company's modulators to improve performance across the board, enabling higher reliability in the fiber optic communications environment.

On October 15, 2020, we announced that our proprietary polymer technologies are compatible with currently available integrated photonics platforms. Our proprietary electro-optic materials are currently in the prototyping phase and are fabricated onto standard silicon wafers, and this Polymer Plus™ advancement, driven by the feedback our Company received from potential customers to-date, has allowed our materials to be suitable for additive integration to integrated photonics platforms such as silicon photonics, as well as indium phosphide and other standard platforms – therefore enabling simpler integration by customers. We believe this breakthrough allows a polymer modulator to enhance the performance of existing integrated photonics solutions in the marketplace, enabling higher speed and lower power consumption on foundry-fabricated photonics designs. Since our technology is additive to existing platforms such as silicon photonics, our electro-optic polymers are not actually competing with integrated photonic platforms, but rather enabling them to be more competitive in the marketplace, and it further validates our EO polymer platform as ideally suited to enable optical networking more efficiently than ever.

On October 21, 2020, we announced that we have optimized a robust, photo-stable organic polymer material for use in our next-generation modulators intended to be trialed with potential customers under NDA. Our materials show high tolerance to high-intensity infrared light, common in a fiber optic communications environment and increasingly important as higher density of devices access the network, directly resulting in higher intensity infrared light levels. Our preliminary results suggest that our recently developed electro-optic polymer material, designed based on potential customer input, displays unrivaled light tolerance (also known as photostability) compared to any organic commercial solution in use today. Our results meet both our current internal criteria and address potential customer feedback.

On November 2, 2020, we disclosed results on our polymer material stability testing including further results for electro-optic efficiency for our Company's materials that operate both at 1550nm as well as 1310nm. We demonstrated test materials results for electro-optic efficiency to 4000hrs, improvement in sensitivity to oxygen as part of a broadband exposure test, and stability for polymers exposed to 1310nm light at 100mW.

On November 20, 2020 we announced the receipt of U.S. Patent number 10,591,755 that details an important invention that allows users of electro-optic polymer modulators to not only operate the devices with high speed and low power directly from CMOS IC chips, but gives them the opportunity to avoid the expense, physical footprint and power consumption of high-speed modulator driver ICs. Furthermore, this patent strengthens our freedom of manufacturing, and directly enables our modulators to become more competitive in the marketplace.

On December 16, 2020 we announced the development of a new sealant for our future Chip-on-Board (COB) packaged polymer platform. The sealant, which blocks oxygen and other atmospheric gases, is a key step in our Company's development towards a polymer modulator without a package, an important enabling technology for the industry. We plan to develop the sealant for commercial implementation in our future modulators. Recent results suggest that our electro-optic polymer sealant material displays encouraging barrier properties and is expected to translate to significant improvement in bare chip robustness against atmospheric gases, as compared to existing EO polymer commercial solutions in use today. While the initial measurements are highly promising, our Company plans to continue development work to further optimize the sealant material and barrier performance towards the chip-on-board goal.

On January 13, 2021, we announced the receipt of U.S. Patent number 10,886,694 that details an invention that allows electro-optic polymer modulators to be packaged in a hermetic environment using well-known, high-volume and low-cost fabrication processes that are available in a typical semiconductor fabrication foundry – improving suitability for mass production. Further, the design of this capsule package can improve both the reliability and the coupling interface between fiber optic cables and their laser sources for arrayed photonic integrated circuit solutions. The package can also interpose signals from an underlying circuit board to the polymer modulators, lasers, and other components for data transfer. The hermetic capsule is built from a semiconductor base that contains electrical and optical circuits and components. A hermetic capsule chamber is created by the design of a semiconductor lid that is sealed to the semiconductor base platform by a metallization process. Using standardized fabrication techniques we can now create a package that achieves the performance, reliability, cost, and volume requirements that has been a challenge for the photonics industry for years.

On May 11, 2021, we announced the receipt of U.S. Patent number 10,989,871 that details an invention that allows for improved protective polymer layers in modulators when designed into advanced integrated photonic platforms, better positioning them for high-volume manufacturing processes. The protective layers will enhance electro-optic polymer devices' performance through higher reliability, better optical performance and enable the use of standardized manufacturing processes best suited for mass-production.

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30

On June 7, 2021, we announced that our company's common stock was added to the Solactive EPIC Core Photonics EUR Index NTR as part of the index's semi-annual additions. The index includes global public companies with a common theme of optoelectronics, photonics, and optical technologies in general that range from components, modules, manufacturers, and optical network system companies. This inclusion broadens our exposure to the capital markets community, as well as credibility with potential partners and customers.

On June 16, 2021, we announced test results from new modulators fabricated in 2021, which exceeded bandwidth design targets and achieved triple the data rate as compared to competing devices in use today. The breakthrough new devices demonstrated 3dB electro-optical with electrical bandwidths that exceed 100GHz – with measurements coming close to our Company's state-of-the-art 110GHz test equipment capability. We expect this advancement to have a profound impact on the traffic flow on the internet.

On June 24, 2021, we announced the receipt of U.S. patent number 11,042,051 that details a breakthrough new device design that enables mass-volume manufacturing when designed into advanced integrated photonic platforms. The device design enhances reliability, improves optical mode control and most important, lowers by consumption through the use of direct-drive, low-voltage operation. The patent is entitled, "Direct drive region-less polymer modulator methods of fabricating and materials therefor" and is expected to open the opportunity for low power consumption electro-optic polymers to be developed into large foundry PDKs (process development kits) and be ready for mass volume commercialization. The patent emphasizes our technology platform using fabrication techniques that would naturally fit into foundry PDKs.

On August 4, 2021, we announced that we developed improved thermal design properties for electro-optic polymers used in our Polymer Plus™ and Polymer Slot™ modulators, enabling the speed, flexibility and stability needed for high-volume silicon foundry processes. We successfully created a 2x improvement in  $\tau_{33}$ , while allowing higher stability during poling and post-poling. This provides better thermal performance and enables greater design flexibility in high-volume silicon foundry PDK (process development kit) processes.

On August 9, 2021, we announced the receipt of U.S. patent number 11,067,748 entitled "Guide Transition Device and Method" that covers a new invention that enables enhanced optical routing architectures for polymer-based integrated photonics that can be scaled with partner foundries. This new invention will enable innovative, highly scalable optical routing architectures for integrated photonic platforms. The patent provides novel optical waveguide transition designs using two planes of optical waveguides that are expected to be critical for optical signal routing and optical switching, opening the opportunity for high speed, energy efficient electro-optic polymers to be implemented into foundry PDKs (process development kits) to improve the performance of integrated photonic circuits. This breakthrough technology opens the door for advanced integrated photonics architectural design. We believe the simplicity of the design is ideal for production in foundries and will best position our Company to enable increased data traffic on the internet while using less power.

On September 1, 2021, our Company's common shares began trading on the Nasdaq Capital Market ("Nasdaq"). The Company's Nasdaq listing will help to expand our potential shareholder base, improve liquidity, elevate our public profile within the industry and should ultimately enhance shareholder value.

On September 15, 2021, we announced the receipt of the 2021 Industry Award for Optical Integration from the European Conference on Optical Communications (ECOC), a premier industry exhibition that was held in Bordeaux from September 13-15, 2021. ECOC created the fiber communication industry awards in six categories to put the spotlight on innovation happening within the industry. The awards recognize and highlight key industry achievements in advancing optical components, photonic integration, optical transport and data center innovation. The awards are selected from top industry players, representing significant innovation in photonics integration at our prestigious exhibition.

On September 16, 2021, we announced the achievement of world-record performance for a polymer modulator, as demonstrated in an optical transmission experiment by ETH Zurich, using our Company's proprietary, advanced Perkinamine™ chromophores and Polariton Technologies Ltd.'s newest plasmonic EO modulator, a silicon-photonics-based plasmonic racetrack modulator offering energy-efficient, low-loss, and high-speed modulation in a compact footprint. The groundbreaking results were presented as a post-deadline paper at the prestigious European Conference on Optical Communications (ECOC) industry exhibition and conference in Bordeaux on September 16, 2021. Polariton's plasmonic modulator transmitted 220 Gbit/s OOK and 408 Gbit/s 8PAM. Transmission of an optical signal was conducted over 100 m using a low-voltage electrical drive of 0.6Vp, an on-chip loss of 1 dB, and an optical 3 dB bandwidth of beyond 110 GHz.

On January 3, 2022, we announced the publication of our patent application 20210405504A1 by the United States Patent and Trademark Office (USPTO) – entitled *'Nonlinear Optical Chromophores Having a Diamondoid Group Attached Thereto, Methods of Preparing the Same, and Uses Thereof'* – which significantly improves the overall stability and performance of our electro-optic polymers. The Company's electro-optic chromophores are designed to have one or more diamondoid molecular groups attached to the chromophore. When such chromophores are dispersed in a host polymer matrix, the electro-optic materials result in improved macroscopic electro-optic properties, increased poling efficiency, increased loading as well as increased stability of these materials after poling. The impact of this technology is that it will accelerate the path for very high-speed, low-power electro-optic polymers to be implemented into large foundry process development kits ("PDKs") to boost performance of integrated photonic circuits.

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31

On January 3, 2022, we announced that we enhanced our Company's Foundry Process Development Kit Offering with the addition of Optical Grating Couplers. This expanded design tool kit will enable silicon foundries to implement PDKs and fabricate modulators and optical gratings in a single fab run, further enhancing modulator efficacy. We are continuing to work on additional design tool kit components to enable an expedited commercialization process through a more simplified manufacturing process for our foundry partners.

On January 3, 2022, we announced that we appointed respected industry leader Dr. Craig Ciesla to our Board of Directors and that retired director Dr. Joseph A. Miller transitioned to our Company's Advisory Board. Dr. Ciesla is currently the Vice President, Head of the Advanced Platforms and Devices Group at Illumina, a leading provider of DNA sequencing and array technologies. There he leads a team driving innovation in sequencing platforms, microfluidics, electronics, and nanofabrication. Prior to Illumina, he was Vice President of Engineering at Kaiam, where he was responsible for the development and production of 100G transceivers for the data-center market. He was also the founding CEO of Tactus Technology, an innovator in the user interface industry, where he was the co-inventor of Tactus' polymer morphing

screen technology. Before Tactus he had a variety of roles at Intel, JDSU (now Lumentum), Bookham (now Oclaro) and Ignis Optics developing a wide range of products in the fiber-optics market. He started his career at Toshiba Research Europe, where he performed early terahertz images of skin cancer. Dr. Ciesla holds a BSc (Hons.) in Applied Physics and Ph.D. in Physics from Heriot-Watt University in Edinburgh.

On February 10, 2022, we announced breakthrough photostability results on our electro-optic polymer modulators that are compatible with high-volume silicon foundry processes. The improved photostability of our polymers are expected to minimize any optical losses and provide a more robust platform for silicon foundries. This breakthrough photostability performance is incredibly important as we optimize our polymers for high-volume silicon foundry processes.

On March 7, 2022, we announced the receipt of U.S. patent number 11,262,605 entitled, "Active region-less polymer modulator integrated on a common PIC platform and method." This invention will simplify modulator integration for high-volume foundry manufacturing operations while enhancing polymer reliability to enable a more effective photonic engine. The essence of the invention is a complete optical engine that fits into fiber optic transceivers (either pluggable or co-packaged) that are used in routers, servers and elsewhere in optical networks. The engine is designed for high-volume manufacturing operations using silicon foundry infrastructure. The patent illustrates the use of our polymer modulators as a high speed, low power engine not only for data communication and telecommunication applications, but other new market opportunities as well.

On March 22, 2022 we announced the achievement of world-class results for a polymer modulator, as demonstrated in an enhanced stability and high-speed measurement by Polariton Technologies and ETH Zurich. The results were generated using the Company's proprietary, advanced Perkinamine™ chromophores in Polariton's silicon-photonics-based plasmonic racetrack modulator that offers energy-efficient, low-loss, and high-speed modulation in a compact footprint that is ideal for pluggable and/or co-packaging transceiver modules. The plasmonic modulator performance was compared to that of silicon photonic microring modulators. The plasmonic device, using Lightwave Logic's electro-optic polymer material, was shown to be 250-3000x more stable than the silicon devices relative to operating condition changes. In addition, the plasmonic modulator was tested for 70+ minutes at 100 Gbps NRZ at 80C with no decrease in performance. The world-class results were presented as a contributed peer-reviewed paper at the prestigious 2022 Optical Fiber Conference (OFC2022), the optical communication industry's leading international technical conference and trade show, in San Diego on March 10, 2022.

On April 19, 2022, we announced the publication of our patent application 2022/0113566 A1 entitled "TFP (thin film polymer) optical transition device and method" that illustrates the design of a simpler to fabricate, lower cost hybrid integrated photonics chip using electro-optic polymers which are more advantageous for high-volume production. The invention will simplify polymer modulator fabrication when integrated with silicon photonics for high-volume foundry manufacturing applications. The simplified fabrication approach enables us to simplify the production of very high speed, low power proprietary polymer modulators that will enable significantly faster data rates in the internet environment. The essence of the invention is a hybrid polymer-silicon photonics engine that fits into fiber optic transceivers (either pluggable or co-packaged) that are used in the routers, servers and network equipment that are proliferating with the growth of data centers, cloud computing and optical communications capacity. The hybrid polymer-silicon photonics engine is designed to use high-volume silicon foundry infrastructure.

On May 25, 2022, we announced enhanced photostability results on our Company's proprietary electro-optic polymer modulators – demonstrating the reliability necessary for commercial deployments – all based on a technology which can be ported into high-volume silicon foundries and integrated onto a silicon photonics platform with other optical devices. Photostability is a critical performance metric required both in high volume manufacturing processes (such as photolithography) and in offering the high reliability and network availability required for commercial deployments. In the tests conducted, subjecting the Company's latest polymers to high intensity optical power for over 3000 hours produced no change in device performance. The ability of our proprietary polymers to pass this accelerated photostability aging test provides assurance that they will both tolerate the optical exposures which occur in high-volume manufacturing and support the reliability over the required operating life of optical transceivers and network elements.

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32

On June 21, 2022, we announced the publication of our patent application 2022/0187637A1 entitled "Hybrid electro-optic polymer modulator with silicon photonics" that details a novel fabrication process that allows our Company's proprietary polymers to be fabricated by silicon foundries in a high-volume manufacturing environment. The published patent application also details a more efficient process that allows for high yielding, high stability poling of polymers in a high-volume foundry manufacturing environment. The development of the PDK for this new optical hybrid optical modulator design is now in progress with our Company's foundry partners.

June 23, 2022, we announced the publication of our patent application 2022/0187638A1 entitled "Hybrid electro-optic polymer modulator with atomic layer deposition (ALD) sealant layer" that allows our Company's proprietary polymers to be sealed to moisture and other atmospheric gases in a very low temperature and quasi-hermetic environment through the use of a chip-scale packaging approach that can be applied in parallel at wafer level (i.e. in volume) and that eliminates the need for a separate hermetic enclosure or "gold box." Chip-scale packaging is a technique that has been gathering momentum in the silicon electronics industry for the past decade to reduce device chip packaging costs and increase device performance – enabling high-volume front and back-end manufacturing as well as extremely small sizes in miniaturization. Specifically, our electro-optic polymer modulators are sealed with a low-temperature conformal atomic layer deposition dielectric layers that are supported on a silicon substrate with passive silicon photonics waveguides.

On June 27, 2022, our Company's common stock was added to the Russell 3000® Index. We expect that the awareness of being included in one of the most widely followed benchmarks will not only benefit our existing shareholders but will lead to a broader base of institutional investors. The annual Russell index reconstitution captures the 4,000 largest US stocks as of May 6, ranking them by total market capitalization. Our membership in the US all-cap Russell 3000® Index, which remains in place for one year, means automatic inclusion in the small-cap Russell 2000® Index as well as the appropriate growth and value style indexes.

On June 30, 2022, we announced that our CEO, Dr. Michael Lebby, was again invited to co-chair the Photonic Integrated Circuits (PIC) International Conference that took place June 28-29, 2022, in Brussels, Belgium. At the conference, Dr. Lebby led an invited talk entitled, "Enabling lower power consumption optical networking using high speed, low power polymer modulators", focusing on the issue of reducing power consumption in datacenters and optical networks. He also contributed to a panel session, "Hybrid PICs technology challenges and solutions," on the need for hybrid integration addressing the volume production of 3D and 2.5 integrated electronic and photonic integrated circuits (PICs) based on the utilization of large silicon foundries. This included a discussion on the use of silicon photonics with hybrid technologies such as electro-optic polymers, polymer based plasmonics, silicon nitride and III-V laser sources.

On September 22, 2022, we announced the achievement of world record performance for low-power consumption ultra-high-speed 'green' slot modulators in collaboration with Karlsruhe Institute of Technology (KIT) and its spin-off SiOriX as part of a peer-reviewed post-deadline paper presented at the prestigious 2022 European Conference on Optical Communications (ECOC) in Basel, Switzerland on September 22, 2022. The team presented the first sub-1mm Mach Zehnder-type modulators with sub-1V drive voltage that rely on Lightwave's proprietary advanced Perkinamine™ chromophores. The devices rely on the slot-waveguide device concept developed at KIT and commercialized through SiOriX. Further, the material has experimentally proven thermal stability at 85°C and offers extreme energy-efficiency along with high-speed modulation in a compact footprint. Additionally, this shows that our material can perform in a variety of device structures and designs and is positioned to significantly reduce power consumption of optical networking and to become a true 'green photonics' enabler for the industry.

On September 22, 2022, we announced the achievement of a world-record demonstration of a 250GHz super high bandwidth electro-optical-electrical (EOE) link through a collaboration with ETH Zurich. The link was demonstrated by ETH Zurich and uses Polariton's high-speed plasmonic modulators containing Lightwave's proprietary Perkinamine™ chromophores and ETH Zurich's high-speed graphene photodetectors. The link contained a plasmonic modulator using electro-optic polymer material as well as a novel metamaterial enhanced graphene photodetector featuring a 200 nm spectral window and a setup-limited<sup>1</sup>; bandwidth of 500 GHz. The EOE link achieved a world record and unprecedented 250 GHz 3dB bandwidth<sup>2</sup>. This is an optical link that utilizes devices with extremely high bandwidths, and the plasmonic demonstration shows that hybrid technologies such as our electro-optic polymers and graphene together form an important technology platform for volume scalability using large silicon foundries for mass commercialization. The groundbreaking results were presented by Stephan Koepfli as part of a peer-reviewed post-deadline paper presented at the prestigious 2022 European Conference on Optical Communications (ECOC) in Basel, Switzerland on September 22, 2022.

On November 15, 2022, we announced the receipt of U.S. patent number 11,435,603 B2 entitled "TFP (thin film polymer) optical transition device and method," which illustrates the design of a simpler to fabricate, lower cost hybrid integrated photonics chip using electro-optic polymers which are more advantageous for high-volume production. The simplified fabrication approach enables streamlined production of very high speed, low power proprietary polymer modulators that will enable significantly faster data rates in the internet environment. The essence of the invention is a hybrid polymer-silicon photonics engine that fits into fiber optic transceivers (either pluggable or co-packaged) that are used in the routers, servers and network equipment that are proliferating with the growth of data centers, cloud computing and optical communications capacity.

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<sup>1</sup> Set-up limited' indicates that the measurement was limited by the testing equipment.

<sup>2</sup> University of Kiel, Germany supported the digital signal processor (DSP), and ETHZ supported the photodetector.

On November 17, 2022, we announced the receipt of U.S. patent number 11,435,604 B2 entitled "Hybrid electro-optic polymer modulator with silicon photonics," which allows Lightwave Logic's proprietary polymers to be fabricated by silicon foundries in a high-volume manufacturing environment. The patent also details a more efficient process that allows for high yielding, high stability poling of polymers in a high-volume foundry manufacturing environment. From a commercial standpoint, this patent enables our polymers to be mass-produced using existing silicon foundry equipment, simplifying production for the foundry's we are working with.

On November 29, 2022, we announced our acquisition of the polymer technology and intellectual property assets of Chromosol Ltd (UK). The acquisition significantly strengthened our Company's design capabilities with foundry PDKs with extremely low temperature atomic layer deposition (ALD) processes that effectively hermetically seal polymer devices that have been prepared for high volume manufacturing. The advanced fabrication processes of ALD with temperatures below 100C will solidify our Company's market position with both the Company's manufacturing foundry partners as well as end-users as we prepare to enter the 800Gbps integrated photonics marketplace. The acquisition also advanced our Company's patent portfolio of electro-optic polymer technology with an innovative polymer chemistry device patent that has potential to increase the performance of integrated modulators through optical amplification in a photonic integrated circuit (PIC) and enhance the functionality of the PIC by integrating laser light sources made using the polymer-based gain and a laser optical cavity defined on the Silicon photonic platform, with our Company's high speed, high efficiency modulators. Having access to extremely low temperature ALD allows our Company's polymer modulators to be protected from the environment without the need for expensive and large footprint gold box packaging, propelling our Company forward with chip-scale packaging as required by major hyper-scaler end-users. The patent opens a new class of PICs which expands our variety of devices. The Patent is US patent number 9837794, EU patent number 3017489, China registration number 201480048236 & 201910230856, and is entitled, "Optoelectronic devices, methods of fabrication thereof and materials therefor."

On December 12, 2022, we announced the receipt of U.S. patent number 11,506,918 B2 entitled "Hybrid electro-optic polymer modulator with atomic layer deposition (ALD) sealant layer," which allows our proprietary polymers to be sealed to moisture and atmospheric gases in a very low temperature and quasi-hermetic environment through the use of a chip-scale packaging approach that can be applied in parallel at wafer level (i.e. in volume) and that eliminates the need for a separate hermetic enclosure or "gold box." Specifically, our electro-optic polymer modulators will be sealed with low-temperature conformal atomic layer deposition dielectric layers that are supported on a silicon substrate with passive silicon photonics waveguides. The sealant process will enable lower cost system implementation in a high-volume foundry environment.

On December 13, 2022, we provided a world-class figure-of merit performance for modulators using electro-optical polymers and a plasmonic device design in conjunction with Polariton Technologies. Building from the world record performance and demonstration of a 250 GHz super high bandwidth electro-optical-electrical (EOE) link that was presented at the 2022 European Conference on Optical Communications (ECOC)<sup>3</sup> through a collaboration with ETH Zurich, these latest figure of merit results show the potential for extreme power savings for optical network equipment and demonstrated clearly that polymer-based technology platforms are positioned well for general implementation. These results were achieved using Polariton's electro-optic polymer-based plasmonic devices with Lightwave's electro-optic materials, with a bandwidth greater than 250 GHz. While these high-speed results have been reported previously, here Lightwave Logic reported for the first time that the voltage-length product Figure of Merit (FoM) for this modulator is just 60 Vum, which is approximately 10X better than the performance of the optical semiconductor modulators that are incumbent in the optical network and internet today. This figure of merit will allow ultra-low voltage operation and, enabled by Polariton's plasmonic modulator, the ability to carry significantly more data per modulator while consuming much less power. The net positive effect on system level equipment is expected not only to be significant, but perhaps more importantly, also a strong driver of a "green photonics" platform. These results position our Company extremely well for next generation ultra-high-capacity interconnects for the hyper-scale market. The combination of electro-optic polymers and plasmonics is becoming an ideal sunrise technology platform to address the 'Achilles heel' of the data industry: high power consumption. As the industry contemplates the implementation of PAM4 200G lanes for 2023 and 2024, these optical devices already have shown capability for at least 2X these lane speeds.

On January 12, 2023, our Chief Executive Officer, Dr. Michael Lebby, hosted a presentation and participated in an industry panel discussion at the 2023 Photonics Spectra Conference, a prominent virtual conference within the photonics industry. In the panel discussion, Dr. Lebby and a panel of industry experts from the entire photonics integrated chip (PIC) value chain, discussed lessons learned when scaling PIC production for volume applications. In his presentation, Dr. Lebby reviewed the potential solutions that electro-optical polymer modulators offer to integrated and hybrid photonics integrated chips (PICs), discussing their relevance to PIC packaging operations as well as how electro-optic polymers boost PIC speed and power efficiency.

On January 30, 2023, our Chief Executive Officer, Dr. Michael Lebby, participated in an industry panel discussion at the 2023 Laser Focus World Executive Forum. The Laser Focus World Executive Forum is one of the industry's premier events for senior-level executives, technology directors, and business managers from technology companies around the world, delivering an in-depth analysis of the global laser and photonics market. In this discussion, Dr. Lebby joined a panel of industry experts to discuss how the success of Silicon Photonics is based on the premise that it is a semiconductor technology, and hence it can be manufactured in volume by semiconductor fabs. The panel addressed the manufacturing plans of photonic integrated circuits (PICs) by semiconductor fabs and how the photonic industry can transfer their processes to the semiconductor industry.

<sup>3</sup> The groundbreaking results were presented by Stefan Koepfli (ETH Zurich) as part of a peer-reviewed post-deadline paper presented at the prestigious 2022 European Conference on Optical Communications (ECOC) in Basel, Switzerland on September 22, 2022. The post-deadline paper is titled ">500 GHz Bandwidth Graphene Photodetector Enabling Highest-Capacity Plasmonic-to-Plasmonic Links."

On March 22, 2023, we announced that our latest commercial-class electro-optic polymer material achieved breakthrough performance metrics at 1310 nanometers (nm), a wavelength popular in hyperscale datacenter applications. These commercial-class improvements include a significantly higher electro-optic coefficient exceeding 200 pm/V, which allows for very low drive power of 1 volt or less. Other characteristics include optimized chromophore loading, superior low optical loss, excellent temporal stability at 85° Celsius, and extremely high thermal and photo stability. The breakthrough commercial-class electro-optic material is expected to enable ultra-small footprint modulators with at least 100 GHz bandwidth as well as meeting all critical requirements for pluggable transceivers, on-board optics and co-packaging solutions. Additionally, the achievement of these results at the 1310nm bandwidth positions us for potential near-term licensing opportunities in datacenter applications.

In April 2023, our Chief Executive Officer, Dr. Michael Lebby, co-chaired the Photonic Integrated Circuits (PIC) International Conference in Brussels, Belgium. Industry-leading insiders delivered more than 30 presentations spanning six sectors at the conference. The conference provided attendees with an up-to-date overview of the status of the global photonics industry as well as the opportunity to meet many other key players within the community. In addition to serving as co-chair of the event, Dr. Lebby hosted a presentation for in-person attendees within the "Scaling PICs in Volume Using Foundries" track, focusing on the industry's consideration of electro-optic polymer modulators due to their increased modulation speed, lower power consumption, and potential for future multi-Tbps aggregated data-rates in the next decade. Additionally, Dr. Lebby discussed the latest results on foundry fabricated EO polymers, as well as the latest work in photonics roadmaps on both the integrated photonics (PIC) level as well as PIC packaging level.

On May 4, 2023, we announced, that in conjunction with our research partners at the Karlsruhe Institute of Technology and Solarix, the achievement of record optical modulator performance using our Company's latest Perkinamine® Series 5 material at extremely low cryogenic temperatures, delivering the potential to revolutionize applications in supercomputers, quantum circuits and advanced computing systems. Building from the world record performance and demonstration of super high bandwidth, and super low voltage electro-optic modulators with Karlsruhe Institute of Technology and Solarix over the past year, the results have the potential to enable supercomputing and quantum systems to be more competitive than standard computational systems given its faster speeds at low temperatures. This achievement opens huge opportunities to our Company in the areas of supercomputing and quantum systems by giving access to very high data rate, low power optical modulators.

On May 18, 2023, we announced the receipt of U.S. patent number 11,614,670 B2 entitled "Electro-optic polymer devices having high performance claddings and methods of preparing the same," which is a cutting-edge design technique, enhancing the performance of polymer modulators through the use of innovative polymer cladding design that is amenable for high-volume foundry fabrication when integrated with silicon photonics. The patent details a novel fabrication process that allows our proprietary polymers to perform more effectively and to be fabricated by silicon foundries in a high-volume manufacturing environment. It also introduces a more efficient process for improving the performance of the polymer claddings, leading to increased poling efficiency and lower losses in both optical and RF aspects. This patent is helping us move forward with our commercial discussions through the enabling of enhanced performance and simplified manufacturing of our polymer modulators with silicon photonics.



On May 25, 2023, we announced our Company's first commercial material supply license agreement for our Perkinamine<sup>®</sup> chromophore materials. This agreement is to provide Perkinamine<sup>®</sup> chromophore materials for polymer based photonic devices and photonic integrated circuits (PICs). Supplying licensed materials is one prong of our Company's three-prong revenue model and business strategy that includes polymer modulator products as well as technology transfer. This agreement recognizes market acceptance and competitive advantage of our technology and validates the first prong of our business model. Further, it represents tangible commercial progress for electro-optic polymers as part of our business plan.

On May 31, 2023, we announced the receipt of U.S. patent number 11,661,428 entitled "Nonlinear Optical Chromophores, Nonlinear Optical Materials Containing the Same, and Uses Thereof in Optical Devices," which details an innovative organic chromophore design using a novel 'thiophene bridge' to significantly improve material performance in a production environment. This is accomplished by designing thiophene-containing bridging groups that are positioned between the electron-donating and electron-accepting ends of the chromophore. These designs provide nonlinear optical chromophores with significantly improved optical properties and improved stability. We expect this patent will help us progress our commercial discussions with potential customers.

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35

In June 2023, we announced the publication of World Intellectual Property Organization (WIPO) PCT Patent Publication - PCT Patent No. WO 2023/102066 entitled "Nonlinear Optical Materials Containing High Boiling Point Solvents, and Methods of Efficiently Poling The Same," which illustrates novel organic chemical structural designs that offer increased poling efficiency, as well as thermal stability for electro-optic materials. These designs provide non-linear optical chromophores with significantly improved material properties and stability for processing and fabrication by commercial foundries. Specifically, the patent teaches material processing and poling methods that directly leads to significantly enhanced electro-optic efficiency (r33) as compared to previous poling techniques. We consider this WIPO PCT Patent Publication to be a strong step forward in the scaling and volume commercialization of our polymer technology platform.

On August 1, 2023, we appointed respected industry executive Laila Partridge to our Board of Directors. Ms. Partridge brings over 30 years of executive experience in technology, corporate innovation and finance to our Board – having worked with a wide range of technologies, including telecommunications, internet infrastructure, AI, internet of things and more. She was named by Boston Business Journal as one of the ten "2017 Women to Watch in Science and Technology". She currently serves as Founder and Chief Executive Officer of The HardTech Project, a new venture with a novel approach to early-stage hardware investing. Previously, she was Managing Director of the STANLEY + Techstars Accelerator where she directed a global effort for Stanley Black & Decker's Chief Technology Officer to identify and invest in innovative technologies for industrial applications with an emphasis on electrification, sustainability and advanced manufacturing. Prior to that, she began her technology career at Intel Capital, serving as a Director of Strategic Investments. Ms. Partridge began her career at Wells Fargo, where she ultimately achieved the role of VP of Corporate Banking, having led complex corporate finance transactions for the company's senior secured debt agencies in the Midwest. Ms. Partridge brings significant board experience to the Board of Directors, including at Intel Capital serving privately-held technology companies, and in her current role as an independent Director at Cambridge Trust (NASDAQ: CATC). She holds a Bachelor's degree with Honors from Wellesley College.

On August 21, 2023, we announced the completion of new laboratory production facilities, expanding our corporate headquarters by over 65%, nearly 10,000 square feet, for a total of approximately 23,500 square feet to support new commercial activity, including enabling commercial device testing and evaluation, production reliability testing, laser characterization, SEM analysis and the expansion of our Company's chemical synthesis production line.

On October 3, 2023, we announced our receipt of the 2023 Industry Award for Most Innovative Hybrid PIC/Optical Integration Platform from the European Conference on Optical Communications (ECOC) – a premier industry exhibition – held in Glasgow, Scotland from October 2-4, 2023. ECOC is one of the leading conferences on optical communication and attracts top industry minds from across the world. The ECOC awards emphasize technology and product commercialization, highlighting significant achievements in advancing the business of optical communications, transport, networking, fiber-based products, photonic integration circuits and related developments. The Innovative Product category with 5 subcategories looks across the industry at new products driving change in their respective market segment, and what is timely and helping to increase the use of optics. Metrics include design features that are photonics, electronics, thermal, mechanical, chemical, environmental and carbon footprint based.

On March 24, 2024, at the 2024 Optical Fiber Conference in San Diego, California (OFC 2024), we presented world-class results for our Company's 200Gbps heterogeneous polymer/silicon photonic modulator at a record low drive voltage, which are based on a novel packaged heterogeneous polymer EO modulator design leveraging silicon photonics devices from a 200mm production foundry process and Lightwave Logic's proprietary high temperature, high performance EO Polymer material. Each modulator was operated at 100GBaud PAM4 and achieved all drive voltages below 2V, and as low as 1V which is excellent for low power operation. We discussed the test set-up for the high-speed results, and how electro-optic polymer-based modulators based on 200mm silicon foundry wafers are ideal for 4 lane 200Gbps per lane 800Gbps pluggable optical transceivers for datacenter applications. We also shared updated lifetime and reliability data for both the electro-optic polymer materials and electro-optic polymer devices. Our results demonstrate that a hybrid approach, leveraging the cost and integration benefits of silicon photonics along with the unparalleled bandwidth and low power advantages of Lightwave Logic's proprietary EO polymers, lays a clear path for competitive performance and integration for today's and future optical pluggable transceivers, and we expect these results will position our Company to support the burgeoning demand of generative AI as datacenters around the world begin to upgrade their hardware faster than expected to meet the demands of the future.

On March 28, 2024, we announced world-class performance of the Company's Perkinamine<sup>®</sup> EO polymer material operating in an optical interconnect link, at 437.1Gbps employing a PAM8 178GBaud signal encoded by a plasmonic Mach Zehnder modulator (MZM). In this work, intensity modulated, direct detection (IM/DD) techniques were utilized to drive higher performance. The paper, authored by our teammates ETH Zurich and Polariton Technologies, demonstrated data rates beyond 400Gbps for a IM/DD optical interconnect link for the first time. This world-class result, achieving data rates of 400Gbps per lane, demonstrates that our Company's EO polymers are capable of exceeding double the current industry expectation. This has the potential to enable 4 lane 1.6Tbps (1600Gbps) pluggable transceiver modules, which is on the roadmap of datacenter operators today.

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36

On April 1, 2024, we announced the issuance of patent 11,921,401 by the United States Patent and Trademark Office (USPTO) – entitled 'Nonlinear Optical Chromophores Having a Diamondoid Group Attached Thereto, Methods of Preparing the Same, and Uses Thereof' issued on March 5, 2024, which has been shown to significantly improve the overall stability and performance of our Company's EO chromophores. This materials-based chemical-engineered invention advances the overall performance of our Company's EO chromophores and their use in high-speed, low power and commercial-grade EO polymer modulators that operate at 200Gbps with drive voltage levels of 1V. The proprietary chromophores are designed with Diamondoid molecular groups that are attached to the chromophore. Results show that when these chromophores are dispersed in a host polymer matrix, the EO materials result in improved macroscopic EO properties, increased poling efficiency, increased loading as well as increased stability of these materials after poling. The impact of the technology disclosed is significant in that it will increase the overall robustness of polymer materials that are utilized in optical modulator devices. Further, the materials can be easily utilized in silicon foundries for high-volume manufacturing processes. We believe this invention will help us bring in more commercial license deals for our EO polymers, especially as we work with high-volume manufacturing silicon foundries and 200mm silicon wafers. Additionally, we consider this material as a key component for next generation 800Gbps and 1600Gbps pluggable optical transceiver modules that support the rise of generative AI and upgrading of datacenter hardware equipment.

On April 16, 2024, we announced our substantial contributions to the recently published "Integrated Photonics System Roadmap - International" (IPSR-I) to accelerate the high-volume commercial manufacturing of high-value integrated photonics over the next decade and beyond. More than 400 technology, academic and industrial organizations from around the world contributed to IPSR-I. The IPSR-I describes a route toward building a global, aligned integrated photonics industry with the ability to help solve major societal challenges. It includes a comprehensive overview of major technology gaps for volume manufacturing of photonic integrated circuits (PIC) and a detailed analysis of the challenges that the integrated photonics industry needs to overcome to achieve its potential. Lightwave Logic was instrumental in two chapters of the IPSR-I, serving as co-chair of the "Transceivers" chapter and chair of the "Polymers" chapter. Our Company also contributed to the "Interconnects" chapter. 'Transceivers' are a critical commercial pluggable optical engine, for example in hyperscaler datacenters, telecom networks, and high-performance computing. 'Interconnects' focuses on optical fiber links that connect pluggable optical transceivers together for routers, switches, computational systems etc. 'Polymers' focuses on active electro-optic polymers for optical modulators as well as passive polymers that guide and manipulate light in fiber optic communications markets. The integrated photonics roadmaps both plan and anticipate commercial opportunities as well as potential roadblocks and/or critical needs on the way to scaling the manufacturing of integrated photonics through 2040. The silicon semiconductor industry has relied on these types of roadmaps for the past 50 years and with IPSR-I, the photonics industry is becoming organized and more influential as well.

On May 21, 2024, we announced our collaboration with Advanced Micro Foundry (AMF), a leading Silicon Photonics volume foundry, to develop state-of art polymer slot modulators utilizing AMF's silicon photonics platform. These modulators have been shown to achieve a record low drive voltage below 1V and data rates of 200Gbps PAM4. This performance will enable a new generation of 800 Gb/s and 1.6T Gb/s pluggable transceivers to address fast growing requirements for optical connectivity for large generative AI computing clusters. Lightwave Logic and AMF have collaborated over the past year to develop the electro optic polymer slot modulators utilizing AMF's standard manufacturing process flow on 200-mm wafers. This successful demonstration marked a significant milestone in integrated photonics, blending Silicon photonics with polymer materials. Building on this demonstration, both parties are aiming to enhance the modulators to ensure these advanced components are readily accessible to product companies on a manufacturing scale. This accomplishment puts our Company in a very strong position to ramp volume both

for our polymers as well as 200-mm silicon wafer volume with AMF. It also opens exciting opportunities to develop novel solutions for commercial-grade-compatible EO polymer modulators seamlessly integrated with AMF's standard processes.

On August 1, 2024, we appointed Yves LeMaitre to our Board of Directors. Mr. LeMaitre brings over 30 years of executive experience in technology, corporate strategy and marketing to the Board of Directors. He currently serves as a Strategic Board Advisor to Trumpf Photonic Components, a global technology company specializing in the development of lasers for optics, and as a strategic advisor to the Optical, RF & Micro-Electronics division of Sanmina AMT. Mr. LeMaitre most recently served as CEO of Astrobeam.Space, where he launched the startup's development of next-generation of laser beam steering for satellite to satellite communication. Previously, Mr. LeMaitre was the Head of the Optical Coherent Division of IPG Photonics, where he advised and oversaw the division's divestiture to Lumentum. Prior to that, he was the SVP of Luna Innovations' North America Business Operation (following the company's acquisition of RIO Lasers where he served as President). Previously, he spent 10 years in varying roles of increasing responsibility through multiple acquisitions with Oclaro (later acquired by Lumentum), ultimately achieving the roles of Chief Strategy Officer at Lumentum. During his time at OCLARO, he played a key role in positioning OCLARO as a leader in the optical connectivity business, driving the growth of Indium Phosphide lasers in the datacenter (now Generative AI front-end networks) segments. He holds a degree from Télécom Paris and a "Maitrise" Degree in Computer Science and Mathematics from Nantes Université in France.

37

On September 4, 2024, we appointed Thomas M. Connelly, Jr. to our Board of Directors. Mr. Connelly's exceptional industry knowledge and deep experience in the polymers business will be an outstanding resource to the Lightwave Logic management team and he is uniquely qualified to help our Company as we expand our business focus for our EO polymer platform. Mr. Connelly has served as CEO of the American Chemical Society, one of the largest scientific societies with 170,000 members worldwide, and as Chief Innovation Officer of DuPont, where he was a member of its Office of the Chief Executive. Among his responsibilities in chemicals and materials over 35+ years at DuPont were its Performance Polymers and Packaging & Industrial Polymers businesses. He also served as its Chief Science and Technology Officer, with responsibility across business units in the U.S., Europe and Asia. He joined DuPont in 1977, and played key roles in Delrin®, Kevlar®, Sorona® and Teflon®. Dr. Connelly holds degrees in chemical engineering (highest honors) and economics from Princeton University, and as a Winston Churchill Scholar he received a PhD in chemical engineering from the University of Cambridge. As a member of the National Academy of Engineering and its committees, he has been chair of the National Academies of Sciences, Engineering, and Medicine's committee for the Division on Earth and Life Studies. In addition, he has held advisory roles to the U.S. government and Republic of Singapore.

On September 24, 2024, we announced our receipt of the 2024 Industry Award for Most Innovative Hybrid PIC/Optical Integration Platform from the European Conference on Optical Communications (ECOC), a premier industry exhibition held in Frankfurt, Germany from September 22-26, 2024. The ECOC Exhibition Awards highlight exceptional achievements in advancing the business of optical communications, transport, networking, fiber-based products, photonic integration circuits and related developments. The awards, granted by a technical committee of industry peers and industrial corporations, indicate market recognition and cover 2 broad value-chain categories: Optical materials, components, packages, modules etc.; and Optical Systems, networks, standards, architecture etc. This award serves as a highlight amidst our ongoing engagement with a wide spectrum of companies discussing device designs to materials supply and licensing agreements for our EO polymer materials with OEMs and tier-1 multinational corporations. ECOC is one of the leading global industry conferences on optical communications, adding to the recognition for this particular innovation award, which provides further market validation of our technology and provides industry peer confirmation of the inherent benefits of our platform. This is the second time we received this award.

On September 24, 2024, we announced a collaboration with Polariton Technologies to demonstrate a packaged device with over 110 GHz super high bandwidth packaged electro-optic polymer modulators using Polariton's plasmonic modulator device design that contains Lightwave's proprietary Perkanamine™ chromophores at the European Conference on Optical Communications (ECOC) held in Frankfurt, Germany from September 22-26, 2024. The packaged device contains a plasmonic modulator using electro-optic polymer material and platform chips have demonstrated 400 Gbps, which is the current specification that datacenters are looking for in optical transceiver modules. This collaboration forms an important technology platform for scalability using large silicon foundries for mass commercialization with 200mm silicon wafers. The combination of electro-optic polymers and plasmonics can support datacenters around the world which are responding to high power consumption and the burgeoning demand for higher speed data transmission from artificial intelligence, machine learning, and other cloud-based services. This device enables ultra-high bandwidths, which are extremely well suited for next generation internet and optical networking transceivers that require 200Gbps per lane today, and 400Gbps per lane soon.

As we move forward to diligently meet our commercial goals, we continue to work closely with our packaging and foundry partners for 112Gbaud prototypes, and we are advancing our reliability and characterization efforts to support our prototyping. Depending on electrical encoding schemes such as PAM4, or PAM8, or wavelength optical multiplexing, these Gigabaud rates roughly translate to 200Gbps and 300Gbps per lane and are the key speed rates for emerging 800Gbps to future possible 1200Gbps applications. Our partnership with silicon-based foundries will allow us to scale commercial volumes of electro-optic polymer modulator devices using large silicon wafers, and we are currently working to have our fabrication processes accepted into foundry PDKs (process development kits). These are the recipes that foundries use to manufacture devices in their fabrication plants.

We are currently engaging with Tier 1 transceiver component manufacturers who since the demonstration of 200Gbps at less than 1V, and more recently less than 0.5V, have shown increased interest in our polymer platform. These manufacturers are datacenter based and are planning to upgrade their product portfolio with faster and lower power modulators and are based in USA, Europe as well as the Far East. Our polymer modulators represent a route that these transceiver manufacturers can upgrade their silicon photonics platform to datacenter performance levels that are being driven in part by G-AI.

We are actively engaged with test equipment manufacturers of the most advanced test equipment to test our state-of-the-art polymer devices. We continue to engage with multiple industry bodies to promote our roadmap. We continue to fine tune our business model with target markets, customers, and technical specifications. Our business model includes the licensing of our strong IP and Patent portfolio, as well as technology transfer to entities such as foundries. Discussions with prospective customers are validating that our modulators are ideally suited for the datacenter and telecommunications markets that are over 10km in length. Details and feedback of what these prospective customers are seeking from a prototype are delivered to our technical team.

Capital Requirements

We commenced commercial operations in May 2023, and we do not generate sufficient revenues to pay for our operating expenses. We have incurred substantial net losses since inception. We have satisfied our capital requirements since inception primarily through the issuance and sale of our common stock.

38

Results of Operations

Comparison of three months ended September 30, 2024 to three months ended September 30, 2023

Revenues

During the three months ended September 30, 2024, we recognized \$22,916 of licensing and royalty revenue. As a development stage company, during the three months ended September 30, 2023, we had no revenues. The Company is in various stages of photonic device and materials development and evaluation with potential customers and strategic partners, and commercialization. The Company expects to continue obtaining a revenue stream from technology licensing agreements, to obtain additional revenue streams from technology transfer agreements and direct sale of its own electro-optic device components.

Cost of Sales

During the three months ended September 30, 2024 and September 30, 2023 we recognized \$1,236 and \$0 in Cost of Sales, respectively.

Operating Expenses

	For the Three Months Ended September 30, 2024	For the Three Months Ended September 30, 2023	Change from Prior Three Month Period	Percent Change from Prior Three Month Period
Research and development	\$ 3,828,301	\$ 4,040,941	\$ (212,640)	-5%
General and administrative	1,490,481	1,345,335	145,146	11%

	\$ 5,318,782	\$ 5,386,276	\$ (67,494)	-1%
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Research and development expenses decreased for the three months ended September 30, 2024, as compared to the three months ended September 30, 2023, primarily due to decreases in research and development non-cash stock option amortization expenses, prototype device development and wafer fabrication expenses, and laboratory and wafer fabrication materials and supplies expenses, offset by increases in research and development salary expenses, research and development equipment depreciation expense, research and development travel expense, and software expense.

- Research and development non-cash stock option amortization expense decreased by \$382,832 in the three months ended September 30, 2024, compared to the same period in 2023.
- Prototype device development and wafer fabrication expenses decreased by \$226,262 in the three months ended September 30, 2024, compared to the same period in 2023.
- Laboratory and wafer fabrication materials and supplies expenses decreased by \$68,090 in the three months ended September 30, 2024, compared to the same period in 2023.
- These decreases were offset by a \$243,124 increase in research and development salary expense, \$134,612 increase in research and development equipment depreciation expense, \$69,939 increase in research and development travel expenses, and a \$34,109 increase in research and development software expenses in the three months ended September 30, 2024, compared to the same period in 2023.

39

We expect to continue to incur substantial research and development expense developing and commercializing our photonic devices, and electro-optic materials platform. These expenses will increase because of accelerated development effort to support commercialization of our non-linear optical polymer materials technology; to build photonic device prototypes; working with semiconductor foundries; hiring additional technical and support personnel; engaging senior technical advisors; pursuing other potential business opportunities and collaborations; customer testing and evaluation; and incurring related operating expenses.

General and administrative expenses increased for the three months ended September 30, 2024, as compared to the three months ended September 30, 2023, primarily due to increases in general and administrative salary expenses and legal fees, offset by decreases in general and administrative non-cash stock option amortization expenses, accounting fees and office expenses.

- General and administrative salary expenses increased by \$196,796 in the three months ended September 30, 2024, compared to the same period in 2023.
- Legal fees increased by \$147,576 in the three months ended September 30, 2024, compared to the same period in 2023.
- These increases were offset by a \$144,675 decrease in general and administrative non-cash stock option amortization expenses, a \$29,900 decrease in accounting fees, and a \$26,726 decrease in office expenses.

#### Other Income (Expense)

	For the Three Months Ended September 30, 2024	For the Three Months Ended September 30, 2023	Prior Three Month Period	Change from Prior Three Month Period
Other Income (Expense)	\$ (3,811)	\$ 221,685	\$ (225,496)	-102%

Other income decreased for the three months ended September 30, 2024, as compared to the three months ended September 30, 2023, primarily due to the recognition of a \$210,274 loss on retirement of certain expired patent applications and patents, and a \$24,582 decrease in interest income on money market account, offset by a \$9,428 decrease in commitment fee associated with the purchase of shares by an institutional investor for sale under a stock purchase agreement.

#### Net Loss

	For the Three Months Ended September 30, 2024	For the Three Months Ended September 30, 2023	Change from Prior Three Month Period	Percent Change from Prior Three Month Period
Net Loss	\$ 5,300,913	\$ 5,164,591	\$ 136,322	3%

Net loss was \$5,300,913 and \$5,164,591 for the three months ended September 30, 2024 and 2023, respectively, for an increase of \$136,322 due primarily to increases in salary expenses, recognition of loss on retirement of certain expired patent applications and patents, increases in legal fees, depreciation of research and development equipment, and travel expenses, and a decrease in interest income on money market account, offset by decreases in non-cash stock option amortization expenses, prototype device development and wafer fabrication expenses, laboratory and wafer fabrication materials and supplies expenses, accounting fees, office expenses, and commitment fee associated with the purchase of shares by an institutional investor for sale under a stock purchase agreement.

40

## Results of Operations

### Comparison of nine months ended September 30, 2024 to nine months ended September 30, 2023

#### Revenues

During the nine months ended September 30, 2024, we recognized \$58,938 of licensing and royalty revenue and \$13,750 revenue for the device processing work on the device supplied by a customer. As a development stage company, during the nine months ended September 30, 2023, we had no revenues.

#### Cost of Sales

During the nine months ended September 30, 2024, we recognized \$6,411 in Cost of Sales, and \$0 in Cost of Sales during the nine months ended September 30, 2023.

#### Operating Expenses

	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023	Change from Prior Nine Month Period	Percent Change from Prior Nine Month Period
Research and development	\$ 12,811,221	\$ 12,006,758	\$ 804,463	7%
General and administrative	4,642,603	3,879,515	763,088	20%
	\$ 17,453,824	\$ 15,886,273	\$ 1,567,551	10%



Research and development expenses increased for the nine months ended September 30, 2024, as compared to the nine months ended September 30, 2023, primarily due to increases in research and development salary expenses, prototype device development and wafer fabrication expenses, research and development equipment depreciation expense, laboratory and wafer fabrication materials and supplies expenses, research and development travel expenses, rent expenses, property tax expenses, software expenses, research and development repair expenses, and research and development consulting expenses, offset by decreases in research and development non-cash stock option amortization expenses, research and development employee relocation expenses, and research and development recruiting fees in the nine months ended September 30, 2024, compared to the same period in 2023.

- Research and development salary expenses increased by \$1,133,765 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Prototype device development and wafer fabrication expenses increased by \$327,210 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Depreciation expense increased by \$304,509 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Laboratory and wafer fabrication materials and supplies expenses increased by \$140,123 in the nine months ended September 30, 2024, compared to the same period in 2023.

41

- Research and development travel expenses increased by \$138,924 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Research and development rent expenses increased by \$90,483 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Property tax expenses increased by \$80,937 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Research and development software expenses increased by \$46,768 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Research and development repair expenses increased by \$38,643 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Research and development consulting expenses increased by \$32,281 in the nine months ended September 30, 2024, compared to the same period in 2023.
- These increases were offset by a \$1,265,933 decrease in research and development non-cash stock option amortization expenses, a \$178,626 decrease in research and development employee relocation expenses, and a \$172,803 decrease in research and development recruiting fees in the nine months ended September 30, 2024, compared to the same period in 2023.

We expect to continue to incur substantial research and development expense developing and commercializing our photonic devices, and electro-optic materials platform. These expenses will increase because of accelerated development effort to support commercialization of our non-linear optical polymer materials technology; to build photonic device prototypes; working with semiconductor foundries; hiring additional technical and support personnel; engaging senior technical advisors; pursuing other potential business opportunities and collaborations; customer testing and evaluation; and incurring related operating expenses.

General and administrative expenses increased for the nine months ended September 30, 2024, as compared to the nine months ended September 30, 2023, primarily due to increases in general and administrative salary expenses, consulting fees, depreciation expense, sales and marketing expenses, general and administrative recruiting fees, travel expenses, rent expenses, directors' fees, and software expenses, offset by decreases general and administrative non-cash stock option amortization expenses, and accounting expenses

- General and administrative salary expenses increased by \$509,356 in the nine months ended September 30, 2024, compared to the same period in 2023.
- General and administrative consulting fees increased by \$166,286 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Depreciation expense increased by \$109,164 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Sales and marketing expenses increased by \$51,360 in the nine months ended September 30, 2024, compared to the same period in 2023.
- General and administrative recruiting fees increased by \$48,817 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Travel expenses increased by \$35,822 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Rent expenses increased by \$24,012 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Directors' fees increased by \$22,500 in the nine months ended September 30, 2024, compared to the same period in 2023.
- Software expenses increased by \$21,847 in the nine months ended September 30, 2024, compared to the same period in 2023.
- These increases were offset by a \$244,254 decrease in general and administrative non-cash stock option amortization expense and a \$45,294 decrease in accounting fees in the nine months ended September 30, 2024, compared to the same period in 2023.

42

#### Other Income (Expense)

	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023	Change from Prior Nine Month Period	Percent Change from Prior Nine Month Period
Other Income (Expense)	\$ 387,039	\$ (212,083)	\$ 599,122	282%

Other income increased for the nine months ended September 30, 2024, as compared to the nine months ended September 30, 2023, primarily due to a \$485,894 decrease in commitment fee associated with the purchase of shares by an institutional investor for sale under a stock purchase agreement, a \$334,636 increase in interest income on money market account, and a recognition of a \$210,274 loss on retirement of certain expired patent applications and patents.

#### Net Loss

	For the Nine Months Ended September 30, 2024	For the Nine Months Ended September 30, 2023	Change from Prior Nine Month Period	Percent Change from Prior Nine Month Period
Net Loss	\$ 17,000,508	\$ 16,098,356	\$ 902,152	6%

Net loss was \$17,000,508 and \$16,098,356 for the nine months ended September 30, 2024 and 2023, respectively, for an increase of \$902,152 due primarily to increases in salary expenses, depreciation expense, prototype device development and wafer fabrication expenses, recognition of loss on retirement of certain expired patent applications and patents, increases in consulting fees, travel expenses, laboratory and wafer fabrication materials and supplies expenses, rent expense, property tax expenses, software expenses, sales and marketing expenses, repair expenses, and directors' fees. These increases were offset by decreases in non-cash stock option amortization expense, commitment fee associated with the purchase of shares by an institutional investor for sale under a stock purchase agreement, employee relocation expenses, recruiting fees, and accounting fees, and an increase in interest income on money market account.

43

## Liquidity and Capital Resources

Our primary source of operating cash inflows was (i) proceeds from the sale of common stock to Lincoln Park, an institutional investor, pursuant to purchase agreements with Lincoln Park (the institutional investor) and proceeds from sale of common stock by Roth Capital pursuant to the at the market sale agreement with the investment banking company as described in Note 10 to the Financial Statements and (ii) proceeds received pursuant to the exercise of options and warrants.

On July 2, 2021, our Company filed a \$100 million universal shelf registration statement which became effective on July 9, 2021 and expired on July 8, 2024. On July 26, 2024, the Company filed a new \$100 million universal shelf registration statement which became effective on August 5, 2024. On October 4, 2021, our Company entered into the 2021 purchase agreement with Lincoln Park to sell up to \$33 million of registered common stock over a 36-month period. All of the registered shares under the October 4, 2021 purchase agreement with Lincoln Park have been issued as of December 31, 2023. On February 28, 2023, our Company entered into the 2023 purchase agreement with Lincoln Park to sell up to \$30 million of registered common stock over a 36-month period. As of the date of this filing, \$2.8 million remain on the 2023 Purchase Agreement. On December 9, 2022, our Company entered into the at the market sale agreement with Roth Capital, as sales agent, whereby pursuant to the at the market sale agreement, our Company may offer and sell up to \$35,000,000 in shares of our registered common stock, from time to time through Roth Capital. As of the date of this filing, \$31.9 million remains available to our Company pursuant to the at the market sale agreement.

During the nine months ended September 30, 2024, the Company received \$9,175,900 in proceeds pursuant to the 2023 purchase agreement with Lincoln Park, \$714,901 in proceeds pursuant to the at the market sale agreement with Roth Capital, \$252,450 in proceeds pursuant to the exercise of options and warrants and \$63,884 in cash collections from customer contracts, of which \$50,000 related to the proceeds received under a material supply and license agreement and \$13,884 – to the proceeds received for a contract for processing work on the devices supplied by a customer. During the year ended December 31, 2023, the Company received \$19,993,359 in proceeds pursuant to the 2021 purchase agreement and 2023 purchase agreement with Lincoln Park, \$1,515,878 in proceeds pursuant to the at the market sale agreement with Roth Capital, \$1,013,924 in proceeds pursuant to the exercise of options and warrants and \$50,000 in a proceed received under a material supply and license agreement of which \$39,875 is recorded as deferred revenue as of December 31, 2023.

During the nine months ended September 30, 2024, our primary sources of cash outflows from operations included payroll, rent, utilities, payments to vendors including prototypes development and foundries expenses, laboratory and wafer fabrication materials and supplies expenses, and third-party service providers. During the year ended December 31, 2023, our primary sources of cash outflows from operations included payroll, rent, utilities, payments to vendors including prototypes development and foundries expenses and third-party service providers.

Our future expenditures and capital requirements will depend on numerous factors, including: the progress of our research and development efforts; the rate at which we can, directly or through arrangements with original equipment manufacturers, introduce and sell products incorporating our polymer materials technology; the costs of filing, prosecuting, defending and enforcing any patent claims and other intellectual property rights; market acceptance of our products and competing technological developments; and our ability to establish cooperative development, joint venture and licensing arrangements. We expect that we will incur approximately \$1,687,000 of expenditures per month over the next 12 months.

We expect the proceeds received pursuant to the 2023 purchase agreement and any future purchase agreements with Lincoln Park, the at the market sale agreement with Roth Capital, the exercise of options and warrants and commercial operations to provide us with sufficient funds to maintain our operations over the next 12 months. Our current cash position enables us to finance our operations through February 2026 before we will be required to replenish our cash reserves. Our cash requirements are expected to increase at a rate consistent with our Company's revenue growth as we expand our activities and operations with the objective of increasing our revenue stream from the commercialization of our electro-optic polymer technology. We currently have no debt to service.

We expect that our cash used in operations will continue to increase during 2024 and beyond because of the following planned activities:

- The addition of management, sales, marketing, technical and other staff to our workforce;
- Increased spending for the expansion of our research and development efforts, including purchases of additional laboratory and production equipment;
- Increased spending in marketing as our products are introduced into the marketplace;
- Partnering with commercial foundries to implement our electro-optic polymers into accepted PDKs by the foundries;
- Developing and maintaining collaborative relationships with strategic partners;
- Developing and improving our manufacturing processes and quality controls; and
- Increases in our general and administrative activities related to our operations as a reporting public company and related corporate compliance requirements.

### *2023 Purchase Agreement with Lincoln Park*

On February 28, 2023, our Company entered into the 2023 purchase agreement with Lincoln Park, pursuant to which Lincoln Park agreed to purchase from us up to \$30 million of our common stock (subject to certain limitations) from time to time over a 36-month period. Pursuant to the 2023 purchase agreement, Lincoln Park is obligated to make purchases as the Company directs in accordance with the purchase agreement, which may be terminated by the Company at any time, without cost or penalty. Sales of shares will be made in specified amounts and at prices that are based upon the market prices of our common stock immediately preceding the sales to Lincoln Park. We expect this and any future purchase agreements with Lincoln Park to provide us with sufficient funds to maintain our operations for the foreseeable future. With the additional capital, we expect to achieve a level of revenues attractive enough to fulfill our development activities and adequate enough to support our business model for the foreseeable future.

There are no trading volume requirements or restrictions under the 2023 purchase agreement, and we will control the timing and amount of any sales of our common stock to Lincoln Park. Lincoln Park has no right to require any sales by us but is obligated to make purchases from us as we direct in accordance with the 2023 purchase agreement. We can also accelerate the amount of common stock to be purchased under certain circumstances. There are no limitations on the use of proceeds, financial or business covenants, restrictions on future financings (other than restrictions on the Company's ability to enter into a similar type of agreement or equity line of credit during the term, excluding an at-the-market transaction with a registered broker-dealer), rights of first refusal, participation rights, penalties or liquidated damages under the 2023 purchase agreement.

### *At the Market Sale Agreement – Roth Capital*

On December 9, 2022, we entered into the at the market sale agreement with Roth Capital, as sales agent. Pursuant to the at the market sale agreement, our Company may offer and sell up to \$35,000,000 in shares of our common stock, from time to time through Roth Capital. Upon delivery of a placement notice based on our Company's instructions and subject to the terms and conditions of the at the market sale agreement, Roth Capital may sell the shares by methods deemed to be an "at the market offering" as defined in Rule 415(a)(4) promulgated under the Securities Act, including sales made directly on or through The Nasdaq Capital Market, on any other existing trading market for the Company's common stock, in negotiated transactions at market prices prevailing at the time of sale or at prices related to such prevailing market prices, or by any other method permitted by law, including negotiated transactions, subject to the prior written consent of our Company. We are not obligated to make any sales of shares under this agreement. The Company or Roth Capital may suspend or terminate the offering of shares upon notice to the other party, subject to certain conditions. Roth Capital will act as sales agent on a commercially reasonable efforts basis consistent with its normal trading and sales practices and applicable state and federal law, rules and regulations and the rules of Nasdaq. We have agreed to pay Roth Capital commissions for its services of acting as agent of 3.0% of the gross proceeds from the sale of the shares pursuant to the at the market sale agreement.

The amount of proceeds we receive from the at the market sale agreement, if any, will depend upon the number of shares of our common stock sold and the market price at which they are sold. There can be no assurance that we will be able to sell any shares under or fully utilize this agreement. Roth Capital is not required to sell any specific number of shares of our common stock under the agreement. We intend to use net proceeds from the at the market sale agreement for general corporate purposes, including, without limitation, sales and marketing activities, product development, making acquisitions of assets, businesses, companies or securities, capital expenditures, and for working capital needs.

We cannot assure you that we will meet the conditions of the 2023 purchase agreements with Lincoln Park in order to obligate Lincoln Park to purchase our shares of common stock, and we cannot assure you that we will be able to sell any shares under or fully utilize the at the market sale agreement with Roth Capital. In the event we fail to do so, and other adequate funds are not available to satisfy long-term capital requirements, or if planned revenues are not generated, we may be required to substantially limit our operations. This limitation of operations may include reductions in capital expenditures and reductions in staff and discretionary costs.

## Analysis of Cash Flows

*For the nine months ended September 30, 2024*

Net cash used in operating activities was \$12,414,222 for the nine months ended September 30, 2024, primarily attributable to the net loss of \$17,000,508 adjusted by \$3,468,243 in stock options issued for services, \$304,937 amortization of deferred compensation, \$121,833 in common stock issued for commitment shares, \$1,240,639 in depreciation expenses and patent amortization expenses, \$143,239 amortization of right of use asset, \$213,440 loss on disposal of property and equipment and retirement of certain expired patent applications and patents, \$3,562 in accounts receivable, \$675,537 in prepaid expenses and other current assets and (\$1,585,144) in accounts payable, accrued bonuses, accrued expenses, deferred revenue and other liabilities. Net cash used in operating activities consisted of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure.

Net cash used in investing activities was \$2,278,649 for the nine months ended September 30, 2024, consisting of \$343,233 in cost for intangibles and \$1,935,416 in net asset additions for the Colorado headquarter facility and labs.

Net cash provided by financing activities was \$10,143,251 for the nine months ended September 30, 2024, and consisted of \$252,450 in proceeds from exercise of options and warrants, \$9,175,900 in proceeds from resale of common stock to an institutional investor and \$714,901 in proceeds from at the market sale of common stock by an investment banking company.

On September 30, 2024, our cash and cash equivalents totaled \$26,882,467, our assets totaled \$37,236,197, our liabilities totaled \$3,764,627 and we had stockholders' equity of \$33,471,570.

*For the nine months ended September 30, 2023*

Net cash used in operating activities was \$9,913,798 for the nine months ended September 30, 2023, primarily attributable to the net loss of \$16,098,356 adjusted by \$5,085,114 in options issued for services, \$198,253 amortization of deferred compensation, \$607,728 in common stock issued for services, \$797,500 in depreciation expenses and patent amortization expenses, \$138,502 amortization of right of use asset, \$581 loss on disposal of property and equipment, \$87,058 in prepaid expenses and (\$730,178) in accounts payable, accrued expenses, deferred revenue and other liabilities. Net cash used in operating activities consisted of payments for research and development, legal, professional and consulting expenses, rent and other expenditures necessary to develop our business infrastructure.

Net cash used by investing activities was \$1,386,164 for the nine months ended September 30, 2023, consisting of \$215,061 in cost for intangibles, \$1,813,813 in asset additions for the Colorado headquarter facility and labs offset by \$642,120 in a loan repayment and \$590 in proceeds on sale of property and equipment.

Net cash provided by financing activities was \$18,074,457 for the nine months ended September 30, 2023 and consisted of \$632,074 in proceeds from exercise of options and warrants, \$16,063,909 in proceeds from resale of common stock to an institutional investor and \$1,378,474 in proceeds from at the market sale of common stock by an investment banking company.

On September 30, 2023, our cash and cash equivalents totaled \$30,876,646, our assets totaled \$39,104,017, our liabilities totaled \$3,683,798 and we had stockholders' equity of \$35,420,219.

## Contractual Obligations

There have been no material changes outside the ordinary course of business in our contractual commitments during the nine months ended September 30, 2024. See Note 8 to the financial statements herein for a discussion of our contractual commitments.

## Significant Accounting Policies

We believe our significant accounting policies affect our more significant estimates and judgments used in the preparation of our financial statements. Our Annual Report on Form 10-K for the year ended December 31, 2023, contains a discussion of these significant accounting policies. The Company's significant accounting policies have not materially changed since that report was filed.

## Item 3. Quantitative and Qualitative Disclosures About Market Risk

At September 30, 2024, we had \$26.8 million in cash and cash equivalents. For the purposes of this Item 3 we consider all highly liquid instruments with maturities of three months or less at the time of purchase to be cash equivalents. The fair value of all of our cash equivalents is determined based on "Level 1" inputs, which are based upon quoted prices for identical or similar instruments in markets that are active. We do not use any market risk sensitive instruments to hedge any risks, and we hold no market risk sensitive instruments for trading or speculative purposes. We place our cash investments in instruments that meet credit quality standards. At September 30, 2024, we had deposits with a financial institution that exceeded the Federal Depository Insurance coverage.

### *Market Interest Rate Risk*

We are exposed to market risk related to changes in interest rates. Our primary exposure to market risk is interest rate sensitivity, which is affected by changes in the general level of U.S. interest rates. If a 10% change in interest rates had occurred on September 30, 2024, this change would not have had a material effect on the fair value of our investment portfolio as of that date.

Due to the short holding period of our investments and the nature of our investments, we have concluded that we do not have a material financial market risk exposure.

## Item 4. Controls and Procedures

*Evaluation of Disclosure Controls and Procedures.* The Company's management, with the participation of the Company's Principal Executive Officer and Principal Financial Officer, evaluated the effectiveness of the Company's disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended) as of September 30, 2024. Based on this evaluation, the Company's Principal Executive Officer and Principal Financial Officer concluded that, as of September 30, 2024 the Company's disclosure controls and procedures were effective, in that they provide reasonable assurance that information required to be disclosed by the Company in the reports that it files or submits under the Securities Exchange Act of 1934, as amended, is recorded, processed, summarized and reported within the time periods specified in the Securities and Exchange Commission's rules and forms, and is accumulated and communicated to the Company's management, including the Company's Principal Executive Officer and Principal Financial Officer, as appropriate to allow timely decisions regarding required disclosure.

*Changes in Internal Control Over Financial Reporting.* There were no changes in our internal control over financial reporting during the quarter ended September 30, 2024, that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

**Item 1. Legal Proceedings**

No material legal proceedings.

**Item 1A. Risk Factors**

In addition to the information set forth in this Form 10-Q, you should carefully consider the risk factors discussed in *Part I, Item 1A. Risk Factors* in our 2023 Form 10-K, which could materially affect our business, financial condition or future results. The risks described in this Form 10-Q and in our 2023 Form 10-K are not the only risks facing our Company. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial condition or future results.

**We have incurred substantial operating losses since our inception and will continue to incur substantial operating losses for the foreseeable future.**

Since our inception, we have been engaged primarily in the research and development of our electro-optic polymer materials technologies and potential products. As a result of these activities, we incurred significant losses and experienced negative cash flow since our inception. We incurred a net loss of \$17.0 million for the nine months ended September 30, 2024, and a net loss of \$21.0 million for the year ended December 31, 2023 and \$17.2 million for the year ended December 31, 2022. As of September 30, 2024, we had an accumulated deficit of \$144.8 million. We anticipate that we will continue to incur operating losses through at least 2024.

We may not be able to generate significant revenue either through customer contracts for our potential products or technologies or through development contracts from the U.S. government or government subcontractors. We expect to continue to make significant operating and capital expenditures for research and development and to improve and expand production, sales, marketing and administrative systems and processes. As a result, we will need to generate significant revenue to achieve profitability. We cannot assure you that we will ever achieve profitability.

**We will require additional capital to continue to fund our operations and if we do not obtain additional capital, we may be required to substantially limit our operations.**

Our business does not presently generate the cash needed to finance our current and anticipated operations. Based on our current operating plan and budgeted cash requirements, we believe that we have sufficient funds to finance our operations through February 2026; however, we will need to obtain additional future financing after that time to finance our operations until such time that we can conduct profitable revenue-generating activities. We expect that we will need to seek additional funding through public or private financings, including equity financings, and through other arrangements, including collaborative arrangements. Poor financial results, unanticipated expenses or unanticipated opportunities could require additional financing sooner than we expect. Other than with respect to the 2023 purchase agreement with Lincoln Park and the at the market sale agreement with Roth Capital we have no plans or arrangements with respect to the possible acquisition of additional financing, and such financing may be unavailable when we need it or may not be available on acceptable terms. We currently have a remaining amount of \$2.8 million that is available to our Company pursuant to the 2023 purchase agreement with Lincoln Park, and \$31.9 million that is available to our Company pursuant to the at the market sale agreement with Roth Capital.

Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement and involves risks and uncertainties, and actual results could vary as a result of a number of factors, including the factors discussed in our 2023 Form 10-K. We have based this estimate on assumptions that may prove to be wrong, and we could use our available capital resources sooner than we currently expect.

Additional financing may not be available to us, due to, among other things, our Company not having a sufficient credit history, income stream, profit level, asset base eligible to be collateralized, or market for its securities. If we raise additional funds by issuing equity or convertible debt securities, the percentage ownership of our existing shareholders may be reduced, and these securities may have rights superior to those of our common stock. If adequate funds are not available to satisfy our long-term capital requirements, or if planned revenues are not generated, we may be required to substantially limit our operations.

**Item 2. Unregistered Sales of Equity Securities and Use of Proceeds.**

None.

**Item 3. Defaults Upon Senior Securities**

None.

**Item 4. Mine Safety Disclosures**

Not Applicable.

**Item 5. Other Information**

During the three months ended September 30, 2024, none of our directors or officers (as defined in Rule 16a-1(f) under the Exchange Act) adopted or terminated any contract, instruction or written plan for the purchase or sale of our securities that was intended to satisfy the affirmative defense conditions of Rule 10b5-1(c) under the Exchange Act or any "non-Rule 10b5-1 arrangement" as defined in Item 408(c) of Regulation S-K.

**Item 6. Exhibits**

The following exhibits are included herein:

Exhibit No.	Description of Exhibit	Location
31.1	<a href="#">Certification pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as amended, executed by the Principal Executive Officer of the Company.</a>	Filed herewith
31.2	<a href="#">Certification pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934, as amended, executed by the Principal Financial Officer of the Company.</a>	Filed herewith
32.1	<a href="#">Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, executed by the Principal Executive Officer of the Company.</a>	Furnished herewith
32.2	<a href="#">Certification pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, executed by the Principal Financial Officer of the Company.</a>	Furnished herewith
101.INS	Inline XBRL Instance Document (the instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document)	Filed herewith
101.SCH	Inline XBRL Taxonomy Extension Schema Document	Filed herewith
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document	Filed herewith
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document	Filed herewith
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document	Filed herewith
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document	Filed herewith
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)	Filed herewith

**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.

**LIGHTWAVE LOGIC, INC.**

Registrant

By: /s/ Michael S. Lebby  
Michael S. Lebby,  
Chief Executive Officer  
(Principal Executive Officer)

Date: November 12, 2024

By: /s/ James S. Marcelli  
James S. Marcelli,  
President, Chief Operating Officer  
(Principal Financial Officer)

Date: November 12, 2024

## CERTIFICATION

I, Michael S. Lebby, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Lightwave Logic, Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:
  - (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;
  - (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;
  - (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and
  - (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):
  - (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and
  - (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 12, 2024

/s/ Michael S. Lebby  
Michael S. Lebby  
Chief Executive Officer  
(Principal Executive Officer)

## CERTIFICATION

I, James S. Marcelli, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Lightwave Logic, Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: November 12, 2024

/s/ James S. Marcelli  
James S. Marcelli  
President, Chief Operating Officer  
(Principal Financial Officer)

**CERTIFICATION PURSUANT TO  
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002  
18 U.S.C. SECTION 1350**

In connection with the Quarterly Report on Form 10-Q of Lightwave Logic, Inc. (the "Company") for the period ending September 30, 2024 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Michael S. Lebby, Chief Executive Officer of our Company, certify, pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, 18 U.S.C. Section 1350, that, to my knowledge:

1. The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of our Company.

Date: November 12, 2024

/s/ Michael S. Lebby  
\_\_\_\_\_  
Michael S. Lebby  
Chief Executive Officer  
(Principal Executive Officer)



**CERTIFICATION PURSUANT TO  
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002  
18 U.S.C. SECTION 1350**

In connection with the Quarterly Report on Form 10-Q of Lightwave Logic, Inc. (the "Company") for the period ending September 30, 2024 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, James S. Marcelli, Chief Operating Officer of our Company, certify, pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, 18 U.S.C. Section 1350, that, to my knowledge:

1. The Report fully complies with the requirements of section 13(a) or 15(d) of the Securities Exchange Act of 1934; and
2. The information contained in the Report fairly presents, in all material respects, the financial condition and result of operations of our Company.

Date: November 12, 2024

/s/ James S. Marcelli  
\_\_\_\_\_  
James S. Marcelli  
President, Chief Operating Officer  
(Principal Financial Officer)