LIGHTWAVELOGIC Faster by Design

Investor Presentation: Oppenheimer 5G Summit 14th Dec 2021

Michael Lebby, CEO Lightwave Logic (NASDAQ:LWLG)

Safe harbor

The information in this presentation may contain forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. You can identify these statements by use of the words "may," "will," "should," "plans," "explores," "expects," "anticipates," "continue," "estimate," "project," "intend," and similar expressions. Forward-looking statements involve risks and uncertainties that could cause actual results to differ materially from those projected or anticipated. These risks and uncertainties include, but are not limited to, general economic and business conditions, effects of continued geopolitical unrest and regional conflicts. competition, changes in technology and methods of marketing, delays in completing various engineering and manufacturing programs, changes in customer order patterns, changes in product mix, continued success in technological advances and delivering technological innovations, shortages in components, production delays due to performance quality issues with outsourced components, and various other factors beyond the Company's control.

Lightwave Logic overview

Successfully up-listed to NASDAQ in 1st Sept 2021

- Organic up-list (no reverse split)
- Invited to speak at investment conferences
- Invited to speak at international technical conferences

Strong Balance Sheet

- Looking to strengthen for product acceleration to market
- Very strong IP and patent position
 - Over 70+ patents & patent applications
 - Freedom of manufacturing

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Lightwave Logic NASDAQ: LWLG

Share Price ¹	\$18.76
Market Cap ¹	\$2.04B
Cash ²	\$13.9M
Total Liabilities ¹	\$1.0M
Shares Outstanding	107.8M
Headquarters	Englewood, CO

L) As of 13th Dec, 2021

2) As of 16th August, 2021



Ringing the bell at NASDAQ (10th Sept 2021) IGHTWAVELOGICE









NASDAQ and Lightwave Logic energy.....

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Closing the market 10th September at 4pm East coast time precisely...

Lightwave Logic impact

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Company Headquarters



- We are a technology platform that is designed to help scale existing internet structure by providing transmission of data at higher speeds with less power
- Essential for 5G, data communications & telecommunications markets)
- We leverage our proprietary electro-optic (EO) polymer materials to create photonic devices (that convert data from electrical signals into optical signals)
- Technology evaluation underway with Tier-1 partners under NDA
- In-house control of material supply, device fabrication & package design

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Applications & Markets

We solve headaches for the internet

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The internet (which are fiber optic pipes that carry optical data needs to grow in speed, and keep power in check (5G, back haul, datacenters)

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Fiber Optic Network (5G back haul) Industry experts agree that radical innovation is needed to enable tomorrow's data services (such as 5G) within the current framework of existing internet infrastructure

Our photonic devices are the radical innovation the internet needs...

However, the traffic keeps on growing...

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- Network capacity is rapidly falling behind traffic growth with the exponential rise of consumer-level data usage
- Network cost and energy consumption have become the new hot spot for data providers



Polymers can transform the internet with better performance

Source: Cisco Global Cloud Index

Photonics components markets (inc. 5G)

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•Fiber optic transceivers and modules are a perfect vehicle for hybrid PICs



Fiber optic transceivers & modules explode over next decade

Source: Oculi

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Photonics markets (inc. 5G) grow quickly

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	Photonics applications	Photonics → 2030 (rough forecasts*)	Opportunity for PICs (polymer & silicon photonics/InP)
\square	5G systems/back haul/RF	~\$4-10B	Existing
	Display/project	~\$5-20B	Yes
	Automotive (LIDAR)	~\$20-50B	Yes
	Optical sensing/3D	~\$2-5B	Yes
	Bio-photonic sensing	~\$2-5B	Yes
	Medical	~\$5-10B	Yes
	Instrumentation	~\$1-3B	Yes
	Fiber comms	~\$40-60B	Existing
	HPC/computational/AI	~\$10-20B	Existing
	DCI/datacenter	~\$20-30B	Existing

Photonics becomes ubiquitous during the next decade

Source: *Many market forecasts predict huge photonics opportunities; Oculi

Proprietary EO polymer technology

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Starting With Fiber Communications/5G, current applications are exciting...

Lightwave's proprietary, internally-engineered organic polymer materials use **less power & increase data throughput in existing network infrastructure**

How? By developing **ultrafast optical modulators** using its polymers that convert ultra-high-speed electrical data to light that travels over existing fiber-optic networks



Current Applications

- Initial prototypes cover today's state-ofthe-art 50/100 Gbaud and the next-generation 400 Gbaud fiber optic applications
- Target speeds up to 100 & 200 Gigabaud per device, 800 & 1600 Gbit/s in aggregate with low voltage
- Modulators can be integrated to make more complex chips such as multi-channel modulators for higher aggregate speed



Future Applications

 Potential development of new polymer materials for specific non-communication applications such as: LIDAR automotive, sensing, displays, high speed computational processing, crypto, medical, and areas where light needs to be switched quickly at low power

Our polymers enable faster devices, low power solutions today

Our competitive advantages

Our Technology Suite Addresses Major Pain Points Facing Network Operators using 5G



We reduce network energy costs... Our low-cost, easy to fabricate modulators operate at a low voltage, that can save network operators on energy costs as compared to competing solutions.

FASTER NETWORKS



We enable faster networks...

Our robust, stable Perkinamine[™] family of materials will allow network operators to squeeze more performance from existing network infrastructure.

ENGINEERING ADVANTAGE



Technology Platform Flexibility..

Full control from materials science to device & package design will allow greater flexibility to adapt performance and cost to each individual application.

Targeting customers

As an optical component supplier, our plan is to sell into components, highspeed optics, and 5G networking equipment manufacturers



Potential to enter market in many verticals

Business model & commercialization roadmap

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3-pronged business model with customer engagement process...

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Intellectual Property

Robust intellectual property portfolio

70+ Patents & Patent Applications

Freedom of manufacturing...

Technology transfer (large foundries) Licensing royalties (OEM, CM, Comms customers)



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ISSUED	ISSUED	INTERNATIONAL
Heterocyclical chromophore architectures	Polymer modulator devices Fab, high speed, PIC, pkg	USA, EU, Canada, Japan and China
PUBLISHED	ACQUIRED	FILING

Powerful patent portfolio with freedom of manufacturing

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Technologies

Our technology breaks through the wall...

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Polymer has head-room to go much much faster than competition

Modulator bandwidth regions: polymer vs 'the pack'

3dB optical bandwidth (3dB) 150GHz Disruptive technology – faster optical components Polymers 120GHz – 150Gbps NRZ & 300GBaud PAM4 Polymer modulators (Polymer plus ™) 100GHz 70GHz – 100Gbps NRZ & 200GBaud PAM4 InP modulators The pack... 50GHz Commercial limit today 40GHz – 50Gbps NRZ & 100GBaud PAM4 Silicon & LN modulators 2000 2005 2010 2015 2020 2025

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Polymers are positioned well for 5G systems

Polymer modulator chip



Polymer optical modulator chip fabricated on silicon wafers

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Natural integration with big foundries

and high stability.

Standard fab equipment & methods

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Additive to semiconductor platforms (silicon photonics, InP, GaAs...) to enhance performance



 Natural integration with PDK of silicon foundries

the high-speed EO functionality) Natural integration with PDK of silicon foundries

Turbo-charge your silicon photonics & integrated photonics with polymers...

Polymer attributes are impressive...

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- **Polymer Stack™** Traditional design. Very high performance
- Polymer Plus[™] Boost to SiPh PICs fabricated in silicon foundries
- **Polymer Slot**[™] Smallest form factor. Ideal for *silicon foundries*

Technology strengths and weaknesses \rightarrow polymer platforms are attractive

Relative technical comparison of modulators

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Optical bandwidth – polymer modulators



Polymer modulators outperform competitive semiconductor technologies

5G systems: both 1550nm and 1310nm

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Building block for 1310nm MZ modulators (new to the organic industry)

New results that enable broader optical communications applications

Improved performance of EO chromophore r33 for low power

1550nm & 1310nm r33 now ~200pm/V with excellent stability at 85C



Important material building block for 1310nm and 1550nm fiber optics \rightarrow 5G systems

25

Route to maturity & volume



We are progressing on the TRL scale

Polymer business roadmap

Driving forward with our 'high speed, low power' polymer platform for the industry **Customer** acceptance and ramp Customer qualification, design verification, partnership Customer interaction, Planning capacity vs OF //foundry testing, evaluation Continual forecasting with customer Foundry partnering Roadmap for future products Business pudel optimization *Polymer Setting the stage to support customer strategy performance Exploring licensing, technology transfer opportunities *Reliability Upgrading capacity; partnering with foundries Engaging on outsourcing with contract manufacturer for high volume ramp *Robustness Exploring customer manufacturing facilities/services Coming In progress Time Inneulate

Current engagement includes foundry partnering

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Foundry Scaling

Silicon foundries are hungry for 'opto' business wavelous

- Silicon fabrication plants want silicon photonics (SiPh)...new upside
- PDKs will drive the hybrid integration of PIC platforms



Drive to 200/300mm allows competitive PIC cost/volume and scale and impact for 5G...

Partnering with silicon foundries

Process Development Kit (PDK) to include polymers

- Standard fabrication techniques
 - Wet etching, dry etching, metallization, dielectric deposition, spinning, curing, baking, poling
- PDK is provided by the foundry in SiPh
- PDK allows you to create innovative designs and ramp volume quickly...*perfect vehicle for polymers*





PDKs are the route to partner with foundries

Industry award

- 14th September 2021
- European Conference on Optical Communications (ECOC) exhibition industry award
- Optical integration award to Lightwave Logic Inc.



ECOC Exhibition industry award for optical integration

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Leadership

Experienced management & board

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Dr. Michael S. Lebby - CEO

35+ years in photonics & semiconductors (CEO/CTO level)

AT&T Bell Laboratories tuco íntel)



Mr. Jim Marcelli - President & COO

35+ years experience in finance & operations

SANMINA







Rear Admiral Tom Zelibor, USN (Ret) Chairman

35+ years experience in global operations & CEO leadership





Dr. Fred Leonberger

Independent Director

35+ years in optical modulators & systems (CTO level)









Mr. Siraj Nour El-Ahmadi

Independent Director

Leadership in telecom network equipment businesses (CTO level)







Mr. Ronald A. Bucchi Independent Director

Dr. Joseph A. Miller, Jr.

Independent Director

35+ years experience in accounting & finance

35+ years chemistry, fiber optics R&D (CTO level)

CORNING Greatbatch





World class advisory board

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JDSU



Dr. Craig Ciesla

Innovator in optics, microfluidics, electronics and nanofabrication (CTO/CEO level)

illumina 🗹 toctus 🐽 тозніва 🔷 JDSU



Dr. Christoph Harder

Expert in photonics, technology development, and manufacturing/selling of photonics components/apps (CTO/CEO level)

ETH zürich IBM

SWISS*PHOTONICS



Dr. Andreas Umbach

Coach and consultant on entrepreneurship and photonics technologies (CTO/CEO level)





Dr. Franky So

Leading materials research authority and thought leader in polymer-based OLEDs (CTO/Professor level)

Hoechst 🕑









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Summary

Partnering for success...Impact for 5G

Our technology platform that is working to help scale existing internet structure and 5G networks

- Technology designed to transmit data at higher speeds with less power (essential for 5G back haul, data communications & telecommunications markets)
- Leveraging internally-engineered electro-optic (EO) ٠ **polymers** to create photonic devices that convert data from electrical signals into optical signals (both 1550nm) and 1310nm)
- Working with multiple foundries, packaging partners and module/transceiver partners to position Lightwave for future high-volume production
- Technology evaluation underway with Tier-1 partners under NDA

Oculi Ilc. 1)







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Contact

Investor Relations Contact

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lightwavelogic.com

Technology roadmap



Our technology roadmap emphasizes our unique value to the industry

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Stability of polymers

- 3 layer-stack devices
- Over 5khrs stability @ 85C
- Voltage delta <5% @ 50Hz for continuous change



die V_{π} @ 50Hz vs 85C storage time

Polymer modulator chip stability >5000Hrs