

31 January 2023

December Quarter Activities Update

Highlights

- Launched first suite of gallium nitride laser products at leading industry conference, SPIE Photonics West
- Demonstrated feasible reliability of GaN lasers with more than 500 hours' continuous operation
 - Stable optical and electrical performance at 20-25°C with less than 20% degradation
- Vertical integration progressing with successful transition of p-side processing from contract manufacturers (CMs) to Fremont fab
- Signed collaboration agreement with Ganvix to develop green GaN Vertical Cavity Surface Emitting Lasers (VCSELs)
- Raised \$1.91 million from the exercise of listed options

Global semiconductor developer BluGlass Limited (**ASX: BLG**) provides the following update and Appendix 4C Quarterly Report for the three months ended 31 December 2022 (Q2 FY23).

Launched laser product suite at Photonics West

In January, BluGlass launched its first suite of gallium nitride (GaN) laser products for customer purchase at leading industry conference, Photonics West. Held in San Francisco from 28 January – 2 February, Photonics West is the world's premier optics and laser event and is expected to attract 22,000 attendees from across the industry. Performance data is available for six products – across 405nm, 420nm, and 450nm wavelengths, in both single-mode and multi-mode devices. Customers can purchase these products in various form factors, including TO Cans of different sizes and Chip-on-Submounts.

BluGlass' initial GaN laser products are meeting entry-level commercial specifications. The release of these laser diodes reflects the significant performance and reliability improvements we have made over the past year. BluGlass has several potential customers interested in both the Company's launched and development portfolios, and this significant milestone paves the way for first orders and commercial revenues. In addition to the six products launched, lasers in expanded wavelengths and novel architectures are also progressing through the company's supply chain.

Commenting on the commercialisation milestone, BluGlass President Jim Haden said, "Launching our first GaN lasers is an important technical validation, de-risking our technology ahead of customer orders and commercial revenues. The launch at this key industry conference allows us to engage with many potential customers, who are telling us that there is a need for a more agile and flexible manufacturing partner who, through a dedicated GaN laser production facility, can meet custom requirements and provide flexible form factors. We have a large market opportunity within the high-value, high-margin US\$2.5 billion GaN laser industry".

BluGlass GaN Laser Diode Product Suite

		Available for Purchase	In Development			Next Generation
Violet	405nm	MM – 1W SM – 250mW	MM – 3W SM – 300mW-400mW			SM – 500mW
	420nm	MM – 1W SM – 250mW	MM – 3W SM – 300mW-400mW			SM – 500mW
	450nm	MM – 1W SM – 100mW	MM – 1.6W	MM – 2.2W	MM – 3.5W	MM – 5W
Blue	470nm		MM – 2W SM – 100-250mW			
	488nm		SM – 100-200mW			MM – 1.5-2W
	525nm		MM – 0.5-2W SM – 80-100mW			

MM: Multi Mode SM: Single Mode

BluGlass to present novel laser paper at Photonics West

During the SPIE Photonics West conference, BluGlass will present a novel paper on RPCVD-grown single-frequency distributed feedback (DFB) laser diodes at visible wavelengths, co-authored by UC Santa Barbara (UCSB).

DFB lasers are a highly promising laser technology commonly utilised in non-visible wavelengths to enable higher powered single frequency devices that require narrow spectral width and high-spectral purity. Compared to ridge-waveguide (RWG) laser diodes, DFB lasers require more complex and challenging fabrication processes, and like RWG LDs they are not immune to the epitaxial challenges when increasing the operating wavelength towards green. Indium-GaN-based DFB lasers are currently not commercially available in visible wavelengths.

RPCVD's unique growth properties enable the deposition of high-quality p-type GaN and AlGaIn layers at temperatures below the thermal damage threshold of indium-rich quantum wells (the key performance material in longer-wavelength visible lasers), enabling higher quality longer wavelength devices. Combined with sophisticated fabrication techniques, this paves the way for commercially-viable, long-wavelength DFB LDs to meet industry demand.

Industry participants can pick up a copy of the paper at BluGlass' Photonics West in the North Hall at booth 5317 from 30 Jan – 3 Feb. A link to the paper will be available on the SPIE Photonics website following the conference.

Lasers demonstrate feasible reliability

BluGlass achieved a key technical milestone in the December quarter, demonstrating feasible reliability of its GaN lasers. The lasers maintained stable optical and electrical performance at 20-25°C for more than 500 hours of continuous operation with less than 20% light-output degradation, meeting viable commercial standards for laser diodes.

Commercial laser reliability is a sliding scale, ranging from one-use reliability to 10,000 hours for very demanding applications. Many applications within BluGlass' target markets require less than 1,000 hours reliability. Reliability of more than 500 hours indicates the design is ready for early manufacturing volumes, enabling BluGlass to increase engagement with potential customers.

BluGlass achieved its reliability milestone on older laser diode iterations completed by the company's contract manufacturers. Newer iterations with further improvements to epitaxy design and processing quality are progressing through the supply chain, and are expected to deliver higher yield, reliability, and performance.

"Feasible reliability reflects the importance of our design and production improvements across epitaxy, metals, facets, and bonds. This milestone has enabled BluGlass to launch its first suite of laser products to market. More recent iterations manufactured at our Silicon Valley fab show promise beyond levels achieved with our contract manufacturers. Over time we will continue to address more applications, customers, and industries," said BluGlass President Jim Haden.

Vertical integration progressing

BluGlass continues to bring more of its core manufacturing processes in-house with p-side processing successfully transferred from contract manufacturers to its Fremont fab. Testing of first lasers processed at the Fremont fab demonstrated electrical and light-output performance in-line or better than contract manufacturer performance benchmarks.

Thinning, cleaving and n-metalisation processes have commenced the transition from CMs to the Fremont fab, and facet coating is already well underway. In-house qualification of downstream manufacturing processes is expected to be completed by the end of FY23, complementing BluGlass epitaxy production in Silverwater.

"Vertical integration has technical and commercial benefits. Each downstream manufacturing process we bring in-house not only enhances the quality, repeatability, and availability of our lasers, but also de-risks our supply and improves margins and profitability. We are benefitting from our fab's faster learning cycles and highly experienced technical team, enabling us to fast-track development timelines for our RPCVD-enhanced lasers and longer-wavelength products," said BluGlass President Jim Haden.

Partnership with Ganvix

During the quarter, BluGlass entered a paid collaboration agreement with Ganvix, Inc. to develop green gallium nitride vertical cavity surface emitting lasers (VCSELs) in 515nm-525nm wavelengths. Ganvix is a leading developer of nanoporous GaN VCSELs. A type of laser diode, VCSELs differ to the edge-emitting lasers BluGlass focuses on, emitting light perpendicularly to the mounting surface instead of parallel to it.

Under the agreement, BluGlass is using its low-temperature remote plasma chemical vapour deposition (RPCVD) technology to provide Ganvix with green quantum-well epitaxy - the light emitting region in lasers. BluGlass' proprietary growth technology has significant advantages for green wavelengths, enabling higher power and brighter green performance.

RPCVD complements Ganvix's VCSEL architecture to facilitate green GaN VCSELs for advanced applications such as augmented and virtual reality headsets and 5G wireless communications.

Semiconductor Spotlight Series

During the December quarter, BluGlass partnered with ShareCafe to host two expert panel sessions on applications and opportunities within the global semiconductor industry. *From Star Wars to Supermarkets: How Semiconductors Power the Universe* outlined Australia's semiconductor and high-tech sector in the context of the global industry and featured a keynote presentation by Professor Shuji Nakamura - the inventor of GaN semiconductors. The second roundtable, *Gaining exposure to the booming semiconductor sector on the ASX*, featured CEOs from three of Australia's leading semiconductor companies, Coby Hanoach of Weebit Nano, Scott Jewler of Revasum, James Walker of BluGlass, and sector analyst Marc Kennis of Pitt Street Research.

Webinar recordings are available here: <https://www.bluglass.com.au/investor-webcast/>

Financials

Revenue in Q2 FY23 of \$368K comprised foundry services for its European wafer developer customer and early revenues from Ganvix under a collaboration agreement. In October, the Company received a \$4 million R&D tax rebate for development work conducted in Australia and the US in 2021. In addition to the rebate, BluGlass secured \$1.91 million from the exercise of listed options and a \$250,000 Placement to sophisticated shareholders.

BluGlass' research and development expenses for the quarter were \$2,085k, encompassing salaries, materials, and fabrication costs. Development costs over the past two quarters reflect the company bringing core manufacturing processes in-house at its Silicon Valley fab whilst simultaneously progressing the development of its GaN lasers with contract manufacturers.

Payments to related parties in Q2 FY23 were \$103k, comprising Executive Chair and Non-Executive Director fees. Cash at end of the Q2 FY23 was \$3.01 million.

Activity Undertaken	Amount paid during the Quarter \$'000
Laser Diode product development	\$3,042
RPCVD equipment development	\$49
Total direct expenditure	\$3,091

Outlook

BluGlass expects to start securing customer orders of its 405nm, 420nm, and 450nm GaN lasers in the coming quarter. Alongside commercial progress, BluGlass is continuing to optimise its laser design and manufacturing capabilities to improve its product offering and accelerate roadmaps for higher-value lasers. Ongoing vertical integration of downstream manufacturing processes at BluGlass' Silicon Valley fab will contribute to additional quality, performance, and reliability improvements.

"The launch of our initial product suite is an important technical and commercial milestone for the business, and we look forward to engaging with customers across various industries. There is significant unmet demand in the market, which is currently under-served by just a handful of GaN laser providers, and several of them are largely focused on their non-laser businesses. BluGlass will position itself as a dedicated visible blue laser manufacturer. With our unique technologies, we look forward to emerging as a market leader focused on offering the industry's easiest-to-use laser light. Through custom manufacturing, flexible form factors, and our novel architectures, we will also progress to higher power applications. While we are very excited to launch our initial products and continuing our vertical integration progress - we remain focused on developing competitive, leading products and novel capabilities to set the business up for continued success," finished BluGlass President Jim Haden.

This announcement has been approved for release by the BluGlass Board.

For more information, please contact:

Stefanie Winwood | +61 2 9334 2300 | swinwood@bluglass.com

About BluGlass

BluGlass Limited (ASX:BLG) is a leading supplier of GaN laser diode products to the global photonics industry, focused on the industrial, defense, bio-medical, and scientific markets.

Listed on the ASX, BluGlass is one of just a handful of end-to-end GaN laser manufacturers globally. Its operations in Sydney, Nashua and Silicon Valley offer cutting-edge, custom laser diode development and manufacturing, from small-batch custom lasers to medium and high-volume off-the-shelf products.

Its proprietary low temperature, low hydrogen, remote plasma chemical vapour deposition (RPCVD) manufacturing technology and novel device architectures are internationally recognised, and provide the potential to create brighter, better performing lasers to power the devices of tomorrow.

BluGlass' technical innovations are protected by 93 internationally granted patents and 17 trademarks in key semiconductor manufacturing jurisdictions.

Appendix 4C

Quarterly cash flow report for entities subject to Listing Rule 4.7B

Name of entity

BluGlass Limited

ABN

20 116 625 793

Quarter ended ("current quarter")

31 December 2022

Consolidated statement of cash flows	Current quarter \$A'000	Year to date (6 months) \$A'000
1. Cash flows from operating activities		
1.1 Receipts from customers	368	609
1.2 Payments for		
(a) research and development	(2,085)	(3,794)
(b) product manufacturing and operating costs		
(c) advertising and marketing	(49)	(87)
(d) leased assets	(188)	(321)
(e) staff costs	(1,546)	(3,320)
(f) administration and corporate costs	(561)	(972)
1.3 Dividends received (see note 3)		
1.4 Interest received		
1.5 Interest and other costs of finance paid		
1.6 Income taxes paid		
1.7 Government grants and tax incentives	4,050	4,100
1.8 Other (provide details if material)		
1.9 Net cash from / (used in) operating activities	(11)	(3,785)
2. Cash flows from investing activities		
2.1 Payments to acquire or for:		
(a) entities		
(b) businesses		
(c) property, plant and equipment	(96)	(369)
(d) investments		
(e) intellectual property		

Consolidated statement of cash flows		Current quarter \$A'000	Year to date (6 months) \$A'000
	(f) other non-current assets (security deposits)	(1)	(74)
2.2	Proceeds from disposal of:		
	(a) entities		
	(b) businesses		
	(c) property, plant and equipment		
	(d) investments		
	(e) intellectual property		
	(f) other non-current assets		
2.3	Cash flows from loans to other entities		
2.4	Dividends received (see note 3)		
2.5	Other (provide details if material)		
2.6	Net cash from / (used in) investing activities	(97)	(443)

3.	Cash flows from financing activities		
3.1	Proceeds from issues of equity securities (excluding convertible debt securities)	1,840	1,914
3.2	Proceeds from issue of convertible debt securities		
3.3	Proceeds from exercise of options		
3.4	Transaction costs related to issues of equity securities or convertible debt securities		
3.5	Proceeds from borrowings		
3.6	Repayment of borrowings		
3.7	Transaction costs related to loans and borrowings	(16)	(36)
3.8	Dividends paid		
3.9	Other (provide details if material)		
3.10	Net cash from / (used in) financing activities	1,824	1,878

4.	Net increase / (decrease) in cash and cash equivalents for the period		
4.1	Cash and cash equivalents at beginning of period	1,289	5,352
4.2	Net cash from / (used in) operating activities (item 1.9 above)	(11)	(3,785)

Consolidated statement of cash flows		Current quarter \$A'000	Year to date (6 months) \$A'000
4.3	Net cash from / (used in) investing activities (item 2.6 above)	(97)	(443)
4.4	Net cash from / (used in) financing activities (item 3.10 above)	1,824	1,878
4.5	Effect of movement in exchange rates on cash held	6	9
4.6	Cash and cash equivalents at end of period	3,011	3,011

5.	Reconciliation of cash and cash equivalents at the end of the quarter (as shown in the consolidated statement of cash flows) to the related items in the accounts	Current quarter \$A'000	Previous quarter \$A'000
5.1	Bank balances	422	851
5.2	Call deposits	2,589	438
5.3	Bank overdrafts		
5.4	Other (provide details)		
5.5	Cash and cash equivalents at end of quarter (should equal item 4.6 above)	3,011	1,289

6.	Payments to related parties of the entity and their associates	Current quarter \$A'000
6.1	Aggregate amount of payments to related parties and their associates included in item 1	103
6.2	Aggregate amount of payments to related parties and their associates included in item 2	
<i>Note: if any amounts are shown in items 6.1 or 6.2, your quarterly activity report must include a description of, and an explanation for, such payments.</i>		

7.	Financing facilities <i>Note: the term "facility" includes all forms of financing arrangements available to the entity.</i> <i>Add notes as necessary for an understanding of the sources of finance available to the entity.</i>	Total facility amount at quarter end \$A'000	Amount drawn at quarter end \$A'000
7.1	Loan facilities		
7.2	Credit standby arrangements		
7.3	Other (please specify)		
7.4	Total financing facilities		
7.5	Unused financing facilities available at quarter end		
7.6	Include in the box below a description of each facility above, including the lender, interest rate, maturity date and whether it is secured or unsecured. If any additional financing facilities have been entered into or are proposed to be entered into after quarter end, include a note providing details of those facilities as well.		

8.	Estimated cash available for future operating activities	\$A'000
8.1	Net cash from / (used in) operating activities (item 1.9)	(11)
8.2	Cash and cash equivalents at quarter end (item 4.6)	3,011
8.3	Unused finance facilities available at quarter end (item 7.5)	
8.4	Total available funding (item 8.2 + item 8.3)	3,011
8.5	Estimated quarters of funding available (item 8.4 divided by item 8.1)	281.71
<i>Note: if the entity has reported positive net operating cash flows in item 1.9, answer item 8.5 as "N/A". Otherwise, a figure for the estimated quarters of funding available must be included in item 8.5.</i>		
8.6	If item 8.5 is less than 2 quarters, please provide answers to the following questions:	
8.6.1	Does the entity expect that it will continue to have the current level of net operating cash flows for the time being and, if not, why not?	
	Answer:	
8.6.2	Has the entity taken any steps, or does it propose to take any steps, to raise further cash to fund its operations and, if so, what are those steps and how likely does it believe that they will be successful?	
	Answer:	
8.6.3	Does the entity expect to be able to continue its operations and to meet its business objectives and, if so, on what basis?	
	Answer:	
<i>Note: where item 8.5 is less than 2 quarters, all of questions 8.6.1, 8.6.2 and 8.6.3 above must be answered.</i>		

Compliance statement

- 1 This statement has been prepared in accordance with accounting standards and policies which comply with Listing Rule 19.11A.
- 2 This statement gives a true and fair view of the matters disclosed.

Date: 31 January 2023

Authorised by: The Board
(Name of body or officer authorising release – see note 4)

Notes

1. This quarterly cash flow report and the accompanying activity report provide a basis for informing the market about the entity's activities for the past quarter, how they have been financed and the effect this has had on its cash position. An entity that wishes to disclose additional information over and above the minimum required under the Listing Rules is encouraged to do so.
2. If this quarterly cash flow report has been prepared in accordance with Australian Accounting Standards, the definitions in, and provisions of, *AASB 107: Statement of Cash Flows* apply to this report. If this quarterly cash flow report has been prepared in accordance with other accounting standards agreed by ASX pursuant to Listing Rule 19.11A, the corresponding equivalent standard applies to this report.
3. Dividends received may be classified either as cash flows from operating activities or cash flows from investing activities, depending on the accounting policy of the entity.
4. If this report has been authorised for release to the market by your board of directors, you can insert here: "By the board". If it has been authorised for release to the market by a committee of your board of directors, you can insert here: "By the [name of board committee – eg Audit and Risk Committee]". If it has been authorised for release to the market by a disclosure committee, you can insert here: "By the Disclosure Committee".
5. If this report has been authorised for release to the market by your board of directors and you wish to hold yourself out as complying with recommendation 4.2 of the ASX Corporate Governance Council's *Corporate Governance Principles and Recommendations*, the board should have received a declaration from its CEO and CFO that, in their opinion, the financial records of the entity have been properly maintained, that this report complies with the appropriate accounting standards and gives a true and fair view of the cash flows of the entity, and that their opinion has been formed on the basis of a sound system of risk management and internal control which is operating effectively.