Financial Results Briefing of FY2023

QD Laser, Inc.
May 2024

Copyright © 2024 QD Laser, Inc., All Rights Reserved.

Mission

With the power of the semiconductor laser, “I can’t” becomes “I can”.

Contents

01 Financial Results for FY2023

02 Semiconductor Laser Devices

03 Laser Retinal Projection

04 Business Growth

05 ESG Initiatives

What was once thought to be impossible is now a reality;
we have become the only company in the world
to successfully mass produce Quantum Dot LASERs.

Our laser technology will enable
dramatic improvements in our ability to process information,
support visually impaired people, prevent eye diseases,
and enhance vision, continually pushing the boundaries of
human possibility.

01

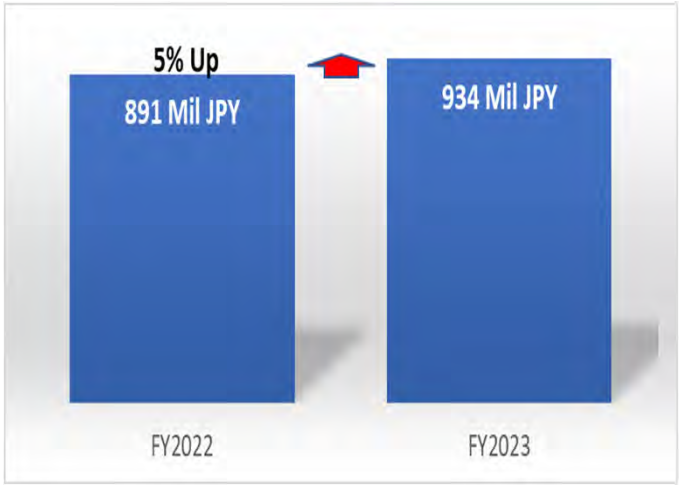
Financial Results for FY2023

Financial Results Highlights for FY2023 vs FY2022

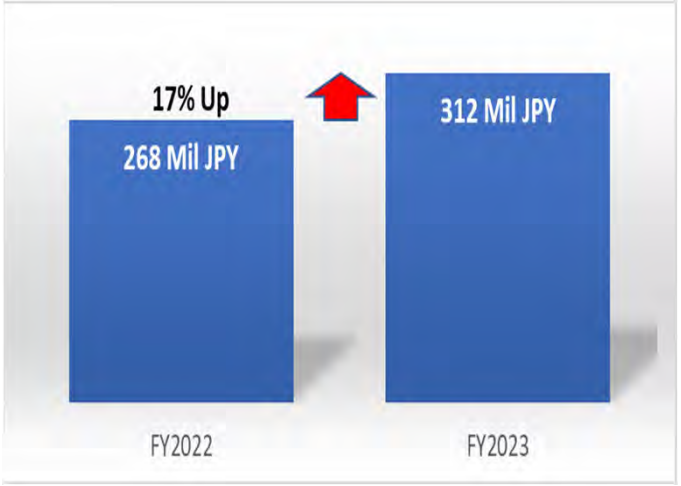
01 LD business sales increased by 5% YOY to 891 mil yen and LEW business sales increased by 17% YOY to 312 mil yen. Company-wide sales increased by 8% YOY to 1,247 million yen.

The LD business increased by 5% due to increases in DFB, high-power, and quantum-dot lasers, while the compact visible laser business decreased.
The LEW business increased by 17% due to sales of RETISSA MEOCHECK, US sales of RETISSA NEOVIEWER, and the expansion of eye health check services.

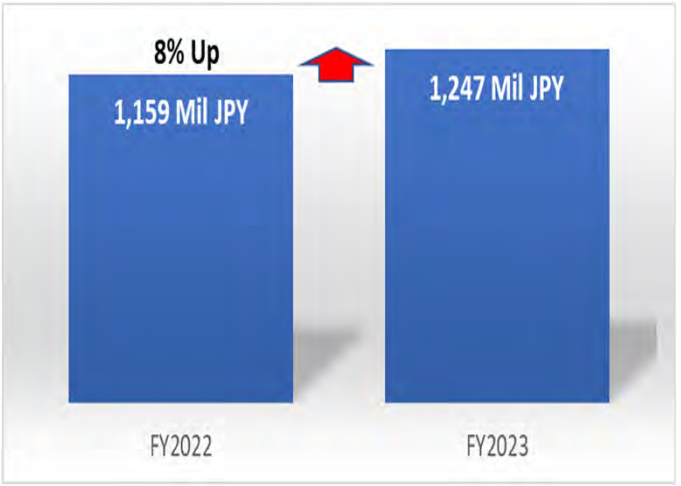
LD sales



LEW sales



Company-wide sales

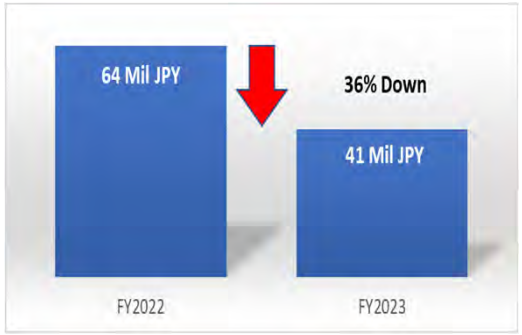


Financial Results Highlights for FY2023 vs FY2022

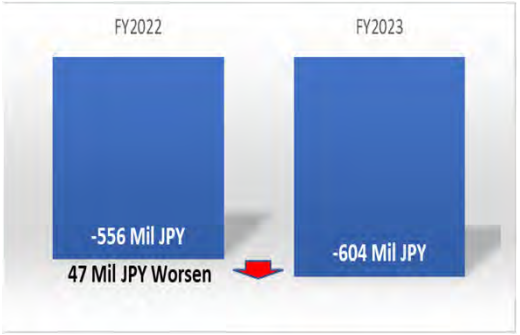
02 LD business operating income decreased by 36% YOY to 41 mil yen. Company-wide operating loss worsened by 47 mil yen (8%) YOY.

In the LD business, although inventory valuation losses increased, gross profit increased due to increased sales, but operating income decreased 36% from the previous year to 41 million yen due to an increase in SG&A, mainly personnel expenses. In the LEW business, sales increased, but gross profit decreased due to inventory write-downs mainly for ON HAND, and although SG&A decreased, operating loss worsened from the previous year. As a result, company-wide operating loss worsened by 47 million yen from the previous year.

LD operating income



Company-wide operating loss



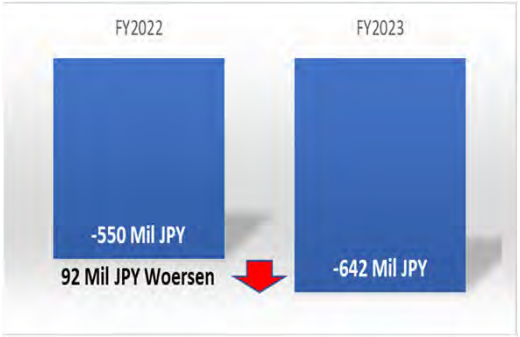
03 Ordinary loss worsened by 54 mil yen (10%) YOY, and net loss worsened by 92 mil yen (17%) YOY.

Ordinary loss worsened by 54 million yen compared to the previous fiscal year, which was larger than the deterioration in operating loss due to the loss on retirement of MBE #1. Net loss worsened by 92 million yen compared to the previous year, which was larger than the deterioration in ordinary loss due to impairment of fixed assets in the LEW business.

Ordinary loss



Net loss



Financial Results Highlights for FY2023 vs FY2022

Increase in sales and worsened in losses compared with the previous year

Sales increased by 5% from the previous year in the LD business and by 17% from the previous year in the LEW business, resulting in a company-wide increase of 8% from the previous year. Operating income decreased by 23% YOY in the LD business to 41 million yen, and in the LEW business operating loss worsened by 37 million yen YOY to 375 million yen. Company-wide operating loss worsened by 47 million yen YOY to 604 million yen.

Performance Summary

(Million JPY)	FY2023	FY2022	YOY	FY2023 Forecast*1	vs Forecast
Sales	**1,247**	1,159	+8% (+88)	1,244	+0.3% (+3)
(LD)	**934**	891	+5%	930	+1%
(LEW)	**312**	268	+17%	314	△0%
Operating Profit or Loss (△)	**△604**	△556	△47	△559	△45
(LD)	**41**	64	△23	67	△25
(LEW)	**△375**	△338	△37	△305	△70
Ordinary Loss (△)	**△600**	△546	△54	△577	△23
Net Loss (△)	**△642**	△550	△92	△582	△60

Sales by Product Group

(Million JPY)	FY2023	FY2022	YOY
DFB Laser	**394**	320	+23%
Compact Visible Laser	**202**	257	△21%
High-Power Laser	**228**	218	+5%
Quantum Dot Laser	**109**	94	+16%
LD Total	**934**	**891**	**+5%**
Products	**188**	123	+53%
NRE	**107**	141	△24%
Health Check Service	**16**	3	+413%
LEW Total	**312**	**268**	**+17%**
Grand Total	**1,247**	**1,159**	**+8%**

*1： Published on February 14, 2024

Balance Sheet

Total assets increased by 1,227 million yen due to increases in cash and deposits, tangible fixed assets, etc. Total liabilities decreased by 0.03 million yen due to a decrease in A/P and an increase in other payables. Net assets increased by 1,227 million yen due to capital increase through the exercise of stock acquisition rights, and the equity ratio was 92.1%[*1] (90.1%[*2] at the end of the previous fiscal year).

Balance Sheet

(Million JPY)	**End of March 2024**	End of March 2023	YOY
Current Assets	5,762	4,617	+1,144
Fixed Assets	384	300	+83
Total of Assets	**6,146**	**4,918**	**+1,227**
Current Liabilities	444	436	+8
Fixed Liabilities	34	42	△8
Total of Liabilities	**478**	**478**	**△0**
Net Assets	**5,667**	**4,439**	**+1,227**
Total Liabilities and Net Assets	**6,146**	**4,918**	**+1,227**

*1 : Calculated by deducting subscription rights of 6 million yen from net assets
*2 : Calculated by deducting stock acquisition rights of 7 million yen from net assets

Cash Flow

Cash and cash equivalents increased by 1,255 million yen from the end of the previous year.

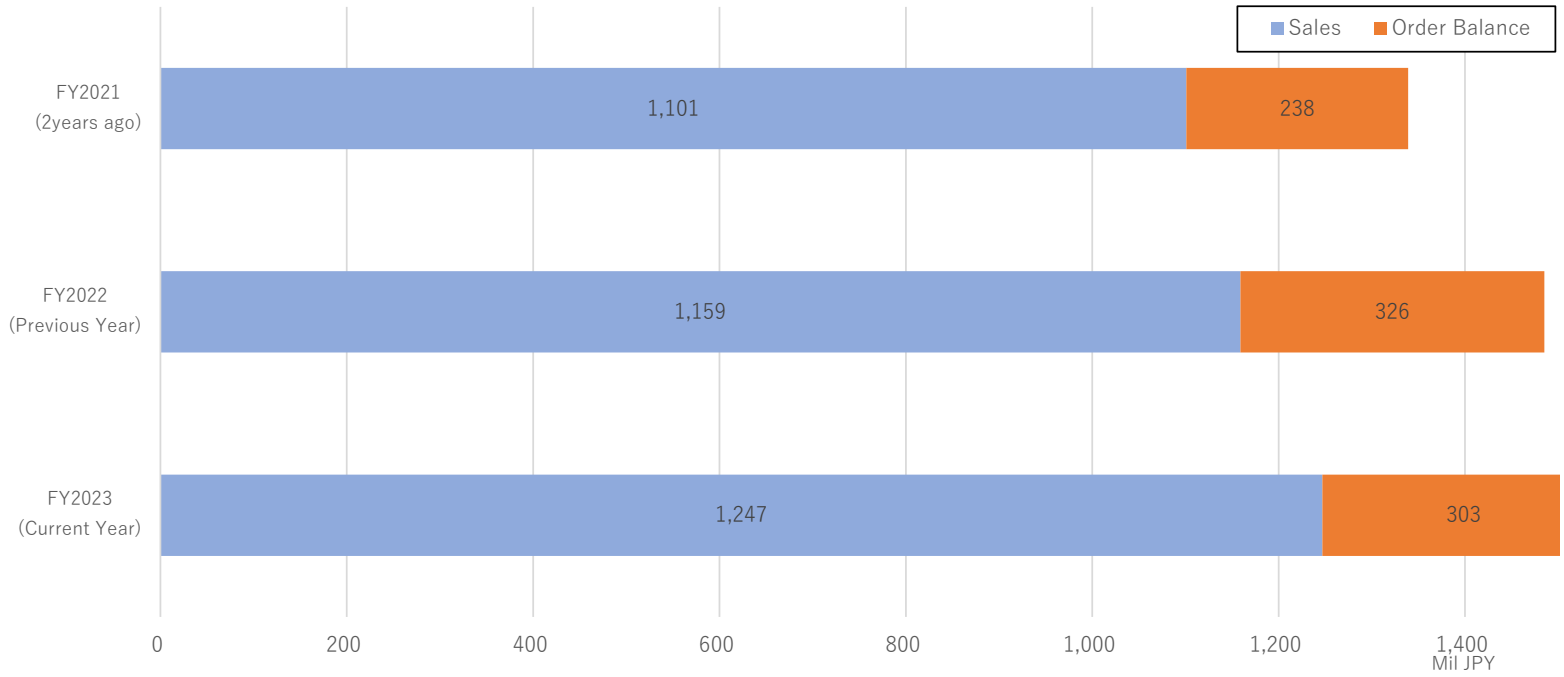
Cash Flow

(Million yen)	**FY2023**	FY2022	YOY
CF from Operating Activities	**△443**	△515	+71
CF from Investing Activities	**△138**	△22	△115
CF from Financing Activities	**1,835**	1,298	+536
Effect of Exchange Rate Change on Cash and Cash Equivalents	**1**	△0	+1
Cash and Cash Equivalents Year-end Balance	**4,836**	3,581	+1,255

Order Status

Sales are steadily increasing. The order backlog as of the end of FY2023 was 303 million yen, down 7% from the end of FY2022. In FY2022, the backlog of orders increased due to large orders for DFB lasers near the end of the period.

Net sales for FY2023 and order backlog as of the end of the FY2023



DFB Lasers for Precision Machining and Measurement[*1]: Sales in FY2023

394 million JPY sales, increased by 23% YOY.

- **Measurement(semiconductor wafer inspection): 24%**

•Europe: Sales of light sources for inspection equipment in the semiconductor wafer process increased by 16% YOY.

- **Micromachining: 32%**

•North America: Postponed due to overstock of lasers for processing equipment and sales decreased by 7% YOY.

•China: Sales of 39,747K yen due to new orders for lasers for processing equipment

- **Measurement(Sensor system): 25%**

•Europe: Sales of light sources for LiDAR increased by 26% YOY

•Japan: Sales of light sources for inspection increased by 488% YOY.

•North America: Sales of 8,293K yen due to orders for light sources for sensors.

- **Medical equipment: 18%**

•Japan: Sales of light sources for ophthalmic diagnosis increased by 38% YOY.

•Europe: Sales of light sources for medical inspection increased by 146% YOY.

•Europe: Sales of light sources for medical inspection due to order for samples for mass production certification increased by 169% YOY.

Sales in FY2021, 2022 and 2023





DFB lasers
Left：for 15 ps pulsed operation
Right：for 50 ps pulsed,
ns pulsed, and CW operations

*1： Classified for convenience according to application, including some FP lasers, etc.

Compact Visible Lasers：Sales in FY2023

202 million JPY sales, decreased by 22% YOY.

- **Blood/cell analysis(Flow cytometer/cell sorter*1): 52%**

•China: Demand for bio-testing equipment declined due to the end of COVID-19 countermeasures. Due to changes in customer production plans and inventory adjustments associated with this, sales decreased by 53% YOY.

・North America: Sales of light sources for biomedical equipment increased by 73% YOY.

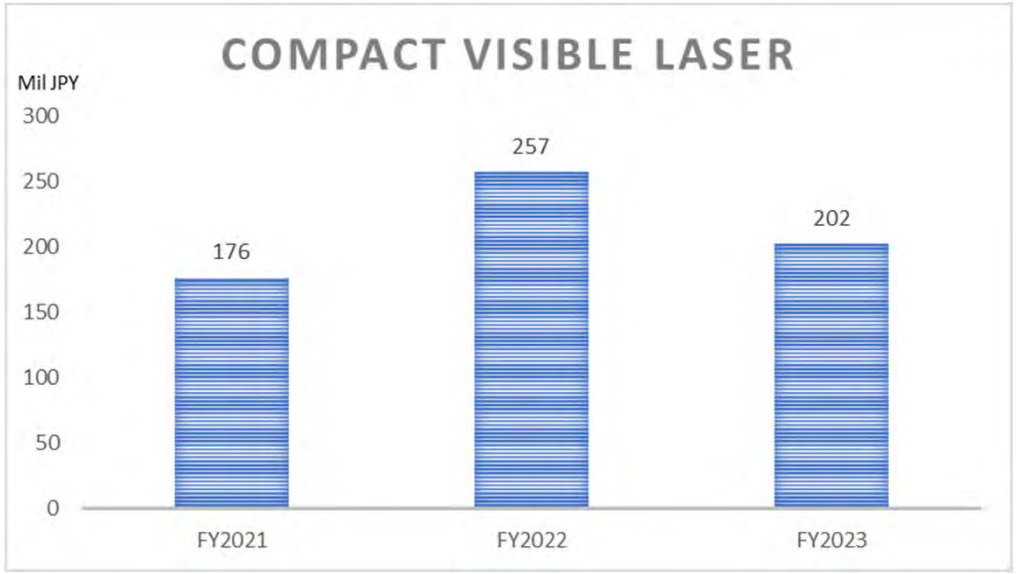
- **Microscope: 44%**

•Europe: Sales increased by 208% YOY due to orders from a biomedical STED*2 microscope manufacturer in mass production.

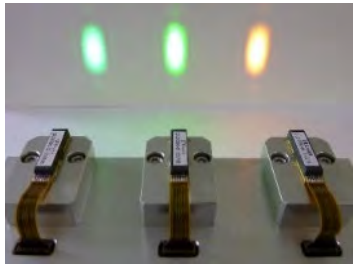
•Europe: Sales increased by 273% YOY with the start of mass production for biomedical applications.

•Japan: Sales increased by 145% YOY with the start of mass production for biomedical applications.

Sales in FY2021, 2022 and 2023



Compact visible lasers
Left: green,
Middle: yellow-green, and
Right: orange.



*1: A type of flow cytometer to separate specific cells.
*2: STED: STimulated Emission Depletion microscopy. A type of fluorescence microscope.

High-Power Lasers：Sales in FY2023

228 million JPY sales, increased by 5% YOY.

- **Leveler for construction/DIY and sensor: 45%**

•China: A light source for sensors and levelers. Sales increased by 3% YOY, despite the impact of the suspension of factory operations due to COVID-19 in the previous fiscal year.

•North America: Sales of light sources for sensors increased by 212% YOY.

•Japan: Sales of light sources for sensors increased by 39% YOY.

•Europe: Sales of light sources for sensors decreased by 83% YOY due to low orders.

- **Sensor in semiconductor factories: 26%**

•Japan: Sales of light sources for sensors of wafer transfer machines to be used in semiconductor factories for 2 companies increased by 34% YOY.

•North America: Sales of light sources for particle counters in semiconductor factories increased by 3% YOY.

- **Machine vision and data communication in factories: 26%**

•Europe: Sales of light sources for data communication in factories increased by 245 % YOY.

•North America(USA): Sales of light sources for machine vision increased by 186% YOY.

•North America(Canada): Sales of light sources for machine vision decreased by 34% YOY due to low orders.

Sales in FY2021, 2022 and 2023





High-power lasers
TO package

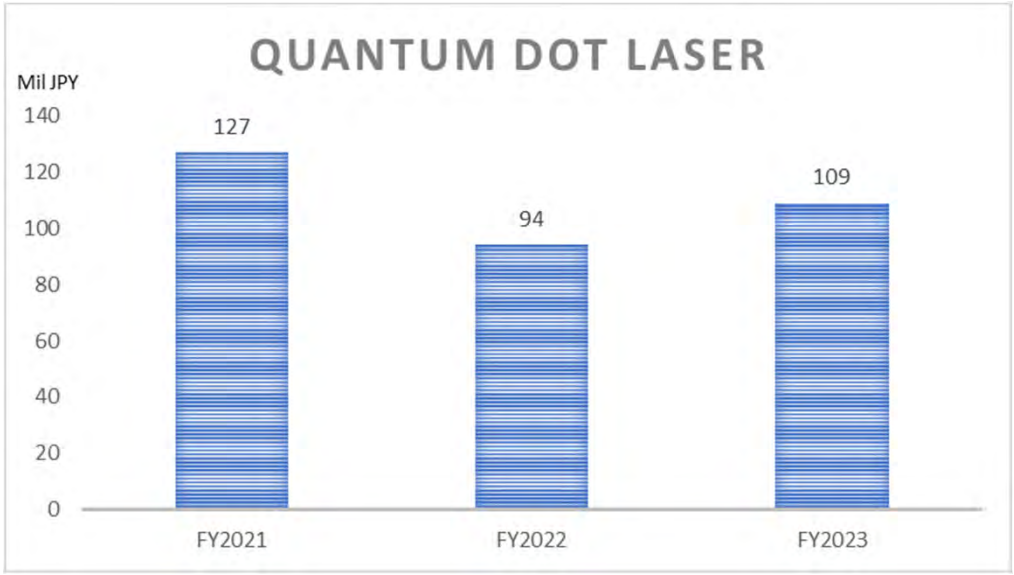
Quantum Dot Lasers[*1] : Sales in FY2023

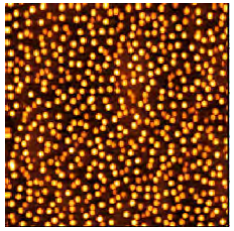
109 million JPY sales, increased by 16% YOY.

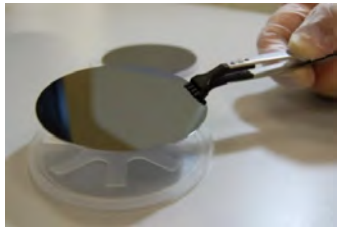
Working on quantum-dot lasers for silicon photonics with nine customers in Japan, the US, and Europe.

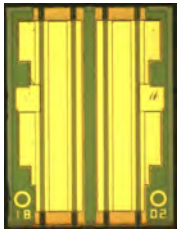
•Japan: Shipped chips for optical connector and chip-to-chip communication. Continuing cost-reduction activities. Mass production started in 2023, and 60,000 units were ordered from 2023 to 2024. 42,000 units were shipped.
•North America: Shipment of wafers for optical connector and chip-to-chip communication.
•North America: Wafers were shipped after receiving repeat orders from the customer of the optical connector and chip-to-chip communication.
•Four universities and research institutes in Japan, North America and Europe: Inquiries about quantum dot wafers for research. Wafers were shipped after receiving the PO.

Sales in FY2021, 2022 and 2023




Quantum dot


Quantum dot wafer


Quantum dot laser chip

*1: Classified for convenience according to application; includes some quantum well lasers, etc.

Laser Eyewear (LEW) : Sales in FY2023

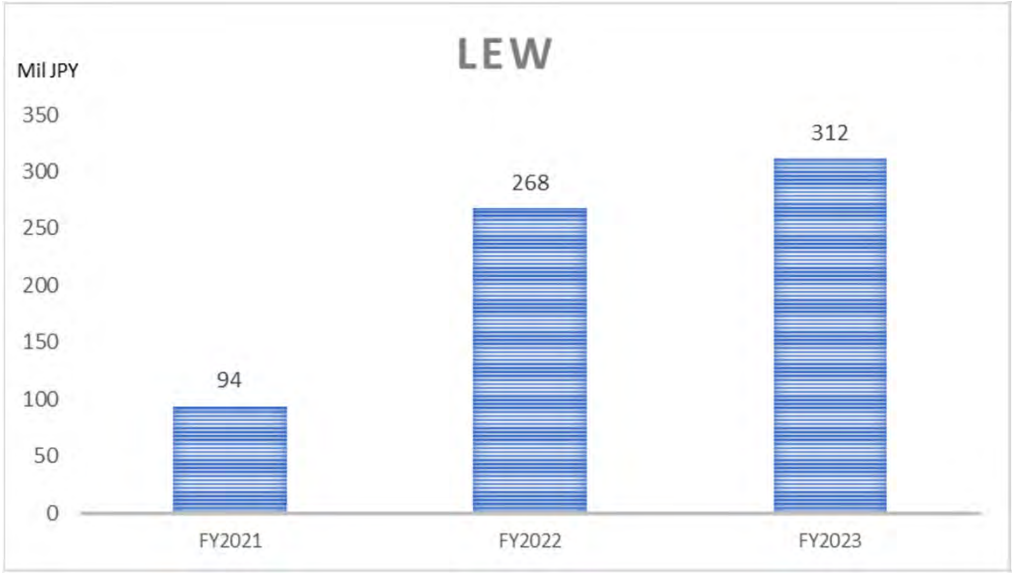
312 million JPY sales, increased by 17% YOY.

■RETISSA Display II+RD2CAM
- Sold through distributors such as SEED and various EC channels
- Gradual expansion of certification and informal offers on subsidies for daily life tools
  - approved in 15 cities, accredited in 5 cities.

■RETISSA ON HAND
- Gradual introduction in public facilities such as libraries and museums
- Collaborated and trialed cultural and artistic activities, including live events sponsored by the Nippon Foundation DIVERSITY IN THE ARTS.
- Certified welfare products under Kawasaki City's "Kawasaki Innovation Standards (KIS)."
- Designated as assistive devices for people with disabilities by the Minister of Health, Labour and Welfare, with purchases and rentals exempt from consumption tax from fiscal year 2026.
- Launched in the U.S. in conjunction with the CSUN Assistive Technology Conference in March 2024.
- Continued market development and business expansion in China and other regions.

■Initiatives to increase awareness in the field of visual support
- Enhanced and ongoing information dissemination on various social media platforms (X, Instagram, note, YouTube, etc.).
- Primarily introduced and provided experiential opportunities at exhibitions for visually impaired individuals, including the Japan Lighthouse Exhibition and SightWorld.

Sales in FY2021, 2022 and 2023




RETISSA Display II


RD2CAM


RETISSA ON HAND

Laser Eyewear (LEW)

(Cont.)

■RETISSA NEOVIEWER

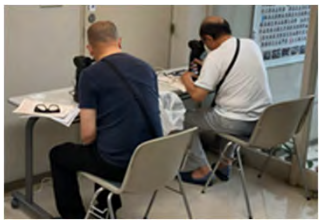
- Released as a bundle "DSC-HX99 RNV kit" with a Sony digital camera
- Available at five Sony stores nationwide and in the US. Increased touch and try opportunities through rental program
- The "DSC-HX99 RNV kit" won the Good Design Best 100 and the VGP 2023 Summer Universal Award, and was selected for the Good Design Award Jury's Selection "My Favorite Product 2023" and "Historic Cameras of Japan."



■RETISSA MEOCHECK

- In addition to device sales through domestic general distributors, implemented an "Eye Health Check Service" targeting automobile transportation operators, including taxi (Nihon Kotsu, >6,000 individuals) and truck (Waki Yuso, ~400 individuals).
- This service is available both as a mass implementation aligned with regular health examinations and as a flexible self-check method adaptable to customer conditions.
- Continued industry-academic collaboration with Tohoku University: Development of algorithms and accumulation of evidence (papers published).
- Proof of concept (PoC) for an online service oriented towards a subscription model.







■Commissioned development

- Undergoing elemental technology development such as eye-tracking for next-generation retinal projection eyewear (smart glasses ,i.e., Display 3) under collaboration with TDK, NTT Laboratories, mobile device manufacturers, etc.





(Images by TDK)

02

Business Growth

Fiscal year ending March 2023, fiscal year ending March 24, medium-term, and medium- to long-term

Business Highlights for FY2023

Total company sales of 1.24 billion yen (up 8% YoY), steady expansion across both business units.

Laser Device (LD) Business

Operating profit

Consecutive **9** years

Operating profit of 41 million yen.
Net sales 0.93 billion yen.
(up 5% YoY)

Certified customers

68 to **77** institutions

Expanded customer base from 8 to 13 companies for compact visible lasers for biosensing.
7 new applications with DFB lasers.

QD lasers for silicon optical wiring. Mass production sales

42,000units

Mass production starting in May 2023.
Constructing mass production system for 1 million units/year.

Laser Eyewear (LEW) Business

YoY sales

17%UP

Sales of 314 million yen.
Sales of 950 RETISSA products, and progress in commissioned development of smart glasses

New retinal projection devices

Overseas expansion

RNV sold by Sony in the United States.
ON HAND sold in the U.S. and Asia, and preparation for mass production.

Vision Health Check Service

Service **Expansion**

Full-scale introduction by major taxi operators (>6,000 individuals).
Initiated implementation in the trucking industry (~400 individuals).

*1: Wafer inspection, precision machining, flow cytometry, microscopy, LiDAR, mask inspection, axial length measurement.

Major Business Target for FY2024

Updating business for early company-wide operating profit and subsequent explosive growth

Laser Device (LD) Business

Operating profit

Consecutive **10** years

Operating profit of 8 million yen.
Net sales 1 billion yen. (up 7% YoY)
Increase in new product development costs and depreciation expenses.*1

Certified customers

68 to **77** institutions

Expansion of customer base for compact visible lasers for biosensing: from 13 to 18 companies.
Expansion of DFB laser applications: 9 applications.*2
New product development and commercialization.

Launch of solution products*3

Lantana

Starting sales of the world's smallest compact visible laser unit.
Initial year sales plan for 16 units (field test)

Laser Eyewear (LEW) Business

YoY sales

78%

Sales of 244 million yen.
Progress in contracted development of smart glasses and SLO.
Preparation for profitability and stable earnings.

New retinal projection devices

Overseas expansion

RNV sold by Sony in the United States.
Preparation for sales of ON HAND in the U.S. and China, and low-cost production.

Vision Health Check Service

Service expansion

Full-scale introduction by major taxi operators, cross-industry expansion and the implementation of subscription model.

*1: Due to a decision to relocate the division, there is a reduction in the service life.
*2: Wafer inspection, precision machining, flow cytometry, microscopy, LiDAR, mask inspection, axial length measurement, inter-satellite communication, and brain examination.
*3: Contributed to enhancing customer product competitiveness through miniaturization and improved design flexibility of biomedical devices.

Forecast for FY2024

While the LD business is steadily growing, the LEW business is undergoing business restructuring aimed at 2026, and company-wide sales will be flat.

Full-year earnings forecast

(Million JPY)	FY2024	FY2023	YOY
Sales	**1,245**	1,247	△0% (△1)
(LD)	**1,000**	934	+7%
(LEW)	**244**	312	△22%
Operating Profit or Loss (△)	**△589**	△604	+14
(LD)	**8**	41	△33
(LEW)	**△290**	△375	+85
Ordinary Loss (△)	**△592**	△600	+7
Net Loss (△)	**△596**	△642	+45

【LD business】
・Sales increase 7% YOY to 1,000 million yen due to growth in DFB lasers and small visible lasers.
・SG&A increase 38% YOY to 375 million yen due to securing highly skilled human resources, increasing depreciation costs due to shortening the depreciation period of the current base due to base relocation, and an increase in development items centered on DFB lasers and small visible lasers.
・Operating income will be 8 million yen, down 80% from FY2023.

【LEW business】
・FY2024 is positioned as a period of business restructuring targeting 2026, and sales are 244 million yen, down 22% from FY2023.
・SG&A are expected to be 349 million yen, down 8% YOY due to a decrease in development items and a review of advertising.
・Operating loss will be 290 million yen, an improvement of 85 million yen from FY2023.

【Company-wide】
・Operating loss will be 589 million yen, an improvement of 14 million yen from FY2023.
・Ordinary loss improve by 7 million yen compared to FY2023, and net loss improved by 45 million yen compared to the previous year due to fixed asset impairment losses in FY2023.

Mid-term business target (about 3 years)

Achieve company-wide turn around and establish the foundation for explosive growth thereafter

Laser Device (LD) Business

Operating profit

Consecutive **12-13** years

Operating Profit >250 million yen
(Gross margin >40%)
Expansion of global niche products.
Transition from joint research to mass production for silicon photonics products.

New products for global niche

Net sales >**400mil.** yen

Contribution of new products scheduled in FY2024
- Value added visible laser modules
- DFB laser for semiconductor wafer/mask inspection
- DFB laser for fast and precise machining

QD lasers for silicon optical wiring mass production order

60k units[*1] → **100k** units[*2]

Increased market for silicon photonics by joint research partner's mass production, a milestone for the introduction of 3rd MBE to expand mass production capacity

Laser Eyewear (LEW) Business

Net sales

310mil.[*3] →> **1bil.** yen

Steady continuation of Low Vision Aid.
Stable earnings from the eye health check service business.
Monetization of retinal projection intellectual property.

Retinal projection products: RETISSA

Corporate Collaboration and International Expansion

Started production and sales of next-generation devices for visual support.
Expansion into the vision healthcare sector internationally.
Field testing of smart glasses and product launch.

Vision health check service

6,000 users[*1] → **70,000** users

Expansion by penetration to health check in transportation industry such as taxi and freight.
Nationwide expansion of contact lens stores.
Launch of data service to administrator/individual viewer.

*1: Results in FY2023
*2: Milestone for the introduction of MBE No. 3 machine aimed at significantly expanding mass production subsequently.
*3: Results in FY2023

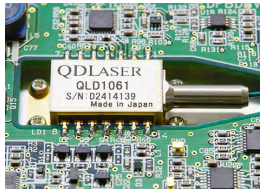
Expected growth potential in mid to long term

03 In the mid to long term, in addition to the laser eyewear business, plan to expand sales of vision health check service and silicon photonics.

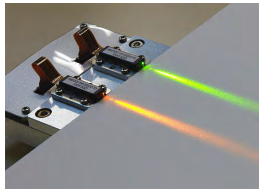
02 Establish mass production and sales channels of consumer/medical eyewear
Three new RETISSA as the growth driver in the short to mid term

01 Through R&D of various laser technologies and stable profits from laser device business, strengthen business base for dramatic future growth.

DFB laser

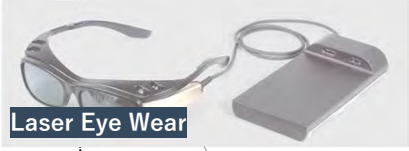


Compact visible laser









5,000 units/y
for 3 RETISSA
(FY2025 target)

Plan to national
and international
sales growth

World's smallest laser
light source unit
"Lantana series".
Shipping starts in FY2024.



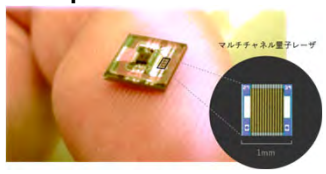
Mass production of
3 new RETISSA
(FY2022)

IPO

Now

Future

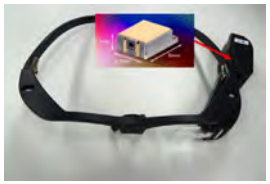
- QD lasers for optical wiring (silicon photonics)
  Mass production in FY2023



- Vision health check service
  Full service-in in FY2023



- Smart glass as RETISSA Display3
  Progress in R&D, launch in 2026-27



*1： The graph is shown as an image

Laser Device Business Strategy

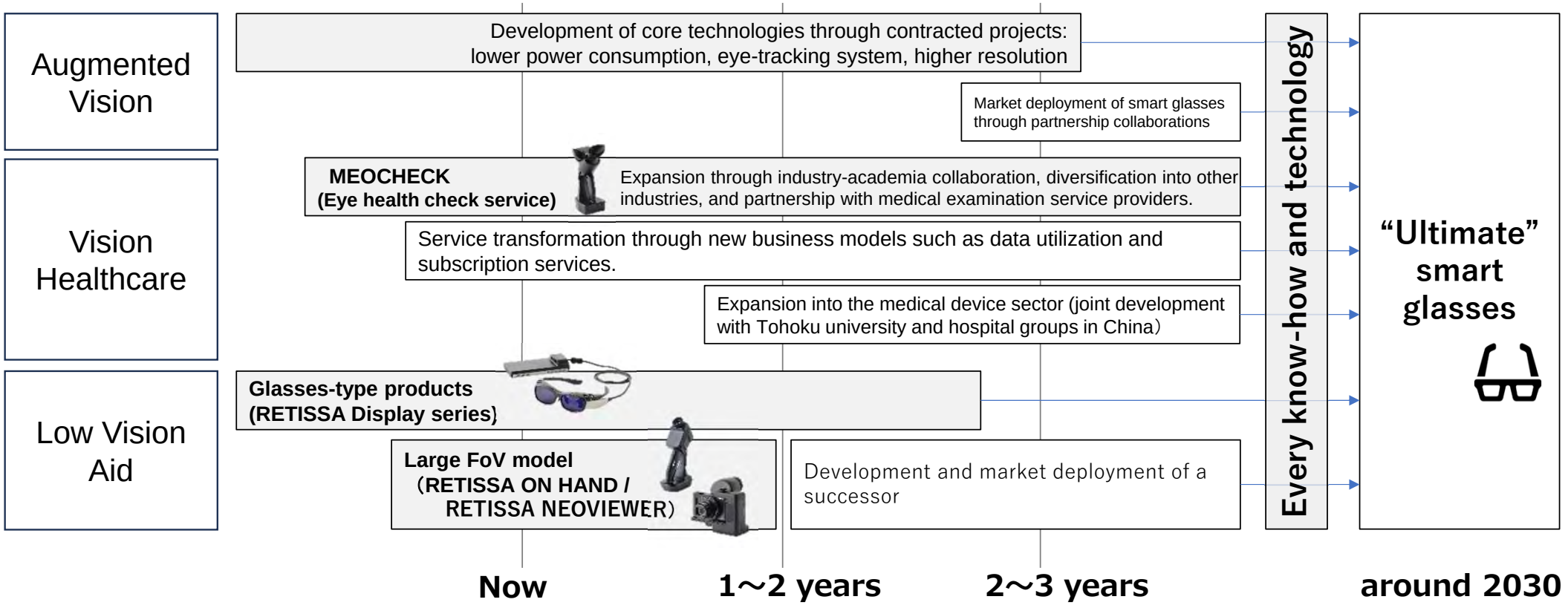
Based on the technology and products that have established our position in the industry, we will 1) expand across customers and develop new applications, 2) expand globally, and 3) develop module & solutions to realize significant growth.

			Estimated market size of the final product*1	Estimated market size of QDL products
DFB ・World's fastest speed of 15ps ・High-speed electronic circuit	Measurement	Wafer test / Mask test / Topographic survey / Brain monitor / Axial length	1,480 billion-yen@2032 CAGR 10%*2	14.8 billion-yen
	Micro machining	Electronic circuits / Composite materials / Emerging countries for nano and pico-second machining	652 billion-yen@2027 CAGR 7.3%*3	6.5 billion-yen
Compact Visible ・World's smallest size ・World's minimum power consumption ・World's fastest 50ps	Bio-analysis	Flow Cytometer / Cell sorter	1,129 billion-yen@2030 CAGR 7.2%*4	11.3 billion-yen
	Microscope	Confocal microscope / STED microscope	990 billion-yen@2030 CAGR 9.0%*5	9.9 billion-yen
		Total solution with 1)All wavelength (405nm~635nm) 2)World's smallest modules		
High Power ・World's highest nanosecond peak power ・High reliability	Leveler	Construction site / Manufacturing plant / DIY / Measurement	555 billion-yen@2032 CAGR 4.3%*6	5.6 billion-yen
	Sensors	Wafer transport / Spatial communication / Machine vision / Particle counter	233 billion-yen@2030 CAGR 10.1%*7	2.3 billion-yen
Quantum dots ・High temperature stable operation ・High reliability ・Low noise	Optical wiring	Super computor / Medical・FA / 5G/6G / Self-driving	1,219 billion-yen @2030 CAGR 25.8%*8	12.2 billion-yen
	LiDAR	Drone / Self-driving / Robotics		
			Todal 6 trillion-yen	**Total 63 billion-yen**

*1： Please note that it is indicative of the overall size of our potential target market and is not a predictor of our performance. Calculated at the exchange rate of JPY/USD=150 yen/dollar.
*2： Future Market Insights「Wafer Inspection Market by Technology, Defect Type & Region - Forecast 2022 - 2032」
*3： Grand View Research「Micromachining Market Size & Share Report, 2020-2027」
*4： Grand View Research「Global Flow Cytometry Market Size Analysis Report, 2030」
*5： Grand View Research「Super-resolution Microscopes Market Size Report, 2022-2030」
*6： Global Market Insights「Construction Laser Market」
*7： Marketysers Global Consulting「Laser Sensor Market」
*8： Grand View Research「Silicon Photonics Market Size, Share & Trends Analysis Report」

Laser Eyewear（Visual Information device） Products Strategy

Continuing technology development, product development, and business development aimed at creating the ultimate smart glasses that integrate three fields.



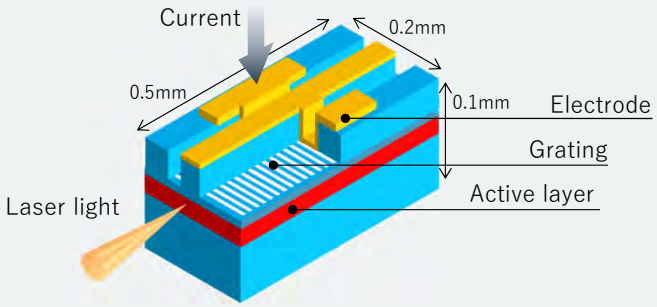
03

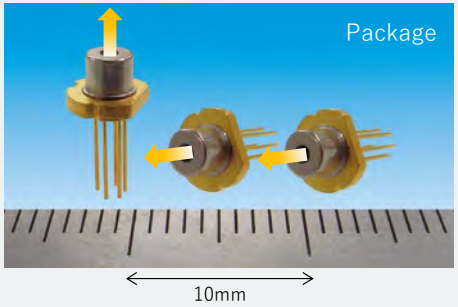
Semiconductor Laser Devices

Solid Earnings Base and High Growth Potential
under Global Laser Market Expansion

What is a Semiconductor Laser?

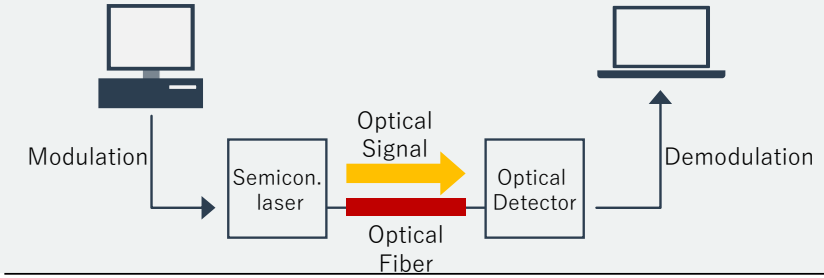
A tiny device to provide laser light by injecting an electric current through a semiconductor.



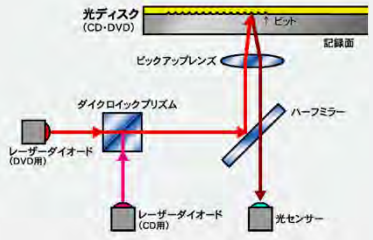


First Large-Scale Applications of Semiconductor Lasers: Optical communication and optical recording have significantly contributed to the global information and communication infrastructure.

Optical Communication@1310, 1550 nm



Optical Recording@660nm, 450nm





CD/DVD/Blu-ray

Expected Role of QD Laser, Inc.

Semiconductor Laser History and Our Position in the 3rd Phase

1st phase
Proposals of Scientific Principles and Invention of Laser (1960s)

Laser

A technology used in recording, communication, processing and sensing.

Applied in various industries such as medicine, home appliances, automobiles, manufacturing and entertainment.

2nd phase
Invention of Semiconductor Lasers, Building out Optical Communication and the Internet (1995~)

Semiconductor lasers and packaging



Semiconductor laser:

A small element with a length of about 1 mm that causes a laser to oscillate by passing a current through a semiconductor. Compared with other lasers, possesses excellent properties such as ultra-small size, high-speed modulation characteristics reaching several 10s of GHz, high power-to-light conversion efficiency (in several 10s of %), and wavelength controllability, etc.

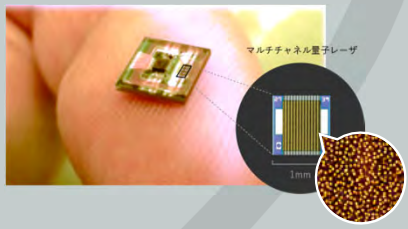
3rd phase
Accelerating the Integration of Humans and Information(2020s~)

Fields where our lasers are applied (being Developed or Commercialized)

- 5G base station
- Supercomputer
- Visual Aid
- Smart Glass
- Optical Interconnect
- Facial recognition
- Fundus photography
- Micromachining
- In-Vehicle communication
- LiDAR for autonomous cars
- Biophotonics
- Visal field testing

Nanotechnology of QD laser to generate and control laser light

Image of quantum dots taken by an atomic force microscope and a quantum dot laser equipped on fingertip-sized silicon chip as 100Gbps optical transceiver



Quantum Dot Laser:
A semiconductor laser adopting a quantum dot structure which has a semiconductor nano-sized microcrystal in its active layer.
Compared with existing semiconductor lasers, these lasers are superior in temperature stability, temperature resistance, and low noise.

New Era for Semiconductor Lasers

We are developing products for all applications shown below and have launched a part of them.

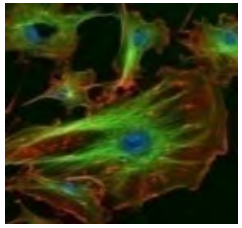
■ **Optical interconnect ⇒ enhancing the computing and data processing power**





■ **Sensor ⇒ Precise detection of human and material (shape, position, velocity)**

Biomedical

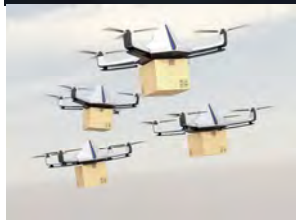


Face recognition



LiDAR（Automotive, Robotics, Drone）

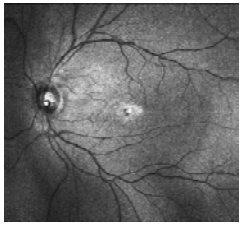




Motion recognition



Fundus, Sight, Field of view



■ **Display ⇒AR/VR/XR**

Smart Glasses



Head-up display



■ **Micromachining**
⇒Highly functional/high precision device manufacturing



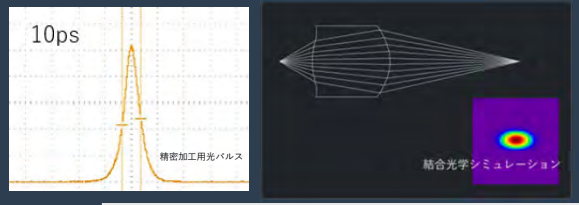
Our Core Technologies and Competitive Advantages

Material Creation, Design, and Control

Cutting Edge Semiconductor Laser Technology with Several Unique Features

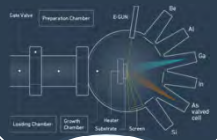
Laser Design

A technology to design lasers suitable for each use.
World's fastest (10ps)*3 semiconductor laser
for precision material processing
utilizing optical communication technology,



Semiconductor Crystal Growth

Technology to grow
each atomic layer of semiconductor crystals
on a semiconductor substrate



Quantum Dot

Succeeded in the mass production of
quantum dot lasers with world's highest operating temperature *1
and developed world's smallest silicon-based optical transceiver *2



Small Module

A technology to make DFB lasers ultra compact.
Our yellow/orange laser modules led us
to become one of the finalists at the Prism Awards 2014.



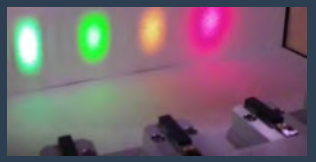
VISIRIUM Technology

A technology to project
images directly on the retina
through ultra small laser projectors.
World's First Commercialization*4



Diffraction Grating

Technology to form periodic refractive index change inside the laser
enabling arbitrary wavelength control.
World's first*5 commercialization of yellow/orange semiconductor laser



Material / Design / Control / QD LASER

*1: "Extremely high temperature (220° C) continuous-wave operation of 1300-nm-range quantum-dot lasers", Published in 2011 Conference on Lasers and Electro-Optics Europe and 12th European

*2: Developed the world's smallest 5mm square ultra-high-speed, low-power-consumption optical transceiver – Achieved the world's best, 25Gbps / ch transmission speed –

*3: 2017 PRISM Award in Industrial Lasers - QD Laser (2nd Feb 2017)

*4: Prism Awards honour photonic innovations at Photonics West 2019

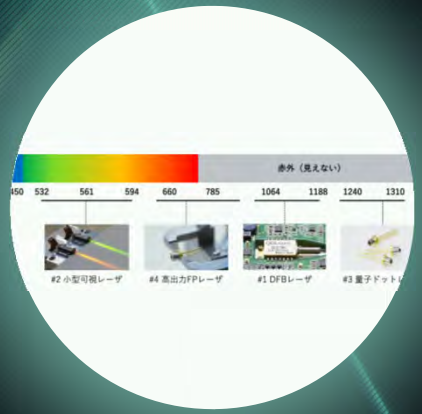
*5: Japan/U.S. PATENT JP5362301/US8896911

Features of semiconductor lasers developed and offered by QD Laser

01

Flexible arrangement

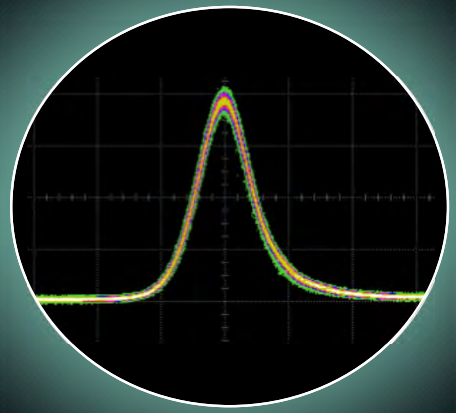
Providing semiconductor lasers with any wavelengths suitable for applications



02

Stable short pulse

Leading to precision in various applications due to low noise in time and spectrum



Unique manufacturing process by QD Laser

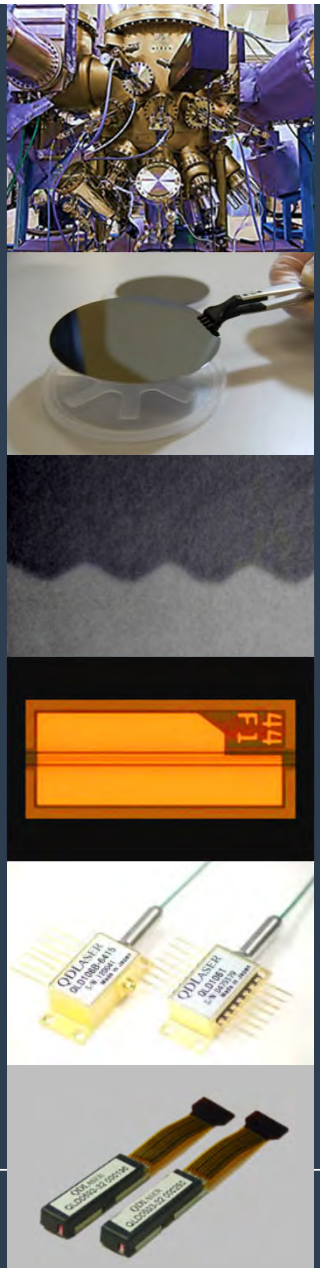
The only semi-fabless system in semiconductor laser industry

”Horizontal specialization” powered by our core competency of epitaxial growth technology

- Flexible manufacturing scale of several units to tens of millions units
- Converting fixed costs into variable costs
- Mass production and diverse product offering lead to beyond breakeven point

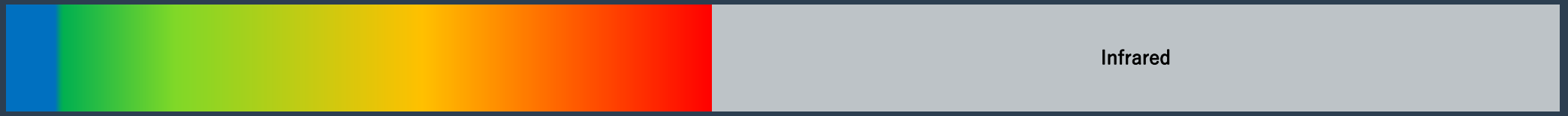
QD LASER Product design Quality control

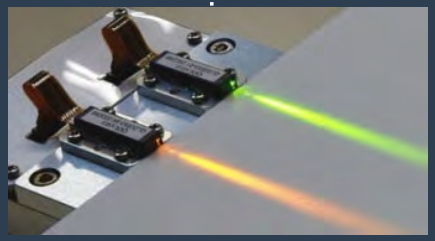
Epitaxial growth	QD LASER
Laser chip process	Partner company
Chip test	QD LASER
Module assembly	Partner company
Final test	QD LASER
Product shipment	QD LASER



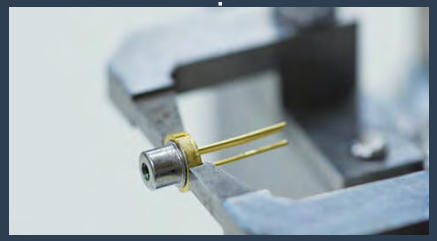
Variations on semiconductor lasers developed and sold by QD Laser

QD Laser provides a wide range of semiconductor lasers with wavelengths suitable for each application





#2 Compact Visible Laser



#4 High Power Laser

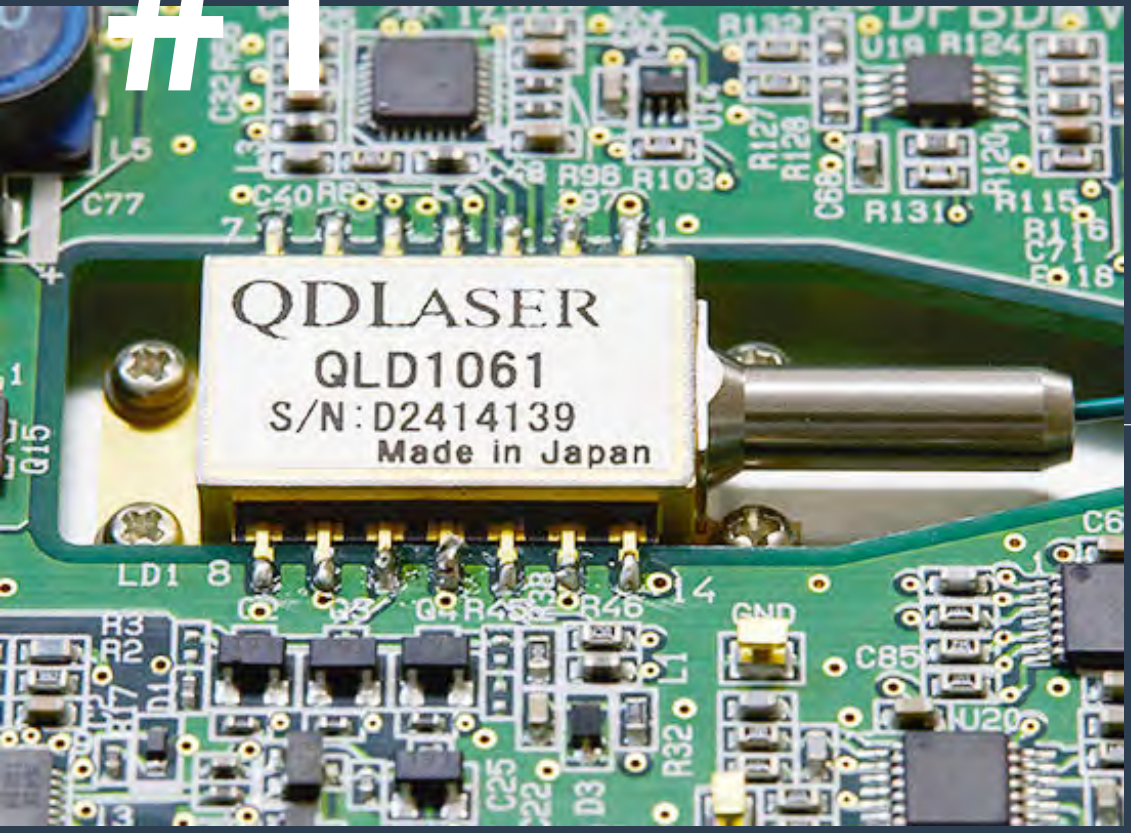


#1 DFB Laser



#3 Quantum Dot Laser

#1



DFB Laser

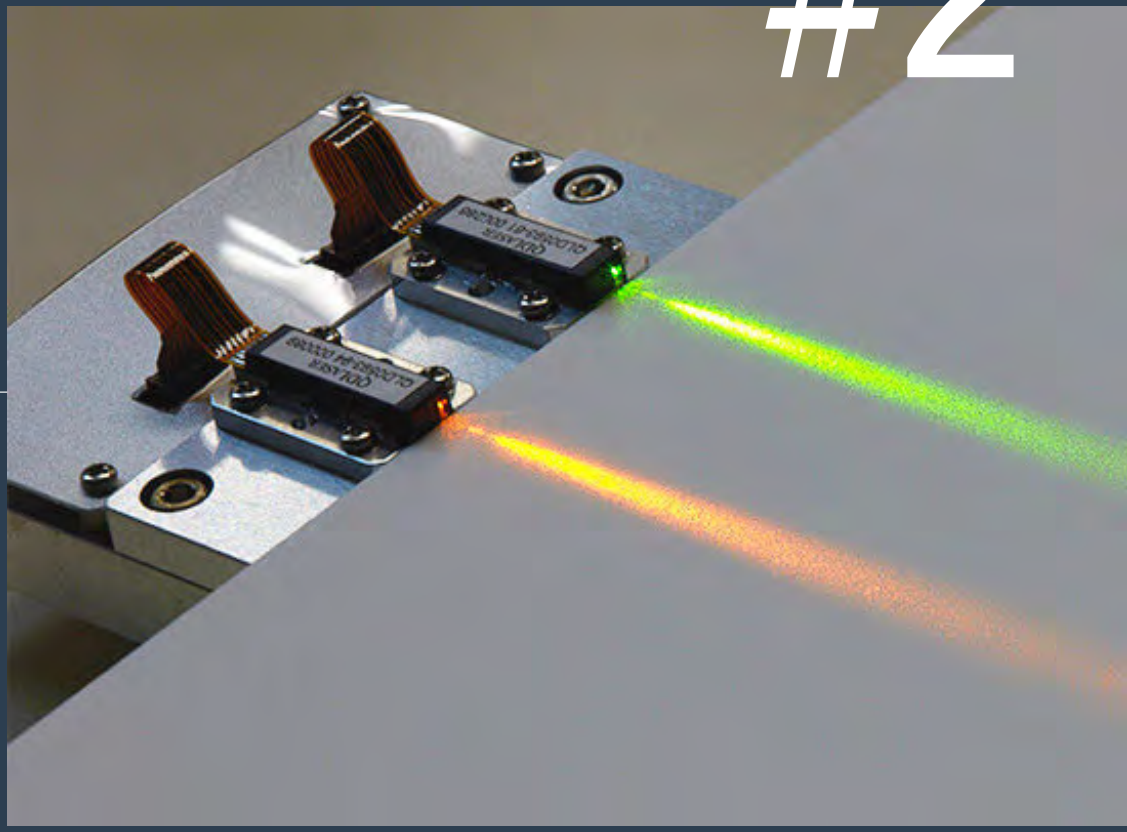
- Applications: Laser processing, measurement, and LiDAR.

Amplifies only the wavelength selected by the diffraction grating. **High output power, high stability, and low noise.** Provides the optimum wavelength for a wide range of applications and required performance.

- **Wavelength lineup of**
  1030, 1053, 1064, 1080, 1120, 1180nm
- **Provided in 1nm unit**
- Non-heated processing is possible by **short-pulse operation in picoseconds.**
- **Highly stable and low noise** enables high-precision machining and measurement.
- Only a few companies worldwide can manufacture DFB lasers in this wavelength band.

#2

Compact Visible Laser
Small Multi-Color Laser Light Source
- Application ：Biomedical



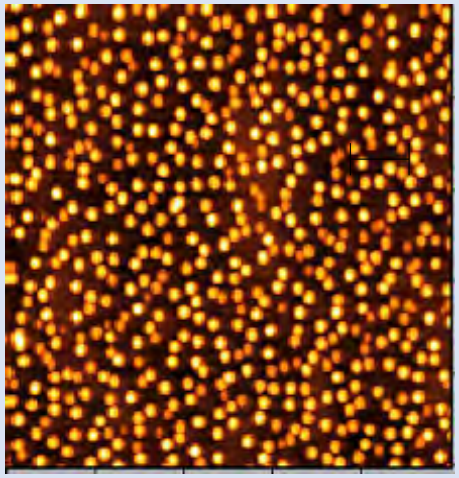
Green, Yellow-Green, and Orange visible laser

The patented technology * 1 realizes a small device that other companies cannot manufacture.

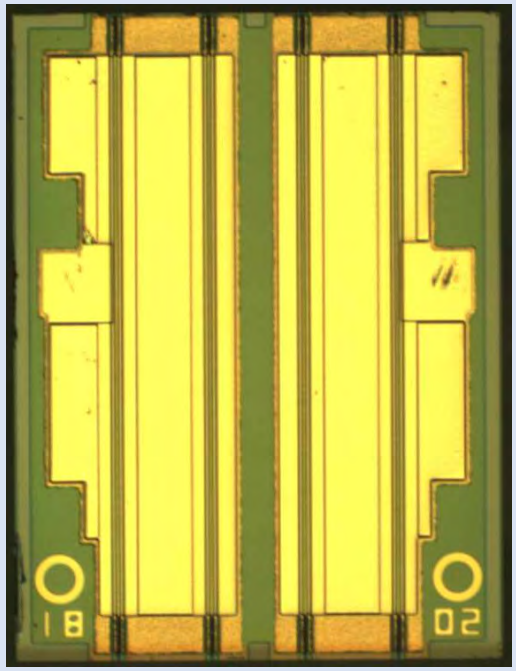
- Wavelength lineup of 532, 561, and 594nm.
- Used for “flow cytometer", "cell sorter" , "laser microscope", "fundus diagnostics" etc.
- Wavelength range where there is no direct emitting semiconductor lasers.
- Wavelength doubling with a nonlinear optical crystal.
- Unique semiconductor laser chip and wavelength conversion crystal package achieves miniaturization.
- Low noise and excellent pulse stability.

*1 : Japan/U.S. PATENT JP5362301/US8896911

#3



100 nm



Quantum-dot laser

- Application：Optical communication, LiDAR, and Silicon photonics.

Mass-produced by our world's only technology.

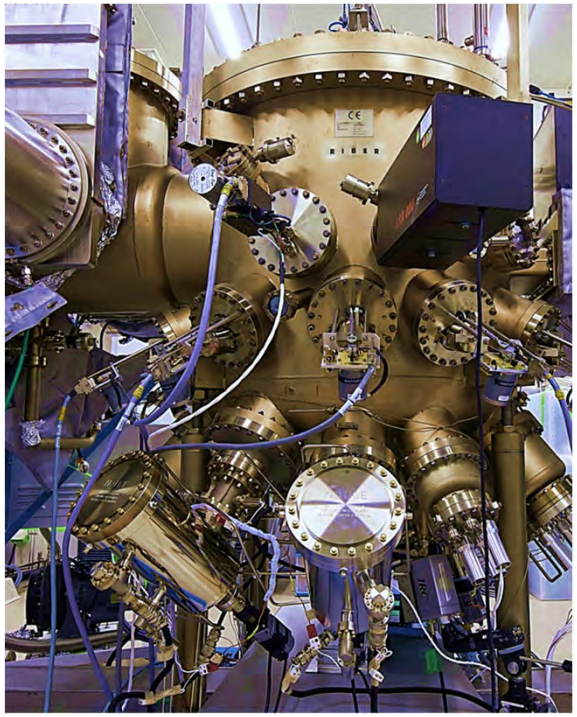
Achieved the world's highest operating temperature with excellent temperature stability at 1300nm.

- The wavelength lineup is 1200-1330nm.
- Silicon photonics (optical connector-chip communication, LiDAR) is evolved by quantum dot laser.
- Can operate even in a high temperature environment of 150-200 ° C . The operating limit temperature of a normal semiconductor laser is 80-100 ° C.
- Can be used in high-temperature environments such as servers, wireless base stations, and automobiles.
- Excellent reflected return light resistance, leading to miniaturization by eliminating isolators.

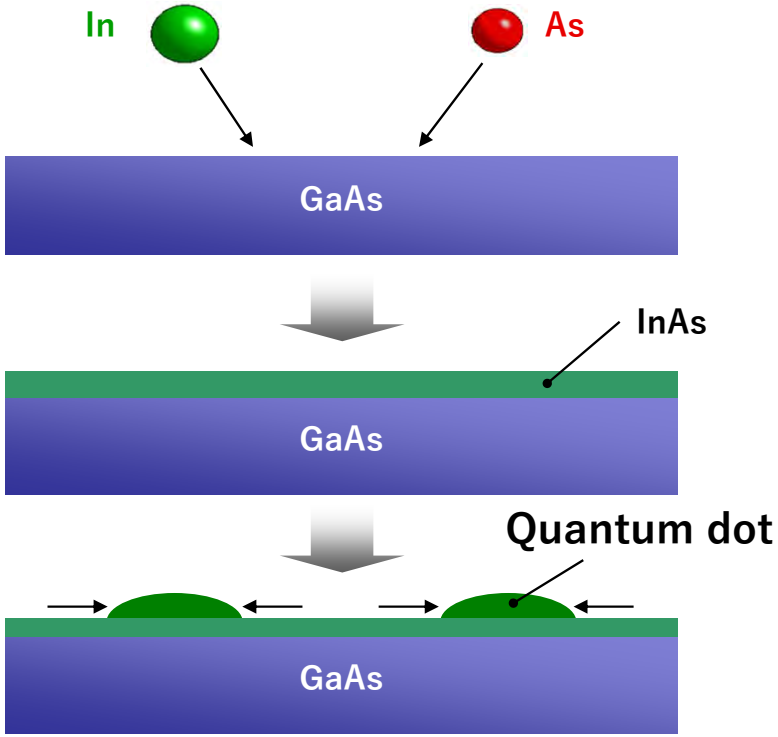
QDLaser's World Only-One Mass-Production Technology of Quantum Dot Lasers

- Introduction of mass-production MBE（Molecular Beam Epitaxy) system
- Control of temperature, indium source supply, and arsenic pressure at each second.
- Material recipe and know-hows for optimum growth conditions with several-tens-of-years experience (secret internal techniques which are intentionally not patented)

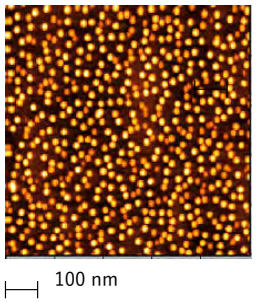
Mass production MBE system



Growth sequence of quantum dots (illustration of side view)



Atomic force microscope (top view) of quantum dots



Tangible Silicon Photonics Market as Electronic / Optical Integrated Circuit Technology Platform

Received orders of 60,000-unit quantum dot lasers for mass production.
Customizing quantum dot lasers for Japan/US/EU silicon photonics vendors.

Development and production

2010
World's first mass production of quantum dot laser for optical communication

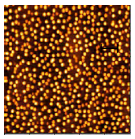
2012
Started development of quantum dot laser for silicon photonics

2017
Established mass production system of quantum dot lasers for silicon photonics (supplied to AIO Core Co., Ltd.)

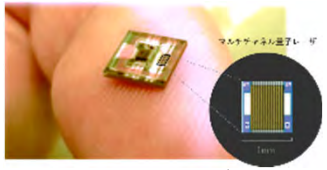
2019
Our products installed in the "Ultra-thin connector integrated active optical module (I-PEX EOM)" developed by I-PEX

2023
Received orders of 60,000pcs quantum dot lasers for mass production. Start shipment in May 2023.
Working on joint development with silicon photonics vendors around the world.

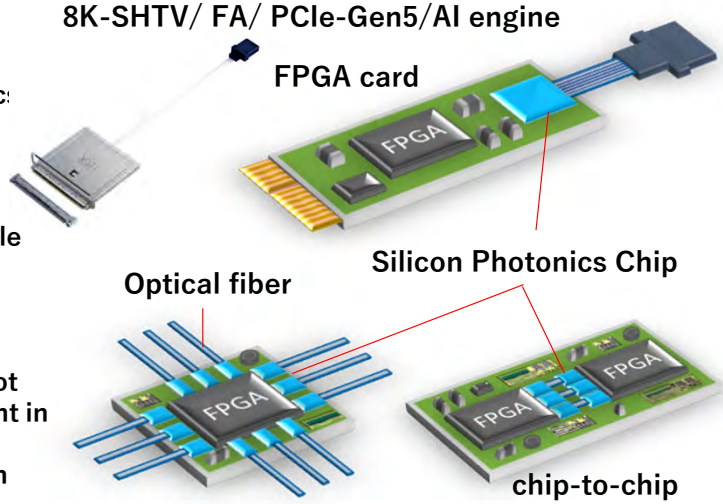
Quantum Dots



100Gbps optical transceiver with quantum dot lasers as light sources



Optical Connector(EOM *1,CPO *2) :
8K-SHTV/ FA/ PCIe-Gen5/AI engine



Roadmap of mass production

Phase 1: Lower production cost (2023-2024)

2023
Started mass production of quantum dot lasers for AIO Core Co., Ltd.
Lower cost of back-end process

2024
Increase wafer diameter of quantum dot lasers

Phase 2: Increase production capacity (2024-)

2024
Start construction of new factory for Laser Device Division

2026
Relocation of Laser Device Division
Investment for increasing production capacity to 1million pcs per year

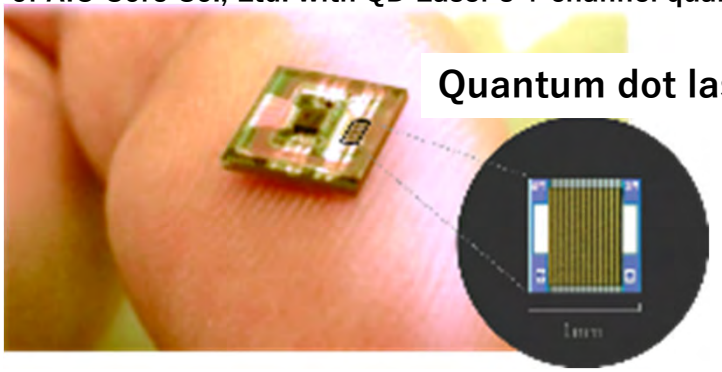
After 2026
Install mass production MBE machine #3
Start mass production with two MBE machines

*1 EOM:Embedded Optical Module
*2 CPO:Co-Packaged Optics

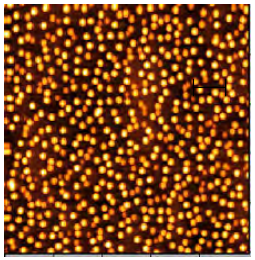
IOCore ™ with Quantum-Dot Laser Launched for Mass Production

- **Installed in IOCore's silicon photonics chip for optical wiring "IOCore™" (commonly known as NPO *1)**
- **Implementation of optical wiring technology contributes to dramatic improvements in computer information processing capabilities essential for AI and the Metaverse**

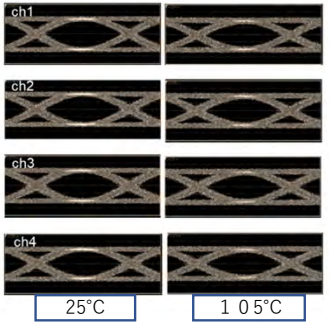
100Gb/s Silicon photonics chip named IOCore™
of AIO Core Co., Ltd. with QD Laser's 4-channel quantum dot lasers

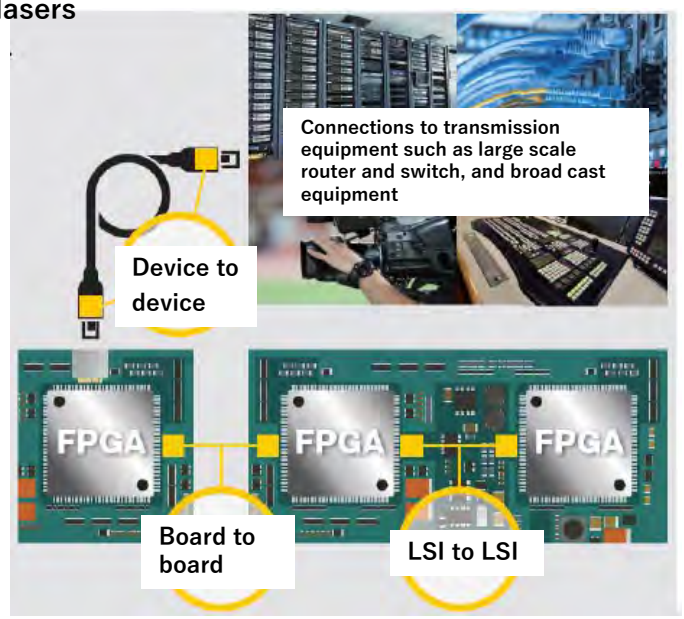


Quantum dots



Optical eye diagrams at 25Gbps





Courtesy of AIO Core Co., Ltd.
Note: Yellow squares show 100Gb/s transceiver Silicon chip

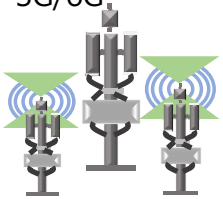
Data center, Server, Super Computer



Demonstration of immersion cooling by AIO Core Co., Ltd.



5G/6G



FA、Medical



Automatic Driving



*1: Near Packaged Optics. It is a photoelectric conversion element for optical wiring that is placed and mounted near packages such as FPGA and ASIC and has entered the practical stage.

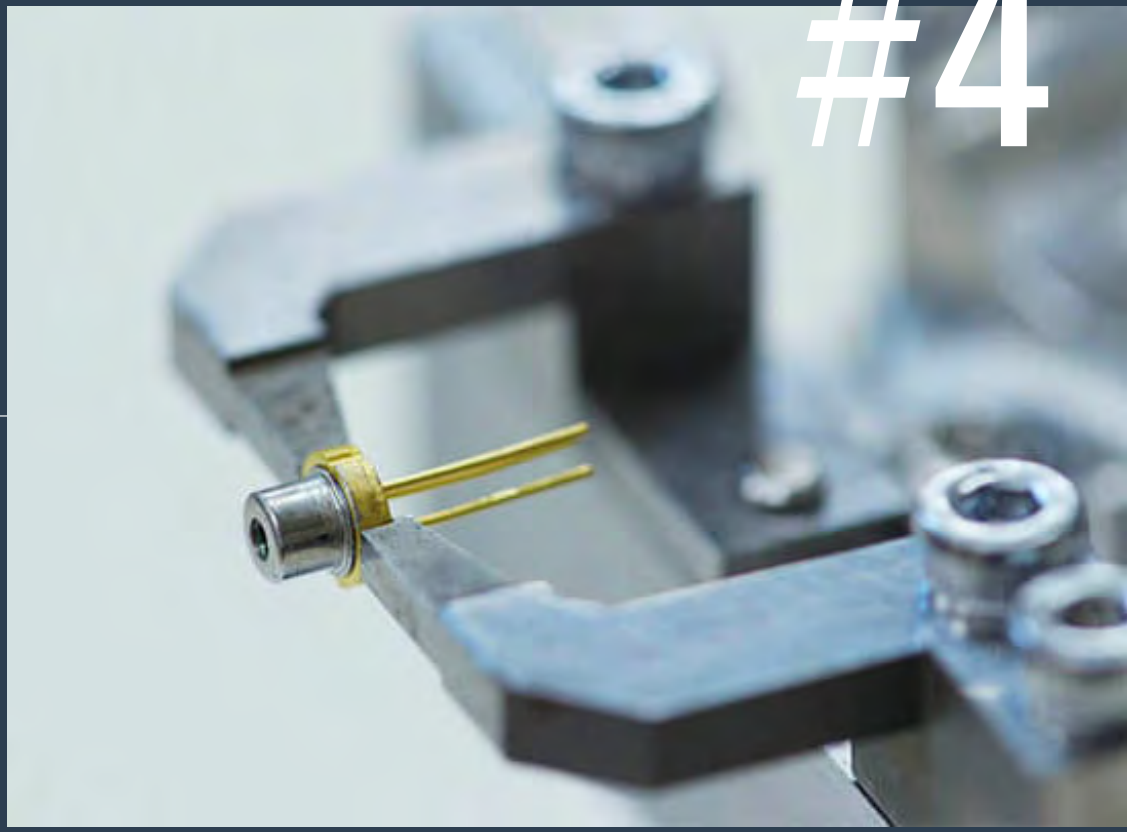
High Power FP Laser

- Applications：Particle Counter, Leveler, Machine Vision and Factory LiDAR.

Highly reliable and high-quality CW / nanosecond pulse high power laser.

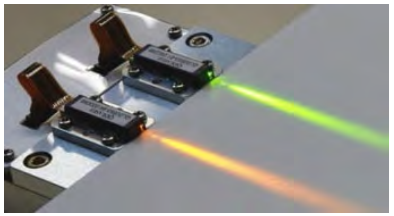
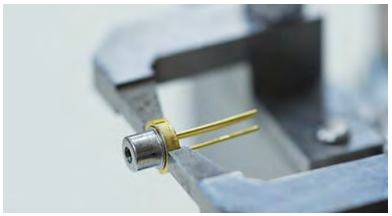
Providing services that meet customer requirements, such as usage conditions and small-quantity support.

- The wavelength lineup is 640-940nm.
- CW and high-power nanosecond pulse drive for a wide range of sensor applications.
- Hearing customer needs on pulse, optical output, reliability, wavelength, and control method to propose optimal products and solution.
- Small quantity production possible.



#4

Our Major Laser Device Products, Wavelengths, Features, and Uses

	Compact visible lasers	High power laser	DFB laser	Quantum dot laser
Produccts				
Wavelength	**532, 561,594 nm**	**640-940nm**	**1030, 1053, 1064, 1080, 1120, 1180nm** **1020-1120nm provided 1nm by 1nm**	**1200-1330nm**
Features	● Miniature size, low power consumption, stability, short pulse generation, and high-speed modulation, etc. ● World's first current injection yellow-green and orange lasers	● High power Fabry Perot laser ● Providing products and solutions according to applications. ● Supports various wavelengths, small quantities, and custom production.	● Precise control of wavelength with stable operation under continuous, nanosecond, and picosecond modes. ● High beam quality, small size, lightweight, high electricity-light conversion efficiency, and long life compared to existing solid-state lasers. ● Extensive product lineup that meets the various needs of customers.	● Quantum dots are used for the active layer (light-emitting part) of semiconductor lasers. ● Excellent temperature stability, high-temperature resistance, and low noise performance compared to existing semiconductor lasers.
Use		Measurement	Measurement Processing	Measurement Communication Silicon photonics
			Bio.	

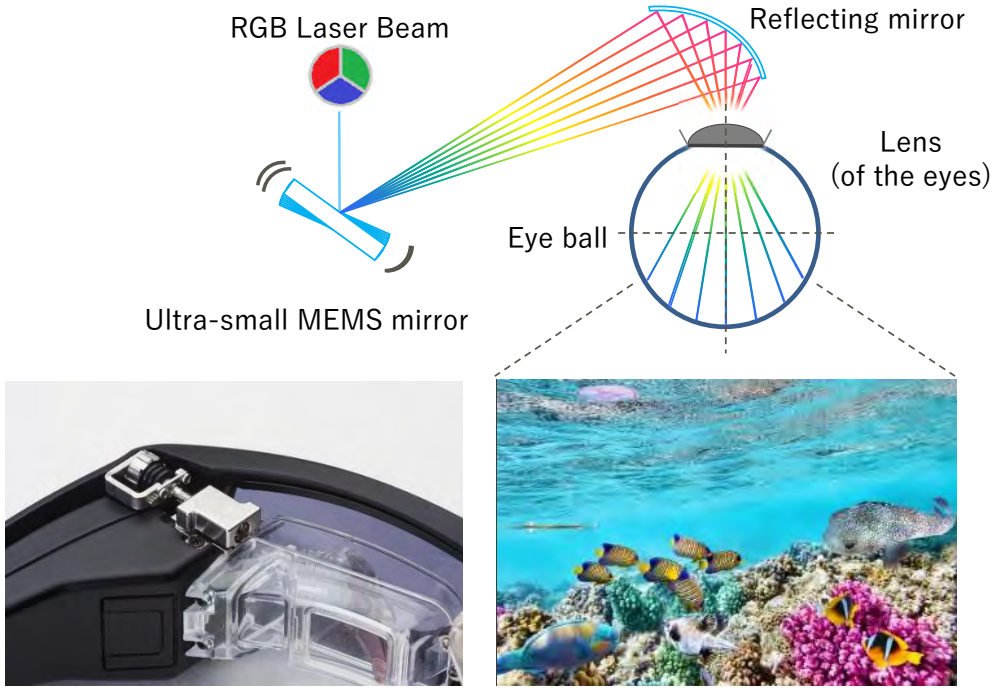
04

Laser Retinal Projection

World’s First Commercialization of Laser Retinal Projection Eyewear

VISIRIUM TECHNOLOGY®

Unique Laser Technology bringing Innovation to Vision



Direct Image Projection onto Retina

Visual experience independent of the condition of your cornea or lens

You can recognize an image clearly even with myopia, hyperopia, astigmatism, or ametropia.

Free focus

The focus of both the landscape you see with the naked eye and the image projected by our glasses can be superimposed on the retina.
This is a unique feature not found in other AR glasses.

Enables vision even in the periphery of the retina*1

Since the image is in focus even over a wide area of the retina, we expect that it can also be effective for patients with retinopathy.

*1: At major airline company and National University Corporation Tsukuba University of Technology, a systematic demonstration study is currently underway.

Three Areas based on Retinal Projection Technology



Low Vision Aids : Total Addressable Market (※Anterior eye disease patients only : Ametropia and corneal opacity)

JPY 900 bn (USD 8.6 bn) Market in Japan, U.S. and Europe

Plan to Expand into Other Countries like China further behind in Ophthalmic Technologies

Low Vision Market



Japan — Population of people with low vision **1.45 million**[*1]



Europe (EU) — (our estimate) **18.77 million**[*2]



U.S. — (our Estimate) **12.00 million**[*2]

Estimated percentage of applicability (our estimate)*3: **11%**

Product Price per Unit (our assumption)*6: **JPY 200k (USD 1.9k)**

Total market size of advanced countries (Our estimate)
JPY 708.7 bn (USD 6.7 bn)

Senior Citizens Market



Japan — Population of People over 65 years old **36.08 million**[*4]



Europe (EU) **102.76 million**[*4]



U.S. **52.79 million**[*4]

Estimated percentage of applicability (our estimate)*5: **1%**

Product Price per Unit (our assumption)*6: **JPY 100k (USD 950)**

Total market size of advanced countries (our estimate)
JPY 191.7 bn (USD 1.8 bn)

JPY 900 bn (USD 8.6 bn)

*1: Japan Ophthalmologists Association “Social costs of visual impairment in Japan”
*2: Calculated by multiplying the ratio of persons with low vision sourced from WHO “Visual Impairment and Blindness 2010” by the current population in each region (Europe: Eurostat “Population on 1 January”, U.S.: United States Census Bureau “Annual Estimates of the Resident Population for the United States”)
*3: According to the survey by Santen Pharmaceuticals, the number of keratoconus patients in Japan is estimated to be 60,000 to 120,000; also, as the data on p.39 shows that the prevalence per 100,000 people of keratoconus is almost the same as that of corneal opacity, it is assumed that the number of corneal opacity patients in Japan is similar to that of keratoconus patients . Assuming the number of patients suffering from each of these diseases to be an intermediate value of 80,000, the total is calculated to be 160,000; then, we apply the estimated percentage of applicability of 11%, calculated by dividing 160,000 by the population of persons with low vision (1,450,000), to each country’s population of low vision persons. This percentage only takes into account anterior eye diseases; therefore, if our product is also effective for patients with retinal disease, the estimated percentage of applicability is expected to increase.
*4: Assuming that all the elderly aged 65 and over use near-sighted, presbyopic or bifocal glasses, we can estimate that each country’s population aged 65 and over can be the potential population of persons with gap vision (Japan: Statistics Bureau of Japan “Population Estimates May 2020”, EU: Eurostat “Population on 1 January by broad age group and sex”, U.S.: United States Census Bureau “Population by Age and Sex: 2019”).
*5: Due to the products’ similarity in characteristics to hearing aids (used by the elderly on a daily basis, wearable equipment, sold at glasses stores, etc.), the hearing aid market is used as a reference to estimate the percentage of applicability. Given that the number of hearing aids shipped in Japan in 2017 numbered 562,747 (Japan Hearing Instruments Manufacturers Association “2018 Shipment Volume of Hearing Aids”), this number divided by the number of elderly people in Japan will give us an estimate that 1.7% of the elderly purchased a hearing aid, which we then adjust conservatively to assume an estimated percentage of applicability of 1.0% which can then be applied to each country’s population of gap vision persons.
*6: Expected price per unit after the mass production is realized.

Transforms "hard to see" to "visible"
Low Vision Aid

Extend the healthy lifespan of your vision
Vision Health Care

The power of "vision" broadens your world
Augmented Vision

World's First Laser Retinal Projection Eyewear

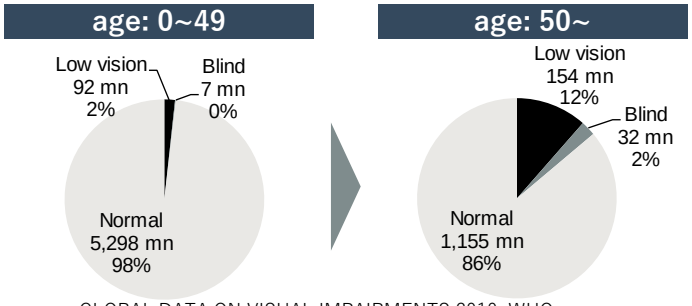
In the Low Vision Aid Space where Innovation has been Minimal, Laser Technology makes a Breakthrough

250 mn people

with Low Vision Globally*1

Currently they use magnifying glasses, video magnifiers, and telescopes daily. These tools are limited in use, have operational, issues and are not suitable for all users.

Here, we will make a breakthrough with our laser retinal projection technology.



GLOBAL DATA ON VISUAL IMPAIRMENTS 2010, WHO



WAZ SEITE 3 ESSEN

Fast Blinder kann mit Super-Brille wieder sehen

Mit 15 Jahren hat Dominic Schmitz bei einem schweren Unfall seine Sehkraft fast völlig verloren. Mit einer neuartigen Sehhilfe, die am Uniklinikum getestet wird, hat er nun ein gestochen scharfes Bild der Welt

„Papa, du bist aber alt geworden, ich kann die Falten auf deiner Stirn sehen."

"Papa, you have grown old, I can see the wrinkles on your forehead."*2





*1: WHO Definition: Low vision is defined as the best-corrected visual acuity of less than 0.3 in the better-seeing eye. Blindness is defined as the best-corrected visual acuity of less than 0.05 in the better-seeing eye.
*2: Translated from German

RETISSA Series：Eyewear Products

Continued sales of RETISSA Display II, expanded to new products with wider FoV



RETISSA Display

・Announced in January 2018 and released in July 2018 as the first commercialization of VISIRIUM technology.

・The world's first commercial launch of a wearable display with a built-in retinal scanning projector using semiconductor lasers.



RETISSA Medical

・Obtained manufacturing and marketing approval in January 2020 as a medical device with the laser retinal projection technology.

・Corrects low vision due to irregular astigmatism by projecting images of the built-in camera (clinical trial completed in JAPAN, October 2018)

・Conducted a clinical trial for corneal opacification in Europe and confirmed its efficacy.



RETISSA Display II

・Wearable display equipped with the 2nd generation VISIRIUM technology, announced in December 2019 and released in March 2020.

・With improved image quality, reduced size and weight, reduced power consumption, and improved usability.

・ Optional camera RD2CAM released in August 2021



RETISSA Series Development Status: New Product with wider FoV

Released three products equipped with the 3rd generation VISIRIUM technology with wider viewing angle as the main feature.
It can deliver clear and bright images to the peripheral area of the retina, which is a major technological breakthrough in the field of Low Vision Aid.

1st/2nd generation

Horizontal viewing angle of 26 degrees

3rd generation

Horizontal viewing angle of 60 degrees



RETISSA ON HAND

Transforms "hard to see" to "visible" **Low Vision Aid** | Extend the healthy lifespan of your vision **Vision Health Care** | The power of "vision" broadens your world **Augmented Vision**

Released in March 2023 as a "retinal projection video magnifier"

- Visual assistance with up to 7x digital zoom and wide viewing angle retinal projection.
- All-in-one design with built-in battery, portable as well as desktop use.
- Gradual introduction to public facilities such as libraries and museums as devices that comply with the Reading Barrier Free Act in JAPAN.
- Collaboration with TRC Library Service Inc. working on contracted operation of 562 public libraries and 19 museums, etc.







RETISSA NEOVIEWER（RNV）



Released in March 2023 as a bundle "DSC-HX99 RNV kit" with a Sony compact digital camera

- Products from the "With My Eyes" project that changes the vision of the low vision into visible.
- Providing the enjoyment of shooting with a high-performance camera equipped with a high-magnification (up to 28x) optical zoom.
- Positioned as an inclusive design to enhance accessibility. *1
- Received VGP2023 Summer special award and Good Design Best[*1] 100.
- Launched in Japan and the US at the special price. Rental programs are also offered.







*1 : as of August 10th, 2023.

Activities to expand sales of products in the Low Vision Aid field

Added English-language content.



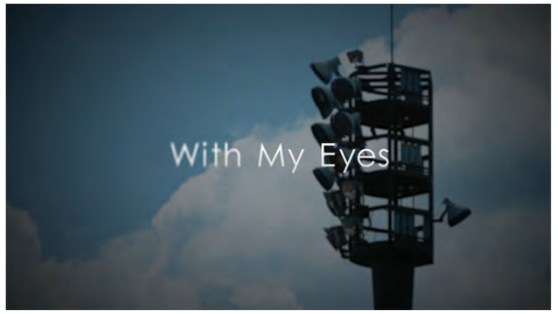
RETISSA official Instagram (Japanese)
https://www.instagram.com/retissa_official/



With My Eyes 4 (Japanese Ver.)
https://www.youtube.com/watch?v=0jAH9BPs8Vc&t=17s



With My Eyes (Global Episode)
Visions Captured: Sight Without Borders
https://youtu.be/RCKCBF6PMuM



With My Eyes 4 （English Ver.）
Experiencing and Capturing Car Racing with the Five Senses
https://youtu.be/hK-WWgP83v8

RETISSA MEOCHECK



Full-fledged launch of vision healthcare field with eye health check equipment in February 2023

・Aiming for early awareness of eye diseases such as glaucoma, which is the leading cause of blindness in Japan and visual field abnormalities.

・Self-check method that can check vision in about 1 minute per eye to show eye age score.

・In addition to equipment sales through the Nihon Ganka Iryocenter Co., Ltd. (agency), we are launching a service business.

・Promoted as a response measure in the "Field of Vision Impairment Manual for Automobile Transportation Operators."







Initiatives in the Expanding Vision Health Care Field



Using eye health check device “MEOCHECK” commercialized in FY2023-Q1, and fundus imaging device SLO under development.

Eye health check service for the transportation industry

Setup of a health check corner, including corporate employee health management

Collaborative research/clinical research with universities

Extend the healthy lifespan of your vision

Vision Health Care

Launch of compact and inexpensive ophthalmic medical equipment

Introduction to ophthalmology clinics and medical examination facilities

Realization of continuous, daily eye health check habits

Elemental technology development for next-generation laser eyewear



Direct Retinal Projection (DRP) technology by QD Laser is a unique technique that enables the ultimate AR/MR glasses. Features not found in other technologies include:

1. **No need for vision adjustment,**
2. **Ultra-miniaturization (allows placement of the projection device inside the glasses),**
3. **Inhibition of myopia (expansion of axial length).**

Compact, low-power integrated scanning light source as a standardized module

Unprecedented High image quality (1080P) by direct retinal projection

Eye tracking drive system

Prototypes exhibited at CEATEC 2023 and CES2024





[Reference] TDK's world smallest-class ultra-compact full-color laser module.(images by TDK)



05

ESG Initiatives

Business Development from an ESG Perspective

Social

Estimated economic cost in Japan due to visual impairment in 2030[*1]
USD105bn
JPY11tn

Global prevalence of people with low vision[*2]
250mn

Estimated number of glaucoma patients in Japan[*3]
4mn

- World's first laser retinal projection technology for low vision aids
- Through the spread of laser eyewear, provide visual support for the elderly
- Through the spread of more affordable optometers, contribute to the early detection of various eye diseases including glaucoma, etc.
- Employment support for people with low vision

Environmental

Energy savings from semiconductors with silicon photonics[*4]
90%

- Silicon photonics with quantum dot lasers improve semiconductor performance dramatically

Governance

*1: Japan Ophthalmologists Association "Economic Cost of Visual Impairment in Japan" and "Prevalence of Visual Impairment in the Adult Japanese Population by Cause and Severity and Future Projections"
Economic cost = Direct health costs + Other financial costs + monetary converted number of loss of well-being from visual impairment (measured in disability-adjusted life years (DALYs))
*2: WHO "GLOBAL DATA ON VISUAL IMPAIRMENTS 2010"
*3: Santen Pharmaceutical "Annual Report 2017"
*4: Target numbers in "Development of Technologies for Super Energy-Efficient Optical Electronics Implementation Systems" Promoted by METI, The Institute of Electronics, Information and Communication Engineers "Opt-Electronics Packaging Technology for Silicon Photonics"

With My Eyes project

#1 Photographs by low vision people.
https://www.youtube.com/watch?v=p5bIfs94Oys

#2 Let's go and see the invisible world.
https://www.youtube.com/watch?v=ZM52dax_5yc

#3　- Discovering a World of My Own –
https://www.youtube.com/watch?v=Ip6a5h6UfxA&t=37s











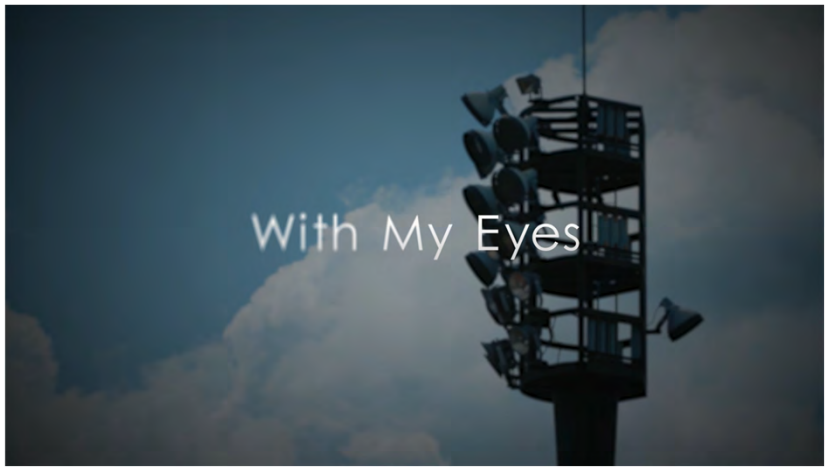






With My Eyes #4 Toyota Mobility Foundation

Watching and capturing car race with all five senses (2023/10/17)



■Overview of the documentary movie

On September 2nd and 3rd, 2023, individuals with low vision attended and photographed the racing event "ENEOS Super Endurance Series 2023 Supported by BRIDGESTONE Round 5" held at Mobility Resort Motegi. This was part of a demonstration experiment conducted under the theme "Mobility for All 2023" of the "Make a Move Project," an idea contest organized by the Toyota Mobility Foundation.



Company Profile

Spin-off Venture from Fujitsu

Tier 1 Medical Companies such as Nikon/Santen joined as Shareholders

Company Name	QD Laser, Inc.
Foundation	April 24, 2006
Fiscal year-ended	March 31
Representative	Mitsuru Sugawara, President and CEO
Location	Headquarter: 1-1 Minamiwatarida-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa
Number of Persons*1	43
Business	Planning, design, development, production and sales of semiconductor laser and its application products
Licenses	• Class II Marketing License for Medical Devices • Registration of medical equipment manufacturer • ISO 9001 • EN ISO 13485



Science and Technology Award from the Minister of MEXT

Prime Minister's Honorary Award for Achievement in Industry-Academia-Governmental Collaboration

- Graduated from The University of Tokyo; Doctor of Engineering
- 1984: Graduated with a master's degree in Physical Engineering from the Department of Applied Physics, School of Engineering, University of Tokyo; joined Fujitsu Laboratory Ltd.
- 1995: Assumed the role of Senior Researcher at Optical Semiconductor Device Laboratory, Fujitsu Laboratory Ltd.; obtained degree in Eng. from The University of Tokyo
- 2004: Assumed the role of non-tenured professor at the Institute of Industrial Science, University of Tokyo
- 2005: Assumed the role of Deputy Head of Nanotechnology Research Center, Fujitsu Laboratory Ltd.
- 2006: Launched QD Laser Inc.; assumed the role of President and CEO

*1: As March 31, 2024. Excluding 14 dispatched employees.

Laser Retinal Projection: Diseases and Applicable Rate

Parts of Eye		Major diseases	# of patients per 100k people*1	Total per eye part*1		Possible Efficacy*2	Estimated applicability %*3	Future Outlook
Anterior eye	Cornea	Corneal angiogenesis	4,000	4,104	◎	Effective on astigmatism and moderate opacity	50%	• May not be applicable in cases of severe opacity • Focused on obtaining the approvals to marketing medical devices by targeting diseases for which high efficacy can be expected. • Plan to expand the scope of application with RDII and RDIII on page 25 and the wide-angle viewfinder on page 27.
		Keratoconus	54					
		Corneal opacity	50					
	Crystalline lens	Cataract	47,800	52,900	◎	Effective on near/far-sightedness, astigmatism, opacity, etc. and as the technology does not depend on the function of the crystalline lens	40%	
		Aphakia	5,100					
		Phacocele	<50					
	Uvea	Uveitis	714	714	△	Effective on astigmatism developed as a complication	10%	
		Choroidal neovascularization	<50					
Vitreum		Vitreous opacity	NA	-	○	Effective on low to moderate opacity	20%	
Retina		Epiretinal membrane	28,900	55,614	○	Enlargement and black and white inversion features are effective on macular diseases	30%	• Adaptable to central scotoma by changing the projection position and increasing magnification • May not be applicable in cases with severe symptoms
		Lattice degeneration of retina	10,600					
		Hypertensive retinopathy	9,100			Some efficacy is seen in cases where anterior eye disease is also present		
		Age-related maculopathy	3,900					
		Diabetic retinopathy	3,114			AE camera feature is exceptionally effective on photophobia, night blindness, etc.		
		Retinitis pigmentosa	<50					
Optic nerve		Glaucoma	3,550	3,865	△	Image downsizing feature is effective on tunnel vision	10%	
		Optic nerve head drusen	200					
		Optic neuritis	115					
Other		High myopia	3,000	3,000	◎	Exceptionally effective	50%	
		Color amblyopia, color blindness	2,500	2,500	○	-	20%	• Can improve by processing images taken by camera

*1: These numbers were calculated by research company Lampe & Company in a report we commissioned with reference to scholarly papers published by governments and research institutions from each country. Figures for "# of patients per 100k people" and "Total per eye part" reflect the general research conducted across several jurisdictions and are not necessarily indicative of the number of potential cases in the markets in which we currently operate.
*2: Based on our assumptions
*3: Evaluated the "expected efficacy" using a scale: ◎ = 40-50%, ○ = 20-30% and △ = 5-10%.

Terminology

Semiconductor laser	A compact device with an approximate length of 1mm that causes laser oscillation by passing an electric current to a semiconductor. In comparison with a solid-state laser or gas laser, more micro-miniature in size; higher speed modulation characteristics up to 10GHz; higher photoelectric conversion efficiency achieving several tens of percent and better controllability of wavelength, among other things. Became widely used in the 1980s as a light source for communication systems and optical recording media, such as CDs and DVDs, etc.
Quantum dot laser (QDL)	A semiconductor laser using a quantum-dot structure comprising nanocrystalline semiconductors in its active layer. QD Laser is the only firm in the world to mass-produce QDLs for optical communications and silicon photonics. In comparison to existing semiconductor lasers, it is superior in temperature stability, high-temperature endurance and low-noise properties.
DFB laser	Distributed Feedback Laser: QD Laser's DFB laser is equipped with a diffraction grating which enables laser oscillation at a single wavelength. It is suitable for applications where the light output needs to be concentrated into a narrow wavelength range, such as the seed light of a fiber laser.
Silicon photonics	A technology which integrates an optical circuit with a silicon electronic circuit that has signal processing and memory functions, thus enabling a breakthrough in the processing capacity limitation of the conventional electronic circuit system (achieving 100 times faster processing speed and lower power consumption) and high-capacity data transmission between LSI chips (10Tb/s).
VISIRIUM technology	A technology that projects images onto the retina using precise optical systems, creating different colors flexibly from the three primary laser light colors - red, green and blue.
Diffraction grating technology	A technology that freely and precisely controls the wavelength of semiconductor lasers to fit into various applications by forming periodic irregularities inside the laser.
Ultrashort pulse	A laser with a very short pulse width (duration). It is used for microfabrication and other processes as it can prevent shape distortion due to thermal effects.
Retinal projection	To project images onto the retina
Simple perimeter	A device to assess the visual field of human eyes
CE marking	A certification mark that indicates conformity with standards required to be met by products exported to the EU. The CE mark is granted when a product meets standards in all EU member states.
Flow cytometer	A device capable of measuring certain properties of cells. By irradiating a cell suspension in a tube with a laser beam, it can measure the number and size of a large volume of cells over a short period of time using fluorescence and scattered light parameters. It is used in various fields including molecular biology, pathology, immunology, plant biology and marine biology.
LiDAR	LiDAR (Light Detection and Ranging) is a technology which irradiates an object and uses a light sensor to detect the reflection to measure the distance. It is expected to be used in autonomous driving systems in the future.
Heads-up Display	A technology that projects information and images onto various surfaces, such as glass, within the field of view. It is expected one day to project necessary information for drivers onto the windshield and the like.

Caution When Handling This Document

- The materials and information provided in this presentation include forward-looking statements.
- These statements are based on expectations, forecasts and risk assumptions as of this presentation's publishing, and contain uncertainties that could lead to results that are substantially different from these statements.
- These risks and uncertainties are present in any transaction, and are applicable to general industry and market conditions as well as general domestic and international economic conditions, including fluctuations in interest rates and currency exchange rates.
- Note that QD Laser does not bear any duty to update or revise forward-looking statements provided in this document, even if new information comes to light or future events occur.