



Financial Results Briefing of FY2021

QD Laser, Inc.
May 2022

Mission

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

Contents

01 Financial Results for FY2021

02 Semiconductor Laser Devices

03 Laser Retinal Projection

04 Further Growth Upside Expected

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 FY2021

Financial Results Highlights for FY2021 vs FY2020

➤ 23% Sales Growth

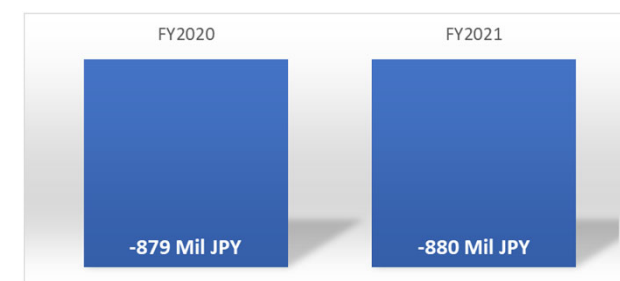
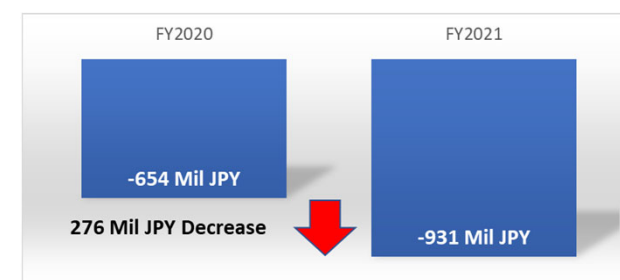
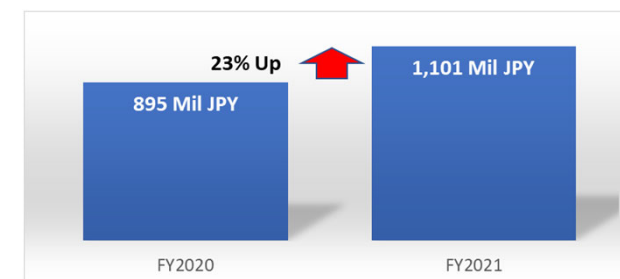
Orders for DFB lasers for precision machining, compact visible lasers for bio-inspection equipment, and high-power lasers for sensors increased in the laser device (LD) business. The laser eyewear (LEW) business grew due to sales to the financial company, and sales of new products such as cameras and newly developed products.

➤ 276 Million JPY Operating Loss Deteriorated

Due to the stagnation of overseas expansion with the impact of COVID-19 on the LEW business and the revision of product strategy, the LEW business recorded an inventory valuation loss of 408 million yen, and the operating loss worsened. The LD business recorded a profit of 43 million yen.

➤ 1 Million JPY Net Loss Deteriorated

In the previous fiscal year, the LEW business recorded an impairment loss on fixed assets of 168 million yen. The net loss was only 1 million yen worse.



Financial Result Highlights for FY2021 vs FY2020

Sales Growth and Operating Loss Deteriorated

23% sales growth driven by both businesses. While profits increased in the LD business, the LEW business recorded inventory valuation losses, resulting in the total operating loss deteriorating by 276 million yen from the previous year.

Performance Summary

(Million JPY)	FY2021 Result	FY2020 Result	YOY	FY2021 Forecast ^{*1}	vs Forecast
Sales	1,101	895	+23% (+205)	1,097	+0% (+4)
(LD)	1,006	841	+20%		
(LEW)	94	54	+75%		
Operating Profit or Loss (△)	△931	△654	△276	△549	△382
(LD)	43	7	+35		
(LEW)	△693	△434	△259		
Ordinary Loss (△)	△893	△707	△185	△516	△377
Net Loss (△)	△880	△879	△1	△502	△378

Sales by Product Group

(Million JPY)	FY2021	FY2020	YOY
DFB Laser	320	253	+26%
Compact Visible Laser	176	97	+81%
High-Power Laser	279	227 ^{*2}	+23%
Quantum Dot Laser	127	137	△8%
NRE	102	124	△18%
LD Total	1,006	841	+20%
LEW Total	94	54	+75%
Grand Total	1,101	895	+23%



Balance Sheet

Total assets decreased by 657 million JPY due to reduced cash and deposits, raw materials, and supplies. The equity ratio was 88.9%,^{*1} while 81.5% at the end of the previous fiscal year.

Balance Sheet

(Million JPY)	FY2021	FY2020	YOY
Current Assets	3,729	4,349	△620
Fixed Assets	288	325	△36
Total of Assets	4,018	4,675	△657
Current Liabilities	383	690	△307
Fixed Liabilities	51	175	△124
Total of Liabilities	434	866	△431
Net Assets	3,583	3,808	△225
Total Liabilities and Net Assets	4,018	4,675	△657

Cash Flow

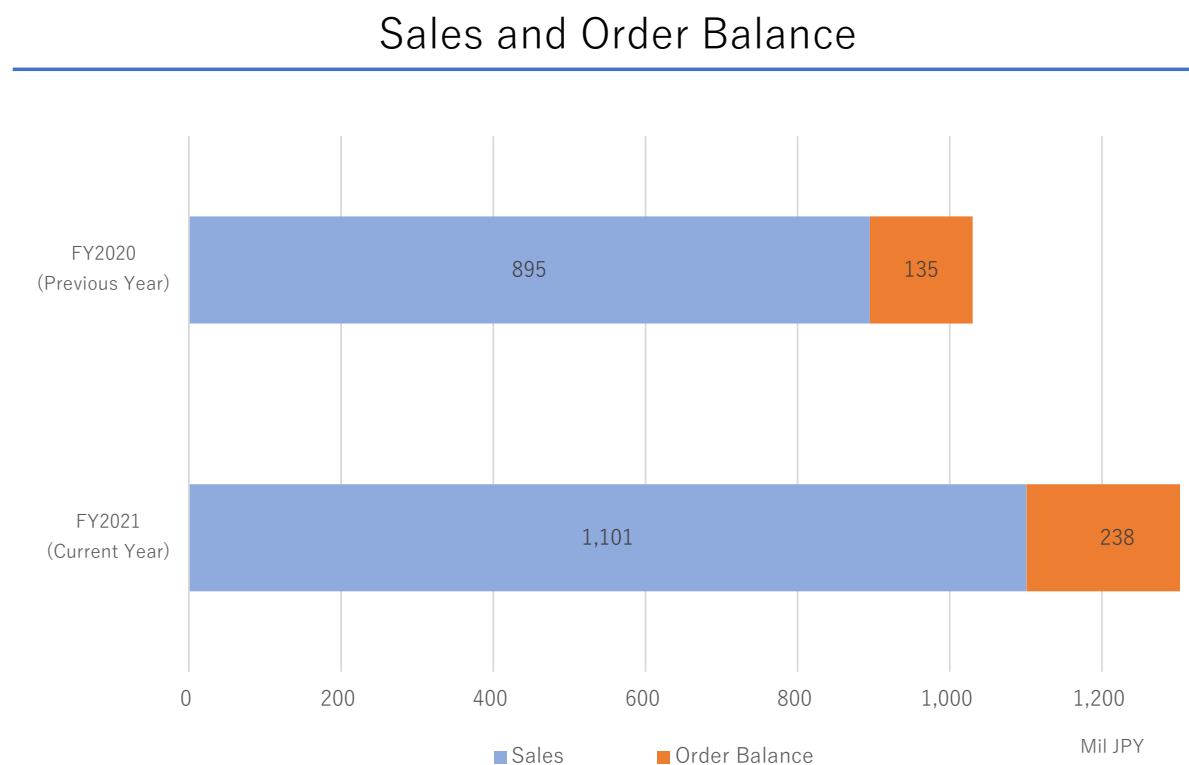
Cash and cash equivalents decreased by 403 million JPY year on year.

Cash Flow

(Million JPY)	FY2021	FY2020	YOY
CF from Operating Activities	△700	△822	+122
CF from Investing Activities	△90	△44	△45
CF from Financing Activities	377	2,643	△2,265
Effect of Exchange Rate Change on Cash and Cash Equivalents	10	△15	+ 26
Cash and Cash Equivalents Year-end Balance	2,821	3,224	△403

Order Status

As of the end of FY2021, the order balance planned to sell in the next fiscal year was 238 million, a 76% increase from the previous year's.



Inventory valuation loss of LEW business

In FY2021, we posted an inventory valuation loss of 408 million yen for the LEW business on RETISSA Medical and RETISSA Display II. The reason for this inventory valuation loss is fourfold: First, sales progress in China and Korea is still unclear due to the prolonged behavioral restrictions like a lockdown in China under the COVID-19 pandemic. Second, it has become clear that the market needs for the three new products, i.e., the handheld RETISSA ON HAND, RETISSA SUPER CAPTURE as a digital camera viewfinder, and MEOCHECK as a simplified optometer, are higher than those for the eyewear-type RETISSA Display II. Third, the development of Display III is progressing to realize a compact, lightweight, and low-price eyewear with improved operability. Finally, while RETISSA Medical has gained recognition and reliability in the medical society and industries, it is still unclear whether it will penetrate the market in the future from the viewpoint of price and performance.

As a result, with the future sales forecast of RETISSA Display II and RETISSA Medical estimated conservatively, we have written down the inventory valuation loss as shown below. Please note there is no outflow of cash.

We will build a business foundation that can steadily record profits as the financial structure of the LEW business has become sound with an expected increase in future sales of the new products mentioned above.

T1 shows the breakdown of valuation losses by product type. T2 shows the profit and loss when the valuation loss effect is excluded.

(T1) Breakdown by product type

Product type	Valuation Loss (Mil JPY)
RETISSA Medical	221
RETISSA Display II	170
Common parts etc.	17
Total	408

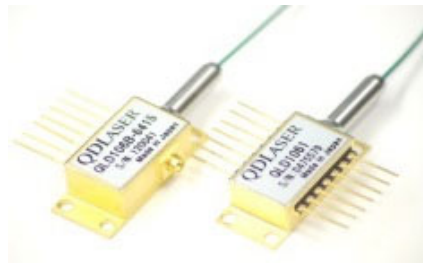
(T2) Loss exclusion valuation loss

(Million JPY)	FY2021 Forecast*1	FY2021 Actual(A)	FY2021 Actual(B) Excluded valuation loss	Actual(A) / Forecast	Actual(B) / Forecast
Sales	1,097	1,101	1,101	+0% (+ 4)	+0% (+ 4)
(LD)		1,006	1,006		
(LEW)		94	94		
Operating Profit or Loss (△)	△549	△931	△522	△382	+27 ^{*2}
(LD)		43	43		
(LEW)		△693	△284		

^{*1} DFB Lasers for Precision Machining and Measurement : Sales in FY2021

320 million JPY sales, increased by 26% YOY.

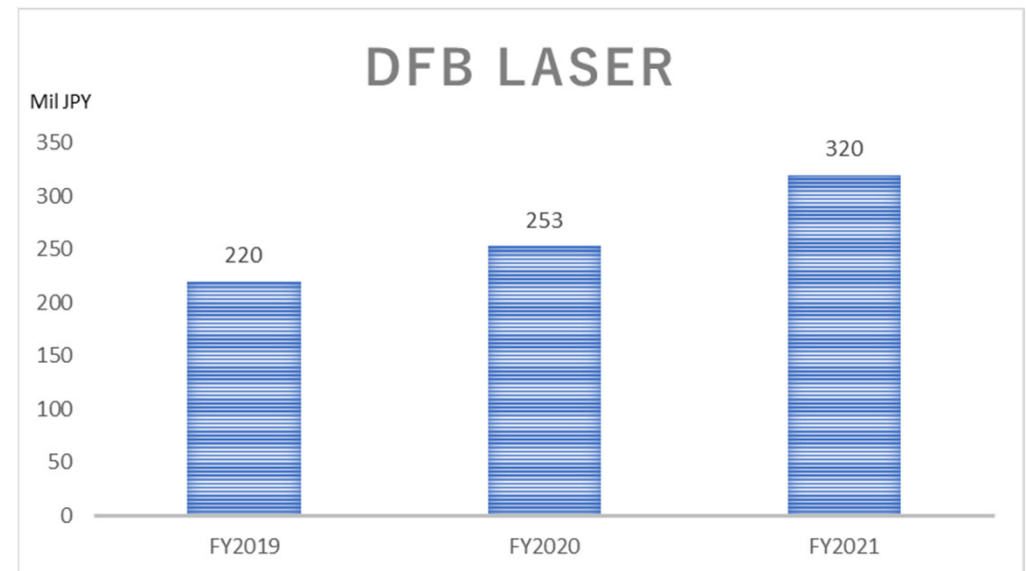
- North America: Sales increased by 238% YOY with the mass production of new equipment for precision machining started and solid orders for existing products.
 - Europe: Sales of light sources for inspection equipment in the semiconductor wafer process increased by 57% YOY.
 - Asia: Sales of light sources for LiDAR increased by 110% YOY.
 - Europe: Sales of light sources for geomagnetic observation increased by 6.32 million JPY YOY.
 - Newly certified by 2 customers in Europe and Asia.
- Applications are measurement system and LiDAR.



DFB lasers

Left : for 15 ps pulsed operation

Right : for 50 ps pulsed, ns pulsed, and CW operations

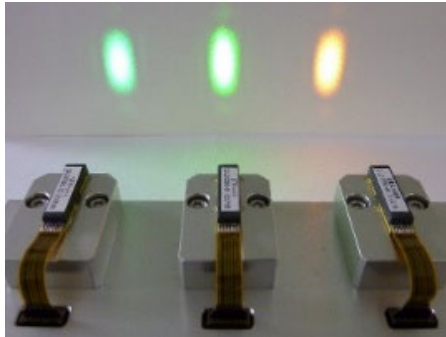


Cumulative sales in FY2019, 2020 and 2021

Compact Visible Lasers : Sales in FY2021

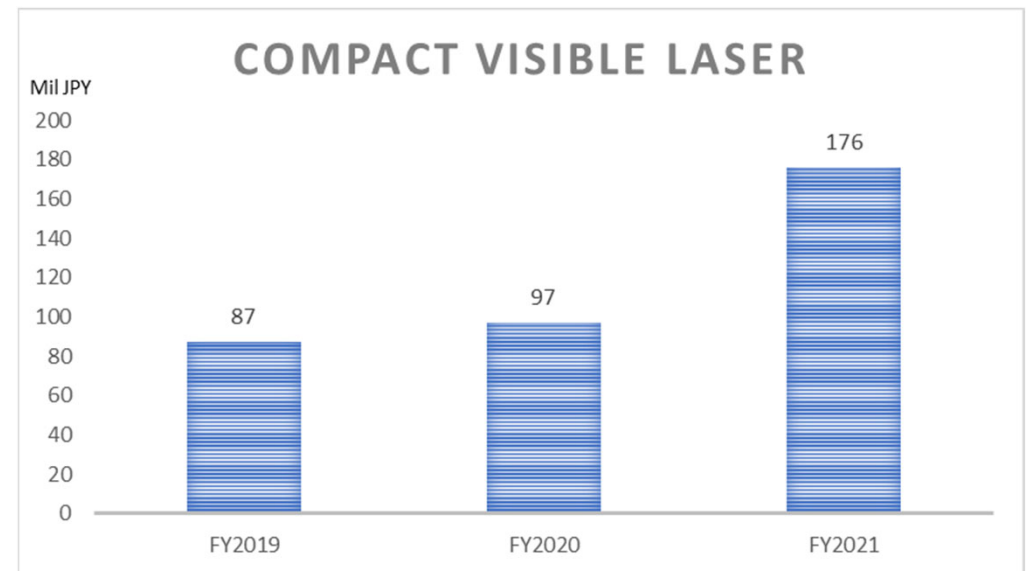
176 million JPY sales, increased by 81% YOY.

- China: Sales increased by 89% YOY with the mass production of a new application (cell sorter*1) started in the biomedical equipment manufacturer.
- Europe: Orders from a biomedical STED*2 microscope manufacturer resumed with sales of 2.9 million JPY and a forecast of 100pcs in 2022-2023 received. Note: the manufacturer has consumed most of the stock of 300 units shipped in 2019.
- Newly certified by one European customer for microscope applications.



Compact visible lasers

Left: green, middle: yellow-green, and right: orange.



Cumulative sales in FY2019, 2020 and 2021

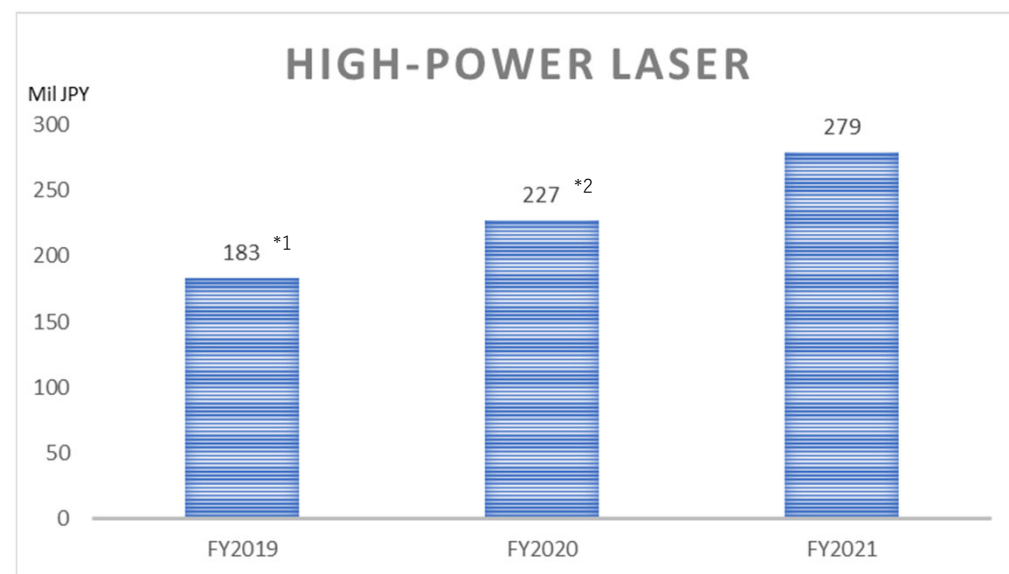
High-Power Lasers : Sales in FY2021

279 million JPY sales, increased by 23% YOY.

- Europe: Increased sales of light sources for baggage management sensors by 70% YOY.
- Europe: Increased sales of light sources for factory communications by 214% YOY.
- North America: Increased sales of light sources for machine visions by 69% YOY.
- Japan: Increased sales of light sources for particle counter at semiconductor factories by 569% YOY.
- Japan: Increased sales of light sources for machine vision by 408% YOY.
- Newly certified by seven customers: four in Europe and three in Japan. Applications are sensors of wafer transfer machines, particle counters, factory communications in semiconductor factories, and distance measurement.



High-power lasers
TO package



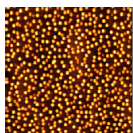
Cumulative sales in FY2019, 2020 and 2021



Quantum Dot Lasers^{*1} : Sales in FY2021

127 million JPY sales, decreased by 8% YOY.

- QDLaser is working on quantum-dot lasers for silicon photonics with nine customers in Japan, the US, and Europe.
- Japan: Continuous orders on LiDAR development project for autonomous driving.
- Japan: Completed the development of highly efficient chips for the optical connector and chip-to-chip communication customer. With the excellent test results from the customer, the chip is to move on to mass production in 2023.
- North America: Shipped to three customers (Cisco, HP, Rockley) working on LiDAR and optical connector/chip-to-chip communication in Q1-Q3. Received first order from the other customer in Q4.
- North America: Received first order from a new customer for optical connector/ chip-to-chip communication. Received second order and shipped in Q4.
- Europe: Continuous discussion about development items with a new customer for optical connector/ chip-to-chip communication. The first order is planned for 2022.



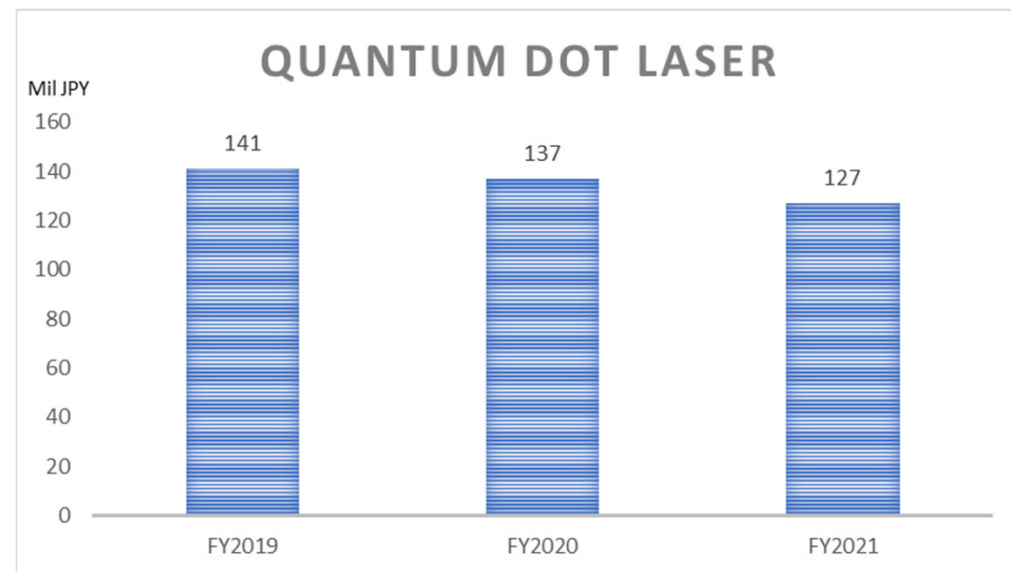
Quantum dot



Quantum dot wafer



Quantum dot
laser chip



Cumulative sales in FY2019, 2020 and 2021

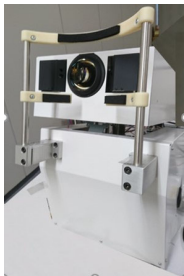
NRE : Sales in FY2021

102 million JPY sales, decreased by 18% YOY.

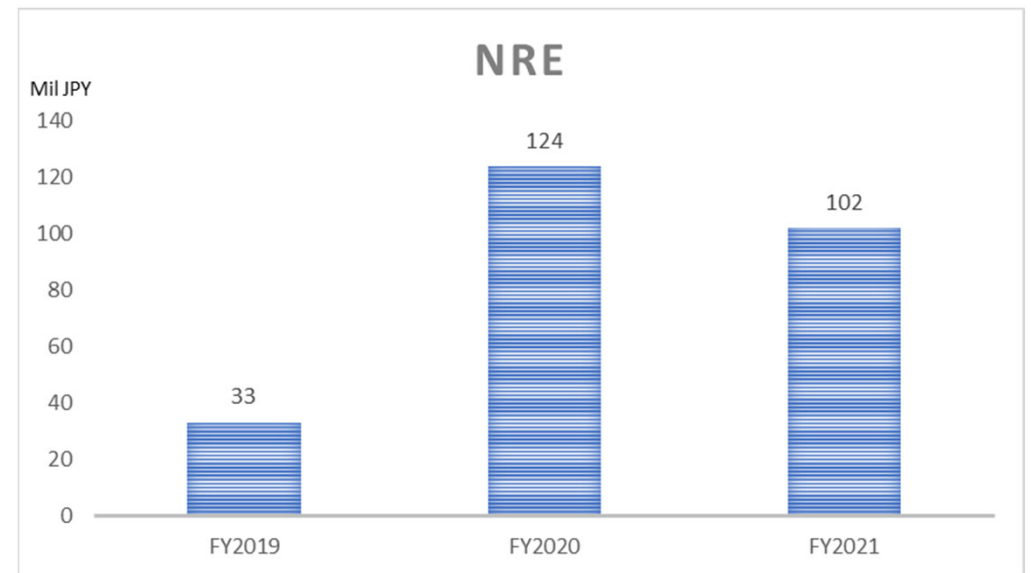
- Received the development consignment from medical, eyeglass, and university hospital-related customers with NRE (Non-Recurring Engineering) fee to realize the prototypes for
 - ✓ Laser scanning fundus photography ※1
 - ✓ Refractive power measurement ※2
 - ✓ Handy-type visual field testing ※3based on the laser retinal projection technology.

- Since the fundamental development of all of the above was completed by the third quarter, the product was transferred to the laser eyewear (LEW) business for commercialization (product sales will start next fiscal year).

Fundus photography



Handy-type visual field testing



Cumulative sales in FY2019, 2020 and 2021



- ※ 1 A prototype for laser scanning fundus photography enables fundus image acquisition at low cost and easy operability.
- ※ 2 A prototype for refractive power measurement allows you to subjectively and objectively inspect the refractive power of your eyes.
- ※ 3 A handheld device that directly projects a point image onto the retina according to an algorithm and measures the field of view and sensitivity.

Laser Eyewear (LEW) : Sales in FY2021

94 million JPY sales, increased by 75% YOY.

■ RETISSA Medical

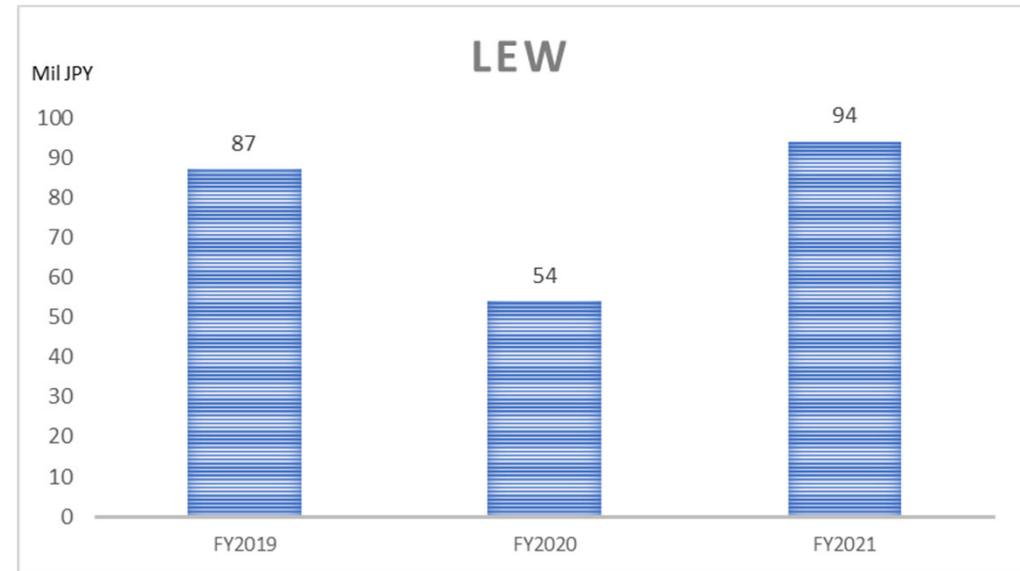
- 11 domestic medical institutions now introducing the device to patients
- Promotion by Santen Pharmaceutical and Seed to 479 hospitals on corneal diseases.
- 15 units sold to hospitals and patients.

■ RETISSA Display II

- Sold a total of 252 units of eyewear, cameras, and the new product of RETISSA ON HAND.
- Video: <https://youtu.be/RSSeiCLq7v8>
- Local Municipality Subsidy with 90% benefit registered in 6 cities in Tokyo. Plan to expand to many cities nationwide
- 37th CSUN Assistive Technology Conference on March 14th to 18th @ Anaheim in the USA Joint exhibition with a digital camera maker
- Opened US EC site.

■ Development consignment

- Commissioned to develop several laser retinal projection-related technologies (mainly for next-generation eyewear).
- Develop products in the next fiscal year (some of them to be commercialized).



Cumulative sales in FY2019, 2020 and 2021



RETISSA Display II



RD2CAM



RETISSA Medical

FY2022 Financial Forecast

Promote sales expansion of the LD business and market penetration of the LEW business to increase sales and suppress losses.

Financial Forecast

(Million JPY)	FY2022 Forecast	FY2021 Result	YOY
Sales	1,277	1,101	+16% (+ 175)
(LD)	1,037	1,006	+3%
(LEW)	239	94	+152%
Operating Profit or Loss (△)	△567	△931	+364
(LD)	100	43	+56
(LEW)	△367	△693	+326
Ordinary Loss (△)	△558	△893	+335
Net Loss (△)	△562	△880	+318

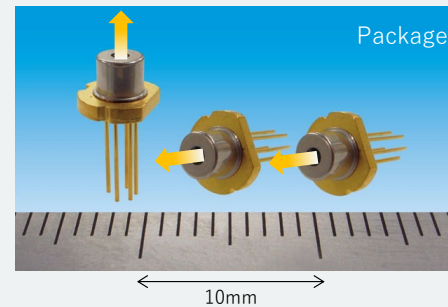
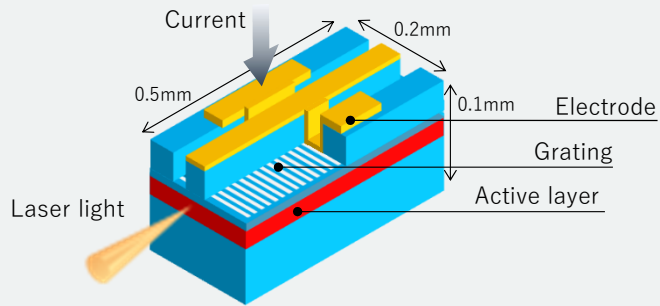
02

Semiconductor Laser Devices

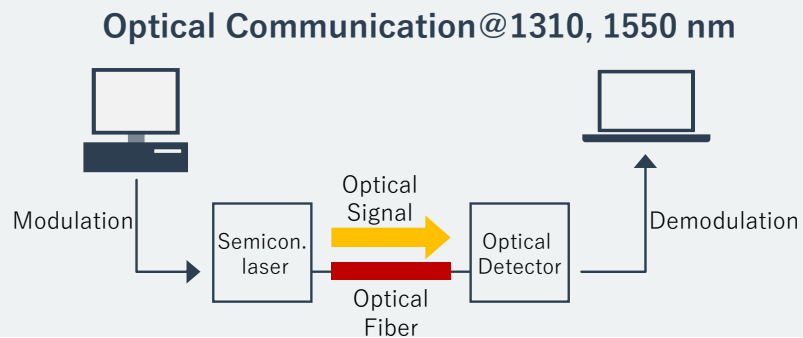
Solid Earnings Base and High Growth Potential
under Global Laser Market Expansion

What is a Semiconductor Laser?

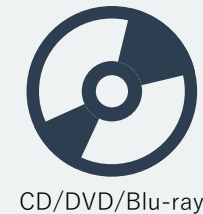
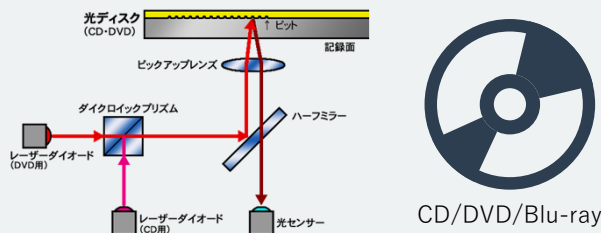
A tiny device to provide laser light by injecting an electric current through a semiconductor.



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



Optical Recording@660nm, 450nm



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:

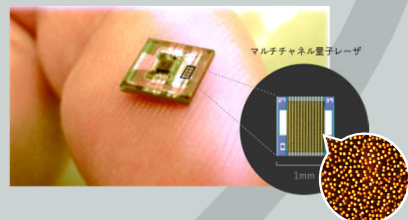
A small element with a length of about 1 mm that causes a laser to oscillate by passing a current through a semiconductor. Compared with other lasers, possesses excellent properties such as ultra-small size, high-speed modulation characteristics reaching several 10s of GHz, high power-to-light conversion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

3rd phase

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

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.

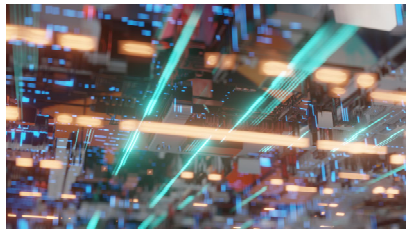
Fields where our lasers are applied (being Developed or Commercialized)

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

New Era for Semiconductor Lasers

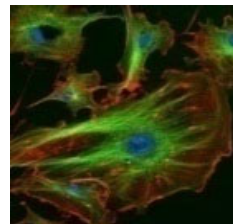
We are developing products for all applications shown below and have launched a part of them

- Optical interconnect ⇒ enhancing the computing and data processing power



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

Biomedical



Motion recognition



Face recognition



Fundus, Sight, Field of view



LiDAR (Automotive, Robotics, Drone)



- Display ⇒ AR/VR/XR

Smart Glasses



Head-up display



- Micromachining ⇒ Highly functional/high precision device manufacturing



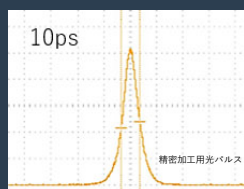
Our Core Technologies and Competitive Advantages

Material Creation, Design, and Control

Cutting Edge Semiconductor Laser Technology with Several Unique Features

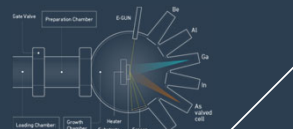
Laser Design

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



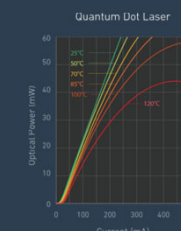
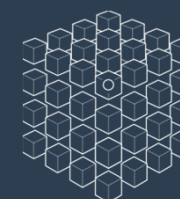
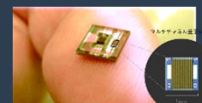
Semiconductor Crystal Growth

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}



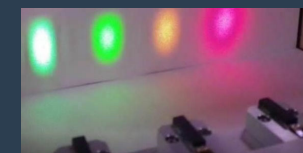
Small Module

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.



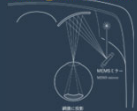
Diffraction Grating

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



VISIRIUM Technology

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



^{*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

^{*3}: 2017 PRISM Award in Industrial Lasers - QD Laser (2nd Feb 2017)
 Prism Awards honour photonic innovations at Photonics West 2019

^{*4}: Japan/U.S. PATENT JP5362301/US8896911

^{*5}:

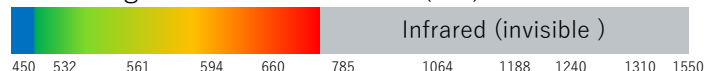
Semiconductor Laser Devices Our Competitive Advantages / Barriers to Entry

Business Model

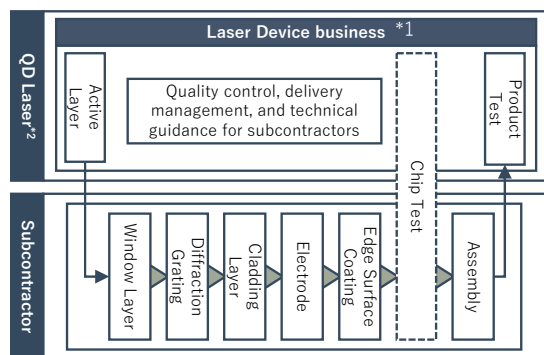
- **The only fabless company in the semiconductor laser industry**
 - Flexible manufacturing scale of several units to tens of millions units
 - Made fixed costs into variable costs
 - Mass production and diverse product offering lead to beyond breakeven point

- **Any wavelengths of lasers**

Wavelengths of lasers we offer (nm)

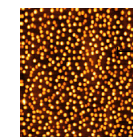


- **High level of freedom in creating new business, fields and products**



Core Competence : Quantum Dot Lasers

- **Atomic-level precision epitaxy technology (proprietary)**
 - Growth control by 0.1 second
 - Extracted the best recipes from over 100,000 recipes
 - The only one to succeed in mass production of quantum dot lasers, thanks to over 20 years of accumulated technology



100 nm

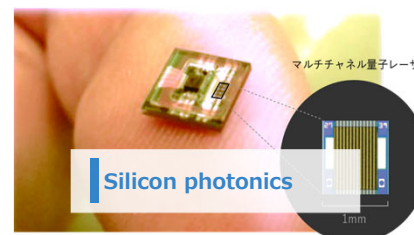
image of quantum dot by atomic force microscope

- **Capable of operating in harsh environments of over 100°C and under high density packaging**

- Optoelectronic integrated circuit
- In-vehicle devices

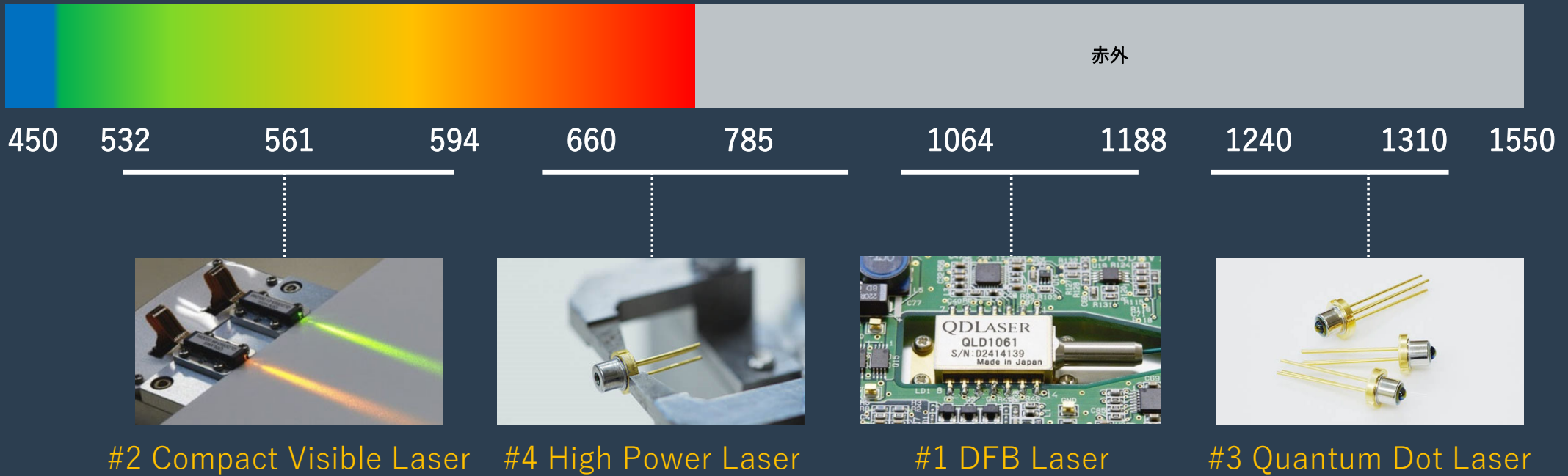
- **New potential market created by quantum dot lasers**

- Chip-to-chip optical interconnect
- LiDAR
- Quantum cryptography



Variations on semiconductor lasers developed and sold by QD Laser.

QDLaser provides a wide range of semiconductor lasers with wavelengths suitable for each application.

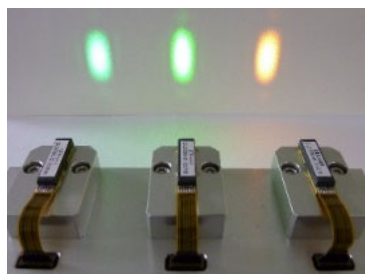


Launch of Palm-Sized Multi-color Compact Laser Light Source for Biomedical Equipment

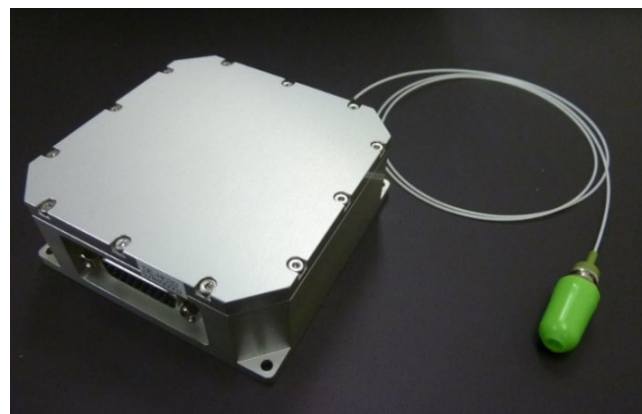
High value-added solution for biomedical equipment *1

- This light source provides manufacturers with all laser wavelengths required for any biomedical equipment in one palm-sized compact module *2 with stable output power and plug-and-play operation.
- This product enables manufacturers to miniaturize their equipment and shorten the development and production period as a new solution.
- Under testing by equipment manufactures.
- QD Laser aims for an industry share of *3 20% in light sources for biomedical equipment in five years.

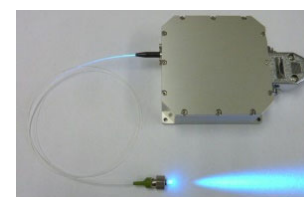
Compact Visible Lasers



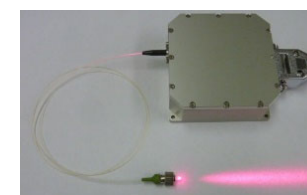
Integrated
into



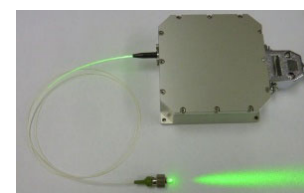
**Palm-Sized Multi-color
Compact Laser Light Source
(80 x 80 x t30mm)**



488nm



660nm



561nm



785nm

*1: Biomedical equipment is flow cytometers, ophthalmic examination equipment, fluorescence microscopes, and the like.

*2: The total volume of the driver integrated light sources is less than 50% of other company's products.

*3: Estimated annual accessible market size is 12,500 units. (8,000 out of 16,000 units for flow cytometer based on the "Global Flow Cytometer Market 2020-2024", and 4,500 units for an ophthalmic medical device)

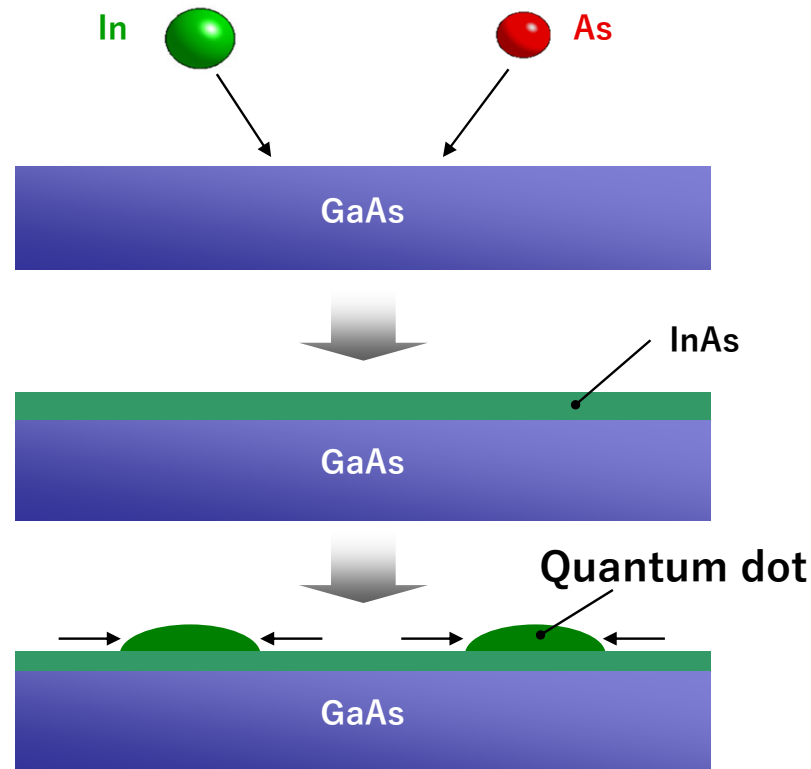
QDLaser's World Only-One Mass-Production Technology of Quantum Dot Lasers

- 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)

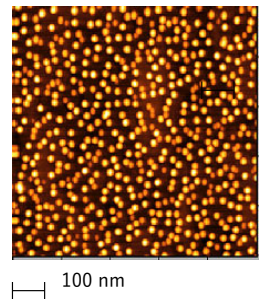
Mass production MBE system



Growth sequence of quantum dots (illustration of side view)



Atomic force microscope (top view) of quantum dots



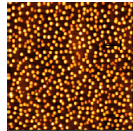
Tangible Silicon Photonics Market as Electronic / Optical Integrated Circuit Technology Platform

Customizing quantum dot lasers for Japan/US/EU nine silicon photonics vendors.
Starting mass production in 2023.

Development and production

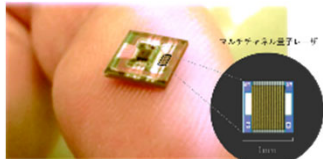
- 2010**
World's first mass production of quantum dot laser for optical communication
- 2012**
Started development of quantum dot laser for silicon photonics
- 2017**
Established mass production system of quantum dot lasers for silicon photonics (supplied to AIO core)
- 2019**
Our products installed in the "Ultra-thin connector integrated active optical module (I-PEX EOM)" developed by I-PEX
- 2021**
Working on joint development with silicon photonics vendors around the world. Starting mass production for chip-to-chip optical interconnect and Lidar by FY2023.

Quantum Dots



100 nm

100Gbps optical transceiver with quantum dot lasers as light sources



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

FPGA card

Silicon Photonics Chip

Optical fiber

chip-to-chip interconnects

Increased data and power consumption to be solved by Silicon Photonics

Problem

Increasing demand for global data in turn creates a global issue of increasing power consumption

World total amount of data is estimated to multiply 5 times ^{*3} within 7 years	World IT-related power consumption is estimated to multiply almost 35 times ^{*4} within 15 years
CY18: 33ZB	CY16: 1,170TWh
CY25E: 175ZB	CY30E: 42,300TWh

Solution

Silicon photonics with quantum dot lasers mounted on silicon chips enable dramatic improvement in semiconductor performance^{*5}

Power consumption reduction

90%

Footprint

1/100

Processing speed

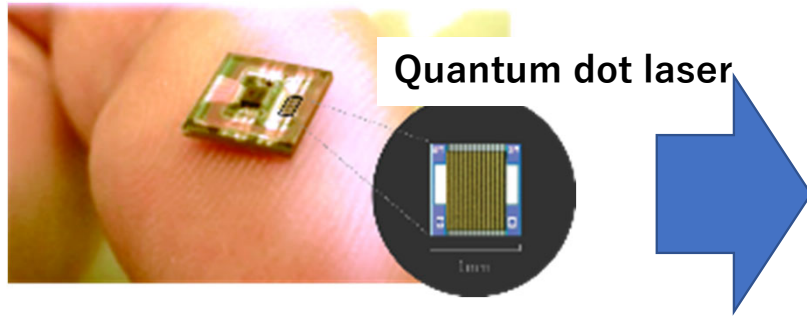
100x

Huge information processing application that requires high-temperature operation

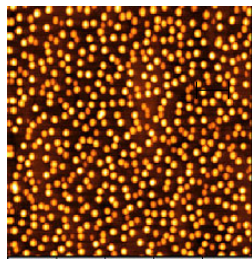
Date Centers	5G base stations	Automatic Driving/LiDAR
80°C	105°C	105°C

I/O core with Quantum-Dot Lasers Ready for Commercialization

100Gb/s Silicon photonics chip
named **I/O core of AIO Core** with
QDLaser's 4-channel quantum dot lasers

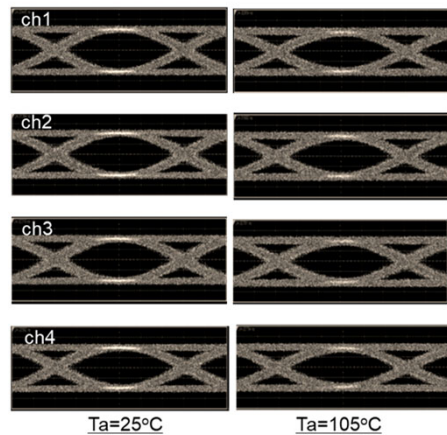


Quantum dots



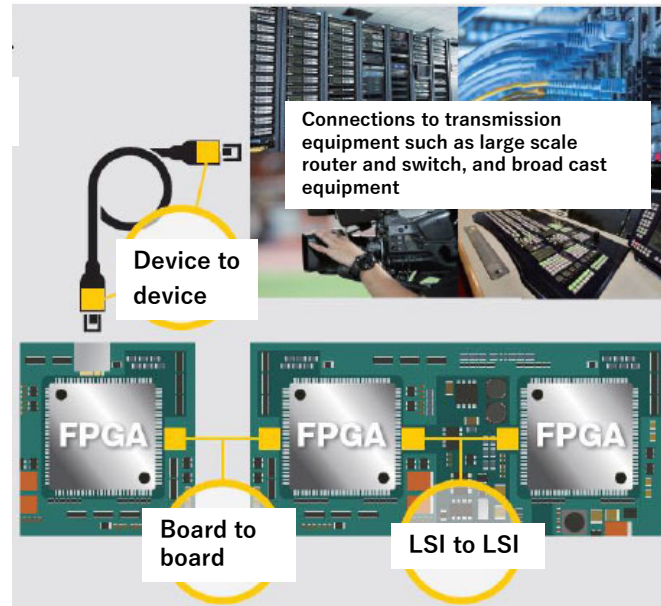
100 nm

Optical eye diagrams at 25Gbps



Ta=25°C

Ta=105°C

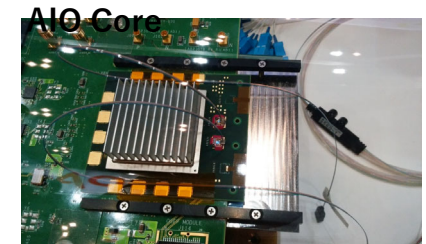


Courtesy of AIO Core Co., Ltd.

Note: Yellow squares show 100Gb/s transceiver
Silicon chip

Applied modules
(Sample shipment)

IPEX: LIGHTPASS™



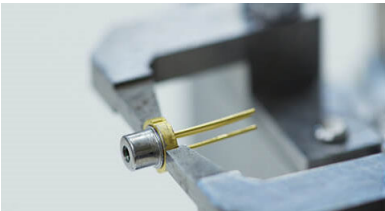
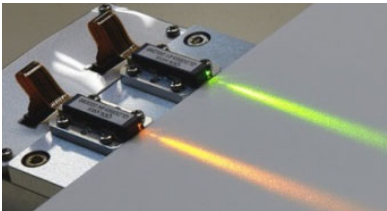
Our major laser device products, wavelengths, features, and uses

Compact visible lasers

High power laser

DFB laser

Quantum dot laser



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

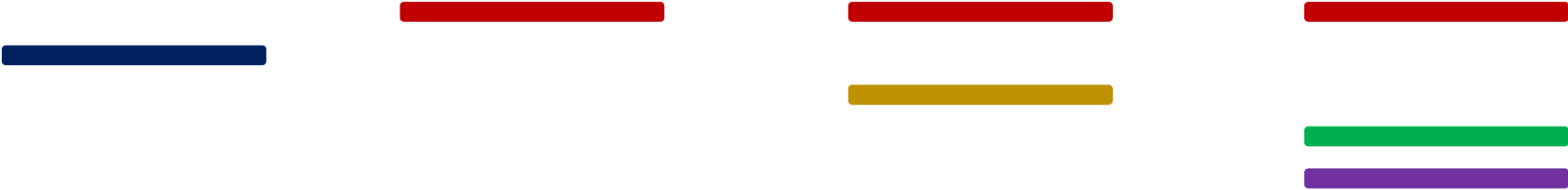
Measurement

Bio.

Processing

Communication

Silicon photonics



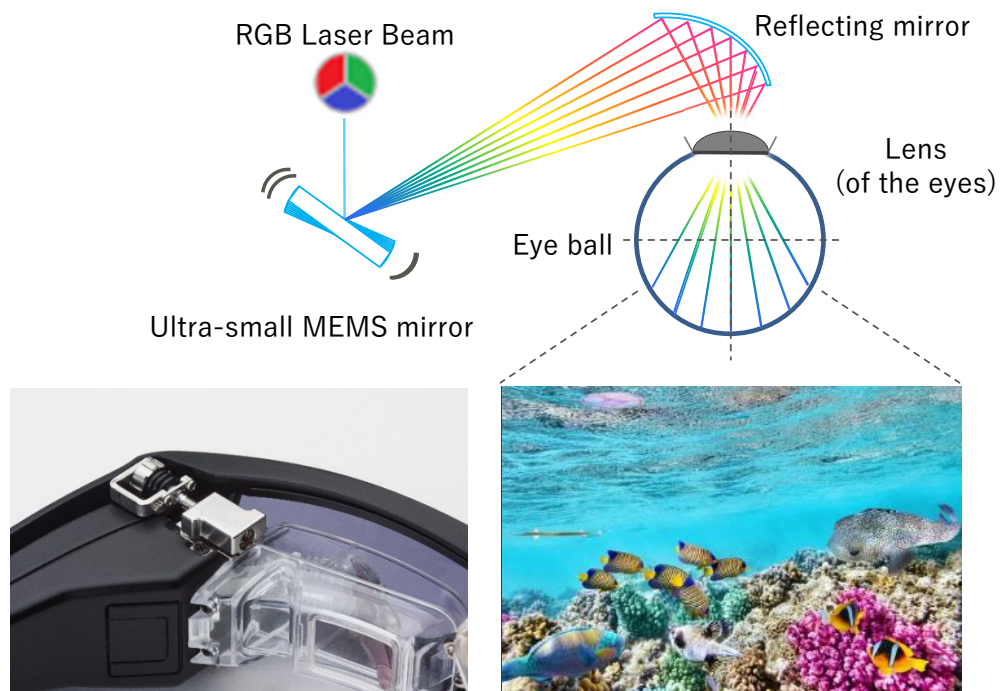
03

Laser Retinal Projection

World's First Commercialization of Laser Retinal Projection Eyewear

VISIRIUM TECHNOLOGY®

Unique Laser Technology bringing Innovation to Vision

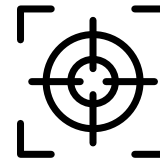


Direct Image Projection onto Retina



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

Transforms
“hard to see”
to “visible”

Low Vision Aid

Sales started

Extend the healthy
lifespan of your vision

Vision Health Care

Business Development

The power of
“vision” broadens
your world

augmented vision

Strengthening Alliance

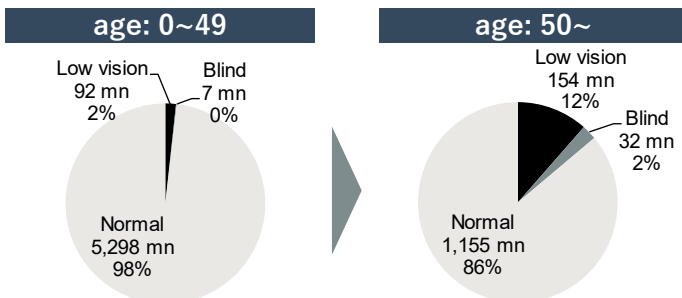
World's First Laser Retinal Projection Eyewear In the Low Vision Aid Space where Innovation has been Minimal, Laser Technology makes a Breakthrough

250mn 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.

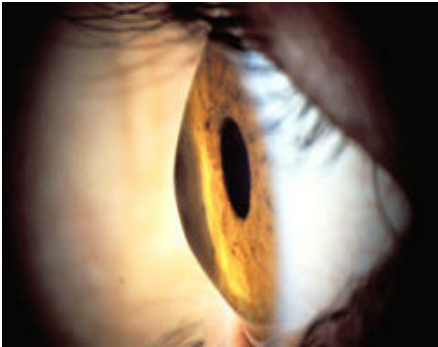


GLOBAL DATA ON VISUAL IMPAIRMENTS 2010, WHO



Medical Regulatory Affairs: Completed Clinical Study in Japan and EU

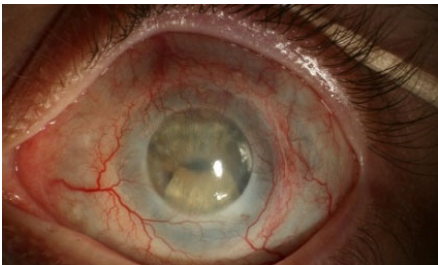
JAPAN



Irregular astigmatism

- Improved visual acuity and reading speed of **15 subjects** verified.
- Domestic medical device manufacturing and marketing approval @ January 28, 2020

Europe



Corneal clouding

- Improved visual acuity on and reading speed of **20 subjects** verified.
- Long-term safety confirmed after one year of home use.
- Clinical trial completed in June 2021.

RETISSA® series product development status

Medical device model sales started.

Sales increase in both consumer and medical models

RETISSA® Display II consumer use



Corrected vision: 0.8

- Refractive power: 0.8 corrected vision without eyeglasses in the power range of -11D*¹ (high myopia) to +6D (medium high hyperopia) *²

Sales strategy of this term

- New frame to improve wearing alignment and stability
- Accessory camera connected to the frame for enhanced functionality
- Proposals of use cases for companies
- Overseas sales, including US, China, and South Korea.



RETISSA® Medical Approved to market as a Medical Device in Japan

Controlled medical device (Controlled medical devices requiring special maintenance)*³

- Used to correct vision in patients whose vision is impaired by unjustified astigmatism (patients who are unable to achieve adequate vision using existing eyeglasses or contact lenses)
- Expected to (1) correct visual acuity, (2) improve reading speed, and (3) improve reading acuity

Sales strategy of this term

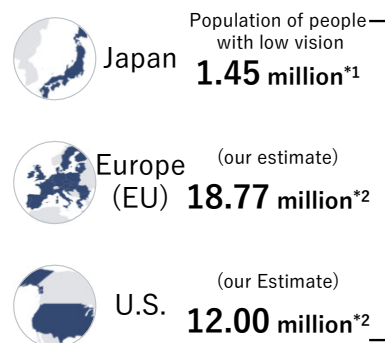
- Sales collaboration with Santen Pharmaceutical and Seed. • Efforts to reduce the burden on purchasers: Healthcare subsidy, medical insurance, tax deduction, etc.

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

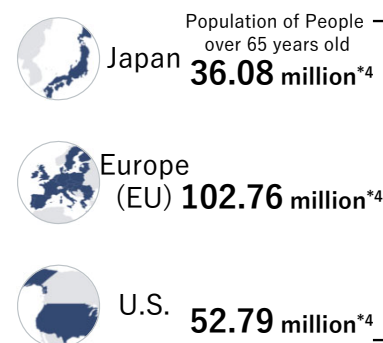


Estimated percentage of applicability (our estimate)*3 \times **11%** \times Product Price per Unit (our assumption)*6 **JPY 200k (USD 1.9k)**

Total market size of advanced countries (Our estimate)

JPY 708.7 bn
(USD 6.7 bn)

Senior Citizens Market



Estimated percentage of applicability (our estimate)*5 \times **1%** \times 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.

Sales and Manufacturing Strategies

01

Through partnership with major manufacturers such as MinebeaMitsumi and Audio Technica, achieved fabless manufacturing for high-performance and low-cost products.

02

Through media exposure / participating in large-scale exhibitions / donations to schools for blind children / trial sessions and interviews, raise awareness

Cumulative
sales record as
of Marc 2022
>800 units



03

Develop close cooperation with major players in each field

Zoff

KAGA FEI

Santen

SONY

04

Improving usability and developing new products

Retinal Imaging Product "Retissa" Roadmap: Laser Eyewear

- Medical Equipment "Medical": Being promoted by Santen Pharmaceutical and Seed to 479 hospitals on corneal diseases. Eleven domestic medical institutions are now introducing the device to patients.
- Consumer Product "Display / Display2": Cumulative sales of 800 units via EC, domestic and overseas distributors. Local Municipality Subsidy with 90% benefit starting to be registered.
- Display 3: Under development to realize a compact, lightweight, and low-price eyewear with improved operability.

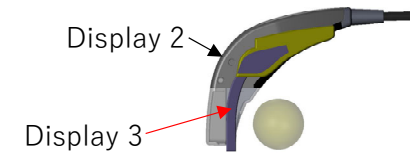
Medical



Display/Display 2



Display 3



FY2018-2021

- Domestic manufacturing and marketing approval.
- Introduction to low vision and corneal outpatient.
- Treated in 11 medical institutions.

- Free focus / high resolution (equivalent to 0.8 visual acuity) / full color
- Launch of accessory camera RD2CAM
- Cumulative sales of 800 units

- Jointly developed with a domestic electronics manufacturer.

FY2022

- Continue sales activities
- Expansion of application range through clinical research (Clouding, retinopathy)
- Strategy in Europe

- Subsidy, administrative budget acquisition activity (already certified by 6 municipalities)
- Overseas expansion
US in-house EC
Korean subsidy acquisition activity
Resume Chinese agency activities

- Development and Marketing
Flat mirror (thinner and wider FOV)
Built-in camera
Low-cost design
Compact controller BOX
Eye Track

FY2023-2024

Consolidation of sales channels and know-how to comply with various regulations (Pharmaceutical Equipment Law, Consumer Product Safety Law, Welfare Equipment Law, etc.)

Commercialization
100,000 yen selling price
100,000 units sales target after launch

Retinal Imaging Product "Retissa" Roadmap : Three New Products

● Commercialization of three new laser retinal imaging devices for various usage scenarios

<https://www.qdlaser.com/uploads/2021/12/20211214-1.pdf>

ONHAND

Hand-held devices used by visitors in public spaces (libraries, museums, theaters, etc.)



Super Capture

Digital cameras viewfinders that extend the vision and behavior of low vision users



MEOCHECK

Self-measuring simple checkers to help people recognize eye diseases



FY2021

Prototype

- Questioned and deliberated as a device to comply with the Reading Barrier-Free Act*1 at four congresses in the Tokyo metropolitan area.

Prototype

- Exhibited with Sony Corporation at CSUN, an accessibility exhibition in the U.S.
- Successful crowdfunding

Prototype

- Conducted eye examinations on 500 drivers at cab companies in Japan under collaborative research with medical universities.
- Obtained evidence of highly sensitive detection of glaucoma, cataract, etc. (to be published)

FY2022

Product launch in August (planned)

- Introduction to administrative services like libraries, art galleries, museums, theaters, etc.
- Sales collaboration with three distributors.

Product launch in December (tentative)

- Promotion and sales collaboration with digital camera manufacturers
- Operation of EC sites in Japan and the U.S. (already established)

Product launch in September (planned)

- Sales collaboration with medical equipment distributors nationwide
- Eye check service pilot operation with Tohoku University and DX companies at transportation companies, drug chains, extensive private facilities, nursing care facilities, etc.

FY2023

Sales are expected to reach several thousand units/year.

• Assumed sales of 1,000 units/year

- Assumed sales of 1,000 units/year
- Full-scale operation of eye check service



QD LASER

*1読書バリアフリー法: 2019年6月28日施行「視覚障害者等の読書環境の整備の推進に関する法律」。障害の有無にかかわらずすべての人が読書による文字、活字文化の恩恵を受けられるようにするための法律。

IEC (International Electrotechnical Commission) officially published an international standard that defines how to evaluate the overall image quality of scanning retinal projection devices

QD Laser Co., Ltd. is the only company to have commercialized the laser scanning retinal projection product globally. On June 20th, the IEC [Note 1] officially issued the international standard on scanning retinal projection devices. This document covers a general image quality evaluation method, including the free focus characteristics. As a result, the performance of our products to provide "clear images that do not depend on eyesight" has come to be evaluated objectively and quantitatively. With this standardization, QDLaser expects the guarantee of product quality and the elimination of inferior products in the market, accelerating the worldwide spread of our products and forming a healthy industry and market.

International Standard

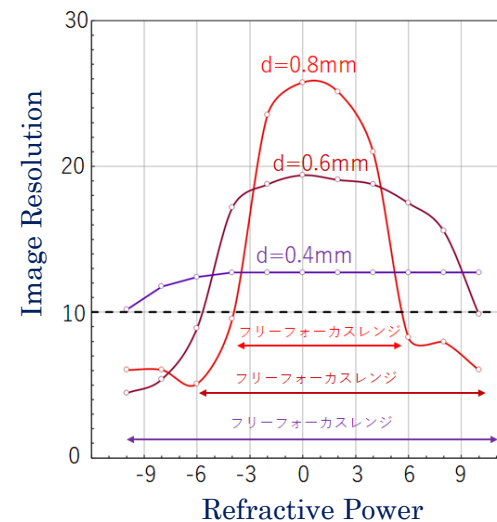
IEC 62906-5-5:2022

- Laser displays – Part 5-5
- Optical measuring methods of raster-scanning retina direct projection laser displays
- <https://webstore.iec.ch/publication/60142>

Note 1: IEC is an abbreviation for International Electrotechnical Commission.

Note 2: Free focus means that the visibility of the image projected by the scanning retinal projection device does not depend on the refractive power of the eyeball or the focus position. The performance of free focus changes depending on the beam diameter and divergence angle of the laser incident on the eyeball.

Free Focus Range Evaluation



The refractive power of the eyeball determines the resolution of the retinal projection image with the diameter of the parallel laser beam as a parameter. This international standard states that the range of refractive power of the eyeball to provide free focus is determined according to the diameter. When commercializing a scanning retinal projection device, it is required to specify the range of refractive power to provide free focus.

04

Further Growth Upside Expected

Large Growth Potential in Optometry Market

Utilizing Laser Retinal Projection Technology, Developed New Optometry Prototypes and Working with Partners to Launch in FY2022-2023

Estimated economic loss in Japan
due to visual impairment*1

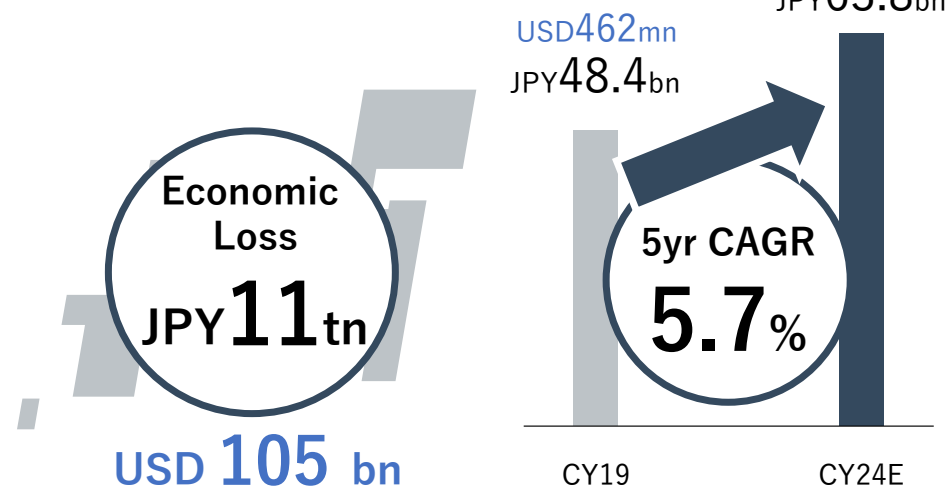
Fundus photography equipment
market size*2

Conventional
optometry equipment

Large / expensive /
Requires medical staff

New optometry equipment

Small / low cost / short time /
self-examination possible



Medical resources are available mainly in urban areas. Given the time and the financial cost, people miss the chance to go to their optometrist and end up detecting their glaucoma late



Enables an environment where anyone can easily examine their eyes, increasing the early detection rate of glaucoma and expecting to extend the healthy lifespan of the eye

*1: Japan Ophthalmologists Association (2009) "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: TechNavio (2020) "Global Ophthalmic Diagnostic Devices MARKET 2020-2024" Converted at an exchange rate of JPY/USD = 110 yen
*3: The approximate measurement time of the Goldmann perimeter and Humphrey perimeter, which are typical perimeters in conventional perimeter measurement.

A new group of optometry devices that utilize laser retinal projection technology

■ Eye & Brain Diseases

- Cataract (47%)
- Glaucoma (3.6%)
- Retinopathy (55%)
- Brain tumor (10 to 15 patients per 100,000)

Note: % is the average appearance rate of the entire population. The older the person, the more it increases.

■ Cognitive Function Degradation

- Aging
- Dementia
- Fatigue, Stress
- Alcohol

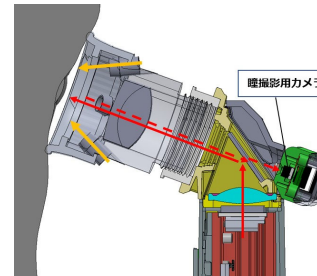
■ Cardiovascular Diseases

- Disease
- Diabetes
- Stroke
- Heart attack

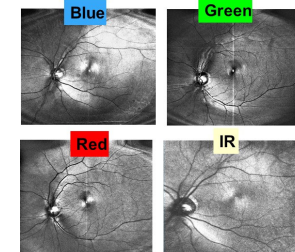
1st generation: Simple perimeter to be commercialized in FY2022, screening eye diseases in 1 minute.



2nd generation: Eye track perimeter with a camera to measure fixation stability and dynamic response to various visual stimuli. Software medical equipment.



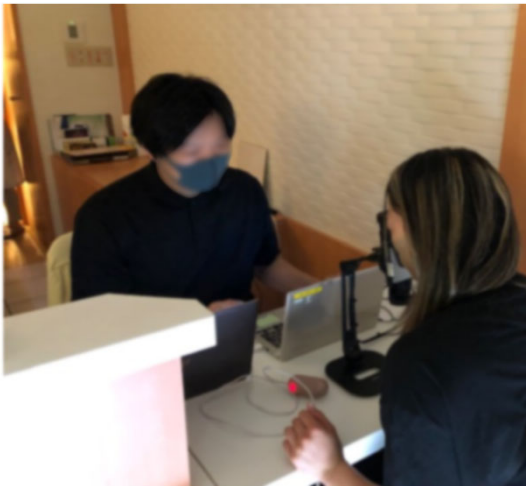
3rd generation: Ultra-compact fundus photography device. Hardware medical equipment.



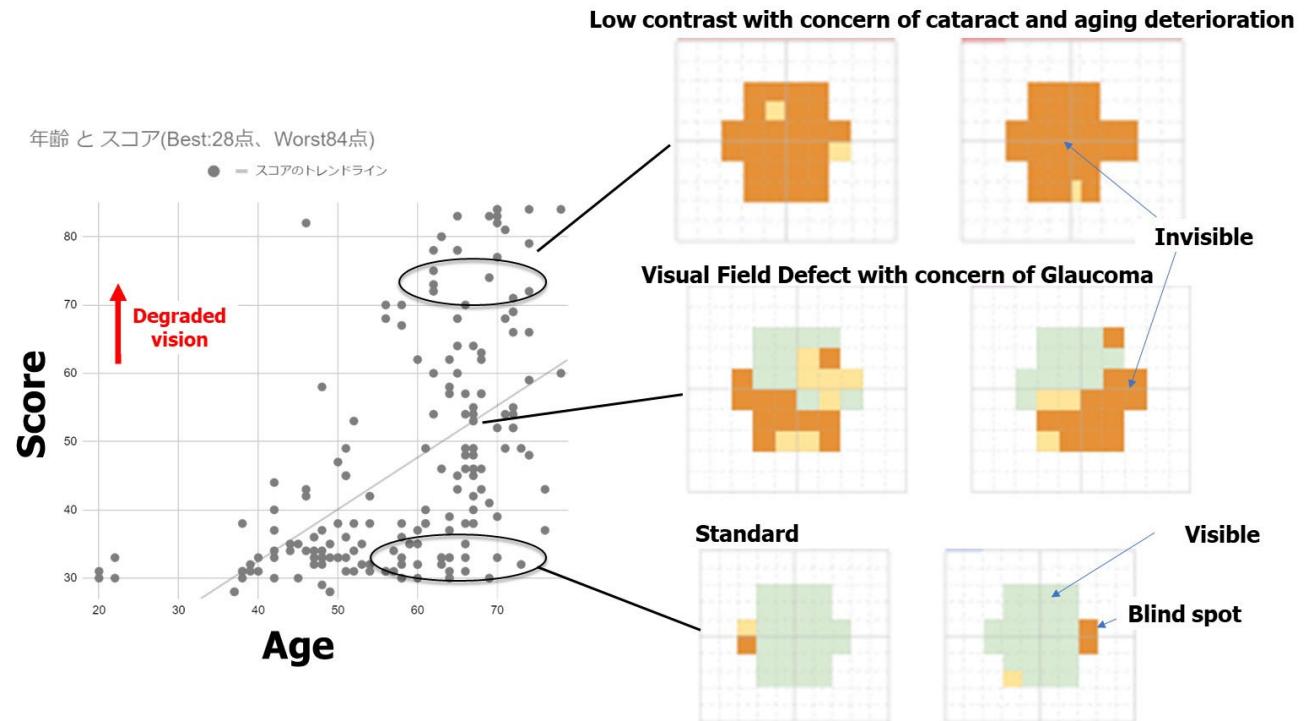
Results of the visual field test of 97 drivers of a taxi company

- We found a significant decrease in visual sensing ability with aging.
- A definitive diagnosis was made by an ophthalmologist as cataract for low contrast and glaucoma for visual field defect.
- The screening for eye diseases and the health check, including cognitive function, has become possible.
- We started studying with the taxi company about applying this device and system to health management of employees for accident prevention and employment maintenance.

Optometry diagnosis

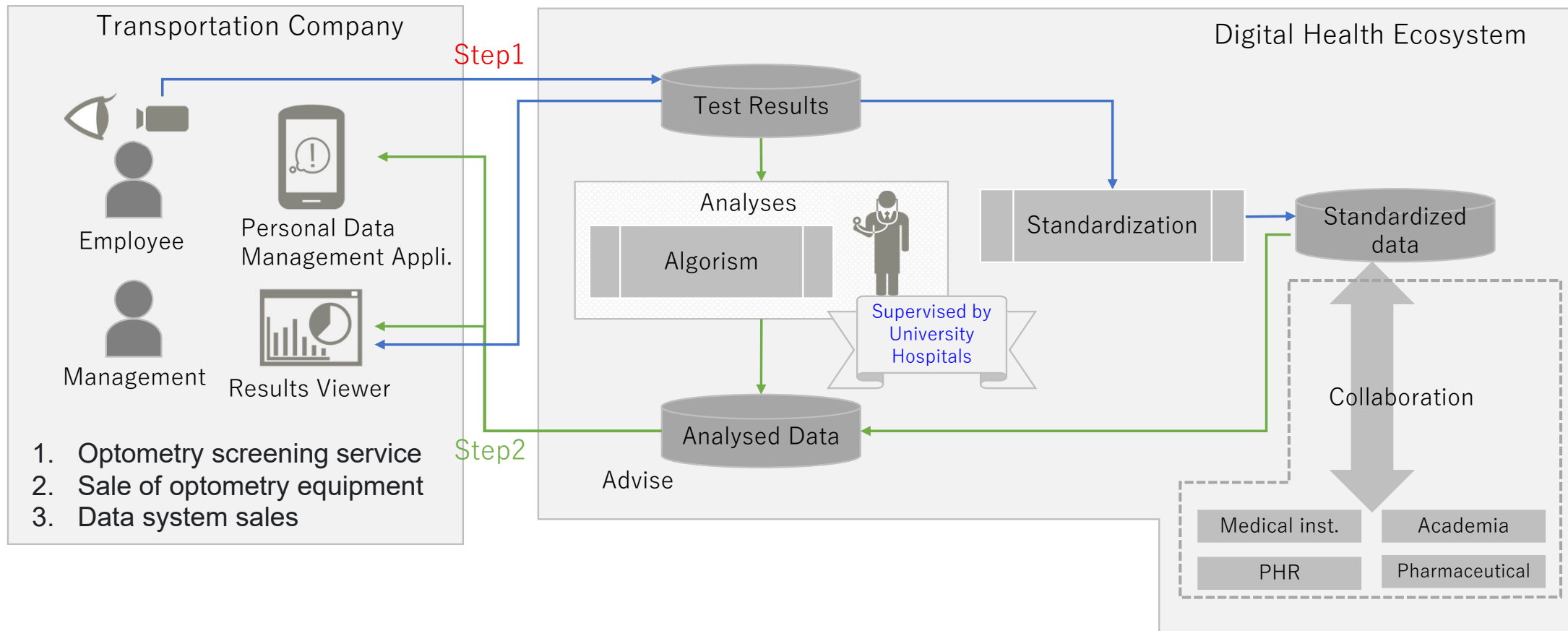


QDLaser is conducting medical research for people based on the Ministry of Health, Labor, and Welfare guidelines.



Service System Image

Starting introduction to companies with commercial drivers



Expected Growth Potential in Mid-Long Term

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



02 Establish mass production and sales channels of consumer / medical eyewear
Make laser eyewear business the growth driver in the short to medium term



Target cumulative sales of 100,000 units and annual production of 50,000 units at FY2025.

Sales expansion in domestic and overseas markets

Starting low-cost mass production of RDIII later in FY 2023 to 2024

IPO

Present



03

In the mid to long term, in addition to the laser eyewear business, plan to expand sales of optometers and silicon photonics.



Quantum dot lasers for silicon photonics are being developed with nine companies in Japan, the United States, and Europe. Mass production is to start in FY 2023 in order.



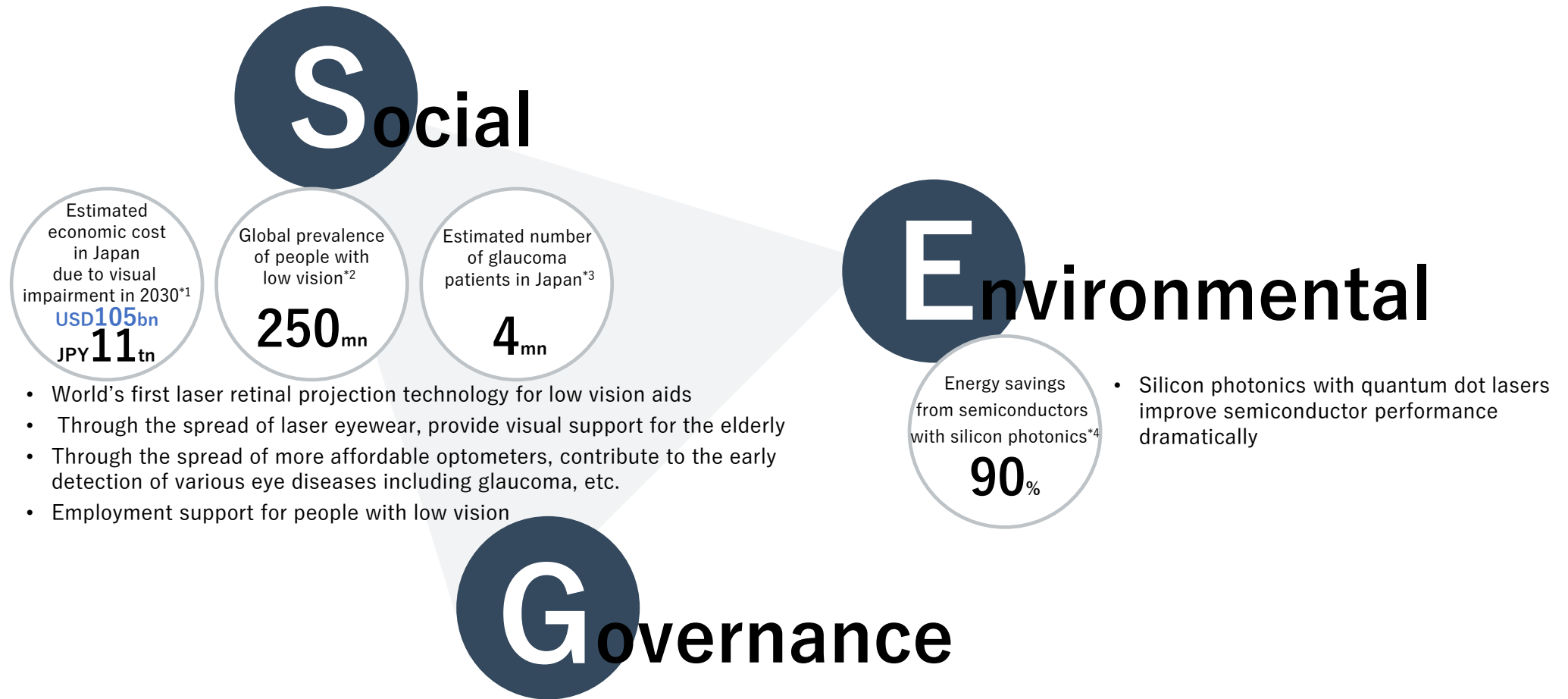
Trial operation of "optometry screening service" in FY2022 and full-scale delivery in FY2023. The compact optometry machine under is to be launched in FY2022.

Future

05

ESG Initiatives

Business Development from an ESG Perspective



*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.

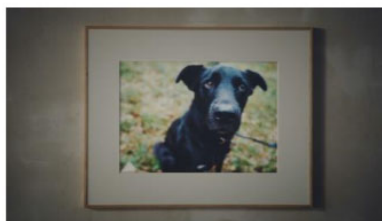
<https://www.youtube.com/watch?v=p5blfs94Oys>

#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=lp6a5h6UfxA&t=37s>



QD Laser Announce Part 3 of “With My Eyes” Project supported by Sony

Latest documentary short in series depicts quest of Paralympic swimmer with low vision to use laser retinal imaging camera to see inside ocean
To be launched Mar. 14, 2022, on YouTube and presented at the QD Laser and Sony booths at the 37th Annual CSUN Assistive Technology Conference

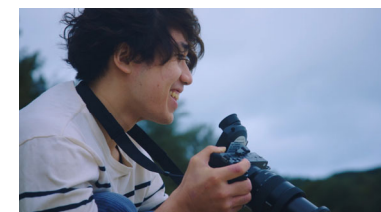
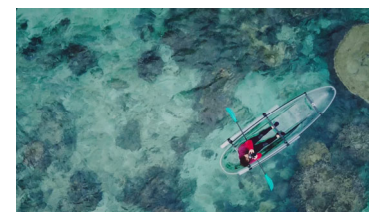
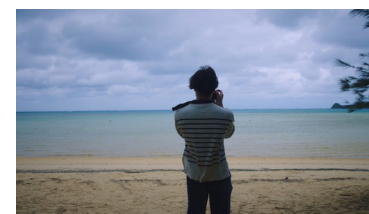
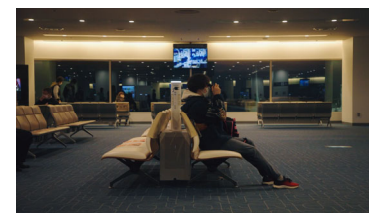
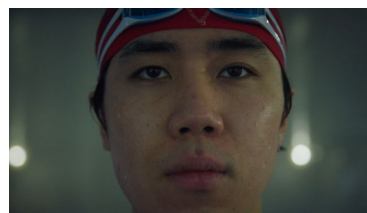
QD Laser Co., Ltd. (Headquarters: Kawasaki City, Kanagawa Prefecture, hereinafter referred to as "QD Laser") is the state-of-the-art semiconductor laser technology company that plans, designs, develops, manufactures, and sells a variety of unique semiconductor lasers and related products. The company launched the project "With My Eyes," employing the original laser retinal imaging technology to change the "difficult to see" to "visible" of the 250 million low vision worldwide who have visual inconvenience even when wearing corrective glasses. This release shows off the third project carried out with the cooperation of Sony Corporation (hereinafter, Sony), featuring a newly produced documentary movie to be on air on March 14, 2022 (Monday). At the 37th Annual CSUN Assistive Technology Conference in Anaheim, USA, starting on the same day, each booth of the companies exhibits this documentary movie and the retinal imaging camera device "RETISSA SUPER CAPTURE."

Retissa Super Capture

Digital cameras viewfinders that extend the vision and behavior of low vision users



■ Scenes from the Movie



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	58
Business	Planning, design, development, production and sales of semiconductor laser and its application products
Licenses	<ul style="list-style-type: none">• 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 of March 31, 2022. Including 1 employee and officer, 13 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					
		Phacocoele	<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 • Adaptable to tunnel vision through wide-angle imaging • May not be applicable in cases with severe symptoms	
	Lattice degeneration of retina	10,600			Some efficacy is seen in cases where anterior eye disease is also present AE camera feature is exceptionally effective on photophobia, night blindness, etc.			
	Hypertensive retinopathy	9,100						
	Age-related maculopathy	3,900						
	Diabetic retinopathy	3,114						
	Retinitis pigmentosa	<50						
Optic nerve	Glaucoma	3,550	3,865	△	Image downsizing feature is effective on tunnel vision	10%	• May not be applicable in cases with severe symptoms	
	Optic nerve head drusen	200						
	Optic neuritis	115						
Other	High myopia	3,000	3,000	◎	Exceptionally effective	50%	• Can improve by processing images taken by camera	
	Color amblyopia, color blindness	2,500	2,500	○	-	20%		

*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.
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- 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.