



Explanatory Material on Potential for Growth

July 2022

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Mission

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

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.

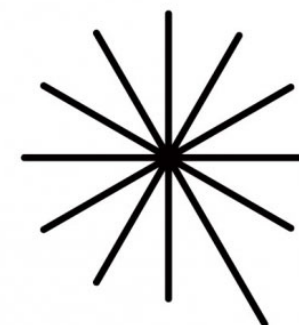
Our laser technology will enable
dramatic improvements in our ability to process information.
support visually impaired people, prevent eye diseases,
and enhance vision, continually pushing the boundaries of
human possibility.

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	58 (Laser Devices Division: 22, Laser Eyewear Division 24, Corporate and others: 12)
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

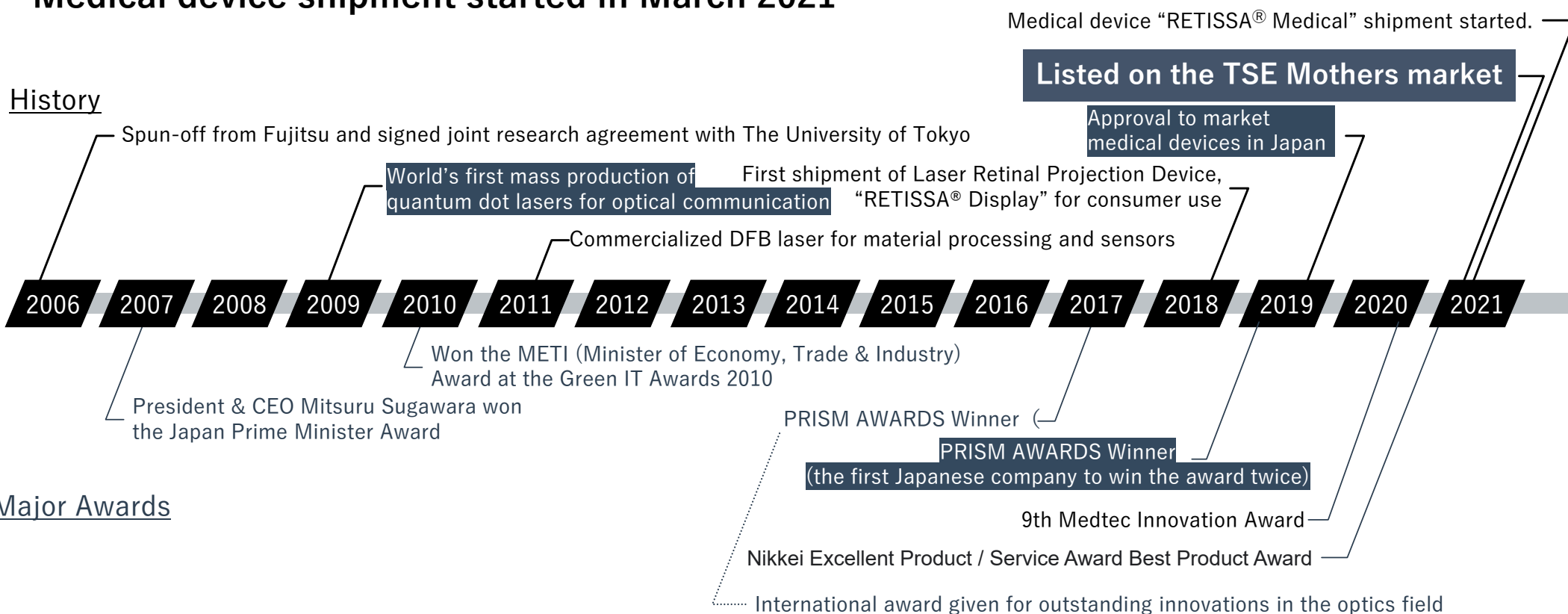


QD LASER

Company History

Listed on the TSE Mothers market in February 2021 (Securities code: 6613)

Medical device shipment started in March 2021



Investment Highlights

- 1 Cutting-Edge Semiconductor Laser Technology with Several Unique Features**
- 2 Semiconductor Laser Devices**
Solid earnings base and high growth potential due to expansion of global laser market
⇒ Record high sales forecast for this term. Steady and further growth expected in every product.
⇒ The silicon photonics market is emerging, with mass production shipment of quantum-dot lasers approaching.
- 3 Laser Retinal Projection Technology**
Commercialization of eyewear utilizing the world's first retinal projection technology
⇒ Sales of laser eyewear for consumer and medical equipment increased, and the development of next-generation laser eyewear Retissa Display 3 progressed. Launch of three new products that apply retinal projection technology. Trial operation of "vision health screening" business.
- 4 ESG initiatives**
Working on business areas directly linked to solving social issues
⇒ "With my eyes" project

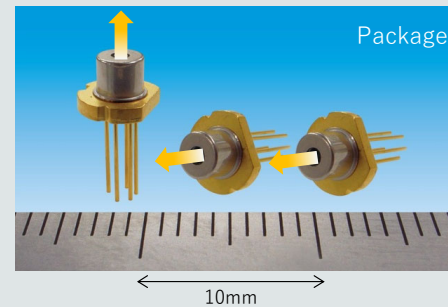
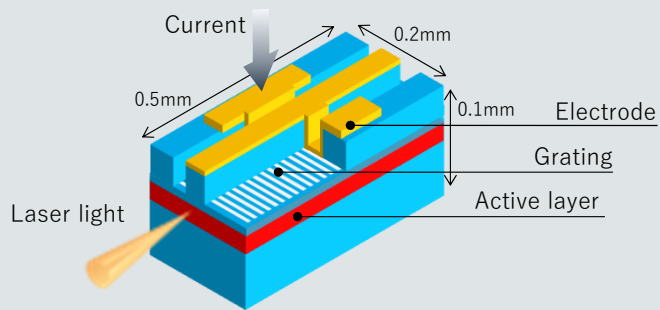
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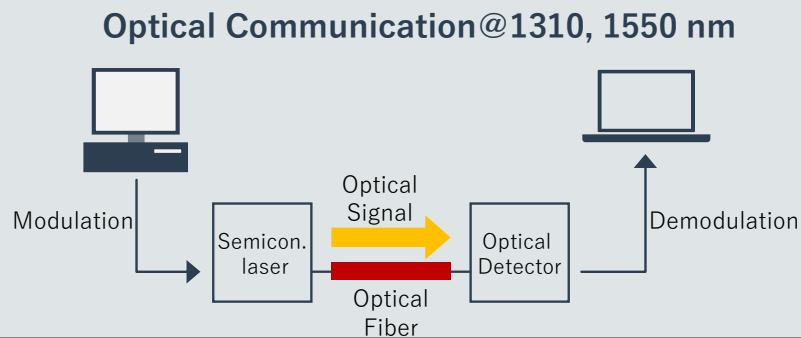
**Cutting Edge Semiconductor Laser
Technology with Several Unique Features**

What is a Semiconductor Laser?

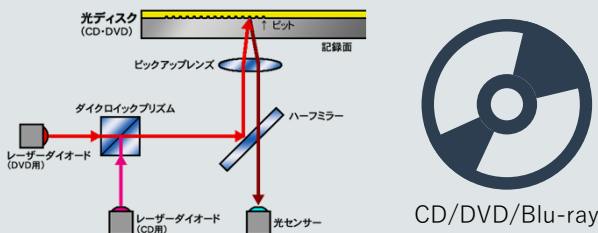
A tiny device to provide laser light by injecting an electric current through a semiconductor.



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

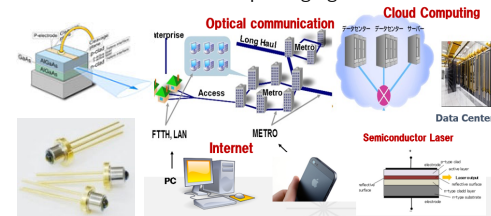
A technology used in recording, communication, processing and sensing.

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:

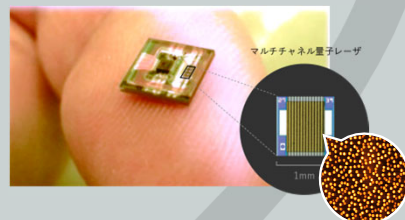
A small element with a length of about 1 mm that causes a laser to oscillate by passing a current through a semiconductor. Compared with other lasers, possesses excellent properties such as ultra-small size, high-speed modulation characteristics reaching several 10s of GHz, high power-to-light conversion 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
- Visual field testing

New Era for Semiconductor Lasers

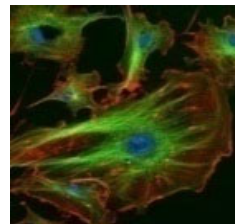
We are developing products for all applications shown below and have launched a part of them.

- Optical interconnect ⇒ enhancing the computing and data processing power



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

Biomedical



Face recognition



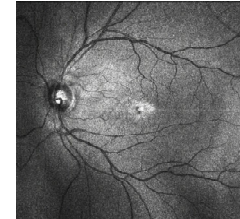
LiDAR (Automotive, Robotics, Drone)



Motion recognition



Fundus, Sight, Field of view



- Micromachining ⇒ Highly functional/high precision device manufacturing



- Display ⇒ AR/VR/XR

Smart Glasses



Head-up display



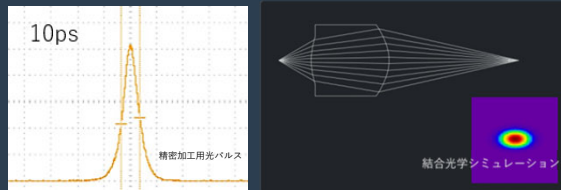
Our Core Technologies and Competitive Advantages

Material Creation, Design, and Control

Cutting Edge Semiconductor Laser Technology with Several Unique Features

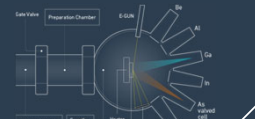
Laser Design

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



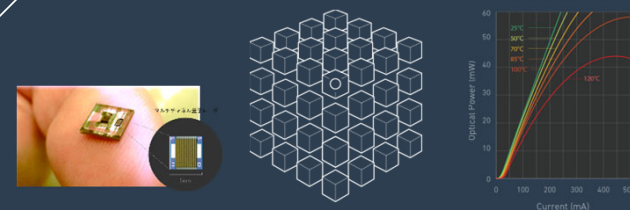
Semiconductor Crystal Growth

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}



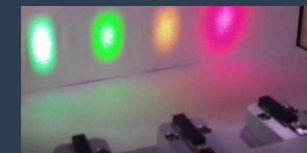
Small Module

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 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

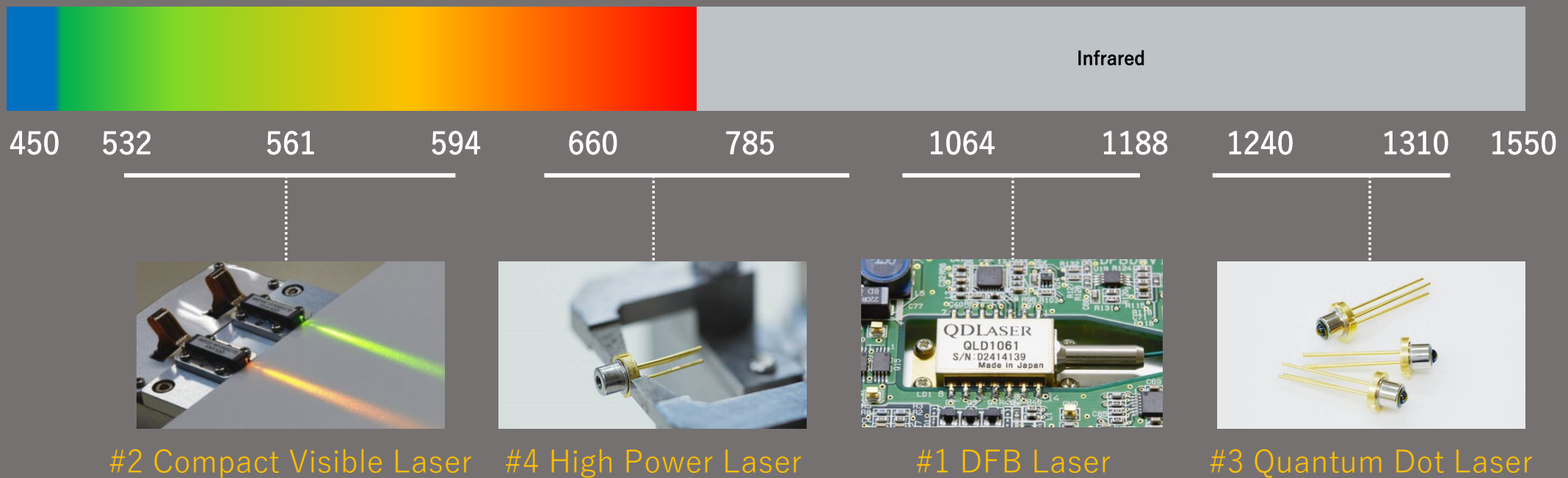
02

 QD LASER

Semiconductor Laser Devices

Variations on semiconductor lasers developed and sold by QD Laser

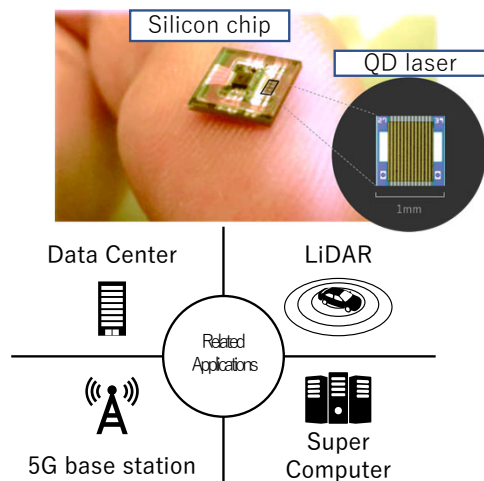
QD Laser provides a wide range of semiconductor lasers with wavelengths suitable for each application



Laser Devices based on Our Core Technology

Evolution of Silicon Circuit

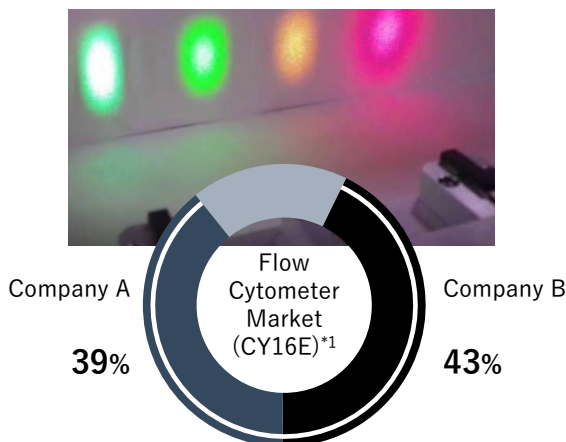
- Silicon electronic and optical Integrated circuit is now a reality owing to quantum dot lasers with stable performance even in high temperatures over 100 °C.
- See a photo of a commercialized fingertip-sized silicon chip as 100Gbps optical transceiver with quantum dot lasers as light sources.



- Cumulative sales of quantum-dot lasers for silicon photonics chips:
- approx. **15,600 units**^{*2}

Evolution of Sensing

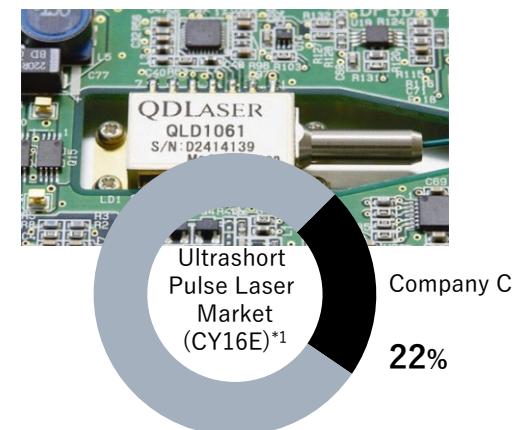
- Unique lasers with various wavelengths are applied to a variety of technologies such as biosensing equipment (flow cytometers, etc.) machine vision, and facial recognition, etc.



- A certified supplier for Top 2 companies that occupy **82.7%** of Flow Cytometer **Global Market** (JPY 77 bn^{*1} / approx. USD 73mn)
- Cumulative sales of laser devices for bioinstrumentation such as flow cytometers: approx. **4,700 units**^{*3}

Evolution of Laser Processing

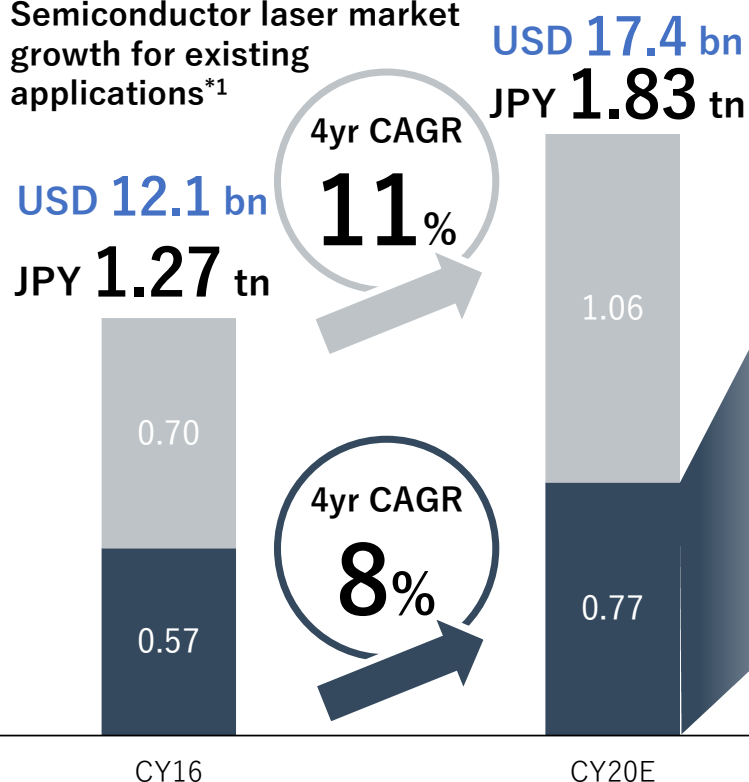
- Ultrashort pulse (10 ps) lasers enable unheated high-precision processing
- Currently used to process smartphone electronic circuit boards



- A certified supplier for the second largest company that occupies **22.4%** of Ultrashort Pulse Laser **Global Market** (JPY 46.6 bn^{*1} / approx. USD 424mn)
- Expanding into Airplane LiDAR
- Cumulative sales of ultrashort pulse laser devices: approx. **8,500 units**^{*4}

The Semiconductor Laser Market Continues to Expand, Even for Existing Applications Alone Achieved 20% Increase of the Certification Number (Customer X Product) in FY2021 from 47 to 57

Semiconductor laser market
growth for existing
applications*1



New target market of QDLaser via new product development

Quantum-Dot Laser in Silicon Circuit :

- Interconnect(368M\$) : Data centers, 5 G base stations, HPC, Automobiles
- LiDAR(28M\$) : Robotics, Drone, Security, and Self-driving cars

Laser Processing & Measurements

- Fiber lasers for micromachining(11M\$) : Composite electronic circuit boards, glass, ceramics, semiconductors, etc.
- LiDAR(3M\$) : Aircrafts, meteorological and terrain observation

Sensing

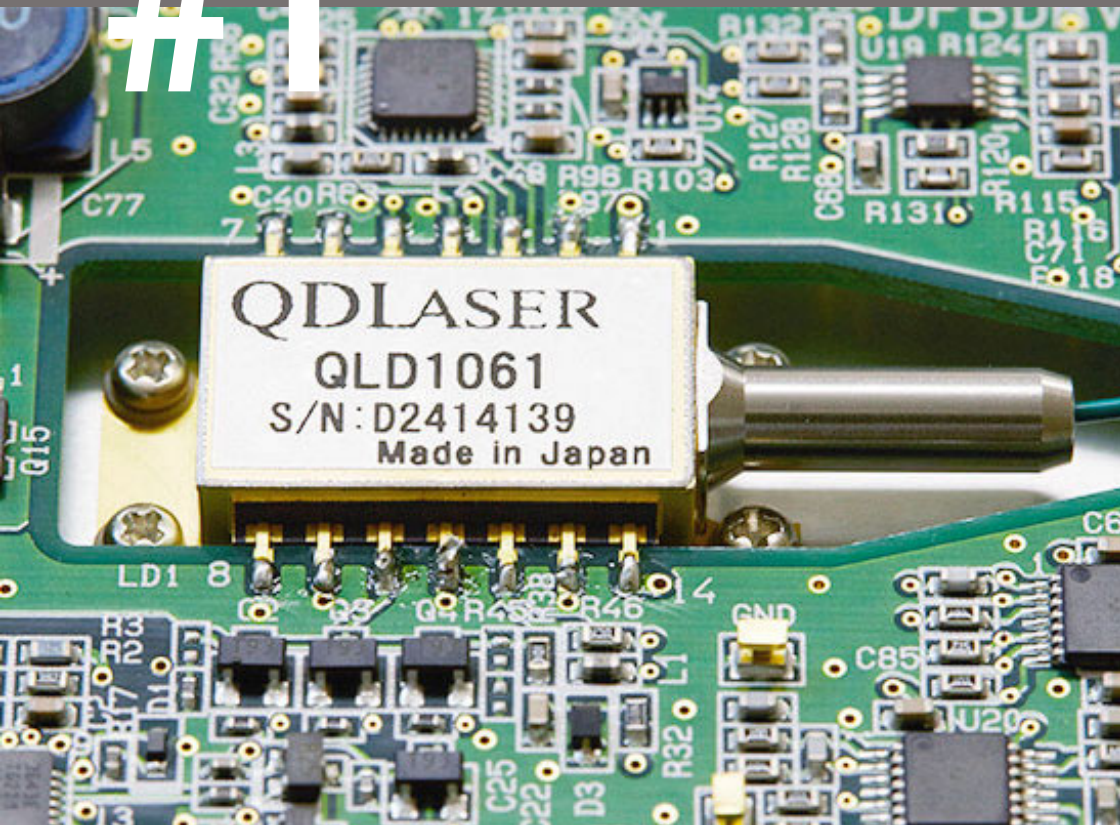
- Biosensing(64M\$): Flow cytometer, cell sorter, and various microscopes
- Ubiquitous sensor(339M\$): train, automatic transport device, level sensor, particle counter

* Numbers are our accessible market forecast in FY2025

Measures to achieve 20% increase of Certification Number

- New product development based on industry trends and market analysis
- Device customization for adding value to customer products
- Proposal activities to customers based on market trends and needs
- Issuance of White Paper on new product/technology development

#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.

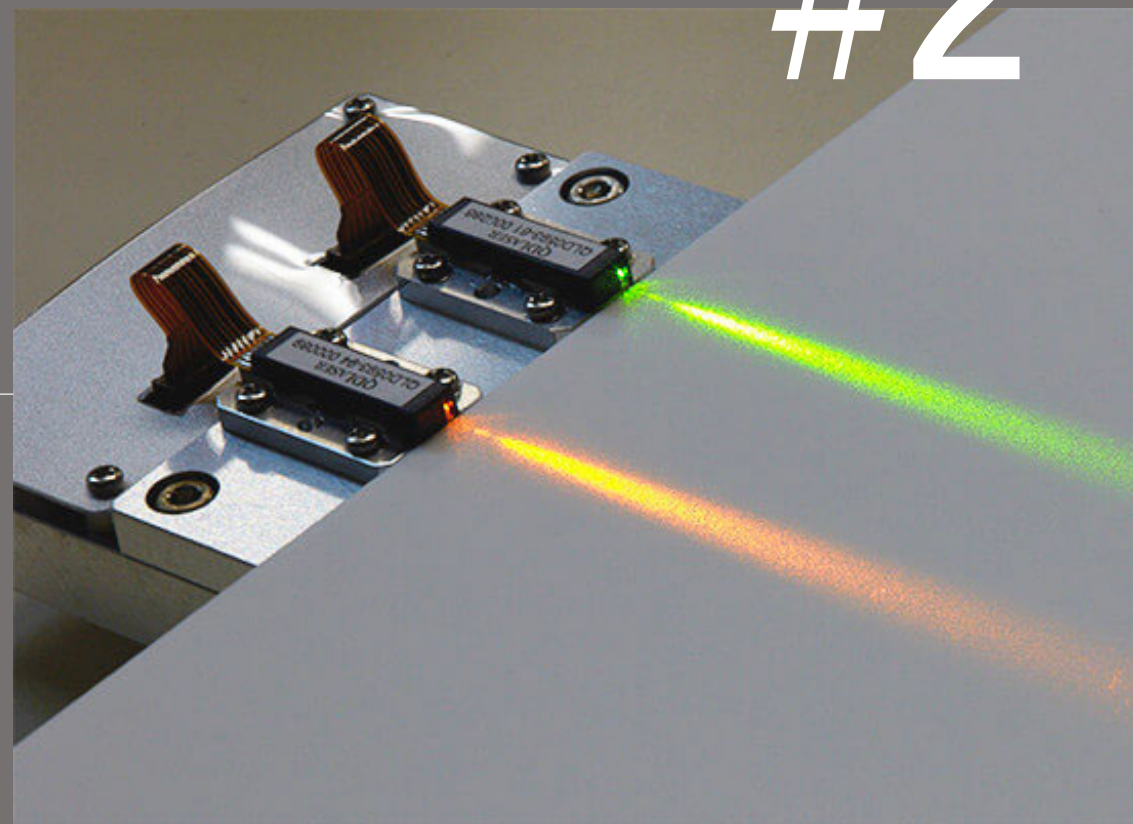
Compact Visible Laser Small Multi-Color Laser Light Source

- 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**.



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

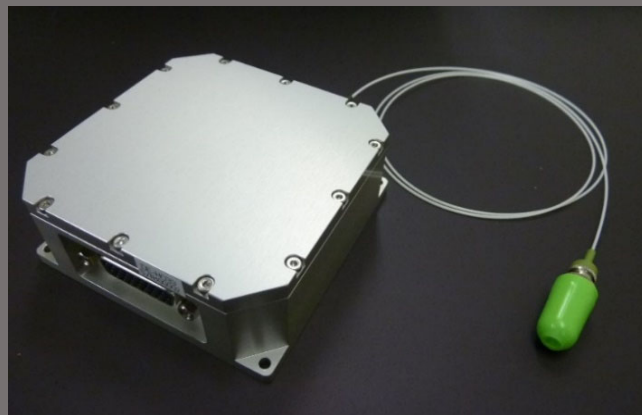
High value-added solution for biomedical equipment *1

- 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.

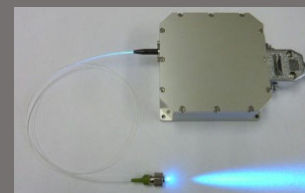
Compact Visible Lasers



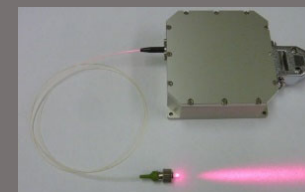
Integrated
into



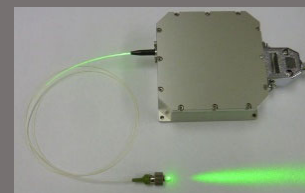
**Palm-Sized Multi-color
Compact Laser Light Source
(80 x 80 x t30mm)**



488nm



660nm



561nm



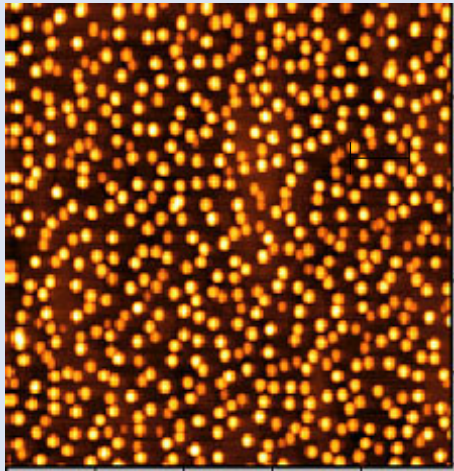
785nm

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

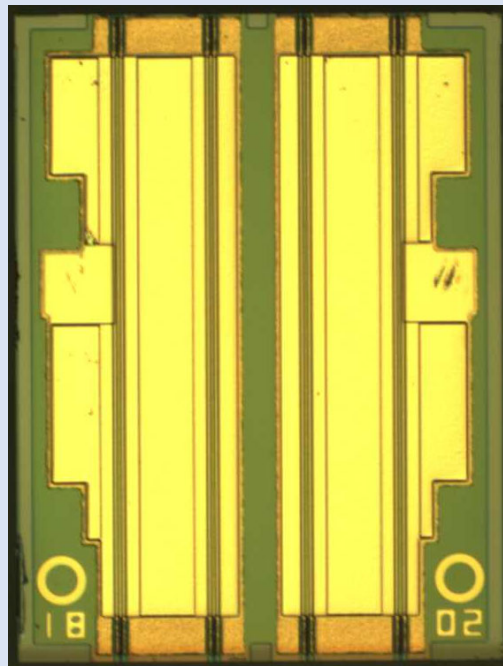
*2: The total volume of the driver integrated light sources is less than 50% of other company's products.

*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)

#3



100 nm



Quantum-dot laser

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

Mass-produced by our world's only technology.

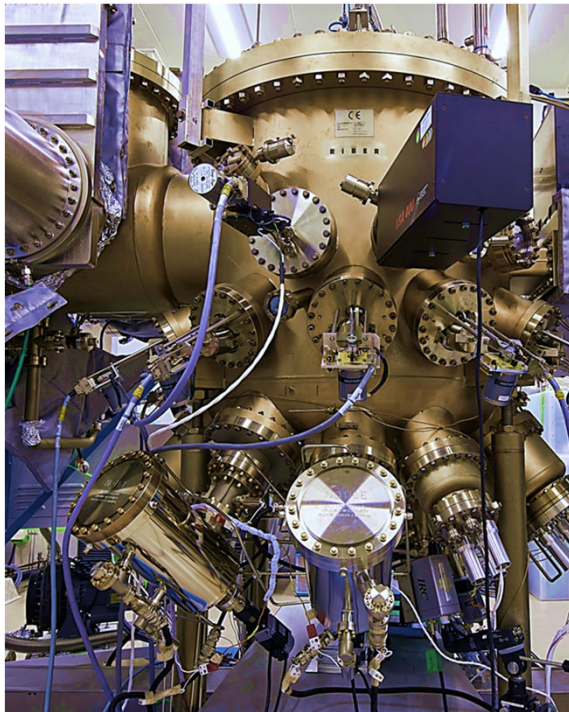
Achieved the **world's highest operating temperature** with excellent temperature stability at 1300nm.

- 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.

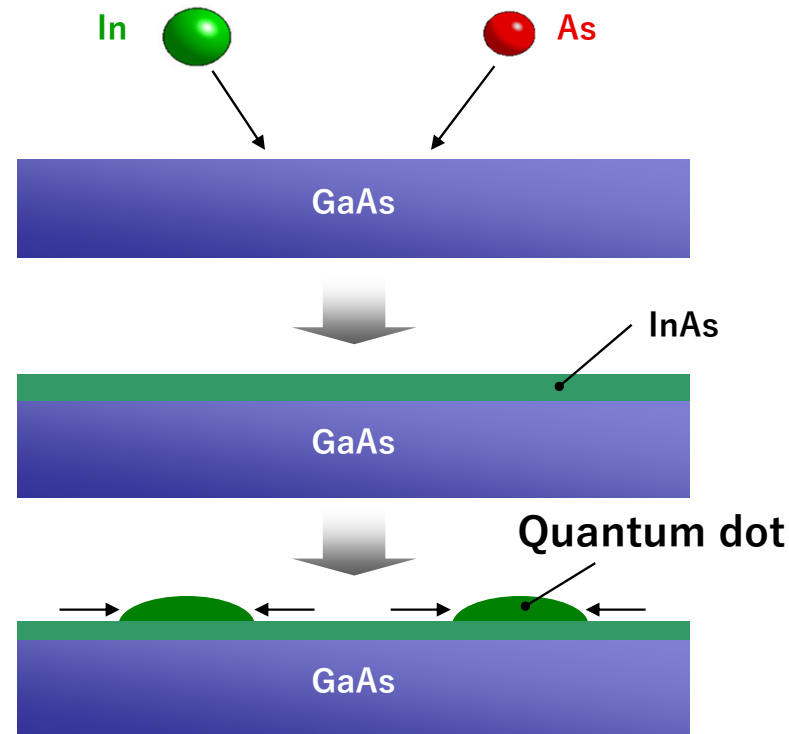
QDLaser's World Only-One Mass-Production Technology of Quantum Dot Lasers

- 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)

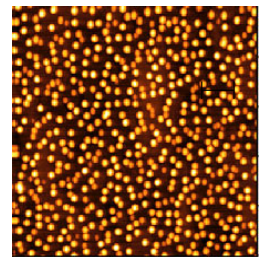
Mass production MBE system



Growth sequence of quantum dots (illustration of side view)



Atomic force microscope (top view) of quantum dots



100 nm

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

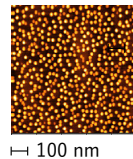
Customizing quantum dot lasers for Japan/US/EU silicon photonics vendors.

Starting mass production in FY2021-2023.

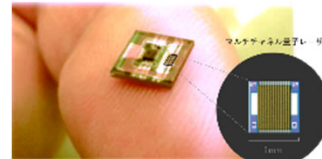
Development and production

- 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 during FY2021 to FY2023.

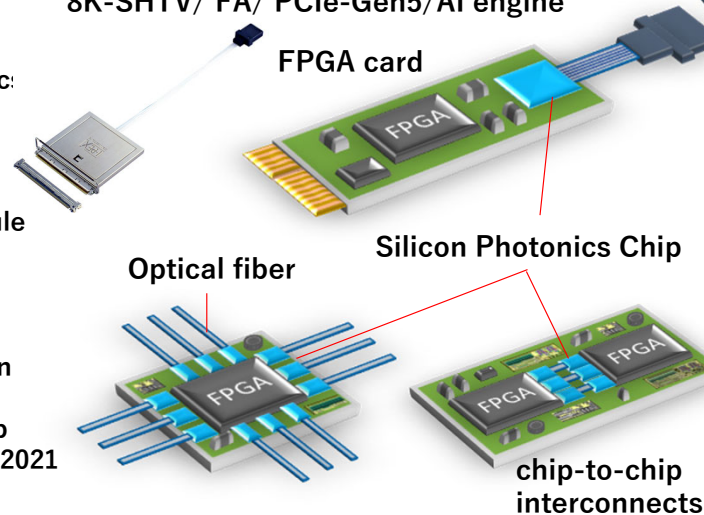
Quantum Dots



100Gbps optical transceiver with quantum dot lasers as light sources

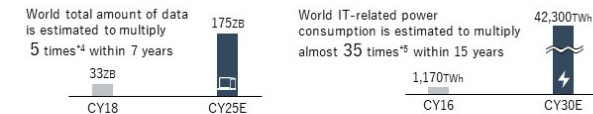


Optical Connector(EOM^{*1},CPO^{*2}) : 8K-SHTV/ FA/ PCIe-Gen5/AI engine



Increased data and power consumption to be solved by Silicon Photonics

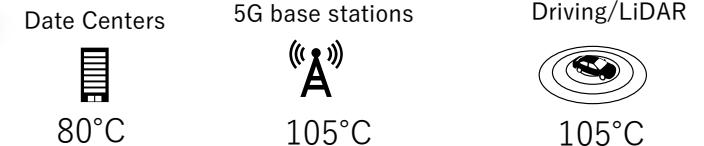
Problem Increasing demand for global data in turn creates a global issue of increasing power consumption



Solution Silicon photonics with quantum dot lasers mounted on silicon chips enable dramatic improvement in semiconductor performance^{*6}

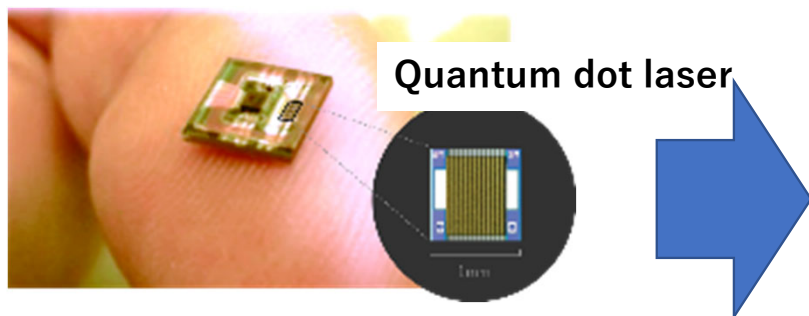


Huge information processing application that requires high-temperature operation

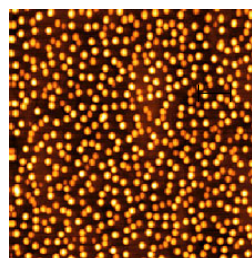


I/O core with Quantum-Dot Lasers Ready for Commercialization

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

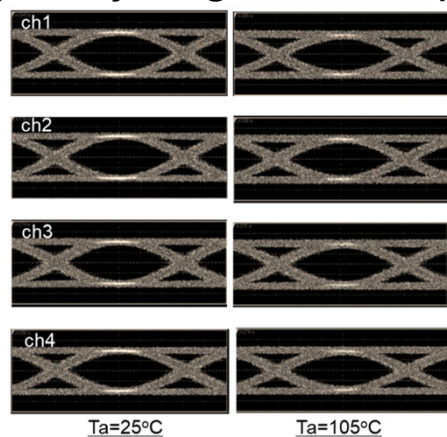


Quantum dots



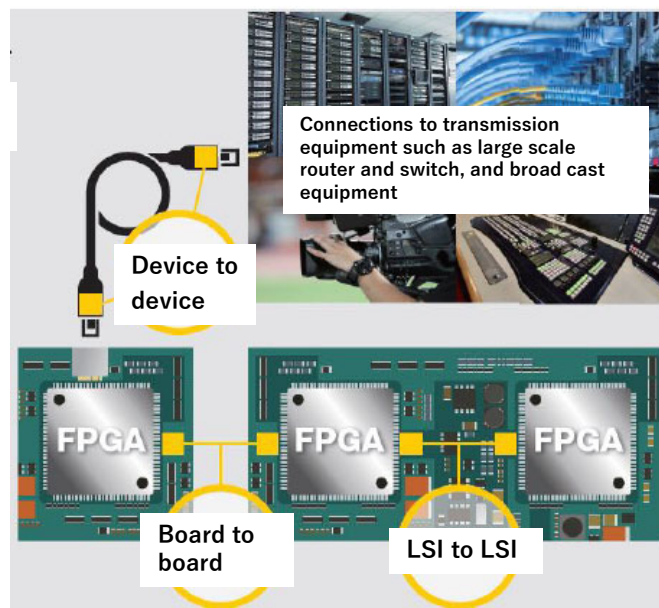
100 nm

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™



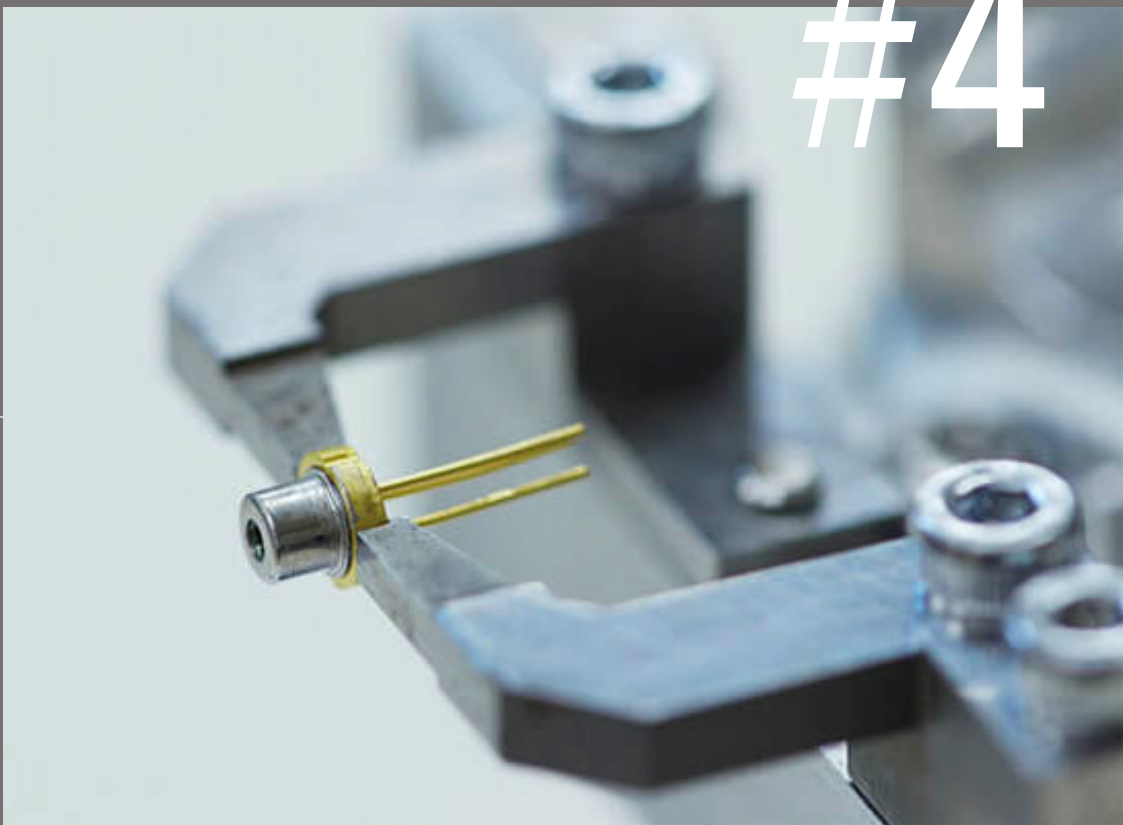
High Power FP Laser

- 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.



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

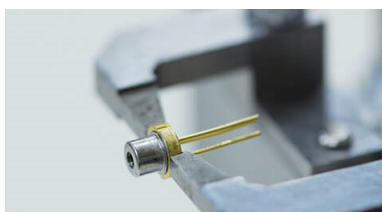
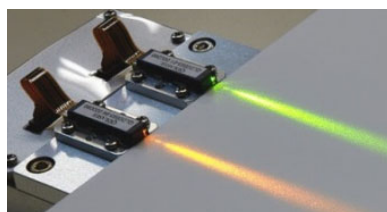
Compact visible lasers

High power laser

DFB laser

Quantum dot laser

Products



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



Semiconductor Laser Devices

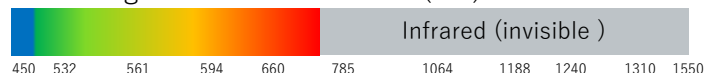
Our Competitive Advantages / Barriers to Entry

Business Model

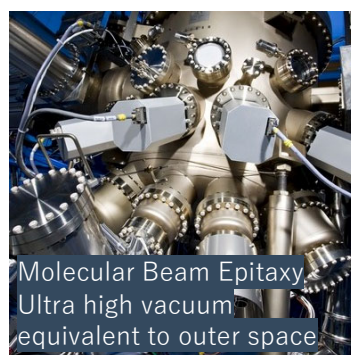
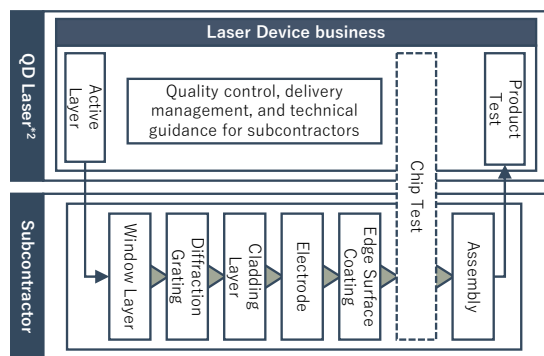
- **The only fabless company in the semiconductor laser industry**
 - Flexible manufacturing scale of several units to tens of millions units
 - High marginal profit ratio of over 45% on average*¹ (made fixed costs into variable costs)
 - Mass production and diverse product offering lead to beyond breakeven point

- **Any wavelengths of lasers**

Wavelengths of lasers we offer (nm)

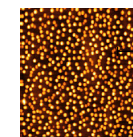


- **High level of freedom in creating new business, fields and products**



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

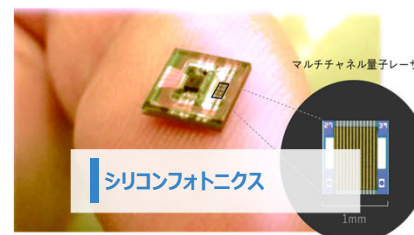
image of quantum dot by atomic force microscope

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

- Optoelectronic integrated circuit
- In-vehicle devices

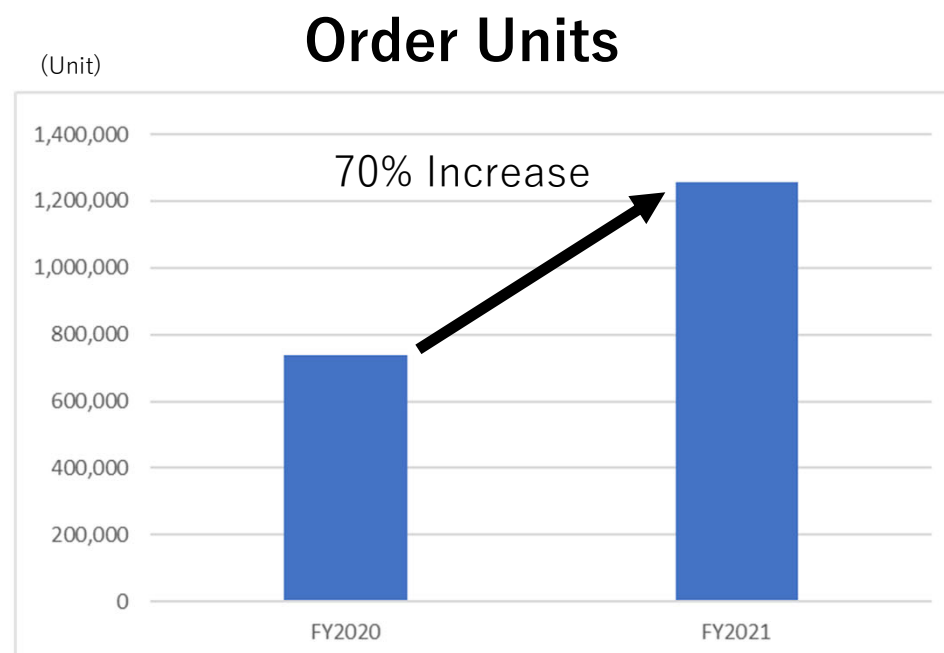
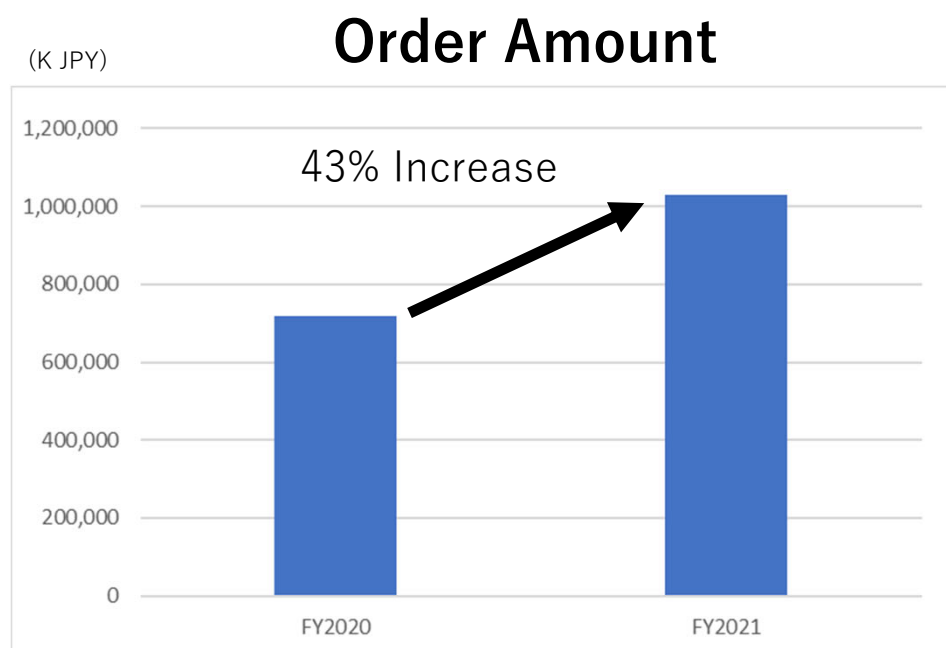
- **New potential market created by quantum dot lasers**

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



Orders in Laser Device Division for this term

Order amount increased by 43%, and order units increased by 70% from the previous year. Solid orders for DFB Lasers, Compact Visible Lasers and High-Power Lasers due to increased customer capital investment.



03



QD LASER

Laser Retinal Projection

Vision and Technology

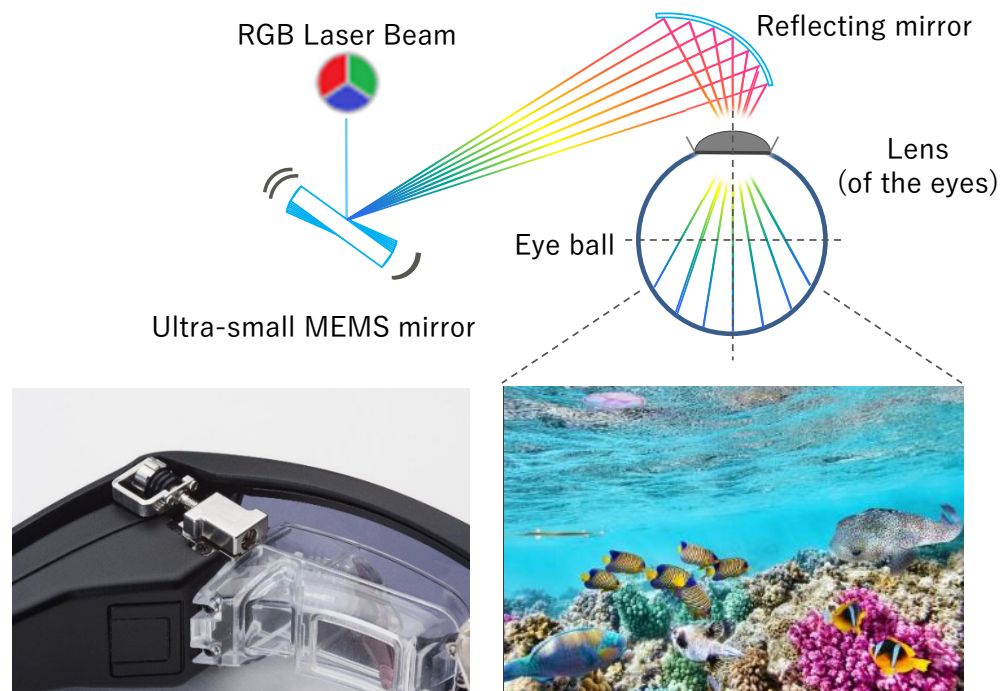
Humans perceive **83%**^{*1} of information through vision.

Since the invention of glasses in the 13th century, sight correction^{*2} technology has not evolved.

*1: Educational Equipment Editorial Committee, JUSE Press, Ltd. "Industrial Education Equipment System Handbook" (1972). "Taste 1.0%, Tactile 1.5%, Olfaction 3.5%, Hearing 11.0%, Visual 83.0%"
*2: Including eye glasses and contact lens

VISIRIUM TECHNOLOGY®

Unique Laser Technology bringing Innovation to Vision

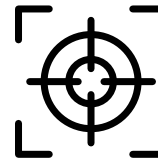


Direct Image Projection onto Retina



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

Three Areas based on Retinal Projection Technology

Transforms
“hard to see”
to “visible”

Low Vision Aid

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Strengthening Alliance

World's First Laser Retinal Projection Eyewear "RETISSA® Series"



 QD LASER

World's First Laser Retinal Projection Eyewear

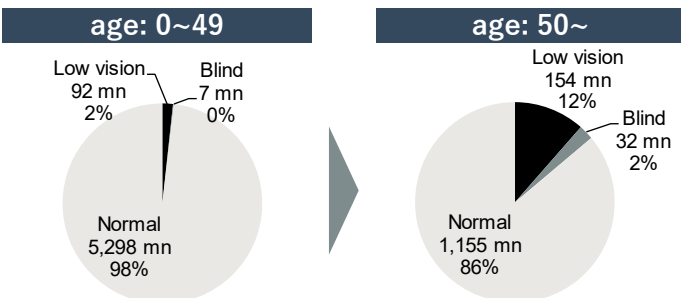
In the Low Vision Aid Space where Innovation has been Minimal, Laser Technology makes a Breakthrough

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



“Papa, you have grown old, I can see the wrinkles on your forehead.”^{*2}

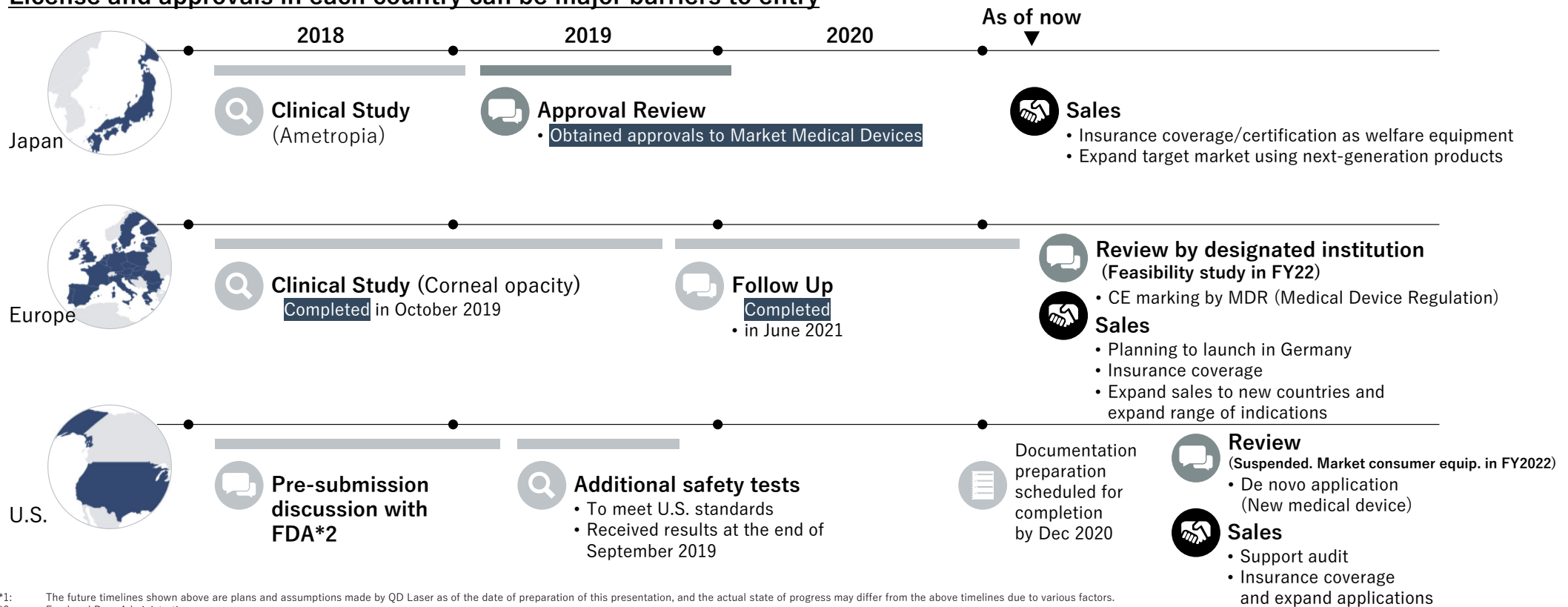


Marketing License Status for Medical Devices

Japan: Medical device manufacturing and sales approval acquired. Sales started.

Europe: Clinical trial follow-up completed in June ⇒ Confirmed long-term safety.

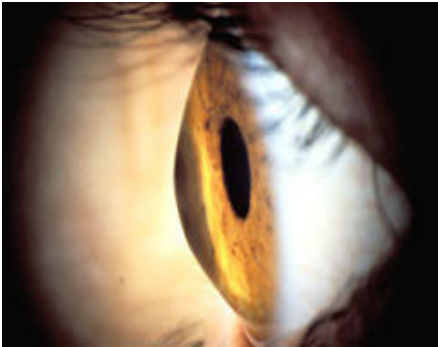
License and approvals in each country can be major barriers to entry



*1: The future timelines shown above are plans and assumptions made by QD Laser as of the date of preparation of this presentation, and the actual state of progress may differ from the above timelines due to various factors.
 *2: Food and Drug Administration

Medical Regulatory Affairs: Completed Clinical Study in Japan and EU

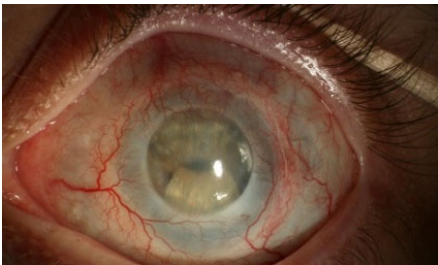
JAPAN



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

- Accessory camera connected to the frame for enhanced functionality
- Proposals of use cases for companies
- Overseas sales, including US, China, and South Korea.
- Under the development of Display 3 to reduce the size, weight, operability, and price.

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.

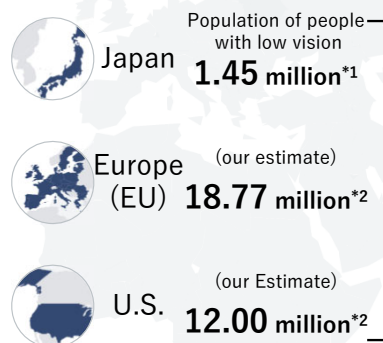
Low Vision Aids: Total Addressable Market

(※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

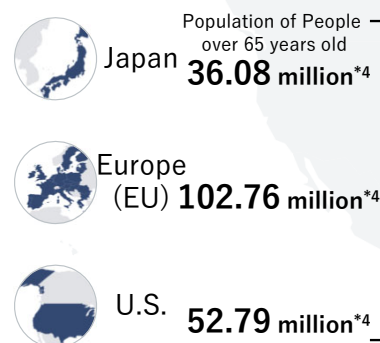


Estimated percentage of applicability (our estimate)^{*3} × **11%** × Product Price per Unit (our assumption)^{*6} × **JPY 200k (USD 1.9k)**

Total market size of advanced countries (Our estimate)

JPY 708.7 bn
(USD 6.7 bn)

Senior Citizens Market



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.

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

Laser Retinal Projection Competitive Advantages/Barriers to Entry



First to commercialize laser retinal projection technology globally

- Owing to cultivated and commercialized laser and optical technology
- At present, we recognize there are no other companies in the world which have succeeded in commercializing the same level of retinal projection



Patent strategy

- By applying for various essential patents like basic / improvement patents, employing essential patent portfolio and top niche strategy^{*1}
- Compared to competitors, maintain advantage in terms of intellectual property
 - Applied for basic patents related to core optics and improvement patents for improved imaging quality and mounting operability
 - Completed competitive patent landscape analysis
 - Applied for 44 in-house patents (applied by 9th Mar 2020)
 - 21 patents registered including 6 essential patents^{*2} (in-house evaluation, registered by 17th Feb 2020)
 - About 2,300^{*3} related patents held by other companies registered by end of March 2020, among which none have been identified as barriers within the markets our products launch (in-house evaluation)



Obtained a variety of licenses such as approval to market medical devices

- In order to sell medical devices, necessary to obtain licenses or approvals from authorities of each country
- We have already obtained approval to market medical devices in Japan and are currently in the process of applying for approvals in the EU and the US. We estimate it will take at least several years for new entrants to complete these processes.

^{*1}: "Essential Patent" Portfolio Strategy: Strategy whereby a company holds several "essential patents" which will limit competitors entering the market. This will make it possible for the company to continue its business through cross-licensing even if a competitor files for patent infringement against the company

"Essential patent" is a technology that has been adopted as an official standard in a certain product / technical field (here, laser retinal projection technology) , a technology that has become a so-called de facto standard or an already patented one that has been actually implemented by a competitor

^{*2}: "Top of Niche" Strategy: Strategy which excludes competitors from entering market by holding core patents and any improvement patents relating to a particular product

^{*3}: Obtained patents which we regard as highly demanded and difficult to avoid for other companies

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.

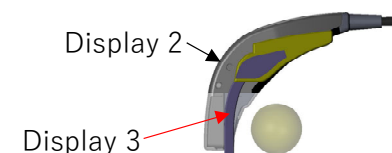
Medical



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

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

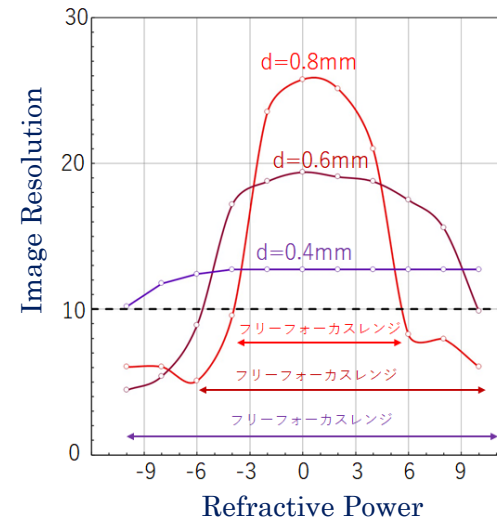
IEC 62906-5-5:2022

- 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.

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

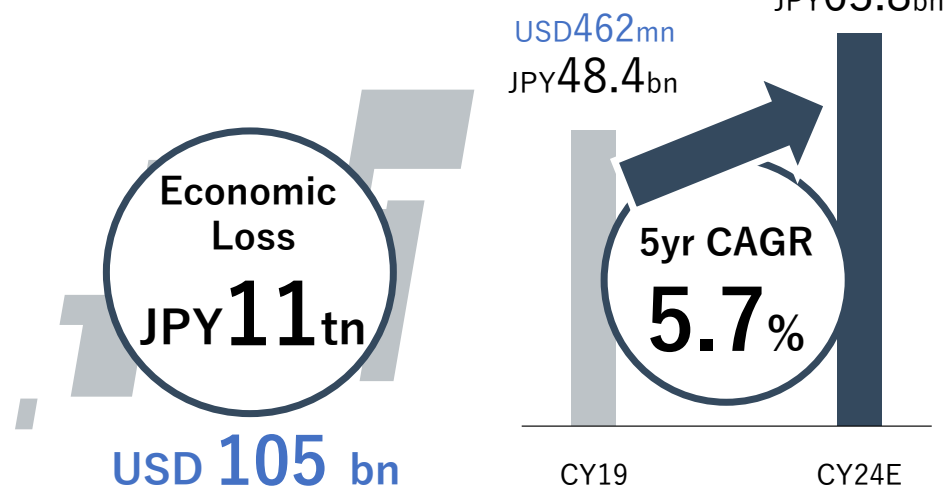
Strengthening Alliance

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



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

New optometry equipment

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



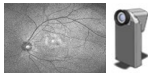


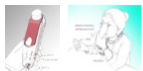

Enables an environment where anyone can easily examine their eyes, increasing the early detection rate of glaucoma and expecting to extend the healthy lifespan of the eye

*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.

High Feasibility

Utilizing Technology and Know-how Acquired through R&D,
Co-Develop and Commercialize New Products
Conducting Principle Verification and Prototype Building with Partners



Product	Overview	Co-development Partner(s)
Fundus Photography Equipment 	<ul style="list-style-type: none"> A device to examine the optic nerve, retina, blood vessels, etc. in the fundus of the eye to detect various eye diseases such as diabetic retinopathy and glaucoma. 	<ul style="list-style-type: none"> Medical device manufacturers around the world Major eyeglasses chain in Japan
Perimeter 	<ul style="list-style-type: none"> Portable and handy perimetry device for self-checking visual field and acuity. 	<ul style="list-style-type: none"> Medical device manufacturers around the world Major ophthalmic pharmaceutical company in Japan
Ophthalmic Refractometer 	<ul style="list-style-type: none"> Next-generation measuring equipment that allow customers to perform subjective and objective refraction tests 	<ul style="list-style-type: none"> Major eye glasses chain in Japan Major supplement maker
Fundus Trainer 	<ul style="list-style-type: none"> Vision healthcare equipment aimed at allowing one to self-examine their own visual field, acquiring sports vision and improving vision. 	<ul style="list-style-type: none"> Healthcare equipment manufacturer
Visibility Simulation System 	<ul style="list-style-type: none"> A system allowing you; <ul style="list-style-type: none"> to see your self wearing an eyeglass frame through AR when considering which one to buy to see, through a simulation, how a pair of glasses would look on you depending on the prescription strength and lens grade 	<ul style="list-style-type: none"> Major eye glasses chain in Japan

Estimated Markets Size of Conventional Optometry Equipment

JPY **52.0** bn^{*1}
(USD **496** mn^{*1})

JPY **12.1** bn^{*2}
(USD **115** mn^{*2})

JPY **17.4** bn^{*3}
(USD **165** mn^{*3})

↑ Estimated market size of current competitors' products belonging to each category

- Similar equipment does not exist
- Expect widespread adoption like Weight scale or blood pressure monitor
- Similar equipment does not exist
- Will be promoted through partnership with eyeglass stores

*1: AnalystView Market Insights (2020) "Fundus Camera Market, By Product, By End-use and By Geography - Analysis, Share, Trends, Size, & Forecast From 2020 - 2026"

*2: Perimeter: Our analysis and estimates based on Perimeter Instrument" portion in Japan Ophthalmic Instruments Association 2020 Annual Report

*3: Perimeter: Our analysis and estimates based on numbers from "Refraction adjustment visual function test instrument" portion of Japan Ophthalmic Instruments Association's "2020 Annual Report"

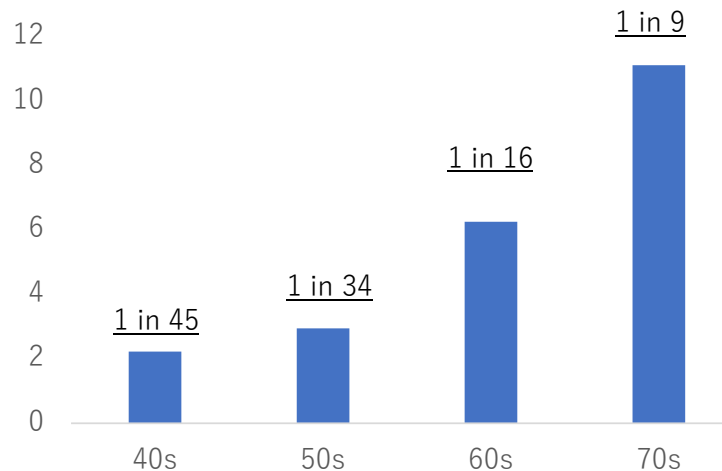
Problem: Unrecognized symptoms

While the risk of blindness is expected to increase in the aging society, Glaucoma, the number one cause of blindness in JAPAN, can hardly be self-recognized.

People who are not aware of their glaucoma

90%

Glaucoma prevalence



World blindness and severe myopia risk population in 2050 * 1

1 billion people

2030 visual impairment costs in Japan

1.1 trillion yen

Solution

World's only laser retinal projection technology and optimized algorithm enables you to scan retinal conditions in a short time by yourself without opening your pupils with mydriatics

1: Promote awareness

2: Less burden on the subject

3. Inspection anywhere



No medicine,
Self-check



Less time



Portable size

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.

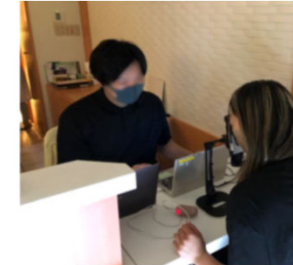
■ Cognitive Function Degradation

- Aging
- Dementia
- Fatigue, Stress
- Alcohol

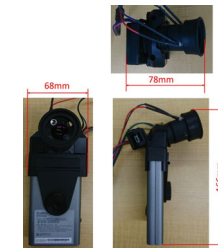
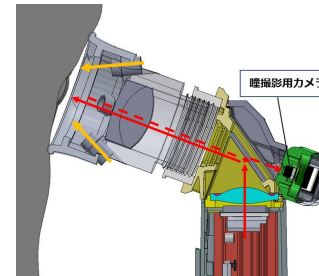
■ Cardiovascular Diseases

- Disease
- Diabetes
- Stroke
- Heart attack

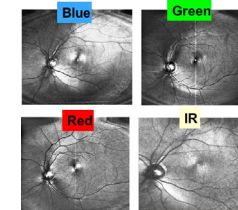
1st generation: Simple perimeter to be commercialized in FY2022, screening eye diseases in 1 minute.



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



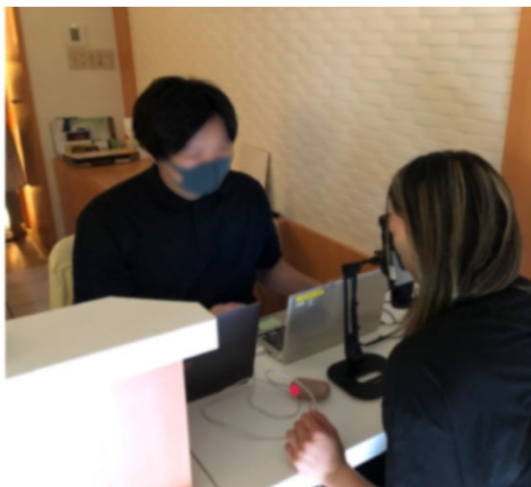
3rd generation: Ultra-compact fundus photography device. Hardware medical equipment.



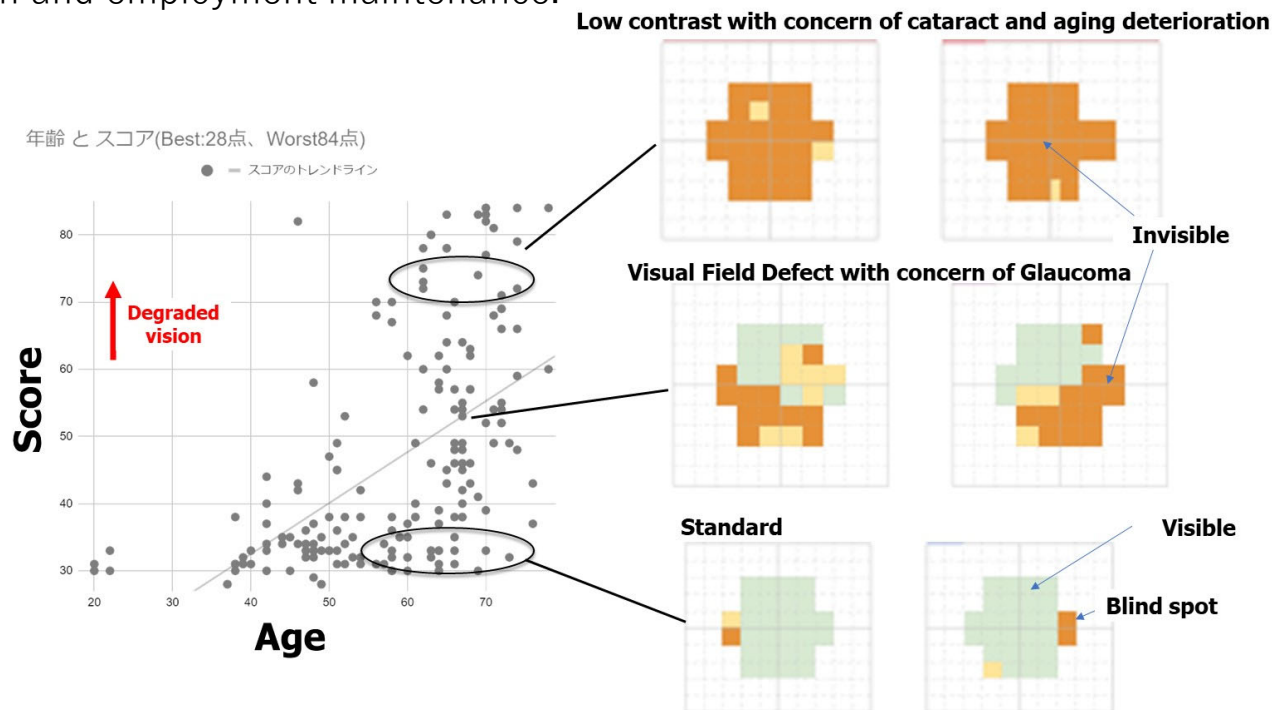
Results of the visual field test of 97 drivers of a taxi company

- 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

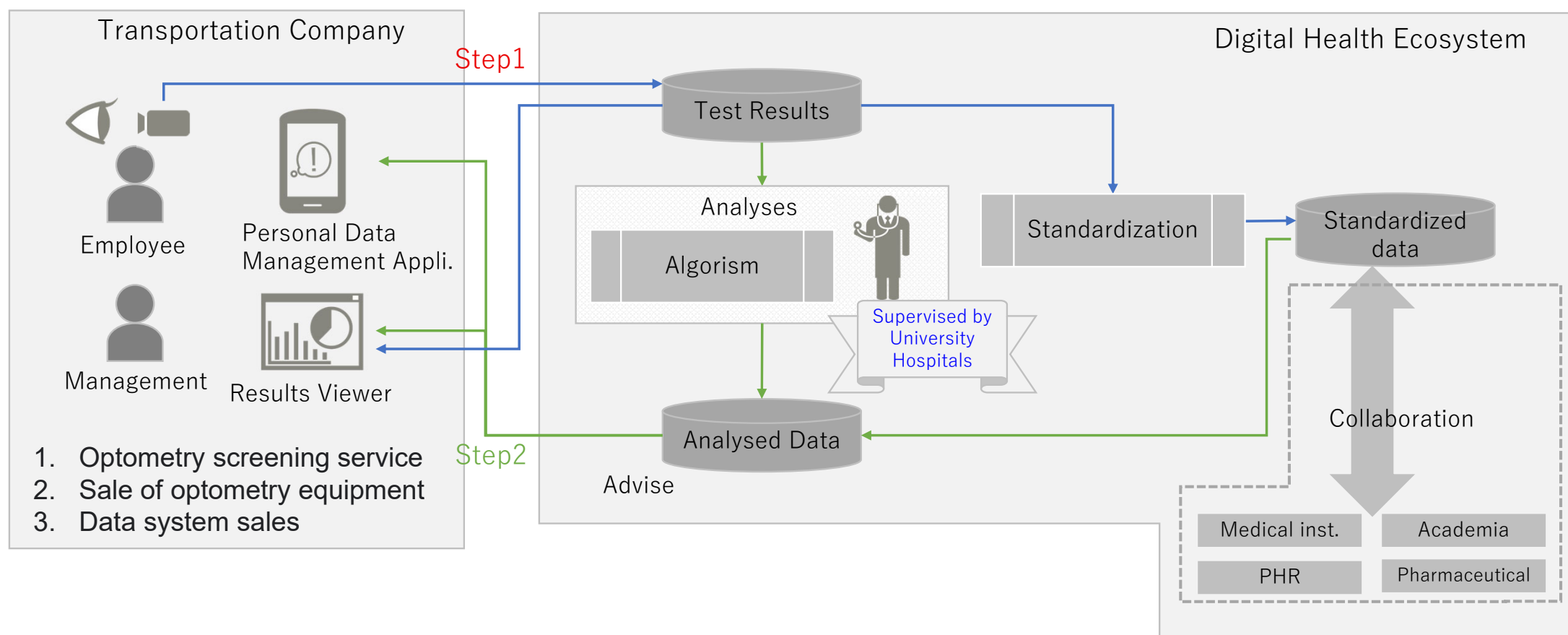


QDLaser is conducting medical research for people based on the Ministry of Health, Labor, and Welfare guidelines.



Service System Image

Starting introduction to companies with commercial drivers

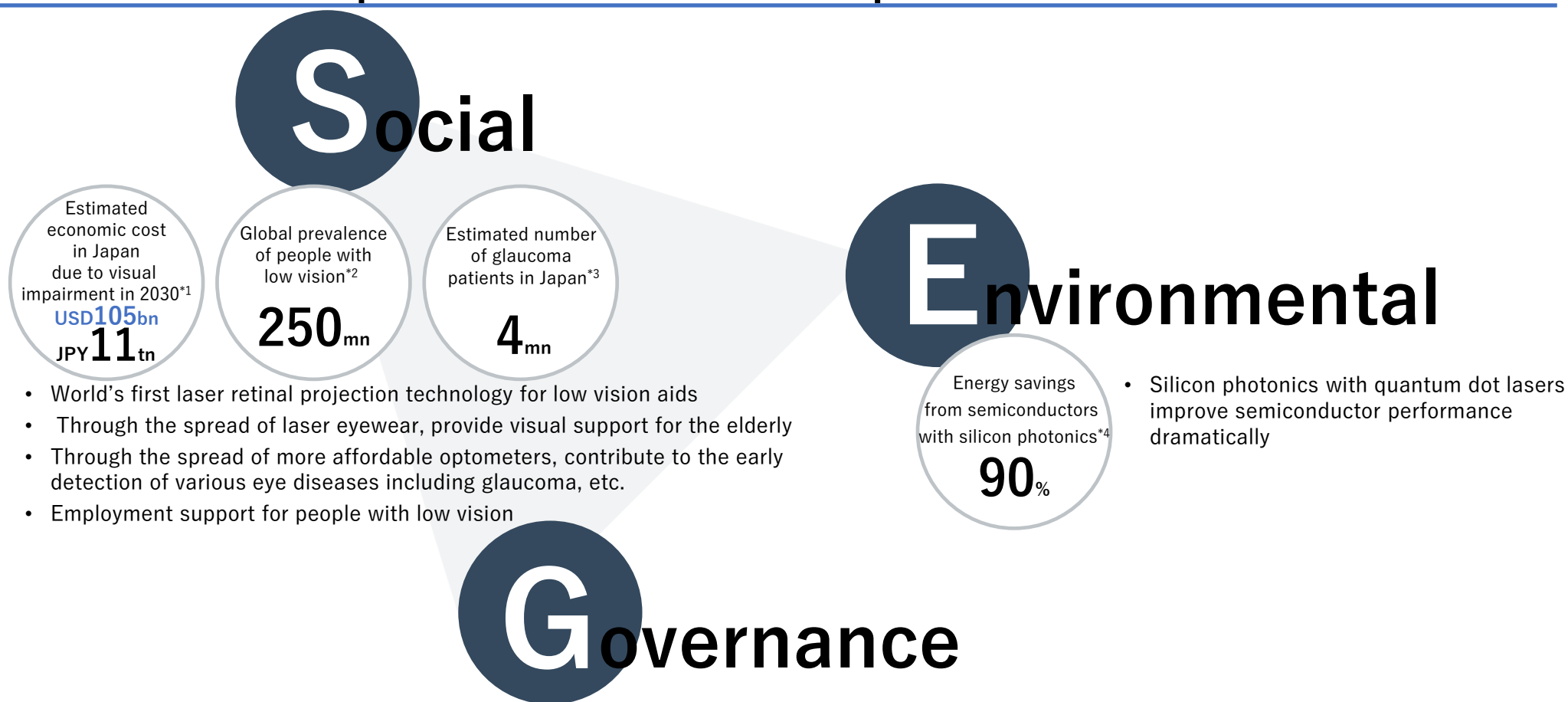


04

 QD LASER

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"

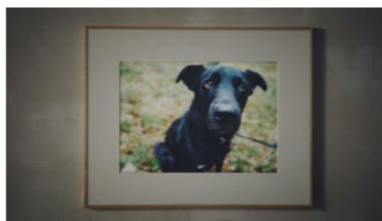
With My Eyes project

#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



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

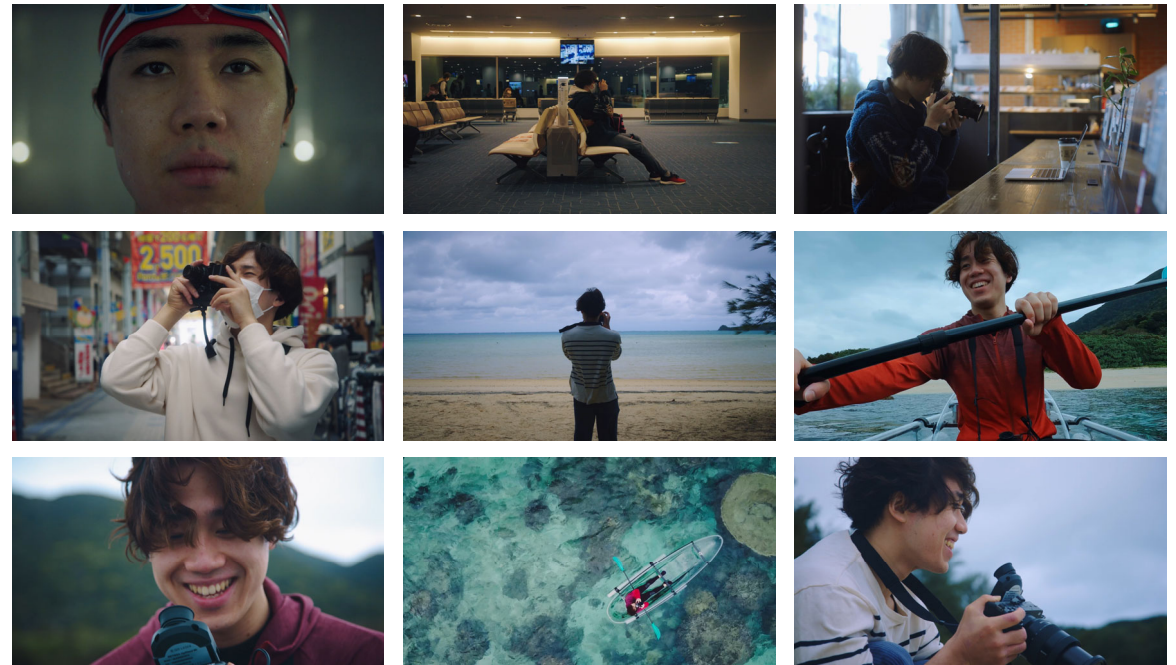
Retissa Super Capture

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



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."

■Scenes from the Movie



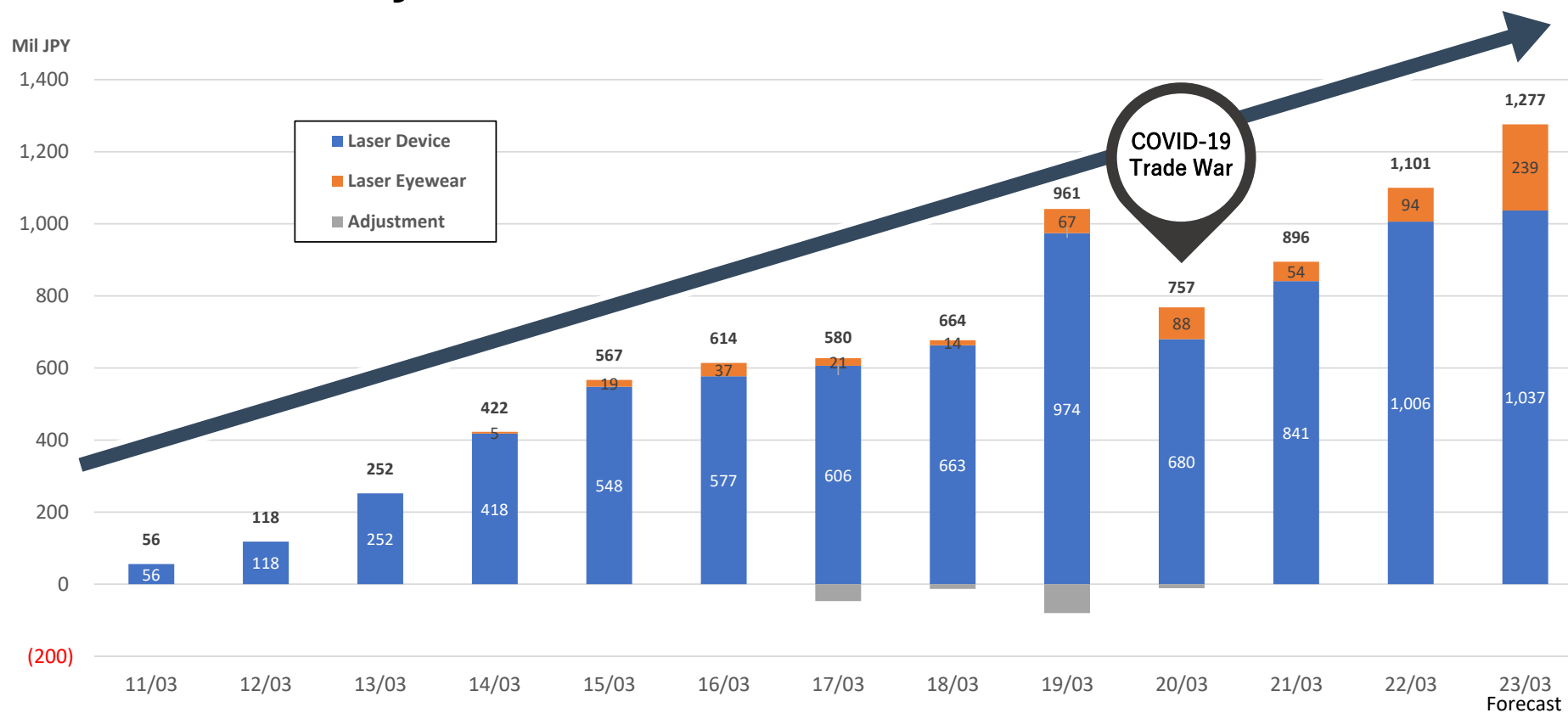


Financial Highlights

Sales Trend

Continuous growth for over ten years

Exceed one billion yen for the first time in 2022/3



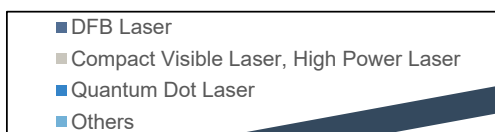
Laser Device Division Sales Trend

Under the expansion of the global laser market, record-high sales forecast for this term.

12yrs CAGR*1

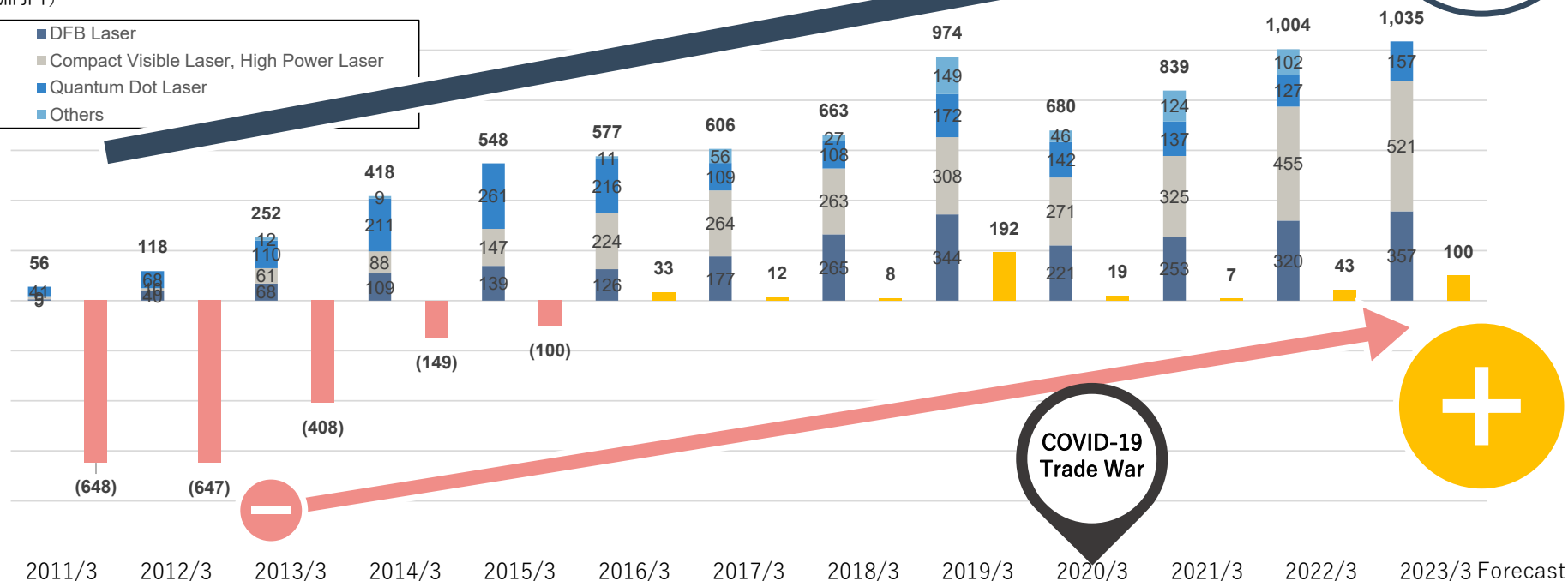
27%

(Mil JPY)



Revenue

Operating Profit

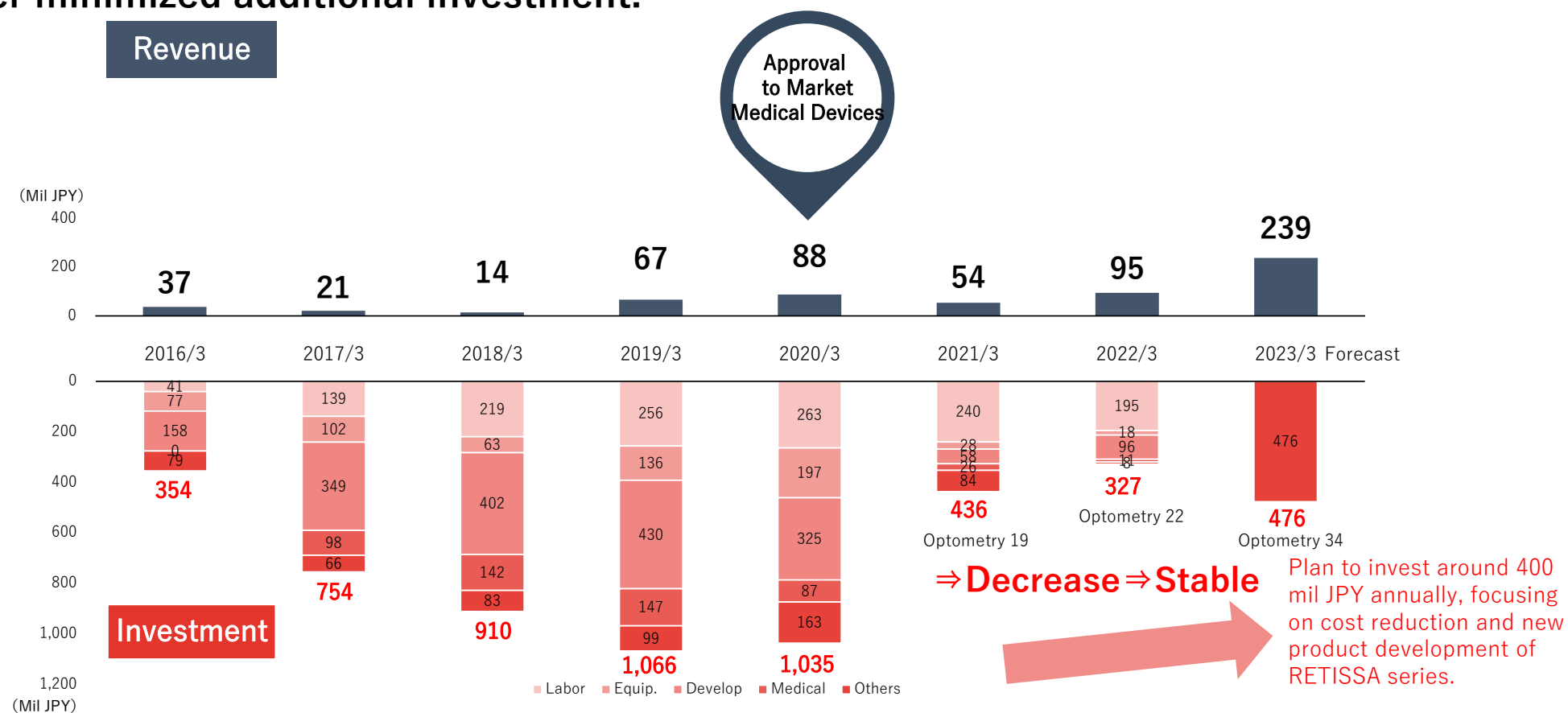


	2011/3	2012/3	2013/3	2014/3	2015/3	2016/3	2017/3	2018/3	2019/3	2020/3	2021/3	2022/3	2023/3 Forecast
Sales of Segment	56	118	252	418	548	577	606	663	974	680	841	1,004	1,035
Adjustment	0	0	0	0	0	0	(47)	(13)	(80)	(11)	0	0	0
Sales of Segment after Adjustment	56	118	252	418	548	577	559	650	894	669	841	1,004	1,035

*1: Compound annual growth rate in segment sales after internal adjustment.

Laser Retinal Projection: Profit Structure

Shifting from R & D to the recovery phase. Aim to establish an "Optometry" business under minimized additional investment.



Business plan achievement status

Sales increase and loss worsen both compared to the plan and the previous year




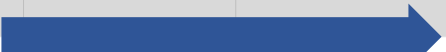
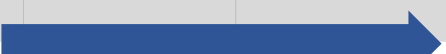
Compared to the plan, sales were + 0.4% and operating income deteriorated by 382 million yen due to an inventory valuation loss of 408 million yen in the LEW business. Sales increased by 23% in both businesses and profits increased in the LD business compared to the previous year, while inventory valuation loss was recorded in the LEW business, and the total operating loss deteriorated by 276 million yen from the previous year. In addition, since the sales activities of the LEW business were affected by the restrictions on the behavior of each country due to the prolonged spread of COVID-19, business plan was revised on February 10, 2022^{*4} from the initial plan (announced on May 13, 2021).

(Mil JPY)	FY2021 Result	FY2021 Plan ^{*1}	Result vs Plan	FY2020 Result	YOY	FY2021 Plan(2) ^{*2}
Sales	1,101	1,097	+0% (+ 4)	895	+23% (+ 205)	1,260
(LD)	1,006	1,003	+0%	841	+20%	1,076
(LEW)	94	93	+1%	54	+75%	183
Operating Profit or Loss(△)	△ 931	△549	△382	△654	△276	△533
(LD)	43	37	+6	7	+35	+32
(LEW)	△ 693	△304	△388	△434	△259	△320

Allocation plan for raised funds

Main uses of IPO funding and stock acquisition rights financing

- (1). Production costs of Laser Eyewear
- (2). Increased production capacity of Laser Device business and capital and business alliance costs

Item	Financing amt ^{*1} (Used amt) ^{*2}	FY2021	FY2022	After FY2023
Production costs of Laser Eyewear	2,926			
	(257)			
Productive capacity reinforcement of Laser Device	3,000			
	(0)			
Labor Costs	320			
	(0)			
Advertising expenses	80			
	(0)			
M&A, capital and business alliance investment	1,606			
	(0)			
Total	7,932			
	(257)			

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 2023-24

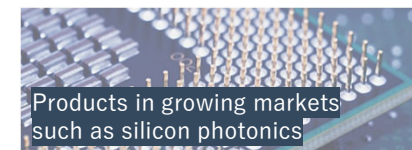
IPO

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 EU. Mass production is to start n FY 2023 in order.



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

Future

Appendix

 QD LASER

Management Profiles



President and CEO
Mitsuru Sugawara

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



Director and CFO

Shinji Konoya

- 1991: Joined Fujitsu Ltd.
- 2015: Assumed the role of Senior Manager of the Business Strategy Department, Fujitsu, Ltd. and General Manager of Corporate Planning at QD Laser, Inc. (current role)
- 2016: Assumed the role of Director and CFO and concurrently serves as General Manager of Corporate Planning at QD Laser (current role)



Outside Director

Tsutomu Yoshida

- 1980: Joined Mitsui & Co., Ltd.
- 2013: Assumed the role of Director of QD Laser (current role)
- 2022: Assumed the role of Director, Corporate Development Department, at Mitsubishi Chemical Holdings Corporation (current role)



Outside Director

Kaoru Hatano

- 2001: Joined Semiconductor Energy Laboratory Co., Ltd.
- 2021: Assumed the role of Department of Intellectual Property & New Business Development, at Cardio Intelligence Inc. (current role)
- 2022: Assumed the role of Director of QD Laser (current role)



Technical Advisor

Yasuhiko Arakawa

- Serves as Head of Institute for Nano Quantum Information Electronics, and Director of Center for Photonics Electronics Convergence, Institute of Industrial Science, University of Tokyo
- Notable awards:
 - Reona Esaki Award
 - Prime Minister's Honorary Award for Achievement in Industry-Academia- Governmental collaboration
 - Medal with Purple Ribbon

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%.

Customer Voice

User Experience No. 10

“For the first time I was able to distinguish the edge of objects.”

Name: Mr. Nomura (35 years old)

Occupation: ITAGAKI (Glasses and Hearing Aid Retailer) Products Division

Eye Condition: Congenital Lens Subluxation (Dislocation)

I finally found the image and yelled out “This is awesome. This is really so awesome!” several times over. When I looked at the images of a sea turtle swimming in the ocean and a sea anemone, I could see the outline of their images so clearly.

Up until now, if I looked at a PC, for example, I couldn’t distinguish the edge of the computer screen. When I put on the RETISSA®, for the first time I was able to distinguish the edge of objects.

Rather than a new world, I felt “re-born!” in a sense.

It might be better to describe it as my third eye. Having my vision stabilize and come clear truly moved me and I couldn’t hide my excitement.

For the first time, I saw my CEO’s face. It was the first time I’ve seen the outline of someone’s face. After that, in that same office I recognized the face of my boss. Up to this point, my own face I had only seen very vaguely in the mirror, but with the RETISSA® Display II, I could see it clearly. I thought to myself, “Is that so? I have also aged quite a bit” (laugh).

First of all I would like to say “Thank you for the light. I have seen a new world.”

*1: The interview was held on August 27, 2020.

*2: These are the impressions of the individual. There may be individual differences in vision.

*3: The RETISSA® Display II is not a medical device. It is not intended for use to improve, correct or treat a condition.



Customer Voice

User Experience No.8

The bronze medalist said, “Wow, I haven’t seen things like this for a long time.”

Name: Mr. Sugiuchi (40s)

Career:

- Fujitsu Limited Tokyo Olympic and Paralympic Promotion Headquarters
- Director of Japanese Para-Swimming Federation
- Director of Kanto Swimming Federation for the Disabled
- Athlete Committee of the Japan Swimming Federation

Eye Condition: Retinitis pigmentosa

When I was first passed the device, I was impatient, and put them on immediately, saying, “yes, yes.” The test video had not been prepped, and all I could see was the initial Windows PC screen which blew me away. What I had seen before, I could see so clearly, in a way I hadn’t seen in so long. I thought to myself, “Wow, I haven’t seen things like this for a long time.” It was like the haze cleared, and I felt a crisp feeling as if I had brushed my teeth for the first time in 2-3 days (laugh). Now I use the RETISSA® demo device every day and I’ve become quite used to it.

I mainly use it to read words on paper. When I read magazines, documents sent in the mail, for example, tax documents and insurance documents, it is very useful. It’s hands free and the camera can auto-focus, so it is very convenient to see what I want to see.

I don’t think there is a single person in this world who has truly overcome their disability, but the RETISSA® helps people who have been diagnosed and shocked by a disability to recover. For example, even if your eyes are poor, if you can understand that by using this device, you can return to a quality of life close to your former quality of life, even if it’s not 100%, and then if you can connect with a friend with the same disability, you can take your first step forward in improving your life. Retinitis pigmentosa is a progressive disease, so you must accept that it will only get worse. I was prepared to give up on making any progress, so I’ll never forget my amazement seeing the Windows screen the first time I used the RETISSA®.



Customer Voice

User Experience No.4 “With this I can read a book!”

Name: Mrs. Asano (70s)

Eye Condition: Late-stage cataracts (moderate symptoms) – both eyes, mydriasis – left eye

(Using a laser kaleidoscope (hereinafter "LKS") which is a prototype with a RETISSA® OptHead) With this, I can read a book. I'm glad that I can see the letters clearly. I don't think I'll get tired even if I read for a long time. It seems easier to read a book while holding it under the camera than reading it on a reading table. With this, I'm planning to read a lot of books that I own.

My right eye is my dominant eye, so I am used to looking at things with my right eye. This time, I realized that I have barely used my left eye so far. I am thinking about using the LKS to practice seeing things with my left eye.

I believe useful machines will change not only your lifestyle but also your body. (By using LKS,) I can try reading with my left eye and get better at looking at things with both of my eyes. While I'm not confident using machines and am a little bit unsure about some things, I want to first try reading, and then do a trial and error using it to do a variety of things.

I talked with my ophthalmologist about the LKS as well. Thankfully, my cataract surgery was postponed for the time being. My ophthalmologist is also very interested in the device and plans on contacting your company.

- *1: The Interview was held on September 18, 2020.
- *2: These are the impressions of the individual. There may be individual differences in vision.
- *3: LKS is a small and handy wide-viewing angle retinal projection device.
- *4: LKS is not a medical device and is not intended for use to improve, correct or treat a condition.



Low Vision Aid & Vision Healthcare: Industry-University Cooperation

Research and Development for Laser Retinal Projection Technology in Collaboration with Universities and Hospitals



- ▶ Gaining social recognition and sharing knowledge through sponsorship of conferences, etc.
- ▶ Ongoing clinical research with universities and hospitals:
 - Low vision aide for clouding and retinopathy at two institutions
 - Visual field testing and fundus photograph at seven institutions

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

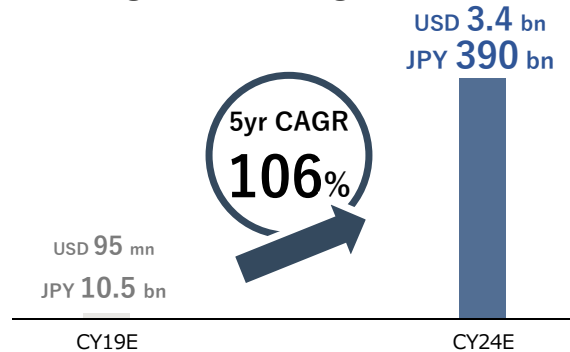
augmented vision

Strengthening Alliance

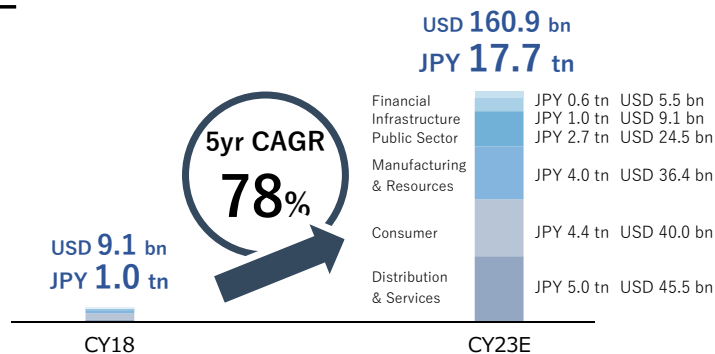
AR Market Potential

Making the Best Use of Unique Technical Features, Began Demonstration Experiments with Partner Companies in Each Field

Forecast of global smart glasses market*1



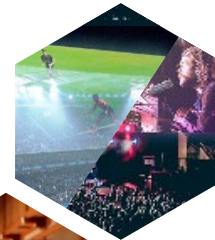
Forecast of global AR/VR market*2



Possible laser eyewear applications

Sports watching and live entertainment

- Close-up of players / artists
- Display bird's-eye view of the field or the scores



Smartphone link

- Display GPS navigation, advertisements
- Multilingual translation with subtitles

Arts appreciation

- Subtitles display when watching entertainment, at multi-view theater
- Display of commentary in the museum



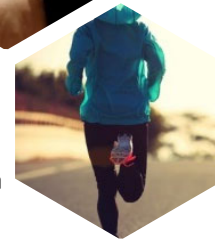
Business support

Business support

- Work support in the manufacturing industry
- Support for drivers of heavy machinery and vehicles

Sports

- AR display of leading runners in long-distance running
- Display the trajectory of balls / arrows, and quantify qualitative adjustments to improve practice efficiency



Video Watching

Video watching

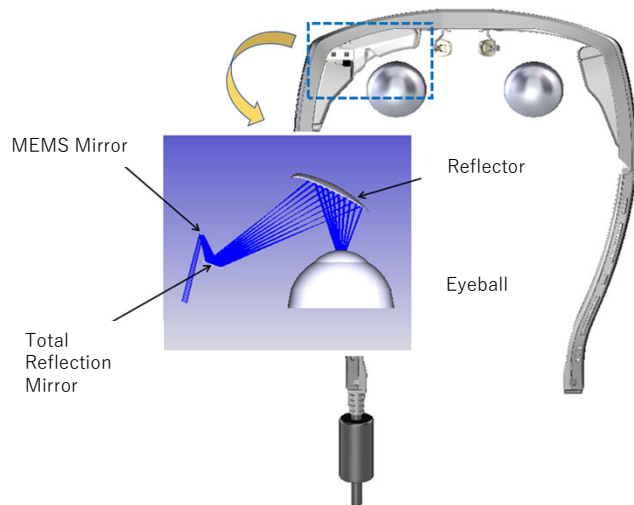
- Video streaming for people with visual impairment
- Watching movies and videos

*1: Fuji Chimera Research Institute, Inc. "Wearable/Healthcare Business Research 2020"
 *2: IDC "Worldwide Semiannual Augmented and Virtual Reality Spending Guide, 2018H2"

Laser Retinal Projection Technology

Details of the Core Technology

Asymmetric Optics for HMD



01

Optical Design

- Resolution control based on beam diameter / NA control
- Reflection / transmission optics selected and designed for each application
- Optimized shape and size through the selection and design of optical materials for each application

02

MEMS

- MEMS design and prototype products provided with the size and frequency required for optical design

03

RGB Laser Modules & Drivers

- Precisely combined and collimated small RGB laser module for images
- Driver chip suitable for displaying image information

04

Solution

- An operating projection optical system integrating the technologies above
- Retinal projection / fundus photography system

Possible Risks

The main business risks we are aware of and their countermeasures are as follows.

< Business Risks*1 >

Economic trends

- The laser-related market in which we are entering is expected to continue its growth trend, mainly for industrial and medical equipment such as precision processing equipment and bio medical equipment. If market growth slow down due to economic trends and the accompanying decline in capital investment motivation, our business performance and financial position may be affected.

Management deterioration of manufacturing contractors and quality accidents

- We have a fables manufacturing policy, so we outsource manufacturing to an external partner company. Considering the characteristics of each company, we decide the manufacturing items to each company according to the manufacturing capacity of our products.
- For each company, we carry out quality inspections and confirmation of business conditions. If the management of the contractor deteriorates or a quality accident occurs, it is possible to easily change the contractor, but it will affect our business performance and financial position until the new production system is rebuilt.

Cash flow and financing

- With the progress of our R&D activities, a large amount of R&D expenses have been recorded in advance. It is expected that the demand for working capital, R&D investment, capital investment, etc. will continue to increase as the business progresses. We will continue to strengthen our financial position in the future. But depending on the status of profits or raising funds, it may affect our business performance and financial position. Regarding the use of funds raised through the public offering, we plan to allocate it to the manufacturing cost of Laser Eyewear, but due to sudden changes in the business environment, etc., it may be used for purposes other than the originally planned use of funds and the return on investment may not be as expected.
- In addition, regarding the use of funds raised by the Stock Acquisition Rights with Exercise Price Amendment Clause of the Company, it is planned to be used mainly for capacity increase and M&A of the Laser Device business, but it is initially planned due to sudden changes in the business environment. It may be used for purposes other than the used funds, and the investment effect may not be as expected.

Partnership with other companies in laser eyewear business

- Consumer equipment in the Laser Eyewear business will be sold to end users via distributors with eyeglass stores, etc., other than direct sales, or modules will be provided by us, and each company will commercialize and sell them. Specifically, with Seed Co., Ltd., Tokyo Optical Co., Ltd., Casio Computer Co., Ltd., and overseas distributors for China, we will do promotion activities that tie up the products and services of each company with our products. In addition, we will endeavor to popularize medical devices by concluding a sales support contract with Santen Pharmaceutical Co., Ltd. We planned product manufacturing and sales based on the sales targets handled by each company, but if we cannot sell more than the initial target number, or if there is a change in the business policy of each company, our business performance may be affected.

< Possibility/ Time >

» Middle/
Medium to
long term

» Low/
Medium to
long term

» Middle/
Medium to
long term

» Middle/
Medium to
long term

< counter-measure >

- »
- Promote the construction of a business model that is resistant to economic fluctuations by entering a wide range of markets

- »
- Disperse risks by securing multiple outsourcers

- »
- Secure financing means by promoting the establishment of bank credit lines such as commitment lines and overdrafts

- »
- Disperse risks by diversifying alliances

*1: For risks other than the above that we recognize, please refer to "Business Risks" in the securities report.

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.

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