

HAMAMATSU
PHOTON IS OUR BUSINESS

NKT Photonics

Promotion of growth strategy through acquisition of NKT Photonics

HAMAMATSU PHOTONICS CO LTD

2024.7

Promotion of growth strategy through acquisition of NKT Photonics

- A. **Outline of NKT Photonics**
- B. Growth Strategy

Outline of Acquisition

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Hamamatsu Photonics K.K.

PME
(Photonics Management Europe S.R.L.)

Consolidated subsidiaries
Regional management and holding subsidiary in Europe

NKT Photonics

Total amount of acquisition

Approx. €247 million (Approx. JPY42 billion)

※Calculated at €1 = JPY170.15

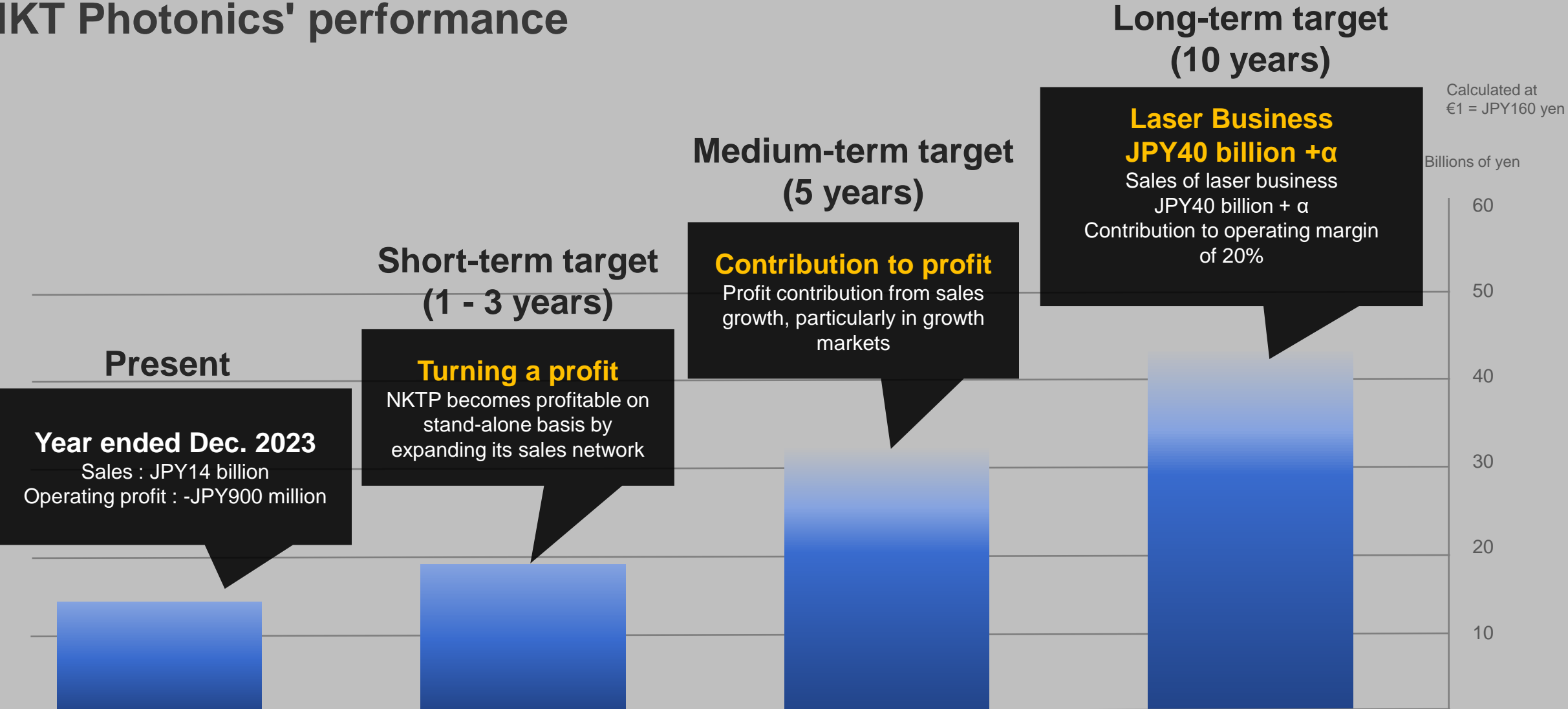
Acquisition fund

Combination of own funds and bank loans

Forecast

As a result of share acquisition, NKT Photonics became subsidiary of PME (our sub-subsidiary). There are no changes to announced consolidated earnings forecasts for year ending Sep. 2024.

NKT Photonics' performance



Expected Growth in New Markets Beyond Projected Sales

Significance of acquisition

1

Evolution of Hamamatsu Photonics :
From leading light detection company to
true leading photonics company

2

New era for Hamamatsu Photonics
New challenge to unknown and unexplored

Significance of acquisition

- 1** **NKT Photonics is only company in world with world's state-of-the-art fiber laser and fiber technology* for amplifying laser beam**
(*Photonic Crystal Fiber)
- 2** **By adding NKT Photonics' state-of-the-art fiber laser technology to Hamamatsu Photonics' light detection technology, we have acquired all essential technologies in photonics** (All parameters of light, such as wavelength, phase, Brightness and Sensitivity, can be controlled)
- 3**
 - Short-term** **Proposing solutions for growth markets centered on semiconductors and quantum, including both light detecting and emitting devices**
 - Medium-to long-term** **Creating unlimited new photonics solutions through integrated control of light detectors and emitters**

Outline of NKT Photonics



Business Activities

Development, manufacture and sale of laser equipment and laser equipment components

Products

- White light lasers
- Single-frequency fiber lasers
- Ultra-short pulsed lasers
- Photonic Crystal Fiber (PCF)



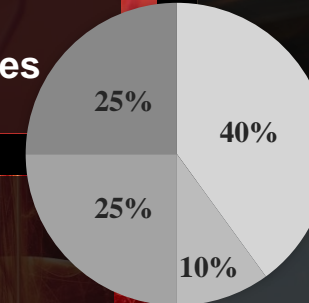
Market



Medical & Life sciences



Industrial



Quantum & Nanotechnology

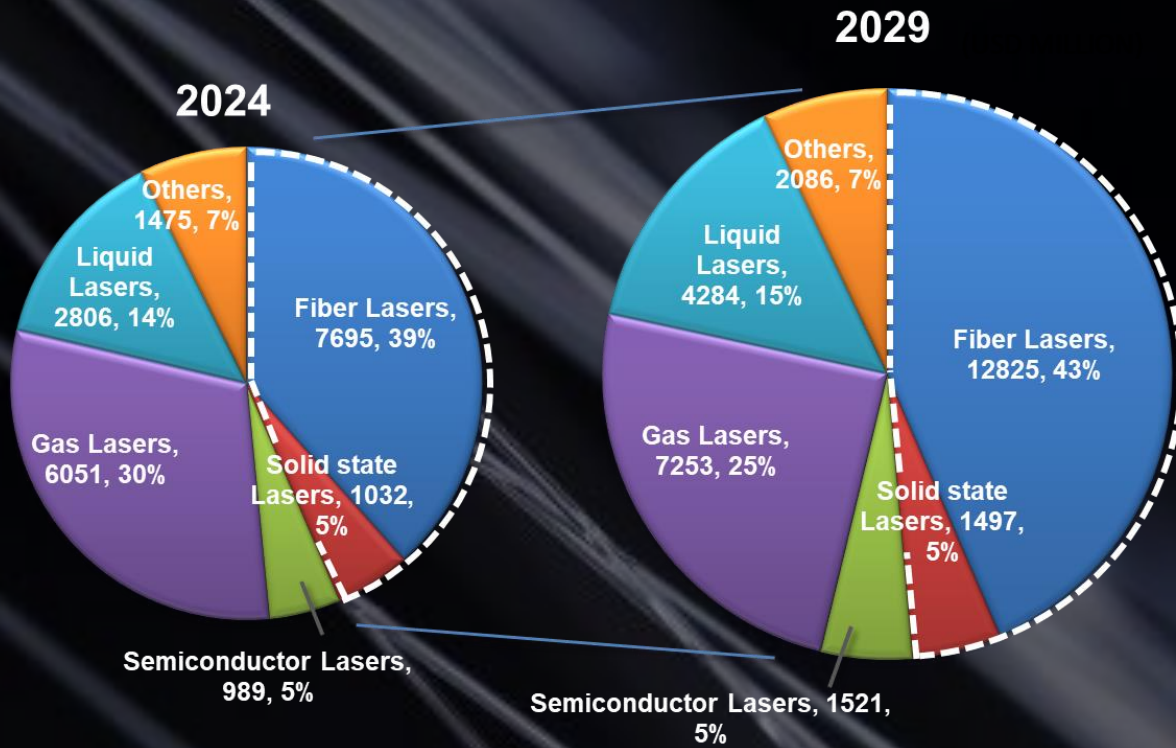
Security



NKT Photonics' product areas and related markets

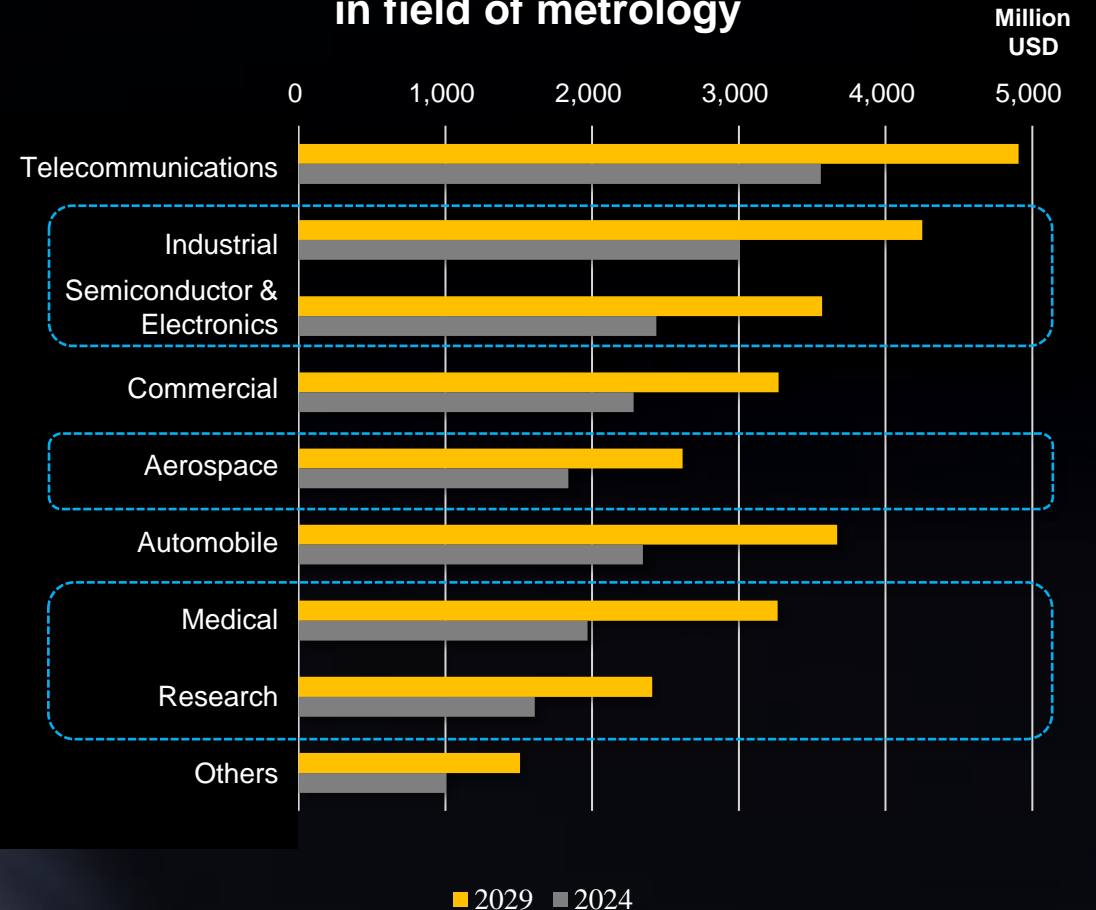
Product areas

Fiber lasers expected to be technology with greatest growth potential



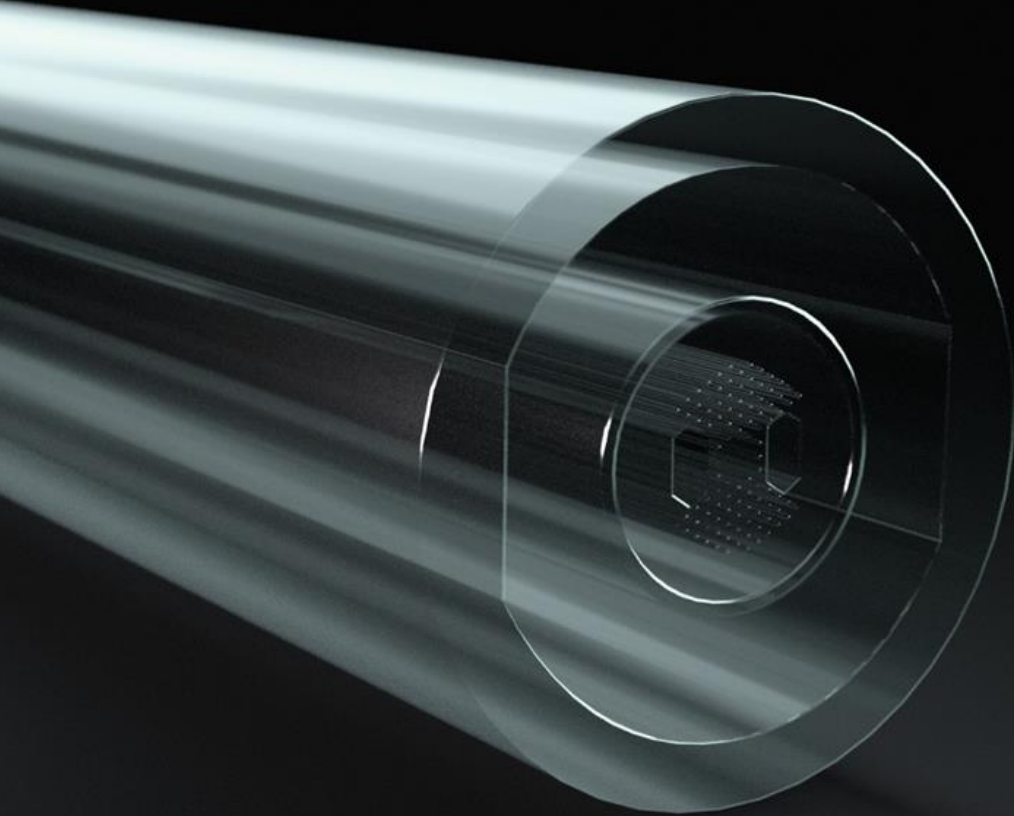
Related applications

Laser technology grew significantly in field of metrology



Our charts are based on MarketsandMarkets's "LASER TECHNOLOGY MARKET –FORECAST TO 2029."

NKT Photonics' Core Technologies ~Photonic Crystal Fiber (PCF)~



1 World's only laser light amplification technology

World's only optical fiber technology capable of amplifying ultrashort pulsed laser

2 Sole manufacturer with mass production and supply system for PCF

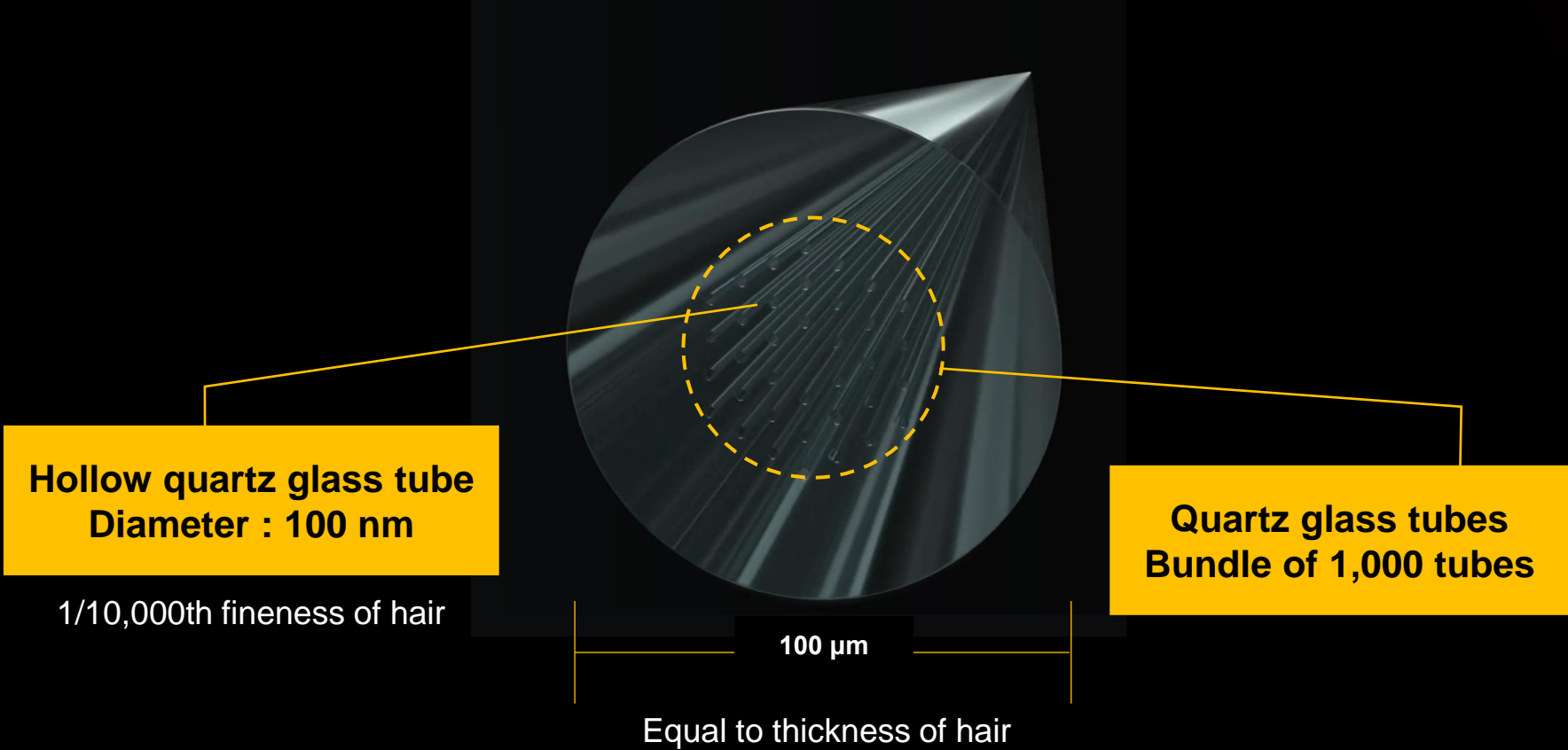
3 Capable of fiber transmission and light conduction of ultra bright light

Photonic Crystal Fiber (PCF)

- Bundling 1,000 hollow glass tubes
- Melting at high temperatures, tubes are squeezed down to thickness of hair
- Diameter of hollow glass tube is about 1/10,000th of hair
- High-precision ultra-fine multi-hollow structured fibers without optical distortion



Fiber Drawing



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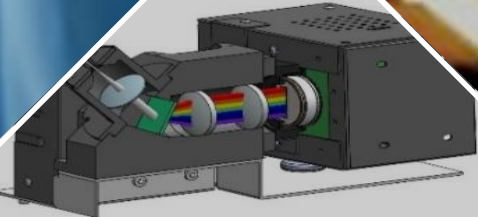
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- A. Outline of NKT Photonics
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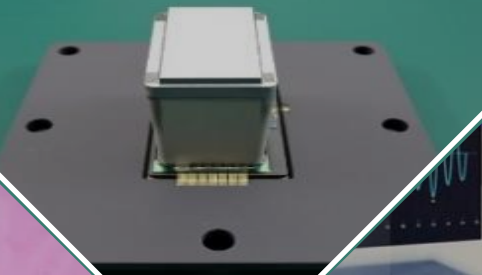
Synergies in our strategic growth markets

Semiconductor

Quantum



**High value-added
(Custom Modules)**



Analysis

Medical-bio

Hamamatsu Photonics' device line-up of light detectors and emitters

Lamps (vacuum tube products) are main business development



Light-emitting devices



Lamps



LEDs



LDs

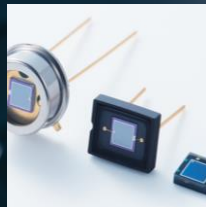
Missing piece



Light-detecting devices



Photomultiplier tubes



Optical semiconductors



2-D imagers

World's leading technology and market share in light detectors

New Hamamatsu Photonics' device line-up of light detectors and emitters

World's leading technology and market share in fiber lasers for measurement



Light-emitting devices



Lamps



LEDs



LDs

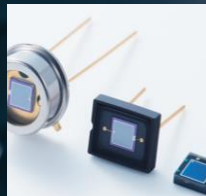
NKT Photonics Lasers



Light-detecting devices



Photomultiplier tubes



Optical semiconductors



2-D imagers

World's leading technology and market share in light detectors

New Hamamatsu Photonics' device line-up of light detectors and emitters

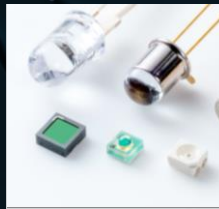
With all type of light sources, light emitters



Light-emitting devices



Lamps



LEDs



LDs

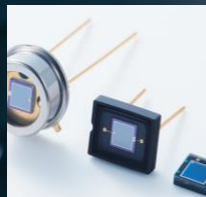
NKT Photonics Lasers



Light-detecting devices



Photomultiplier tubes



Optical semiconductors



2-D imagers

World's leading technology and market share in light detectors

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Light-emitting devices



Lamps



LEDs



LDs

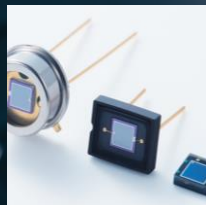
NKT Photonics Lasers



Light-detecting devices



Photomultiplier tubes



Optical semiconductors



2-D imagers



Light transmission

Light amplification

Fiber optic elements

World's leading technology and market share in light detectors

Only company with world-leading control technology for both **light detectors and light emitters**

- Laser light source capable of producing characteristic light freely
- Fiber optical elements for easy and flexible delivery of laser light (key to modularity and compactness)
- Significant advantages in development of light detectors that "catch targeted light with targeted performance".

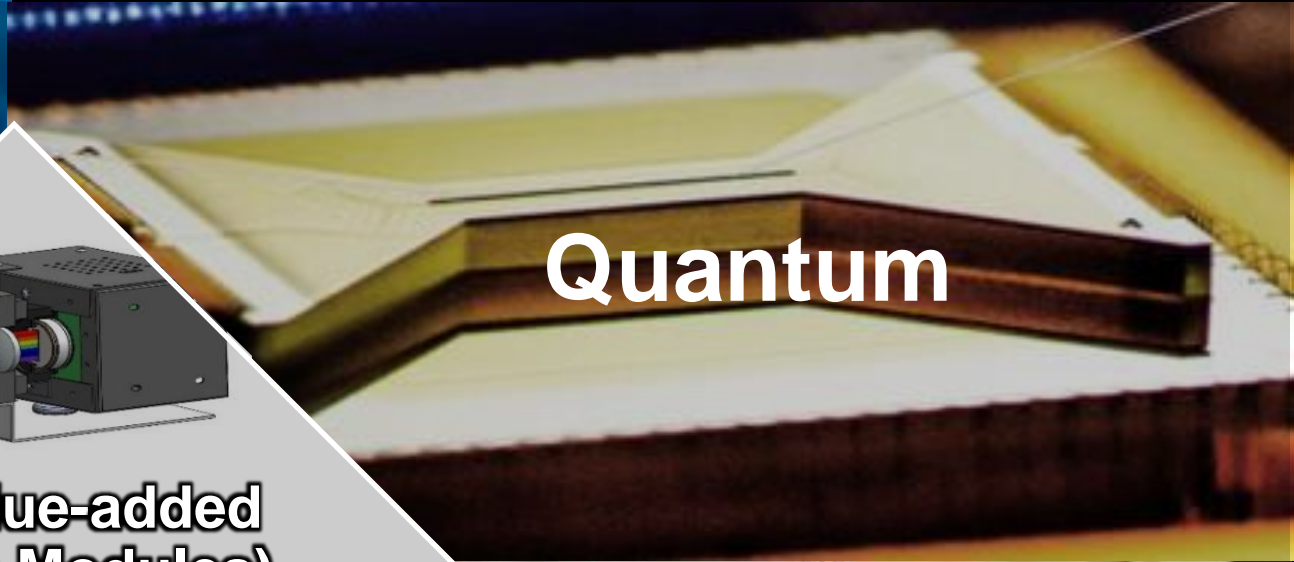
Capable of offering unprecedented high value-added products

Proposal for integrated light detecting and emitting modules

Synergies in our strategic growth markets



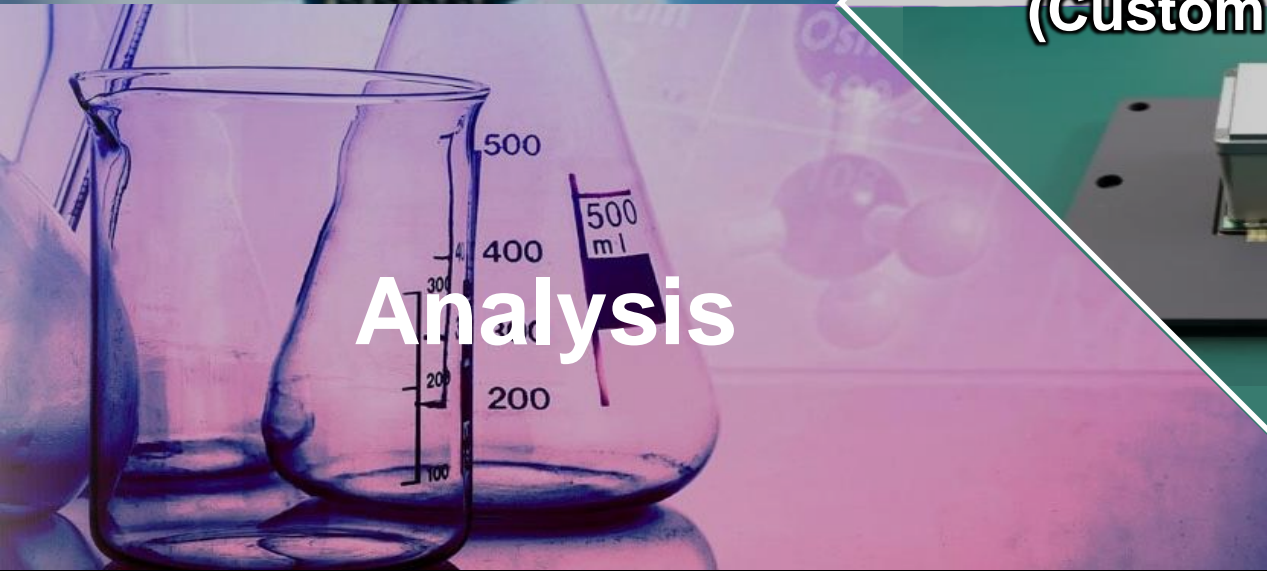
Semiconductor



Quantum



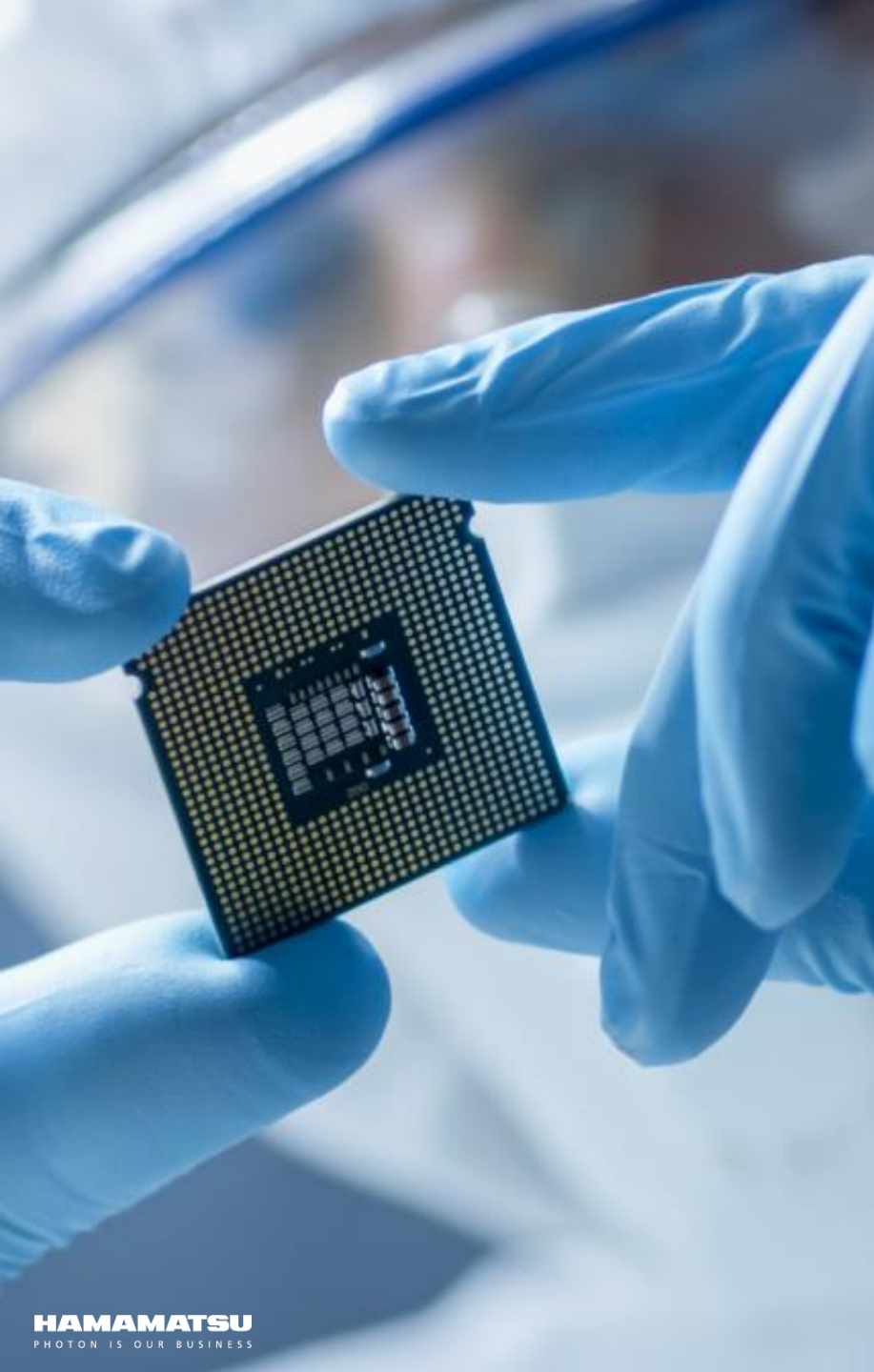
**High value-added
(Custom Modules)**



Analysis



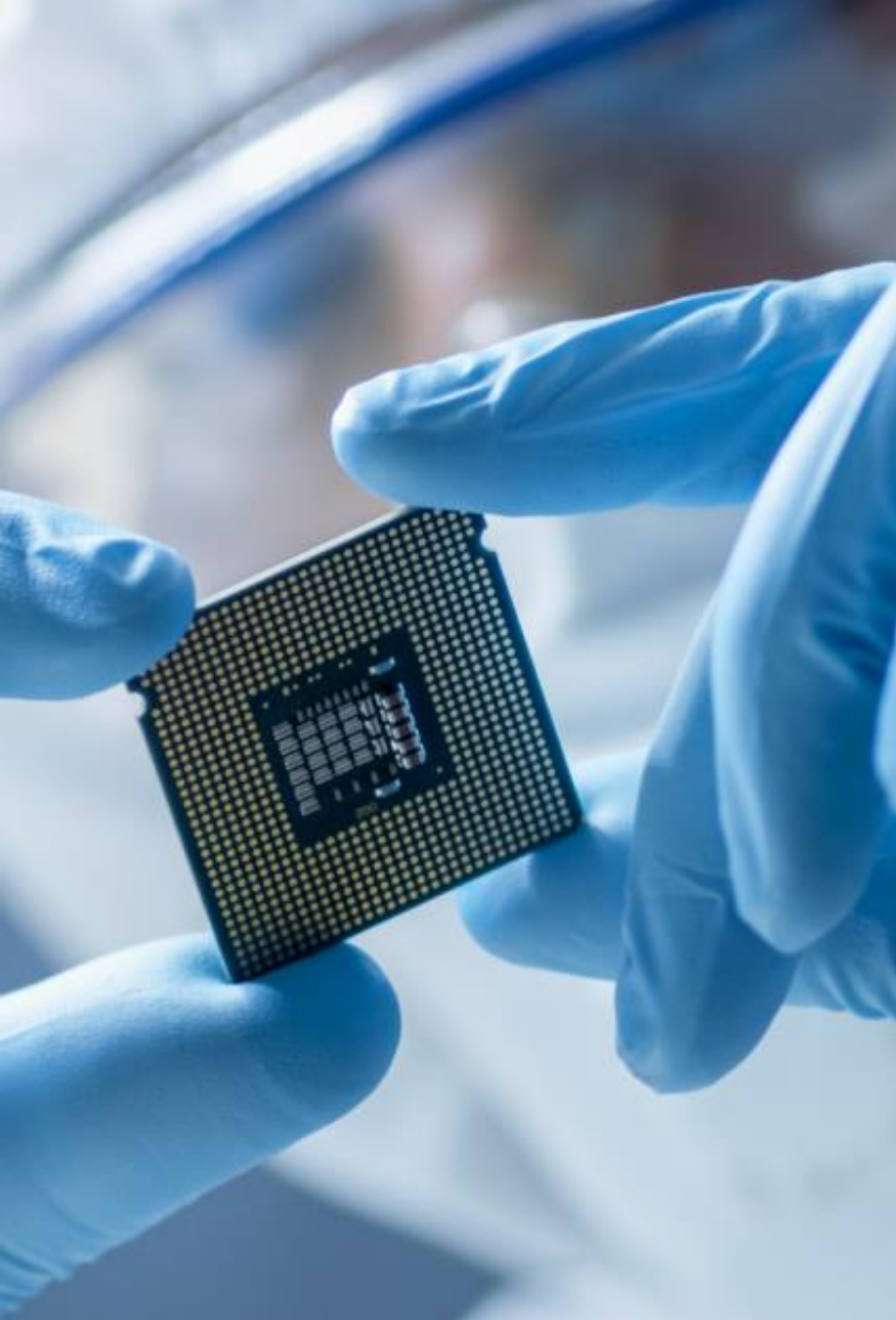
Medical-bio



Semiconductor

Why semiconductor?

- 1 Proposal for **optical measurement technology** required for semiconductor manufacturing, **from both light detectors and emitters**
- 2 Proposal of new added value with photonics for **semiconductor manufacturing equipment market**, which is expected to grow
- 3 Rapid market growth of **generative AI**



Capturing semiconductor inspection light source market from lamps to next generation laser light sources

Future potential
(new inspection technologies)



Existing business



Xenon lamps



Laser-Driven Light Sources (LDLS)



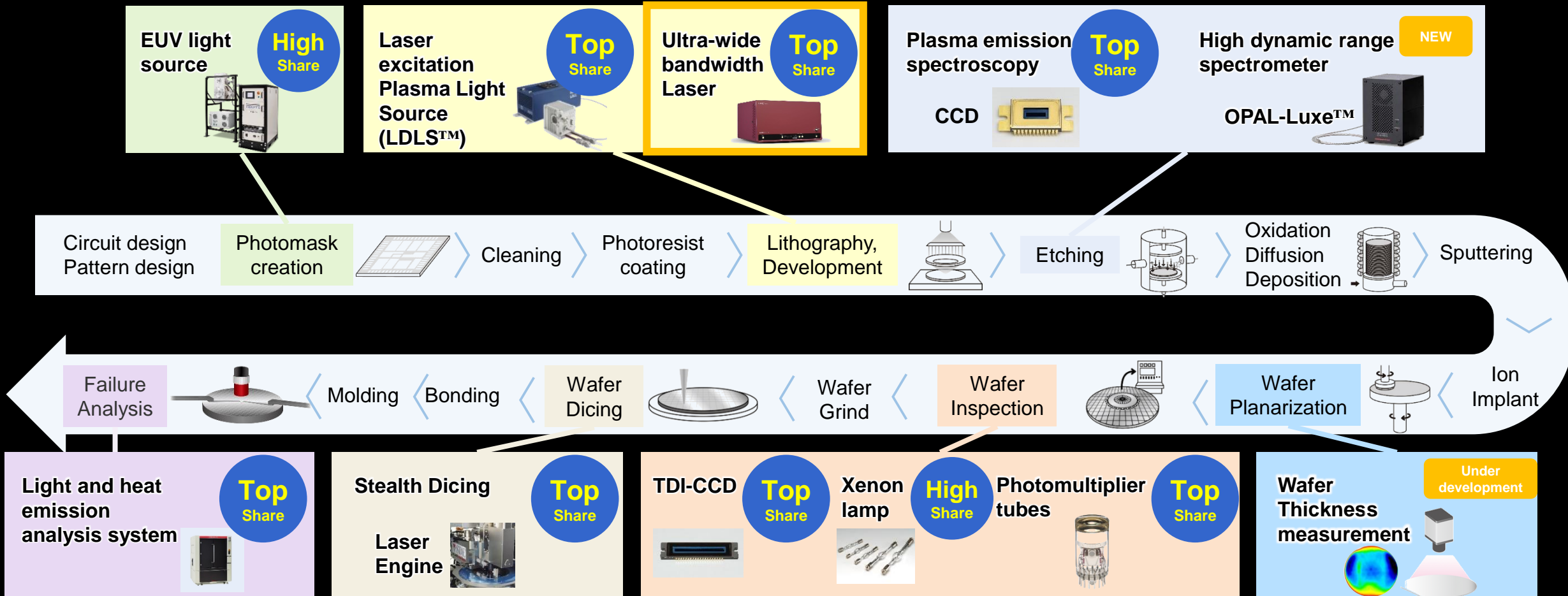
High illuminance

Sales are expected to increase in response to rapid expansion of AI/IoT market

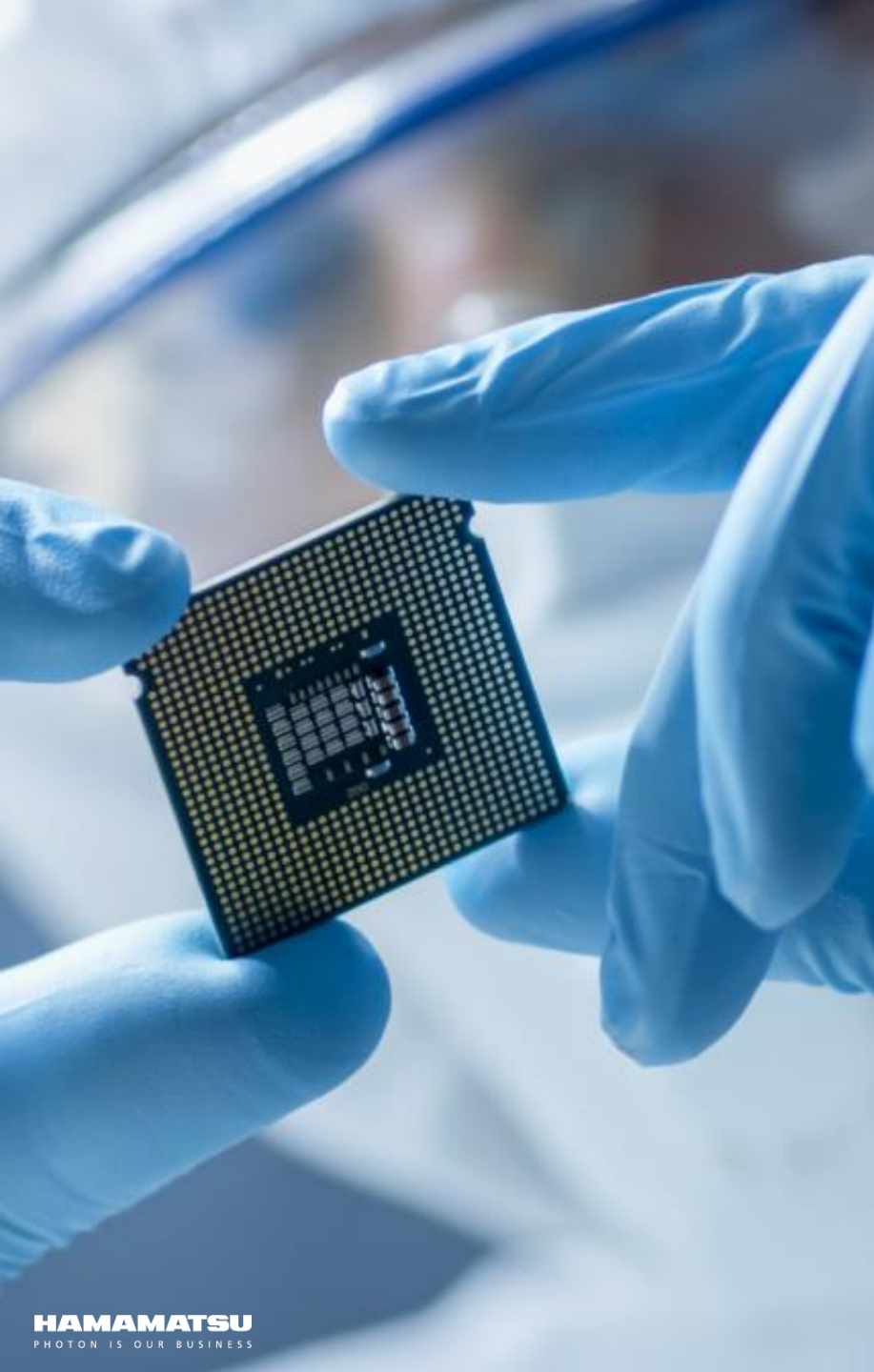
High brightness

Our products used in semiconductor process

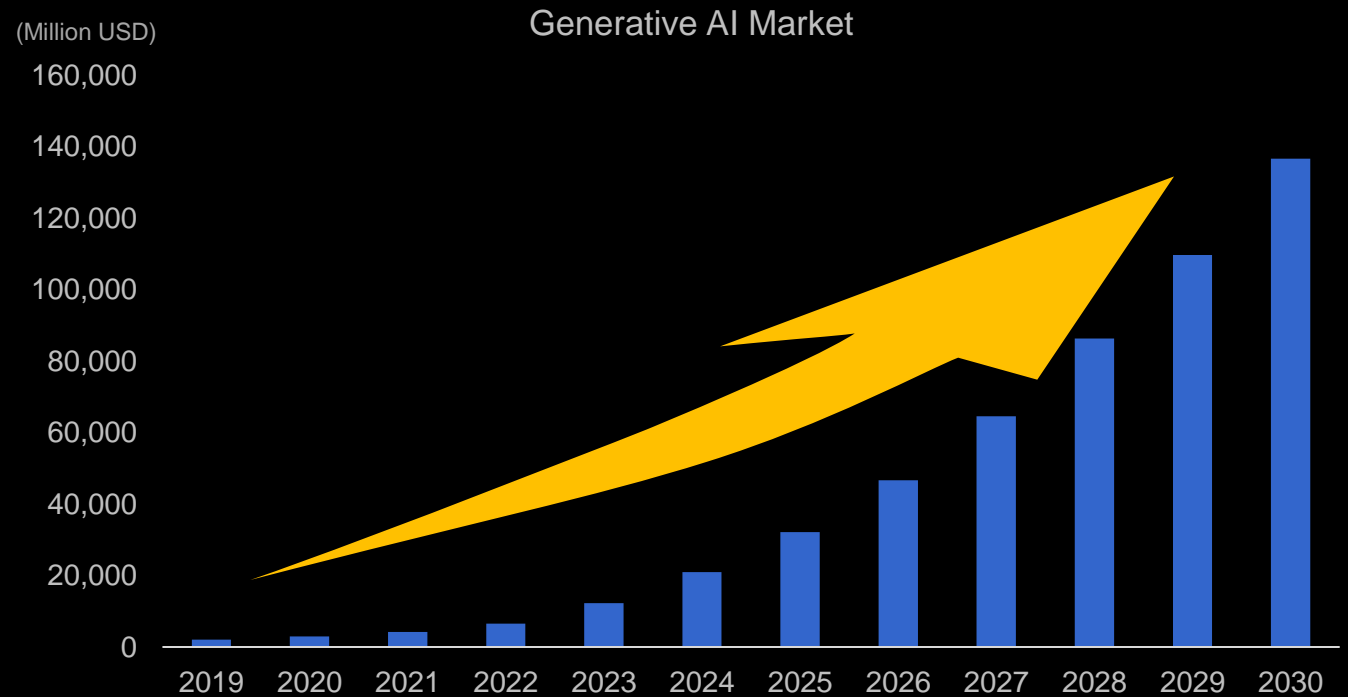
High-share products used in major semiconductor production and inspection equipment



Share: Our research

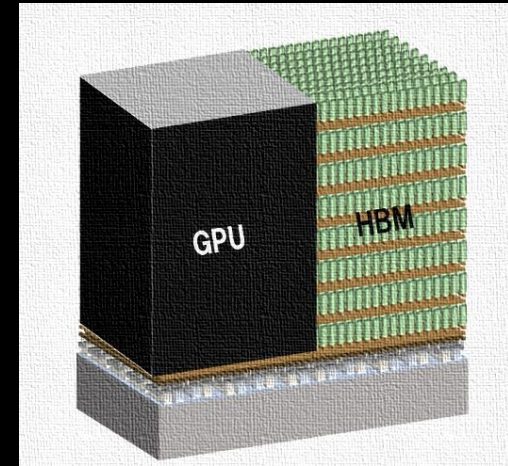


Recent Attention on Generative AI Market Projected Expansion at Approx. CAGR of 50% over Next Decade



Source: GENERATIVE AI MARKET, Forecast to 2030, MarketsandMarkets

Devices for Generative AI



- Increasingly 3D AI (high-bandwidth, high-capacity and high-speed special memory) devices with GPUs and HBM
- HBM's 3D stacked structure technology with more and thinner layers
- Yield of HBM is serious problem for semiconductor manufacturers

Importance of our related technologies and new proposals in response to rapid growth of generative AI market

Semiconductor Front-End Process

Semiconductor Back-End Process

Exposure
Process

Wafer Test

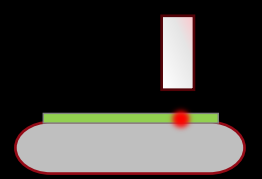
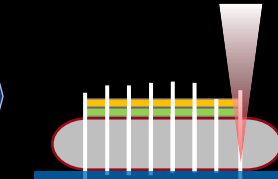
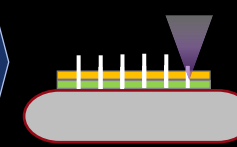
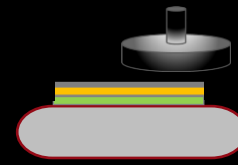
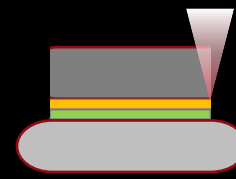
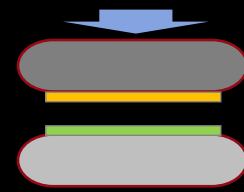
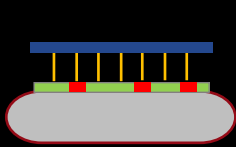
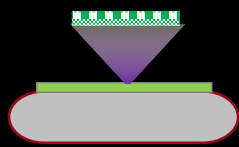
Wafer Bonding

Wafer edge processing

Dicing pretreatment

Dicing

Product inspection



Overlay inspection
light source

Laser engine for
Failure Analysis

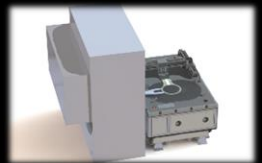
Ultra-high resolution
camera for optical
void inspection

Laser engine for Edge
Trimming

Femtosecond lasers
for semiconductor
microfabrication

Stealth Dicing Engine

Failure Analysis system



SuperK

Origami

QPM

JIZAI™

AeroPulse

Stealth Dicing™

Failure analysis system

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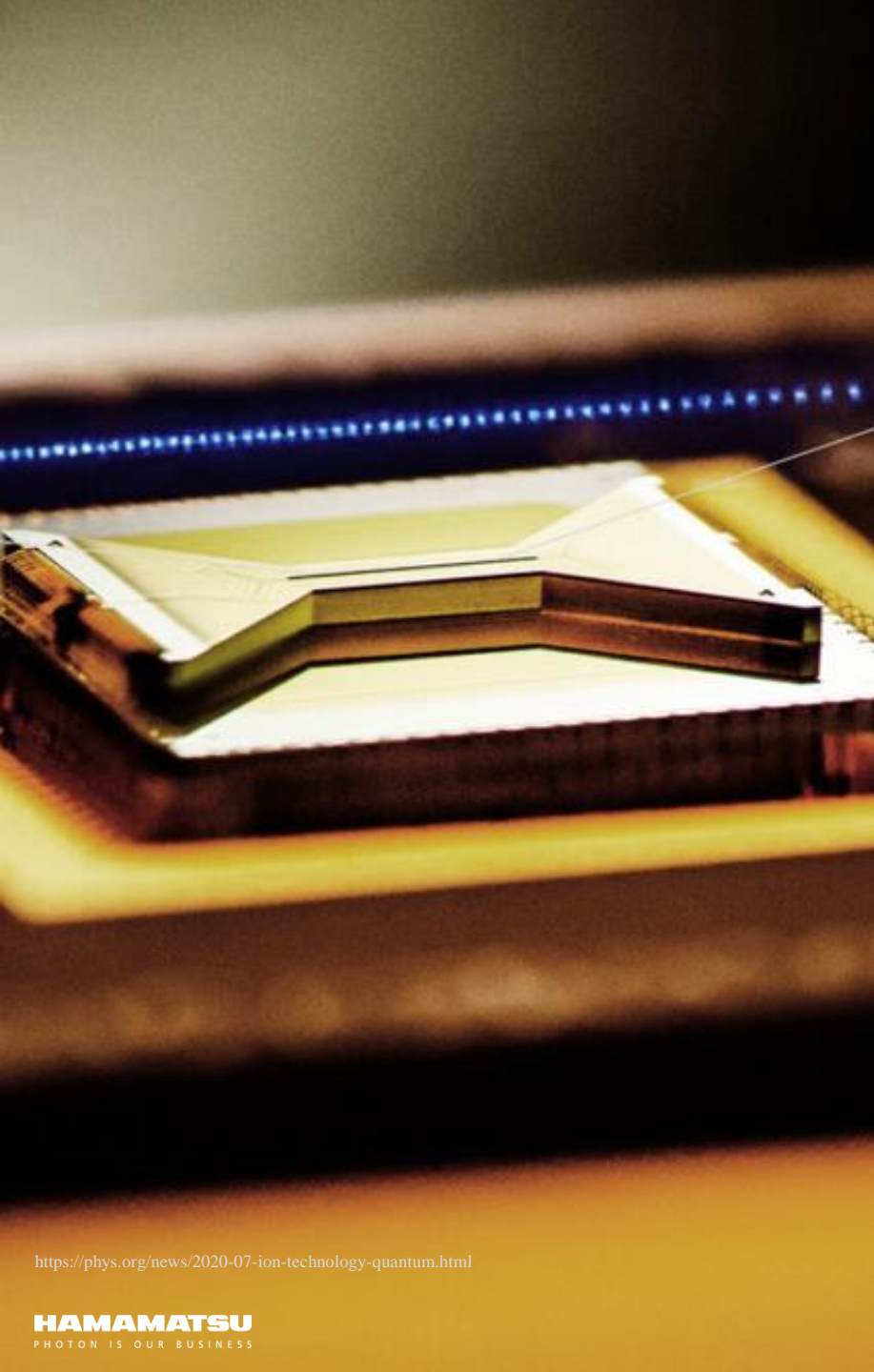
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Quantum

Why quantum computing?

1

Only company capable of providing comprehensive range of key light detectors, light emitters and optical components for optical quantum computers

2

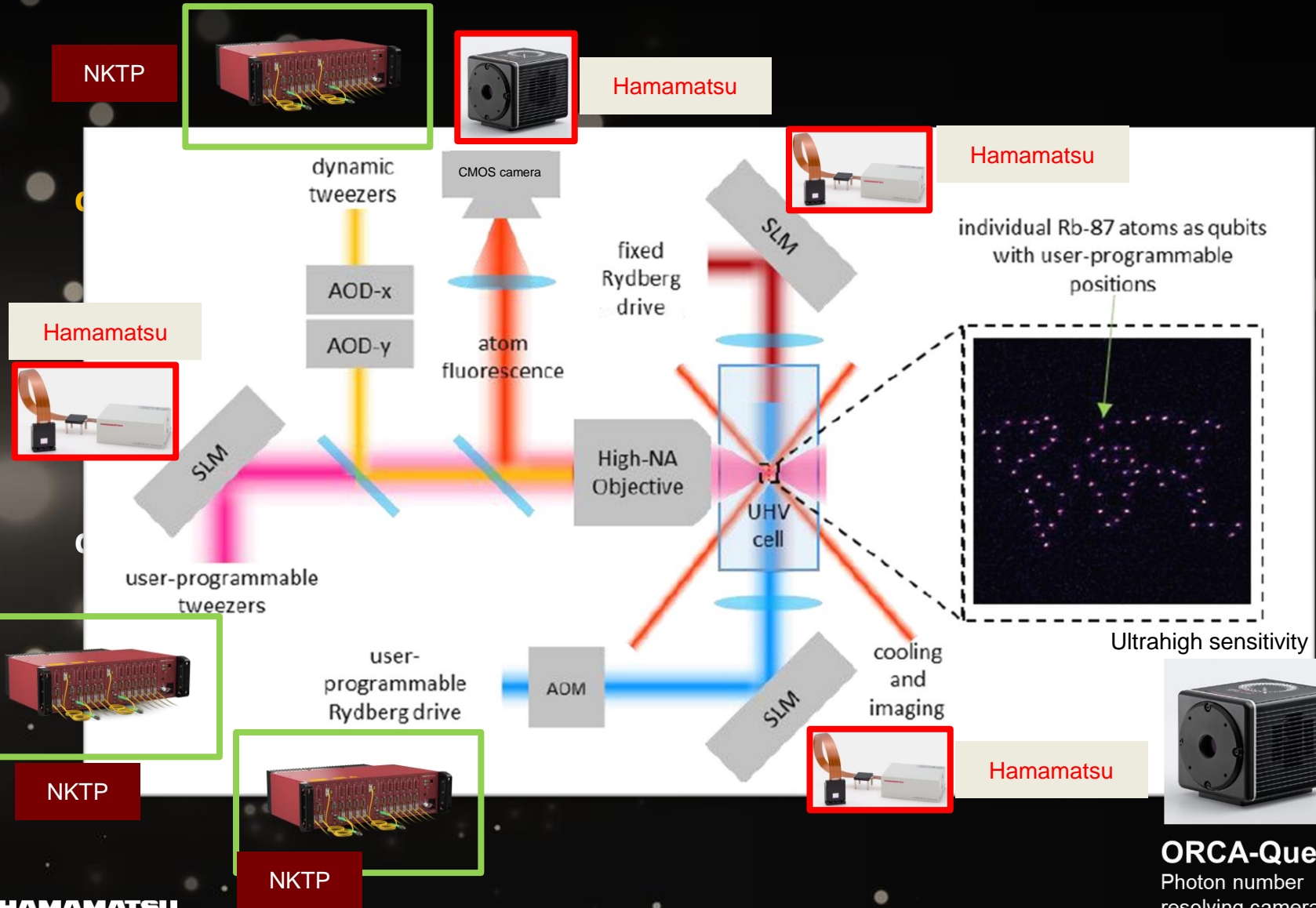
Quantum computer hardware market is forecast to grow from \$65 million in 2022 to \$700 million in 2035 **(CAGR: 20%)**

3

Record government and private investment in quantum computing

<https://phys.org/news/2020-07-ion-technology-quantum.html>

Optical quantum computing - Neutral atom trap method - Most popular method



- **Methods for creating, manipulating and measuring quantum states by light**
- **Only company in world to own all lasers, light detectors and light manipulation devices**
- **Supplying key devices that determine performance of quantum computers**

Phase control of light
Ultra high stability
Ultra low noise



LCOS-SLM
Optical phase modulator

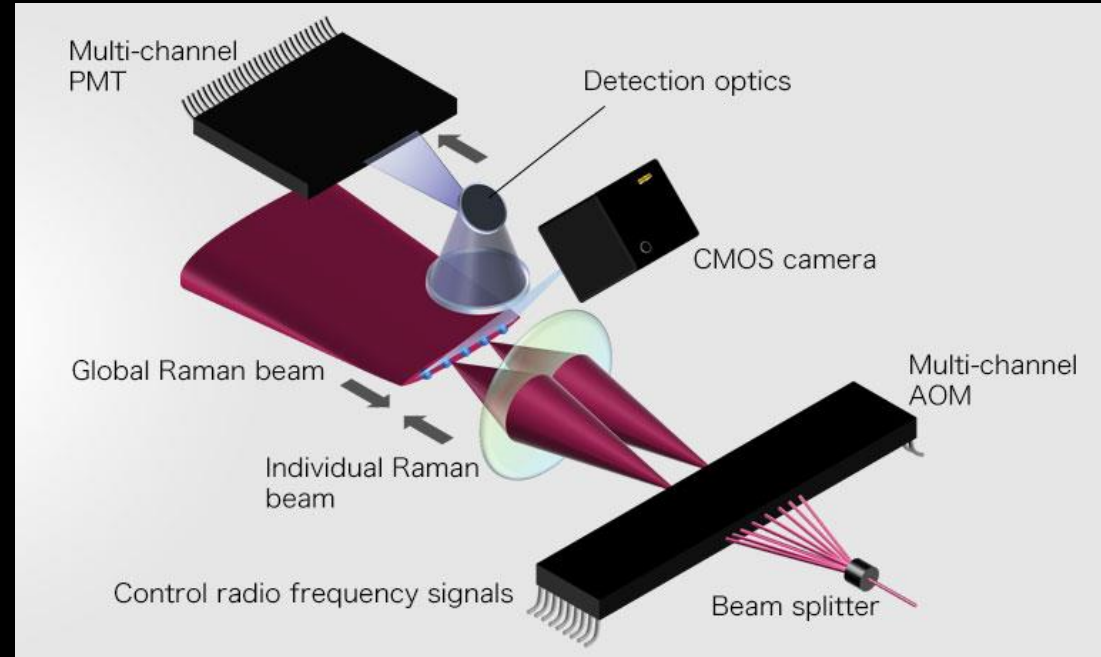
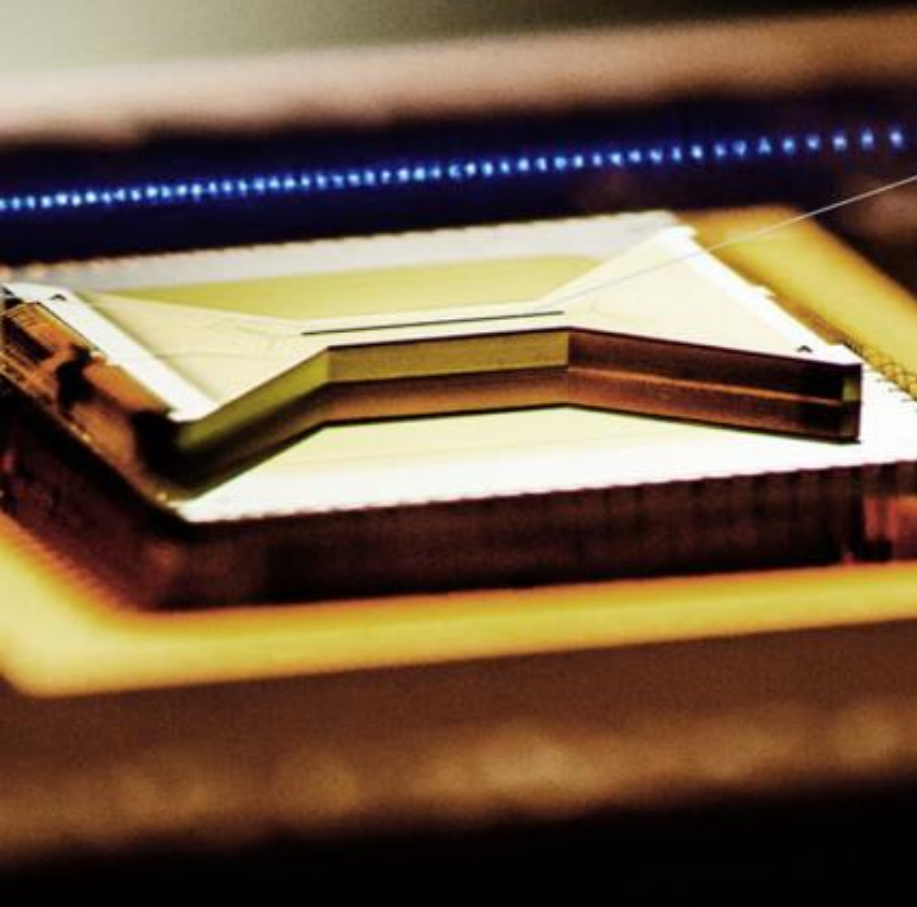


NKTP Koheras HARMONIK



ORCA-Quest
Photon number resolving camera

Optical quantum computing (ion trap method)



ORCA-Quest
Photon number
resolving camera



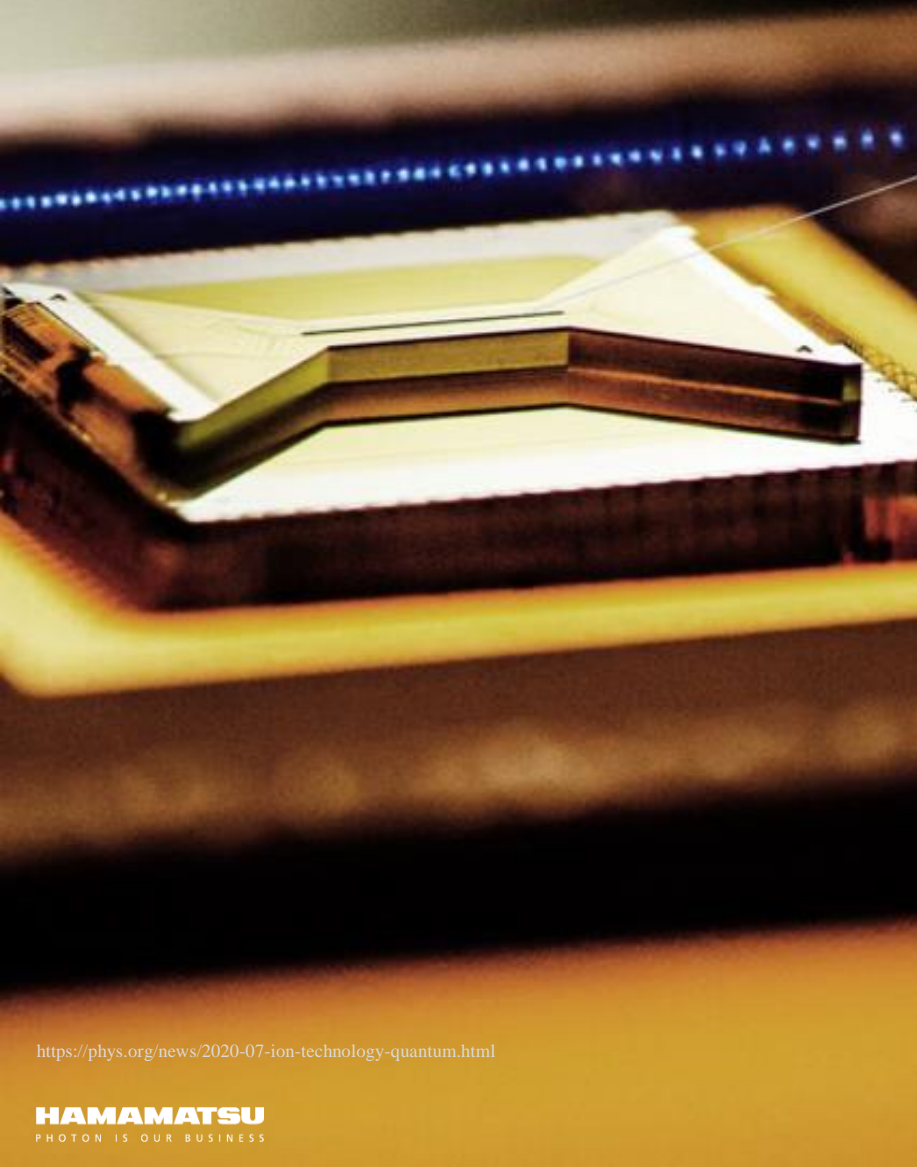
**Multi channel
PMT modules**



**NKTP Koheras
HARMONIK**

<https://phys.org/news/2020-07-ion-technology-quantum.html>

Expectation of demand for high value-added modules from quantum computer market players



Private companies



Consortium / Government agency



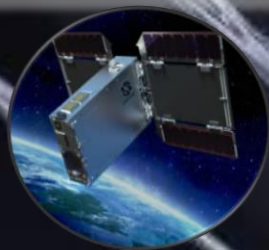
<https://phys.org/news/2020-07-ion-technology-quantum.html>

Summary of synergies in our strategic growth markets

1

Short-term

Selling NKT Photonics' products through Hamamatsu Photonics' worldwide sales channels



2

Medium-to short-term

- Synergies in semiconductor and quantum markets
- High value-added modules with integrated light detectors and emitters

3

Medium-to long-term

- Creation of new markets through synergies
- Development of PIC technologies in quantum computers
- Long-range sensing and inter-satellite communications
- **Establishment of new optical measurement methods**

Summary

Hamamatsu Photonics' light detection technology

+

NKT Photonics' state-of-the-art fiber laser light sources

1

Acquisition of all elemental technologies related in Photonics

2

Creation of new markets through synergies

3

Evolution into true leading photonics company, opening up new age of photonics

New era dawns for Hamamatsu Photonics

New challenge to unknown and unexplored

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 - **Our prospects may differ from actual results.**

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