

Mitsubishi Electric Corp.

Photonics and Quantum Technology for Society 5.0

Dr. Koji Yasui Senior Chief Technologist

- **1982: joined Mitsubishi Electric Corporation**
- **35 years+ in R&D and Management in Mitsubishi Electric Corporation**
 - Roles as Researcher, R&D Manager as well as factory manager and corporate strategic manager
 - Providing automation solutions including industrial processing machines
- **Leading roles in state-run technology projects**
 - "Photonics and Quantum Technology for Society 5.0," supported by Cabinet Office and QST
 - COI program "A center for innovation using coherent photon technology" supported by MEXT and JST
- B.S. and Ph.D. degrees in applied physics from the University of Tokyo
- Visiting scientist at Stanford University in 1989



Mitsubishi Electric corp. - Outline

Mitsubishi Electric Corp.

President & CEO:	Takeshi Sugiyama
Phone:	+81 (3) 3218-2111
Established:	January 15, 1921
Paid-in Capital:	¥175,820 million
Shares Issued:	2,147,201,551 shares
Consolidated Revenue:	¥4,462,509 million
Consolidated Total Assets:	¥4,409,771 million
Employees:	146,518

https://www.mitsubishielectric.com/en/about/corporate_data/index.page



<https://www.mitsubishielectric.com/en/about/strategy/index.page>

SIP program, cabinet office, Japan
(Photonics and Quantum Technology for Society 5.0)

Technologies for realizing smart manufacturing

Three breakthroughs needed for practical applications of smart manufacturing

This project comprises three R&D topics: Laser Processing (realizing smart manufacturing through CPS-type laser processing), Photonic Quantum Communication (realizing absolute safety of data distribution, storage, and utilization in cyberspace), and Photonic and Electronic Information Processing (improving speed and precision in information processing necessary for smart manufacturing). We aim to make breakthroughs in smart manufacturing by tackling R&D focused on these photonic and quantum technologies.

Establishing a CPS

Contribute to establishing a network-type manufacturing system that leads to a qualitative change in productivity

Breakthrough 1 Laser Processing

Provide a boost to smart manufacturing by establishing a CPS for laser processing – a procedure which is in high demand but for which it is difficult to construct physical models.

CPS-type laser material processing system

By eliminating bottlenecks preventing investment in smart manufacturing, we will implement a network-type manufacturing system incorporating CPS-type laser processing in order to improve manufacturing productivity.

Spatial light modulator technology

A spatial light modulator technology can be used to realize multipoint simultaneous processing and die-cutting that surpasses the concept of conventional laser processing. By setting our sights on becoming a global leader in processing productivity in the manufacturing industry, we hope Japanese companies will recapture market share in laser processing.

Photonic crystal laser

We aim to develop high-performance sensing devices for assisting smart mobility, and core technologies for future smart processing (ultra-small laser processing systems).

Breakthrough 2 Photonic Quantum Communication

Develop quantum secure cloud technology incorporating quantum cryptography to sustain secure data storage and utilization now and in the future.

Quantum cryptographic and quantum secure cloud technologies

We will develop quantum cryptographic technology that cannot be broken by any advanced computers, and quantum secure cloud technology which combines quantum cryptographic networks with secret sharing, digital signatures, and secret computing. We will deploy a data storage system that can meet proven security into the future, and will realize the long-term secure transport, storage, and utilization of digital data in the cyberspace of Society 5.0.

Breakthrough 3 Photonic and Electronic Information Processing

Develop a next-generation accelerator platform that automatically selects optimal computing resources to improve speed and accuracy in information processing.

Next-generation accelerator platform

We will enhance the overall speed and precision of application programs used in smart manufacturing by utilizing a sophisticated, high-speed platform that can automatically select an optimal arrangement of classical computers and next-generation accelerators, such as analog computers, noisy intermediate-scale quantum (NISQ) computers, and fault-tolerant quantum computers. This accelerator platform will be able to perform data processing and analysis faster than conventional computing methods, improving productivity in manufacturing and logistics.

<https://www.qst.go.jp/book/list/book61.html>

Mitsubishi Electric corp. - Relation NL

We propose collaborations regarding

1. Photonic crystal surface-emitting lasers
2. Quantum computing platform for industrial applications
3. EUV-related technologies

We can offer

1. Photonic crystal lasers for your industrial applications as lidars, et al. Kyoto Univ.
2. Quantum computing platform to connect your quantum computing powers with industrial applications in Japan. Waseda/Keio Univ.
3. EUV-related technologies: driver lasers based on both gas & solid-state lasers. Mitsubishi, Riken

You could offer

1. Industrial applications and EUV based lithography to produce photonic crystal lasers in high volumes.
2. State-of-the-art quantum computing and algorithm services.
3. Field test on EUV-related apparatuses.

