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RIKEN Center for Advanced Photonics

2025 - 2026

RIKEN Center for Advanced Photonics

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RIKEN 2025-013

Walking the scientific path with light.

— Drawing out the full potential of light

The Old Testament passage “God said, ‘Let there be light,’ and there was light.” and the story of the existence of “light,” which is thought to have been inseparable from matter at the beginning of the Big Bang universe, have been going around and around in my head and heart. I have come to the thrilling conclusion that the root of nature always involves an as yet unknown essence of light. This is a completely unscientific statement, but I have a feeling that the allure of “light” felt by all people originates from such a thought.

Light has undoubtedly been our most familiar means of observation and exploration in the development of science. Observations of the distant universe through telescopes and explorations of bacteria through microscopes have contributed to the development of astronomy and medicine. The light-quantum hypothesis proposed by Einstein in 1905 led to the understanding of light as a quantum “photon.” This has led to the current development of quantum physics and has laid the foundations of modern society. The laser, invented around 1960, advanced the technology to measure frequency and time with ultra-precision, defining time by the technology of light. The development of lasers capable of emitting pulses with very short intervals of femtoseconds (10^{-15} s) and attoseconds (10^{-18} s) has also contributed significantly to the development of physics. These pulses allow for precise prediction of the dynamic movement of electrons in atoms and molecules. Photonics research will continue to maximize the various potentials of light, making it an indispensable research area for the development of science as a whole.

The RIKEN Center for Advanced Photonics (RAP) is on the cutting-edge of scientific discovery, pioneering new frontiers in various fields with its groundbreaking research in photonics. We’ re thrilled to announce our new motto, “Edge Photonics,” which beautifully captures the essence of our pioneering spirit. The word “edge” symbolizes our innovative approach, with its triple meaning: cutting-edge photonics, photonics at the edge (boundary area), and photonics at the network edge. In the cutting-edge photonics, we are at the forefront of ultra-precise optical lattice clocks and developing materials science research using attosecond lasers. The development of quantum electronics in the terahertz range is also a promising area of research in the future. Photonics in the boundary research area provides new means of observation and analysis necessary for solving fundamental problems in the life sciences and the universe. In the field of photonics at the network edge, we are exploring the potential of artificial intelligence (AI)-based photonics, which is a highly advanced area that connects the digital and physical worlds.

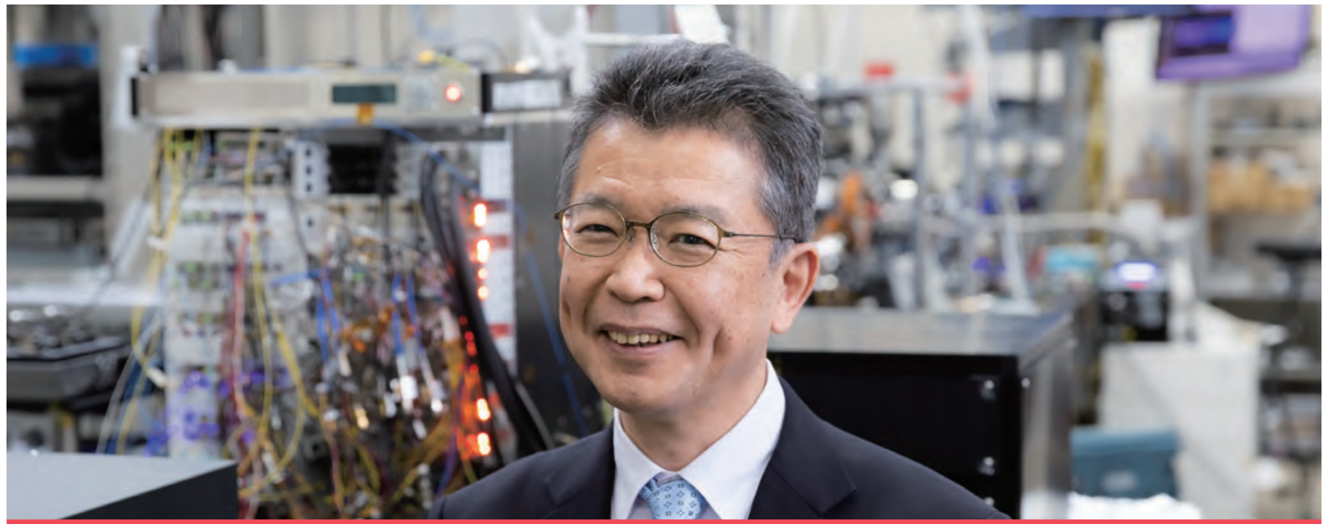
Center Director
Koichiro Tanaka

田中耕一郎

RIKEN Center
for Advanced Photonics

Space-Time Engineering Research Team

Team Director Hidetoshi Katori D.Eng.

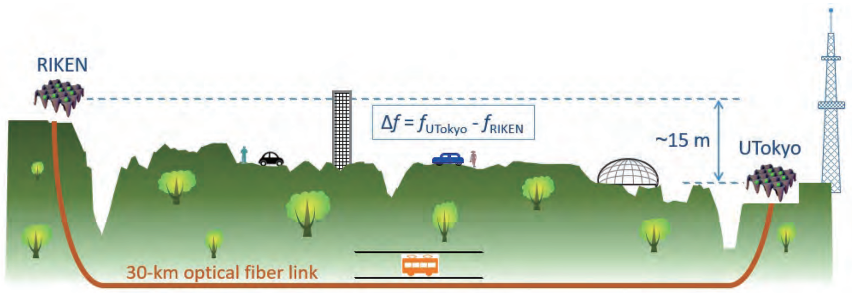


Relativistic Space-Time Engineering with Ultra Precise Atomic Clocks

Clocks have been a tool for sharing time based on universal periodic phenomena; humankind has relied upon the earth's rotation since antiquity. The radiation from an atom provides us with far more accurate periodicity. State-of-the-art atomic clocks sense the relativistic space-time curved by gravity, which reveals the difficulty of sharing time with others. Moreover, such clocks may be used to investigate the constancy of fundamental constants upon which their operation is based.

Optical lattice clocks proposed in 2001 made ultra-stable and accurate clocks possible by applying the "magic wavelength" protocol. Their precision now surpasses the current definition of the SI second, positioning them as strong candidates for its future redefinition.

Our team leverages advanced atomic physics and quantum optics techniques to develop highly precise, compact, and long-term-operable optical lattice clocks. This enables us to explore novel applications of “space-time engineering” that fully use these new time resources. For instance, a transportable optical lattice clock deployed in the field can function as a gravitational potential sensor. Through such experiments, we are investigating the scientific and practical impact of relativistic geodesy—and the new roles that clocks may play in the future.



Remote frequency comparison of optical lattice clocks between RIKEN and the University of Tokyo (UTokyo) reveals their different tick rates as predicted by general relativity.

▶ Fields

Interdisciplinary Science and Engineering, Engineering

▶ Keywords

Quantum electronics, Atomic clock, Quantum metrology, Optical lattice clock, Relativistic geodesy

▶ Publications

1. Takamoto, M., Ushijima, I., Ohmae, N., Yahagi, T., Kokado, K., Shinkai, H., and Katori, H.: "Test of general relativity by a pair of transportable optical lattice clocks", ***Nat. Photonics*** 14, 411-415 (2020).
2. Ushijima, I., Takamoto, M., and Katori, H.: "Operational magic intensity for Sr optical lattice clocks", ***Phys. Rev. Lett.*** 121, 263202 (2018).
3. Takano, T., Takamoto, M., Ushijima, I., Ohmae, N., Akatsuka, T., Yamaguchi, A., Kuroishi, Y., Munekane, H., Miyahara, B., and Katori, H.: "Geopotential measurements with synchronously linked optical lattice clocks", ***Nat. Photonics*** 10, 662-666 (2016).
4. Yamanaka, K., Ohmae, N., Ushijima, I., Takamoto, M., and Katori, H.: "Frequency ratio of ^{199}Hg and ^{87}Sr optical lattice clocks beyond the SI limit", ***Phys. Rev. Lett.*** 114, 230801 (2015).
5. Ushijima, I., Takamoto, M., Das, M., Ohkubo, T., and Katori, H.: "Cryogenic optical lattice clocks", ***Nat. Photonics*** 9, 185-189 (2015).

▶ Member

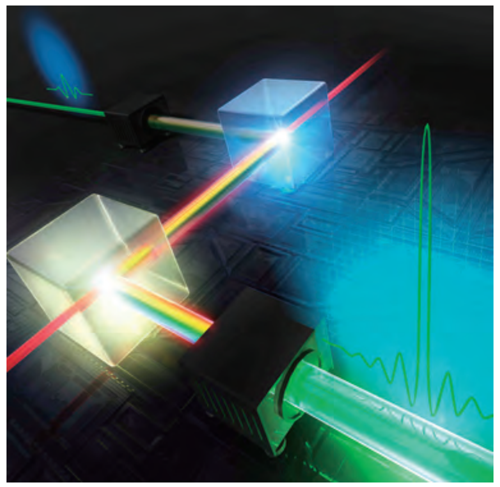
Masao Takamoto / Atsushi Yamaguchi / Quentin d’ Armagnac de Castanet / Shinji Ito

Ultrafast Coherent Soft X-ray Photonics Research Team

Team Director Eiji J. Takahashi D.Eng.

Creating innovative optical pulses by exploiting the extreme nature of laser

Laser is highly controllable light, and by using various laser technologies, we can create optical pulses with arbitrary electric field shape, pulse duration, and beam shape. The main research goal of our laboratory is to extend the wavelength range of coherent light sources up to hard x-ray by using the extreme nature of laser light, such as ultra-short pulse duration, ultra-broadband wavelength, and ultra-high intensity. Through the development of novel laser technologies, we demonstrate extreme laser sources useful for strong field physics and push the frontiers of laser science.



Amplification of single-cycle laser pulses

▶ Fields

Interdisciplinary Science and Engineering, Engineering, Physics

▶ Keywords

High-power single-cycle laser, Attosecond laser, Thin-disk laser, Fiber laser, Strong-field physics

▶ Publications

1. Rajpoot, R., and Takahashi E. J.: "Systematic analysis of an attosecond pulse generation by a subcycle laser field", ***Phys. Rev. Res.*** 7, 013047 (2025).
2. Nishimiya, K., and Takahashi E. J.: "Octave-spanning supercontinuum coherent soft x-ray for producing a single-cycle soft x-ray pulse", ***Opt. Lett.*** 49, 5779 (2024).
3. Lu, X., and Takahashi, E.J.: "Dual-chirped optical parametric amplification of high-energy single-cycle laser pulses", ***Nat. Photonics*** 18, 99-106 (2024).
4. Bing, X., Midorikawa, K., and Takahashi, E.J.: "Gigawatt-class, tabletop, isolated-attosecond-pulse light source", ***Optica*** 9, 360-363 (2022).
5. Lu, X., Bing, X., Ishii, N., Itatani, J., Midorikawa, K., and Takahashi, E.J.: "100-mJ class, sub-two-cycle, carrier-envelope phase-stable dual-chirped optical parametric amplification", ***Opt Lett*** 47, 3371-3374 (2022).

▶ Member

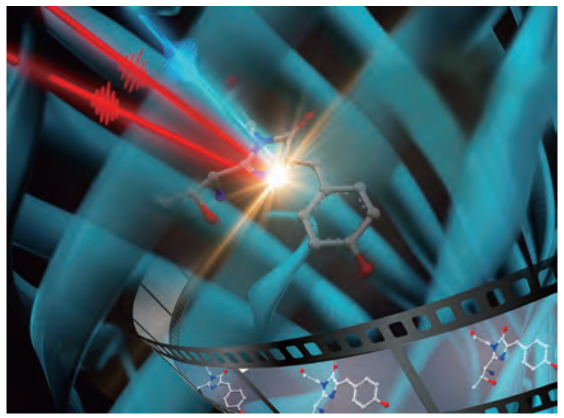
Yasuo Nabekawa / Natsuki Kanda / Lin Yu-Chieh / Dai Ikeda / Kaito Nishimiya / Kotaro Imasaka / Hiroki Kawase / Rambabu Rajpoot / Ahmed Ramadan Ibrahim / Dianhong Dong / Minshuang Xia

Ultrafast Spectroscopy Research Team

Team Director Tahei Tahara D.Sci.

Elucidating complex molecular dynamics with femtosecond light

Most of the phenomena in nature are realized by the dynamic behavior of molecules. Among them, chemical reactions are critically important, which dynamically cause the cleavage and formation of chemical bonds and alter the nuclear arrangement within the molecules. Even non-reactive molecules are vibrating, which provides rich information about the molecular properties. Because the timescale of such molecular motion is femtosecond (one quadrillionth of a second), femtosecond spectroscopy is essential for elucidating chemical phenomena. Our team investigates the dynamics of molecules from fundamental to complex systems, as well as the molecules in special environments such as interfaces. We extend the frontier of molecular science through the development and use of advanced spectroscopic methods.



Coherent nuclear motion of the chromophore of a protein in reaction

Fields

Chemistry, Physics, Biology / Biochemistry

Keywords

Ultrafast spectroscopy, Nonlinear spectroscopy, Single molecule spectroscopy, Dynamics, Interface

Publications

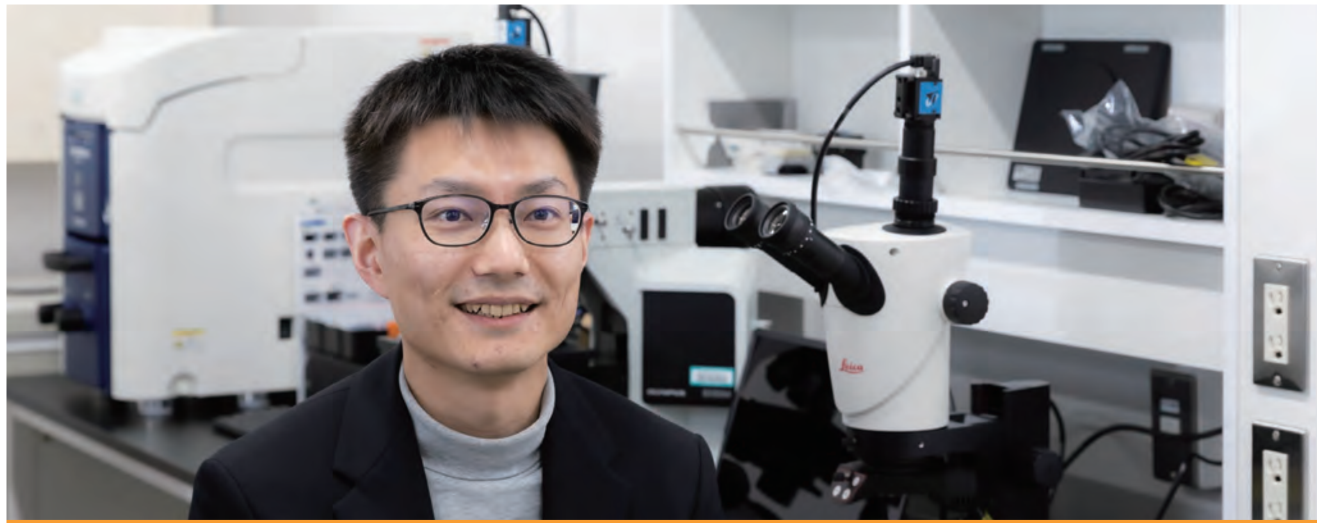
1. Kuramochi, H., Tsutsumi, T., Saita, K., Wei, Z., Osawa, M., Kumar, P., Liu, L., Takeuchi, S., Taketsugu, T., and Tahara, T.: "Ultrafast Raman observation of the perpendicular intermediate phantom state of stilbene photoisomerization", ***Nat. Chem.*** 16, 22 (2024).
2. Sung, W., Inoue, K., Nihonyanagi, S., and Tahara, T.: "Unified picture of vibrational relaxation of OH stretch at the air/water interface", ***Nat. Commun***. 15, 1258 (2024).
3. Kumar, P., Kuramochi, H., Takeuchi, S., and Tahara, T.: "Photoexcited plasmon-driven ultrafast dynamics of the adsorbate probed by femtosecond time-resolved surface-enhanced time-domain Raman spectroscopy", ***J. Phys. Chem. Lett***. 14, 2845 (2023).
4. Chang, C., Kuramochi, M., Singh, M., Abe-Yoshizumi, R., Tsukuda, T., Kandori, H., and Tahara, T.: "A unified view on varied ultrafast dynamics of the primary process in microbial rhodopsins", ***Angew. Chem. Int***. Ed. 61, e202111930 (2022).
5. Kusaka, R., Nihonyanagi, S., and Tahara, T.: "The photochemical reaction of phenol becomes ultrafast at the air–water interface", ***Nat. Chem***. 13, 306 (2021).

Member

Kunihiko Ishii / Satoshi Nihonyanagi / Korenobu Matsuzaki / Jan-Hendrik Borter

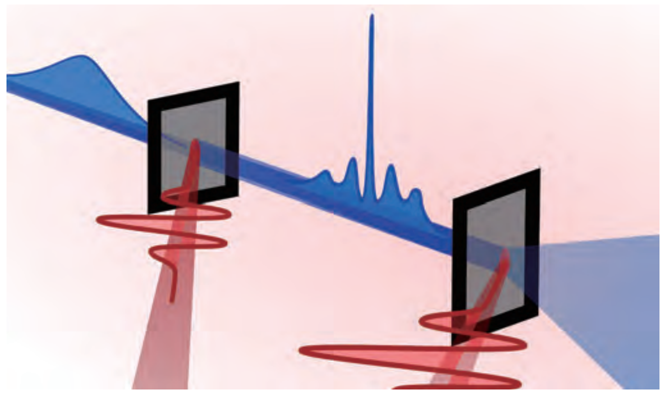
Ultrashort Electron Beam Science RIKEN Hakubi Research Team

RIKEN Hakubi Team Leader Yuya Morimoto Ph.D.



Space-time imaging of the initial steps of chemical reactions with ultrashort electron beams

Electron beams are used for examples in electron microscopy and electron-beam lithography, where high spatial resolution is required. By using state-of-the-art laser and electron-beam technologies, we control the temporal structure of an electron beam with ultimate attosecond resolution and apply the controlled electron beams for imaging and controlling ultrafast chemical reactions. We explore the atomic-scale dynamics of electrons in a material which is the initial step of most photochemical reactions.



Light-wave modulation of an electron beam

Fields

Chemistry, Physics, Interdisciplinary Science and Engineering, Engineering

Keywords

Ultrashort electron beam, Electron beam imaging, Nonlinear optics, Attosecond science, Atomic collisions

Publications

1. Morimoto, Y. and Baum, P. "Field-induced rocking curve effects in attosecond electron diffraction", ***Phys. Rev. Lett***. 132, 216902 (2024).
2. Morimoto, Y. and Madsen, L.B., "Scattering of ultrashort electron wave packets: optical theorem, differential phase contrast and angular asymmetries", ***New J. Phys.*** 26, 053012 (2024).
3. Morimoto, Y.: "Attosecond electron-beam technology: a review of recent progress", ***Microscopy*** 72, 2-17 (2023).
4. Morimoto, Y., Shinohara, Y., Tani, M., Chen, B.H., Ishikawa, K.L., and Baum, P.: "Asymmetric single-cycle control of valence electron motion in polar chemical bonds", ***Optica*** 8, 382 (2021).
5. Morimoto, Y., Hommelhoff, P., and Madsen, L.B.: "Coherent scattering of an optically-modulated electron beam by atoms", ***Phys. Rev***. A 103, 043110 (2021).

Member

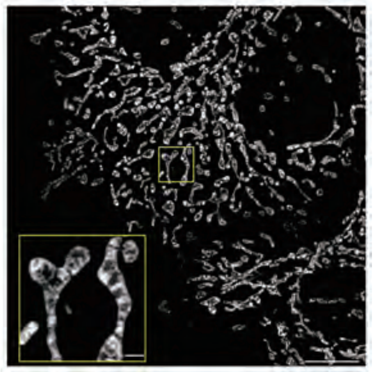
Yuichi Tachibana / Yui Yamashita

Biotechnological Optics Research Team

Team Director Atsushi Miyawaki M.D., Ph.D

Bioimaging Technologies by use of glowing proteins

We label a fluorescent probe on a specific region of a biological molecule and bring it back into a cell. We can then visualize how the biological molecule behaves in response to external stimulation. Since fluorescence is a physical phenomenon, we can extract various kinds of information by making full use of its characteristics. For example, the excited energy of a fluorescent molecule donor transfers to an acceptor relative to the distance and orientation between the two fluorophores. This phenomenon can be used to identify interaction between biological molecules or structural change in biological molecules. Besides, we can apply all other characteristics of fluorescence, such as polarization, quenching, photobleaching, photoconversion, and photochromism, in experimentation. Cruising inside cells in a super-micro corps, gliding down in a microtubule like a roller coaster, pushing our ways through a jungle of chromatin while hoisting a flag of nuclear localization signal --- we are reminded to retain a playful and adventurous perspective at all times. What matters is mobilizing all capabilities of science and giving full play to our imagination.



Visualization of mStayGold-harboring inner mitochondrial membranes by super-resolution microscopy (lattice structured illumination microscopy). Cells were scanned with a *z* step of 0.11μm over an axial range of 2.08μm. Scale bars, 10μm, 1μm (inset).

▶ Fields

Medicine, dentistry, and pharmacy, Engineering, Biological Sciences, Biology / Biochemistry

▶ Keywords

Bio-imaging, Fluorescence protein, Chromophore

▶ Publications

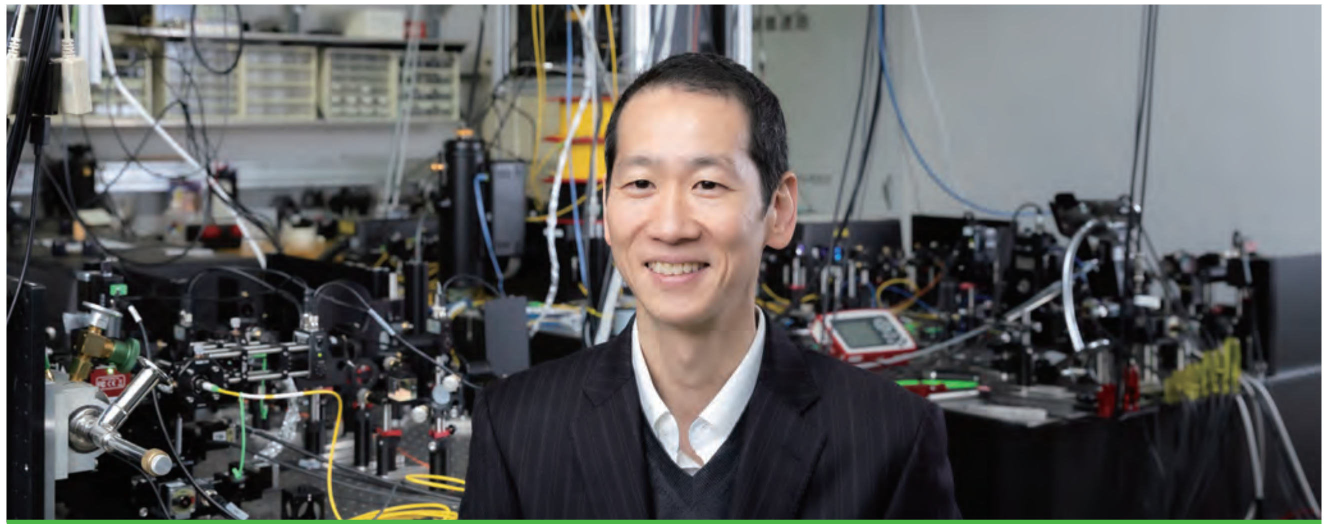
1. Hirano, M., Yonemaru, Y., Shimozono, S., Sugiyama, M., Ando, R., Okada, Y., Fujiwara, T., and Miyawaki, A.: "StayGold photostability under different illumination modes", ***Sci. Rep.*** 14, 5541 (2024).
2. Ando, R., Shimozono, S., Ago, H., Takagi, M., Sugiyama, M., Kurokawa, H., Hirano, M., Niino, Y., Ueno, G., Ishidate, F., Fujiwara, T., Okada, Y., Yamamoto, M., and Miyawaki, A.: "StayGold variants for molecular fusion and membrane-targeting applications", ***Nat. Methods*** 21, 648-656 (2024).
3. Hirano, M., Ando, R., Shimozono, S., Sugiyama, M., Takeda, N., Kurokawa, H., Deguchi, R., Endo, K., Haga, K., Takai-Todaka, R., Inaura, S., Matsumura, Y., Hama, H., Okada, Y., Fujiwara, T., Morimoto, T., Katayama, K., Miyawaki, A.: "A highly photostable and bright green fluorescent protein", ***Nat. Biotechnol.*** 40, 1132–1142 (2022).
4. Michikawa, T., Yoshida, T., Kuroki, S., Ishikawa, T., Kakei, S., Kimizuka, R., Saito, A., Yokota, H., Shimizu, A., Itohara, S., and Miyawaki, A.: "Distributed sensory coding by cerebellar complex spikes in units of cortical segments", ***Cell Rep***.37(6), 109966 (2021)
5. Katayama, H., Hama, H., Nagasawa, K., Kurokawa, H., Sugiyama, M., Ando, R., Funata, M., Yoshida, N., Homma, M., Nishimura, T., Takahashi, M., Ishida, Y., Hioki, H., Tsujihata, Y., and Miyawaki, A.: "Visualizing and Modulating Mitophagy for Therapeutic Studies of Neurodegeneration", ***Cell*** 181(5), 1176-1187 (2020).

▶ Member

Asako Sakaue-Sawano / Masahiko Hirano / Asako Tosaki

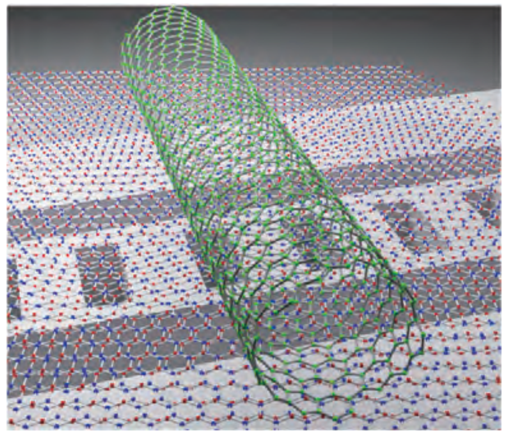
Quantum Optoelectronics Research Team

Team Director Yuichiro Kato Ph.D



Shaping light at the nanoscale edge for the quantum era

Optoelectronic devices harness the interactions between electrons and photons and are widely used in everyday applications, for example solar cells and light-emitting diodes. Continued advances in device fabrication techniques have enabled the integration of individual nanomaterials into device structures, providing opportunities to utilize the quantum nature of photons. Our research focuses on pioneering and engineering next-generation nanodevices that exploit the quantum properties of nanomaterials and enable control of light at the quantum level. By combining state-of-the-art nanofabrication and nanosynthesis techniques, we investigate devices capable of manipulating single photons in the telecommunication band as well as integrated photonics for quantum applications at room temperature.



carbon nanotube and two-dimensional material on photonic crystal nanobeam cavity

▶ Fields

Interdisciplinary Science and Engineering, Engineering, Physics, Chemistry

▶ Keywords

Carbon nanotubes, Two-dimensional materials, Photonic crystals, Nanoscale devices, Integrated photonics

▶ Publications

1. Fang, N., Chang, Y. R., Fujii, S., Yamashita, D., Maruyama, M., Gao, Y., Fong, C. F., Kozawa, D., Otsuka, K., Nagashio, K., Okada, S., Kato, Y. K.: "Room-temperature quantum emission from interface excitons in mixed-dimensional heterostructures", ***Nat. Commun***. 15, 2871 (2024).
2. Fang, N., Chang, Y. R., Yamashita, D., Fujii, S., Maruyama, M., Gao, Y., Fong, C. F., Otsuka, K., Nagashio, K., Okada, S., Kato, Y. K.: "Resonant exciton transfer in mixed-dimensional heterostructures for overcoming dimensional restrictions in optical processes", ***Nat. Commun***. 14, 8152 (2023).
3. Kozawa, D., Wu, X., Ishii, A., Fortner, J., Otsuka, K., Xiang, R., Inoue, T., Maruyama, S., Wang, Y., Kato, Y. K.: "Formation of organic color centers in air-suspended carbon nanotubes using vapor-phase reaction", ***Nat. Commun***. 13, 2814 (2022).
4. Otsuka, K., Fang, N., Yamashita, D., Taniguchi, T., Watanabe, K., and Kato, Y. K.: "Deterministic transfer of optical-quality carbon nanotubes for atomically defined technology", ***Nat. Commun***. 12, 3138 (2021).
5. Ishii, A., Machiya, H., Kato, Y. K.: "High efficiency dark-to-bright exciton conversion in carbon nanotubes", ***Phys. Rev. X*** 9, 041048 (2019).

▶ Member

Nan Fang / Mengyue Wang / Ufuk Erkilic / Kenichi Cho / Hiroyuki Nishidome / Clement Deleau

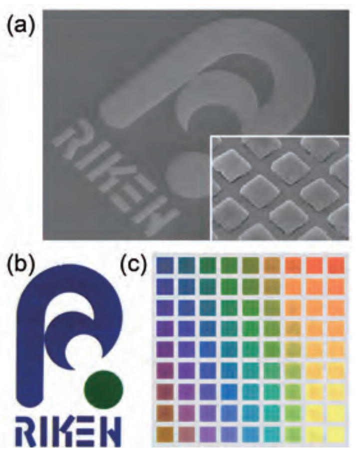
Metaphotonics Research Team

Team Director Takuo Tanaka D.Eng.

Lightwave manipulation by subwavelength structures

Our team conducts intensive research on novel photon manipulation technologies, building upon knowledge and experience gained from studies of light-wave interactions with nanometer scale fine structures. These photon manipulation technologies are intended for applications such as three-dimensional nanofabrication systems and ultra-sensitive molecular sensing devices.

Figure (a) shows a scanning electron microscope image of the RIKEN logo, composed of a nanometer scale aluminum structure that absorbs light at specific wavelengths determined by its size and shape. Figure (b) presents an optical image of the RIKEN logo under white light illumination. Figure (c) demonstrates a color palette exhibiting a wide gamut of colors.



Colors created by metamaterial absorber that consists of subwavelength aluminum structure.

▶ Fields

Engineering, Complex systems, Interdisciplinary Science and Engineering

▶ Keywords

Metamaterials, Plasmonics, Nanophotonics, Near-field Optics, Applied Optics

▶ Publications

1. Liu, X., Zhao, Z., Xu, S., Zhang, J., Zhou, Y., He, Y., Yamaguchi, T., Ouyang, H., Tanaka, T., Chen, M. K., Shi, S., Qi, F., and Tsai, D. P.: "Meta-Lens Particle Image Velocimetry", ***Adv. Mater.*** 36, 2310134 (2023).
2. Chu, C. H., Chia, Y.-H., Hsu, H.-C, Vyas, S., Tsai C.-M., Yamaguchi, T., Tanaka, T., Chen, H.-W., Luo, Y. , Yang P.-C., and Tsai, D. P.: "Intelligent Phase Contrast Meta-Microscope System", ***Nano Letters*** 23(24), 11630-11637 (2023).
3. Chen, M. K., Chu, C. H., Liu, X., Zhang, J., Sun, L., Yao, J., Fan, Y., Liang, Y., Yamaguchi, T., Tanaka, T., and Tsai, D. P.: "Meta-Lens in the Sky", ***IEEE Access*** 10, 46552-46557 (2022).
4. Tanaka, T., Yano, T., and Kato, R.: "Nanostructure-enhanced infrared spectroscopy", ***Nanophotonics*** 11, 2541-2561 (2022).
5. Jung, W., Jung, Y., Pikhitsa, P., Feng, J., Yang, Y., Kim, M., Tsai, H., Tanaka, T., Shin, J., Kim, K., Choi, H., Rho, J., and Choi, M.: "Three-dimensional nanoprinting via charged aerosol jets", ***Nature*** 592, 54 (2021).

▶ Member

Norihiko Hayazawa / Daiki Kawasaki / Cherrie May Mogueis Olaya / Daigo Oue / Takeshi Yamaguchi

Image Processing Research Team

Team Director Hideo Yokota D.Eng.

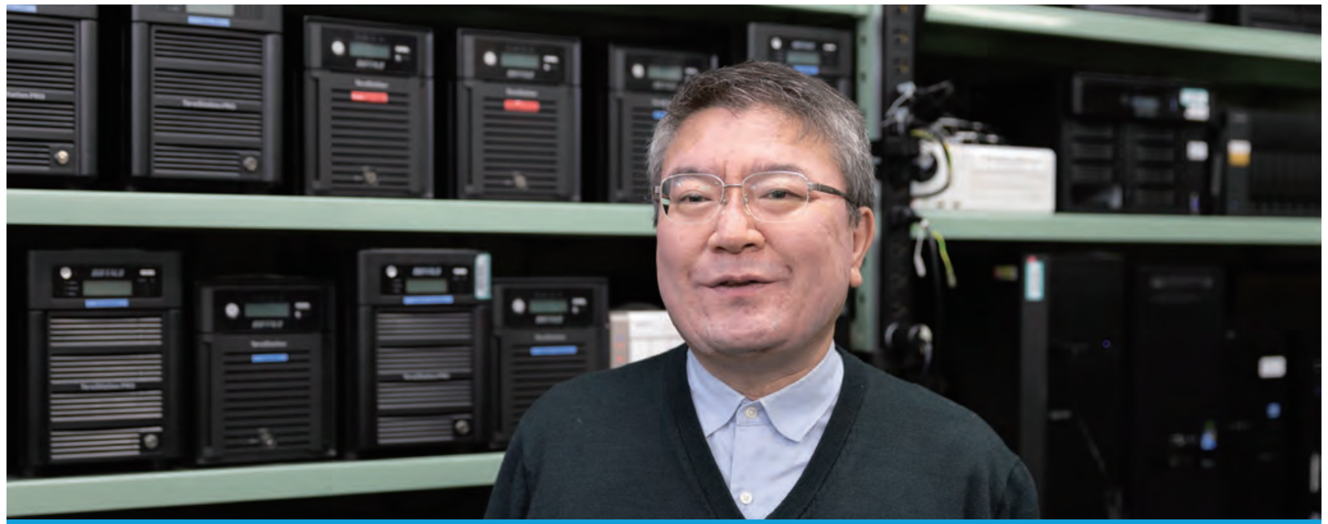


Image processing research for scientific information

Our goal is to develop RIKEN's unique data processing and multidimensional imaging technologies for the advancement of science and technology. We focus on contributing to the fields of precision engineering, mathematical biology, biomedical simulation, quantification of biological phenomena, and computer-aided diagnosis by developing new image processing tools and new imaging devices for researchers both inside and outside RIKEN.

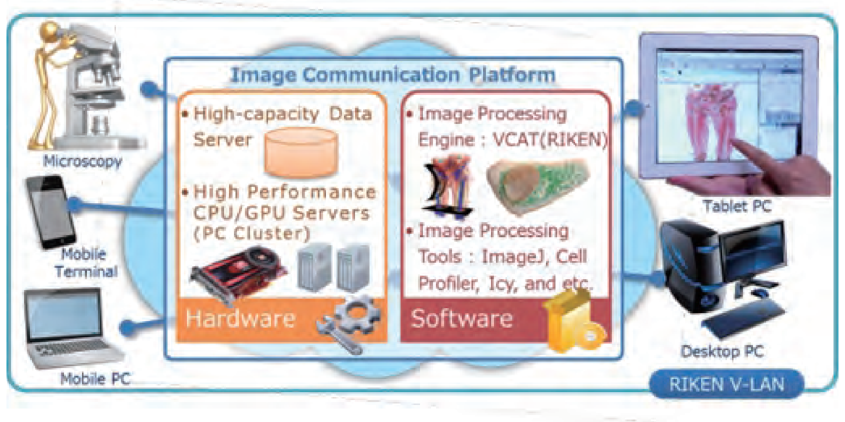


Image Processing Cloud

▶ Fields

Engineering, Informatics, Computer Science

▶ Keywords

Multi dimensional image processing, Multi dimensional imaging, Bioengineering, Image analysis, Medical engineering

▶ Publications

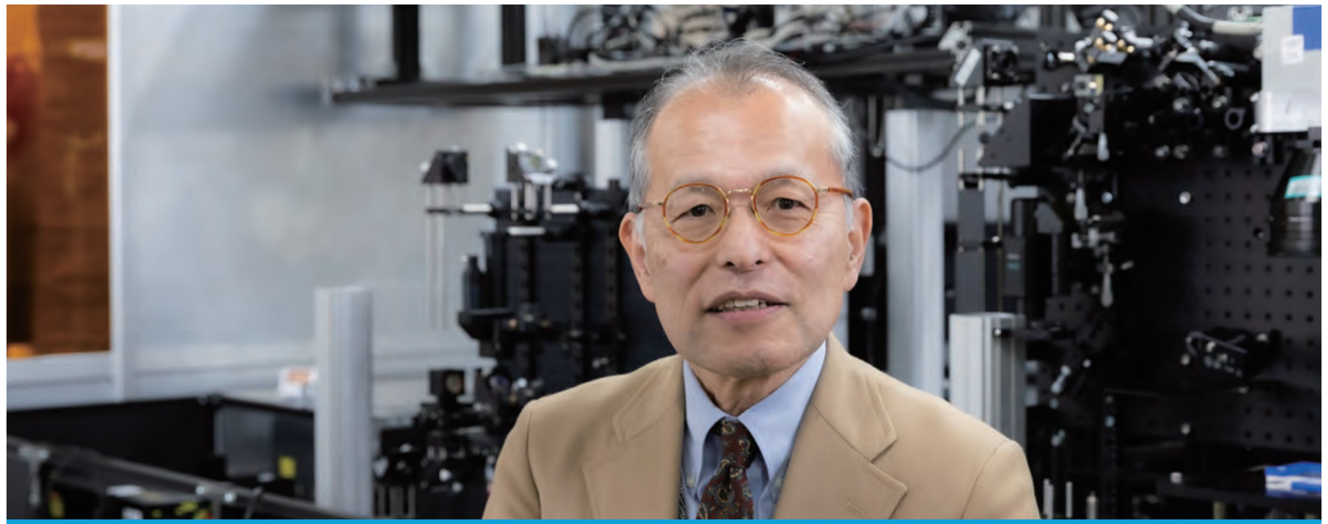
1. Yoshizawa, S., Michikawa, T., and Yokota, H.: "Topological Delaunay Graph for Efficient 3D Binary Image Analysis", ***Int. J. Autom. Technol.*** 18 (5), 632-650 (2024).
2. Fukatsu, M., Yoshizawa, S., Takemura, H., and Yokota, H.: "Bilateral Half-box Image Filtering", ***Int. J. Autom. Technol.*** 18(3), 427-432 (2024).
3. Chu, S., Abe, K., Yokota, H., Cho, D., Hayashi, Y., Tsai, M.-D.: "Deep learning for quantifying spatial patterning and formation process of early differentiated human-induced pluripotent stem cells with micropattern images", ***J. Microsc.*** 296 (1), 79-93 (2024).
4. Uematsu, T., Tsuboi, T., Hiraga, K., Tamakoshi, D., Fukushima, T., Sato, M., Nishida, K., Yokota, H., Katsuno, M.: "Differential impact of fixation characteristics on 3D perception via texture gradient recognition in Parkinson's disease", ***Parkinsonism & Relat. Disord.*** 128, 107116 (2024).
5. Sakamaki, K., Sakamoto, N., Tsujimura, Y., Iwasaki, T., Kawamura, T., Nakabayashi, J.: "Caspase-mediated cleavage of a scaffold protein, MPRIP, yields a truncated form that is involved in repetitive bleb formation", ***FEBS J.*** 292(9), 2287-2305 (2025).

▶ Member

Shin Yoshizawa / Satoshi Oota / Shigeho Noda / Takashi Michikawa / Satoko Takemoto / Hidekazu Takahashi / Sakiko Nakamura / Yuki Tsujimura / Masaomi Nishimura / Kotaro Oikawa

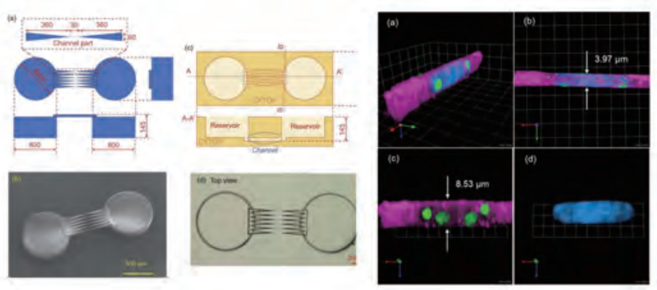
Advanced Laser Processing Research Team

Team Director Koji Sugioka D.Eng.



Femtosecond Laser 3D Processing: Fabrication of Highly Functional Micro/Nanosystems

Our research team is developing advanced laser processing techniques which realize low environmental load, high quality, high efficiency fabrication of materials. In particular, by using femtosecond lasers, novel material processing techniques including 3D fabrication, surface nanostructuring, novel nanomaterial synthesis, and tailored beam processing are developed, which are applied to fabricate highly functional micro/nanodevices. As one of examples, our team has developed a technique that can fabricate 3D micro/nanofluidic chips using CYTOP as substrates by combining two-photon polymerization and molding process. CYTOP is an amorphous fluoropolymer with excellent transmittance over a wide range of wavelengths and the almost same refractive index as water. By taking advantage of these properties, we successfully demonstrated super-resolution live imaging of the behavior of cancer cells migrating in microchannels. The CYTOP biochips produced by the developed technique can be used for various biological studies and are expected to provide new knowledge.



(Left) Structural drawing and optical micrograph of a 3D CYTOP microfluidic chip.
(Right) Multicolor 3D super-resolution imaging of cancer cells migrating in a CYTOP microfluidic channel.

▶ Fields

Engineering, Materials Sciences, Interdisciplinary science, Multidisciplinary

▶ Keywords

Femtosecond laser, Laser processing, Micro/nanofabrication, 3D fabrication, Biochip

▶ Publications

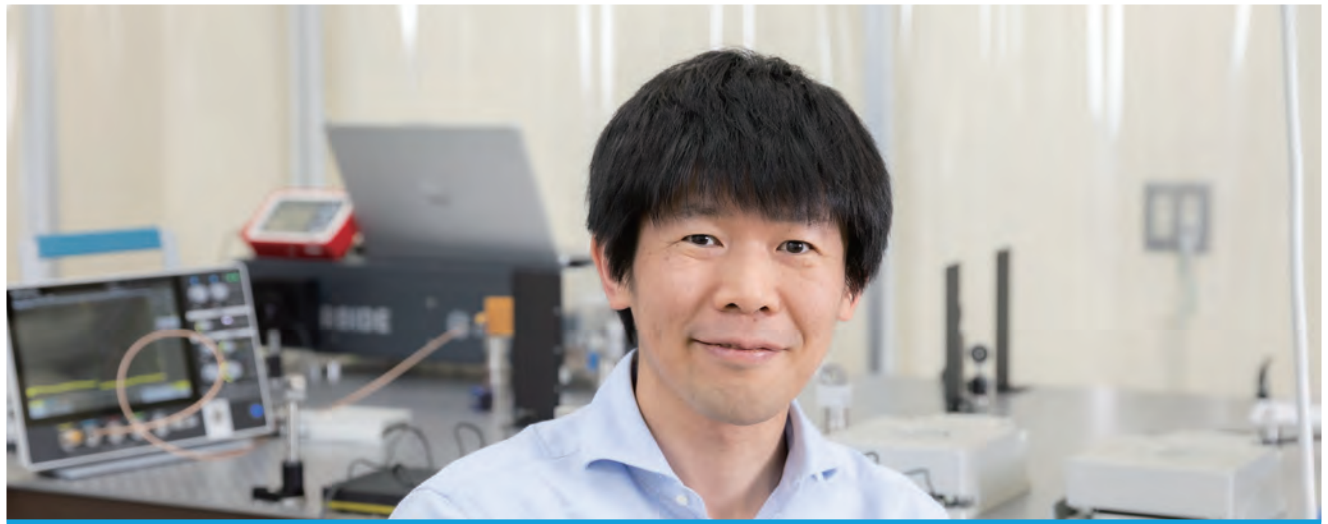
1. Zhang, J., Obata, K., Ozasa, K., Uzawa, T., Ito, Y., Sugioka, K.: "Rapid manufacturing of glass-based digital nucleic acid amplification chips by ultrafast Bessel pulses", ***Small Sci.*** 4, 2300166 (2024).
2. Kawabata, S., Bai, S., Obata, K., Miyaji, G., and Sugioka, K.: "Two-dimensional laser-induced periodic surface structures formed on crystalline silicon by GHz burst mode femtosecond laser pulses", ***Int. J. Extreme Manuf.*** 5, 015004 (2023).
3. Bai, S., Serien, D., Ma, Y., Obata, K., and Sugioka, K.: "Attomolar sensing based on liquid-interface assisted surface enhanced Raman scattering in microfluidic chip by femtosecond laser processing", ***ACS Appl. Mater. Interfaces*** 12, 42328–42338 (2020).
4. Bai, S., Serien, D., Hu, A., and Sugioka, K.: "Three-dimensional microfluidic SERS chips fabricated by all-femtosecond-laser-processing for real-time sensing of toxic substances", ***Adv. Funct. Mater.*** 28, 1706262 (2018).
5. Wu, D., Xu, J., Niu, L., Wu, S., Midorikawa, K., and Sugioka, K.: "In-channel integration of designable microoptical devices using flat scaffold-supported femtosecond-laser microfabrication for coupling-free optofluidic cell counting", ***Light Sci. Appl.*** 4, e228 (2014).

▶ Member

Shi Bai/ Ashkan MomeniBidzard / Kun Fang / Wilder Rodrigues / Kazunari Ozasa / Shota Kawabata

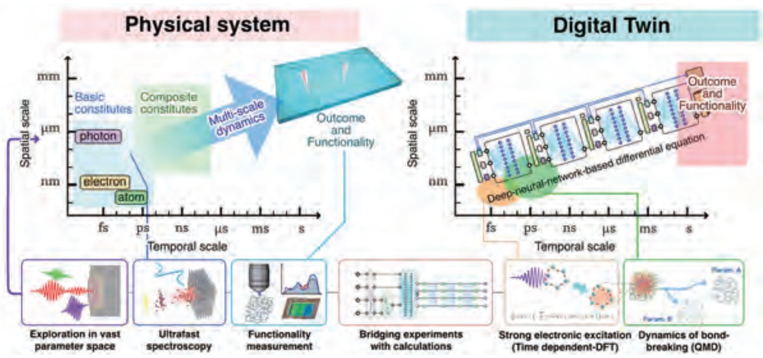
Digital Twin for Light-Matter Interaction RIKEN ECL Research Team

RIKEN ECL Team Leader Shuntaro Tani Ph.D.



Constructing Digital Twin for Multi-Scale Phenomena Driven by Photo-Excitation

With the advancement of laser technology, we can now apply laser fields onto materials, the strength of which is comparable to the interatomic bonds of the materials themselves. These strong and controllable light electric fields are expected to be utilized in precise laser processing and various forms of material state control. However, the physics underlying irreversible processes, such as the fragmentation of a continuous solid into discrete atoms, remains not fully understood. At present, extensive trial and error is necessary to control these processes. In this research project, we aim to develop a method to extract the 'context' of phenomena by extensively observing microscopic processes beginning with photoexcitation, through the complete automation of experiments. Utilizing this technique, we intend to elucidate the governing equations of materials' irreversible transformation and construct a digital twin for optimizing these processes.



Digital twin of laser processing

▶ Fields

Interdisciplinary science and engineering, Physics, Engineering

▶ Keywords

Precision laser processing, Ultrafast spectroscopy, Deep learning, Digital Twin, Autonomous experiment

▶ Publications

1. Suemoto, T., Ono, S., Asahara, A., Okuno, T., Suzuki T., Okazaki, K., Tani, S., and Kobayashi, Y.: "Comprehensive study of the luminescence properties of elemental metals", ***Phys. Rev,*** B 111, 035150 (2025).
2. Tani, S., and Kobayashi, Y.: "Pulse-by-pulse evolution of surface morphology driven by femtosecond laser pulses", ***J. Appl. Phys.*** 133, 143104 (2023).
3. Shimahara, K., Tani, S., Sakurai, H., and Kobayashi, Y.: "A deep learning-based predictive simulator for the optimization of ultrashort pulse laser drilling", ***Commun. Eng.*** 2, 1 (2023).
4. Tani, S., Sugiyama, K., Sukegawa, T., Sato, T., Ishizuka, Y., Taya, S., Feng, F., Komeda, O., Suto, H., Saitoh, H., and Kobayashi, Y.: "Real-time high-spectral-resolution mid-infrared spectroscopy with a signal-to-noise ratio of ten thousand", ***Opt. Express*** 30, 36813 (2022).
5. Tani, S., and Kobayashi, Y.: "Ultrafast laser ablation simulator using deep neural networks", ***Sci. Rep.*** 12, 5837 (2022).

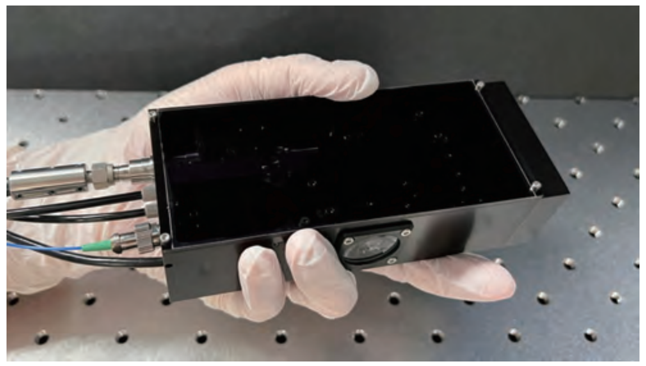
▶ Member

Tera-Photonics Research Team

Team Director Hiroaki Minamide D.Eng.

Shaping the future with advanced terahertz-wave nonlinear photonics

Our team is advancing innovative research in terahertz (THz)-wave nonlinear photonics. We have achieved world-leading results, including kilowatt-level THz-wave generation, attojoule-level THz-wave detection, and backward THz-wave parametric oscillation. Moving forward, we aim to develop Terahertz-System on a Chip (T-SoC) technology. We are focusing on next-generation sensing technologies such as coherent detection and quantum interference with non-classical light to drive future innovations. By strengthening collaborations with universities and industries worldwide, we are expanding our international network and fostering young researchers, with a goal to promote THz-wave technologies and technological advancements globally.



Palm-sized backward THz-wave parametric oscillator

▶ Fields

Engineering,
Interdisciplinary science and engineering

▶ Keywords

Advanced Nonlinear Photonics,
Backward THz-wave parametric oscillation,
THz-System on a Chip (T-SoC),
Next-Generation Sensing Technologies,
THz quantum research

▶ Publications

1. Xu, Y., Takida, Y., Suzuki, T., Minamide, H.: "Terahertz-Wave Polarization Space-Division Multiplexing Meta-Devices based on Spin-Decoupled Phase Control", *Adv. Sci.* 12, 2412688, (2025).
2. Buchmann, T. O., Takida, Y., Sebek, M., Kawai, M., Sugiura, G., Minamide, H., Jepsen, P. U., and Lange, S. J.: "Leveraging the nonlinearity of THz photomultiplier tubes for enhanced spectroscopic sensitivity", *IEEE Trans. Terahertz Sci. Technol.* 14, 592–598 (2024).
3. Okatani, T., Imai, K., Takida, Y., Ohno, S., Minamide, H., and Kanamori, Y.: "Phase-controllable spoof surface plasmon coupling from Bull' s eye antenna to planar silicon waveguide in the terahertz band", *IEEE Trans. Terahertz Sci. Technol.* 14(4), 519–530 (2024).
4. Nishida, M., Notake, T., Takida, Y., Hirosawa, K., Ohata, N., and Minamide, H.: "High-repetition-rate injection-seeded terahertz-wave parametric generation pumped by a 1.5 μm sub-nanosecond laser", *Appl. Phys. Lett.* 124(12), 121105 (2024).
5. Muldera, J.E., Nawata, K., Takida, Y., Yadav, D., and Minamide, H.: "Tunable backward terahertz-wave parametric oscillator centered at a high frequency of 0.87 THz with injection seeding", *Opt. Express* 31(15), 23966-23973 (2023).

▶ Member

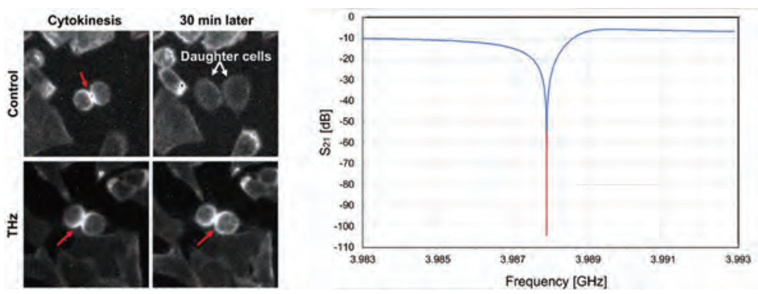
Yuma Takida / Joselito Muldera /
Alexander De Los Reyes / Yuto Yoneda

Terahertz Sensing and Imaging Research Team

Team Director Chiko Otani D.Sci.

Terahertz Sensing, Imaging and Applications

Terahertz (THz) wave has the unique characteristics such as the transparency to many soft materials and their spectral absorption features. These characteristics can be utilized for many applications in various scientific and industrial fields. In this team, we are developing novel technologies, science and applications in THz sensing, imaging, and detection. In particular, we are conducting research and development on the control of molecular structure and function by THz-wave irradiation, high-sensitivity imaging and observations using superconducting detectors as well as the collaborative research and development with companies.



(Left) Inhibition of cell division by actin protein fibrillation in cells by terahertz-wave irradiation (microscopic image).
(Right) VNA spectrum of a thin-film superconducting microwave resonator with a high quality factor (Q_i~10^8).

▶ Fields

Engineering, Space Science,
Molecular Biology / Genetics, Physics,
Agricultural Sciences, Chemistry,
Interdisciplinary science and engineering

▶ Keywords

Terahertz wave, Spectroscopy and Imaging, Sensing, Structural and Functional control of biological tissues, Superconducting detector

▶ Publications

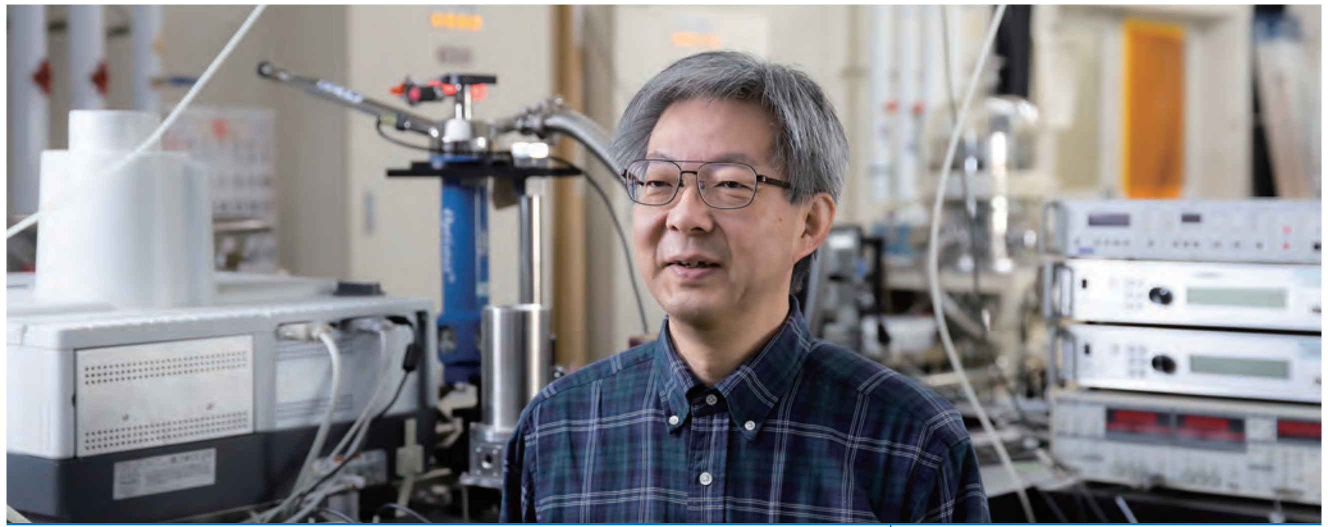
1. Hernández-Cabrera, J. F., De Miguel, J., Hernández-Suárez, E., Joven, E., Otani, C., Rubiño-Martín, J. A., and Zioutas, K.: "Echo-free quality factor of a multilayer axion haloscope", ***Phys. Rev. D.*** 110(7), 072013 (2024).
2. Kamei, Y., Ishidoshiro, K., Ito, R., Kobayashi, T., Mima, S., Nakajo, Y., Otani, C., and Taino, T.: "Development of Kinetic Inductance Detector on ZrO_2 Substrate for Double-Beta Decay Search", ***J. Low Temp. Phys.*** 217, 481-490 (2024).
3. Sueno, Y., Baselmans, J. J. A., Coppens, A. H. M., Génova-Santos, R. T., Hattori, M., Honda, S., Karatsu, K., Kutsuma, H., Lee, K., Nagasaki, T., Oguri, S., Otani, C., Peel, M., Suzuki, J., Tajima, O., Tanaka, T., Tsujii, M., Thoen, D. J., and Won, E.: "Pointing Calibration of GroundBIRD Telescope Using Moon Observation Data", ***Prog. Theor. Exp. Phys.*** 2024, 023F01 (2024).
4. Ikari, T., Sasaki, Y., and Otani, C.: "275-305 GHz FM-CW radar 3D imaging for walk-through security body scanner", ***Photonics.*** 10(3), 343 (2023).
5. Yamazaki, S., Ueno, Y., Hosoki, R., Saito, T., Idehara, T., Yamaguchi, Y., Otani, C., Ogawa, Y., Harata, M., and Hoshina, H.: "THz irradiation inhibits cell division by affecting actin dynamics", ***PLOS One.*** 16, e0248381 (2021).

▶ Member

Hiromichi Hoshina / Yoshiaki Sasaki /
Shusaku Nakajima / Yuto Kamei /
Shinsuke Uno / Sota Mine / Ryota Ito

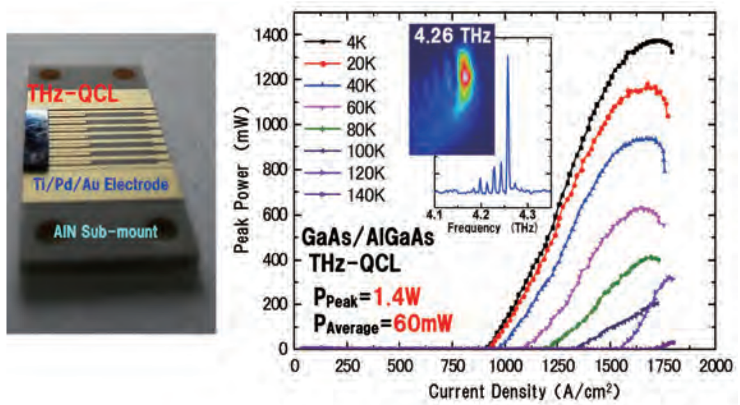
Terahertz Quantum Device Research Team

Team Director Hideki Hirayama D.Eng.



Development of compact and potable terahertz laser source

Terahertz light having both the transparency of radio wave and the high resolution of light is expected to be used in a wide range of application fields as a light source for various perspective and nondestructive inspections. We are developing THz-QCL (terahertz quantum-cascade laser), which is expected to be a very compact, portable, high power terahertz light source. Through the introduction of a new quantum subband structure and/or nitride semiconductors, THz-QCL aiming for implementation in society is being developed by performing room temperature oscillation and enlarging the operating frequency region which have been impossible so far. By developing the next generation compact terahertz imaging devices, we would like to contribute to the realization of a prosperous society in the near future.



Photograph and operating properties of terahertz quantum-cascade laser (THz-QCL)

▶ Fields

Optical Devise Engineering, Quantum Electronics, Semiconductor Physics

▶ Keywords

Terahertz, Quantum Cascade lasers, Inter-subband transition, Nitride semiconductors lasers, Molecular-beam epitaxy

▶ Publications

1. Wang, L., Lin, T. T., Wang, K., and Hirayama, H.: "Clean three-level direct-phonon injection terahertz quantum cascade laser", *Appl. Phys. Lett.* 122, 221103 (2023).
2. Wang, L., Chen, M., Lin, T. T., Wang, K., and Hirayama, H.: "Interdiffusion limiting on self-consistent optical gain in terahertz quantum cascade lasers", *Appl. Phys. Express* 16, 072004 (2023).
3. Wang, L., Lin, T. T., Chen, M., Wang, K., and Hirayama, H.: "Terahertz quantum cascade laser considering compositional interdiffusion effect", *Appl. Phys. Express* 16, 032007 (2023).
4. Lin, T. T., Wang, L., Wang, K., Grange, T., Birner, S., Miyoshi, T., and Hirayama, H.: "Increasing the output power of a heavily doped terahertz quantum cascade laser by avoiding the subband misalignment", *J. Appl. Phys.* 132, 173101 (2022).
5. Lin, T. T., Wang, L., Wang, K., Grange, T., Birner, S., and Hirayama, H.: "Over one watt output power terahertz quantum cascade lasers by using high doping concentration and variable barrier-well height", *Phys. Status Solidi RRL* 16, 2200033 (2022).

▶ Member

Krishan Kumar / Shashank Shekhar Mishra / Takayuki Ishida / Kenji Yamazawa

Terahertz and Infrared Quantum Photonics Research Team

Team Director Koichiro Tanaka D.Sci.

Developing quantum light sources in the terahertz and infrared regions

Our team aims to elucidate the quantum states of materials and the conversion processes of light energy by developing new light sources in the terahertz and infrared regions and making full use of new spectroscopic methods based on these light sources. In particular, in the terahertz region, we will generate frequency-stabilized light and use it to coherently control the quantum state of matter. We will also focus on non-classical light and develop new nonlinear spectroscopy and imaging methods that make use of its characteristics, in order to clarify the true nature of matter that has not been elucidated until now.

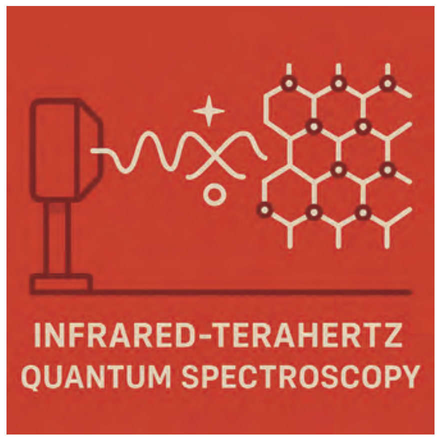


Illustration of THz and Infrared Quantum Photonics

▶ Fields

Physics, Engineering, Interdisciplinary science and engineering

▶ Keywords

Solid state spectroscopy, Semiconductors, Atomic physics, Terahertz wave

▶ Publications

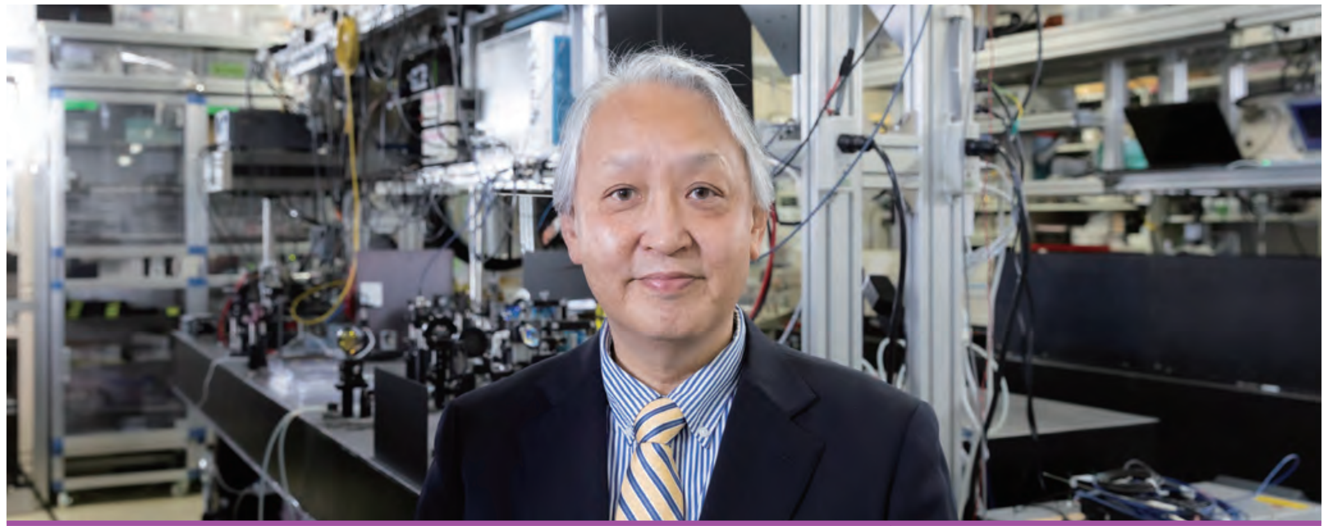
1. Katayama, I., Uchida, K., Takashina, K., Kishioka, A., Kaiho, M., Kusaba, S., Tamaki, R., Shudo, K., Kitajima, M., Ngo, T.D., Nagao, T., Takeda, J., Tanaka, K., Matsunaga, T.: "Three-dimensional bonding anisotropy of bulk hexagonal metal titanium demonstrated by high harmonic generation", *Commun. Phys.* 7, 404(2024).
2. Nakano, A., Uchida, K., Tomioka, Y., Takaya, M., Okimoto, Y., Tanaka, K,: "Dominant role of charge ordering on high harmonic generation in $Pr_{0.6}Ca_{0.4}MnO_3$", *Phys. Rev. Res.* 6, L042032(2024).
3. Uchida, K., Tanaka, K.: "High harmonic Mach–Zehnder interferometer for probing sub-laser-cycle electron dynamics in solids", *Optica* 11, 1130-1137 (2024).
4. Arikawa, T., Kim, J., Mukai, T., Nishigami, N., Fujita, M., Nagatsuma, T., Tanaka, K.: "Phase-resolved measurement and control of ultrafast dynamics in terahertz electronic oscillators", *Nat, Commun.* 15, 5358 (2024).
5. Takeda, K. S., Uchida, K., Nagai, K., Kusaba, S., Takahashi, S., Tanaka, K.: "Ultrafast Electron-Electron Scattering in Metallic Phase of 2H−$NbSe_2$ Probed by High Harmonic Generation", *Phys. Rev. Lett.* 132, 186901(2024).

▶ Member

Keisuke Isobe / Tomoki Hiraoka

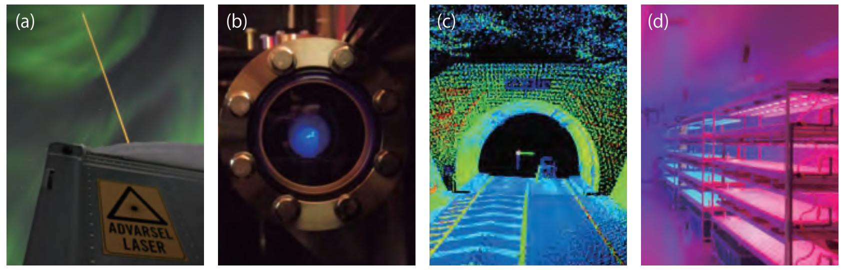
Photonics Control Technology Team

Team Director Satoshi Wada Ph.D.



Development of photonics control technology for science and social issues

Our team leverages advanced photonic technologies to tackle global challenges such as agriculture, aging societies, energy resource management, and environmental change, while also contributing to breakthroughs in fundamental science. We develop optical remote sensing systems for detecting gases in daily life and industry, atmospheric monitoring tools for analyzing cosmic ray and solar activity indicators, breath analysis techniques for health diagnostics, short-range LiDAR for tunnel degradation detection, and hydrogen-based renewable energy systems. In fundamental science, we are advancing high-power coherent Lyman-alpha light sources for ultra-slow muon generation in particle physics, as well as laser-based solutions for space debris removal and spaceborne sensing. These efforts are rooted in core research on photonic materials and optical control. We focus especially on tunable infrared light sources based on nonlinear wavelength conversion for quantum sensing.



(a) Sodium LIDAR
(b) Coherent Lyman-α resonance radiation source for ultra-slow muon generation
(c) Laser inspection of infrastructure by courtesy of Shizuoka Pref. and Topcon Corp.
(d) Application of photonics control technology to plant cultivation

▶ Fields

Engineering, Physics, Biology / Biochemistry, Agricultural Sciences, Medicine, dentistry, and pharmacy

▶ Keywords

Particle control and measurement, Medical and agricultural measurement, Trace gas measurement, Natural energy, Space applications

▶ Publications

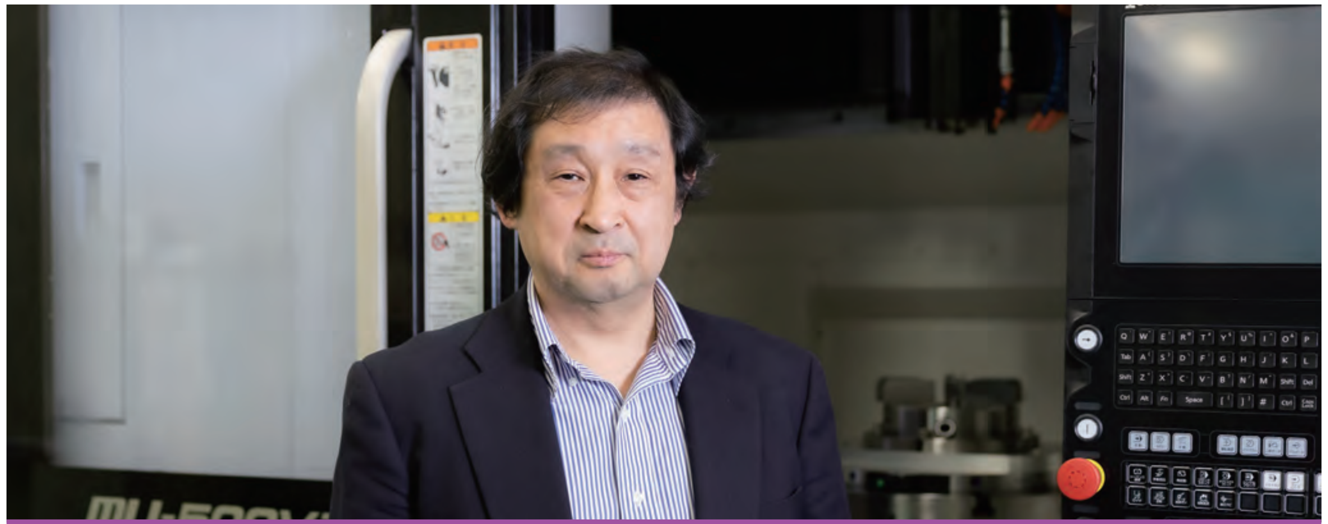
1. Kurose, N., Obata, K., Koike, K., Nomura, S., Ogawa, T., Wada, S., Sugioka, K., and Aoyagi, Y.: "Formation of two-dimensional multichannel vertical optical waveguides in a nitrogen-vacancy center diamond using a femtosecond Bessel beam laser for local quantum sensing", ***Appl. Phys. Lett.*** 126, 161102 (2025).
2. Tsai, M., Wang, K., Wada, S., Hsieh, C., Tseng, L., Horie, M., Sassa, T.: "Enhanced Photorefractive Performance by Controlling Ion-Assisted Charge Injection and Accumulation with Random Biphenyl Co-Polymerized Poly(Carbazolyl-Amine)" , ***Adv. Funct. Mater.*** 34(51), 2409659 (2024).
3. Mikami, N., Morishita, K., Murakami, T., Hosobata, T., Yamagata, Y., Ogawa, T., Mukouyama, Y., Nakanishi, S., Ager, III,J.W., Fujii, K., and Wada, S.: "Long Period Voltage Oscillations Associated with Reaction Changes between CO_2 Reduction and H_2 Formation in Zero-Gap-Type CO_2 Electrochemical Reactor", ***ACS Energy Lett***. 9(9), 4225–4232 (2024).
4. Nakamura, Y., Moriyama, D., Isomura A., Sasoh, A., Tsuno, K., Ogawa, T., Wada, S., and Fukushima, T.: "Laser ablation impulse dependence on beam Spatial-Profile", ***Opt. Laser Technol.*** 169, 110160 (2024).
5. Yumoto, M., Miyata, K., Kawata, Y., and Wada, S.: "Mid-infrared self-difference frequency generation via random quasi-phase-matching in Cr:ZnSe laser", ***Opt. Technol.*** 169, 110161 (2024).

▶ Member

Norihito Saito / Kiwamu Kase / Tomoki Matsuyama / Takafumi Sassa / Shigeharu Moriya / Yutaka Nagata / Takayo Ogawa / Katsushi Fujii / Kentaro Miyata / Masato Otagiri /Takeharu Murakami / Manabu Inukai / Tatsuya Shinozaki / Kentaro Nishigori / Naoki Uchiyama /Hiroshi Kasuga / Katsuhiko Tsuno / Kei Morishita / Yasushi Kawata / Akihiro Tanabashi / Saki Miyajima / Hiroshi Matsutaka /Aya Kashifuku / Tomohiro Tsukihana / Norihiro Matsuyama / Noriko Kurose / Yoko Ono / Takeshi Matsumoto / Miyuki Nara

Ultrahigh Precision Optics Technology Team

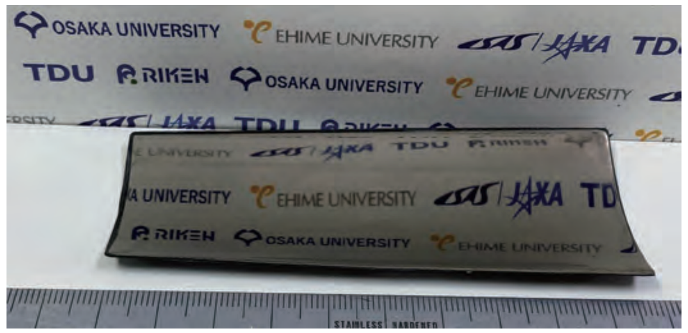
Team Director Yutaka Yamagata D.Eng.



Developing advanced optical components by ultrahigh precision technology

Our team develops advanced ultrahigh-precision/micro fabrication technologies and their application to scientific apparatuses and devices to support advanced scientific research at RIKEN. Research and development plans of our team include the following three topics; (1) Development of ultrahigh-precision optics including design, fabrication, metrology and computational simulation; (2) Development of ultrahigh-precision/micro fabrication technologies; (3) Development of materials and devices for biology or biochemistry such as microfluidic immunoassay devices.

In all R&D topics, our team collaborates with laboratories inside and outside of RIKEN and helps them to construct the most advanced experimental apparatuses, which will lead to innovative scientific research results.



A segment of wolter mirror with NiP platine on CFRP

▶ Fields

Engineering, Interdisciplinary science and engineering

▶ Keywords

Ultrahigh Precision Machining, Ultrahigh Precision Metrology, Aspherical Optics, Production Technology, Neutron Optics

▶ Publications

1. Kawasaki, Y., Iwaguchi, S., Ishikawa, T., Nishizawa, A., Kitaguchi, M., Yamagata, Y., Chen, Y., Wu, B., Shimizu, R., Umemura, K., Tsuji, K., Shimizu, H., Michimura, Y., Kobayashi, K., Onishi, T., and Kawamura, S.: "Sagnac-type neutron displacement-noise-free interferometeric gravitational-wave detector", ***Class. Quantum Gravity*** 41(11), 115001 (2024).
2. Kushibiki, K., Ozaki, S., Takeda, M., Hosobata, T., Yamagata, Y., Morita, S., Tsuzuki, T., Nakagawa, K., Saiki, T., Ohtake, Y., Mitsui, K., Okita, H., Kitagawa, Y., Kono, Y., Motohara, K., Takahashi, H., Konishi, M., Kato, N, M, Koyama, S., Chen, N.: "Development of a near-infrared wide-field integral field unit by ultra-precision diamond cutting", ***J. Astron. Telesc. Instrum. Syst.*** 10(1), 015004 (2024).
3. Fujiie, T., Hino, M., Hosobata, T., Ichikawa, G., Kitaguchi, M., Mishima, K., Seki, Y., Shimizu, M. H, and Yamagata, Y.: "Development of Neutron Interferometer Using Multilayer Mirrors and Measurements of Neutron-Nuclear Scattering Length with Pulsed Neutron Source", ***Phys. Rev. Lett***. 132, 023402 (2024).
4. Iwaguchi, S., Nishizawa, A., Chen, Y., Kawasaki, Y., Ishikawa, T., Kitaguchi, M., Yamagata, Y., Wu, B., Shimizu, R., Umemura, K., Tsuji, K., Shimizu, H., Michimura, Y., Kawamura, S.: "Displacement-noise-free interferometeric gravitational-wave detector using unidirectional neutrons with four speeds". ***Phys. Lett. A*** 458, 128581 (2023).
5. Aoki, H., Yuki, M, Shimizu, M., Hongoh, Y., Ohkuma, M., Yamagata, Y.: "Agarose gel microcapsules enable easy-to-prepare, picolitre-scale, single-cell genomics, yielding high-coverage genome sequences", ***Sci Rep*** 12, 17014–17026 (2022).

▶ Member

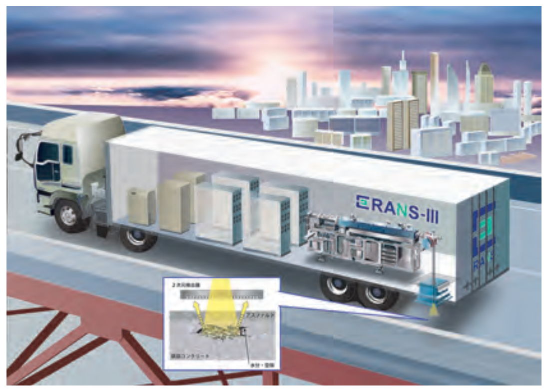
Koichiro Shirota / Yoshiyuki Takizawa / Tetsuya Aoyama / Noboru Ebizuka / Hiroyoshi Aoki / Takuya Hosobata / Masahiro Takeda

Neutron Beam Technology Team

Team Director Yoshie Otake D.Sci.

Research and development of compact neutron systems for practical use at anytime, anywhere

The project of RIKEN accelerator-driven compact neutron system (RANS) has two main development goals: the first is the realization of an evaluation and analysis system for use in the field of manufacturing, and the second is the development of non-destructive inspection techniques and equipment for preventive maintenance at infrastructure sites. RANS-II with a total length of 5 m, which can be introduced into the onsite of manufacturing field, has been successfully developed. Neutron salt meter, RANS-μ for outdoor use was successfully used to measure bridge salt density on national highways, and inspection support performance catalogue of MILT. The transportable compact neutron system RANS-III mounted in the trailer is scheduled for neutron generation demonstration tests in FY2025.



The future imaging of compact neutron non-destructive test system on-site

Fields

Physics, Engineering, Space Science, Interdisciplinary science and engineering

Keywords

Research and Development of Accelerator-driven compact neutron systems,
Research and development of non-destructive inspection for infrastructures,
Detection of salt damage in the concrete by prompt-gamma neutron activation analysis,
Visualization of water and air hole in concrete slabs, and anchorage of cable stayed bridge,
Neutron and gamma-ray irradiation

Publications

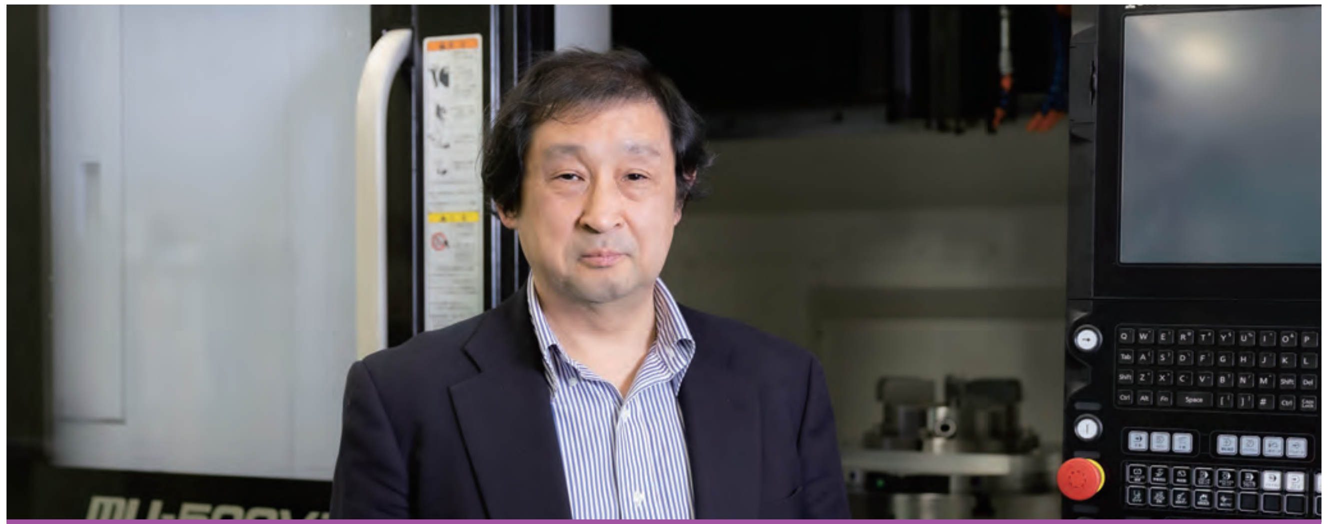
1. Fukuchi, T., Onda, M., Ichioka, T., Yabuki, T., and Otake, Y.: "Study of non-destructive diagnostic technology for cable-stayed bridge anchorage using neutron beam", ***Concrete Structure Scenarios***, JSMS, 24, 565-570 (2024).
2. Otake, Y., Wakabayashi, Y., Takamura, M., Mizuta, M., and Takanashi, T.: "RIKEN Compact Neutron Source Systems RANS Project", ***Nucl. Phys. News*** 33(2), 17-21 (2023).
3. Hatsuda, M., Kawasaki, H., Yamakura, F., Taketani , A., Takanashi, T., Wakabayashi, Y., Otake, Y., Kamata, Y., Kurokawa, C., Ikeda, K., Shigenaga, A., Iesaki, T., and Nagaoka, I.: "Effects of neutron radiation as cosmic radiation on food resources", ***J. Neutron Res.*** 25, 41–46 (2023).
4. Ikeda, S., Kobayashi, T., Otake, Y., Matsui, R., Okamura, M., and Hayashizaki, N.: "Fabrication and RF test of the 500 MHz-RFQ linear accelerator for a transportable neutron source RANS-III", ***J. Neutron Res.*** 24(3-4), 249-259 (2022).
5. Wakabayashi, Y., Yan, M., Takamura, M., Ooishi, R., Watase, H., Ikeda, Y., and Otake,Y.: "Development of neutron salt-meter RANS-μ for non-destructive inspection of concrete structure at on-site use", ***J. Neutron Res.*** 24(3-4), 411-419 (2022).

Member

Tomohiro Kobayashi / Maki Mizuta / Takaoki Takanashi / Yasuki Okuno / Tomonori Fukuchi / Yasuo Wakabayashi / Sohei Imajo / Hiroki Kusano / Abdul Muneem / Sho Otsuka

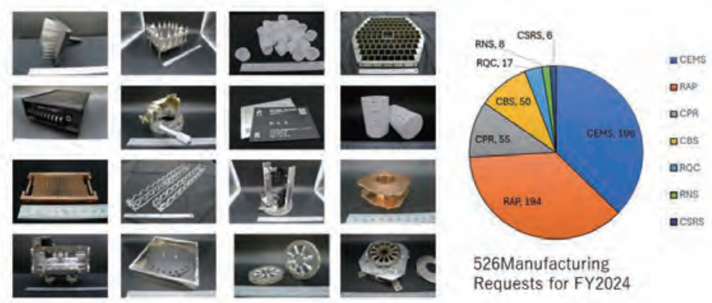
Advanced Manufacturing Support Team

Team Director Yutaka Yamagata D.Eng.



Manufacturing of apparatuses by requests from researchers and technological developments

It is inevitably required to devise and/or maintain variety of advanced research instruments and equipment to promote and support laboratories for wide ranges of research fields from fundamental to practical phases. The main duty of our team is to develop those instruments required by researchers, and also this duty should be conducted consequently from concept design to manufacture through detailed design and instrumentation. Our team also deals with improvement and maintenance of working scientific experimental equipment. For these purposes, we are constantly making efforts to improve our design, manufacturing and engineering capabilities for rapid services.



Examples of manufactured components for scientific apparatuses and number of requests in FY2024

Fields

Engineering, Interdisciplinary science and engineering

Keywords

Production technology, Mechanical machining, Laser machining, CAD/CAM/CAE, 3D printer

Publications

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