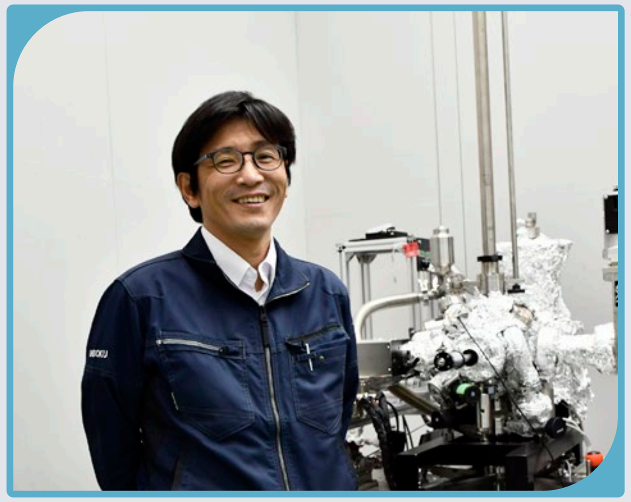
2026 UNISOKU NEWSLETTER

Message from the CEO
社長挨拶



"UNISOKU's Craftsmanship Begins with Each Researcher's Unique Challenge."
「研究者一人ひとりの課題から始まる、ユニソクのものづくり」

UNISOKU is guided by the philosophy of "providing measurement solutions that respond to researchers' curiosity and contribute to the advancement of science and technology."
We sincerely listen to the challenges and questions faced by researchers at the forefront of science, and our mission is to contribute to society through "measurement" that supports their pursuit of discovery.

Our company consists of a team of approximately fifty employees.
Although we may not match the scale of large corporations, this size allows us to work closely and carefully with our customers.
Each of our engineers takes personal responsibility and uses creativity to communicate directly with researchers, turning their needs and ideas into practical solutions.
UNISOKU's craftsmanship begins with the real challenges faced in research laboratories and is guided by our strong commitment to creating solutions that truly work. This spirit has been part of our company since its founding and continues to shape who we are today.

UNISOKU began as a manufacturer of spectroscopic measurement instruments, and last year we celebrated our 50th anniversary.
Along with our ultrafast spectroscopy systems, our low-temperature SPM products have become one of our core product lines. These highly specialized instruments are now used by researchers around the world, and thanks to the continued support of our customers, they have

株式会社ユニソクは、「研究者の探究心に応える計測を提供し、科学技術の発展に貢献する」という理念を掲げています。
科学の最前線に立つ研究者の方々が計測において抱える課題や問いに対して誠実に耳を傾け、その探究を支える"計測"を通じて社会に貢献することを使命としています。

当社の社員はわずか五十名ほど。
大企業のようなスケールこそありませんが、
だからこそできることがあります。
それは、一人ひとりの技術者が責任と創意をもってお客様に向き合い、現場の声を直接形にできる「小回りのきく対応力」です。
ユニソクのものづくりは、研究者の「困った」を出発点とし、その解決を具現化することにあります。
その姿勢は、創業以来のDNAとして、今日まで変わることなく受け継がれています。

分光計測機器のメーカーとしてスタートした私たちユニソクは、昨年、創業50年を迎えました。
高速分光装置とともに、主力製品となっている低温SPM製品は、グローバルニッチな製品として世界に展開し、お客様のご愛顧により、広く知っていただけるようになりました。
しかし、私たちの原点は、研究者一人ひとりの課題に応じて設計されるカスタマイズ製品への取り組みにあります。
既製品では満たせない要求に応えること、そしてお客様の声を起点に新たな価値を生み出すことが、ユニソクの存在意義であると考えています。

gained wide recognition in the global scientific community.
However, the origin of UNISOKU lies in our dedication to developing customized instruments designed to meet the individual needs of each researcher.
We believe that responding to requirements that cannot be fulfilled by standard products, and creating new value based on the voices of our customers, defines the true mission of UNISOKU.

Modern society faces many challenges, including a declining population, limited resources, and growing environmental concerns. At the same time, it is an era in which new and sustainable solutions must be explored through wisdom and technology.
UNISOKU views these changes positively and, as a flexible and highly responsive team of engineers, will further strengthen our ability to provide fast and accurate solutions to our customers' challenges.
At the same time, we place great value on being "unique."

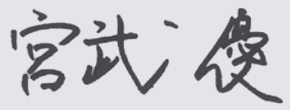
We believe that truly original measurement technologies and environments—born from ideas that are not bound by existing frameworks rather than simple imitation—can open new possibilities for scientific progress.
We will continue to uphold the principle of "unique measurement" embodied in the name UNISOKU, and pursue innovation through constant challenge and creativity.

At UNISOKU, we believe that teamwork among our employees, together with the sincerity of each individual, builds trust with our customers. This trust is our greatest asset.
The development of measurement instruments is a collaborative effort to shape the future together with researchers.
As technology continues to advance, we will also refine the human qualities of communication and proposal-making, and strive to remain a reliable partner for researchers around the world.

March 2026 

これからの社会は、少子化や省資源、環境配慮といった多くの制約を抱えながらも、知恵と技術によって新しい持続可能な形を模索する時代です。
ユニソクは、そうした変化を前向きに捉え、「小回りのきく技術者集団」として、お客様の課題解決にスピーディかつ的確に応える体制をより一層強化してまいります。
同時に、私たちは「ユニークであること」を大切にしています。
単なる模倣ではなく、既存の枠にとらわれない発想から生まれる独自の計測技術や計測環境の実現こそが、科学の進歩に新たな可能性をもたらすと考えています。
ユニソクという社名に込められた"ユニークな測定"という方針をこれからも受け継ぎ、挑戦と創造を重ねてまいります。

私たちユニソクは、社員同士のチームワーク、そして一人ひとりが持つ誠実さこそが、お客様との信頼関係をつくり、それが私たちの最大の資産であると考えます。
計測機器の開発は、研究者とともに未来を形づくる共同作業です。
技術の深化とともに、対話力や提案力といった「人の力」を磨き続けて、世界の研究者の皆さまにとって「頼れるパートナー」であり続ける努力を重ねてまいります。

2026年3月 

July 2025: Photographed after the Management Planning Meeting
2025年7月経営計画会議後撮影

2025 Yearly Events 2025年 年間イベント

1 Jan.
- Visit by Dr. Andreas of SPECS GmbH and Dr. Kawamura, President of TII.
  - (独)SPECS社・Andreas氏、TII河村社長が来社❶

3 Mar.
- Visit by Professor Emeritus Yoshihisa Inoue and Professor Tadashi Mori of The University of Osaka.
  - 大阪大学名誉教授 井上佳久先生と大阪大学工学部 森直先生が来社
- We installed an AED for workplace safety, and attended AED training.
  - 職場の安全のためAEDを導入し、社員がAED使用講習を受講。
- Participated in “APS 2025” with local distributor SPECS-TII. (Anaheim, USA)
  - 「APS2025」に現地代理店 SPECS-TII と参加
- UNISOKU was introduced in a report published by the Center for Research and Development Strategy (CRDS), Japan Science and Technology Agency (JST).
  - 国立研究開発法人科学技術振興機構(JST) 研究開発戦略センター(CRDS) の報告書において紹介される
- Director Nakagawa attended the award ceremony for the Chemical Technology Achievement Award at the 105th Spring Annual Meeting of the CSJ (Suita, Japan).
  - 弊社取締役 中川達央が、日本化学会第105春季年会<関西大学・吹田市>において「化学技術有功賞」授賞式に参加❷

4 Apr.
- Joint exhibition at the “19th National Photochemistry Symposium of the Chinese Chemical Society”(Chengdu, China)
  - 「中国化学会第19会全国光化学学術討論会」<中国・成都>に代理店と共同出展

6 Jun.
- Sponsored the crowdfunding campaign for the Quantum Festival celebrating 100 years of quantum mechanics.
  - 量子力学100周年 日本物理学会 量子フェスのクラウドファンディングに協賛
- Provided all employees with Expo 2025 Osaka–Kansai tickets and special “Expo Leave.”
  - 社員の視野を広げる機会として、全社員に大阪・関西万博のチケットと訪問のため「万博特別休暇」を配布・実施
- Exhibited and delivered a corporate presentation at STM’25 (Seoul, South Korea); introduced capsule toy machines.
  - STM’25 <韓国・ソウル>にて企業展示・企業講演、ガチャマシーン導入❸

7 Jul.
- Delivered a lecture at the “2025 Joint Seminar for Supporting Member Companies of the Photochemistry Association”
  - 「光化学協会・賛助会員企業 共同セミナー2025」(オンライン)にて講演

8 Aug.
- Exhibited at “NC-AFM 2025” (Toyama, Japan)
  - 「NC-AFM 2025」<富山県富山市>に出展
- Visit by Mr. Nicolaj Betz from the Loth Laboratory, University of Stuttgart.
  - シュトゥットガルト大学Sebastian Loth研 Nicolaj Betzさん来社
- UNISOKU featured in the Hirakata City publication highlighting world-class local manufacturers.
  - 枚方市発行「日本のワザ(技術)と出会うまち枚方市」において、世界的シェアを誇る枚方ものづくりを牽引する企業としてユニソクが紹介される
- Delivered an industry-guidance lecture at Osaka Prefectural Ichiritsu High School
  - 大阪府立いちりつ高校にて業界別ガイダンス講演(ハローワーク・北大阪商工会議所)を実施❹

9 Sep.
- Exhibited at the “2025 Photochemistry Symposium” (Ikebukuro, Japan)❺
  - 「2025年光化学討論会」<立教大学・池袋>に出展
- Exhibited at the “86th Autumn Meeting of the Japan Society of Applied Physics”(Nagoya, Japan)
  - 「第86回応用物理学会秋季学術講演会」<名城大学・名古屋>に出展
- Exhibited at the “75th Symposium of the Japan Society of Coordination Chemistry”(Nagasaki, Japan)
  - 「錯体化学会第75回討論会」<長崎大学・長崎>に出展

10 Oct.
- Exhibition and Luncheon seminar at the “JVSS 2025”(Tsukuba, Japan)
  - 「2025年日本表面真空学会学術講演会(JVSS 2025)」<つくば市・茨城>に出展、ランチョンセミナー実施
- Publication of Handbook of Surface Analysis Techniques: Scanning Probe Microscopy/ Spectroscopy, 2nd Edition❻
  - 『表面分析技術選書 走査プローブ顕微鏡/分光法 第2版』（丸善出版）が刊行される

11 Nov.
- Exhibited at the “RPGR 2025 Conference on Graphene and 2D Materials”. (Toyama, Japan)
  - 「The 16th International Conference on Recent Progress in Graphene and 2D Materials Research」<富山県富山市>に出展
- Oral presentation at the “24th Young Researchers' Joint Symposium on Cryogenic Engineering and Superconductivity” (Osaka, Japan)
  - 「第24回低温工学・超伝導若手合同講演会」<関西学院大学(梅田)・大阪>にて講演

12 Dec.
- Exhibition and oral presentation at the “ICSPM33” (Tochigi, Japan)
  - 「33rd International Colloquium on Scanning Probe Microscopy (ICSPM33)」<那須高原・栃木>に出展、講演
- Gave a lecture at the 80th Chugoku-Shikoku Industry-Academia Collaboration Chemistry Forum.
  - 「第80回 中国四国産学連携化学フォーラム」<愛媛大学・松山>にて講演
- Poster presentation at the “Surface Photonic Processes and Advanced Research Convergence” (Aichi, Japan)
  - 「表面・光融合先端計測研究会」<分子科学研究所・愛知>にてポスター発表

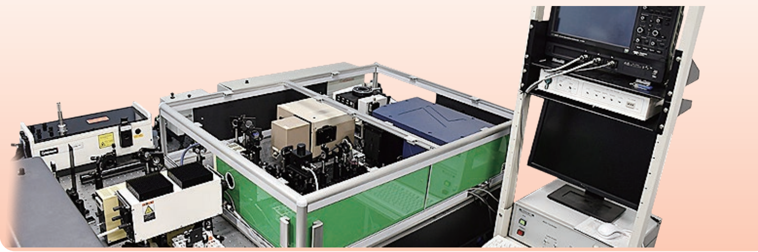
弊社では最新製品のデモルームを開設し、来社実験サービスを行っています。興味を持っていただいた製品について、購入前に実際に性能を確認の上、購入後も満足して使っていただきたいと考えております。また装置をなかなか購入できないお客様にも測定をしていただき、研究の一助となりたいとも願っております。

Because we aim for after-purchase satisfaction, we provide our customers the opportunity to check the product performance before purchase. Further, we also aim to help customers who are not ready to purchase our systems conduct their research. To these ends, we have set up a room showing the newest instruments, both for demonstration purposes and for in-house experiment service.

ピコ秒過渡吸収分光 + 蛍光寿命コンバインシステム
picoTAS + TCSPC
Combined System of Picosecond Transient Absorption and TCSPC Fluorescence Lifetime

分光用クライオスタット
CoolSpeK ※
Cryostat for Spectrophotometer USP-203 Series

近赤外対応ナノ秒時間分解分光測定装置
TSP-2000
Conventional UV/VIS/NIR Flash Photolysis System



※CoolSpeKにつきましてはお客様のラボに伺い、お客様が所有している分光計と組み合わせることによる訪問デモ測定も随時行っております。(国内限定サービスとなっております)

We also offer on-site CoolSpeK demonstration at your facility. CoolSpeK adaptation to your spectrometer for custom demonstration measurements is available (only domestic)

Hydrogen-Sensitive Thermal Desorption Spectroscopy System
HEMTO-TDS
超高感度熱脱離分析装置

デモ測定受付中
※こちらはデモ測定のみの対応です。
Now Accepting Demo Measurements

試料導入室を備えたスタンドアロンの3室構成のシステムをデモ測定器として準備しています。
本計測は大気中での水分吸着に敏感な可能性がありますので、試料の導入方法や測定内容については相談して進めさせていただきます。

【Custom demo measurements】
We organize demonstration measurements of your samples using the HEMTO-TDS at our facility.
Contact us to discuss the details of the samples you are interested in!

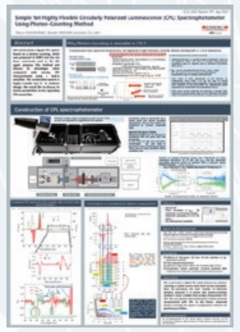
Brand-New Product Introduction 新製品情報

New Circularly Polarized Luminescence Spectrophotometer
円偏光発光分光装置 CirCLa <仮称>

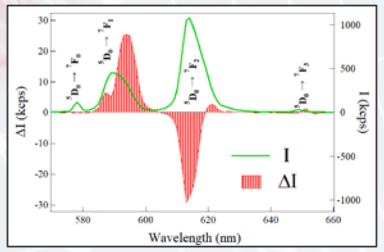
2025–2026 Activity Highlights

2025 Jan. Poster presentation at the Italia-Japan Binational Conference on Chiroptical and Related Phenomena.
キラル光学特性および関連現象に関する日本-イタリア２カ国会議
Mar. Poster and product exhibition at The Chemical Society of Japan (CSJ).
日本化学会でポスター広告展示
Apr. Participated in the Chinese Photochemistry Conference (On-site exhibition).
中国光化学会に出展、現地で製品説明を実施
Jun. A customer's research paper featuring our technology was published in Macromolecules.
お客様の論文が Macromolecules に掲載される S. Morii *et al.*, Macromolecules **58**, 6534 (2025).
Aug. Launched support for measurements using CW laser diode excitation.
CW laser diode 励起による測定に対応
Sep. Poster presentation at ICCS-2025 Kyoto.
ICCS-2025 Kyoto にてポスター発表

2026 Feb. Live demonstrations commenced in our dedicated Demo Room.
デモルームでデモ開始



ICCS-2025 Kyoto



Eu(III) adduct with R,R-Ph-pybox in 1:1 of MeCN and MeOH;Samples courtesy of Dr. Hirahara, OIT

<*Features*・特徴>
- **Compatible with Both Film and Solution Samples** 膜試料と溶液試料の両方に対応
- **Reasonable Price** 納得の価格

<*Current Initiatives*・現在進行中>
- **Development of a Stylish New Chassis Design** 新筐体デザイン
- **Near-Infrared (NIR) CPL Measurement** 近赤外CPL測定

Adaptable Blueprint for Non-metal Near-Infrared Organic Photocatalysts by Aromatic Sulfones

K. Yoshida, T. Suzuki, V. Biju, and Y. Takano, ACS Appl. Mater. Interfaces **17**, 4813 (2025).
Product used : picoTAS

Publication Introduction 論文紹介

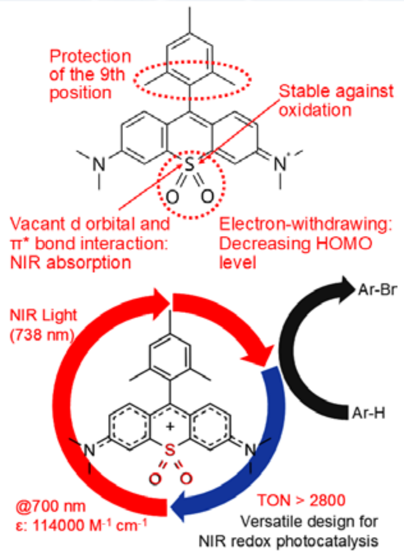
Prof. Takano

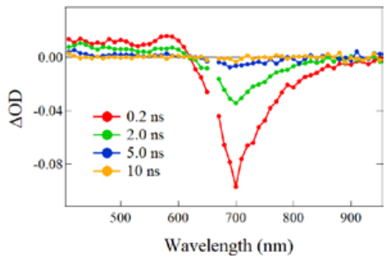
Nonmetal organic photoredox catalysts provide cost-effectiveness and low environmental impact, and they facilitate covalent bond formation under mild reaction conditions. NIR light's high permeability allows for broader applications based on more extensive substrate selection and fewer side reactions in photocatalytic processes. The expansion of organic photocatalysts into the near-infrared (NIR) region (≥700 nm) has gained significant interest.

Takano and co-workers developed a xanthene-based dye containing an SO_2 moiety (dye 3) as a high-performance NIR photoredox catalyst. Dye 3 exhibits the highest photooxidizing capability ($E_{red1}{}^*$ = +1.35 V vs Fc/Fc+) and an outstanding turnover number (TON = 2830) among single molecular NIR photocatalysts.

They investigated the photoreaction mechanism of this photocatalyst by employing fluorescence lifetime, transient absorption (TA) spectroscopy, electrochemical analysis, and DFT calculation. The TA measurements were performed during an in-house experimental service of our company, using PicoTAS system. Although the sample exhibited relatively strong fluorescence (φ = 0.16), TA measurements were enabled by effective fluorescence suppression using the RIPT method implemented in the PicoTAS system. Only the excited singlet state was observed in the measured spectra, and neither the triplet state nor the radical anion was detected. These results indicate that the catalytic process originates from the excited singlet state.

Their molecular design strategy employing aromatic sulfones provides a new guideline for developing nonmetal organic NIR photocatalysts and further broadens the possibilities in this field.





Transient absorption spectra of dye 3 in the presence of HBr excited at 660 nm. Solvent: MeCN.
Illustration and Data Courtesy from Prof. Takano

Updates of Luminescence Lifetime System 発光寿命測定システム最新情報

Various Luminescence Lifetime Measurements Now Available 多彩な発光寿命測定に対応

- **picoTAS + TCSPC Redesigned:** Optimized for picoTAS 2024 model / Easier Switching between TAS and TCSPC
- **Various Acquisition Mode by a single Oscilloscope:** TCSPC / MultiPhoton (corresponding to MCS) / Analog Signal Direct Acquisition
- **NIR Singlet Oxygen Luminescence Lifetime Measurement by NIR Photomultiplier**
- **Various Excitation Light Source Available**

・**picoTAS＋TCSPCの再設計：**2024年モデルの設計を最適化し、TAS（過渡吸収分光）とTCSPC（時間相関単一光子計数法）測定の切り替えがより容易に。
・**1台のオシロスコープで多様なアクイジションモードを実現：**TCSPC、マルチフォトン（MCS：マルチチャネルスケーリング法に対応）、およびアナログ信号の直接取り込みが可能。
・**近赤外（NIR）光電増倍管による一重項酸素の発光寿命測定：**NIR-PMTを採用し、近赤外領域における一重項酸素の微弱な発光寿命計測に対応。
・**多彩な励起光源を選択可能：**用途に応じた各種励起光源のラインアップ。

○ Available ╳ Not possible — Not supported

Excitation Light Source	Specifications		Our Products			
	Freq.	Wavelength (nm)	picoTAS	LSP-1000 / TSP Series	Customized System	Singlet Oxygen Lifetime System
SC*1 Light Source	20 MHz Fixed	Variable	○*2	—	○	
Sub-ns laser	10～1 kHz	355 / 532	○*2	—	○	—
ps YAG laser	10～1 kHz	(266 /) 355 / 532(/ 410-1000)	○*2	—	○	—
ps Laser Diode	3 kHz～ 10 MHz	406, 520, etc. (Fixed)	○*2	╳	○*2	╳
ns YAG Laser	0.1～10 Hz	(266 /) 355 / 532(/ 410-1000)	╳	○*2	○	○*2
N_2 Laser	0.1～20 Hz	(266 /) 355 / 532(/ 410-1000)	╳	○*2	○	—
Flash Lamp	0.1～100 Hz	300-800	╳	○	○	╳

*1 SC: Supercontinuum *2 Measurement available in our Demo room.

Demo Room Information 分光デモルームの情報

Stopped-Flow System Remains in Service! ストップトフロー装置、健在！

Production and sales continue for the Stopped-Flow System. Demonstration measurements are now available in our spectroscopy demo room. The Stopped-Flow Method is an analytical technique used to observe reaction kinetics by rapidly mixing two or more sample solutions and instantaneously stopping the flow to monitor the reaction process. Experience Stopped-Flow experiments in our demo room, including Rapid-Scan and Photomultiplier Time-Resolved measurements. We accommodate both Absorption and Fluorescence analysis.

私たちは、創業以来ストップトフロー装置の製造販売を続け、そしてこれからも続けます。現在、分光デモルームにて本装置のデモ測定をご利用いただけます。ストップトフロー法とは、2種類以上の試料溶液を高速に混合し、瞬時にフローを停止して反応過程を観測する方法です。弊社デモルームでは、吸収スペクトルおよび蛍光スペクトルの時間変化測定（ラピッドスキャン測定）、単一波長での時間分解測定（フォトマル時間分解測定）を行って試料混合後の反応を追跡できます。

Wavelength Range: 350nm to 800nm
波長範囲：350nm ～ 800nm
Measurable Reaction Time Range: Milliseconds to seconds
追跡可能時間：数ミリ秒～秒
Temperature Range: 10℃ to 50℃ (Using a circulator bath)
温度：10℃～50℃ (循環恒温槽による温調)

※ Please contact us regarding any conditions not specified above. 上記に記載がない条件についてはお問い合わせください

Sponsorship of the Joint Program for the JPA 50th Anniversary 光化学協会50周年合同事業への協賛

We are pleased to announce that our company will be sponsoring the Photochemistry Association 50th Anniversary Joint Project as a Diamond Sponsor. As part of this commemorative initiative, international and domestic conferences will be held. We sincerely encourage all concerned parties to take this opportunity and join us.

この度、弊社は光化学協会設立50周年記念合同事業に、ダイヤモンドスポンサーとして協賛させていただくことになりました。記念事業の一環として、2026年9月に神戸で学会が開催されます。皆様におかれましては、この機会にぜひ奮ってご参加くださいますようお願い申し上げます。

Under Development クールスペック新モデル開発進行中

Our upcoming instrument utilizes a proprietary vacuum-seal technology to maintain high airtightness at liquid nitrogen temperatures.
By minimizing dew condensation, it enables more precise measurements at extreme low temperatures.
Currently in the final stages of development for commercialization.

開発中の装置は、真空維持が可能な特殊シール構造を採用し、液体窒素温度下でも高い密閉性の維持を実現します。これにより今まで以上の低温においてもサンプルやセル表面での結露の影響を低減できる見込みです。現在、製品化に向けて鋭意改良中です。

Update on Spectroscopy Demo Room Utilization　分光製品デモルーム利用状況

Nearly five years have passed since the launch of our Spectroscopy Product Demo Room in 2020. We are pleased that many customers have utilized the facility to date, and we have seen concrete results, such as the measurement data being successfully integrated into research papers. This report details the utilization status of the Demo Room to date, serving as a helpful reference for customers considering a visit.

2020年の分光製品デモルーム運用開始から、おかげさまで約5年が経過いたしました。これまでに多くのお客様にご利用いただき、デモルームでの測定データが研究論文に活用されるなどの具体的な成果も多数生まれています。デモルームのご利用をご検討中のお客様の一助となるよう、これまでの利用状況についてご報告いたします。

Publication List

★=picoTAS ●=TSP-1000 ●=TSP-2000 ■=LSP-1000 ◆=RSP-2000

This is part of our publication list.　以下は出版された論文の一部です。

Angewandte Chemie

● **Intermolecular Toroidal Conjugation: Circularly Stacked 16 π-Planes Formed by Supramolecular Assembly Enabling Cyclic Charge and Energy Delocalization**
D. Sakamaki *et al.*, Angew. Chem. Int. Edn. **64**, e202504353 (2025).
Prof. Sakamaki Group (Osaka Metropolitan Univ.)

● **A Nonlinear Photochromic Reaction Based on Sensitizer-Free Triplet-Triplet Annihilation in a Perylene-Substituted Rhodamine Spirolactam**
G. Kawai *et al.*, Angew. Chem. Int. Edn. **63,** e202404140 (2024).
Prof. Kobayashi Group (Ritsumeikan Univ.)

★ **Photocatalytic CO_2 Reduction Using an Osmium Complex as a Panchromatic Self-Photosensitized Catalyst: Utilization of Blue, Green, and Red Light**
K. Kamada *et al.*, Angew. Chem. Int. Edn. **63,** e202403886 (2024). *Prof. Saito Group (Nagoya Univ.)*

ACS Nano

● **Anomalous Photoinduced Hole Transport in Type I Core/Mesoporous-Shell Nanocrystals for Efficient Photocatalytic H_2 Evolution.**
Z. Lian *et al.*, ACS Nano **13**, 8356 (2019). *Prof. Sakamoto Group (The University of Osaka)*

Journal of the American Chemical Society (JACS)

★ **Ferrocenyl PNNP Ligands-Controlled Chromium Complex-Catalyzed Photocatalytic Reduction of CO_2 to Formic Acid**
T. Wakabayashi *et al.*, J. Am. Chem. Soc. **146**, 25963 (2024). *Prof. Saito Group (Nagoya Univ.)*

★ **Photocatalytic CO_2 Reduction Using a Robust Multifunctional Iridium Complex toward the Selective Formation of Formic Acid**
K. Kamada *et al.*, J. Am. Chem. Soc. **142**, 10261 (2020). *Prof. Saito Group (Nagoya Univ.)*

★ **Carrier-Selective Blocking Layer Synergistically Improves the Plasmonic Enhancement Effect**
T. Kawawaki *et al.*, J. Am. Chem. Soc. **141**, 8402 (2019). *Prof. Sakamoto Group (The University of Osaka)*

JACS Au

★ **Fluorescein-Based Type I Supramolecular Photosensitizer via Induction of Charge Separation by Self-Assembly**
H. Shigemitsu *et al.*, JACS Au **2**, 1472 (2022). *Prof. Kida Group (The University of Osaka)*

Chemical Science

◆ **Overall Reaction Mechanism of Photocatalytic CO_2 Reduction on a Re(i)-Complex Catalyst Unit of a Ru(ii)-Re(i) Supramolecular Photocatalyst**
K. Kamogawa *et al.*, Chem. Sci. **15**, 2074 (2024). *Prof. Ishitani Group (Tokyo Institute of Technology, at the time.)*

ACS Photonics

★ **Number of Surface-Attached Acceptors on a Quantum Dot Impacts Energy Transfer and Photon Upconversion Efficiencies**
J. Zhang *et al.*, ACS Photonics **7**, 1876 (2020). *Prof. Sakamoto Group (The University of Osaka)*

ACS Applied Nano Materials

★ **Amphiphilic Rhodamine Nano-assembly as a Type i Supramolecular Photosensitizer for Photodynamic Therapy**
H. Shigemitsu *et al.*, ACS Appl. Nano Mater. **5**, 14954 (2022). *Prof. Sakamoto Group (The University of Osaka)*

Nanoscale

★ **Synthesis of Au_{13}-Based Building Block Clusters for Programmed Dimer Formation and Au_{13} Cluster Dmer Photoexcitation Properties**
T. Kosaka *et al.*, Nanoscale **17**, 12695 (2025). *Prof. Niihori Group (Shinshu Univ.)*

ACS Macro Letters

● **Incorporation of Visible Light-Responsive Push–Pull Azobenzene into Polymer Networks toward the Construction of Photodynamic Hydrogel Scaffolds**
I. Miyaguni *et al.*, ACS Macro Lett. **14**, 1418 (2025). *Prof. Matsusaki Group (The University of Osaka.)*

Chemical Communications

★ **Supramolecular Nanosheet Formation-Induced Photosensitisation Mechanism Change of Rose Bengal Dye in Aqueous Media**
A. Bunno *et al.*, Chem. Commun. **60**, 889 (2024). *Prof. Kida Group (The University of Osaka)*

★ **Importance of Steric Bulkiness of Iridium Photocatalysts with PNNP Tetradentate Ligands for CO_2 Reduction**
K. Kamada *et al.*, Chem. Commun. **58**, 9218 (2022). *Prof. Saito Group (Nagoya Univ.)*

★ **A Cyanine Dye Based Supramolecular Photosensitizer Enabling Visible-Light-Driven Organic Reaction in Water**
H. Shigemitsu *et al.*, Chem. Commun. **57**, 11217 (2021). *Prof. Kida Group (The University of Osaka)*

Journal of Organic Chemistry

● **Oxygen-Independent Activatable Photosensitizers Based on the Control of Intersystem Crossing with a Tetrad-BODIPY Scaffold**
T. Maki *et al.*, J. Org. Chem. **90**, 14177 (2025). *Prof. Maki Group (Nagasaki Univ.)*

Dalton Transactions

■ **Discrete Inorganic Molecular Upconversion: a Dinuclear Ytterbium-Polyoxometalate Complex Exhibits cooperative upconversion luminescence**
R. Karashimada *et al.*, Dalton Trans. **54**, 12443 (2025). *Prof. Iki Group (Touhoku Univ.)*

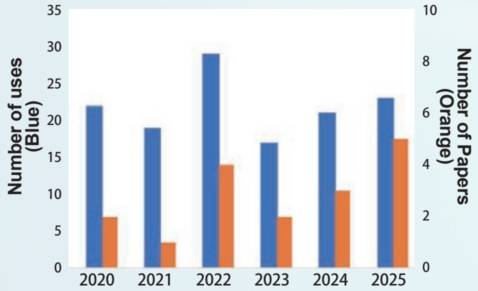
The Journal of Physical Chemistry

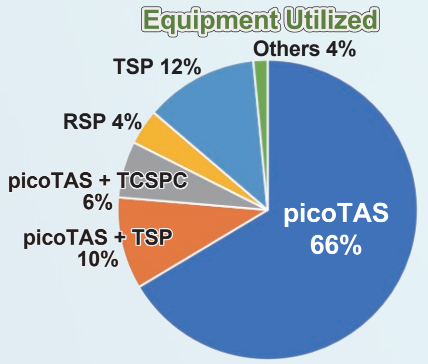
● **Exciton Recycling in Triplet Energy Transfer from a Defect-Rich Quantum Dot to an Organic Molecule**
J. Zhang *et al.*, J. Phys. Chem. C **126**, 11674 (2022). *Prof. Sakamoto Group (The University of Osaka)*

Organometallics

★ **Photocatalytic CO_2 Reduction Using an Iron-Bipyridyl Complex Supported by Two Phosphines for Improving Catalyst Durability**
T. Wakabayashi *et al.*, Organometallics **41**, 1865 (2022). *Prof. Saito Group (Nagoya Univ.)*

Utilization Report





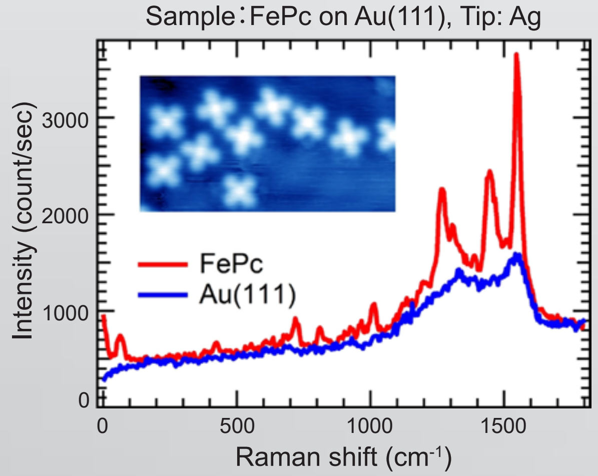
Snapshot at the Demo Room

New Technologies in the USM Series

USMシリーズにおける新技術紹介

1 Cryogen-Free STM-TERS (USM1800TERS)

Designed by Tetsuya Maeda　設計者：前田 哲也



Sample: FePc on Au(111), Tip: Ag

液体ヘリウムフリーSTM-TERS

By integrating a movable lens stage into the cryogen-free USM1800 and combining it with the modular 3D micro-Raman spectrometer (Nanofinder FLEX), single-molecule Raman spectroscopy measurements have become possible.　*This capability is supported when using the Bayonet-type STM head.

液体ヘリウムフリーSPM(USM1800)に可動レンズステージを導入し、モジュラー型3D顕微レーザーラマン分光装置(Nanofinder FLEX)と組み合わせることで、単分子ラマン測定が可能となりました。*Bayonet型STMヘッドでのみ対応可能となります。

The first paper from a USM1800 user has been published!　USM1800ユーザーから初の論文が出版されました！

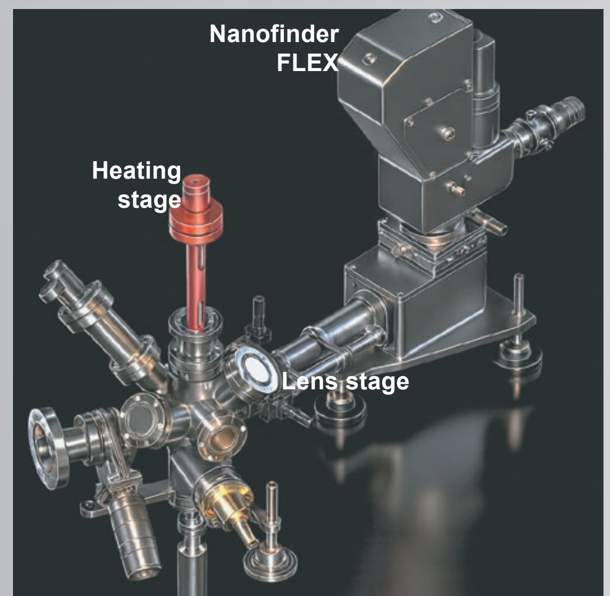
Layer Thickness and Substrate Effects on Superconductivity in Epitaxial FeSe Films on BLG/SiC(0001)
Y. Wang *et al.*, Phys. Rev. Research **7**, 023288 (2025).

2 Raman Spectroscopy System on UHV Heating Stage

高温ラマン分光システム

By implementing an optical setup for Raman measurements on an ultrahigh-vacuum heating stage, Raman spectroscopy measurements during sample heating can be performed for observing surface synthesis and catalytic reactions.
*Sample temp. < 1000 ℃, 5 μm laser spot, λ=472 nm

超高真空中の加熱ステージにラマン測定用の光学セットアップを導入し、表面合成や触媒反応の観測を目的とした、試料加熱中のラマン測定を実現します。
*試料温度 < 1000 ℃, レーザースポット径5 μm, λ=472 nm

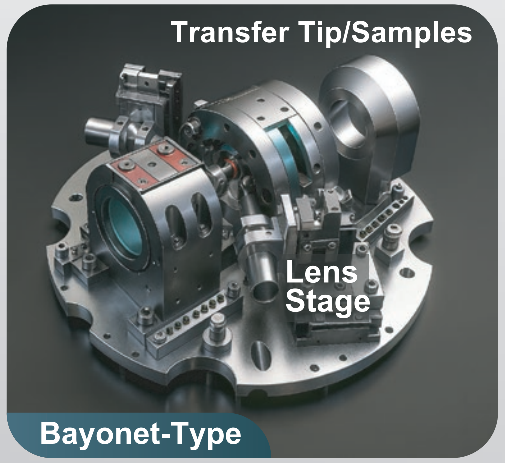


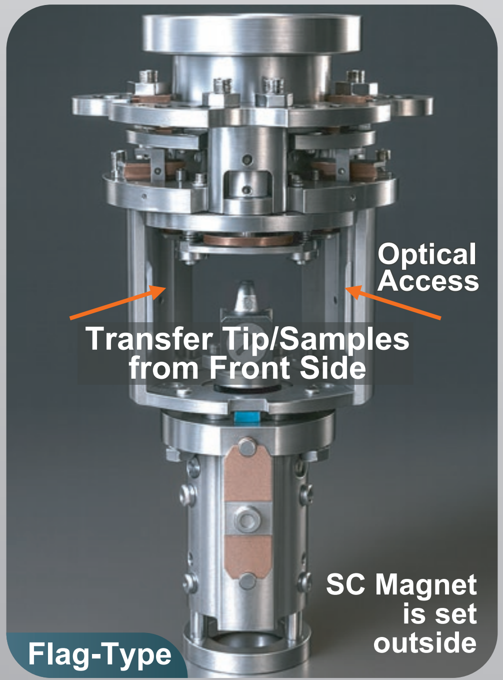
*The photo is for illustrative purposes only.　写真はイメージ図です

Main Users　納品実績

- Japan Atomic Energy Agency (JAEA) 日本原子力研究開発機構
- Chinese Academy of Sciences (CAS) 中国科学院

③ Bayonet- and Flag-Type STM Head Options for USM1200/1800

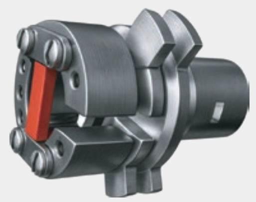




USM1200/1800 バヨネット型・フラッグ型 STMヘッドオプション

The USM1200/1800 now offer selectable STM heads compatible with two types of sample holder geometries. Both STM heads are compatible with options such as *in-situ* deposition in cryogenic environments, JT cooling*, AFM, and high-frequency antenna integration. A key feature of the Bayonet-type STM head is its cryogenic sample holder geometry combined with a movable lens stage.

Bayonet-Type Sample Holder

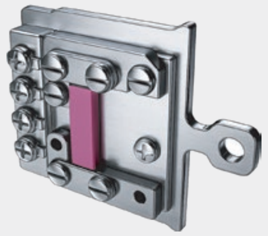


Key features of the Flag-type STM head include compatibility with the standard sample holder geometry, as well as the ability to accommodate a 3 T superconducting magnet.

*Using ^{3}He cooling, a stage temperature of 0.6 K has been achieved.

USM1200/1800では、２種類の試料ホルダー形状に対応したSTMヘッドを選択可能となりました。いずれのSTMヘッドも、極低温環境での*in-situ*蒸着、JT冷却*、AFM、高周波アンテナ搭載などのオプションに対応しています。Bayonet型STMヘッドの特長は、極低温型試料ホルダ形状を採用しており、可動レンズステージを搭載している点です。

Flag-Type Sample Holder



Flag型STMヘッドの特長は、他社製試料ホルダー形状が利用可能となるだけでなく、3 Tの超伝導磁石が搭載可能となる点です。

*^{3}Heを用いた冷却で、ステージ温度0.6 Kの実績があります。

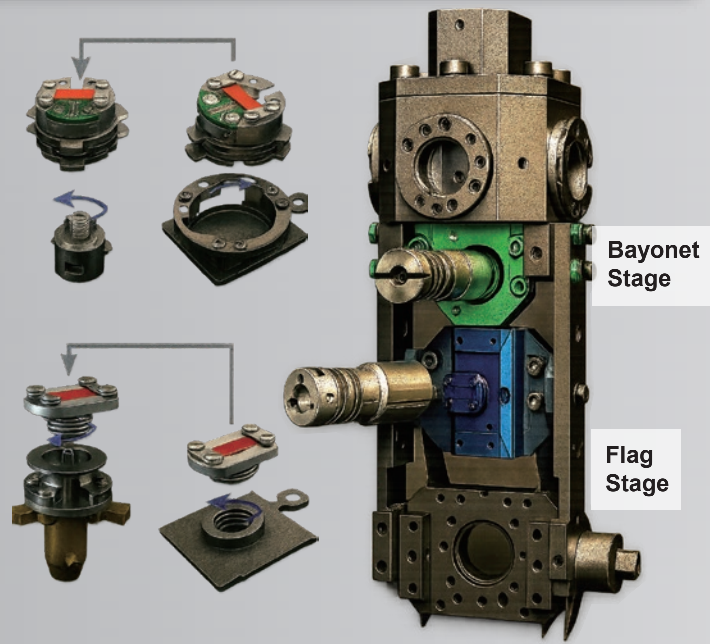
*The photo is for illustrative purposes only.　写真はイメージ図です

④ Flag-to-Bayonet Conversion Available in the Prep. Chamber

準備チャンバー内での フラッグ型–バヨネット型変換が 可能になりました

Previously, performing Flag-to-Bayonet conversion under UHV required a dedicated transit chamber; however, a conversion stage can now be installed as an add-on to the standard prep-chamber heating stage.
*This option is applicable only to heating stages without a cooling option.

フラッグ型-バヨネット型変換を超高真空内で行うため、従来は専用トランジットチャンバーが必要でしたが、標準の処理室加熱ステージ*に追加する形で、型変換ステージを設置できるようになりました。
*冷却ステージを備えていない加熱ステージ限定です。



Designed by Masahiro Sasada
設計者：笹田 雅博

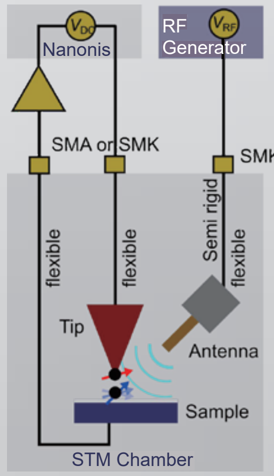
*The photo is for illustrative purposes only.
写真はイメージ図です

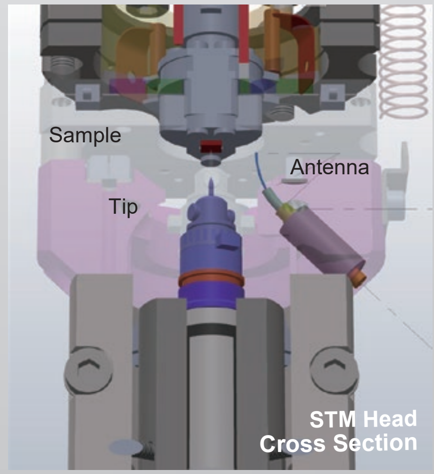
⑤ Microwave ESR Capability for USM1300/1600

USM1300/1600用マイクロ波ESR機能

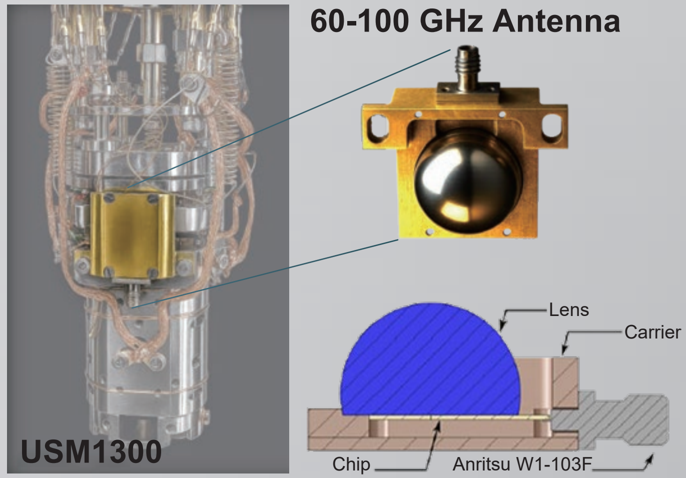
The USM1300/1600 now support the introduction of microwave-frequency signals (< 40 GHz), enabling the use of all necessary components for ESR-STM, including Nanonis software, a microwave source, semi-rigid cables, and an antenna.

USM1300/1600では、マイクロ波領域（<40 GHz）の高周波導入に対応し、ESR-STMを実現するための各種装備 (Nanonisソフト・高周波源・セミリジッドケーブル・アンテナ) が使用可能になりました。





⑥ Millimeter-Wave ESR Model: USM1300AST



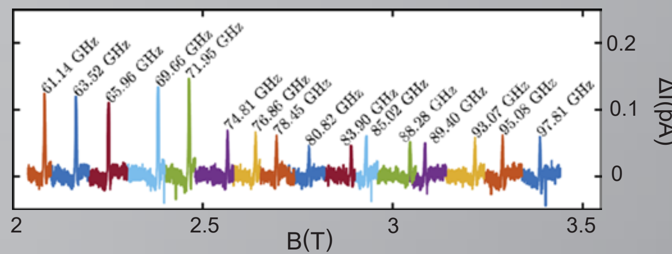
*The photo is for illustrative purposes only.
写真はイメージ図です

Combining Electron Spin Resonance Spectroscopy with Scanning Tunneling Microscopy at High Magnetic Fields
R. Drost *et al.*, Rev. Sci. Instrum. **93**, 043705 (2022).

ミリ波ESR対応モデル: USM1300AST

A specialized USM1300 model—originally developed by Dr. Christian R. Ast group at the Max Planck Institute—is now available from UNISOKU. The STM head allows ESR-STM with the introduction of millimeter wave frequencies (<100 GHz) to the STM tip.

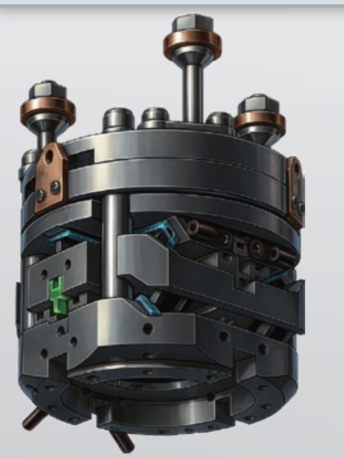
Max Planck Institute のDr. Christian R. Astにより考案されたミリ波領域（<100 GHz）の高周波をSTMヘッドの探針先端まで導入可能なUSM1300モデルが、ユニソクで対応可能となりました。



ESR-STM Publication List in 2025 (selected)

1. **Quantum Spin-engineering in On-Surface Molecular Ferrimagnets**
   W. Huang *et al.*, Nat. Commun. **16**, 5208 (2025).
2. **Single-Shot Readout of the Nuclear Spin of an On-Surface Atom**
   E. W. Stolte *et al.*, Nat. Commun. **16**, 7785 (2025).
3. **Spin-State Engineering of Single Titanium Adsorbates on Ultrathin Magnesium Oxide**
   S. Phark *et al.*, Nat. Commun. DOI: 10.1038/s41467-026-68314-6
4. **An Electrically Controlled Single-Molecule Spin Switch**
   W. Huang *et al.*, Nat. Commun. **16**, 8242 (2025).

7 Capacitive-Position-Sensor-Equipped Ultra-Low-Temp. STM Head



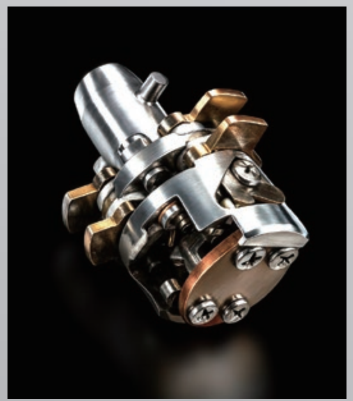
Designed by Tetsuya Maeda　設計者：前田 哲也
*The photo is for illustrative purposes only.
写真はイメージ図です

位置センサー搭載超低温STMヘッド

Capacitive position detection sensors can now be integrated into the sample stage of our ceramic STM head designed for ultra-low temperatures.
*We are also introducing optional configurations that allow the capacitance sensor to be mounted on other components, such as the lens stage.

超低温のためのセラミックSTMヘッド（USM1600）において、サンプルステージに容量式の位置検出センサーを搭載可能となりました。
＊容量センサーをレンズステージなど他の部品に設置するオプションを随時開始しています。

8 Dual-Sample Bayonet-Type Sample Holder: Shiranui Under Development



Designed by Masahiro Sasada
設計者：笹田 雅博
*The photo is for illustrative purposes only.
写真はイメージ図です

2つの試料を搭載可能なバヨネット型試料ホルダー: 不知火 開発中

In response to requests for “mounting multiple samples on a single sample holder,” we have been developing a new sample holder incorporating a piezo-driven single-axis movable stage (±2 mm) within the extremely limited space of the holder. This holder enables measurements of multiple samples without removing it from the STM head, allowing measurements to be continued at mK temperatures in the USM1300/1600 without returning to helium temperature for tip adjustment or sample exchange. As a result, measurement efficiency in low-temperature experiments is significantly improved.

「試料ホルダーに複数の試料を搭載したい」というご要望に応え、試料ホルダー内の極めて限られた空間に、ピエゾ駆動による１方向可動ステージ（±2 mm）を搭載した新規試料ホルダーを開発中です。
本ホルダーでは、STMヘッドから取り出さず複数試料の測定が可能な為、USM1300/1600などのmK温度測定において、探針調整や試料交換のためにヘリウム温度に戻すことなく測定を継続できます。これにより、低温実験における測定効率を大幅に向上させます。

USM1200 Publication List in 2025 (selected)

1. **Magnetic Bloch States at Integer Flux Quanta Induced by Super-moiré Potential in Graphene Aligned with Twisted Boron Nitride**
   Y. Ma *et al.*, Nat. Commun. **16**, 1860 (2025).
2. **Using Achiral Monomers to Synthesize Organometallic Chiral Copolymers on an Achiral Surface**
   Y. Bai *et al.*, ACS Nano **19**, 11111 (2025).
3. **Regulation of Reaction Pathways in Coordinated Chains by Directional Mechanical Force**
   Z. Xu *et al.*, ACS Nano **19**, 6120 (2025).
4. **One-Dimensional Electron Gas Confined along Nanowrinkles in a Unidirectional Charge Density Wave Material**
   E. Kim *et al.*, ACS Nano **19**, 15767 (2025).
5. **Emergence of the Flat Band and Kondo Resonance in the Superconducting T/H-NbS_2 Heterostructure**
   W. Li *et al.*, ACS Nano **19**, 21962 (2025).
6. **Programmable Higher-Order Topological Phases in Open-Shell Metal–Organic Frameworks**
   C. Li *et al.*, J. Am. Chem. Soc. **147**, 39662 (2025).
7. **Direct Evidence of Intrinsic Mott State and Its Layer-Parity Oscillation in a Breathing Kagome Crystal Down to Monolayer**
   H. Liu *et al.*, Phys. Rev. Lett. **135**, 076503 (2025).
8. **Electronic Correlations in Rhombohedral Graphene at Atomic Scale**
   Y. Liu *et al.*, Phys. Rev. Lett. **135**, 156401 (2025).

9 Remotely Switchable Bias Attenuator

リモートバイアスアッテネータ

Remote control of bias attenuator switching via a PC is now available. This eliminates the need for manual operation during measurements on the USM series.
In the RentalLab service, this attenuator also allows users to perform remote switching operations.

バイアスアッテネータの切替をPC上からリモート制御可能にしました。
これにより、USMシリーズでの測定において手動操作が不要となります。
＊レンタルラボUSM1600では、本アッテネータにより、ユーザーが遠隔で切替操作を行うことが可能となりました。

10 Robust Vibration Isolation System for STILL: Twin T tower

Designed by Thomas Berghaus　設計者：Thomas Berghaus
*The photo is for illustrative purposes only.　写真はイメージ図です

STILL用高剛性防振システム: ツインTタワー

For the USM1600, which requires continuous STILL evacuation for dilution refrigeration, a robust vibration isolation system that prevents the transmission of pump-induced vibrations is now available as an option.

希釈冷凍のために常時STILLを排気する必要があるUSM1600において、ポンプからの振動を伝達しない堅牢な除振システムをオプションとして提供可能となりました。

Publication List on Kagome Materials in 2025 (selected)

1. **Interwoven Magnetic Kagome Metal Overcomes Geometric Frustration**
   E. Cheng *et al.*, Nat. Mater. DOI: 10.1038/s41563-025-02414-4　USM1300
2. **Interplay of Nanoscale Strain and Smectic Susceptibility in Kagome Superconductors**
   Y. Wang *et al.*, Phys. Rev. X **15**, 021074 (2025).　USM1300
3. **Anisotropic Response of Defect Bound States to the Magnetic Field in Epitaxial FeSn Films**
   H. Zhang *et al.*, Nano Lett. **25**, 4689 (2025).　USM1300
4. **Electron-Correlation-Induced Charge Density Waves and Magnetism-Related Energy Gap in Kagome FeGe Unraveled by STM/STS**
   X. Yuan *et al.*, Nano Lett. **25**, 10412 (2025).　USM1300
5. **Direct Evidence of Intrinsic Mott State and Its Layer-Parity Oscillation in a Breathing Kagome Crystal Down to Monolayer**
   H. Liu *et al.*, Phys. Rev. Lett. **135**, 076503 (2025).　USM1200

Publication List on Altermagnetism in 2025 (selected)

1. **Crystal-Symmetry-Paired Spin–Valley Locking in a Layered Room-Temperature Metallic Altermagnet Candidate**
   F. Zhang *et al.*, Nat. Phys. **21**, 760 (2025).　USM1500
2. **Altermagnetism in the Layered Intercalated Transition Metal Dichalcogenide $CoNb_4Se_8$**
   R. Regmi *et al.*, Nat. Commun. **16**, 4399 (2025).　USM1500
3. **Discovery of Magnetic-Field-Tunable Density Waves in a Layered Altermagnet**
   C. Candelora *et al.*, arXiv:2503.03716　USM1300
4. **Atomic-Scale Spin Sensing of a 2D d-Wave Altermagnet via Helical Tunneling**
   Z. Wang *et al.*, arXiv:2512.23290　USM1300
5. **Atomic-Scale Visualization of d-Wave Altermagnetism**
   D. Fu *et al.*, arXiv:2512.24114　USM1200

11 New Optical System Capabilities for the USM1400

USM1400光学系新機能

Movable Parabolic Mirror

The USM1400, equipped with a movable lens stage, allows the integration of a parabolic mirror. While a parabolic mirror enables highly efficient focusing without chromatic aberration, it also presents challenges in optical-axis alignment. These challenges are effectively addressed by the piezo-driven stage. This configuration is widely used in applications ranging from state-of-the-art near-field optical measurements to THz-STM.

可動 放物面鏡

可動レンズステージを備えたUSM1400では、放物面鏡の搭載が可能です。放物面鏡は色収差がなく、高効率な集光が可能である一方、光軸調整が難しいという課題がありますが、ピエゾ駆動ステージによりその課題を補っています。本構成は、最先端の近接場光学測定からTHz-STMまで、幅広く利用されています。

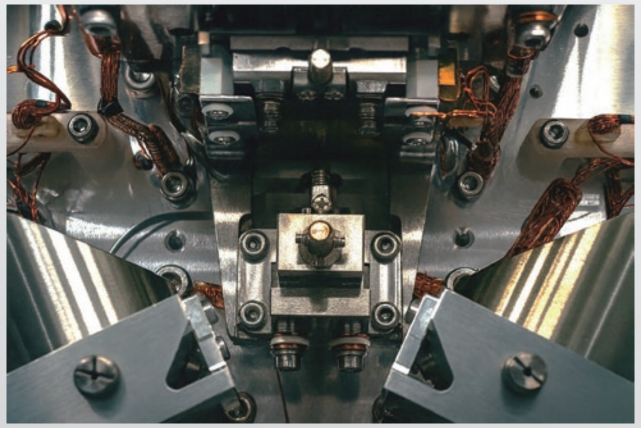


*Photo courtesy of Dr. Melanie Müller's website. Designed by Masaharu Sakai
*写真は、Dr. Melanie Müllerのホームページより掲載 設計者：坂井雅春

Publications Using the Parabolic Mirror System

1. **All-Optical Subcycle Microscopy on Atomic Length Scales**
T. Siday *et al.*, Nature **629**, 329 (2024).

2. **Plasmonic Light Emission by Inelastic Charge Transport in Ultrathin Zinc Oxide/Metal Heterostructures**
H. Wiedenhaupt *et al.*, Nano Lett. **25**, 2870 (2025).

3. **Atomic-Scale Ultrafast Dynamics of Local Charge order in a THz-Induced Metastable State of 1T-TaS_2**
L. E. Parra López *et al.*, arXiv: 2505.20541

*The photo is for illustrative purposes only.
写真はイメージ図です

Lens Stage Position Detection **Under Development**

The lens stage is equipped with capacitive sensors that enable absolute position detection. This allows precise focusing from the millimeter to micrometer scale, making optical alignment easier.Please feel free to contact us for more information.

レンズステージの位置検出 **開発中**

レンズステージに容量センサーを搭載することで、レンズの絶対位置検出が可能となりました。これにより、mmスケールからμmスケールに至るまで高精度な焦点合わせが可能となり、光学調整が容易になります。
詳細につきましては、お気軽にご相談ください。

USM1400 Publication List in 2025 (selected)

1. **Optical Spectroscopic Probing and Atomic Visualization of the Motion of N-Heterocyclic Carbenes on Ag(111)**
L. Li *et al.*, ACS Nano **19**, 15363 (2025).

2. **Exploiting Structural Flexibility for Reversible Kondo-State Switching in a Pure Organic Radical on Au(111)—Submolecular Imaging and Manipulation**
J. Duan *et al.*, ACS Nano **19**, 34981 (2025).

3. **Electrically Driven Cascaded Photon-Emission in a Single Molecule**
K. Kaiser *et al.*, Phys. Rev. X **15**, 021072 (2025).

4. **Plasmonic Light Emission by Inelastic Charge Transport in Ultrathin Zinc Oxide/Metal Heterostructures**
H. Wiedenhaupt *et al.*, Nano Lett. **25**, 2870 (2025).

5. **Tip-Enhanced Sum Frequency Generation for Molecular Vibrational Nanospectroscopy**
A. Sakurai *et al.*, Nano Lett. **25**, 6390 (2025).

6. **Deep Moiré Potential and Absence of Layer Polarization in Twisted Trilayer WS_2**
Y. Xiao *et al.*, Nano Lett. **25**, 6335 (2025).

7. **Manipulating Superlattice Potentials and Quantum Confinement in Graphene via Moiré Ferroelectricity**
Z. Guo *et al.*, Nano Lett. **25**, 11543 (2025).

8. **Chemical and Structural Insights into Nonequilibrium Polyrotaxanes Formed by Molecular Pumps**
S. Mahapatra *et al.*, Nano Lett. **25**, 12343 (2025).

9. **Picocavity-Enhanced Raman Spectroscopy of Physisorbed H_2 and D_2 Molecules**
A. Shiotari *et al.*, Phys. Rev. Lett. **134**, 206901 (2025).

12 Compact Optical Unit for Optical Pump-Probe SPM

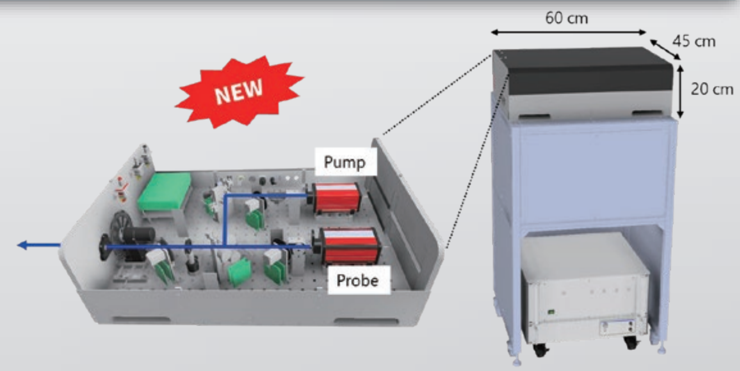
光ポンプ・プローブSPM用コンパクト光学ユニット

Time-Resolved SPM Unit Compatible with AFM

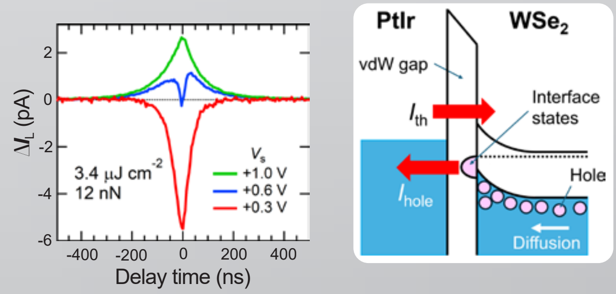
We offer an optical unit that enables time-resolved STM measurements, originally developed by Professor Hidemi Shigekawa at the University of Tsukuba. This system has been further developed to support time-resolved AFM measurements, allowing the study of quantum dots, solar cell materials, and other advanced nanostructures.

時間分解測定のAFM対応

筑波大学 重川グループと共同開発した光ポンプ・プローブ時間分解STM用光学ユニットを販売しております。AFMとの組み合わせにも対応し、遷移金属ダイカルコゲナイド/金属ショットキー接合のキャリアダイナミクス、量子ドット、太陽電池材料等の研究に利用されています。



Characteristic Time-Resolved Current at WSe_2/PtIr Schottky Junction



Collaboration with Dr. Taketoshi Minato (Institute for Molecular Science)
分子研 湊丈俊博士との共同研究

Concerted Carrier-Barrier Dynamics in van der Waals Schottky Junctions Revealed by Time-Resolved Atomic Force Microscopy
M. Yokota *et al.*, arXiv:2602.21463

13 Automatic Gas Flow Control Valve for USM1400: Flow Shogun

ガス流量の自動制御バルブ：フロー将軍

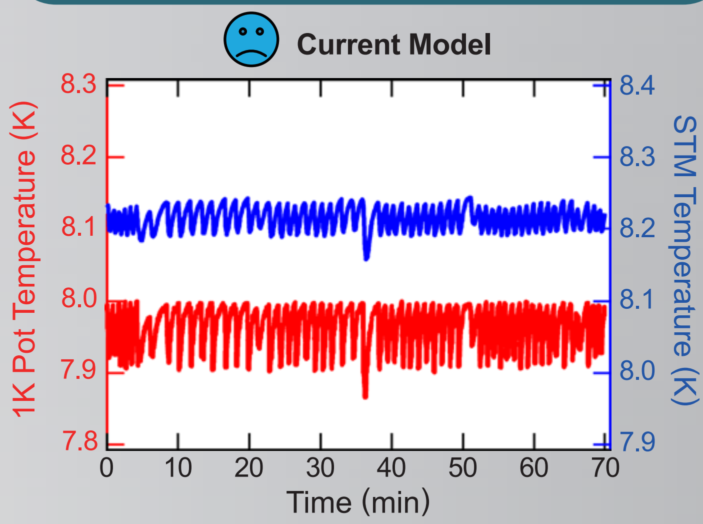
PID control of the He or N_2 gas flow improves the temperature stability of the USM1400, enabling lower cryogen consumption and more stable STM measurements.

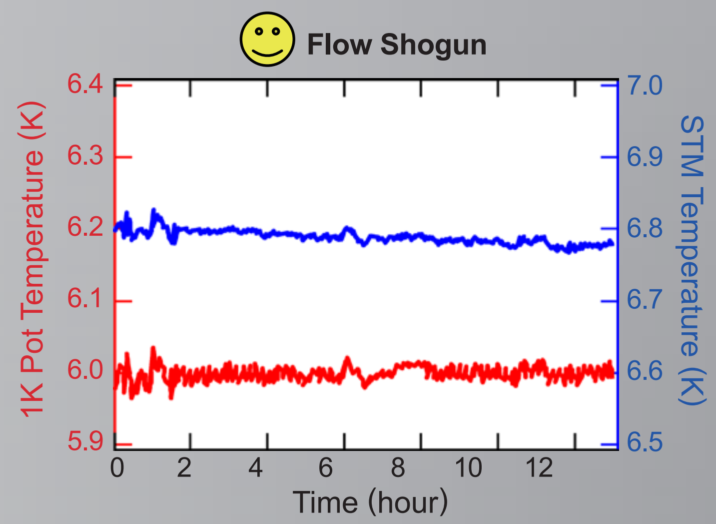
- STM stage temperature stability: better than 30 mK
- Helium consumption: 5–20% reduction

HeまたはN₂ガス流量のPID制御により、USM1400の温度安定性を向上させ、寒剤消費量の低減とSTM測定の安定化を実現しました。

- STMステージ温度ゆらぎ：30 mK以下
- ヘリウム消費量：5～20%削減

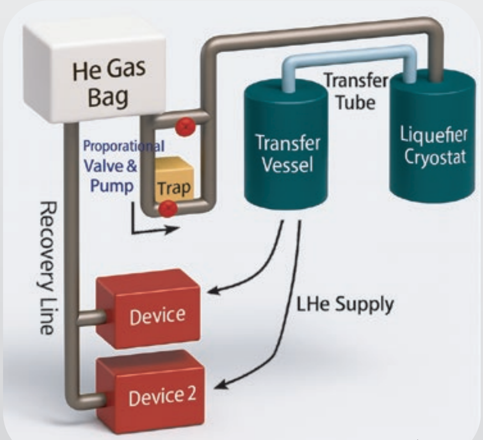
*The photo is for illustrative purposes only.
写真はイメージ図です





14 Helium Liquefaction System

Helium gas bag installed in the Second Factory
第二工場内に設置されたヘリウムガスバッグ（画面上部）



*The photo is for illustrative purposes only. 写真はイメージ図です

ヘリウム液化システム

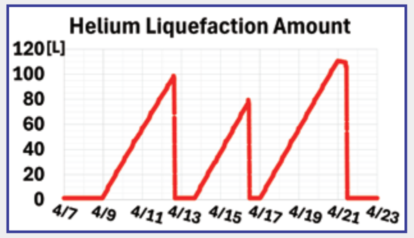
We offer a helium liquefaction system suitable for installation at the laboratory scale.
The liquefaction rate is guaranteed at 22 L/day, and the liquid nitrogen used for cooling the helium gas purifier allows operation for approximately 4 days with a 50 L supply and approximately 13 days with a 500 L supply.
The liquefaction control system (which supplies helium gas to the liquefier) is equipped with an automatic purifier cleaning function and an automatic liquid nitrogen refill function, and is also available as a standalone unit.
*This system has been operating in-house for several years and has an established sales record.

研究室規模で設置可能なヘリウム液化システムを提供しています。
液化レートは22 L/日を保証し、ヘリウムガスの純化機の冷却に使う液体窒素は、50Lで約4日、500Lで約13日間の運用が可能です。（ヘリウムガスを液化機に送る）液化制御システムは、純化機の自動洗浄機能と液体窒素自動投入機能を備え、単体販売にも対応しています。 *本システムは社内にて数年間稼働実績があり、すでに販売実績もあります。

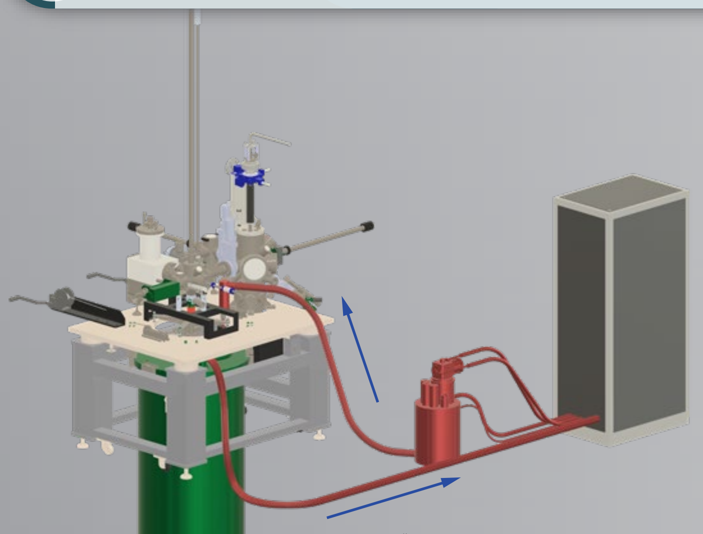
Example Installation 納品先

■ **National Tsing Hua University**
国立清華大学 (台湾)

Full-scale operation to begin in summer 2024
2024年夏より本格稼働開始
Liquefaction rate of 27 L/day achieved
液化能力：27 L/日を達成



15 Closed-Loop Helium Liquefaction System for SPM Under Development



*The photo is for illustrative purposes only.
写真はイメージ図です

連続循環液化機 開発中

Integration of a helium liquefier into an existing SPM system enables closed-loop continuous helium liquefaction. Ultra-low-temperature STM systems (e.g., USM1300 and USM1600) can be operated like cryogen-free systems, while the liquefier can also be used as a standalone unit with a liquid helium vessel.
Please feel free to contact us for further details.

既存のSPM装置にヘリウム液化機を組み込むことで、閉回路によるヘリウム連続液化を実現します。極低温STM(USM1300, USM1600 など)を無冷媒装置のように運用できるほか、液体ヘリウム容器に設置して通常の液化機としても利用可能です。
詳細はお気軽にご相談ください。

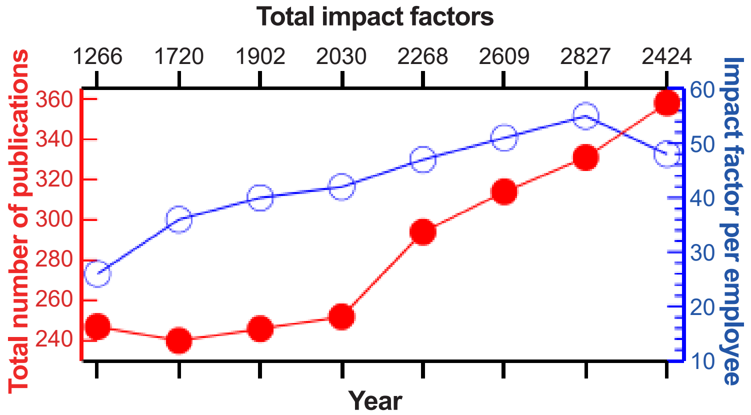
Introduction of Publications

論文の紹介

Publication Stats in 2025

- Total number of publications using UNISOKU systems* = 358 (331 in 2024)
- Total impact factors ~2424 (2827 in 2024)
  Corresponding to 48 Nature papers (56 in 2024)
  c.f. Impact factor of Nature ~50
- Impact factor per employee ~ 48 (~55 in 2024)

* Including preprints.



Popular Research Fields	Num. of Publications	Average Impact Factor
Molecules (including TERS, ESR-STM)	43	9.7
Superconductivity (Cuprate, Heavy Fermion, 2D Superconductivity)	32	7.1
Topological Materials	30	10.1
Kagome Materials	24	14.5
Transition Metal Dichalcogenides (TMDs)	24	10.5
Fe-based Superconductors	19	12.1
Low Dimensional Materials excluding TMDs, Graphene, 2D Superconductivity	19	8.0
Photochemistry	15	6.6
Graphene	13	13.1
Altermagnet	7	17.0

Orbital Hybridization in Graphene-Based Artificial Atoms

Product used: USM1300 & USM1500

Y. Mao *et al.*, Nature **639**, 73 (2025).

This study experimentally demonstrates atomic orbital hybridization inside quantum dots (QDs). Mao *et al.* (Lin He group, Beijing Normal University) developed a unique method to fabricate QDs *in situ* by using STM tip pulses to induce the formation of 1T′-phase TMD nano-islands at the graphene/TMD interface. This approach allows the QD shape to be precisely tuned from circular to elliptical *in situ*. Under this anisotropic potential, the *s* orbital and the *d* orbital hybridize to form new orbital states, directly visualized through STS. Furthermore, the energy splitting between the hybridized states increases systematically as the QD anisotropy is enhanced. This behavior is in good agreement with theoretical calculations, providing strong evidence for the emergence of orbital hybridization. This study represents a significant step toward the creation of artificial quantum materials in which electronic states within QDs can be designed and controlled *in situ*, offering valuable insights for the future development of quantum nanoscience.

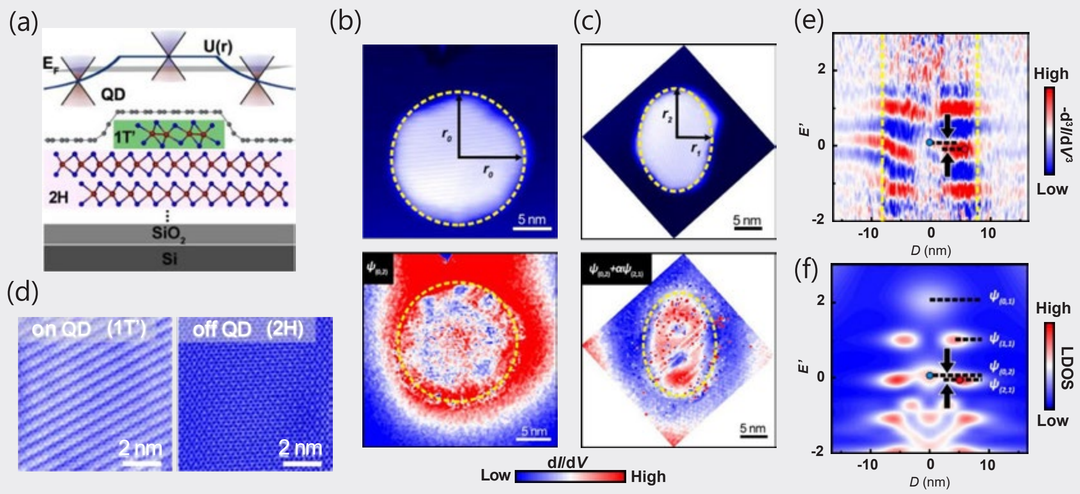


Figure (a) Schematics of an interfacial monolayer 1T′-phase TMD island embedded in a graphene/TMD heterostructure. (b, c) STM images of (b) a circular QD and (c) an elliptical QD (top), together with representative d*I*/d*V* maps (bottom). (d) Atomically resolved STM images acquired on and off the QD. (e, f) Spatial-energy spectra taken along the minor axis of the elliptical QD. (e) Experimental -d³*I*/d*V*³. (f) Simulated LDOS.

Magnetic Hofstadter Cascade in a Twisted Semiconductor Homobilayer

Product used: USM1300-SET

B. A. Foutty *et al.*, Nature Physics **21**, 1942 (2025).

Twisted WSe_2 (tWSe_2) is a unique system where magnetism, strong electron interactions, and topology coexist. Under a strong magnetic field, the electronic spectrum exhibits both the Zeeman effect and the Hofstadter effect arising from the moiré superlattice, but observing the latter experimentally has been challenging. Foutty *et al.* (Ben Feldman group, Stanford University) employed a scanning single-electron transistor (sSET) to track changes in electronic compressibility and uncovered a sequence of magnetic phase transitions. These transitions arise from electrons sequentially filling spin-resolved Hofstadter subbands, which are finely split by the applied magnetic field. This technique enabled the authors to experimentally resolve spin-identified band structures, typically difficult to observe because spin components tend to mix. Notably, this magnetic behavior remains nearly unchanged even when the twist angle is varied, indicating that the intrinsic magnetic character of tWSe_2 dominates over the engineered moiré superlattice effects.

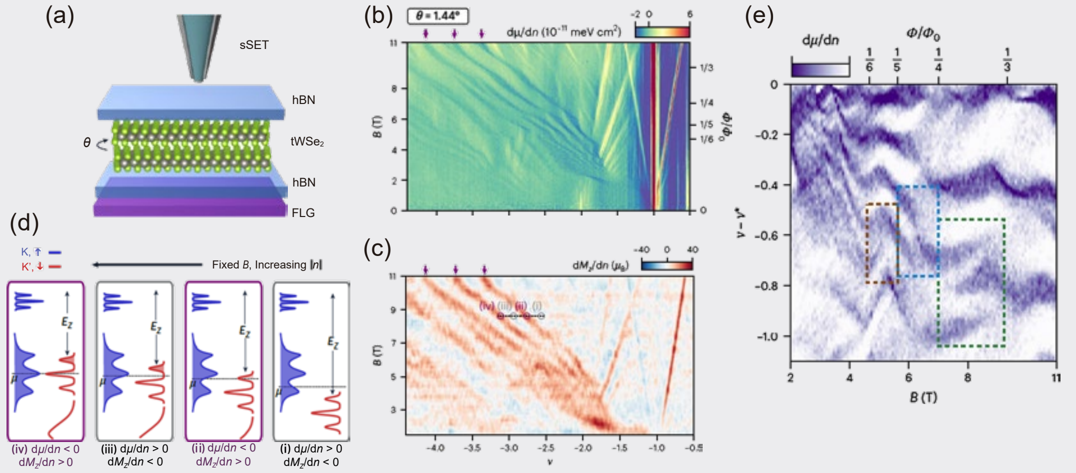


Figure (a) Schematic of the sSET and tWSe_2 heterostructure device. (b) Inverse electronic compressibility dμ/dn at twist angle θ = 1.44°as a function of moiré filling factor ν and magnetic field B.
(c) Derivative of the out-of-plane magnetization, dM_z/dn, as a function of ν and B.
(d) Schematic illustration of the sequence of Hofstadter subband crossings as carrier density n is tuned at fixed B. (e) dμ/dn as a function of B and $\nu - \nu^*$, where ν^* marks the onset of magnetic phase transitions.

Cooper-Pair Density Modulation State in an Iron-Based Superconductor

Product used: USM1300

L. Kong *et al.*, Nature, **640**, 55 (2025).

This study introduces the concept of pair-density modulation, a newly proposed spatially modulated state of the superconducting order parameter. Unlike conventional cases where such modulations require broken translational symmetry, this phenomenon arises from symmetry breaking only within the unit cell, while preserving long-range lattice translational symmetry. Kong *et al.* (Nadj-Perge group, Caltech) report the first experimental observation of this state in exfoliated thin films of an iron-based superconductor. The superconducting gap shows a robust modulation whose wavelength precisely matches the crystal lattice periodicity and whose amplitude exceeds 30% of the average gap. The modulation originates from a substantial difference in the superconducting gap between two nominally equivalent iron sublattices. It is driven by the interplay between sublattice symmetry breaking and thin-film–induced nematic distortion. This work opens up a new avenue for exploring intertwined orders in strongly correlated electronic systems.

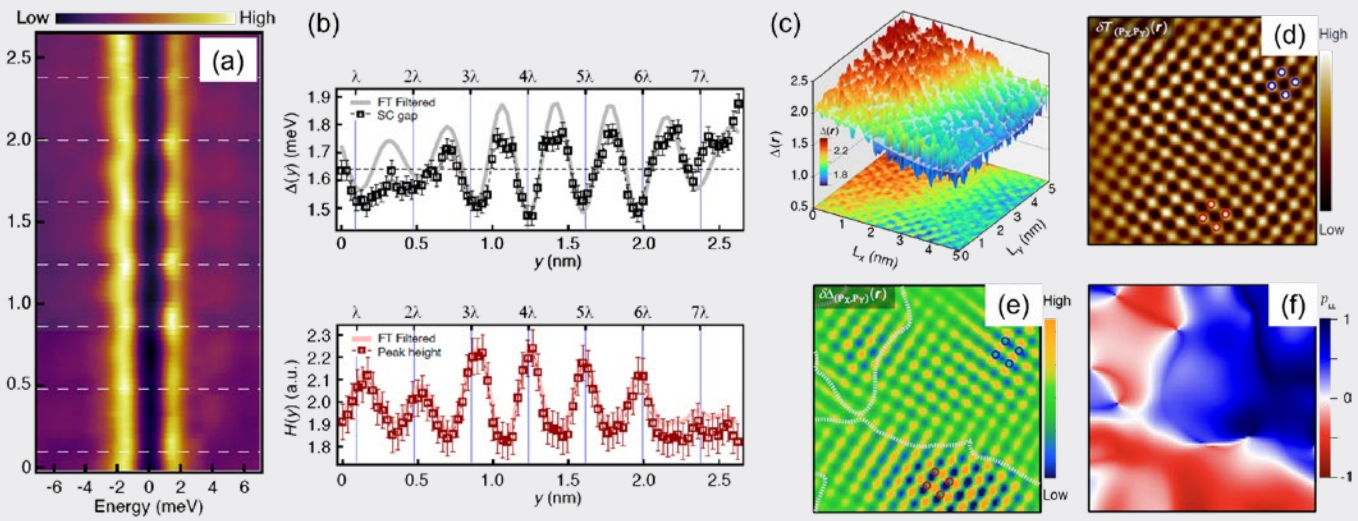
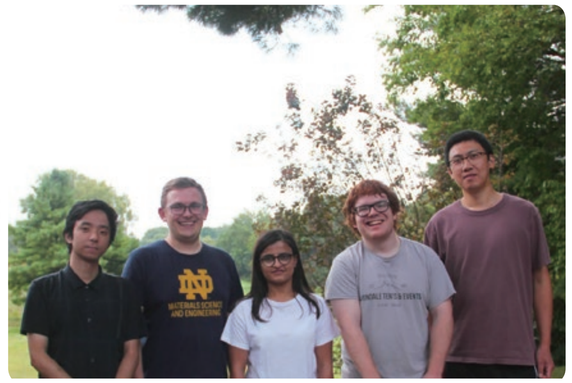


Figure (a) False-color plot of a dI/dV linecut along the y-axis in a thin flake of $FeTe_{0.55}Se_{0.45}$. (b) Spatial variations of the superconducting (SC) gap (top) and the coherence peak height (bottom). (c) Spatial map of the SC gap. (d) Fourier-filtered STM image highlighting the underlying modulation pattern. (e) Fourier-filtered map of the pair density modulation. The domain boundaries are also indicated. (f) Map of the sublattice-resolved SC gap maxima, where regions whose gap maxima reside on Fe_x sites are assigned +1 and those on Fe_y sites are assigned −1.

Xiaolong Liu

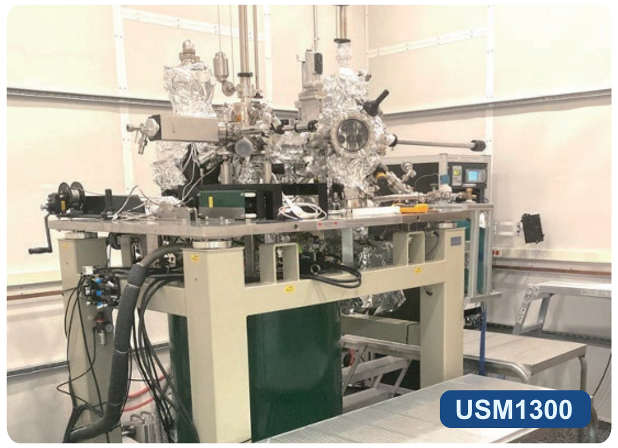
Department of Physics and Astronomy
University of Notre Dame, USA

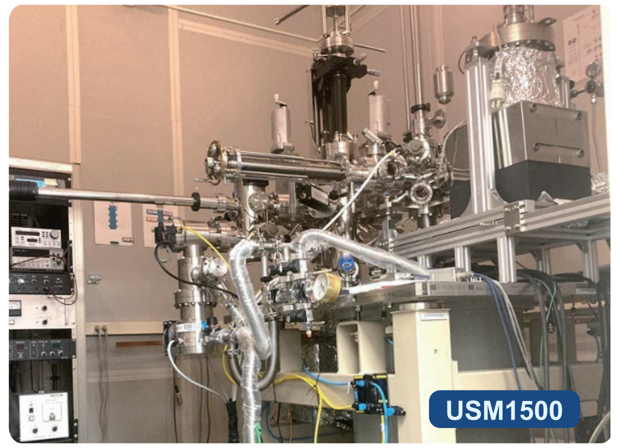


Research Interests

- Scanning Tunneling Microscopy
- Scanned Josephson Tunneling Microscopy
- Unconventional and Topological Superconductivity
- Atom/molecule Manipulation
- Low-Dimensional Materials and Heterostructures

SPM Facilities in the Team

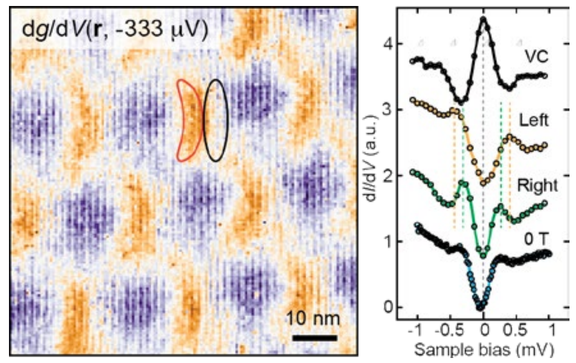




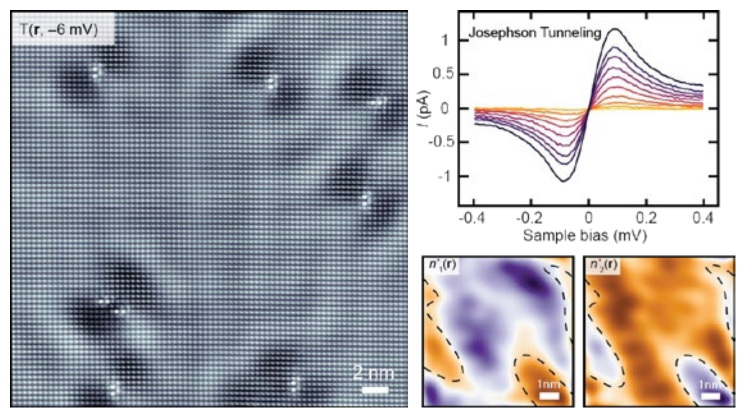
Features:

- 9-2-2 T Vector Magnet (USM1300)
- 8 T Magnet (USM1500)
- Six Independent Contacts on Sample Holders (USM1300)
- Base Temperatures: 0.3 K (USM1300), 2 K (USM1500)

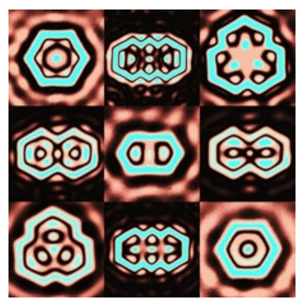
Vortex Doublets and Persistent Zero Modes in UTe_2



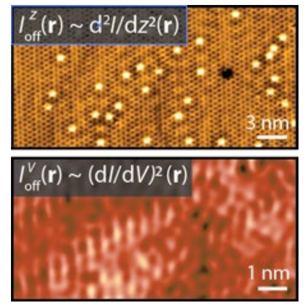
Atomic Scale Frustrated Josephson Coupling and Multicondensate Visualization in FeSe



Molecular Quantum Simulators



Deriving Material Properties from STM Error Signals



Selected References:

(1) N. Sharma, M. Toole *et al.* Nat. Mater. **24**, 1709 (2025).
(2) N. Sharma, M. Toole, *et al.* ACS Nano **19,** 31539 (2025).
(3) N. Sharma, J. McKenzie, *et al.* Nano Letters **25**, 3309 (2025).
(4) N. Sharma, S. Ghonge, A. Francisco, *et al.* Nano Letters **24**, 6658 (2024).

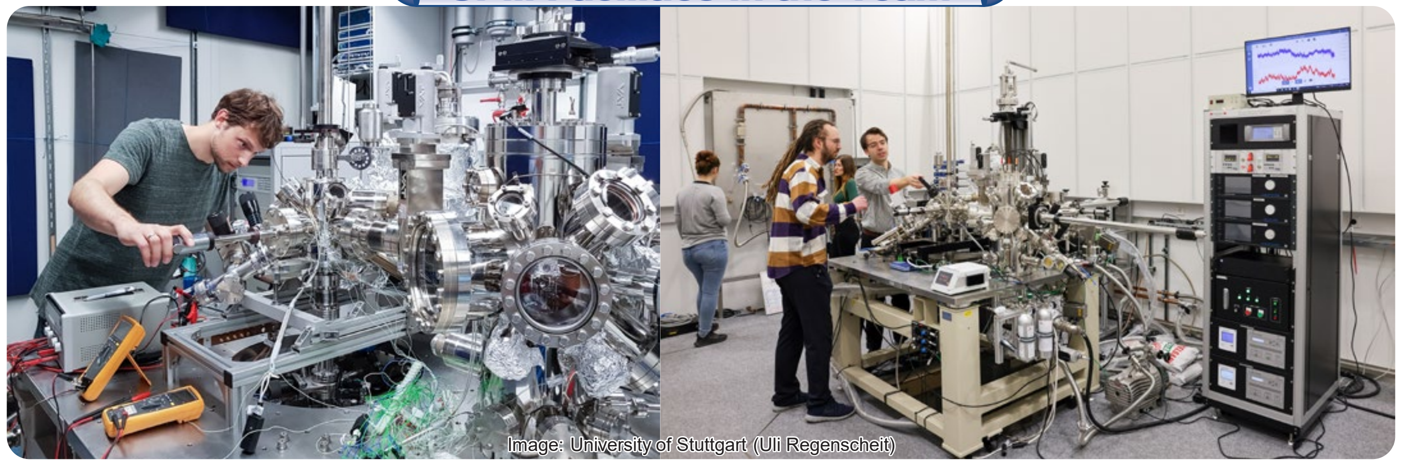
Sebastian Loth

Institute for Functional Matter and Quantum Technologies, University of Stuttgart

Research Interests

- Atomic-scale Physics
- Spin Dynamics in Open Quantum Systems
- Local Structure of Electron and Phonon Dynamics in Charge-Ordered Materials
- Atom-by-Atom Construction of Nanostructures
- Ultrafast Scanning Probe Microscopy

SPM Facilities in the Team



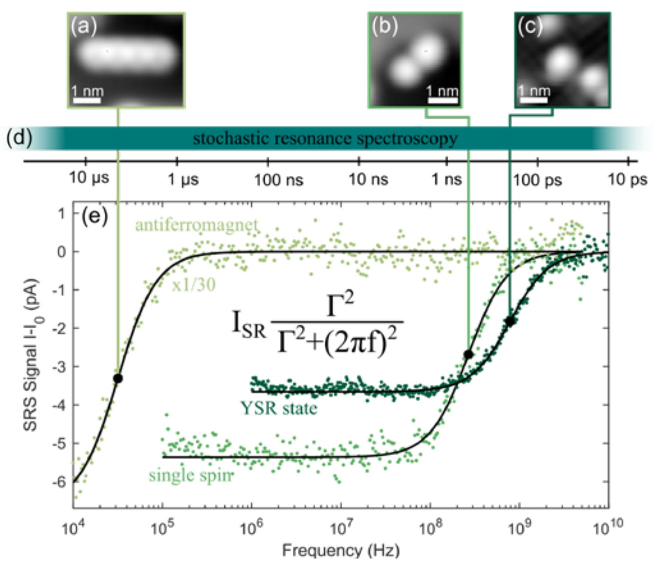
USM1300 ^{3}He features:

- Broadband microwave excitation (40 GHz)
- Ultrafast all-electronic time resolution (80 ps)
- Vector magnet (2-2-9 T)
- two microwave and four bias contacts for coherent manipulation experiments

USM1600 features:

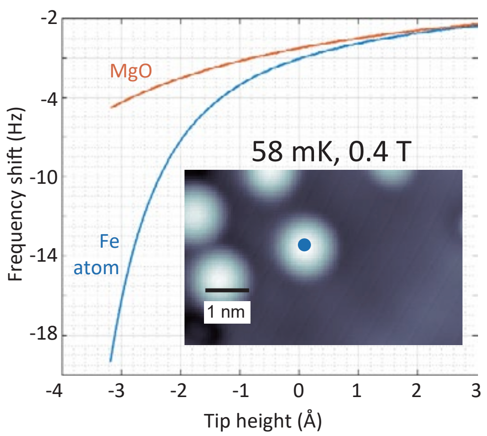
- High-frequency excitation for ESR spectroscopy
- Combined STM/AFM operation at ultrasmall amplitudes (< 5 pm)
- Low temperatures below 50 mK
- High magnetic field (15 T)

Stochastic Resonance Spectroscopy



Broadband microwave excitation measures the ultrafast stochastic switching of atomic-scale systems, e.g. few-atom antiferromagnets (a), single spins (b), or Yu–Shiba–Rusinov states in superconductors (c). The method uses stochastic resonance to measure dynamics over a large frequency range (d) as a Lorentzian response in the tunnel current (e).

Non-Contact AFM at mK-Temperatures



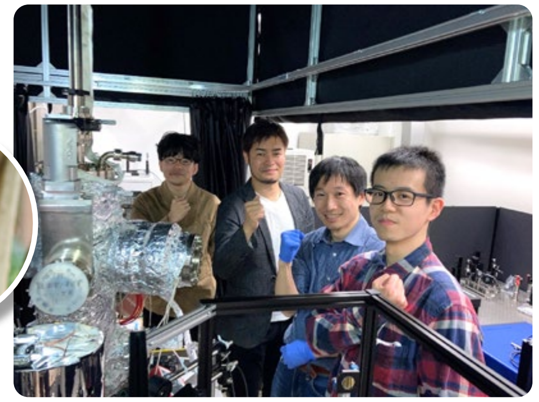
Individual Fe atoms adsorbed on the MgO/Ag(100) surface are S=2 spin qubits. Adressing them by force spectroscopy provides insights into their bonds with the surfaces and enables experiments on thick insulators.

Selected References:

(1) S. Sheng*, M. Abdo* *et al.*, Nature Phys. **20** 1603 (2024).
(2) S. Baumann *et al.* Small M. **8** 2301526 (2024).
(3) N. Betz *et al.*, arXiv:2412.12647 (2024).
(4) S. Sheng *et al.*, Phys. Rev. Lett. **129** 043001 (2022).
(5) M. Hänze*, G. McMurtie* *et al.*, Science Adv. **7** eabg2618 (2021).
(6) N. Betz*, L. Veldman* *et al.* in preparation

Toshiki Sugimoto

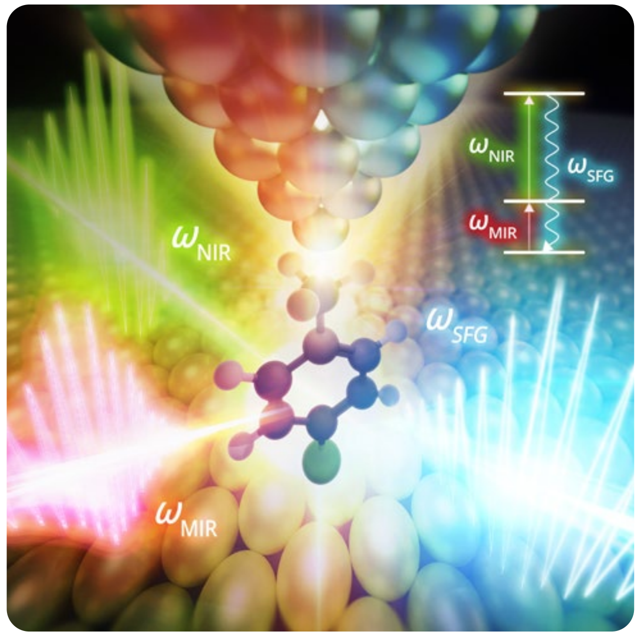
Department of Materials Molecular Science, Institute for Molecular Science (IMS), Japan



Research Interests

- Interfacial Molecular Structure and Dynamics
- Tip-Enhanced Nonlinear Molecular Spectroscopy
- Near-Field and Far-Field Spectroscopy
- Scanning Probe Microscopy and Spectroscopy
- Catalytic Reactions at Surfaces and Interfaces
- Emergent Properties at Surfaces and Interfaces
- Strongly Correlated Proton System

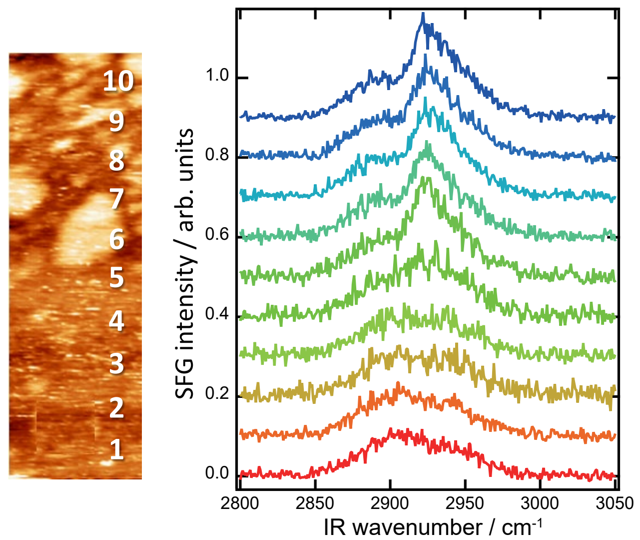
USM1400 Customized for Tip-Enhanced Nonlinear Spectroscopy



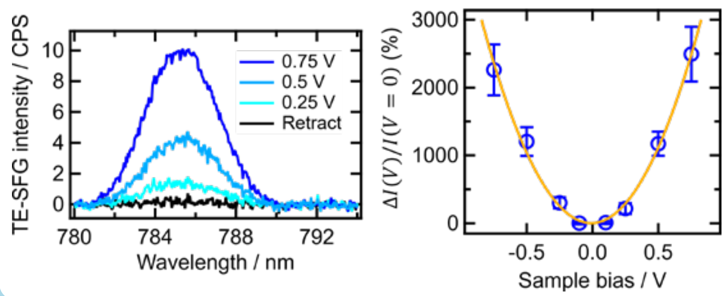
Features:

- Tip-Enhanced Sum-Frequency Generation (TE-SFG)
- Wavelength Tunable Ultrafast Pulse Laser System
- STM/AFM Capability

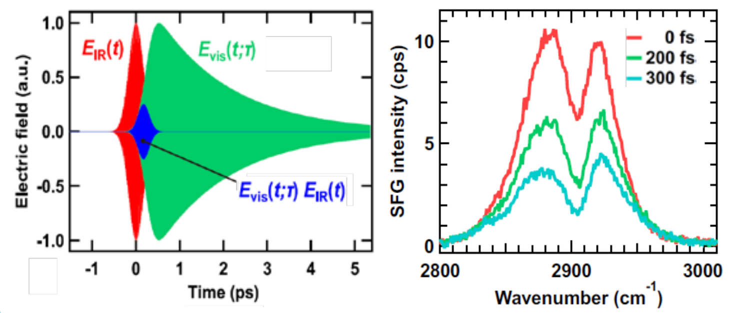
Tip-Enhanced SFG Nanoscopy Beyond the Diffraction Limit



More Than 2000 %/V Giant Electric Modulation of Nonlinear Optical Response at Picocabity



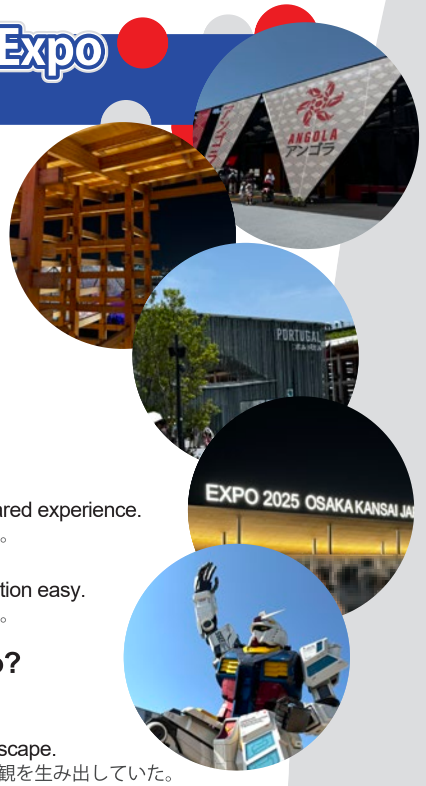
Time-Resolved & Phase-Sensitive Tip-Enhanced SFG Nanospectroscopy



Selected References:

(1) J. Phys. Chem. Lett. **14**, 6919 (2023).
(2) Nano Lett. **25**, 6390 (2025).
(3) J. Phys. Chem. C **130**, 373 (2026).
(4) J. Chem. Phys. **164**, 074202 (2026). ★ Selected as a Featured Article
(5) Nat. Commun. **17**, 2012 (2026).

Our Visit to the 2025 Osaka, Kansai Expo
2025大阪・関西万博へ行ってきました!



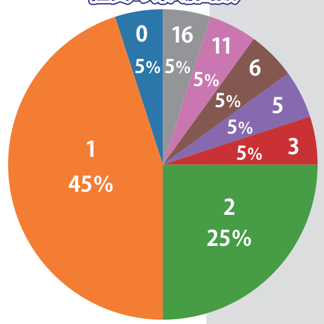
Q. What motivated you to visit the Expo?
万博に行ったきっかけはなんですか？

1. **Familiarity through local hosting**
   Being held in Osaka and nearby areas made it a familiar and easy-to-visit event.
   地元開催による親しみやすさ　大阪・近隣開催で、気軽に足を運べるイベントだった。
2. **Long-standing interest and commemorative significance**
   With prior interest in world expos, many felt it was an experience worth having at least once.
   以前からの関心と記念のため　万博への関心があり、「一度は体験したい」という思いから。
3. **Attractive events and personal curiosity**
   Music performances, various programs, and simple curiosity encouraged attendance.
   イベントや個人的な興味　音楽や催しへの参加、純粋な好奇心からの来場。
4. **The opportunity to share the experience with family and friends**
   Inspired by family interest and invitations from friends, the Expo was seen as a chance to enjoy a shared experience.
   家族・友人との共有体験への期待　家族の希望や友人からの誘いをきっかけに、一緒に楽しめる機会として。
5. **The company's support and the ease of participation**
   Support from the company such as ticket distribution and flexible leave arrangements made participation easy.
   会社からの後押しと参加しやすい環境　チケット配布や休暇制度など、会社の支援により参加しやすかった。

Q. What impressed you most or felt particularly positive about the Expo?
万博で印象に残ったことや良かったことを教えてください

1. **An impressive spatial experience symbolized by the Grand Ring**
   Its overwhelming scale and beauty exceeded expectations, creating a memorable Expo-specific landscape.
   大屋根リングに象徴される圧倒的な空間体験　想像以上のスケールと美しさが、万博ならではの印象的な景観を生み出していた。
2. **A lively and extraordinary atmosphere**
   The venue was filled with a festive energy, making the visit enjoyable in itself.
   非日常感と活気あふれる雰囲気　会場全体にお祭りのような高揚感があり、訪れるだけで楽しめた。
3. **Encounters with global cultures and advanced technologies**
   Experiencing diverse cultures and cutting-edge technologies provided new perspectives and discoveries.
   世界各国の文化・技術との出会い　多様な文化や最先端技術に触れ、新しい視点や発見が得られた。
4. **Warm hospitality and human connections**
   We felt a sense of connection through the kind support of staff from around the world and their events.
   人の温かさとホスピタリティ　各国スタッフの丁寧な対応やイベントを通じ、人との交流を感じられた。
5. **Special moments shared with family and colleagues**
   We realized the value of creating memories and sharing experiences with those we visited with.
   家族や仲間と過ごす特別な時間　一緒に訪れた人との思い出づくりや、共有体験の価値を実感できた。

Number of Employee Visits
社員の来場回数



最も多く万博を訪れた社員に聞きました！

大阪・関西万博来場の感想：

1. 来場の背景とスタイル

私は、1歳未満の乳幼児を連れた家族連れとして、通期パスを利用し計11回の来場を果たした。当初はメディアのネガティブな報道により関心が薄かったものの、親族の来訪を機に「4回行けば元が取れる」との判断からパスを購入。開幕直後の4月は気候も良く、人出も少なく非常に快適であった。乳幼児同伴のため、午後3時頃には帰宅するという短時間滞在を繰り返した。移動手段については、ベビーカーでの度重なる電車乗り換えの疲労を避けるため、東大阪（長田駅）まで自家用車で移動し、そこから地下鉄を利用する「パーク・アンド・ライド」方式を確立したが、会期終盤には同様の手段をとる来場者が増え、駐車場不足も見られた。

2. パビリオンの評価と印象

来場回数の割に体験数は限定的（海外18、国内10）であったが、以下の通り明確な所感を得ている。

● **海外パビリオン：** 映像主体の展示が多く、特に内容が画一的な「SDGs関連」には退屈さを感じた。
一方で、「実物」の展示には強い訴求力を感じた。
- **イタリア（最高評価）：** 国宝級の文化財に加え、プラスチック成形装置などの産業機器も展示されており、私の関心を強く惹いた。
- **トルクメニスタン：** 指導者を象徴的に表現した映像展示が印象的であり、権力構造の明確さという点で強いインパクトと感銘を受けた。
- **その他：** 台湾の観光・技術アピールや、日本との縁を強調したフランス・マルタ等に好感を持った。

● **国内パビリオン：**
- **関西パビリオン：** 府県ごとの特色（徳島の阿波踊り等）があり予想以上に楽しめた。
- **ガンダムNEXT FUTURE館：** 夫婦で全話予習をしてから臨んだことで、展示内容を深く享受でき、関連グッズ購入への納得感も高まった。

3. 展示以外の体験と会場内の食事

パビリオン以外では、JR東日本が開発した「壁面移動ロボット」の実演に強く惹かれた。炎天下、重量のある機械が垂直移動する姿を熱心に見学した。飲食に関しては、欧米並みの高価格帯であったが、UAE館のサーゴという「温かく甘いイクラのような謎のスイーツ」など、万博ならではの未知の食体験には価値を感じた。一方で、会場内の高価格に慣れた結果、日本の日常的な食事が「高品質かつ極めて安価」であることを再認識するに至った。

4. おわりに

本記録は個人的な体験に基づくものであるが、来場者の属性（子供の有無や事前知識）によって、万博の受け止め方が大きく異なることを示唆している。私にとってこの経験は、単なる展示観覧にとどまらず、家族間のコミュニケーションや価格認識の変化などをもたらす有意義なものであった。

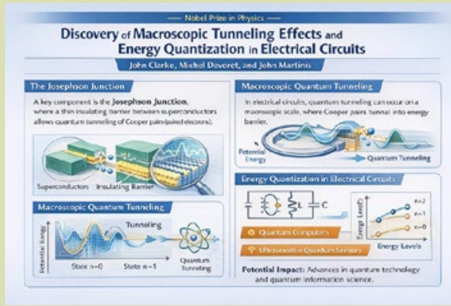
The 2025 Nobel Prize
2025年のノーベル賞

In 2025, two Japanese researchers received the Nobel Prize in Physiology or Medicine and in Chemistry. In addition, the “tunneling effect,” which is also utilized in UNISOKU's STM systems, was recognized with the Nobel Prize in Physics.

2025年、日本人研究者2名がノーベル賞（生理学・医学賞および化学賞）を受賞しました。
また、ユニソクのSTMでも利用されている「トンネル効果」が物理学賞の対象となりました。

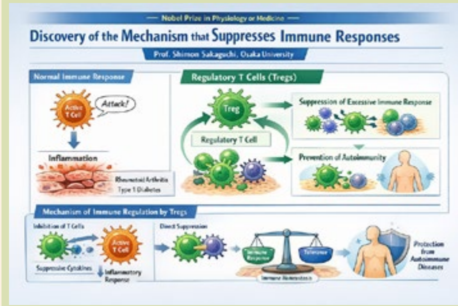
Nobel Prize in Physics
“Discovery of macroscopic **tunneling effects** and energy quantization in electrical circuits.”
Awarded to **Profs. John Clarke, Michel Devoret, and John Martinis**.

物理学賞
「電気回路におけるマクロな**トンネル効果**とエネルギー量子化の発見」
ジョン・クラーク教授、ミシェル・デボレ教授、ジョン・マルティニス教授の３名に授与



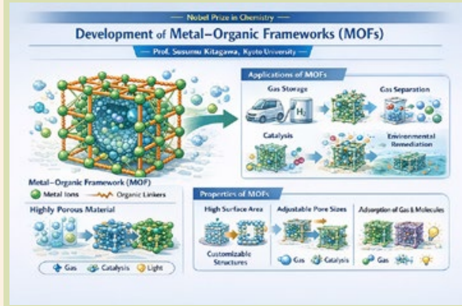
Nobel Prize in Physiology or Medicine
“Discovery of the mechanism that suppresses immune responses.”
Prof. Shimon Sakaguchi,
Distinguished Professor at The University of Osaka

生理学・医学賞
「免疫応答を抑制する仕組みの発見」
大阪大学　坂口 志文 教授



Nobel Prize in Chemistry
“Development of metal–organic frameworks (MOFs).”
Prof. Susumu Kitagawa,
Distinguished Professor at Kyoto University

化学賞
「金属有機構造体（MOF）の開発」
京都大学　北川 進 教授



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List of Japanese Laureates of the Nobel Prizes in the Natural Sciences
（参考）日本の自然科学系ノーベル賞受賞者一覧

Year of award 受賞年	Category 賞	Name 氏名	Affiliation at the time of award 受賞時の所属
2025	Chemistry　化学賞	Susumu Kitagawa　北川　進	Kyoto University　京都大学　理事・副学長、高等研究院特別教授
	Physiology or Medicine　生理学・医学賞	Shimon Sakaguchi　坂口　志文	The University of Osaka　大阪大学　免疫学フロンティア研究センター特任教授、京都大学名誉教授
2021	Physics　物理学賞	Syukuro (Suki) Manabe　真鍋　淑郎	Princeton University　プリンストン大学(米国)　上席研究員
2019	Chemistry　化学賞	Akira Yoshino　吉野　彰	Asahi Kasei Corporation　旭化成株式会社　名誉フェロー、名城大学 教授
2018	Physiology or Medicine　生理学・医学賞	Tasuku Honjo　本庶　佑	Kyoto University　京都大学　高等研究院副院長・特別教授
2016	Physiology or Medicine　生理学・医学賞	Yoshinori Ohsumi　大隅　良典	Tokyo Institute of Technology　東京工業大学　特任教授
2015	Physics　物理学賞	Takaaki Kajita　梶田　隆章	The University of Tokyo　東京大学　教授
	Physiology or Medicine　生理学・医学賞	Satoshi Omura　大村　智	Kitasato University　北里大学　特別栄誉教授
2014	Physics　物理学賞	Isamu Akasaki　赤﨑　勇	Meijo University　名城大学　教授
		Hiroshi Amano　天野　浩	Nagoya University　名古屋大学　教授
		Shuji Nakamura　中村　修二	University of California, Santa Barbara　カリフォルニア大学 サンタバーバラ校(米国)　教授
2012	Physiology or Medicine　生理学・医学賞	Shinya Yamanaka　山中　伸弥	Kyoto University　京都大学　iPS細胞研究所長・教授
2010	Chemistry　化学賞	Eiichi Negishi　根岸　英一	Purdue University　パデュー大学(米国)　特別教授
		Akira Suzuki　鈴木　章	Hokkaido University　北海道大学　名誉教授
2008	Physics　物理学賞	Yoichiro Nambu　南部　陽一郎	University of Chicago　シカゴ大学(米国)　名誉教授
		Makoto Kobayashi　小林　誠	High Energy Accelerator Research Organization　高エネルギー加速器研究機構　名誉教授
		Maskawa Toshihide　益川　敏英	Kyoto Sangyo University　京都産業大学　教授、京都大学　名誉教授
	Chemistry　化学賞	Osamu Shimomura　下村　脩	Boston University　ボストン大学(米国)　名誉教授
2002	Chemistry　化学賞	Koichi Tanaka　田中　耕一	Shimadzu Corporation　株式会社島津製作所　主任
	Physics　物理学賞	Masatoshi Koshiba　小柴　昌俊	The University of Tokyo　東京大学　名誉教授
2001	Chemistry　化学賞	Ryoji Noyori　野依　良治	Nagoya University　名古屋大学　教授
2000	Chemistry　化学賞	Hideki Shirakawa　白川　英樹	University of Tsukuba　筑波大学　名誉教授
1987	Physiology or Medicine　生理学・医学賞	Susumu Tonegawa　利根川　進	Massachusetts Institute of Technology　マサチューセッツ工科大学(米国) 教授
1981	Chemistry　化学賞	Kenichi Fukui　福井　謙一	Kyoto University　京都大学工学部教授
1973	Physics　物理学賞	Reona Ezaki　江崎　玲於奈	IBM Watson Research Center　IBMワトソン研究所(米国)主任研究員
1965	Physics　物理学賞	Sin-itiro Tomonaga　朝永　振一郎	Tokyo University of Education　東京教育大学 教授
1949	Physics　物理学賞	Hideki Yukawa　湯川　秀樹	Kyoto University　京都大学理学部 教授

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