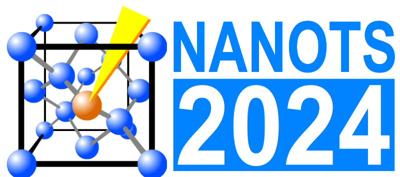

The 44th Annual NANO Testing Symposium

Senri Life Science Center
(Toyonaka, Osaka, Japan)

12–14 November 2024

https://inanot.sakura.ne.jp/nanots/

secretariat@inanot.sakura.ne.jp

Sponsored by The Institute of NANO Testing
In cooperation with

- The Institute of Electronics, Information and Communication Engineers
- The Japan Society of Applied Physics
- Reliability Engineering Association of Japan
- Union of Japanese Scientists and Engineers

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1 Location

Technical Sessions:

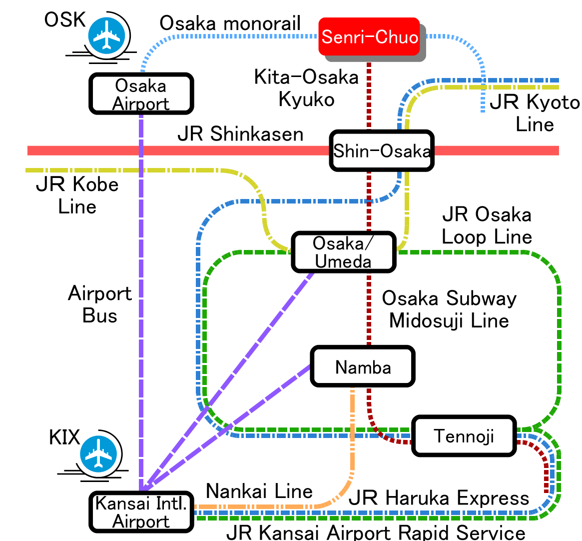
Life Hall, the 5th floor, Senri Life Science Center
1-4-2, Shin-Senri-Higashi-Machi, Toyonaka
Osaka, 560-0082 JAPAN
Phone: +81-6-6873-2010, FAX: +81-6-6873-2011

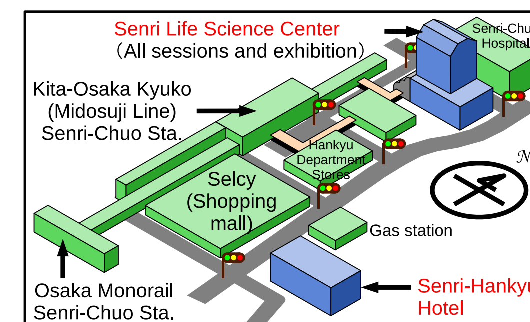
Exhibition:

Senri Room, the 6th floor, Senri Life Science Center

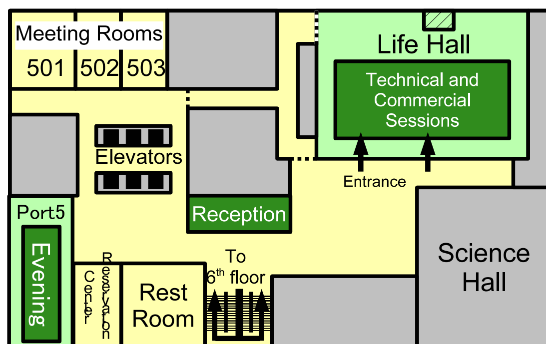
Evening Session:

Port 5, the 5th floor, Senri Life Science Center

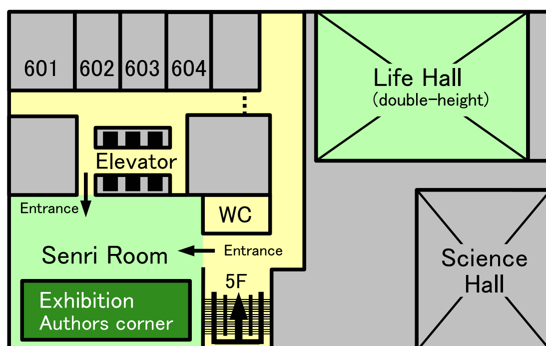




2 Floor Map



Senri Life Science Center 5F



Senri Life Science Center 6F

3 Invited Talk

The following invited talks will be given.

9:30–10:30, Tuesday, 12 November:
"Development of an integrated measurement system for management of nanomaterials, and standardization of output data formats of measurement and analysis instruments"
by Prof. Shingo ICHIMURA, *Waseda University*

13:15–14:15, Tuesday, 12 November:
"Overview of generative AI implementation in industrial manufacturing Talkative Products' business and technical challenges"
by Dr. Makiko NAEMURA, *Hitachi Industrial Equipment Systems Co., Ltd.*

16:01–17:01, Wednesday, 13 November:
"Development of SiC semiconductors at Mirise Technologies"
by Dr. Hirokazu FUJIWARA, *MIRISE Technologies*

9:30–10:30, Thursday, 14 November:
"Crystal Defect Characterization Technology of Widegap Semiconductors using Multiphoton-Excitation Photoluminescence"
by Prof.Tomoyuki TANIKAWA, *Osaka University*

13:15–14:15, Thursday, 14 November:
"The Current Status and Future Prospects of Diamond Power Devices – The Story of the Founding of a Deep Tech Start-Up –"
by Dr. Tatsuya FUJISHIMA, *Power Diamond Systems, Inc.*

4 Authors Corner

Authors corner, a place for audience to meet with and discuss with authors, will be given just after the sessions (except for commercial sessions) in Senri room on 6F.

5 Evening Session

Evening session of NANOTS is a special session for introducing P&A workshop activities and discussing on research trend around the world and the future perspective. The session will be held on 18:00–20:00, Wednesday, 13 November. (Cafe & Restaurant Port5 on 5F).

6 Exhibition and Commercial Session

The Symposium will feature the latest in service providers, equipment manufacturers and suppliers. A large exhibit floor will give the opportunity to key-vendors to represent the core business area in these fields. Furthermore, a commercial session will give the opportunity to introduce new products with short presentation.

7 Luncheon Seminar

Luncheon seminars will be given in lunch break time on Wednesday, 13 November. You must pre-register to attend the seminar. In some cases, your registration may not be accepted because of a business policy of the sponsor.

Hitachi High-Tech Luncheon Seminar: Wednesday, 13 November

Theme: Hitachi's new nanoprobing system and FIB-SEM technology equipped with AI functions

8 Official Languages

The official languages of the symposium are Japanese and English. Papers included in the proceeding will be written in Japanese or English. Papers in Japanese will have an abstract written in English. We will have no interpreter.

9 Registration Fee

Course	Fee	Including
Non-student	JPY 13000	All sessions, exhibition, and proceeding (download only)
Student	JPY 5000	

Please pay the fee by 25 October 2024 in one of the following ways.

Wire Transfer: Please send Japanese YEN (JPY) to the following account by wire transfer:
Bank Name: Resona Bank, Ltd.
SWIFT (BIC) Code: DIWAJPJT
Branch Name: Senri-Kita Branch
Branch Code: 222
Address: 4-2-D2-201, Furuedai, Suita, Osaka, 565-0874, Japan
Phone: +81-6-6872-0651
Account Number: 6843152
Account Name: The Institute of NANO Testing Nakamae Koji
Note: All bank charges JPY 5,000 (= the sending bank charge + the receiving bank charge) must be paid by the participant.

Credit card: After you register on the web, the secretariat will send information on how to pay the registration fee by credit card to your e-mail address.

10 Symposium Registration

Please register on line by using our following website by 25 October 2024 (punctuality).

https://inanot.sakura.ne.jp/nanots/en/

This symposium is for pre-registration only, and we will not accept participation on the day. Thank you for your understanding.

11 Cancellation Policy

Cancellations must be submitted in an e-mail. Cancellations received by 17:00, 25 October 2024 (in Japan Standard Time) are entitled to a refund minus an administrative fee (all bank charges plus a 10 % processing fee). No refunds will be given to registrants who cancel after 25 October 2024 or who fail to attend the event.

12 Accommodation Information

There is Senri Hankyu Hotel around the symposium site. The hotel is located close to the symposium site. You can go to the symposium site from the hotel by 5 minutes walk. If you want to stay at Senri Hankyu Hotel, please visit the hotel's web site and book a room. Please keep in mind that the reservation will be closed in the case all available rooms are booked.

http://www.senri-htl.co.jp/

13 Proceedings

Technical papers will be provided on electronic media (download). Download information will be announced on November 7, 2024. The conference program will be provided on print media.

14 Latest Information

You can find latest information on all aspects of NANOTS at https://inanot.sakura.ne.jp/nanots/en/ .

15 Steering & Program Committee

Chairman:

Koji NAKAMAE (Osaka University)

Member:

Yasuo CHO (Tohoku University)
Yasuhisa HIGUCHI (Hitachi, Ltd.)
Kazunobu KOJIMA (Osaka University)
Toru KOYAMA (Fuji Electric Co., Ltd.)
Shunsuke ASAHINA (JEOL Ltd)
Suigen KYOH (Kioxia Corp.)
Hitoshi MAEDA (Renesas Electronics Corp.)
Kiyoshi NIKAWA (Device Evaluation Technology Lab.)
Yoichi OSE (Hitachi High-Tech Corp.)
Hirotoshi TERADA (Hamamatsu Photonics)
Masahiko TSUJITA (Sony Semiconductor Manufacturing Corp.)
Yuichiro YAMAZAKI (TASMIT Inc.)

16 Secretariat

Yoshihiro MIDOH and Koji NAKAMAE
Secretariat of the Institute of NANO Testing
Miura Lab., Dept. Information Systems Engineering,
Grad. Sch. Information Science and Technology
Osaka University
1-5, Yamada-Oka, Suita, Osaka, 565-0871 JAPAN
Phone/Fax: +81-6-6879-7813 / +81-6-6879-7812
E-mail: secretariat@inanot.sakura.ne.jp
Web: https://inanot.sakura.ne.jp/nanots/en/

17 Technical Program

Tuesday, Nov. 12, a.m. / Life Hall

(1) *09:20* Opening remarks
K. Nakamae / Chairman, The Institute of NANO Testing

Invited Talk I — a.m., Tue 12

Chairman Koji Nakamae

(I1) *09:30* Development of an integrated measurement system for management of nanomaterials, and standardization of output data formats of measurement and analysis instruments
S. Ichimura / Waseda University

·········· 10:30〜10:50 Authors corner & break ··········

Metrology and Inspection I — a.m., Tue 12

Chairman Yoichi Ose

(2) *10:50* The Roughness Control in The Silicon Thinning Process for Failure Analysis Samples
Y. I. Kawamura[a], A. Uvarov[b], A. Pageau[b], H. Shibata[a], T. Lazerand[b] / [a]Plasma-Therm-Japan K.K., [b]Plasma-Therm Europe

(3) *11:15* Evaluation of hole shape using roundness and circularity for process evaluation
H. Nakao, W. J. Know, C. Kang, H. Tanaka / Thermo Fisher Scientific

·········· 11:40〜12:00 Authors corner & break ··········

·············· 12:00〜13:15 Lunch Break ··············

Tuesday, Nov. 12, p.m. / Life Hall

Invited Talk II — p.m., Tue 12

Chairman Yasuhisa Higuchi

(I2) *13:15* Overview of generative AI implementation in industrial manufacturing Talkative Products' business and technical challenges
N. Makiko / Hitachi Industrial Equipment Systems Co., Ltd.

·········· 14:15〜14:35 Authors corner & break ··········

Metrology and Inspection II — p.m., Tue 12

Chairman Suigen Kyoh

(4) *14:35* Automated cross-sectional SEM observation technology using image recognition of semiconductor-device structures
T. Dobashi, H. Yamamoto, T. Ohmori / Hitachi Ltd.

(5) *15:00* A generative model for SEM images of semiconductor line patterns and its application in metrology
S. Asano, Y. Midoh, J. Shiomi, N. Miura / Osaka University

·········· 15:25〜15:45 Authors corner & break ··········

Metrology and Inspection III — p.m., Tue 12

Chairman Shunsuke Asahina

(6) *15:45* A study of robust pattern contour extraction using contour vibration network
S. Murakami[a], M. Oya[a], Y. Okamoto[b], S. Nakazawa[b], K. Maruyama[b], Y. Yamazaki[b], Y. Midoh[a], N. Miura[a] / [a]Osaka University, [b]TASMIT, Inc.

(7) *16:10* Advanced contour extraction of lower layer patterns for see through BSE image of high voltage SEM
M. Oya[a], Y. Okamoto[b], S. Nakazawa[b], K. Maruyama[b], Y. Yamazaki[b], S. Murakami[a], Y. Midoh[a], N. Miura[a] / [a]Osaka University, [b]TASMIT, Inc.

·········· 16:35〜16:55 Authors corner & break ··········

Wednesday, Nov. 13, a.m. / Life Hall

Metrology and Inspection IV — a.m., Wed 13

Chairman Yuichiro Yamazaki

(8) *09:30* Time-resolved measurement using pulsed scanning electron microscope equipped with NEA secmiconductor photocathode as electron source
H. Morishita[a], T. Ohshima[b], M. Kuwahara[c], T. Agemura[b], Y. Ose[b], D. Takane[a], T. Saito[b] / [a]Hitachi, Ltd., [b]Hitachi High-Tech Corporation, [c]Institute of Materials and Systems for Sustainability, Nagoya University

(9) *09:55* Relationship between contrast formation in the mirror electron images and the distribution of crystal defects in polishing damage introduced on the surface of SiC wafers.
H. Sako[a], S. Hayashi[a], K. Ohira[b], K. Kobayashi[b], T. Isshiki[c] / [a]Toray Research Center, Inc., [b]Hitachi High-Tech Corp., [c]Kyoto Institute of Technology

·········· 10:20〜10:40 Authors corner & break ··········

Commercial Session — a.m., Wed 13

Chairman Hitoshi Maeda

(C1) *10:40* High-speed sample processing system by pulse laser
K. Suzuki, S. Ichikawa, O. Tasgit / NanoTech Solutions Inc.

(C2) *10:47* Effectiveness of CAD-navigation Tools in Failure Analysis using EOP
T. Imoto, K. Hirai / TOOL Corporation

(C3) *10:54* Introduction of Sequencer software U15707-03 for Emission microscope
M. Fujiwara, K. Kudo, S. Suzuki, T. Yamada, Y. Kano / Hamamatsu Photonics K.K.

(C4) *11:01* Emission microscopes and peripheral equipment
K. Koshikawa, Y. Numajiri, Y. Nakashima / TOKI COMMERCIAL CO., LTD.

(C5) *11:08* Imina Technologies Nano probing system
Y. Nakayama / APOLLOWAVE Corporation

(C6) *11:15* Unveiling the Advantages of the Thermo Fisher Hyperion II AFM-based Nanoprobing System in Transistor Characteriza-tion and Fault Localization
Y. Koya / Thermo Fisher Scientific

(C7) *11:22* Introduction of EBAC Image Analysis Software Image Data Manager
J. Fuse, T. Shimamori, Y. Wu, M. Ozawa, M. Watahiki, N. Bito, M. Hijikata / Hitachi High-Tech Corporation

(C8) *11:29* Analysis system AZSA series
K. Konishi / Astron,Inc

(C9) *11:36* Visualization of p-n junctions of SiC devices using "Spectrum Image" using the Auger Electron Spectrometer (JAMP-9510F)
K. Ikita / JEOL Ltd.

(C10) *11:43* Introduction of new DualBeam system, Helios 6 HD
T. Muneta, K. Mu / FEI Company Japan Ltd,

(C11) *11:50* Progresses of TEM lamella preparation workflows in Carl Zeiss Japan
T. Kohata / Carl Zeiss Co., Ltd.

(C12) *11:57* Non-contact mobility and sheet resistance measurement technology for SiC/GaN and most new semiconductor materials
M. Kumadaki, S. Salam, I. Kato / Semilab Japan K. K.

(C13) *12:04* Electrical Defect measurement of SiC/GaN and other WideGap semiconductors
S. Salam, K. Masahiko, I. Kato / Semilab Japan K. K.

(C14) *12:11* Construction of Evaluation Criteria in Fin-FET Structures for LSI Process Diagnosis
N. Otani, E. Yagyu, H. Tateyama, I. Murakami, Y. Yatagawa, K. Asai, K. Takamori / OKI Engineering Co., Ltd.

Luncheon seminar — a.m., Wed 13

(L1) *12:18* Hitachi's new nanoprobing system and FIB-SEM technology
B. Nanami, Y. Ii / Hitachi High-Tech

Wednesday, Nov. 13, p.m. / Life Hall

Equipment and systems — p.m., Wed 13

Chairman Kiyoshi Nikawa

(10) *13:41* X-ray nano-tomography enables high-resolution investigations from micro-bumps to hybrid bonding in advanced packaging
T. Dreier, D. Nilsson, S. Tanaka / Excillum AB

(11) *14:06* Semiconductor application by novel nano X-ray CT device
T. Ogaki / Canon Marketing Japan Inc.

·········· 14:31～14:51 Authors corner & break ··········

Fault Localization — p.m., Wed 13

Chairman Yasuo Cho

(12) *14:51* High-precision localization technique using AI
K. Oota[a], K. Sugiyama[b], M. Uchida[b] / [a]Toshiba Information Systems (Japan), [b]Toshiba Corporation

(13) *15:16* Evaluation of EBAC sensitivity improvement using lock-in amplifier
Y. Katakura / Sony Semiconductor Manufacturing Corporation

·········· 15:41～16:01 Authors corner & break ··········

Invited Talk III — p.m., Wed 13

Chairman Koji Nakamae

(I3) *16:01* Development of SiC semiconductors at Mirise Technologies
H. Fujiwara / MIRISE Technologies

·········· 17:01～17:06 NANOTS2023 Awards ··········

·············· 17:06～17:11 Group Photo ··············

·········· 17:11～17:31 Authors corner & break ··········

Evening Session — p.m., Wed 13

18:00 – 20:00 Evening session of NANOTS is a special session for discussing on research trend around the world and the future perspective. This session will be held at Port5, Senri Life Science Center 5F.

Chairman Koji Nakamae

Introduction of P&A Workshop Activities, Etc.
T. Koyama / Fuji Electric Co., Ltd.

····················· 20:00 Close ·····················

Thursday, Nov. 14, a.m. / Life Hall

Invited Talk IV — a.m., Thu 14

Chairman Hirotoshi Terada

(I4) *09:30* Crystal Defect Characterization Technology of Widegap Semiconductors using Multiphoton-Excitation Photoluminescence
T. Tanikawa / Osaka University

·········· 10:30～10:50 Authors corner & break ··········

Photonics technology — a.m., Thu 14

Chairman Kazunobu Kojima

(14) *10:50* Evaluation of crystal quality by omnidirectional PL spectroscopy
K. Suzuki / Hamamatsu Photonics K.K.

(15) *11:15* Evaluation of damage depth by ion-implantation process using plan-view cathodoluminescence
R. Sugie / Toray Research Center

·········· 11:40～12:00 Authors corner & break ··········

·············· 12:00～13:15 Lunch Break ··············

Thursday, Nov. 14, p.m. / Life Hall

Invited Talk V — p.m., Thu 14

Chairman Toru Koyama

(I5) *13:15* The Current Status and Future Prospects of Diamond Power Devices – The Story of the Founding of a Deep Tech Start-Up –
T. Fujishima / Power Diamond Systems, Inc.

·········· 14:15～14:35 Authors corner & break ··········

Power Device Analysis — p.m., Thu 14

Chairman Masahiko Tsujita

(16) *14:35* Analysis of compound semiconductors using low accelerating voltage SEM and various CL detectors
T. Otsuka, Y. Nakajima, S. Asahina, T. Nagoshi, Y. Okano / JEOL Ltd.

(17) *15:00* Quantitative evaluation of 3C-SiC/4H-SiC stacked structure MOS interface using scanning nonlinear dielectric microscopy
Y. Cho[a], H. Nagasaw[b], M. Sakuraba[a], S. Sato[a] / [a]Tohoku University, [b]CUSIC inc.

·········· 15:25～15:45 Authors corner & break ··········

Physical Analysis — p.m., Thu 14

Chairman Kiyoshi Nikawa

(18) *15:45* Case Study of Machine Learning Utilization in Semiconductor Analysis: Automation of Wire Bond Alloy Ratio Measurement
M. Sasaki / SCK

(19) *16:10* Analysis of impurity doping in 3D GaN nanowire crystal
N. Sone[a], A. Nomura[a], R. Okuda[a], S. Kamiyama[b], T. Takeuchi[b], M. Iwaya[b] / [a]KOITO MANUFACTURING CO., LTD., [b]Meijo university

·········· 16:35～16:55 Authors corner & break ··········

(20) *16:55* Closing remarks
K. Nakamae / Chairman, The Institute of NANO Testing

18 Author Index

※ Numbers show presentation numbers in the technical program.

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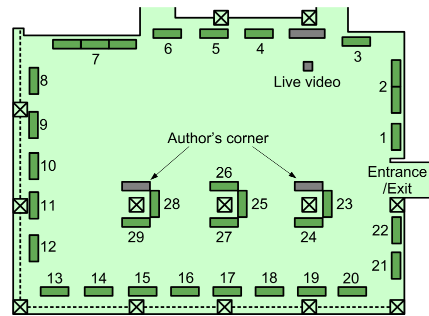
19 Exhibition

Date & time:
Tuesday, 12 November 2024, 13:00–17:00
Wednesday, 13 November 2024, 9:30–17:00
Thursday, 14 November 2024, 9:30–16:00

Venue: Senri room on 6rd floor



(The exhibition floorplan is subject to change without notice.)

1. MARUBUN Corp.:
   Marubun Failure analysis solution
2. FEI Company Japan Ltd.: (C6, C10)
   Thermo Fisher Scientific
3. Nippon Barnes Co., Ltd.:
   Projection Moire Warpage and Deformation measurement system ”TDM”
4. ITES Co.,Ltd.:
   Introduction of power semiconductor evaluation and analysis
5. Hanwa Trading Corp.:
   Signatone, semiconductor inspection equipment
6. MA-tek Japan Inc.:
   Contract analysis services
7. Hamamatsu Photonics K.K.: (C3)
   Semiconductor failure analysis systems, Quantitative evaluation system for the quality of GaN single crystals
8. TOKI COMMERCIAL CO., LTD: (C4)
   Emission microscopes & peripheral equipment
9. Tool Corp.: (C2)
   Advanced Failure Analysis Technique using LAVIS-plus
10. Toshiba NANOANALYSIS:
    Nano-Level Physical Analysis
11. APOLLOWAVE Corp.: (C5)
    Imina Technologies Nano probing system
12. SEIKO FUTURE CREATION INC.:
    Advanced Techniques in Semiconductor Analysis: “FIB Circuit Repair” and “3D Cross-Sectional Analysis for Foreign Object Detection using FIB/TEM”
13. Nippon Scientific Co. Ltd.:
    Valid Decapsulation systems
14. Semilab Japan K.K.: (C12, C13)
    For All Your Metrology Needs
15. JEOL Ltd.: (C9)
    Failure analysis using electron microscope
16. Astron: (C8)
    Analysis System AZSA-HS
17. Sanyu Co.,Ltd.:
    Introduction of new product ELLMID - a local polishing machine for semiconductor devices
18. Hightec Systems Corp.:
    JIACO MIP Decapsulation System & Neocera Magma MFI For Failure Analysis
19. AD Science Inc.:
    Nano probing system for SEM/FIB, plasma cleaner, manipulators, sputter coaters
20. IR System Co., Ltd.:
    Application of thermography for semiconductor failure analysis
21. Excillum:
    Nanofocus X-ray source NanoTube / World’s brightest mifrofocus X-ray tube MetalJet
22. Carl Zeiss Co., Ltd.: (C11)
    Carl Zeiss Co., Ltd.
23. Nano Tech Solutions Inc.: (C1)
    MicroPREP PRO-FEMTO for high-speed sample processing system m
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    Development of non-destructive inspection method for solder voids and cracks using deep learning techniques
25. TOYO Corp.:
    TENSOR, dedicated real-time 4D-STEM
26. Hitachi High-Tech Corp.: (C7)
    Innovation, Synergy, Solutions -New EM Lineup
27. LTEC Co.:
    Product Benchmarking Services
28. Oki Engineering Co., Ltd.: (C14)
    Construction of Evaluation Criteria in Fin-FET Structures for LSI Process Diagnosis
29. Comet Technologies Japan K.K.:
    Nano Testing Symposium

20 List of Associate Members

(in alphabetic order, 31 October 2024)

- AD Science Inc.
- ADVANTEST CORPORATION

- AMETEK Co. Ltd.
- APOLLOWAVE Corp.
- Applied Materials, Inc.
- ASTRON Inc.
- ATE Service Corp.
- Carl Zeiss Co.,Ltd.
- Comet Technologies Japan K.K.
- Excillum AB
- FEI Company Japan Ltd.
- Hamamatsu Photonics K.K.
- Hanwa Trading Corp.
- HiSOL, INC.
- Hitachi High-Tech Corporation
- Hightec Systems Corp.
- IR System Co., Ltd.
- ITES CO., Ltd.
- JEOL Ltd.
- LTEC Co.
- MARUBUN CORPORATION
- MA-tek Japan Inc.
- Nano Tech Solutions Inc.
- NIKON SOLUTIONS CO., LTD.
- Nippon BARNES Company, Ltd.
- Nippon Scientific Co., Ltd
- NIPPON STEEL TECHNOLOGY Co., Ltd.
- Oki Engineering Co., Ltd.
- Plasma-Therm-Japan K.K.
- Qualtec Co., Ltd.
- Sanyu Co.,Ltd.
- SEIKO FUTURE CREATION INC.
- Semilab Japan
- TASMIT, Inc.
- Toki Commercial Co., Ltd.
- TOOL CORPORATION
- Toshiba Nanoanalysis Corporation
- TOYO Corporation

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