Program Book

The 15th International Symposium on Measurement Technology and Intelligent Instruments

ISMTII 2023

COEX, Seoul, South Korea

September 17 Sun. ~ 20 Wed., 2023

On-site Symposium

Organized by

Korea Institute of Machinery & Materials (KIMM)
International Committee on Measurements and Instrumentation (ICMI)

Co-organized by

Korea Advanced Institute of Science and Technology (KAIST)
Korea Research Institute of Standards and Science (KRISS)

Supported by

Korean Society for Precision Engineering (KSPE)

Financially Supported by

KIMM KOREA INSTITUTE OF MACHINERY & MATERIALS
SEOUL METROPOLITAN GOVERNMENT
KOREA TOURISM ORGANIZATION
INTEK PLUS Integrated Measurement System
LMI TECHNOLOGIES
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Contents

Welcome Message

Dr. Jeong Seok Oh

Korea Institute of Machinery & Materials

Chair of ISMTII 2023

Prof. Seung-Woo Kim

Korea Advanced Institute of Science and Technology

Honorary Chair of ISMTII 2023

Welcome to ISMTII 2023

It is my great pleasure and honor to host the 15th International Symposium on Measurement Technology and Intelligent Instruments (ISMTII 2023) at COEX, Seoul, South Korea. The Symposium is being steered by the International Committee on Measurements and Instrumentation (ICMI), and organized by the Korea Institute of Machinery & Materials (KIMM). It is co-organized by the Korea Advanced Institute of Science and Technology (KAIST) and the Korea Research Institute of Standards and Science (KRISS).

In continuation of the successful series of the previous fourteen ISMTII symposiums held every two years, this 15th symposium is aimed to provide a forum to bring together experts working in the field of precision metrology and instrumentation from all around the world. The four-day symposium from September 17 to 20, 2023 will be focused on technical exchanges of the current state-of-the-art and future perspectives of measurement and instrumentation technologies and also the timely introduction of current activities of related industries and research institutions. I look forward to your participation and hope to see you enjoy all the oral and poster presentations as well as the tradition of Seoul and South Korea. Finally, I would like to express my appreciation for the support from the Korean Society for Precision Engineering (KSPE).

Best Regards,

Dr. Jeong Seok Oh & **Prof. Seung-Woo Kim**

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Seung-Woo Kim	Korea Advanced Institute of Science and Technology, South Korea

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T. Hatsuzawa	Tokyo Institute of Technology, Japan
A. Shimokohbe	Tokyo Institute of Technology, Japan
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Y. Takaya	Osaka University, Japan
R. Taymanov	D.I.Mendeleyev Institute for Metrology, Russia
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Minku Kang	INTEKPLUS, Inc, South Korea
Geon Hee Kim	Hanbat National University, South Korea
Yang Jin Kim	Pusan National University, South Korea

Keynote Speakers

Han Haitjema
Professor
- KU Leuven (Belgium)
- Department of Mechanical Engineering

Title

Metrologic characteristics and uncertainty evaluation of surface texture measurements

Keynote-1

Sep. 18 (Mon.) / 09:00~09:30

Room E5

Sang-Yoon LEE
CEO
- INTEKPLUS (South Korea)

Title

Industrial use cases of 3D optical metrology

Keynote-2

Sep. 18 (Mon.) / 09:30~10:00

Room E5

Eberhard Manske
Professor
- Technische Universität Ilmenau (Germany)
- Institute of Process Measurement and Sensor Technology

Title

Nanopositioning and nanomeasuring machines with a direct link to the unit of time

Keynote-3

Sep. 18 (Mon.) / 10:00~10:30

Room E5

Kaoru Minoshima
Professor
- University of Electro-Communications (Japan)
- Department of Engineering Science

Title

Precision measurements beyond frequency metrology using versatile control of optical waves with optical frequency comb

Keynote-4

Sep. 19 (Tue.) / 08:30~09:00

Room E5

Laura Sinclair
Doctor
- National Institute of Standards and Technology (USA)
- Fiber Sources and Applications Group

Title

Pushing the boundaries of ranging and time transfer through precise control of optical frequency combs

Keynote-5

Sep. 19 (Tue.) / 09:00~09:30

Room E5

Liandong Yu
Professor
- China University of Petroleum (UPC) (China)
- College of Control Science and Engineering

Title

Microfluidic sensor on the early diagnostic of cancer diseases

Keynote-6

Sep. 19 (Tue.) / 09:30~10:00

Room E5

Peter de Groot
Doctor
- Chief Scientist, Zygo Corporation (USA)

Title

Interferometric metrology solutions for digital optical immersive displays

Keynote-7

Sep. 19 (Tue.) / 10:00~10:30

Room E5

Invited Speakers

Florian Pollinger
Doctor
• Physikalisch-Technische Bundesanstalt (Germany)

Title
Multi-wavelength interferometry for geodesy and large volume metrology

B-1
Sep. 18 (Mon.) / 10:45~11:10
Room E2

Satoru Takahashi
Professor
• The University of Tokyo (Japan)

Title
Super resolution optical measurement for functional microstructures beyond the diffraction limit

C-4
Sep. 19 (Tue.) / 10:45~11:10
Room E3

Liang-Chia Chen
Professor
• National Taiwan University (Taiwan)

Title
Current advances and challenges in optical metrology for advanced semiconductor packaging

A-1
Sep. 18 (Mon.) / 10:45~11:10
Room E1

Masato Aketagawa
Professor
• Nagaoka University of Technology (Japan)

Title
Picometer displacement/length measurement using regular crystalline lattice and super-resolution interferometry

B-1
Sep. 18 (Mon.) / 11:10~11:35
Room E2

Guanhao Wu
Professor
• Tsinghua University (China)

Title
Dual-comb-based distance and multi-degree-of-freedom measurements

B-2
Sep. 18 (Mon.) / 13:50~14:15
Room E2

Daewook Kim
Professor
• University of Arizona (USA)

Title
Deflectometry and Interferometry

C-1
Sep. 18 (Mon.) / 11:10~11:35
Room E3

Sang-Joon Cho
Vice President
• Park Systems (South Korea)

Title
Automated Nano-Metrological AFM with Intelligent Data Preparation

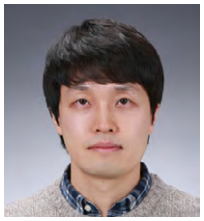
E-3
Sep. 19 (Tue.) / 14:00~14:25
Room E4

Chao Zuo
Professor
• Nanjing University of Science and Technology (China)

Title
Learning based fringe projection profilometry

C-5
Sep. 19 (Tue.) / 14:00~14:25
Room E3

Invited Speakers



Kye-Sung Lee
Doctor
• Korea Basic Science Institute (South Korea)

Title

Tissue culture monitoring using line-field fluorescence microsocpy combined with optical coherence microscopy

C-4

Sep. 19 (Tue.) / 11:10~11:35

Room E3

Byung-Seon Chun
Doctor
• Nanoscope Systems, Inc. (South Korea)

Title

Thermoreflectance microscopy for steady-state and transient thermal analysis of electronic devices in microscopic scale

C-3

Sep. 18 (Mon.) / 16:25~16:50

Room E3

Chi Ho Ng
Vice President of Technology
• LMI Technologies (Canada)

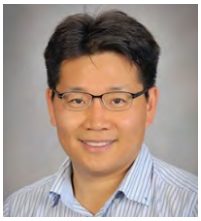
Title

Simplified solutions in an increasingly complicated market

A-4

Sep. 19 (Tue.) / 10:45~11:10

Room E1



ChaBum Lee
Professor
• Texas A&M University (USA)

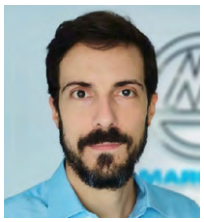
Title

Wafer-level metrology and inspection for advanced electronics packaging

A-3

Sep. 18 (Mon.) / 16:25~16:50

Room E1



Matteo Bosi
President
• Marposs Korea (Italy)

Title

A capacitor coupling-based instrument to assess in a more reliable way the quality of insulation in mass-produced electric stators and motors

B-6

Sep. 19 (Tue.) / 15:40~16:05

Room E2

Youjian Song
Professor
• Tianjin University (China)

Title

Time-of-flight measurement of micro-structures based on electronically controlled optical sampling

B-2

Sep. 18 (Mon.) / 14:15~14:40

Room E2

Byoung-Ho Lee
Doctor
• Hitachi High-tech (Japan)

Title

MI (Metrology & Inspection): essential technology for future devices

C-3

Sep. 18 (Mon.) / 16:50~17:15

Room E3

Taejoong Kim
Doctor
• Samsung Electronics (South Korea)

Title

Massive overlay metrology solution by realizing imaging Mueller matrix spectroscopic ellipsometry

C-1

Sep. 18 (Mon.) / 10:45~11:10

Room E3

Dong-Wook Lee
Doctor
• Advanced Materials Research Center, Technology Innovation Institute (UAE)

Title

Deep learning-based stress intensity factors analysis of bi-material interface crack from photoelastic images

F-2

Sep. 19 (Tue.) / 10:45~11:10

Room E5

Wanxin Sun
Doctor
• Bruker Singapore Pte Ltd. (Singapore)

Title

Nano scale physical and chemical property characterization by scanning probe techniques

D-3

Sep. 18 (Mon.) / 16:25~16:50

Room E4

In-Ho Lee
Doctor
• Korea Research Institute of Standards and Science (South Korea)

Title

Designing and exploring super functional materials and devices using evolutionary and deep learning methods

F-4

Sep. 19 (Tue.) / 15:40~16:05

Room E5

Yang Lu
Professor
• China University of Petroleum (UPC) (China)

Title

Ultrafast holographic microscopy based on fs laser for wavefront inspection and biological applications

B-4

Sep. 19 (Tue.) / 10:45~11:10

Room E2

Rongke Gao
Professor
• China University of Petroleum (UPC) (China)

Title

The SERS measurements on micro-nano interface substrate integrated microfluidic biosensor

C-5

Sep. 19 (Tue.) / 14:25~14:50

Room E3

Ruitao Yang
Professor
• Harbin Institute of Technology (China)

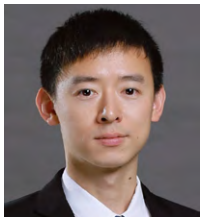
Title

Real-time suppression of random phase drift for optical frequency comb ranging with high-frequency intermode beats

B-4

Sep. 19 (Tue.) / 11:10~11:35

Room E2



Kai Ni
Professor
• Tsinghua University (China)

Title

Dual-comb spectroscopy and ranging based on mechanical sharing mode-locked fiber lasers

B-3

Sep. 18 (Mon.) / 16:50~17:15

Room E2

Akifumi Asahara
Professor
• University of Electro-Communications (Japan)

Title

Dual-comb spectroscopy extended for spatiotemporal measurement applications using OAM light

B-3

Sep. 18 (Mon.) / 16:25~16:50

Room E2

Invited Speakers

Takashi Kato
Professor
• University of Electro-Communications (Japan)

Title

Optical phased array with phase-controlled optical frequency comb

B-5

Sep. 19 (Tue.) / 14:00~14:25

Room E2

Jiao Jiannan
Professor
• Shenzhen University (China)

Title

Generation of non-divergent surface third-harmonics with a two-photon-polymerized phase-type diffractive micro axicon

B-5

Sep. 19 (Tue.) / 14:25~14:50

Room E2

Jindong Tian
Professor
• Shenzhen University (China)

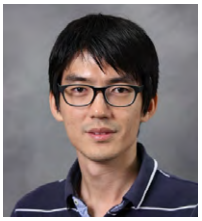
Title

Quantitative phase imaging for dynamic processes

C-2

Sep. 18 (Mon.) / 14:15~14:40

Room E3



Huitaek Yun
Professor
• Korea Advanced Institute of Science and Technology (South Korea)

Title

Virtual reality based human-machine interface for human-AI collaboration

F-1

Sep. 18 (Mon.) / 16:25~16:50

Room E5

Jiyeon Choi
Doctor
• Korea Institute of Machinery & Materials (South Korea)

Title

Ultrafast laser processing for advanced packaging of glass-based devices

D-1

Sep. 18 (Mon.) / 10:45~11:10

Room E4

Sangbaek Park
Professor
• Chungnam National University (South Korea)

Title

Laser-patterned energy storage devices integrated with wearable electronics

D-2

Sep. 18 (Mon.) / 13:50~14:15

Room E4

Hyung Cheoul Shim
Doctor
• Korea Institute of Machinery & Materials (South Korea)

Title

Advanced characterization of the active materials for lithium Ion batteries using TEM techniques to promote mechanism understanding

D-2

Sep. 18 (Mon.) / 14:15~14:40

Room E4

Soongeun Kwon
Doctor
• Korea Institute of Machinery & Materials (South Korea)

Title

Laser processing of graphene materials for high-performance energy storage devices

D-1

Sep. 18 (Mon.) / 11:10~11:35

Room E4

In Sung Kang
Doctor
• KOH YOUNG TECHNOLOGY, INC. (South Korea)

Title
Optical 3D inspection technologies

A-2
Sep. 18 (Mon.) / 13:50~14:15
Room E1

Ki Joon Heo
Professor
• Chonnam National University (South Korea)

Title
Real-time monitoring of airborne microbial colony forming unit based on on-chip cell imaging platform with continuous aerosol-to-hydrosol transfer

C-6
Sep. 19 (Tue.) / 15:40~16:05
Room E3

Sungho Suh
Doctor
• Deutsches Forschungszentrum für Künstliche Intelligenz (Germany)

Title
Remaining useful life prediction of lithium-ion batteries using spatio-temporal transformers

A-3
Sep. 18 (Mon.) / 16:50~17:15
Room E1

Martin Tangari Larrategui
Doctor
• University of Arizona (USA)

Title
Advancements in non-null surface figure measurement interferometry

C-2
Sep. 18 (Mon.) / 13:50~14:15
Room E3

Ilkoo Kim
Doctor
• Gauss Labs (USA)

Title
Universal denoising method for boosting the throughput of semiconductor image metrology

F-3
Sep. 19 (Tue.) / 14:00~14:25
Room E5

Program

The 15th International Symposium on
Measurement Technology and Intelligent Instruments

ISMTII 2023

Program at a Glance

DAY 1 / September 17 Sun., 2023

Time	
16:00~17:00	**Registration** (Room 402, 4F)
17:00~19:00	**Welcome Reception** (Room 402, 4F)
19:00~	**ICMI Member Meeting** (Conference Room E4)

DAY 2 / September 18 Mon., 2023

Time	Room E1 Session A	Room E2 Session B	Room E3 Session C	Room E4 Session D	Room E5 Session E, F	Lobby
08:30~09:00	**Opening Ceremony** (Room E5)					Registration (08:00~18:00)
09:00~10:30	**Keynote Session-1 (Keynote 1, 2&3)** (Room E5)					
10:30~10:45	Coffee Break					
10:45~12:10	**A-1** In-Process Measurement - I	**B-1** Dimensional Metrology - I	**C-1** Optical Interferometry - I	**D-1** Laser Material Processing - I	**E-1** Precision Metrology - I	
12:10~13:50	Lunch					
13:50~15:15	**A-2** In-Process Measurement - II	**B-2** Frequency Comb - I	**C-2** Optical Interferometry - II	**D-2** Laser Material Processing - II	**E-2** Precision Metrology - II	
15:15~16:25	Post Only Session & Coffee Break					Poster Only
16:25~18:00	**A-3** Intelligent Measurement - I	**B-3** Frequency Comb - II	**C-3** Metrology & Inspection - I	**D-3** Material Characterization	**F-1** Machine Learning & Signal Processing I	

DAY 3 / September 19 Tue., 2023

Time	Room E1 Session A	Room E2 Session B	Room E3 Session C	Room E4 Session D, E	Room E5 Session F	Lobby
08:30~10:30	**Keynote Session-2 (Keynote 4, 5, 6&7)** (Room E5)					Registration (08:00~17:00)
10:30~10:45	Coffee Break					
10:45~12:10	**A-4** Intelligent Measurement - II	**B-4** Dimensional Metrology - II	**C-4** Microscopy & Profilometry - I	**D-4** Sensors & Actuators	**F-2** Machine Learning & Signal Processing II	
12:10~14:00	Lunch					
14:00~15:25	**A-5** Intelligent Measurement - III	**B-5** Frequency Comb - III	**C-5** Metrology & Inspection - II	**E-3** Precision Metrology - III	**F-3** Machine Learning & Signal Processing III	
15:25~15:40	Coffee Break					
15:40~17:15	**A-6** Intelligent Measurement - IV	**B-6** Uncertainty, Traceability & Calibration	**C-6** Microscopy & Profilometry - II	**E-4** Precision Metrology - IV	**F-4** Machine Learning & Signal Processing IV	
17:45~20:30	**Banquet** (Cheonggyesan Yettgol Fortress Restaurant)					

DAY 4 / September 20 Wed., 2023

Time	
08:30~13:00	**Technical Tour** (Korea Institute of Industrial Technology)
09:00~13:00	**Culture Tour** (Gyeongbokgung Palace)

Oral Session

Session A
In-Process and Intelligent Measurement

Conference Room E1, COEX

September 18 Mon. 10:45~12:10

[A-1] In-Process Measurement - I

Chair: Prof. Ki-Nam Joo (Chosun University), Dr. Sungho Suh (Deutsches Forschungszentrum für Künstliche Intelligenz)

Invited
10:45~11:10 **Current advances and challenges in optical metrology for advanced semiconductor packaging**
Liang-Chia Chen
National Taiwan University (Taiwan)

A014
11:10~11:25 **Vertical registration of in-process topography data with post-process volumetric data**
Afaf Remani*, Fernando Peña, Arianna Rossi, Adam Thompson, John Dardis, Nick Jones, Nicola Senin, Richard Leach
** University of Nottingham (United Kingdom)*

A203
11:25~11:40 **One-wire reconfigurable and damage-tolerant sensor array**
Zhihe Long, Zhengbao Yang*
** Hong Kong University of Science and Technology (China)*

A106
11:40~11:55 **An indirect spatial positioning method for black volute depalletizing system based on a RGB-D camera**
Shuonan Xiao*, Ping Yang, Haiyang Lin, Qiming Zhong
** Xiamen University (China)*

A126
11:55~12:10 **Embedded algorithm for diagnosis of spindle bearings and machining problems**
Chi Cong Dang*, Jooho Hwang
** Korea Institute of Machinery and Materials (South Korea)*

September 18 Mon. 13:50~15:15

[A-2] In-Process Measurement - II

Chair: Dr. Seungman Kim (Korea Institute of Machinery and Materials)

Invited
13:50~14:15 **Optical 3D inspection technologies**
In Sung Kang
KOH YOUNG TECHNOLOGY, INC. (South Korea)

A131
14:15~14:30 **In-process observation of physical phenomena inside the workpiece processed by water jet guided laser**
Shoichi Ui*, Mayuko Osawa, Ryota Washio, Shotaro Kadoya, Masaki Michihata, Satoru Takahashi
** The University of Tokyo (Japan)*

A048
14:30~14:45 **Correlation analysis between molding conditions and demolding forces in injection molding**
Tetsuya Ofusa*, Fuminobu Kimura, Yusuke Kajihara
** The University of Tokyo (Japan)*

A136
14:45~15:00 **Real-time measurement for multi-layer thin-film structure with micro-ellipsometry and pixelated polarizing camera**
Dong-Geun Yang*, Young-Sik Ghim, Hyug-Gyo Rhee
** Korea Research Institute of Standards and Science (South Korea)*

A191
15:00~15:15 **In-process measurement of effective distance and bubble structure by high-speed imaging technique in optical cavitation**
Saikat Medya*, Swee Hock Yeo
** Nanyang Technological University (Singapore)*

September 18 Mon. 16:25~18:00

[A-3] Intelligent Measurement - I

Chair: Dr. Jiyong Park (Korea Institute of Industrial Technology), Dr. In Sung Kang (KOH YOUNG TECHNOLOGY)

Invited
16:25~16:50 **Wafer-level metrology and inspection for advanced electronics packaging**
ChaBum Lee
Texas A&M University (USA)

Invited
16:50~17:15 **Remaining useful life prediction of lithium-ion batteries using spatio-temporal transformers**
Sungho Suh
Deutsches Forschungszentrum für Künstliche Intelligenz (Germany)

A017
17:15~17:30 **Buried patterns and defects see-through imaging by high-voltage SEM**
Hang Zhao*, Shiyuan Liu, Jinlong Zhu
** Huazhong University of Science and Technology (China)*

A150
17:30~17:45 **Absolute distance measurement based on radio-frequency Interferometer using the method of excess fraction**
Tao Liu*, Jiucheng Wu, Ryo Sato, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

A045
17:45~18:00 **Measurement of wedge's global angular sizes based on parallel profile extraction strategy**
Zexiang Zhao*, Xinyu Zhao, Jianpu Xi, Yixiang He, Guanghua Hua
** Zhongyuan University of Technology (China)*

September 19 Tue. 10:45~12:10

[A-4] Intelligent Measurement - II

Chair: Dr. Young-Sik Ghim (Korea Research Institute of Standards and Science)

Invited
10:45~11:10 **Simplified solutions in an increasingly complicated market**
Chi Ho Ng
LMI Technologies (Canada)

A046
11:10~11:25 **Stroboscopic sampling moiré microscope for investigation of MEMS' full surface in-plane vibration**
Mona Yadi*, Tsutomu Uenohara, Yasuhiro Mizutani, Yoshiharu Morimoto, Yasuhiro Takaya
** Osaka University (Japan)*

A101
11:25~11:40 **Research on the measurement method for the full-surface profile of micro curved workpiece**
Zhonghao Cao*, Yuan-Liu Chen
** Zhejiang University (China)*

A115
11:40~11:55 **Parameters quantification of subsurface detection technology based on probe ultrasonic excitation and discrimination of different materials**
Yuyang Wang*, Yuan-Liu Chen, Mingyu Duan
** Zhejiang University (China)*

A102
11:55~12:10 **Investigation on the resolution improvement of an optical angle sensor based on laser autocollimation**
Hyunsung Lim, Yuki Shimizu*
** Hokkaido University (Japan)*

September 19 Tue. 14:00~15:15

[A-5] Intelligent Measurement - III

Chair: Dr. Seongheum Han (Korea Institute of Machinery and Materials), Prof. Yuan-Liu Chen (Zhejiang University)

A032
14:00~14:15 **Tomographic imaging Mueller-matrix ellipsometry: Principle, instrumentation and emerging applications**
Xiuguo Chen*, Chao Chen, Sheng Sheng, Shiyuan Liu
** Huazhong University of Science and Technology (China)*

A056
14:15~14:30 **Vision-based pose measurement technology for mobile machine**
Seungman Kim*. Gyungho Khim, Seongheum Han, Jeong Seok Oh, Seung-Kook Ro
** Korea Institute of Machinery and Materials (South Korea)*

A179
14:30~14:45 **Automatic high-frequency induction brazing through an ensembled detection with heterogenous sensor measurements**
Joonhyeok Moon*, Min-Gwan KIM, Ok Hyun Kang, Heejong Lee, Ki-Yong Oh
** Hanyang University (South Korea)*

A096
14:45~15:00 **A novel calibration method for kinematic parameter errors of industrial robot based on Levenberg-Marquard and beetle antennae search algorithm**
Mengyao Fan*, Huining Zhao, Liandong Yu, Haojie Xia
** Hefei University of Technology (China)*

A168
14:45~15:15 **Novel multi-electromagnetic-force-compensation axis-symmetric mass comparator**
Kyung-Taek Yoon*, Young-Man Choi
** Ajou University (South Korea)*

September 19 Tue. 15:40~16:55

[A-6] Intelligent Measurement - IV

Chair: Prof. Young-Man Choi (Ajou University), Prof. Jinlong Zhu (Huazhong University of Science and Technology)

A154 15:40~15:55
Design and implementation of AI-based computer vision system for quality control of product and processes
Miro Hegedić, Mihael Gudlin*, Matija Golec, Petar Gregurić, Borna Skrlec
** University of Zagreb (Croatia)*

A025 15:55~16:10
Straightness measurement with laser beam and deep learning
Satoru Takano*, Hibiki Takeoka, Koji Horie, Yohei Yamada, Toshinori Yasuhara, Kohsei Terao, Masato Aketagawa
** Nagaoka University of Technology (Japan)*

A066 16:10~16:25
Sinusoidal phase modulation interferometer using high speed phase demodulation and comb filter
Masato Higuchi*, Katsunari Katagiri, Taku Sato, Masato Aketagawa
** Nagaoka University of Technology (Japan)*

A166 16:25~16:40
Crack inspection in tunnel structures by fusing information from a 3D light detection and ranging and pan-tilt-zoom camera system
Siheon Jeong*, Min Gwan Kim, Ki-Yong Oh
** Hanyang University (South Korea)*

A034 16:40~16:55
Laser feedback FMCW LiDAR for noncooperative-target ranging with a stand-off distance of several hundred meters
Yifan Wang*, Yidong Tan
** Tsinghua University (China)*

Session B

Dimensional Metrology & Frequency Combs

Conference Room E2, COEX

September 18 Mon. 10:45~12:05

[B-1] Dimensional Metrology - I

Chair: Prof. Young-Jin Kim (Korea Advanced Institute of Science and Technology), Prof. Kai Ni (Tsinghua University)

Invited
10:45~11:10
Multi-wavelength interferometry for geodesy and large volume metrology
Florian Pollinger
Physikalisch-Technische Bundesanstalt (Germany)

Invited
11:10~11:35
Picometer displacement/length measurement using regular crystalline lattice and super-resolution interferometry
Masato Aketagawa
Nagaoka University of Technology (Japan)

A071
11:35~11:50
Synchronization of distant frequency combs via 1.3-km free-space optical frequency transfer
Dong Il Lee*, Jaewon Yang, Dong-Chel Shin, Jaehyun Lee, Seung-Woo Kim, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

A122
11:50~12:05
Frequency modulation control using heterodyne ineterferometer for FMCW LiDAR
Jubong Lee*, Youngjun Cho, Kyihwan Park
** Gwangju Institute of Science and Technology (South Korea)*

September 18 Mon. 13:50~15:10

[B-2] Frequency Comb - I

Chair: Prof. Kaoru Minoshima (University of Electro-Communications), Dr. Laura Sinclair (National Institute of Standards and Technology)

Invited
13:50~14:15 **Dual-comb-based distance and multi-degree-of-freedom measurements**
Guanhao Wu
Tsinghua University (China)

Invited
14:15~14:40 **Time-of-flight measurement of micro-structures based on electronically controlled optical sampling**
Youjian Song
Tianjin University (China)

A051
14:40~14:55 **Development and applications of the dual-comb absolute distance measurement**
Seongheum Han*, Seungman Kim, Jeong-Seok Oh, Gyungho Khim, Seung-Kook Ro, Seung-Woo Kim
** Korea Institute of Machinery and Materials (South Korea)*

A081
14:55~15:10 **Absolute distance measurement based on time-of-flight via high-efficiency optical cross-correlation using a semiconductor optical amplifier**
Jaeyoung Jang*, Young-Jin Kim, Seung-Woo Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

September 18 Mon. 16:25~18:00

[B-3] Frequency Comb - II

Chair: Prof. Guanhao Wu (Tsinghua University), Prof. Takashi Kato (University of Electro-Communications)

Invited
16:25~16:50 **Dual-comb spectroscopy extended for spatiotemporal measurement applications using OAM light**
Akifumi Asahara
University of Electro-Communications (Japan)

Invited
16:50~17:15 **Dual-comb spectroscopy and ranging based on mechanical sharing mode-locked fiber lasers**
Kai Ni
Tsinghua University (China)

A035
17:15~17:30 **Frequency-comb based phase spectroscopy for surface plasmon polariton phase change detection on nano structure**
Dae Hee Kim*, Young Ho Park, In Jae Lee, Jun Hyung Park, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

A078
17:30~17:45 **Polarization-multiplexed dual-comb fiber laser with dual-phase-biased nonlinear amplifying loop mirror**
Jiayang Chen*, Yuxuan Ma, Liheng Shi, Guanhao Wu
** Tsinghua University (China)*

A104
17:45~18:00 **Improvement of the resolution of pitch deviation measurement of a diffraction scale grating by optical angle sensors**
Tomoki Kitazume, Wei Gao, Yuki Shimizu*
** Hokkaido University (Japan)*

September 19 Tue. 10:45~12:05

[B-4] Dimensional Metrology - II

Chair: Dr. Florian Pollinger (Physikalisch-Technische Bundesanstalt), Dr. Seongheum Han (Korea Institute of Machinery and Materials)

Invited
10:45~11:10 **Ultrafast holographic microscopy based on fs laser for wavefront inspection and biological applications**
Yang Lu
China University of Petroleum (UPC) (China)

Invited
11:10~11:35 **Real-time suppression of random phase drift for optical frequency comb ranging with high-frequency intermode beats**
Ruitao Yang
Harbin Institute of Technology (China)

A128
11:35~11:50 **An absolute angle measurement based on the interference of a mode-locked femtosecond laser in a Fabry-Pérot etalon**
Dong Wook Shin*, Ryo Sato, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

A120
11:50~12:05 **A capacitive absolute angular displacement sensor based on dual re-modulation scheme with time-division multiplexing**
Bingnan Zhan*, Changliang Wu, Pei Huang, Xiaokang LiuPei, Hongji Pu
** Beijing Institute of Technology (China)*

September 19 Tue. 14:00~15:20

[B-5] Frequency Comb - III

Chair: Prof. Joohyung Lee (Seoul National University of Science and Technology),
Prof. Akifumi Asahara (University of Electro-Communications)

Invited
14:00~14:25 **Optical phased array with phase-controlled optical frequency comb**
Takashi Kato
University of Electro-Communications (Japan)

Invited
14:25~14:50 **Generation of non-divergent surface third-harmonics with a two-photon-polymerized phase-type diffractive micro axicon**
Jiao Jiannan
Shenzhen University (China)

A061
14:50~15:05 **Spatial beam shaping of ultraviolet via phase control of near-infrared fundamental beam in harmonic generation**
Seungjai Won*, Seungman Choi, Taewon Kim, Byunggi Kim, Seung-Woo Kim, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

A010
15:05~15:20 **High-precision terahertz continuous-wave spectroscopy with frequency comb calibration**
Guseon Kang*, Jaeyoon Kim, Dong-Chel Shin, Seong-Woo Kim, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

September 19 Tue. 15:40~17:05

[B-6] Uncertainty, Traceability & Calibration

Chair: Prof. Masato Aketagawa (Nagaoka University of Technology), Prof. Youjian Song (Tianjin University)

Invited
15:40~16:05 **A capacitor coupling-based instrument to assess in a more reliable way the quality of insulation in mass-produced electric stators and motors**
Matteo Bosi
Marposs Korea (Italy)

A001
16:05~16:20 **Uncertainty estimation and validation method of surface roughness measurement on coordinate measuring machine using photometric stereo method**
Thammarat Somthong*, Qing-Ping Yang, Jariya Buajarern
** National Institute of Metrology (Thailand)*

A021
16:20~16:35 **Virtual optical instrument for uncertainty evaluation in surface topography measurement**
Helia Hooshmand*, Athanasios Pappas, Rong Su, Richard Leach, Samanta Piano
** University of Nottingham (United Kingdom)*

A107
16:35~16:50 **Determination of the influence of environmental vibration on the evaluation of measurement noise using a virtual instrument**
Athanasios Pappas*, Helia Hooshmand, Rong Su, Richard Leach, Samanta Piano
** University of Nottingham (United Kingdom)*

A076
16:50~17:05 **Development of a differential angle sensor for evaluation of scale pitch deviation**
Jiucheng Wu*, Lue Quan, Ryo Sato, Hiraku Matsukuma, Yuki Shimizu, Wei Gao
** Tohoku University (Japan)*

Session C

Optical Interferometry, Metrology & Inspection

Conference Room E3, COEX

September 18 Mon. 10:45~12:05

[C-1] Optical Interferometry - I

Chair: Dr. Joonho You (Nexsensor), Dr. Byoung-Ho Lee (Hitachi High-tech)

Invited
10:45~11:10 **Massive overlay metrology solution by realizing imaging Mueller matrix spectroscopic ellipsometry**
Taejoong Kim
Samsung Electronics (South Korea)

Invited
11:10~11:35 **Deflectometry and Interferometry**
Daewook Kim
University of Arizona (USA)

A097
11:35~11:50 **The study of interferometric technologies for the advanced packaging of the semiconductor manufacturing process**
Joonho You*, Chang Soo Kim
** nexensor Inc. (South Korea)*

A005
11:50~12:05 **Simultaneous phase-shifting circular subaperture stitching interferometry based on polarization grating**
Yao Hu, Zhen Wang*, Qun Hao
** Beijing Institute of Technology (China)*

September 18 Mon. 13:50~15:10

[C-2] Optical Interferometry - II

Chair: Prof. Daewook Kim (University of Arizona), Dr. Byung-Seon Chun (Nanoscope Systems)

Invited
13:50~14:15 **Advancements in non-null surface figure measurement interferometry**
Martin Tangari Larrategui
University of Arizona (USA)

Invited
14:15~14:40 **Quantitative phase imaging for dynamic processes**
Jindong Tian
Shenzhen University (China)

A067
14:40~14:55 **Multi-channel vibration measurement based on self-mixing vertical cavity surface-emitting lasers**
Wei Xia*, Mengna Xu, Jingyu Yu, Dongmei Guo, Ming Wang
** Nanjing Normal University (China)*

A105
14:55~15:10 **Stitching interferometry method for the pitch evaluation of a large-scale variable-line-spacing diffraction grating by using a Fizeau interferometer**
Chenguang Yin*, Xin Xiong, Ryo Sato, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

September 18 Mon. 16:25~17:30

[C-3] Metrology & Inspection - I

Chair: Dr. Taejoong Kim (Samsung Electronics), Dr. Martin Tangari Larrategui (University of Arizona)

Invited
16:25~16:50 **Thermoreflectance microscopy for steady-state and transient thermal analysis of electronic devices in microscopic scale**
Byung-Seon Chun
Nanoscope Systems, Inc. (South Korea)

Invited
16:50~17:15 **MI (Metrology & Inspection): essential technology for future devices**
Byoung-Ho Lee
Hitachi High-tech (Japan)

A103
17:15~17:30 **In-situ evaluation of interference fringe patterns generated by non-orthogonal Lloyd's mirror interferometer**
Nozomu Takahiro, Yuki Shimizu*
** Hokkaido University (Japan)*

September 19 Tue. 10:45~12:05

[C-4] Microscopy & Profilometry - I

Chair: Prof. Yangjin Kim (Pusan National University), Prof. Rongke Gao (China University of Petroleum (UPC))

Invited
10:45~11:10 **Super resolution optical measurement for functional microstructures beyond the diffraction limit**
Satoru Takahashi
The University of Tokyo (Japan)

Invited
11:10~11:35 **Tissue culture monitoring using line-field fluorescence microsocpy combined with optical coherence microscopy**
Kye-Sung Lee
Korea Basic Science Institute (South Korea)

A018
11:35~11:50 **Super-resolution and optical phase retrieval using ptychographic structured illumination microscopy**
Keichi Kuwae, Shin Usuki*, Tadatoshi Sekine, Kenjiro T. Miura
** Shizuoka University (Japan)*

A116
11:50~12:05 **Investigation of angle measurement based on confocal probe employing second harmonic generation**
Ryo Sato*, Yuki Shimizu, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

September 19 Tue. 14:00~15:20

[C-5] Metrology & Inspection - II

Chair: Prof. Satoru Takahashi (The University of Tokyo), Dr. Jaehyun Lee (Korea Research Institute of Standards and Science)

Invited
14:00~14:25 **Learning based fringe projection profilometry**
Chao Zuo
Nanjing University of Science and Technology (China)

Invited
14:25~14:50 **The SERS measurements on micro-nano interface substrate integrated microfluidic biosensor**
Rongke Gao
China University of Petroleum (UPC) (China)

A006
14:50~15:05 **Single-shot deflectometry for dynamic measurement of specular surfaces using high carrier-frequency diagonal pattern**
Manh The Nguyen*, Jaehyun Lee, Young-Sik Ghim, Hyug-Gyo Rhee
** Korea Research Institute of Standards and Science (South Korea)*

A042
15:05~15:20 **Measurement of global sizes of cylinder based on spiral profile extraction strategy**
Xinyu Zhao*, Jianpu Xi, Zexiang Zhao, Xinchao Shi, Shuaifei Wang
** Zhongyuan University of Technology (China)*

September 19 Tue. 15:40~17:05

[C-6] Microscopy & Profilometry - II

Chair: Dr. Sangwon Hyun (Korea Basic Research Institute), Dr. Kye-Sung Lee (Korea Basic Science Institute)

Invited
15:40~16:05 **Real-time monitoring of airborne microbial colony forming unit based on on-chip cell imaging platform with continuous aerosol-to-hydrosol transfer**

Ki Joon Heo

Chonnam National University (South Korea)

A134
16:05~16:20 **Parallel computation using a whale optimization algorithm for faster misalignment estimation in reflective Fourier ptychography microscopy**

Van Huan Pham*, Byong Hyuk Chon, Hee Kyung Ahn

** Korea Research Institute of Standards and Science (South Korea)*

A175
16:20~16:35 **Misalignment evaluating and compensating for freeform optical system using CMM**

Jimin Han*, Hojae Ahn, Joong Kyu Ham, Geon Hee Kim, Bongkon Moon, Woojin Park, Seung-Wook Park, Dae-Hee Lee, Soojong Pak

** Kyung Hee University (South Korea)*

A028
16:35~16:50 **Form error measurement of CMM probe tip ball based on interpolation method**

So Ito*, Daisuke Yamashita, Shiori Toyomoto, Kouki Tsuchida, Kimihisa Matsumoto, Kazuhide Kamiya

** Toyama Prefectural University (Japan)*

A079
16:50~17:05 **New galvo-scanned chromatic confocal microscopy for accurate full-field surface profilometry**

Yu-Feng Chou, Wei-Chi Hung*, Han-Ju Tsai, Fu-Sheng Yang, Liang-Chia Chen

** National Taiwan University (Taiwan)*

Session D

Material Processing & Characterization, Sensors and Actuators

Conference Room E4, COEX

September 18 Mon. 10:45~12:05

[D-1] Laser Material Processing - I

Chair: Dr. Hyungcheoul Shim (Korea Institute of Machinery and Materials),
Dr. Han Ku Nam (Korea Advanced Institute of Science and Technology)

Invited
10:45~11:10 **Ultrafast laser processing for advanced packaging of glass-based devices**
Jiyeon Choi
Korea Institute of Machinery & Materials (South Korea)

Invited
11:10~11:35 **Laser processing of graphene materials for high-performance energy storage devices**
Soongeun Kwon
Korea Institute of Machinery & Materials (South Korea)

A112
11:35~11:50 **Graphene-assisted laser lift-off for clean delamination of ultra-thin polyimide film**
Sumin Kang*, Jaeseung Lim, Seung Man Kim, Ah-Young Park, Seongheum Han, Jae Hak Lee, Jub-Yeob Song
** Korea Institute of Machinery and Materials (South Korea)*

A016
11:50~12:05 **Maskless 3D fabrication based on laser-induced chemical etching**
Pan Peng*, Xinqin Liu, Shiyuan Liu, Jinlong Zhu
** Huazhong University of Science and Technology (China)*

September 18 Mon. 13:50~15:10

[D-2] Laser Material Processing - II

Chair. Dr. Jiyeon Choi (Korea Institute of Machinery and Materials), Dr. Soongeun Kwon (Korea Institute of Machinery and Materials)

Invited
13:50~14:15 **Laser-patterned energy storage devices integrated with wearable electronics**
Sangbaek Park
Chungnam National University (South Korea)

Invited
14:15~14:40 **Advanced characterization of the active materials for lithium ion batteries using TEM techniques to promote mechanism understanding**
Hyung Cheoul Shim
Korea Institute of Machinery & Materials (South Korea)

A008
14:40~14:55 **Fabrication of optical patterns using laser-induced graphene in colorless polyimide**
Younggeun Lee*, Dongwook Yang, Han Ku Nam, Young-Ryul Kim, Hyogeun Han, Seunghwan Kim, Truong-Son Dinh Le, Hongki Yoo, Hyosang Yoon, Joohyung Lee, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

A026
14:55~15:10 **Laser-induced graphene formation on woods for smart green electronics applications**
Han Ku Nam*, Dongwook Yang, Younggeun Lee, Truong-Son Dinh Le, Young-Ryeul Kim, Tongmei Jing, Manping Wang, Seung-Woo Kim, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

September 18 Mon. 16:25~17:50

[D-3] Material Characterization

Chair. Prof. Seunghwoi Han (Chonnam National University), Dr. Seungman Kim (Korea Institute of Machinery and Materials)

Invited
16:25~16:50 **Nano scale physical and chemical property characterization by scanning probe techniques**
Wanxin Sun
Bruker Singapore Pte Ltd. (Singapore)

A172
16:50~17:05 **Characterization of the mechanical properties of amorphous NiTi thin film for stretchable display electrodes**
Ah-Young Park*, Sumin Kang, Hakyung Jeong, Jun-Yeob Song, Seungman Kim, Seongheum Han, Jae Hak Lee
** Korea Institute of Machinery and Materials (South Korea)*

A065
17:05~17:20 **Passive near-field detection of dielectric materials near the surface phonon-polariton wavelength**
Ryoko Sakuma*, Kuan-Ting Lin, Yusuke Kajihara
** The University of Tokyo (Japan)*

A178
17:20~17:35 **Mechanical property evaluation of a copper thin film using the surface acoustic wave spectrometry**
Yun Young Kim*, Taehyeong Kim
** Chungnam National University (South Korea)*

A099
17:35~17:50 **Thermal measurement on biased graphene wires by measuring the thermally excited evanescent wave**
Ryoya Sugimura*, Kuan-Ting Lin, Ryoko Sakuma, Fuminobu Kimura, Yusuke Kajihara
** University of Tokyo (Japan)*

September 19 Tue. 10:45~11:45

[D-4] Sensors & Actuators

Chair: Prof. Sangbaek Park (Chungnam National University), Dr. Ah-Young Park (Korea Institute of Machinery and Materials)

A047 10:45~11:00
ZnO-PTFE based antimicrobial, hydrophobicity, anti-reflective display coatings, and high-sensitivity touch sensor
Swathi Ippili, Venkatraju Jella, Jeong Min Lee, Jang-Su Jung, Soon-Gil Yoon*
** Chungnam National University (South Korea)*

A009 11:00~11:15
Femtosecond-laser-induced graphene formation on textile for e-textile applications
Dongwook Yang*, Han Ku Nam, Youonggeun Lee, Young-Ryeul Kim, Le Dinh Truong Son, Seung-Woo Kim, Young-Jin Kim
** Korea Advanced Institute of Science and Technology (South Korea)*

A125 11:15~11:30
An experimental analysis of multi sensor's performance degradation in harsh driving environment
Junseok Heo*, Byeongjun Im, Sungjae Shin, Se-Eun Ha, Seunghwoi Han
** Chonnam National University (South Korea)*

A124 11:30~11:45
Laser-induced Micro-LED transfer process
Jaeseung Lim, Sumin Kang, Seongheum Han, Ah-Young Park, Jae-Hak Lee, Jun-Yeob Song, Sangseon Lee, Rakibul Islam, Seungman Kim, Seunghwoi Han*
** Chonnam National University (South Korea)*

Session E

Precision Metrology & Optical Inspection

Conference Room E4~5, COEX

September 18 Mon. Room E5 / 10:45~12:00

[E-1] Precision Metrology - I

Chair: Dr. Byung Jae Chun (Korea Atomic Energy Research Institute), Dr. Keunwoo Lee (LASERNGRAPN)

A022 10:45~11:00
Principle verification of grating encoder using multi diffracted light through circular optical system
Soki Fujimura*, Shotaro Kadoya, Masaki Michihata, Satoru Takahashi
** University of Tokyo (Japan)*

A004 11:00~11:15
Measurement of gear integrated error based on improved Zernike moment
Yiming Fang*, Zhaoyao Shi
** Beijing University of Technology (China)*

A090 11:15~11:30
A surface encoder with an improved Z-range and reduced crosstalk errors
Yifan Hong*, Yuki Shimizu, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

A170 11:30~11:45
Absolute optical rotary encoder with multiple focusing spots and autofocusing
Hsi-Fu Shih*, Wei-Lun Lo, Hung Huang
** National Chung Hsing University (Taiwan)*

A086 11:45~12:00
Spectroscopic ellipsometry for ultra-thin film with sub-10 nm thickness
Honggang Gu*, Shiyuan Liu
** Huazhong University of Science and Technology (China)*

September 18 Mon. — Room E5 / 13:50~15:05

[E-2] Precision Metrology - II

Chair: Prof. Jae-Sang Hyun (Younsei University), Heesuk Jang (Agency for Defense Development)

A196 13:50~14:05
A high-SNR fiber interferometer using phase modulation for precise displacement measurement
Chen-Yu Liao, Jia-Hong Chen, Fu-Sheng Yang*, Chin-Yu Hsieh, Hsi-Hui Lin, Liang-Chia Chen
** National Taiwan University (Taiwan)*

A007 14:05~14:20
Exposure-induced optical responses in UV photoresist using spectroscopic ellipsometry
Jiamin Liu*, Lei Li, Hao Jiang, Shiyuan Liu
** Huazhong University of Science and Technology (China)*

A033 14:20~14:35
Improving period accuracy of planar diffraction gratings fabricated in a Lloyd's mirror exposure system
Shen Sitong*, Zeng Lijiang
** Tsinghua University (China)*

A129 14:35~14:50
Conductive carbon nanowire produced by using femtosecond laser irradiation with acetylene gas
Rakibul Islam*, Sangseon Lee, Seungsik Shin, Jaeseung Lim, Daeseop Kim, Seongwon Choi, Seunghwoi Han
** Chonnam National University (South Korea)*

A156 14:50~15:05
Predicting the critical dimensions of HAR TSV structures using joint training models and electromagnetic simulation tools
Jia-Wei Li, Chong-Han Hsu, Jiao-Kai Wang, Bo-En Tsai, Yong-Jing Su, Chao-Ching Ho*
** National Taipei University of Technology (Taiwan)*

September 19 Tue. — Room E4 / 14:00~15:25

[E-3] Precision Metrology - III

Chair: Prof. Seunghwoi Han (Chonnam National Unviersity), Dr. Wanxin Sun (Bruker Singapore Pte Ltd.)

Invited 14:00~14:25
Automated nano-metrological AFM with intelligent data preparation
Sang-Joon Cho
Park Systems (South Korea)

A077 14:25~14:40
Dual-beam laser feedback interferometer for displacement and rotation measurement
Xin Xu*, Yu Wang, Yidong Tan
** Tsinghua University (China)*

A190 14:40~14:55
Development of wafer align and pre-bonding system for wafer level hybrid bonding
Hakjun Lee
Korea Institute of Industrial Technology (South Korea)

A198 14:55~15:10
Roll angular displacement measurement with Polarization Interferometry
Shu-Han Chang*, Ching-Tse Hsu, Wun-Yan Chen, Ju-Yi Lee
** National Central University (Taiwan)*

A144 15:10~15:25
Improvement approach for accuracy of combined vision measurement based on coupling measurement pose optimization
Ronghui Guo*, Haihua Cui
** Nanjing University of Aeronautics and Astronautics (China)*

September 19 Tue. Room E4 / 15:40~16:55

[E-4] Precision Metrology - IV

Chair: Dr. Sang-Joon Cho (Park Systems), Prof. Hao Jiang (Huazhong University of Science and Technology)

A039 Roughness analysis method of lateral shearing interferometry using polarization grating
15:40~15:55
Hyo Mi Park*, Luke D. Mayer, Daewook Kim, Ki-Nam Joo
** Chosun University (South Korea)*

A023 A study on point cloud to CAD model alignment method based on gear optical measurement
15:55~16:10
Hao Lv*, Zhaoyao Shi
** Beijing University of Technology (China)*

A202 High-speed 3D surface measurement with cylindrical-shaped mechanical projector
16:10~16:25
Mincheol Choi, Gaeun Kim, Jae Sang Hyun*
** Yonsei University (South Korea)*

A100 An angle sensor based on second harmonic generation in transmission of a collimated femtosecond beam
16:25~16:40
Jiahui Lin*, Kuangyi Li, Zhiyang Zhang, Ryo Sato, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

A199 Analysis of through silicon via sidewall etch parameters variation using FDTD simulation
16:40~16:55
Saurav Gautam, Shih-Wen Chen, Chao-Ching Ho*
** National Taipei University of Technology (Taiwan)*

Session F

Machine Learning & Signal Processing

Conference Room E5, COEX

September 18 Mon. 16:25~17:50

[F-1] Machine Learning & Signal Processing I

Chair: Dr. Jeong Seok Oh (Korea Institute of Machinery and Materials), Prof. Liang-Chia Chen (National Taiwan University)

Invited
16:25~16:50 **Virtual reality based human-machine interface for human-AI collaboration**
Huitaek Yun
Korea Advanced Institute of Science and Technology (South Korea)

A013
16:50~17:05 **Efficient method for measuring 21 geometric errors and identifying key errors for three linear axes of machine tools**
Fajia Zheng*, Qibo Feng, Yuqiong Zhao, Bin Zhang, Jiakun Li, Fei Long
** Beijing Jiaotong University (China)*

A059
17:05~17:20 **Single-frame phase extraction for measuring geometric properties of optical components based on deep learning**
Jurim Jeon*, Yangjin Kim, Naohiko Sugita
** Pusan National University (South Korea)*

A054
17:20~17:35 **A unified approach for simulating the volumetric errors of three-axis machine tools of all possible configurations**
Quoc-Khanh Nguyen*, Gyungho Khim, Seung-Kook Ro, Jeong Seok Oh
** Korea Institute of Machinery and Materials (South Korea)*

A058
17:35~17:50 **Error averaging mechanism of multi-row ball bearing spindle**
Shuang-shuang Zhang*, Hong-Tao Yang
** Anhui University of Science and Technology (China)*

September 19 Tue. 10:45~12:10

[F-2] Machine Learning & Signal Processing II

Chair: Prof. Huitaek Yun (Korea Advanced Institute of Science and Technology), Dr. Sangwon Hyun (Korea Basic Research Institute)

Invited
10:45~11:10 **Deep learning-based stress intensity factors analysis of bi-material interface crack from photoelastic images**
Dong-Wook Lee
Technology Innovation Institute (United Arab Emirates)

A049
11:10~11:25 **Precise energy distribution measurement of electron source with high performance compact lens-type energy analyzer**
Ha Rim Lee*, Junhyeok Hwang, Takashi Ogawa, Haewon Jung, Dal-Jae Yun, Jisoo Kim, Sangsun Lee, In-Yong Park
** Korea Research Institute of Standards and Science (South Korea)*

A062
11:25~11:40 **Instance segmentation using mask R-CNN for object extraction and background removal in a complex photogrammetry system**
Mingda Harvey Yang*, Adam Thompson, Sofia Catalucci, David T Branson III, Samanta Piano
** University of Nottingham (United Kingdom)*

A082
11:40~11:55 **Wavefront sensing and Control using an approximate point-spread function model in the sensorless adaptive optics**
Jinsung Kim, Hwan Hur*
** Korea Basic Science Institute (South Korea)*

A043
11:55~12:10 **Measurement of nano-thickness distribution of lubricant film in tool-work interface using fluorescence**
Motoya Yoshikawa*, Shotaro Kadoya, Masaki Michihata, Satoru Takahashi, Tatsuya Sugihara
** The University of Tokyo (Japan)*

September 19 Tue. 14:00~15:25

[F-3] Machine Learning & Signal Processing III

Chair: Prof. Yangjin Kim (Pusan National University)

Invited
14:00~14:25 **Universal denoising method for boosting the throughput of semiconductor image metrology**
Ilkoo Kim
Gauss Labs (USA)

A098
14:25~14:40 **The application of neural network for angle measurement based on second harmonic generation**
Zhiyang Zhang*, Kuangyi Li, Jiahui Lin, Ryo Sato, Hiraku Matsukuma, Wei Gao
** Tohoku University (Japan)*

A149
14:40~14:55 **Anomaly detection of underground transmission-line connectors through multiscale mask DCNN and statistical image enhancement**
Min Gwan Kim*, Siheon Jeong, Seok-Tae Kim, Ki-Yong Oh
** Hanyang University (South Korea)*

A155
14:55~15:10 **Real-time dynamic intelligent image recognition and tracking system for rockfall disasters**
Yu-Wei Lin, Chu-Fu Chiu, Bo-En Tsai, Li-Hsien Chen, Chao-Ching Ho*
** National Taipei University of Technology (Taiwan)*

A162
15:10~15:25 **Deep learning-based 3D printing metal powder classification**
Jide Obeyanji*, Dong-Wook Lee, Prabakaran Balasubramanian, Heungjo An, Tae Yeon Kim, Sung Mun Lee
** Technology Innovation Institute (United Arab Emirates)*

September 19 Tue. 15:40~16:50

[F-4] Machine Learning & Signal Processing IV

Chair: Dr. In-Yong Park (Korea Research Institute of Standards and Science)

Invited
15:40~16:05 **Designing and exploring super functional materials and devices using evolutionary and deep learning methods**

In Ho Lee

Korea Research Institute of Standards and Science (South Korea)

A195
16:05~16:20 **An AI-powered diffraction imaging approach for optical critical dimension metrology**

Fu-Sheng Yang, Yen-Hung Hung*, Min-Ru Wu, Zih-Ying Fu, Chen-Yu Liao, Liang-Chia Chen

** National Taiwan University (Taiwan)*

A161
16:20~16:35 **Deep learning based identifying impact location on plate using wavelet transform**

Jide Obeyanji*, Dong-Wook Lee, Prabakaran Balasubramanian, Heungjo An, Tae Yeon Kim, Sung Mun Lee

** Technology Innovation Institute (United Arab Emirates)*

A084
16:35~16:50 **Super-resolution imaging of sub-diffraction-limited pattern with superlens based on deep learning**

Yizhao Guan*, Shuzo Masui, Shotaro Kadoya, Masaki Michihata, Satoru Takahashi

** The University of Tokyo (Japan)*

Poster Session

September 18 Mon. — Conference Room E (Lobby) / 15:15~16:25

Intelligent Measurement and Instrumentation

A029 Creation and utilization of straightness standard due to reciprocal measurement of linear stage
Yusuke SAKAUCHI*, Ryoshu FURUTANI
** Tokyo Denki University (Japan)*

A064 A method for error estimation and alignment feedback of heterodyne interferometry based on single PMF
Yibin Qian*, Jiakun Li, Fajia Zheng, Fei Long, Qibo Feng
** Beijing Jiaotong University (China)*

A075 High-precision roll measurement method based on laser polarization
Fei Long*, Fajia Zheng, Yibin Qian, Jiakun Li, Qibo Feng
** Beijing Jiaotong university (China)*

A080 Resonant mirror based laser direct lithography instrument
Junhee Jo*, Hyungjun Lim, Seokyoung Ji, Wonseok Chang
** Korea Institute of Machinery and Materials (South Korea)*

A087 Real-time 3D surface reconstruction of deflectometry using deep learning
In-Kyu Park*, Young-Sik Ghim, Hyug-Gyo Rhee
** University of Science and Technology (South Korea)*

A094 Photometric stereo for anisotropic reflectance with tangent estimation
Xi Wang*, ZhenXiong Jian, MingJun Ren
** Shanghai Jiao Tong University (China)*

A121 Slopes-based wavefront reconstruction method in Cartesian grid geometry
Vu Hai Linh Nguyen*, Hyug-Gyo Rhee, Young-Sik Ghim
** University of Science and Technology (South Korea)*

A143 Phase plate fabrication process to simulate the turbulence effects on an optical imaging system in Korean atmospheric circumstances
Han-gyol Oh, Pilseong Kang, Jaehyun Lee, Hyug-gyo Rhee, Young-sik Ghim
** Korea Research Institute of Standards and Science (South Korea)*

A152 Fatigue life improvement of rear axle gearbox in agricultural vehicles by optimizing gear macro-geometry
Jae-Hyun Kim*, Dong-Joo Moon, Dongu Im, Tae Ick Moon, Seung-Hwa Yu, Young-Jun Park
** Seoul National University (South Korea)*

A169 Fast infrared small target detection based on improved weighted global contrast measurement
Yixuan Zhang, Hong Chang*, Yuxiang Feng, Ye Tang
** Beijing Aerospace Institute for Metrology and Measurement Technology (China)*

In-Process and On-Line Measurement

A140 An on-line surface quality detection method for wide cold-rolled strip based on normalizing flow

Pan Jiang, Zhenying Xu*, Liling Han, Yun Wang, Ziqian Wu

** Jiangsu University (China)*

A148 Management system using docker and robot middleware framework

Min Cheol Park*, Seung-Hun Kim

** Korea Electronics Technology Institute (South Korea)*

A163 Actual process synchronized simulation of deposited geometry in DED process

Segon Heo*, Min-Kyo Jung, Taeho Ha

** Korea Institute of Machinery and Materials (South Korea)*

A177 Measurement technology for quality improvement in 3D printing processes

Jiyong Park

Korea Institute of Industrial Technology (South Korea)

A187 Extrusion quality monitoring for screw-based 3D printer using computer vision

Song Hyeon Ju, Sang Il Kim, Jungsoo Nam*

** Korea Institute of Industrial Technology (South Korea)*

A189 Image-based monitoring approach for an in-situ analysis of the vapour plume behaviour of PBF-LB/M manufactured titanium alloys

E. Uhlmann, J. Polte, M. Bösing*

** Fraunhofer Institute for Production Systems and Design Technology (Germany)*

Machine Tool Metrology

A060 Determination of candidate temperature points for thermal error modeling of five-axis machine tools based on finite element analysis

Lei Cao*, Gyungho Khim, Jeong Seok Oh, Seung-Kook Ro, Chang-Kyu Song

** Korea Institute of Machinery and Materials (South Korea)*

A127 Diagnosis of high-speed ball-bearing spindles by data mining of dynamic responses from various rotating elements

Jiwan Kang*, Changhyuk Lim, Heeyoung Maeng, Keun Park

** Seoul National University of Science and Technology (South Korea)*

Material Characterization

A019 Study on microstructure, strengthening mechanism and wear resistance of fe-based alloy cladding layer reinforced with TiC by laser cladding

L.J. Cui*, P.X. WANG, S.R. Guo, J.H. ZHANG, Z. CHEN, W.D. ZHOU, G.M. LIU, W.L. LI, D.F. WANG, Y.M. TIAN

** Zhongyuan University of Technology (China)*

Micro/Nano-Metrology

A003 Laser self-mixing grating interferometry for multi-dimensional displacement sensing

Dongmei Guo*, Zhanwu Xie, Wei Xia, Ming Wang
** Nanjing Normal University (China)*

A024 Laser induced silver ink-doping porous graphene based on natural wood for sensitive SERS detection

Tongmei Jing*, Manping Wang, Han Ku Nam ,Truong-Son Dinh Le, Rongke Gao, Seung-Woo Kim, Young-Jin Kim, Liandong Yu
** China University of Petroleum (UPC) (China)*

A027 Influence of laser fabricating parameters on the surface hydrophobicity of laser-induced graphene on wood

Manping Wang*, Tongmei Jing, Han Ku Nam, Truong-Son Dinh Le, Yang Lu, Seung-Woo Kim, Liandong Yu, Young-Jin Kim
** China University of Petroleum (UPC) (China)*

A069 Current modulated self-mixing interference in VCSELs for vibration measurement and sensing: theory and applications

Ming Wang
Nanjing Normal University (China)

A070 Parametric examination of differential evolution algorithm for form error evaluation of non-axisymmetric aspheric surface based on Taguchi method

Hsin-Tung Lin, Kuo-Ming Chang, Wang-Long Li, Yung-Tien Liu*
** National Kaohsiung University of Science and Technology (Taiwan)*

A110 Deterministic nanoantenna array design for stable plasmon-enhanced harmonic generation

Tae-In Jeong*, Seungchul Kim
** Pusan National University (South Korea)*

A153 High-resolution repairing process of metal patterns using laser ablation for fine-patterned advanced packaging

Hakyung Jeong*, Seung Man Kim, Jae Hak Lee, Jun-Yeob Song, Seongheum Han, Ah-Young Park, Sumin Kang, Hayoung Youn
** Korea Institute of Machinery and Materials (South Korea)*

A164 Statistical analysis to improve sub-nano scale surface roughness reliability of Si mirrors for accelerators

Hwanjin Choi*, Wonkyun Lee, Mincheol Kim, Minwoo Jeon, Woo-Jong Yeo, Sangwon Hyun
** Korea Basic Science Institute (South Korea)*

A180 A study on SiC wafer thinning process using femtosecond pulse laser

Hayoung Youn*, Seungman Kim, Sumin Kang, Jae Seung Lim, Jae-Hak Lee, Seongheum Han, Ah-Young Park, Jun-Yeob Song
** University of Science and Technology (South Korea)*

A184 Work coordinate setup in ultra-precision machine tool using electron tunneling

Sangjin Maeng*, Byungmin Kim
** Hongik University (South Korea)*

Optical Metrology and Inspection

A011 Measurement of the axial displacement error of a segmented mirror using a Fizeau interferometer

Ha-Lim Jang*, Jae-Hyuck Choi, Jae-Bong Song, Hagyong Kihm

** University of Science and Technology (South Korea)*

A030 Single shot radial constant shearing interferometry with axicon lenes using polarization camera

Hiroyuki Akiyama*, Ryoshu Furutani

** Tokyo Denki University (Japan)*

A031 A study of common path length and angle measurement interferometer

Kota Ishii*, Ryoshu Furutani

** Tokyo Denki University (Japan)*

A036 Optical sectioning structured illumination microscopy with improved lateral resolution

Jong-Kyu Park*, Ki-Nam Joo

** Chosun University (South Korea)*

A038 Multiplexed optical spectrometer with high resolution in the wide spectral range

Jin Hee Cho*, Ki-Nam Joo

** Chosun University (South Korea)*

A050 Development of a table-top surface inspection system based on phase-measuring deflectometry

Sangwon Hyun*, Kyesung Lee

** Korea Basic Science Institute (South Korea)*

A053 Characterization of polarization structured illumination microscopy

Minseo Cho*, Ki-Nam Joo

** Chosun University (South Korea)*

A055 Enhancement of third-order harmonic generation using upconversion nanoparticle coated on the borosilicate glass

Taewon Kim*, Won-Woo Noh, Seungjai Won, Murad Abualrejal, Geon Dae Kim, Donghwan Kim, Young-Jin Kim

** Korea Advanced Institute of Science and Technology (South Korea)*

A057 Measurement and analysis of atmospheric effects for free-space optical communication

Jaehyeon Lim*, Dong Il Lee, Shinhyung Kim, Seung-Woo Kim, Young-Jin Kim

** Korea Advanced Institute of Science and Technology (South Korea)*

A068 Polarized dual low-coherence scanning interferometry using a polarization camera and the dual low coherence characteristics

Seon-Ile Seo*, Seong-Wook Jang, Ki-Nam Joo

** Chosun University (South Korea)*

A088 Effect of actuator position on parasitic motion reduction in tip-tilt-piston stage guided by flexure mechanism

Hyeeun Yun*, Minseok Kim, Joohyung Lee, Dahoon Ahn

** Seoul National University of Science and Technology (South Korea)*

A108 In vivo moiré sensing technology for quantitative evaluation of bio-materials

Geehong Kim*, Soongeun Kwon, Semin Kim, Won-Gun Koh

** Korea Institute of Machinery and Materials (South Korea)*

A109 Chromatic confocal sensor based on a geometric phase lens

Min Kwan Song*, Ki-Nam Joo

** Chosun University (South Korea)*

A135 The development of a high-speed linear stage straightness measurement system using the industrial camera

Chun-Jen Chen*, Yi-Hung Yang

* National Formosa University (Taiwan)

A145 Fourier transform spectrometer based on broadband infrared light source using supercontinuum generation method

Jungyoon Kim*, Woojeong Lee, Joohyung Lee

** Seoul National University of Science and Technology (South Korea)*

A146 Relative MTF measurement method for push-broom hyperspectral imager

Tri Nguyen*, Huy Vu, Joohyung Lee

** Seoul National University of Science and Technology (South Korea)*

A147 High-resolution hyperspectral imaging payload for small-satellite based on a dual sensing

Huy Vu*, Van Tri Nguyen, Dea-soo Oh, Sang-jun Seo, Joohyung Lee

** Seoul National University of Science and Technology (South Korea)*

A159 Accurate measurement of micro-gap in roll-to-roll equipment using optical diffraction patterns

Hwijun Koo*, Jinsu Choi, Dongwoo Kang ,Seung-Hyun Lee, Hongki Yoo

** Korea Advanced Institute of Science and Technology (South Korea)*

Sensors and Actuators

A020 Study on the influence of cycloidal gear pin tooth wear on transmission error of precision planetary cycloidal reducer

Hang Xu*, Xianxing Liu, Chenzhou Wei, Yuanchun He, Guiping Xie, Yaoting Wu

** Henan University (China)*

A063 Design and performance analysis of a MEMS-based LiDAR by range equation

Heesuk Jang*, Hajun Song, Hansol Jang, Hae Seog Koh, Taehyun Yoon

** Agency for Defense Development (South Korea)*

A083 Development of wireless communications system to collect foot pressure data generated during gait

Kyeong-Jun Seo*, Junhyeok Ham, Ji-Eun Cho ,Hogene Kim, Jung Hwan Kim

** National Rehabilitation Center (South Korea)*

A089 Fault analysis of transformer using tunable infrared gas sensors

Gun-Ho Lee, SeungHwan Yi*

** Korea National University of Transportation (South Korea)*

A092 Wearable colorimetric sweat pH sensor-based smart textile for cystic fibrosis monitoring

Ji-Hwan Ha*, Junseong Ahn, Yongrok Jeong, Byeongmin Kang, Sohee Jeon, Soonhyong Hwang, Inkyu Park, Jun-Ho Jeong

** Korea Institute of Machinery and Materials (South Korea)*

A093 Development of piezo-transmittive mechanical metamaterial for self-powered strain sensor

Junseong Ahn*, Jimin Gu, Ji-Hwan Ha ,Soon Hyoung Hwang, Sohee Jeon, Inkyu Park, Jun-Ho Jeong

** Korea Institute of Machinery and Materials (South Korea)*

A113 Biomimetic virus-based gas sensor measured with plasmon-assisted photothermoelectric effect

Sehyeon Kim*, San Kim, Taein Jeong, Seungchul Kim

** Pusan National University (South Korea)*

A123 Ultra-sensitive gas sensor of nanobiomaterials using convolution neural networks based on hyperspectral analysis

Eunji Choi*, Tae-In Jeong, Seungchul Kim

** Pusan National University (South Korea)*

A138 Fabrication of nanohole arrays using a nano-printer for extraordinary optical transmission

Eunju Yang*, San Kim, Seungchul Kim

** Pusan National University (South Korea)*

A141 Ion beam figuring process for ultrafine precision optical components

Seungsik Shin*, Yeon Hwang, Seunghwoi Han

** Chonnam National University (South Korea)*

Signal Processing and Machine Learning

A118 Advancing optical coherence tomography image quality through interference fringe-leveraged deep learning

Woojin Lee*, Hyeong Soo Nam, Jae Yeon Seok ,Wang-Yuhl Oh, Jin Won Kim, Hongki Yoo

** Korea Advanced Institute of Science and Technology (South Korea)*

A132 Measurement and interpretation of ionization properties of CxFy molecules through quadrupole mass spectrometry

Mi-Young Song*, Dae-Chul Kim, Nidhi Shinha, Sanghyeok Park

** Korea Institute of Fusion Energy (South Korea)*

A139 Unsupervised learning-based anomaly detection for high-speed non-destructive industrial inspection using multi-digital X-ray tubes

Sunghoon Choi*, Jin-Woo Jeong, Jae-Woo Kim, Jun-Tae Kang, Sora Park, Yoon-Ho Song

** Electronics and Telecommunications Research Institute (South Korea)*

A151 Real-time compensation for thermal error reduction in diamond turning based on temperature monitoring and neural network prediction

Woo-Jong Yeo*, Hwan-Jin Choi, Minwoo Jeon, Mincheol Kim, Sangwon Hyun, I Jong Kim, Min-Gab Bog, Young-Jae Kim, Wonkyun Lee

** Korea Basic Science Institute (South Korea)*

A173 Use case of image segmentation and machine learning for characterizing nanoparticles in scanning electron microscope images

Byong Chon Park*, Min Jeong Kwak, In Yong Park

** Korea Research Institute of Standards and Science (South Korea)*

A194 Using genetic algorithms for geometric calibrations of X-ray computed tomography equipment

Chia-Hung Liao, Shih-Chieh Lin*

** National Tsing Hua University (Taiwan)*

Frequency Comb: Fundamentals & Applications

A037 Study on length measurement method using optical frequency comb

Keito Nagata*, Nobukazu Ishii, Ryoshu Furutani

** Tokyo Denki University (Japan)*

A073 Development of frequency comb-based free-space optical communication system with compensation for atmospheric effects

Shinhyung Kim*, Dong Il Lee, Jaehyeon Lim, Seung-Woo Kim, Young-Jin Kim

** Korea Advanced Institute of Science and Technology (South Korea)*

A117 Chip-scale flexible materials enable highly-enhanced acoustic phase modulation for direct frequency comb spectroscopy

San Kim*, Tae-In Jeong, Sehyeon Kim, Young-Jin Kim, Seungchul Kim

** Pusan National University (South Korea)*

General Information

Registration Fee

Category	Early Registration	Late & On-Site Registration
Date	July 30, 2023	
Regular	USD **600** / KRW **720,000**	USD **700** / KRW **840,000**
Student	USD **300** / KRW **360,000**	USD **400** / KRW **480,000**
Banquet	USD **100** / KRW **120,000** * **'Student Registration'** DOSE NOT include **'Banquet'**	

Symposium Registration Includes

Regular	Student
Access to oral/poster sessions Program Book · e-Proceedings (USB) Coffee break · Lunches · Banquet	Access to oral/poster sessions Program Book · e-Proceedings (USB) Coffee break · Lunches

- Registration desk at the lobby of Hall E, COEX but 402 (4F) on Sep. 17 (Sun).
- Early-bird : Inform the name of participants to Registration desk and Get the Name tag and symposium KIT.
- On-Site : Available at registration desk. (Credit card only)
- Receipt : Can download and Print out at http://www.ismtii2023.org after log-in. Also you can have the confirmation of attendance attached with name tag.
- Symposium kit. (Backpack, usb memory for symposium proceeding, program book, prepaid card for lunch)

Guidelines for Oral Presentation

- Please bring your presentation file(PPT format) at your USB memory, and upload the lap-top computer at the session room at least 10 mins before. You can get the help from assistant from staff of ISMTII 2023.
- Keynote speakers will be given 30 mins, including Q&A.
- Invited speakers will be given 25 mins, including Q&A.
- Regular oral speakers will be given 15 mins, including Q&A.

Guidelines for Poster Presentation

- Size of Presentation : Max A0 (841 mm × 1189 mm)
- Poster presenter has to be present in front of her or his own poster stand during poster session with name tag.
- Each presenter will be provided 1(one) poster board with presenter's No.
- Posters can be installed from 10:30 am in the morning on 18 (Mon), September, 2023.

ICMI Member Meeting

Date & Time	Place
September **17 (Sun.) / 19:00**	**Hall E**, E4 Conference Room

Awards

Best Paper Awards will be presented during '**Banquet**' for ISMTII 2023.

Lunch

Date & Time	Place
September **18 (Mon.) ~ 19 (Tue.) / 12:10~13:50**	**Restaurants in anyplaces**

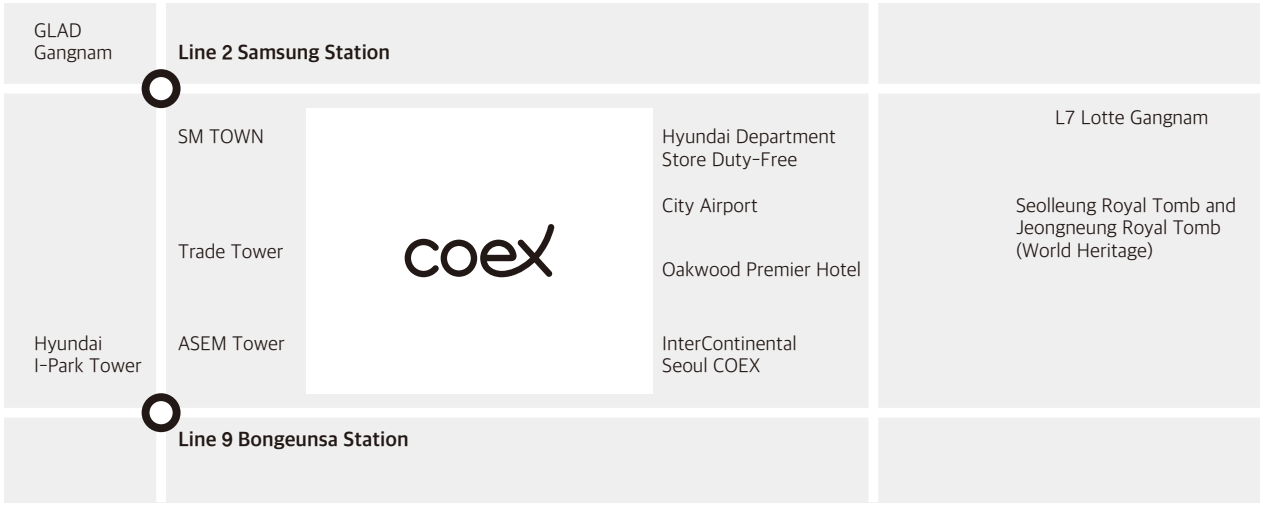
- Please bring your prepaid card (KRW 50,000) provided at your registration. Please keep your remaining amount when you use it. You can use this prepaid card for other purpose, for example, drinking or buying some goods up to the total amount.
- Restaurants in COEX (https://www.starfield.co.kr/coexmall/cafeDining/restaurant.do)
  'You can change the language from Korean to English at the bottom of the website'

Symposium Venue

Since opening in March of 1979, COEX has provided a global exchange platform through exhibitions and international conferences and has become the MICE business hub of Asia and the greatest exhibition venue and tourist attraction with a range of infrastructures for global business.

The Coex Center is comprised of four stories above ground with a total of 36,007 m^2 of exhibition space and a floor area of 460,000 m^2. Four specialized exhibition halls can be partitioned into a total of 12 separate rooms, and include a convention hall with space for up to 7,000 people. The Coex Center also boasts 54 meeting rooms and office space equipped with state-of-the-art facilities and a cutting edge building management system.

Coex has evolved into a leading culture-business platform, propelled by the opening of the new Coex Mall in 2014 and SM Town in 2015, and the designation of Gangnam as a 'Special Tourist Zone' dedicated to the MICE industry.

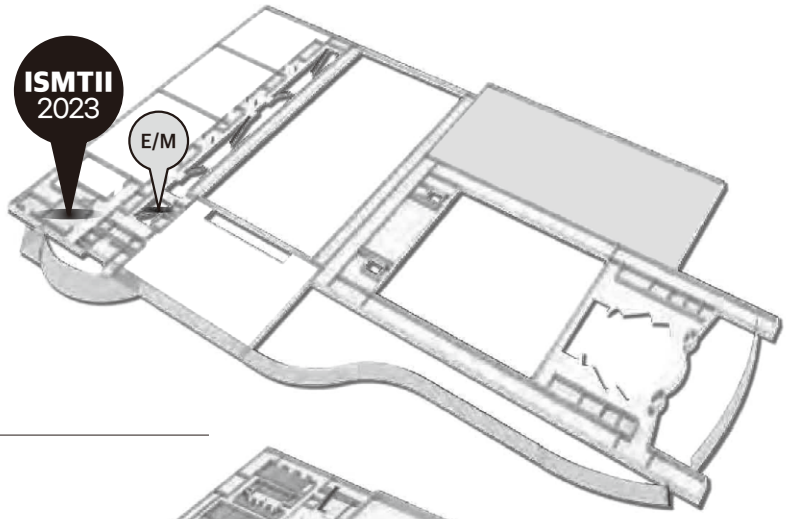


COEX, 513, Yeongdong-daero, Gangnam-gu, Seoul 06164 South Korea
Tel. 02 6000 0114 / Site. www.coex.co.kr

Floor Map (1F ⟷ 3F ⟷ 4F)

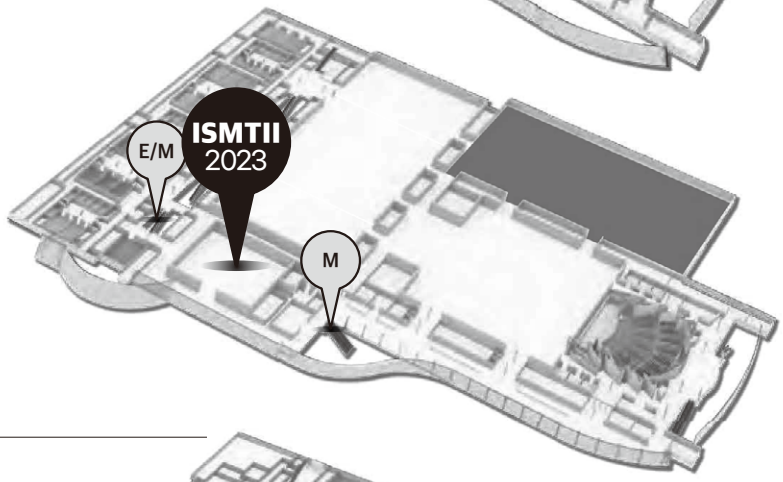
4F

- **Rm. 402** : **Welcome Reception**
- **E/M** : Elevator / Moving Stair



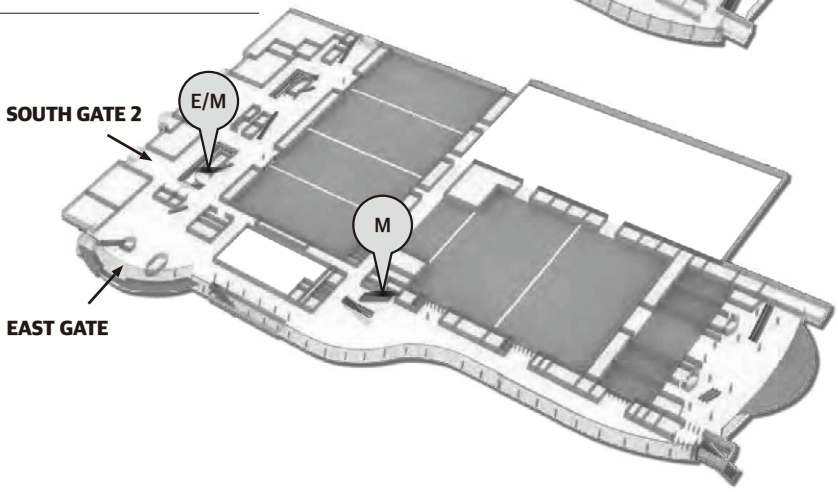
3F

- **Conference Room E** : **ISMTII 2023**
- **M** : Moving Stair
- **E/M** : Elevator / Moving Stair

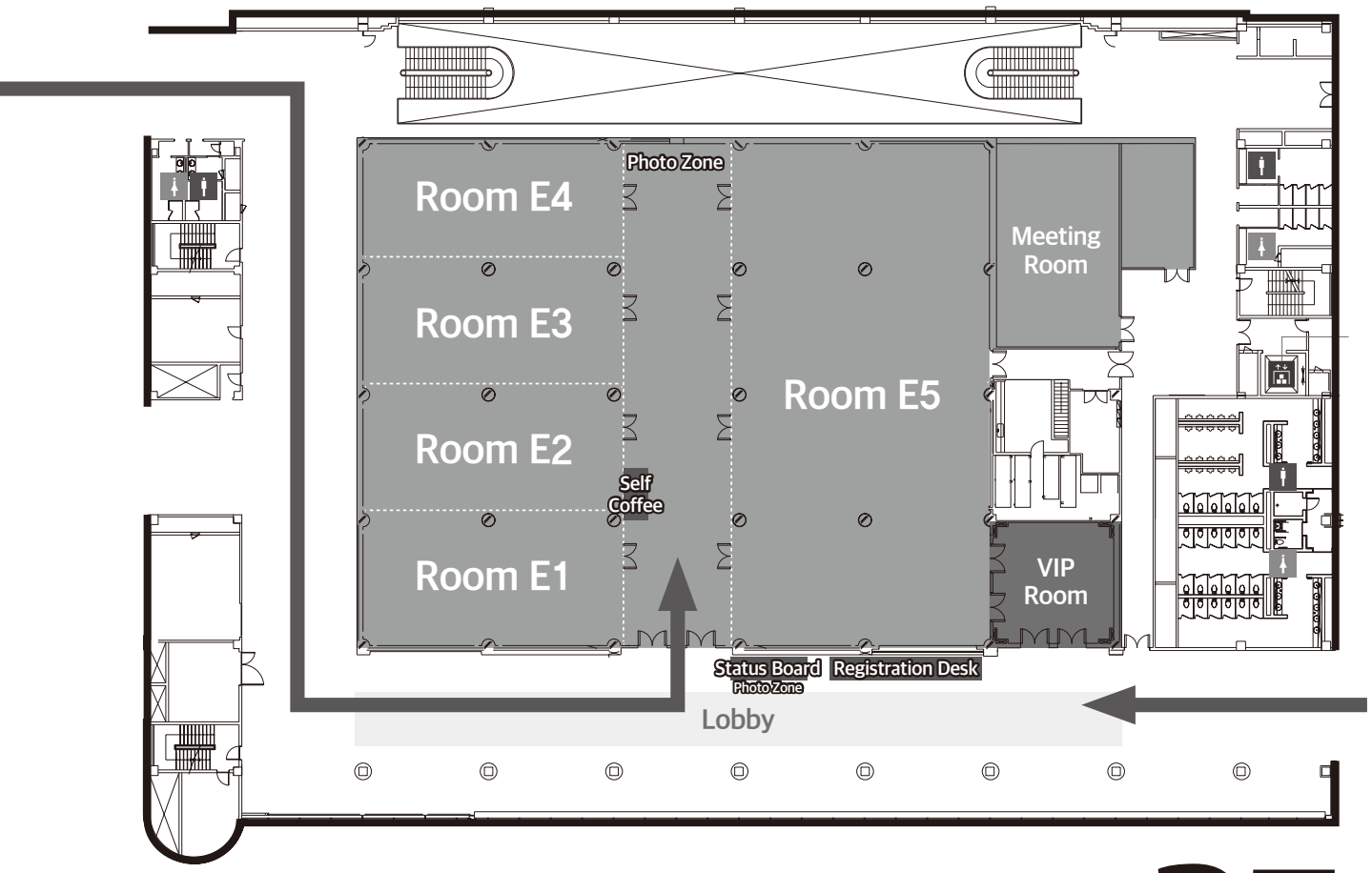


1F

- **M** : Moving Stair
- **E/M** : Elevator / Moving Stair



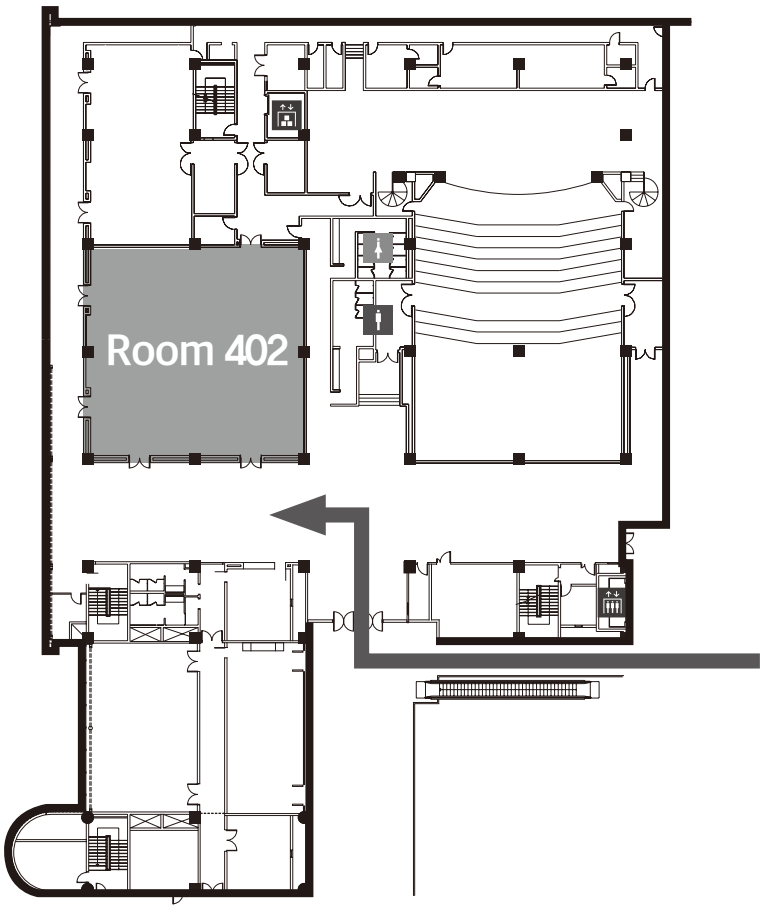
Floor Map (3F, Conference Room E)



- **Lobby** : Registration (September 18 (Mon.) - 19 (Tue.))
  Poster Presentation (September 18 (Mon.))

- **Room E1~5** : Opening Ceremony
  Keynote Session
  Oral Presentation
  ICMI Member Meeting

Welcome Reception



4F

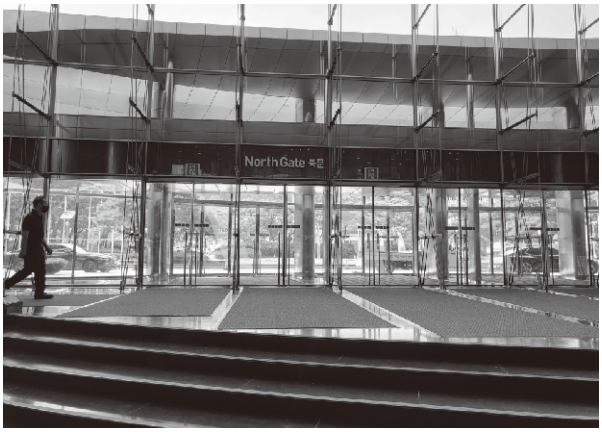
• **Room 402** : Welcome Reception
Registration (September 17 (Sun.))

Banquet

Date & Time	Destination
September **19 (Tue) / 17:45~21:00**	**Cheonggyesan Yettgol Fortress Restaurant**

Itinerary

- **17:45** : Meet up at the bus stop near the main entrance on the 1st floor of COEX (Symposium venue) **(North gate, photo below).**



* The bus will depart at 17:45 sharp, so please make sure to arrive at the meeting spot before then. (Those who arrive late will not be able to take the bus to the banquet.)

- **18:30** : Arrive at Cheonggyesan Yettgol Fortress Restaurant.
- **18:30~20:30** : Banquet
- **21:00** : Return to the venue, COEX (Tentative).

* Please note that due to possible traffic congestion, there may be changes in the travel times.

Cheonggyesan Yettgol Fortress Restaurant is a charming dining establishment located within the historic site of Cheonggyesan Yettgol Fortress in South Korea. This restaurant offers a unique culinary experience that combines traditional Korean cuisine with a touch of history.

The restaurant is known for its warm and inviting ambiance, with its interior reflecting the traditional architectural style of the Joseon Dynasty. The decor features wooden accents, elegant furnishings, and cultural artifacts, creating a delightful atmosphere that transports guests back in time.

The menu at Cheonggyesan Yettgol Fortress Restaurant showcases a variety of authentic Korean dishes, prepared with fresh and locally sourced ingredients. From classic favorites to regional specialties, the restaurant offers a diverse selection to cater to every palate. Whether you're in the mood for hearty stews, grilled meats, or flavorful vegetarian options, the menu has something for everyone.

The combination of delectable cuisine and historic charm makes Cheonggyesan Yettgol Fortress Restaurant a popular destination for locals and tourists alike, seeking a memorable dining experience immersed in Korean culture.

Technical Tour

Date & Time	Destination	Maximum Participants
September **20 (Wed) / 08:30~13:00**	The **KITECH** Research Institute of Advanced Manufacturing & Materials Technology in Incheon	**40**

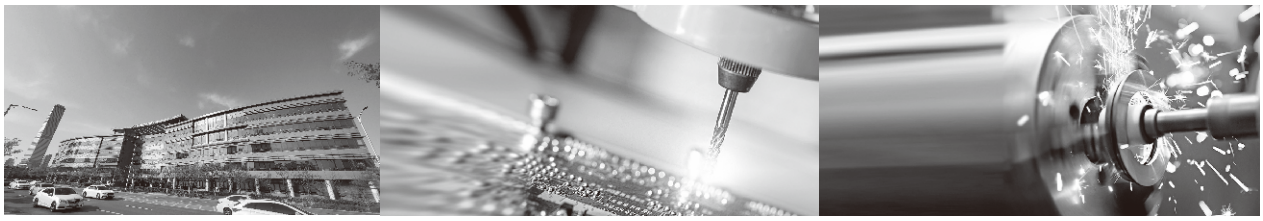
Itinerary

- **08:30** : Meet up at the bus stop near the main entrance on the 1st floor of COEX (Symposium venue)
  (North gate / The meeting location for the departure is the same with the banquet).

  * The bus will depart at 9:00 am sharp, so please make sure to arrive at the meeting spot before then. (Those who arrive late will not be able to take the bus to the tour.)

- **10:20** : Arrive at KITECH.
- **10:30** : Lab Tour and Eco-Mg demonstration.
- **11:40** : Depart from KITECH.
- **13:00** : Return to the venue, COEX (Tentative).

  * Please note that due to possible traffic congestion, there may be changes in the travel times.



Korea Institute of Industrial Technology (KITECH) was founded in 1989 to support the industry sector, particularly SMEs, as an application-oriented research institute, striving to lead in its field. KITECH focuses on three key research areas: advanced manufacturing technology, industrial technology convergence, and sustainable manufacturing system technology. With the goal of enhancing field-oriented support for SMEs, the institute operates three research institutes and seven regional divisions.

The Research Institute of Advanced Manufacturing & Materials Technology in Incheon is a prominent division within KITECH. It plays a crucial role in developing and disseminating original root technologies, including Casting, Molding, Forging, Welding, Heat treatment, and Surface treatment. Moreover, the institute provides essential support to companies by granting them access to the latest research findings and cutting-edge technologies.

Culture Tour

Date & Time	Destination	Maximum Participants
September **20 (Wed) / 09:00~13:00**	**Gyeongbokgung Palace**	**40**

Itinerary

- **09:00** : Meet up at the bus stop near the main entrance on the 1st floor of COEX (Symposium venue)
  (North gate / The meeting location for the departure is the same with the banquet).

  * The bus will depart at 9:30 am sharp, so please make sure to arrive at the meeting spot before then. (Those who arrive late will not be able to take the bus to the tour.)

- **10:30** : Arrive at Gyeongbokgung Palace.
- **10:40** : Ticketing at Gwanghwamun.
- **11:00** : Palace Tour with an English-speaking guide.
- **12:10** : Depart from Gyeongbokgung Palace.
- **13:00** : Return to the venue, COEX (Tentative).

  * Please note that due to possible traffic congestion, there may be changes in the travel times.

Built in 1395, **Gyeongbokgung Palace** is commonly referred to as the Northern Palace because its location is furthest north when compared to the neighboring palaces of Changdeokgung (Eastern Palace) and Gyeonghuigung (Western Palace). Gyeongbokgung Palace is arguably the most beautiful, and remains the largest of all five palaces. The premises were once destroyed by fire during the Imjin War (1592-1598). However, all of the palace buildings were later restored under the leadership of Heungseondaewongun during the reign of King Gojong (1852-1919).

Remarkably, the most representative edifices of the Joseon dynasty, Gyeonghoeru Pavilion and the pond around Hyangwonjeong Pavilion have remained relatively intact. The raised dias and stone markers of Geunjeongjeon showcase the representative art style of their time. The National Palace Museum of Korea is located outside of Heungnyemun Gate, and the National Folk Museum is located on the eastern side of Hyangwonjeong Pavillion.

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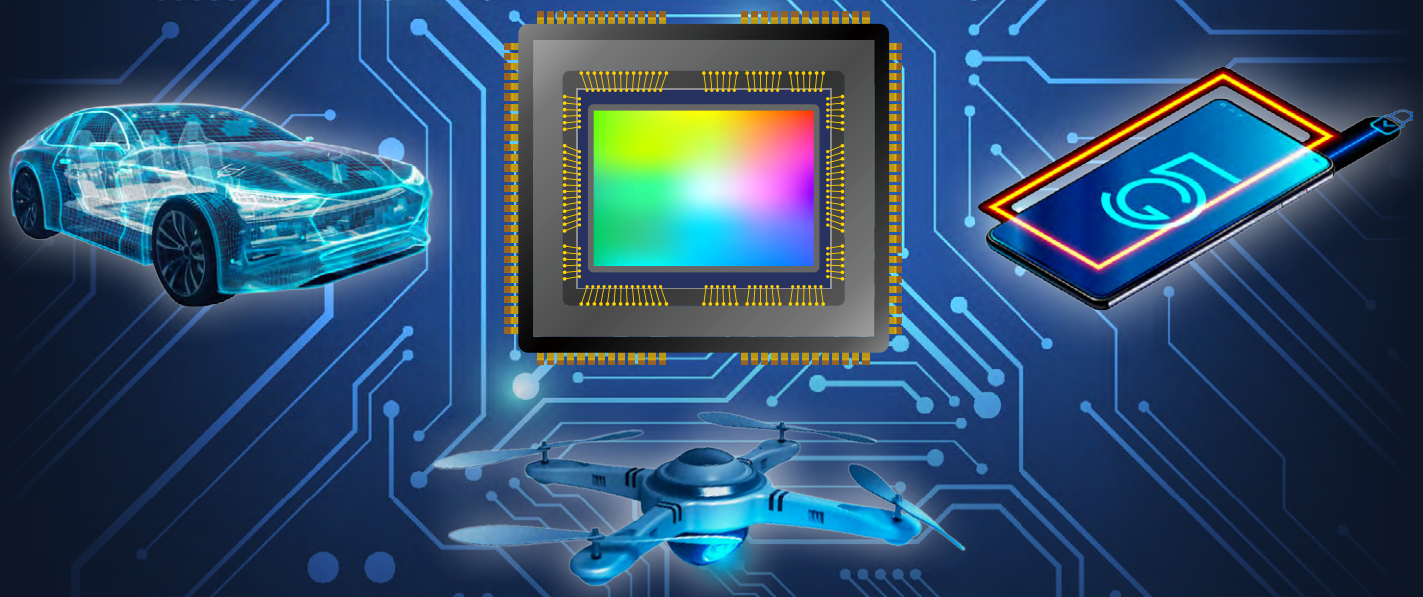

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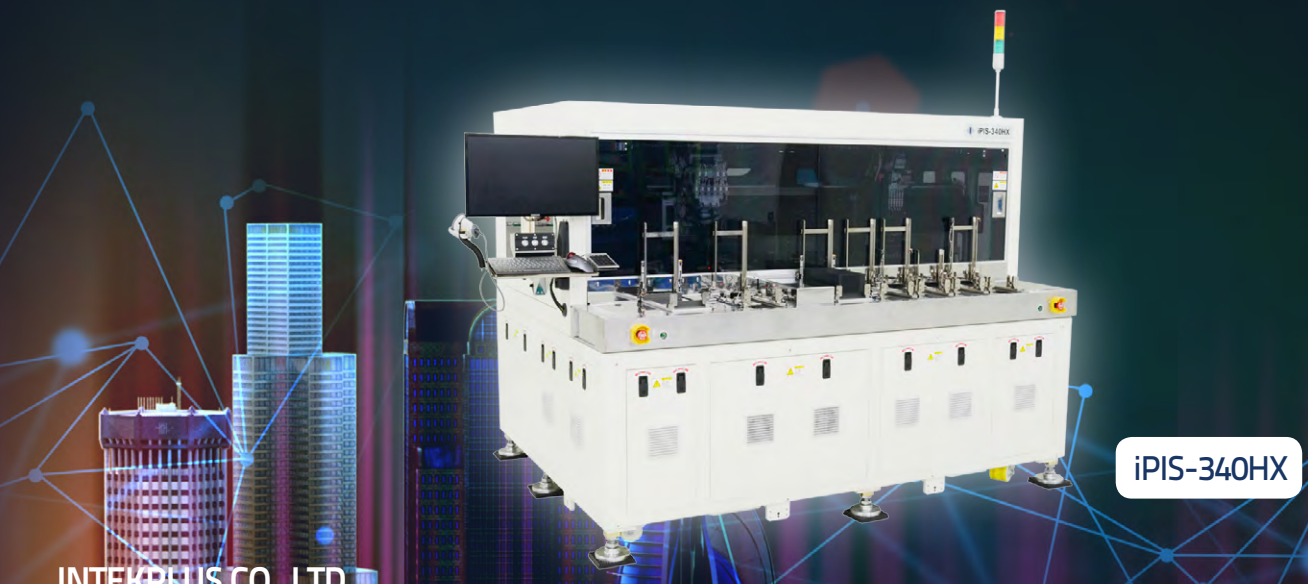

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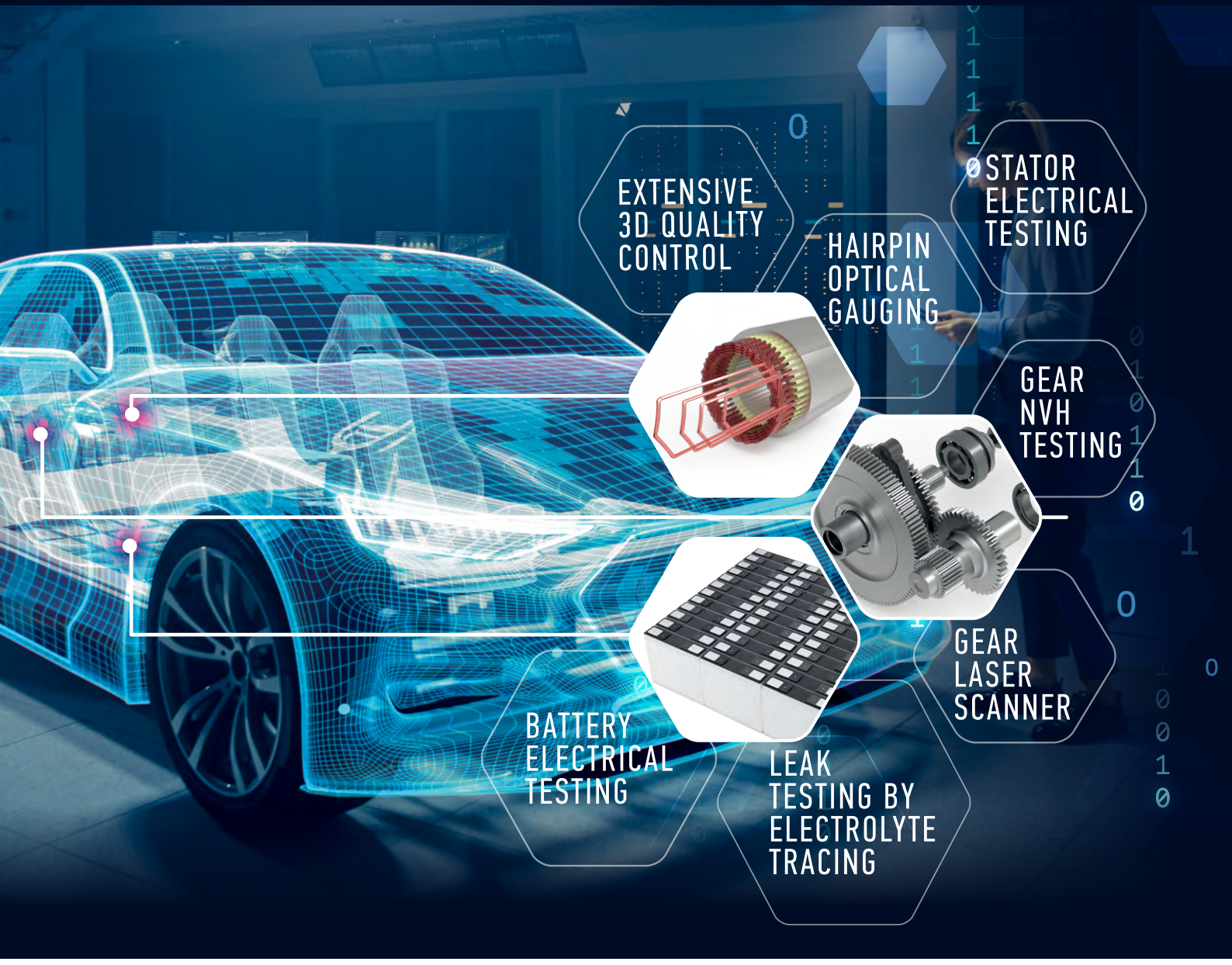

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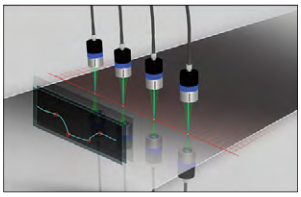

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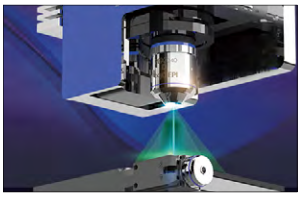

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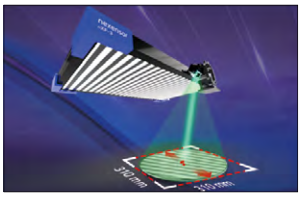

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