IDW ’19
THE 26TH INTERNATIONAL DISPLAY WORKSHOPS

Special Topics of Interest on
• AR/VR and Hyper Reality
• Automotive Displays
• Micro/Mini LEDs
• Quantum Dot Technologies

Topical Session on
• Artificial Intelligence and Smart Society
• 3DSA2019

Workshops on
• LC Science and Technologies (LCT)
• Active Matrix Displays (AMD)
• FPD Manufacturing, Materials and Components (FMC)
• Inorganic Emissive Display and Phosphors (PH)
• OLED Displays and Related Technologies (OLED)
• 3D/Hyper-Realistic Displays and Systems (3D)
• Applied Vision and Human Factors (VHF)
• Projection and Large-Area Displays and Their Components (PRJ)
• Electronic Paper (EP)
• MEMS and Emerging Technologies for Future Displays and Devices (MEET)
• Display Electronic Systems (DES)
• Flexible Electronics (FLX)
• Touch Panels and Input Technologies (INP)

Online Advance Program

Sapporo Convention Center
Sapporo, Japan
November 27 – 29, 2019
IDW ’19 Online Advance Program

From this year, the IDW ‘19 Advance Program is available on the Internet, not in PDF file format.

Access the online advance program here:
URL: https://confit.atlas.jp/idw2019?lang=en
The 26th International Display Workshops will be held as IDW ’19 for encouraging aggressive research and development of display technologies throughout the world and especially in the Asian region. IDW ’19 focuses on the following 4 special topics and 2 topical sessions, which are extremely timely, as well as 13 active workshops.

Special Topics of Interest on
- AR/VR and Hyper Reality
- Automotive Displays
- Micro/Mini LEDs
- Quantum Dot Technologies

Topical Sessions on
- Artificial Intelligence and Smart Society
- The 11th International Conference on Three Dimensional Systems and Applications

Workshops on
- LC Science and Technologies
- Active Matrix Displays
- FPD Manufacturing, Materials and Components
- Inorganic Emissive Display and Phosphors
- OLED Displays and Related Technologies
- 3D/Hyper-Realistic Displays and Systems
- Applied Vision and Human Factors
- Projection and Large-Area Displays and Their Components
- Electronic Paper
- MEMS and Emerging Technologies for Future Displays and Devices
- Display Electronic Systems
- Flexible Electronics
- Touch Panels and Input Technologies

The three-day conference will feature 429 papers, including 4 keynote addresses, 134 invited presentations, 121 oral presentations, and 170 poster presentations. Following the plenary session of keynote addresses on Wednesday morning, presentations will begin and continue in 8 parallel oral sessions through Friday. Poster sessions, author interviews, and demonstrations will enable participants to discuss topics in detail. Exhibits by universities and display industry-related businesses will also be featured from Wednesday to Friday in parallel with workshops. IDW ’19 should be of interest to not only researchers and engineers, but also managers of companies and institutions in the display community.

Special Topics of Interest on AR/VR and Hyper Reality (AR&VR)
Augmented reality (AR) and virtual reality (VR) applications employing high-performance display devices such as sensors, cameras with tracking capabilities, and computer graphics technologies have shown significant progress in the past few years. This year, we provide several sessions on state-of-the-art optics for HMD, VR/AR display devices including Light Field Displays, the history of VR and current AR technology in industry, interaction devices/techniques using AR/VR, and VR-related human perception.

Special Topics of Interest on Automotive Displays (AUTO)
AUTO, which began in 2016 as one of the Special Topics of Interests (STIs), will present wide-ranging presentations on automotive displays. This year, AUTO sessions will be held in three WSs: PRJ for projection technology, VHF for ergonomics, and INP for touch panel technology and its application. In addition, AUTO-related presentations will be made in other oral sessions and poster exhibitions in WSs such as 3DSA, LCT, etc.
In the AUTO session, interesting presentations will be made, covering topics such as advanced headlamps using laser light, visibility of road signs, three-dimensional head-up displays, touch sensors, and information transmission to people outside the vehicle in addition to the display on the driver. The sessions have been arranged in a manner ideal for understanding a wide range of automotive related display technologies. AUTO will surely interest audiences such as users and designers of automobiles.

Special Topics of Interest on Micro/Mini LEDs (mLED)
At IDW ’19, Micro/Mini LEDs has been established as one of the Special Topics of Interest (STI), drawing together presentations on Micro LEDs, which have garnered much interest in recent years. Micro/Mini LEDs feature the special characteristics of high luminance, low electricity consumption, wide gamuts, wide viewing angles and simple device structures. In addition to their wide ranges of applications enabling the realization of large-screen direct viewing displays to micro displays, their adoption in direct backlights is also drawing attention. Starting with an Invited Address by Professor Kei May Lau of The Hong Kong University of Science and Technology, the session will cover all the latest technologies in materials, LED atomization, mounting on substrates, and other manufacturing technologies, as well as thermal/optical design techniques, drive technologies, and applications in displays. A session is being planned in which presentations and debate will unfold regarding the latest results of the technologies that lead the micro LED field.

Special Topics of Interest on Quantum Dot Technologies (QDT)
This topic will cover all aspects of the science and technologies of Quantum Dots (QD) and Quantum Rods (QR), ranging from materials research, device structure and properties, device applications for lighting and display, manufacturing and high color gamut displays using QD. This topic will specialize in QD Technologies (QDT) in order to provide a venue for the vitalization of debates in each field.

The highlights for IDW’19 will be verbal presentations and poster sessions regarding the development of recent progress in polarized QLED using Q-rods, Cd-free QD materials and devices, and QD converted micro-LED display (PH-WS), display and light source applications using high quantum-efficiency cd-free quantum-dot materials such as colloidal perovskites for full compatibility with REC 2020 (ITU-R-BT 2020) for HDR (High Dynamic Range) (MEET-WS), perovskite QDs based LEDs with high color purity emission spectra, and efficient solution-processed perovskite LED and efficient indium phosphate based QDs using sol-gel processed electron transfer layers (OLED-WS).

Topical Session on Artificial Intelligence and Smart Society (AIS)
Recently, artificial intelligence has become a common technology, and it will be a key concept of the smart societies of the future, known as “Industry 4.0” and “Society 5.0”. In this scope, the relationship between information displays, artificial intelligence, and smart society will be discussed.

This year, five invited speakers are invited, and there will be presentations that propose how to interact with information displays in a smart society where artificial intelligence is essential. Image processing with deep neural networks is already a main battlefield, and there is also a more advanced technology called GAN. In addition, joint oral sessions with INP, DES, and PRJ and joint poster sessions with DES and VHF on image processing and image quality are also planned.

Topical Session on the 11th International Conference on Three Dimensional Systems and Applications (3DSA)
3DSA is an international conference on audio-visual 3D technologies,
systems, applications and other hyper-realistic systems, such as 3D capturing and processing, 3D coding and transmission, 3D displays and systems, 3D contents and applications, computer graphics, holographic technology, human vision, augmented reality, virtual reality, immersive display systems, free viewpoint image systems, ultra-realistic audio systems, and interactive systems. It is organized by the Ultra Realistic Communication Forum (URCF)/The Virtual Reality Society of Japan (VRSJ) in Japan, 3D Interaction & Display Alliance (3DIDA)/the Industrial Technology Research Institute (ITRI)/the Society for Information Display (SID) Taipei Chapter in Taiwan, the Association of Realistic Media Industry (ARMI)/Electronics and Telecommunications Research Institute (ETRI)/and the Korean Institute of Broadcast and Media Engineers (KIBME). This year, it provides a very good opportunity to follow the recent trends in Virtual Reality presented by Professor Hirose, the president of the University of Tokyo Virtual Reality Educational Research Center.

Workshop on LC Science and Technologies (LCT)
The LC Science and Technologies (LCT) workshop showcases novel device structures, materials, and evaluation methods for advanced displays, as well as novel and emerging applications based on LCs. As excitement over the Tokyo 2020 Olympics rises, sessions are planned on the newest display technologies that maximize the viewing experience of LCDs: invited presentations are planned on ultra-high-resolution (8K), BT.2020, high dynamic range (HDR), and flexible technologies. Sessions are also planned for novel applications where LCs are used as 'smart' electrolytes or sensors, and as ultra-thin diffractive optical elements for AR/VR applications. The workshop is an excellent opportunity for participants to learn about the latest LC-based technologies and discuss future prospects.

Workshop on Active Matrix Displays (AMD)
The AMD workshop covers active matrix displays, thin film devices such as oxide TFT, Si-TFT, micro-LED, AM-OLED, sensors, and other devices. Recent paper presentations tend to focus on oxide TFT, which is highly expected to play a role in applications for higher resolution LC and OLED displays.

We highlight the oxide TFT with three dedicated sessions covering a wide area from materials, physics, devices, and processes to applications. Furthermore, we have scheduled sessions for foldable OLEDs, high resolution displays, active-matrix type micro-LEDs, emerging TFTs and advanced driving technology.

Workshop on FPD Manufacturing, Materials and Components (FMC)
The FPD Manufacturing, Materials and Components (FMC) workshop covers recent developments and achievements in the field of flat panel display technologies, including display optics, materials, components, display panel manufacturing and measurements technologies. The oral sessions includes 39 papers, of which 11 are invited papers. The poster session contains 21 papers. In the FMC sessions, the papers related to Micro/Mini LEDs Displays (joint session: FMC/LCT), Advanced Material and Components (joint session: FLX/FMC), Optical Films, Quantum Dots, Metrology and Manufacturing are highlighted. Presentations on manufacturing of Micro/Mini LEDs Displays and related backlight technologies will be held in the FMC/LCT joint session. Recent trends in the fields of Projection will be presented at the PRJ/FMC joint session.

Workshop on Inorganic Emissive Display and Phosphors (PH)
This workshop presents the latest achievements in devices and phosphors for emissive displays, lighting, and imaging. Invited talks will present the development of novel nitride phosphors using high throughput calculation. Recent progress of QLEDs utilizing Cd-free QD
and Q-Rods, flexible powder-ELD, and monolithic full-color micro-LED displays will be also presented.

**Workshop on OLED Displays and Related Technologies (OLED)**
The OLED workshop covers all aspects of the science and technologies of OLED, QLED and other organic devices, ranging from material science, basic device physics for OLED devices and display technologies, and other applications. The oral and poster sessions will cover OLED display and device technologies, materials and process technologies for soluble OLED and advanced technologies concerning OLED/QLED devices and materials. Recent progress such as micro-OLED displays, perovskite QD technologies, and automotive applications etc. will be reported on. We will also focus in particular on Quantum Dot Technologies (QDT) as a special topic of interest (STI).

**Workshop on 3D/Hyper-Realistic Displays and Systems (3D)**
The 3D/Hyper-Realistic Displays and Systems workshop will consist of many papers on 3D systems and devices for holography, autostereoscopic display, integral photography, and emerging applications for AR/VR. This year, the 3D workshop presents a lot of sessions in conjunction with the 3DSA international conference to provide a good opportunity for audiences to understand the trends in these fields. In addition, it features “illusion” and provides two oral sessions in the evening of the 27th and the morning of the 28th, and a demo exhibition over all three days.

**Workshop on Applied Vision and Human Factors (VHF)**
The VHF workshop covers all ergonomic factors on human interfaces, such as visual aspects, environmental related aspects, and measurements. We have eight oral sessions and four poster sessions, including special topic sessions on automotive applications and virtual reality, in addition to display applications, image quality and physiological factors. We also have a joint session on illusions. Seven invited talks will be given in the oral sessions, concerning foveated rendering HMD, dynamic signs, office applications, elevator/escalator applications, and motion sickness.

**Workshop on Projection and Large-Area Displays and Their Components (PRJ)**
The PRJ workshop covers the latest eyewear displays, automotive displays, solid-state light sources, electronic holograms, aerial displays, short throw optics, 3D-measurement optics including light detection and ranging (LiDAR), and all the projection related technologies. This year’s session will focus on AR/VR, projection mapping and lighting, Artificial Intelligence applications, automotive displays and headlamp optics, and international standardization of HMDs.

**Workshop on Electronic Paper (EP)**
The EP workshop focuses on emerging topics in electronic paper including novel display methods, new applications, and user interface studies. Fields for the application of e-paper are now expanding to books, documents, notes, shelf labels, signage, smart device and etc. Aggressive challenges will be presented in the following three sessions: 1) Chromic materials, 2) Electrophoretic Displays, 3) Electro-wetting Displays and Related Systems.

**Workshop on MEMS and Emerging Technologies for Future Displays and Devices (MEET)**
The MEET workshop is unique in covering all aspects of MEMS, micro-LED, Quantum Dot, nanotechnologies and emerging technologies concerning future displays, imaging devices, and emerging electron devices. The MEET workshop has established sessions on micro-LEDs and Quantum Dot/Quantum Dot light-emitting diodes for the first time in the world academic society and seeks to broaden the horizon of display and imaging technologies into cutting-edge technologies. Research
areas such as materials, basic physics, and fabrication processes are included. Among all the MEMS, Nanotechnologies and display conferences in the world, this is the only opportunity for MEMS, Nanotechnologies and cutting-edge technology researchers to gather and discuss such devices. Authorities from top research institutions around the world in this field have been invited. Invited speakers will come from CEA-LETI, Ecole Polytechnique, Brunel University, Fraunhofer Institute for Applied Polymer Research, Seoul National University, Kyung Hee University, Beijing Institute of Technology, Fuzhou University, Southern University of Science and Technology, ETH Zurich, National Ciao Tung University, BOE, QMAT, PlayNitride, and Yole Développement. Together with contributed papers with high-quality content, this workshop is aimed at participants who wish to open up new fields in displays, imaging devices, and emerging devices such as carbon nanotube electron beam sources and ultraviolet light sources by using MEMS micro/nano fabrication technology, cd-free quantum-dot materials as well as highly quantum-efficient nanocrystals such as colloidal perovskites satisfying the international conditions for REC 2020 (ITU-R-BT 2020) for HDR (High Dynamic Range), high brightness and wide color-gamut micro-LEDs as next generation displays and so on.

Workshop on Display Electronic Systems (DES)
The DES workshop (Display Electronic Systems) proposes next-generation systems, advanced applications, and pursues high display performance based on advances in circuit technology and software processing technology. This year, DES-WS will organize three single and three joint sessions. We will feature 8K related techniques and machine learning related image processing as at previous IDWs and state-of-the-art video coding. The 8K session covers a wide range from driving hardware to medical applications. The video coding session, which is applied to reduce video memory consumption, will focus on the latest technologies.

Workshop on Flexible Electronics (FLX)
The FLX workshop focuses on advanced technologies for flexible electronics including foldable displays, rollable displays, wearable sensors, stretchable devices, and IoT-related devices, which are composed of a wide range of fields from material science to practical applications. The sessions cover all aspects of the most topical flexible devices and material technologies including stretchable material and device technologies, flexible displays, wearable sensors, and printed and flexible hybrid technologies.

Workshop on Touch Panels and Input Technologies (INP)
Interface technologies such as touch panels and interactive technologies which have already extended to automotive HMIs are the stars of the session. Following to the last meeting, this year, progress in in-cell force touch panels and fingerprint sensors, tactile sensors by impedance tomography, olfactory display, haptics using illusion, wearable devices for touch sensory feedback, eye contacts considering the Mona Lisa effects and so on, are topics that will be focused on. INP papers will open a new window in displays and interactive technologies, not only for devices but also for systems, making them essential viewing.

Kobayashi-Uchiike-Mikoshiba Prize
The Kobayashi-Uchiike-Mikoshiba Prize shall be conferred by the International Display Workshops General Incorporated Association Board of Directors upon a person who has both an outstanding record of accomplishments in any of the IDW fields of interest and made an outstanding contribution to the IDW. The accomplishments that are being honored shall have led to important contributions in the advancement or application of engineering, science and technology,
resulting in the realization of significant value to society.

**IDW Best Paper Award and IDW Outstanding Poster Paper Award**

IDW will present “IDW Best Paper Award” and “IDW Outstanding Poster Paper Award”. The award committee of IDW will select the most outstanding papers from those presented at IDW ‘19. The award winners will be announced on the IDW website and given a plaque after the conference.

**I-DEMO (Innovative Demonstration Session)**

I-DEMO will be held on November 28 at Main Hall (1F). IDW provides the opportunity for an interdisciplinary technical demonstration/discussion in a larger space, more preparation and demonstration time than in the “Author Interviews”. Demonstration Award will be awarded to the demonstration that has the biggest impact on the audience.

**SPECIAL EVENT “Sensory Illusion”**

**Exhibition:**

Touch and somatic illusions and amazing artworks such as “Impossible Object Illusion” will be exhibited on Wednesday, November 27 – Friday, November 29, 2019 at Main Hall (1F)

**Special Talks:**

Variety of Visual Illusions, Akiyoshi Kitaoka (Ritsumeikan Univ.)
Latest Developments of 3D Illusion, Kokichi Sugihara (Meiji Univ.)
Related technical sessions will be held on November 27, 2019 at Mid-sized Hall A (1F)

**Exhibition**

The IDW ’19 Exhibition, which will be held from November 27 through November 29, covers materials, components, manufacturing and measuring equipment, software systems and other related products for display devices. Please join in and enjoy discussions at exhibitors’ booths Main Hall (1F).

- November 27 (Wed.) 12:40 – 18:00
- November 28 (Thu.) 10:00 – 18:00
- November 29 (Fri.) 10:00 – 14:00
GENERAL INFORMATION

SPONSORSHIP
IDW ’19 is sponsored by the Institute of Image Information and Television Engineers (ITE) and the Society for Information Display (SID).

CONFERENCE SITE
Sapporo Convention Center
1-1-1 Higashi-Sapporo 6-jo, Shiroishi-ku, Sapporo, 003-0006, Japan
URL: https://www.sora-scc.jp/eng/
Phone: +81-11-817-1010
Fax: +81-11-820-4300

ON-SITE SECRETARIAT
Telephone and fax machines for IDW ’19 will be temporarily set up in the secretariat room (Room104) at Sapporo Convention Center (November 27-29).

RECEPTION
A buffet style reception will be held on the evening of November 27 from 19:20-21:00 at the Conference Hall (1F) in Sapporo Convention Center. As the number of tickets is limited, you are urged to make an advance reservation through the registration website.

EVENING GET-TOGETHER WITH WINE
A get-together will be held on November 26 from 18:00 to 20:00 at Restaurant ‘SORA’ (1F) in the conference site. Wine (sponsored by International Display Workshops General Incorporated Association) and snacks will be served to participants in a relaxed atmosphere for networking. Admission is free with your name tag.

REGISTRATION
Registration is available in advance and also on-site, however, advance registration is strongly recommended to speed up the arrival procedure at the conference site.

Registration Fees
The registration fee for IDW ’19 includes admission to the conference and a USB flash drive of the proceedings.
All dates and hours indicated here are in Japan Standard Time.

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<td>Individual Member</td>
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<td>Reception</td>
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**ASO: Academic Supporting Organizations
(See p.9 as well as “Supporting Organizations” of workshops and topical sessions)
**Non-Member: If you intend to join either ITE or SID, the one year membership fee will be subsidized by IDW ’19 committee.
***Full-time student, photocopy of student ID is required.
****Photocopy of your membership card is required.

Please note that the payment of reduced registration fee is accepted until Oct. 25, 2019, at 23:59 (JST). The full fee will be charged for payments made on and after Oct. 26, 2019. Also note that the number of reception tickets to register on site is limited.

Additional proceedings (USB flash drive)
| At the conference site       | ¥8,000 |
| Airmail after the conference | ¥12,000 |
| Domestic mail after the conference | ¥10,000 |
Payment
Two ways are provided for registration.

(1) e-Registration
Access the following URL.
https://www.idw.or.jp/regist.html
e-Registration will be accepted until November 15, 2019, at 23:59 (JST).

(2) On-site Registration
Conference registration desk will open:
- November 26 (Tue.)  17:00 – 20:00
- November 27 (Wed.)  8:00 – 18:00
- November 28 (Thu.)  8:00 – 18:00
- November 29 (Fri.)  8:00 – 13:00
On-site registration fee will be payable by:
  1) Cash (JAPANESE YEN only)
  2) Credit Card (Visa, MasterCard, JCB, AMEX or China Union Pay)
Bank transfer, bank checks, or personal/traveler’s checks are not accepted.

Cancellation Policy
Until Oct. 25 2019, at 23:59 (JST), cancellation is accepted by writing to IDW ’19 Secretariat to obtain refunds for registration and reception. Please note that refunds will not be made under the following conditions:
- Cancellations received on and after Oct. 26, 2019
- No-shows
- Cancellations by presenters
- Cancellations by visa invitation letter applicants who have already received a visa invitation letter.

However, after IDW ’19 closes, a USB flash drive of the proceedings will be sent to the registrants who have paid the registration fees. If it becomes difficult to hold IDW ’19 due to the outbreak of infectious diseases or other unavoidable factors, we will substitute the IDW with the mail delivery of the IDW ’19 proceedings at a later date to all those who have registered and completed payment.
INQUIRIES
IDW ’19 Secretariat
c/o Bilingual Group Ltd.
3-3-6 Kudan Minami, Chiyoda-ku, Tokyo 102-0074, Japan
Phone:+81-3-3263-1345  Fax: +81-3-3263-1264
E-mail: idw@idw.or.jp

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• The Electrochemical Society of Japan
• Human Interface Society
• The Illuminating Engineering Institute of Japan
• The Imaging Society of Japan
• Information Processing Society of Japan
• The Institute of Electrical Engineers of Japan
• The Institute of Electronics, Information and Communication Engineers
• The Institute of Image Electronics Engineers of Japan
• International Electrotechnical Commission
• The Japan Ergonomics Society
• The Japan Society of Applied Physics
• The Japanese Liquid Crystal Society
• The Japanese Society for Artificial Intelligence
• The Optical Society of Japan
• The Society of Automotive Engineers of Japan
• The Society of Instrument and Control Engineers
• The Society of Polymer Science, Japan
• The Virtual Reality Society of Japan
• Vision Society of Japan

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For updated information, please visit our website,
https://www.idw.or.jp/
ACCOMMODATION
JTB Hokkaido Branch will handle arrangements for your hotel reservations.

Hotel reservations can be made at the IDW official website. https://www.idw.or.jp/accommodation.html

Hotel list and the rates are available on the Pullout of this Advance Program.

JTB Hokkaido Branch
Office Hours: 9:30-17:00 (Weekdays only)
Address: Urban Net Sapporo BLDG, 8th floor, North 1, West 6, Chuo-ku, Sapporo 060-0001

There will be an on-site travel information desk during the conference period to handle arrangements for transport.

VISAS
Visitors from countries / regions whose citizens must have visas should apply to the Japanese consular office or diplomatic mission in their respective countries / regions. For further details, please contact your travel agency or the local consular office in your country / region.

Attention: For some countries’ / regions’ citizens, official documents prepared by the secretariat will be needed. Please ask the secretariat at least two months before the conference.

RAIL PASS
Japan Railway (JR) provides the following economical passes. There are some restrictions on use, such as the lines and types of trains that can be used, and the length of validity. Please ensure you visit the following sites for more details.

• Japan Rail Pass
  An economical way to travel through all parts of Japan. This pass must be purchased before you leave your country.
  http://www.japanrailpass.net/en/

• Hokkaido Rail Pass
  An economical pass that lets you travel all around Hokkaido. This pass can be purchased before your departure or after you arrive in Japan.
  http://www2.jrhokkaido.co.jp/global/English/ticket/railpass/index.html

• JR East-South Hokkaido Rail Pass
  An economical pass that lets you travel from around Tokyo to Sapporo. This pass can be purchased before your departure or after you arrive in Japan.
  http://www.jreasthokkaido.com/easthokkaido/e/

• JR Tohoku-South Hokkaido Rail Pass
  An economical pass that lets you travel from Tohoku region to Sapporo. This pass can be purchased before your departure or after you arrive in Japan.
  http://www.jreasthokkaido.com/tohokuhokkaido/e/

CLIMATE
The average temperature in Sapporo during the period is around 4°C in the daytime and -5°C at night.
Sapporo City
Sapporo City in Hokkaido is the northernmost city designated by government ordinance in Japan with a population of around 2 million. Sapporo is known for the functional rectangular grid of streets and avenues as a city modeled after Kyoto. The word "Sapporo" is originated from the Ainu (indigenous people of Japan) language and is well known as the host city for the 1972 Winter Olympics. Dishes using local Hokkaido produce and seafood rank high amongst the many charms of Sapporo, as well as being known for the annual snow festival and YOSAKOI Soran Festival.

Places of Interest

Odori Park
Odori Park divides the city center into north and south. It stretches for about 1.5 km, covering 12 blocks, and the grounds around the TV tower located there provide an oasis for people living and working in the surrounding office district. In every corner of the park, you will find attractions, monuments, art work (including pieces by the famous Isamu Noguchi), play-areas, fountains, and of course the beauty of the seasonal flowers and trees. The park is home to 4,700 trees of 92 species such as lilacs, elms, Japanese zelkovas, azaleas and cherry trees. Many events are held here throughout the year including the world-famous Snow Festival.

Jozankei Onsen (Spa)
A 75-minute bus tour from JR Sapporo station takes you to one of the largest hot springs in Japan, Jozankei. The history of Jozankei dates back to 1866, when Miizumi Jozan, an ascetic monk, discovered the hot springs and opened a healing spa on the upper Toyohira River. The hot spring waters that bubble out of the ground at Jozankei spa resort contain sodium chloride, which is colorless, transparent, and mildly salty. These are common qualities of the water in Japanese spas.

http://jozankei.jp/en/

Susukino
Susukino is Japan's largest entertainment district north of Tokyo, however it is not an official designation of any municipality. There are said to be approximately 4,500 bars and restaurants, including Ramen Yokocho, a narrow lane lined with shops serving Sapporo's famous ramen.

Further information
Sapporo Official Travel Guide
http://www.welcome.city.sapporo.jp/english/
Access to Conference Site

Transportation information on this program may be changed. Please confirm the details with each airline and railway company. (as of August 7, 2019)
Sapporo Convention Center Map and Directions
For hotel rates and other information, please see the Pullout.
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Y. Oyamada Tottori Univ.
M. Shinohara Omron
Local Arrangement Member: K. Azuma Shimadzu
S. Yoshida Sharp
Exhibition Chair: Y. Hisatake Shizuoka Univ.
Exhibition Member: K. Azuma Shimadzu
K. Inoue Zeon
Financial Supporting Chair: Y. Hisatake Shizuoka Univ.
Financial Supporting Member: K. Azuma Shimadzu
K. Inoue Zeon
Senior Member: R. Hattori Kyushu Univ.
A. Mikami Kanazawa Inst. of Tech.
Members: I. Fujieda Ritsumeikan Univ.
Y. Fujisaki NHK
D. Gosain AKT
H. Hirata Toray Eng.
M. Inoue Huawei Techs. Japan
H. Kajiyama Tokushima Bunri Univ.
S. Kaneko
S. Kobayashi Sanyo Onoda City Univ.
H. Kuma Idemitsu Kosan
T. Kurita NHK Tech.
S. Maeda Tokai Univ.
K. Makita Canon
H. Mimura Shizuoka Univ.
H. Mori AGC
S. Naemura
Y. Nakai Toshiba
M. Nakata NHK
K. Nakatani Touchpanel Labs.
H. Okada Univ. of Toyama
Y. Sakamoto Hokkaido Univ.
H. Sakurai IBLC
A. Sasaki Kyoto Univ.
Y. Shimodaira Shizuoka Univ.
M. Suzuki
S. Takamura NTT
Y. Toko Stanley Elec.
T. Uchida Tohoku Univ.
H. Uchiike Saga Univ.
T. Wakimoto Merck PM
Y. Yamamoto ITAC
S. Yano Shimane Univ.
H. Yokoyama Kent State Univ.

PROGRAM COMMITTEE
Program Chair: M. Kimura Nagaoka Univ. of Tech.
Program Vice-Chair: M. Date NTT
H. Kominami Shizuoka Univ.
H. Kumomi Tokyo Tech
Program Secretary: K. Akamatsu Fujifilm
O. Akimoto Sony Semiconductor Solutions
K. Hara Shizuoka Univ.
N. Hashimoto Citizen Watch
M. Higuchi NIMS
Y. Hisatake Shizuoka Univ.
T. Honda Kogakuin Univ.
T. Ikuta JNC
T. Ishinabe Tohoku Univ.
H. Kato Sharp

16
Committee:
LCT  S. Oka  Japan Display
AMD  Y. Shibata  Tohoku Univ.
FMC  T. Nonaka  Merck PM
PH  N. Miura  Meiji Univ.
OLED  T. Tsuji  Nippon Steel Chem. & Material
3D  M. Katayama  NHK
VHF  Y. Imai  Mitsubishi Elec.
PRJ  K. Ohara  Marubun
EP  T. Fujisawa  DIC
MEET  J. Moon  Shizuoka Univ.
DES  Y. Oyamada  Tottori Univ.
FLX  M. Nakata  NHK
INP  M. Sato  Tokyo Tech
AIS  Y. Imai  Mitsubishi Elec.
3DSA  K. Yamamoto  NICT

Workshop on LC Science and Technologies
Workshop Chair:  K. Miyachi  JSR
Program Chair:  S. Oka  Japan Display
Program Vice-Chair:  Y. Iwashita  DIC
General Secretary:  T. Nose  Akita Pref. Univ.
Program Committee:  F. Araoka  RIKEN
M. Chida  Sharp
M. Funahashi  Kagawa Univ.
I. Hirosawa  JASRI
H. Ichinose  Merck PM
M. Inoue  TOYOtech
S. Ishihara  Osaka Inst. of Tech.
K. Ishikawa  Tokyo Tech
T. Ishinabe  Tohoku Univ.
S. Kawasaki  JNC Korea
A. Kubono  Shizuoka Univ.
H. Okada  Univ. of Toyama
S. Shibahara  Sony Home Entertainment
& Sound Prods.
T. Takahashi  Kogakuin Univ.
H. Yoshida  Osaka Univ.

Workshop on Active Matrix Displays
Workshop Chair:  K. Nomoto  Sony
Workshop Vice-Chair:  H. Minemawari  AIST
Program Chair:  Y. Shibata  Tohoku Univ.
General Secretary:  M. Shibazaki  Innolux
Program Committee:  Y. Fujisaki  NHK
H. Hamada  Kinki Univ.
S. Horita  JAIST
M. Inoue  Huawei Techs. Japan
Workshop on FPD Manufacturing, Materials and Components

Workshop Chair: H. Yamamoto Utsunomiya Univ.
Program Chair: T. Nonaka Merck PM
Program Vice-Chair: S. Namekawa Nippon PM
General Secretary: R. Yamaguchi Akita Univ.
Vice-Secretary: I. Amimori A51Tech
Program Committee: M. Arai ULVAC
A. Fujita JNC
Y. Inoue Corning Japan
K. Käläntär Global Optical Solutions
H. Kato Sharp
D. Matsuura Dai Nippon Printing
D. Ogomi Nitto Denko
S. Ohara AGC
Y. Saitoh Fujifilm
T. Sato Zeon
M. Shinohara Omron
T. Tsuzuki NHK
H. Wakemoto Nissan Chem.
Y. Yang V-Tech.

Workshop on Inorganic Emissive Display and Phosphors

Workshop Chair: Y. Nakanishi Shizuoka Univ.
Program Chair: N. Miura Meiji Univ.
General Secretary: N. Matsuda Toshiba Materials
Program Committee: K. Haru Shizuoka Univ.
T. Hisamune Mitsubishi Chem.
S. Itoh Futaba
D. Jeon KAIST
T. Kunimoto Tokushima Bunri Univ.
T. Kusunoki Dexerials
T. Miyata Kanazawa Inst. of Tech.
K. Ohmi Tottori Univ.
D. Poelman Ghent Univ.
T. Shiga Univ. of Electro-Commun.
K. Wani
R. Xie Xiamen Univ.

Workshop on OLED Displays and Related Technologies

Workshop Chair: T. Shimizu NHK
Program Chair: T. Tsuji Nippon Steel Chem. & Material
Program Vice-Chair: K. Kishino Idemitsu Kosan
General Secretary: K. Nakayama Osaka Univ.
Program Committee: C. Adachi Kyushu Univ.
M. Adachi Japan Display
S. Aratani Samsung Elect.
S. Enomoto Toshiba Infrastructure Sys. & Solutions
T. Fukuda Sekisui Integrated Res.
Workshop on 3D/Hyper-Realistic Displays and Systems

Workshop Chair: M. Tsuchida
Program Chair: M. Katayama
General Secretary: H. Mizushina
Program Committee:
- T. Fujii
- Y. Ichihashi
- T. Koike
- T. Nishitsuji
- J. Son
- C. Tsai
- M. Tsuboi
- H. Yamamoto
- K. Yamamoto
- S. Yano

Workshop on Applied Vision and Human Factors

Workshop Chair: S. Uehara
Program Chair: Y. Imai
General Secretary: J. Bergquist
Program Committee:
- Y. Endo
- M. Harasawa
- K. Hirai
- N. Hiruma
- Y. Hisatake
- T. Kurita
- K. Masaoka
- K. Morita
- Y. Nakamura
- G. Ohashi
- T. Sakamoto
- T. Shiga
- H. Ujike

Workshop on Projection and Large-Area Displays and Their Components

Workshop Chair: S. Ouchi
Program Chair: K. Ohara
Program Vice-Chair: S. Shikama
General Secretary: T. Suzuki
Vice-Secretary: O. Akimoto
Program Committee:
- K. Masaoka
- Y. Nakamura
- G. Ohashi
- T. Sakamoto
- T. Shiga
- H. Ujike

Program Chair: S. Shikama
Program Vice-Chair: T. Suzuki
General Secretary: M. Takaso
Vice-Secretary: O. Akimoto
Program Committee:
- K. Masaoka
- Y. Nakamura
- G. Ohashi
- T. Sakamoto
- T. Shiga
- H. Ujike

Program Chair: S. Shikama
Program Vice-Chair: T. Suzuki
General Secretary: M. Takaso
Vice-Secretary: O. Akimoto
Program Committee:
- K. Masaoka
- Y. Nakamura
- G. Ohashi
- T. Sakamoto
- T. Shiga
- H. Ujike
Workshop on Electronic Paper
Workshop Chair: K. Hashimoto E Ink Japan
Program Chair: T. Fujisawa DIC
Program Vice-Chair: N. Kobayashi Chiba Univ.
General Secretary: Y. Toko Stanley Elec.
Program Committee: M. Higuchi NIMS
Y. Hotta Ricoh
S. Maeda Tokai Univ.
M. Omodani Tokai Univ.
N. Roh Samsung Elect.
A. Suzuki Chiba Univ.
M. Wang Amazon Lab
G. Zhou South China Normal Univ.

Workshop on MEMS and Emerging Technologies for Future Displays and Devices
Workshop Chair: M. Nakamoto Shizuoka Univ.
Program Chair: J. Moon Shizuoka Univ.
Program Vice-Chair: Y. Nakai Toshiba
General Secretary: T. Ichihara Panasonic
Vice-Secretary: T. Komoda Yamagata Univ.
Program Committee: T. Akinwande MIT
Z. Alpaslan Ostendo Techs.
G. Barbastathis MIT
I. Bita Apple
Y. Bonnassieux Ecole Polytechnique
V. Bulovic MIT
S. Chen Southern Univ. of S&T
S. Coe-Sullivan Luminit
B. Cossairt Univ. of Washington
Y. Dong Univ. of Central Florida
J. Drolet Osram
M. Esashi Tohoku Univ.
G. Fern Brunel Univ.
A. Flewitt Univ. of Cambridge
H. Fujita Univ. of Tokyo
K. Gahagan Corning
M. Hasegawa Huawei Techs. Japan
P. Holloway Univ. of Florida
J. Jang Kyung Hee Univ.
P. Kathirgamanathan Brunel Univ.
Workshop on Display Electronic Systems

Workshop Chair: H. Okumura Toshiba
Program Chair: Y. Oyamada Tottori Univ.
General Secretary: R. Tanida NTT
Program Committee:
- H. Fujine Sharp
- R. Hattori Kyushu Univ.
- K. Käläntär Global Optical Solutions
- L. Kerofsky InterDigital Communs.
- T. Kishigami Mitsubishi Elec.
- H. Koo Minghsin Univ. of S&T
- O. Kwon Hanyang Univ.
- C. Lu Nat. Tsing Hua Univ.
- K. Makita Canon
- K. Morita Chuo Univ.
- K. Nakajima Tianma Japan
- H. Nam Kyung Hee Univ.
- H. Nitta Japan Display
- R. Oke Panasonic Liquid Crystal Display
- S. Ono Apple
- A. Sakaigawa Huawei Techs. Japan
- T. Sato AIST
- K. Sekiya Kanagawa Inst. of Tech.
- S. Takamura NTT

Workshop on Flexible Electronics

Workshop Chair: T. Kamata AIST
Program Chair: M. Nakata NHK
General Secretary: H. Endo NEC
Program Committee:
- K. Akamatsu Fujifilm
- T. Eguchi Sumitomo Bakelite
- H. Fujikake Tohoku Univ.
M. Funahashi Kagawa Univ.
T. Furukawa Yamagata Univ.
K. Goda Sanyo Onoda City Univ.
H. Hirata Toray Eng.
M. Ito Toppan Printing
M. Kimura Nagaoka Univ. of Tech.
H. Maeda Dai Nippon Printing
Y. Mishima AIST
A. Miyamoto Univ. of Tokyo
T. Nagase Osaka Pref. Univ.
A. Nakazawa AGC
T. Sekitani Osaka Univ.
T. Shiro Teijin
T. Tomono Toppan Printing
K. Uemura Nippon Steel
Y. Uraoka NAIST

Workshop on Touch Panels and Input Technologies
Workshop Chair: N. Hashimoto Citizen Watch
Program Chair: M. Sato Tokyo Tech
Program Vice-Chair: M. Konyo Tohoku Univ.
Y. Sugita Sharp
General Secretary: H. Haga Tianma Japan
Program Committee: J. Akita Kanazawa Univ.
K. Imoto Toshiba
M. Inoue Huawei Techs. Japan
H. Koo Minghsin Univ. of S&T
K. Nakatani Touchpanel Labs.
H. Okumura Toshiba
T. Ono Mitsubishi Elec.
Y. Sasaki Mitsubishi Elec.
Y. Tanaka Nagoya Inst. of Tech.
S. Uchino Japan Display
K. Yamazaki Corning Japan

Topical Session on Artificial Intelligence and Smart Society
Session Chair: M. Kimura Ryukoku Univ.
Program Chair: Y. Imai Mitsubishi Elec.
General Secretary: H. Haga Tianma Japan
Program Committee: K. Käläntär Global Optical Solutions
H. Yamamoto Utsunomiya Univ.

Topical Session on the 11th International Conference on Three Dimensional Systems and Applications
Session Chair: S. Suyama Tokushima Univ.
Session Vice-Chair: J. Kim ETRI
H. Lin Nat. Taiwan Univ.
Program Chair K. Yamamoto NICT
Program Vice-Chair: C. Huang Nat. Kaohsiung Univ. of S&T
G. Lee ETRI
General Secretary: H. Sakumoto Tokushima Univ.
Y. Sakamoto Hokkaido Univ.
Program Committee: A. Ando Toyama Univ.
H. Ando NICT
H. Chang Nat. Yunlin Univ. of S&T
C. Chen Nat. Chiao Tung Univ.
C. Chen Nat Taiwan Univ. of S&T
C. Chen Nat. Chiao Tung Univ.
W. Cheong ETRI
B. Choi KETI
Special Topics of Interest on AR/VR and Hyper Reality
Facilitator: Y. Oyamada Tottori Univ.
Program Committee:
LCT S. Oka Japan Display
FMC H. Yamamoto Utsunomiya Univ.
3D M. Tsuchida NTT
VHF T. Shibata Tokyo Univ. of Social Welfare
PRJ K. Ohara Marubun
DES Y. Oyamada Tottori Univ.
INP Y. Sugita Sharp
3DSA K. Yamamoto NICT

Special Topics of Interest on Automotive Displays
Facilitator: K. Morita Chuo Univ.
Program Committee:
LCT K. Miyachi JSR
FMC H. Yamamoto Utsunomiya Univ.
OLED K. Kishino Idemitsu Kosan
3D M. Tsuchida NTT
VHF Y. Imai Mitsubishi Elec.
PRJ K. Ohara Marubun
DES K. Morita Chuo Univ.
INP Y. Sugita Sharp
3DSA K. Yamamoto NICT

Special Topics of Interest on Micro/Mini LEDs
Facilitator: T. Honda Kogakuin Univ.
Program Committee:
LCT K. Miyachi JSR
AMD K. Nomoto Sony
FMC H. Kato Sharp
PH N. Miura Meiji Univ.
MEET J. Moon Shizuoka Univ.

Special Topics of Interest on Quantum Dot Technologies
Facilitator: T. Ikuta JNC
Program Committee:
LCT S. Oka Japan Display
FMC T. Nonaka Merck PM
PH N. Miura Meiji Univ.
OLED T. Tsuji Nippon Steel Chem. & Material
MEET J. Moon Shizuoka Univ.

SUPPORTING MEMBERS (as of August 7, 2019)
EIZO Corporation
JAPAN BROADCASTING CORPORATION
JNC Corporation
Merck Performance Materials Ltd.
Tianma Japan, Ltd.
TOKYO ELECTRON LIMITED
ULVAC, Inc.
Zeon Corporation

FINANCIAL SUPPORTING ORGANIZATIONS (as of August 7, 2019)
Applied Materials, Inc.
Japan Display Inc.
NICHIA CORPORATION
Sharp Corporation
Sony Corporation
# IDW '19 Workshop Timetable

<table>
<thead>
<tr>
<th>Date</th>
<th>Lobby</th>
<th>Conference Hall</th>
<th>Mid-Sized Hall A</th>
<th>Mid-Sized Hall B</th>
<th>Room 107</th>
<th>Room 108</th>
<th>Small Hall</th>
<th>Room 204</th>
<th>Room 206</th>
<th>Room 207</th>
<th>Main Hall</th>
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<td><strong>Tue., Nov. 26</strong></td>
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<td><strong>Registration</strong></td>
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<td><strong>Evening Get - Together at Sora (1F)</strong></td>
<td>18:00 - 20:00</td>
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<td><strong>Wednesday, November 27</strong></td>
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<td><strong>Registration</strong></td>
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<td><strong>Opening, Keynote &amp; Invited Addresses</strong></td>
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<tr>
<td><strong>Break</strong></td>
<td>VHF3/DES3 17:00 - 18:30</td>
<td>AMD3 17:00 - 18:35</td>
<td>LCT3 17:00 - 18:30</td>
<td>FLX3/MC3 17:00 - 18:30</td>
<td>PRJ3/3DSA3 17:00 - 18:30</td>
<td>OLED3 17:00 - 18:30</td>
<td>AIP3 17:00 - 18:30</td>
<td>OLED2 17:00 - 18:30</td>
<td>AIP2/S2 17:00 - 18:30</td>
<td>OLED3 17:00 - 18:30</td>
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<td><strong>Author Interviews</strong></td>
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<td><strong>Reception at Conference Hall (1F)</strong></td>
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<tr>
<td><strong>MEET1</strong></td>
<td>9:00 - 10:30</td>
<td>FMC4/LCT4 9:00 - 10:20</td>
<td>AMD4 9:00 - 10:15</td>
<td>EP2/DES4 9:00 - 10:35</td>
<td>PRJ2† 9:00 - 10:32</td>
<td>PRJ2† 9:00 - 10:32</td>
<td>OLED4 9:00 - 10:20</td>
<td>OLED4 9:00 - 10:20</td>
<td>INP3 9:00 - 10:15</td>
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<td><strong>Exhibition</strong></td>
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<td><strong>Author Interviews</strong></td>
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<tr>
<td><strong>Innovative Demonstration Session</strong></td>
<td>LCTp, AMDp, FMCp, PRJp, OLEDp, MEETp, 3Dp, 3DSAp, 10:40 - 13:10</td>
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<tr>
<td>**LCTp, AMDp, FMCp, PRJp, OLEDp, MEETp, 3Dp, 3DSAp, 14:30 - 17:00</td>
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<tr>
<td><strong>MEET3</strong></td>
<td>9:00 - 10:20</td>
<td>LCT5/FMC5 9:00 - 10:15</td>
<td>AMD5 9:00 - 10:30</td>
<td>FLX5 9:00 - 10:15</td>
<td>PRJ4 9:00 - 10:20</td>
<td>PRJ4 9:00 - 10:20</td>
<td>3DGA/3DS5 9:00 - 10:20</td>
<td>3DGA/3DS5 9:00 - 10:20</td>
<td>INP5 9:00 - 10:35</td>
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<td><strong>Author Interviews</strong></td>
<td>12:10 - 12:40</td>
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<td><strong>Author Interviews</strong></td>
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</tbody>
</table>

† Including Short Presentations
<table>
<thead>
<tr>
<th>Topic</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
<th>A.I.</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
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</thead>
<tbody>
<tr>
<td>3D/4K Hyper-Realistic Displays (3D/4KAR)</td>
<td>13:40-</td>
<td>15:20-</td>
<td>17:00-</td>
<td>18:30-19:00</td>
<td>19:00-</td>
<td>15:40-19:10</td>
<td>19:40-</td>
<td>17:00-</td>
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<tr>
<td>Active-Matrix Displays</td>
<td>14:50-</td>
<td>17:00-</td>
<td>18:30-19:00</td>
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A.I.: Author Interviews
*: Joint Session
# IDW '19 Special Topics of Interest Navigator

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<th>Time</th>
<th>AR/VR &amp; Hyper Reality</th>
<th>Automotive Displays</th>
<th>Micro/Mini LEDs</th>
<th>Quantum Dot Technologies</th>
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**Wednesday, Nov. 27**

**PM**

- **13:40**
  - PRJ1/FMC1: AR/VR

**15:20**

- **LCT2:** LC Flat
  - Diffusive Optics
  - 15:20 - 15:50

**17:00**

- **VHF3/DES2:** Virtual Reality
  - 17:00 - 18:30

**Thursday, Nov. 28**

**AM**

- **9:00**
  - INP3: Haptic Technologies (1)

**10:40**

- **3DSE1/3DSE2:** Virtual Reality
  - 10:40 - 12:00

**PM**

- **14:30**
  - PRJ3: Image Quality & Display Design

- **17:20**
  - PRJ4: Image Quality & Display Design
  - 17:20 - 18:40

**Friday, Nov. 29**

**AM**

- **9:00**
  - INP5: AR/VR Interactive Technologies

**10:40**

- **3D5A/3D5B:** Virtual Reality
  - 10:40 - 12:00

**PM**

- **15:00**
  - PRJ7: Eyewear

- **17:20**
  - PRJ8: Automotive Display
  - 17:20 - 18:40

**Conference Hall B(1F)**

- **IPR:** Micro/Mini Displays & Nanotechnology
  - 13:30 - 14:40
The registration fee includes admission to the conference and a USB flash drive of the proceedings. In addition, a printed Final Program including abstracts of each paper will be provided at the conference site. No refunds will be made on and after October 26, 2019. All dates and hours indicated here are in Japan Standard Time.

(2) Reception Fee
Until October 25 ¥8,000
On and After October 26 ¥10,000
One free ticket will be provided to each invited speaker.

(3) Additional Proceedings (USB flash drive)
At the Conference Site ¥8,000
Airmail after the Conference ¥12,000
Domestic Mail after the Conference ¥10,000

(4) Payment
1) e-Registration (Deadline: November 15, 2019)
Access https://www.idw.or.jp/regist.html
2) On-site

**Accommodations**
JTB Hokkaido Branch will handle arrangements for your hotel reservations.
Room rates include breakfast, service charge, and consumption tax.

**Reservation**
Access https://www.idw.or.jp/accommodation.html

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<td>¥18,500 ~¥19,800</td>
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**Cancellation Policy**
4 or more days prior to the first night of stay .......... No charge
3 to 1 day before the first night of stay .......... 20% of daily room rate
On the first night of stay .......... 50% of daily room rate
On the first night of stay (after check-in) or no notice given .......... 100% of daily room rate