

2024 International Conference on Display Technology



Final Call for Papers

ICDT International Symposium
March 29–April 1, 2024

ICDT

International Conference on Display Technology

Special Topics

- ❖ Advanced TFT
- ❖ Printed Displays
- ❖ VR/AR/MR and Metaverse
- ❖ Mini/Micro-LED Display and HISID (Highly Integrated Semiconductor Information Display)
 - ❖ Light Filed Display
 - ❖ Flexible Electronics and Display
 - ❖ Quantum Dots and Related Display
 - ❖ Vehicle Display
- ❖ Green and Intelligent Display Manufacturing

Hefei, Anhui, China

www.sidicdt.org

Technical Summary Format and Submission Requirements

Thank you for submitting a technical summary to ICDT 2024. Please follow the instruction & guidelines prior to submitting. The format guideline is as follows:

Number of pages allowed for the paper is ONLY 1 page, and the authors are required to narrow down the content of whole paper into one full page summary. All authors are required to upload their technical summary to the online submission system (www.sidicdt.org). Please prepare your paper in both PDF format and MS Word for the submission. We wish to give this Technical Summary a consistent, high-quality appearance. We therefore ask that authors follow some simple guidelines.

The body text of your submission should be 10 pt. Times New Roman, single spaced with an additional 4 points of space at the beginning of each paragraph. However, when typing complicated mathematical text, it is important to increase the space between text lines in order to prevent sub- and super-script fonts overlapping one another and making your electronic version completely displayed.

Figures and tables should appear after where they are cited. Figure captions should appear centered under the corresponding figure and set in 10 pt. Helvetica or Arial Bold. Use the abbreviation “Fig. 1,” even at the beginning of a sentence in the body text. Figures may be full color. All colors will be retained on the USB Proceeding. Figures must not use stipple fill patterns because they may not be reproduced properly. Please use only SOLID FILL colors which contrast well on screen, as shown in Fig. 1.

Tables should be presented in the form shown in Table 1. Table captions should appear centered above the corresponding table and be set in 10 pt. Helvetica or Arial Bold. Wide tables and figures should be placed at the top or bottom of the page that they are mentioned. Not within the middle of a page with text above and below.

Equations are placed in center. If they are numbered, make sure that they are numbered consecutively. Place the numbers in parentheses. Flush with the right-hand margin of the column.

Images in your document should be at least 300 or 600 dpi for quality reproduction and saved as .tif images (or other compatible format that supports print quality resolution). When creating or revising your images for inclusion in the paper, we recommend choosing CMYK (and not RGB) as the color profile.

Please submit a technical summary to <https://www.cvent.com/c/abstracts/80acfd29-4e7a-4760-b63d-16e200bf2fec>

The conference program committee will select three distinguished papers and ten best student papers. The leading author of the distinguished papers will be awarded one-year free SID membership and the leading author of the best student papers will be awarded the bonus.

We wish you the best of luck, and we hope to see you all at ICDT 2024.

For more information about ICDT 2024, please visit www.sidicdt.org

Deadline and Key Dates

The deadline for technical summary submission is **December 3, 2023**.

Technical summary will be submitted to each technical committee for review and will be decided either to be accepted (oral presentation or poster presentation) or rejected.

Notification of acceptance or rejection will be sent via an e-mail to the corresponding author by **December 22, 2023**.

The deadline for submission of the full paper is **February 25, 2024**. The full paper shall consist of four pages, including all illustrations.

After reviewing by ICDT technical committee, accepted papers will be published in **ICDT 2024 proceedings** for the purpose of tracking talks during ICDT. With the author's consent, the paper in the proceedings will be published at **SID International Symposium Digest of Technical Papers (EI searchable)** at **Wiley Online**. Submitted paper of ICDT will also be selected to be published at **Journal of the Society for Information Display (JSID) (SCI searchable)**.

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As part of the technical symposium covering the broad range of information display topics listed, ICDT 2024 will feature topical sessions which focus specifically on selected issues or key developments. Paper submissions are welcome for any of the general symposium topics or for any of the specific topical sessions described below.

Active Matrix Devices

1. TFTs of New Materials and Processing Technologies

Metal oxide semiconductors with different compositions are continuing to be improved in terms of mobility, stability, uniformity and ease of processing. In the meantime, other alternative semiconductors are also attracting interests for low cost, flexible or high performance TFT backplanes, including organics, 1D/2D materials, and composite materials. Papers on TFTs made of these new semiconducting materials with new device structures or processing approaches for scalable manufacturing, and integration in active matrix display panels are solicited. TFT devices and backplanes, by printing or coating processes with chemical compatibility, dimensional-tolerance control during process and during usage are encouraged.

2. High-Performance TFTs & Active-Matrix Displays

The trend of display technology is moving to higher resolution with larger pixel numbers and higher pixel density, and faster frame rate for ideal visual experience. Therefore, many technical issues need to be addressed for TFT device and backplane technologies. LTPS and oxide TFTs with higher mobility, smaller feature sizes and less parasitic capacitances, high density pixel circuits, approaches for solving the RC delay issues, and any related technologies are solicited.

3. TFT Device Physics, Characterization and Modeling

Understanding the carrier transport mechanisms, source/drain contact and dielectric/semiconductor interface properties is important for development of semiconductor material, device structures and processing techniques to achieve high performance and reliable TFTs. Moreover, with accurate physically-based compact models of TFTs, it will enable expedient circuit simulation that accurately and reliably predicts system behaviors. Device physics, characterization and compact modeling for various TFT technologies including LTPS, Oxide and organic TFTs are all solicited. Especially, reliability characterization and understanding of TFTs under electrical bias, temperature and light stresses to meet the display operation are encouraged.

4. Pixel Circuits and Backplane for Current Driving Displays

OLED displays have been of focus in the display industry for their superb image quality and suitability for flexible or curved applications with slim form factor. AMOLED

displays must deal with issues such as mura, aging, image retention, and power consumption. Other current driving displays such as QLED and micro-LEDs also show great potential for certain applications. Papers related to pixel integration structure, pixel circuit design, peripheral circuitry, and driving schemes, with an emphasis on reducing mura, aging and image retention issues, and reducing power consumption are solicited.

5. Novel TFT Circuits and Hybrid TFT Integration

Development of high performance TFTs enables the monolithic integration of peripheral driver circuits and other novel functions onto the active-matrix-display panels. Hybrid TFT integration would be able to combine the advantages of various TFT technologies. Papers on design and fabrication of TFT based circuits or systems allowing for such display system-on-panel integration are solicited. New circuit designs for high density and reliable operation are encouraged. Papers on new concepts and process implementation of hybrid TFT integration are solicited.

6. Active-Matrix Displays with Integrated Sensors

Active-matrix displays with in-cell touch sensors become popular. Finger print and force touch sensors start to be integrated under/in/on display panels. Papers on new integrated sensor concepts, the state of the art of active-matrix displays with integrated sensors are solicited. Papers that describe clearly the integration structures, processes, pixel circuits, and readout electronic circuits for achieving the required performance are encouraged.

7. New Applications of TFTs and Related Active-Matrix Devices

Various TFT technologies are being explored for new applications beyond displays, including sensors in IoT, and neuromorphic computing. Papers on using TFTs for different new applications beyond displays, including device design, processing, TFT interfacing with nanostructured or biological sensing materials, system implementation and actual measurements are solicited.

Applied Vision

1. Display, Lighting and Visual Health

The topic covers the functional endpoints, methodologies and technologies for quantitatively assessing the functional performance of human observer, especially for the occurrence and development of myopia under the influence of the displays and the ambient lighting. Papers on how normal or abnormal visual systems being

affected by different visual displays or lighting systems are also solicited.

2. Virtual/Augmented/Mixed Reality Visual Perception

The topic covers the research on different types of virtual reality technology, including virtual/augmented/mixed reality, and the study on the relationship between the application of them, and the relationship with visual perception are especially solicited.

3. Light Environment Perception and Design of Lighting and Display Integrated

The integrated lighting and display constitutes the light environment of which human lived in. Perception and design can decrease the influence of the environment to people in some extent. The topic of research on the perception of this environment and the design investigation are solicited.

4. Color Vision and Perception

The topic covers the neural underpinnings and models of human color vision, the characteristics of color perception, and the factors affecting color perception. Papers on the relationship of color and vision are solicited.

VR/AR/MR & Metaverse

Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) are emerging technologies and next generation terminals for Metaverse. The session will focus on the enabling technologies and devices including near-eye micro-display, light-field display, display optics, waveguide, imaging and video processing, interactive sensors as well as the 3D content generation, modeling and rendering for the applications in Metaverse.

1. Display Technologies for VR/AR/MR

Papers on near-eye and micro-display technologies such as fast-LCD, MicroOLED, MircoLED, Stereoscopic display, fiber and retinal scanning display and the related techniques for Head Mounted Display (HMD) are solicited.

2. Display Optics, Sensors and Interaction for VR/AR/MR

Papers on near-eye display optics such as microlens, waveguide, holographic, grating, metalens, metasurface, sensors, scanning and tracking, localization, mapping, and end-to-end system integration are solicited.

3. 3D Generation, Rendering and Modeling Technologies for VR/AR/MR and Metaverse

Papers on light-field capture, 3D imaging and panoramic video recording, 3D avatar modeling and rendering, 3D reconstruction and interaction are solicited. Papers

addressing the related technical issues of computation, graphics, immersive audio are also encouraged.

4. Metaverse and Digital Twin (DT) Technologies and Applications

Papers on applications of VR/AR/MR, Metaverse and Digital Twin (DT) in industry, medical education and military etc. are solicited.

5. The Standardization and Performance Evaluation of VR/AR/MR Products and Systems

The physical and optical properties of VR/AR/MR HMD displays are different from traditional real image displays (e. g., LCD and OLED displays, projection displays, etc.), which makes it difficult to design characterization methods that deliver consistent understanding in the industry. Papers on the evaluation and measurement methods, and standardization for optical characteristics and image quality of VR/AR/MR devices are solicited, especially the quantification methods related to the immersion and vertigo are encouraged.

Display Applications

1. New Applications of Flat Panel Displays

The flat panel displays are being developed to be of larger size, higher resolution, better picture quality, faster refresh rate, and become thinner and flexible. Papers on new or emerging applications of flat panel displays based on these advanced features for consumer electronics, automotive, medical and military industry are solicited.

2. Applications of 3D Display

Papers on applications of 3D, stereoscopy, and holography display technologies for medical modeling, CAD, entertainment and movie industry are solicited. Discussions on current barriers for mainstream product applications and the solutions are especially encouraged.

3. Applications of Wearable Displays

Wearable displays are demanded in wide range of applications including smart watches, exercise bands, talk bands, kid watches, wrist bands, as well as near-the-eye devices. These devices need to be comfortable and stylish to be worn, as well as convenient for the users to access the information. Therefore, in addition to the conventional requirements, wearable displays should be of light weight, low power, good outdoor readability and low cost. Papers on assessment, design, and system integration of the displays for wearable applications are solicited.

4. Environmental Impacts on Display Applications

With further development of various display technologies, "display everywhere" is going to happen. Papers on assessment of the display performance under different

environmental conditions, and the design considerations are solicited.

5. Foldable Display

Foldable display has entered mass production since 2019, which has generated many new applications, such as the integration of tablet and mobile. Meanwhile, it has also brought a lot of new technical challenges, such as how to better match the display and hinge, how to protect the display. Papers on the innovative application, interaction solution, system integration of foldable display are encouraged.

6. Non-conventional and Special Displays

Papers on applications of the displays in non-conventional and special application fields (super large size public information displays, free form displays, etc.) are solicited. Papers on analysis of the special requirements and issues for these applications, and solutions in terms of display design, manufacturing, and system integration are encouraged.

Display Electronics

1. Display Drivers and Driving Technologies

Advances of display technologies with requirements of higher refresh rate, larger size, higher bit-depth, and crisp rendition of moving images have brought challenges for driver design. Additionally, the self-emissive displays (e.g. Micro-LED, mini-LED, AMOLED) cause different design considerations for the driving schemes compared to the conventional LCD displays. Papers on advanced driving schemes, driver architectures, driver circuit design, and display ASICs to provide the best image quality for various types of displays are solicited.

2. Image/Video Capture and Processing

Image quality remains one of the most important market drivers for any display applications. The image quality on the displays can be optimized by improving the display device itself as well as by applying suitable image- and video-processing algorithms. The processing algorithms depend on the nature of content captured as well as the characteristics of the display used. Papers addressing image/video capture, display-specific video-processing algorithms and circuits are solicited. General processing includes, but is not limited to Video (de)coding, noise reduction, super-resolution, video enhancement by AI, and 8K video interface. In particular, papers on new image/ video capture and processing methods to address various issues (e.g. motion-artifact reduction, viewing-angle improvement, lifetime improvement, etc.) are solicited.

Display Measurement

1. Optical Characterization and Measurement of High-Dynamic Range and Wide-Color-Gamut Displays.

High-dynamic-range (HDR) and wide-color-gamut (WCG) display technologies are developing rapidly. HDR and WCG image capture, transmission, and display enable an unparalleled visual experience. Papers are solicited for the characterization and metrology of these new systems. Methods for establishing perceptually meaningful and sensible metrics for EOTF (gamma) and color volume are of special interest.

2. Measurement Methods for Near-to-Eye Displays for AR, VR, and Other Applications

Applications such as augmented reality (AR), virtual reality (VR), TV, and medical imaging impose unique demands on the specific display technology and the methods used to characterize their performance. Certain display types such as near-to-eye and projection, for instance, use complex optical systems that require unique characterization considerations. Papers describing methods, experiences and results in this area are welcome.

3. Optical Characterization and Measurement of Light-Field and 3D Displays

Numerical optical models are often used to aid the design process for new displays. This is exactly the same for Light-Field and 3D displays. Papers are solicited which explore the theory of these optical models and correlate the models against measured results, especially for light-field and 3D displays.

4. Display Measurements Method and Standards; Instrument Calibration and Verification

Organizations such as the ICDM, ISO, IEC, and CEA are constantly proposing new methods and concepts in the field of display measurement to address characterization issues brought about by new technologies and applications. Authors are encouraged to submit papers that explore the performance and correlation of proposed methods from current or future international standards. The field of display metrology benefits from the growing number of instrument developers and new devices. These benefits come with the challenge of verifying the accuracy and traceability of new instruments, as well as their suitability for a given task. Of special interest are procedures and simple diagnostics for on-site calibration. Authors are encouraged to submit papers which describe their recent work in calibrating, testing, and validating new instrumentation.

Display Manufacturing

1. Manufacture of TFT Devices, Arrays, and Circuits

Papers are solicited on the topics related to the technical

challenges associated with the manufacturing processes of displays backplanes based on a-Si TFTs, LTPS TFTs, oxide TFTs, and organic TFTs.

2. Manufacture of LCDs and Other Non-Emissive Display Panels

Papers are solicited on the topics related to the manufacturing of LCDs, LCOS, MEMS based displays, and other non-emissive display panels.

3. Manufacture of OLEDs and Other Emissive Display Panels

Papers are solicited on the topics related to the manufacturing of emissive displays, such as OLEDs, quantum-dot LEDs, and so on.

4. Display Module Manufacturing

Papers are solicited on the display module manufacturing processes, including cutting, polarizer attachment, encapsulation techniques, interconnect technologies, etc.

5. Display Material and Component Manufacturing

Papers are solicited on the material developments to support display manufacturers, including substrates, targets, gases, photo resists, photo masks, etchants, liquid crystals, organic light emitting materials, seals, PI, ACF, ICs, PCBs, polarizers, backlights, touch panels, etc.

6. Display Manufacturing Equipment

Papers are solicited on the development and application of new designs or unique adaptations of equipment for the manufacture of displays, including array, cell, OLED, module, and roll to roll processing.

Display Systems

1. Novel Display System Technology

New and unconventional display systems of today are building blocks for the products of tomorrow. From micro displays to handhelds to wall displays to projection systems to vehicle display, all sizes and novel approaches are of interest. Papers are solicited that describe new concept display systems and may include novel devices, integration, image/video processing, artificial intelligence, real-time controlling or monitoring of operations, and system evaluations.

2. Mini-LED Backlight Module and Novel Backlight Technology

The Mini-LED backlight technology has developed rapidly in recent years. The technologies based on Mini-LED backlight module emerge one after another, such as POB, COB, COG and the technologies related to Mini-LED chips, drivers, materials and schemes. A backlight is an indispensable device for transmissive or transreflective

LCDs. Papers on the following technologies are solicited: new-type LED backlight technology, flexible BLUs, narrow margin BLUs for cell phones, direct-view or edge-lit BLUs for LCD TV and monitors, and novel BLUs' component such as light source, films and light guide plate.

3. Display Interactive Technology and 3D Holographic Technology

Display-based human-computer interactive technology is an important development direction in the future, among which visual and non-visual technology with the function of perception and interaction has been widely applied in recent years, such as voice interaction, gesture interaction, TOF technology, infrared perception technology, laser radar technology, low light level technology, etc., which may be applied in the future display interactive function. Interaction is often inseparable from 3D technology, based on the application of 3D holographic technology in display, is also an important direction of the development of display system in the future

4. System Technologies for AI, IC, OS and APP

As the core technology of intelligent display system, intelligent chip and operating system are being paid more and more attention. Papers on the following technologies are solicited: new display Soc chip, artificial intelligence chip, operating system, edge computing and application software. Artificial intelligence algorithms, super resolution technology, image enhancement and deep learning technologies.

5. High Speed Interface and Transmission Technology:5G

With the ultra high definition display, the huge amount of display data transmission requires faster and simpler multimedia interfaces and transmission technologies: HDMI, DisplayPort, 12g-sdi, optical fibre, 5G, ultra hd remote network transmission system, etc.

6. Audio Technology、Video Technology

Papers on the following technologies are solicited: image acquisition, video encoding and decoding algorithm, and application implementation based on FPGA and ARM. Display system audio technology and stereo system.

Emissive Display, MicroLED, and Quantum Dots Display (EMQ)

1. Micro/Mini-LED Displays

As an emerging and promising class of emissive display technology, Micro/Mini LEDs have been attracting extensive interests and shown great display application prospects. Research has been widely conducted on devices, Metrology, Materials, and Manufacturing levels. Papers concerning the technology and applications of Micro/Mini LED are solicited.

2. Quantum Dot Materials and Its Photoluminescence

With the wide-color-gamut drive in displays, we see a great increase in quantum-dot research and applications, especially for backlight and color conversion layers in various display forms. Papers are solicited over a wide range of topics related to colloidal quantum dots and quantum rods, including physics, chemistry, material synthesis, passivation, and film, tube/bar and their photoluminescent applications.

3. Quantum Dot Light Emitting Diode Devices (QLEDs)

Due to ease for solution processed protocols and intrinsically narrow full width at half maximum, QLEDs gained significant amount of momentum during last couple of years. More and more impressive progress in terms of performance and durability has been recently reported. Extensive research has been widely conducted by tuning key functional layers, device structures and processing. Papers concerning the fundamental device mechanisms, performance enhancement and various applications, are solicited.

4. Unconventional and Emerging Emissive Display Materials and Technologies

Advances in materials, process, design, and function of emissive displays, including perovskite materials, inorganic EL displays, field-emission, plasma and phosphors are sought. Papers concerning the technology and applications of all emerged emissive display technologies are solicited.

E-paper and Flexible Displays

1. Critical Components of Foldable Displays

Foldable displays can be regarded as an updated version of flexible OLED display, which attracts increasing interest from the display community. Developing foldable displays from robust and rollable counterparts requires more critical materials, components, and techniques, e.g., highly transparent and flexible electrodes, low-film-resistance light-emitting layer, matched manufacturing processes, etc. Papers related to relevant research are highly desired.

2. Fabrication of Flexible Displays

For the fabrication of flexible displays, papers and research work concerning industrial manufacturing, equipment, high throughput and low-cost printing and related techniques are highly desired. Other topics related to conventional and unconventional micro-nano fabrication processes for flexible displays (e.g., photolithography, nanoimprinting, softlithography, etc.) are also welcome.

3. Stretchable and Deformable Displays

Flexible, stretchable, deformable displays offer diversified visualization techniques for the developing direction of future display techniques. Papers concerning stretchable and deformable active matrix, FET arrays, LED arrays, interconnections, and related electronic materials/devices are solicited. Research topics focusing on novel processing techniques or facilities for achieving stretchable electronic devices are also welcome.

4. Flexible Sensors and Beyond

With the development of flexible displays, flexible or soft sensors have also been highly desired in information and display industry for future flexible interactive systems. Different types of flexible sensors, sensing materials, and devices have been rapidly developing. Papers are sought on all manner of flexible or wearable touch and other environmental or bio-sensors, electronic-skin sensors, flexible display interfaces, and novel applications or uses for flexible electronics.

5. E-Paper Displays

Electronic paper (e-Paper) combines the benefits of ink on paper with the rewritability of an information display. Papers are sought on both rigid and flexible displays employing electrophoretic, electrowetting, flexible Ch-LCDs, MEMS, and other novel reflective displays.

Liquid-Crystal Technology

1. LC Optics in AR/VR/MR Applications

LC optical elements are widely applied in virtual reality, augmented reality, and hybrid reality technologies, such as spatial light modulators, adaptive lenses, diffractive optical devices, optical waveguides and tunable filters. Among them, there is a great demand for spatial light modulator, LC lens and LC polarizer grating used in VR, AR and MR display. The research of LC optical elements, including novel materials, device physics, new processes and applications are encouraged.

2. High Perceptive LCDs

High perceptive LCD technology is to face the human body's cognition of nature, to enable the display to reproduce the natural state with high quality in terms of display characteristics, and to enable people to obtain perfect viewing perception when watching the display. In this session, high quality image display is realized from the aspects of wide color gamut, high contrast ratio, high resolution, wide viewing angle, fast response speed, high environmental adaptability and low Gamma shift. This topic covers liquid crystal technologies and materials for rapid response, ultra-low surface reflection and local-dimming technologies for high contrast ratio, various technologies for improving color gamut and gamma shift, and various technical solutions for obtaining high

resolution and wide viewing angle. All research on new materials and technologies that can improve the quality of display images are encouraged.

3. LC Phase Modulator and Beamforming Device

LC Phase Modulator and beamforming device have been widely used in many photonic applications, such as spatial light modulators, adaptive lenses, diffractive optics, lasers, tunable filters, and microwave and terahertz phase shifters. In particular, the phase modulation and/or the high diffraction efficiency based on LCoS for holographic applications and WSS are in great demand. Original papers addressing advanced materials, device physics, and new applications that may relate to LC phase modulator and beamforming device are all encouraged.

4. Smart Windows

Liquid crystals have been widely used in smart windows. In particular, the temperature-dependent-transparence technology and normal transparent mode are in great demand. Original papers addressing advanced materials, new phenomena, device physics, and new applications that may relate to smart windows are all encouraged.

5. Alignment and LC Materials

LC alignment is essential in the operation of LCDs. New techniques, especially lphotoalignment, have been deployed recently for manufacturing. Papers covering new LC alignment techniques that improve LCD performance, reduce cost, and improve production yield, as well as allowing the realization of novel LCDs and optical elements, are solicited. The developments for LC materials, polymer materials and material process to support the efforts of and LCD development are also encouraged.

6. Emerging LC Technologies

Liquid crystals, liquid-crystal polymers, and elastomers can be widely used in photonic applications, such as spatial light modulators, adaptive lenses, lasers, sensors, antenna, smart windows, tunable filters, optical engine, fiber optics, non-linear optics, and microwave and terahertz phase shifters. Papers include, but not limited to new materials, new mechanism, new phenomena, and new applications are encouraged.

Lighting

1. Human-centric Lighting

- Papers on fundamentals of vision and non-vision of light
- Circadian rhythms and non-visual effects of light, an introduction

- Human Centric lighting, a paradigm shift in lighting and its control.
- Human Centric lighting, emergence of a prescription.

2. Engineering Lighting

- Intelligent lighting in engineering applications
- Safety issues in road and tunnel lighting systems

3. Display Light Sources

a. Dynamic backlight

The emergence of dynamic backlight technology not only effectively reduces the power consumption of the display, improves the contrast of the display in various ambience, but also plays an important role in improving the overall image quality. Papers are welcomed in providing insights into active dynamic LED backlight, local dimming technology and other dynamic backlight technologies.

b. backlight unit

Backlight unit is an important part of the liquid crystal display device. Backlight unit usually includes EL, CCFL and LED. Papers are solicited on novel techniques for backlight unit.

c. Graphene lighting technology

Graphene has constituted to a new lighting technology. As the graphene thin film contributes to a great enhancement of heat-dissipation in the existing display products. Graphene thus has broad application prospects in the display field. Papers are encouraged on the progress of the graphene lighting technology, high performance devices, and the applications.

d. Front light unit

Characteristics of reflective displays are of low power consumption, omni-directional reflection and wide viewing angle. So it required built-in illumination (a distinctive FLU) and integrated FLU. Papers are encouraged on illuminate the reflective display under dim ambient light, preserve the original function of the reflective display even with the built-in and or integrated FLU, deal with the characteristics of the front light unit and its measurements and evaluations.

OLEDs

1. OLED Materials

Papers on vacuum deposited and solution processed organic and polymer light-emitting diodes, including design, synthesis and characterization of low-mass organic molecules, oligomers, and polymers; the structural, electrical and optical properties of light-emitting and/or carrier transporting materials, TADF OLED materials, OLED inks are solicited. The new concept OLED materials, the device physics of high performance OLEDs with new organic materials are also encouraged.

2. OLED Devices

Papers on OLED device engineering, including design, fabrication, interface adjusting and out-coupling techniques for highly efficient and long-lifetime OLEDs are solicited. OLED lightings with high power efficiency, high color rendering index and lifetime, advanced device architectures, electrodes, substrates and barrier films for flexible OLEDs, thermally activated delayed fluorescent (TADF) OLEDs, exciplex-based OLEDs, quantum-dot LEDs, perovskite LEDs, mechanism studies of charge transport, injection, generation and recombination which could lead to better understanding of device physics and/or improvement of device performance. Papers that discuss smart and intelligent OLEDs as new applications are welcome.

3. OLED Mobile Displays and Micro-OLED Displays

Papers describing enabling OLED panel configuration, including pixels and backplanes, device architectures and performance, display and driving circuit, and sensor-integrated active-matrix devices that lead to active-matrix full-color OLED displays are particularly welcome. Micro-OLED Displays include IC design, backplanes, OLED devices, modules and system applications (VR/AR).

4. Flexible & Wearable OLED

Papers are solicited for flexible encapsulation technology which enhanced lifetime, flexibility, and light out-coupling efficiency of flexible OLEDs. Papers related to integration technology of flexible OLED display modules, including IC bonding, touch panel integration, cover window films, and modules reliability improving technology are solicited.

5. Large Area OLED Displays

Papers are sought for OLED based displays with unique attributes that include transparent OLEDs, high-resolution displays on novel active backplanes, large-area displays for TV. Papers covering materials (small molecule and polymer), devices, patterning, and unique drive schemes leading to television applications will be considered.

6. OLED Lighting

Papers are sought for relevant OLED lighting, including the materials and device techniques that are utilized to improve the efficiency, quality, and lifetime of white OLEDs, such as light-extraction, tandem structure, and thin-film encapsulation. Papers that discuss the application of OLED lighting in plant lighting sources, vehicle lighting and flexible smart lighting are welcome. To enlarge the share of OLED lighting in market, the effect of OLED lighting on health will be considered.

Printed Displays

Papers on advances in printed display technologies, including materials, process, device, applications, electronics, system and equipment are solicited. Papers on advanced materials and technologies associated with printed display and applications are also encouraged.

1. Solution-processed OLED Materials and Devices

Papers in the area of solution-processed OLED materials and printed device architectures with state-of-the-art performance in terms of color chromaticity, high power efficiency, and long operational lifetime at display level luminance are sought. Of particular interest are deep-blue with high efficiency, color, and long lifetime. Papers describing enabling device architectures, including top and bottom emitters, and robust thin film encapsulation that lead to stable passive- and active-matrix flexible full-color displays are particularly welcome. Papers are solicited on novel techniques for enhancing out-coupling efficiency of printed OLEDs.

2. Manufacturing Processes and Equipment for Printed OLED Displays

Novel full-color printed OLED fabrication and patterning techniques that are capable of producing high-resolution displays are of high interest for the industry. Papers dealing with recent advancements in areas of ink-jet printing processes and equipment and other novel printing techniques as well as development of solution-processed OLED materials and devices are sought. Particularly, approaches to obtain multilayer devices from printing are highly welcome. Papers are sought on printed OLED display panel design and performance of small-to-large-area panels.

3. Printing of Quantum-Dot Electroluminescence Materials

With the market success of core-shell quantum dots as down-conversion materials for LCDs, their application in future printed displays (QLEDs) has seen a resurgence of interest within the research community. In addition to core-shell quantum dots, perovskite quantum dots also have recently attracted intense interest owing to potentially good electro-luminescent properties. The electronic properties can be easily manipulated by molecular engineering, thus making them valuable as an additional set of materials for applications in printed displays. Papers concerning the printing processes, device fabrication and electroluminescence performance with these quantum-dot materials are solicited.

4. Stability of Printed OLEDs and QLEDs

Lifetime of printed OLED/QLED devices is one of the most important factors. Papers providing insight into

degradation mechanism and describing novel materials and device architectures to substantially increase lifetimes and suppress differential aging and image sticking are solicited.

5. Printed TFTs and Active-Matrix Displays

Manufacturing TFT backplanes in solution and printing approaches would potentially be able to reduce the cost. Papers on printable semiconductor/dielectric/electrode materials, printing process, new device and integration structures for printed TFT and backplane fabrication are solicited.

Projection

1. Laser Display Devices

Papers on the progress of the laser display technology, such as RGB Laser TV, high brightness laser projector, mini laser projector and so on are encouraged.

2. Laser Speckle Measurement and Application

Papers on speckle theory research, measurement methods, and measurement instruments are encouraged. The research on speckle elimination methods, speckle effect evaluation, and laser speckle imaging technology is also very welcome.

3. Laser Near-eye Display Technology

papers on near-eye display technology (including holographic waveguide display technology) based on laser light sources, including research on key materials for near-eye display, image generators, opto-mechanical modules, and prototype development are encouraged.

4. Laser Holographic Display Technology

Holographic display technology based on laser light source is encouraged, including fast holographic algorithm, spatial light modulator, color holographic display and the latest progress report of holographic display technology.

5. RGB Laser and Application

Papers on the RGB laser materials and devices, high performance laser modules and its applications are encouraged. Including epitaxial growth, chip fabrication, packaging and testing, and other key technologies and equipment.

6. Spatial Light Modulator and Optical Imaging Design

Papers on ultra - high resolution optical lens design and high efficiency projection imaging optical design are encouraged. Including the key technologies of precision inspection and installation and calibration.

Touch and Interactive Display

Interactive Displays and TFT Sensors

1. Function Integration of Displays

Papers are solicited on new technologies for sensing and inter-activity that are fundamentally integrated into a display. Examples include:

- Fingerprint sensing, including optical, capacitive, and ultrasonic mechanisms
- Environmental light sensing
- Antenna
- Force sensing, haptic or tactile
- Microphone or speaker
- Under-panel camera
- Touch sensing

2. TFT based Sensors

Papers are solicited on novel sensor technologies based on TFT process. Examples include, but are not limited to:

- Photo-sensor arrays based on TFTs and organic PDs
- Microfluidic chips based on TFT technologies
- Novel TFT circuits for sensor driving

Vehicle Displays

1. Advanced Technology/Application in Vehicle Display

More and more displays applied in vehicle area, besides much higher reliability requirements than those used in consumer electronics field, have below higher requirements: display aesthetic (invisible display, freeform display, AMOLED, etc.), display convenience (Gesture), display energy efficiency (local dimming), display safety (privacy display, DMS etc.)

2. Head UP Display (HUD) for Vehicle and Aircraft Display

The head-up display (HUD) system can create a safer display environment with more notifications when driving, which has been accepted by more and more drivers and pilots. Up to now, the HUD system has significantly developed, from original combined HUD (C-HUD) and windshield HUD (W-HUD) to the augment reality HUD (AR-HUD) mode, which can make an instant interaction with outside car environment. New technologies and components for HUD (image calibration algorithm, reflector design, optical waveguide technique, etc.) are continuously proposed and made, which will promote the diversified development of HUD systems.

3. Intelligent Cockpit Display System for Internet of Vehicles

As the automotive industry continues to accelerate towards connected cars, more Intelligent Cockpit Display Systems for Internet of Vehicles, the most important HMI between cars and drivers/passengers, are emerging through advancements of networking, 5G, and the Internet

of Things. People's understanding of vehicles is changing into the "Third Space" except home and company from simple transportation machines. The development of innovative cockpit display systems can bring better experience to drivers/passengers.

4. High Ability Materials Applied in Vehicle Display

Owing to the special running environment and high requirement of the vehicle display, the ability of materials plays a key role in the design of the display which includes optical performance, long running stability, interaction function and module appearance. The ability of materials limits the performance of display directly, which means that it is important and necessary to continuously develop high-performance materials for different uses.

5. High Performance Process Applied in Vehicle Display

As more and more new designs and materials were used for vehicle display, various new process technologies arise which include not only the improvement of traditional process abilities with original instruments, but also the development of new process abilities with novel instruments. Many merits such as reduction of cost, improvement of performance and extension of application, are brought by these process technologies, which play key roles for the promotion of the vehicle display.
