Session 1: Annual SID Business Meeting  
Tuesday, June 2 / 8:00 – 8:20 am / Ballroom 220A

Session 2: Opening Remarks / Keynote Addresses  
Tuesday, June 2 / 8:20 – 10:20 am / Ballroom 220A

2.1:  
Keynote 1: TBA

2.2:  
Keynote 2: TBA

2.3:  
Keynote 3: TBA

Session 3: Wearable Display Systems (Wearable Displays / Display Systems / Projection)  
Tuesday, June 2 / 10:50 am – 12:10 pm / Ballroom 220B
Chair: Brian Schowengerdt, University of Washington  
Co-Chair: Matthew Brennesholz, Display Central

3.1: Achieving Inconspicuous Head-Mounted-Display Optics  
Timothy Wong, 3M Co., St. Paul, MN, USA

3.2: High-Image-Quality Wearable Displays with Fast-Response Liquid Crystal  
Zhenye Luo, University of Central Florida, Orlando, FL, USA

3.3: Single-Mirror IMOD Display for Practical Wearable Devices  
Tallis Chang, Qualcomm MEMS Technologies, Inc., San Jose, CA, USA

Session 4: Flexible Display Manufacturing (Display Manufacturing)  
Tuesday, June 2 / 10:50 am – 12:10 pm / Ballroom 220C
Chair: Bradley Bowden, Corning Incorporated  
Co-Chair: Chiewoo Kim, Samsung Display

4.1: Apparatus for Manufacturing Flexible OLED Displays: Adoption of Transfer Technology  
Satoru Idojiri, Advanced Film Device, Inc., Tochigi, Japan

4.2: Study of ACF Bonding Technology in Flexible Display Module Packages  
Yen Lai, AU Optronics Corp., Hsinchu, Taiwan, ROC

4.3: Ultra-Thin LTPS TFT-LCD by Using Glass-on-Carrier Technology  
Shun-Ping Chiao, AU Optronics Corp., Hsinchu, Taiwan, ROC

4.4: Dimension Control of a Color Filter Fabricated by Using a Transfer Method  
Tadahiro Furukawa, Yamagata University, Yamagata, Japan

Session 5: Image Quality of Displays (Applied Vision/Human Factors)  
Tuesday, June 2 / 10:50 am – 12:10 pm / Room LL20A
Chair: Sakuichi Ohtsuka, Kagoshima University  
Co-Chair: David Hoffman, Samsung Semiconductor

5.1: Influence of Pixel Density on Image Quality of Smartphone Displays  
Yuzo Hisatake, Japan Display, Inc., Tokyo, Japan

5.2: Simulation of Color-Breakup Perception Using Eye-Tracking Data  
Keita Hirai, Chiba University, Chiba, Japan

5.3: Extending the Flicker Visibility Metric to a Range of Mean Luminance  
Andrew Watson, NASA Ames Research Center, Moffett Field, CA, USA

5.4: Subpixel Rendering for a High-Resolution OLED Display with Low-Resolution Photomasks  
Hsin-Chun Lin, National Taiwan University of Science and Technology, Taipei, Taiwan, ROC

Session 6: Novel Display Applications I (Applications)  
Tuesday, June 2 / 10:50 am – 12:10 pm / Room LL20BC
Chair: Ian Underwood, University of Edinburgh  
Co-Chair: Jean-Noel Perbet, THALES Avionics

6.1: A New Application of a Touch-Screen Display for Data Transfer  
Philippe Comi, THALES Avionics SAS, Le Haillan, France

6.2: Hybrid-Type Temperature Sensors Using TFTs  
Mutsumi Kimura, Ryukoku University, Otsu, Japan

6.3: Adaptable Light Beaming and Shaping Using an LED Matrix and Fresnel Lens Array  
Feixia Wang, Southeast University, Nanjing, China

6.4: Local Tone-Mapping-Based Dynamic Backlight Control Algorithm  
Viacheslav Chesnokov, Apical Ltd., London, UK
Session 7: OLED Driving Techniques (Display Electronics)
Tuesday, June 2 / 10:50 am – 12:10 pm / Room LL20D
Chair: Wei Yao, Apple, Inc.
Co-Chair: Dick McCartney, Consultant
7.1: Invited Paper: Novel OLED Display Technology for Large-Sized UHD OLED TVs
Hong-Jae Shin, LG Display Co., Ltd., Gyeonggi-do, South Korea
7.2: A Pixel Structure Using a Switching Error-Reduction Method for High-Image-Quality AMOLED Displays
Oh-Kyong Kwon, Seoul, South Korea
7.3: Depletion-Mode Oxide-TFT Shift Register with Wide Operating Frequency Range for AMOLED Displays
Inhyo Han, LG Display Co., Ltd., Gyeonggi-do, South Korea
7.4: A Slim Border Design for Wearable Displays: Using a Novel P-Type Shift Register and an Optimal Layout Arrangement
Yung-Sheng Tsai, AU Optronics Corp., Taiwan, ROC

Session 8: Quantum-Dot Materials (Emissive Displays / Disruptive Materials)
Tuesday, June 2 / 10:50 am – 12:10 pm / Room LL20EF
Chair: Seth Coe-Sullivan, QD Vision, Inc.
Co-Chair: Tomokazu Shiga, The University of Electro-Communications
8.1: Invited Paper: Alignment of Quantum Rods
Masaki Hasegawa, Merck, Ltd., Japan, Kanagawa, Japan
8.2: Semiconductor Quantum Rods for Display Applications
Ehud Shaviv, Qlight Nanotech, Ltd., Jerusalem, Israel
8.3: Next-Generation Display Technology: Quantum-Dot LEDs
Jesse Manders, NanoPhotonica, Gainesville, FL, USA

Session 9: Wearable Displays: Direct View (Wearable Displays / e-Paper and Flexible Displays)
Tuesday, June 2 / 2:00 – 3:20 pm / Ballroom 220B
Chair: Ruiqing (Ray) Ma, Universal Display Corp.
Co-Chair: Yongtaek Hong, Seoul National University
Zhennan Bao, Stanford University, Stanford, CA, USA
9.2: A Novel Lamination Process for Flexible AMOLED Encapsulation
Wang Tao, BOE Technology Group Co., Ltd., Beijing, China
9.3: The First Flexible LCD Applied to a Wearable Smart Device
Wen-Yuan Li, AU Optronics Corp., Hsinchu, Taiwan, ROC
9.4: Stretchable 45 x 80 RGB-LED Display Using Meander Wiring Technology
Hideki Ohmoe, Panasonic Corp., Moriguchi, Japan

Session 10: OLED Encapsulation and Reliability (Display Manufacturing)
Tuesday, June 2 / 2:00 – 3:20 pm / Ballroom 220C
Chair: Ion Bita, Apple, Inc.
Co-Chair: Dawei Wang, BOE Technology Group Co., Ltd.
Jörg Fahlteich, Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Dresden, Germany
10.2: High-Performance Barrier Films for Flexible Organic Display and Lighting Applications
Jyrki Kimmel, Nokia Technologies, Tampere, Finland
10.3: An Empirical Analysis of the Factors Effecting the Reliability of AMOLED Displays
Jang-Yeon Kwon, Yonsei University, Incheon, South Korea
10.4: Non-Contact Current Measurements for AMOLED Backplanes Using Electron-Beam-Induced Plasma Probes
Daniel Toet, Photon Dynamics, an Orbotech Company, San Jose, CA, USA

Session 11: Human Factors and Applications (Applied Vision/Human Factors)
Tuesday, June 2 / 2:00 – 3:20 pm / Room LL20A
Chair: Yi-Pai Huang, National Chiao Tung University
Co-Chair: Takashi Shibata, Tokyo University of Social Welfare
Fang-Cheng Lin, Display Institute, National Chiao Tung University, Hsinchu, Taiwan, ROC
11.2: Usefulness of Stereoscopic 3D Images in Elementary-School Classes
Takashi Shibata, Tokyo University of Social Welfare, Gunma, Japan
11.3: Readability Performance and Subjective Appraisal of Curved Monitors
Hyeon-Jeong Suk, KAIST, Daejeon, South Korea
11.4: Study on the Saccadic-Eye-Movement Metric of Visual Fatigue Induced by 3D Displays
Yue Liu, Beijing Institute of Technology, Beijing, China

Session 12: Novel Display Applications II (Applications)
Tuesday, June 2 / 2:00 – 3:20 pm / Room LL20BC
Chair: Gary Jones, Nanoquantum Corp.
Co-Chair: Bao-Jen Pong, ITRI
Fu-Chung Huang, University of California at Berkeley, Berkeley, CA, USA

12.2: Flame-Resistant and Heat-Resistant Lithium-Ion Battery Used to Operate Heat-Resistant OLEDs
Teppei Oguni, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

12.3: Creation of a Wavy Ag Nanowire Network and Its Implication for Transparent Electrodes with Robust Stretchability
Jun Beom Pyo, KIST, Seoul, South Korea

12.4: A Liquid-Crystal Biosensor for Liver Diseases
Sihui He, University of Central Florida, Orlando, FL, USA

**Session 13: Advanced Displays and Imaging (Display Electronics)**
Tuesday, June 2 / 2:00 – 3:20 pm / Room LL20D
Chair: Haruhiko Okumura, Toshiba Corp.
Co-Chair: Achin Bhowmik, Intel Corp.

13.1: *Invited Paper:* Head-Up Displays with MEMS Laser Microprojection Technology
Nicolas Abelé, Lemoptix SA, Lausanne, Switzerland

13.2: 360° Multi-Faced Tracking and Interaction Using a Panoramic Camera
Li Feng, Zhejiang University, Hangzhou, China

13.3: Efficient Direct Light-Field Rendering for Autostereoscopic 3D Displays
Young Ju Jeong, Samsung Advanced Institute of Technology, Suwon, South Korea

13.4: An Electro-Optical Transfer Function with Improved Uniformity of Palette-Color Distribution in Absolute Color Space
Senfar Wen, Yuan Ze University, Chung-Li, Taiwan, ROC

**Session 14: Photoluminescent Quantum Dots (Emissive Displays)**
Tuesday, June 2 / 2:00 – 3:20 pm / Room LL20EF
Chair: John Van Derlofske, 3M Co.
Co-Chair: Larry Weber, PLEXIE

14.1: *Invited Paper:* Heavy-Metal-Free Quantum Dots for Display Applications
Nigel Pickett, Nanoco Technologies, Ltd., Manchester, UK

14.2: *Invited Paper:* Cadmium- and Indium-Based Quantum-Dot Materials
Seth Coe-Sullivan, QD Vision, Lexington, MA, USA

14.3: Optimizing Quantum-Dot LCD Systems to Achieve Rec. 2020 Color Performance
James Thielen, 3M Co., Maplewood, MN, USA

**Session 15: Applied Vision and Applications of Wearable Displays (Wearable Displays / Applications)**
Tuesday, June 2 / 3:40 – 5:00 pm / Ballroom 220B
Chair: Jyrki Kimmel, Nokia Technologies
Co-Chair: Jeffrey Mulligan, NASA Ames Research Center

15.1: Data Glasses for Improved User Interaction in 3D
Rigo Herold, Westsächsische Hochschule Zwickau, Zwickau, Germany

15.2: High-Luminance Monochromatic See-Through Eyewear Display with Volume Hologram
Takashi Oka, Sony Corp., Kanagawa, Japan

15.3: Optimal Monitor Gamma for Transparent Displays
Youngshin Kwak, Ulsan National Institute of Science and Technology, Ulsan, South Korea

15.4: Weight Optimization of Near-to-Eye Light-Field Displays Based on the Human Visual System
Li Feng, Zhejiang University, Hangzhou, China

**Session 16: OLED Deposition and Patterning (Display Manufacturing)**
Tuesday, June 2 / 3:40 – 5:00 pm / Ballroom 220C
Chair: Greg Gibson, FAS Holdings Group
Co-Chair: Ake Hornell, EuroLCDs SIA

Ian Parker, DuPont Displays, Santa Barbara, CA, USA

16.3: True-Color 640-ppi OLED Arrays Patterned by CA In-Line Photolithography
Pawel Malinowski, imec, Leuven, Belgium

16.4: Fully R2R-Processed Flexible OLEDs for Lighting
Takashi Minakata, Chemical Materials Evaluation and Research Base (CEREBA), Ibaraki, Japan

16.5: Electroforming Technology for Manufacturing Thin Metal Masks with Very Small Apertures for OLED Display Manufacturing
Sundaram N. Kumar, Advantek US, Inc., Pittsburgh, PA, USA

**Session 17: Color Appearance of Displays (Applied Vision/Human Factors)**
Tuesday, June 2 / 3:40 – 5:00 pm / Room LL20A
Chair: Miyoshi Ayama, Utsunomiya University
Co-Chair: Jennifer Gille, Qualcomm Technologies

James Hillis, 3M Co., Maplewood, MN, USA

17.2: Kansei Evaluation of Color Images Presented in Color Gamuts of Different Blue Primaries
Miyoshi Ayama, Utsunomiya University, Utsunomiya, Japan

17.3: D-CIELab: A Color Metric for Dichromatic Observers
Huamiao Jiang, Stanford University, Stanford, CA, USA
17.4: Image-Quality Assessment of Large UHD LCDs Using Quantum-Dot and RGBW Technologies
Ji-Yuan Huang, National Taiwan University, Taipei, Taiwan, ROC

Session 18: Applications of Flexible Display Technology (Applications / e-Paper and Flexible Displays)
Tuesday, June 2 / 3:40 – 5:00 pm / Room LL20BC
Chair: Jin Jang, Kyung Hee University
Co-Chair: Lauren Palmateer, Rovi Corp.

18.1: **Invited Paper:** Foldable AMOLED Displays with a Touch Panel
Jia-Chong Ho, ITRI, Hsinchu, Taiwan, ROC

18.2: **Invited Paper:** Flexible eWriter Technology and Applications
Asad Khan, Kent Displays, Inc., Kent, OH, USA

18.3: A 8.67-in. Foldable OLED Display with an In-Cell Touch Sensor
Kazunori Watanabe, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

18.4: A 13.3-in. 664-ppi Foldable AMOLED Display with Crystalline Oxide-Semiconductor FETs
Kei Takahashi, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

Session 19: Image Processing for Display Enhancement (Display Electronics)
Tuesday, June 2 / 3:40 – 5:00 pm / Room LL20D
Chair: Seung Woo Lee, Kyung Hee University
Co-Chair: Ya Hsiang Tai, National Chiao Tung University

Yong-Duck Ahn, Dong-A University, Busan, South Korea

19.2: Compensation of OLED I-V Drift for Suppressing Image Sticking in a Digital AMOLED Display Module
Pascal Volker, Saarland University, Saarbruecken, Germany

19.3: A Novel Rendering Algorithm with Adaptive Weighting Factors
Shang-Yu Su, AU Optronics Corp., Hsinchu, Taiwan, ROC

19.4: Denoising for Polarizer-Free Imaging of a Liquid-Crystal Lens
Mao Ye, SuperD Co., Ltd., Quanzhou, China

Session 20: Electroluminescent Quantum Dots (Emissive Displays / Disruptive Materials)
Tuesday, June 2 / 3:40 – 5:00 pm / Room LL20EF
Chair: Masayuki Nakamoto, Shizuoka University
Co-Chair: Yong-Seog Kim, Hongik University

20.1: **Invited Paper:** Red and Green Quantum-Dot-Based LEDs Demonstrating Excellent Color Coordinates
Poopathy Kathirgamanathan, Brunel University London, Uxbridge, UK

20.2: Ultra-Bright Highly Efficient Low-Roll-Off Inverted Quantum-Dot LED Devices (QLEDs)
Yajie Dong, University of Central Florida, Orlando, FL, USA

20.3: Optimizing the Balance of Holes and Electrons in Inverted Quantum-Dot LEDs by Inserting an Electron-Transport Barrier Layer
Yibin Jiang, Hong Kong University of Science & Technology, Kowloon, Hong Kong

20.4: Quantum-Dot LEDs with Charge-Generation Layers
Jin Jang, Kyung Hee University, Seoul, South Korea

Session 21: Oxide-TFT Manufacturing (Display Manufacturing)
Wednesday, June 3 / 9:00 – 10:20 am / Ballroom 220B
Chair: Toshiaki Arai, JOLED, Inc.
Co-Chair: Tian Xiao, CBRITE, Inc.

21.1: **Invited Paper:** High-Throughput Metal-Oxide TFT with Organic Etch Stopper and SiN, Gate Insulator
Gang Yu, CBRITE, Inc., Goleta, CA, USA

21.2: Highly Reliable Oxide TFT with Novel Oxide Passivation Layers by All-Printing Processes
Shinji Matsumoto, Ricoh Co., Ltd., Yokohama, Japan

21.3: A Novel 5-Mask Etch-Stopper Pixel Structure with a Short-Channel Oxide-Semiconductor TFT
Joon-Young Yang, LG Display Co., Ltd., Gyeonggi-do, South Korea

21.4: Deposition Conditions and High-Resolution TEM Characterization of CAAC IGZO
David Lynch, Cornell University, Ithaca, NY, USA

Session 22: OLED Materials I (OLEDs)
Wednesday, June 3 / 9:00 – 10:20 am / Ballroom 220C
Chair: Denis Kondakov, DuPont Displays
Co-Chair: C. C. Lee, BOE Technology Group Co., Ltd., Beijing, China

22.1: **Invited Paper:** New Fluorescent Blue Host Materials for Achieving Low Voltage in OLEDs
Hitoshi Kuma, Idemitsu Kosan Co., Ltd., Chiba, Japan

22.2: **Invited Paper:** Development of Electron-Transport Material to Improve the Efficiency and Lifetime of Blue-Emitting Devices in OLEDs
Tae-Hyung Kim, Doosan Corp., Gyeonggi-do, South Korea

22.3: CbzTAZ Hosts in Blue OLED Device Demonstrates an High Current Efficiency of Over 52 cd/A
Tien-Lung Chiu, Yuan Ze University, Chung-Li, Taiwan, ROC

22.4: Synthesis of Host Materials for Blue Phosphorescent OLEDs with High Efficiency and Low Driving Voltage
Jun Yeob Lee, Dankook University, Yongin, South Korea
Session 23: e-Paper (e-Paper and Flexible Displays)
Wednesday, June 3 / 9:00 – 10:20 am / Room LL20A
Chair: Chao-Yuan Chen, Jiangsu Hecheng Display Technology
Co-Chair: Makoto Omodani, Tokai University

23.1: Invited Paper: Colloidal Dispersion Materials for Electrophoretic Displays and Beyond
Mark Goulding, Merck Chemicals, Ltd., Southampton, UK

23.2: Predicting the Viewing-Direction Performance of e-Paper Displays with a Front Light under Ambient Lighting Conditions
Dirk Hertel, E Ink Corp., Billerica, MA, USA

23.3: Flexible Semitransparent eWriter Displays
Clinton Braganza, Kent Displays, Inc., Kent, OH, USA

Session 24: 3D Light-Field Displays and Imaging (Display Systems)
Wednesday, June 3 / 9:00 – 10:20 am / Room LL20BC
Chair: Nikhil Balram, Ricoh Innovations Corp.
Co-Chair: K. Käläntär, Global Optical Solutions

24.1: Invited Paper: Design Principles for Light-Field Image Capture and Display
Kathrin Berkner, Ricoh Innovations Corp., Menlo Park, CA, USA

24.2: Real-Time Rendering 360° Floating Light-Field 3D Display
Li Feng, Zhejiang University, Hangzhou, China

24.3: Adaptive Optimization of Rendering for Multi-Projector-Type Light-Field Display
Li Feng, Zhejiang University, Hangzhou, China

24.4: Floating 3D Image for High-Resolution Portable Device Using Integral Photography Theory
Chih-Wei Shih, National Chiao Tung University, Hsinchu, Taiwan, ROC

Session 25: Laser Phosphor Light Sources for Projectors (Projection)
Wednesday, June 3 / 9:00 – 10:20 am / Room LL20D
Chair: David Eccles, Rockwell Collins
Co-Chair: Frederic Kahn, Kahn International, Inc.

25.1: The Progress in International Safety Standards for Laser-Illuminated Projection Systems
Heidi Hoffman, LIPA, San Jose, CA, USA

25.2: High-Brightness Solid-State Light Source for 4K Ultra-Short-Throw Projector
Yuki Maeda, Sony Corp., Kanagawa, Japan

25.3: A Miniature Laser-Driven Visible-Light Source
Nayef Abu-Ageel, Michigan State University, East Lansing, MI, USA

25.4: Laser-Excited Phosphor/Dye in Liquid for High-Power Digital Projectors
Kenneth Li, Wavien, Inc., Valencia, CA, USA

Session 26: Micro LED Displays and Electroluminescence (Emissive Displays)
Wednesday, June 3 / 9:00 – 10:20 am / Room LL20EF
Chair: Poopathy Kathirgamanathan, Brunel University London
Co-Chair: Qun Yan, Sichuan COC Display Devices Co., Ltd.

Chih-Li Chuang, Ostendo Technologies, Inc., Carlsbad, CA, USA

26.2: Invited Paper: High-Brightness Emissive Microdisplay Developed by Integration of III-V LEDs with Thin-Film Silicon Transistors
Vincent Lee, Lumioide, Inc., New York, NY, USA

26.3: High-Resolution Laser-Etched Circuitry for ACEL Lamps
Jack Silver, Wolfson Centre, Brunel University, Uxbridge, UK

Session 27: Advanced Manufacturing Technologies (Display Manufacturing)
Wednesday, June 3 / 10:40 am – 12:00 pm / Ballroom 220B
Chair: Joerg Winkler, PLANSEE SE
Co-Chair: Wei Lung Liau, AU Optronics Corp.

27.1: Invited Paper: Liquid-Crystal Mixtures for Creating Polymer Walls in LCDs
Nils Greinert, Merck KGaA, Darmstadt, Germany

27.2: The Fabrication of a New PSVA Pixel Structure by Using Gray-Tone Mask Technology
Zhuming Deng, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

27.3: Development of Highly Durable Achromatic Polarizer with High Heat and Moisture Resistance
Noriaki Mochizuki, Nippon Kayaku Co., Ltd., Tokyo, Japan

27.4: Selective Laser-Annealing System for LTPS-TFT Panels
Shigeto Sagimoto, V Technology Co., Ltd., Kanagawa, Japan

Session 28: OLED Materials II (OLEDs)
Wednesday, June 3 / 10:40 am – 12:00 pm / Ballroom 220C
Chair: Yasunori Kijima, JOLED, Inc.
Co-Chair: Chin Hsin (Fred) Chen, Guangdong Aglaia Optoelectronic Materials Co., Ltd.

28.1: Invited Paper: Triplet-Energy Control of PAHs by Heteroatom Incorporation for Development of Efficient Materials for PHOLEDs
Takuji Hatakeyama, Kwansei Gakuin University, Hyogo, Japan
28.2: **Invited Paper:** Reverse Intersystem Crossing from High-Lying Triplet Energy Levels to an Excited Singlet: A “Hot Excitation” Path for OLEDs
Yuguang Ma, South China University of Technology, Guangzhou, China

28.3: **Invited Paper:** Progress on Phosphorescent OLED Materials
Banumathy Balaganesan, e-Ray Optoelectronics Technology Co., Ltd., Taoyuan, Taiwan, ROC

**Session 29: TFTs and Circuits for Flexible Devices (e-Paper and Flexible Displays / Active-Matrix Devices / Oxide and LTPS TFTs)**

**Wednesday, June 3 / 10:40 am – 12:00 pm / Room LL20A**

**Chair:** Ryoichi Ishihara, Delft University of Technology

**Co-Chair:** Sang-Hee Park, KAIST

29.1: Solution-Processed Poly-Si TFTs at Paper-Compatible Temperatures
Miki Trifunovic, Delft University of Technology, Delft, The Netherlands

29.2: Silicon Ink-Based Poly-Si CMOS TFT Fabricated on 300-μm Stainless-Steel-Foil Substrates
Mao Takashima, Thin Film Electronics, Inc., San Jose, CA, USA

29.3: High-Resolution Flexible AMOLED Display with Integrated Gate Driver Using Bulk-Accumulation a-IGZO TFTs
Jin Jang, Kyung Hee University, Seoul, South Korea

29.4: Flexible AMOLED Display with Integrated Gate Driver Operating at an Operation Speed Compatible with a 4k x 2k Display
Soeren Steudel, imec, Leuven, Belgium

**Session 30: 3D Applications (Applications)**

**Wednesday, June 3 / 10:40 am - 12:00 pm / Room LL20BC**

**Chair:** Susan Jones, Nulumina Corp.

**Co-Chair:** Adi Abileah, Adi-Display Consulting, LLC

30.1: Review of Dynamic Holography in Materials for Large-Sized Holographic 3D Video Displays
Jicheng Liu, Shanghai University, Shanghai, China

30.2: Color Holographic Projection Based on Liquid Lens
Qiong-Hua Wang, Sichuan University, Chengdu, China

30.3: Design Parameters for a Curved Barrier-Type Autostereoscopic Display
Wei-Chieh Lin, National Taiwan University, Taipei, Taiwan, ROC

30.4: Multi-Plane Holographic Display with a Uniform 3D Gerchberg-Saxton Algorithm
Yikai Su, Shanghai Jiao Tong University, Shanghai, China

**Session 31: Disruptive LCD Materials (Liquid-Crystal Technology / Disruptive Materials)**

**Wednesday, June 3 / 10:40 am – 12:00 pm / Room LL20D**

**Chair:** Shui-Chih Lien, TCL Group

**Co-Chair:** Yukito Saitoh, FUJIFILM Corp.

31.1: Evolution of Cellulose Triacetate (TAC) Films for LCDs: Novel Technologies for High Hardness, Durability, and Dimensional Stability
Ryo Suzuki, FUJIFILM Corp., Kanagawa, Japan

31.2: Low-Dielectric-Constant Materials for High-Performance LCDs
Haiwei Chen, University of Central Florida, Orlando, FL, USA

31.3: New Approach to Developing Liquid-Crystal Materials for Idling Stop Driving on Reflective Displays
Yasuhito Niiura, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

31.4: Nano-Phase-Separated Liquid Crystals (NPS LCs) with Fast Response Time
Tora Fujisawa, DIC Corp., Ina, Japan

**Session 32: Front Lighting and Reflective Displays (Display Systems / e-Paper and Flexible Displays / Lighting)**

**Wednesday, June 3 / 10:40 am – 12:00 pm / Room LL20EF**

**Chair:** K. Käläntär, Global Optical Solutions

**Co-Chair:** Kevin Gahagan, Corning Incorporated

32.1: Front Light for Color Electrophoretic Display Applications
Hsin-Tao Huang, E Ink Holding, Inc., Hsinchu, Taiwan, ROC

32.2: A Study on the Front Light Guide Used in Color Reflective LCDs
Xinxing Wang, BOE Technology Group Co., Ltd., Beijing, China

32.3: Enhancing Interferometric Display Color Viewing-Angle Performance Using a Fiber-Array Film
Jian Ma, Qualcomm MEMS Technologies, Inc., San Jose, CA USA

**Session 33: Novel Devices (Active-Matrix Devices)**

**Wednesday, June 3 / 3:30 – 4:50 pm / Ballroom 220B**

**Chair:** Kazuyoshi Omata, Konica Minolta

**Co-Chair:** Mike Hack, Universal Display Corp.

33.1: **Invited Paper:** A Novel Vertical-Type Light-Emitting Transistor
Tadahiko Hirai, CSIRO, Clayton, Australia

33.2: Neuron MOS Devices Using TFTs
Mutsumi Kimura, Ryukoku University, Otsu, Japan

33.3: Fabrication of an All-Screen-Printed Oxide-Semiconductor-TFT Active-Matrix Backplane
Kazuhiro Fukuda, Japan Advanced Institute of Science and Technology, Ishikawa, Japan

33.4: Flexible IGZO TFTs with a Disruptive Photo-Patternable and Thermally Stable Organic Gate Insulator
Hsing-Hung Hsieh, Polyera Taiwan Corp., Hsinchu, Taiwan, ROC
Session 34: Disruptive OLED Materials (OLEDs / Disruptive Materials)
Wednesday, June 3 / 3:30 – 4:50 pm / Ballroom 220C
Chair: Seth Coe-Sullivan, QD Vision, Inc.
Co-Chair: Sven Zimmermann, Novaled AG

34.1: Invited Paper: Effect of Singlet Triplet Recycling in the Charge-Transfer-State Manifold and Molecular Geometry on Thermally Activated Delayed Fluorescence.
Andrew Monkman, Durham University, Durham, UK

34.2: Invited Paper: Highly Efficient and Stable OLEDs Using Hosts with Thermally Activated Delayed Fluorescence
Lian Duan, Tsinghua University, Beijing, China

34.3: Emitting Materials for Thermally Activated Delayed Fluorescent OLEDs Using Benzofurocarbazole and Benzothienocarbazole as Donor Moieties
Dong Ryan Lee, Dankook University, Yongin, South Korea

34.4: Invited Paper: Combinatorial Design of OLED-Emitting Materials
Alán Aspuru-Guzik, Harvard University, Cambridge, MA, USA

Session 35: Projection Optics (Projection)
Wednesday, June 3 / 3:30 – 4:50 pm / Room LL20A
Chair: John Vieth, Christie Digital Systems
Co-Chair: Ming Hsien Wu, Hamamatsu Corp

35.1: Auto-Calibration for Screen Correction and Point Cloud Generation
Jason Deglaf, University of Waterloo, Waterloo, Ontario, Canada

35.2: Design of Hybrid Refractive-Reflective Projection Optics for Family Theatres
Xiao Wei Sun, Nanyang Technological University, Singapore

35.3: Resolution Enhancement Based on Shifted Superposition
Elnaz Barshan, University of Waterloo, Waterloo, Ontario, Canada

35.4: A High Contrast Ratio and Compact-Sized Prism for DLP Projection System
Jui-Wen Pan, National Chiao Tung University, Tainan, Taiwan, ROC

Session 36: Holographic 3D Displays (Display Systems)
Wednesday, June 3 / 3:30 - 4:50 pm / Room LL20BC
Chair: W. Hendrick, Rockwell Collins Optoptrics
Co-Chair: K. Käläntär, Global Optical Solutions

36.1: Binocular Holographic Display Using the Pupil Space Division Method
Jungkwuen An, SAIT, Samsung Electronics Co., Suwon, South Korea

36.2: Speckle Suppression in a Scaled Holographic Display from Single-Phase-Only Computer-Generated Hologram
Jun Xia, Southeast University, Nanjing, China

36.3: Flat-Panel Coherent Backlight for Holographic Displays with Improved Diffraction Efficiency
Yikai Su, Shanghai Jiao Tong University, Shanghai, China

36.4: Invited Paper: Real-Time Light Amplification by Using Photorefractive Ferroelectric Liquid-Crystal Mixtures
Takeo Sasaki, Tokyo University of Science, Tokyo, Japan

Session 37: Blue-Phase LCDs (Liquid-Crystal Technology)
Wednesday, June 3 / 3:30 – 4:50 pm / Room LL20D
Chair: Michael Wittek, Merck KGaA
Co-Chair: Shin-Tson Wu, University of Central Florida

37.1: A Blue-Phase LCD with Wall Electrode and High-Driving-Voltage Circuit
Cheng-Yeh Tsai, AU Optoptrics Corp., Hsinchu, Taiwan, ROC

37.2: High-Performance Blue-Phase LCDs Stabilized by Linear Photopolymers
Daming Xu, University of Central Florida, Orlando, FL, USA

37.3: Polymer-Stabilized Blue-Phase Liquid Crystal Cured with a Visible Laser
Yikai Su, Shanghai Jiao Tong University, Shanghai, China

Session 38: OLED Lighting (OLEDs / Lighting)
Wednesday, June 3 / 3:30 – 4:50 pm / Room LL20EF
Chair: Jang Hyuk Kwon, Kyung Hee University
Co-Chair: Franky So, University of Florida

38.2: High-Efficiency Three-Stack Tandem White OLEDs
Jang Hyuk Kwon, Kyung Hee University, Seoul, South Korea

38.3: Simulations, Measurements, and Optimization of OLEDs with a Scattering Layer
Stéphane Altazin, Fluxim AG, Winterthur, Switzerland

Session 39: Advanced TFTs (Active-Matrix Devices)
Thursday, June 4 / 9:00 – 10:20 am / Ballroom 220B
Chair: Hyun Jae Kim, Yonsei University
Co-Chair: Junho Song, Samsung Display Co., Ltd.
39.1: Invited Paper: High-Performance Flexible TFTs from Oxide/Carbon Heterostructures

Xiangfeng Duan, University of California at Los Angeles, Los Angeles, CA, USA

39.2: Invited Paper: Printed Inorganic Transistors Based on Transparent Oxides

Vivek Subramanian, University of California at Berkeley, Berkeley, CA, USA

39.3: Invited Paper: Recent Progress of Oxide-Semiconductor-Based p-Channel TFTs

Kenji Nomura, Qualcomm Technology, Inc., San Jose, CA, USA


Yongbin Jeong, LG Display Co., Ltd., Gyeonggi-do, South Korea

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Session 40: OLED Devices I (OLEDs)
Thursday, June 4 / 9:00 – 10:20 am / Ballroom 220C
Chair: Michael Weaver, Universal Display Corp.
Co-Chair: Denis Kondakov, DuPont Displays

40.1: Efficiency Enhancement in Phosphorescent and Fluorescent OLEDs Utilizing Energy Transfer from Exciplex to Emitter

Tatsuyoshi Takahashi, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

40.2: Optimization of Host-Dopant System for Realizing Efficient Thermally Activated Delayed Fluorescence OLEDs

Min Chul Sah, Kyung Hee University, Seoul, South Korea

40.3: High-Efficiency Blue Phosphorescent OLEDs with >57 cd/A, >50 lm/W, and >25% External Quantum Efficiency

Jian-Haw Lee, National Taiwan University, Taipei, Taiwan, ROC

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Session 41: Automotive Display Applications and Systems (Vehicular)
Thursday, June 4 / 9:00 – 10:20 am / Room LL20A
Chair: Jerzy Kanicki, University of Michigan

Co-Chair:

41.1: Development of RGBW LCD with Edge-Lit 2D Local-Dimming System for Automotive Applications

Naoyuki Takasaka, Japan Display, Inc., Kanagawa, Japan

41.2: High-Reliability Integrated Gate Driver Circuit in a Panel for Automotive Displays

Dahye Sim, LG Display Co., Ltd., Gyeonggi-do, South Korea

41.3: Invited Paper: Megatrends Driving Automotive Displays and Associated Mega Issues

Paul M. Russo, GEO Semiconductor, Inc., San Jose, CA, USA

41.4: TBA

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Session 42: Curved and High-Resolution Display Metrology (Display Measurement)
Thursday, June 4 / 9:00 – 10:20 am / Room LL20BC
Chair: Stephen Arwood, Azonix Corp.
Co-Chair: Frank Rochow, Adviser

42.1: Comparison of Key Optical Measurements of Curved to Flat LCD TVs and Their Impact on Image Quality

Karlheinz Blankenbach, Pforzheim University, Pforzheim, Germany

42.2: Stress-Induced Substrate Mura in Curved LCDs

K. Hemanth Vepakomma, Corning Incorporated, Corning, NY, USA

42.3: How to Perform Viewing-Angle Measurements on Curved Displays

Pierre Boher, ELDIM, Herouville, France

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Session 43: FFS/IPS I (Liquid-Crystal Technology)
Thursday, June 4 / 9:00 – 10:20 am / Room LL20D
Chair: Hyun Chul Choi, LG Display Co., Ltd.
Co-Chair: Ki Chul Shin, Samsung Display Co., Ltd.

43.1: Invited Paper: UB-FFS: New Materials for Advanced Mobile Applications

Martin Engel, Merck Group, Darmstadt, Germany

43.2: New Fast-Response-Time IPS Liquid-Crystal Mode

Toshiharu Matsushima, Japan Display, Inc., Ebina, Japan

43.3: Fast-Response-Time Fringe-Field-Switching LCD with Patterned Common Electrode

Daming Xu, University of Central Florida, Orlando, FL, USA

43.4: A Fast-Response A-Film-Enhanced FFS LCD

Haiwei Chen, University of Central Florida, Orlando, FL, USA

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Session 44: Advanced Light Sources, Components, and Systems I (IES Lighting Track)
Thursday, June 4 / 9:00 – 10:20 am / Room LL20EF
Chair: Mike Lu, Acuity Brands Lighting
Co-Chair: David Aurelien, Soraa, Inc.

44.1: Invited Paper: OLED Lighting for General Lighting Applications

Seongsoo Jang, LG Chem, Ltd., Cheong, South Korea

44.2: Invited Paper: Current and Future Projection of Edge-Lit LED Panel Adoption in Lighting

Brett Shriver, Global Lighting Technology, Brecksville, OH, USA

44.3: Display Technologies for LED Lighting. Part I: Optical Components

William Edmonds, 3M Co., St. Paul, MN, USA

44.4: Display Technologies for LED Lighting. Part II: Scalable Optical Architectures Enabled by Modular Film-Based Components

William Edmonds, 3M Co., St. Paul, MN USA
Session 45: High-Performance Oxide TFTs I (Active-Matrix Devices)
Thursday, June 4 / 10:40 am – 12:00 pm / Ballroom 220B
Chair: Hsing-Hung Hsieh, Polyera Taiwan Corp.
Co-Chair: Roger Stewart, Sourland Mountain Associates
45.1: Invited Paper: Future Possibilities of Crystalline Oxide Semiconductors, Especially C-Axis-Aligned Crystalline IGZO
Shunpei Yamazaki, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan
45.2: Sputtering C-Axis-Aligned Crystalline (CAAC) IGZO Films: A Design of Experiment (DOE) Study
Michael Thompson, Ithaca, NY, USA
45.3: Invited Paper: High-Performance Nanocrystalline ZnOxNy for Imaging and Display Applications
Eunha Lee, SAIT, Samsung Electronics Co., Suwon, South Korea
45.4: Invited Paper: Amorphous-Metal-Oxide/1D Nanomaterial Hybrid TFTs: A New Avenue to High-Speed Microelectronics
Lei Liao, Wuhan University, Wuhan, China

Session 46: OLED Devices II (OLEDs)
Thursday, June 4 / 10:40 am – 12:00 pm / Ballroom 220C
Chair: Eric Forsythe, Army Research Laboratory
Co-Chair: Denis kondakov, DuPont Displays
46.1: Invited Paper: Recent Progress of LEDs Based on Colloidal Quantum Dots
Changhee Lee, Seoul National University, Seoul, South Korea
46.2: Transparent Inverted OLEDs with a Multilayered Graphene Top Anode Using a Novel Lamination Technique
Jeong-Ik Lee, ETRI, Daejeon, South Korea
46.3: Anchoring Energy of PEDOT:PSS Alignment Layer for High-Order Parameter and Polarized Luminescence of Organic Dyes
Andrew Stankevich, Institute of Chemistry of New Materials, National Academy of Sciences Belarus, Minsk, Belarus
46.4: Effects of Electron-Injection Layer on Storage and Operational Stability of Air-Stable OLEDs
Hiroyuki Fukagawa, NHK Science & Technology Research Laboratories, Tokyo, Japan

Session 47: Next-Generation Automotive Display Technologies I: HUDs (Display Systems / Vehicular)
Thursday, June 4 / 10:40 am – 12:00 pm / Room LL20A
Chair: Rashmi Rao, Harman International
Co-Chair: Masaru Suzuki, SKC Haas Display Films
47.1: TBA
47.2: Invited Paper: Laser-Scanning Head-Up Display for Better Driving Assistance
Koichiro Nakamura, Ricoh Co., Ltd., Yokohama, Japan
47.3: TBA
47.4: TBA

Session 48: Display Standards and Their Application to Transparent Displays (Display Measurement)
Thursday, June 4 / 10:40 am – 12:00 pm / Room LL20BC
Chair: Thomas Fiske, Consultant
Co-Chair: Marja Salmimaa, Nokia Research Center
48.1: Invited Paper: Recent Advances in the Standardization of Display Metrology and Light Measurement
Michael Becker, Instrument Systems GmbH, Munich, Germany
48.2: Invited Paper: Recent Developments in Standardization in IEC TC 110, Electronic Display Devices: Reflecting Market Interests
Kei Hyodo, Konica Minolta, Inc., Hachioji, Japan
48.3: Optical Measurement Method for Transparent LCDs
Xinli Ma, BOE Technology Group Co., Ltd., Beijing, China
48.4: General Metrology Framework for Determining the Ambient Optical Performance of Flat-Panel Displays
John Penczek, University of Colorado, Boulder, CO, USA, and National Institute of Standards and Technology, Boulder, CO, USA
48.5: Optical Measuring Methods for Transparent Displays
John Penczek, University of Colorado, Boulder, CO, USA, and National Institute of Standards and Technology, Boulder, CO, USA

Session 49: FFS/IPS II (Liquid-Crystal Technology)
Thursday, June 4 / 10:40 am – 12:00 pm / Room LL20D
Chair: Takahiro Ishinabe, Tohoku University
Co-Chair: Jae Hoon Kim, Hanyang University
49.1: Invited Paper: n-FFS vs. p-FFS: Who Wins?
Shin-Tson Wu, University of Central Florida, Orlando, FL, USA
49.2: Image-Sticking Reduction of FFS-LCDs
Daming Xu, University of Central Florida, Orlando, FL, USA
49.3: Analysis of Press Mura in FFS-LCDs
Yu-Ling Yeh, AU Optronics Corp., Hsinchu, Taiwan, ROC
49.4: A High-Transmittance IPS LC Mode Using a New Self-Aligned Structure
Sun-Hwa Lee, LG Display Co., Ltd., Gyeonggi-do, South Korea

Session 50: Effect of Lighting on Health and Perception (IES Lighting Track)
Thursday, June 4 / 10:40 am – 12:00 pm / Room LL20EF
Chair: James Larimer, ImageMetrics LLC
Co-Chair: Ingrid Heynderickx, Eindhoven University of Technology

50.1: Invited Paper: The Importance of Melanopsin Activation in Perception, Health, and Lighting Design
Dingcai Cao, University of Illinois at Chicago, Chicago, IL, USA

50.2: Invited Paper: Stroboscopic Effect of LED Lighting
Lili Wang, Southeast University, Nanjing, China

50.3: Invited Paper: Perceptual Accuracy in the Visualization of Lighting Scenes
Michael Murdoch, Philips Research, Eindhoven, The Netherlands

50.4: Relationship between Short-Term and Long-Term Assessment of Glare
Yan Tu, Southeast University, Nanjing, China

Session 51: High-Performance Oxide TFTs II (Active-Matrix Devices)
Thursday, June 4 / 1:30 – 2:50 pm / Ballroom 220B
Chair: Kalluri Sarma, Honeywell, Inc.
Co-Chair: Tohru Nishibe, Japan Display, Inc.

51.1: a-IGZO TFTs with High Mobility and Reliability
Chih-Yu Su, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

51.2: Development of a High-Mobility Zinc-Oxynitride TFT for AMOLED Displays
Liangchen Yan, BOE Technology Group Co., Ltd., Beijing, China

51.3: A Mobility-Enhancing Method Adopting a Multi-Active-Layer Structure in TFTs
Ming-Yen Tsai, National Sun Yat-Sen University, Kaohsiung, Taiwan, ROC

Session 52: OLED Devices III (OLEDs)
Thursday, June 4 / 1:30 – 2:50 pm / Ballroom 220C
Chair: Sven Zimmermann, Novaled AG
Co-Chair: Yasunori Kijima, JOLED, Inc.

52.1: Analysis of Self-Heating and Negative Capacitance in Organic Semiconductor Devices
Evelyne Knapp, Zurich University of Applied Sciences, Winterthur, Switzerland

52.2: Non-Destructive Analyses of Operational Degradation of OLED Devices
Toshihiro Yoshihata, Chemical Materials Evaluation Research Base (CERBA), Tsukuba, Japan

52.3: Exciton Management in Non-Doped Ultra-Thin Emissive-Layer-Based OLED Displays
Te Tan, Shanghai Jiao Tong University, Shanghai, China

Session 53: Touch, Interactivity, and Human-Machine Interface (Vehicular / Touch and Interactivity)
Thursday, June 4 / 1:30 – 2:50 pm / Room LL20A
Chair: Silviu Pala, Denso International America
Co-Chair:

Beomshik Kim, Samsung Display Co., Ltd., Yongin, South Korea

53.2: Visual Search and Attention: What Eye-Tracking Reveals about Visual Performance in the Curved Display
Hyeon-Jeong Suk, KAIST, Daejeon, South Korea

53.3: TBA

53.4: Metal-Mesh Design for High-ppi LCD Application
Chun Chen, General Interface Solution Ltd., Miaoli, Taiwan, ROC

Session 54: Transparent Display Systems (Display Systems)
Thursday, June 4 / 1:30 – 2:50 pm / Room LL20BC
Chair: Bill Cummings, BYD Technology Services
Co-Chair: Jean-Pierre Guillou, Apple, Inc.

54.1: A Switched Emissive Transparent Display with Controllable Per-Pixel Opacity
Quinn Smithwick, Disney Research, Glendale, CA, USA

54.2: A Novel Flat-TypeTransparent LCD
Chia-Wei Kuo, AU Optronics Corp., Hsinchu, Taiwan, ROC

54.3: A Polymer-Stabilized Cholesteric Texture (PCST) for Switchable Transparent LCDs
Alireza Moheghi, Liquid Crystal Institute, Kent State University, Kent, OH, USA

54.4: High-Contrast Smart-Window OLED Device with New Black-Screen Technique
Jang Hyuk Kwon, Kyung Hee University, Seoul, South Korea

Session 55: LC Beyond Displays (Liquid-Crystal Technology)
Thursday, June 4 / 1:30 – 2:50 pm / Room LL20D
Chair: Philip Chen, National Chiao Tung University
Co-Chair: Xiaoyang Sun, Chinese Academy of Sciences

55.1: Invited Paper: Liquid Crystals for Smart Antennas and Other Microwave Applications
Michael Wittek, Merck KGaA, Darmstadt, Germany

55.2: Invited Paper: Rethinking Wireless Communications: Advanced Antenna Design Using LCD Technology
Ryan Stevenson, Kymeta Corp., Redmond, WA, USA

55.3: A Low-Voltage Fast-Response IR Spatial Light Modulator
Fenglin Peng, University of Central Florida, Orlando, FL, USA
Session 56: Advanced Lighting Applications (IES Lighting Track)
Thursday, June 4 / 1:30 – 2:50 pm / Room LL20EF
Chair: Ingrid Heynderickx, Eindhoven University of Technology
Co-Chair: Po-Chieh Hung, Konica Minolta Sensing

56.1: **Invited Paper:** Creating an Effective Lighting Environment with Task, Surround, and Ambient Lighting
Peter Ngai, Acuity Brands Lighting, Berkeley, CA, USA

56.2: **Invited Paper:** Progress in Color-Rendition Metrics for Lighting
David Aurelien, Soraa, Fremont, CA, USA

56.3: **Invited Paper:** New Color-Rendition Standards and Implications for Displays that Provide Illumination
Lorne Whitehead, University of British Columbia, Vancouver, British Columbia, Canada

56.4: **Invited Paper:** Forward-Looking Light-Sensor Utilization for Automatic Luminance Control
Paul Weindorf, Visteon Corp., Van Buren Township, MI, USA

Session 57: Oxide and LTPS TFTs (Active-Matrix Devices / Oxide and LTPS TFTs)
Thursday, June 4 / 3:10 – 4:30 pm / Ballroom 220B
Chair: James Chang, Apple, Inc.
Co-Chair: Norbert Fruehauf, University of Stuttgart

57.1: **Invited Paper:** High-Performance Poly-Si TFTs Using Pressure-Induced Nucleation Technology
Myung-Koo Kang, Samsung Electronics Co., Gyonggi-do, South Korea

57.2: **Invited Paper:** Electrical Characterization of BCE-TFTs with IGZO Oxide Semiconductor Compatible with Cu and Al Interconnections
Mototaka Ochi, Kobe Steel, Ltd., Kobe, Japan

57.3: New Pixel Circuits for Controlling Threshold Voltage by Back-Gate Bias Voltage Using Crystalline-Oxide-Semiconductor FETs
Motoko Kaneyasu, Semiconductor Energy Laboratory, Co., Ltd., Kanagawa, Japan

57.4: **Invited Paper:** Device Physics of Amorphous-Oxide TFTs
Ananth Dodabalapur, The University of Texas at Austin, Austin, TX, USA

Session 58: OLED Displays I (OLEDs)
Thursday, June 4 / 3:10 – 4:30 pm / Ballroom 220C
Chair: Tariq Ali, eMagin Corp.
Co-Chair: Chin Hsin (Fred) Chen, Guangdong Aglaia Optoelectronic Materials Co., Ltd.

58.1: A Study of Adaptive Temporal Aperture Control for OLED Displays with Motion Vector
Takenobu Usui, NHK Science & Technology Research Laboratories, Tokyo, Japan

58.2: High-Performance Large-Sized OLED TV with UHD Resolution
Yu-Hung Chen, AU Optronics Corp., Hsinchu, Taiwan, ROC

58.3: A Novel Highly Transparent 6-in. AMOLED Display Consisting of IGZO TFTs
Chia-Tse Lee, Chungwha Picture Tubes, Taoyuan, Taichung, ROC

58.4: A 31-in. 4K x 2K WRGB AMOLED TV with a High-Stability IGZO Backplane
Chih-Yu Su, Shenzhen China Star Optoelectronics Technology Co., Ltd, Shenzhen, China

Session 59: Next-Generation Automotive Display Technologies II: Flexible, Curved, Coatings (Vehicular)
Thursday, June 4 / 3:10 – 4:10 pm / Room LL20A
Chair: Takatoshi Tsujimura, Konica Minolta, Inc.

Co-Chair:
59.1: TBA

59.2: Highly Stable and Transparent Oxide TFTs for Rollable Displays
Jin Jang, Kyung Hee University, Seoul, South Korea

59.3: Functional Transparent Coatings for Displays
Songwei Lu, PPG Industries, Inc., Allison Park, PA, USA

59.4: A Curved Cover with Carbon-NanoBud Touch for Mobile Applications
Erkki Soininne, Canatu Oy, Helsinki, Finland

Session 60: Capacitive Touch (Touch and Interactivity)
Thursday, June 4 / 3:10 – 4:30 pm / Room LL20BC
Chair: Jeff Han, Microsoft
Co-Chair: John Zhong, Apple, Inc.

60.1: A Capacitive Touch Panel for Simultaneous Detection of Non-Conductive and Conductive Objects
Christopher Brown, Sharp Laboratories of Europe, Oxford, UK

Session 61: Liquid-Crystal Lenses (Liquid-Crystal Technology)
Thursday, June 4 / 3:10 – 4:30 pm / Room LL20D
Chair: Philip Bos, Kent State University
Co-Chair: Hoi-Sing Kwok, Hong Kong University of Science & Technology

61.1: Variable-Lens-Pitch LC GRIN Lens for Adapting a 3D Viewing Angle
Ayako Takagi, Toshiba Corp., Kawasaki, Japan

61.2: Dependence of Optical Power of an LC Lens on Cell Gap
Mao Ye, SuperD Co., Ltd., Shenzhen, China

Philip Bos, Liquid Crystal Institute, Kent State University, Kent, OH, USA
Session 62: Advanced Light Sources, Components, and Systems II (IES Lighting Track)
Thursday, June 4 / 3:10 – 4:30 pm / Room LL20EF
Chair: Bob Horner, IES
Co-Chair: Mike Lu, Acuity Brands Lighting
62.1: Invited Paper: Application-Specific Spectral Power Distributions of White Light
Po-Chieh Hung, Konica Minolta Laboratory U.S.A., Inc., San Mateo, CA, USA

62.2: Invited Paper: LED Life vs. LED System Life
Nadarajah Narendran, Lighting Research Center, Troy, NY, USA

Shih-Yu Tu, GIPO and National Taiwan University, Taipei, Taiwan, ROC

Session 63: High-Resolution Displays (Active-Matrix Devices / Oxide and LTPS TFTs)
Friday, June 5 / 9:00 – 10:20 am / Ballroom 220B
Chair: Man Wong, Hong Kong University of Science & Technology
Co-Chair: Kenichi Takatori, NLT Technologies, Ltd.
63.1: An Ultra-High-Density 736-ppi LCD Using an InGaZnO Platform
Naoki Ueda, Sharp Corp., Nara, Japan

63.2: A 2K x 4K 550-ppi In-Cell Touch TFT-LCD Using 1.5-µm Channel-Width LTPS TFTs
Takashi Nakamura, Japan Display, Inc., Saitama, Japan

63.3: Fabrication of 8K x 4K Organic EL Panel Using High-Mobility IGZO Material
Kenichi Okazaki, Advanced Film Device, Inc., Tochigi, Japan

63.4: High-Performance 4K x 2K 65-in. TV with BCE-Type Oxide TFTs
Bo-Liang Yeh, AU Optronics Corp., Hsinchu, Taiwan, ROC

Session 64: OLED Displays II: Curved and High Resolution (OLEDs / Curved and High-Resolution Displays)
Friday, June 5 / 9:00 – 10:20 am / Ballroom 220C
Chair: Yusin Lin, AU Optronics Corp.
Co-Chair: Changwoong Chu, Samsung Display Co., Ltd.
64.1: Slim Design of an 65-in. UHD OLED TV
Koichi Miwa, LG Display Co., Ltd., Gyeonggi-do, South Korea

64.2: Panel and Circuit Designs for the World’s First 65-in. UHD OLED TV
Ryoake Tani, LG Display Co., Ltd., Gyeonggi-do, South Korea

64.3: Development of 55-in. UHD AMOLED TV
Zhong-Yuan Wu, BOE Technology Group Co., Ltd., Beijing, China

Session 65: Flexible Display Technology (e-Paper and Flexible Displays)
Friday, June 5 / 9:00 – 10:20 am / Room LL20A
Chair: Janglin Chen, DTC/ITRI
Co-Chair: Chuyu Liu, AU Optronics Corp.
65.1: Invited Paper: World’s First Large-Sized 18-in. Flexible OLED Display and Key Technologies
Jong-Geun Yoon, LG Display Co., Ltd., Gyeonggi-do, South Korea

65.2: Invited Paper: Bias-Stress-Induced Charge Trapping at Flexible Polymer Gate Dielectric in Organic TFTs
Kilvon Cho, Pohang University of Science and Technology, Pohang, South Korea

65.3: Development of Flexible Displays Using Back-Channel-Etched In–Sn–Zn–O TFTs and Air-Stable Inverted OLEDs
Mitsuru Nakata, NHR Science & Technology Research Laboratories, Tokyo, Japan

65.4: Organic-TFT-Driven Backplane for Flexible Electrophoretic Display
Wen-Chung Tang, E Ink Holding, Inc., Hsinchu, Taiwan, ROC

Session 66: Stereoscopic 3D Displays (Display Systems / Projection)
Friday, June 5 / 9:00 – 10:20 am / Room LL20BC
Chair: Fujio Okumura, NEC Corp.
Co-Chair: Han Ping Shieh, Display Institute, National Chiao Tung University
66.1: Feasibility of 3D Cinema with Uncompromised Performance
Gary Sharp, RealD, Boulder, CO, USA

66.2: Tracked Automultiscopic 3D Tabletop
Quinn Smithwick, Disney Research, Glendale, CA, USA

66.3: Smooth-Motion-Parallax Autostereoscopic 3D Display Using Linear Blending of Viewing Zones
Munekazu Date, NTT Media Intelligence Laboratories, Nippon Telegraph and Telephone Corp., Kanagawa, Japan

66.4: Invited Paper: Circularly Polarized (CPL) 3D Monitors Attract Attention Again for Medical Applications
Takahito Tanabe, Arisawa Manufacturing Co., Ltd., Niigata, Japan

Session 67: Photo Alignment (Liquid-Crystal Technology)
Friday, June 5 / 9:00 – 10:20 am / Room LL20D
Chair: Cheng Chen, Apple, Inc.
Co-Chair: Matthew Sousa, 3M Co.
67.1: Reactive Mesogen Stabilized Azodye Alignment for High-Contrast Displays
Valerie Finnemeyer, Liquid Crystal Institute, Kent State University, Kent, OH, USA
Session 68: Touch Systems and Materials (Touch and Interactivity / Display Manufacturing / Vehicular)
Friday, June 5 / 9:00 – 10:20 am / Room LL21EF
Chair: Willem den Boer, Guardian Industries
Co-Chair: Reiner Mauch, Schott AG

68.1: Invited Paper: Panel-Structure Evolution of In-Cell Capacitive Touch Sensor
Qijun Yao, Shanghai Tianma Microelectronics Co., Ltd., Shanghai, China

68.2: Study of the Optimized Design for High-Resistance Black Matrix at In-Cell Touch Structure
Yoonsung Na, LG Display Co. Ltd, Gyeonggi-do, South Korea

Session 69: Oxide-TFT Reliability (Active-Matrix Devices)
Friday, June 5 / 10:40 am – 12:00 pm / Ballroom 220B
Chair: Yoshitaka Yamamato, Semiconductor Energy Laboratory Co., Ltd.
Co-Chair: Hyun Jae Kim, Yonsei University

69.1: Invited Paper: Advantages of the Self-Aligned Top-Gate Oxide-TFT Technology for AMOLED Displays
Toshiaki Arai, JOLED, Inc., Kanagawa, Japan

69.2: Highly Reliable a-IGZO TFTs with Self-Aligned Coplanar Structure for Large-Sized UHD OLED TV
Chanki Ha, LG Display Co., Ltd., Gyeonggi-do, South Korea

69.3: a-IGZO TFT Reliability Improvement by Using a Dual-Gate Structure
Kuo-jui Chang, AU Optronics Corp., Hsinchu, Taiwan, ROC

Session 70: OLED Displays III (OLEDs)
Friday, June 5 / 10:40 am – 12:00 pm / Ballroom 220C
Chair: C. C. Lee, BOE Technology Group Co., Ltd.
Co-Chair: Yustin Lin, AU Optronics Corp.

70.1: High-Resolution OLED Display with the Lowest Level of Power Consumption Using a Blue/Yellow Tandem Structure and RGBY Subpixels
Ryohei Yamaoka, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

70.2: An 81-in. 8K x 4K OLED Kawara-Type Multidisplay Providing a Seamless Continuous Image
Hisao Ikeda, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

70.3: Low-Power-Consumption and Wide-Color-Gamut AMOLED Display Having Four Primary Colors
Chung-Chia Chen, AU Optronics Corp., Hsinchu, Taiwan, ROC

70.4: A 2.78-in 1058-ppi UHD OLED Display Using CAAC-OS FETs
Kohei Tokoyama, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

Session 71: Flexible Encapsulation (e-Paper and Flexible Displays)
Friday, June 5 / 10:40 am – 12:00 pm / Room LL20A
Chair: Kyung Cheol Choi, KAIST
Co-Chair: Bo-Ru Yang, Sun Yat-Sen University

71.1: High-Throughput and Scalable Spatial Atomic Layer Deposition of Al2O3 as a Moisture Permeation Barrier for a Flexible OLED Display
Hagyoung Choi, LIG ADP Co., Ltd., Seongnam, South Korea

71.2: Mechanical Characteristics of Flexible AMOLED Displays
Ji-Feng Chen, AU Optronics Corp., Hsinchu, Taiwan, ROC

71.3: Quantification of Water Penetration and Degradation through Adhesives Applicable to Flexible OLED Design
Yoshiko Ohzu, Chemical Materials Evaluation and Research Base (CEREBA), Ibaraki, Japan

Session 72: Curved or High-Resolution Large Displays (Display Systems / Curved and High-Resolution Displays)
Friday, June 5 / 10:40 am – 12:00 pm / Room LL20BC
Chair: Wei Chen, Apple, Inc.
Co-Chair: Brian Berkeley, Independent

72.1: World’s First 55-in. 120-Hz-Driven 8K x 4K IPS-LCDs with Wider Color Gamut
Ryutaro Oke, Panasonic Liquid Crystal Display Co., Ltd., Himeji, Japan

72.2: Development and Analysis of Technical Challenges in the World’s Largest (110-in.) Curved LCD
Ken Hsiao, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

72.3: The Mechanical Reliability of Glass Displays in Bending
K. Ramanath Vepakomma, Corning Incorporated, Corning, NY, USA

72.4: Development of a Laser Optical System for a 4K Laser-Backlit LCD TV
Nami Okimoto, Mitsubishi Electric Corp., Advanced Technology R&D Center, Nagakakyo, Japan

Session 73: Ultra-Low-Power LCDs (Liquid-Crystal Technology)
Friday, June 5 / 10:40 am – 12:00 pm / Room LL20D
Chair: Gang Xu, Hewlett-Packard Co.
Co-Chair: Akihiro Mochizuki, I-CORE Technology, LLC

**73.1:** A Novel Pixel Structure for High-Transmittance and High-Image-Quality LCDs
Joong-Dong Lee, LG Display Co., Ltd., Gyeonggi-do, South Korea

**73.2:** A Novel TFT Pixel and Driving Scheme of Electrically Suppressed-Helix FLC for Active-Matrix FPDs
Tsz Kin Ho, Hong Kong University of Science and Technology, Kowloon, Hong Kong

**73.3:** Elimination of Image Flicker in an FFS Mode under Low-Frequency Driving
Tae-Hoon Yoon, Pusan National University, Busan, South Korea

**73.4:** Reflective LCD with High Reflectivity and Color Reproductivity for Reduced Eye Strain
Daisuke Kubota, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

**Session 74: Touch Applications (Touch and Interactivity)**
Friday, June 5 / 10:40 am – 12:00 pm / Room LL20EF
Chair: Deuksu Lee, LG Display Co., Ltd.
Co-Chair: Bob Senior, Canatu Oy

**74.1:** A Novel Near-Field Three-Dimensional User-Interface Technology
Russ Gruhlke, Qualcomm Technologies, Santa Clara, CA, USA

**74.2:** Invited Paper: What Lies Beyond Multitouch?
Chris Harrison, Carnegie-Mellon University, Pittsburgh, PA, USA

**Poster Session**
Thursday, June 5 / 4:00 – 7:00 pm / Ballroom 220A

**Active-Matrix Devices**

**P.1:** Current-Supplying Driving Method of Active-Matrix Ionic Polymer-Metal Composites for Stereoscopic Displays
Mutsumi Kimura, Ritsukyo University, Otsu, Japan

**P.2:** A Novel Method for LTPS Model Extraction with Hysteresis and Transient Current Analysis
Chen-Hao Kuo, AU Optronics Corp., Hsinchu, Taiwan, ROC

**P.3:** A New LTPS Pixel Circuit for Compensating the Variation of TFT Characteristics and Alleviating OLED Degradation
Wei-Chu Hu, AU Optronics Corp., Hsinchu, Taiwan, ROC

**P.4:** Feasibility Study of a Dual-Gate Photosensitive TFT for Fingerprint-Sensor-Integrated Active-Matrix Display
Kai Wang, Sun Yat-Sen University – Carnegie-Mellon University Joint Institute of Engineering, Guangdong, China

**P.5:** Oxide Semiconductor/Polypropylene Carbonate Paste for a TFT Using Screen Printing
Akinari Matoba, Industrial Research Institute of Ishikawa, Ishikawa, Japan

**P.6:** Impact of Buffer Layers on the Self-Aligned Top-Gate a-IGZO TFT Characteristics
Manoj Nag, imec, Leuven, Belgium

**P.7:** Improvement of PBTS Stability in Top-Gate Coplanar Amorphous-InGaZnO TFTs
Suo rooner Oh, LG Display Co., Ltd., Gyeonggi-do, South Korea

**P.8:** Investigation the Degradation Behavior of Bottom/Top-Gate Sweep under Negative-Bias Illumination Stress in Dual-Gate InGaZnO TFTs
Ming-Yen Tsai, National Sun Yat-Sen University, Kaohsiung, Taiwan, ROC

**P.9:** Improved Electrical Stability of Double-Gate a-IGZO TFTs
Zhih Shengdong, Peking University, Shenzhen, China

**P.10:** Comparative Studies of ZnON and ZnO TFTs Fabricated by DC Reactive Sputtering Method
Jin-Seong Park, Chungnam National University, Seoul, South Korea

**P.11:** Channel-Etched CAAC-OS FETs Using Multi-Layered IGZO
Yukihiro Shina, Advanced Film Device, Inc., Tochigi, Japan

**P.12:** A Study on the Characteristics of Crystalline IGZO TFTs
Jang-Yeon Kwon, Yonsei University, Incheon, South Korea

**P.13:** The Influence of Nano-Scale Crystal Structures of Oxide Semiconductors on FETs
Yoiichi Kurosawa, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

**P.14:** A Narrow-Bezel FFS-Mode WQHD 4.9-in. 600-ppi LCD with a Modified ESL-Type a-IGZO TFT
En-Chih Liu, Chungwha Picture Tubes, Ltd., Taipei, Taiwan, ROC

**P.15:** Self-Aligned Top-Gate Zinc-Oxide TFTs Fabricated by Reactive Sputtering of a Metallic Zinc Target
Meng Zhang, Hong Kong University of Science and Technology, Kowloon, Hong Kong

**P.16:** Research on Dual-Layer Channel ITO/MZO TFTs Fabricated on Glass at Low Temperature
Pan Shi, Peking University, Shenzhen, China

**P.17:** High-Mobility ITZO BCE-Type TFTs for AMOLED Applications
Fengqian Liu, BOE Technology Group Co., Ltd., Beijing, China

**P.18:** Extraction and Simulation with Time-Dependent Voltage-Threshold-Shift Model for IGZO Panel
Zhong-Yuan Wu, BOE Technology Group Co., Ltd., Beijing, China

**P.19:** Effect of Strain on the Characteristics of a-IGZO TFTs Fabricated on Engineered Aluminum Substrates
Forough Mahmoudabadi, Lehigh University, Bethlehem, PA, USA

**P.20:** The Effect of Oxide-TFT Design on Voltage-Threshold Shift
Xiaolin Wang, BOE Technology Group Co., Ltd., Beijing, China

**P.21:** Effects of Low-Hydrogen Dielectric Film on a-IGZO TFT Properties
Xiaodi Liu, BOE Technology Group Co., Ltd., Beijing, China

**P.22:** High-Performance a-IGZO TFT with Cu Gate, Source, and Drain Electrodes
Xiuming Zhu, BOE Technology Group Co., Ltd., Beijing, China

**P.23:** Simulation Calibration Procedure of Leakage Current in TFTs
Nam-Kyun Tak, Silvaco Korea, Seoul, South Korea

**P.24:** Bridged-Grain Metal-Induced Crystallization of Poly-Si TFT Process with Shorter Annealing Time
Rongsheng Chen, Hong Kong University of Science and Technology, Kowloon, Hong Kong

**P.25:** Enhanced Positive-Bias-Stress Stability of a-IGZO TFTs with a Vertically Graded Oxygen-Vacancy Active Layer
Byun Jae Kim, Yonsei University, Seoul, South Korea

**P.26:** High-Capacity Memory Using Oxide-Based Schottky Diode and Unipolar Resistive Array
Nam-Kyun Tak, Silvaco Korea, Seoul, South Korea
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Jose Dominguez-Caballero, Intel Corp., Santa Clara, CA, USA

P.28: Contrast Enhancement for an Imaging System Using Electrically Tunable Liquid-Crystal Lens
Mao Ye, SuperD Co., Ltd., Shenzhen, China

P.29: A Polymer/Fullerene-Based Material in Near-Infrared Photodetector Applications
Hsiao-Tsai Hsiao, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Wei-Chieh Lin, National Taiwan University, Taipei, Taiwan, ROC

Applied Vision / Human Factors

P.31: Will Curved Displays Become Mainstream in Electronics? Appraisal for Aesthetic and Usability Aspects of Curved Large Displays
Hyeon-Jeong Suk, KAIST, Daejeon, South Korea

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Johanna Rousson, Barco NV and iMinds-IPTELIN, Ghent University, Kortrijk, Belgium

Dunli Wang, Institute of Software, Chinese Academy of Sciences, Beijing, China

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Shunpei Yamazaki, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

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Feng Jiang, BOE Technology Group Co., Ltd., Beijing, China

P.36: Subjective Size of News Presentation Shrinking with Recent Enlargement of Display Size in Japan
Sakuichi Ohitsu, Kagoshima University, Kagoshima, Japan

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Yu Chi Kang, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Chun-Da Tu, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Chun-Jen Su, IIL Technology Corp., Hsinchu, Taiwan, ROC

Chia-Chun Chang, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan, ROC

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Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan, ROC

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Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan, ROC

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Zhang Shengdong, Peking University, Shenzhen, China

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Hu Liang, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

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Liao Congwei, Peking University, Shenzhen, China

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Kyujin Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

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Kun Cao, BOE Technology Group Co., Ltd., Beijing, China

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Jin Jang, Kyung Hee University, Seoul, South Korea

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Zhan Xu, BOE Technology Group, Ltd., Hefei, China

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Chul Ho Park, LG Display Co., Ltd., Gyeonggi-do, South Korea

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Hee Young Kwack, LG Display Co., Ltd., Gyeonggi-do, South Korea

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Poong Yu Chen, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Tadahiro Furukawa, Yamagata University, Yamagata, Japan

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Yingtao Xie, Jiao Tong University, Shanghai, China

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Yi Chiu, Chungwa Picture Tubes, Ltd., Taoyuan, Taiwan, ROC

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Hikaru Ikeda, Nippon Electric Glass Co., Ltd., Shiga, Japan

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Yousuke Ono, Taica Corp., Tokyo, Japan

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Ryan Schneider, Dow Corning Corp., Midland, MI, USA

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Kazutaka Hayashi, Asahi Glass Co., Ltd., Kanagawa, Japan

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Manuela Junghaehnel, Fraunhofer Institute for Organic Electronics, Dresden, Germany

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Alex Xiao, BOE Ordos Yuansheng Optoelectronics Co., Ltd., Ordos, China

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Pierre Boher, ELDIM, Herouville, France

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Tae-Sung Lee, KIST, Seoul, South Korea

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Seondeok Hwang, Samsung Electronics Co., Suwon, South Korea

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Yu-Han Chiang, AU Optronics Corp., Hsinchu, Taiwan, ROC

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Qiong-Hua Wang, Sichuan University, Chengdu, China

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Qiong-Hua Wang, Sichuan University, Chengdu, China

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Hyoseok Hwang, Samsung Electronics Co., Suwon, South Korea

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Wa Kun, BOE Technology Group Co., Ltd., Beijing, China

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Daniel Schäfer, Institute of Microelectronics, Saarland University, Saarbruecken, Germany

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Lei Niu, Shanghai Tianma Microelectronics Co., Ltd., Shanghai, China

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Xiao Wei Sun, Nanyang Technological University, Singapore

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Qiong-Hua Wang, Sichuan University, Chengdu, China

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Changhee Lee, Seoul National University, Seoul, South Korea

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Ruidong Zhu, University of Central Florida, Orlando, FL, USA

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Chaoyang Li, Kochi University of Technology, Kami, Japan

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Junjie Hao, South University of Science and Technology of China, Shenzhen, China

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Zhenyue Luo, University of Florida, Orlando, FL, USA

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Shunpei Yamazaki, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

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Ming Lai, Changhwa Picture Tubes, Ltd., Taoyuan, Taiwan, ROC

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Seung Hee Lee, Chonbuk National University, Jeonju, South Korea

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Wei Chen, South University of Science and Technology of China, Shenzhen, China

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Wei-Shen Liao, National Taiwan University, Taipei, Taiwan, ROC

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Tetsuji Ishitani, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

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Hyungmin Kim, Chonbuk National University, Jeonbuk, South Korea

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Libo Weng, Liquid Crystal Institute, Kent State University, Kent, OH, USA

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Jiatong Sun, Hong Kong University of Science and Technology, Kowloon, Hong Kong

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Jaegeon You, BOE Technology Group Co., Ltd., Beijing, China

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Libo Weng, Liquid Crystal Institute, Kent State University, Kent, OH, USA

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Shinichiro Oka, Japan Display, Inc., Mobaara, Japan

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Seungbin Yang, Chonbuk National University, Jeonbuk, South Korea

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Alexander Muravsky, Institute of Chemistry of New Materials, NAS Belarus, Minsk, Belarus

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Yanjun Song, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

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Yongchao Zhao, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

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Chenxiang Zhao, Hong Kong University of Science and Technology, Kowloon, Hong Kong

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Oleg Lavrentovich, Liquid Crystal Institute, Kent State University, Kent, OH, USA

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