ADVANCE PROGRAM

2020 DISPLAY WEEK INTERNATIONAL SYMPOSIUM

August 4-7, 2020 (Tuesday – Friday)
San Jose McEnery Convention Center
San Jose, California, US

Session 1: Annual SID Business Meeting
Tuesday, August 4, 2020 / 8:00 AM – 8:20 AM / Room 220A

Session 2: Opening Remarks / Keynote Addresses
Tuesday, August 4, 2020 / 8:20 AM – 10:20 AM / Room 220A
Chair: Yi-Pai Huang, Apple, Inc., Cupertino, CA US

2.1: ***Keynote Address 1:*** *Display Technology Requirements for Next Generation PCs, James Johnson, Corporate Vice President, Intel*
2.2: ***Keynote Address 2:*** *The Future of Display Technologies, SooYoung Yoon, SVP, LG Display*
2.3: ***Keynote Address 3:*** *Quantum Computing System, Robert Wisnieff, CTO, Quantum Computing/Distinguished Research Staff Member, IBM TJ Watson Research Center*

Session 3: 8K, High Resolution LCDs *(Liquid Crystal Technology)*
Tuesday, August 4, 2020 / 11:10 AM - 12:40 PM / Room LL21EF
Chair: *Miyoshi Ayama, Utsunomiya University*
Co-Chair: *Philip Chen, National Chiao Tung University*

3.1: ***Invited Paper:*** **Super Bright 8K LCD with 10,000 nit has been Realized with Excellent Light-Resistance Characteristics of IGZO TFT Backplane**
Jun Nishimura, Sharp Corp. Display Device Company, Kameyama, Japan
3.2: ***Invited Paper:*** **A Wide Color Gamut LCD with a Polarized Laser Backlight**
Shinichi Komura, Japan Display Inc., Mobara, Japan
3.3: **Novel Microstructure Film to Improve Viewing Angle of Multi-Domain Polymer Sustained Alignment LCD**
Kun-Cheng Tien, AU Optronics, Hsinchu, Taiwan Roc
3.4: **Novel LCD Pixel Design with Extra Large Aperture Ratio for PsVA Mode Display**
Surigalatu Borjigin, Shenzhen China Star Optoelectronics Semiconductor Display Technology Co.Ltd., Shenzhen, China
3.5: ***Late-News Paper:*** **Two-Dimensionally Aligned Array with 1μm Pixel Pitch Using Ferroelectric Liquid Crystal Pixels for Holography Application**
Shintaro Aso, Japan Broadcasting Corporation, Tokyo, Japan

Session 4: Automotive Display Components *(Automotive/Vehicular Displays and HMI Technologies)*
Tuesday, August 4, 2020 / 11:10 AM - 12:30 PM / Room LL20A
Chair: *David Hermann, Volvo Car Corporation AB*
Co-Chair: *Karlheinz Blankenbach, Pforzheim University*

4.1: ***Invited Paper:*** **Technical Cover Glass Designed for Automotive Infotainment Display**
Casey Kang, Corning Incorporated, Corning, NY US
4.2: **Anti-Glare Cover Glass Optical Properties Dependence on the Display Module Configuration**
Masanobu Isshiki, AGC Inc., Yokohama, Japan
4.3: ***Late-News Paper:*** **OLED Device Technologies for Automotive Application**
Shigeru Mori, Tianma Japan, Ltd., Kawasaki, Japan
4.4: **Increase of Contrast in 3D HUD Using an Active Parallax Barrier**
Akinori Sato, KYOCERA Corporation, Shiga, Japan

Session 5: AR/VR Invited Session *(Augmented, Virtual and Mixed Reality / Display Systems)*
Tuesday, August 4, 2020 / 11:10 AM - 12:30 PM / Room 220B
Chair: *Achin Bhowmik, Starkey Hearing Technologies*
Co-Chair: *Seung Woo Lee, Kyung Hee University*

5.1: ***Invited Paper:*** **Human Factors in Virtual and Augmented Reality**
Martin Banks, University of California Berkeley, Berkeley, CA US
5.2: ***Invited Paper:*** **Computational Eyeglasses and Near-eye Displays with Focus Cues**
Gordon Wetzstein, Stanford University, Stanford, CA US
5.3: ***Invited Paper:*** **Towards Cost-Effective AR/MR Displays Mass Production: The Emergence of an Industrial Hardware Ecosystem for Waveguide Combiners and Micro iLED Displays**
Bernard Kress, Microsoft, Redwood City, CA US
5.4: ***Invited Paper:*** **Current Challenges in Augmented-Reality Waveguide Display Technology**
Jonathan Waldern, DigiLens Inc., Sunnyvale, CA US

Session 6: OLED Materials I *(OLEDs)*
Tuesday, August 4, 2020 / 11:10 AM - 12:30 PM / Room LL21CD
Chair: *Denis Kondakov, DuPont*
Co-Chair: *Sven Zimmermann, Novaled GmbH*

6.1: ***Invited Paper:*** **Lifetime Improvement of TADF-OLEDs**
Jun-Yun Kim, LG Display, Seoul, South Korea

6.2: ***Invited Paper:*** **Innovative Technological Progress of Lifetime in Hyperfluorescence**
Junji Adachi, Kyulux Inc., Fukuoka, Japan

6.3: **Efficient and Long Lifetime Blue TADF and Deep Blue Hyper Fluorescent Materials and Devices**
Jang-Hyuk Kwon, Kyung Hee University, Seoul, South Korea

6.4: ***Late-News Paper:*** **Realizing Deep Blue Emission in Blue Phosphorescent Organic Light- Emitting Diodes**
Jinwon Sun, Samsung Display, Co., Ltd., Yongin, South Korea

Session 7: Reliability *(Active Matrix Devices)*
Tuesday, August 4, 2020 / 11:10 AM - 12:30 PM / Room LL20D
Chair: *Hsing-Hung Hsieh, HP International Pte. Ltd.*
Co-Chair: *Xiaojun Guo, Shanghai Jiao Tong University*

7.1: ***Distinguished Paper:*** **Alleviation of Abnormal NBTI Phenomenon in LTPS TFTs on Polyimide Substrate for Flexible AMOLED**
Jaeseob Lee, Samsung Display Co., Ltd., Yongin, South Korea

7.2: ***Invited Paper:*** **Hot Carrier Degradation in High Mobility Metal Oxide Thin Film Transistors**
Yukiharu Uraoka, Nara Institute of Science and Technology, Ikoma, Japan

7.3: **High ESD Robustness and Low Visible Light Reflectance Design for LTPS-TFTs on Glass Substrates in Modular Micro-LED Displays**
Seongho Son, Samsung Electronics Co., Ltd., Suwon, South Korea

7.4: ***Late-News Paper:*** **Development of High-Mobility Top-Gate IGZTO-TFT and Suppression of Threshold Voltage Shift in Short Channel Utilizing Laser Irradiation Process**
Mitsuru Nakata, NHK Science & Technology Research Laboratories, Tokyo, Japan

Session 8: Advances in Lighting: OLEDs, Materials, and Manufacturing *(Lighting)*
Tuesday, August 4, 2020 / 11:10 AM - 12:30 PM / Room LL20BC
Chair: *Eric Margulies, Universal Display Corporation*
Co-Chair: *J. Norman Bardsley, Bardsley Consulting*

8.1: ***Invited Paper:*** **Development of High-Temperature Stable Red OLEDs for Automotive Lighting**
Marina Kondakova, OLEDWorks LLC, Rochester, NY US

8.2: ***Invited Paper:*** **High Refractive Index Material for Display and Lighting Applications**
Selina Monickam, Pixelligent Technologies, LLC, Baltimore, MD US

8.3: ***Invited Paper:*** **OLED Lighting Design and Roll-to-Roll Manufacturing**
Christian May, Fraunhofer-Institute for Organic Electronics, Dresden, Germany

8.4: ***Invited Paper:*** **Flexible Glass Substrate for OLED Lighting Application and Efficient Internal Light Extraction for OLED Lighting Devices**
Dipak Chowdhury, Corning Technology Center Korea, Seoul, South Korea

Session 9: MicroLED Manufacturing *(Display Manufacturing)*
Tuesday, August 4, 2020 / 11:10 AM - 12:40 PM / Room 220C
Chair: *Ion Bita, Google LLC*
Co-Chair: *Bradley Bowden, Corning Research and Development Corporation*

9.1: ***Invited Paper:*** **Colloidal Lead Halide Perovskite Nanocrystals as Classical and Quantum Light Sources**
Maksym Kovalenko, ETH Zurich and Empa, Zurich, Switzerland

9.2: **Manufacturing Process for Mass-Production of Micro LED Displays**
Koichi Kajiyama, V-Technology Co., Ltd, Yokohama, Japan

9.3: **Advanced Process and Structure of Backplane for Micro LED Display**
Hua-Fei Xie, Peking University, Shenzhen, China

9.4: **Applying FPD Panel and Manufacturing Technologies to Alternative Applications and New Business Models**
Charles Annis, IHS Markit, Tokyo, Japan

9.5: ***Late-News Paper:*** **A 3.9-inch LTPS TFT Full Color MicroLED Display with Novel Driving and Reflector Cavity Process**
Masaya Tamaki, Kyocera Corporation, Shiga, Japan

Session 10: HDR LCDs I *(Liquid Crystal Technology / Display Systems / High-Dynamic-Range LCDs)*
Tuesday, August 4, 2020 / 2:00 PM - 3:20 PM / Room LL21EF
Chair: *Brian Berkeley, Highlight Display LLC*
Co-Chair: *Shin-Tson Wu, University of Central Florida*

10.1: ***Invited Paper:*** **High Dynamic Range Mini-LED and Dual-Cell LCDs**
Shin-Tson Wu, University of Central Florida, Orlando, FL US

10.2: ***Invited Paper:*** **Development of Dual-Cell LCD with Mega Contrast**
Lei Guo, Hefei Xinsheng Optoelectronics Technology Co., Ltd., Hefei, China

10.3: ***Invited Paper:*** **Active Matrix Mini-LED Backlight on Glass for 75-inch LCDs**
Jiayang Fei, TCL China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

10.4: ***Invited Paper:*** **A High Dynamic Range Monitor: Apple Pro Display XDR**
Mingxia (Vincent) Gu, Apple Inc., Cupertino, CA US

Session 11: Automotive Display Technologies and Systems *(Automotive/Vehicular Displays and HMI Technologies)*

Tuesday, August 4, 2020 / 2:00 PM - 3:20 PM / Room LL20A

Chair: *Casey Kang, Corning Incorporated*

Co-Chair: *Rashmi Rao, Harman International*

11.1: **High Reliability Flexible AMOLED Display with Algorithm Compensation for Automotive Application**
Youxiong Feng, BOE Technology Group Co., Ltd., Chengdu, China

11.2: ***Late-News Paper:*** **Display/Projection Features: The Next Growth Driver for Automotive Lighting**
Pars Mukish, Yole Développement, Villeurbanne, France

11.3: ***Distinguished Paper:*** **Advanced Methods for Safe Visualization on Automotive Displays**
Benjamin Axmann, Daimler AG Group Research, Boeblingen, Germany

11.4: ***Invited Paper:*** **Virtual prototyping and testing of automotive capacitive touch sensors**
George Bouzianas, Fieldscale PC, Thessaloniki, Greece

Session 12: OLED AR/VR *(Augmented, Virtual and Mixed Reality / OLEDs)*

Tuesday, August 4, 2020 / 2:00 PM - 3:20 PM / Room 220B

Chair: *Qi Wang, eMagin Corporation*

Co-Chair: *Franky So, North Carolina State University*

12.1: ***Invited Paper:*** **Directional SPP Emission in OLEDs Using Diffractive Optical Elements**
Xiangyu Fu, North Carolina State University, Raleigh, NC US

12.2: **High Performance OLED Microdisplays Made with Multi-Stack OLED Formulations**
John Hamer, OLEDWorks LLC, Rochester, NY US

12.3: **Organic Light-Emitting Diode Microdisplay with a 32:9 Aspect Ratio for Wide Field of View**
Hyunkoo Lee, Electronics and Telecommunications Research Institute, Daejeon, South Korea

12.4: **1000PPI LTPS OLED Display for VR Application**
Ziyang Yu, Chengdu BOE Optoelectronics Technology Co., Ltd., Chengdu, China

Session 13: OLED Materials II *(OLEDs)*

Tuesday, August 4, 2020 / 2:00 PM - 3:20 PM / Room LL21CD

Chair: *Hitoshi Kuma, Idemitsu Kosan Co., Ltd.*

Co-Chair: *Nicholas Thompson, Universal Display Corporation*

13.1: ***Invited Paper:*** **The Impact of Spontaneous Orientation Polarization on the Maximum Efficiency and Stability of Organic Light-Emitting Devices**
Russell Holmes, University of Minnesota, Minneapolis, MN US

13.2: ***Late-News Paper:*** **How to Reduce Harmful Blue Light on OLED Device**
Jinsook Bang, Samsung Display Corporation, Youngin, South Korea

13.3: **Improvement of Blue Pixels in OLED Panels with More Efficient Fluorescent and TADF Emitters**
Thomas Baumann, cynora GmbH, Bruchsal, Germany

13.4: ***Late-News Paper:*** **Effect of Molecular Structure of Host Materials on Thermal Stability and Device Characteristics of Solution Processed OLEDs**
Min Chul Suh, Kyung Hee University, Seoul, South Korea

Session 14: Image Sensors *(Active Matrix Devices)*

Tuesday, August 4, 2020 / 2:00 PM - 3:00 PM / Room LL20D

Chair: *Sang Hee Park, KAIST*

Co-Chair: *Tse Nga Tina Ng, University of California San Diego*

14.1: **Flexible Large-Area Multi-Fingerprint Sensors Based on Thermal Mass Detection**
Florian De Roose, imec, Leuven, Belgium

14.2: ***Invited Paper:*** **OLED Display Incorporating an Organic Image Sensor**
Yasuhiro Niikura, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

14.3: **Flexible Image Sensor Array Using IGZO TFT Backplane Technology for X-Ray Detector**
Rikiya Takita, Sharp Corporation, Taki, Japan

14.4: ***Late-News Paper:*** **Large-Area Optical Fingerprint Sensors for Next Generation Smartphones**
Noémie Ballot, Isorg, Limoges, France

Session 15: Advanced TFT Manufacturing *(Display Manufacturing)*

Tuesday, August 4, 2020 / 2:00 PM - 3:20 PM / Room LL20BC

Chair: *Dr. Chiwoo Kim, APS Holdings*
Co-Chair: *Greg Gibson, nTact*

15.1: ***Invited Paper:*** **Manufacturing Technology of LTPO TFT**
Ui-Jin Chung, LG Display Co., Ltd., Paju, South Korea

15.2: **Gen 10 Excimer Laser Annealing System**
Takahiro Fuji, The Japan Steel Works, Ltd., Yokohama, Japan

15.3: **Resistance Reduction of Molybdenum Metallization by Tungsten Seed Layer**
Harald Köstenbauer, Plansee SE, Reutte, Austria

15.4: **New Gen. 6 Exposure Tools for 1.2 ?m Resolution**
Nobuhiko Yabu, Canon Inc., Utsunomiya, Japan

Session 16: MicroLED Color Conversion *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Tuesday, August 4, 2020 / 2:00 PM - 3:30 PM / Room 220C
Chair: *Seth Coe-Sullivan, Luminit, LLC*
Co-Chair: *Ioannis Kymissis, Columbia University*

16.1: ***Invited Paper:*** **Hybrid Full-Color MicroLED Display with Quantum-Dot Color Conversion Using Inkjet-Printing and Photolithography Methods**
Yang Gu, X-Vision Lab, Visionox Technology Inc., Kun shan, China

16.2: **A 4-inch Full Color Active-matrix Mini-LED Display Based on 0408 Chip and 500um Pixel**
Hong Meng, Peking University, Shenzhen, China

16.3: **High-End Displays Applications by Micro-LEDs**
Chien-Chung Lin, Industrial Technology Research Institute, Hsinchu, Taiwan Roc

16.4: ***Late-News Paper:*** **High Color Gamut Mini-LED Backlight Demon Based on Dual-Emissive Perovskite Quantum Dots Films**
Haizheng Zhong, Beijing Institute of Technology, Beijing, China

16.5: ***Late-News Paper:*** **High Flux Stable Perovskite Quantum Dots-Polymer Composite for Down-Converting Applications**
Lutfan Sinatra, Quantum Solutions LLC, Thuwal, Saudi Arabia

Session 17: HDR LCDs II *(Liquid Crystal Technology / Display Systems / High-Dynamic-Range LCDs)*
Tuesday, August 4, 2020 / 3:40 PM - 5:40 PM / Room LL21EF
Chair: *Jenn Jia Su, AU Optronics Corporation*
Co-Chair: *Matthew Sousa, 3M*

17.1: ***Invited Paper:*** **An Overview of Solutions for Achieving HDR LCDs**
Jenn Jia Su, AU Optronics Corporation, Hsinchu, Taiwan Roc

17.2: **A Method for Improving Image Contrast Based on Dual Cell Display**
Yizhuo Zhao, TCL China Star Optoelectronics Technology Co., ShenZhen, China

17.3: **Novel Mini-LED Backlit for 75-inch HDR LCD**
Enhui Guan, BOE Technology Group Co., Ltd., Beijing, China

17.4: **Enhancing the Picture Quality of Local Dimming Mini-LED LCD**
Chun-Chi Chen, TCL China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

17.5: ***Distinguished Paper:*** **Birefringent Light-Shaping Films for Mini-LED Backlights**
Ziqian He, University of Central Florida, Orlando, FL US

17.6: ***Invited Paper:*** **4K HDR "Stacked-Panel" TV Based on Dual-Cell LCD**
Weidong Liu, Hisense Visual Technology Co., Ltd, Qingdao, Shandong, China

Session 18: Head-Up Displays (HUD) *(Automotive/Vehicular Displays and HMI Technologies)*
Tuesday, August 4, 2020 / 3:40 PM - 5:00 PM / Room LL20A
Chair: *Philippe Coni, THALES Avionics*
Co-Chair: *Haruhiko Okumura, Toshiba Corporation*

18.1: ***Invited Paper:*** **Holographic Optical Elements for Automotive Windshield Displays**
Ian Redmond, Ceres Holographics Ltd, St Andrews, FL United Kingdom

18.2: **Improvement of Light Leakage in HUD System**
Kenta Kamoshida, KYOCERA Corporation, Shiga, Japan

18.3: **Impact Study of Windshield Geometry on the Subjective Customer Perception for Augmented Reality Head-Up Displays (AR-HUD)**
Daniel Wagner, Mercedes-Benz AG, Sindelfingen, Germany

18.4: ***Invited Paper:*** **Switchable Lightfield Displays for Automotive Applications**
David Fattal, Leia Inc, Menlo Park, CA US

Session 19: Human Factors with AR/VR *(Augmented, Virtual and Mixed Reality / Applied Vision)*
Tuesday, August 4, 2020 / 3:40 PM - 5:00 PM / Room 220B
Chair: *Takashi Shibata, Tokyo University of Social Welfarae*
Co-Chair: *Paolo Sacchetto, Apple, Inc.*

19.1: ***Distinguished Paper:*** **Differences Between Oculomotor and Perceptual Artifacts for Temporally Limited Head-Mounted Displays**
T. Scott Murdison, Facebook, Redmond, WA US

19.2: **Vergence-Accommodation Conflicts in Augmented Reality: Impacts on Perceived Image Quality**
Ian Erkelens, Facebook, Redmond, WA US

19.3: **Foveated Brightness Control Technology for VR Applications**
Seung-Woo Lee, Kyung Hee University, Seoul, South Korea

19.4: **Research on Reducing Motion Sickness of Playing First Person Shooting VR Game with Texture Blur**
Ting-Lan Tsai, National Taiwan University of Science and Technology, Taipei City, Taiwan Roc

Session 20: OLED Materials III *(OLEDs)*
Tuesday, August 4, 2020 / 3:40 PM - 5:00 PM / Room LL21CD
Chair: *Jang Hyuk Kwon, Kyung Hee University*
Co-Chair: *Changwoong Chu, Samsung Display Corporation*

20.1: ***Invited Paper:*** **High-Efficiency Near-Infrared OLEDs with Pure Organic Materials**
Ken-Tsung Wong, National Taiwan University, Taipei, Taiwan Roc

20.2: **High Efficiency and Long Device Lifetime Green Organic Light Emitting Fiodes Using a Pt Complex**
Sunghun Lee, Samsung Electronics, Suwon, South Korea

20.3: **Universal Method to Inject Electrons Into Organic Semiconductors Utilizing Hydrogen Bonds**
Hirohiko Fukagawa, NHK Science & Technology Research Laboratories, Tokyo, Japan

20.4: **Study on the Effect of OLED Device Lifetime Improvement According to Hole Injection Barrier and p-Dopants**
Jaechul Hong, Samsung Display Co.,Ltd., Yongin, South Korea

Session 21: Super Resolution and Gen 11 *(Active Matrix Devices)*
Tuesday, August 4, 2020 / 3:40 PM - 4:40 PM / Room LL20D
Chair: *Dr. Kalluri Sarma, Honeywell, Inc*
Co-Chair: *Hyun Jae Kim, Yonsei University*

21.1: ***Invited Paper:*** **5291-ppi Microdisplay Using CAAC-IGZO FET with Channel Length of 60 nm**
Hideaki Shishido, Semiconductor Energy Laboratory Co., Ltd., Atsugi, Japan

21.2: ***Invited Paper:*** **1?m Pixel Pitch Spatial Light Modulator Panel for Digital Holography**
Chi-Sun Hwang, ETRI, Daejeon, South Korea

21.3: ***Invited Paper:*** **High Quality 8K4K Displays Driven by Oxide Semiconductor Thin Film Transistor in the Generation 11 Equipment**
Hyun-Sik Seo, TCL Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

Session 22: Flexible Technologies I: Manufacturing *(Display Manufacturing / Flexible Displays and E-Paper)*
Tuesday, August 4, 2020 / 3:40 PM - 5:10 PM / Room LL20BC
Chair: *Yukio Endo, AGC Inc.*
Co-Chair: *Kyung-Tae Kang, Korea Institute of Industrial Technology*

22.1: **Formation of Silicon-Based Thin Film Encapsulation for Fabrication of Highly Flexible OLED Devices**
Eun Jung, Samsung Display, Yongin, South Korea

22.2: **An Ultra-Thin Flexible Thin Film Encapsulation Structure with High Transmittance and Reliability**
Youwei Wang, BOE Technology Group Co., Ltd., Beijing, China

22.3: **5um Thickness of Low-Retardation Plastic Foil with Gas Barrier and Transparent Conductive Layer for Bendable Devices**
Hiroki Kinoshita, LINTEC Corporation, Saitama, Japan

22.4: **Development of Rolled Long Ultra-thin Glass and Its Mass Production Technology**
Hiroki Mori, Nippon Electric Glass Co., Ltd., Otsu, Japan

22.5: ***Late-News Paper:*** **Silicone-Based Low-k Material for Display**
Brandon Swatowski, Dow Chemical, Midland, MI US

Session 23: MicroLED Display Systems *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Tuesday, August 4, 2020 / 3:40 PM - 5:10 PM / Room 220C
Chair: *Yong-Seog Kim, Hongik University*
Co-Chair: *Larry Weber, Consultant*

23.1: ***Invited Paper:*** **Invited: Essentials of MicroLED Display Production**
Reza Chaji, VueReal, Waterloo, ON Canada

23.2: ***Distinguished Paper:*** **Wrap-Around Electrodes for MicroLED Tiled Displays**
David Pastel, Corning Inc., Corning, NY US

23.3: **Highly Transparent, Ultra-Thin Flexible, Full Color Mini-LED Display with IGZO TFT Substrate**
Yang Sun, TCL China Star Optoelectronics Technology Co. Ltd., Shenzhen, China

23.4: **Full Color, Active-Matrix Micro-LED Display with Dual Gate a-IGZO TFT Backplane**
Jin Jang, Kyung Hee University, Seoul, South Korea

23.5: ***Late-News Paper:*** **High-Resolution Monolithic Micro-LED Full-Color Micro-Display**
Xu Zhang, Hong Kong University of Science and Technology, Kowloon, Hong Kong

Session 24: LTPO *(Active Matrix Devices)*
Wednesday, August 5, 2020 / 9:00 AM - 10:20 AM / Room LL21EF

Chair: *James Chang, Apple, Inc.*
Co-Chair: *Man Wong, Hong Kong University of Science & Technology*

24.1: ***Invited Paper:*** **Development of High Quality IGZO-TFT with Same On-Current as LTPS**
Kazuatsu Ito, Sharp Corporation, Tenri, Japan

24.2: ***Distinguished Paper:*** **Fluorination for Enhancing the Resistance of Indium-Gallium-Zinc Oxide Thin-Film Transistor against Hydrogen-Induced Degradation**
Sisi Wang, The Hong Kong University of Science and Technology, Hong Kong, China

24.3: **Complementary LTPO Technology, Pixel Circuits and Integrated Gate Drivers for AMOLED Displays Supporting Variable Refresh Rates**
Jiahao Kang, Royole Corporation, Fremont, CA US

24.4: ***Distinguished Paper:*** **High Refresh Rate and Low Power Consumption AMOLED Panel Using Top-gate n-Oxide and p-LTPS TFTs**
Ryo Yonebayashi, Sharp Corporation, Tenri, Japan

Session 25: Innovative Display Driving Circuits *(Display Electronics)*
Wednesday, August 5, 2020 / 9:00 AM - 10:00 AM / Room LL20A
Chair: *Ya Hsiang Tai, National Chuao Tung University*
Co-Chair: *Soo-Yeon Lee, Seoul National University*

25.1: **Multi-Bit MIP(Memory-in-Pixel)-Based Pixel Circuit of CMOS Backplane for Micro-LED Display**
Jewoo Seong, Ulsan National Institute of Science and Technology (UNIST), Ulsan, UNK South Korea

25.2: **LTPO TFT Technology for Level Shifter Integrated Gate Driver in UHD 4K Displays**
Jin Jang, Kyung Hee University, Seoul, South Korea

25.3: **Fault-Tolerant Integrated Gate Driver for Flexible Displays**
Seung-Woo Lee, Kyung Hee University, Seoul, South Korea

Session 26: Novel Waveguides for AR Glasses *(Augmented, Virtual and Mixed Reality / Display Systems)*
Wednesday, August 5, 2020 / 9:00 AM - 10:20 AM / Room 220B
Chair: *Nikhil Balram, Google Inc.*
Co-Chair: *Brian Schowengerdt, Magic Leap*

26.1: ***Distinguished Paper:*** **Chirped Polarization Volume Grating for Wide FOV and High Efficiency Waveguide-Based AR Displays**
Kun Yin, University of Central Florida, Orlando, FL US

26.2: ***Invited Paper:*** **A Holographic Waveguide Display with Polarization Volume Gratings**
Yuning Zhang, Southeast University, Nanjing, China

26.3: **Tolerancing Capabilities of Crossed Gratings Versus Linear Gratings**
Alexandra Crai, WaveOptics Ltd., Abingdon, United Kingdom

26.4: ***Late-News Paper:*** **Super-Light Smart Glasses Using a Thin Plastic Light Guide Plate**
Shigenobu Hirano, Ricoh Company, Ltd., Ebina, Japan

Session 27: Printed OLEDs I *(OLEDs)*
Wednesday, August 5, 2020 / 9:00 AM - 10:20 AM / Room LL21CD
Chair: *Changwoong Chu, Samsung Display Corporation*
Co-Chair: *Yasunori Kijima, Huawei Technologies Japan K.K.*

27.1: ***Invited Paper:*** **Latest Development of Soluble OLED Material for Printed Display.**
Daisuke Fukushima, Sumitomo Chemical Co., Ltd., Tsukuba, Japan

27.2: ***Invited Paper:*** **Soluble Small Molecules in Top Emission OLED Devices from Ink Jet Printing: Requirements and Performance Status**
Sebastian Meyer, Merck KGaA, Darmstadt, Germany

27.3: **Improved Device Performance for Inkjet Printed OLEDs via Interfacial Mixing Control**
Heung Gyu Kim, Samsung Display Co., Ltd., Yongin, South Korea

27.4: ***Late-News Paper:*** **Key Materials for High Performance Solution-Process OLEDs**
Koichiro Iida, Mitsubishi Chemical Corporation, Yokohama, Japan

Session 28: Seeing Through the Display *(Interactive Displays and Systems)*
Wednesday, August 5, 2020 / 9:00 AM - 10:00 AM / Room LL20D
Chair: *Steven Bathiche, Microsoft*
Co-Chair: *Jeff Han, Consultant*

28.1: **Image Capture Through TFT Arrays**
Neil Emerton, Microsoft Applied Sciences, Redmond, WA US

28.2: **Study of the Image Blur Through FFS LCD Panel Caused by Diffraction for Camera Under Panel**
Quan Tang, Wuhan China Star Optoelectronics Technology Co., Ltd., Wuhan, China

28.3: **Pixel Design for Transparent MicroLED Display with Low Blurring**
Zhengyu Feng, Peking University, Shenzhen, China

28.4: **Investigation of Moiré Interference in Pinhole Matrix Fingerprint on Display Technology**
Yang Zeng, Shanghai Tianma Microelectronics, Shanghai, China

Session 29: Flexible/Foldable Device Manufacturing *(Display Manufacturing)*
Wednesday, August 5, 2020 / 9:00 AM - 10:00 AM / Room LL20BC
Chair: *Tian Xiao, NEXT Biometrics Inc.*
Co-Chair: *Wei Lung Liau, AU Optronics Corp.*

29.1: ***Invited Paper:*** **Analysis of Dynamic Strain on Foldable Devices**
Naotsugu Ando, Yuasa System, Okayama, Japan

29.2: ***Invited Paper:*** **Mechanics of Bendable Glass Substrates**
Timothy Gross, Corning Incorporated, Corning, NY US

29.3: **WITHDRAWN**

29.4: **Edge Strength Measurement of Free-Form Displays**
Bosun Jang, Corning Incorporated, Corning, NY US

Session 30: MicroLED Displays *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Wednesday, August 5, 2020 / 9:00 AM - 10:10 AM / Room 220C
Chair: *Francois Templier, CEA-LETI*
Co-Chair: *Jean-Jacques Drolet, Osram Opto Semiconductors*

30.1: ***Invited Paper:*** **Development of MicroLED Display by PixeLED Display Technology**
Ying-Tsang Liu, PlayNitride Inc., Zhubei, Taiwan Roc

30.2: **WITHDRAWN**

30.3: ***Distinguished Paper:*** **Sub-Micron Full-Color LED Pixels for Micro-Displays and Micro-LED Main Displays**
Seth Coe-Sullivan, NS Nanotech, Ann Arbor, MI US

30.4: **MicroLED Display Technology Trends and Intellectual Property Landscape**
Eric Virey, Yole Developpement, Portland, OR US

30.5: ***Late-News Paper:*** **Glass Based High Brightness AMLED Using Dual Gate Coplanar a-IGZO TFT**
Jin-Woo Choi, Samsung Display, Yongin, South Korea

Session 31: Structure Engineering *(Active Matrix Devices)*
Wednesday, August 5, 2020 / 10:40 AM - 11:20 AM / Room LL21EF
Chair: *Norbert Fruehauf, University of Stuttgart*
Co-Chair: *Kwon-Shik Park, LG Display*

31.1: ***Invited Paper:*** **The Multimodal Thin-Film Transistor (MMT): A Versatile Low-Power and High-Gain Device with Inherent Linear Response**
Radu Sporea, University of Surrey, Guildford, United Kingdom

31.2: ***Invited Paper:*** **Nanostructures Oxide Thin-Film Transistors Fabricated by Near-Field Nanolithography with Enhanced Device Performance**
Chuan Liu, Sun Yat-sen University, Guangzhou, China

Session 32: Algorithms for Image Quality Improvement *(Display Electronics)*
Wednesday, August 5, 2020 / 10:40 AM - 12:00 PM / Room LL20A
Chair: *Mainak Biswas, Google*
Co-Chair: *Moon-Sang Hwang, Samsung Display Co., Ltd.*

32.1: **Weak Sub-Color Sub-Sampling for High Resolution Image Bandwidth Reduction**
JoonHee Lee, LG Display, Seoul, South Korea

32.2: **Improvement in Directional Cubic Convolution Image Interpolation**
Liu-Xiao Lei, Beijing BOE Optoelectronics Technology Corporation, Beijing, China

32.3: **AMOLED IR Drop Compensation for Channel Length Modulation**
Feng-Ting Pai, Novatek Microelectronics Corp., Hsinchu, Taiwan Roc

32.4: ***Late-News Paper:*** **OLED Display Gamma LUT Optimization Based on Principal Component Analysis**
Hyunchul Kim, Google. Inc, Mountain view, CA US

Session 33: 3D and Holographic *(Augmented, Virtual and Mixed Reality / Display Systems)*
Wednesday, August 5, 2020 / 10:40 AM - 11:40 AM / Room 220B
Chair: *W. Hendrick, Collins Aerospace*
Co-Chair: *Zong Qin, National Chiao Tung University*

33.1: ***Invited Paper:*** **Tabletop True 3D Display Systems Based on Projection Light Field and Integral Imaging**
Qiong-Hua Wang, Beihang University, Beijing, China

33.2: **Improving Image Quality of 360-Degree Tabletop 3D Screen System**
Motohiro Makiguchi, NTT Service Evolution Laboratories, Kanagawa, Japan

33.3: **Viewing Angle Enhanced DMD Holographic Display with Reduced Speckle Noise**
Byounghyo Lee, School of Electrical and Computer Engineering, Seoul National University, Seoul, South Korea

Session 34: Printed OLEDs II *(OLEDs)*

Wednesday, August 5, 2020 / 10:40 AM - 12:00 PM / Room LL21CD

Chair: *CC Lee, BOE Technology Group Co., Ltd.*

Co-Chair: *JJ Lih, CPT Technology Group*

34.1: ***Invited Paper:*** **Towards Efficient and Stable Printed Single-Layer OLEDs**
Paul Blom, Max Planck Institute for Polymer Research, Mainz, Germany

34.2: **Development of 55-inch 8K AMOLED TV by Inkjet Printing Process**
Zhongyuan Wu, BOE Technology Group Co., Ltd., Hefei, China

34.3: ***Distinguished Paper:*** **OLED Display with High Resolution Fabricated by Electrohydrodynamic Printing**
Lan Mu, South China University of Technology, Guangzhou, China

Session 35: Touch Sensing on Flexible Displays *(Interactive Displays and Systems / Flexible Displays and E-Paper)*

Wednesday, August 5, 2020 / 10:40 AM - 12:00 PM / Room LL20D

Chair: *Martin Grunthaner, Apple*

Co-Chair: *Shiming Shi, BOE Technology Group Co., Ltd.*

35.1: **The Mechanism and Solution of Horizontal Line Defects by Mutual Interference of Flexible OLED and Touch Sensor**
Hyun Wook Cho, Samsung Display, Yongin, South Korea

35.2: **Influence of Low Ground Mass and Moisture Touch in On-Cell Touch with Foldable AMOLED**
Shih-Hsuan Huang, AU Optronics Corporation, Hsinchu, Taiwan Roc

35.3: **The Application of Metal Mesh Manhattan Patterns in Flexible Touch Panel**
Shuang Wang, Shanghai Tianma Micro-Electronics Co. Ltd., Shanghai, China

35.4: **High Sensitive Pen Writing Solution Based on Mechanical Sensing**
Hee Seomoon, Samsung Display, Yongin, South Korea

Session 36: Novel Process for Printed Displays *(Display Manufacturing / Printed Displays)*

Wednesday, August 5, 2020 / 10:40 AM - 12:00 PM / Room LL20BC

Chair: *Toshiaki Arai, JOLED Inc*

Co-Chair: *Yong Taek Hong, Seoul National University*

36.1: ***Invited Paper:*** **High-Resolution Induced-Electrohydrodynamic (iEHD) Jet Printing for Display**
Doyoung Byun, Sungkyunkwan University, Suwon, South Korea

36.2: ***Invited Paper:*** **The Latest Breakthrough of Printing Technology for Next Generation Premium TV**
Jueng Gil(James) Lee, Guangdong Juhua Printed Display Technology Co. Ltd., Guangzhou, China

36.3: **Novel and Simple Patterning process of Quantum dots via Transfer Printing for Active Matrix QD-LED**
Soo Deok Han, University of Cambridge, Cambridge, United Kingdom

36.4: **Solution-Processed Transparent Top Electrode for QD-LED**
Hywel Hopkin, Sharp Laboratories of Europe Ltd., Oxford, United Kingdom

Session 37: MicroLEDs: Manufacturing and Characterization *(Emissive, Micro-LED, and Quantum-Dot Displays)*

Wednesday, August 5, 2020 / 10:40 AM - 12:00 PM / Room 220C

Chair: *Ioannis Kymissis, Columbia University*

Co-Chair: *Zhaojun Liu, Southern University of Science and Technology*

37.1: **Yield Statistics for Fault Tolerant Micro LED Displays**
Khaled Ahmed, Intel Corporation, Santa Clara, CA US

37.2: **Efficient MicroLED Display Manufacturing Necessitates New Functional Production Test Technologies to Replace Traditional LED Parametric Test**
Francois Henley, Tesoro Scientific, Inc., Saratoga, CA US

37.3: **Power Consumption of OLED and µLED Displays**
En-Lin Hsiang, University of Central Florida, Orlando, FL US

37.4: **Micro LED Defect Analysis via Photoluminescent and Cathodoluminescent Imaging**
Keith Behrman, Columbia University, New York, NY US

Session 38: Circuit and New Application of TFTs *(Active Matrix Devices)*

Wednesday, August 5, 2020 / 3:30 PM - 4:50 PM / Room LL21EF

Chair: *Takashi Nakamura, Japan Display Inc.*

Co-Chair: *Chen Xi, BOE Technology Group Co., Ltd.*

38.1: ***Invited Paper:*** **High-Performance Metal-Oxide Semiconductor Based Optoelectronics**
Sung Kyu Park, Chung-Ang University, Seoul, South Korea

38.2: **Magnifying Viewer Using Poly-Si Thin-Film Phototransistor and Liquid-Crystal Microlens Array**
Mutsumi Kimura, Ryukoku University, Otsu, Japan

38.3: **A Novel Gate Driver Circuit Employing IGZO TFTs for External Compensation**
Xuehuan Feng, BOE Technology Group Co., Ltd., Hefei, China

38.4: **AMOLED Display Global Dimming Using PWM on Backgate**
Lynn Verschueren, imec, Leuven, Belgium

Session 39: Advanced Pixel and Driving Circuits *(Display Electronics)*
Wednesday, August 5, 2020 / 3:30 PM - 4:50 PM / Room LL20A
Chair: *Richard McCartney, Pixel Scientific, Inc.*
Co-Chair: *Carlin Vieri, Google*

39.1: **8K Broadcast Monitor Display System**
Ran Duan, BOE Technology Group Co., Ltd., Beijing, China

39.2: ***Distinguished Paper:*** **A 14-Gb/s Dual Mode Receiver with MIPI D-PHY and C-PHY Interfaces for Mobile Display Drivers**
Tae-Jin Kim, Samsung Electronics, Hwaseong, South Korea

39.3: ***Distinguished Paper:*** **In-Pixel Temperature Sensor for High-Luminance Active-Matrix Micro-LED Display Using LTPO TFTs**
Jin Jang, Kyung Hee University, Seoul, South Korea

39.4: **A Method of Panel-Current Limitation for Automotive OLED Displays**
Hyun-Chang Kim, Samsung Display Co., Yongin, South Korea

Session 40: Novel Optics for HMDs *(Augmented, Virtual and Mixed Reality / Emerging Technologies and Applications)*
Wednesday, August 5, 2020 / 3:30 PM - 5:10 PM / Room 220B
Chair: *Susan Jones, Nulumina Corp.*
Co-Chair: *Gary Jones, Nanoquantum Corporation*

40.1: ***Invited Paper:*** **Fast-Switching Liquid Crystal Devices for Near-Eye and Head-Up Displays**
Shin-Tson Wu, University of Central Florida, Orlando, FL US

40.2: **Cost-Efficient Polymer Flat Lens for Chromatic Aberration Correction in Virtual Reality Displays**
Tao Zhan, University of Central Florida, Orlando, FL US

40.3: ***Distinguished Paper:*** **A Scanning Waveguide Display with 100° FOV**
Jianghao Xiong, University of Central Florida, Orlando, FL US

40.4: **Demonstration of a Novel Single-Layer Double-Pass Optical Architecture for a Pupil-Matched Occlusion-Capable Optical See-Through Head-Mounted Display**
Hong Hua, University of Arizona, Tucson, AZ US

40.5: ***Invited Paper:*** **A Large RGB-Achromatic Metalens for Virtual/Augmented Reality Applications**
Federico Capasso, Harvard University, Cambridge, MA US

Session 41: Printed OLEDs III *(OLEDs)*
Wednesday, August 5, 2020 / 3:30 PM - 4:50 PM / Room LL21CD
Chair: *DZ Peng, TIanma*
Co-Chair: *Yifan Zhang, Apple, Inc.*

41.1: ***Invited Paper:*** **Recent Technology of Printed OLED Display and Its World's First Commercialization**
Kazuhiro Noda, JOLED Inc., Kyoto, Japan

41.2: ***Invited Paper:*** **Recent Developments in Inkjet-Printed OLEDs for High Resolution, Large Area Applications**
Jin-Goo Kang, Samsung Display Co., Ltd., Yongin, South Korea

41.3: **17.3 Inch UHD Resolution AMOLED Panel Fabricated by Ink Jet Printing Process**
Peng-Yu Chen, AU Optronics Corporation, Hsinchu, Taiwan Roc

41.4: **Preparation of High Performance Top-Emission OLED for Large Size Display**
Chunjing Hu, BOE Technology Group Co., Ltd., Beijing, China

Session 42: Fingerprint Sensing Displays *(Interactive Displays and Systems)*
Wednesday, August 5, 2020 / 3:30 PM - 5:10 PM / Room LL20D
Chair: *Patrick Worfolk, Synaptics*
Co-Chair: *Hong-Jye Hong, AU Optronics*

42.1: **A Controller IC for On-Display Touch and Multi-Fingerprint Sensor**
Min Gyu Kim, Samsung Electronics, Hwaseong, South Korea

42.2: **Establishment and Simulation Optimization of Optical Fingerprint Recognition Structure in LCD Screen**
Jianmou Huang, XiaMen Tianma Microelectronics Co., Ltd., Xiamen, China

42.3 ***Late-News Paper:*** **Full-Screen Capacitive Fingerprint Sensor and Touch Sensor**
Toshinori Uehara, Japan Display Inc., Ebina, Japan

42.4: **LTPS TFT-LCD with In-Cell Optical Fingerprint Scanner**
Bozhi Liu, XiaMen Tianma Microelectronics, Xiamen, China

42.5: **Spoof Detection Scheme for Optical Fingerprint Sensors Under Display**
Jin-Woo Kim, Samsung Display Corporation, Yongin, South Korea

Session 43: OLED Analysis and Mechanisms *(OLEDs)*
Wednesday, August 5, 2020 / 3:30 PM - 4:50 PM / Room LL20BC
Chair: *Nicholas Thompson, Universal Display Corporation*

Co-Chair: *Hitoshi Kuma, Idemitsu Kosan Co., Ltd.*

43.1: ***Invited Paper:*** **A Quantitative Microscopic Kientic Model for Efficiency Roll-Off in OLEDs**
Troy Van Voorhis, MIT, Cambridge, MA US

43.2: **Application of Liquid Extraction Surface Analysis (LESA)-NanoESI-Orbitrap-MS to a Degradation Analysis of Organic EL Elements**
Hikaru Takano, Toray Research Center, Inc., Otsu, Japan

43.3: **Ab-Initio Simulation of Doped Injection Layers**
Tobias Neumann, Nanomatch GmbH, Karlsruhe, Germany

43.4: **Combining Steady-State, Frequency, and Time Domain Data for a Comprehensive Analysis of Multilayer TADF OLEDs**
Sandra Jenatsch, Fluxim AG, Winterthur, Switzerland

Session 44: Highly Integrated Semiconductor Information Displays *(Emissive, Micro-LED, and Quantum-Dot Displays)*

Wednesday, August 5, 2020 / 3:30 PM - 4:30 PM / Room 220C

Chair: *Qun Yan, Fuzhou University*

Co-Chair: *Kevin Gahagan, Corning Incorporated*

44.1: ***Invited Paper:*** **Micro-LEDs for Technological Convergence between Displays, Optical Communications, and Sensing and Imaging Systems**
Martin Dawson, University of Strathclyde, Glasgow, United Kingdom

44.2: ***Invited Paper:*** **More Than MicroLED: Mass Transfer of Pixel Engines for Emissive Displays**
John Rogers, Northwestern University, Evanston, IL, US

44.3: ***Invited Paper:*** **Integration of Additional Functionalities into the Frontplane of AMOLED Displays**
Pawel Malinowski, imec, Leuven, Belgium

44.4: **A Brief Survey of MicroLED Technologies**
Ioannis Kymissis, Columbia University, New York, NY, US

Session 45: Conformable LCDs *(Liquid Crystal Technology)*

Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room LL21EF

Chair: *Takahiro Ishinabe, Tohoku University*

Co-Chair: *Linghui Rao, Microsoft*

45.1: ***Invited Paper:*** **Multi-Spliced LCDs for Foldable Mobile Device - Seamless Technology and Applications**
Yung Hsun Wu, Innolux Corporation, Maili County, Taiwan Roc

45.2: ***Distinguished Paper:*** **Ultra-Narrow Border Display with a Cover Glass Using LCDs with a Polyimide Substrate**
Shinichiro Oka, Japan Display Inc., Mobara, Japan

45.3: ***Late-News Paper:*** **Homogeneous Alignment LCDs Could be Prime Candidate for Multiple Scene Interactive Interface and Devices**
Ruizhi Yang, BOE Technology Group Co., Ltd., Beijing, China

45.4: ***Late-News Paper:*** **Zero Light Leakage ADS Display Technology**
Feifei Wang, BOE Technology Group Co., Ltd., Beijing, China

Session 46: Variable Refresh Rate *(Display Electronics)*

Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room LL20A

Chair: *Taesung Kim, Google LLC*

Co-Chair: *Bong-Hyun You, Samsung Display Co.*

46.1: ***Invited Paper:*** **Variable Refresh Rate Displays**
Gerrit Slavenburg, NVIDIA, Santa Clara, CA US

46.2: **A Novel Hybrid Frame Rate Driving Method for Low Frequency OLED Displays**
Nana Xiong, Tianma Micro-Electronics Co., Ltd., Shanghai, China

46.3: ***Invited Paper:*** **Image Adaptive Refresh Rate Technology for Ultra Low Power Consumption**
Bonghyun You, Samsung Display, Yongin, South Korea

46.4: **Novel OLED Low Frame Frequency Driving Method with Minimized Flicker**
Jieliang Li, XiaMen Tianma Microelectronics, Xiamen, China

Session 47: Micro-Projection Technology *(Augmented, Virtual and Mixed Reality / Display Systems)*

Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room 220B

Chair: *Satoshi Ouchi, Hitachi, Ltd*

Co-Chair: *Fujio Okumura, NEC Corporation*

47.1: **The World Smallest OLED Microdisplay Projection Device Design Methodology**
Kazuichiro Itonaga, Sony Corporation, Atsugi, Japan

47.2: **Solid State Projection Display Based on Angular Color Projection and MicroLED**
Yongjing Wang, Photonic Crystal Co. LTD, San Jose, CA China

47.3: ***Invited Paper:*** **High Brightness and RGB Integration of Eu-doped GaN-based Red LEDs for Ultrahigh-resolution Micro-LED Display**
Yasufumi Fujiwara, Osaka University, Osaka, Japan

47.4: **Fiber Scanning Technology with Rectangle Display Area for Projection Unit**
Shinsuke Onoe, Hitachi, Ltd., Tokyo, Japan

Session 48: OLED Devices I *(OLEDs)*
Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room LL21CD
Chair: *Yasunori Kijima, Huawei Technologies Japan K.K.*
Co-Chair: *Denis Kondakov, DuPont*

48.1: ***Invited Paper:*** **Next Generation Highly Efficient and Stable Phosphorescent Emitting Materials For OLEDs**
Byoung ki Choi, Samsung Electronics, Suwon, South Korea

48.2: **Design Strategies of Fluorescent Dopants toward Pure Blue for Highly Efficient Top Emission OLEDs**
Ryota Takahashi, Idemitsu Kosan Co., Ltd., Sodegaura, Japan

48.3: **Efficiency Color-Shift Tradeoffs in Strong-Cavity, Top-Emitting OLEDs**
S. Matthew Menke, 3M, Saint Paul, MN US

48.4: **Toward the Achieving Excellent Longevity of Blue OLED Device: A Computation Study on Importance of the Co-Optimization of Material and Device**
Sangho Jeon, Samsung Display, Yongin, South Korea

Session 49: E-Paper *(Flexible Displays and E-paper)*
Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room LL20D
Chair: *Makoto Omodani, Tokai University*
Co-Chair: *Keisuke Hashimoto, E Ink Holdings*

49.1: **Fast-Switching Electrophoretic E-Paper with Mixture of Liquid Crystal and E-ink for Charging and Rheological Optimizations**
Bo-Ru Yang, Sun Yat-sen University, Guangzhou, China

49.2: **Color Reproduction in Reflective Displays: Stacked CMY**
Alex Henzen, South China Normal University, Guangzhou, China

49.3: ***Late-News Paper:*** **Hybrid Capacitor Type Organic Electrochromic Device for Multicolor Representation**
Norihisa Kobayashi, Chiba University, Chiba, Japan

49.4: ***Late-News Paper:*** **Prototyping of Practical e-Tile and Estimation of its Image Impression from Distant Observers**
Makoto Omodani, Tokai University, Hiratsuka, Japan

Session 50: Display Measurement Standards I *(Display Measurement)*
Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room LL20BC
Chair: *Stephen Atwood, Eaton Corporation*
Co-Chair: *Thomas Fiske, Microsoft*

50.1: ***Invited Paper:*** **Color/White Light Output, Luminance Contours, and Colour Volume**
David LeHoty, Independent, Mountain View, CA US

50.2: ***Distinguished Paper:*** **Measuring the Color Capability of Modern Display Systems**
Euan Smith, Kaptivo Ltd, Cambridge, United Kingdom

50.3: **Electro-Optical Transfer Characteristic, the Undervalued Display Feature**
Michael Becker, Instrument Systems GmbH, München, Germany

50.4: **Standardizing Fundamental Criteria for Near Eye Display Optical Measurements: Determining the Eye-Box**
Rupal Varshneya, Night Vision Electronic Sensors Directorate Department of the Army, Fort Belvoir, VA US

Session 51: Quantum Dot Electroluminescence I *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Thursday, August 6, 2020 / 9:00 AM - 10:20 AM / Room 220C
Chair: *Michele Ricks, EMD Performance Materials*
Co-Chair: *Jean-Jacques Drolet, Osram Opto Semiconductors*

51.1: ***Invited Paper:*** **Charge Injection Control of Cadmium-Free Quantum Dot Light-Emitting Diodes**
Baek Kim, NanoPhotonica Inc., Gainesville, FL US

51.2: **High Efficiency and Long Lifetime InP-Based Red Quantum Dot Light-Emitting Diodes**
Jang-Hyuk Kwon, Kyung Hee University, Seoul, South Korea

51.3: **Efficient InP/ZnS Quantum Dot Light-Emitting Diodes with Improved Electron Confinement**
Zhenghui Wu, Southern University of Science and Technology, Shenzhen, China

51.4: **QLED-on-Silicon Microdisplays with Peripheral-Circuit-Compensation Design**
Sikai Su, Peking University, Shenzhen, China

Session 52: Fast Switching LCDs *(Liquid Crystal Technology)*
Thursday, August 6, 2020 / 10:40 AM - 12:00 PM / Room LL21EF
Chair: *Dr Akihiro Mochizuki, I-CORE Technology, LLC*
Co-Chair: *Prof. Jian Gang Lu, Shanghai Jiao Tong University*

52.1: ***Invited Paper:*** **Liquid Crystal Materials and Devices for Displays and Photonics**
Vladimir Chigrinov, Foshan University, Foshan, China

52.2: **Fast-Response Liquid Crystals for AR and Head-Up Displays**
Yannanqi Li, University of Central Florida, Orlando, US

52.3: **Fast-Response Cloud-Point Ferroelectric Liquid Crystal Dammann Grating for LiDAR Applications**
Zhengnan Yuan, The Hong Kong University of Science and Technology, Hong Kong, China

52.4: ***Late-News Paper:*** **27" 240Hz Wide View ADS Gaming LCM Development Meeting 1.x ms RT and VESA HDR Standard**
Dongchuan Chen, Beijing BOE Display Technology Co., Ltd., Beijing, China

Session 53: Emerging Processes and Materials *(Emerging Technologies and Applications)*
Thursday, August 6, 2020 / 10:40 AM - 12:10 PM / Room LL20A
Chair: *Abhishek Srivastava, Hong Kong University of Science & Technology*
Co-Chair: *Ian Underwood, University of Edinburgh*

53.1: **WITHDRAWN**

53.2: **Composite Films with Ultra-Thin Glass and Polymer for Novel Optically-Functional Films**
Takeshi Murashige, Nitto Denko Corporation, Osaka, Japan

53.3: **CdSe/CdS Nanorod Enhancement Film for Blue-Laser Based Visible Light Communication Systems**
Jerry Cheng, The Hong Kong University of Science and Technology, Hong Kong, Hong Kong

53.4: **Dielectric Metasurfaces: Design for Manufacturability**
Khaled Ahmed, Intel Corporation, Santa Clara, CA US

53.5: ***Late-News Paper:*** **a-IGZO TFT Based Active Matrix Pressure Sensor by Integrating ZnO Nanowires as Sensing Unit**
Xuewen Shi, Institute of Microelectronics of Chinese Academy of Sciences, Beijing, China

Session 54: AR/VR Technologies *(Augmented, Virtual and Mixed Reality / Display Systems)*
Thursday, August 6, 2020 / 10:40 AM - 12:20 PM / Room 220B
Chair: *Sergei Yakovenko, Apple*
Co-Chair: *Grace Lee, Google*

54.1: **Improved Polarizing Film for PBS Applications in HMDs**
David Aastuen, 3M Display Materials & Systems Division, St. Paul, MN US

54.2: ***Distinguished Paper:*** **Doubling the Pixel Density for VR Displays with a Polymer Grating**
Junyu Zou, University of Central Florida, Orlando, FL US

54.3: **Digitally Switchable Micro-Lens Array for Integral Imaging**
Hong Hua, University of Arizona, Tucson, AZ US

54.4: **Prediction of Saccadic Eye Movement for Foveated Rendering**
Anna Kruchinina, Lomonosov Moscow State University, Moscow, Russian Fed.

54.5: **Measuring Direct Retinal Projection Displays**
John Penczek, University of Colorado, Boulder, Boulder, CO US

Session 55: OLED Devices II *(OLEDs)*
Thursday, August 6, 2020 / 10:40 AM - 12:00 PM / Room LL21CD
Chair: *Sven Zimmermann, Novaled GmbH*
Co-Chair: *Qi Wang, eMagin Corporation*

55.1: ***Invited Paper:*** **Self-Assembled Cathode Patterning in AMOLED for Under-Display Camera**
Zhibin Wang, OTI Lumionics Inc., Toronto, ON Canada

55.2: **Methods for Overcoming the Trade-Off Between Efficiency and Lifetime of Organic Light-Emitting Diodes: OLED Lifetime Simulation**
Junyoung Lee, Samsung Display Corporation, Yongin, South Korea

55.3: **Efficient, Low Haze Light Extraction for OLED Displays Using Micro-Optic Patterns Imprinted on Glass**
Dmitri Kuksenkov, Corning Research & Development Corporation, Corning, NY US

55.4: **Novel Methodology for Reproducibility of OLED Lifetimes and Identification of Killer Impurities**
Hiroshi Fujimoto, Fukuoka i3-Center for Organic Photonics and Electronics Research (i3-opera), Fukuoka, Japan

Session 56: Foldable Displays I *(Flexible Displays and E-paper)*
Thursday, August 6, 2020 / 10:40 AM - 12:00 PM / Room LL20D
Chair: *Kyung Cheol Choi, KAIST*
Co-Chair: *Cheng-Chung Lee, ITRI*

56.1: ***Invited Paper:*** **Research on a Commercial Foldable AMOLED and Relevant Technologies**
Shiming Shi, BOE Technology Group Co., Ltd., Beijing, China

56.2: **A Foldable AMOLED Module with Excellent Bending Capability and Pencil Hardness after Low Temperature Testing**
Takehiro Murao, Sharp Corporation, Kameyama, Japan

56.3: **Quantitative Evaluation of Neutral-plane Splitting for Foldable Displays**
Masumi Nishimura, Japan Display, Inc., Mobara, Japan

56.4: **Suppression of Angular Color Shift for Foldable OLEDs by Integrating an Advanced Circular Polarizer**
Wei-Feng Xu, BenQ Materials Corporation, Taoyuan, Taiwan Roc

Session 57: Display Measurement Standards II *(Display Measurement)*
Thursday, August 6, 2020 / 10:40 AM - 12:00 PM / Room LL20BC
Chair: *Udo Krueger, TechnoTeam*

Co-Chair: *Frank Rochow, Adviser*

57.1: **Spatiotemporal Noise Targets Inspired by Natural Imagery Statistics**
Timo Kunkel, Dolby Labs, Inc., San Francisco, US

57.2: **A New Approach to Motion Frequency Metrics Quantifies Motion-Induced Blur**
Dale Stolitzka, Samsung Electronics, Co., Ltd., San Jose, CA US

57.3: **Characterizing Image Retention for HDR OLED Displays**
Kevin Kam, Columbia University, New York, NY US

57.4: **Simulation of Line-Based MTF Measurements for Pixelated Displays**
Kenichiro Masaoka, NHK Science & Technology Research Laboratories, Tokyo, Japan

Session 58: Quantum Dot Electroluminescence II *(Emissive, Micro-LED, and Quantum-Dot Displays)*

Thursday, August 6, 2020 / 10:40 AM - 12:00 PM / Room 220C

Chair: *Chang Hee Lee, Samsung Display Corporation*

Co-Chair: *Xiao Wei Sun, Southern University of Science and Technology*

58.1: ***Invited Paper:*** **Progress in High Efficiency Heavy Metal Free QD-LED Development**
Christian Ippen, Nanosys, Inc., Milpitas, CA US

58.2: ***Distinguished Paper:*** **Active Matrix QD-LED with Top Emission Structure by UV Lithography for RGB Patterning**
Yohei Nakanishi, SHARP Corporation, Tenri, Japan

58.3: ***Distinguished Paper:*** **High Efficient Quantum Dot Light Emitting Diodes with Blue Cadmium-Free Quantum Dots**
Tatsuya Ryowa, Sharp Corporation, Tenri, Japan

58.4: **Efficient Cadmium-Free Quantum Dot Light-Emitting Diodes**
Mo Hinwai, Fukuoka i3-Center for Organic Photonics and Electronics Research (i3-opera), Fukuoka, Japan

Session 59: Privacy and Sunviewable Displays *(Liquid Crystal Technology)*

Thursday, August 6, 2020 / 1:30 PM - 2:50 PM / Room LL21EF

Chair: *Xiao-Yang Huang, Ebulent Technologies Corp*

Co-Chair: *Gang Xu, Huawei*

59.1: **FFS-Based Privacy LCD With High Contrast and Transmittance**
Koji Murata, SHARP, Nara, Japan

59.2: **Brightness Improvement of Reflective LCD**
Xinli Ma, Beijing BOE Display Technology Co., Ltd., Beijing, China

59.3: **A Transflective 31.5" IGZO-TFT LCD with Twisted VA Mode**
Takahiro Sasaki, SHARP, Tenri, Japan

59.4: ***Late-News Paper:*** **High Transmittance and High Charging Rate 8K 120Hz ADS LCD TV**
He He Hu, BOE Technology Group Co., Ltd., Beijing, AL China

Session 60: Machine Learning for Display Algorithms and Electronics *(Machine Learning for Displays / Display Electronics)*

Thursday, August 6, 2020 / 1:30 PM - 2:50 PM / Room LL20A

Chair: *Chaohao Wang, Apple Inc.*

Co-Chair: *Hyoungsik Nam, Kyung Hee University*

60.1: **Novel Image Sticking Prevention Method Using Deep Learning**
Youngwook Yoo, Samsung Display, Youngin, South Korea

60.2: **Self-Supervised Perceptual Motion Deblurring Using a Conditional Generative Neural Network Guided by Optical Flow**
Jaihyun Koh, Samsung Display Corporation, Yongin, South Korea

60.3: ***Invited Paper:*** **Machine Learning Approaches to Active Stylus for Capacitive Touch-Screen Panel Applications**
Hyoungsik Nam, Kyung Hee University, Seoul, South Korea

60.4: **Implementation and Optimization of FSRCNN-s Algorithm Based on SDSoC Platform**
Yanan Ji, TCL China Star Optoelectronics Technology Co. Ltd., Guangdong, China

Session 61: High-Resolution OLED Display Manufacturing *(Augmented, Virtual and Mixed Reality / Display Manufacturing)*

Thursday, August 6, 2020 / 1:30 PM - 2:30 PM / Room 220B

Chair: *Dr Robert Visser, Applied Materials*

Co-Chair: *Joerg Winkler, Plansee SE*

61.1: **A New Fine Metal Mask Pixel Patterning Technology for High Resolution OLED Displays**
Chiwoo Kim, APS Holdings, Hwaseong, South Korea

61.2: **2-inch, 2000 ppi Silicon Nitride Mask for Patterning Ultrahigh-Resolution OLED Displays**
Yibin Jiang, Hong Kong University of Science and Technology, Kowloon, Hong Kong

61.3: ***Distinguished Paper:*** **Vertically Integrated, Double-Stack Oxide-TFT Layers for High Resolution AMOLED Backplane**
Jin Jang, Kyung Hee University, Seoul, South Korea

61.4: ***Invited Paper:*** **Development of the OLED Mass Production System (2:30 PM - 2:50 PM)**
Eiichi Matsumoto, Canon Tokki Corporation, Mitsuke Japan

Session 62: OLED Devices III *(OLEDs)*
Thursday, August 6, 2020 / 1:30 PM - 2:50 PM / Room LL21CD
Chair: *Chang-Wook Han, LG Display Co., Ltd*
Co-Chair: *Jang Hyuk Kwon, Kyung Hee University*

62.1: ***Invited Paper:*** **Understanding Degradation Processes of Organic Light-Emitting Devices**
Youngmin You, Ewha Womans University, Seoul, South Korea

62.2: **Deep-Red and Near-Infrared OLEDs with High Efficiency and Long Lifetime for Display and Light-Source Applications**
Satoshi Seo, Semiconductor Energy Laboratory Co., Ltd., Atsugi, Japan

62.3: **Design of High-Performance Tandem Blue Devices for Quantum Dot OLED Display**
Linlin Wang, Hefei BOE Joint Technology Co., Ltd., Beijing, China

62.4: **Ultrathin Cu-Ag Anode for High Light Outcoupling Efficiency by Eliminating Waveguide Mode in OLED**
Yong-Bum Park, University of Michigan, Ann Arbor, MI US

Session 63: Foldable Displays II *(Flexible Displays and E-paper)*
Thursday, August 6, 2020 / 1:30 PM - 2:30 PM / Room LL20D
Chair: *Kyung Cheol Choi, KAIST*
Co-Chair: *Meng-Ting Lee, Huawei Technology*

63.1: **Numerical Study on Module Stacking Design of Flexible Panel with Water-Drop Folding Shape**
Liming Dong, BOE Technology Group Co., Ltd., Beijing, China

63.2: **Continuous Observation of Neutral-Plane Splitting throughout the Folding Process of Foldable Displays Using Optical Microscopy and Digital Image Correlation Method**
Masatomo Hishinuma, Japan Display, Inc., Mobara, Japan

63.3: **Translating 2 Point Bend with Step Stress Methodology**
Kurt Gerber, Corning Incorporated, Corning, NY US

Session 64: Flexible Technologies II: Measurement *(Display Measurement)*
Thursday, August 6, 2020 / 1:30 PM - 2:30 PM / Room LL20BC
Chair: *Makoto Omodani, Tokai University*
Co-Chair: *Stephen Atwood, Eaton Corporation*

64.1: **Separating Specular Reflection from Diffuse Haze for ePaper Using the Extended Variable Aperture Source Method**
Dirk Hertel, E Ink Corporation, Billerica, MA US

64.2: **Metrology of Non-Planar Light Sources Using Near-Field Goniometric Measurement Method**
K Kalantar, Global Optical Solutions, Tokyo, Japan

64.3: **Simulation of Beam Shaping by Micro-Textures for Curved Displays**
Urs Aeberhard, Fluxim AG, Winterthur, Switzerland

Session 65: Quantum Dot Electroluminescence III *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Thursday, August 6, 2020 / 1:30 PM - 2:50 PM / Room 220C
Chair: *Dr. Jonathan Steckel, ST Microelectronics*
Co-Chair: *Yajie Dong, University of Central Florida*

65.1: ***Invited Paper:*** **Enhanced Efficiency of InP-Based Red and Green Quantum Dot Light-Emitting Diodes**
Yanzhao Li, BOE Technology Group Co., Ltd., Beijing, China

65.2: **High Luminescent Red Quantum Dot Light-Emitting Diodes by Inkjet Printing**
Xiao Wei Sun, Southern University of Science and Technology, Shenzhen, China

65.3: **Green Top-Emission Quantum Dot Light-Emitting Diodes (TE-QLED) with Normal and Inverted Structure**
Jiun-Haw Lee, National Taiwan University, Taipei, Taiwan Roc

65.4: **Control of Carrier Injection and Transport Behavior in QLEDs via Modulating the Schottky Barrier**
Yong-Seog Kim, Hongik University, Seoul, South Korea

Session 66: Self-Aligned LCDs *(Liquid Crystal Technology)*
Thursday, August 6, 2020 / 3:10 PM - 4:40 PM / Room LL21EF
Chair: *Michael Wittek, Merck KGaA*
Co-Chair: *Shui Chih Lien, CSOT*

66.1: ***Invited Paper:*** **Liquid Crystal Mixture with a Composition Including Highly Reliable Fluorinated Diluter and RM-Monomer for PSVA and PI-less IPS LCDs**
Toshihiro Shibata, Chiracol Co.LTD, Saitama, Japan

66.2: ***Invited Paper:*** **Reactive Mesogen Multi-Twist Retarders for Advanced AR/VR Displays**
Michael Escuti, ImagineOptix Corporation, Durham, NC US

66.3: **The Way To Improve Black Circle Mura in Curved Display by Polyimide-Less Technology**
Wei Cui, Peking University, Shenzhen, China

66.4: **Reactive Monomers Optimized for Fast Response Liquid Crystals with High Reliability**
Mei Chen, TCL China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

66.5: ***Late-News Paper:*** **Fast Response Texture Free Polymer Stabilized Vertically Aligned Liquid Crystal Displays**
Yong-Woon Lim, Samsung Display, Asan, South Korea

Session 67: Emerging Applications with Machine Learning *(Machine Learning for Displays / Emerging Technologies and Applications)*

Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room LL20A

Chair: *K Käläntär, Global Optical Solutions*

Co-Chair: *Fang-Cheng Lin, Apple Inc*

67.1: ***Distinguished Paper:*** **Efficient Multi-Quality Super-Resolution Using a Deep Convolutional Neural Network for an FPGA Implementation**
Min Beom Kim, LG Display Co., Ltd., Seoul, South Korea

67.2: **Lightweight Tone-Mapped HDRNET with Exposure Stack Generation**
So Yeon Jo, Sogang University, Seoul, South Korea

67.3: **ColorNet: A Neural Network-Based System for Consistent Display of Brand Colors for Video**
Erica Walker, Clemson University, Clemson, SC US

67.4: **Visual Simultaneous Localization and Mapping with Deep Neural Network Based Loop Detection for Augmented Reality**
Chao Ping Chen, Shanghai Jiao Tong University, Shanghai, China

Session 68: Light Field 3D *(Display Systems)*

Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room 220B

Chair: *Shinichi Uehara, AGC Inc.*

Co-Chair: *K Käläntär, Global Optical Solutions*

68.1: **Investigation on Defocusing-Induced Accommodation Shift in Microlens Array-Based Near-Eye Light Field Displays**
Zong Qin, Sun Yat-Sen University, Guangzhou, China

68.2: **View-Dependent Light-Field Display that Supports Accommodation Using a Commercially-Available High Pixel Density LCD Panel**
Ronald Azuma, Intel Labs, Santa Clara, CA US

68.3: **A Super-Multiview Display with Horizontal and Vertical Parallax by Time Division and Color Multiplexing**
Yuta Watanabe, University of Tsukuba, Tsukuba, Japan

68.4: ***Late-News Paper:*** **3D/2D Partially Convertible Integral Imaging Display Using Geometric Phase Lens Array**
Hayato Watanabe, NHK (Japan Broadcasting Corporation), Tokyo, Japan

Session 69: OLED Devices IV *(OLEDs)*

Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room LL21CD

Chair: *Franky So, North Carolina State University*

Co-Chair: *Chihaya Adachi, Kyushu University*

69.1: ***Invited Paper:*** **Analysis on the Defects in the Aged Organic Light-Emitting Diodes**
Jaesang Lee, Seoul National University, Seoul, South Korea

69.2: **Transparent Conductive Hybrid Cathode Structure for Top-Emitting Organic Light-Emitting Devices**
Wei Quan, Hefei BOE Joint Technology Co., Ltd., Beijing, China

69.3: **Examination of Degradation Analysis of p-i-n Type OLEDs Device**
Daichi Shirakura, Toray Research Center, Inc., Otsu, Shiga, Japan

69.4: ***Late-News Paper:*** **High Transparency Adhesive Encapsulation Film for OLED Device**
Satoru Ohashi, Ajinomoto Fine-Techno Co., Inc., Kawasaki, Japan

Session 70: Flexible Technologies III *(Flexible Displays and E-paper)*

Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room LL20D

Chair: *Yong Taek Hong, Seoul National University*

Co-Chair: *Simon Kang, Apple*

70.1: ***Invited Paper:*** **Advances in the Development of Flexible AMOLED Display**
Ze Yuan, Royole Corporation, Fremont, CA US

70.2: ***Invited Paper:*** **Low Temperature Process and Material Development for Flexible/Stretchable Transparent Conductor**
Seung Hwan Ko, Seoul National University, Seoul, South Korea

70.3: ***Distinguished Paper:*** **Flexible OLED Display with 620 Degree Celsius LTPS TFT and Touch Sensor Manufactured by Weak Bonding Method**
Tsung-Ying Ke, AU Optronics Corp., Hsinchu, Taiwan Roc

70.4: ***Distinguished Paper:*** **Flexible OLED-based Photonic Skin for Attachable Phototherapeutics**
Kyung Cheol Choi, Korea Advanced Institute of Science and technology (KAIST), Daejeon, South Korea

Session 71: Spatial Uniformity *(Display Measurement)*

Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room LL20BC

Chair: *Thomas Fiske, Microsoft*

Co-Chair: *Frank Rochow, Adviser*

71.1: **Fractional Pixel Method for Improved Pixel-Level Measurement and Correction (Demura) of High-Resolution Displays**
Douglas Kreysar, Radiant Vision Systems LLC, Redmond, WA US

71.2: **Subpixel Non-Uniformity Correction for Displays**
Xiaofan Feng, Jingce Electronic (USA), Camas, WA US

71.3: **Meeting Optical Testing Challenges of High-Resolution µLED-Displays**
Martin Wolf, Instrument Systems GmbH, Munich, Germany

71.4: **Imaging Luminance Measuring Devices (ILMDs) – Characterization and Standardization with Respect to Display Measurements**
Udo Krüger, TechnoTeam Bildverarbeitung GmbH, Ilmenau, Germany

Session 72: Quantum Dot Electroluminescence IV *(Emissive, Micro-LED, and Quantum-Dot Displays)*
Thursday, August 6, 2020 / 3:10 PM - 4:30 PM / Room 220C
Chair: *Kevin Gahagan, Corning Incorporated*
Co-Chair: *Yanzhao Li, BOE Technology Group Co., Ltd.*

72.1: ***Invited Paper:*** **Realizing Long Lifetime Blue Quantum Dots Light Emitting Diodes (QLEDs) through Quantum Dot Structure Tailoring**
Yixing Yang, TCL Corporate Research, Shenzhen, China

72.2: **Highly Efficient Cadmium-Free Quantum Dot Light-Emitting Diodes Employing Top-Emitting Architecture**
Myoungjin Park, Samsung Display Co., Ltd., Yongin, South Korea

72.3: **Influence of Mobility Effect on Top-Emission Red Quantum Dot Light Emitting Diode with Weak-Cavity Structure**
Ming-Yi Lin, National United University, Miaoli, Taiwan Roc

72.4: **Spectrum Narrowing and Efficiency Enhancement of Quantum Dot Light-Emitting Diodes by Microcavity**
Xiao Wei Sun, Southern University of Science and Technology, Shenzhen, China

Session 73: Displays and Health *(Applied Vision / Lighting)*
Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room LL21EF
Chair: *Chien-Yu Chen, National Taiwan University of Science & Technology*
Co-Chair: *Marina Kondakova, OLEDWorks*

73.1: ***Invited Paper:*** **Pediatric Device Use: Implications for Myopia Development**
Elise Harb, UC Berkeley School of Optometry, Berkeley, CA US

73.2: ***Invited Paper:*** **Effects of Displays on Myopia and Possible Countermeasures Based on Epidemiology in Japan**
Takushi Kawamorita, Kitasato University, Sagamihara, Japan

73.3: ***Invited Paper:*** **Influences of Circadian Illuminances from Lighting and TV on the Human Locomotor Activity, Sleep Disorder, EEG, HRV, and Melatonin Secretion**
Dae Hwan Kim, Kookmin University, Seoul, South Korea

73.4: ***Invited Paper:*** **Are Displays Giving Us the Blues?**
John Bullough, Rensselaer Polytechnic Institute, Troy, NY US

Session 74: Seeing Through the Display Image Reconstruction Techniques *(Machine Learning for Displays / Interactive Displays and Systems)*
Friday, August 7, 2020 / 9:00 AM - 10:00 AM / Room LL20A
Chair: *Steven Bathiche, Microsoft*
Co-Chair: *Jeff Han, Consultant*

74.1: **Image Restoration for Display-Integrated Camera**
Sehoon Lim, Microsoft Applied Sciences, Redmond, WA US

74.2: **Diffracted Image Retrieving with Deep Learning**
Seungin Baek, Samsung Display, Yongin, South Korea

74.3: **WITHDRAWN**

Session 75: Display Systems and Backlights *(Display Systems)*
Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room 220B
Chair: *Jean-Pierre Guillou, Apple, Inc.*
Co-Chair: *Masaru Suzuki, Kriya Materials*

75.1: ***Invited Paper:*** **Digital Signage: Advances, Requirements, and Solutions**
Michael Schmid, Ströer SE & Co. KGaA, Köln, Germany

75.2: **Design Criteria in the Development of Anti-Glare Surfaces**
Brett Sitter, 3M, Saint Paul, MN US

75.3: **Highly Collimated Backlight for Liquid Crystal Displays**
Brecht Berteloot, Ghent University, Ghent, Belgium

75.4: **All-Glass Light Guide Plate with Tapered Lenticular Lens Array by Mask and Etch**
Shenping Li, Corning Research & Development Corporation, Corning, NY US

Session 76: OLED Displays I *(OLEDs)*
Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room LL21CD
Chair: *Yifan Zhang, Apple, Inc.*
Co-Chair: *DZ Peng, TIanma*

76.1: ***Invited Paper:*** **Electroforming Fine Metal Mask for High Resolution OLED Displays**
Xialing Chen, Changzhou U.G.Oled Technology Co., Ltd., Changzhou, China

76.2: **A High Image Quality OLED Display with Motion Blur Reduction for Ultra-High Resolution and Premium TVs**
Hong-Jae Shin, LG Display, Paju, South Korea

76.3: **Ultra High Efficiency OLED Display by 3D Pixel Configuration**
Robert Visser, Applied Materials, Santa Clara, CA US

76.4: ***Late-News Paper:*** **Aromatic Hydrocarbon Macrocycles for Highly Efficient Organic Light-Emitting Devices with Simple-Layer Architectures**
Tomoo Izumi, Konica Minolta, Inc., Hachioji, Japan

Session 77: Free Form Displays I *(Flexible Displays and E-paper)*

Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room LL20D

Chair: *Jennifer Lin, AU Optronics*

Co-Chair: *Hajime Yamaguchi, Japan Display Inc.*

77.1: **Design of Stretchable AMOLED Display with Transitional Area**
Qian Yang, BOE Technology Group Co., Ltd., Beijing, China

77.2: **Stretchability Improvement of stretchable OLED by Rotation Plate Structure and Pillar Array Susbtrate**
Young Hyun Son, Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea

77.3: **Wearable Organic Light-Emitting Diode Displays – From Fibers to Textiles**
Sung-Min Lee, Kookmin University, Seoul, South Korea

77.4: **HIgh Efficiency Flexible Fiber-Based Light-Emitting Devices Processed by Phosphorescent Solution**
Kyung Cheol Choi, Korea Advanced Institute of Science and technology (KAIST), Daejeon, South Korea

Session 78: Novel Display Applications *(Emerging Technologies and Applications)*

Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room LL20BC

Chair: *Gary Jones, Nanoquantum Corporation*

Co-Chair: *Vincent Gu, Apple, Inc.*

78.1: ***Invited Paper:*** **Application of OLED Area Light in Textiles: Approaches, Challenges, Limitations and Perspectives**
Jan Hesse, Fraunhofer FEP, Dresden, Germany

78.2: **Using Physical Books as Interfaces to Digital Displays**
Georgios Bairaktaris, University of Surrey, Guildford, United Kingdom

78.3: ***Distinguished Paper:*** **Vein Detection with Near-infrared Organic Photodetectors for Biometric Authentication**
Daniel Tordera, TNO / Holst Centre, Eindhoven, Netherlands

78.4: **IGZO-Based Identification Tags Communicating with Everyday Touchscreens**
Nikolaos Papadopoulos, imec, Leuven, Belgium

Session 79: Quantum Dot Color Conversion I *(Emissive, Micro-LED, and Quantum-Dot Displays)*

Friday, August 7, 2020 / 9:00 AM - 10:20 AM / Room 220C

Chair: *John Van Derlofske, 3M*

Co-Chair: *Seth Coe-Sullivan, Luminit, LLC*

79.1: ***Invited Paper:*** **A New Generation of QD Diffusion Plate Technology for TV**
Honglei Ji, TCL Electronics Holdings Limited, Shenzhen, China

79.2: **Ambient Light Excitation in Quantum Dot-Converted Micro-LED Displays**
Fangwang Gou, University of Central Florida, Orlando, FL US

79.3: ***Invited Paper:*** **The Past, the Present and the Future of Perovskite QDs**
Norman Lüchinger, Avantama AG, Stafa, Switzerland

79.4: **Theoretical Prediction of Changes in Spectra of InP- and InGaP-Based Quantum Dots and Comparison with Experimental Measurement of InP-Based Quantum Dots**
Seungin Baek, Samsung Display, Yongin, South Korea

79.5: ***Late-News Paper:*** **Bright and Narrow Green Emitting InP-based Quantum Dots for Wide Color Gamut Displays**
Eunjoo Jang, Samsung Electronics, Suwon, South Korea

Session 80: Color Perception *(Applied Vision)*

Friday, August 7, 2020 / 10:40 AM - 12:20 PM / Room LL21EF

Chair: *Youngshin Kwak, Ulsan National Institute of Science and Technology*

Co-Chair: *Youn Jin Kim, Xiaomi Corporation*

80.1: **OLED Gamut Mapping Method to Generate Exact Standard Color Results**
Jongwoong Park, Samsung Display Co., Ltd., Yongin, South Korea

80.2: **Spatiochromatic Model for Image Quality Prediction of High Dynamic Range and Wide Color Gamut Content**
Robert Wanat, Dolby Laboratories, Inc, Sunnyvale, CA US

80.3: **Immanent Dichromaticity in Trichromatic Observer: 2nd Coordinate in MDS Analyses of R-G Neutral- and Y-B Only Changed-Stimuli Reflects Chromatic Saliency**
Shoko Hira, Kagoshima University, Kagoshima, Japan

80.4: **Human Visual System Uses Just a Few Transfer Functions Depending on Various Environments to Realize Normalized Visual Percept: Investigation Using Real Photographic Images**

Sakuichi Ohtsuka, Kagoshima University, Kagoshima, Japan

80.5: **An Experimental Study of the Effect of Subpixel Arrangements on Subjective Spatial Resolution**
Midori Tanaka, Chiba University, Chiba, Japan

Session 81: Machine Learning for Manufacturing and Calibration *(Machine Learning for Displays / Display Manufacturing / Display Measurement)*

Friday, August 7, 2020 / 10:40 AM - 12:20 PM / Room LL20A

Chair: *Dr. Andriy Romanyuk, Glas Troesch AG*

Co-Chair: *Stephen Atwood, Eaton Corporation*

81.1: ***Invited Paper:*** **Data Augmentation for Applying Deep Learning to Display Manufacturing Defect Detection**
Wei Xiong, Samsung Electronics, Co., Ltd., San Jose, CA US

81.2: ***Invited Paper:*** **Neural Network Based Quantitative Evaluation of Display Non-Uniformity Corresponds Well with Human Visual Evaluation**
Yusuke Bamba, EIZO Corporation, Hakusan, Japan

81.3: **Display Graylevel Gamma Tuning Algorithm and System Implementation**
Gang Xu, Jingce Electronic (USA) Inc., San Jose, CA US

81.4: **Array Defect Detection and Repair Based on Deep Learning**
Kai Guo, BOE Technology Group Co., Ltd., Beijing, China

81.5: **Image Quality Predication System in Display Fabrication Process**
Yongwoo Lee, Samsung Display, Yongin, South Korea

Session 82: Projectors and Light Sources *(Display Systems)*

Friday, August 7, 2020 / 10:40 AM - 12:00 PM / Room 220B

Chair: *David Eccles, Collins Aerospace*

Co-Chair: *Hidekazu Hatanaka, Ushio Inc.*

82.1: ***Invited Paper:*** **Latest Status of Blue and Green Laser Diodes and Laser Packages for Display Applications**
Eiichiro Okahisa, Nichia Corporation, Toushima, Japan

82.2: ***Invited Paper:*** **Latest Progress of Laser Phosphor Projection Display**
Fei Hu, Appotronics, Shenzhen, China

82.3: **Red-Enhanced Laser Phosphor Light Source with Quantum Dot Conversion Layer**
Tomohiro Kaji, Sony Corporation, Atsugi, Japan

82.4: ***Invited Paper:*** **Speckle Reduction in Laser Projectors by Angular, Wavelength, and Polarization Diversities**
Hirotaka Yamada, Ushio Inc., Hyogo, Japan

Session 83: OLED Displays II *(OLEDs)*

Friday, August 7, 2020 / 10:40 AM - 12:00 PM / Room LL21CD

Chair: *Chihaya Adachi, Kyushu University*

Co-Chair: *Chang-Wook Han, LG Display Co., Ltd*

83.1: ***Invited Paper:*** **Optimization of High Performance Deep Red OLEDs Using Tandem Structure for Automotive Lighting Application**
Huiqing Pang, Beijing Summer Sprout Technology Co., Ltd., Beijing, China

83.2: **Reliability Characterization of Luminance Degradation of OLED Mobile Display Considering Color Difference Index Based on Usage Patterns**
Yoonsuk Choi, Technology Quality Reliability, Samsung Display Co. Ltd., Yongin, South Korea

83.3: **TE-Type AMOLED Display with Wide Viewing Angle and Ultra-Low Reflectance**
Kaoru Abe, Sharp Corporation, Sakai, Japan

83.4: **Techniques to Achieve an AMOLED Display with Ultra-Narrow Border**
Quan Liu, Kunshan Govisionox Optoelectronics Co., Ltd., Kunshan, China

Session 84: Free Form Displays II *(Flexible Displays and E-paper)*

Friday, August 7, 2020 / 10:40 AM - 12:10 PM / Room LL20D

Chair: *Paul Drzaic, Apple, Inc.*

Co-Chair: *Joon Young Yang, LG Display Co. Ltd*

84.1: ***Invited Paper:*** **30-inch 4K Rollable OLED Display**
Tohru Sonoda, Sharp Corporation, Osaka, Japan

84.2: **Study on Reliability for Impact and Rolling of Film Stacks in Rollable AMOLED Display by Finite Element Analysis**
Aries Cheng, Tianma Micro-Electronics Group, Wuhan, China

84.3: ***Invited Paper:*** **Advanced Cover Window and Thin-film Encapsulation Technologies for Foldable AMOLED Display**
Kuang-Jung Chen, ITRI, Hsinchu, Taiwan Roc

84.4: **New Barrier Fabrication Method Based on an Infiltration Technology for Flexible OLED Displays**
Seung Hun Kim, Samsung Display, Yongin, South Korea

84.5: ***Late-News Paper:*** **Flexble Cover Window Film with Improved Optical Clarity**
Min Sang Park, SK Innovation, Daejeon, South Korea

Session 85: Novel Displays and Optics *(Emerging Technologies and Applications)*

Friday, August 7, 2020 / 10:40 AM - 12:10 PM / Room LL20BC

Chair: *Timothy Large, Microsoft Corp*

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

85.1: ***Invited Paper:*** **Organic LCDs Using Polarisers as Substrates - Enabling Pixel Level Dimming in Dual Cell LCDs**
James Harding, FlexEnable, Cambridge, United Kingdom

85.2: ***Invited Paper:*** **Fourth Gen Optics - Planar Optics Revolutionized by LCD Technology**
Nelson Tabiryan, BEAM Engineering for Advanced Measurements Co., Orlando, FL US

85.3: **In-Cell Optical Compensation Technology for OLED Demura Application**
Yunke Qin, BOE Technology Group Co., Ltd., Beijing, China

85.4: **Enhancing Ambient Viewing Performance of Anisotropic Nano-Structure Light Control Film**
Lung-Hai Wu, BenQ Materials, Taoyuan, Taiwan Roc

85.5: ***Late-News Paper:*** **Real Time Dynamic Holographic Display Based on Perovskite Doped Liquid Crystal**
Gufeng He, Shanghai Jiao Tong University, Shanghai, China

Session 86: Quantum Dot Color Conversion II *(Emissive, Micro-LED, and Quantum-Dot Displays)*

Friday, August 7, 2020 / 10:40 AM - 12:00 PM / Room 220C

Chair: *Jean-Jacques Drolet, Osram Opto Semiconductors*

Co-Chair: *John Van Derlofske, 3M*

86.1: ***Invited Paper:*** **Nano-particle heat sinking for quantum-dot colour conversion**
Jinhyun Cho, Samsung Electronics, Suwon, South Korea

86.2: **Color Conversion Using Quantum Dots for LCD, OLED and MicroLED Displays**
Ravisubhash Tangirala, Nanosys Inc, Milpitas, CA US

86.3: **Ultra-Stable Deep-Dyed Perovskite-Polymer Composites as Tunable Downconverters**
Caicai Zhang, University of Central Florida, Orlando, FL US

86.4: **Color Conversion Enhancement of Perovskite Quantum Dots by Integrating with Cholesteric Liquid Crystals**
Su Pan, TCL China Star Optoelectronics Technology Co. Ltd., Shenzhen, China

86.5: ***Late-News Paper:*** **Giant Shell Quantum Dots for Color Conversion and as Active Material in QLEDs**
Jan Niehaus, Fraunhofer CAN, Hamburg, Germany

Poster Session

Thursday, August 6, 2020 / 5:00 PM - 8:00 PM / Room 220A

Active Matrix Devices

P.1: **New P-Type LTPS Pixel Circuit with Negative Feedback for AMOLED Smartwatch Displays**
Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan Roc

P.2: **Hydrogenated SnO for p-Channel Oxide Thin Film Transistor**
Kenji Nomura, University of California, San Diego, La Jolla, CA US

P.3: **Effects of Negative Bias Illumination Stress on IGZO Device and Luminance Behaviors in OLED Display Panel Operated by AC Conditions**
Kiju Im, Samsung Display Co.,Ltd., Yongin, South Korea

P.4: **Enhanced the Scalability and the Reliability of High Mobility Elevated-Metal Metal-Oxide Thin-Film Transistors with Bandgap Engineering**
Zhihe Xia, Department of Electronic and Computer Engineering, The Hong Kong University of Science and Technology, Hong Kong, Hong Kong

P.5: **Compact Modeling of Independent Dual Gate TFTs and OLED for Display Panel Circuit Simulations**
Jiahao Kang, Royole Corporation, Fremont, CA US

P.6: **Four-Sided Micro-Border 8K4K LCD with Oxide-TFT Gate Driver Embedded Array**
ManHong Na, AU Optronics Corp., Hsinchu, Taiwan Roc

P.7: **Improvement of Electrical Stability of In-Ga-Zn-O Thin-Film Transistors by Incorporation of Polytetrafluoroethylene in the Back Channel Region**
Hyun Jae Kim, Yonsei University, Seoul, South Korea

P.8: **Degradation Model of LTPS TFT under Off-State Bias Stress on Flexible Substrate**
Kihwan Kim, Samsung Display, Yongin, South Korea

P.9: **Timing Model and Maximum-Aperture Pixel Design of an Active-Matrix Display**
Xuchi Liu, Department of Electronic and Computer Engineering, The Hong Kong University of Science and Technology, Hong Kong, Hong Kong

P.10: **Advantages of Active Pixel Circuit Using Gap-Type TFT as the Photo Device to Sense Low Intensity Light**
Cheng-Che Tu, National Chiao Tung University, Hsinchu, Taiwan Roc

P.11: **High Performance All-Solution Processed InZnO Thin-Film Transistors via Photo-Functionalization at Varying Fluence and Annealing Environment**
Dianne Corsino, Nara Institute of Science and Technology, Ikoma, Japan

P.12: **A Robust a-IGZO TFT Integrated Scan/Emission Driver with Dynamic Inverter for AMOLED Display**
Lei Tengteng, Peking University, Shenzhen, China

P.13: **Large Subthreshold Swing of LTPS TFTs by Efficient Annealing Method for Light Emitting Diode Displays**
Takao Saito, Sharp Corporation, Taki, Japan

P.14: **Electrical Characteristics of P3HT:TIPS-Pentacene Blend Organic Thin-Film Transistor Under Light irrradiation**

Hyunji Shin, Hongik University, Seoul, South Korea

P.15: **Thermal Conductivity Measurement of Indium-Gallium-Zinc-Oxide Thin Films Utilizing Three-Omega Method**
Reiji Hattori, Kyushu University, Fukuoka, Japan

P.16: **Homojunction Indium–Gallium–Zinc Oxide Thin-Film Transistors by Selective Simultaneous UV and Thermal Treatment**
Hyun Jae Kim, Yonsei University, Seoul, South Korea

P.17: **Low-Temperature, Solution-Processed Inorganic p-Channel Cu-based Thin-Film Transistors and Circuits**
Ao Liu, POSTECH, Pohang, South Korea

P.18: **Ultra-Compact Multi-Level Digital-to-Analog Converter Based on Linear Multimodal Thin-Film Transistors**
Eva Bestelink, University of Surrey, Guildford, United Kingdom

P.19: **A Study of Oxide TFT Vth Shift Behavior by Characterizing with Nano-Scale SIMS**
Jung Hwa Park, Samsung Display Co. Ltd., Youngin, South Korea

P.191: ***Late-News Poster:*** **Effects of Channel Doping on Flexible LTPS TFTs: Density of State, Generation Lifetime and Image Sticking**
Hyojung Kim, Sungkyunkwan University, Suwon, South Korea

P.192: ***Late-News Poster:*** **Study of IGZO Dual Gate with BCE Structure in a Touch In-Cell Smartphone**
Ping Sheng Kuo, Mantix Display Technology, Putian, China

P.193: ***Late-News Poster:*** **A Novel Charge Based TFT Compact Model Applicable to Image Retention Simulation of AMOLEDs**
Genshiro Kawachi, Tianma Japan, Saiwai, Japan

P.194: ***Late-News Poster:*** **Selenium 4p Orbital Enables High Mobility p-Type Tin Oxyselenide Semiconductor for the Thin-Film Transistor Application**
Jae Kyeong Jeong, Hanyang University, Seoul, South Korea

P.195: ***Late-News Poster:*** **Data Retention in Pixel Drivers Based on Source-Gated Transistors**
Eva Bestelink, University of Surrey, Guildford, United Kingdom

P.196: ***Late-News Poster:*** **Amorphous Metal Thin-Film Transistors: High Mobility IGZO TFT Fabricated by a Low-Temperature All Sputter PVD Process**
Sean Muir, Amorphyx Inc., Corvallis, OR US

Applied Vision

P.20: **Image Distortion and Image Correction of Curved OLED Displays**
Po-Jui Chen, National Taiwan University, Taipei, Taiwan Roc

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