ADVANCE PROGRAM

2016 DISPLAY WEEK INTERNATIONAL SYMPOSIUM

May 24-27, 2016 (Tuesday – Friday)
Moscone Convention Center
San Francisco, California, USA

Session 1: Annual SID Business Meeting
Tuesday, May 24 / 8:00 – 8:20 am / Room 103

Session 2: Opening Remarks / Keynote Addresses
Tuesday, May 24 / 8:20 – 10:20 am / Room 103/104
Chair: Hoi-Sing Kwok, Hong Kong University of Science & Technology

2.1: ***Keynote Address 1:*** **Devices of Today and the Future**
Mr. Stephen Bathiche, Microsoft Reserach, Redmond, WA, USA

2.2: ***Keynote Address 2:*** **Opportunities and Challenges in Mobile Displays**
Mr. Hiroyuki Ohshima, CTO, Japan Display Inc., Tokyo, Japan

2.3: ***Keynote Address 3:*** **Critical Technical Issues and the Future of Flexible OLED Displays**
Dr. Sung-Chul Kim, Executive VP and Chief of the Research Center, Samsung Display Co., Ltd., Gyeonggi-do, Korea

Session 3: AR/VR Display Systems I *(Augmented Reality and Virtual Reality / Display Systems)*
Tuesday, May 24 / 11:10 am – 12:30 pm / Room 103
Chair: *Nikhil Balram, Ricoh Innovations Corp.*
Co-Chair: *W. Lee Hendrick, Rockwell Collins Optronics*

3.1: **A Multi-Plane Volumetric Optical See-Through Head-Mounted 3D Display**
Shuxin Liu, Shanghai Jiao Tong University, Shanghai, China

3.2: **Near-to-Eye Waveguide Display Based on Holograms**
Jian Han, Beijing Institute of Technology, Beijing, China

3.3: **Study on the Field-of-View Properties for a Holographic Waveguide Display System**
Yishi Weng, Southeast University, Nanjing, China

3.4: **Switchable Lens for 3D Displays, Augmented Reality, and Virtual Reality**
Yun-Han Lee, University of Central Florida, Orlando, FL, USA

Session 4: Flexible and Curved LCDs I *(Liquid-Crystal Technology)*
Tuesday, May 24 / 11:10 am – 12:30 pm / Room 104
Chair: *Jenn Jia Su, AU Optronics Corp.*
Co-Chair: *Shui Chih Lien, TCL Group, China*

4.1: ***Invited Paper:*** ***Roll TFT-LCD with 20R Curvature Using Optically Compensated Colorless Polyimide Substrate***
Pin-Hsiang Chiu, AU Optronics Corp., Hsinchu, Taiwan, ROC

4.2: **Thin Flexible LCDs Using Dye-Type In-Cell Polarizer and PET Substrates**
Daichi Fujiwara, Polatechno Co., Ltd., Niigata, Japan

4.3: **Wide-Viewing-Angle TN-LCD Enhanced by Printed Quantum-Dot Film**
Huang-Ming Chen, National Chiao Tung University, Hsinchu, Taiwan, ROC

4.4: **Application of BOA on a Curved Panel**
Cheng-Liang Ye, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

Session 5: MEMS Projection Displays *(Projection)*
Tuesday, May 24 / 11:10 am – 12:10 pm / Room 130
Chair: *David Eccles, Rockwell Collins*
Co-Chair: *Fujio Okumura, NEC Corp.*

5.1: ***Invited Paper:*** **Steering Light with TI's Digital Micromirror Device: Past, Present, and Future**
Patrick Oden, Texas Instruments, Plano, TX, USA

5.2: **MEMS-Mirror-Based Dynamic Solid-State-Lighting Module**
Abhishek Kasturi, Mirrorcle Technologies, Inc, Richmond, CA, USA

5.3: **Image-Quality Evaluation of a Laser-Projection Light-Field 3D Display**
Chun-Chia Hsu, National Taiwan University, Taipei, Taiwan, ROC

Session 6: Advancements in Solid-State-Lighting Sources *(Lighting)*
Tuesday, May 24 / 11:10 am – 12:30 pm / Room 131
Chair: *Mike Lu, Acuity Brands Lighting*
Co-Chair: *J. Larimer, ImageMetrics, Half Moon Bay, CA, USA*

6.1: ***Invited Paper:*** **Status and Future Prospects for Visible-Spectrum LEDs**
Mike Krames, Arkesso LLC, Palo Alto, CA, USA

6.2: ***Invited Paper:*** **Development of a Vertically Stacked Color-Tunable Polychromatic OLED Device for Roll-to-Roll Manufacturing**
Takatoshi Tsujimura, Konica Minolta, Tokyo, Japan

6.3: **Correlated-Color-Temperature Tunable WLED for Smart Lighting**
Haiwei Chen, University of Central Florida, Orlando, FL, USA

6.4: **High-Efficacy High-Color-Quality Hybrid White OLEDs Incorporating Red Quantum Dots with Narrow Emission Bands**
Hao Chen, University of Central Florida, Orlando, FL, USA

Session 7: AMOLED Driving *(Display Electronics)*
Tuesday, May 24 / 11:10 am – 12:30 pm / Room 132
Chair: *Wei Yao, Apple, Inc., Cupertino, CA, USA*
Co-Chair: *Ya Hsiang Tai, National Chuao Tung University*

7.1: ***Distinguished Paper:*** **A 13.3-in. 8K x 4K 664-ppi 120-Hz 12-bit OLED Display Using Top-Gate Self-Aligned CAAC-OS FETs and a 12-bit Source Driver IC**
Roh Yamamoto, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

7.2: **Transmissive OLED and Reflective LC Hybrid (TR-Hybrid) Display**
Koji Kusunoki, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

7.3: **AMOLED Pixel Structure Using the Closed-Loop Negative-Feedback Method for High-Resolution Displays**
Chen Chi Lin, AU Optronics Corp., Hsinchu, Taiwan, ROC

7.4: **AMOLED Pixel Circuit Using Dual-Gate a-IGZO TFTs for Simple Scheme and High-Speed V_{th} Extraction**
JIn Jang, Kyung Hee University, Seoul, South Korea

Session 8: AR/VR Display Systems II *(Augmented Reality and Virtual Reality / Display Systems)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 103
Chair: *William Cummings, Microsoft*
Co-Chair: *K. Käläntär, Global Optical Solutions*

8.1: ***Invited Paper:*** **The Avegant Glyph: Optical Design Considerations and Approach to Near-to-Eye Displays**
Scott Dewald, Ergo Engineering, Addison, TX, USA

8.2: ***Invited Paper:*** **Hyper-Reality Head-Up-Display Systems for Medical Applications**
Takashi Sasaki, Toshiba Corp., Kawasaki, Japan

8.3: **Hybrid Modulation for Near-Zero Display Latency**
Turner Whitted, NVIDIA Research, Durham, NC, USA

8.4: ***Invited Paper:*** **Pixels towards Pixies: Post-Multimedia interactions with Air-Based Media**
Yoichi Ochiai, University of Tsukuba, Ibaraki, Japan

Session 9: Flexible and Curved LCDs II *(Liquid-Crystal Technology)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 104
Chair: *Philip Chen, National Chiao Tung University*
Co-Chair: *Xiao-Yang Huang, Ebulent Technologies Corp.*

9.1: ***Distinguished Paper:*** **A Foldable Ultra-Thin LCD Using a Coat-Debond Polyimide Substrate and Polymer Walls**
Takahiro Ishinabe, Tohoku University, Sendai, Japan

9.2: **Optical Compensation Method for Wide-Viewing-Angle IPS-LCDs Using a Plastic Substrate**
Shinichiro Oka, Japan Display, Inc., Chiba, Japan

9.3: **Brightness Uniformity of a IPS-Mode ASG Curved Display**
Wang Jing ,Tianma Corp., Shanghai, China

Session 10: Laser Speckle *(Projection / Vehicular Displays)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 130
Chair: *Satoshi Ouchi, Hitachi, Ltd.*
Co-Chair: *Karlheinz Blankenbach, Pforzheim University*

10.1: **Color Speckle Estimation Using Monochromatic Speckle Measurements**
Junichi Kinoshita, Osaka University, Osaka, Japan

10.2: **Direct Measurement of Color Speckle Using XYZ Filters**
Keizo Ochi, Konica Minolta, Inc., Osaka, Japan

10.3: **A Pragmatic Speckle Measurement Method**
Yanning Zhao, Visteon, Kerpen, Germany

10.4: **Analysis of Speckle Reduction for Multiple Lasers with Narrow Linewidth**
Qianli Ma, McMaster University, Hamilton, Ontario, Canada

Session 11: Convergence of Lighting and Displays *(Lighting)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 131
Chair: *Steve Paolini, Telelumen*
Chair: *Mike Lu, Acuity Brands Lighting*

11.1: ***Invited Paper:*** **Convergence of Lighting and Display: Opportunities, Requirements, Challenges**
Matthias Bues, Fraunhofer Institute for Industrial Engineering, Stuttgart, Germany

11.2: ***Invited Paper:*** **Spatial and Beam Control in Solid-State-Lighting Applications**
Rodrigo Pereyra, OSRAM Sylvania, Beverly, MA, USA

11.3: ***Invited Paper:*** **Daylight-Emulating LED Luminaires as Daylight Phase Indicators and Occupant Circadian-Rhythm Entrainment**
Jonathan Mapel, Arborlight, Inc., Ann Arbor, MI, USA

Session 12: Driving Circuits *(Display Electronics)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 132
Chair: *Oh-Kyong Kwon, Hanyang University*
Co-Chair: *Taesung Kim, Samsung Electronics, Ltd.*

12.1: **A Timing-Controller Embedded Driver IC with 3.24-Gbps eDP Interface for COG Applications**
Tae-Jin Kim, Samsung Electronics Co., Ltd., Hwasung, South Korea

12.2: ***Distinguished Paper:*** **A 13-bit Universal Column Driver for Various OLED and LCD Displays**
Seong-Young Ryu, Samsung Electronics Co., Ltd., Hwasung, South Korea

12.3: **Real-Time External Compensation of Threshold-Voltage Shift Using Double-Gate Oxide TFTs in Gate Driving System**
Bong Hyun You, Samsung Display, Yongin, South Korea

12.4: **TFT Integrated Gate Driver with V_{th} Shift Compensable Low-Level Holding Unit**
Shengdong Zhang, Peking University, Beijing, China

Session 13: Digital-Signage Displays *(Display Systems / Digital Signage)*
Tuesday, May 24 / 2:00 – 3:20 pm / Room 133
Chair: *Jae Hyeung Park, Inha University*
Co-Chair: *Masaru Suzuki, Rohm and Haas Electronic Materials*

13.1: **WITHDRAWN**

13.2: ***Invited Paper:*** **New Glass Signage Manufacturing, Glass Direct-Bonded LCD, and Transparent Glass Screen**
Yuriko Kaida, Asahi Glass Co. Ltd., Tokyo, Japan

13.3: **Display-Quality Measures for Direct-Emission LED Displays**
Edward Buckley, NanoLumens, Inc., Norcross, GA, USA

13.4L: ***Late-News Paper:*** **Screen-Free Floating 3D Image in a Crystal Ball Using Spatially Imaged Iris and Multiview Depth Fused 3D Technologies**
Munekazu Date, Nippon Telegraph and Telephone Corp., Tokyo, Japan

Session 14: Wearable AR/VR Applications *(Augmented Reality and Virtual Reality / Applications)*
Tuesday, May 24 / 3:40 – 5:10 pm / Room 103
Chair: *Susan Jones, Nulumina Corp.*
Co-Chair: *Lauren Palmateer, Rovi Corp.*

14.1: **Augmented-Reality and Virtual-Reaity Smart Eye Wear: Forecasts for the Next Decade**
Harry Zervos, IDTechEx, Boston, MA, USA

14.2: ***Invited Paper:*** **Enabling Technologies for Wearable Smart Headsets**
Hong Choi, Kopin Corp., Westborough, MA, USA

14.3: **Eyeglasses-Type Wearable Device Using a Multi-Mirror Array**
Tomoya Tsuruyama, Toshiba Corp., Kawasaki, Japan

14.4: ***Invited Paper:*** **A Diffractive LCD Backlight Approach to Dynamic Light-Field Displays**
David Fattal, Leia, Inc., Menlo Park, CA, USA

14.5L: ***Late-News Paper:*** **Retinal Imaging Laser Eyewear with Focus-Free and Perfect Augmented Reality**
Mitsuru Sugawara, QD Laser, Inc., Kanagawa, Japan

Session 15: Color-Sequential Displays *(Liquid-Crystal Technology)*
Tuesday, May 24 / 3:40 – 5:00 pm / Room 104
Chair: *Jian Gang Lu, Shanghai Jiao Tong University*
Co-Chair: *Shintson Wu, University of Central Florida*

15.1: **Flat Transparent Display Demonstrating Field Sequential Color**
Chia-Wei Kuo, AU Optronics Corp., Hsinchu, Taiwan, ROC

15.2: **Effective Color-Breakup Suppression by a Low-Cost Global Dimming Backlight for Field-Sequential-Color Displays**
Fang-Cheng Lin, National Chiao Tung University, Hsinchu, Taiwan Roc

15.3: ***Invited Paper:*** **Liquid-Crystal Technologies towards Realizing a Field-Sequential-Color Display**
Simoin Siemianowski, Merck KGaA, Darmstadt, Germany

Session 16: Liquid-Crystal Projection Devices *(Projection / Liquid-Crystal Technology)*
Tuesday, May 24 / 3:40 – 5:00 pm / Room 130
Chair: *Frederic Kahn, Kahn International, Inc.*
Co-Chair: *Ming Hsien Wu, Hamamatsu Corp.*

16.1: ***Distinguished Student Paper:*** **A Submillisecond-Response Liquid Crystal for Color-Sequential Projection Displays**
Fenglin Peng, University of Central Florida, Orlando, FL, USA

16.2: **A Novel Three-Electrode LCoS Structure with Low Fringe-Field Effect**
Qing Li, Southeast University, Nanjing, China

16.3: **A Novel Transparent Screen Using Cholesteric Liquid-Crystal Dots**
Akira Yamamoto, FUJIFILM Corp., Kanagawa, Japan

Session 17: Luminaire and Lighting System Design *(Lighting)*
Tuesday, May 24 / 3:40 – 5:00 pm / Room 131
Chair: *Mike Lu, Acuity Brands Lighting*

17.1: ***Invited Paper:*** **Daylight as a Model for Electronic Illumination Systems**
Steve Paolini, Telelumen, Saratoga, CA, USA

17.2: ***Invited Paper:*** **Advanced Sensing and Control in the Smart Lighting Engineering Research Center's Smart Conference Room**
Richard Radke, Rensselaer Polytechnic Institute, Troy, NY, USA

17.3: **Simultaneous Optimization of Color Contrast and Color-Rendering Index for Surgical Lighting**
Huihui Wang, Zhejiang University, Hangzhou, China

17.4: **Effective Architectural Lighting with Free-Form Optics**
Ruidong Zhu, University of Central Florida, Orlando, FL, USA

Session 18: Advanced Displays *(Display Electronics)*
Tuesday, May 24 / 3:40 – 5:00 pm / Room 132
Chair: *Achin Bhowmik, Intel Corp.*
Co-Chair: *Haruhiko Okumura, Toshiba Corp.*

18.1: ***Invited Paper:*** **2D/3D Displays with LC GRIN Lens for Medical Systems**
Shinichi Uehara, Toshiba Corp., Kawasaki, Japan

18.2: **Oxide-TFT LC Oscillators on Glass and Plastic for Wireless Functions in Large-Area Flexible Electronic Systems**
Yasmin Afsar, Princeton University, Princeton, NJ, USA

18.3: **Brilliant Images and Saturated Colors for 4K Edge-Lit LED TVs Generated by an Efficient Versatile SSC Local-Dimming Processor**
Daniel Schäfer, Saarland University, Saarbruecken, Germany

18.4: **A Low-Latency Compression Algorithm for Visually Lossless Display Stream Systems Using a Temporal Differential Method**
Gregory Cook, Samsung Display Co., San Jose, CA, USA

Session 19: Holographic and Light-Field Display Systems *(Display Systems)*
Tuesday, May 24 / 3:40 – 5:10 pm / Room 133
Chair: *W. Lee Hendrick, Rockwell Collins Optronics*
Co-Chair: *K. Käläntär, Global Optical Solutions*

19.1: **Planar Parallax-Based Camera Array Calibration Method to Acquire Integral-Imaging Three-Dimensional Information**
Wang Hua, Sichuan University, Chengdu, China

19.2: **Gray-Scale Enhancement Strategies for Scanning Light-Field Displays**
Chen Su, Instrumentation, College of Optical Science and Engineering, Hangzhou, China

19.3: ***Invited Paper:*** **Computational 3D Imaging**
Hajime Nagahara, Kyushu University, Fukuoka, Japan

19.4: **Stereoscopic Hologram Calculation Based on Gerchberg–Saxton (GS) Algorithm**
Xinyi Xia, Southeast University, Nanjing, China

19.5L: ***Late-News Paper:*** **Perceptually Optimized Dual-Layer Light-Field 3D Display Using A Moiré-Aware Compressive Factorization**
Shizheng Wang, Nanyang Technological University, Jurong West, Singapore

Session 20: Quantum Dots/Rods *(Display Systems / Emissive Displays)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 102
Chair: *Wei Chen, Apple, Inc.*
Co-Chair: *K. Käläntär, Global Optical Solutions*

20.1: ***Invited Paper:*** **The Quantum-Dot Revolution**
Seth Coe-Sullivan, QD Vision, Inc., Lexington, MA, USA

20.2: ***Invited Paper:*** **Use of Quantum Rods for Display Applications**
Masaki Hasegawa, Merck, Ltd., Japan, Kanagawa, Japan

20.3: ***Invited Paper:*** **Utilization of Heavy-Metal-Free Quantum Dots to Enhance Color Quality in Lighting Applications**
Steve Reinhard, Nanoco Technologies, Manchester, UK

Session 21: Mixed Reality Applications *(Augmented Reality and Virtual Reality / Applications)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 103
Chair: *Adi Abileah, Adi - Displays Consulting LLC*
Co-Chair: *Philippe Coni, THALES Avionics*

21.1: **3D Multitouch and Connected Displays for Future Interactive and Collaborative Display Systems**
Jean-Baptiste de la Rivière, Immersion, Bordeaux, France

21.2: **Exploring 3D Interactive Performance Animation for Virtual-Reality/Augmented-Reality Applications Using Low-Cost Motion Capture**
Yifan Peng, University of British Columbia, Vancouver, British Columbia, Canada,

21.3: **A 3D Interactive System Based on Vision Computing of Direct-Flective Cameras**
Xuan Li, National Chiao Tung University, Hsinchu, Taiwan, ROC

21.4: **Portable Reference Images (PRI) for Augmented-Reality/Virtual-Reality Displays**
Kenneth Abeloe, Integrity Applications, Inc., Carlsbad, CA, USA

Session 22: Automotive Human–Machine Interaction *(Vehicular Displays)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 104
Chair: *Liu Ren, Robert Bosch Research*
Co-Chair: ***Rashmi Rao, Harman International***

22.1: ***Invited Paper:*** **FutureAutomotive Interiors: The Third Living Space**
Prashanth Halady Datatreya, Robert Bosch GmbH, Leonberg, Germany

22.2: ***Invited Paper:*** **Irystec DriveSafe: An Ambient Adaptive Software That Makes Driving Safer**
Afsoon Soudi, Irystec, Montreal, Quebec, Canada

22.3: ***Invited Paper:*** **Deriving User Requirements for Haptic-Enhanced Automotive Touch-Screen Interaction**
Frank Beruscha, Robert Bosch GmbH, Rennington, Germany

Session 23: High Image Quality *(Liquid-Crystal Technology)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 130
Chair: *Seung Hee Lee, Chonbuk National University*
Co-Chair: *Ki Chul Shin, Samsung Display Co., Ltd.*

23.1: ***Distinguished Student Paper:*** **Flexoelectric Effect on the Image Flickering of FFS-LCDs**
Haiwei Chen, University of Central Florida, Orlando, FL, USA

23.2: **Investigation on the Flowing Behavior of Liquid Crystal in Large ADS-Mode Displays**
Wei Zhang, BOE Hefei Xinsheng Optoelectronics Technology Co., Ltd., Hefei, China

23.3: **Splay and Bend of Liquid Crystal in Vertical-Alignment Mode**
Jieh-Wen Tsung, AU Optronics Corp., Hsinchu, Taiwan, ROC

23.4: **Study of the Optical and Chemical Properties of Dye Colorant Material**
Chang Soo Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

Session 24: OLED Devices I *(OLEDs)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 131
Chair: *Denis Kondakov, DuPont*
Co-Chair: *Sven Zimmermann, Novaled AG*

24.1: **Device Stability Enhancement in TADF OLEDs**
Ping Kuen Daniel Tsang, Kyushu University, Fukuoka, Japan

24.2: ***Invited Paper:*** **High-Brightness OLED Lighting**
Jeffrey Spindler, OLEDWorks LLC, Rochester, NY, USA

24.3: ***Invited Paper:*** **Light Outcoupling of OLEDs: The Transparent Electrode Effects**
Chung-Chih Wu, National Taiwan University, Taipei, Taiwan, ROC

24.4: **Investigation of Triplet–Triplet Annihilation and Molecular Orientation on External Quantum Efficiency of Ultra-High-Efficiency Blue Fluorescent Device**
Kaori Ogita, Semiconductor Energy Laboratory Co., Ltd, Kanagawa, Japan

24.5L: ***Late-News Paper:*** **Ultra-Durable Foldable AMOLED Displays Capable of Withstanding One-Million Folding Cycles**
M-T. Lee, AU Optronics Corp., Hsinchu, Taiwan, ROC

Session 25: Touch Materials I *(Touch and Interactivity)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 132
Chair: *Willem Den Boer, Guardian Industries*
Co-Chair: *John Zhong, Apple, Inc.*

25.1: **A New Touch-Panel Structure Using Metal Mesh and Ag Nanowire**
Goki Toshima, Hitachi Chemical Co., Ltd., Tsukuba, Japan

25.2: ***Distinguished Paper:*** **Coating, Patterning, and Transferring Processes of Silver Nanowire for Flexible-Display Sensing**
Bo-Ru Yang, Sun Yat-Sun University, Guangzhou, P. R. China

25.3: **A Single-Layer Capacitive Touch Sensor with High Conductive Electrodes**
Chan-Hwa Hong, ETRI, Daejeon, South Korea

Session 26: Oxide-TFT Manufacturing *(Display Manufacturing)*
Wednesday, May 25 / 9:00 – 10:20 am / Room 133
Chair: *Toshiaki Arai, JOLED, Inc.*
Co-Chair: *Joerg Winkler, Plansee SE*

26.1: ***Invited Paper:*** **Metal-Oxide TFT Turnkey Manufacturing Solutions for a-Si TFT Lines**
Tian Xiao, CBRITE, Inc., Goleta, CA, USA

26.2: **A 5.8-in. Ultra-Narrow-Border LCD with Soluble Metal-Oxide TFTs and Integrated with GIP Circuit**
Yu-Hsien Chen, Chunghwa Picture Tubes, Ltd., Bade City, Taiwan, ROC

26.3: **Scalability and Homogeneity of Slot-Die Coated Metal-Oxide Semiconductor for TFTs**
Ryo Takata, Evonik Resource Efficiency GmbH, Marl, Germany

26.4: **Highly Oxidation-Resistant Mo Alloys for Metal-Oxide TFT Metallization**
Harald Koestenbauer, Plansee SE, Reutte, Austria

Session 27: Applications and Issues for Quantum Dots/Rods *(Emissive Displays / Display Systems)*
Wednesday, May 25 / 10:40 am – 12:10 pm / Room 102
Chair: *Larry Weber, PLEXIE*
Co-Chair: *Qun Yan, Sichuan COC Display Devices Co., Ltd.*

27.1: ***Invited Paper:*** **Performance Benchmarking of Wide-Color-Gamut Televisions and Monitors**
Sridhar Sadasivan, QD Vision, Inc., Lexington, MA, USA

27.2: ***Invited Paper:*** **Correlation of Accelerated Aging to In-Device Lifetime of Quantum-Dot Enhancement Film**
James Thielen, 3M, Maplewood, MN, USA

27.3: ***Invited Paper:*** **Quantum-Rod-Containing Film Development for Display Applications**
Masayoshi Suzuki, Merck, Ltd., Kanagawa, Japan

27.4: ***Distinguished Student Paper:*** **Integrated Sensing Platform Based on Quantum-Dot LEDs**
Juan He, University of Central Florida, Orlando, FL, USA

27.5L: ***Late-News Paper:*** **Elongated Semiconductor Nanorods: Emitter of Polarized Light in Red and Green**
Jan Niehaus, CAN GmbH, Hamburg, Germany

Session 28: Augmented Reality and Virtual Reality Human Factors and Display Optics *(AR/VR / Applied Vision)*
Wednesday, May 25 / 10:40 am – 12:00 pm / Room 103
Chair: *Achin Bhowmik, Intel Corp.*
Co-Chair: *Cheng Chen , Apple, Inc.*

28.1: ***Invited Paper:*** **Why Focus Cues (Blur and Accommodation) Matter**
Marty Banks, University of California at Berkeley, Berkeley, CA, USA

28.2: ***Invited Paper:*** **A Simple Method to Reduce Accommodation Fatigue in Virtual-Reality and Augmented-Reality Displays**
Phil Bos, Liquid Crystal Institute, Kent State University, Kent, OH, USA

28.3: ***Invited Paper:*** **Light Fields and Computational Optics for Near-to-Eye Displays**
Gordon Wetzstein, Stanford University, Stanford, CA, USA

Session 29: Advances in Automotive Display Measurements *(Vehicular Displays / Display Measurement)*
Wednesday, May 25 / 10:40 am – 12:00 pm / Room 104
Chair: *Thomas Fiske, Microsoft*
Co-Chair: *E. Auger, Harman International*

29.1: ***Invited Paper:*** **Recent Standardization Efforts and Measurement Procedures of German Automotive OEM and German Flat Panel Forum (DFF)**
Karlheinz Blankenbach, Pforzheim University, Pforzheim, Germany

29.2: **Pixel Crosstalk: A New Metric to Characterize DOI Loss Due to AG Treatments of Display Lenses**
Thomas Fink, Porsche AG, Weissach, Germany

29.3: **High-Resolution Scatter Analysis of Anti-Glare Layer Reflections**
Michael Becker, Instrument Systems GmbH, München, Germany

29.4: **Image Blurring Induced by Scattering Anti-Glare Layers**
Michael Becker, Display-Messtechnik&Systeme GmbH & Co. KG, Rottenburg am Neckar, Germany

Session 30: LC Beyond Displays *(Liquid-Crystal Technology)*
Wednesday, May 25 / 10:40 am – 12:00 pm / Room 130
Chair: *Michael Wittek, Merck KGaA*
Co-Chair: *Koichi Miyachi, JSR Corp.*

30.1: ***Invited Paper:*** **Liquid-Crystal Windows for Adaptive Facades**
Casper van Oosten, Merck Window Technologies B.V., Eindhoven, Netherlands

30.2: **A Low-Voltage Blue-Phase Liquid-Crystal Spatial Light Modulator**
Fenglin Peng, University of Central Florida, Orlando, FL, USA

30.3: **Depth Enhancement of a Light-Field Microscope with Hexagonal Liquid-Crystal Lens Array**
Po-Yuan Hsieh, National Chiao Tung University, Hsinchu, Taiwan, ROC

30.4: **Low-Voltage-Driving Liquid-Crystal Lens with Precise Control of Pretilt Angles Using e-Beam Lithography**
Chenxiang Zhao, Hong Kong University of Science and Technology, Kowloon, Hong Kong

Session 31: OLED Devices II *(OLEDs)*
Wednesday, May 25 / 10:40 am – 12:00 pm / Room 131
Chair: *Chang-Wook Han, LG Display Co., Ltd.*
Co-Chair: *Chihaya Adachi, Kyushu University*

31.1: **Novel Laminated OLEDs Using a Non-Metal Transparent Top Electrode with an Embedded Metal Mesh**
Jeong-Ik Lee, ETRI, Daejeon, South Korea

31.2: **See-Through Image Blurring of Transparent OLED Display: Diffraction Analysis and OLED Pixel Optimization**
Zong Qin, National Chiao Tung University, Hsinchu, Taiwan, ROC

31.3: **Suppression of Ambient-Light Reflection in OLED Displays by Using a Micro-Lens Array and Cruciform Black Matrices**
Zong Qin, National Chiao Tung University, Hsinchu, Taiwan, ROC

31.4: **Novel Inorganic Electron Injection and Transport Materials Enabling Large-Sized Inverted OLEDs Driven by Oxide TFTs**
Hideo Hosono, Tokyo Institute of Technology, Yokohama, Japan

Session 32: Touch Materials II *(Touch and Interactivity)*
Wednesday, May 25 / 10:40 am – 11:20 am / Room 132
Chair: *Bob Senior, Canatu Ltd.*
Co-Chair: *Reiner Mauch, Schott AG*

32.1: **Transparent Conductive Film for an In-Cell Touch Structure**
Sejong Shin, LG Display Co., Ltd., Gyeonggi-do, South Korea

32.2: **High-Speed Capacitive Touch Sensor with Pseudo-CMOS Buffer Using a-IGZO TFTs on Plastic**
Jin Jang, Kyung Hee University, Seoul, South Korea

Session 33: Flexible Display Manufacturing and Test *(Display Manufacturing)*
Wednesday, May 25 / 10:40 am – 12:00 pm / Room 133
Chair: *Greg Gibson, NTact*
Co-Chair: *Dawei Wang, BOE Technology Group Co., Ltd.*

33.1: ***Invited Paper:*** **Development of AMOLED Displays: From Rigid to Flexible**
Xiu Huang, Kunshan New Flat Panel Display Technology Center Co., Ltd., Kunshan, China

33.2: ***Invited Paper:*** **Evaluating the Reliability of Flexible Electronic Materials with Combined Electromechanical Testing Techniques**
Megan Cordill, Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Leoben, Austria

33.3: **Study of Bonding Technology for Flexible Substrates**
Liqiang Chen, Beijing, China

33.4: **COA Technology Applied to ADS-Mode LCDs**
Lianjie Qu, Beijing BOE Display Technology Co., Ltd., Beijing, China

Session 34: Quantum-Dot Materials *(Emissive Displays)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 102
Chair: *Poopathy Kathirgamanathan, Brunel University*
Co-Chair: *Ravi Rao, Specialty Phopshors, Inc.*

34.1: ***Invited Paper:*** **Heavy-Metal-Free Quantum Dots Making Inroads for Consumer Applications**
Nigel Pickett, Nanoco Technologies Ltd., Manchester, UK

34.2: **A Rapid Procedure for Synthesizing Giant Pure-Red Core-Shell Quantum Rods by Using the Modified Tributylphosphine-Assisted Method**
Jing Qin, South University of Science and Technology of China, Shenzhen, China

34.3: **A Low-Cost Two-Step Nucleation and Growth of CdTe Quantum Dots via Magic-Sized Cluster Intermediates in the Aqueous Phase**
Junjie Hao, South University of Science and Technology of China, Shenzhen, China

34.4: **Simultaneous Scanning TEM, Cathodoluminescence Imaging, and EELS of Quantum Dots in Rods**
George Fern, Brunel University London, Uxbridge, UK

Session 35: Augmented-Reality and Virtual-Reality 3D-Sensing Technology *(AR/VR)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 103
Chair: *Achin Bhowmik, Intel Corp.*
Co-Chair: *Ian Underwood, University of Edinburgh, Edinburgh, Scotland.*

35.1: ***Invited Paper:*** **Real-Time 3D-Sensing Technologies and Applications in Interactive Mixed-Reality Devices**
Achin Bhowmik, Intel Corp., Santa Clara, CA, USA

35.2: ***Invited Paper:*** **Scene Understanding Using RGB-D Images**
Jitendra Malik, University of California at Berkeley, Berkeley, CA, USA

35.3: ***Invited Paper:*** **Industrial Deployments of Full-Featured Head-Mounted AR Systems and The Incorporation of a 3D-Sensing Platform**
Philip Greenhalgh, DAQRI, Los Angeles, CA, USA

35.4: ***Invited Paper:*** **A Wide-Field-of-View Head-Mounted Display and Its Effects on Search Performance in Augmented Reality**
Kiyoshi Kiyokawa, Osaka University, Osaka, Japan

Session 36: Automotive Display-System Optimization *(Vehicular Displays)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 104
Chair: *Peter Knoll, Bosch*
Co-Chair: *Rashmi Rao, Harman International*

36.1: **Automotive OLED Luminance Consumption Control Methods**
Paul Weindorf, Visteon Corp., Van Buren Township, MI, USA

36.2: **Micro-Structure Optical Film for LED Backlights in Automotive Displays**
Guoqiang Lv, Hefei University of Technology, Hefei, China

36.3: **Emissive and Reflective Properties of Vehicle Displays Measured Using Fourier-Optics Viewing-Angle Instruments**
Thierry Leroux, ELDIM, Herouville, France

36.4: **Effective Surface Treatment on the Cover Glass for Auto-Interior Applications**
Chengchung Li, Corning Incorporated, Corning, NY, USA

Session 37: High-Resolution LCDs *(Liquid-Crystal Technology)*
Wednesday, May 25 / 3:30 - 4:50 pm / Room 130
Chair: *Koichi Miyachi, JSR Corporation*
Co-Chair: *Akihiro Mochizuki, I-CORE Technology, LLC*

37.1: **Development of an 82-in. Super Hi-Vision 10K x 4K LCD**
Weipin Hu, BOE TECHONOLOGY GROUP CO.,LTD, Beijing, China

37.2: **A 1058-ppi 4K LCD Using a Top-Gate Self-Aligned CAAC-OS FET**
Shuhei Yoshitomi, Semiconductor Energy Laboratory Co.,Ltd., Kanagawa, Japan

37.3: **A Novel Pixel Structure for an 847-ppi Display with LTPS Technology**
Yangzhao Ma, XiaMen Tianma Microelectronics Co., Ltd., Xiamen, China

37.4L: ***Late-News Paper:*** **Development of a 27-in. 8K x 4K LCD Utilizing an InGaZnO TFT Backplane**
Shigeyuki Yamada, Sharp Corp., Mie, Japan

Session 38: OLED Printing *(OLEDs)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 131
Chair: *C. C. Lee, BOE Technology Group Co., Ltd.*
Co-Chair: *Chris Brown, Kateeva*

38.1: ***Invited Paper:*** **Ink-Jet-Printed OLEDs for Display Applications**
Peter Levermore, Merck KGaA, Darmstadt, Germany

38.2: ***Invited Paper:*** **Latest Progress and Its Fundamentals for Polymer-OLED Material**
Takeshi Yamada, Sumitomo Chemical Co., Ltd., Tsukuba, Japan

38.3: ***Invited Paper:*** **Solution Printing for OLED TVs**
Reid Chesterfield, DuPont Displays, Wilmington, DE, USA

38.4: **The Interfacial Effect between HTL and EML on the Efficiency of Solution-Processed Green Phosphorescent OLEDs (4:30)**
K. John. The Dow Chemical Company, Midland, TX, USA

Session 39: Capacitive Touch *(Touch and Interactivity)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 132
Chair: *Jeff Han*
Co-Chair: *Deuk Su Lee, LG Display Co., Ltd.*

39.1: **Mutual-Capacitance In-Cell Touch Panel**
Chen-Hao Chiang, AU Optronics Corp., Hsinchu, Taiwan, ROC

39.2: **New In-Cell Capacitive Touch-Panel Technology with Low-Resistance Material Sensor and New Driving Method for a Narrow-Dead-Band Display**
Yasuyuki Teranishi, Japan Display, Inc., Kanagawa, Japan

39.3: **An Electrostatic Haptic Display with a Projected-Capacitive Touch Screen**
Ki Duk Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

Session 40: Optical Materials and Component Manufacturing *(Display Manufacturing)*
Wednesday, May 25 / 3:30 – 4:50 pm / Room 133
Chair: *Ion Bita, Apple, Inc.*
Co-Chair: *Ake Hornell, EuroLCDs SIA*

40.1: ***Distinguished Paper:*** **A Novel Ultra-Thin Polarizer to Achieve Thinner and More-Flexible Displays**
Shusaku Goto, Nitto Denko Corp., Hiroshima, Japan

40.2: **Development of Super Retardation Film and Its Application to the Protection Films of Polarizers**
Koichi Murata, Toyobo Co., Ltd., Fukui, Japan

40.3: **Fabrication of a Wire-Grid Polarizer on an LCD Using Nanoimprint Lithography**
Wei-Chi Wang, AU Optronics Corp., Hsinchu, Taiwan, ROC

40.4: **Development of Color Resists Containing Novel Dyes for LCDs**
Yasuki Tatsumi, Sumitomo Chemical Co., Ltd., Tokyo, Japan

Session 41: Photoluminescent Quantum Dots *(Emissive Displays)*
Thursday, May 26 / 9:00 – 10:20 am / Room 102
Chair: *John Van Derlofske, 3M*
Co-Chair: *Seth Coe-Sullivan, QD Vision*

41.1: ***Invited Paper:*** **"Greener" Quantum-Dot-Enabled LCDs with Rec. 2020 Color Gamut**
Charlie Hotz, Nanosys, Inc., Milpitas, CA, USA

41.2: ***Invited Paper:*** **Quantum Dots and Aligned Quantum Rods for Polarized Liquid-Crystal Backlight Units**
Kristiaan Neyts, Ghent University, Gent, Belgium

41.3: ***Invited Paper:*** **Luminescent Nanocrystals and Composites for High-Quality Displays and Lighting**
Xiao Wei Sun, South University of Science and Technology Shenzhen, China

41.4: ***Distinguished Paper:*** **Design Considerations for Highly Efficient Edge-Lit Quantum-Dot Displays**
Karen Twietmeyer, QD Vision, Inc., Lexington, MA, USA

Session 42: Wearable Devices and Displays *(Wearable Displays)*
Thursday, May 26 / 9:00 – 10:20 am / Room 103
Chair: *Ruiqing Ma, Universal Display Corp.*
Co-Chair: *Deng-Ke Yang, Kent State University*

42.1: ***Invited Paper:*** **Display Technologies for Wearable Devices**
Gang Xu, Huawei, Shenzhen, China

42.2: ***Invited Paper:*** **A True Circular 1.39-in. AMOLED for Wearable Applications**
Tsang-Hong Wang, Hsinchu, Taiwan, ROC

42.3: ***Invited Paper:*** **Requirements for Next-Generation Wearable Display and Battery Technologies**
Kunjal Parikh, Intel, Santa Clara, CA, USA

42.4: ***Invited Paper:*** **A Full-Color Electrophorectic Display**
Michael McCreary, E Ink Corp., Billerica, MA, USA

Session 43: Automotive Applied Vision: Challenges in High Ambient Light *(Vehicular Displays / Applied Vision / Lighting)*
Thursday, May 26 / 9:00 – 10:20 am / Room 104
Chair: *Karlheinz Blankenbach, Pforzheim University*
Co-Chair: *Liu Ren, Robert Bosch Research*

43.1: ***Invited Paper:*** **Automotive Biometric Automatic Luminance Control System**
Paul Weindorf, Visteon Corp., Van Buren Township., MI, USA

43.2: **Measurement and Deformation of a Curved LCD**
Lixuan Chen, Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen, China

43.3: **Image-Sticking Evaluation Using Fast-Fourier-Transform Analysis**
Yanxue Wang, Shenzhen China Star Optoelectronics Technology Co., Ltd, Shenzhen, China

43.4: **Revisiting Lighting Standards for Critical Viewing Tasks**
Michael Miller, Air Force Institute of Technology, Wright-Patterson AFB, OH, USA

Session 44: Photoalignment *(Liquid-Crystal Technology)*
Thursday, May 26 / 9:00 – 10:30 am / Room 130
Chair: *Michael Wand, LC Vision, LLC*
Co-Chair: *Martin Schadt, MS Hightech Consulting*

44.1: ***Invited Paper:*** **Photoalignment and n-FFS LCD Technologies with IGZO-TFTs Applied to a Gen 8 Factory**
Hiroaki Asagi, Sharp Corp., Nara, Japan

44.2: **Ultra-Thin High-Dichroic-Ratio Polarizer Generated by Photoalignment**
Su Pan, Hong Kong University of Science and Technology, Kowloon, Hong Kong

44.3: **Nanoscopic Patterned Photoalignment for Electrically Switchable Liquid-Crystal Pancharatnam-Berry Phase Diffractive Lens**
Alwin Tam, Hong Kong University of Science and Technology, Lowloon, Hong Kong

44.4L: ***Late-News Paper:*** **Photoaligned Quantum-Rod Dispersed Liquid-Crystal Polymer Films**
Abhishek Srivastava, Hong Kong University of Science and Technology, Kowloon, Hong Kong

Session 45: OLED Displays I *(OLEDs)*

Thursday, May 26 / 9:00 – 10:20 am / Room 131

Chair: *Yasunori Kijima, JOLED, Inc.*

Co-Chair: *Yusin Lin, AU Optronics Corp.*

45.1: ***Invited Paper:*** **Recent Progress of White OLEDs for Application to New OLED TV Models**
Chang Wook Han, LG Display Co., Ltd., Gyeonggi-do, South Korea

45.2: **Advanced OLED Display Technologies for Large-Sized and Semi-Flexible TVs**
Hong-Jae Shin, LG Display Co., Ltd., Gyeonggi-do, South Korea

45.3: **A Novel Seamless Kawara-Type Multidisplay with Flexible OLED Panels Using an Optically Isotropic Film**
Daiki Nakamura, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

Session 46: Force Sensing and Emerging Technologies *(Touch and Interactivity)*

Thursday, May 26 / 9:00 – 10:20 am / Room 132

Chair: *Martin Grunthaner, Apple, Inc.*

Co-Chair: *Steven Bathiche, Microsoft*

46.1: ***Invited Paper:*** **Touch and Display Integration with Force Measurement**
Kurth Reynolds, Synaptics, San Jose, CA, USA

46.2: **Multi-Level-Pressure Touch Sensor Using P(VDF-TrFE) Deposited on Metal-Oxide TFTs**
Sang-Hee Ko Park, KAIST, Daejeon, South Korea

46.3: **Piezoelectric Pressure Sensor Using Top-Gate Effect with Dual-Gate Amorphous-IGZO TFTs**
Jin Jang, Kyung Hee University, Seoul, South Korea

Session 47: TFTs on Flexible Substrates *(Active-Matrix Devices / TFTs on Flexible Substrates)*

Thursday, May 26 / 9:00 – 10:20 am / Room 133

Chair: *Chien Hung Chen, AU Optronics Corp.*

Co-Chair: *Kenichi Takatori, NLT Technologies, Ltd*

47.1: ***Invited Paper:*** **Sensor and Circuit Solutions for Organic Flexible Electronics**
A.K.M Islam, University of Tokyo, Meguro, Japan

47.2: ***Invited Paper:*** **Oxide/Organic Semiconductor Electronics on Plastic Substrates for Flexible AMOLED Displays**
Yoshihide Fujisaki, NHK, Tokyo, Japan

47.3: ***Invited Paper:*** **Various Low-Temperature Activation Methods for a-IGZO TFTs in Flexible Displays**
Hyun Jae Kim, Yonsei University, Seoul, South Korea

47.4: ***Invited Paper:*** **A Flexible AMOLED Based on Oxide TFTs with High Mobility**
Lei Wang, Guangzhou, China

Session 48: Electroluminescent Quantum Dots *(Emissive Displays)*

Thursday, May 26 / 10:40 am – 12:00 pm / Room 102

Chair: *Masayuki Nakamoto, Shizuoka University*

Co-Chair: *Chang Hee Lee, Seoul National University*

48.1: ***Invited Paper:*** **High Efficiency and Ultra-Wide-Color-Gamut Colloidal Hybrid Quantum-Dot LEDs**
Jesse Manders, NanoPhotonica, Gainesville, FL, USA

48.2: ***Invited Paper:*** **N- and P-Type Metal Oxides for Quantum-Dot LEDs**
Jin Jang, Kyung Hee University, Seoul, South Korea

48.3: ***Invited Paper:*** **Quantum-Dot Electroluminescence: Towards Achieving the Rec 2020 Color Coordinates**
Poopathy Kathirgamanthan, Brunel University, London, UK

48.4: ***Invited Paper:*** **Quantum Dots for Displays: From Photoluminescence to Electroluminescence**
Xiaogang Peng, Zhejiang University, Hangzhou, China

Session 49: Wearable/Stretchable Displays/Sensors *(Wearable Displays / e-Paper and Flexible Displays)*

Thursday, May 26 / 10:40 am – 12:00 pm / Room 103

Chair: *Yong Taek Hong, Seoul National University*

Co-Chair: *Bo-Ru Yang, Sun Yat-Sen University*

49.1: ***Invited Paper:*** **Large-Area Tactile Skins Prepared with Thin-Film Technology**
Aaron Gerratt, EPFL LSBI, Lausanne, Switzerland

49.2: ***Invited Paper:*** **Stretchable Passive-Matrix-Addressed LED Display with Thin-Film-Based Interconnects**
Jan Vanfleteren, CMST, imec and Ghent University, Gent-Zwijnaarde, Belgium

49.3: ***Late-News Paper:*** **Flexible and Stretchable Hybrid Electronics Systems for Wearable Applications**
Cui Zheng, Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences, Suzhou, China

49.4: ***Late-News Paper:*** **All-Ink-Jet-Printed Wearable Information Display Directly Fabricated onto an Elastomeric Substrate**
Yongtaek Hong, Seoul National University, Seoul, South Korea

Session 50: Automotive Head-Up Displays: Technology and Challenges *(Vehicular Displays)*
Thursday, May 26 / 10:40 am – 12:00 pm / Room 104
Chair: *Rashmi Rao, Harman International*
Co-Chair: *Petewr Knoll, Bosch*

50.1: ***Invited:*** **The Digitalization of Motorcycles: How Wearable Displays Increase Safety and Convenience While Riding Motorcycles**
Robert Richter, BMW Group Technology Office, USA

50.2: **Development of a New Head-Up-Display System Utilizing an RGBW LCD and a Local-Dimming Backlight**
Kazuhiko Sako, Japan Display, Inc., Kanagawa, Japan

50.3: **A Full-Windshield Head-Up Display Using Simulated Collimation**
Philippe Coni, THALES Avionics SAS, Le Haillan, France

Session 51: Reflective LC Devices *(Liquid-Crystal Technology)*
Thursday, May 26 / 10:40 am – 12:00 pm / Room 130
Chair: *Takahiro Ishinabe, Tohoku University*
Co-Chair: *Zhibing Ge, Apple, Inc.*

51.1: **Reflective Full-Color LCD Using LTPS-TFTs at 1 Hz with Measures against Photo-Leakage Current**
Takumi Sano, Japan Display, Inc., Chiba, Japan

51.2: **Novel Achromatic Polarizer with High Dichromatic Ratio**
Noriaki Mochizuki, Nippon Kayaku Co., Ltd., Tokyo, Japan

51.3: **Polarization-Selective Reflective Liquid-Crystal Lens with Wavelength Tunability**
Chang-Jae Yu, Hanyang University, Seoul, South Korea

Session 52: OLED Displays II *(OLEDs)*
Thursday, May 26 / 10:40 am – 12:00 pm / Room 131
Chair: *Tariq Ali, eMagin Corp.*
Co-Chair: *Franky So, North Carolina State University*

52.1: ***Invited Paper:*** **OLED Microdisplays Control Cell Behavior through Optogenetics**
Malte Gather, University of St Andrews, St. Andrews, UK

52.2: ***Invited Paper:*** **OLED Microdisplays: Enabling Advanced Near-to-Eye Displays, Sensors, and Beyond**
Uwe Vogel, Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP, Dresden, Germany

52.3: ***Distinguished Paper:*** **A 3-Stack Top-Emitting White OLED for High-Resolution OLED TV**
Chang Wook Han, LG Display Co., Ltd., Gyeonggi-do, South Korea

52.4: **Achievement of a Blue Phosphorescent OLED with High Efficiency, Low Driving Voltage, and Long Lifetime by Exciplex–Triplet Energy-Transfer Technology**
Yui Yamada, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

Session 53: Display Imaging and Color Vision *(Applied Vision)*
Thursday, May 26 / 10:40 am – 12:00 pm / Room 132
Chair: *Miyoshi Ayama, Utsunomiya University*
Co-Chair: *Youngshin Kwak, Ulsan National Institute of Science and Technology*

53.1: ***Invited Paper:*** **The Winter Green and Summer Blue Optimal Primaries from a KANSEI Evaluation Point of View**
Miyoshi Ayama, Utsunomiya University, Utsunomiya, Japan

53.2: **Wide-Color-Gamut and High-Dynamic-Range Color-Image Encoding Scheme Based on CIECAM02**
Youngshin Kwak, UNIST, Ulsan, South Korea

53.3: **Observer Metamerism and Its Effect on Color Accuracy in Display-Media Technology**
Rodney Heckaman, Beaufort, SC, USA

53.4: **Image-Saliency-Detection-Based Depth Adjustment for Stereoscopic Images**
Zhenping Xia, Suzhou University of Science and Technology, Suzhou, China

Session 54: Novel Active-Matrix Applications *(Active-Matrix Devices)*
Thursday, May 26 / 10:40 – 11:50 am / Room 133
Chair: *Kalluri Sarma, Honeywell, Inc.*
Co-Chair: *Takashi Nakamura, Japan Display, Inc.*

54.1: **Parallel Fabrication for Integration of Electronic and Microelectromechanical Systems**
Patrick Schalberger, University of Stuttgart, Stuttgart, Germany

54.2: **Transmissive OLED and Reflective LC Hybrid (TR-Hybrid) Displaywith High Visibility and Low Power Consumption**
Tatsuya Sakuishi, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

54.3: ***Invited Paper:*** **Flexible Active-Matrix OLET Display on a Plastic Substrate**
Hsing-Hung Hsieh, Polyera Taiwan Corp., Hsinchu, Taiwan, ROC

Session 55: Emissive Devices *(Emissive Displays)*
Thursday, May 26 / 1:30 – 2:50 pm / Room 102
Chair: *Ioannis Kymissis, Columbia University*

55.1: ***Invited Paper:*** **Passive-Matrix Displays with Transfer-Printed Microscale Inorganic LEDs**
Christopher Bower, X-Celeprint, Inc.

55.2: ***Invited Paper:*** **ILED Displays: Next-Generation Display Technology**
William Henry, InfiniLED, Cork, Ireland

55.3: **MOVED TO POSTER P.210**

55.4: **Efficient Large-Sized Quantum-Dot-Based Organic/Inorganic Hybrid LEDs Fabricated by Using a Blade Coating Technique**
Fushan Li, Fuzhou University, Fuzhou, Chin

Session 56: Automotive LCDs I: Wide Color Gamut and High Temperature *(Vehicular Displays / Liquid-Crystal Technology)*

Thursday, May 26 / 1:30 – 3:00 pm / Room 104

Chair: *Karlheinz Blankenbach, Pforzheim University*

Co-Chair: *Gang Xu, Huawei*

56.1: **High-Performance Liquid Crystals for Vehicular Displays**
Fenglin Peng, University of Central Florida, Orlando, FL, USA

56.2: **Development of a Higher-Performance Polarizer with Dye Components**
Hiroki Kato, Polatechno Co., Ltd., Japan

56.3: ***Distinguished Paper:*** **A Novel Moth-Eye-like Surface Film That Is Anti-Reflective and Highly Scratch Resistant**
Ayako Matsumoto, FUJIFILM Corp., Kanagawa, Japan

56.4: **Quantum-Dot LCDs for Rec. 2020**
Ruidong Zhu, University of Central Florida, Orlando, FL, USA

56.5. **A New Optically Clear Adhesive Material for Vehicle Displays**
Naoki Takahara, Hitachi Chemical Co., Ltd., Tsukuba, Japan

Session 57: e-Paper/Reflective Displays *(e-Paper and Flexible Displays)*

Thursday, May 26 / 1:30 – 2:50 pm / Room 130

Chair: *Makoto Omodani, Tokai University*

Co-Chair: *Norihisa Kobayashi, Chiba University*

57.1: ***Invited Paper:*** **Measurement of Readability of e-Paper**
Takehito Kojima, Nagoya University, Aichi, Japan

57.2: ***Invited Paper:*** **Flexible Electrophoretic Displays with Novel Drive Schemes for Wearables and Mobiles**
Ian French, E Ink Corp., Hsinchu, Taiwan, ROC

57.3: **Janus Particles Containing Inorganic Electroluminescent Phosphor for Emissive and Reflective Dual-Mode Twisting-Ball Display**
Yusuke Komazaki, The University of Tokyo, Chiba, Japan

57.4L: ***Late-News Paper:*** **A Silver Electrodeposition-Based Multicolor Electrochromic Device toward Color e-Paper**
Norihisa Kobayashi, Chiba University, Chiba, Japan

Session 58: OLED Materials *(OLEDs)*

Thursday, May 26 / 1:30 – 2:30 pm / Room 131

Chair: *Michael Weaver, Universal Display Corp.*

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

58.1: **WITHDRAWN**

58.2: **Revealing the Excited-State Dynamics of Thermally Activated Delayed Fluorescence Molecules by Using Transient Absorption Spectroscopy**
Takuya Hosokai, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan

58.3: ***Invited Paper:*** **Demonstration of Highly Efficient and Air-Stable OLED Utilizing Novel Heavy-Doping Technique**
Hirohiko Fukagawa, NHK, Tokyo, Japan

58.4: **Highly Efficient Tandem OLEDs with Novel Electron-Transport Materials**
Jang Hyuk Kwon, Kyung Hee University, Seoul, South Korea

Session 59: High-Dynamic-Range and Field-Sequential-Color Displays *(Applied Vision)*

Thursday, May 26 / 1:30 – 2:50 pm / Room 132

Chair: *Yuning Zhang, Southeast University*

Co-Chair: *Fang Cheng Lin, National Chiao Tung University*

59.1: ***Invited Paper:*** **Modeling and Suppressing of Color Breakup**
Yuning Zhang, Southeast University, Nanjing, China

59.2: ***Distinguished Paper:*** **Role of Local-Dimming Density, Native Panel Contrast, and Glare Sources in the Visual Quality of HDR Displays**
David Hoffman, Samsung Display Co., Ltd., San Jose, CA, USA

59.3: **Proper Luminance for an HDR TV System**
Haisong Xu, Zhejiang University, Hangzhou, China

59.4: **Reduction of Possible Flicker and Color Breakup Using the Deflicker-FSC Method for Field-Sequential-Color Displays**
Kai-Tung Teng, National Chiao Tung University, Hsinchu, Taiwan, ROC

Session 60: New TFTs *(Active-Matrix Devices / Liquid-Crystal Technology)*

Thursday, May 26 / 1:30 – 2:30 pm / Room 133

Chair: *Man Wong, Hong Kong University of Science & Technology*

Co-Chair: *Junho Song, Samsung Display*

60.1: ***Invited Paper:*** **The Emerging Era of 2D Materials**
Saptarshi Das, Penn State University, State College, PA, USA

60.2: **A New Concept of In-Ga-Zn-Ox Composition for Fabricating High Mobility and Stability FETs**
Noritaka Ishihara, Semiconductor Energy Laboratory Co., Ltd., Atsugi, Japan

60.3: ***Distinguished Paper:*** **Application of Oxide Vertical TFTs for Ultra-High-Resolution Displays**
Sang-Hee Ko Park, KAIST, Daejeon, South Korea

60.4L: **WITHDRAWN**

Session 61: Backlight Systems *(Display Systems)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 102
Chair: *Masaru Suzuki, Rohm and Haas Electronic Materials*
Co-Chair: *K. Käläntär, Global Optical Solutions*

61.1: **Content-Adaptive Expandable Color Gamut LCD**
Ben Broughton, Sharp Laboratories of Europe Ltd., Oxford, UK

61.2: **Optical Efficiency Enhancement in Wide-Color-Gamut LCDs by Using a Patterned Quantum-Dot Film and Short Pass Reflector**
Young-Joo Kim, Yonsei University, Seoul, South Korea

61.3: **Tripling LCD-BLU Efficiency by Simultaneous Color and Polarization Recycling**
Zhenyue Luo, University of Central Florida, Orlando, FL, USA

61.4: **Holographic Diffuser Design for Multi-Band Beam Shaping**
Chao Yu, Hangzhou, China

Session 62: OLED Wearable Displays *(Wearable Displays / OLEDs)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 103
Chair: *Jang Hyuk Kwon, Kyung Hee University*
Co-Chair: *Changwoong Chu, Samsung Display Co., Ltd.*

62.1: ***Invited Paper:*** **Directly Patterned 2645-ppi Full-Color OLED Microdisplay for Head-Mounted Wearables**
Amal Ghosh, eMagin Corp., Hopewell Junction, NY, USA

62.2: **Novel Thin-Film-Encapsulation Structure for Wearable Plastic AMOLED Displays**
Chieh-Hung Yang, AU Optronics Corp., Hsinchu, Taiwan, ROC

62.3: **Panel Design Technology for Circular OLED Displays**
Nakwoo Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

62.4L: ***Late-News Paper:*** **A Circular Flexible AMOLED Display with a 1-mm Slim Border**
Li-Fong Lin, AU Optronics Corp., Hsinchu, Taiwan, ROC

Session 63: Automotive LCDs II: Fast Response and High Luminance *(Vehicular Displays / Liquid-Crystal Technology)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 104
Chair: *Shin-Tson Wu, University of central Florida*
Co-Chair: *Karlheinz Blankenbach, Pforzheim University*

63.1: **High-Transmittance and Fast-Response-Time LCDs Using a Novel Electrode Pattern**
Ankai Ling, Xiamen Tianma Microelectronics Co., Ltd., Xiamen, China

63.2: ***Distinguished Paper:*** **Large-Scale Luminance Enhancement Film with Quantum Rods Aligned in Polymeric Nanofibers for High-Efficiency Wide-Color-Gamut LED Displays**
Jing Qin, Southern University of Science and Technology of China, Shenzhen, China

63.3: **A Novel FFS Structure to Improve Image-Sticking in LCDs**
Woo Seung, LG Display Co., Ltd., Gyeonggi-do, South Korea

63.4: **Anti-Reflection Films with Scratch Resistance**
Yong Yang, Wuhan China Star Optoelectronics Technology Co., Ltd., Wuhan, China

Session 64: Flexible/Printed TFTs *(e-Paper and Flexible Displays / Active-Matrix Devices / TFTs on Flexible Substrates)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 130
Chair: *Chao-Yuan Chen, Jiangsu Hecheng Display Technology*
Co-Chair: *Xiaojun Guo, Shanghai Jiao Tong University*

64.1: **Photolithographic Integration of High-Performance Polymer TFTs**
Stephen Bain, Merck Chemicals, Ltd., Southampton, UK

64.2: **New Organic Semiconductors for Improved Processing: Direct Photo-Patterning and High-Mobility Materials for Flexible TFTs**
Daniel Kaelblein, BASF SE, Ludwigshafen, Germany

64.3: ***Distinguished Student Paper:*** **Bulk-Accumulation Oxide TFTs for Flexible AMOLED Displays with High-Yield Integrated Gate Driver**
In Jang, Kyung Hee University, Seoul, South Korea

64.4: ***Invited Paper:*** **Printed Metal-Oxide TFTs**
Chih-hung Chang, Oregon State University, Corvallis, OR, USA

Session 65: Advanced Measurement and Modeling Techniques *(Display Measurement)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 131
Chair: *Thomas Fiske, Microsoft*
Co-Chair: *Frank Rochow, Adviser*

65.1: ***Invited Paper:*** **Characterizing High-Dynamic-Range Display-System Properties in the Context of Today's Flexible Ecosystems**
Scott Daly, Dolby Laboratories, Kalama, WA, USA

65.2: **Peak Brightness and Contrast Evaluation for HDR TVs**
Jang-Un Kwon, LG Display Co., Ltd., Gyeonggi-do, South Korea

65.3: ***Invited Paper:*** **Light-Field, Holographic and Volumetric Display Measurements**
Adi Abileah, Adi - Displays Consulting LLC, Portland, OR, USA

65.4: **Visual Effect Analysis for an Autostereoscopic Display Illuminated with a Directional Backlight**
Jianying Zhou, Sun Yat-Sen University, Guangzhou, China

65.5L: ***Late-News Paper:*** **Sparkle Evaluation with Visual Weighting**
Michael Becker, Display-Messtechnik&Systeme GmbH & Co. KG, Rottenburg am Neckar, Germany

Session 66: Curved and 3D Displays *(Applied Vision)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 132
Chair: *Eli Peli, Harvard Medical School*
Co-Chair: *Sakuichi Ohtsuka, Kagoshima University*

66.1: ***Invited Paper:*** **Trends in Perception of Displayed 3D Stereoscopic Content**
Alan Bovik, University of Texas, Austin, TX, USA

66.2: **Comparison of Flat and Curved Monitors: Eyestrain Caused by the Intensive Visual Search Task**
Gang Luo, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School, Boston, MA, USA

66.3: **Aftereffect of Viewing Concave Curved Displays in a Large and Wide-Angle Environment: Assessment of Individual Differences**
Sakuichi Ohtsuka, Kagoshima University, Kagoshima, Japan

66.4: **Effects of Display Curvature and Lateral Viewing Position on Spatial Presence and Image Quality for 55-in. TVs**
Gyouhyung Kyung, UNIST, Ulsan, South Korea

Session 67: Low-Temperature-Polysilicon TFTs *(Active-Matrix Devices)*
Thursday, May 26 / 3:10 – 4:30 pm / Room 133
Chair: *Norbert Fruehauf, University of Stuttgart*
Co-Chair: *Kazuyoshi Omata, Konica Minolta*

67.1: **Novel LTPS Technology for Large Subsutrate**
Nobutake Nodera, Sakai Display Products Corp., Osaka, Japan

67.2: **A 510-ppi 8K x 4K LTPS TFT-LCD with 120-Hz Frame-Rate Driving**
Kazuhide Mochizuki, Japan Display Inc., Chiba, Japan

67.3: **Bottom-Gate ELA Poly-Si TFT for High-Resolution AMOLED Mobile Displays**
Kummi Oh, LG Display Co., Ltd., Gyeonggi-do, South Korea

Session 68: Applications Beyond Displays *(Applications)*
Friday, May 27 / 9:00 – 10:20 am / Room 102
Chair: *Ian Underwood, University of Edinburgh*
Co-Chair: *Jyrki Kimmel, Nokia Research Center*

68.1: ***Invited Paper:*** **Novel Liquid-Crystal Devices for Photonics Applications**
V. Chigrinov, Hong Kong University of Science and Technology, Kowloon, Hong Kong,

68.2: **Smart Liquid-Crystal Beam Deflector with Laser-Ablated Polymer Micro-Grating Structure**
Xiaobing Shang, Ghent University and imec, Gent, Belgium

68.3: **Luminous Efficiency of SC-OLED Improved by Distributed Bragg Reflector**
Chia-Sheng Wang, National Taiwan University, Taipei, Taiwan, ROC

68.4: **Demonstration of a Novel Ultra-Slim Flexible Glass as a Substrate with a Metal-Meshed Antenna**
Chia-Ying Tseng, National Taiwan University, Taipei, Taiwan, ROC

Session 69: Oxide TFTs I *(Active-Matrix Devices)*
Friday, May 27 / 9:00 – 10:20 am / Room 103
Chair: *James Chang, Apple, Inc.*
Co-Chair: *Hyun Jae Kim, Yonsei University*

69.1: ***Invited Paper:*** **Oxide-TFT Development for AMLCDs and AMOLED Displays**
Yong-Min Ha, LG Display Co., Ltd., Gyeonggi-do, South Korea

69.2: **Oxide-TFT Mobility Limits and CMOS Feasibility**
Kevin Stewart, Oregon State University, Corvallis, OR, USA

69.3: **A 806-ppi 4K x 2K LCD Using Top-Gate Self-Aligned CAAC-OS FETs**
Hideaki Shishido, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

69.4L: ***Late-News Paper:*** **NBIS-Stable Oxide TFTs Using Ultra-Wide-Bandgap Amorphous Oxide Semiconductors**
Junghwan Kim, Tokyo Institute of Technology, Tokyo, Japan

Session 71: Printed Electronics *(e-Paper and Flexible Displays)*
Friday, May 27 / 9:00 – 10:20 am / Room 130
Chair: *Ryoichi Ishihara, Delft University of Technology*
Co-Chair: *Chuyu Liu, AU Optronics Corp.*

71.1: ***Invited Paper:*** **Design Rules for Additive Printing of Flexible Electronics**
Tse Nga Ng, University of California at San Diego, La Jolla, CA, USA

71.2: ***Invited Paper:*** **Printed Transistors and MEMS for Large-Area Electronics**
Vivek Subramanian, University of California at Berkeley, Berkeley, CA, USA

71.3: ***Invited Paper:*** **Development of Printed Ambipolar Polymer Complementary ICs**
Yong-Young Noh, Dongguk University, Seoul, South Korea

71.4L: ***Late-News Paper:*** **Illumination-Insensitive Mechanically Stable Transparent Flexible All-Ink-Jet-Printed Single-Walled Carbon-Nanotube TFTs**
Yongtaek Hong, Seoul National University, Seoul, South Korea

71.5L: ***Late-News Paper:*** **In-Depth Study on Large-Area Bar Printing and Selective-Area Direct Patterning of Metal-Oxide Dielectrics for High-Performance Transistor Application**
Myung-Han Yoon, Gwangju Institute of Science and Technology (GIST), Gwangju, South Korea

Session 72: Measurement Methods and Equipment *(Display Measurement)*
Friday, May 27 / 9:00 – 10:20 am / Room 131
Chair: *Frank Rochow, Adviser*
Co-Chair: *Chuck Yin, Square, Inc.*

72.1: ***Invited Paper:*** **Reflection Measurements and Uncertainties Using Sampling Spheres on Flat, Convex, and Concave Displays**
Edward Kelley, KELTEK, Longmont, CO, USA

72.2: **A High-Speed 2-in-1 Imaging Colorimeter for Display-Production Applications**
Martin Wolf, Instrument Systems GmbH, Munich, Germany

72.3: **Optical Characterization of a Transparent LCD Using a Fourier-Optics Multispectral Viewing-Angle System**
Thierry Leroux, ELDIM, Herouville, France

72.4: **A New Contrast Metric for Realistic Display-Performance**
Alex Hwang, Schepens Eye Research Institute, Massachusetts Eye and Ear, Harvard Medical School, Boston, MA, USA

Session 73: Autostereoscopic Displays I *(Display Systems)*

Friday, May 27 / 9:00 – 10:20 am / Room 132

Chair: *K. Käläntär, Global Optical Solutions*

Co-Chair: *Jae Hyeung Park, Inha University*

73.1: **Design and Implementation of Landscape/Portrait-Mode Convertible Light-Field 3D Display**
Kyuhwan Choi, Samsung Electronics Co., Ltd., Gyeonggi-do, South Korea

73.2: ***Distinguished Paper:*** **A Wide-View Glass-less 3D Display with Head-Tracking System for Horizontal and Vertical Directions**
Daichi Suzuki, Japan Display, Inc., Kanagawa, Japan

73.3: **Super Multi-View 3D Display with Reduced Accommodation-Vergence Conflict Using the Holographic Method**
Hoon Song, Samsung Advanced Institute of Technology, Gyeonggi-do, South Korea

73.4: **A Two-Way Multi-View 2D/3D Display Combining a LC Lens and HVxDP Panel Using a Novel Pixel Arrangement**
Jin Matsushima, NLT Technologies, Ltd., Kanagawa, Japan

Session 74: OLED Manufacturing *(Display Manufacturing / OLEDs)*

Friday, May 27 / 9:00 – 10:20 am / Room 133

Chair: *Tian Xiao, CBRITE, Inc.*

Co-Chair: *Bradley Bowden, Corning Incorporated*

74.1: **Application of Transfer Technology to the Manufacture of a Transmissive OLED and Reflective LC Hybrid (TR-Hybrid) Display**
Ohide Takayuki, Advanced Film Device, Inc., Tochigi, Japan

74.2: **Collimated Flux Deposition Technology for RGB SBS OLED Displays**
Shinichi Kawato, Sharp Corp., Nara, Japan

74.3: **Multicolor 1250-ppi OLED Arrays Patterned by Photolithography**
Pawel Malinowski, imec, Leuven, Belgium

Session 75: Emerging Technologies *(Applications)*

Friday, May 27 / 10:40 am – 12:00 pm / Room 102

Chair: *Gary Jones, Nanoquantum Corp.*

Co-Chair: *Ian Underwood, University of Edinburgh*

75.1: ***Invited Paper:*** **GaN-Based Emissive Microdisplays: A Very Promising Technologyfor Compact Ultra-High-Brightness Display Systems**
Francois Templier, CEA-LETI, Grenoble, France

75.2: ***Invited Paper:*** **Realizing Holographic Head-Up Displays**
Jamieson Christmas, Two Trees Photonics, Milton Keynes, UK

75.3: **Chemical Gas Sensors Using Chiral Nematic Liquid Crystals**
Shoichi Ishihara, Osaka Institute of Technology, Osaka, Japan

75.4: ***Distinguished Student Paper:*** **A High-Ambient-Contrast Augmented-Reality System**
Ruidong Zhu, University of Central Florida, Orlando, FL, USA

Session 76: Oxide TFTs II *(Active-Matrix Devices)*

Friday, May 27 / 10:40 am - 12:00 pm / Room 103

Chair: *Sang Hee Park, KAIST*

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

76.1: ***Invited Paper:*** **CAAC-IGZO Technology**
Takuya Matsuo, Sharp Corp., Nara, Japan

76.2: ***Invited Paper:*** **Amorphous-Oxide TFTs with Nitrogen-Doped Active Layers**
Chengyuan Dong, Shanghai Jiao Tong University, Shanghai, China

76.3: **Development of a Top-Gate Transistor with Short Channel Length and C-Axis-Aligned Crystalline IGZO for High-Resolution Panels**
Yukinori Shima, Advanced Film Device, Inc., Tochig-shi, Japan

Session 78: Flexible AMOLED Displays *(e-Paper and Flexible Displays)*

Friday, May 27 / 10:40 am – 12:00 pm / Room 130

Chair: *Jin Jang, Kyung Hee University*

Co-Chair: *Simon Kang, Apple, Inc.*

78.1: ***Invited Paper:*** **Foldable AMOLED Integrated with On-Cell Touch and Edge-Sealing Technologies**
Janglin Chen, ITRI, Hsinchu, Taiwan, ROC

78.2: **Improving the Flexibility of AMOLED Displays by Modulating the Thickness of the Layer Stack Structure**
Yi-Fan Niu, Chunghwa Picture Tubes, Ltd., Taoyuan, Taiwan, ROC

78.3: ***Distinguished Paper:*** **Flexible AMOLED Displays with a Bending Interactive Interface**
Chia-Hsun Tu, AU Optronics Corp., Hsinchu, Taiwan, ROC

78.4: ***Distinguished Paper:*** **A 2.78-in. 1058-ppi Ultra-High-Resolution Flexible OLED Display Using CAAC-IGZO FETs**
Takaaki Nagata, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

Session 79: Measurements for AR/VR Displays *(Display Measurement)*
Friday, May 27 / 10:40 am – 12:00 pm / Room 131
Chair: *Marja Salmimaa, Nokia Technologies*
Co-Chair: *Thomas Fiske, Microsoft*

79.1: ***Invited Paper:*** **Optical Measurements of Different Near-to-Eye Display Types**
Toni Järvenpää, Nokia Technologies, Tampere, Finland

79.2: **An Image-Quality Evaluation Method of Near-to-Eye Displays**
Xiaodi Tan, Beijing Institute of Technology, Beijing, China

79.3: **Eyewear Display Measurement Method: Entrance Pupil-Size Dependence on Measurement Equipment**
Kosei Oshima, Otsuka Electronics Corp., Ltd., Shiga, Japan

Session 80: Autostereoscopic Displays II *(Display Systems)*
Friday, May 27 / 10:40 am – 12:20 pm / Room 132
Chair: *J-P. Guillou, Apple, Inc.*
Co-Chair: *K. Käläntär, Global Optical Solutions*

80.1: **An Integral-Imaging Display Based on a Micro-Liquid-Lens Array**
Wang Hua, Sichuan University, Chengdu, China

80.2: **A Distorted PVC Membrane Micro-Lens Array for Switchable 2D/3D Displays**
Miao Xu, Jeonju, South Korea

80.3: **A Fast 2D/3D Switchable Display Using a Polarization-Sensitive Lens Array and an Electrically Suppressed Helix Ferroelectric Liquid Crystal**
Liangyu Shi, Hong Kong University of Science and Technology, Kowloon, Hong Kong

80.4: **A Dual-Layered Display that Presents Autostereoscopic 3D Images to Multiple Viewers in Arbitrary Positions**
Jae-Hyeung Park, Inha University, Incheon, South Korea

80.5: **Fast Calculation of Stereoscopic View Points via Fourier Slice Transformation and Boundary In-Painting**
Jian Zhao, Southeast University, Nanjing, China

Session 81: Advanced LCD Manufacturing *(Display Manufacturing / Liquid-Crystal Technology)*
Friday, May 27 / 10:40 am – 12:00 pm / Room 133
Chair: *Wei Lung Liau, AU Optronics Corp.*
Co-Chair: *Yukio Endo, Asahi Glass Co., Ltd.*

81.1: ***Invited Paper:*** **ADS Wide-Viewing-Angle TFT-LCD Manufacturing for TV Products**
Xibin Shao, Beijing BOE Display Technology Co., Ltd., Beijing, China

81.2: **Innovative Mask-Reduction Process for High-Resolution TFT-LCDs Using Organic Dielectrics**
Min-Joo Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

81.3: ***Invited Paper:*** **Glass Light-Guide Plate for Ultra-Thin Large-Sized TV**
Yuki Kondo, Asahi Glass Co. Ltd., Tokyo, Japan

81.4: **Glass Light-Guide Plate for Large Edge-Lit LED LCD-TV Application**
Tomohiro Ishikawa, Corning Incorporated, Corning, NY, USA

Poster Session
Thursday, May 26 / 5:00 – 8 pm / City View Room - Metreon

Active-Matrix Devices

P.1: ***Distinguished Student Poster:*** **Oxide TFT with Split Active and Source-Drain Electrodes for Highly Flexible Displays**
Jin Jang, Kyung Hee University, Seoul, South Korea

P.2: **Novel High-Mobility Oxide TFT with Self-Aligned S/D Regions Formed by Wet-Etching**
Kwang Hwan Ji, LG Display Co., Ltd., Gyeonggi-do, South Korea

P.3: **WITHDRAWN**

P.4: **Electrical Characteristics of Dual-Gate CAAC-IGZO FET with Self-Aligned Top Gate**
Ryunosuke Honda, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

P.5: **A Simple Dipping Method to Improve Positive-Bias-Stress Stability of In-Ga-Zn-O TFTs Using Hydrogen Peroxide**
Hyun Jae Kim, Yonsei University, Seoul, South Korea

P.6: **Aqueous-Precursor-Based Solution-Processed Metal-Oxide Semiconductor**
Huajun Chen, University of California at Los Angeles, Los Angeles, CA, USA

P.7: **High-Performance LTPS TFTs Using Low-Cost Polycrystalline Silicon by Blue-Laser Annealing**
Jin Jang, Kyung Hee University, Seoul, South Korea

P.8: **Corbino Oxide TFTs for Flexible-AMOLED-Display Stability**
Mallory Mativenga, Kyung Hee University, Seoul, South Korea

P.9: **High-Performance Back-Channel-Etched Metal-Oxide TFT with Double Active Layers**
Sung Haeng Cho, ETRI, Daejeon, South Korea

P.10: **Excellent Mechanical Bending Stability of Flexible a-IGZO TFTs by Dual-Gate Dual Sweep Using TCAD Simulation**
JIn Jang, Kyung Hee University, Seoul, South Korea

P.11: **Development of IGZO ESL-Type TFTs at Gen 8.5 for 55-in. AMOLED TVs**
Dongfang Wang, BOE Technology Group Co. Ltd, Hefei, China

P.12: **3D TCAD Simulation for Describing Intrinsic Fluctuations in Poly-Si TFTs**
Seunghyun Jang, Samsung Display Co., Ltd., Gyounggi-do, South Korea

P.13: **Influence of Oxide Thinning by Using a Selective Etching Process on Solution-Processed IZO TFTs**
Hyun Jae Kim, Yonsei University, Seoul, South Korea

P.14: **Narrow Bezel FFS-Mode De-Mux LCD with an ESL-Type a-IGZO TFT**
Yi-Kai Chen, Chunghwa Picture Tubes, Ltd., Taoyuan, Taiwan, ROC

P.15: **AZO Etch Buffer Layer Based Back-Channel-Etch a-IGZO TFT Technology**
Shengdong Zhang, Peking University, Beijing, China

P.16: **Single-Photon Avalanche Diode Array Integrated with InGaZnO TFTs for Time-Correlated Applications**
Nobuyoshi Saito, Toshiba Corp., Kawasaki, Japan

P.17: **New Gate-Driver Circuit for Slim-Border TFT-LCD Applications**
Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan, ROC

P.18: **High-Reliability a-InGaZnO TFTs with an Expanded-Electrode Structure**
Bo-Liang Yeh, AU Optronic Corp., Taoyuan, Taiwan, ROC

P.19: **Dual-Active-Layer Structure of Nitrogen-Doped Amorphous-InSnZnO TFTs for Negative-Gate-Bias Stability Improvement**
Bo-Ru Yang, SYSU-CMU Shun de International Joint Research Institute, Foshan City, China

P.20: **AMOLED Driving Circuit with Subthreshold Current Compensating Capability for High-ppi Display Panel**
Xuan-Yong Lin, National Chiao Tung University, Hsinchu, Taiwan, ROC

P.21: **The High Luminance Levels of RGBW Ultra Pixel Design**
Wenqing Song, Wuhan China Star Optoelectronics Technology Co., Ltd., Wuhan, China

P.22: **Turn-On Voltage Modulation of IGZO TFTs through Thermal Annealing Processes**
Zhuoqun Feng, Hong Kong University of Science and Technology, Kowloon, Hong Kong

P.23: **Ultra-Slim-Border TFT-LCD Technology Using One-Third Source Line Driving and Tracking Gate Line in the Pixel Area**
Yu-Han Huang, AU Optronic Corp., Hsinchu, Taiwan, ROC

P.24: **Novel Pixel Structure for Improving the Transmittance of High-Resolution LCDs**
Gyutae Kang, LG Display Co. Ltd, Gyounggi-do, South Korea

P.25: **Super-Low-Temperature Doping of Phosphorus to Poly-Si Thin Films Using XeF Excimer-Laser Irradiation in Phosphoric-Acid Solution**
Akira Suwa, Kyushu University, Fukuoka, Japan

P.26: **A 1058-ppi 8K x 4K OLED Display Using a Top-Gate Self-Aligned CAAC Oxide-Semiconductor FET**
Masataka Shiokawa, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

P.186L: ***Late-News Poster:*** **Development and Characteristic Analysis of Crystalline IGZO**
Jia Ye, AU Optronics Corp., Hsinchu, Taiwan, ROC

P.190L: ***Late-News Poster:*** **Device Mobility >300 cm^2/V-sec Using Planarized Single-Crystal-Silicon Spheres for Large-Area-Display Backplanes**
Douglas Dykaar, University of Waterloo, Waterloo, Ontario, Canada

P.191L: ***Late-News Poster:*** **Solution-Processed P-Channel Oxide TFTs Employing Metal-Doped Nickel Oxide**
Jin Jang, Kyung Hee University, Seoul, South Korea

Applications

P.27: **An Optical Zoom Method Based on a Spatial Light Modulator**
Wang Hua, Sichuan University, Chengdu, China

P.28: **A Holographic Encryption Method Based on the Hash Function**
Wang Hua, Sichuan University, Chengdu, China

P.29: **Transparent-Display Application: Parallax-Free Video-Conferencing System**
Han Tai, AU Optronics Corp., Taiwan, ROC

Applied Vision

P.30: **Research on the Relationship between Visual Fatigue and Stereoscopic Parallax**
Jiahui Wang, Sun Yat-Sen University, Guangzhou, China

P.31: **Visual-Fatigue Assessment and Modeling Based on ECG and EOG Caused by 2D and 3D Displays**
Danli Wang, Institute of Software, Chinese Academy of Sciences, Beijing, China

P.32: **Parametric Characterization of Perceived Light-Field-Display Resolution**
Zahir Alpaslan, Ostendo Tecnologies, Inc., Carlsbad, CA, USA

P.33: **Color Classification of Images Using a Categorical Color Database**
Akihisa Kumakura, Utsunomiya University, Utsunomiya, Japan

Display Electronics

P.34: **A Peripheral Compensation Scheme for AMOLED with Data Voltage, V_{th} and Aging Information Analogously Added to the Pixel Circuit**
Shengdong Zhang, Peking University, Beijing, China

P.35: **New Voltage-Programmed AMOLED Pixel Circuit Employing an In-Pixel Compensation Scheme for Mobility Variation**
Chih-Lung Lin, National Cheng Kung University, Tainan, Taiwan, ROC

P.36: **An Area-Efficient Segmented R-DAC Realized by Low-Voltage Transistors for AMOLED Driver ICs**
Min Zhang, Peking University, Shenzhen, China

P.37: **A High-Accuracy Current Comparison Scheme for External Compensation Circuit of AMOLED Displays**
Shengdong Zhang, Peking University, Beijing, China

P.38: **WITHDRAWN**

P.39: **Low-Power and Fast-Response Driving Method for an MUX Circuit Using Polarity MUX Technology**
Hak-Su Kim, LG Display Co., Ltd., Gyeonggi-do, South Korea

P.40: **High-Reliability Gate Driver Using Reverse-Bias Method with Oxide TFTs**
Seungwoo Han, BOE Technology Group Co., Ltd., Beijing, China

P.41: **A Low-Power Integrated Gate Driver Circuit Using a-IGZO TFTs with Etching Stop Layer**
Shengdong Zhang, Peking University, Beijing, China

P.42: **A Novel Gate-Driver-Circuit Design for an Ultra-Slim Border**
Chang-Yi Li, AU Optronics Corp., Hsinchu, Taiwan, ROC

P.43: **18.5-in. FHD TFT-LCD with Separated V_{com} Structure Reducing the Greenish Artifact Caused by V_{com} Delay**
Hyunsic Choi, BOE Technology Group Co., Ltd., Beijing, China

P.44: **A Voltage-Programmable Current-Source-Free AMOLED Pixel Circuit with Separate Frame Compensation**
Shengdong Zhang, Peking University, Beijing, China

P.45: **Subpixel-Rendering Technology Applied to a 5.5-in. FHD Panel**
Wei-Fu Chang, Chunghwa Picture Tubes, Ltd., Taoyuan, Taiwan, ROC

P.46: **Essential Image-Enhancement Algorithms for Mobile Displays**
Ke-Jun Liu, National Chiao Tung University, Hsinchu, Taiwan, ROC

P.47: **A 10K UHD Display System**
Ran Duan, BOE Technology Group Co., Ltd., Beijing, China

P.192L: ***Late-News Poster:*** **A Novel Architecture and Algorithm for Real-Time Correction of Pincushion Distortion in Microdisplay Systems**
Sung-Wook Eo, Raontech, Gyeonggi-do, South Korea

P.193L: ***Late-News Poster:*** **Improving Motion Image Quality of LCDs by Visual Inspection Only**
Seung-Woo Lee, Kyung Hee University, Seoul, South Korea

P.194L: ***Late-News Poster:*** **Color-Performance Prediction Method of AMLCD by Adopting Field-Sequential Driving**
Seung-Woo Lee, Kyung Hee University, Seoul, South Korea

P.209L; ***Late-News Poster:*** Pseudo-Gate Doubling Method to Increase Charging Time in High-Resolution Shutter-Type Stereoscopic 3D LCD TVs
J-K. Song, Sungkyunkwan University, Suwon, South Korea

P.213: **Low-Power and Fast-Response Driving Method for MUX Circuit Using Polarity MUX Technology**
Hak-Su Kim, LG Display Co., Ltd., Gyeonggki-do, South Korea

Display Manufacturing

P.48: **Growth of Highly Oriented LTPS Films by CW-Laser Lateral Crystallization**
Nobuo Sasaki, Sasaki Consulting, Kawasaki, Japan

P.49: **A Novel Glass Composition for Chemical Strengthening**
Yoshihiko Fujita, Nippon Sheet Glass Co., Ltd., Kanagawa, Japan

P.50: **WITHDRAWN**

P.51: **Array-Orientation Silver-Nanowire Transparent Conductive Film**
Wang Ruiyong, Beijing BOE Optoelectronics Technology Co., Ltd, Beijing, China

P.52: **Morphological and Electrical Differences in C-Axis-Aligned Crystalline IGZO Films Based on the Sputtering Method**
Takuya Kawata, Semiconductor Energy Laboratory Co., Ltd., Kanagawa, Japan

P.53: **Novel Process for Cover Glass with Ideal Stress Distribution**
Mutsumu Fukada, Nippon Electric Glass Co., Ltd., Shiga, Japan

P.54: **Glass Substrate for LTPS-TFTs with Precisely Controlled Thermal Shrinkage**
Kazutaka Hayashi, Asahi Glass Co., Ltd., Yokohama, Japan

P.55: **Ga and In Co-Doped Zinc-Oxide Films Deposited on Flexible High-Gas-Barrier Films for a Transparent Conductive Electrode**
Koichi Nagamoto, Lintec Corp., Saitama, Japan

P.56: **Environmently Friendly Copper Metallization for IGZO and LTPS with New Molybdenum Barrier Layer**
Jong Hyun Seo, Korea Aerospace University, Goyang, South Korea

P.57: **A Sponge Design for the Breakage of a TFT-LCD Pad in Reliability Testing**
Xijun An, Beijing BOE Optoelectronics Co., Ltd., Beijing, China

P.58: **Damage Introduction of Ion-Exchanged Glass under Dynamic Loading Conditions**
G. Glaesemann, Corning Incorporated, Corning, NY, USA

P.59: **Toward High-Resolution Ink-Jet-Printed Quantum-Dot LEDs for Next-Generation Displays**
Changhee Lee, Seoul National University, Seoul, South Korea

P.60: **High-Strength Damage-Resistant Display Panels**
K. Hemanth Vepakomma, Corning Incorporated, Corning, NY, USA

P.201L: ***Late-News Poster:*** **Modeling and Improvement of an Invisible ITO Pattern above a Touch Screen**
Dezhi Xu, BOE Hefei Xinsheng Optoelectronics Technology Co., Ltd., Hefei, China

Display Measurement

P.61: **Advanced Method for Curved-Display Cell-Gap Measurement**
Wang-Shuo Kao, AU Optronics Corp., Hsinchu, Taiwan, ROC

P.62: **Parameter-Optimized Simple-Matrix-Display Color Device Model with Piece-Wise-Continuous Signal Non-Linear Transforms**
Senfar Wen, Yuan Ze University, Chung-Li, Taiwan, ROC

P.63: **Analysis of Light Leakage in Light-Guide Plates Used for Autostereoscopic Displays**
Seondeok Hwang, Samsung Electronics Co., Suwon, South Korea

P.64: **Ultra-Uniform Oblong Integrating Light Source**
Edward Kelley, KELTEK, Longmont, CO, USA

P.65: **Photobiological Safety Classification and Measurement for Electronic Display Devices**
Bo Qiao, Sensing Instruments Co., Ltd., Zhejiang, China

P.195L: ***Late-News Poster:*** **A Head-Position Model-Based Latency Measurement System for Virtual-Reality Head-Mounted Displays**
Song-Woo Choi, Sogang University, Seoul, South Korea

Display Systems

AR/VR

P.66: **Optimization of Near-to-Eye Light-Field Displays Based on the Subpixel Structure of LCDs**
Mali Liu, Zhejiang University, Hangzhou, China

P.67: **Wide-Bandwidth Reflective Microshutter Blind Panel for Transparent OLEDs**
Jun-Bo Yoon, KAIST, Daejeon, South Korea

Autostereoscopic Displays

P.68: **A Dual-Side Floating Autostereoscopic 3D Display Based on a Micro-Prism Array and Lenticular Sheet**
Wang Hua, Sichuan University, Chengdu, China

P.69: **Studies on 2D/3D Switchable Autostereoscopic Display with Spatial and Sequential Hybrid Control Using PDLC Films**
Jiahui Wang, Sun Yat-Sen University, Guangzhou, China

P.70: **Light-Shifted Light-Guide Plate for a Simple Multi-View Spatial/Temporal Hybrid Autostereoscopic Display**
Jun-Bo Yoon, KAIST, Daejeon, South Korea

Backlights

P.71: **Encoding Saliency Information in Video Sequences and Its Application to Backlight Scaling of HDR LCDs**
Jae-Sung Park, Seoul National University, Seoul, South Korea

P.72: **Ultra-Thin Edge-Type Single-Sheet Backlight Unit for Seamless Two-Dimensional Local Dimming**
Jun-Bo Yoon, KAIST, Daejeon, South Korea

P.73: **Intelligent Privacy: A Context-Aware Illumination System for Sensitive Data**
Eric Sommerlade, RealD Research Europe, Oxford, UK

P.74: **Quantum-Dot-Enhanced LCDs with Wide Color Gamut and Broad Angular Luminance Distribution**
Haiwei Chen, University of Central Florida, Orlando, FL, USA

P.188L: **WITHDRAWN**

Digital-Signage Displays

P.75: **Turn-Type Color 3D Movie Display System Using Arrays of LEDs**
Takahiro Mizuno, Industrial Research Institute of Ishikawa, Kanazawa, Japan

P.76: **Polarization-Controllable Light Printer for an Optically Rewritable LCD**
Wanlong Zhang, Hong Kong University of Science and Technology, Kowloon, Hong Kong

P.77: **Long-Term Effects of Dynamic Driving on LED Video Screens**
Jorge Bravo, NanoLumens, Inc., Norcross, GA, USA

P.78: **WITHDRAWN**

Holographic and Light-Field Displays

P.79: **A Multi-Plane Holographic Display System Free of Light Artifacts**
Wang Hua, Sichuan University, Chengdu, China

P.80: **A Color Holographic Magnification System Using Spatial Light Modulators**
Wang Hua, Sichuan University, Chengdu, China

P.81: **Two Options for a Holographic Magnification System**
Wang Hua, Sichuan University, Chengdu, China

P.82: **A Refocusing Algorithm in an Integral-Imaging Display with a Tunable Central Depth Plane**
Wang Hua, Sichuan University, Chengdu, China

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